

bra: $\langle s, \uparrow |, \langle s, \downarrow |$
ket: $= |s, \uparrow \rangle, |s, \downarrow \rangle$

Table 1: (s,s) block.

| No. | multipole | matrix |
|-----|----------------------------------|---|
| 1 | symmetry | 1 |
| | $\mathbb{Q}_0^{(a)}(A_1)$ | $\begin{bmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \end{bmatrix}$ |
| 2 | symmetry | z |
| | $\mathbb{M}_1^{(1,-1;a)}(A_2)$ | $\begin{bmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & -\frac{\sqrt{2}}{2} \end{bmatrix}$ |
| 3 | symmetry | x |
| | $\mathbb{M}_{1,0}^{(1,-1;a)}(E)$ | $\begin{bmatrix} 0 & \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & 0 \end{bmatrix}$ |
| 4 | symmetry | y |
| | $\mathbb{M}_{1,1}^{(1,-1;a)}(E)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{2}i}{2} \\ \frac{\sqrt{2}i}{2} & 0 \end{bmatrix}$ |

bra: $\langle s, \uparrow |, \langle s, \downarrow |$
ket: $= |p_x, \uparrow \rangle, |p_x, \downarrow \rangle, |p_y, \uparrow \rangle, |p_y, \downarrow \rangle, |p_z, \uparrow \rangle, |p_z, \downarrow \rangle$

Table 2: (s,p) block.

| No. | multipole | matrix |
|-----|-----------------------------|--|
| 5 | symmetry | z |
| | $\mathbb{Q}_1^{(a)}(A_2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ |
| 6 | symmetry | x |
| | $\mathbb{Q}_{1,0}^{(a)}(E)$ | $\begin{bmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$ |

continued ...

Table 2

| No. | multipole | matrix |
|-----|-----------|--|
| 7 | symmetry | y $\mathbb{Q}_{1,1}^{(a)}(E)$ $\begin{bmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \end{bmatrix}$ |
| 8 | symmetry | z $\mathbb{Q}_1^{(1,0;a)}(A_2)$ $\begin{bmatrix} 0 & -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 9 | symmetry | x $\mathbb{Q}_{1,0}^{(1,0;a)}(E)$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & -\frac{\sqrt{2}}{4} & 0 \end{bmatrix}$ |
| 10 | symmetry | y $\mathbb{Q}_{1,1}^{(1,0;a)}(E)$ $\begin{bmatrix} \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 11 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\mathbb{G}_2^{(1,-1;a)}(A_1)$ $\begin{bmatrix} 0 & -\frac{\sqrt{6}i}{12} & 0 & -\frac{\sqrt{6}}{12} & \frac{\sqrt{6}i}{6} & 0 \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}i}{6} \end{bmatrix}$ |
| 12 | symmetry | $\sqrt{3}yz$ $\mathbb{G}_{2,0}^{(1,-1;a)}(E, 1)$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & -\frac{\sqrt{2}}{4} & 0 \end{bmatrix}$ |
| 13 | symmetry | $-\sqrt{3}xz$ $\mathbb{G}_{2,1}^{(1,-1;a)}(E, 1)$ $\begin{bmatrix} -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 14 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\mathbb{G}_{2,0}^{(1,-1;a)}(E, 2)$ $\begin{bmatrix} 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 15 | symmetry | $-\sqrt{3}xy$ $\mathbb{G}_{2,1}^{(1,-1;a)}(E, 2)$ $\begin{bmatrix} 0 & -\frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 16 | symmetry | 1 |

continued ...

Table 2

| No. | multipole | matrix |
|-----|-------------------------------|--|
| | $\mathbb{G}_0^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \end{bmatrix}$ |
| 17 | symmetry | z $\mathbb{T}_1^{(a)}(A_2)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \end{bmatrix}$ |
| 18 | symmetry | x $\mathbb{T}_{1,0}^{(a)}(E)$ $\begin{bmatrix} \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 19 | symmetry | y $\mathbb{T}_{1,1}^{(a)}(E)$ $\begin{bmatrix} 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 & 0 \end{bmatrix}$ |
| 20 | symmetry | z $\mathbb{T}_1^{(1,0;a)}(A_2)$ $\begin{bmatrix} 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 21 | symmetry | x $\mathbb{T}_{1,0}^{(1,0;a)}(E)$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & \frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 22 | symmetry | y $\mathbb{T}_{1,1}^{(1,0;a)}(E)$ $\begin{bmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \end{bmatrix}$ |
| 23 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\mathbb{M}_2^{(1,-1;a)}(A_1)$ $\begin{bmatrix} 0 & -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{6} & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{6} \end{bmatrix}$ |
| 24 | symmetry | $\sqrt{3}yz$ $\mathbb{M}_{2,0}^{(1,-1;a)}(E, 1)$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 25 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 2

| No. | multipole | matrix |
|-----|-------------------------------------|--|
| | $\mathbb{M}_{2,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \end{bmatrix}$ |
| 26 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| | $\mathbb{M}_{2,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 27 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{M}_{2,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 28 | symmetry | 1 |
| | $\mathbb{M}_0^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & \frac{\sqrt{3}}{6} & 0 \\ \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} \end{bmatrix}$ |

bra: $= \langle s, \uparrow |, \langle s, \downarrow |$ ket: $|d_u, \uparrow \rangle, |d_u, \downarrow \rangle, |d_{xz}, \uparrow \rangle, |d_{xz}, \downarrow \rangle, |d_{yz}, \uparrow \rangle, |d_{yz}, \downarrow \rangle, |d_{xy}, \uparrow \rangle, |d_{xy}, \downarrow \rangle, |d_v, \uparrow \rangle, |d_v, \downarrow \rangle$

Table 3: (s,d) block.

| No. | multipole | matrix |
|-----|--------------------------------|--|
| 29 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{Q}_2^{(a)}(A_1)$ | $\begin{bmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 30 | symmetry | $\sqrt{3}yz$ |
| | $\mathbb{Q}_{2,0}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 31 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{Q}_{2,1}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \end{bmatrix}$ |
| 32 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 3

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{Q}_{2,0}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 33 | symmetry | $-\sqrt{3}xy$ $\mathbb{Q}_{2,1}^{(a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} \end{bmatrix}$ |
| 34 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\mathbb{Q}_2^{(1,0;a)}(A_1)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 35 | symmetry | $\sqrt{3}yz$ $\mathbb{Q}_{2,0}^{(1,0;a)}(E, 1)$ $\begin{bmatrix} 0 & -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 \end{bmatrix}$ |
| 36 | symmetry | $-\sqrt{3}xz$ $\mathbb{Q}_{2,1}^{(1,0;a)}(E, 1)$ $\begin{bmatrix} 0 & -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 \end{bmatrix}$ |
| 37 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\mathbb{Q}_{2,0}^{(1,0;a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & \frac{\sqrt{6}i}{6} \end{bmatrix}$ |
| 38 | symmetry | $-\sqrt{3}xy$ $\mathbb{Q}_{2,1}^{(1,0;a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 39 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\mathbb{G}_3^{(1,-1;a)}(A_1)$ $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \end{bmatrix}$ |
| 40 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ $\mathbb{G}_3^{(1,-1;a)}(A_2, 1)$ $\begin{bmatrix} \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{10} & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 \end{bmatrix}$ |
| 41 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 3

| No. | multipole | matrix |
|-----|-------------------------------------|--|
| | $\mathbb{G}_3^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 42 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{G}_{3,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{10}i}{10} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & -\frac{\sqrt{30}}{60} \\ \frac{\sqrt{10}i}{10} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{15} & \frac{\sqrt{30}}{60} & 0 \end{bmatrix}$ |
| 43 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{G}_{3,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{10}}{10} & 0 & \frac{\sqrt{30}}{60} & \frac{\sqrt{30}i}{15} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} \\ -\frac{\sqrt{10}}{10} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & -\frac{\sqrt{30}i}{15} & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 \end{bmatrix}$ |
| 44 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{G}_{3,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \end{bmatrix}$ |
| 45 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | $\mathbb{G}_{3,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{bmatrix}$ |
| 46 | symmetry | z |
| | $\mathbb{G}_1^{(1,1;a)}(A_2)$ | $\begin{bmatrix} \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 47 | symmetry | x |
| | $\mathbb{G}_{1,0}^{(1,1;a)}(E)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ -\frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & -\frac{\sqrt{30}}{20} & 0 & 0 \end{bmatrix}$ |
| 48 | symmetry | y |
| | $\mathbb{G}_{1,1}^{(1,1;a)}(E)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{30}}{20} & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} \\ \frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 \end{bmatrix}$ |
| 49 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{T}_2^{(a)}(A_1)$ | $\begin{bmatrix} \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 50 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 3

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{T}_{2,0}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \end{bmatrix}$ |
| 51 | symmetry | $-\sqrt{3}xz$ $\mathbb{T}_{2,1}^{(a)}(E, 1)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \end{bmatrix}$ |
| 52 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\mathbb{T}_{2,0}^{(a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 53 | symmetry | $-\sqrt{3}xy$ $\mathbb{T}_{2,1}^{(a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} \end{bmatrix}$ |
| 54 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\mathbb{T}_2^{(1,0;a)}(A_1)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 55 | symmetry | $\sqrt{3}yz$ $\mathbb{T}_{2,0}^{(1,0;a)}(E, 1)$ $\begin{bmatrix} 0 & -\frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & \frac{\sqrt{6}i}{12} \\ -\frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & -\frac{\sqrt{6}i}{12} & 0 \end{bmatrix}$ |
| 56 | symmetry | $-\sqrt{3}xz$ $\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)$ $\begin{bmatrix} 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \end{bmatrix}$ |
| 57 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\mathbb{T}_{2,0}^{(1,0;a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & \frac{\sqrt{6}}{6} \end{bmatrix}$ |
| 58 | symmetry | $-\sqrt{3}xy$ $\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 59 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 3

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{M}_3^{(1,-1;a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 60 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{M}_3^{(1,-1;a)}(A_2, 1)$ | $\begin{bmatrix} \frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & -\frac{\sqrt{15}}{10} & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 \end{bmatrix}$ |
| 61 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | $\mathbb{M}_3^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \end{bmatrix}$ |
| 62 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{M}_{3,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{10}}{10} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 & \frac{\sqrt{30}i}{60} \\ \frac{\sqrt{10}}{10} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{15} & -\frac{\sqrt{30}i}{60} & 0 \end{bmatrix}$ |
| 63 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{10}i}{10} & 0 & -\frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{15} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} \\ \frac{\sqrt{10}i}{10} & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & -\frac{\sqrt{30}}{60} & 0 \end{bmatrix}$ |
| 64 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{M}_{3,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & \frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} \end{bmatrix}$ |
| 65 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | $\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 66 | symmetry | z |
| | $\mathbb{M}_1^{(1,1;a)}(A_2)$ | $\begin{bmatrix} \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{10} & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 67 | symmetry | x |
| | $\mathbb{M}_{1,0}^{(1,1;a)}(E)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}i}{20} \\ -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & \frac{\sqrt{30}i}{20} & 0 \end{bmatrix}$ |
| 68 | symmetry | y |

continued ...

Table 3

| No. | multipole | matrix |
|-----|---------------------------------|---|
| | $\mathbb{M}_{1,1}^{(1,1;a)}(E)$ | $\begin{bmatrix} 0 & \frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ -\frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \end{bmatrix}$ |

bra: $= \langle s, \uparrow |, \langle s, \downarrow |$ ket: $= |f_{az}, \uparrow \rangle, |f_{az}, \downarrow \rangle, |f_1, \uparrow \rangle, |f_1, \downarrow \rangle, |f_2, \uparrow \rangle, |f_2, \downarrow \rangle, |f_{3x}, \uparrow \rangle, |f_{3x}, \downarrow \rangle, |f_{3y}, \uparrow \rangle, |f_{3y}, \downarrow \rangle, |f_3, \uparrow \rangle, |f_3, \downarrow \rangle, |f_{bz}, \uparrow \rangle, |f_{bz}, \downarrow \rangle$

Table 4: (s,f) block.

| No. | multipole | matrix |
|-----|--------------------------------|--|
| 69 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| | $\mathbb{Q}_3^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 70 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{Q}_3^{(a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 71 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | $\mathbb{Q}_3^{(a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 \end{bmatrix}$ |
| 72 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{Q}_{3,0}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 73 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{Q}_{3,1}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 74 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{Q}_{3,0}^{(a)}(E, 2)$ | $\begin{bmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 75 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 4

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{Q}_{3,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ |
| 76 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| | $\mathbb{Q}_3^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & \frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{16} & 0 & 0 & \frac{\sqrt{2}}{8} \\ \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{16} & -\frac{\sqrt{2}}{8} & 0 \end{bmatrix}$ |
| 77 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{Q}_3^{(1,0;a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 78 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | $\mathbb{Q}_3^{(1,0;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{2}}{8} & \frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ -\frac{\sqrt{2}}{8} & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{16} & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 \end{bmatrix}$ |
| 79 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{Q}_{3,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{30}i}{24} & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{30}i}{48} & 0 & 0 & -\frac{\sqrt{30}}{24} \\ \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & \frac{\sqrt{30}}{24} & 0 \end{bmatrix}$ |
| 80 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{Q}_{3,1}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{30}}{24} & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & -\frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{24} \\ \frac{\sqrt{30}}{24} & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & -\frac{\sqrt{30}i}{24} & 0 \end{bmatrix}$ |
| 81 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{Q}_{3,0}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \end{bmatrix}$ |
| 82 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | $\mathbb{Q}_{3,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{6} & \frac{\sqrt{5}}{8} & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & 0 \end{bmatrix}$ |
| 83 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |
| | $\mathbb{G}_4^{(1,-1;a)}(A_1, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & \frac{3\sqrt{7}}{56} & \frac{\sqrt{7}i}{7} & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & -\frac{\sqrt{7}i}{7} & \frac{\sqrt{105}i}{56} & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 \end{bmatrix}$ |
| 84 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 4

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{G}_4^{(1,-1;a)}(A_1, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & \frac{\sqrt{6}}{8} \\ \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & -\frac{\sqrt{6}}{8} & 0 \end{bmatrix}$ |
| 85 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
| | $\mathbb{G}_4^{(1,-1;a)}(A_2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{6}}{8} & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} \\ \frac{\sqrt{6}}{8} & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & \frac{\sqrt{6}i}{8} & 0 \end{bmatrix}$ |
| 86 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| | $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{3\sqrt{70}i}{112} & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & \frac{5\sqrt{42}i}{112} & 0 & 0 & \frac{\sqrt{42}}{56} \\ -\frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}i}{112} & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & -\frac{5\sqrt{42}i}{112} & -\frac{\sqrt{42}}{56} & 0 \end{bmatrix}$ |
| 87 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| | $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{42}}{56} & \frac{3\sqrt{70}i}{112} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{28} & \frac{5\sqrt{42}i}{112} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} \\ -\frac{\sqrt{42}}{56} & 0 & 0 & -\frac{3\sqrt{70}i}{112} & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 & -\frac{5\sqrt{42}i}{112} & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 \end{bmatrix}$ |
| 88 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |
| | $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & \frac{\sqrt{3}}{8} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 89 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 90 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & -\frac{\sqrt{21}}{28} & \frac{\sqrt{21}i}{14} & 0 \\ 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}i}{14} \end{bmatrix}$ |
| 91 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| | $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} -\frac{\sqrt{21}i}{14} & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & \frac{3\sqrt{21}}{56} & 0 & -\frac{3\sqrt{21}i}{56} & 0 & 0 \\ 0 & \frac{\sqrt{21}i}{14} & -\frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & -\frac{3\sqrt{21}}{56} & 0 & -\frac{3\sqrt{21}i}{56} & 0 & 0 & 0 \end{bmatrix}$ |
| 92 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{G}_2^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & -\frac{\sqrt{21}}{28} & \frac{\sqrt{21}i}{14} & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & \frac{\sqrt{35}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}i}{14} & -\frac{\sqrt{35}i}{28} & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| 93 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 4

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{G}_{2,0}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{105}}{42} \\ \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & \frac{\sqrt{105}}{42} & 0 \end{bmatrix}$ |
| 94 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{G}_{2,1}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{105}}{42} & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} \\ \frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 \end{bmatrix}$ |
| 95 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| | $\mathbb{G}_{2,0}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{7}i}{28} & 0 & -\frac{3\sqrt{7}}{28} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & -\frac{\sqrt{105}}{84} & \frac{\sqrt{105}i}{42} & 0 \\ 0 & 0 & \frac{3\sqrt{7}i}{28} & 0 & \frac{3\sqrt{7}}{28} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{\sqrt{105}i}{42} \end{bmatrix}$ |
| 96 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{G}_{2,1}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} -\frac{\sqrt{105}i}{42} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{42} & -\frac{\sqrt{7}}{14} & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 97 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| | $\mathbb{T}_3^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 98 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{T}_3^{(a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 99 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | $\mathbb{T}_3^{(a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 \end{bmatrix}$ |
| 100 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{T}_{3,0}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 101 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{T}_{3,1}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 102 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 4

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{T}_{3,0}^{(a)}(E, 2)$ | $\begin{bmatrix} \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 103 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | $\mathbb{T}_{3,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \end{bmatrix}$ |
| 104 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| | $\mathbb{T}_3^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{16} & \frac{\sqrt{2}i}{8} & 0 & 0 \end{bmatrix}$ |
| 105 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{T}_3^{(1,0;a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & \frac{\sqrt{5}}{8} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 106 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | $\mathbb{T}_3^{(1,0;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{2}i}{8} & \frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} \\ \frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 \end{bmatrix}$ |
| 107 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{T}_{3,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{30}}{24} & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & \frac{\sqrt{30}i}{24} \\ \frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & -\frac{\sqrt{30}i}{24} & 0 \end{bmatrix}$ |
| 108 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{T}_{3,1}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{30}i}{24} & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{24} \\ -\frac{\sqrt{30}i}{24} & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & 0 & -\frac{\sqrt{30}}{24} & 0 \end{bmatrix}$ |
| 109 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{T}_{3,0}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & \frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} \end{bmatrix}$ |
| 110 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | $\mathbb{T}_{3,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & \frac{\sqrt{3}}{24} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{5}i}{8} & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & 0 \end{bmatrix}$ |
| 111 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 4

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{M}_4^{(1,-1;a)}(A_1, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & -\frac{3\sqrt{7}i}{56} & \frac{\sqrt{7}}{7} & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & -\frac{\sqrt{7}}{7} & \frac{\sqrt{105}}{56} & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 \end{bmatrix}$ |
| 112 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| | $\mathbb{M}_4^{(1,-1;a)}(A_1, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{6}}{8} & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & -\frac{\sqrt{6}i}{8} \\ \frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & \frac{\sqrt{6}i}{8} & 0 \end{bmatrix}$ |
| 113 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
| | $\mathbb{M}_4^{(1,-1;a)}(A_2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{6}i}{8} & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{8} \\ -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & \frac{\sqrt{6}}{8} & 0 \end{bmatrix}$ |
| 114 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| | $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & -\frac{3\sqrt{70}}{112} & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 & \frac{5\sqrt{42}}{112} & 0 & 0 & -\frac{\sqrt{42}i}{56} \\ -\frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}}{112} & \frac{\sqrt{70}i}{28} & 0 & 0 & 0 & -\frac{5\sqrt{42}}{112} & \frac{\sqrt{42}i}{56} & 0 \end{bmatrix}$ |
| 115 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{42}i}{56} & \frac{3\sqrt{70}}{112} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & \frac{5\sqrt{42}}{112} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{56} \\ \frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{3\sqrt{70}}{112} & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & -\frac{5\sqrt{42}}{112} & 0 & 0 & \frac{\sqrt{42}}{56} & 0 \end{bmatrix}$ |
| 116 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |
| | $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{8} & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 117 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 118 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & \frac{\sqrt{21}i}{28} & \frac{\sqrt{21}}{14} & 0 \\ 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{21}}{14} \end{bmatrix}$ |
| 119 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} -\frac{\sqrt{21}}{14} & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & -\frac{3\sqrt{21}i}{56} & 0 & -\frac{3\sqrt{21}}{56} & 0 & 0 \\ 0 & \frac{\sqrt{21}}{14} & \frac{\sqrt{35}i}{56} & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & \frac{3\sqrt{21}i}{56} & 0 & -\frac{3\sqrt{21}}{56} & 0 & 0 & 0 \end{bmatrix}$ |
| 120 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 4

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{M}_2^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & \frac{\sqrt{21}i}{28} & \frac{\sqrt{21}}{14} & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{21}}{14} & -\frac{\sqrt{35}}{28} & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| 121 | symmetry | $\sqrt{3}yz$ |
| | $\mathbb{M}_{2,0}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & \frac{\sqrt{105}i}{42} \\ \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & -\frac{\sqrt{105}i}{42} & 0 & 0 \end{bmatrix}$ |
| 122 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{M}_{2,1}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{105}i}{42} & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} \\ -\frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 \end{bmatrix}$ |
| 123 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| | $\mathbb{M}_{2,0}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{7}}{28} & 0 & \frac{3\sqrt{7}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & \frac{\sqrt{105}i}{84} & \frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & \frac{3\sqrt{7}}{28} & 0 & -\frac{3\sqrt{7}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & -\frac{\sqrt{105}}{42} \end{bmatrix}$ |
| 124 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{M}_{2,1}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} -\frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{105}}{42} & 0 & 0 \\ 0 & \frac{\sqrt{105}}{42} & \frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 \end{bmatrix}$ |

bra: = $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$ ket: = $|p_x, \uparrow \rangle, |p_x, \downarrow \rangle, |p_y, \uparrow \rangle, |p_y, \downarrow \rangle, |p_z, \uparrow \rangle, |p_z, \downarrow \rangle$

Table 5: (p,p) block.

| No. | multipole | matrix |
|-----|---------------------------|--|
| 125 | symmetry | 1 |
| | $\mathbb{Q}_0^{(a)}(A_1)$ | $\begin{bmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{bmatrix}$ |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|--|
| 126 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} \end{bmatrix}$ |
| 127 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \end{bmatrix}$ |
| 128 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{1}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 129 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 130 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 5

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | $\mathbb{Q}_{2,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ -\frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 131 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 132 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 133 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \end{bmatrix}$ |
| 134 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 135 | symmetry | $-\sqrt{3}xy$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 136 | symmetry | 1 |
| | | $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}}{6} & 0 \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{bmatrix}$ |
| 137 | symmetry | z |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 138 | symmetry | x |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 139 | symmetry | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{bmatrix}$ |
| 140 | symmetry | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 141 | symmetry | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \end{bmatrix}$ |
| 142 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{6}i}{6} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & -\frac{\sqrt{6}i}{6} & 0 \end{bmatrix}$ |
| 143 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| | | $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 144 | symmetry | $-\sqrt{3}xy$ |
| | | $\begin{bmatrix} -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 145 | symmetry | z |
| | | $\begin{bmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 146 | symmetry | x |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \end{bmatrix}$ |
| 147 | symmetry | y $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 148 | symmetry | z $\begin{bmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \end{bmatrix}$ |
| 149 | symmetry | x $\begin{bmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{bmatrix}$ |
| 150 | symmetry | y |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \end{bmatrix}$ |
| 151 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 152 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | | $\begin{bmatrix} -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{10} & \frac{\sqrt{5}}{5} & 0 \\ -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}}{5} \end{bmatrix}$ |
| 153 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 154 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{15} & 0 \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{15} \\ 0 & \frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{15} \\ 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & \frac{\sqrt{30}}{15} & 0 \end{bmatrix}$ |
| 155 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | | $\begin{bmatrix} 0 & \frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{15} & 0 \\ -\frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{15} \\ 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 & -\frac{\sqrt{30}i}{15} \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{15} & \frac{\sqrt{30}i}{15} & 0 \end{bmatrix}$ |
| 156 | symmetry | $\sqrt{15}xyz$ |
| | | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \end{bmatrix}$ |
| 157 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | | $\begin{bmatrix} \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{bmatrix}$ |
| 158 | symmetry | z |

continued ...

Table 5

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} -\frac{\sqrt{30}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & \frac{\sqrt{30}}{30} & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{30}i}{20} \\ 0 & 0 & 0 & \frac{\sqrt{30}}{30} & \frac{\sqrt{30}i}{20} & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{15} & 0 \\ \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{15} \end{bmatrix}$ |
| 159 | symmetry | x $\begin{bmatrix} 0 & \frac{\sqrt{30}}{15} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{15} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{30} & 0 \end{bmatrix}$ |
| 160 | symmetry | y $\begin{bmatrix} 0 & \frac{\sqrt{30}i}{30} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \\ -\frac{\sqrt{30}i}{30} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{15} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & \frac{\sqrt{30}i}{30} \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & -\frac{\sqrt{30}i}{30} & 0 \end{bmatrix}$ |
| | | $\mathbb{M}_1^{(1,1;a)}(E)$ |

bra: = $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$ ket: = $|d_u, \uparrow \rangle, |d_u, \downarrow \rangle, |d_{xz}, \uparrow \rangle, |d_{xz}, \downarrow \rangle, |d_{yz}, \uparrow \rangle, |d_{yz}, \downarrow \rangle, |d_{xy}, \uparrow \rangle, |d_{xy}, \downarrow \rangle, |d_v, \uparrow \rangle, |d_v, \downarrow \rangle$

Table 6: (p,d) block.

| No. | multipole | matrix |
|-----|-----------|--------|
| 161 | symmetry | z |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 162 | symmetry | x $\begin{bmatrix} -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \end{bmatrix}$ |
| 163 | symmetry | y $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ -\frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 164 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 165 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 166 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 167 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{10}}{10} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}}{10} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 \end{bmatrix}$ |
| 168 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} \\ \frac{\sqrt{10}}{10} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}}{10} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 169 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \end{bmatrix}$ |
| 170 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 171 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \end{bmatrix}$ |
| 172 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{30}}{60} & -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{60} \\ \frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 \\ 0 & \frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{60} \\ \frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 \end{bmatrix}$ |
| 173 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{Q}_3^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \end{bmatrix}$ |
| 174 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{Q}_{3,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{12} & 0 & -\frac{\sqrt{5}}{60} & -\frac{\sqrt{5}i}{15} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{12} & 0 & \frac{\sqrt{5}}{60} & 0 & 0 & \frac{\sqrt{5}i}{15} \\ -\frac{\sqrt{15}i}{15} & 0 & \frac{\sqrt{5}i}{15} & 0 & 0 & \frac{\sqrt{5}}{60} & 0 & \frac{7\sqrt{5}i}{60} & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{15} & 0 & -\frac{\sqrt{5}i}{15} & -\frac{\sqrt{5}}{60} & 0 & \frac{7\sqrt{5}i}{60} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{30} & \frac{\sqrt{5}i}{15} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{30} \\ 0 & 0 & -\frac{\sqrt{5}}{30} & 0 & 0 & -\frac{\sqrt{5}i}{15} & 0 & 0 & -\frac{\sqrt{5}i}{30} & 0 \end{bmatrix}$ |
| 175 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{Q}_{3,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{15}i}{15} & 0 & \frac{\sqrt{5}i}{15} & 0 & 0 & -\frac{7\sqrt{5}}{60} & 0 & -\frac{\sqrt{5}i}{60} & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{15} & 0 & -\frac{\sqrt{5}i}{15} & \frac{7\sqrt{5}}{60} & 0 & -\frac{\sqrt{5}i}{60} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{60} & 0 & \frac{\sqrt{5}}{12} & \frac{\sqrt{5}i}{15} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{60} & 0 & -\frac{\sqrt{5}}{12} & 0 & 0 & -\frac{\sqrt{5}i}{15} \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{30} & 0 & 0 & -\frac{\sqrt{5}i}{15} & 0 & 0 & \frac{\sqrt{5}}{30} \\ 0 & 0 & \frac{\sqrt{5}i}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{15} & -\frac{\sqrt{5}}{30} & 0 \end{bmatrix}$ |
| 176 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{Q}_{3,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}}{12} \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{12} & \frac{\sqrt{2}}{12} & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{2}}{12} & -\frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{12} \\ \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{6} & 0 & 0 & \frac{\sqrt{2}}{12} & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{6} & -\frac{\sqrt{2}}{12} & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 177 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{2}}{12} & -\frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{12} \\ \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{2}}{12} & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}i}{12} & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}}{12} \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{12} & \frac{\sqrt{2}}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & \frac{\sqrt{2}}{12} & \frac{\sqrt{2}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & -\frac{\sqrt{2}i}{6} \end{bmatrix}$ |
| 178 | symmetry | $\begin{bmatrix} 0 & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 \\ 0 & -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} \\ -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 179 | symmetry | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & \frac{\sqrt{15}i}{20} \\ \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 180 | symmetry | $\begin{bmatrix} -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \end{bmatrix}$ |
| 181 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & \frac{\sqrt{6}}{24} & -\frac{\sqrt{6}i}{8} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & \frac{\sqrt{6}i}{8} \\ 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{8} & \frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} \\ 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 \end{bmatrix}$ |
| 182 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{15}}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{60} \\ \frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{15}}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{60} & 0 \\ 0 & \frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{15}i}{60} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{60} \\ \frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{15}i}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{15} & 0 & -\frac{\sqrt{15}}{15} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{15} & 0 & \frac{\sqrt{15}}{15} & 0 & 0 \end{bmatrix}$ |
| 183 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & -\frac{\sqrt{6}}{24} & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & \frac{\sqrt{6}}{24} & -\frac{\sqrt{6}i}{8} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & \frac{\sqrt{6}i}{8} \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} \\ 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 \end{bmatrix}$ |
| 184 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{24} & 0 & -\frac{11\sqrt{10}}{120} & \frac{\sqrt{10}i}{120} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{24} & 0 & \frac{11\sqrt{10}}{120} & 0 & 0 & -\frac{\sqrt{10}i}{120} \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{10}i}{120} & 0 & 0 & -\frac{\sqrt{10}}{120} & 0 & \frac{\sqrt{10}i}{24} & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{120} & \frac{\sqrt{10}}{120} & 0 & \frac{\sqrt{10}i}{24} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{10}}{24} & -\frac{\sqrt{10}i}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{24} \\ -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{10}}{24} & 0 & 0 & \frac{\sqrt{10}i}{30} & 0 & 0 & \frac{\sqrt{10}i}{24} & 0 \end{bmatrix}$ |
| 185 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} \frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{10}i}{120} & 0 & 0 & -\frac{\sqrt{10}}{24} & 0 & \frac{\sqrt{10}i}{120} & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{120} & \frac{\sqrt{10}}{24} & 0 & \frac{\sqrt{10}i}{120} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{11\sqrt{10}i}{120} & 0 & -\frac{\sqrt{10}}{24} & -\frac{\sqrt{10}i}{120} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{11\sqrt{10}i}{120} & 0 & \frac{\sqrt{10}}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 & \frac{\sqrt{10}i}{30} & 0 & 0 & -\frac{\sqrt{10}}{24} \\ -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{30} & \frac{\sqrt{10}}{24} & 0 \end{bmatrix}$ |
| 186 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & 0 & 0 & \frac{i}{6} & 0 & 0 & -\frac{1}{6} \\ -\frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & 0 & 0 & 0 & 0 & -\frac{i}{6} & \frac{1}{6} & 0 \\ 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & -\frac{i}{6} & 0 & 0 & 0 & 0 & \frac{i}{6} \\ -\frac{\sqrt{3}}{12} & 0 & \frac{1}{12} & 0 & 0 & \frac{i}{6} & 0 & 0 & \frac{i}{6} & 0 \\ 0 & 0 & \frac{i}{6} & 0 & 0 & \frac{1}{6} & 0 & -\frac{i}{6} & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{6} & -\frac{1}{6} & 0 & -\frac{i}{6} & 0 & 0 & 0 \end{bmatrix}$ |
| 187 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{1}{6} & -\frac{i}{6} & 0 & 0 & 0 & 0 & \frac{i}{12} \\ -\frac{\sqrt{3}}{12} & 0 & \frac{1}{6} & 0 & 0 & \frac{i}{6} & 0 & 0 & \frac{i}{12} & 0 \\ 0 & \frac{\sqrt{3}i}{12} & 0 & \frac{i}{6} & 0 & 0 & -\frac{i}{6} & 0 & 0 & \frac{1}{12} \\ \frac{\sqrt{3}i}{12} & 0 & \frac{i}{6} & 0 & 0 & 0 & 0 & \frac{i}{6} & -\frac{1}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{6} & 0 & \frac{1}{6} & -\frac{i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{6} & 0 & -\frac{1}{6} & 0 & 0 \end{bmatrix}$ |
| 188 | symmetry | z $\begin{bmatrix} 0 & \frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{5}}{20} & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} \\ -\frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 \\ 0 & -\frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{5}}{20} \\ -\frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & -\frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{5}}{20} & 0 & 0 \end{bmatrix}$ |
| 189 | symmetry | x |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & -\frac{\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & \frac{\sqrt{5}i}{20} \\ -\frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{20} & 0 & -\frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 \end{bmatrix}$ |
| 190 | symmetry | y $\begin{bmatrix} \frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{20} & 0 & -\frac{\sqrt{5}i}{20} & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{10} & 0 \end{bmatrix}$ |
| 191 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 192 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} -\frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \end{bmatrix}$ |
| 193 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 194 | $\mathbb{G}_{2,1}^{(a)}(E, 1)$ | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \end{bmatrix}$ |
| 195 | $\mathbb{G}_{2,0}^{(a)}(E, 2)$ | symmetry $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 196 | $\mathbb{G}_{2,1}^{(a)}(E, 2)$ | symmetry $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 197 | $\mathbb{G}_2^{(1,-1;a)}(A_1)$ | symmetry $\begin{bmatrix} 0 & \frac{\sqrt{15}i}{60} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}}{20} \\ \frac{\sqrt{15}i}{60} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & \frac{\sqrt{5}}{20} & 0 \\ 0 & \frac{\sqrt{15}}{60} & 0 & \frac{\sqrt{5}}{20} & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} \\ -\frac{\sqrt{15}}{60} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 \\ \frac{\sqrt{15}i}{15} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{15} & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 197 | | $\sqrt{3}yz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{G}_{2,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & \frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 198 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{G}_{2,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 199 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| | $\mathbb{G}_{2,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} \\ -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 \end{bmatrix}$ |
| 200 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{G}_{2,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} \\ \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 201 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------------------------------|---|
| | $\mathbb{G}_4^{(1,-1;a)}(A_1, 1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{70} & 0 & \frac{\sqrt{35}i}{140} & 0 & 0 & -\frac{\sqrt{35}i}{35} & 0 & 0 & \frac{\sqrt{35}}{140} \\ -\frac{\sqrt{105}i}{70} & 0 & \frac{\sqrt{35}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{35} & -\frac{\sqrt{35}}{140} & 0 \\ 0 & -\frac{\sqrt{105}}{70} & 0 & -\frac{\sqrt{35}}{140} & -\frac{\sqrt{35}i}{35} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{140} \\ \frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{35}}{140} & 0 & 0 & \frac{\sqrt{35}i}{35} & 0 & 0 & \frac{\sqrt{35}i}{140} & 0 \\ \frac{\sqrt{105}i}{35} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{35} & 0 & -\frac{\sqrt{35}i}{35} & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{35} & 0 & 0 & \frac{\sqrt{35}}{35} & 0 & -\frac{\sqrt{35}i}{35} & 0 & 0 & 0 \end{bmatrix}$ |
| 202 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{8} & \frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & \frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} \\ 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 \end{bmatrix}$ |
| 203 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & \frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & -\frac{\sqrt{2}}{8} & -\frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{2}i}{8} \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} \\ 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 \end{bmatrix}$ |
| 204 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & -\frac{\sqrt{14}i}{56} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & \frac{\sqrt{14}i}{56} \\ \frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & -\frac{3\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{28} & 0 & -\frac{\sqrt{14}i}{56} & \frac{3\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{14}}{56} & \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} \\ -\frac{\sqrt{42}}{28} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 \end{bmatrix}$ |
| 205 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & \frac{3\sqrt{14}i}{56} & 0 & 0 \\ 0 & \frac{\sqrt{42}i}{28} & 0 & -\frac{\sqrt{14}i}{56} & -\frac{\sqrt{14}}{56} & 0 & \frac{3\sqrt{14}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & \frac{\sqrt{14}i}{56} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{14}i}{56} \\ 0 & -\frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & \frac{\sqrt{14}}{56} \\ -\frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{14} & -\frac{\sqrt{14}}{56} & 0 \end{bmatrix}$ |
| 206 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| | $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} \\ 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} & 0 \\ 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} \\ 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 207 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} & 0 \\ 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} \\ 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 208 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2 + y^2 - 6z^2)}{4}$ |
| | $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & \frac{\sqrt{21}i}{28} & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 \\ \frac{\sqrt{21}i}{28} & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 \\ 0 & -\frac{\sqrt{21}}{28} & 0 & -\frac{\sqrt{7}}{28} & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{21}}{28} & 0 & \frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & \frac{\sqrt{7}}{14} & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 \end{bmatrix}$ |
| 209 | symmetry | $\frac{\sqrt{5}xy(x^2 + y^2 - 6z^2)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-------------------------------------|--|
| | $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{28} \\ \frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 \\ 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{7}}{28} \\ -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & -\frac{\sqrt{7}}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & -\frac{\sqrt{7}}{14} & -\frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{7}i}{14} \end{bmatrix}$ |
| 210 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{G}_2^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{i}{4} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} \\ \frac{i}{4} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 \\ 0 & \frac{1}{4} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} \\ -\frac{1}{4} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 211 | symmetry | $\sqrt{3}yz$ |
| | $\mathbb{G}_{2,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{i}{3} & 0 & -\frac{1}{12} & -\frac{i}{12} & 0 \\ 0 & 0 & 0 & 0 & \frac{i}{3} & 0 & \frac{1}{12} & 0 & 0 & \frac{i}{12} \\ -\frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & \frac{1}{12} & 0 & -\frac{i}{6} & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & -\frac{1}{12} & 0 & -\frac{i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{6} & \frac{i}{12} & 0 & 0 & 0 & 0 & -\frac{i}{6} \\ 0 & 0 & -\frac{1}{6} & 0 & 0 & -\frac{i}{12} & 0 & 0 & -\frac{i}{6} & 0 \end{bmatrix}$ |
| 212 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{G}_{2,1}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & \frac{1}{6} & 0 & -\frac{i}{12} & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & -\frac{1}{6} & 0 & -\frac{i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{12} & 0 & -\frac{1}{3} & \frac{i}{12} & 0 \\ 0 & 0 & 0 & 0 & \frac{i}{12} & 0 & \frac{1}{3} & 0 & 0 & -\frac{i}{12} \\ 0 & 0 & 0 & \frac{i}{6} & 0 & 0 & -\frac{i}{12} & 0 & 0 & \frac{1}{6} \\ 0 & 0 & \frac{i}{6} & 0 & 0 & 0 & 0 & \frac{i}{12} & -\frac{1}{6} & 0 \end{bmatrix}$ |
| 213 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{G}_{2,0}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & -\frac{i}{6} & 0 & 0 & -\frac{1}{12} \\ \frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & 0 & 0 & \frac{i}{6} & \frac{1}{12} & 0 \\ 0 & -\frac{\sqrt{3}}{12} & 0 & \frac{1}{12} & \frac{i}{6} & 0 & 0 & 0 & 0 & \frac{i}{12} \\ \frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & -\frac{i}{6} & 0 & 0 & \frac{i}{12} & 0 \\ 0 & 0 & \frac{i}{3} & 0 & 0 & \frac{1}{12} & 0 & -\frac{i}{12} & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{3} & -\frac{1}{12} & 0 & -\frac{i}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 214 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{G}_{2,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & \frac{i}{6} & 0 & 0 & 0 & 0 & -\frac{i}{12} \\ \frac{\sqrt{3}}{12} & 0 & \frac{1}{12} & 0 & 0 & -\frac{i}{6} & 0 & 0 & -\frac{i}{12} & 0 \\ 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & \frac{i}{6} & 0 & 0 & -\frac{1}{12} \\ -\frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & 0 & 0 & -\frac{i}{6} & \frac{1}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{12} & 0 & \frac{1}{12} & -\frac{i}{3} & 0 \\ 0 & 0 & 0 & 0 & \frac{i}{12} & 0 & -\frac{1}{12} & 0 & 0 & \frac{i}{3} \end{bmatrix}$ |
| 215 | symmetry | 1 |
| | $\mathbb{G}_0^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & \frac{\sqrt{10}}{20} \\ -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & -\frac{\sqrt{10}}{20} & 0 \\ 0 & -\frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{10}}{20} & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} \\ \frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 \\ \frac{\sqrt{30}i}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{30} & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 216 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{G}_2^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{35}i}{35} & 0 & -\frac{\sqrt{105}i}{210} & 0 & 0 & -\frac{\sqrt{105}i}{70} & 0 & 0 & -\frac{\sqrt{105}}{210} \\ \frac{\sqrt{35}i}{35} & 0 & -\frac{\sqrt{105}i}{210} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{70} & \frac{\sqrt{105}}{210} & 0 \\ 0 & \frac{\sqrt{35}}{35} & 0 & \frac{\sqrt{105}}{210} & -\frac{\sqrt{105}i}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{210} \\ -\frac{\sqrt{35}}{35} & 0 & -\frac{\sqrt{105}}{210} & 0 & 0 & \frac{\sqrt{105}i}{70} & 0 & 0 & -\frac{\sqrt{105}i}{210} & 0 \\ \frac{3\sqrt{35}i}{70} & 0 & 0 & 0 & 0 & \frac{2\sqrt{105}}{105} & 0 & \frac{2\sqrt{105}i}{105} & 0 & 0 \\ 0 & -\frac{3\sqrt{35}i}{70} & 0 & 0 & -\frac{2\sqrt{105}}{105} & 0 & \frac{2\sqrt{105}i}{105} & 0 & 0 & 0 \end{bmatrix}$ |
| 217 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & -\frac{\sqrt{35}}{105} & -\frac{\sqrt{35}i}{105} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}i}{105} \\ \frac{2\sqrt{105}i}{105} & 0 & \frac{\sqrt{35}i}{105} & 0 & 0 & \frac{4\sqrt{35}}{105} & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 \\ 0 & -\frac{2\sqrt{105}i}{105} & 0 & -\frac{\sqrt{35}i}{105} & -\frac{4\sqrt{35}}{105} & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{70} & 0 & -\frac{\sqrt{35}}{42} & \frac{4\sqrt{35}i}{105} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} \\ \frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{4\sqrt{35}i}{105} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 \end{bmatrix}$ |
| 218 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} -\frac{2\sqrt{105}i}{105} & 0 & \frac{\sqrt{35}i}{105} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & -\frac{4\sqrt{35}i}{105} & 0 & 0 \\ 0 & \frac{2\sqrt{105}i}{105} & 0 & -\frac{\sqrt{35}i}{105} & \frac{\sqrt{35}}{42} & 0 & -\frac{4\sqrt{35}i}{105} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{105} & 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{105} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{105} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{105} \\ 0 & \frac{\sqrt{105}i}{70} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{4\sqrt{35}i}{105} & 0 & 0 & -\frac{\sqrt{35}}{42} \\ \frac{\sqrt{105}i}{70} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & \frac{4\sqrt{35}i}{105} & \frac{\sqrt{35}}{42} & 0 \end{bmatrix}$ |
| 219 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{210} & 0 & \frac{4\sqrt{35}i}{105} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{35}}{30} \\ -\frac{\sqrt{105}i}{210} & 0 & \frac{4\sqrt{35}i}{105} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & -\frac{\sqrt{35}}{30} & 0 \\ 0 & \frac{\sqrt{105}}{210} & 0 & \frac{4\sqrt{35}}{105} & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{30} \\ -\frac{\sqrt{105}}{210} & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{35}i}{30} & 0 \\ 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{35}}{105} & 0 & -\frac{\sqrt{35}i}{105} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & -\frac{\sqrt{35}}{105} & 0 & -\frac{\sqrt{35}i}{105} & 0 & 0 & 0 \end{bmatrix}$ |
| 220 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & \frac{\sqrt{105}}{210} & 0 & \frac{\sqrt{35}}{30} & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & -\frac{4\sqrt{35}i}{105} \\ -\frac{\sqrt{105}}{210} & 0 & -\frac{\sqrt{35}}{30} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{4\sqrt{35}i}{105} & 0 \\ 0 & \frac{\sqrt{105}i}{210} & 0 & -\frac{\sqrt{35}i}{30} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{4\sqrt{35}}{105} \\ \frac{\sqrt{105}i}{210} & 0 & -\frac{\sqrt{35}i}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & \frac{4\sqrt{35}}{105} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{105} & 0 & \frac{\sqrt{35}}{105} & -\frac{\sqrt{35}i}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{105} & 0 & -\frac{\sqrt{35}}{105} & 0 & \frac{\sqrt{35}i}{42} \end{bmatrix}$ |
| 221 | symmetry | z |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 222 | symmetry | x $\begin{bmatrix} -\frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 \end{bmatrix}$ |
| 223 | symmetry | y $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} \\ -\frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 224 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 225 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 226 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 227 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | | $\begin{bmatrix} \frac{\sqrt{10}i}{10} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{10} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 \end{bmatrix}$ |
| 228 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} \\ \frac{\sqrt{10}i}{10} & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{10} & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 229 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|--|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \end{bmatrix}$ |
| 230 | $\mathbb{T}_{3,0}^{(a)}(E, 2)$ symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 231 | $\mathbb{T}_{3,1}^{(a)}(E, 2)$ symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \end{bmatrix}$ |
| 232 | $\mathbb{T}_3^{(1,-1;a)}(A_1)$ symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} \\ \frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{60} & 0 \\ 0 & -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{60} \\ -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & \frac{\sqrt{30}i}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 \end{bmatrix}$ |
| 233 | $\mathbb{T}_3^{(1,-1;a)}(A_2, 1)$ symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \end{bmatrix}$ |
| 234 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{12} & 0 & -\frac{\sqrt{5}i}{60} & \frac{\sqrt{5}}{15} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{12} & 0 & \frac{\sqrt{5}i}{60} & 0 & 0 & -\frac{\sqrt{5}}{15} \\ \frac{\sqrt{15}}{15} & 0 & -\frac{\sqrt{5}}{15} & 0 & 0 & \frac{\sqrt{5}i}{60} & 0 & -\frac{7\sqrt{5}}{60} & 0 & 0 \\ 0 & -\frac{\sqrt{15}}{15} & 0 & \frac{\sqrt{5}}{15} & -\frac{\sqrt{5}i}{60} & 0 & -\frac{7\sqrt{5}}{60} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{30} & -\frac{\sqrt{5}}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{30} \\ 0 & 0 & -\frac{\sqrt{5}i}{30} & 0 & 0 & \frac{\sqrt{5}}{15} & 0 & 0 & \frac{\sqrt{5}}{30} & 0 \end{bmatrix}$ |
| 235 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{15}}{15} & 0 & -\frac{\sqrt{5}}{15} & 0 & 0 & -\frac{7\sqrt{5}i}{60} & 0 & \frac{\sqrt{5}}{60} & 0 & 0 \\ 0 & \frac{\sqrt{15}}{15} & 0 & \frac{\sqrt{5}}{15} & \frac{7\sqrt{5}i}{60} & 0 & \frac{\sqrt{5}}{60} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{60} & 0 & \frac{\sqrt{5}i}{12} & -\frac{\sqrt{5}}{15} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{60} & 0 & -\frac{\sqrt{5}i}{12} & 0 & 0 & \frac{\sqrt{5}}{15} \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{30} & 0 & 0 & \frac{\sqrt{5}}{15} & 0 & 0 & \frac{\sqrt{5}i}{30} \\ 0 & 0 & -\frac{\sqrt{5}}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{15} & -\frac{\sqrt{5}i}{30} & 0 \end{bmatrix}$ |
| 236 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & -\frac{\sqrt{2}i}{12} \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{12} & \frac{\sqrt{2}i}{12} & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{2}i}{12} & \frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{12} \\ \frac{\sqrt{6}i}{12} & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{6} & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & \frac{\sqrt{2}}{12} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{6} & -\frac{\sqrt{2}i}{12} & 0 & \frac{\sqrt{2}}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 237 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{6}i}{12} & 0 & -\frac{\sqrt{2}i}{12} & \frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{12} \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & \frac{\sqrt{2}}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & \frac{\sqrt{2}}{12} & 0 & 0 & -\frac{\sqrt{2}i}{12} \\ \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{12} & \frac{\sqrt{2}i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & \frac{\sqrt{2}i}{12} & -\frac{\sqrt{2}}{6} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & \frac{\sqrt{2}}{6} \end{bmatrix}$ |
| 238 | symmetry | $\begin{bmatrix} z \\ \vdots \end{bmatrix}$ $\begin{bmatrix} 0 & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} \\ \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \end{bmatrix}$ |
| 239 | symmetry | $\begin{bmatrix} x \\ \vdots \end{bmatrix}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}}{20} \\ \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 240 | symmetry | $\begin{bmatrix} y \\ \vdots \end{bmatrix}$ $\begin{bmatrix} -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} \\ 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \end{bmatrix}$ |
| 241 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & -\frac{\sqrt{6}i}{24} & -\frac{\sqrt{6}}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & \frac{\sqrt{6}}{24} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{8} & -\frac{\sqrt{6}i}{24} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} \\ 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 \end{bmatrix}$ |
| 242 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | | $\begin{bmatrix} 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{15}i}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{60} \\ -\frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{15}i}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{60} & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{15}}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{60} \\ \frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{15}}{60} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{60} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & \frac{\sqrt{15}i}{15} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & -\frac{\sqrt{15}i}{15} & 0 & 0 \end{bmatrix}$ |
| 243 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & \frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & -\frac{\sqrt{6}i}{24} & -\frac{\sqrt{6}}{8} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & \frac{\sqrt{6}}{8} \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} \\ 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 \end{bmatrix}$ |
| 244 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{24} & 0 & \frac{11\sqrt{10}i}{120} & \frac{\sqrt{10}}{120} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{24} & 0 & -\frac{11\sqrt{10}i}{120} & 0 & 0 \\ -\frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{10}}{120} & 0 & 0 & \frac{\sqrt{10}i}{120} & 0 & \frac{\sqrt{10}}{24} & 0 & 0 \\ 0 & \frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{10}}{120} & -\frac{\sqrt{10}i}{120} & 0 & \frac{\sqrt{10}}{24} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & \frac{\sqrt{10}i}{24} & -\frac{\sqrt{10}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{24} \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 & \frac{\sqrt{10}}{30} & 0 & 0 & \frac{\sqrt{10}}{24} & 0 \end{bmatrix}$ |
| 245 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} \frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{10}}{120} & 0 & 0 & \frac{\sqrt{10}i}{24} & 0 & \frac{\sqrt{10}}{120} & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{10}}{120} & -\frac{\sqrt{10}i}{24} & 0 & \frac{\sqrt{10}}{120} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{11\sqrt{10}}{120} & 0 & \frac{\sqrt{10}i}{24} & -\frac{\sqrt{10}}{120} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{11\sqrt{10}}{120} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{10}}{24} & 0 & 0 & \frac{\sqrt{10}}{30} & 0 & 0 & \frac{\sqrt{10}i}{24} \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{10}}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{30} & -\frac{\sqrt{10}i}{24} & 0 \end{bmatrix}$ |
| 246 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & -\frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & \frac{1}{6} & 0 & 0 & \frac{i}{6} \\ -\frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & 0 & 0 & -\frac{1}{6} & -\frac{i}{6} & 0 \\ 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & -\frac{1}{6} & 0 & 0 & 0 & 0 & \frac{1}{6} \\ \frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & 0 & 0 & \frac{1}{6} & 0 & 0 & \frac{1}{6} & 0 \\ 0 & 0 & \frac{1}{6} & 0 & 0 & -\frac{i}{6} & 0 & -\frac{1}{6} & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{6} & \frac{i}{6} & 0 & -\frac{1}{6} & 0 & 0 & 0 \end{bmatrix}$ |
| 247 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{i}{6} & -\frac{1}{6} & 0 & 0 & 0 & 0 & \frac{1}{12} \\ \frac{\sqrt{3}i}{12} & 0 & -\frac{i}{6} & 0 & 0 & \frac{1}{6} & 0 & 0 & \frac{1}{12} & 0 \\ 0 & \frac{\sqrt{3}}{12} & 0 & \frac{1}{6} & 0 & 0 & -\frac{1}{6} & 0 & 0 & -\frac{i}{12} \\ \frac{\sqrt{3}}{12} & 0 & \frac{1}{6} & 0 & 0 & 0 & 0 & \frac{1}{6} & \frac{i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{6} & 0 & -\frac{i}{6} & -\frac{1}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{6} & 0 & \frac{i}{6} & 0 & 0 \end{bmatrix}$ |
| 248 | symmetry | z $\begin{bmatrix} 0 & \frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} \\ -\frac{\sqrt{15}i}{20} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & \frac{\sqrt{5}}{20} \\ 0 & \frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{20} \\ \frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 249 | symmetry | x |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{20} \\ \frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & -\frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{5}}{20} & \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \end{bmatrix}$ |
| 250 | symmetry | y $\begin{bmatrix} -\frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 \\ 0 & \frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{5}}{20} & -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}i}{10} \\ 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & \frac{\sqrt{5}i}{10} & 0 \end{bmatrix}$ |
| 251 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 252 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \end{bmatrix}$ |
| 253 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 254 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \end{bmatrix}$ |
| 255 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 256 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} 0 & \frac{\sqrt{15}}{60} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{20} \\ \frac{\sqrt{15}}{60} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{20} & 0 \\ 0 & -\frac{\sqrt{15}i}{60} & 0 & -\frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} \\ \frac{\sqrt{15}i}{60} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 \\ \frac{\sqrt{15}}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{15}}{15} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 257 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & \frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & -\frac{\sqrt{15}}{20} \\ -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 258 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} \\ 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 \end{bmatrix}$ |
| 259 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} \\ \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 260 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} \\ \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 261 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{35}}{140} & 0 & 0 & -\frac{\sqrt{35}}{35} & 0 & 0 & -\frac{\sqrt{35}i}{140} \\ -\frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{35}}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{35} & \frac{\sqrt{35}i}{140} & 0 \\ 0 & \frac{\sqrt{105}i}{70} & 0 & \frac{\sqrt{35}i}{140} & -\frac{\sqrt{35}}{35} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{140} \\ -\frac{\sqrt{105}i}{70} & 0 & -\frac{\sqrt{35}i}{140} & 0 & 0 & \frac{\sqrt{35}}{35} & 0 & 0 & \frac{\sqrt{35}}{140} & 0 \\ \frac{\sqrt{105}}{35} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{35} & 0 & -\frac{\sqrt{35}}{35} & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{35} & 0 & 0 & -\frac{\sqrt{35}i}{35} & 0 & -\frac{\sqrt{35}}{35} & 0 & 0 & 0 \end{bmatrix}$ |
| 262 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & -\frac{\sqrt{2}i}{8} & \frac{\sqrt{2}}{8} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{2}}{8} \\ 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & -\frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} \\ 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 \end{bmatrix}$ |
| 263 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & -\frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{8} & -\frac{\sqrt{2}}{8} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & \frac{\sqrt{2}}{8} \\ 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} \\ 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 \end{bmatrix}$ |
| 264 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 & \frac{\sqrt{14}i}{56} & -\frac{\sqrt{14}}{56} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & \frac{\sqrt{14}}{56} \\ \frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & \frac{3\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{28} & 0 & -\frac{\sqrt{14}}{56} & -\frac{3\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{28} & 0 & -\frac{\sqrt{14}i}{56} & \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} \\ \frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 \end{bmatrix}$ |
| 265 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & \frac{3\sqrt{14}}{56} & 0 & 0 \\ 0 & \frac{\sqrt{42}}{28} & 0 & -\frac{\sqrt{14}}{56} & \frac{\sqrt{14}i}{56} & 0 & \frac{3\sqrt{14}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & \frac{\sqrt{14}}{56} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & -\frac{\sqrt{14}i}{56} \\ -\frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{14} & \frac{\sqrt{14}i}{56} & 0 \end{bmatrix}$ |
| 266 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |
| | $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 \\ 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} \\ 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 267 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} & 0 \\ 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 268 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & \frac{\sqrt{21}}{28} & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 \\ \frac{\sqrt{21}}{28} & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 \\ 0 & \frac{\sqrt{21}i}{28} & 0 & \frac{\sqrt{7}i}{28} & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{21}i}{28} & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & -\frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 \end{bmatrix}$ |
| 269 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-------------------------------------|--|
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{28} \\ -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{7}}{28} & 0 \\ 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{7}i}{28} \\ -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & \frac{\sqrt{7}i}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & \frac{\sqrt{7}i}{14} & -\frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{7}}{14} \end{bmatrix}$ |
| 270 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{M}_2^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & -\frac{1}{4} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} \\ -\frac{1}{4} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 \\ 0 & \frac{i}{4} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} \\ -\frac{i}{4} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 271 | symmetry | $\sqrt{3}yz$ |
| | $\mathbb{M}_{2,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{1}{3} & 0 & -\frac{i}{12} & \frac{1}{12} & 0 \\ 0 & 0 & 0 & 0 & -\frac{1}{3} & 0 & \frac{i}{12} & 0 & 0 & -\frac{1}{12} \\ \frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & \frac{i}{12} & 0 & \frac{1}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{12} & 0 & \frac{1}{12} & -\frac{i}{12} & 0 & \frac{1}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{6} & -\frac{1}{12} & 0 & 0 & 0 & 0 & \frac{1}{6} \\ 0 & 0 & -\frac{i}{6} & 0 & 0 & \frac{1}{12} & 0 & 0 & \frac{1}{6} & 0 \end{bmatrix}$ |
| 272 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{M}_{2,1}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & \frac{i}{6} & 0 & \frac{1}{12} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{12} & 0 & \frac{1}{12} & -\frac{i}{6} & 0 & \frac{1}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{12} & 0 & -\frac{i}{3} & -\frac{1}{12} & 0 \\ 0 & 0 & 0 & 0 & -\frac{1}{12} & 0 & \frac{i}{3} & 0 & 0 & \frac{1}{12} \\ 0 & 0 & 0 & -\frac{1}{6} & 0 & 0 & \frac{1}{12} & 0 & 0 & \frac{i}{6} \\ 0 & 0 & -\frac{1}{6} & 0 & 0 & 0 & 0 & -\frac{1}{12} & -\frac{i}{6} & 0 \end{bmatrix}$ |
| 273 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{M}_{2,0}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & \frac{1}{6} & 0 & 0 & -\frac{i}{12} \\ -\frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & 0 & 0 & -\frac{1}{6} & \frac{i}{12} & 0 \\ 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & -\frac{1}{6} & 0 & 0 & 0 & 0 & -\frac{1}{12} \\ \frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & 0 & 0 & \frac{1}{6} & 0 & 0 & -\frac{1}{12} & 0 \\ 0 & 0 & -\frac{1}{3} & 0 & 0 & \frac{i}{12} & 0 & \frac{1}{12} & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{3} & -\frac{i}{12} & 0 & \frac{1}{12} & 0 & 0 & 0 \end{bmatrix}$ |
| 274 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{M}_{2,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{i}{12} & -\frac{1}{6} & 0 & 0 & 0 & 0 & \frac{1}{12} \\ \frac{\sqrt{3}i}{12} & 0 & \frac{i}{12} & 0 & 0 & \frac{1}{6} & 0 & 0 & \frac{1}{12} & 0 \\ 0 & \frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & -\frac{1}{6} & 0 & 0 & -\frac{i}{12} \\ \frac{\sqrt{3}}{12} & 0 & -\frac{1}{12} & 0 & 0 & 0 & 0 & \frac{1}{6} & \frac{i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{12} & 0 & \frac{i}{12} & \frac{1}{3} & 0 \\ 0 & 0 & 0 & 0 & -\frac{1}{12} & 0 & -\frac{i}{12} & 0 & 0 & -\frac{1}{3} \end{bmatrix}$ |
| 275 | symmetry | 1 |
| | $\mathbb{M}_0^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & -\frac{\sqrt{10}i}{20} \\ -\frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & \frac{\sqrt{10}i}{20} & 0 \\ 0 & \frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{20} & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & \frac{\sqrt{10}}{20} & 0 \\ \frac{\sqrt{30}}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| 276 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{M}_2^{(1,1;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{35}}{35} & 0 & -\frac{\sqrt{105}}{210} & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & \frac{\sqrt{105}i}{210} \\ \frac{\sqrt{35}}{35} & 0 & -\frac{\sqrt{105}}{210} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{70} & -\frac{\sqrt{105}i}{210} & 0 \\ 0 & -\frac{\sqrt{35}i}{35} & 0 & -\frac{\sqrt{105}i}{210} & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{210} \\ \frac{\sqrt{35}i}{35} & 0 & \frac{\sqrt{105}i}{210} & 0 & 0 & \frac{\sqrt{105}}{70} & 0 & 0 & -\frac{\sqrt{105}}{210} & 0 \\ \frac{3\sqrt{35}}{70} & 0 & 0 & 0 & 0 & -\frac{2\sqrt{105}i}{105} & 0 & \frac{2\sqrt{105}}{105} & 0 & 0 \\ 0 & -\frac{3\sqrt{35}}{70} & 0 & 0 & \frac{2\sqrt{105}i}{105} & 0 & \frac{2\sqrt{105}}{105} & 0 & 0 & 0 \end{bmatrix}$ |
| 277 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 6

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{105} & -\frac{\sqrt{35}}{105} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{105} & 0 & 0 & \frac{\sqrt{35}}{105} \\ \frac{2\sqrt{105}}{105} & 0 & \frac{\sqrt{35}}{105} & 0 & 0 & -\frac{4\sqrt{35}i}{105} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 \\ 0 & -\frac{2\sqrt{105}}{105} & 0 & -\frac{\sqrt{35}}{105} & \frac{4\sqrt{35}i}{105} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{70} & 0 & \frac{\sqrt{35}i}{42} & \frac{4\sqrt{35}}{105} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} \\ -\frac{\sqrt{105}i}{70} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 \end{bmatrix}$ |
| 278 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} -\frac{2\sqrt{105}}{105} & 0 & \frac{\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 \\ 0 & \frac{2\sqrt{105}}{105} & 0 & -\frac{\sqrt{35}}{105} & -\frac{\sqrt{35}i}{42} & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{105} & 0 & \frac{\sqrt{35}i}{42} & \frac{\sqrt{35}}{105} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{105} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{35}}{105} \\ 0 & \frac{\sqrt{105}}{70} & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}i}{42} \\ \frac{\sqrt{105}}{70} & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{4\sqrt{35}}{105} & -\frac{\sqrt{35}i}{42} & 0 \end{bmatrix}$ |
| 279 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{105}}{210} & 0 & \frac{4\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{30} \\ -\frac{\sqrt{105}}{210} & 0 & \frac{4\sqrt{35}}{105} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{30} & 0 \\ 0 & -\frac{\sqrt{105}i}{210} & 0 & -\frac{4\sqrt{35}i}{105} & -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{30} \\ \frac{\sqrt{105}i}{210} & 0 & \frac{4\sqrt{35}i}{105} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}}{30} \\ 0 & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{105} & 0 & -\frac{\sqrt{35}}{105} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{105} & 0 & -\frac{\sqrt{35}}{105} & 0 & 0 & 0 \end{bmatrix}$ |
| 280 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{210} & 0 & -\frac{\sqrt{35}i}{30} & -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & -\frac{4\sqrt{35}}{105} \\ \frac{\sqrt{105}i}{210} & 0 & \frac{\sqrt{35}i}{30} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{4\sqrt{35}}{105} & 0 \\ 0 & \frac{\sqrt{105}}{210} & 0 & -\frac{\sqrt{35}}{30} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & \frac{4\sqrt{35}i}{105} \\ \frac{\sqrt{105}}{210} & 0 & -\frac{\sqrt{35}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & -\frac{4\sqrt{35}i}{105} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{105} & 0 & -\frac{\sqrt{35}i}{105} & -\frac{\sqrt{35}}{42} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{105} & 0 & \frac{\sqrt{35}i}{105} & 0 & 0 & \frac{\sqrt{35}}{42} \end{bmatrix}$ |

bra: = $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$

ket: = $|f_{az}, \uparrow \rangle, |f_{az}, \downarrow \rangle, |f_1, \uparrow \rangle, |f_1, \downarrow \rangle, |f_2, \uparrow \rangle, |f_2, \downarrow \rangle, |f_{3x}, \uparrow \rangle, |f_{3x}, \downarrow \rangle, |f_{3y}, \uparrow \rangle, |f_{3y}, \downarrow \rangle, |f_3, \uparrow \rangle, |f_3, \downarrow \rangle, |f_{bz}, \uparrow \rangle, |f_{bz}, \downarrow \rangle$

Table 7: (p,f) block.

| No. | multipole | matrix |
|-----|--|--|
| 281 | symmetry $\mathbb{Q}_2^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 282 | symmetry $\mathbb{Q}_{2,0}^{(a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 283 | symmetry $\mathbb{Q}_{2,1}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} \\ -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 284 | symmetry | $\begin{bmatrix} \frac{\sqrt{3}(x-y)(x+y)}{2} \end{bmatrix}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{Q}_{2,0}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & \frac{3\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} \end{bmatrix}$ |
| 285 | symmetry | $-\sqrt{3}xy$ |
| | $\mathbb{Q}_{2,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 286 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |
| | $\mathbb{Q}_4^{(a)}(A_1, 1)$ | $\begin{bmatrix} 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 287 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| | $\mathbb{Q}_4^{(a)}(A_1, 2)$ | $\begin{bmatrix} \frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{8} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 \end{bmatrix}$ |
| 288 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ..

Table 7

| No. | multipole | matrix |
|-----|---------------------------|---|
| | $\mathbb{Q}_4^{(a)}(A_2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{8} \\ -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 289 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{56} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{56} \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{70}}{112} & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}}{112} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{70}}{112} & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}}{112} & 0 & 0 \end{bmatrix}$ |
| 290 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{56} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{56} \\ \frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{70}}{112} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}}{112} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{70}}{112} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}}{112} & 0 & 0 & 0 \end{bmatrix}$ |
| 291 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 292 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | $\mathbb{Q}_{4,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 293 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} \end{bmatrix}$ |
| 294 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{21}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{21}}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{21}}{56} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 295 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ $\begin{bmatrix} 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & -\frac{\sqrt{35}}{56} \\ \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & \frac{\sqrt{21}}{28} & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & \frac{\sqrt{35}}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{35}}{56} & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{56} \\ \frac{\sqrt{35}}{56} & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{112} & 0 & \frac{\sqrt{21}i}{112} & 0 & 0 & 0 & -\frac{\sqrt{35}}{112} & 0 & -\frac{\sqrt{35}i}{112} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}}{112} & 0 & \frac{\sqrt{21}i}{112} & 0 & 0 & 0 & \frac{\sqrt{35}}{112} & 0 & -\frac{\sqrt{35}i}{112} & 0 & 0 & 0 \end{bmatrix}$ |
| 296 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------------------------------|--|
| | $\mathbb{Q}_4^{(1,-1;a)}(A_1, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & -\frac{\sqrt{2}}{32} & \frac{\sqrt{2}i}{16} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{32} & 0 & 0 & -\frac{\sqrt{2}i}{16} \\ -\frac{\sqrt{2}i}{16} & 0 & 0 & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{32} & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{16} & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{32} & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{8} & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ -\frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \end{bmatrix}$ |
| 297 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & -\frac{\sqrt{2}i}{32} & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & -\frac{\sqrt{2}i}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{32} & 0 & \frac{\sqrt{2}}{8} & -\frac{\sqrt{2}i}{16} & 0 \\ 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{32} & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{2}i}{16} \\ 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & \frac{\sqrt{2}}{8} \\ \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{32} & -\frac{\sqrt{2}}{8} & 0 \end{bmatrix}$ |
| 298 | symmetry | $\frac{-\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{210}}{224} & \frac{\sqrt{210}i}{56} & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & -\frac{11\sqrt{14}}{224} & \frac{5\sqrt{14}i}{112} & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{210}}{224} & 0 & 0 & -\frac{\sqrt{210}i}{56} & \frac{\sqrt{14}i}{56} & 0 & \frac{11\sqrt{14}}{224} & 0 & 0 & -\frac{5\sqrt{14}i}{112} \\ \frac{5\sqrt{14}i}{112} & 0 & 0 & -\frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & 0 & -\frac{9\sqrt{14}}{224} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 \\ 0 & -\frac{5\sqrt{14}i}{112} & \frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{9\sqrt{14}}{224} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 \\ 0 & \frac{\sqrt{14}}{56} & \frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{14}i}{224} & 0 & 0 & 0 & \frac{\sqrt{14}i}{56} \\ -\frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{14}i}{224} & 0 & 0 & \frac{\sqrt{14}i}{56} \end{bmatrix}$ |
| 299 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} \frac{5\sqrt{14}i}{112} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{224} & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 & \frac{9\sqrt{14}i}{224} & 0 & 0 \\ 0 & -\frac{5\sqrt{14}i}{112} & 0 & 0 & -\frac{\sqrt{210}i}{224} & 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & \frac{9\sqrt{14}i}{224} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{210}i}{224} & 0 & 0 & \frac{\sqrt{210}i}{56} & 0 & 0 & \frac{11\sqrt{14}i}{224} & 0 & -\frac{\sqrt{14}}{56} & -\frac{5\sqrt{14}i}{112} & 0 \\ 0 & 0 & \frac{3\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{56} & \frac{11\sqrt{14}i}{224} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & \frac{5\sqrt{14}i}{112} \\ 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & \frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{14}i}{224} & 0 & 0 & -\frac{\sqrt{14}}{56} \\ \frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{14}i}{224} & \frac{\sqrt{14}}{56} & 0 \end{bmatrix}$ |
| 300 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{Q}_{4,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{8} \\ -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{8} & 0 \\ 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{8} \\ -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{8} \\ 0 & 0 & 0 & \frac{\sqrt{15}}{16} & 0 & -\frac{\sqrt{15}i}{16} & 0 & 0 & 0 & -\frac{3}{16} & 0 & -\frac{3i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & -\frac{\sqrt{15}i}{16} & 0 & 0 & 0 & \frac{3}{16} & 0 & -\frac{3i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 301 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{8} \\ \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{8} \\ 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{8} \\ -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{8} \\ 0 & 0 & 0 & -\frac{\sqrt{15}i}{16} & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & \frac{3i}{16} & 0 & -\frac{3}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{15}i}{16} & 0 & \frac{\sqrt{15}}{16} & 0 & 0 & 0 & \frac{3i}{16} & 0 & \frac{3}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 302 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ $\begin{bmatrix} 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & -\frac{3\sqrt{7}}{56} \\ -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & \frac{3\sqrt{7}}{56} & 0 \\ 0 & -\frac{\sqrt{7}}{28} & \frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & \frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} \\ \frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 \\ \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 \\ 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{28} & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| 303 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ $\begin{bmatrix} 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{28} \\ -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 \\ 0 & -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{7}}{28} \\ -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & \frac{\sqrt{7}}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}i}{112} & 0 & \frac{\sqrt{105}}{112} & 0 & 0 & 0 & -\frac{\sqrt{7}i}{112} & 0 & -\frac{\sqrt{7}}{112} & \frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & -\frac{\sqrt{105}i}{112} & 0 & -\frac{\sqrt{105}}{112} & 0 & 0 & 0 & -\frac{\sqrt{7}i}{112} & 0 & \frac{\sqrt{7}}{112} & 0 & 0 & -\frac{\sqrt{7}i}{14} \end{bmatrix}$ |
| 304 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------|---|
| | $\mathbb{Q}_2^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{84} \\ \frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 \\ 0 & -\frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{84} \\ \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & \frac{\sqrt{210}i}{84} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}}{84} & 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & 0 \end{bmatrix}$ |
| 305 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{84} & -\frac{\sqrt{42}i}{84} & 0 & 0 & \frac{\sqrt{70}i}{42} & 0 & \frac{\sqrt{70}}{84} & \frac{\sqrt{70}i}{84} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{42}i}{84} & \frac{\sqrt{70}i}{42} & 0 & -\frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{70}i}{84} \\ \frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{42}}{84} & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & -\frac{\sqrt{70}i}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{70}i}{84} & -\frac{\sqrt{42}}{84} & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & 0 & \frac{\sqrt{70}}{84} & 0 & -\frac{\sqrt{70}i}{84} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}}{84} & -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{28} & -\frac{\sqrt{70}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} \\ \frac{\sqrt{70}}{84} & 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} \end{bmatrix}$ |
| 306 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} \frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 & \frac{\sqrt{70}}{84} & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{70}i}{84} & -\frac{\sqrt{42}}{28} & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & -\frac{\sqrt{70}}{42} & -\frac{\sqrt{70}i}{84} & 0 \\ 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{84} & -\frac{\sqrt{70}i}{84} & 0 & \frac{\sqrt{70}}{42} & 0 & 0 & \frac{\sqrt{70}i}{84} \\ 0 & -\frac{\sqrt{70}i}{84} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{70}}{84} \\ -\frac{\sqrt{70}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{84} & \frac{\sqrt{42}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & -\frac{\sqrt{70}}{84} & 0 \end{bmatrix}$ |
| 307 | symmetry | $\sqrt{3}(x-y)(x+y)$ $\begin{bmatrix} 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{70}i}{42} & 0 & 0 & \frac{\sqrt{70}}{84} \\ \frac{\sqrt{70}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{42} & \frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{42} & -\frac{\sqrt{70}}{84} & 0 \\ 0 & \frac{\sqrt{70}}{84} & \frac{\sqrt{42}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{84} & -\frac{\sqrt{70}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} \\ -\frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & \frac{\sqrt{70}i}{42} & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 \\ -\frac{\sqrt{70}i}{42} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 \\ 0 & \frac{\sqrt{70}i}{42} & \frac{\sqrt{42}}{84} & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & \frac{\sqrt{70}}{84} & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & 0 \end{bmatrix}$ |
| 308 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{Q}_{2,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{70}}{84} & -\frac{\sqrt{42}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{84} & \frac{\sqrt{70}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{84} \\ \frac{\sqrt{70}}{84} & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 \\ 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{70}}{84} \\ \frac{\sqrt{70}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{28} & -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & -\frac{\sqrt{70}}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & -\frac{\sqrt{70}}{84} & -\frac{\sqrt{70}i}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & \frac{\sqrt{70}}{84} & 0 & 0 & \frac{\sqrt{70}i}{42} \end{bmatrix}$ |
| 309 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ $\begin{bmatrix} 0 & -\frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{56} \\ -\frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{56} \\ 0 & \frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{56} \\ -\frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{56} \\ 0 & 0 & 0 & \frac{3\sqrt{35}}{112} & 0 & -\frac{3\sqrt{35}i}{112} & 0 & 0 & 0 & \frac{5\sqrt{21}}{112} & 0 & \frac{5\sqrt{21}i}{112} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{35}}{112} & 0 & -\frac{3\sqrt{35}i}{112} & 0 & 0 & 0 & -\frac{5\sqrt{21}}{112} & 0 & \frac{5\sqrt{21}i}{112} & 0 & 0 & 0 \end{bmatrix}$ |
| 310 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{32} & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & \frac{\sqrt{30}}{32} & \frac{3\sqrt{30}i}{80} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{32} & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & -\frac{3\sqrt{30}i}{80} \\ -\frac{3\sqrt{30}i}{80} & 0 & 0 & -\frac{3\sqrt{2}}{32} & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{30}}{160} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{30}i}{80} & \frac{3\sqrt{2}}{32} & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & \frac{\sqrt{30}}{160} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{40} & \frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{30}i}{160} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{40} \\ -\frac{\sqrt{30}}{40} & 0 & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{30}i}{160} & 0 & 0 & -\frac{\sqrt{30}i}{40} & 0 & 0 \end{bmatrix}$ |
| 311 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ $\begin{bmatrix} -\frac{3\sqrt{30}i}{80} & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{160} & 0 & 0 \\ 0 & \frac{3\sqrt{30}i}{80} & \frac{\sqrt{2}}{8} & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{160} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{40} & -\frac{3\sqrt{30}i}{80} & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & \frac{\sqrt{30}}{40} & 0 & 0 & \frac{3\sqrt{30}i}{80} \\ 0 & \frac{\sqrt{30}i}{40} & 0 & 0 & \frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & \frac{3\sqrt{30}i}{160} & 0 & 0 & 0 & \frac{\sqrt{30}}{40} \\ \frac{\sqrt{30}i}{40} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{30}i}{160} & -\frac{\sqrt{30}}{40} & 0 \end{bmatrix}$ |
| 312 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{Q}_{4,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{14}}{224} & \frac{\sqrt{14}i}{56} & 0 & 0 & -\frac{\sqrt{210}i}{280} & 0 & -\frac{9\sqrt{210}}{1120} & -\frac{\sqrt{210}i}{560} & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{14}}{224} & 0 & 0 & -\frac{\sqrt{14}i}{56} & -\frac{\sqrt{210}i}{280} & 0 & \frac{9\sqrt{210}}{1120} & 0 & 0 & \frac{\sqrt{210}i}{560} \\ -\frac{\sqrt{210}i}{560} & 0 & 0 & \frac{3\sqrt{14}}{224} & 0 & -\frac{3\sqrt{14}i}{56} & 0 & 0 & 0 & \frac{9\sqrt{210}}{1120} & 0 & \frac{\sqrt{210}i}{70} & 0 & 0 \\ 0 & \frac{\sqrt{210}i}{560} & -\frac{3\sqrt{14}}{224} & 0 & -\frac{3\sqrt{14}i}{56} & 0 & 0 & 0 & -\frac{9\sqrt{210}}{1120} & 0 & \frac{\sqrt{210}i}{70} & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{210}}{280} & -\frac{3\sqrt{14}i}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & -\frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{210}i}{280} \\ \frac{3\sqrt{210}}{280} & 0 & 0 & \frac{3\sqrt{14}i}{224} & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & \frac{\sqrt{210}i}{224} & 0 & 0 & -\frac{3\sqrt{210}i}{280} & 0 \end{bmatrix}$ |
| 313 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{210}i}{560} & 0 & 0 & -\frac{3\sqrt{14}}{56} & 0 & \frac{3\sqrt{14}i}{224} & 0 & 0 & 0 & -\frac{\sqrt{210}}{70} & 0 & -\frac{9\sqrt{210}i}{1120} & 0 & 0 \\ 0 & \frac{\sqrt{210}i}{560} & \frac{3\sqrt{14}}{56} & 0 & \frac{3\sqrt{14}i}{224} & 0 & 0 & 0 & \frac{\sqrt{210}}{70} & 0 & -\frac{9\sqrt{210}i}{1120} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{14}i}{224} & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & \frac{9\sqrt{210}i}{1120} & 0 & \frac{\sqrt{210}}{280} & \frac{\sqrt{210}i}{560} & 0 \\ 0 & 0 & \frac{3\sqrt{14}i}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & \frac{9\sqrt{210}i}{1120} & 0 & -\frac{\sqrt{210}}{280} & 0 & 0 & -\frac{\sqrt{210}i}{560} \\ 0 & -\frac{3\sqrt{210}i}{280} & 0 & 0 & -\frac{3\sqrt{14}i}{224} & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & \frac{\sqrt{210}i}{224} & 0 & 0 & \frac{3\sqrt{210}}{280} \\ -\frac{3\sqrt{210}i}{280} & 0 & 0 & 0 & 0 & \frac{3\sqrt{14}i}{224} & \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{224} & -\frac{3\sqrt{210}}{280} & 0 \end{bmatrix}$ |
| 314 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ $\begin{bmatrix} 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}}{40} \\ \frac{\sqrt{15}i}{40} & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & -\frac{\sqrt{15}}{40} & 0 \\ 0 & -\frac{\sqrt{15}}{40} & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & \frac{\sqrt{15}i}{40} \\ \frac{\sqrt{15}}{40} & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}i}{40} & 0 \\ 0 & 0 & 0 & \frac{1}{16} & 0 & -\frac{i}{16} & 0 & 0 & 0 & -\frac{\sqrt{15}}{80} & 0 & -\frac{\sqrt{15}i}{80} & 0 & 0 \\ 0 & 0 & -\frac{1}{16} & 0 & -\frac{i}{16} & 0 & 0 & 0 & \frac{\sqrt{15}}{80} & 0 & -\frac{\sqrt{15}i}{80} & 0 & 0 & 0 \end{bmatrix}$ |
| 315 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & \frac{\sqrt{15}}{40} & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} \\ -\frac{\sqrt{15}}{40} & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & -\frac{\sqrt{15}i}{40} & 0 \\ 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & \frac{\sqrt{15}}{40} \\ \frac{\sqrt{15}i}{40} & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & -\frac{\sqrt{15}}{40} & 0 \\ 0 & 0 & 0 & -\frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{80} & 0 & -\frac{\sqrt{15}}{80} & 0 & 0 \\ 0 & 0 & -\frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{80} & 0 & \frac{\sqrt{15}}{80} & 0 & 0 & 0 \end{bmatrix}$ |
| 316 | symmetry | $\frac{-\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{Q}_{4,0}^{(1,0;a)}(E, 3)$ | $\begin{bmatrix} 0 & \frac{\sqrt{105}i}{140} & 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & -\frac{3\sqrt{105}i}{280} & 0 & 0 & -\frac{\sqrt{105}}{56} \\ \frac{\sqrt{105}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{56} & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{105}i}{280} & \frac{\sqrt{105}}{56} & 0 \\ 0 & \frac{\sqrt{105}}{140} & \frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & \frac{3\sqrt{105}i}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} \\ -\frac{\sqrt{105}}{140} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & -\frac{3\sqrt{105}i}{280} & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 \\ -\frac{\sqrt{105}i}{70} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}}{140} & 0 & \frac{\sqrt{105}i}{140} & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{70} & \frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & \frac{\sqrt{105}}{140} & 0 & \frac{\sqrt{105}i}{140} & 0 & 0 & 0 \end{bmatrix}$ |
| 317 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ $\begin{bmatrix} 0 & \frac{\sqrt{105}}{56} & \frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & \frac{\sqrt{105}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{140} \\ -\frac{\sqrt{105}}{56} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & -\frac{\sqrt{105}i}{140} & 0 & 0 & \frac{\sqrt{105}i}{140} & 0 \\ 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & \frac{\sqrt{105}i}{140} & 0 & 0 & \frac{\sqrt{105}}{140} \\ -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{28} & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{140} & -\frac{\sqrt{105}}{140} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{112} & 0 & \frac{\sqrt{7}}{112} & 0 & 0 & 0 & -\frac{11\sqrt{105}i}{560} & 0 & -\frac{11\sqrt{105}}{560} & -\frac{\sqrt{105}i}{70} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}i}{112} & 0 & -\frac{\sqrt{7}}{112} & 0 & 0 & 0 & -\frac{11\sqrt{105}i}{560} & 0 & \frac{11\sqrt{105}}{560} & 0 & 0 & \frac{\sqrt{105}i}{70} & 0 \end{bmatrix}$ |
| 318 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & \frac{\sqrt{105}}{84} \\ -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}i}{56} & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & -\frac{\sqrt{105}}{84} & 0 \\ 0 & \frac{\sqrt{105}}{84} & -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{84} \\ -\frac{\sqrt{105}}{84} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & \frac{\sqrt{105}i}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & \frac{\sqrt{105}}{168} & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 319 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{21} & \frac{\sqrt{21}i}{21} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{42} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & -\frac{\sqrt{21}i}{21} & -\frac{\sqrt{35}i}{42} & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{84} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{35}i}{42} & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 \end{bmatrix}$ |
| 320 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|---|
| | $\mathbb{Q}_{2,1}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{21} & 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{42} & -\frac{\sqrt{35}i}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{21} & -\frac{\sqrt{35}i}{42} & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & \frac{\sqrt{35}i}{42} \\ 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} \\ -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{84} & -\frac{\sqrt{35}}{42} & 0 & 0 \end{bmatrix}$ |
| 321 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & \frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & -\frac{\sqrt{35}i}{168} & 0 & 0 & \frac{\sqrt{35}}{42} \\ -\frac{\sqrt{35}i}{84} & 0 & 0 & 0 & 0 & -\frac{5\sqrt{21}i}{168} & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{168} & -\frac{\sqrt{35}}{42} & 0 \\ 0 & -\frac{\sqrt{35}}{84} & \frac{5\sqrt{21}i}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & \frac{\sqrt{35}i}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{84} & 0 & 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{35}i}{168} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 \\ \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{24} & 0 & -\frac{\sqrt{21}i}{24} & 0 & 0 & 0 & \frac{5\sqrt{35}}{168} & 0 & -\frac{5\sqrt{35}i}{168} & 0 & 0 \\ 0 & -\frac{\sqrt{35}i}{42} & \frac{\sqrt{21}}{24} & 0 & -\frac{\sqrt{21}i}{24} & 0 & 0 & 0 & -\frac{5\sqrt{35}}{168} & 0 & -\frac{5\sqrt{35}i}{168} & 0 & 0 & 0 \end{bmatrix}$ |
| 322 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{84} \\ \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 \\ 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{35}}{84} \\ \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & \frac{\sqrt{35}}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & -\frac{\sqrt{21}}{21} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{42} & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} \end{bmatrix}$ |
| 323 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 \end{bmatrix}$ |
| 324 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------|---|
| | $\mathbb{G}_3^{(a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 325 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{8} \\ \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 326 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{24} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| 327 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{24} \\ -\frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 328 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | $\mathbb{G}_{3,0}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \end{bmatrix}$ |
| 329 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 330 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{168} & 0 & \frac{\sqrt{210}}{84} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{168} & 0 & -\frac{\sqrt{210}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & -\frac{3\sqrt{14}i}{56} & 0 & 0 & 0 & -\frac{\sqrt{210}}{84} & 0 & -\frac{\sqrt{210}i}{168} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & -\frac{3\sqrt{14}i}{56} & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & -\frac{\sqrt{210}i}{168} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} \\ \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} & 0 \end{bmatrix}$ |
| 331 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{21}}{42} & -\frac{3\sqrt{35}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{70} & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{42} \\ \frac{\sqrt{21}}{42} & 0 & 0 & \frac{3\sqrt{35}i}{140} & 0 & 0 & 0 & \frac{\sqrt{35}i}{70} & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 \\ 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{3\sqrt{35}i}{140} & 0 & 0 & \frac{\sqrt{35}}{70} & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{21}}{42} \\ -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & \frac{3\sqrt{35}i}{140} & -\frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & -\frac{\sqrt{21}}{42} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}i}{70} & 0 & \frac{\sqrt{35}}{70} & \frac{3\sqrt{35}i}{70} & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}i}{70} & 0 & -\frac{\sqrt{35}}{70} & 0 & 0 & -\frac{3\sqrt{35}i}{70} & \frac{\sqrt{21}i}{42} & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 332 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------------------------------|---|
| | $\mathbb{G}_3^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}}{168} & 0 & -\frac{\sqrt{210}i}{84} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & \frac{\sqrt{210}}{168} & 0 & -\frac{\sqrt{210}i}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & -\frac{3\sqrt{14}}{56} & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & \frac{3\sqrt{14}}{56} & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} & 0 & \frac{\sqrt{210}}{168} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} \\ \frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{84} & 0 \end{bmatrix}$ |
| 333 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{210}i}{280} & 0 & \frac{\sqrt{210}}{420} & -\frac{\sqrt{210}i}{105} & 0 & 0 & -\frac{5\sqrt{14}i}{168} & 0 & \frac{\sqrt{14}}{84} & \frac{\sqrt{14}i}{21} & 0 \\ 0 & 0 & -\frac{3\sqrt{210}i}{280} & 0 & -\frac{\sqrt{210}}{420} & 0 & 0 & \frac{\sqrt{210}i}{105} & -\frac{5\sqrt{14}i}{168} & 0 & -\frac{\sqrt{14}}{84} & 0 & 0 & -\frac{\sqrt{14}i}{21} \\ \frac{\sqrt{14}i}{21} & 0 & 0 & \frac{\sqrt{210}}{420} & 0 & -\frac{\sqrt{210}i}{280} & 0 & 0 & 0 & -\frac{\sqrt{14}}{84} & 0 & \frac{\sqrt{14}i}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{21} & -\frac{\sqrt{210}}{420} & 0 & -\frac{\sqrt{210}i}{280} & 0 & 0 & 0 & \frac{\sqrt{14}}{84} & 0 & \frac{\sqrt{14}i}{24} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{84} & -\frac{\sqrt{210}i}{105} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{70} & -\frac{\sqrt{14}i}{21} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{84} \\ \frac{\sqrt{14}}{84} & 0 & 0 & \frac{\sqrt{210}i}{105} & 0 & 0 & \frac{\sqrt{210}i}{70} & 0 & 0 & \frac{\sqrt{14}i}{21} & 0 & 0 & -\frac{\sqrt{14}i}{84} & 0 \end{bmatrix}$ |
| 334 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{14}i}{21} & 0 & 0 & -\frac{\sqrt{210}}{280} & 0 & \frac{\sqrt{210}i}{420} & 0 & 0 & 0 & -\frac{\sqrt{14}}{24} & 0 & \frac{\sqrt{14}i}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{21} & \frac{\sqrt{210}}{280} & 0 & \frac{\sqrt{210}i}{420} & 0 & 0 & 0 & \frac{\sqrt{14}}{24} & 0 & \frac{\sqrt{14}i}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{210}i}{420} & 0 & -\frac{3\sqrt{210}}{280} & -\frac{\sqrt{210}i}{105} & 0 & 0 & -\frac{\sqrt{14}i}{84} & 0 & \frac{5\sqrt{14}}{168} & -\frac{\sqrt{14}i}{21} & 0 \\ 0 & 0 & \frac{\sqrt{210}i}{420} & 0 & \frac{3\sqrt{210}}{280} & 0 & 0 & \frac{\sqrt{210}i}{105} & -\frac{\sqrt{14}i}{84} & 0 & -\frac{5\sqrt{14}}{168} & 0 & 0 & \frac{\sqrt{14}i}{21} \\ 0 & -\frac{\sqrt{14}i}{84} & 0 & 0 & -\frac{\sqrt{210}i}{105} & 0 & 0 & \frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{14}i}{21} & 0 & 0 & \frac{\sqrt{14}}{84} \\ -\frac{\sqrt{14}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{105} & -\frac{\sqrt{210}}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{21} & -\frac{\sqrt{14}}{84} & 0 \end{bmatrix}$ |
| 335 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{35}}{42} \\ \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{42} & \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & -\frac{\sqrt{35}}{42} & 0 \\ 0 & \frac{\sqrt{35}}{42} & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{42} & \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} \\ -\frac{\sqrt{35}}{42} & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 \\ \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 \\ 0 & -\frac{\sqrt{35}i}{42} & \frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 336 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{42} & -\frac{\sqrt{35}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & \frac{\sqrt{35}i}{84} & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 \\ 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & \frac{\sqrt{35}}{42} & \\ \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{84} & -\frac{\sqrt{35}}{42} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & -\frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} \end{bmatrix}$ |
| 337 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{5\sqrt{2}i}{48} & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{80} & 0 & -\frac{\sqrt{30}}{48} & \frac{\sqrt{30}i}{30} & 0 \\ 0 & 0 & -\frac{5\sqrt{2}i}{48} & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{80} & 0 & \frac{\sqrt{30}}{48} & 0 & 0 & -\frac{\sqrt{30}i}{30} \\ -\frac{\sqrt{30}i}{30} & 0 & 0 & \frac{\sqrt{2}}{48} & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & \frac{7\sqrt{30}}{240} & 0 & -\frac{\sqrt{30}i}{48} & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{30} & -\frac{\sqrt{2}}{48} & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & -\frac{7\sqrt{30}}{240} & 0 & -\frac{\sqrt{30}i}{48} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{30} & \frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{30} \\ \frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & \frac{\sqrt{30}i}{30} & 0 \end{bmatrix}$ |
| 338 | symmetry | $z\frac{(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ $\begin{bmatrix} 0 & \frac{\sqrt{21}}{84} & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & \frac{5\sqrt{21}i}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} \\ -\frac{\sqrt{21}}{84} & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 \\ 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & -\frac{\sqrt{21}}{84} & \\ \frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{56} & \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{5\sqrt{21}i}{168} & \frac{\sqrt{21}}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & \frac{\sqrt{35}}{56} & \frac{\sqrt{35}i}{21} & 0 & 0 & \frac{5\sqrt{21}i}{168} & 0 & -\frac{5\sqrt{21}}{168} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 & -\frac{\sqrt{35}i}{21} & \frac{5\sqrt{21}i}{168} & 0 & \frac{5\sqrt{21}}{168} & 0 & 0 & 0 \end{bmatrix}$ |
| 339 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ $\begin{bmatrix} \frac{\sqrt{30}i}{30} & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & -\frac{\sqrt{2}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & \frac{7\sqrt{30}i}{240} & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{30} & \frac{\sqrt{2}}{16} & 0 & -\frac{\sqrt{2}i}{48} & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & \frac{7\sqrt{30}i}{240} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & \frac{5\sqrt{2}}{48} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{48} & 0 & -\frac{\sqrt{30}}{80} & \frac{\sqrt{30}i}{30} & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & -\frac{5\sqrt{2}}{48} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{48} & 0 & \frac{\sqrt{30}}{80} & 0 & 0 & -\frac{\sqrt{30}i}{30} \\ 0 & \frac{\sqrt{30}i}{30} & 0 & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & \frac{\sqrt{30}}{30} & \\ \frac{\sqrt{30}i}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{30}}{60} & -\frac{\sqrt{30}}{30} & 0 \end{bmatrix}$ |
| 340 | symmetry | $\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{G}_{5,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 341 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 342 | symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ $\begin{bmatrix} 0 & 0 & 0 & \frac{5\sqrt{21}i}{168} & 0 & \frac{\sqrt{21}}{168} & \frac{\sqrt{21}i}{21} & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 & -\frac{3\sqrt{35}}{280} & -\frac{\sqrt{35}i}{70} & 0 \\ 0 & 0 & \frac{5\sqrt{21}i}{168} & 0 & -\frac{\sqrt{21}}{168} & 0 & 0 & -\frac{\sqrt{21}i}{21} & \frac{\sqrt{35}i}{40} & 0 & \frac{3\sqrt{35}}{280} & 0 & 0 & \frac{\sqrt{35}i}{70} \\ -\frac{\sqrt{35}i}{70} & 0 & 0 & \frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{70} & -\frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & -\frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{35}}{70} & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{21} & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{70} \\ \frac{\sqrt{35}}{70} & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{70} & 0 \end{bmatrix}$ |
| 343 | symmetry | $\frac{\sqrt{15}y(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ $\begin{bmatrix} -\frac{\sqrt{35}i}{70} & 0 & 0 & \frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{70} & -\frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & -\frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{168} & 0 & \frac{5\sqrt{21}}{168} & \frac{\sqrt{21}i}{21} & 0 & 0 & \frac{3\sqrt{35}i}{280} & 0 & -\frac{\sqrt{35}}{40} & \frac{\sqrt{35}i}{70} & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{168} & 0 & -\frac{5\sqrt{21}}{168} & 0 & 0 & -\frac{\sqrt{21}i}{21} & \frac{3\sqrt{35}i}{280} & 0 & \frac{\sqrt{35}}{40} & 0 & 0 & -\frac{\sqrt{35}i}{70} \\ 0 & -\frac{\sqrt{35}i}{70} & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & \frac{\sqrt{35}}{70} \\ -\frac{\sqrt{35}i}{70} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & -\frac{\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & -\frac{\sqrt{35}}{70} & 0 \end{bmatrix}$ |
| 344 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & -\frac{\sqrt{15}}{20} \\ -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & \frac{\sqrt{15}}{20} & 0 \\ 0 & \frac{\sqrt{15}}{20} & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{15}}{20} & 0 & 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & -\frac{1}{8} & 0 & \frac{i}{8} & 0 & 0 & 0 & \frac{\sqrt{15}}{40} & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 \\ 0 & 0 & \frac{1}{8} & 0 & \frac{i}{8} & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & 0 \end{bmatrix}$ |
| 345 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ $\begin{bmatrix} 0 & -\frac{\sqrt{15}}{20} & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ \frac{\sqrt{15}}{20} & 0 & 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & -\frac{\sqrt{15}}{20} \\ -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & \frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & \frac{i}{8} & 0 & \frac{1}{8} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & 0 & \frac{\sqrt{15}}{40} & 0 & 0 \\ 0 & 0 & \frac{i}{8} & 0 & -\frac{1}{8} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & 0 & -\frac{\sqrt{15}}{40} & 0 & 0 & 0 \end{bmatrix}$ |
| 346 | symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & \frac{3\sqrt{5}i}{40} & 0 & 0 \\ -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}i}{40} & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{20} & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & -\frac{3\sqrt{5}i}{40} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{5}}{20} & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & \frac{3\sqrt{5}i}{40} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & -\frac{3\sqrt{5}}{40} & 0 & \frac{3\sqrt{5}i}{40} & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{10} & \frac{\sqrt{3}}{24} & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & \frac{3\sqrt{5}}{40} & 0 & \frac{3\sqrt{5}i}{40} & 0 & 0 & 0 \end{bmatrix}$ |
| 347 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}i}{20} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{20} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{5}}{20} & \frac{\sqrt{5}i}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}i}{10} \end{bmatrix}$ |
| 348 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{G}_3^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{96} & -\frac{\sqrt{6}i}{16} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & \frac{\sqrt{6}}{96} & 0 & 0 & \frac{\sqrt{6}i}{16} \\ \frac{\sqrt{6}i}{16} & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{96} & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{16} & -\frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{24} & \frac{3\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{6}i}{32} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} \\ -\frac{\sqrt{6}}{24} & 0 & 0 & -\frac{3\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{6}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} \end{bmatrix}$ |
| 349 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{G}_3^{(1,0;a)}(A_2, 1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} \\ -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} \\ 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} \\ \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{24} \\ 0 & 0 & 0 & \frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{48} & 0 & -\frac{\sqrt{15}}{48} & 0 & 0 \\ 0 & 0 & \frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{48} & 0 & \frac{\sqrt{15}}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| 350 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | $\mathbb{G}_3^{(1,0;a)}(A_2, 2)$ | $\begin{bmatrix} -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & -\frac{\sqrt{10}i}{32} & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{96} & 0 & 0 & -\frac{\sqrt{6}}{24} & -\frac{\sqrt{6}i}{16} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{96} & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & \frac{\sqrt{6}i}{16} \\ 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{3\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{6}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}}{24} \\ -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 & 0 & \frac{3\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{6}i}{32} & \frac{\sqrt{6}}{24} & 0 & 0 \end{bmatrix}$ |
| 351 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{G}_{3,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{96} & -\frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{24} & 0 & -\frac{5\sqrt{10}}{96} & -\frac{\sqrt{10}i}{48} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 & \frac{\sqrt{6}i}{24} & -\frac{\sqrt{10}i}{24} & 0 & \frac{5\sqrt{10}}{96} & 0 & 0 & \frac{\sqrt{10}i}{48} \\ -\frac{\sqrt{10}i}{48} & 0 & 0 & -\frac{11\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{7\sqrt{10}}{96} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{48} & \frac{11\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & \frac{7\sqrt{10}}{96} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{24} & -\frac{\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{96} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{24} \\ \frac{\sqrt{10}}{24} & 0 & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{96} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{24} & 0 \end{bmatrix}$ |
| 352 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{G}_{3,1}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{10}i}{48} & 0 & 0 & 0 & 0 & -\frac{11\sqrt{6}i}{96} & 0 & 0 & 0 & \frac{\sqrt{10}}{24} & 0 & \frac{7\sqrt{10}i}{96} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{48} & 0 & 0 & -\frac{11\sqrt{6}i}{96} & 0 & 0 & 0 & -\frac{\sqrt{10}}{24} & 0 & \frac{7\sqrt{10}i}{96} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & \frac{5\sqrt{10}i}{96} & 0 & \frac{\sqrt{10}}{24} & \frac{\sqrt{10}i}{48} & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & \frac{5\sqrt{10}i}{96} & 0 & -\frac{\sqrt{10}}{24} & 0 & 0 & -\frac{\sqrt{10}i}{48} \\ 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 & -\frac{\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{96} & 0 & 0 & \frac{\sqrt{10}}{24} & 0 \\ -\frac{\sqrt{10}i}{24} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{96} & -\frac{\sqrt{10}}{24} & 0 & 0 \end{bmatrix}$ |
| 353 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{G}_{3,0}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{i}{6} & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & \frac{\sqrt{15}}{24} & 0 & 0 & -\frac{i}{24} & 0 & 0 & \frac{1}{24} \\ \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & \frac{i}{24} & -\frac{1}{24} & 0 \\ 0 & \frac{1}{6} & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & \frac{i}{24} & 0 & 0 & 0 & 0 & -\frac{i}{24} \\ -\frac{1}{6} & 0 & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & -\frac{i}{24} & 0 & 0 & -\frac{i}{24} & 0 \\ \frac{i}{6} & 0 & 0 & \frac{\sqrt{15}}{24} & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & -\frac{1}{24} & 0 & \frac{i}{24} & 0 & 0 & 0 \\ 0 & -\frac{i}{6} & -\frac{\sqrt{15}}{24} & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & \frac{1}{24} & 0 & \frac{i}{24} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 354 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | $\mathbb{G}_{3,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{1}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & \frac{i}{6} \\ \frac{1}{24} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & -\frac{i}{6} & 0 & 0 & \frac{i}{6} & 0 \\ 0 & \frac{i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & \frac{i}{6} & 0 & 0 & \frac{1}{6} \\ \frac{i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & -\frac{i}{6} & -\frac{1}{6} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{15}i}{48} & 0 & \frac{\sqrt{15}}{48} & 0 & 0 & 0 & \frac{7i}{48} & 0 & \frac{7}{48} & \frac{i}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{15}i}{48} & 0 & -\frac{\sqrt{15}}{48} & 0 & 0 & 0 & \frac{7i}{48} & 0 & -\frac{7}{48} & 0 & 0 & -\frac{i}{6} & 0 \end{bmatrix}$ |
| 355 | symmetry | z |
| | $\mathbb{G}_1^{(1,1;a)}(A_2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{14}}{28} & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{140} & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} \\ -\frac{\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 \\ 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 \\ \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{140} & \frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & \frac{\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & -\frac{\sqrt{210}}{140} & \frac{\sqrt{210}i}{70} & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & \frac{\sqrt{14}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & \frac{\sqrt{210}}{140} & 0 & 0 & -\frac{\sqrt{210}i}{70} & -\frac{\sqrt{14}i}{28} & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| 356 | symmetry | x |

continued ...

Table 7

| No. | multipole | matrix |
|-----|---------------------------------|--|
| | $\mathbb{G}_{1,0}^{(1,1;a)}(E)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{210}i}{70} & 0 & -\frac{\sqrt{210}}{140} & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & \frac{\sqrt{14}i}{28} & 0 \\ 0 & 0 & \frac{\sqrt{210}i}{70} & 0 & \frac{\sqrt{210}}{140} & 0 & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & -\frac{\sqrt{14}i}{28} \\ \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{28} & \frac{\sqrt{210}}{140} & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{14}}{28} & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{140} & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} \\ -\frac{\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 \end{bmatrix}$ |
| 357 | symmetry | $\begin{bmatrix} \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{28} & \frac{\sqrt{210}}{140} & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & \frac{\sqrt{210}}{70} & -\frac{\sqrt{210}i}{140} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 \\ 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{210}i}{140} & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} \\ 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{14}}{28} \\ \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{140} & \frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & \frac{\sqrt{14}}{28} & 0 \end{bmatrix}$ |
| 358 | symmetry | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{70}i}{42} & 0 & -\frac{5\sqrt{70}}{224} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{56} & 0 & -\frac{11\sqrt{42}}{672} & \frac{\sqrt{42}i}{48} & 0 \\ 0 & 0 & \frac{\sqrt{70}i}{42} & 0 & \frac{5\sqrt{70}}{224} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{56} & 0 & \frac{11\sqrt{42}}{672} & 0 & 0 & -\frac{\sqrt{42}i}{48} \\ -\frac{\sqrt{42}i}{48} & 0 & 0 & \frac{13\sqrt{70}}{672} & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & -\frac{17\sqrt{42}}{672} & 0 & \frac{\sqrt{42}i}{42} & 0 & 0 \\ 0 & \frac{\sqrt{42}i}{48} & -\frac{13\sqrt{70}}{672} & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & \frac{17\sqrt{42}}{672} & 0 & \frac{\sqrt{42}i}{42} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}}{168} & \frac{\sqrt{70}i}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{96} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{168} \\ -\frac{\sqrt{42}}{168} & 0 & 0 & -\frac{\sqrt{70}i}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{96} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{168} \end{bmatrix}$ |
| 359 | symmetry | $\begin{bmatrix} 0 & -\frac{\sqrt{105}}{168} & \frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & \frac{5\sqrt{7}i}{84} & \frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} \\ \frac{\sqrt{105}}{168} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & \frac{5\sqrt{7}i}{84} & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 \\ 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & \frac{5\sqrt{7}}{84} & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & \frac{\sqrt{105}}{168} \\ -\frac{\sqrt{105}i}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{28} & -\frac{5\sqrt{7}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{84} & -\frac{\sqrt{105}}{168} & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{7}i}{112} & 0 & -\frac{5\sqrt{7}}{112} & \frac{2\sqrt{7}i}{21} & 0 & 0 & -\frac{5\sqrt{105}i}{336} & 0 & \frac{5\sqrt{105}}{336} & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{7}i}{112} & 0 & \frac{5\sqrt{7}}{112} & 0 & 0 & -\frac{2\sqrt{7}i}{21} & -\frac{5\sqrt{105}i}{336} & 0 & -\frac{5\sqrt{105}}{336} & 0 & 0 & 0 \end{bmatrix}$ |
| 360 | symmetry | $\begin{bmatrix} \frac{\sqrt{10}y(3x^2-y^2)}{4} \end{bmatrix}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|----------------------------------|---|
| | $\mathbb{G}_3^{(1,1;a)}(A_2, 2)$ | $\begin{bmatrix} \frac{\sqrt{42}i}{48} & 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & -\frac{13\sqrt{70}i}{672} & 0 & 0 & 0 & \frac{\sqrt{42}}{42} & 0 & -\frac{17\sqrt{42}i}{672} & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{48} & \frac{\sqrt{70}}{56} & 0 & -\frac{13\sqrt{70}i}{672} & 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & -\frac{17\sqrt{42}i}{672} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{70}i}{224} & 0 & -\frac{\sqrt{70}}{42} & 0 & 0 & 0 & -\frac{11\sqrt{42}i}{672} & 0 & -\frac{\sqrt{42}}{56} & \frac{\sqrt{42}i}{48} & 0 \\ 0 & 0 & \frac{5\sqrt{70}i}{224} & 0 & \frac{\sqrt{70}}{42} & 0 & 0 & 0 & -\frac{11\sqrt{42}i}{672} & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & -\frac{\sqrt{42}i}{48} \\ 0 & -\frac{\sqrt{42}i}{168} & 0 & 0 & -\frac{\sqrt{70}i}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{96} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{168} \\ -\frac{\sqrt{42}i}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{96} & \frac{\sqrt{42}}{168} & 0 & 0 \end{bmatrix}$ |
| 361 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & -\frac{5\sqrt{42}}{672} & \frac{5\sqrt{42}i}{168} & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & \frac{3\sqrt{70}}{224} & -\frac{\sqrt{70}i}{112} & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & \frac{5\sqrt{42}}{672} & 0 & 0 & -\frac{5\sqrt{42}i}{168} & -\frac{\sqrt{70}i}{56} & 0 & -\frac{3\sqrt{70}}{224} & 0 & 0 & \frac{\sqrt{70}i}{112} \\ -\frac{\sqrt{70}i}{112} & 0 & 0 & -\frac{5\sqrt{42}}{672} & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & 0 & -\frac{3\sqrt{70}}{224} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{70}i}{112} & \frac{5\sqrt{42}}{672} & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{70}}{224} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{70}}{56} & -\frac{5\sqrt{42}i}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{42} & -\frac{5\sqrt{70}i}{224} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{56} \\ -\frac{\sqrt{70}}{56} & 0 & 0 & \frac{5\sqrt{42}i}{224} & 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & 0 & \frac{5\sqrt{70}i}{224} & 0 & 0 & 0 & \frac{\sqrt{70}i}{56} & 0 \end{bmatrix}$ |
| 362 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{70}i}{112} & 0 & 0 & \frac{\sqrt{42}}{168} & 0 & -\frac{5\sqrt{42}i}{672} & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}i}{224} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{70}i}{112} & -\frac{\sqrt{42}}{168} & 0 & -\frac{5\sqrt{42}i}{672} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}i}{224} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{42}i}{672} & 0 & -\frac{\sqrt{42}}{42} & \frac{5\sqrt{42}i}{168} & 0 & 0 & -\frac{3\sqrt{70}i}{224} & 0 & \frac{\sqrt{70}}{56} & \frac{\sqrt{70}i}{112} & 0 \\ 0 & 0 & -\frac{5\sqrt{42}i}{672} & 0 & \frac{\sqrt{42}}{42} & 0 & 0 & -\frac{5\sqrt{42}i}{168} & -\frac{3\sqrt{70}i}{224} & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & -\frac{\sqrt{70}i}{112} \\ 0 & \frac{\sqrt{70}i}{56} & 0 & 0 & -\frac{5\sqrt{42}i}{224} & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & \frac{5\sqrt{70}i}{224} & 0 & 0 & 0 & -\frac{\sqrt{70}}{56} \\ \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}i}{224} & \frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & -\frac{5\sqrt{70}i}{224} & \frac{\sqrt{70}}{56} & 0 & 0 \end{bmatrix}$ |
| 363 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & -\frac{3\sqrt{7}}{56} \\ \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{168} & \frac{\sqrt{105}}{168} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}i}{56} & \frac{3\sqrt{7}}{56} & 0 \\ 0 & \frac{\sqrt{7}}{14} & -\frac{\sqrt{105}i}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} & -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 \\ -\frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 \\ \frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & -\frac{3\sqrt{7}i}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{7}i}{14} & \frac{\sqrt{105}}{168} & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 \end{bmatrix}$ |
| 364 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{G}_{3,1}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{3\sqrt{7}}{56} & -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} & -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} \\ -\frac{3\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{105}i}{84} & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 \\ 0 & -\frac{3\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{105}i}{84} & 0 & 0 & \frac{\sqrt{105}}{168} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{7}}{14} \\ -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{28} & -\frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{105}i}{336} & 0 & -\frac{5\sqrt{105}}{336} & 0 & 0 & 0 & -\frac{\sqrt{7}i}{112} & 0 & -\frac{\sqrt{7}}{112} & \frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & \frac{5\sqrt{105}i}{336} & 0 & \frac{5\sqrt{105}}{336} & 0 & 0 & 0 & -\frac{\sqrt{7}i}{112} & 0 & \frac{\sqrt{7}}{112} & 0 & 0 & -\frac{\sqrt{7}i}{14} \end{bmatrix}$ |
| 365 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | $\mathbb{T}_2^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 366 | symmetry | $\sqrt{3}yz$ |
| | $\mathbb{T}_{2,0}^{(a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 367 | symmetry | $-\sqrt{3}xz$ |
| | $\mathbb{T}_{2,1}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} \\ -\frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 368 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{T}_{2,0}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & \frac{3\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} \end{bmatrix}$ |
| 369 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 370 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ $\begin{bmatrix} 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 371 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \end{bmatrix}$ |
| 372 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|---------------------------|--|
| | $\mathbb{T}_4^{(a)}(A_2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} \\ -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 373 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{28} & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{70}i}{112} & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}i}{112} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{70}i}{112} & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}i}{112} & 0 & 0 \end{bmatrix}$ |
| 374 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} \\ \frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{70}i}{112} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}i}{112} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{70}i}{112} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}i}{112} & 0 & 0 & 0 \end{bmatrix}$ |
| 375 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 376 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | $\mathbb{T}_{4,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 377 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{14} & 0 \end{bmatrix}$ |
| 378 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{21}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{21}i}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{21}i}{56} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 379 | symmetry | $\frac{3x^4 + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4}{8}$ $\begin{bmatrix} 0 & -\frac{\sqrt{35}}{56} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & -\frac{\sqrt{35}i}{56} \\ -\frac{\sqrt{35}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{28} & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & \frac{\sqrt{35}i}{56} & 0 \\ 0 & -\frac{\sqrt{35}i}{56} & \frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{56} \\ \frac{\sqrt{35}i}{56} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & \frac{\sqrt{35}}{56} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{112} & 0 & -\frac{\sqrt{21}}{112} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{112} & 0 & \frac{\sqrt{35}}{112} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{112} & 0 & -\frac{\sqrt{21}}{112} & 0 & 0 & 0 & \frac{\sqrt{35}i}{112} & 0 & \frac{\sqrt{35}}{112} & 0 & 0 & 0 \end{bmatrix}$ |
| 380 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & -\frac{\sqrt{2}i}{32} & -\frac{\sqrt{2}}{16} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & \frac{\sqrt{2}i}{32} & 0 & 0 & \frac{\sqrt{2}}{16} \\ \frac{\sqrt{2}}{16} & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{32} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{16} & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{32} & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{8} & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} \\ -\frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & 0 & 0 & \frac{\sqrt{2}}{8} \end{bmatrix}$ |
| 381 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{32} & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & \frac{\sqrt{2}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{32} & 0 & \frac{\sqrt{2}i}{8} & \frac{\sqrt{2}}{16} & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{32} & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & -\frac{\sqrt{2}}{16} \\ 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & 0 & \frac{\sqrt{2}i}{8} \\ -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{32} & -\frac{\sqrt{2}i}{8} & 0 \end{bmatrix}$ |
| 382 | symmetry | $\frac{-\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{210}i}{224} & -\frac{\sqrt{210}}{56} & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 & -\frac{11\sqrt{14}i}{224} & -\frac{5\sqrt{14}}{112} & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{210}i}{224} & 0 & 0 & \frac{\sqrt{210}}{56} & -\frac{\sqrt{14}}{56} & 0 & \frac{11\sqrt{14}i}{224} & 0 & 0 & \frac{5\sqrt{14}}{112} \\ -\frac{5\sqrt{14}}{112} & 0 & 0 & -\frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & 0 & -\frac{9\sqrt{14}i}{224} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 & 0 \\ 0 & \frac{5\sqrt{14}}{112} & \frac{\sqrt{210}i}{224} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{9\sqrt{14}i}{224} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{14}i}{56} & -\frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{14}}{224} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} \\ -\frac{\sqrt{14}i}{56} & 0 & 0 & \frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{14}}{224} & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 \end{bmatrix}$ |
| 383 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{5\sqrt{14}}{112} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{224} & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & -\frac{9\sqrt{14}}{224} & 0 & 0 \\ 0 & \frac{5\sqrt{14}}{112} & 0 & 0 & \frac{\sqrt{210}}{224} & 0 & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & -\frac{9\sqrt{14}}{224} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{210}}{224} & 0 & 0 & -\frac{\sqrt{210}}{56} & 0 & 0 & -\frac{11\sqrt{14}}{224} & 0 & -\frac{\sqrt{14}i}{56} & \frac{5\sqrt{14}}{112} & 0 \\ 0 & 0 & -\frac{3\sqrt{210}}{224} & 0 & 0 & 0 & \frac{\sqrt{210}}{56} & -\frac{11\sqrt{14}}{224} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & -\frac{5\sqrt{14}}{112} & 0 \\ 0 & -\frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{14}}{224} & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 \\ -\frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{14}}{224} & \frac{\sqrt{14}i}{56} & 0 & 0 \end{bmatrix}$ |
| 384 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{T}_{4,0}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{8} \\ \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{8} & 0 \\ 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{8} \\ -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{8} \\ 0 & 0 & 0 & \frac{\sqrt{15}i}{16} & 0 & \frac{\sqrt{15}}{16} & 0 & 0 & 0 & -\frac{3i}{16} & 0 & \frac{3}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{15}i}{16} & 0 & \frac{\sqrt{15}}{16} & 0 & 0 & 0 & \frac{3i}{16} & 0 & \frac{3}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 385 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{8} \\ \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{8} \\ 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{8} \\ \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{8} \\ 0 & 0 & 0 & \frac{\sqrt{15}}{16} & 0 & -\frac{\sqrt{15}i}{16} & 0 & 0 & 0 & -\frac{3}{16} & 0 & -\frac{3i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{15}}{16} & 0 & \frac{\sqrt{15}i}{16} & 0 & 0 & 0 & -\frac{3}{16} & 0 & \frac{3i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 386 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ $\begin{bmatrix} 0 & \frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & -\frac{3\sqrt{7}i}{56} \\ \frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & \frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{56} & \frac{3\sqrt{7}i}{56} & 0 \\ 0 & -\frac{\sqrt{7}i}{28} & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & -\frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}}{56} \\ \frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 \\ -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 \\ 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| 387 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ $\begin{bmatrix} 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{28} \\ -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{7}}{28} \\ 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{7}i}{28} \\ \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & \frac{\sqrt{7}i}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{105}}{112} & 0 & \frac{\sqrt{105}i}{112} & 0 & 0 & 0 & \frac{\sqrt{7}}{112} & 0 & -\frac{\sqrt{7}i}{112} & -\frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & \frac{\sqrt{105}}{112} & 0 & -\frac{\sqrt{105}i}{112} & 0 & 0 & 0 & \frac{\sqrt{7}}{112} & 0 & \frac{\sqrt{7}i}{112} & 0 & 0 & \frac{\sqrt{7}}{14} \end{bmatrix}$ |
| 388 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------|---|
| | $\mathbb{T}_2^{(1,0;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} \\ \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 \\ 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{84} \\ -\frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{84} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 389 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{84} & -\frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{70}}{42} & 0 & -\frac{\sqrt{70}i}{84} & \frac{\sqrt{70}}{84} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & \frac{\sqrt{42}}{84} & \frac{\sqrt{70}}{42} & 0 & \frac{\sqrt{70}i}{84} & 0 & 0 & -\frac{\sqrt{70}}{84} \\ \frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & \frac{\sqrt{42}}{28} & 0 & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 & -\frac{\sqrt{70}}{84} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}}{84} & \frac{\sqrt{42}i}{84} & 0 & \frac{\sqrt{42}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & -\frac{\sqrt{70}}{84} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{70}i}{84} & -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{28} & -\frac{\sqrt{70}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} \\ -\frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & \frac{\sqrt{70}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 \end{bmatrix}$ |
| 390 | symmetry | $-\sqrt{3}xz$ $\begin{bmatrix} \frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & \frac{\sqrt{70}}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{70}}{84} & \frac{\sqrt{42}i}{28} & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 & \frac{\sqrt{70}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & \frac{\sqrt{70}i}{42} & -\frac{\sqrt{70}}{84} & 0 \\ 0 & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{84} & -\frac{\sqrt{70}}{84} & 0 & -\frac{\sqrt{70}i}{42} & 0 & 0 & \frac{\sqrt{70}}{84} \\ 0 & -\frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & \frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{70}i}{84} \\ -\frac{\sqrt{70}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{84} & -\frac{\sqrt{42}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & \frac{\sqrt{70}i}{84} & 0 \end{bmatrix}$ |
| 391 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & \frac{\sqrt{70}}{84} & 0 & 0 & \frac{\sqrt{42}}{42} & 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & \frac{\sqrt{70}}{42} & 0 & 0 & -\frac{\sqrt{70}i}{84} \\ \frac{\sqrt{70}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{42} & \frac{\sqrt{70}i}{84} & 0 \\ 0 & -\frac{\sqrt{70}i}{84} & \frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{84} & -\frac{\sqrt{70}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} \\ \frac{\sqrt{70}i}{84} & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{70}}{42} & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 \\ -\frac{\sqrt{70}}{42} & 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & \frac{\sqrt{70}i}{84} & 0 & \frac{\sqrt{70}}{84} & 0 & 0 \\ 0 & \frac{\sqrt{70}}{42} & -\frac{\sqrt{42}i}{84} & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{84} & 0 & \frac{\sqrt{70}}{84} & 0 & 0 & 0 \end{bmatrix}$ |
| 392 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|---------------------------|---|
| | $T_{2,1}^{(1,0;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{70}i}{84} & -\frac{\sqrt{42}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{84} & \frac{\sqrt{70}}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{84} \\ -\frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{42}}{28} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & 0 & 0 & \frac{\sqrt{70}}{84} & 0 \\ 0 & \frac{\sqrt{70}}{84} & 0 & 0 & \frac{\sqrt{42}}{28} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & \frac{\sqrt{70}}{84} & 0 & 0 & -\frac{\sqrt{70}i}{84} \\ \frac{\sqrt{70}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{28} & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & \frac{\sqrt{70}i}{84} & 0 & -\frac{\sqrt{70}i}{84} \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & \frac{\sqrt{70}i}{84} & -\frac{\sqrt{70}}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{84} & 0 & -\frac{\sqrt{70}i}{84} & 0 & 0 & \frac{\sqrt{70}}{42} \end{bmatrix}$ |
| 393 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ $\begin{bmatrix} 0 & -\frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{56} \\ -\frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{56} \\ 0 & -\frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{56} \\ \frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{56} \\ 0 & 0 & 0 & -\frac{3\sqrt{35}i}{112} & 0 & -\frac{3\sqrt{35}}{112} & 0 & 0 & 0 & -\frac{5\sqrt{21}i}{112} & 0 & \frac{5\sqrt{21}}{112} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{35}i}{112} & 0 & -\frac{3\sqrt{35}}{112} & 0 & 0 & 0 & \frac{5\sqrt{21}i}{112} & 0 & \frac{5\sqrt{21}}{112} & 0 & 0 & 0 \end{bmatrix}$ |
| 394 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{32} & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & -\frac{\sqrt{30}i}{32} & \frac{3\sqrt{30}}{80} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{32} & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & -\frac{3\sqrt{30}}{80} \\ -\frac{3\sqrt{30}}{80} & 0 & 0 & \frac{3\sqrt{2}i}{32} & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & \frac{\sqrt{30}i}{160} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{30}}{80} & -\frac{3\sqrt{2}i}{32} & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{160} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{40} & \frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{30}}{160} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{40} \\ \frac{\sqrt{30}i}{40} & 0 & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{30}}{160} & 0 & 0 & 0 & -\frac{\sqrt{30}}{40} & 0 \end{bmatrix}$ |
| 395 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ $\begin{bmatrix} -\frac{3\sqrt{30}}{80} & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{160} & 0 & 0 \\ 0 & \frac{3\sqrt{30}}{80} & -\frac{\sqrt{2}i}{8} & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{160} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & \frac{\sqrt{30}i}{40} & -\frac{3\sqrt{30}}{80} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & -\frac{\sqrt{30}i}{40} & 0 & 0 & \frac{3\sqrt{30}}{80} \\ 0 & \frac{\sqrt{30}}{40} & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{30}}{160} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{40} \\ \frac{\sqrt{30}}{40} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{30}}{160} & \frac{\sqrt{30}i}{40} & 0 & 0 \end{bmatrix}$ |
| 396 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{14}i}{224} & \frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{210}}{280} & 0 & \frac{9\sqrt{210}i}{1120} & -\frac{\sqrt{210}}{560} & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{14}i}{224} & 0 & 0 & -\frac{\sqrt{14}}{56} & -\frac{\sqrt{210}}{280} & 0 & -\frac{9\sqrt{210}i}{1120} & 0 & 0 & \frac{\sqrt{210}}{560} \\ -\frac{\sqrt{210}}{560} & 0 & 0 & -\frac{3\sqrt{14}i}{224} & 0 & -\frac{3\sqrt{14}}{56} & 0 & 0 & 0 & -\frac{9\sqrt{210}i}{1120} & 0 & \frac{\sqrt{210}}{70} & 0 & 0 \\ 0 & \frac{\sqrt{210}}{560} & \frac{3\sqrt{14}i}{224} & 0 & -\frac{3\sqrt{14}}{56} & 0 & 0 & 0 & 0 & \frac{9\sqrt{210}i}{1120} & 0 & \frac{\sqrt{210}}{70} & 0 & 0 \\ 0 & \frac{3\sqrt{210}i}{280} & -\frac{3\sqrt{14}}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{14} & -\frac{\sqrt{210}}{224} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{210}}{280} \\ -\frac{3\sqrt{210}i}{280} & 0 & 0 & \frac{3\sqrt{14}}{224} & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & \frac{\sqrt{210}}{224} & 0 & 0 & 0 & -\frac{3\sqrt{210}}{280} \end{bmatrix}$ |
| 397 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{210}}{560} & 0 & 0 & \frac{3\sqrt{14}i}{56} & 0 & \frac{3\sqrt{14}}{224} & 0 & 0 & 0 & \frac{\sqrt{210}i}{70} & 0 & -\frac{9\sqrt{210}}{1120} & 0 & 0 \\ 0 & \frac{\sqrt{210}}{560} & -\frac{3\sqrt{14}i}{56} & 0 & \frac{3\sqrt{14}}{224} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{70} & 0 & -\frac{9\sqrt{210}}{1120} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{14}}{224} & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & \frac{9\sqrt{210}}{1120} & 0 & -\frac{\sqrt{210}i}{280} & \frac{\sqrt{210}}{560} & 0 \\ 0 & 0 & \frac{3\sqrt{14}}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} & \frac{9\sqrt{210}}{1120} & 0 & \frac{\sqrt{210}i}{280} & 0 & 0 & -\frac{\sqrt{210}}{560} \\ 0 & -\frac{3\sqrt{210}}{280} & 0 & 0 & -\frac{3\sqrt{14}}{224} & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 & \frac{\sqrt{210}}{224} & 0 & 0 & -\frac{3\sqrt{210}i}{280} \\ -\frac{3\sqrt{210}}{280} & 0 & 0 & 0 & 0 & \frac{3\sqrt{14}}{224} & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{224} & \frac{3\sqrt{210}i}{280} & 0 \end{bmatrix}$ |
| 398 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ $\begin{bmatrix} 0 & \frac{\sqrt{15}}{40} & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}i}{40} \\ \frac{\sqrt{15}}{40} & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & \frac{\sqrt{15}i}{40} & 0 \\ 0 & \frac{\sqrt{15}i}{40} & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{40} \\ -\frac{\sqrt{15}i}{40} & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & \frac{\sqrt{15}}{40} & 0 \\ 0 & 0 & 0 & -\frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{80} & 0 & -\frac{\sqrt{15}}{80} & 0 & 0 \\ 0 & 0 & \frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{80} & 0 & -\frac{\sqrt{15}}{80} & 0 & 0 & 0 \end{bmatrix}$ |
| 399 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{15}i}{40} & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} \\ \frac{\sqrt{15}i}{40} & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} \\ 0 & \frac{\sqrt{15}}{40} & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & -\frac{\sqrt{15}i}{40} \\ \frac{\sqrt{15}}{40} & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & \frac{\sqrt{15}i}{40} & 0 \\ 0 & 0 & 0 & -\frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & 0 & \frac{\sqrt{15}}{80} & 0 & \frac{\sqrt{15}i}{80} & 0 & 0 \\ 0 & 0 & -\frac{1}{16} & 0 & -\frac{i}{16} & 0 & 0 & 0 & \frac{\sqrt{15}}{80} & 0 & -\frac{\sqrt{15}i}{80} & 0 & 0 & 0 \end{bmatrix}$ |
| 400 | symmetry | $\frac{-\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|---------------------------|--|
| | $T_{4,0}^{(1,0;a)}(E, 3)$ | $\begin{bmatrix} 0 & \frac{\sqrt{105}}{140} & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & -\frac{3\sqrt{7}i}{56} & 0 & 0 & -\frac{3\sqrt{105}}{280} & 0 & 0 & \frac{\sqrt{105}i}{56} \\ \frac{\sqrt{105}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{56} & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & \frac{3\sqrt{105}}{280} & -\frac{\sqrt{105}i}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{140} & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & \frac{3\sqrt{105}}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} \\ \frac{\sqrt{105}i}{140} & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & -\frac{3\sqrt{105}}{280} & 0 & 0 & \frac{\sqrt{105}}{56} & 0 \\ -\frac{\sqrt{105}}{70} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & \frac{\sqrt{105}i}{140} & 0 & \frac{\sqrt{105}}{140} & 0 & 0 \\ 0 & \frac{\sqrt{105}}{70} & -\frac{\sqrt{7}i}{14} & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{140} & 0 & \frac{\sqrt{105}}{140} & 0 & 0 & 0 \end{bmatrix}$ |
| 401 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{56} & \frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & \frac{\sqrt{105}}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{140} \\ \frac{\sqrt{105}i}{56} & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & -\frac{\sqrt{105}}{140} & 0 & 0 & 0 & \frac{\sqrt{105}}{140} \\ 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{105}}{140} & 0 & 0 & -\frac{\sqrt{105}i}{140} \\ -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{28} & -\frac{3\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{140} & \frac{\sqrt{105}i}{140} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{112} & 0 & -\frac{\sqrt{7}i}{112} & 0 & 0 & 0 & -\frac{11\sqrt{105}}{560} & 0 & \frac{11\sqrt{105}i}{560} & -\frac{\sqrt{105}}{70} & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{112} & 0 & \frac{\sqrt{7}i}{112} & 0 & 0 & 0 & -\frac{11\sqrt{105}}{560} & 0 & -\frac{11\sqrt{105}i}{560} & 0 & 0 & \frac{\sqrt{105}}{70} \end{bmatrix}$ |
| 402 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ $\begin{bmatrix} 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & \frac{\sqrt{105}i}{84} \\ \frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & -\frac{\sqrt{105}i}{84} & 0 \\ 0 & \frac{\sqrt{105}i}{84} & \frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} \\ -\frac{\sqrt{105}i}{84} & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 \end{bmatrix}$ |
| 403 | symmetry | $\sqrt{3}yz$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{21} & -\frac{\sqrt{21}}{21} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{42} & -\frac{\sqrt{35}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & 0 & \frac{\sqrt{21}}{21} & \frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{35}}{42} \\ -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{84} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}}{42} & \frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{35}i}{42} & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 \\ \frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{84} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 \end{bmatrix}$ |
| 404 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|---------------------------|---|
| | $T_{2,1}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{84} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}}{42} & 0 & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & -\frac{\sqrt{21}}{21} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{42} & \frac{\sqrt{35}}{42} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{21} & \frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} \\ 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{84} & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & -\frac{\sqrt{35}i}{42} & 0 & 0 \end{bmatrix}$ |
| 405 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & \frac{\sqrt{35}}{84} & 0 & 0 & -\frac{5\sqrt{21}}{168} & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & \frac{\sqrt{35}}{168} & 0 & 0 & \frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{84} & 0 & 0 & 0 & 0 & \frac{5\sqrt{21}}{168} & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{168} & -\frac{\sqrt{35}i}{42} & 0 \\ 0 & -\frac{\sqrt{35}i}{84} & -\frac{5\sqrt{21}}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{84} & -\frac{\sqrt{35}}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} \\ \frac{\sqrt{35}i}{84} & 0 & 0 & \frac{5\sqrt{21}}{168} & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{35}}{168} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 \\ -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{21}i}{24} & 0 & \frac{\sqrt{21}}{24} & 0 & 0 & 0 & \frac{5\sqrt{35}i}{168} & 0 & \frac{5\sqrt{35}}{168} & 0 & 0 \\ 0 & \frac{\sqrt{35}}{42} & \frac{\sqrt{21}i}{24} & 0 & \frac{\sqrt{21}}{24} & 0 & 0 & 0 & -\frac{5\sqrt{35}i}{168} & 0 & \frac{5\sqrt{35}}{168} & 0 & 0 & 0 \end{bmatrix}$ |
| 406 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{84} & -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{84} \\ \frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & \frac{\sqrt{35}}{84} & 0 \\ 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 \\ -\frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{21} & 0 & -\frac{\sqrt{21}i}{21} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{42} & -\frac{\sqrt{35}}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{21} & 0 & \frac{\sqrt{21}i}{21} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{35}}{42} \end{bmatrix}$ |
| 407 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 408 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------|---|
| | $\mathbb{M}_3^{(a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 409 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} \\ -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{16} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 410 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| 411 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} \\ \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 412 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | $\mathbb{M}_{3,0}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \end{bmatrix}$ |
| 413 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 414 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}}{168} & 0 & -\frac{\sqrt{210}i}{84} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{14}}{56} & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}}{168} & 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & -\frac{3\sqrt{14}}{56} & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & -\frac{3\sqrt{14}}{56} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} \\ -\frac{\sqrt{210}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 \end{bmatrix}$ |
| 415 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & \frac{\sqrt{21}i}{42} & -\frac{3\sqrt{35}}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{70} & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{42} \\ -\frac{\sqrt{21}i}{42} & 0 & 0 & \frac{3\sqrt{35}}{140} & 0 & 0 & 0 & \frac{\sqrt{35}}{70} & 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 \\ 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & -\frac{3\sqrt{35}}{140} & 0 & 0 & -\frac{\sqrt{35}i}{70} & 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}i}{42} \\ -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & \frac{3\sqrt{35}}{140} & \frac{\sqrt{35}i}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & \frac{\sqrt{21}i}{42} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}}{70} & 0 & -\frac{\sqrt{35}i}{70} & \frac{3\sqrt{35}}{70} & 0 & 0 & \frac{\sqrt{21}}{42} & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}}{70} & 0 & \frac{\sqrt{35}i}{70} & 0 & 0 & -\frac{3\sqrt{35}}{70} & \frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 416 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------------------------------|---|
| | $\mathbb{M}_3^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & \frac{\sqrt{210}i}{168} & 0 & -\frac{\sqrt{210}}{84} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{168} & 0 & -\frac{\sqrt{210}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & \frac{3\sqrt{14}i}{56} & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & \frac{\sqrt{210}i}{168} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & -\frac{3\sqrt{14}i}{56} & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & -\frac{\sqrt{210}i}{168} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{84} \\ \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{84} & 0 \end{bmatrix}$ |
| 417 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{210}}{280} & 0 & -\frac{\sqrt{210}i}{420} & -\frac{\sqrt{210}}{105} & 0 & 0 & -\frac{5\sqrt{14}}{168} & 0 & -\frac{\sqrt{14}i}{84} & \frac{\sqrt{14}}{21} & 0 \\ 0 & 0 & -\frac{3\sqrt{210}}{280} & 0 & \frac{\sqrt{210}i}{420} & 0 & 0 & \frac{\sqrt{210}}{105} & -\frac{5\sqrt{14}}{168} & 0 & \frac{\sqrt{14}i}{84} & 0 & 0 & -\frac{\sqrt{14}}{21} \\ \frac{\sqrt{14}}{21} & 0 & 0 & -\frac{\sqrt{210}i}{420} & 0 & -\frac{\sqrt{210}}{280} & 0 & 0 & 0 & \frac{\sqrt{14}i}{84} & 0 & \frac{\sqrt{14}}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{21} & \frac{\sqrt{210}i}{420} & 0 & -\frac{\sqrt{210}}{280} & 0 & 0 & 0 & -\frac{\sqrt{14}i}{84} & 0 & \frac{\sqrt{14}}{24} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{14}i}{84} & -\frac{\sqrt{210}}{105} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{70} & -\frac{\sqrt{14}}{21} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{84} \\ -\frac{\sqrt{14}i}{84} & 0 & 0 & \frac{\sqrt{210}}{105} & 0 & 0 & \frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{14}}{21} & 0 & 0 & 0 & -\frac{\sqrt{14}}{84} \end{bmatrix}$ |
| 418 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ $\begin{bmatrix} \frac{\sqrt{14}}{21} & 0 & 0 & \frac{\sqrt{210}i}{280} & 0 & \frac{\sqrt{210}}{420} & 0 & 0 & 0 & \frac{\sqrt{14}i}{24} & 0 & \frac{\sqrt{14}}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{21} & -\frac{\sqrt{210}i}{280} & 0 & \frac{\sqrt{210}}{420} & 0 & 0 & 0 & -\frac{\sqrt{14}i}{24} & 0 & \frac{\sqrt{14}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{210}}{420} & 0 & \frac{3\sqrt{210}i}{280} & -\frac{\sqrt{210}}{105} & 0 & 0 & -\frac{\sqrt{14}i}{84} & 0 & -\frac{5\sqrt{14}i}{168} & -\frac{\sqrt{14}}{21} & 0 \\ 0 & 0 & \frac{\sqrt{210}}{420} & 0 & -\frac{3\sqrt{210}i}{280} & 0 & 0 & \frac{\sqrt{210}}{105} & -\frac{\sqrt{14}}{84} & 0 & \frac{5\sqrt{14}i}{168} & 0 & 0 & \frac{\sqrt{14}}{21} \\ 0 & -\frac{\sqrt{14}}{84} & 0 & 0 & -\frac{\sqrt{210}}{105} & 0 & 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & \frac{\sqrt{14}}{21} & 0 & 0 & -\frac{\sqrt{14}i}{84} \\ -\frac{\sqrt{14}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{105} & \frac{\sqrt{210}i}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{21} & \frac{\sqrt{14}i}{84} & 0 \end{bmatrix}$ |
| 419 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{42} & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} & \frac{\sqrt{35}i}{42} & 0 \\ 0 & -\frac{\sqrt{35}i}{42} & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{42} & \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} \\ \frac{\sqrt{35}i}{42} & 0 & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 \\ \frac{\sqrt{35}}{42} & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 \\ 0 & -\frac{\sqrt{35}}{42} & -\frac{\sqrt{21}i}{42} & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{42} & 0 & \frac{\sqrt{35}}{42} & 0 & 0 & 0 \end{bmatrix}$ |
| 420 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{35}i}{42} & \frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{42} & -\frac{\sqrt{35}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{42} \\ -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & \frac{\sqrt{35}}{84} & 0 & 0 & 0 & \frac{\sqrt{35}}{42} \\ 0 & \frac{\sqrt{35}}{42} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & -\frac{\sqrt{35}i}{42} \\ \frac{\sqrt{35}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{28} & \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{84} & \frac{\sqrt{35}i}{42} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & \frac{\sqrt{35}i}{42} & \frac{\sqrt{35}}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & -\frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{\sqrt{35}}{42} \end{bmatrix}$ |
| 421 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ $\begin{bmatrix} 0 & 0 & 0 & -\frac{5\sqrt{2}}{48} & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{30}}{80} & 0 & \frac{\sqrt{30}i}{48} & \frac{\sqrt{30}}{30} & 0 \\ 0 & 0 & -\frac{5\sqrt{2}}{48} & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{30}}{80} & 0 & -\frac{\sqrt{30}i}{48} & 0 & 0 & -\frac{\sqrt{30}}{30} \\ -\frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{2}i}{48} & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & -\frac{7\sqrt{30}i}{240} & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 \\ 0 & \frac{\sqrt{30}}{30} & \frac{\sqrt{2}i}{48} & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & \frac{7\sqrt{30}i}{240} & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{30} & \frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{30} \\ -\frac{\sqrt{30}i}{30} & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 & \frac{\sqrt{30}}{30} & 0 \end{bmatrix}$ |
| 422 | symmetry | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ $\begin{bmatrix} 0 & -\frac{\sqrt{21}i}{84} & \frac{\sqrt{35}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{42} & \frac{5\sqrt{21}}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{84} \\ \frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 & -\frac{\sqrt{35}}{42} & 0 & 0 & -\frac{5\sqrt{21}}{168} & 0 & 0 & 0 & \frac{\sqrt{21}}{84} \\ 0 & \frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & \frac{\sqrt{35}i}{42} & 0 & 0 & -\frac{5\sqrt{21}}{168} & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} \\ \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{56} & -\frac{\sqrt{35}i}{42} & 0 & 0 & 0 & 0 & \frac{5\sqrt{21}}{168} & -\frac{\sqrt{21}i}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & -\frac{\sqrt{35}i}{56} & \frac{\sqrt{35}}{21} & 0 & 0 & \frac{5\sqrt{21}}{168} & 0 & \frac{5\sqrt{21}i}{168} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & -\frac{\sqrt{35}}{21} & \frac{5\sqrt{21}}{168} & 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & 0 \end{bmatrix}$ |
| 423 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ $\begin{bmatrix} \frac{\sqrt{30}}{30} & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & -\frac{\sqrt{2}}{48} & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & \frac{7\sqrt{30}}{240} & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{30} & -\frac{\sqrt{2}i}{16} & 0 & -\frac{\sqrt{2}}{48} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{48} & 0 & \frac{7\sqrt{30}}{240} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & -\frac{5\sqrt{2}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & \frac{\sqrt{30}i}{80} & \frac{\sqrt{30}}{30} & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & \frac{5\sqrt{2}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & -\frac{\sqrt{30}i}{80} & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & \frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{30} \\ \frac{\sqrt{30}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & \frac{\sqrt{30}i}{30} & 0 & 0 \end{bmatrix}$ |
| 424 | symmetry | $\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-------------------------------------|--|
| | $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 425 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 426 | symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ $\begin{bmatrix} 0 & 0 & 0 & \frac{5\sqrt{21}}{168} & 0 & -\frac{\sqrt{21}i}{168} & \frac{\sqrt{21}}{21} & 0 & 0 & \frac{\sqrt{35}}{40} & 0 & \frac{3\sqrt{35}i}{280} & -\frac{\sqrt{35}}{70} & 0 \\ 0 & 0 & \frac{5\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & -\frac{\sqrt{21}}{21} & \frac{\sqrt{35}}{40} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 & \frac{\sqrt{35}}{70} \\ -\frac{\sqrt{35}}{70} & 0 & 0 & -\frac{\sqrt{21}i}{168} & 0 & \frac{\sqrt{21}}{168} & 0 & 0 & 0 & -\frac{3\sqrt{35}i}{280} & 0 & -\frac{3\sqrt{35}}{280} & 0 & 0 \\ 0 & \frac{\sqrt{35}}{70} & \frac{\sqrt{21}i}{168} & 0 & \frac{\sqrt{21}}{168} & 0 & 0 & 0 & \frac{3\sqrt{35}i}{280} & 0 & -\frac{3\sqrt{35}}{280} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{70} & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{21} & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{70} \\ -\frac{\sqrt{35}i}{70} & 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & -\frac{\sqrt{35}}{70} \end{bmatrix}$ |
| 427 | symmetry | $\frac{\sqrt{15}y(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ $\begin{bmatrix} -\frac{\sqrt{35}}{70} & 0 & 0 & -\frac{\sqrt{21}i}{168} & 0 & \frac{\sqrt{21}}{168} & 0 & 0 & 0 & -\frac{3\sqrt{35}i}{280} & 0 & -\frac{3\sqrt{35}}{280} & 0 & 0 \\ 0 & \frac{\sqrt{35}}{70} & \frac{\sqrt{21}i}{168} & 0 & \frac{\sqrt{21}}{168} & 0 & 0 & 0 & \frac{3\sqrt{35}i}{280} & 0 & -\frac{3\sqrt{35}}{280} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{168} & 0 & -\frac{5\sqrt{21}i}{168} & \frac{\sqrt{21}}{21} & 0 & 0 & \frac{3\sqrt{35}}{280} & 0 & \frac{\sqrt{35}i}{40} & \frac{\sqrt{35}}{70} & 0 \\ 0 & 0 & \frac{\sqrt{21}}{168} & 0 & \frac{5\sqrt{21}i}{168} & 0 & 0 & -\frac{\sqrt{21}}{21} & \frac{3\sqrt{35}}{280} & 0 & -\frac{\sqrt{35}i}{40} & 0 & 0 & -\frac{\sqrt{35}}{70} \\ 0 & -\frac{\sqrt{35}}{70} & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{21}i}{21} & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & -\frac{\sqrt{35}i}{70} \\ -\frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{28} & \frac{\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & \frac{\sqrt{35}i}{70} & 0 \end{bmatrix}$ |
| 428 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{M}_{5,0}^{(1,-1;a)}(E,3)$ | $\begin{bmatrix} 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{40} & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{20} & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} \\ \frac{\sqrt{15}i}{20} & 0 & 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & \frac{i}{8} & 0 & \frac{1}{8} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{40} & 0 & \frac{\sqrt{15}}{40} & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{8} & 0 & \frac{1}{8} & 0 & 0 & 0 & \frac{\sqrt{15}i}{40} & 0 & \frac{\sqrt{15}}{40} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 429 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ $\begin{bmatrix} 0 & \frac{\sqrt{15}i}{20} & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} \\ -\frac{\sqrt{15}i}{20} & 0 & 0 & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{40} & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{40} & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & \frac{1}{8} & 0 & -\frac{i}{8} & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & 0 & -\frac{\sqrt{15}i}{40} & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{8} & 0 & \frac{i}{8} & 0 & 0 & 0 & -\frac{\sqrt{15}}{40} & 0 & \frac{\sqrt{15}i}{40} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 430 | symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ $\begin{bmatrix} 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 & \frac{3\sqrt{5}}{40} & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{24} & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}}{40} & 0 & 0 \\ 0 & \frac{\sqrt{5}i}{20} & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & -\frac{3\sqrt{5}}{40} & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & \frac{3\sqrt{5}}{40} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}i}{40} & 0 & \frac{3\sqrt{5}}{40} & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{10} & -\frac{\sqrt{3}i}{24} & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & -\frac{3\sqrt{5}i}{40} & 0 & \frac{3\sqrt{5}}{40} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 431 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & \frac{\sqrt{5}i}{20} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & -\frac{\sqrt{5}i}{20} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{5}i}{20} & \frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \end{bmatrix}$ |
| 432 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{32} & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & -\frac{\sqrt{6}i}{96} & \frac{\sqrt{6}}{16} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{32} & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & \frac{\sqrt{6}i}{96} & 0 & 0 & -\frac{\sqrt{6}}{16} \\ -\frac{\sqrt{6}}{16} & 0 & 0 & \frac{\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{96} & 0 & \frac{\sqrt{6}}{24} & 0 & 0 \\ 0 & \frac{\sqrt{6}}{16} & -\frac{\sqrt{10}i}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{96} & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{24} & -\frac{3\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{6}}{32} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} \\ -\frac{\sqrt{6}i}{24} & 0 & 0 & \frac{3\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{6}}{32} & 0 & 0 & 0 & \frac{\sqrt{6}}{24} \end{bmatrix}$ |
| 433 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | | $\begin{bmatrix} 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} \\ -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 \\ 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} \\ -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 \\ 0 & 0 & 0 & -\frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & 0 & -\frac{\sqrt{15}}{48} & 0 & -\frac{\sqrt{15}i}{48} & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{16} & 0 & -\frac{i}{16} & 0 & 0 & 0 & -\frac{\sqrt{15}}{48} & 0 & \frac{\sqrt{15}i}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| 434 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | $\begin{bmatrix} \frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{96} & 0 & -\frac{\sqrt{6}i}{24} & \frac{\sqrt{6}}{16} & 0 \\ 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{96} & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{6}}{16} \\ 0 & \frac{\sqrt{6}}{24} & 0 & 0 & \frac{3\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{6}}{32} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} \\ \frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{6}}{32} & \frac{\sqrt{6}i}{24} & 0 & 0 \end{bmatrix}$ |
| 435 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{96} & \frac{\sqrt{6}}{24} & 0 & 0 & \frac{\sqrt{10}}{24} & 0 & -\frac{5\sqrt{10}i}{96} & \frac{\sqrt{10}}{48} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{96} & 0 & 0 & -\frac{\sqrt{6}}{24} & \frac{\sqrt{10}}{24} & 0 & \frac{5\sqrt{10}i}{96} & 0 & 0 & -\frac{\sqrt{10}}{48} \\ \frac{\sqrt{10}}{48} & 0 & 0 & -\frac{11\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{7\sqrt{10}i}{96} & 0 & \frac{\sqrt{10}}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{48} & \frac{11\sqrt{6}i}{96} & 0 & 0 & 0 & 0 & 0 & \frac{7\sqrt{10}i}{96} & 0 & \frac{\sqrt{10}}{24} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{24} & \frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{96} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{24} \\ \frac{\sqrt{10}i}{24} & 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{96} & 0 & 0 & 0 & \frac{\sqrt{10}}{24} \end{bmatrix}$ |
| 436 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{M}_{3,1}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} \frac{\sqrt{10}}{48} & 0 & 0 & 0 & 0 & \frac{11\sqrt{6}}{96} & 0 & 0 & 0 & \frac{\sqrt{10}i}{24} & 0 & -\frac{7\sqrt{10}}{96} & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{48} & 0 & 0 & \frac{11\sqrt{6}}{96} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{24} & 0 & -\frac{7\sqrt{10}}{96} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & -\frac{5\sqrt{10}}{96} & 0 & \frac{\sqrt{10}i}{24} & -\frac{\sqrt{10}}{48} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & -\frac{5\sqrt{10}}{96} & 0 & -\frac{\sqrt{10}i}{24} & 0 & 0 & \frac{\sqrt{10}}{48} \\ 0 & \frac{\sqrt{10}}{24} & 0 & 0 & \frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{96} & 0 & 0 & 0 & \frac{\sqrt{10}i}{24} \\ \frac{\sqrt{10}}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{96} & -\frac{\sqrt{10}i}{24} & 0 & 0 \end{bmatrix}$ |
| 437 | symmetry | $\sqrt{15}xyz$ $\begin{bmatrix} 0 & -\frac{1}{6} & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & \frac{1}{24} & 0 & 0 & \frac{i}{24} \\ -\frac{1}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{24} & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & -\frac{1}{24} & -\frac{i}{24} & 0 \\ 0 & \frac{i}{6} & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & -\frac{1}{24} & 0 & 0 & 0 & 0 & \frac{1}{24} \\ -\frac{i}{6} & 0 & 0 & \frac{\sqrt{15}}{24} & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & \frac{1}{24} & 0 & 0 & \frac{1}{24} & 0 \\ -\frac{1}{6} & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & -\frac{i}{24} & 0 & -\frac{1}{24} & 0 & 0 \\ 0 & \frac{1}{6} & -\frac{\sqrt{15}i}{24} & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & \frac{i}{24} & 0 & -\frac{1}{24} & 0 & 0 & 0 \end{bmatrix}$ |
| 438 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & -\frac{i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & -\frac{1}{6} & 0 & 0 & 0 & 0 & -\frac{1}{6} \\ \frac{i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & \frac{1}{6} & 0 & 0 & -\frac{1}{6} & 0 \\ 0 & -\frac{1}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & -\frac{1}{6} & 0 & 0 & \frac{i}{6} \\ -\frac{1}{24} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & \frac{1}{6} & -\frac{i}{6} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{15}}{48} & 0 & \frac{\sqrt{15}i}{48} & 0 & 0 & 0 & -\frac{7}{48} & 0 & \frac{7i}{48} & -\frac{1}{6} & 0 \\ 0 & 0 & \frac{\sqrt{15}}{48} & 0 & -\frac{\sqrt{15}i}{48} & 0 & 0 & 0 & -\frac{7}{48} & 0 & -\frac{7i}{48} & 0 & 0 & \frac{1}{6} \end{bmatrix}$ |
| 439 | symmetry | z $\begin{bmatrix} 0 & -\frac{\sqrt{14}i}{28} & -\frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{140} & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} \\ \frac{\sqrt{14}i}{28} & 0 & 0 & \frac{\sqrt{210}}{140} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{14}}{28} & 0 \\ 0 & \frac{\sqrt{14}}{28} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{14}i}{28} \\ \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{140} & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & -\frac{\sqrt{14}i}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & \frac{\sqrt{210}i}{140} & \frac{\sqrt{210}}{70} & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{210}}{70} & -\frac{\sqrt{14}}{28} & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| 440 | symmetry | x |

continued ...

Table 7

| No. | multipole | matrix |
|----------------------------------|---|----------------------------------|
| $\mathbb{M}_{1,0}^{(1,1;a)}(E)$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{210}}{70} \quad 0 \quad \frac{\sqrt{210}i}{140} \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}i}{28} \quad \frac{\sqrt{14}}{28} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{210}}{70} \quad 0 \quad -\frac{\sqrt{210}i}{140} \quad 0 \quad 0 \quad \frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad -\frac{\sqrt{14}i}{28} \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad \frac{\sqrt{210}i}{140} \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}i}{28} \quad 0 \quad -\frac{\sqrt{14}}{28} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{14}}{28} \quad -\frac{\sqrt{210}i}{140} \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}i}{28} \quad 0 \quad -\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{14}i}{28} \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{140} \quad -\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}i}{28} \quad 0 \quad 0 \quad \frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad \frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{28}$ | |
| 441 | symmetry | y |
| $\mathbb{M}_{1,1}^{(1,1;a)}(E)$ | $\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad \frac{\sqrt{210}i}{140} \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}i}{28} \quad 0 \quad -\frac{\sqrt{14}}{28} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{14}}{28} \quad -\frac{\sqrt{210}i}{140} \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}i}{28} \quad 0 \quad -\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad -\frac{\sqrt{210}i}{70} \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad \frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{28} \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad \frac{\sqrt{210}i}{70} \quad 0 \quad 0 \quad \frac{\sqrt{210}}{140} \quad \frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{28}$ | |
| | $0 \quad \frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{140} \quad 0 \quad 0 \quad \frac{\sqrt{210}i}{140} \quad 0 \quad 0 \quad \frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad \frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{210}}{140} \quad -\frac{\sqrt{210}i}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{28} \quad -\frac{\sqrt{14}i}{28} \quad 0$ | |
| 442 | symmetry | $\frac{\sqrt{10}(x^2-3y^2)}{4}$ |
| $\mathbb{M}_3^{(1,1;a)}(A_1)$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{70}}{42} \quad 0 \quad \frac{5\sqrt{70}i}{224} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{56} \quad 0 \quad \frac{11\sqrt{42}i}{672} \quad \frac{\sqrt{42}}{48} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{70}}{42} \quad 0 \quad -\frac{5\sqrt{70}i}{224} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{56} \quad 0 \quad -\frac{11\sqrt{42}i}{672} \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{48}$ | |
| | $-\frac{\sqrt{42}}{48} \quad 0 \quad 0 \quad -\frac{13\sqrt{70}i}{672} \quad 0 \quad \frac{\sqrt{70}}{56} \quad 0 \quad 0 \quad 0 \quad \frac{17\sqrt{42}i}{672} \quad 0 \quad \frac{\sqrt{42}}{42} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{42}}{48} \quad \frac{13\sqrt{70}i}{672} \quad 0 \quad \frac{\sqrt{70}}{56} \quad 0 \quad 0 \quad 0 \quad -\frac{17\sqrt{42}i}{672} \quad 0 \quad \frac{\sqrt{42}}{42} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{42}i}{168} \quad \frac{\sqrt{70}}{96} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{168}$ | |
| | $\frac{\sqrt{42}i}{168} \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{96} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{168} \quad 0$ | |
| 443 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| $\mathbb{M}_3^{(1,1;a)}(A_2, 1)$ | $0 \quad \frac{\sqrt{105}i}{168} \quad \frac{\sqrt{7}}{28} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{7}}{84} \quad \frac{\sqrt{105}}{84} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{168}$ | |
| | $-\frac{\sqrt{105}i}{168} \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{28} \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{7}}{84} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{84} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{168} \quad 0$ | |
| | $0 \quad -\frac{\sqrt{105}}{168} \quad 0 \quad 0 \quad \frac{\sqrt{7}}{28} \quad 0 \quad 0 \quad -\frac{5\sqrt{7}i}{84} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{84} \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{168}$ | |
| | $-\frac{\sqrt{105}}{168} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{28} \quad \frac{5\sqrt{7}i}{84} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{105}}{84} \quad \frac{\sqrt{105}i}{168} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{5\sqrt{7}}{112} \quad 0 \quad \frac{5\sqrt{7}i}{112} \quad \frac{2\sqrt{7}}{21} \quad 0 \quad 0 \quad -\frac{5\sqrt{105}}{336} \quad 0 \quad -\frac{5\sqrt{105}i}{336} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{5\sqrt{7}}{112} \quad 0 \quad -\frac{5\sqrt{7}i}{112} \quad 0 \quad 0 \quad -\frac{2\sqrt{7}}{21} \quad -\frac{5\sqrt{105}}{336} \quad 0 \quad \frac{5\sqrt{105}i}{336} \quad 0 \quad 0 \quad 0$ | |
| 444 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{M}_3^{(1,1;a)}(A_2, 2)$ | $\begin{bmatrix} \frac{\sqrt{42}}{48} & 0 & 0 & \frac{\sqrt{70}i}{56} & 0 & -\frac{13\sqrt{70}}{672} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & -\frac{17\sqrt{42}}{672} & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{48} & -\frac{\sqrt{70}i}{56} & 0 & -\frac{13\sqrt{70}}{672} & 0 & 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & -\frac{17\sqrt{42}}{672} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{70}}{224} & 0 & \frac{\sqrt{70}i}{42} & 0 & 0 & 0 & -\frac{11\sqrt{42}}{672} & 0 & \frac{\sqrt{42}i}{56} & \frac{\sqrt{42}}{48} & 0 \\ 0 & 0 & \frac{5\sqrt{70}}{224} & 0 & -\frac{\sqrt{70}i}{42} & 0 & 0 & 0 & -\frac{11\sqrt{42}}{672} & 0 & -\frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{42}}{48} \\ 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & -\frac{\sqrt{70}}{96} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{96} & 0 & 0 & 0 & \frac{\sqrt{42}i}{168} \\ -\frac{\sqrt{42}}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{96} & -\frac{\sqrt{42}i}{168} & 0 \end{bmatrix}$ |
| 445 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{M}_{3,0}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & \frac{5\sqrt{42}i}{672} & \frac{5\sqrt{42}}{168} & 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & -\frac{3\sqrt{70}i}{224} & -\frac{\sqrt{70}}{112} & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & -\frac{5\sqrt{42}i}{672} & 0 & 0 & -\frac{5\sqrt{42}}{168} & -\frac{\sqrt{70}}{56} & 0 & \frac{3\sqrt{70}i}{224} & 0 & 0 & \frac{\sqrt{70}}{112} \\ -\frac{\sqrt{70}}{112} & 0 & 0 & \frac{5\sqrt{42}i}{672} & 0 & \frac{\sqrt{42}}{168} & 0 & 0 & 0 & \frac{3\sqrt{70}i}{224} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{70}}{112} & -\frac{5\sqrt{42}i}{672} & 0 & \frac{\sqrt{42}}{168} & 0 & 0 & 0 & -\frac{3\sqrt{70}i}{224} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}i}{56} & -\frac{5\sqrt{42}}{224} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & -\frac{5\sqrt{70}}{224} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{56} \\ \frac{\sqrt{70}i}{56} & 0 & 0 & \frac{5\sqrt{42}}{224} & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & \frac{5\sqrt{70}}{224} & 0 & 0 & 0 & \frac{\sqrt{70}}{56} \end{bmatrix}$ |
| 446 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | $\mathbb{M}_{3,1}^{(1,1;a)}(E, 1)$ | $\begin{bmatrix} -\frac{\sqrt{70}}{112} & 0 & 0 & -\frac{\sqrt{42}i}{168} & 0 & -\frac{5\sqrt{42}}{672} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}}{224} & 0 & 0 \\ 0 & \frac{\sqrt{70}}{112} & \frac{\sqrt{42}i}{168} & 0 & -\frac{5\sqrt{42}}{672} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}}{224} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{42}}{672} & 0 & \frac{\sqrt{42}i}{42} & \frac{5\sqrt{42}}{168} & 0 & 0 & -\frac{3\sqrt{70}}{224} & 0 & -\frac{\sqrt{70}i}{56} & \frac{\sqrt{70}}{112} & 0 \\ 0 & 0 & -\frac{5\sqrt{42}}{672} & 0 & -\frac{\sqrt{42}i}{42} & 0 & 0 & -\frac{5\sqrt{42}}{168} & -\frac{3\sqrt{70}}{224} & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 & -\frac{\sqrt{70}}{112} \\ 0 & \frac{\sqrt{70}}{56} & 0 & 0 & -\frac{5\sqrt{42}}{224} & 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & 0 & \frac{5\sqrt{70}}{224} & 0 & 0 & \frac{\sqrt{70}i}{56} \\ \frac{\sqrt{70}}{56} & 0 & 0 & 0 & 0 & \frac{5\sqrt{42}}{224} & -\frac{\sqrt{42}i}{42} & 0 & 0 & 0 & 0 & -\frac{5\sqrt{70}}{224} & -\frac{\sqrt{70}i}{56} & 0 \end{bmatrix}$ |
| 447 | symmetry | $\sqrt{15}xyz$ |
| | $\mathbb{M}_{3,0}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & \frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & \frac{3\sqrt{7}i}{56} \\ \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{168} & -\frac{\sqrt{105}i}{168} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{7}}{56} & -\frac{3\sqrt{7}i}{56} & 0 \\ 0 & -\frac{\sqrt{7}i}{14} & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{168} & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} \\ \frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{105}}{168} & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 \\ \frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 & -\frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{14} & -\frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 \end{bmatrix}$ |
| 448 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 7

| No. | multipole | matrix |
|-----|------------------------------------|--|
| | $\mathbb{M}_{3,1}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & -\frac{3\sqrt{7}i}{56} & -\frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{168} & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} \\ \frac{3\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & \frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{7}}{14} & 0 \\ 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{7}i}{14} \\ -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & \frac{\sqrt{105}i}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{28} & \frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{105}}{336} & 0 & \frac{5\sqrt{105}i}{336} & 0 & 0 & 0 & -\frac{\sqrt{7}}{112} & 0 & \frac{\sqrt{7}i}{112} & \frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & \frac{5\sqrt{105}}{336} & 0 & -\frac{5\sqrt{105}i}{336} & 0 & 0 & 0 & -\frac{\sqrt{7}}{112} & 0 & -\frac{\sqrt{7}i}{112} & 0 & 0 & -\frac{\sqrt{7}}{14} \end{bmatrix}$ |

bra: = $\langle d_u, \uparrow |, \langle d_u, \downarrow |, \langle d_{xz}, \uparrow |, \langle d_{xz}, \downarrow |, \langle d_{yz}, \uparrow |, \langle d_{yz}, \downarrow |, \langle d_{xy}, \uparrow |, \langle d_{xy}, \downarrow |, \langle d_v, \uparrow |, \langle d_v, \downarrow |$ ket: = $|d_u, \uparrow \rangle, |d_u, \downarrow \rangle, |d_{xz}, \uparrow \rangle, |d_{xz}, \downarrow \rangle, |d_{yz}, \uparrow \rangle, |d_{yz}, \downarrow \rangle, |d_{xy}, \uparrow \rangle, |d_{xy}, \downarrow \rangle, |d_v, \uparrow \rangle, |d_v, \downarrow \rangle$

Table 8: (d,d) block.

| No. | multipole | matrix |
|-----|-----------|--|
| 449 | symmetry | $\begin{bmatrix} \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} \end{bmatrix}$ |
| 450 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 8

| No. | multipole | matrix |
|---------------------------|-----------|--|
| $\mathbb{Q}_2^{(a)}(A_1)$ | | $\begin{bmatrix} \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} \end{bmatrix}$ |
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| | | |
| | | |
| 451 | symmetry | $\sqrt{3}yz$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} \end{bmatrix}$ |
| | | |
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| | | |
| | | |
| | | |
| | | |
| 452 | symmetry | $-\sqrt{3}xz$ |
| | | |

continued ...

Table 8

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{Q}_{2,1}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} \\ -\frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| 453 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ $\begin{bmatrix} 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| 454 | symmetry | $-\sqrt{3}xy$ $\begin{bmatrix} & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \end{bmatrix}$ |
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continued ...

Table 8

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 455 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ $\begin{bmatrix} \frac{3\sqrt{35}}{35} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{35}}{35} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{2\sqrt{35}}{35} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{2\sqrt{35}}{35} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{2\sqrt{35}}{35} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{2\sqrt{35}}{35} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{70} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{70} \end{bmatrix}$ |
| 456 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----|------------------------------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$ |
| 457 | $\mathbb{Q}_4^{(a)}(A_1, 2)$ | $\frac{\sqrt{70}xz(x^2 - 3y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 458 | $\mathbb{Q}_4^{(a)}(A_2)$ | $\frac{-\sqrt{10}yz(3x^2 + 3y^2 - 4z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|--------------------------------|-----------|---|
| $\mathbb{Q}_{4,0}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 \\ \frac{\sqrt{42}}{14} & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}}{14} & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{Q}_{4,1}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} \\ -\frac{\sqrt{42}}{14} & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{14} & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} \end{bmatrix}$ |
| 461 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 462 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 463 | $\mathbb{Q}_{4,0}^{(a)}(E, 3)$ | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{14} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 464 | $\mathbb{Q}_{4,1}^{(a)}(E, 3)$ | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 8

| No. | multipole | matrix |
|--------------------------------|--|--------|
| $\mathbb{Q}_2^{(1,-1;a)}(A_1)$ | 0 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 $\frac{\sqrt{10}}{20}$ 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 $-\frac{\sqrt{10}}{20}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}i}{60}$ 0 $-\frac{\sqrt{30}}{60}$ $-\frac{\sqrt{30}i}{15}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{30}i}{60}$ 0 $\frac{\sqrt{30}}{60}$ 0 0 $\frac{\sqrt{30}i}{15}$ | |
| | 0 $\frac{\sqrt{10}i}{20}$ 0 $\frac{\sqrt{30}i}{60}$ 0 0 $\frac{\sqrt{30}i}{30}$ 0 0 $\frac{\sqrt{30}}{60}$ | |
| | $\frac{\sqrt{10}i}{20}$ 0 $\frac{\sqrt{30}i}{60}$ 0 0 0 0 $-\frac{\sqrt{30}i}{30}$ $-\frac{\sqrt{30}}{60}$ 0 | |
| | 0 $-\frac{\sqrt{10}}{20}$ 0 $\frac{\sqrt{30}}{60}$ $-\frac{\sqrt{30}i}{30}$ 0 0 0 0 $-\frac{\sqrt{30}i}{60}$ | |
| | $\frac{\sqrt{10}}{20}$ 0 $-\frac{\sqrt{30}}{60}$ 0 0 $\frac{\sqrt{30}i}{30}$ 0 0 $-\frac{\sqrt{30}i}{60}$ 0 | |
| | 0 0 $\frac{\sqrt{30}i}{15}$ 0 0 $-\frac{\sqrt{30}}{60}$ 0 $\frac{\sqrt{30}i}{60}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}i}{15}$ $\frac{\sqrt{30}}{60}$ 0 $\frac{\sqrt{30}i}{60}$ 0 0 0 | |
| 465 symmetry | $\sqrt{3}yz$ | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{30}i}{20}$ 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 $-\frac{\sqrt{10}}{10}$ | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ $\frac{\sqrt{10}}{10}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{10}}{20}$ $-\frac{\sqrt{10}i}{20}$ 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{10}}{20}$ 0 0 $\frac{\sqrt{10}i}{20}$ | |
| | $\frac{\sqrt{30}i}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 $-\frac{\sqrt{10}}{20}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{30}i}{20}$ 0 $\frac{\sqrt{10}i}{20}$ $\frac{\sqrt{10}}{20}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{10}}{10}$ $\frac{\sqrt{10}i}{20}$ 0 0 0 0 0 | |
| 466 symmetry | $-\sqrt{3}xz$ | |
| | <i>continued ...</i> | |

Table 8

| No. | multipole | matrix |
|-------------------------------------|--|--------------------------------|
| $\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{30}i}{20}$ 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 0 $\frac{\sqrt{10}i}{10}$ | |
| | 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 $\frac{\sqrt{10}i}{10}$ 0 | |
| | $\frac{\sqrt{30}i}{20}$ 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 | |
| | 0 $-\frac{\sqrt{30}i}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 0 $\frac{\sqrt{10}i}{20}$ | |
| | 0 0 0 $-\frac{\sqrt{10}i}{10}$ 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{10}i}{10}$ 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 | |
| 467 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| $\mathbb{Q}_{2,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 0 0 $\frac{\sqrt{30}i}{20}$ 0 $\frac{\sqrt{30}}{20}$ 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{30}i}{20}$ 0 $-\frac{\sqrt{30}}{20}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 $-\frac{\sqrt{10}}{20}$ 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 $\frac{\sqrt{10}}{20}$ 0 0 | |
| | 0 $-\frac{\sqrt{30}i}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 0 0 $\frac{\sqrt{10}}{20}$ | |
| | $-\frac{\sqrt{30}i}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{20}$ 0 | |
| | 0 $-\frac{\sqrt{30}}{20}$ 0 $\frac{\sqrt{10}}{20}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ | |
| | $\frac{\sqrt{30}}{20}$ 0 $-\frac{\sqrt{10}}{20}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{10}}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{10}}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 | |
| 468 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|-------------------------------------|--|
| $\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} \\ -\frac{\sqrt{30}i}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| | | 469 symmetry $\frac{3x^4 + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4}{8}$ |
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| 470 symmetry | $\frac{\sqrt{70}yz(3x^2 - y^2)}{4}$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{70} & 0 & \frac{\sqrt{105}}{70} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{70} & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{35}i}{140} & 0 & \frac{3\sqrt{35}}{140} & \frac{\sqrt{35}i}{35} & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{35}i}{140} & 0 & -\frac{3\sqrt{35}}{140} & 0 & 0 & -\frac{\sqrt{35}i}{35} \\ 0 & \frac{\sqrt{105}i}{70} & 0 & -\frac{3\sqrt{35}i}{140} & 0 & 0 & \frac{2\sqrt{35}i}{35} & 0 & 0 & -\frac{3\sqrt{35}}{140} \\ \frac{\sqrt{105}i}{70} & 0 & -\frac{3\sqrt{35}i}{140} & 0 & 0 & 0 & 0 & -\frac{2\sqrt{35}i}{35} & \frac{3\sqrt{35}}{140} & 0 \\ 0 & -\frac{\sqrt{105}}{70} & 0 & -\frac{3\sqrt{35}}{140} & -\frac{2\sqrt{35}i}{35} & 0 & 0 & 0 & 0 & \frac{3\sqrt{35}i}{140} \\ \frac{\sqrt{105}}{70} & 0 & \frac{3\sqrt{35}}{140} & 0 & 0 & \frac{2\sqrt{35}i}{35} & 0 & 0 & \frac{3\sqrt{35}i}{140} & 0 \\ 0 & 0 & -\frac{\sqrt{35}i}{35} & 0 & 0 & \frac{3\sqrt{35}}{140} & 0 & -\frac{3\sqrt{35}i}{140} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}i}{35} & -\frac{3\sqrt{35}}{140} & 0 & -\frac{3\sqrt{35}i}{140} & 0 & 0 & 0 \end{bmatrix}$ |
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continued ...

Table 8

| No. | multipole | matrix |
|-----------------------------------|-----------|--|
| $\mathbb{Q}_4^{(1,-1;a)}(A_1, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{8} \\ 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 \\ 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 \\ \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
| $\mathbb{Q}_4^{(1,-1;a)}(A_2)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} \\ 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} \\ 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|--------------------------|--|
| $\mathbb{Q}_{4,0}^{(1,-1;a)}(E, 1)$ | 0 | 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 $-\frac{\sqrt{42}i}{28}$ 0 0 $\frac{\sqrt{42}}{56}$ |
| | 0 | 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 0 0 $\frac{\sqrt{42}i}{28}$ $-\frac{\sqrt{42}}{56}$ 0 |
| | 0 | $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 $\frac{\sqrt{14}}{28}$ |
| | $-\frac{\sqrt{42}i}{56}$ | 0 0 0 0 0 0 0 $\frac{3\sqrt{14}i}{56}$ $-\frac{\sqrt{14}}{28}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ $\frac{3\sqrt{14}i}{56}$ 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 $-\frac{3\sqrt{14}i}{56}$ |
| | $\frac{\sqrt{42}i}{28}$ | 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 0 0 |
| | 0 | $-\frac{\sqrt{42}i}{28}$ 0 $-\frac{3\sqrt{14}i}{56}$ $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{14}}{28}$ $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 0 |
| | $\frac{\sqrt{42}}{56}$ | 0 $\frac{\sqrt{14}}{28}$ 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 |
| 473 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{Q}_{4,1}^{(1,-1;a)}(E, 1)$ | 0 | 0 0 0 $-\frac{\sqrt{42}}{56}$ $-\frac{\sqrt{42}i}{28}$ 0 0 0 0 $\frac{\sqrt{42}i}{56}$ |
| | 0 | 0 0 $\frac{\sqrt{42}}{56}$ 0 0 $\frac{\sqrt{42}i}{28}$ 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 |
| | 0 | $\frac{\sqrt{42}}{56}$ 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ |
| | $-\frac{\sqrt{42}}{56}$ | 0 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 |
| | $\frac{\sqrt{42}i}{28}$ | 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{14}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{42}i}{28}$ 0 $\frac{3\sqrt{14}i}{56}$ 0 0 $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ |
| | 0 | $-\frac{\sqrt{42}i}{56}$ 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 |
| | $-\frac{\sqrt{42}i}{56}$ | 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 |
| 474 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & -\frac{1}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} \\ 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{4} & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 475 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & \frac{i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{4} & 0 \\ 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & -\frac{1}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{4} & 0 & \frac{1}{4} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 476 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|--|--------------------------------------|
| $\mathbb{Q}_{4,0}^{(1,-1;a)}(E,3)$ | 0 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 $\frac{\sqrt{21}}{28}$ $\frac{\sqrt{21}i}{14}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 $-\frac{\sqrt{21}}{28}$ 0 0 $-\frac{\sqrt{21}i}{14}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{28}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ | |
| | $-\frac{\sqrt{21}i}{28}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 | |
| | 0 $-\frac{\sqrt{21}}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ | |
| | $\frac{\sqrt{21}}{28}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 | |
| | $-\frac{\sqrt{21}i}{14}$ 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 | |
| | 0 $\frac{\sqrt{21}i}{14}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 | |
| 477 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| $\mathbb{Q}_{4,1}^{(1,-1;a)}(E,3)$ | 0 0 $\frac{\sqrt{21}i}{14}$ 0 0 $-\frac{\sqrt{21}}{28}$ 0 $\frac{\sqrt{21}i}{28}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{21}i}{14}$ $\frac{\sqrt{21}}{28}$ 0 $\frac{\sqrt{21}i}{28}$ 0 0 0 | |
| | $-\frac{\sqrt{21}i}{14}$ 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 | |
| | 0 $\frac{\sqrt{21}i}{14}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 | |
| | 0 $\frac{\sqrt{21}}{28}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ | |
| | $-\frac{\sqrt{21}}{28}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 | |
| | 0 $-\frac{\sqrt{21}i}{28}$ 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ | |
| | $-\frac{\sqrt{21}i}{28}$ 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 | |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------|-----------|--|
| $\mathbb{Q}_0^{(1,1;a)}(A_1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 & \frac{\sqrt{15}}{30} & -\frac{\sqrt{15}i}{15} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 & -\frac{\sqrt{15}}{30} & 0 & 0 & \frac{\sqrt{15}i}{15} \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{15}i}{30} & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 & 0 & -\frac{\sqrt{15}}{30} \\ -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{15}i}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{30} & \frac{\sqrt{15}}{30} & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{15}}{30} & -\frac{\sqrt{15}i}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{30} \\ -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{15}}{30} & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 \\ 0 & 0 & \frac{\sqrt{15}i}{15} & 0 & 0 & \frac{\sqrt{15}}{30} & 0 & -\frac{\sqrt{15}i}{30} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{15}i}{15} & -\frac{\sqrt{15}}{30} & 0 & -\frac{\sqrt{15}i}{30} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| | | $\mathbb{Q}_2^{(1,1;a)}(A_1)$ |
| | | |
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| | | |
| | | |
| | | |
| | | |
| 479 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 8

| No. | multipole | matrix |
|---|----------------------------|---|
| $\mathbb{Q}_{2,0}^{(1,1;a)}(E, 1)$ | 0 | 0 0 0 $-\frac{\sqrt{105}i}{42}$ 0 0 $-\frac{2\sqrt{105}i}{105}$ 0 0 $-\frac{\sqrt{105}}{42}$ |
| | 0 | 0 0 $-\frac{\sqrt{105}i}{42}$ 0 0 0 0 $\frac{2\sqrt{105}i}{105}$ $\frac{\sqrt{105}}{42}$ 0 |
| | 0 | $\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 0 $-\frac{\sqrt{35}}{70}$ |
| | $\frac{\sqrt{105}i}{42}$ | 0 0 0 0 0 0 0 $\frac{\sqrt{35}i}{35}$ $\frac{\sqrt{35}}{70}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{35}}{35}$ $\frac{\sqrt{35}i}{35}$ 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{35}}{35}$ 0 0 $-\frac{\sqrt{35}i}{35}$ |
| | $\frac{2\sqrt{105}i}{105}$ | 0 0 $\frac{\sqrt{35}i}{35}$ 0 0 $\frac{\sqrt{35}}{35}$ 0 0 0 0 |
| | 0 | $-\frac{2\sqrt{105}i}{105}$ 0 $-\frac{\sqrt{35}i}{35}$ $-\frac{\sqrt{35}}{35}$ 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{105}}{42}$ 0 $\frac{\sqrt{35}}{70}$ $-\frac{\sqrt{35}i}{35}$ 0 0 0 0 0 0 |
| | $-\frac{\sqrt{105}}{42}$ | 0 0 $-\frac{\sqrt{35}}{70}$ 0 0 $\frac{\sqrt{35}i}{35}$ 0 0 0 0 |
| 481 symmetry $-\sqrt{3}xz$ | | |
| $\mathbb{Q}_{2,1}^{(1,1;a)}(E, 1)$ | 0 | 0 0 0 $\frac{\sqrt{105}}{42}$ $-\frac{2\sqrt{105}i}{105}$ 0 0 0 0 $-\frac{\sqrt{105}i}{42}$ |
| | 0 | 0 0 $-\frac{\sqrt{105}}{42}$ 0 0 $\frac{2\sqrt{105}i}{105}$ 0 0 0 $-\frac{\sqrt{105}i}{42}$ 0 |
| | 0 | $-\frac{\sqrt{105}}{42}$ 0 0 $\frac{\sqrt{35}i}{35}$ 0 0 0 0 0 $\frac{\sqrt{35}i}{70}$ |
| | $\frac{\sqrt{105}}{42}$ | 0 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 0 0 $\frac{\sqrt{35}i}{70}$ 0 |
| | $\frac{2\sqrt{105}i}{105}$ | 0 0 $-\frac{\sqrt{35}i}{35}$ 0 0 0 0 $\frac{\sqrt{35}i}{35}$ 0 0 0 |
| | 0 | $-\frac{2\sqrt{105}i}{105}$ 0 $\frac{\sqrt{35}i}{35}$ 0 0 $\frac{\sqrt{35}i}{35}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 0 $\frac{\sqrt{35}i}{35}$ 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ |
| | 0 | $\frac{\sqrt{105}i}{42}$ 0 $-\frac{\sqrt{35}i}{70}$ 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 0 0 |
| | $\frac{\sqrt{105}i}{42}$ | 0 0 $-\frac{\sqrt{35}i}{70}$ 0 0 0 0 $\frac{\sqrt{35}i}{35}$ 0 0 |
| 482 symmetry $\frac{\sqrt{3}(x-y)(x+y)}{2}$ | | |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|---------------------------|--|
| $\mathbb{Q}_{2,0}^{(1,1;a)}(E, 2)$ | 0 | 0 0 0 0 0 $-\frac{\sqrt{105}i}{210}$ 0 $-\frac{\sqrt{105}}{210}$ $\frac{\sqrt{105}i}{42}$ 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{105}i}{210}$ 0 $\frac{\sqrt{105}}{210}$ 0 0 $-\frac{\sqrt{105}i}{42}$ |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 $\frac{\sqrt{35}}{35}$ 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 $-\frac{\sqrt{35}}{35}$ 0 0 0 |
| | 0 | $\frac{\sqrt{105}i}{210}$ 0 $\frac{\sqrt{35}i}{35}$ 0 0 0 0 0 $\frac{3\sqrt{35}}{70}$ |
| | $\frac{\sqrt{105}i}{210}$ | 0 $\frac{\sqrt{35}i}{35}$ 0 0 0 0 0 0 $-\frac{3\sqrt{35}}{70}$ 0 |
| | 0 | $\frac{\sqrt{105}}{210}$ 0 $-\frac{\sqrt{35}}{35}$ 0 0 0 0 0 0 $\frac{3\sqrt{35}i}{70}$ |
| | $-\frac{\sqrt{105}}{210}$ | 0 $\frac{\sqrt{35}}{35}$ 0 0 0 0 0 0 $\frac{3\sqrt{35}i}{70}$ 0 |
| | $-\frac{\sqrt{105}i}{42}$ | 0 0 0 0 0 $-\frac{3\sqrt{35}}{70}$ 0 $-\frac{3\sqrt{35}i}{70}$ 0 0 |
| | 0 | $\frac{\sqrt{105}i}{42}$ 0 0 $\frac{3\sqrt{35}}{70}$ 0 $-\frac{3\sqrt{35}i}{70}$ 0 0 0 |
| 483 symmetry | | $-\sqrt{3}xy$ |
| | 0 | 0 0 $\frac{\sqrt{105}i}{42}$ 0 0 $\frac{\sqrt{105}}{210}$ 0 $-\frac{\sqrt{105}i}{210}$ 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{105}i}{42}$ $-\frac{\sqrt{105}}{210}$ 0 $-\frac{\sqrt{105}i}{210}$ 0 0 0 |
| | $-\frac{\sqrt{105}i}{42}$ | 0 0 0 0 0 $-\frac{3\sqrt{35}}{70}$ 0 $-\frac{3\sqrt{35}i}{70}$ 0 0 |
| | 0 | $\frac{\sqrt{105}i}{42}$ 0 0 $\frac{3\sqrt{35}}{70}$ 0 $-\frac{3\sqrt{35}i}{70}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{105}}{210}$ 0 $\frac{3\sqrt{35}}{70}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ |
| | $\frac{\sqrt{105}}{210}$ | 0 $-\frac{3\sqrt{35}}{70}$ 0 0 0 0 0 0 $-\frac{\sqrt{35}i}{35}$ 0 |
| | 0 | $\frac{\sqrt{105}i}{210}$ 0 $\frac{3\sqrt{35}i}{70}$ 0 0 0 0 0 0 $\frac{\sqrt{35}}{35}$ |
| | $\frac{\sqrt{105}i}{210}$ | 0 $\frac{3\sqrt{35}i}{70}$ 0 0 0 0 0 0 $-\frac{\sqrt{35}}{35}$ 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{35}i}{35}$ 0 $-\frac{\sqrt{35}}{35}$ 0 0 |
| 484 symmetry | | z |

continued ...

Table 8

| No. | multipole | matrix |
|---------------------------------|-----------|--|
| $\mathbb{G}_1^{(1,0;a)}(A_2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 \\ 0 & \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| | | |
| | | |
| | | |
| 485 | symmetry | x |
| $\mathbb{G}_{1,0}^{(1,0;a)}(E)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & -\frac{\sqrt{10}}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} & \frac{\sqrt{10}}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & \frac{\sqrt{10}i}{20} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & -\frac{\sqrt{10}i}{20} \\ -\frac{\sqrt{30}i}{20} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{10}i}{20} & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{10} & -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{10} & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | |
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| | | |
| | | |
| | | |
| | | |
| 486 | symmetry | y |

continued ...

Table 8

| No. | multipole | matrix |
|---------------------------------|--|----------------------------------|
| $\mathbb{G}_{1,1}^{(1,0;a)}(E)$ | 0 0 0 0 $\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 0 $\frac{\sqrt{10}i}{10}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 $\frac{\sqrt{10}i}{10}$ 0 | |
| | $-\frac{\sqrt{30}i}{20}$ 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 | |
| | 0 $\frac{\sqrt{30}i}{20}$ 0 $\frac{\sqrt{10}i}{20}$ 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 $\frac{\sqrt{10}i}{20}$ | |
| | 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 0 0 $-\frac{\sqrt{10}i}{20}$ | |
| | 0 0 0 $-\frac{\sqrt{10}i}{10}$ 0 0 $-\frac{\sqrt{10}i}{20}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{10}i}{10}$ 0 0 0 0 $\frac{\sqrt{10}i}{20}$ 0 0 | |
| 487 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| $\mathbb{G}_3^{(1,0;a)}(A_1)$ | 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{2}}{8}$ | |
| | 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{8}$ 0 | |
| | 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 $-\frac{\sqrt{6}i}{8}$ 0 0 0 | |
| | $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{6}i}{8}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 $-\frac{\sqrt{6}i}{8}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{6}i}{8}$ | |
| | 0 0 $\frac{\sqrt{6}i}{8}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{6}i}{8}$ 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{2}}{8}$ 0 0 $\frac{\sqrt{6}i}{8}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{2}}{8}$ 0 0 0 0 $-\frac{\sqrt{6}i}{8}$ 0 0 0 0 | |
| 488 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 8

| No. | multipole | matrix |
|----------------------------------|-----------|--|
| $\mathbb{G}_3^{(1,0;a)}(A_2, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 \\ 0 & \frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} \\ \frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 \\ 0 & \frac{\sqrt{2}}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} \\ 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{8} & 0 & 0 \end{bmatrix}$ |
| | | $\frac{-\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | | |
| | | |
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| | | |
| | | |
| | | |
| | | |
| 489 | symmetry | |
| 490 | symmetry | |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{G}_{3,0}^{(1,0;a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{30}i}{24} & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{24} \\ 0 & 0 & -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{24} & 0 \\ 0 & \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} & 0 & 0 & \frac{\sqrt{10}}{20} \\ \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{40} & -\frac{\sqrt{10}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{10} & -\frac{\sqrt{10}i}{40} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{10} & 0 & \frac{\sqrt{10}i}{40} \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & 0 & -\frac{\sqrt{10}}{10} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{40} & \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{24} & 0 & -\frac{\sqrt{10}}{20} & \frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}}{24} & 0 & \frac{\sqrt{10}}{20} & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| $\mathbb{G}_{3,1}^{(1,0;a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{30}}{24} & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{24} \\ 0 & 0 & -\frac{\sqrt{30}}{24} & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{24} \\ 0 & -\frac{\sqrt{30}}{24} & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} \\ \frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 \\ -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} \\ 0 & \frac{\sqrt{30}i}{24} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & \frac{\sqrt{10}i}{40} & 0 & 0 & 0 \\ \frac{\sqrt{30}i}{24} & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 492 | symmetry | $\sqrt{15}xyz$ |
| | | |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|---|--|
| $\mathbb{G}_{3,0}^{(1,0;a)}(E, 2)$ | 0 0 0 0 0 $-\frac{\sqrt{3}i}{12}$ 0 $-\frac{\sqrt{3}}{12}$ $\frac{\sqrt{3}i}{6}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{3}i}{12}$ 0 $\frac{\sqrt{3}}{12}$ 0 0 $-\frac{\sqrt{3}i}{6}$ | |
| | 0 0 0 0 0 $\frac{i}{4}$ 0 $-\frac{1}{4}$ 0 0 | |
| | 0 0 0 0 $\frac{i}{4}$ 0 $\frac{1}{4}$ 0 0 0 | |
| | 0 $\frac{\sqrt{3}i}{12}$ 0 $-\frac{i}{4}$ 0 0 0 0 0 0 | |
| | $\frac{\sqrt{3}i}{12}$ 0 $-\frac{i}{4}$ 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{3}}{12}$ 0 $\frac{1}{4}$ 0 0 0 0 0 0 | |
| | $-\frac{\sqrt{3}}{12}$ 0 $-\frac{1}{4}$ 0 0 0 0 0 0 0 | |
| | $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 | |
| 493 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| $\mathbb{G}_{3,1}^{(1,0;a)}(E, 2)$ | 0 0 $\frac{\sqrt{3}i}{6}$ 0 0 $\frac{\sqrt{3}}{12}$ 0 $-\frac{\sqrt{3}i}{12}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{3}i}{6}$ $-\frac{\sqrt{3}}{12}$ 0 $-\frac{\sqrt{3}i}{12}$ 0 0 0 | |
| | $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{3}}{12}$ 0 0 0 0 0 0 0 $\frac{i}{4}$ | |
| | $\frac{\sqrt{3}}{12}$ 0 0 0 0 0 0 0 $\frac{i}{4}$ 0 | |
| | 0 $\frac{\sqrt{3}i}{12}$ 0 0 0 0 0 0 0 $-\frac{1}{4}$ | |
| | $\frac{\sqrt{3}i}{12}$ 0 0 0 0 0 0 0 $\frac{1}{4}$ 0 | |
| | 0 0 0 0 0 $-\frac{i}{4}$ 0 $\frac{1}{4}$ 0 0 | |
| | 0 0 0 0 $-\frac{i}{4}$ 0 $-\frac{1}{4}$ 0 0 0 | |
| 494 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|--|---------------|
| $\mathbb{T}_2^{(1,0;a)}(A_1)$ | 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 $\frac{\sqrt{14}i}{28}$ 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 $\frac{\sqrt{42}i}{28}$ 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 $-\frac{\sqrt{42}i}{28}$ 0 0 0 | |
| | 0 $\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{42}}{28}$ 0 0 0 0 0 $\frac{\sqrt{42}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{42}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{42}i}{28}$ 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ 0 $\frac{\sqrt{42}i}{28}$ 0 0 0 0 0 $\frac{\sqrt{42}}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{42}i}{28}$ 0 0 0 0 0 $\frac{\sqrt{42}}{28}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{42}i}{28}$ 0 $\frac{\sqrt{42}}{28}$ 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{42}i}{28}$ 0 $\frac{\sqrt{42}}{28}$ 0 0 0 | |
| 495 | symmetry | $\sqrt{3}yz$ |
| $\mathbb{T}_{2,0}^{(1,0;a)}(E, 1)$ | 0 $-\frac{\sqrt{14}}{14}$ 0 $\frac{\sqrt{42}}{42}$ 0 0 $\frac{\sqrt{42}}{84}$ 0 0 $-\frac{\sqrt{42}i}{42}$ | |
| | $-\frac{\sqrt{14}}{14}$ 0 $\frac{\sqrt{42}}{42}$ 0 0 0 0 $-\frac{\sqrt{42}}{84}$ $\frac{\sqrt{42}i}{42}$ 0 | |
| | 0 $\frac{\sqrt{42}}{42}$ 0 $\frac{\sqrt{14}}{14}$ 0 0 $\frac{\sqrt{14}}{28}$ 0 0 0 | |
| | $\frac{\sqrt{42}}{42}$ 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ $\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 $-\frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{42}}{84}$ 0 $\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{14}}{14}$ 0 0 | |
| | 0 $-\frac{\sqrt{42}}{84}$ 0 $-\frac{\sqrt{14}}{28}$ $-\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{14}}{14}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{42}i}{42}$ 0 0 $\frac{\sqrt{14}}{28}$ 0 0 0 0 $\frac{\sqrt{14}}{14}$ | |
| | $\frac{\sqrt{42}i}{42}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 $\frac{\sqrt{14}}{14}$ | |
| 496 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|--------------------------|--------------------------------|
| $\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{\sqrt{14}i}{14}$ |
| | $-\frac{\sqrt{14}i}{14}$ | 0 |
| | 0 | $-\frac{\sqrt{42}i}{42}$ |
| | $-\frac{\sqrt{42}i}{42}$ | 0 |
| | $\frac{\sqrt{42}}{84}$ | $-\frac{\sqrt{14}i}{14}$ |
| | 0 | $-\frac{\sqrt{14}}{28}$ |
| | $-\frac{\sqrt{42}}{84}$ | 0 |
| | 0 | $-\frac{\sqrt{14}}{28}$ |
| | 0 | $-\frac{\sqrt{14}i}{14}$ |
| | $\frac{\sqrt{42}}{42}$ | 0 |
| 497 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| $\mathbb{T}_{2,0}^{(1,0;a)}(E, 2)$ | 0 | 0 |
| | 0 | $-\frac{\sqrt{42}i}{84}$ |
| | 0 | $\frac{\sqrt{42}}{84}$ |
| | 0 | $-\frac{\sqrt{14}}{28}$ |
| | $-\frac{\sqrt{42}}{84}$ | 0 |
| | 0 | $-\frac{\sqrt{14}}{28}$ |
| | $\frac{\sqrt{42}}{84}$ | 0 |
| | $-\frac{\sqrt{42}i}{84}$ | $-\frac{\sqrt{14}i}{14}$ |
| | $\frac{\sqrt{42}i}{84}$ | 0 |
| | $\frac{\sqrt{42}}{21}$ | 0 |
| 498 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|--------------------------|--|
| $\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)$ | 0 | 0 $\frac{\sqrt{42}}{21}$ 0 0 $\frac{\sqrt{42}i}{84}$ 0 $\frac{\sqrt{42}}{84}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{42}}{21}$ $-\frac{\sqrt{42}i}{84}$ 0 $\frac{\sqrt{42}}{84}$ 0 0 0 |
| | $\frac{\sqrt{42}}{21}$ | 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 $\frac{\sqrt{14}}{28}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{42}}{21}$ 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 $\frac{\sqrt{14}}{28}$ 0 0 0 |
| | 0 | $\frac{\sqrt{42}i}{84}$ 0 $-\frac{\sqrt{14}i}{28}$ $\frac{\sqrt{14}}{14}$ 0 0 0 0 $\frac{\sqrt{14}}{28}$ |
| | $-\frac{\sqrt{42}i}{84}$ | 0 $\frac{\sqrt{14}i}{28}$ 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 $\frac{\sqrt{14}}{28}$ 0 |
| | 0 | $\frac{\sqrt{42}}{84}$ 0 $\frac{\sqrt{14}}{28}$ 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 $\frac{\sqrt{14}i}{28}$ |
| | $\frac{\sqrt{42}}{84}$ | 0 $\frac{\sqrt{14}}{28}$ 0 0 0 0 $\frac{\sqrt{14}}{14}$ $-\frac{\sqrt{14}i}{28}$ 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 $\frac{\sqrt{14}i}{28}$ 0 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 |
| 499 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |
| | | 0 0 0 0 0 $\frac{\sqrt{21}}{14}$ 0 $\frac{\sqrt{21}i}{14}$ 0 0 |
| | | 0 0 0 0 $\frac{\sqrt{21}}{14}$ 0 $-\frac{\sqrt{21}i}{14}$ 0 0 0 |
| | | 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 |
| | | 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 |
| | | 0 $\frac{\sqrt{21}}{14}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ |
| | | $\frac{\sqrt{21}}{14}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 |
| | | 0 $\frac{\sqrt{21}i}{14}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ |
| | | $-\frac{\sqrt{21}i}{14}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 |
| | | 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 |
| | | 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 |
| 500 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix | | | | | | | | |
|----------------------------------|-------------------------|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| $\mathbb{T}_4^{(1,0;a)}(A_1, 2)$ | 0 | 0 | 0 | $-\frac{\sqrt{30}}{40}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{30}i}{40}$ |
| | 0 | 0 | $-\frac{\sqrt{30}}{40}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30}i}{40}$ | 0 |
| | 0 | $-\frac{\sqrt{30}}{40}$ | 0 | $-\frac{\sqrt{10}}{20}$ | 0 | 0 | $\frac{3\sqrt{10}}{40}$ | 0 | 0 | $\frac{\sqrt{10}i}{20}$ |
| | $-\frac{\sqrt{30}}{40}$ | 0 | $-\frac{\sqrt{10}}{20}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{10}}{40}$ | $-\frac{\sqrt{10}i}{20}$ | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{20}$ | 0 | $-\frac{\sqrt{10}i}{20}$ | $-\frac{3\sqrt{10}}{40}$ | 0 |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{20}$ | 0 | $\frac{\sqrt{10}i}{20}$ | 0 | 0 | $\frac{3\sqrt{10}}{40}$ |
| | 0 | 0 | $\frac{3\sqrt{10}}{40}$ | 0 | 0 | $-\frac{\sqrt{10}i}{20}$ | 0 | $-\frac{\sqrt{10}}{20}$ | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{3\sqrt{10}}{40}$ | $\frac{\sqrt{10}i}{20}$ | 0 | $-\frac{\sqrt{10}}{20}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{30}i}{40}$ | 0 | $\frac{\sqrt{10}i}{20}$ | $-\frac{3\sqrt{10}}{40}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{20}$ |
| | $\frac{\sqrt{30}i}{40}$ | 0 | $-\frac{\sqrt{10}i}{20}$ | 0 | 0 | $\frac{3\sqrt{10}}{40}$ | 0 | 0 | $\frac{\sqrt{10}}{20}$ | 0 |
| 501 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ | | | | | | | | |
| $\mathbb{T}_4^{(1,0;a)}(A_2)$ | 0 | 0 | 0 | $-\frac{\sqrt{30}i}{40}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30}}{40}$ |
| | 0 | 0 | $\frac{\sqrt{30}i}{40}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30}}{40}$ | 0 |
| | 0 | $-\frac{\sqrt{30}i}{40}$ | 0 | $\frac{\sqrt{10}i}{20}$ | $-\frac{3\sqrt{10}}{40}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{20}$ |
| | $\frac{\sqrt{30}i}{40}$ | 0 | $-\frac{\sqrt{10}i}{20}$ | 0 | 0 | $\frac{3\sqrt{10}}{40}$ | 0 | 0 | $\frac{\sqrt{10}}{20}$ | 0 |
| | 0 | 0 | $-\frac{3\sqrt{10}}{40}$ | 0 | 0 | $\frac{\sqrt{10}i}{20}$ | 0 | $\frac{\sqrt{10}}{20}$ | 0 | 0 |
| | 0 | 0 | 0 | $\frac{3\sqrt{10}}{40}$ | $-\frac{\sqrt{10}i}{20}$ | 0 | $\frac{\sqrt{10}}{20}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{20}$ | 0 | $-\frac{\sqrt{10}i}{20}$ | $-\frac{3\sqrt{10}}{40}$ | 0 |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{20}$ | 0 | $\frac{\sqrt{10}i}{20}$ | 0 | 0 | $\frac{3\sqrt{10}}{40}$ |
| | 0 | $\frac{\sqrt{30}}{40}$ | 0 | $\frac{\sqrt{10}}{20}$ | 0 | 0 | $-\frac{3\sqrt{10}}{40}$ | 0 | 0 | $-\frac{\sqrt{10}i}{20}$ |
| | $\frac{\sqrt{30}}{40}$ | 0 | $\frac{\sqrt{10}}{20}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{10}}{40}$ | $\frac{\sqrt{10}i}{20}$ | 0 |
| 502 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ | | | | | | | | |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|-----------------------------|---|
| $\mathbb{T}_{4,0}^{(1,0;a)}(E, 1)$ | 0 | $-\frac{3\sqrt{70}}{70}$ |
| | $-\frac{3\sqrt{70}}{70}$ | 0 |
| | 0 | $-\frac{3\sqrt{210}}{280}$ |
| | $-\frac{3\sqrt{210}}{280}$ | 0 |
| | 0 | $-\frac{\sqrt{70}}{140}$ |
| | $-\frac{3\sqrt{210}}{280}$ | 0 |
| | 0 | 0 |
| | 0 | $-\frac{\sqrt{70}}{140}$ |
| | $\frac{\sqrt{210}}{140}$ | 0 |
| | 0 | $-\frac{\sqrt{70}}{280}$ |
| 503 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{T}_{4,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{3\sqrt{70}i}{70}$ |
| | $-\frac{3\sqrt{70}i}{70}$ | 0 |
| | 0 | $\frac{3\sqrt{210}i}{280}$ |
| | $-\frac{3\sqrt{210}i}{280}$ | 0 |
| | 0 | $\frac{\sqrt{70}i}{140}$ |
| | $\frac{3\sqrt{210}i}{280}$ | 0 |
| | 0 | $-\frac{\sqrt{70}i}{140}$ |
| | $\frac{\sqrt{210}}{140}$ | 0 |
| | 0 | $-\frac{\sqrt{70}}{280}$ |
| | $-\frac{3\sqrt{210}}{280}$ | 0 |
| 504 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{T}_{4,0}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{20} & -\frac{\sqrt{5}}{5} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}}{5} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} \\ 0 & 0 & \frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} \\ 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{5} & 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{5} & -\frac{\sqrt{5}i}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $505 \quad \text{symmetry} \quad \frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| $\mathbb{T}_{4,1}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{5} & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{5} & \frac{\sqrt{5}i}{20} & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} \\ 0 & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{20} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & -\frac{\sqrt{5}i}{20} & -\frac{\sqrt{5}}{5} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{20} & 0 & \frac{\sqrt{5}i}{20} & 0 & 0 & \frac{\sqrt{5}}{5} \end{bmatrix}$ |
| | | $506 \quad \text{symmetry} \quad -\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|-----------------------------|---|
| $\mathbb{T}_{4,0}^{(1,0;a)}(E, 3)$ | 0 | 0 0 0 0 0 $\frac{3\sqrt{105}}{140}$ 0 $-\frac{3\sqrt{105}i}{140}$ $-\frac{\sqrt{105}}{70}$ 0 |
| | 0 | 0 0 0 0 $\frac{3\sqrt{105}}{140}$ 0 $\frac{3\sqrt{105}i}{140}$ 0 0 $\frac{\sqrt{105}}{70}$ |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{35}}{28}$ 0 $\frac{\sqrt{35}i}{28}$ 0 0 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{35}}{28}$ 0 $-\frac{\sqrt{35}i}{28}$ 0 0 0 |
| | 0 | $\frac{3\sqrt{105}}{140}$ 0 $\frac{\sqrt{35}}{28}$ 0 0 $-\frac{\sqrt{35}}{35}$ 0 0 $-\frac{\sqrt{35}i}{70}$ |
| | $\frac{3\sqrt{105}}{140}$ | 0 $\frac{\sqrt{35}}{28}$ 0 0 0 0 $\frac{\sqrt{35}}{35}$ $\frac{\sqrt{35}i}{70}$ 0 |
| | 0 | $-\frac{3\sqrt{105}i}{140}$ 0 $\frac{\sqrt{35}i}{28}$ $-\frac{\sqrt{35}}{35}$ 0 0 0 0 $\frac{\sqrt{35}}{70}$ |
| | $\frac{3\sqrt{105}i}{140}$ | 0 $-\frac{\sqrt{35}i}{28}$ 0 0 $\frac{\sqrt{35}}{35}$ 0 0 $\frac{\sqrt{35}}{70}$ 0 |
| | $-\frac{\sqrt{105}}{70}$ | 0 0 0 0 $-\frac{\sqrt{35}i}{70}$ 0 $\frac{\sqrt{35}}{70}$ 0 0 0 |
| | 0 | $\frac{\sqrt{105}}{70}$ 0 0 $\frac{\sqrt{35}i}{70}$ 0 $\frac{\sqrt{35}}{70}$ 0 0 0 |
| 507 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| $\mathbb{T}_{4,1}^{(1,0;a)}(E, 3)$ | 0 | 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 $\frac{3\sqrt{105}i}{140}$ 0 $\frac{3\sqrt{105}}{140}$ 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}}{70}$ $-\frac{3\sqrt{105}i}{140}$ 0 $\frac{3\sqrt{105}}{140}$ 0 0 0 |
| | $-\frac{\sqrt{105}}{70}$ | 0 0 0 0 0 $-\frac{\sqrt{35}i}{70}$ 0 $\frac{\sqrt{35}}{70}$ 0 0 |
| | 0 | $\frac{\sqrt{105}}{70}$ 0 0 $\frac{\sqrt{35}i}{70}$ 0 $\frac{\sqrt{35}}{70}$ 0 0 0 |
| | 0 | $\frac{3\sqrt{105}i}{140}$ 0 $-\frac{\sqrt{35}i}{70}$ $\frac{\sqrt{35}}{35}$ 0 0 0 0 $-\frac{\sqrt{35}}{28}$ |
| | $-\frac{3\sqrt{105}i}{140}$ | 0 $\frac{\sqrt{35}i}{70}$ 0 0 $-\frac{\sqrt{35}}{35}$ 0 0 $-\frac{\sqrt{35}}{28}$ 0 |
| | 0 | $\frac{3\sqrt{105}}{140}$ 0 $\frac{\sqrt{35}}{70}$ 0 0 0 $-\frac{\sqrt{35}}{35}$ 0 0 $-\frac{\sqrt{35}i}{28}$ |
| | $\frac{3\sqrt{105}}{140}$ | 0 $\frac{\sqrt{35}}{70}$ 0 0 0 0 $\frac{\sqrt{35}}{35}$ $\frac{\sqrt{35}i}{28}$ 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{35}}{28}$ 0 $-\frac{\sqrt{35}i}{28}$ 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{35}}{28}$ 0 $\frac{\sqrt{35}i}{28}$ 0 0 0 |
| 508 | symmetry | z |

continued ...

Table 8

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{5} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{5} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{5} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{5} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 509 | symmetry | x |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ -\frac{\sqrt{15}i}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \end{bmatrix}$ |
| 510 | symmetry | y |

continued ...

Table 8

| No. | multipole | matrix |
|-----------------------------|-----------|--|
| $\mathbb{M}_{1,1}^{(a)}(E)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} \\ \frac{\sqrt{15}i}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| 511 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{bmatrix}$ |
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| | | |
| 512 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
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continued ...

Table 8

| No. | multipole | matrix |
|------------------------------|-----------|--|
| $\mathbb{M}_3^{(a)}(A_2, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{5} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{5} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{5} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{5} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| $\mathbb{M}_3^{(a)}(A_2, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|--------------------------------|--|--------------------------------------|
| $\mathbb{M}_{3,0}^{(a)}(E, 1)$ | 0 0 0 0 $\frac{\sqrt{10}i}{10}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{10}i}{10}$ 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 0 | |
| | $-\frac{\sqrt{10}i}{10}$ 0 $\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{10}i}{10}$ 0 $\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| 515 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{M}_{3,1}^{(a)}(E, 1)$ | 0 0 0 0 0 0 $-\frac{\sqrt{10}i}{10}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{10}i}{10}$ 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{30}i}{20}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{30}i}{20}$ | |
| | $\frac{\sqrt{10}i}{10}$ 0 $\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{10}i}{10}$ 0 $\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}i}{20}$ 0 0 0 0 | |
| 516 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | | $\begin{bmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 517 | $\mathbb{M}_{3,0}^{(a)}(E, 2)$ | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 518 | symmetry | z |

continued ...

Table 8

| No. | multipole | matrix |
|----------------------------------|---|--------|
| $\mathbb{M}_1^{(1,-1;a)}(A_2)$ | $\frac{\sqrt{10}}{10} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{10}}{10} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{10}}{10}$ | |
| 519 | symmetry | x |
| $\mathbb{M}_{1,0}^{(1,-1;a)}(E)$ | $0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0$ | |
| | $\frac{\sqrt{10}}{10} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{10}}{10} \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{10}}{10}$ | |
| | $0 \quad 0 \quad \frac{\sqrt{10}}{10}$ | |
| 520 | symmetry | y |

continued ...

Table 8

| No. | multipole | matrix |
|----------------------------------|-----------|---|
| $\mathbb{M}_{1,1}^{(1,-1;a)}(E)$ | | $\begin{bmatrix} 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| | | $\mathbb{M}_3^{(1,-1;a)}(A_1)$ |
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| | | |
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| | | |
| 521 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| 522 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----------------------------------|---|--------------------------------------|
| $\mathbb{M}_3^{(1,-1;a)}(A_2, 1)$ | $\frac{\sqrt{105}}{35} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{70} \quad 0 \quad -\frac{\sqrt{35}}{70} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{105}}{35} \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{70} \quad 0 \quad -\frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{105}}{35} \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{105}}{35} \quad \frac{\sqrt{105}i}{70} \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{35}i}{70} \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad \frac{\sqrt{105}}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{70}$ | |
| | $-\frac{\sqrt{35}i}{70} \quad 0 \quad \frac{\sqrt{105}i}{70} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0$ | |
| | $0 \quad -\frac{\sqrt{35}}{70} \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad 0 \quad \frac{\sqrt{105}}{70} \quad 0 \quad 0 \quad \frac{\sqrt{105}i}{70}$ | |
| | $-\frac{\sqrt{35}}{70} \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{70} \quad -\frac{\sqrt{105}i}{70} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad \frac{\sqrt{105}i}{70} \quad -\frac{\sqrt{105}}{35} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{70} \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad 0 \quad 0 \quad \frac{\sqrt{105}}{35}$ | |
| 523 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| $\mathbb{M}_3^{(1,-1;a)}(A_2, 2)$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{14}i}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{14}$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{14}i}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0$ | |
| | $0 \quad \frac{\sqrt{14}i}{14} \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{14}i}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}i}{28} \quad 0 \quad \frac{\sqrt{42}}{28} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}i}{28} \quad 0 \quad \frac{\sqrt{42}}{28} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}}{28} \quad 0 \quad -\frac{\sqrt{42}i}{28} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}}{28} \quad 0 \quad \frac{\sqrt{42}i}{28} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| 524 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|----------------------------|---|
| $\mathbb{M}_{3,0}^{(1,-1;a)}(E, 1)$ | 0 | $\frac{\sqrt{70}}{35}, 0, \frac{\sqrt{210}}{210}, 0, 0, 0, \frac{\sqrt{210}}{105}, 0, 0, -\frac{\sqrt{210}i}{210}$ |
| | $\frac{\sqrt{70}}{35}$ | $0, \frac{\sqrt{210}}{210}, 0, 0, 0, 0, 0, -\frac{\sqrt{210}}{105}, \frac{\sqrt{210}i}{210}, 0$ |
| | 0 | $\frac{\sqrt{210}}{210}, 0, -\frac{\sqrt{70}}{35}, 0, 0, 0, \frac{\sqrt{70}}{35}, 0, 0, 0$ |
| | $\frac{\sqrt{210}}{210}$ | $0, -\frac{\sqrt{70}}{35}, 0, 0, 0, 0, 0, -\frac{\sqrt{70}}{35}, 0, 0$ |
| | 0 | $0, 0, 0, 0, 0, \frac{3\sqrt{70}}{140}, 0, \frac{\sqrt{70}i}{140}, \frac{\sqrt{70}}{35}, 0$ |
| | 0 | $0, 0, 0, 0, \frac{3\sqrt{70}}{140}, 0, -\frac{\sqrt{70}i}{140}, 0, 0, -\frac{\sqrt{70}}{35}$ |
| | $\frac{\sqrt{210}}{105}$ | $0, \frac{\sqrt{70}}{35}, 0, 0, 0, \frac{\sqrt{70}i}{140}, 0, \frac{\sqrt{70}}{140}, 0, 0$ |
| | 0 | $-\frac{\sqrt{210}}{105}, 0, -\frac{\sqrt{70}}{35}, -\frac{\sqrt{70}i}{140}, 0, \frac{\sqrt{70}}{140}, 0, 0, 0, 0$ |
| | 0 | $-\frac{\sqrt{210}i}{210}, 0, 0, \frac{\sqrt{70}}{35}, 0, 0, 0, 0, 0, -\frac{\sqrt{70}}{35}$ |
| | $\frac{\sqrt{210}i}{210}$ | $0, 0, 0, 0, 0, -\frac{\sqrt{70}}{35}, 0, 0, -\frac{\sqrt{70}}{35}, 0$ |
| 525 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | 0 | $0, -\frac{\sqrt{70}i}{35}, 0, \frac{\sqrt{210}i}{210}, \frac{\sqrt{210}}{105}, 0, 0, 0, 0, \frac{\sqrt{210}}{210}$ |
| | $\frac{\sqrt{70}i}{35}$ | $0, 0, -\frac{\sqrt{210}i}{210}, 0, 0, -\frac{\sqrt{210}}{105}, 0, 0, \frac{\sqrt{210}}{210}, 0$ |
| | 0 | $0, \frac{\sqrt{210}i}{210}, 0, \frac{\sqrt{70}i}{35}, -\frac{\sqrt{70}}{35}, 0, 0, 0, 0, 0$ |
| | $-\frac{\sqrt{210}i}{210}$ | $0, -\frac{\sqrt{70}i}{35}, 0, 0, 0, \frac{\sqrt{70}}{35}, 0, 0, 0, 0$ |
| | $\frac{\sqrt{210}}{105}$ | $0, 0, -\frac{\sqrt{70}}{35}, 0, 0, -\frac{\sqrt{70}i}{140}, 0, -\frac{\sqrt{70}}{140}, 0, 0$ |
| | 0 | $0, -\frac{\sqrt{210}}{105}, 0, \frac{\sqrt{70}}{35}, \frac{\sqrt{70}i}{140}, 0, -\frac{\sqrt{70}}{140}, 0, 0, 0$ |
| | 0 | $0, 0, 0, 0, 0, -\frac{\sqrt{70}}{140}, 0, -\frac{3\sqrt{70}i}{140}, \frac{\sqrt{70}}{35}, 0$ |
| | 0 | $0, \frac{\sqrt{210}}{210}, 0, 0, 0, 0, \frac{\sqrt{70}}{35}, 0, 0, \frac{\sqrt{70}i}{35}$ |
| | $\frac{\sqrt{210}}{210}$ | $0, 0, 0, 0, 0, 0, 0, -\frac{\sqrt{70}}{35}, -\frac{\sqrt{70}i}{35}, 0$ |
| 526 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{M}_{3,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 0 0 $\frac{\sqrt{21}}{42}$ 0 $-\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{21}}{21}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{21}}{42}$ 0 $\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{21}}{21}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{7}i}{14}$ | |
| | $\frac{\sqrt{21}}{42}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ $\frac{\sqrt{7}i}{14}$ 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{7}i}{14}$ $\frac{\sqrt{7}}{14}$ 0 0 0 0 $\frac{\sqrt{7}}{14}$ | |
| | $\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}}{14}$ 0 | |
| | $-\frac{\sqrt{21}}{21}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 | |
| | 0 $\frac{\sqrt{21}}{21}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 | |
| 527 symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ | |
| | 0 0 $-\frac{\sqrt{21}}{21}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{21}}{42}$ 0 0 | |
| | 0 0 0 $\frac{\sqrt{21}}{21}$ $-\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{21}}{42}$ 0 0 0 | |
| | $-\frac{\sqrt{21}}{21}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 | |
| | 0 $\frac{\sqrt{21}}{21}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 | |
| | 0 $\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{7}i}{14}$ $-\frac{\sqrt{7}}{14}$ 0 0 0 0 $\frac{\sqrt{7}}{14}$ | |
| | $-\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}}{14}$ 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}i}{14}$ | |
| | $\frac{\sqrt{21}}{42}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{7}i}{14}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 | |
| 528 symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ | |

continued ...

Table 8

| No. | multipole | matrix |
|--------------------------------|---|--------|
| $\mathbb{M}_5^{(1,-1;a)}(A_1)$ | 0 0 0 $\frac{\sqrt{30}}{30}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{30}$ | |
| | 0 0 $\frac{\sqrt{30}}{30}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{30}$ 0 | |
| | 0 $\frac{\sqrt{30}}{30}$ 0 $-\frac{\sqrt{10}}{60}$ 0 0 0 $\frac{\sqrt{10}}{15}$ 0 0 $\frac{\sqrt{10}i}{60}$ | |
| | $\frac{\sqrt{30}}{30}$ 0 $-\frac{\sqrt{10}}{60}$ 0 0 0 0 $-\frac{\sqrt{10}}{15}$ $-\frac{\sqrt{10}i}{60}$ 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{10}}{15}$ 0 $\frac{\sqrt{10}i}{15}$ $-\frac{\sqrt{10}}{15}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{10}}{15}$ 0 $-\frac{\sqrt{10}i}{15}$ 0 0 $\frac{\sqrt{10}}{15}$ | |
| | 0 0 $\frac{\sqrt{10}}{15}$ 0 0 $\frac{\sqrt{10}i}{15}$ 0 $\frac{\sqrt{10}}{15}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{10}}{15}$ $-\frac{\sqrt{10}i}{15}$ 0 $\frac{\sqrt{10}}{15}$ 0 0 0 | |
| | 0 $\frac{\sqrt{30}i}{30}$ 0 $\frac{\sqrt{10}i}{60}$ $-\frac{\sqrt{10}}{15}$ 0 0 0 0 $\frac{\sqrt{10}}{60}$ | |
| | $-\frac{\sqrt{30}i}{30}$ 0 $-\frac{\sqrt{10}i}{60}$ 0 0 $\frac{\sqrt{10}}{15}$ 0 0 $\frac{\sqrt{10}}{60}$ 0 | |
| 529 symmetry | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ | |
| | $\frac{\sqrt{7}}{7}$ 0 0 0 0 $\frac{\sqrt{21}i}{21}$ 0 $-\frac{\sqrt{21}}{21}$ 0 0 | |
| | 0 $-\frac{\sqrt{7}}{7}$ 0 0 $-\frac{\sqrt{21}i}{21}$ 0 $-\frac{\sqrt{21}}{21}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{7}}{42}$ 0 0 $\frac{\sqrt{7}i}{42}$ 0 $\frac{\sqrt{7}}{42}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{7}}{42}$ $-\frac{\sqrt{7}i}{42}$ 0 $\frac{\sqrt{7}}{42}$ 0 0 0 | |
| | 0 $\frac{\sqrt{21}i}{21}$ 0 $\frac{\sqrt{7}i}{42}$ $-\frac{2\sqrt{7}}{21}$ 0 0 0 0 $\frac{\sqrt{7}}{42}$ | |
| | $-\frac{\sqrt{21}i}{21}$ 0 $-\frac{\sqrt{7}i}{42}$ 0 0 $\frac{2\sqrt{7}}{21}$ 0 0 $\frac{\sqrt{7}}{42}$ 0 | |
| | 0 $-\frac{\sqrt{21}}{21}$ 0 $\frac{\sqrt{7}}{42}$ 0 0 $-\frac{2\sqrt{7}}{21}$ 0 0 $-\frac{\sqrt{7}i}{42}$ | |
| | $-\frac{\sqrt{21}}{21}$ 0 $\frac{\sqrt{7}}{42}$ 0 0 0 0 $\frac{2\sqrt{7}}{21}$ $\frac{\sqrt{7}i}{42}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{7}}{42}$ 0 $-\frac{\sqrt{7}i}{42}$ $\frac{\sqrt{7}}{42}$ 0 | |
| 530 symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ | |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{M}_5^{(1,-1;a)}(A_2, 2)$ | 0 | 0 0 0 $-\frac{\sqrt{30}i}{30}$ 0 0 0 0 0 $\frac{\sqrt{30}}{30}$ |
| | 0 | 0 0 $\frac{\sqrt{30}i}{30}$ 0 0 0 0 0 0 $\frac{\sqrt{30}}{30}$ 0 |
| | 0 | $-\frac{\sqrt{30}i}{30}$ 0 $-\frac{\sqrt{10}i}{60}$ $\frac{\sqrt{10}}{15}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{60}$ |
| | $\frac{\sqrt{30}i}{30}$ | 0 $\frac{\sqrt{10}i}{60}$ 0 0 0 $-\frac{\sqrt{10}}{15}$ 0 0 0 $-\frac{\sqrt{10}}{60}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{10}}{15}$ 0 0 0 $\frac{\sqrt{10}i}{15}$ 0 $\frac{\sqrt{10}}{15}$ 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{10}}{15}$ $-\frac{\sqrt{10}i}{15}$ 0 $\frac{\sqrt{10}}{15}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{10}}{15}$ 0 $-\frac{\sqrt{10}i}{15}$ $\frac{\sqrt{10}}{15}$ 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{10}}{15}$ 0 $\frac{\sqrt{10}i}{15}$ 0 0 0 $-\frac{\sqrt{10}}{15}$ |
| | 0 | $\frac{\sqrt{30}}{30}$ 0 $-\frac{\sqrt{10}}{60}$ 0 0 0 $\frac{\sqrt{10}}{15}$ 0 0 0 $\frac{\sqrt{10}i}{60}$ |
| | $\frac{\sqrt{30}}{30}$ | 0 $-\frac{\sqrt{10}}{60}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{15}$ $-\frac{\sqrt{10}i}{60}$ 0 |
| 531 | symmetry | $\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$ |
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{2}}{4}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{4}$ | |
| | 0 0 $\frac{\sqrt{2}}{4}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{4}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{2}i}{4}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{4}$ | |
| | 0 0 $-\frac{\sqrt{2}i}{4}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{4}$ 0 | |
| 532 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-----|-------------------------------------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$ |
| 533 | $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 1)$ | $\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |
| | | $\begin{bmatrix} 0 & \frac{\sqrt{105}}{35} & 0 & -\frac{\sqrt{35}}{70} & 0 & 0 & \frac{2\sqrt{35}}{35} & 0 & 0 & \frac{\sqrt{35}i}{70} \\ \frac{\sqrt{105}}{35} & 0 & -\frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & -\frac{2\sqrt{35}}{35} & -\frac{\sqrt{35}i}{70} & 0 \\ 0 & -\frac{\sqrt{35}}{70} & 0 & \frac{\sqrt{105}}{210} & 0 & 0 & -\frac{\sqrt{105}}{105} & 0 & 0 & 0 \\ -\frac{\sqrt{35}}{70} & 0 & \frac{\sqrt{105}}{210} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{105} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{105} & 0 & \frac{\sqrt{105}i}{105} & -\frac{\sqrt{105}}{105} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{105} & 0 & -\frac{\sqrt{105}i}{105} & 0 & 0 & \frac{\sqrt{105}}{105} \\ \frac{2\sqrt{35}}{35} & 0 & -\frac{\sqrt{105}}{105} & 0 & 0 & \frac{\sqrt{105}i}{105} & 0 & -\frac{\sqrt{105}}{35} & 0 & 0 \\ 0 & -\frac{2\sqrt{35}}{35} & 0 & \frac{\sqrt{105}}{105} & -\frac{\sqrt{105}i}{105} & 0 & -\frac{\sqrt{105}}{35} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{70} & 0 & 0 & -\frac{\sqrt{105}}{105} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{210} \\ -\frac{\sqrt{35}i}{70} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{105} & 0 & 0 & 0 & \frac{\sqrt{105}}{210} \end{bmatrix}$ |
| 534 | $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 2)$ | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|--------------------------|---|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 2)$ | 0 | $-\frac{\sqrt{105}i}{35}$ |
| | $\frac{\sqrt{105}i}{35}$ | 0 |
| | 0 | $-\frac{\sqrt{35}i}{70}$ |
| | $\frac{\sqrt{35}i}{70}$ | 0 |
| | $\frac{2\sqrt{35}}{35}$ | 0 |
| | 0 | $-\frac{2\sqrt{35}}{35}$ |
| | 0 | 0 |
| | 0 | $-\frac{\sqrt{105}}{105}$ |
| | $-\frac{\sqrt{35}}{70}$ | 0 |
| | $-\frac{\sqrt{35}}{70}$ | 0 |
| 535 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 3)$ | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | $-\frac{\sqrt{5}}{10}$ |
| | 0 | $-\frac{\sqrt{5}}{10}$ |
| | 0 | $-\frac{\sqrt{5}}{10}$ |
| | 0 | $\frac{\sqrt{5}i}{10}$ |
| | 0 | $-\frac{\sqrt{5}i}{10}$ |
| | 0 | $\frac{\sqrt{5}i}{10}$ |
| | 0 | $-\frac{\sqrt{5}i}{10}$ |
| 536 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|---|--|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{10} & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{5}}{10} \end{bmatrix}$ |
| | 537 symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ |
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 4)$ | 0 0 0 0 0 $\frac{\sqrt{5}}{10}$ 0 $-\frac{\sqrt{5}i}{10}$ $\frac{\sqrt{5}}{10}$ 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & \frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & 0 & \frac{\sqrt{15}i}{30} \\ \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{15} & -\frac{\sqrt{15}i}{30} & 0 \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{30} \\ \frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{15} & 0 & 0 & 0 & -\frac{\sqrt{15}}{30} & 0 \\ \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 & -\frac{\sqrt{15}}{30} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{15}i}{30} & 0 & -\frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 538 symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|-------------------------------------|---------------------------|---|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 4)$ | 0 | 0 $\frac{\sqrt{5}}{10}$ 0 0 $\frac{\sqrt{5}i}{10}$ 0 $\frac{\sqrt{5}}{10}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{5}}{10}$ $-\frac{\sqrt{5}i}{10}$ 0 $\frac{\sqrt{5}}{10}$ 0 0 0 |
| | $\frac{\sqrt{5}}{10}$ | 0 0 0 0 0 $\frac{\sqrt{15}i}{30}$ 0 $-\frac{\sqrt{15}}{30}$ 0 0 |
| | 0 | $-\frac{\sqrt{5}}{10}$ 0 0 0 $-\frac{\sqrt{15}i}{30}$ 0 $-\frac{\sqrt{15}}{30}$ 0 0 0 |
| | 0 | $\frac{\sqrt{5}i}{10}$ 0 0 $\frac{\sqrt{15}i}{30}$ $-\frac{\sqrt{15}}{15}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{5}i}{10}$ | 0 $-\frac{\sqrt{15}i}{30}$ 0 0 0 $\frac{\sqrt{15}}{15}$ 0 0 0 0 |
| | 0 | $\frac{\sqrt{5}}{10}$ 0 0 $-\frac{\sqrt{15}}{30}$ 0 0 0 $\frac{\sqrt{15}}{15}$ 0 0 |
| | $\frac{\sqrt{5}}{10}$ | 0 $-\frac{\sqrt{15}}{30}$ 0 0 0 0 0 $-\frac{\sqrt{15}}{15}$ 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 |
| 539 | symmetry | z |
| $\mathbb{M}_1^{(1,1;a)}(A_2)$ | $\frac{\sqrt{70}}{35}$ | 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 $\frac{\sqrt{210}}{140}$ 0 0 |
| | 0 | $-\frac{\sqrt{70}}{35}$ 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 $\frac{\sqrt{210}}{140}$ 0 0 0 |
| | 0 | 0 $-\frac{\sqrt{70}}{35}$ 0 0 0 $\frac{3\sqrt{70}i}{140}$ 0 $\frac{3\sqrt{70}}{140}$ 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{70}}{35}$ $-\frac{3\sqrt{70}i}{140}$ 0 $\frac{3\sqrt{70}}{140}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{210}i}{140}$ 0 $\frac{3\sqrt{70}i}{140}$ $\frac{\sqrt{70}}{70}$ 0 0 0 0 $\frac{3\sqrt{70}}{140}$ |
| | $\frac{\sqrt{210}i}{140}$ | 0 $-\frac{3\sqrt{70}i}{140}$ 0 0 0 $-\frac{\sqrt{70}}{70}$ 0 0 $\frac{3\sqrt{70}}{140}$ 0 |
| | 0 | $\frac{\sqrt{210}}{140}$ 0 $\frac{3\sqrt{70}}{140}$ 0 0 0 $\frac{\sqrt{70}}{70}$ 0 0 $-\frac{3\sqrt{70}i}{140}$ |
| | $\frac{\sqrt{210}}{140}$ | 0 $\frac{3\sqrt{70}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{70}}{70}$ $\frac{3\sqrt{70}i}{140}$ 0 |
| | 0 | 0 0 0 0 0 $\frac{3\sqrt{70}}{140}$ 0 $-\frac{3\sqrt{70}i}{140}$ $-\frac{\sqrt{70}}{35}$ 0 |
| | 0 | 0 0 0 0 $\frac{3\sqrt{70}}{140}$ 0 $\frac{3\sqrt{70}i}{140}$ 0 0 $\frac{\sqrt{70}}{35}$ |
| 540 | symmetry | x |

continued ...

Table 8

| No. | multipole | matrix |
|---------------------------------|---------------------------|----------------------------------|
| $\mathbb{M}_{1,0}^{(1,1;a)}(E)$ | 0 | $-\frac{\sqrt{70}}{70}$ |
| | $-\frac{\sqrt{70}}{70}$ | 0 |
| | 0 | $-\frac{\sqrt{210}}{70}$ |
| | $-\frac{\sqrt{210}}{70}$ | 0 |
| | 0 | $\frac{\sqrt{70}}{70}$ |
| | $\frac{\sqrt{210}}{140}$ | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | $-\frac{\sqrt{210}}{70}$ | 0 |
| 541 | symmetry | y |
| $\mathbb{M}_{1,1}^{(1,1;a)}(E)$ | 0 | $\frac{\sqrt{70}i}{70}$ |
| | $-\frac{\sqrt{70}i}{70}$ | 0 |
| | 0 | $\frac{\sqrt{210}i}{70}$ |
| | $\frac{\sqrt{210}i}{70}$ | 0 |
| | 0 | $-\frac{\sqrt{70}i}{70}$ |
| | $\frac{\sqrt{210}i}{140}$ | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | $-\frac{\sqrt{210}}{70}$ | 0 |
| 542 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|----------------------------------|-----------|---|
| $\mathbb{M}_3^{(1,1;a)}(A_1)$ | symmetry | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{168} \\ 0 & 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{168} & 0 \\ 0 & -\frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{14}}{12} & 0 & 0 & \frac{\sqrt{14}}{24} & 0 & 0 & -\frac{\sqrt{14}i}{12} \\ -\frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{14}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{24} & \frac{\sqrt{14}i}{12} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{84} & 0 & -\frac{\sqrt{14}i}{84} & -\frac{\sqrt{14}}{24} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{84} & 0 & \frac{\sqrt{14}i}{84} & 0 & 0 & \frac{\sqrt{14}}{24} \\ 0 & 0 & \frac{\sqrt{14}}{24} & 0 & 0 & -\frac{\sqrt{14}i}{84} & 0 & -\frac{\sqrt{14}}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}}{24} & \frac{\sqrt{14}i}{84} & 0 & -\frac{\sqrt{14}}{84} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{168} & 0 & -\frac{\sqrt{14}i}{12} & -\frac{\sqrt{14}}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{12} \\ \frac{\sqrt{42}i}{168} & 0 & \frac{\sqrt{14}i}{12} & 0 & 0 & \frac{\sqrt{14}}{24} & 0 & 0 & -\frac{\sqrt{14}}{12} & 0 \end{bmatrix}$ |
| | | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | | $\begin{bmatrix} \frac{2\sqrt{35}}{35} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{105}}{42} & 0 & 0 \\ 0 & -\frac{2\sqrt{35}}{35} & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}}{105} & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}}{105} & \frac{\sqrt{35}i}{84} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{42} & 0 & -\frac{\sqrt{35}i}{84} & -\frac{4\sqrt{35}}{105} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} \\ \frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{35}i}{84} & 0 & 0 & \frac{4\sqrt{35}}{105} & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 \\ 0 & \frac{\sqrt{105}}{42} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}i}{84} \\ \frac{\sqrt{105}}{42} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & 0 & 0 & \frac{4\sqrt{35}}{105} & -\frac{\sqrt{35}i}{84} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & \frac{\sqrt{35}i}{84} & \frac{\sqrt{35}}{105} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & -\frac{\sqrt{35}}{105} \end{bmatrix}$ |
| | | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| 543 | symmetry | |
| $\mathbb{M}_3^{(1,1;a)}(A_2, 1)$ | symmetry | $\begin{bmatrix} \frac{2\sqrt{35}}{35} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{105}}{42} & 0 & 0 \\ 0 & -\frac{2\sqrt{35}}{35} & 0 & 0 & \frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{35}}{105} & 0 & 0 & -\frac{\sqrt{35}i}{84} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}}{105} & \frac{\sqrt{35}i}{84} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{42} & 0 & -\frac{\sqrt{35}i}{84} & -\frac{4\sqrt{35}}{105} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} \\ \frac{\sqrt{105}i}{42} & 0 & \frac{\sqrt{35}i}{84} & 0 & 0 & \frac{4\sqrt{35}}{105} & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 \\ 0 & \frac{\sqrt{105}}{42} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & -\frac{4\sqrt{35}}{105} & 0 & 0 & \frac{\sqrt{35}i}{84} \\ \frac{\sqrt{105}}{42} & 0 & -\frac{\sqrt{35}}{84} & 0 & 0 & 0 & 0 & \frac{4\sqrt{35}}{105} & -\frac{\sqrt{35}i}{84} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & \frac{\sqrt{35}i}{84} & \frac{\sqrt{35}}{105} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{84} & 0 & -\frac{\sqrt{35}i}{84} & 0 & 0 & -\frac{\sqrt{35}}{105} \end{bmatrix}$ |
| | | |
| 544 | symmetry | |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{M}_3^{(1,1;a)}(A_2, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{168} \\ 0 & 0 & -\frac{\sqrt{42}i}{168} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{168} & 0 \\ 0 & \frac{\sqrt{42}i}{168} & 0 & \frac{\sqrt{14}i}{12} & \frac{\sqrt{14}}{24} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{12} \\ -\frac{\sqrt{42}i}{168} & 0 & -\frac{\sqrt{14}i}{12} & 0 & 0 & -\frac{\sqrt{14}}{24} & 0 & 0 & \frac{\sqrt{14}}{12} & 0 \\ 0 & 0 & \frac{\sqrt{14}}{24} & 0 & 0 & -\frac{\sqrt{14}i}{84} & 0 & -\frac{\sqrt{14}}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}}{24} & \frac{\sqrt{14}i}{84} & 0 & -\frac{\sqrt{14}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{84} & 0 & \frac{\sqrt{14}i}{84} & \frac{\sqrt{14}}{24} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{84} & 0 & -\frac{\sqrt{14}i}{84} & 0 & 0 & -\frac{\sqrt{14}}{24} \\ 0 & -\frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{14}}{12} & 0 & 0 & \frac{\sqrt{14}}{24} & 0 & 0 & -\frac{\sqrt{14}i}{12} \\ -\frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{14}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{24} & \frac{\sqrt{14}i}{12} & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{M}_{3,0}^{(1,1;a)}(E, 1)$ | | $\begin{bmatrix} 0 & -\frac{\sqrt{210}}{70} & 0 & \frac{\sqrt{70}}{56} & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & -\frac{\sqrt{70}i}{56} \\ -\frac{\sqrt{210}}{70} & 0 & \frac{\sqrt{70}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & \frac{\sqrt{70}i}{56} & 0 \\ 0 & \frac{\sqrt{70}}{56} & 0 & -\frac{\sqrt{210}}{420} & 0 & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 & 0 \\ \frac{\sqrt{70}}{56} & 0 & -\frac{\sqrt{210}}{420} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{168} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{420} & 0 & -\frac{\sqrt{210}i}{84} & -\frac{\sqrt{210}}{168} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{420} & 0 & \frac{\sqrt{210}i}{84} & 0 & 0 & \frac{\sqrt{210}}{168} \\ \frac{\sqrt{70}}{28} & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 & \frac{3\sqrt{210}}{140} & 0 & 0 \\ 0 & -\frac{\sqrt{70}}{28} & 0 & \frac{\sqrt{210}}{168} & \frac{\sqrt{210}i}{84} & 0 & \frac{3\sqrt{210}}{140} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{420} \\ \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{168} & 0 & 0 & -\frac{\sqrt{210}}{420} & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|---------------------------|--|
| $\mathbb{M}_{3,1}^{(1,1;a)}(E, 1)$ | 0 | $\frac{\sqrt{210}i}{70}$ 0 $\frac{\sqrt{70}i}{56}$ $\frac{\sqrt{70}}{28}$ 0 0 0 0 $\frac{\sqrt{70}}{56}$ |
| | $-\frac{\sqrt{210}i}{70}$ | 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 $-\frac{\sqrt{70}}{28}$ 0 0 $\frac{\sqrt{70}}{56}$ 0 |
| | 0 | $\frac{\sqrt{70}i}{56}$ 0 $\frac{\sqrt{210}i}{420}$ $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{70}i}{56}$ | 0 $-\frac{\sqrt{210}i}{420}$ 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 |
| | $\frac{\sqrt{70}}{28}$ | 0 $\frac{\sqrt{210}}{168}$ 0 0 0 $-\frac{3\sqrt{210}i}{140}$ 0 $\frac{\sqrt{210}}{84}$ 0 0 |
| | 0 | $-\frac{\sqrt{70}}{28}$ 0 $-\frac{\sqrt{210}}{168}$ $\frac{3\sqrt{210}i}{140}$ 0 $\frac{\sqrt{210}}{84}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{210}}{84}$ 0 $\frac{\sqrt{210}i}{420}$ $-\frac{\sqrt{210}}{168}$ 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{210}}{84}$ 0 $-\frac{\sqrt{210}i}{420}$ 0 0 $\frac{\sqrt{210}}{168}$ |
| | 0 | $\frac{\sqrt{70}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 $\frac{\sqrt{210}i}{420}$ |
| | $\frac{\sqrt{70}}{56}$ | 0 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ $-\frac{\sqrt{210}i}{420}$ 0 |
| 547 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{M}_{3,0}^{(1,1;a)}(E, 2)$ | 0 | 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{7}i}{28}$ $\frac{\sqrt{7}}{14}$ 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 $-\frac{\sqrt{7}}{14}$ |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{21}}{28}$ 0 $\frac{\sqrt{21}i}{28}$ 0 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{21}}{28}$ 0 $-\frac{\sqrt{21}i}{28}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{21}}{28}$ 0 0 0 $\frac{\sqrt{21}}{21}$ 0 0 $-\frac{\sqrt{21}i}{21}$ |
| | $-\frac{\sqrt{7}}{28}$ | 0 $\frac{\sqrt{21}}{28}$ 0 0 0 0 $-\frac{\sqrt{21}}{21}$ $\frac{\sqrt{21}i}{21}$ 0 |
| | 0 | $\frac{\sqrt{7}i}{28}$ 0 $\frac{\sqrt{21}i}{28}$ $\frac{\sqrt{21}}{21}$ 0 0 0 0 $\frac{\sqrt{21}}{21}$ |
| | $-\frac{\sqrt{7}i}{28}$ | 0 $-\frac{\sqrt{21}i}{28}$ 0 0 $-\frac{\sqrt{21}}{21}$ 0 0 $\frac{\sqrt{21}}{21}$ 0 |
| | $\frac{\sqrt{7}}{14}$ | 0 0 0 0 0 $-\frac{\sqrt{21}i}{21}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 |
| | 0 | $-\frac{\sqrt{7}}{14}$ 0 0 0 $\frac{\sqrt{21}i}{21}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 0 |
| 548 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 8

| No. | multipole | matrix |
|------------------------------------|------------------------|--|
| $\mathbb{M}_{3,1}^{(1,1;a)}(E, 2)$ | 0 | 0 $\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{7}}{14}$ $\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 |
| | $\frac{\sqrt{7}}{14}$ | 0 0 0 0 0 $-\frac{\sqrt{21}i}{21}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{7}}{14}$ 0 0 0 $\frac{\sqrt{21}i}{21}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{21}i}{21}$ $-\frac{\sqrt{21}}{21}$ 0 0 0 0 $-\frac{\sqrt{21}}{28}$ |
| | $\frac{\sqrt{7}i}{28}$ | 0 $\frac{\sqrt{21}i}{21}$ 0 0 $\frac{\sqrt{21}}{21}$ 0 0 $-\frac{\sqrt{21}}{28}$ 0 0 |
| | 0 | $-\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 0 $\frac{\sqrt{21}}{21}$ 0 0 $-\frac{\sqrt{21}i}{28}$ |
| | $-\frac{\sqrt{7}}{28}$ | 0 $\frac{\sqrt{21}}{21}$ 0 0 0 0 $-\frac{\sqrt{21}}{21}$ $\frac{\sqrt{21}i}{28}$ 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{21}}{28}$ 0 $-\frac{\sqrt{21}i}{28}$ 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{21}}{28}$ 0 $\frac{\sqrt{21}i}{28}$ 0 0 0 0 0 |

bra: = $\langle d_u, \uparrow |, \langle d_u, \downarrow |, \langle d_{xz}, \uparrow |, \langle d_{xz}, \downarrow |, \langle d_{yz}, \uparrow |, \langle d_{yz}, \downarrow |, \langle d_{xy}, \uparrow |, \langle d_{xy}, \downarrow |, \langle d_v, \uparrow |, \langle d_v, \downarrow |$ ket: = $|f_{az}, \uparrow \rangle, |f_{az}, \downarrow \rangle, |f_1, \uparrow \rangle, |f_1, \downarrow \rangle, |f_2, \uparrow \rangle, |f_2, \downarrow \rangle, |f_{3x}, \uparrow \rangle, |f_{3x}, \downarrow \rangle, |f_{3y}, \uparrow \rangle, |f_{3y}, \downarrow \rangle, |f_3, \uparrow \rangle, |f_3, \downarrow \rangle, |f_{bz}, \uparrow \rangle, |f_{bz}, \downarrow \rangle$

Table 9: (d,f) block.

| No. | multipole | matrix |
|---------------------------|---|--------|
| 549 | symmetry | z |
| $\mathbb{Q}_1^{(a)}(A_2)$ | 0 0 0 0 0 0 $\frac{3\sqrt{35}}{70}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{3\sqrt{35}}{70}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ | |
| | 0 0 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 | |
| | $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |

continued ...

Table 9

| No. | multipole | matrix |
|-----|-----------|--|
| 550 | symmetry | <i>x</i> |
| | | $\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{35}}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{35}}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{105}}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{105}}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 \end{bmatrix}$ |
| 551 | symmetry | <i>y</i> |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{3\sqrt{35}}{140} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{35}}{140} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{105}}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{105}}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} \\ \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 \end{bmatrix}$ |
| 552 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|------------------------------|---|
| | $\mathbb{Q}_3^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & -\frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{24} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & 0 \end{bmatrix}$ |
| 553 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{Q}_3^{(a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 554 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{Q}_3^{(a)}(A_2, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{24} \\ \frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 555 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{Q}_{3,0}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{10}}{80} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{10}}{80} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{11\sqrt{30}}{240} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{11\sqrt{30}}{240} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{240} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{240} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 556 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|--|----------------------------------|
| $\mathbb{Q}_{3,1}^{(a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{10}}{80}$ 0 0 0 0 0 $\frac{\sqrt{6}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{10}}{80}$ 0 0 0 0 0 $\frac{\sqrt{6}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{11\sqrt{30}}{240}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{11\sqrt{30}}{240}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{30}}{60}$ 0 0 0 0 0 0 $-\frac{\sqrt{2}}{8}$ 0 | |
| | 0 0 0 0 0 0 0 0 $\frac{\sqrt{30}}{60}$ 0 0 0 0 0 0 $-\frac{\sqrt{2}}{8}$ | |
| | $\frac{\sqrt{2}}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{2}}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{30}}{240}$ 0 0 0 0 0 $-\frac{3\sqrt{2}}{16}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}}{240}$ 0 0 0 0 0 $-\frac{3\sqrt{2}}{16}$ 0 0 0 0 0 0 | |
| 557 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{Q}_{3,0}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{3}}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{3}}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{3}}{6}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{3}}{6}$ 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{3}}{6}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{3}}{6}$ 0 0 0 0 0 0 0 | |
| 558 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{Q}_{3,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 559 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ $\begin{bmatrix} 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{15}}{15} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{15}}{15} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{15} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 560 | symmetry | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------|--|--|
| $\mathbb{Q}_5^{(a)}(A_2, 1)$ | 0 0 0 0 0 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{42}}{84}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{42}}{84}$ | |
| | 0 0 0 0 $\frac{\sqrt{70}}{56}$ 0 0 0 0 0 0 $-\frac{5\sqrt{42}}{168}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{70}}{56}$ 0 0 0 0 0 $-\frac{5\sqrt{42}}{168}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{70}}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}}{168}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{70}}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}}{168}$ 0 0 0 0 | |
| | $\frac{\sqrt{42}}{84}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{42}}{84}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 561 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ |
| $\mathbb{Q}_5^{(a)}(A_2, 2)$ | 0 0 0 0 $-\frac{\sqrt{3}}{12}$ 0 0 0 0 0 $-\frac{\sqrt{5}}{20}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{3}}{12}$ 0 0 0 0 0 $-\frac{\sqrt{5}}{20}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{1}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{1}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}}{15}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}}{15}$ | |
| | $\frac{\sqrt{15}}{15}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{15}}{15}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 | |
| 562 | symmetry | $\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|--------------------------------|---|
| | $\mathbb{Q}_{5,0}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 563 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |
| | $\mathbb{Q}_{5,1}^{(a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 564 | symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---|--|
| $\mathbb{Q}_{5,0}^{(a)}(E, 2)$ | 0 0 $-\frac{3\sqrt{14}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{14}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{56}$ 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{42}}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}}{140}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{42}}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}}{140}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{70}}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{70}}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}}{21}$ 0 0 0 0 0 0 $-\frac{\sqrt{70}}{70}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{42}}{21}$ 0 0 0 0 0 $-\frac{\sqrt{70}}{70}$ | |
| | 0 0 0 0 0 $\frac{\sqrt{42}}{168}$ 0 0 0 0 0 $-\frac{3\sqrt{70}}{280}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}}{168}$ 0 0 0 0 0 $-\frac{3\sqrt{70}}{280}$ 0 0 | |
| 565 | symmetry | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |
| $\mathbb{Q}_{5,1}^{(a)}(E, 2)$ | 0 0 0 0 $-\frac{3\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{56}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{56}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{42}}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}}{140}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{42}}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}}{140}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}}{21}$ 0 0 0 0 0 $\frac{\sqrt{70}}{70}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{42}}{21}$ 0 0 0 0 0 $\frac{\sqrt{70}}{70}$ | |
| | $-\frac{\sqrt{70}}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{70}}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{42}}{168}$ 0 0 0 0 0 0 $\frac{3\sqrt{70}}{280}$ 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{42}}{168}$ 0 0 0 0 0 0 $\frac{3\sqrt{70}}{280}$ 0 0 0 0 | |
| 566 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{Q}_{5,0}^{(a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 \end{bmatrix}$ |
| 567 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |
| | $\mathbb{Q}_{5,1}^{(a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{40} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{40} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{40} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 568 | symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{Q}_{5,0}^{(a)}(E, 4)$ | $\begin{bmatrix} \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{10}}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{10}}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{10}}{40} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{10}}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 569 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |
| | $\mathbb{Q}_{5,1}^{(a)}(E, 4)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 570 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----------------------------------|---|--|
| $\mathbb{Q}_3^{(1,-1;a)}(A_1)$ | 0 | $\frac{\sqrt{35}i}{28}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{35}}{28}$ |
| | $\frac{\sqrt{35}i}{28}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{35}}{28}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 |
| | 0 | 0 $-\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{7}}{14}$ 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 0 0 0 |
| 571 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| $\mathbb{Q}_3^{(1,-1;a)}(A_2, 1)$ | 0 0 0 $-\frac{\sqrt{210}}{280}$ 0 $\frac{\sqrt{210}i}{280}$ 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 $-\frac{\sqrt{14}i}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{210}}{280}$ 0 $\frac{\sqrt{210}i}{280}$ 0 0 0 $\frac{\sqrt{14}}{56}$ 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 | |
| | $-\frac{\sqrt{42}i}{28}$ 0 0 $-\frac{\sqrt{70}}{280}$ 0 $-\frac{\sqrt{70}i}{280}$ 0 0 0 $\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 $\frac{\sqrt{42}i}{28}$ $\frac{\sqrt{70}}{280}$ 0 $-\frac{\sqrt{70}i}{280}$ 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $\frac{\sqrt{70}i}{70}$ $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 $\frac{\sqrt{70}i}{70}$ 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 | |
| | 0 0 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 $-\frac{\sqrt{70}}{70}$ 0 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{70}i}{280}$ $\frac{\sqrt{70}}{70}$ 0 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{70}i}{70}$ 0 $-\frac{\sqrt{70}}{70}$ 0 0 0 0 0 $\frac{\sqrt{42}i}{28}$ 0 | |
| | 0 0 $-\frac{\sqrt{70}i}{70}$ 0 $-\frac{\sqrt{70}}{70}$ 0 0 0 0 0 0 0 $-\frac{\sqrt{42}i}{28}$ | |
| 572 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ..

Table 9

| No. | multipole | matrix |
|-------------------------------------|--------------------------|---|
| $\mathbb{Q}_3^{(1,-1;a)}(A_2, 2)$ | 0 | $\frac{\sqrt{35}}{28}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{35}i}{28}$ |
| | $-\frac{\sqrt{35}}{28}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{35}i}{28}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{7}}{56}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{56}$ 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 0 |
| 573 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{Q}_{3,0}^{(1,-1;a)}(E, 1)$ | 0 | $-\frac{\sqrt{21}i}{84}$ 0 0 $-\frac{\sqrt{35}i}{70}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{21}}{84}$ |
| | $-\frac{\sqrt{21}i}{84}$ | 0 0 0 0 0 $\frac{\sqrt{35}i}{70}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{21}}{84}$ 0 |
| | 0 | $-\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{105}i}{210}$ 0 0 $\frac{\sqrt{105}}{420}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 |
| | $-\frac{\sqrt{7}i}{14}$ | 0 0 0 0 0 $-\frac{\sqrt{105}i}{210}$ $-\frac{\sqrt{105}}{420}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{105}i}{168}$ 0 $-\frac{\sqrt{105}}{210}$ $-\frac{2\sqrt{105}i}{105}$ 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}i}{168}$ 0 $\frac{\sqrt{105}}{210}$ 0 0 $\frac{2\sqrt{105}i}{105}$ $-\frac{3\sqrt{7}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}}{210}$ 0 $\frac{\sqrt{105}i}{120}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}}{210}$ 0 $\frac{\sqrt{105}i}{120}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 |
| | 0 | 0 0 $\frac{2\sqrt{105}i}{105}$ 0 0 0 0 $-\frac{\sqrt{105}i}{420}$ 0 0 0 0 $\frac{\sqrt{7}i}{14}$ |
| | 0 | 0 0 0 $-\frac{2\sqrt{105}i}{105}$ 0 0 $-\frac{\sqrt{105}i}{420}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 |
| 574 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ..

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|---|
| $\mathbb{Q}_{3,1}^{(1,-1;a)}(E, 1)$ | 0 | $\frac{\sqrt{21}}{84}, \frac{\sqrt{35}i}{70}, 0, 0, 0, 0, 0, 0, \frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, \frac{\sqrt{21}i}{84}$ |
| | $-\frac{\sqrt{21}}{84}$ | $0, 0, -\frac{\sqrt{35}i}{70}, 0, 0, 0, 0, 0, 0, -\frac{\sqrt{21}i}{42}, 0, 0, 0, \frac{\sqrt{21}i}{84}, 0$ |
| | $0, -\frac{\sqrt{7}}{14}, \frac{\sqrt{105}i}{210}, 0, 0, 0, 0, \frac{\sqrt{105}i}{420}, -\frac{\sqrt{7}i}{14}, 0, 0, 0, 0, 0, 0, 0$ | |
| | $\frac{\sqrt{7}}{14}$ | $0, 0, -\frac{\sqrt{105}i}{210}, 0, 0, \frac{\sqrt{105}i}{420}, 0, 0, 0, \frac{\sqrt{7}i}{14}, 0, 0, 0, 0, 0$ |
| | $0, 0, 0, -\frac{\sqrt{105}}{120}, 0, -\frac{\sqrt{105}i}{210}, 0, 0, 0, -\frac{\sqrt{7}}{56}, 0, 0, 0, 0, 0$ | |
| | $0, 0, \frac{\sqrt{105}}{120}, 0, -\frac{\sqrt{105}i}{210}, 0, 0, 0, \frac{\sqrt{7}}{56}, 0, 0, 0, 0, 0, 0$ | |
| | $0, 0, 0, \frac{\sqrt{105}i}{210}, 0, \frac{\sqrt{105}}{168}, \frac{2\sqrt{105}i}{105}, 0, 0, 0, 0, 0, -\frac{3\sqrt{7}}{56}, 0, 0$ | |
| | $0, 0, \frac{\sqrt{105}i}{210}, 0, -\frac{\sqrt{105}}{168}, 0, 0, -\frac{2\sqrt{105}i}{105}, 0, 0, \frac{3\sqrt{7}}{56}, 0, 0, 0$ | |
| | $0, 0, 0, 0, -\frac{2\sqrt{105}i}{105}, 0, 0, \frac{\sqrt{105}}{420}, 0, 0, 0, 0, 0, \frac{\sqrt{7}}{14}, 0$ | |
| | $0, 0, 0, 0, 0, \frac{2\sqrt{105}i}{105}, -\frac{\sqrt{105}}{420}, 0, 0, 0, 0, 0, -\frac{\sqrt{7}}{14}, 0$ | |
| 575 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{Q}_{3,0}^{(1,-1;a)}(E, 2)$ | 0 | $0, 0, 0, \frac{\sqrt{14}i}{56}, 0, -\frac{\sqrt{14}}{56}, 0, 0, 0, \frac{\sqrt{210}i}{168}, 0, \frac{\sqrt{210}}{168}, -\frac{\sqrt{210}i}{84}, 0$ |
| | $0, 0, \frac{\sqrt{14}i}{56}$ | $0, \frac{\sqrt{14}}{56}, 0, 0, 0, \frac{\sqrt{210}i}{168}, 0, -\frac{\sqrt{210}}{168}, 0, 0, \frac{\sqrt{210}i}{84}$ |
| | $0, 0, 0, \frac{\sqrt{42}i}{168}$ | $0, \frac{\sqrt{42}}{168}, -\frac{\sqrt{42}i}{84}, 0, 0, -\frac{\sqrt{70}i}{56}, 0, \frac{\sqrt{70}}{56}, 0, 0, 0$ |
| | $0, 0, \frac{\sqrt{42}i}{168}$ | $0, -\frac{\sqrt{42}}{168}, 0, 0, \frac{\sqrt{42}i}{84}, -\frac{\sqrt{70}i}{56}, 0, -\frac{\sqrt{70}}{56}, 0, 0, 0$ |
| | $0, 0, 0, 0, \frac{\sqrt{42}i}{42}$ | $0, 0, -\frac{\sqrt{42}}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | $0, 0, 0, 0, 0, -\frac{\sqrt{42}i}{42}, \frac{\sqrt{42}}{42}, 0, 0, 0, 0, 0, 0, 0, 0$ | |
| | $0, 0, -\frac{\sqrt{42}i}{42}$ | $0, 0, 0, \frac{\sqrt{42}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | $0, 0, 0, \frac{\sqrt{42}i}{42}$ | $0, 0, -\frac{\sqrt{42}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | $0, 0, -\frac{\sqrt{42}}{42}$ | $0, -\frac{\sqrt{42}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | $0, 0, -\frac{\sqrt{42}i}{42}$ | $0, -\frac{\sqrt{42}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| 576 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{Q}_{3,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} \frac{\sqrt{210}i}{84} & 0 & 0 & -\frac{\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & 0 & -\frac{\sqrt{210}}{168} & 0 & \frac{\sqrt{210}i}{168} & 0 & 0 \\ 0 & -\frac{\sqrt{210}i}{84} & \frac{\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{168} & 0 & \frac{\sqrt{210}i}{168} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & 0 & \frac{\sqrt{70}}{56} & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{42} & \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{168} & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{168} & \frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & \frac{\sqrt{42}}{42} & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ | |
| | | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ |
| $\mathbb{Q}_5^{(1,-1;a)}(A_1)$ | $\begin{bmatrix} 0 & \frac{\sqrt{6}i}{15} & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{20} & 0 & 0 & \frac{\sqrt{6}}{15} \\ \frac{\sqrt{6}i}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{20} & -\frac{\sqrt{6}}{15} & 0 \\ 0 & \frac{\sqrt{2}i}{60} & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & -\frac{\sqrt{2}}{60} \\ \frac{\sqrt{2}i}{60} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{12} & \frac{\sqrt{2}}{60} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}i}{80} & 0 & \frac{\sqrt{30}}{80} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{240} & 0 & \frac{17\sqrt{2}}{240} & \frac{\sqrt{2}i}{30} & 0 \\ 0 & 0 & \frac{\sqrt{30}i}{80} & 0 & -\frac{\sqrt{30}}{80} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{240} & 0 & -\frac{17\sqrt{2}}{240} & 0 & 0 & -\frac{\sqrt{2}i}{30} \\ \frac{\sqrt{2}i}{30} & 0 & 0 & -\frac{\sqrt{30}}{240} & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & \frac{11\sqrt{2}}{240} & 0 & \frac{7\sqrt{2}i}{240} & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{30} & \frac{\sqrt{30}}{240} & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & -\frac{11\sqrt{2}}{240} & 0 & \frac{7\sqrt{2}i}{240} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{60} & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{30} & \frac{\sqrt{2}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{60} & 0 \\ -\frac{\sqrt{2}}{60} & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}i}{30} & 0 & 0 & -\frac{\sqrt{2}i}{12} & 0 & 0 & \frac{\sqrt{2}i}{60} & 0 \end{bmatrix}$ | |
| | | $z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)$ |
| | | 8 |
| | | |
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| | | |
| | | |
| | | |

continued ...

Table 9

| No. | multipole | matrix |
|-----------------------------------|--|--|
| $\mathbb{Q}_5^{(1,-1;a)}(A_2, 1)$ | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{56} \quad 0 \quad \frac{\sqrt{7}i}{56} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{168} \quad 0 \quad -\frac{\sqrt{105}i}{168} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{7}}{56} \quad 0 \quad \frac{\sqrt{7}i}{56} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{105}}{168} \quad 0 \quad -\frac{\sqrt{105}i}{168} \quad 0 \quad 0 \quad 0$ | |
| | $\frac{\sqrt{35}i}{42} \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{168} \quad 0 \quad -\frac{\sqrt{21}i}{168} \quad 0 \quad 0 \quad 0 \quad -\frac{13\sqrt{35}}{840} \quad 0 \quad \frac{13\sqrt{35}i}{840} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{35}i}{42} \quad \frac{\sqrt{21}}{168} \quad 0 \quad -\frac{\sqrt{21}i}{168} \quad 0 \quad 0 \quad 0 \quad \frac{13\sqrt{35}}{840} \quad 0 \quad \frac{13\sqrt{35}i}{840} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{35}}{60} \quad -\frac{5\sqrt{21}i}{168} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{42} \quad -\frac{5\sqrt{35}i}{168} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{60}$ | |
| | $\frac{\sqrt{35}}{60} \quad 0 \quad 0 \quad \frac{5\sqrt{21}i}{168} \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{42} \quad 0 \quad 0 \quad \frac{5\sqrt{35}i}{168} \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{60} \quad 0$ | |
| | $0 \quad \frac{\sqrt{35}i}{60} \quad 0 \quad 0 \quad \frac{5\sqrt{21}i}{168} \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{42} \quad 0 \quad 0 \quad -\frac{5\sqrt{35}i}{168} \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{60}$ | |
| | $\frac{\sqrt{35}i}{60} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{5\sqrt{21}i}{168} \quad \frac{\sqrt{21}}{42} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{35}i}{168} \quad \frac{\sqrt{35}}{60} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{56} \quad 0 \quad -\frac{\sqrt{21}}{56} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{120} \quad 0 \quad \frac{\sqrt{35}}{120} \quad -\frac{\sqrt{35}i}{42} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{21}i}{56} \quad 0 \quad \frac{\sqrt{21}}{56} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{120} \quad 0 \quad -\frac{\sqrt{35}}{120} \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{42}$ | |
| 579 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ |
| $\mathbb{Q}_5^{(1,-1;a)}(A_2, 2)$ | $0 \quad \frac{\sqrt{6}}{15} \quad -\frac{\sqrt{10}i}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{15}$ | |
| | $-\frac{\sqrt{6}}{15} \quad 0 \quad 0 \quad \frac{\sqrt{10}i}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{20} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{15} \quad 0$ | |
| | $0 \quad -\frac{\sqrt{2}}{60} \quad -\frac{\sqrt{30}i}{60} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{30} \quad -\frac{\sqrt{2}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{60}$ | |
| | $\frac{\sqrt{2}}{60} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{60} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{30} \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{12} \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{60} \quad 0$ | |
| | $\frac{\sqrt{2}i}{30} \quad 0 \quad 0 \quad \frac{\sqrt{30}}{48} \quad 0 \quad -\frac{\sqrt{30}i}{240} \quad 0 \quad 0 \quad 0 \quad -\frac{7\sqrt{2}}{240} \quad 0 \quad -\frac{11\sqrt{2}i}{240} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{2}i}{30} \quad -\frac{\sqrt{30}}{48} \quad 0 \quad -\frac{\sqrt{30}i}{240} \quad 0 \quad 0 \quad 0 \quad \frac{7\sqrt{2}}{240} \quad 0 \quad -\frac{11\sqrt{2}i}{240} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{80} \quad 0 \quad \frac{\sqrt{30}}{80} \quad 0 \quad 0 \quad 0 \quad -\frac{17\sqrt{2}i}{240} \quad 0 \quad \frac{\sqrt{2}}{240} \quad -\frac{\sqrt{2}i}{30} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{30}i}{80} \quad 0 \quad -\frac{\sqrt{30}}{80} \quad 0 \quad 0 \quad 0 \quad -\frac{17\sqrt{2}i}{240} \quad 0 \quad -\frac{\sqrt{2}}{240} \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{30}$ | |
| | $0 \quad \frac{\sqrt{2}i}{60} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{30} \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{12} \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{60}$ | |
| | $\frac{\sqrt{2}i}{60} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{60} \quad \frac{\sqrt{30}}{30} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{12} \quad \frac{\sqrt{2}}{60} \quad 0$ | |
| 580 | symmetry | $\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|-----------------------------|---|
| $\mathbb{Q}_{5,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} \\ -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 & -\frac{3\sqrt{10}i}{80} & 0 & \frac{3\sqrt{10}}{80} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & -\frac{3\sqrt{10}i}{80} & 0 & -\frac{3\sqrt{10}}{80} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & -\frac{3\sqrt{10}}{80} & 0 & -\frac{3\sqrt{10}i}{80} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & \frac{3\sqrt{10}}{80} & 0 & -\frac{3\sqrt{10}i}{80} & 0 & 0 \\ 0 & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} \\ -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{20} \end{bmatrix}$ |
| | 581 symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} \\ -\frac{\sqrt{10}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & \frac{3\sqrt{10}}{80} & 0 & \frac{3\sqrt{10}i}{80} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & -\frac{3\sqrt{10}}{80} & 0 & \frac{3\sqrt{10}i}{80} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 & -\frac{3\sqrt{10}i}{80} & 0 & \frac{3\sqrt{10}}{80} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & -\frac{3\sqrt{10}i}{80} & 0 & -\frac{3\sqrt{10}}{80} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} \\ \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{20} \end{bmatrix}$ |
| | 582 symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{Q}_{5,0}^{(1,-1;a)}(E, 2)$ | $0 \quad -\frac{\sqrt{7}i}{35} \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{28} \quad 0 \quad 0 \quad \frac{\sqrt{7}}{35}$ | |
| | $-\frac{\sqrt{7}i}{35} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{105}i}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}i}{28} \quad -\frac{\sqrt{7}}{35} \quad 0$ | |
| | $0 \quad \frac{\sqrt{21}i}{42} \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{140} \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad -\frac{13\sqrt{21}i}{420} \quad 0 \quad 0 \quad 0$ | |
| | $\frac{\sqrt{21}i}{42} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{140} \quad \frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{13\sqrt{21}i}{420} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{40} \quad 0 \quad \frac{\sqrt{35}}{280} \quad -\frac{\sqrt{35}i}{35} \quad 0 \quad 0 \quad -\frac{23\sqrt{21}i}{840} \quad 0 \quad \frac{\sqrt{21}}{120} \quad \frac{\sqrt{21}i}{30} \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{35}i}{40} \quad 0 \quad -\frac{\sqrt{35}}{280} \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{35} \quad -\frac{23\sqrt{21}i}{840} \quad 0 \quad -\frac{\sqrt{21}}{120} \quad 0 \quad 0 \quad -\frac{\sqrt{21}i}{30}$ | |
| | $-\frac{\sqrt{21}i}{30} \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{280} \quad 0 \quad \frac{3\sqrt{35}i}{280} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}}{120} \quad 0 \quad -\frac{9\sqrt{21}i}{280} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{21}i}{30} \quad \frac{\sqrt{35}}{280} \quad 0 \quad \frac{3\sqrt{35}i}{280} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{120} \quad 0 \quad -\frac{9\sqrt{21}i}{280} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{3\sqrt{35}i}{140} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{70} \quad -\frac{\sqrt{21}i}{60} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}i}{42}$ | |
| | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{35}i}{140} \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{70} \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{21}i}{42} \quad 0$ | |
| 583 | symmetry | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |
| $\mathbb{Q}_{5,1}^{(1,-1;a)}(E, 2)$ | $0 \quad \frac{\sqrt{7}}{35} \quad \frac{\sqrt{105}i}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{28} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{35}$ | |
| | $-\frac{\sqrt{7}}{35} \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}i}{28} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{35} \quad 0$ | |
| | $0 \quad \frac{\sqrt{21}}{42} \quad \frac{\sqrt{35}i}{140} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{70} \quad \frac{13\sqrt{21}i}{420} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{21}}{42} \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{140} \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{70} \quad 0 \quad 0 \quad -\frac{13\sqrt{21}i}{420} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $\frac{\sqrt{21}i}{30} \quad 0 \quad 0 \quad -\frac{3\sqrt{35}}{280} \quad 0 \quad \frac{\sqrt{35}i}{280} \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{21}}{280} \quad 0 \quad \frac{\sqrt{21}i}{120} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{21}i}{30} \quad \frac{3\sqrt{35}}{280} \quad 0 \quad \frac{\sqrt{35}i}{280} \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{21}}{280} \quad 0 \quad \frac{\sqrt{21}i}{120} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{280} \quad 0 \quad \frac{\sqrt{35}}{40} \quad \frac{\sqrt{35}i}{35} \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{120} \quad 0 \quad -\frac{23\sqrt{21}}{840} \quad \frac{\sqrt{21}i}{30} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{35}i}{280} \quad 0 \quad -\frac{\sqrt{35}}{40} \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{35} \quad \frac{\sqrt{21}i}{120} \quad 0 \quad \frac{23\sqrt{21}}{840} \quad 0 \quad 0 \quad -\frac{\sqrt{21}i}{30}$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{35}i}{140} \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad -\frac{\sqrt{21}i}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{42}$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{35}i}{140} \quad \frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{60} \quad \frac{\sqrt{21}}{42} \quad 0$ | |
| 584 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|---|
| $\mathbb{Q}_{5,0}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{3\sqrt{5}i}{40}$ 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 $-\frac{3\sqrt{3}i}{40}$ 0 $\frac{3\sqrt{3}}{40}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{5}i}{40}$ 0 $-\frac{3\sqrt{5}}{40}$ 0 0 0 $-\frac{3\sqrt{3}i}{40}$ 0 $-\frac{3\sqrt{3}}{40}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{15}i}{40}$ 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{8}$ 0 $\frac{1}{8}$ $-\frac{i}{10}$ 0 | |
| | 0 0 $\frac{\sqrt{15}i}{40}$ 0 $\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 $\frac{i}{10}$ | |
| | 0 $-\frac{i}{20}$ 0 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $\frac{3i}{40}$ 0 0 $-\frac{1}{20}$ | |
| | $-\frac{i}{20}$ 0 0 0 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $-\frac{3i}{40}$ $\frac{1}{20}$ 0 | |
| | 0 $-\frac{1}{20}$ $\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $-\frac{3i}{40}$ 0 0 0 0 $\frac{i}{20}$ | |
| | $\frac{1}{20}$ 0 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 0 $\frac{3i}{40}$ 0 0 0 $\frac{i}{20}$ 0 | |
| | $\frac{i}{10}$ 0 0 $-\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 | |
| | 0 $-\frac{i}{10}$ $\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 $\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 0 | |
| 585 | symmetry | $\frac{3\sqrt{35}z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| $\mathbb{Q}_{5,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{3\sqrt{5}}{40}$ 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 0 $-\frac{3\sqrt{3}}{40}$ 0 $-\frac{3\sqrt{3}i}{40}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{5}}{40}$ 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 0 $\frac{3\sqrt{3}}{40}$ 0 $-\frac{3\sqrt{3}i}{40}$ 0 0 0 | |
| | $-\frac{i}{10}$ 0 0 $\frac{\sqrt{15}}{40}$ 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 $\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 | |
| | 0 $\frac{i}{10}$ $-\frac{\sqrt{15}}{40}$ 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 | |
| | 0 $-\frac{1}{20}$ $\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $-\frac{3i}{40}$ 0 0 0 0 $\frac{i}{20}$ | |
| | $\frac{1}{20}$ 0 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $\frac{3i}{40}$ 0 0 0 $\frac{i}{20}$ 0 | |
| | 0 $\frac{i}{20}$ 0 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $-\frac{3i}{40}$ 0 0 0 $\frac{1}{20}$ | |
| | $\frac{i}{20}$ 0 0 0 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 $\frac{3i}{40}$ $-\frac{1}{20}$ 0 | |
| | 0 0 0 $\frac{\sqrt{15}i}{40}$ 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{8}$ 0 $\frac{1}{8}$ $-\frac{i}{10}$ 0 | |
| | 0 0 $\frac{\sqrt{15}i}{40}$ 0 $\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 $\frac{i}{10}$ | |
| 586 | symmetry | $-\frac{\sqrt{105}xyz(x^2 + y^2 - 2z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{Q}_{5,0}^{(1,-1;a)}(E, 4)$ | 0 0 0 $\frac{\sqrt{15}i}{40}$ 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{40}$ 0 $\frac{1}{40}$ $-\frac{i}{5}$ 0 | |
| | 0 0 $\frac{\sqrt{15}i}{40}$ 0 $\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{40}$ 0 $-\frac{1}{40}$ 0 0 $\frac{i}{5}$ | |
| | 0 0 0 $\frac{\sqrt{5}i}{40}$ 0 $\frac{\sqrt{5}}{40}$ $\frac{\sqrt{5}i}{10}$ 0 0 $\frac{3\sqrt{3}i}{40}$ 0 $-\frac{3\sqrt{3}}{40}$ 0 0 | |
| | 0 0 $\frac{\sqrt{5}i}{40}$ 0 $-\frac{\sqrt{5}}{40}$ 0 0 $-\frac{\sqrt{5}i}{10}$ $\frac{3\sqrt{3}i}{40}$ 0 $\frac{3\sqrt{3}}{40}$ 0 0 0 | |
| | 0 $\frac{\sqrt{3}i}{20}$ 0 0 $-\frac{\sqrt{5}i}{40}$ 0 0 $-\frac{\sqrt{5}}{20}$ 0 0 $-\frac{7\sqrt{3}i}{120}$ 0 0 $\frac{\sqrt{3}}{15}$ | |
| | $\frac{\sqrt{3}i}{20}$ 0 0 0 0 $\frac{\sqrt{5}i}{40}$ $\frac{\sqrt{5}}{20}$ 0 0 0 0 $\frac{7\sqrt{3}i}{120}$ $-\frac{\sqrt{3}}{15}$ 0 | |
| | 0 $-\frac{\sqrt{3}}{20}$ $\frac{\sqrt{5}i}{40}$ 0 0 0 0 $\frac{\sqrt{5}i}{20}$ $-\frac{7\sqrt{3}i}{120}$ 0 0 0 0 $\frac{\sqrt{3}i}{15}$ | |
| | $\frac{\sqrt{3}}{20}$ 0 0 $-\frac{\sqrt{5}i}{40}$ 0 0 $\frac{\sqrt{5}i}{20}$ 0 0 $\frac{7\sqrt{3}i}{120}$ 0 0 0 $\frac{\sqrt{3}i}{15}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{5}}{40}$ 0 $\frac{\sqrt{5}i}{40}$ 0 0 0 $-\frac{\sqrt{3}}{120}$ 0 $-\frac{\sqrt{3}i}{120}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{5}}{40}$ 0 $\frac{\sqrt{5}i}{40}$ 0 0 0 $\frac{\sqrt{3}}{120}$ 0 $-\frac{\sqrt{3}i}{120}$ 0 0 0 | |
| 587 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |
| $\mathbb{Q}_{5,1}^{(1,-1;a)}(E, 4)$ | $\frac{i}{5}$ 0 0 0 0 0 0 0 0 $-\frac{1}{10}$ 0 $\frac{i}{10}$ 0 0 | |
| | 0 $-\frac{i}{5}$ 0 0 0 0 0 0 0 $\frac{1}{10}$ 0 $\frac{i}{10}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{3}}{30}$ 0 $-\frac{\sqrt{3}i}{30}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{3}}{30}$ 0 $-\frac{\sqrt{3}i}{30}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{3}}{15}$ $\frac{\sqrt{5}i}{20}$ 0 0 0 0 $-\frac{\sqrt{5}i}{20}$ $-\frac{\sqrt{3}i}{60}$ 0 0 0 0 $\frac{\sqrt{3}i}{20}$ | |
| | $\frac{\sqrt{3}}{15}$ 0 0 $-\frac{\sqrt{5}i}{20}$ 0 0 $-\frac{\sqrt{5}i}{20}$ 0 0 $\frac{\sqrt{3}i}{60}$ 0 0 0 $\frac{\sqrt{3}i}{20}$ 0 | |
| | 0 $-\frac{\sqrt{3}i}{15}$ 0 0 $\frac{\sqrt{5}i}{20}$ 0 0 $-\frac{\sqrt{5}}{20}$ 0 0 $\frac{\sqrt{3}i}{60}$ 0 0 0 $-\frac{\sqrt{3}}{20}$ | |
| | $-\frac{\sqrt{3}i}{15}$ 0 0 0 0 $-\frac{\sqrt{5}i}{20}$ $\frac{\sqrt{5}}{20}$ 0 0 0 0 $-\frac{\sqrt{3}i}{60}$ $\frac{\sqrt{3}}{20}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{5}i}{20}$ 0 $-\frac{\sqrt{5}}{20}$ $-\frac{\sqrt{5}i}{10}$ 0 0 $-\frac{\sqrt{3}i}{20}$ 0 $\frac{\sqrt{3}}{20}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{5}i}{20}$ 0 $\frac{\sqrt{5}}{20}$ 0 0 $\frac{\sqrt{5}i}{10}$ $-\frac{\sqrt{3}i}{20}$ 0 $-\frac{\sqrt{3}}{20}$ 0 0 0 | |
| 588 | symmetry | z |

continued ...

Table 9

| No. | multipole | matrix |
|---------------------------------|--|--------|
| $\mathbb{Q}_1^{(1,0;a)}(A_2)$ | 0 0 0 $\frac{3\sqrt{70}}{280}$ 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $\frac{\sqrt{42}}{56}$ 0 $\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{70}}{280}$ 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 $\frac{\sqrt{42}i}{56}$ 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{210}}{280}$ 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 $-\frac{\sqrt{14}i}{56}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{210}}{280}$ 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 $\frac{\sqrt{210}}{140}$ 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 $\frac{\sqrt{14}}{28}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{210}i}{140}$ 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 | |
| 589 | symmetry | x |
| $\mathbb{Q}_{1,0}^{(1,0;a)}(E)$ | 0 0 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 $\frac{3\sqrt{70}}{140}$ 0 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{70}i}{280}$ $-\frac{3\sqrt{70}}{140}$ 0 0 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 0 0 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 $\frac{\sqrt{14}}{28}$ | |
| | 0 0 0 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ $-\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{210}}{140}$ $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ $\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{14}}{28}$ $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | $-\frac{\sqrt{14}}{28}$ 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 | |
| 590 | symmetry | y |

continued ..

Table 9

| No. | multipole | matrix |
|---------------------------------|--|----------------------------------|
| $\mathbb{Q}_{1,1}^{(1,0;a)}(E)$ | 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $-\frac{3\sqrt{70}i}{140}$ $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 $-\frac{3\sqrt{70}i}{140}$ 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 0 | |
| | 0 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | 0 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 | |
| | $\frac{\sqrt{14}i}{28}$ 0 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{14}i}{28}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 $\frac{\sqrt{210}i}{140}$ $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | 0 $-\frac{\sqrt{14}i}{28}$ 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 | |
| 591 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| $\mathbb{Q}_3^{(1,0;a)}(A_1)$ | 0 0 0 0 $-\frac{5\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{5\sqrt{2}i}{32}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{32}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{6}i}{32}$ $\frac{\sqrt{6}}{24}$ 0 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{32}$ $-\frac{\sqrt{10}i}{16}$ 0 | |
| | 0 0 $-\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}}{32}$ 0 0 $\frac{\sqrt{10}i}{16}$ | |
| | $-\frac{\sqrt{10}i}{16}$ 0 0 $\frac{\sqrt{6}}{96}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{10}i}{16}$ $-\frac{\sqrt{6}}{96}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 0 $-\frac{\sqrt{6}i}{24}$ $-\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{6}i}{32}$ 0 0 $-\frac{\sqrt{6}i}{24}$ 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 | |
| 592 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|--|--------------------------------------|
| $\mathbb{Q}_3^{(1,0;a)}(A_2, 1)$ | 0 0 0 $\frac{3\sqrt{5}}{80}$ 0 $-\frac{3\sqrt{5}i}{80}$ 0 0 0 $\frac{\sqrt{3}}{16}$ 0 $\frac{\sqrt{3}i}{16}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{5}}{80}$ 0 $-\frac{3\sqrt{5}i}{80}$ 0 0 0 $-\frac{\sqrt{3}}{16}$ 0 $\frac{\sqrt{3}i}{16}$ 0 0 0 | |
| | 0 0 0 $\frac{11\sqrt{15}}{240}$ 0 $\frac{11\sqrt{15}i}{240}$ 0 0 0 $\frac{1}{16}$ 0 $-\frac{i}{16}$ 0 0 0 | |
| | 0 0 $-\frac{11\sqrt{15}}{240}$ 0 $\frac{11\sqrt{15}i}{240}$ 0 0 0 $-\frac{1}{16}$ 0 $-\frac{i}{16}$ 0 0 0 | |
| | 0 $-\frac{1}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{60}$ 0 0 0 0 0 $-\frac{i}{8}$ | |
| | $\frac{1}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{60}$ 0 0 0 0 0 $-\frac{i}{8}$ 0 | |
| | 0 $\frac{i}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}}{60}$ 0 0 0 0 0 $-\frac{1}{8}$ | |
| | $\frac{i}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}}{60}$ 0 0 0 0 0 $\frac{1}{8}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{15}i}{240}$ 0 $\frac{\sqrt{15}}{240}$ 0 0 0 $-\frac{3i}{16}$ 0 $-\frac{3}{16}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{15}i}{240}$ 0 $-\frac{\sqrt{15}}{240}$ 0 0 0 $-\frac{3i}{16}$ 0 $\frac{3}{16}$ 0 0 0 | |
| 593 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| $\mathbb{Q}_3^{(1,0;a)}(A_2, 2)$ | 0 0 $-\frac{5\sqrt{2}i}{32}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{5\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{6}i}{32}$ 0 0 0 0 $\frac{\sqrt{6}i}{24}$ $\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 0 $\frac{\sqrt{6}i}{24}$ 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 0 | |
| | $-\frac{\sqrt{10}i}{16}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 | |
| | 0 $\frac{\sqrt{10}i}{16}$ $\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{6}i}{96}$ 0 $-\frac{\sqrt{6}}{24}$ 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 $\frac{\sqrt{10}i}{16}$ 0 | |
| | 0 0 $-\frac{\sqrt{6}i}{96}$ 0 $\frac{\sqrt{6}}{24}$ 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ | |
| | 0 0 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{6}i}{32}$ $\frac{\sqrt{6}}{24}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| 594 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ..

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--------------------------------------|
| $\mathbb{Q}_{3,0}^{(1,0;a)}(E, 1)$ | 0 0 0 0 $\frac{\sqrt{30}i}{160}$ 0 0 $\frac{\sqrt{30}}{30}$ 0 0 $-\frac{\sqrt{2}i}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}i}{160}$ $-\frac{\sqrt{30}}{30}$ 0 0 0 0 $\frac{\sqrt{2}i}{32}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{11\sqrt{10}i}{480}$ 0 0 $\frac{\sqrt{10}}{24}$ 0 0 0 $\frac{\sqrt{6}i}{96}$ 0 0 $-\frac{\sqrt{6}}{12}$ | |
| | 0 0 0 0 0 $\frac{11\sqrt{10}i}{480}$ $-\frac{\sqrt{10}}{24}$ 0 0 0 0 $-\frac{\sqrt{6}i}{96}$ $\frac{\sqrt{6}}{12}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{10}i}{24}$ 0 $-\frac{\sqrt{10}}{480}$ $-\frac{\sqrt{10}i}{120}$ 0 0 0 0 $\frac{7\sqrt{6}}{96}$ $\frac{\sqrt{6}i}{48}$ 0 | |
| | 0 0 $-\frac{\sqrt{10}i}{24}$ 0 $\frac{\sqrt{10}}{480}$ 0 0 $\frac{\sqrt{10}i}{120}$ 0 0 0 $-\frac{7\sqrt{6}}{96}$ 0 0 $-\frac{\sqrt{6}i}{48}$ | |
| | $-\frac{\sqrt{6}i}{48}$ 0 0 $-\frac{11\sqrt{10}}{480}$ 0 $-\frac{\sqrt{10}i}{24}$ 0 0 0 $\frac{\sqrt{6}}{32}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{6}i}{48}$ $\frac{11\sqrt{10}}{480}$ 0 $-\frac{\sqrt{10}i}{24}$ 0 0 0 $-\frac{\sqrt{6}}{32}$ 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{6}}{12}$ $\frac{\sqrt{10}i}{480}$ 0 0 0 0 $-\frac{\sqrt{10}i}{24}$ $\frac{\sqrt{6}i}{32}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{6}}{12}$ 0 0 $-\frac{\sqrt{10}i}{480}$ 0 0 $-\frac{\sqrt{10}i}{24}$ 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 0 0 | |
| 595 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{Q}_{3,1}^{(1,0;a)}(E, 1)$ | 0 0 $-\frac{\sqrt{30}i}{160}$ 0 0 0 0 $-\frac{\sqrt{30}i}{30}$ $-\frac{\sqrt{2}i}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{160}$ 0 0 $-\frac{\sqrt{30}i}{30}$ 0 0 $\frac{\sqrt{2}i}{32}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{11\sqrt{10}i}{480}$ 0 0 0 0 $\frac{\sqrt{10}i}{24}$ $-\frac{\sqrt{6}i}{96}$ 0 0 0 0 $\frac{\sqrt{6}i}{12}$ | |
| | 0 0 0 $\frac{11\sqrt{10}i}{480}$ 0 0 $\frac{\sqrt{10}i}{24}$ 0 0 $\frac{\sqrt{6}i}{96}$ 0 0 $\frac{\sqrt{6}i}{12}$ 0 | |
| | $\frac{\sqrt{6}i}{48}$ 0 0 $\frac{\sqrt{10}}{24}$ 0 $\frac{11\sqrt{10}i}{480}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{32}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{6}i}{48}$ $-\frac{\sqrt{10}}{24}$ 0 $\frac{11\sqrt{10}i}{480}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{32}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{10}i}{480}$ 0 $\frac{\sqrt{10}}{24}$ $\frac{\sqrt{10}i}{120}$ 0 0 $\frac{7\sqrt{6}i}{96}$ 0 0 $\frac{\sqrt{6}i}{48}$ 0 | |
| | 0 0 $\frac{\sqrt{10}i}{480}$ 0 $-\frac{\sqrt{10}}{24}$ 0 0 $-\frac{\sqrt{10}i}{120}$ $\frac{7\sqrt{6}i}{96}$ 0 0 0 0 $-\frac{\sqrt{6}i}{48}$ | |
| | 0 $\frac{\sqrt{6}i}{12}$ 0 0 $-\frac{\sqrt{10}i}{480}$ 0 0 $\frac{\sqrt{10}}{24}$ 0 0 $\frac{\sqrt{6}i}{32}$ 0 0 0 0 | |
| | $\frac{\sqrt{6}i}{12}$ 0 0 0 0 $\frac{\sqrt{10}i}{480}$ $-\frac{\sqrt{10}}{24}$ 0 0 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 0 | |
| 596 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|------------------------|--|
| $\mathbb{Q}_{3,0}^{(1,0;a)}(E, 2)$ | $\frac{\sqrt{3}i}{12}$ | $0 \ 0 \ 0 \ \frac{\sqrt{3}i}{12} \ 0 \ -\frac{\sqrt{3}}{12} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{\sqrt{3}i}{12}$ | $0 \ 0 \ \frac{\sqrt{3}i}{12} \ 0 \ \frac{\sqrt{3}}{12} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{i}{12}$ | $0 \ 0 \ 0 \ \frac{i}{12} \ 0 \ \frac{1}{12} \ -\frac{i}{6} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{i}{12}$ | $0 \ 0 \ \frac{i}{12} \ 0 \ -\frac{1}{12} \ 0 \ 0 \ \frac{i}{6} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ -\frac{i}{24} \ 0 \ 0 \ \frac{1}{24} \ 0 \ 0 \ -\frac{\sqrt{15}i}{24} \ 0 \ 0 \ 0 \ -\frac{\sqrt{15}}{24}$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ \frac{i}{24} \ -\frac{1}{24} \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{15}i}{24} \ \frac{\sqrt{15}}{24} \ 0$ |
| | $\frac{i}{24}$ | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{i}{24} \ -\frac{\sqrt{15}i}{24} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{15}i}{24}$ |
| | $-\frac{i}{24}$ | $0 \ 0 \ 0 \ -\frac{i}{24} \ 0 \ 0 \ -\frac{i}{24} \ 0 \ 0 \ \frac{\sqrt{15}i}{24} \ 0 \ 0 \ -\frac{\sqrt{15}i}{24} \ 0$ |
| | $-\frac{1}{24}$ | $0 \ 0 \ 0 \ -\frac{1}{24} \ 0 \ \frac{i}{24} \ 0 \ 0 \ 0 \ -\frac{\sqrt{15}}{24} \ 0 \ -\frac{\sqrt{15}i}{24} \ 0 \ 0$ |
| | $\frac{1}{24}$ | $0 \ 0 \ \frac{1}{24} \ 0 \ \frac{i}{24} \ 0 \ 0 \ 0 \ \frac{\sqrt{15}}{24} \ 0 \ -\frac{\sqrt{15}i}{24} \ 0 \ 0 \ 0 \ 0$ |
| 597 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| $\mathbb{Q}_{3,1}^{(1,0;a)}(E, 2)$ | $\frac{\sqrt{3}}{48}$ | $0 \ 0 \ 0 \ \frac{\sqrt{3}}{48} \ 0 \ \frac{\sqrt{3}i}{48} \ 0 \ 0 \ 0 \ -\frac{\sqrt{5}}{16} \ 0 \ \frac{\sqrt{5}i}{16} \ 0 \ 0$ |
| | $-\frac{\sqrt{3}}{48}$ | $0 \ 0 \ -\frac{\sqrt{3}}{48} \ 0 \ \frac{\sqrt{3}i}{48} \ 0 \ 0 \ 0 \ \frac{\sqrt{5}}{16} \ 0 \ \frac{\sqrt{5}i}{16} \ 0 \ 0 \ 0$ |
| | $-\frac{7}{48}$ | $0 \ 0 \ 0 \ -\frac{7}{48} \ 0 \ \frac{7i}{48} \ 0 \ 0 \ 0 \ -\frac{\sqrt{15}}{48} \ 0 \ -\frac{\sqrt{15}i}{48} \ 0 \ 0$ |
| | $\frac{7}{48}$ | $0 \ 0 \ \frac{7}{48} \ 0 \ \frac{7i}{48} \ 0 \ 0 \ 0 \ \frac{\sqrt{15}}{48} \ 0 \ -\frac{\sqrt{15}i}{48} \ 0 \ 0 \ 0$ |
| | $\frac{i}{6}$ | $0 \ \frac{\sqrt{15}}{24} \ \frac{i}{6} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{i}{24} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $-\frac{i}{6}$ | $0 \ -\frac{\sqrt{15}}{24} \ 0 \ 0 \ -\frac{i}{6} \ 0 \ 0 \ \frac{i}{24} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{i}{6}$ | $0 \ 0 \ \frac{\sqrt{15}i}{24} \ 0 \ 0 \ \frac{i}{6} \ 0 \ 0 \ \frac{1}{24} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $-\frac{i}{6}$ | $0 \ \frac{\sqrt{15}i}{24} \ 0 \ 0 \ 0 \ -\frac{i}{6} \ -\frac{1}{24} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{i}{48}$ | $0 \ 0 \ 0 \ \frac{i}{48} \ 0 \ \frac{1}{48} \ \frac{i}{6} \ 0 \ 0 \ -\frac{\sqrt{15}i}{48} \ 0 \ \frac{\sqrt{15}}{48} \ 0 \ 0 \ 0$ |
| | $-\frac{1}{48}$ | $0 \ 0 \ \frac{i}{48} \ 0 \ -\frac{1}{48} \ 0 \ 0 \ -\frac{i}{6} \ -\frac{\sqrt{15}i}{48} \ 0 \ -\frac{\sqrt{15}}{48} \ 0 \ 0 \ 0 \ 0$ |
| 598 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|---|--|
| $\mathbb{Q}_5^{(1,0;a)}(A_1)$ | $0 \quad \frac{\sqrt{6}i}{20} \quad 0 \quad 0 \quad \frac{\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{40} \quad 0 \quad 0 \quad \frac{\sqrt{6}}{20}$ | |
| | $\frac{\sqrt{6}i}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{40} \quad -\frac{\sqrt{6}}{20} \quad 0$ | |
| | $0 \quad \frac{3\sqrt{2}i}{40} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{80} \quad 0 \quad 0 \quad \frac{\sqrt{30}}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad -\frac{3\sqrt{2}}{40}$ | |
| | $\frac{3\sqrt{2}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{80} \quad -\frac{\sqrt{30}}{60} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{16} \quad \frac{3\sqrt{2}}{40} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{240} \quad 0 \quad \frac{\sqrt{30}}{240} \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{2}i}{80} \quad 0 \quad -\frac{7\sqrt{2}}{80} \quad -\frac{\sqrt{2}i}{10} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{30}i}{240} \quad 0 \quad -\frac{\sqrt{30}}{240} \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{2}i}{80} \quad 0 \quad \frac{7\sqrt{2}}{80} \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{10}$ | |
| | $-\frac{\sqrt{2}i}{10} \quad 0 \quad 0 \quad -\frac{7\sqrt{30}}{240} \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{80} \quad 0 \quad \frac{3\sqrt{2}i}{80} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{2}i}{10} \quad \frac{7\sqrt{30}}{240} \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{80} \quad 0 \quad \frac{3\sqrt{2}i}{80} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{3\sqrt{2}}{40} \quad \frac{\sqrt{30}i}{80} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{60} \quad \frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{2}i}{40}$ | |
| | $-\frac{3\sqrt{2}}{40} \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{80} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad \frac{3\sqrt{2}i}{40} \quad 0$ | |
| 599 | symmetry | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ |
| $\mathbb{Q}_5^{(1,0;a)}(A_2, 1)$ | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{7}}{56} \quad 0 \quad -\frac{3\sqrt{7}i}{56} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{105}}{56} \quad 0 \quad \frac{\sqrt{105}i}{56} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{3\sqrt{7}}{56} \quad 0 \quad -\frac{3\sqrt{7}i}{56} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{56} \quad 0 \quad \frac{\sqrt{105}i}{56} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{84} \quad 0 \quad -\frac{\sqrt{21}i}{84} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{140} \quad 0 \quad \frac{\sqrt{35}i}{140} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{21}}{84} \quad 0 \quad -\frac{\sqrt{21}i}{84} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}}{140} \quad 0 \quad \frac{\sqrt{35}i}{140} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{21} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{70}$ | |
| | $-\frac{\sqrt{35}}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{21} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{70} \quad 0$ | |
| | $0 \quad -\frac{\sqrt{35}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{21} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{35}}{70}$ | |
| | $-\frac{\sqrt{35}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}}{21} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{70} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{168} \quad 0 \quad -\frac{\sqrt{21}}{168} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{35}i}{280} \quad 0 \quad \frac{3\sqrt{35}}{280} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{21}i}{168} \quad 0 \quad \frac{\sqrt{21}}{168} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{35}i}{280} \quad 0 \quad -\frac{3\sqrt{35}}{280} \quad 0 \quad 0 \quad 0$ | |
| 600 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|------------------------------------|--|
| $\mathbb{Q}_5^{(1,0;a)}(A_2, 2)$ | 0 | $\begin{bmatrix} 0 & \frac{\sqrt{6}}{20} & \frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{20} \\ -\frac{\sqrt{6}}{20} & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{40} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{20} & 0 \\ 0 & -\frac{3\sqrt{2}}{40} & -\frac{\sqrt{30}i}{80} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{60} & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{40} \\ \frac{3\sqrt{2}}{40} & 0 & 0 & \frac{\sqrt{30}i}{80} & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{40} & 0 \\ -\frac{\sqrt{2}i}{10} & 0 & 0 & -\frac{\sqrt{30}}{48} & 0 & -\frac{7\sqrt{30}i}{240} & 0 & 0 & 0 & -\frac{3\sqrt{2}}{80} & 0 & \frac{\sqrt{2}i}{80} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{10} & \frac{\sqrt{30}}{48} & 0 & -\frac{7\sqrt{30}i}{240} & 0 & 0 & 0 & \frac{3\sqrt{2}}{80} & 0 & \frac{\sqrt{2}i}{80} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}i}{240} & 0 & \frac{\sqrt{30}}{240} & 0 & 0 & 0 & \frac{7\sqrt{2}i}{80} & 0 & \frac{9\sqrt{2}}{80} & \frac{\sqrt{2}i}{10} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{30}i}{240} & 0 & -\frac{\sqrt{30}}{240} & 0 & 0 & 0 & \frac{7\sqrt{2}i}{80} & 0 & -\frac{9\sqrt{2}}{80} & 0 & 0 & -\frac{\sqrt{2}i}{10} & 0 \\ 0 & \frac{3\sqrt{2}i}{40} & 0 & 0 & \frac{\sqrt{30}i}{80} & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & -\frac{3\sqrt{2}}{40} & 0 \\ \frac{3\sqrt{2}i}{40} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{80} & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & \frac{3\sqrt{2}}{40} & 0 & 0 \end{bmatrix}$ |
| | 601 | $\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$ |
| | $\mathbb{Q}_{5,0}^{(1,0;a)}(E, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{40} & 0 & 0 & \frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & \frac{\sqrt{10}}{40} & 0 \\ \frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & -\frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & -\frac{\sqrt{10}}{40} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{48} & 0 & \frac{\sqrt{6}}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{80} & 0 & \frac{\sqrt{10}}{80} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{48} & 0 & -\frac{\sqrt{6}}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{80} & 0 & -\frac{\sqrt{10}}{80} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{48} & 0 & -\frac{\sqrt{6}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}}{80} & 0 & -\frac{\sqrt{10}i}{80} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{48} & 0 & -\frac{\sqrt{6}i}{48} & 0 & 0 & 0 & \frac{\sqrt{10}}{80} & 0 & -\frac{\sqrt{10}i}{80} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{40} & -\frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} & 0 \\ \frac{\sqrt{10}}{40} & 0 & 0 & \frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} & 0 \end{bmatrix}$ |
| | 602 | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{Q}_{5,1}^{(1,0;a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{40} & -\frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} \\ \frac{\sqrt{10}}{40} & 0 & 0 & \frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & \frac{\sqrt{10}i}{40} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{48} & 0 & \frac{\sqrt{6}i}{48} & 0 & 0 & 0 & \frac{\sqrt{10}}{80} & 0 & \frac{\sqrt{10}i}{80} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{48} & 0 & \frac{\sqrt{6}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}}{80} & 0 & \frac{\sqrt{10}i}{80} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{48} & 0 & \frac{\sqrt{6}}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{80} & 0 & \frac{\sqrt{10}}{80} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{48} & 0 & -\frac{\sqrt{6}}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{80} & 0 & -\frac{\sqrt{10}}{80} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & -\frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & -\frac{\sqrt{10}}{40} \\ -\frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & \frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & \frac{\sqrt{10}}{40} & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |
| 603 | symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |
| $\mathbb{Q}_{5,0}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} 0 & \frac{\sqrt{7}i}{20} & 0 & 0 & \frac{\sqrt{105}i}{280} & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & -\frac{\sqrt{7}}{20} \\ \frac{\sqrt{7}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{280} & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & \frac{\sqrt{7}}{20} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{420} & 0 & 0 & -\frac{\sqrt{35}}{60} & 0 & 0 & -\frac{\sqrt{21}i}{420} & 0 & 0 & \frac{\sqrt{21}}{84} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{420} & \frac{\sqrt{35}}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{420} & -\frac{\sqrt{21}}{84} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}i}{120} & 0 & \frac{\sqrt{35}}{840} & -\frac{\sqrt{35}i}{105} & 0 & 0 & -\frac{\sqrt{21}i}{40} & 0 & -\frac{11\sqrt{21}}{840} & -\frac{\sqrt{21}i}{210} & 0 \\ 0 & 0 & -\frac{\sqrt{35}i}{120} & 0 & -\frac{\sqrt{35}}{840} & 0 & 0 & \frac{\sqrt{35}i}{105} & -\frac{\sqrt{21}i}{40} & 0 & \frac{11\sqrt{21}}{840} & 0 & 0 & \frac{\sqrt{21}i}{210} \\ \frac{\sqrt{21}i}{210} & 0 & 0 & \frac{29\sqrt{35}}{840} & 0 & -\frac{\sqrt{35}i}{120} & 0 & 0 & 0 & \frac{13\sqrt{21}}{280} & 0 & \frac{\sqrt{21}i}{40} & 0 & 0 \\ 0 & -\frac{\sqrt{21}i}{210} & -\frac{29\sqrt{35}}{840} & 0 & -\frac{\sqrt{35}i}{120} & 0 & 0 & 0 & -\frac{13\sqrt{21}}{280} & 0 & \frac{\sqrt{21}i}{40} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{21}}{84} & -\frac{\sqrt{35}i}{840} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{60} & -\frac{\sqrt{21}i}{280} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{35}i}{840} & 0 & 0 & \frac{\sqrt{35}i}{60} & 0 & 0 & \frac{\sqrt{21}i}{280} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{15}y(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |
| 604 | symmetry | $\frac{\sqrt{15}y(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|---|
| $\mathbb{Q}_{5,1}^{(1,0;a)}(E, 2)$ | 0 | $-\frac{\sqrt{7}}{20}, -\frac{\sqrt{105}i}{280}, 0, 0, 0, 0, 0, -\frac{\sqrt{105}i}{42}, -\frac{\sqrt{7}i}{56}, 0, 0, 0, 0, -\frac{\sqrt{7}i}{20}$ |
| | $\frac{\sqrt{7}}{20}$ | $0, 0, 0, \frac{\sqrt{105}i}{280}, 0, 0, -\frac{\sqrt{105}i}{42}, 0, 0, \frac{\sqrt{7}i}{56}, 0, 0, -\frac{\sqrt{7}i}{20}, 0$ |
| | 0 | $0, 0, \frac{\sqrt{35}i}{420}, 0, 0, 0, 0, -\frac{\sqrt{35}i}{60}, \frac{\sqrt{21}i}{420}, 0, 0, 0, 0, -\frac{\sqrt{21}i}{84}$ |
| | 0 | $0, 0, 0, -\frac{\sqrt{35}i}{420}, 0, 0, -\frac{\sqrt{35}i}{60}, 0, 0, -\frac{\sqrt{21}i}{420}, 0, 0, -\frac{\sqrt{21}i}{84}, 0$ |
| | $-\frac{\sqrt{21}i}{210}$ | $0, 0, \frac{\sqrt{35}}{120}, 0, -\frac{29\sqrt{35}i}{840}, 0, 0, 0, \frac{\sqrt{21}}{40}, 0, \frac{13\sqrt{21}i}{280}, 0, 0$ |
| | $0, \frac{\sqrt{21}i}{210}$ | $-\frac{\sqrt{35}}{120}, 0, -\frac{29\sqrt{35}i}{840}, 0, \frac{\sqrt{35}}{120}, \frac{\sqrt{35}i}{105}, 0, 0, -\frac{\sqrt{21}}{40}, 0, \frac{13\sqrt{21}i}{280}, 0, 0$ |
| | 0 | $0, 0, 0, -\frac{\sqrt{35}i}{840}, 0, \frac{\sqrt{35}}{120}, \frac{\sqrt{35}i}{105}, 0, 0, -\frac{11\sqrt{21}i}{840}, 0, -\frac{\sqrt{21}}{40}, -\frac{\sqrt{21}i}{210}, 0$ |
| | 0 | $0, 0, -\frac{\sqrt{35}i}{840}, 0, -\frac{\sqrt{35}}{120}, 0, 0, -\frac{\sqrt{35}i}{105}, -\frac{11\sqrt{21}i}{840}, 0, \frac{\sqrt{21}}{40}, 0, 0, \frac{\sqrt{21}i}{210}$ |
| | $0, -\frac{\sqrt{21}i}{84}$ | $0, 0, 0, \frac{\sqrt{35}i}{840}, 0, 0, -\frac{\sqrt{35}i}{60}, 0, 0, 0, -\frac{\sqrt{21}i}{280}, 0, 0, 0$ |
| | $-\frac{\sqrt{21}i}{84}$ | $0, 0, 0, 0, -\frac{\sqrt{35}i}{840}, \frac{\sqrt{35}}{60}, 0, 0, 0, 0, \frac{\sqrt{21}i}{280}, 0, 0$ |
| 605 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |
| $\mathbb{Q}_{5,0}^{(1,0;a)}(E, 3)$ | 0 | $0, 0, 0, \frac{\sqrt{5}i}{40}, 0, \frac{\sqrt{5}}{40}, 0, 0, 0, -\frac{\sqrt{3}i}{40}, 0, \frac{\sqrt{3}}{40}, 0, 0$ |
| | 0 | $0, 0, \frac{\sqrt{5}i}{40}, 0, -\frac{\sqrt{5}}{40}, 0, 0, 0, -\frac{\sqrt{3}i}{40}, 0, -\frac{\sqrt{3}}{40}, 0, 0, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{15}i}{120}, 0, -\frac{\sqrt{15}}{120}, 0, 0, 0, -\frac{i}{8}, 0, -\frac{1}{8}, -\frac{i}{5}, 0$ |
| | 0 | $0, 0, \frac{\sqrt{15}i}{120}, 0, \frac{\sqrt{15}}{120}, 0, 0, 0, -\frac{i}{8}, 0, \frac{1}{8}, 0, 0, \frac{i}{5}$ |
| | $0, -\frac{i}{10}$ | $0, 0, 0, -\frac{\sqrt{15}i}{30}, 0, 0, 0, 0, 0, -\frac{i}{10}, 0, 0, 0, -\frac{1}{10}$ |
| | $-\frac{i}{10}$ | $0, 0, 0, 0, 0, \frac{\sqrt{15}i}{30}, 0, 0, 0, 0, 0, \frac{i}{10}, \frac{1}{10}, 0$ |
| | $0, -\frac{1}{10}, -\frac{\sqrt{15}i}{30}$ | $0, 0, 0, 0, 0, 0, 0, 0, \frac{i}{10}, 0, 0, 0, 0, \frac{i}{10}$ |
| | $\frac{1}{10}$ | $0, 0, 0, \frac{\sqrt{15}i}{30}, 0, 0, 0, 0, -\frac{i}{10}, 0, 0, \frac{i}{10}, 0$ |
| | $\frac{i}{5}$ | $0, 0, 0, \frac{\sqrt{15}}{30}, 0, \frac{\sqrt{15}i}{30}, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $-\frac{i}{5}, -\frac{\sqrt{15}}{30}, 0, \frac{\sqrt{15}i}{30}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| 606 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--|
| $\mathbb{Q}_{5,1}^{(1,0;a)}(E, 3)$ | $0 \ 0 \ 0 \ \frac{\sqrt{5}}{40} \ 0 \ -\frac{\sqrt{5}i}{40} \ 0 \ 0 \ 0 \ -\frac{\sqrt{3}}{40} \ 0 \ -\frac{\sqrt{3}i}{40} \ 0 \ 0$ | |
| | $0 \ 0 \ -\frac{\sqrt{5}}{40} \ 0 \ -\frac{\sqrt{5}i}{40} \ 0 \ 0 \ 0 \ \frac{\sqrt{3}}{40} \ 0 \ -\frac{\sqrt{3}i}{40} \ 0 \ 0 \ 0$ | |
| | $-\frac{i}{5} \ 0 \ 0 \ -\frac{\sqrt{15}}{30} \ 0 \ -\frac{\sqrt{15}i}{30} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ \frac{i}{5} \ \frac{\sqrt{15}}{30} \ 0 \ -\frac{\sqrt{15}i}{30} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ -\frac{1}{10} \ -\frac{\sqrt{15}i}{30} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{i}{10} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{i}{10}$ | |
| | $\frac{1}{10} \ 0 \ 0 \ \frac{\sqrt{15}i}{30} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{i}{10} \ 0 \ 0 \ 0 \ \frac{i}{10} \ 0$ | |
| | $0 \ \frac{i}{10} \ 0 \ 0 \ \frac{\sqrt{15}i}{30} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{i}{10} \ 0 \ 0 \ 0 \ \frac{1}{10}$ | |
| | $\frac{i}{10} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{15}i}{30} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{i}{10} \ -\frac{i}{10} \ -\frac{1}{10} \ 0$ | |
| | $0 \ 0 \ 0 \ \frac{\sqrt{15}i}{120} \ 0 \ -\frac{\sqrt{15}}{120} \ 0 \ 0 \ 0 \ -\frac{i}{8} \ 0 \ -\frac{1}{8} \ -\frac{i}{5} \ 0$ | |
| | $0 \ 0 \ \frac{\sqrt{15}i}{120} \ 0 \ \frac{\sqrt{15}}{120} \ 0 \ 0 \ 0 \ -\frac{i}{8} \ 0 \ \frac{1}{8} \ 0 \ 0 \ \frac{i}{5}$ | |
| 607 | symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ |
| $\mathbb{Q}_{5,0}^{(1,0;a)}(E, 4)$ | $0 \ 0 \ 0 \ \frac{\sqrt{15}i}{120} \ 0 \ -\frac{\sqrt{15}}{120} \ 0 \ 0 \ 0 \ \frac{7i}{40} \ 0 \ \frac{7}{40} \ \frac{i}{10} \ 0$ | |
| | $0 \ 0 \ \frac{\sqrt{15}i}{120} \ 0 \ \frac{\sqrt{15}}{120} \ 0 \ 0 \ 0 \ \frac{7i}{40} \ 0 \ -\frac{7}{40} \ 0 \ 0 \ -\frac{i}{10}$ | |
| | $0 \ 0 \ 0 \ \frac{\sqrt{5}i}{120} \ 0 \ \frac{\sqrt{5}}{120} \ \frac{\sqrt{5}i}{30} \ 0 \ 0 \ \frac{\sqrt{3}i}{40} \ 0 \ -\frac{\sqrt{3}}{40} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ \frac{\sqrt{5}i}{120} \ 0 \ -\frac{\sqrt{5}}{120} \ 0 \ 0 \ 0 \ -\frac{\sqrt{5}i}{30} \ \frac{\sqrt{3}i}{40} \ 0 \ \frac{\sqrt{3}}{40} \ 0 \ 0 \ 0$ | |
| | $0 \ \frac{\sqrt{3}i}{10} \ 0 \ 0 \ \frac{\sqrt{5}i}{30} \ 0 \ 0 \ \frac{\sqrt{5}}{15} \ 0 \ 0 \ -\frac{\sqrt{3}i}{30} \ 0 \ 0 \ -\frac{\sqrt{3}}{30}$ | |
| | $\frac{\sqrt{3}i}{10} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{5}i}{30} \ -\frac{\sqrt{5}}{15} \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{3}i}{30} \ \frac{\sqrt{3}}{30} \ 0$ | |
| | $0 \ -\frac{\sqrt{3}}{10} \ -\frac{\sqrt{5}i}{30} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{5}i}{15} \ -\frac{\sqrt{3}i}{30} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{3}i}{30}$ | |
| | $\frac{\sqrt{3}}{10} \ 0 \ 0 \ \frac{\sqrt{5}i}{30} \ 0 \ 0 \ -\frac{\sqrt{5}i}{15} \ 0 \ 0 \ \frac{\sqrt{3}i}{30} \ 0 \ 0 \ -\frac{\sqrt{3}i}{30} \ 0$ | |
| | $0 \ 0 \ 0 \ \frac{\sqrt{5}}{30} \ 0 \ -\frac{\sqrt{5}i}{30} \ 0 \ 0 \ 0 \ \frac{\sqrt{3}}{15} \ 0 \ \frac{\sqrt{3}i}{15} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ -\frac{\sqrt{5}}{30} \ 0 \ -\frac{\sqrt{5}i}{30} \ 0 \ 0 \ 0 \ -\frac{\sqrt{3}}{15} \ 0 \ \frac{\sqrt{3}i}{15} \ 0 \ 0 \ 0$ | |
| 608 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--|
| $\mathbb{Q}_{5,1}^{(1,0;a)}(E, 4)$ | $\begin{bmatrix} -\frac{i}{10} & 0 & 0 & -\frac{\sqrt{15}}{24} & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & -\frac{3}{40} & 0 & \frac{3i}{40} & 0 & 0 \\ 0 & \frac{i}{10} & \frac{\sqrt{15}}{24} & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & \frac{3}{40} & 0 & \frac{3i}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{24} & 0 & -\frac{\sqrt{5}i}{24} & 0 & 0 & 0 & \frac{7\sqrt{3}}{120} & 0 & \frac{7\sqrt{3}i}{120} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{24} & 0 & -\frac{\sqrt{5}i}{24} & 0 & 0 & 0 & -\frac{7\sqrt{3}}{120} & 0 & \frac{7\sqrt{3}i}{120} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{30} & \frac{\sqrt{5}i}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{15} & \frac{\sqrt{3}i}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{10} \\ -\frac{\sqrt{3}}{30} & 0 & 0 & -\frac{\sqrt{5}i}{60} & 0 & 0 & \frac{\sqrt{5}i}{15} & 0 & 0 & -\frac{\sqrt{3}i}{20} & 0 & 0 & \frac{\sqrt{3}i}{10} & 0 \\ 0 & \frac{\sqrt{3}i}{30} & 0 & 0 & \frac{\sqrt{5}i}{60} & 0 & 0 & \frac{\sqrt{5}}{15} & 0 & 0 & -\frac{\sqrt{3}i}{20} & 0 & 0 & -\frac{\sqrt{3}}{10} \\ \frac{\sqrt{3}i}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{60} & -\frac{\sqrt{5}}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{20} & \frac{\sqrt{3}}{10} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{60} & 0 & -\frac{\sqrt{5}}{60} & -\frac{\sqrt{5}i}{30} & 0 & 0 & -\frac{\sqrt{3}i}{60} & 0 & \frac{\sqrt{3}}{60} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}i}{60} & 0 & \frac{\sqrt{5}}{60} & 0 & 0 & \frac{\sqrt{5}i}{30} & -\frac{\sqrt{3}i}{60} & 0 & -\frac{\sqrt{3}}{60} & 0 & 0 & 0 \end{bmatrix}$ | |
| | 609 symmetry | z |
| | $\mathbb{Q}_1^{(1,1;a)}(A_2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 & 0 & \frac{\sqrt{21}}{56} & 0 & \frac{\sqrt{21}i}{56} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 & 0 & -\frac{\sqrt{21}}{56} & 0 & \frac{\sqrt{21}i}{56} & 0 & 0 & 0 \\ -\frac{\sqrt{7}i}{14} & 0 & 0 & \frac{\sqrt{105}}{280} & 0 & \frac{\sqrt{105}i}{280} & 0 & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 \\ 0 & \frac{\sqrt{7}i}{14} & -\frac{\sqrt{105}}{280} & 0 & \frac{\sqrt{105}i}{280} & 0 & 0 & 0 & \frac{3\sqrt{7}}{56} & 0 & \frac{3\sqrt{7}i}{56} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{105}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{70} & -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{105}i}{140} & 0 & 0 & -\frac{\sqrt{105}i}{70} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{140} & 0 & 0 & \frac{\sqrt{105}}{70} & 0 & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{140} & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{105}i}{70} & 0 & -\frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & \frac{\sqrt{105}i}{70} & 0 & \frac{\sqrt{105}}{70} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} \end{bmatrix}$ |
| | 610 symmetry | x |

continued ...

Table 9

| No. | multipole | matrix | | | | | | | | | | | | |
|---------------------------------|-------------------------|----------------------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| $\mathbb{Q}_{1,0}^{(1,1;a)}(E)$ | 0 | $\frac{\sqrt{21}i}{28}$ | 0 | 0 | $-\frac{3\sqrt{35}i}{280}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | 0 | $-\frac{\sqrt{21}}{28}$ |
| | $\frac{\sqrt{21}i}{28}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{35}i}{280}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{56}$ | $\frac{\sqrt{21}}{28}$ | 0 |
| | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | 0 | $\frac{\sqrt{105}i}{280}$ | 0 | 0 | $-\frac{\sqrt{105}}{140}$ | 0 | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 |
| | $\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{280}$ | $\frac{\sqrt{105}}{140}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{70}$ | $-\frac{\sqrt{105}i}{70}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{70}$ | 0 | 0 | $\frac{\sqrt{105}i}{70}$ | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{105}}{70}$ | 0 | $-\frac{\sqrt{105}i}{140}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{105}}{70}$ | 0 | $-\frac{\sqrt{105}i}{140}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{105}i}{70}$ | 0 | 0 | 0 | $\frac{\sqrt{105}i}{140}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{70}$ | 0 | 0 | $\frac{\sqrt{105}i}{140}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 |
| 611 | symmetry | y | | | | | | | | | | | | |
| $\mathbb{Q}_{1,1}^{(1,1;a)}(E)$ | 0 | $-\frac{\sqrt{21}}{28}$ | $\frac{3\sqrt{35}i}{280}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{28}$ |
| | $\frac{\sqrt{21}}{28}$ | 0 | 0 | $-\frac{3\sqrt{35}i}{280}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | $-\frac{\sqrt{21}i}{28}$ | 0 |
| | 0 | $\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{105}i}{280}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{140}$ | $-\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{7}}{28}$ | 0 | 0 | $-\frac{\sqrt{105}i}{280}$ | 0 | 0 | $-\frac{\sqrt{105}i}{140}$ | 0 | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{105}}{140}$ | 0 | $\frac{\sqrt{105}i}{70}$ | 0 | 0 | 0 | $-\frac{\sqrt{7}}{28}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{105}}{140}$ | 0 | $\frac{\sqrt{105}i}{70}$ | 0 | 0 | 0 | $\frac{\sqrt{7}}{28}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{70}$ | 0 | 0 | $\frac{\sqrt{105}i}{70}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{7}}{14}$ | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{105}i}{70}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{70}$ | 0 | 0 | $-\frac{\sqrt{7}}{14}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{70}$ | 0 | 0 | $-\frac{\sqrt{105}}{140}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}}{28}$ |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{70}$ | $\frac{\sqrt{105}}{140}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{7}}{28}$ | 0 |
| 612 | symmetry | $\frac{\sqrt{10x(x^2-3y^2)}}{4}$ | | | | | | | | | | | | |

continued ..

Table 9

| No. | multipole | matrix |
|----------------------------------|----------------------------|--|
| $\mathbb{Q}_3^{(1,1;a)}(A_1)$ | 0 | $-\frac{\sqrt{210}i}{420}$ 0 0 0 $-\frac{\sqrt{14}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{160}$ 0 0 $-\frac{\sqrt{210}}{420}$ |
| | $-\frac{\sqrt{210}i}{420}$ | 0 0 0 0 0 $\frac{\sqrt{14}i}{32}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{160}$ $\frac{\sqrt{210}}{420}$ 0 |
| | 0 | $-\frac{\sqrt{70}i}{60}$ 0 0 0 $\frac{\sqrt{42}i}{96}$ 0 0 $\frac{\sqrt{42}}{168}$ 0 0 $-\frac{\sqrt{70}i}{96}$ 0 0 $\frac{\sqrt{70}}{60}$ |
| | $-\frac{\sqrt{70}i}{60}$ | 0 0 0 0 0 $-\frac{\sqrt{42}i}{96}$ $-\frac{\sqrt{42}}{168}$ 0 0 0 0 $\frac{\sqrt{70}i}{96}$ $-\frac{\sqrt{70}}{60}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 $-\frac{5\sqrt{42}}{224}$ 0 0 0 $-\frac{\sqrt{70}i}{84}$ 0 $-\frac{7\sqrt{70}}{480}$ $\frac{\sqrt{70}i}{240}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{42}i}{56}$ 0 $\frac{5\sqrt{42}}{224}$ 0 0 0 $-\frac{\sqrt{70}i}{84}$ 0 $\frac{7\sqrt{70}}{480}$ 0 0 $-\frac{\sqrt{70}i}{240}$ |
| | $\frac{\sqrt{70}i}{240}$ | 0 0 0 $-\frac{13\sqrt{42}}{672}$ 0 $-\frac{\sqrt{42}i}{42}$ 0 0 0 $\frac{\sqrt{70}}{96}$ 0 $-\frac{11\sqrt{70}i}{840}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{70}i}{240}$ $\frac{13\sqrt{42}}{672}$ 0 0 $-\frac{\sqrt{42}i}{42}$ 0 0 0 $-\frac{\sqrt{70}}{96}$ 0 $-\frac{11\sqrt{70}i}{840}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{70}}{60}$ $\frac{\sqrt{42}i}{96}$ 0 0 0 0 $\frac{\sqrt{42}i}{168}$ $\frac{\sqrt{70}i}{96}$ 0 0 0 0 $-\frac{\sqrt{70}i}{60}$ |
| | $\frac{\sqrt{70}}{60}$ | 0 0 0 $-\frac{\sqrt{42}i}{96}$ 0 0 $\frac{\sqrt{42}i}{168}$ 0 0 $-\frac{\sqrt{70}i}{96}$ 0 0 0 $-\frac{\sqrt{70}i}{60}$ |
| 613 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| $\mathbb{Q}_3^{(1,1;a)}(A_2, 1)$ | 0 | 0 0 0 $\frac{\sqrt{35}}{112}$ 0 $-\frac{\sqrt{35}i}{112}$ 0 0 0 $\frac{5\sqrt{21}}{336}$ 0 $\frac{5\sqrt{21}i}{336}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{35}}{112}$ 0 $-\frac{\sqrt{35}i}{112}$ 0 0 0 $-\frac{5\sqrt{21}}{336}$ 0 $\frac{5\sqrt{21}i}{336}$ 0 0 0 |
| | $\frac{\sqrt{7}i}{21}$ | 0 0 0 $\frac{\sqrt{105}}{336}$ 0 $\frac{\sqrt{105}i}{336}$ 0 0 0 $\frac{13\sqrt{7}}{336}$ 0 $-\frac{13\sqrt{7}i}{336}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{7}i}{21}$ $-\frac{\sqrt{105}}{336}$ 0 0 $\frac{\sqrt{105}i}{336}$ 0 0 0 $-\frac{13\sqrt{7}}{336}$ 0 $-\frac{13\sqrt{7}i}{336}$ 0 0 0 |
| | 0 | $\frac{\sqrt{7}}{24}$ $-\frac{\sqrt{105}}{84}$ 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ $-\frac{5\sqrt{7}i}{84}$ 0 0 0 0 $\frac{\sqrt{7}i}{24}$ |
| | $-\frac{\sqrt{7}}{24}$ | 0 0 0 $\frac{\sqrt{105}i}{84}$ 0 0 $-\frac{\sqrt{105}i}{84}$ 0 0 $\frac{5\sqrt{7}i}{84}$ 0 0 $\frac{\sqrt{7}i}{24}$ 0 |
| | 0 | $-\frac{\sqrt{7}i}{24}$ 0 0 0 $\frac{\sqrt{105}i}{84}$ 0 0 $\frac{\sqrt{105}}{84}$ 0 0 $-\frac{5\sqrt{7}i}{84}$ 0 0 $\frac{\sqrt{7}}{24}$ |
| | $-\frac{\sqrt{7}i}{24}$ | 0 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ $-\frac{\sqrt{105}}{84}$ 0 0 0 0 $\frac{5\sqrt{7}i}{84}$ $-\frac{\sqrt{7}}{24}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{105}i}{112}$ 0 $\frac{\sqrt{105}}{112}$ 0 0 0 $-\frac{\sqrt{7}i}{48}$ 0 $-\frac{\sqrt{7}}{48}$ $-\frac{\sqrt{7}i}{21}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}i}{112}$ 0 $-\frac{\sqrt{105}}{112}$ 0 0 0 $-\frac{\sqrt{7}i}{48}$ 0 $\frac{\sqrt{7}}{48}$ 0 0 $\frac{\sqrt{7}i}{21}$ |
| 614 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--------------------------------------|
| $\mathbb{Q}_3^{(1,1;a)}(A_2, 2)$ | $0 - \frac{\sqrt{210}}{420} - \frac{\sqrt{14}i}{32} 0 0 0 0 0 0 \frac{\sqrt{210}i}{160} 0 0 0 0 0 \frac{\sqrt{210}i}{420}$ | |
| | $\frac{\sqrt{210}}{420} 0 0 \frac{\sqrt{14}i}{32} 0 0 0 0 0 - \frac{\sqrt{210}i}{160} 0 0 0 \frac{\sqrt{210}i}{420} 0$ | |
| | $0 \frac{\sqrt{70}}{60} - \frac{\sqrt{42}i}{96} 0 0 0 0 - \frac{\sqrt{42}i}{168} - \frac{\sqrt{70}i}{96} 0 0 0 0 0 \frac{\sqrt{70}i}{60}$ | |
| | $- \frac{\sqrt{70}}{60} 0 0 \frac{\sqrt{42}i}{96} 0 0 - \frac{\sqrt{42}i}{168} 0 0 \frac{\sqrt{70}i}{96} 0 0 0 \frac{\sqrt{70}i}{60} 0$ | |
| | $\frac{\sqrt{70}i}{240} 0 0 - \frac{\sqrt{42}}{42} 0 - \frac{13\sqrt{42}i}{672} 0 0 0 \frac{11\sqrt{70}}{840} 0 - \frac{\sqrt{70}i}{96} 0 0 0$ | |
| | $0 - \frac{\sqrt{70}i}{240} \frac{\sqrt{42}}{42} 0 - \frac{13\sqrt{42}i}{672} 0 0 0 - \frac{11\sqrt{70}}{840} 0 - \frac{\sqrt{70}i}{96} 0 0 0 0$ | |
| | $0 0 0 - \frac{5\sqrt{42}i}{224} 0 \frac{\sqrt{42}}{56} 0 0 0 \frac{7\sqrt{70}i}{480} 0 \frac{\sqrt{70}}{84} - \frac{\sqrt{70}i}{240} 0$ | |
| | $0 0 - \frac{5\sqrt{42}i}{224} 0 - \frac{\sqrt{42}}{56} 0 0 0 \frac{7\sqrt{70}i}{480} 0 - \frac{\sqrt{70}}{84} 0 0 0 \frac{\sqrt{70}i}{240}$ | |
| | $0 - \frac{\sqrt{70}i}{60} 0 0 \frac{\sqrt{42}i}{96} 0 0 \frac{\sqrt{42}}{168} 0 0 - \frac{\sqrt{70}i}{96} 0 0 0 \frac{\sqrt{70}}{60}$ | |
| | $- \frac{\sqrt{70}i}{60} 0 0 0 0 - \frac{\sqrt{42}i}{96} - \frac{\sqrt{42}}{168} 0 0 0 0 \frac{\sqrt{70}i}{96} - \frac{\sqrt{70}}{60} 0$ | |
| 615 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{Q}_{3,0}^{(1,1;a)}(E, 1)$ | $0 \frac{\sqrt{14}i}{28} 0 0 - \frac{\sqrt{210}i}{224} 0 0 0 0 \frac{5\sqrt{14}i}{224} 0 0 - \frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}i}{28} 0 0 0 0 \frac{\sqrt{210}i}{224} 0 0 0 0 0 - \frac{5\sqrt{14}i}{224} \frac{\sqrt{14}}{28} 0$ | |
| | $0 - \frac{\sqrt{42}i}{84} 0 0 \frac{\sqrt{70}i}{224} 0 0 \frac{\sqrt{70}}{56} 0 0 - \frac{13\sqrt{42}i}{672} 0 0 0$ | |
| | $- \frac{\sqrt{42}i}{84} 0 0 0 0 - \frac{\sqrt{70}i}{224} - \frac{\sqrt{70}}{56} 0 0 0 0 \frac{13\sqrt{42}i}{672} 0 0$ | |
| | $0 0 0 \frac{\sqrt{70}i}{56} 0 - \frac{\sqrt{70}}{224} - \frac{\sqrt{70}i}{56} 0 0 \frac{\sqrt{42}i}{84} 0 - \frac{\sqrt{42}}{96} \frac{\sqrt{42}i}{48} 0$ | |
| | $0 0 \frac{\sqrt{70}i}{56} 0 \frac{\sqrt{70}}{224} 0 0 \frac{\sqrt{70}i}{56} \frac{\sqrt{42}i}{84} 0 \frac{\sqrt{42}}{96} 0 0 - \frac{\sqrt{42}i}{48}$ | |
| | $- \frac{\sqrt{42}i}{48} 0 0 \frac{\sqrt{70}}{224} 0 0 0 0 - \frac{\sqrt{42}}{96} 0 \frac{\sqrt{42}i}{56} 0 0 0$ | |
| | $0 \frac{\sqrt{42}i}{48} - \frac{\sqrt{70}}{224} 0 0 0 0 0 \frac{\sqrt{42}}{96} 0 \frac{\sqrt{42}i}{56} 0 0 0$ | |
| | $0 0 - \frac{3\sqrt{70}i}{224} 0 0 0 0 - \frac{\sqrt{70}i}{56} - \frac{\sqrt{42}i}{96} 0 0 0 0 \frac{\sqrt{42}i}{84}$ | |
| | $0 0 0 \frac{3\sqrt{70}i}{224} 0 0 - \frac{\sqrt{70}i}{56} 0 0 \frac{\sqrt{42}i}{96} 0 0 0 \frac{\sqrt{42}i}{84} 0$ | |
| 616 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|----------------------------------|
| $\mathbb{Q}_{3,1}^{(1,1;a)}(E, 1)$ | $0 - \frac{\sqrt{14}}{28} \frac{\sqrt{210}i}{224} 0 0 0 0 0 0 \frac{5\sqrt{14}i}{224} 0 0 0 0 - \frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28} 0 0 - \frac{\sqrt{210}i}{224} 0 0 0 0 0 - \frac{5\sqrt{14}i}{224} 0 0 0 - \frac{\sqrt{14}i}{28} 0$ | |
| | $0 - \frac{\sqrt{42}}{84} \frac{\sqrt{70}i}{224} 0 0 0 0 \frac{\sqrt{70}i}{56} \frac{13\sqrt{42}i}{672} 0 0 0 0 0 0$ | |
| | $\frac{\sqrt{42}}{84} 0 0 - \frac{\sqrt{70}i}{224} 0 0 \frac{\sqrt{70}i}{56} 0 0 - \frac{13\sqrt{42}i}{672} 0 0 0 0 0$ | |
| | $\frac{\sqrt{42}i}{48} 0 0 0 0 - \frac{\sqrt{70}i}{224} 0 0 0 \frac{\sqrt{42}}{56} 0 - \frac{\sqrt{42}i}{96} 0 0 0$ | |
| | $0 - \frac{\sqrt{42}i}{48} 0 0 - \frac{\sqrt{70}i}{224} 0 0 0 - \frac{\sqrt{42}}{56} 0 - \frac{\sqrt{42}i}{96} 0 0 0 0$ | |
| | $0 0 0 \frac{\sqrt{70}i}{224} 0 - \frac{\sqrt{70}}{56} \frac{\sqrt{70}i}{56} 0 0 - \frac{\sqrt{42}i}{96} 0 \frac{\sqrt{42}}{84} \frac{\sqrt{42}i}{48} 0$ | |
| | $0 0 \frac{\sqrt{70}i}{224} 0 \frac{\sqrt{70}}{56} 0 0 - \frac{\sqrt{70}i}{56} - \frac{\sqrt{42}i}{96} 0 - \frac{\sqrt{42}}{84} 0 0 - \frac{\sqrt{42}i}{48}$ | |
| | $0 0 0 0 \frac{3\sqrt{70}i}{224} 0 0 \frac{\sqrt{70}}{56} 0 0 - \frac{\sqrt{42}i}{96} 0 0 0 \frac{\sqrt{42}}{84}$ | |
| | $0 0 0 0 0 - \frac{3\sqrt{70}i}{224} - \frac{\sqrt{70}}{56} 0 0 0 0 \frac{\sqrt{42}i}{96} - \frac{\sqrt{42}}{84} 0$ | |
| 617 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{Q}_{3,0}^{(1,1;a)}(E, 2)$ | $0 0 0 - \frac{\sqrt{21}i}{28} 0 \frac{\sqrt{21}}{28} 0 0 0 \frac{\sqrt{35}i}{70} 0 \frac{\sqrt{35}}{70} - \frac{\sqrt{35}i}{35} 0$ | |
| | $0 0 - \frac{\sqrt{21}i}{28} 0 - \frac{\sqrt{21}}{28} 0 0 0 \frac{\sqrt{35}i}{70} 0 - \frac{\sqrt{35}}{70} 0 0 \frac{\sqrt{35}i}{35}$ | |
| | $0 0 0 - \frac{\sqrt{7}i}{28} 0 - \frac{\sqrt{7}}{28} \frac{\sqrt{7}i}{14} 0 0 - \frac{\sqrt{105}i}{70} 0 \frac{\sqrt{105}}{70} 0 0$ | |
| | $0 0 - \frac{\sqrt{7}i}{28} 0 \frac{\sqrt{7}}{28} 0 0 - \frac{\sqrt{7}i}{14} - \frac{\sqrt{105}i}{70} 0 - \frac{\sqrt{105}}{70} 0 0 0$ | |
| | $0 0 0 0 - \frac{\sqrt{7}i}{56} 0 0 \frac{\sqrt{7}}{56} 0 0 - \frac{\sqrt{105}i}{120} 0 0 0 - \frac{\sqrt{105}}{120}$ | |
| | $0 0 0 0 0 \frac{\sqrt{7}i}{56} - \frac{\sqrt{7}}{56} 0 0 0 0 \frac{\sqrt{105}i}{120} \frac{\sqrt{105}}{120} 0$ | |
| | $0 0 \frac{\sqrt{7}i}{56} 0 0 0 0 - \frac{\sqrt{7}i}{56} - \frac{\sqrt{105}i}{120} 0 0 0 0 - \frac{\sqrt{105}i}{120}$ | |
| | $0 0 0 - \frac{\sqrt{7}i}{56} 0 0 - \frac{\sqrt{7}i}{56} 0 0 \frac{\sqrt{105}i}{120} 0 0 0 - \frac{\sqrt{105}i}{120}$ | |
| | $0 0 0 - \frac{\sqrt{7}}{56} 0 \frac{\sqrt{7}i}{56} 0 0 0 - \frac{\sqrt{105}}{120} 0 - \frac{\sqrt{105}i}{120} 0 0$ | |
| | $0 0 \frac{\sqrt{7}}{56} 0 \frac{\sqrt{7}i}{56} 0 0 0 \frac{\sqrt{105}}{120} 0 - \frac{\sqrt{105}i}{120} 0 0 0$ | |
| 618 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--|
| $\mathbb{Q}_{3,1}^{(1,1;a)}(E, 2)$ | $\frac{\sqrt{35}i}{35} 0 0 -\frac{3\sqrt{21}}{112} 0 -\frac{3\sqrt{21}i}{112} 0 0 0 \frac{13\sqrt{35}}{560} 0 -\frac{13\sqrt{35}i}{560} 0 0$ | |
| | $0 -\frac{\sqrt{35}i}{35} \frac{3\sqrt{21}}{112} 0 -\frac{3\sqrt{21}i}{112} 0 0 0 -\frac{13\sqrt{35}}{560} 0 -\frac{13\sqrt{35}i}{560} 0 0 0$ | |
| | $0 0 0 -\frac{3\sqrt{7}}{112} 0 \frac{3\sqrt{7}i}{112} 0 0 0 -\frac{11\sqrt{105}}{1680} 0 -\frac{11\sqrt{105}i}{1680} 0 0 0$ | |
| | $0 0 \frac{3\sqrt{7}}{112} 0 \frac{3\sqrt{7}i}{112} 0 0 0 \frac{11\sqrt{105}}{1680} 0 -\frac{11\sqrt{105}i}{1680} 0 0 0 0$ | |
| | $0 \frac{\sqrt{105}}{120} \frac{\sqrt{7}i}{28} 0 0 0 0 \frac{\sqrt{7}i}{56} -\frac{\sqrt{105}i}{420} 0 0 0 0 0 0$ | |
| | $-\frac{\sqrt{105}}{120} 0 0 -\frac{\sqrt{7}i}{28} 0 0 \frac{\sqrt{7}i}{56} 0 0 \frac{\sqrt{105}i}{420} 0 0 0 0 0$ | |
| | $0 \frac{\sqrt{105}i}{120} 0 0 \frac{\sqrt{7}i}{28} 0 0 \frac{\sqrt{7}}{56} 0 0 0 \frac{\sqrt{105}i}{420} 0 0 0 0$ | |
| | $\frac{\sqrt{105}i}{120} 0 0 0 0 -\frac{\sqrt{7}i}{28} -\frac{\sqrt{7}}{56} 0 0 0 0 0 -\frac{\sqrt{105}i}{420} 0 0 0$ | |
| | $0 0 0 \frac{5\sqrt{7}i}{112} 0 \frac{5\sqrt{7}}{112} -\frac{\sqrt{7}i}{14} 0 0 \frac{\sqrt{105}i}{80} 0 -\frac{\sqrt{105}}{80} 0 0 0$ | |
| | $0 0 \frac{5\sqrt{7}i}{112} 0 -\frac{5\sqrt{7}}{112} 0 0 \frac{\sqrt{7}i}{14} \frac{\sqrt{105}i}{80} 0 \frac{\sqrt{105}}{80} 0 0 0 0$ | |
| 619 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| $\mathbb{G}_2^{(a)}(A_1)$ | $0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $\frac{\sqrt{70}}{28} 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $0 \frac{\sqrt{70}}{28} 0 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $0 0 \frac{\sqrt{42}}{56} 0 0 0 0 0 0 \frac{\sqrt{70}}{56} 0 0 0 0 0 0$ | |
| | $0 0 0 \frac{\sqrt{42}}{56} 0 0 0 0 0 \frac{\sqrt{70}}{56} 0 0 0 0 0 0$ | |
| | $0 0 0 0 -\frac{\sqrt{42}}{56} 0 0 0 0 0 \frac{\sqrt{70}}{56} 0 0 0 0 0$ | |
| | $0 0 0 0 0 -\frac{\sqrt{42}}{56} 0 0 0 0 0 0 \frac{\sqrt{70}}{56} 0 0 0$ | |
| | $0 0 0 0 0 0 0 0 0 0 0 0 0 -\frac{\sqrt{70}}{28} 0$ | |
| | $0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -\frac{\sqrt{70}}{28}$ | |
| 620 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---|--------------------------------|
| $\mathbb{G}_{2,0}^{(a)}(E, 1)$ | 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{70}}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{70}}{56}$ 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| 621 | symmetry | $-\sqrt{3}xz$ |
| $\mathbb{G}_{2,1}^{(a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 0 0 0 $\frac{\sqrt{70}}{56}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 0 0 0 $\frac{\sqrt{70}}{56}$ 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{56}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{56}$ 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 622 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ..

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{G}_{2,0}^{(a)}(E, 2)$ | | $\begin{bmatrix} -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | 623 symmetry |
| | | $-\sqrt{3}xy$ |
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | 624 symmetry |
| | | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------|-----------|--|
| $\mathbb{G}_4^{(a)}(A_1, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{7}}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{7}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
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| | | |
| 625 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| $\mathbb{G}_4^{(a)}(A_1, 2)$ | | $\begin{bmatrix} 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{30}}{80} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{30}}{80} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{10}}{40} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{40} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
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| | | |
| 626 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---|--|
| $\mathbb{G}_4^{(a)}(A_2)$ | 0 0 0 0 $\frac{3\sqrt{2}}{16}$ 0 0 0 0 0 $\frac{3\sqrt{30}}{80}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{2}}{16}$ 0 0 0 0 0 $\frac{3\sqrt{30}}{80}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{6}}{16}$ 0 0 0 0 0 $\frac{\sqrt{10}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{6}}{16}$ 0 0 0 0 0 $\frac{\sqrt{10}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{10}}{40}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{10}}{40}$ | |
| | $-\frac{\sqrt{10}}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{10}}{40}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{6}}{16}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{16}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{6}}{16}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{16}$ 0 0 0 0 | |
| 627 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{G}_{4,0}^{(a)}(E, 1)$ | 0 0 $-\frac{3\sqrt{14}}{112}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{112}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{14}}{112}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{112}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{13\sqrt{70}}{560}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{13\sqrt{70}}{560}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{70}}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{70}}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{70}}{40}$ 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{42}}{112}$ 0 0 0 0 0 $\frac{\sqrt{70}}{80}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{42}}{112}$ 0 0 0 0 0 0 $\frac{\sqrt{70}}{80}$ 0 0 0 | |
| 628 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ..

Table 9

| No. | multipole | matrix |
|--------------------------------|--|---|
| $\mathbb{G}_{4,1}^{(a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{14}}{112}$ 0 0 0 0 0 $\frac{\sqrt{210}}{112}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{14}}{112}$ 0 0 0 0 0 $\frac{\sqrt{210}}{112}$ 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{13\sqrt{70}}{560}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{13\sqrt{70}}{560}$ 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 0 0 0 0 $\frac{\sqrt{70}}{40}$ 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 0 0 0 0 $\frac{\sqrt{70}}{40}$ | |
| | $-\frac{\sqrt{70}}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{70}}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{\sqrt{70}}{80}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{42}}{112}$ 0 0 0 0 0 0 $-\frac{\sqrt{70}}{80}$ 0 0 0 0 | |
| 629 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| $\mathbb{G}_{4,0}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | $\frac{\sqrt{5}}{10}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{5}}{10}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 0 0 0 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 0 0 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{3}}{8}$ 0 0 0 0 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{3}}{8}$ 0 0 0 0 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{5}}{10}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{5}}{10}$ | |
| 630 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{G}_{4,1}^{(a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}}{40} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}}{40} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 631 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | $\mathbb{G}_{4,0}^{(a)}(E, 3)$ | $\begin{bmatrix} -\frac{\sqrt{105}}{35} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{35} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{140} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{140} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{140} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{140} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 632 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{G}_{4,1}^{(a)}(E, 3)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{35} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{35} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| 633 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| $\mathbb{G}_2^{(1,-1;a)}(A_1)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{210}i}{280} & 0 & \frac{\sqrt{210}}{280} & \frac{\sqrt{210}i}{70} & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{210}i}{280} & 0 & -\frac{\sqrt{210}}{280} & 0 & 0 & -\frac{\sqrt{210}i}{70} & \frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{70}i}{280} & 0 & \frac{3\sqrt{70}}{280} & 0 & 0 & 0 & \frac{\sqrt{42}i}{168} & 0 & \frac{\sqrt{42}}{168} & \frac{\sqrt{42}i}{42} & 0 \\ 0 & 0 & -\frac{3\sqrt{70}i}{280} & 0 & -\frac{3\sqrt{70}}{280} & 0 & 0 & 0 & \frac{\sqrt{42}i}{168} & 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & -\frac{\sqrt{42}i}{42} \\ 0 & -\frac{\sqrt{42}i}{84} & 0 & 0 & -\frac{\sqrt{70}i}{70} & 0 & 0 & \frac{\sqrt{70}}{140} & 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & 0 & \frac{\sqrt{42}}{84} \\ -\frac{\sqrt{42}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{70} & -\frac{\sqrt{70}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{42} & -\frac{\sqrt{42}}{84} & 0 \\ 0 & -\frac{\sqrt{42}}{84} & -\frac{\sqrt{70}i}{70} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{140} & -\frac{\sqrt{42}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{84} \\ \frac{\sqrt{42}}{84} & 0 & 0 & \frac{\sqrt{70}i}{70} & 0 & 0 & \frac{\sqrt{70}i}{140} & 0 & 0 & \frac{\sqrt{42}i}{42} & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 \\ \frac{\sqrt{42}i}{42} & 0 & 0 & \frac{\sqrt{70}}{140} & 0 & \frac{\sqrt{70}i}{140} & 0 & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{42} & -\frac{\sqrt{70}}{140} & 0 & \frac{\sqrt{70}i}{140} & 0 & 0 & 0 & \frac{\sqrt{42}}{84} & 0 & \frac{\sqrt{42}i}{84} & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| | | |
| 634 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--------------------------------|
| $\mathbb{G}_{2,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 $\frac{3\sqrt{70}}{140}$ 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{70}i}{280}$ $-\frac{3\sqrt{70}}{140}$ 0 0 0 0 $-\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 0 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 $\frac{\sqrt{14}}{28}$ | |
| | 0 0 0 0 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ $-\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{210}}{140}$ $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 $\frac{\sqrt{14}}{28}$ $-\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}i}{28}$ 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{14}i}{28}$ $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{14}}{28}$ $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | $-\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| 635 | symmetry | $-\sqrt{3}xz$ |
| $\mathbb{G}_{2,1}^{(1,-1;a)}(E, 1)$ | 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $-\frac{3\sqrt{70}i}{140}$ $\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 $-\frac{3\sqrt{70}i}{140}$ 0 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | 0 0 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ $\frac{\sqrt{14}i}{28}$ 0 0 0 0 $\frac{\sqrt{14}i}{28}$ | |
| | 0 $-\frac{\sqrt{14}i}{28}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 | |
| 636 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{G}_{2,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 $\frac{3\sqrt{70}}{280}$ 0 0 0 0 $-\frac{\sqrt{42}i}{56}$ 0 $-\frac{\sqrt{42}}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 $-\frac{3\sqrt{70}}{280}$ 0 0 0 0 $-\frac{\sqrt{42}i}{56}$ 0 $\frac{\sqrt{42}}{56}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{210}i}{280}$ 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 0 | |
| | 0 0 $\frac{3\sqrt{210}i}{280}$ 0 $-\frac{3\sqrt{210}}{280}$ 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 0 0 $\frac{\sqrt{210}}{140}$ 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{14}i}{28}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{210}}{140}$ 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 | |
| 637 symmetry | $-\sqrt{3}xy$ | |
| | 0 0 0 $\frac{3\sqrt{70}}{280}$ 0 $\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{70}}{280}$ 0 $\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{210}}{280}$ 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{210}}{280}$ 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 $\frac{\sqrt{14}}{28}$ 0 0 | |
| | 0 0 $\frac{\sqrt{210}i}{140}$ 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 | |
| 638 symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ | |

continued ...

Table 9

| No. | multipole | matrix |
|-----------------------------------|--|-----------------------------------|
| $\mathbb{G}_4^{(1,-1;a)}(A_1, 1)$ | 0 0 0 $\frac{3\sqrt{105}i}{560}$ 0 $\frac{3\sqrt{105}}{560}$ $\frac{2\sqrt{105}i}{105}$ 0 0 $\frac{3\sqrt{7}i}{112}$ 0 $-\frac{3\sqrt{7}}{112}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{105}i}{560}$ 0 $-\frac{3\sqrt{105}}{560}$ 0 0 $-\frac{2\sqrt{105}i}{105}$ $\frac{3\sqrt{7}i}{112}$ 0 $\frac{3\sqrt{7}}{112}$ 0 0 0 | |
| | 0 0 0 $\frac{11\sqrt{35}i}{560}$ 0 $-\frac{11\sqrt{35}}{560}$ 0 0 0 $\frac{\sqrt{21}i}{112}$ 0 $\frac{\sqrt{21}}{112}$ $-\frac{\sqrt{21}i}{21}$ 0 | |
| | 0 0 $\frac{11\sqrt{35}i}{560}$ 0 $\frac{11\sqrt{35}}{560}$ 0 0 0 $\frac{\sqrt{21}i}{112}$ 0 $-\frac{\sqrt{21}}{112}$ 0 0 $\frac{\sqrt{21}i}{21}$ | |
| | 0 $-\frac{\sqrt{21}i}{56}$ 0 0 $-\frac{\sqrt{35}i}{140}$ 0 0 $-\frac{\sqrt{35}}{140}$ 0 0 $\frac{\sqrt{21}i}{84}$ 0 0 $\frac{\sqrt{21}}{56}$ | |
| | $-\frac{\sqrt{21}i}{56}$ 0 0 0 $\frac{\sqrt{35}i}{140}$ $\frac{\sqrt{35}}{140}$ 0 0 0 0 $-\frac{\sqrt{21}i}{84}$ $-\frac{\sqrt{21}}{56}$ 0 | |
| | 0 $-\frac{\sqrt{21}}{56}$ $-\frac{\sqrt{35}i}{140}$ 0 0 0 0 $-\frac{\sqrt{35}i}{140}$ $-\frac{\sqrt{21}i}{84}$ 0 0 0 0 $-\frac{\sqrt{21}i}{56}$ | |
| | $\frac{\sqrt{21}}{56}$ 0 0 $\frac{\sqrt{35}i}{140}$ 0 0 $-\frac{\sqrt{35}i}{140}$ 0 0 $\frac{\sqrt{21}i}{84}$ 0 0 $-\frac{\sqrt{21}i}{56}$ 0 | |
| | $-\frac{\sqrt{21}i}{21}$ 0 0 $\frac{\sqrt{35}}{560}$ 0 $\frac{\sqrt{35}i}{560}$ 0 0 0 $\frac{3\sqrt{21}}{112}$ 0 $-\frac{3\sqrt{21}i}{112}$ 0 0 | |
| | 0 $\frac{\sqrt{21}i}{21}$ $-\frac{\sqrt{35}}{560}$ 0 $\frac{\sqrt{35}i}{560}$ 0 0 0 $-\frac{3\sqrt{21}}{112}$ 0 $-\frac{3\sqrt{21}i}{112}$ 0 0 0 | |
| 639 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| $\mathbb{G}_4^{(1,-1;a)}(A_1, 2)$ | 0 0 0 0 $\frac{5\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{5\sqrt{6}i}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{2}i}{32}$ 0 0 $-\frac{\sqrt{2}}{8}$ 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{2}i}{32}$ $\frac{\sqrt{2}}{8}$ 0 0 0 0 $\frac{\sqrt{30}i}{96}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 $-\frac{\sqrt{2}}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}}{32}$ $\frac{\sqrt{30}i}{48}$ 0 | |
| | 0 0 $-\frac{\sqrt{2}i}{8}$ 0 $\frac{\sqrt{2}}{32}$ 0 0 0 0 0 $\frac{\sqrt{30}}{32}$ 0 0 $-\frac{\sqrt{30}i}{48}$ | |
| | $\frac{\sqrt{30}i}{48}$ 0 0 $\frac{\sqrt{2}}{32}$ 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 $-\frac{\sqrt{30}}{32}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{30}i}{48}$ $-\frac{\sqrt{2}}{32}$ 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 $\frac{\sqrt{30}}{32}$ 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{2}i}{32}$ 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ $\frac{\sqrt{30}i}{96}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}i}{32}$ 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 0 0 | |
| 640 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{G}_4^{(1,-1;a)}(A_2)$ | 0 0 $-\frac{5\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{5\sqrt{6}i}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{2}i}{32}$ 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ $\frac{\sqrt{30}i}{96}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}i}{32}$ 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{30}i}{48}$ 0 0 $\frac{\sqrt{2}}{8}$ 0 $-\frac{\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 | |
| | 0 $\frac{\sqrt{30}i}{48}$ $-\frac{\sqrt{2}}{8}$ 0 $-\frac{\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{2}i}{32}$ 0 $\frac{\sqrt{2}}{8}$ 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 | |
| | 0 0 $\frac{\sqrt{2}i}{32}$ 0 $-\frac{\sqrt{2}}{8}$ 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 0 $-\frac{\sqrt{30}i}{48}$ | |
| | 0 0 0 0 $-\frac{\sqrt{2}i}{32}$ 0 0 $\frac{\sqrt{2}}{8}$ 0 0 $\frac{\sqrt{30}i}{96}$ 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{2}i}{32}$ $-\frac{\sqrt{2}}{8}$ 0 0 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 0 | |
| 641 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{42}i}{224}$ 0 0 $\frac{\sqrt{42}}{42}$ 0 0 $\frac{3\sqrt{70}i}{224}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{42}i}{224}$ $-\frac{\sqrt{42}}{42}$ 0 0 0 0 0 $-\frac{3\sqrt{70}i}{224}$ 0 0 0 | |
| | 0 0 0 0 $\frac{11\sqrt{14}i}{224}$ 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{\sqrt{210}i}{224}$ 0 0 $-\frac{\sqrt{210}}{84}$ | |
| | 0 0 0 0 0 $-\frac{11\sqrt{14}i}{224}$ $\frac{\sqrt{14}}{56}$ 0 0 0 0 $\frac{\sqrt{210}i}{224}$ $\frac{\sqrt{210}}{84}$ 0 | |
| | 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 $-\frac{3\sqrt{14}}{224}$ $\frac{\sqrt{14}i}{56}$ 0 0 0 0 $-\frac{\sqrt{210}}{672}$ $-\frac{\sqrt{210}i}{112}$ 0 | |
| | 0 0 $\frac{\sqrt{14}i}{56}$ 0 $\frac{3\sqrt{14}}{224}$ 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 $\frac{\sqrt{210}}{672}$ 0 0 $\frac{\sqrt{210}i}{112}$ | |
| | $\frac{\sqrt{210}i}{112}$ 0 0 $-\frac{\sqrt{14}}{224}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 $-\frac{5\sqrt{210}}{672}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{210}i}{112}$ $\frac{\sqrt{14}}{224}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 $\frac{5\sqrt{210}}{672}$ 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{210}}{84}$ $-\frac{\sqrt{14}i}{224}$ 0 0 0 0 $\frac{\sqrt{14}i}{56}$ $-\frac{3\sqrt{210}i}{224}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{210}}{84}$ 0 0 $\frac{\sqrt{14}i}{224}$ 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 $\frac{3\sqrt{210}i}{224}$ 0 0 0 0 | |
| 642 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|---|
| $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 1)$ | 0 0 $\frac{3\sqrt{42}i}{224}$ 0 0 0 0 $-\frac{\sqrt{42}i}{42}$ $\frac{3\sqrt{70}i}{224}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{42}i}{224}$ 0 0 $-\frac{\sqrt{42}i}{42}$ 0 0 $-\frac{3\sqrt{70}i}{224}$ 0 0 0 0 | |
| | 0 0 $\frac{11\sqrt{14}i}{224}$ 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ $\frac{\sqrt{210}i}{224}$ 0 0 0 0 $\frac{\sqrt{210}i}{84}$ | |
| | 0 0 0 $-\frac{11\sqrt{14}i}{224}$ 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 $-\frac{\sqrt{210}i}{224}$ 0 0 $\frac{\sqrt{210}i}{84}$ 0 | |
| | $-\frac{\sqrt{210}i}{112}$ 0 0 $-\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{224}$ 0 0 0 0 0 $-\frac{5\sqrt{210}i}{672}$ 0 0 | |
| | 0 $\frac{\sqrt{210}i}{112}$ $\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{224}$ 0 0 0 0 0 $-\frac{5\sqrt{210}i}{672}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{14}i}{224}$ 0 $-\frac{\sqrt{14}}{56}$ $-\frac{\sqrt{14}i}{56}$ 0 0 $-\frac{\sqrt{210}i}{672}$ 0 0 $-\frac{\sqrt{210}i}{112}$ 0 | |
| | 0 0 $\frac{3\sqrt{14}i}{224}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 $\frac{\sqrt{14}i}{56}$ $-\frac{\sqrt{210}i}{672}$ 0 0 0 0 $\frac{\sqrt{210}i}{112}$ | |
| | 0 $\frac{\sqrt{210}i}{84}$ 0 0 $\frac{\sqrt{14}i}{224}$ 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{3\sqrt{210}i}{224}$ 0 0 0 | |
| | $\frac{\sqrt{210}i}{84}$ 0 0 0 0 $-\frac{\sqrt{14}i}{224}$ $\frac{\sqrt{14}}{56}$ 0 0 0 0 $\frac{3\sqrt{210}i}{224}$ 0 0 | |
| 643 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 $-\frac{5\sqrt{3}i}{48}$ 0 $-\frac{5\sqrt{3}}{48}$ 0 0 0 $\frac{\sqrt{5}i}{16}$ 0 $-\frac{\sqrt{5}}{16}$ 0 0 | |
| | 0 0 $-\frac{5\sqrt{3}i}{48}$ 0 $\frac{5\sqrt{3}}{48}$ 0 0 0 $\frac{\sqrt{5}i}{16}$ 0 $\frac{\sqrt{5}}{16}$ 0 0 0 | |
| | 0 0 0 $\frac{i}{16}$ 0 $-\frac{1}{16}$ 0 0 0 $\frac{\sqrt{15}i}{48}$ 0 $\frac{\sqrt{15}}{48}$ 0 0 | |
| | 0 0 $\frac{i}{16}$ 0 $\frac{1}{16}$ 0 0 0 $\frac{\sqrt{15}i}{48}$ 0 $-\frac{\sqrt{15}}{48}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ | |
| | $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 | |
| | 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ | |
| | $\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 | |
| | 0 0 0 $-\frac{1}{16}$ 0 $-\frac{i}{16}$ 0 0 0 $-\frac{\sqrt{15}}{48}$ 0 $\frac{\sqrt{15}i}{48}$ 0 0 | |
| 644 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|-----------|---|
| $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{5\sqrt{3}}{48} & 0 & \frac{5\sqrt{3}i}{48} & 0 & 0 & 0 & \frac{\sqrt{5}}{16} & 0 & \frac{\sqrt{5}i}{16} & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{3}}{48} & 0 & \frac{5\sqrt{3}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{5}}{16} & 0 & \frac{\sqrt{5}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & 0 & \frac{\sqrt{15}}{48} & 0 & -\frac{\sqrt{15}i}{48} & 0 & 0 \\ 0 & 0 & -\frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & 0 & -\frac{\sqrt{15}}{48} & 0 & -\frac{\sqrt{15}i}{48} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} \\ \frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} \\ 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{24} \\ \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{24} \\ 0 & 0 & 0 & \frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{48} & 0 & \frac{\sqrt{15}}{48} & 0 & 0 \\ 0 & 0 & \frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{48} & 0 & -\frac{\sqrt{15}}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| $\mathbb{G}_{4,0}^{(1,-1;a)}(E, 3)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{21}i}{168} & 0 & \frac{\sqrt{21}}{168} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{168} & 0 & -\frac{\sqrt{21}}{168} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & -\frac{\sqrt{7}i}{14} & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & \frac{\sqrt{105}}{168} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{7}i}{56} & 0 & \frac{3\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{7}i}{14} & -\frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{84} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & \frac{\sqrt{105}}{168} \\ \frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & -\frac{\sqrt{105}}{168} & 0 \\ 0 & -\frac{\sqrt{105}}{84} & \frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{168} \\ \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{84} & 0 & \frac{\sqrt{105}i}{84} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & \frac{\sqrt{105}i}{84} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|--|
| $\mathbb{G}_{4,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{21}}{48}$ 0 $\frac{\sqrt{21}i}{48}$ 0 0 0 $\frac{\sqrt{35}}{112}$ 0 $-\frac{\sqrt{35}i}{112}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{21}}{48}$ 0 $\frac{\sqrt{21}i}{48}$ 0 0 0 $-\frac{\sqrt{35}}{112}$ 0 $-\frac{\sqrt{35}i}{112}$ 0 0 0 | |
| | 0 0 0 $\frac{5\sqrt{7}}{112}$ 0 $-\frac{5\sqrt{7}i}{112}$ 0 0 0 $\frac{\sqrt{105}}{336}$ 0 $\frac{\sqrt{105}i}{336}$ 0 0 0 | |
| | 0 0 $-\frac{5\sqrt{7}}{112}$ 0 $-\frac{5\sqrt{7}i}{112}$ 0 0 0 $-\frac{\sqrt{105}}{336}$ 0 $\frac{\sqrt{105}i}{336}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{105}}{168}$ $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{84}$ | |
| | $\frac{\sqrt{105}}{168}$ 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{84}$ 0 | |
| | 0 $-\frac{\sqrt{105}i}{168}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{84}$ | |
| | $-\frac{\sqrt{105}i}{168}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ $\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}}{84}$ 0 | |
| | 0 0 0 $\frac{\sqrt{7}i}{112}$ 0 $\frac{\sqrt{7}}{112}$ $\frac{\sqrt{7}i}{14}$ 0 0 $\frac{5\sqrt{105}i}{336}$ 0 $-\frac{5\sqrt{105}}{336}$ 0 0 | |
| | 0 0 $\frac{\sqrt{7}i}{112}$ 0 $-\frac{\sqrt{7}}{112}$ 0 0 $-\frac{\sqrt{7}i}{14}$ $\frac{5\sqrt{105}i}{336}$ 0 $\frac{5\sqrt{105}}{336}$ 0 0 | |
| 647 | symmetry | $-\frac{5x^6}{16} - \frac{15x^4y^2}{16} + \frac{45x^4z^2}{8} - \frac{15x^2y^4}{16} + \frac{45x^2y^2z^2}{4} - \frac{15x^2z^4}{2} - \frac{5y^6}{16} + \frac{45y^4z^2}{8} - \frac{15y^2z^4}{2} + z^6$ |
| $\mathbb{G}_6^{(1,-1;a)}(A_1, 1)$ | 0 0 0 $\frac{3\sqrt{385}i}{616}$ 0 $\frac{3\sqrt{385}}{616}$ $\frac{\sqrt{385}i}{77}$ 0 0 $\frac{5\sqrt{231}i}{616}$ 0 $-\frac{5\sqrt{231}}{616}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{385}i}{616}$ 0 $-\frac{3\sqrt{385}}{616}$ 0 0 $-\frac{\sqrt{385}i}{77}$ $\frac{5\sqrt{231}i}{616}$ 0 $\frac{5\sqrt{231}}{616}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{1155}i}{924}$ 0 $\frac{\sqrt{1155}}{924}$ 0 0 0 $-\frac{\sqrt{77}i}{308}$ 0 $-\frac{\sqrt{77}}{308}$ $\frac{\sqrt{77}i}{154}$ 0 | |
| | 0 0 $-\frac{\sqrt{1155}i}{924}$ 0 $-\frac{\sqrt{1155}}{924}$ 0 0 0 $-\frac{\sqrt{77}i}{308}$ 0 $\frac{\sqrt{77}}{308}$ 0 0 $-\frac{\sqrt{77}i}{154}$ | |
| | 0 $\frac{\sqrt{77}i}{154}$ 0 0 $\frac{\sqrt{1155}i}{308}$ 0 0 $-\frac{\sqrt{1155}}{231}$ 0 0 0 $-\frac{5\sqrt{77}i}{308}$ 0 0 $-\frac{\sqrt{77}}{154}$ | |
| | $\frac{\sqrt{77}i}{154}$ 0 0 0 $-\frac{\sqrt{1155}i}{308}$ $\frac{\sqrt{1155}}{231}$ 0 0 0 0 $\frac{5\sqrt{77}i}{308}$ $\frac{\sqrt{77}}{154}$ 0 | |
| | 0 $\frac{\sqrt{77}}{154}$ $\frac{\sqrt{1155}i}{308}$ 0 0 0 0 $-\frac{\sqrt{1155}i}{231}$ $\frac{5\sqrt{77}i}{308}$ 0 0 0 0 $\frac{\sqrt{77}i}{154}$ | |
| | $-\frac{\sqrt{77}}{154}$ 0 0 $-\frac{\sqrt{1155}i}{308}$ 0 0 $-\frac{\sqrt{1155}i}{231}$ 0 0 $-\frac{5\sqrt{77}i}{308}$ 0 0 $\frac{\sqrt{77}i}{154}$ 0 | |
| | $\frac{\sqrt{77}i}{154}$ 0 0 $-\frac{\sqrt{1155}}{1848}$ 0 $-\frac{\sqrt{1155}i}{1848}$ 0 0 0 $-\frac{3\sqrt{77}}{616}$ 0 $\frac{3\sqrt{77}i}{616}$ 0 0 | |
| | 0 $-\frac{\sqrt{77}i}{154}$ $\frac{\sqrt{1155}}{1848}$ 0 $-\frac{\sqrt{1155}i}{1848}$ 0 0 0 $\frac{3\sqrt{77}}{616}$ 0 $\frac{3\sqrt{77}i}{616}$ 0 0 0 | |
| 648 | symmetry | $\frac{\sqrt{462}(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}{32}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|-----------------------------------|--|
| | $\mathbb{G}_6^{(1,-1;a)}(A_1, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 649 | symmetry | $-\frac{\sqrt{210}yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{16}$ |
| | $\mathbb{G}_6^{(1,-1;a)}(A_1, 3)$ | $\begin{bmatrix} 0 & \frac{3\sqrt{110}i}{220} & 0 & 0 & -\frac{\sqrt{66}i}{88} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{110}i}{440} & 0 & 0 & \frac{3\sqrt{110}}{220} \\ \frac{3\sqrt{110}i}{220} & 0 & 0 & 0 & 0 & \frac{\sqrt{66}i}{88} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}i}{440} & -\frac{3\sqrt{110}}{220} & 0 \\ 0 & -\frac{\sqrt{330}i}{440} & 0 & 0 & -\frac{3\sqrt{22}i}{176} & 0 & 0 & \frac{\sqrt{22}}{44} & 0 & 0 & \frac{\sqrt{330}i}{176} & 0 & 0 & \frac{\sqrt{330}}{440} \\ -\frac{\sqrt{330}i}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{22}i}{176} & -\frac{\sqrt{22}}{44} & 0 & 0 & 0 & 0 & -\frac{\sqrt{330}i}{176} & -\frac{\sqrt{330}}{440} & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{22}i}{176} & 0 & \frac{5\sqrt{22}}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}i}{176} & 0 & -\frac{3\sqrt{330}}{880} & \frac{\sqrt{330}i}{110} & 0 \\ 0 & 0 & -\frac{3\sqrt{22}i}{176} & 0 & -\frac{5\sqrt{22}}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}i}{176} & 0 & \frac{3\sqrt{330}}{880} & 0 & 0 & -\frac{\sqrt{330}i}{110} \\ \frac{\sqrt{330}i}{110} & 0 & 0 & -\frac{3\sqrt{22}}{176} & 0 & -\frac{\sqrt{22}i}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}}{176} & 0 & \frac{7\sqrt{330}i}{880} & 0 & 0 \\ 0 & -\frac{\sqrt{330}i}{110} & \frac{3\sqrt{22}}{176} & 0 & -\frac{\sqrt{22}i}{176} & 0 & 0 & 0 & \frac{\sqrt{330}}{176} & 0 & \frac{7\sqrt{330}i}{880} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{330}}{440} & -\frac{3\sqrt{22}i}{176} & 0 & 0 & 0 & 0 & \frac{\sqrt{22}i}{44} & -\frac{\sqrt{330}i}{176} & 0 & 0 & 0 & 0 & -\frac{\sqrt{330}i}{440} \\ \frac{\sqrt{330}}{440} & 0 & 0 & \frac{3\sqrt{22}i}{176} & 0 & 0 & \frac{\sqrt{22}i}{44} & 0 & 0 & \frac{\sqrt{330}i}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}i}{440} \end{bmatrix}$ |
| 650 | symmetry | $\frac{\sqrt{462}xy(x^2-3y^2)(3x^2-y^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|-----------------------------------|---|
| | $\mathbb{G}_6^{(1,-1;a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 651 | symmetry | $-\frac{\sqrt{210}xz(x^2-3y^2)(3x^2+3y^2-8z^2)}{16}$ |
| | $\mathbb{G}_6^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & -\frac{3\sqrt{110}}{220} & \frac{\sqrt{66}i}{88} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{110}i}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}i}{220} \\ \frac{3\sqrt{110}}{220} & 0 & 0 & -\frac{\sqrt{66}i}{88} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}i}{440} & 0 & 0 & 0 & \frac{3\sqrt{110}i}{220} & 0 \\ 0 & -\frac{\sqrt{330}}{440} & -\frac{3\sqrt{22}i}{176} & 0 & 0 & 0 & 0 & \frac{\sqrt{22}i}{44} & -\frac{\sqrt{330}i}{176} & 0 & 0 & 0 & 0 & -\frac{\sqrt{330}i}{440} & \\ \frac{\sqrt{330}}{440} & 0 & 0 & \frac{3\sqrt{22}i}{176} & 0 & 0 & \frac{\sqrt{22}i}{44} & 0 & 0 & \frac{\sqrt{330}i}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}i}{440} & 0 \\ -\frac{\sqrt{330}i}{110} & 0 & 0 & \frac{\sqrt{22}}{176} & 0 & \frac{3\sqrt{22}i}{176} & 0 & 0 & 0 & \frac{7\sqrt{330}}{880} & 0 & -\frac{\sqrt{330}i}{176} & 0 & 0 & \\ 0 & \frac{\sqrt{330}i}{110} & -\frac{\sqrt{22}}{176} & 0 & \frac{3\sqrt{22}i}{176} & 0 & 0 & 0 & -\frac{7\sqrt{330}}{880} & 0 & -\frac{\sqrt{330}i}{176} & 0 & 0 & 0 & \\ 0 & 0 & 0 & -\frac{5\sqrt{22}i}{176} & 0 & -\frac{3\sqrt{22}}{176} & 0 & 0 & 0 & -\frac{3\sqrt{330}i}{880} & 0 & -\frac{\sqrt{330}}{176} & \frac{\sqrt{330}i}{110} & 0 & \\ 0 & 0 & -\frac{5\sqrt{22}i}{176} & 0 & -\frac{3\sqrt{22}}{176} & 0 & 0 & 0 & -\frac{3\sqrt{330}i}{880} & 0 & \frac{\sqrt{330}}{176} & 0 & 0 & -\frac{\sqrt{330}i}{110} & \\ 0 & \frac{\sqrt{330}i}{440} & 0 & 0 & \frac{3\sqrt{22}i}{176} & 0 & 0 & -\frac{\sqrt{22}}{44} & 0 & 0 & -\frac{\sqrt{330}i}{176} & 0 & 0 & -\frac{\sqrt{330}}{440} & \\ \frac{\sqrt{330}i}{440} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{22}i}{176} & \frac{\sqrt{22}}{44} & 0 & 0 & 0 & 0 & \frac{\sqrt{330}i}{176} & \frac{\sqrt{330}}{440} & 0 \end{bmatrix}$ |
| 652 | symmetry | $\frac{3\sqrt{154}yz(5x^4-10x^2y^2+y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{G}_{6,0}^{(1,-1;a)}(E, 1)$ | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{2}i}{8} \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{8}$ | |
| | $\frac{\sqrt{2}i}{8} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{16} \quad -\frac{\sqrt{2}}{8} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad \frac{\sqrt{30}}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad \frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad -\frac{\sqrt{30}}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad -\frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}}{48} \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{16} \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{30}}{48} \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{16} \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{2}}{8} \quad \frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{8}$ | |
| | $\frac{\sqrt{2}}{8} \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{8} \quad 0$ | |
| 653 | symmetry | $\frac{3\sqrt{154}xz(x^4 - 10x^2y^2 + 5y^4)}{16}$ |
| $\mathbb{G}_{6,1}^{(1,-1;a)}(E, 1)$ | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{2}}{8} \quad \frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{8}$ | |
| | $\frac{\sqrt{2}}{8} \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{8} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{48} \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{16} \quad 0 \quad \frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{30}}{48} \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{16} \quad 0 \quad \frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad \frac{\sqrt{30}}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad \frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad -\frac{\sqrt{30}}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad 0 \quad -\frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{2}i}{8} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{16} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{8}$ | |
| | $-\frac{\sqrt{2}i}{8} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{16} \quad \frac{\sqrt{2}}{8} \quad 0 \quad 0$ | |
| 654 | symmetry | $\frac{\sqrt{21}yz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|---|
| $\mathbb{G}_{6,0}^{(1,-1;a)}(E, 2)$ | $0 - \frac{\sqrt{11}i}{44} 0 0 - \frac{\sqrt{165}i}{88} 0 0 \frac{\sqrt{165}}{66} 0 0 \frac{5\sqrt{11}i}{88} 0 0 \frac{\sqrt{11}}{44}$ | |
| | $-\frac{\sqrt{11}i}{44} 0 0 0 0 \frac{\sqrt{165}i}{88} -\frac{\sqrt{165}}{66} 0 0 0 0 -\frac{5\sqrt{11}i}{88} -\frac{\sqrt{11}}{44} 0$ | |
| | $0 0 0 0 -\frac{\sqrt{55}i}{132} 0 0 \frac{\sqrt{55}}{132} 0 0 \frac{\sqrt{33}i}{132} 0 0 \frac{\sqrt{33}}{132}$ | |
| | $0 0 0 0 0 \frac{\sqrt{55}i}{132} -\frac{\sqrt{55}}{132} 0 0 0 0 -\frac{\sqrt{33}i}{132} -\frac{\sqrt{33}}{132} 0$ | |
| | $0 0 0 \frac{\sqrt{55}i}{264} 0 \frac{5\sqrt{55}}{264} \frac{\sqrt{55}i}{33} 0 0 \frac{\sqrt{33}i}{88} 0 -\frac{7\sqrt{33}}{264} \frac{\sqrt{33}i}{66} 0$ | |
| | $0 0 \frac{\sqrt{55}i}{264} 0 -\frac{5\sqrt{55}}{264} 0 0 -\frac{\sqrt{55}i}{33} \frac{\sqrt{33}i}{88} 0 \frac{7\sqrt{33}}{264} 0 0 -\frac{\sqrt{33}i}{66}$ | |
| | $-\frac{\sqrt{33}i}{66} 0 0 \frac{\sqrt{55}}{264} 0 \frac{\sqrt{55}i}{264} 0 0 0 \frac{\sqrt{33}}{88} 0 -\frac{\sqrt{33}i}{88} 0 0 0$ | |
| | $0 \frac{\sqrt{33}i}{66} -\frac{\sqrt{55}}{264} 0 \frac{\sqrt{55}i}{264} 0 0 0 -\frac{\sqrt{33}}{88} 0 -\frac{\sqrt{33}i}{88} 0 0 0 0$ | |
| | $0 \frac{\sqrt{33}}{132} \frac{\sqrt{55}i}{264} 0 0 0 0 -\frac{\sqrt{55}i}{132} \frac{\sqrt{33}i}{88} 0 0 0 0 0 0$ | |
| | $-\frac{\sqrt{33}}{132} 0 0 -\frac{\sqrt{55}i}{264} 0 0 0 -\frac{\sqrt{55}i}{132} 0 0 -\frac{\sqrt{33}i}{88} 0 0 0 0$ | |
| 655 | symmetry | $-\frac{\sqrt{21}xz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{8}$ |
| $\mathbb{G}_{6,1}^{(1,-1;a)}(E, 2)$ | $0 \frac{\sqrt{11}}{44} \frac{\sqrt{165}i}{88} 0 0 0 0 -\frac{\sqrt{165}i}{66} \frac{5\sqrt{11}i}{88} 0 0 0 0 \frac{\sqrt{11}i}{44}$ | |
| | $-\frac{\sqrt{11}}{44} 0 0 -\frac{\sqrt{165}i}{88} 0 0 -\frac{\sqrt{165}i}{66} 0 0 -\frac{5\sqrt{11}i}{88} 0 0 \frac{\sqrt{11}i}{44} 0$ | |
| | $0 0 -\frac{\sqrt{55}i}{132} 0 0 0 0 \frac{\sqrt{55}i}{132} -\frac{\sqrt{33}i}{132} 0 0 0 0 0 -\frac{\sqrt{33}i}{132}$ | |
| | $0 0 0 \frac{\sqrt{55}i}{132} 0 0 \frac{\sqrt{55}i}{132} 0 0 \frac{\sqrt{33}i}{132} 0 0 -\frac{\sqrt{33}i}{132} 0$ | |
| | $\frac{\sqrt{33}i}{66} 0 0 -\frac{\sqrt{55}}{264} 0 -\frac{\sqrt{55}i}{264} 0 0 0 -\frac{\sqrt{33}}{88} 0 \frac{\sqrt{33}i}{88} 0 0 0$ | |
| | $0 -\frac{\sqrt{33}i}{66} \frac{\sqrt{55}}{264} 0 -\frac{\sqrt{55}i}{264} 0 0 0 \frac{\sqrt{33}}{88} 0 \frac{\sqrt{33}i}{88} 0 0 0 0$ | |
| | $0 0 0 -\frac{5\sqrt{55}i}{264} 0 \frac{\sqrt{55}}{264} 0 -\frac{\sqrt{55}i}{264} -\frac{\sqrt{55}i}{33} 0 0 -\frac{7\sqrt{33}i}{264} 0 \frac{\sqrt{33}}{88} \frac{\sqrt{33}i}{66} 0$ | |
| | $0 0 -\frac{5\sqrt{55}i}{264} 0 \frac{\sqrt{55}}{264} 0 0 0 \frac{\sqrt{55}i}{33} -\frac{7\sqrt{33}i}{264} 0 -\frac{\sqrt{33}i}{88} 0 0 0 -\frac{\sqrt{33}i}{66}$ | |
| | $0 -\frac{\sqrt{33}i}{132} 0 0 -\frac{\sqrt{55}i}{264} 0 0 0 \frac{\sqrt{55}}{132} 0 0 \frac{\sqrt{33}i}{88} 0 0 0 0$ | |
| | $-\frac{\sqrt{33}i}{132} 0 0 0 0 \frac{\sqrt{55}i}{264} -\frac{\sqrt{55}}{132} 0 0 0 0 0 -\frac{\sqrt{33}i}{88} 0 0 0 0$ | |
| 656 | symmetry | $-\frac{3\sqrt{7}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{G}_{6,0}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{55}i}{88}$ 0 $\frac{\sqrt{55}}{88}$ 0 0 0 $-\frac{\sqrt{33}i}{88}$ 0 $\frac{\sqrt{33}}{88}$ 0 0 | |
| | 0 0 $\frac{\sqrt{55}i}{88}$ 0 $-\frac{\sqrt{55}}{88}$ 0 0 0 $-\frac{\sqrt{33}i}{88}$ 0 $-\frac{\sqrt{33}}{88}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{165}i}{132}$ 0 $\frac{\sqrt{165}}{132}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $-\frac{\sqrt{11}}{44}$ $\frac{\sqrt{11}i}{22}$ 0 | |
| | 0 0 $-\frac{\sqrt{165}i}{132}$ 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $\frac{\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{11}i}{22}$ | |
| | 0 $-\frac{\sqrt{11}i}{22}$ 0 0 $\frac{\sqrt{165}i}{132}$ 0 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 0 0 $-\frac{\sqrt{11}i}{22}$ | |
| | $-\frac{\sqrt{11}i}{22}$ 0 0 0 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}i}{44}$ $\frac{\sqrt{11}}{22}$ 0 | |
| | 0 $-\frac{\sqrt{11}}{22}$ $\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 0 0 0 $\frac{\sqrt{11}i}{22}$ | |
| | $\frac{\sqrt{11}}{22}$ 0 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 0 0 $\frac{\sqrt{11}i}{22}$ 0 | |
| | $-\frac{\sqrt{11}i}{22}$ 0 0 $\frac{\sqrt{165}}{264}$ 0 $\frac{\sqrt{165}i}{264}$ 0 0 0 $\frac{3\sqrt{11}}{88}$ 0 $-\frac{3\sqrt{11}i}{88}$ 0 0 | |
| | 0 $\frac{\sqrt{11}i}{22}$ $-\frac{\sqrt{165}}{264}$ 0 $\frac{\sqrt{165}i}{264}$ 0 0 0 $-\frac{3\sqrt{11}}{88}$ 0 $-\frac{3\sqrt{11}i}{88}$ 0 0 0 | |
| 657 | symmetry | $-\frac{3\sqrt{7}xy(x-y)(x+y)(x^2+y^2-10z^2)}{4}$ |
| $\mathbb{G}_{6,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{55}}{88}$ 0 $-\frac{\sqrt{55}i}{88}$ 0 0 0 $-\frac{\sqrt{33}}{88}$ 0 $-\frac{\sqrt{33}i}{88}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{55}}{88}$ 0 $-\frac{\sqrt{55}i}{88}$ 0 0 0 $\frac{\sqrt{33}}{88}$ 0 $-\frac{\sqrt{33}i}{88}$ 0 0 0 | |
| | $\frac{\sqrt{11}i}{22}$ 0 0 $-\frac{\sqrt{165}}{264}$ 0 $-\frac{\sqrt{165}i}{264}$ 0 0 0 $-\frac{3\sqrt{11}}{88}$ 0 $\frac{3\sqrt{11}i}{88}$ 0 0 | |
| | 0 $-\frac{\sqrt{11}i}{22}$ $\frac{\sqrt{165}}{264}$ 0 $-\frac{\sqrt{165}i}{264}$ 0 0 0 $\frac{3\sqrt{11}}{88}$ 0 $\frac{3\sqrt{11}i}{88}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{11}}{22}$ $\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 0 0 0 $\frac{\sqrt{11}i}{22}$ | |
| | $\frac{\sqrt{11}}{22}$ 0 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 0 0 $\frac{\sqrt{11}i}{22}$ 0 | |
| | 0 $\frac{\sqrt{11}i}{22}$ 0 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 0 0 $\frac{\sqrt{11}}{22}$ | |
| | $\frac{\sqrt{11}i}{22}$ 0 0 0 0 $\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $\frac{\sqrt{11}i}{44}$ $-\frac{\sqrt{11}}{22}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{165}i}{132}$ 0 $\frac{\sqrt{165}}{132}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $-\frac{\sqrt{11}}{44}$ $\frac{\sqrt{11}i}{22}$ 0 | |
| | 0 0 $-\frac{\sqrt{165}i}{132}$ 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $\frac{\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{11}i}{22}$ | |
| 658 | symmetry | $\frac{\sqrt{210}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{32}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|---|
| $\mathbb{G}_{6,0}^{(1,-1;a)}(E, 4)$ | 0 0 0 $-\frac{\sqrt{66}i}{66}$ 0 $\frac{\sqrt{66}}{66}$ 0 0 0 $-\frac{\sqrt{110}i}{110}$ 0 $-\frac{\sqrt{110}}{110}$ $\frac{\sqrt{110}i}{55}$ 0 | |
| | 0 0 $-\frac{\sqrt{66}i}{66}$ 0 $-\frac{\sqrt{66}}{66}$ 0 0 0 $-\frac{\sqrt{110}i}{110}$ 0 $\frac{\sqrt{110}}{110}$ 0 0 $-\frac{\sqrt{110}i}{55}$ | |
| | 0 0 0 $\frac{7\sqrt{22}i}{528}$ 0 $\frac{7\sqrt{22}}{528}$ $\frac{\sqrt{22}i}{33}$ 0 0 $\frac{3\sqrt{330}i}{880}$ 0 $-\frac{3\sqrt{330}}{880}$ 0 0 0 | |
| | 0 0 $\frac{7\sqrt{22}i}{528}$ 0 $-\frac{7\sqrt{22}}{528}$ 0 0 $-\frac{\sqrt{22}i}{33}$ $\frac{3\sqrt{330}i}{880}$ 0 $\frac{3\sqrt{330}}{880}$ 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{22}i}{33}$ 0 0 $-\frac{\sqrt{22}}{33}$ 0 0 $-\frac{\sqrt{330}i}{165}$ 0 0 $-\frac{\sqrt{330}}{165}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{22}i}{33}$ $\frac{\sqrt{22}}{33}$ 0 0 0 0 $\frac{\sqrt{330}i}{165}$ $\frac{\sqrt{330}}{165}$ 0 | |
| | 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 0 $\frac{\sqrt{22}i}{33}$ $-\frac{\sqrt{330}i}{165}$ 0 0 0 0 $-\frac{\sqrt{330}i}{165}$ | |
| | 0 0 0 $\frac{\sqrt{22}i}{33}$ 0 0 $\frac{\sqrt{22}i}{33}$ 0 0 $\frac{\sqrt{330}i}{165}$ 0 0 $-\frac{\sqrt{330}i}{165}$ 0 | |
| | 0 0 0 $\frac{\sqrt{22}}{528}$ 0 $-\frac{\sqrt{22}i}{528}$ 0 0 0 $-\frac{\sqrt{330}}{2640}$ 0 $-\frac{\sqrt{330}i}{2640}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{22}}{528}$ 0 $-\frac{\sqrt{22}i}{528}$ 0 0 0 $\frac{\sqrt{330}}{2640}$ 0 $-\frac{\sqrt{330}i}{2640}$ 0 0 0 | |
| 659 | symmetry | $-\frac{\sqrt{210}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{16}$ |
| $\mathbb{G}_{6,1}^{(1,-1;a)}(E, 4)$ | $-\frac{\sqrt{110}i}{55}$ 0 0 $\frac{\sqrt{66}}{132}$ 0 $\frac{\sqrt{66}i}{132}$ 0 0 0 $\frac{3\sqrt{110}}{220}$ 0 $-\frac{3\sqrt{110}i}{220}$ 0 0 | |
| | 0 $\frac{\sqrt{110}i}{55}$ $-\frac{\sqrt{66}}{132}$ 0 $\frac{\sqrt{66}i}{132}$ 0 0 0 $-\frac{3\sqrt{110}}{220}$ 0 $-\frac{3\sqrt{110}i}{220}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{22}}{528}$ 0 $\frac{\sqrt{22}i}{528}$ 0 0 0 $\frac{\sqrt{330}}{2640}$ 0 $\frac{\sqrt{330}i}{2640}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{22}}{528}$ 0 $\frac{\sqrt{22}i}{528}$ 0 0 0 $-\frac{\sqrt{330}}{2640}$ 0 $\frac{\sqrt{330}i}{2640}$ 0 0 0 | |
| | 0 $\frac{\sqrt{330}}{165}$ $\frac{\sqrt{22}i}{66}$ 0 0 0 0 $-\frac{\sqrt{22}i}{33}$ $\frac{\sqrt{330}i}{110}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{330}}{165}$ 0 0 $-\frac{\sqrt{22}i}{66}$ 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 $-\frac{\sqrt{330}i}{110}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{330}i}{165}$ 0 0 $\frac{\sqrt{22}i}{66}$ 0 0 $-\frac{\sqrt{22}}{33}$ 0 0 $-\frac{\sqrt{330}i}{110}$ 0 0 0 0 | |
| | $\frac{\sqrt{330}i}{165}$ 0 0 0 0 $-\frac{\sqrt{22}i}{66}$ $\frac{\sqrt{22}}{33}$ 0 0 0 0 $\frac{\sqrt{330}i}{110}$ 0 0 0 | |
| | 0 0 0 $-\frac{5\sqrt{22}i}{528}$ 0 $-\frac{5\sqrt{22}}{528}$ $-\frac{\sqrt{22}i}{33}$ 0 0 $-\frac{\sqrt{330}i}{240}$ 0 $\frac{\sqrt{330}}{240}$ 0 0 0 | |
| | 0 0 $-\frac{5\sqrt{22}i}{528}$ 0 $\frac{5\sqrt{22}}{528}$ 0 0 $\frac{\sqrt{22}i}{33}$ $-\frac{\sqrt{330}i}{240}$ 0 0 $-\frac{\sqrt{330}}{240}$ 0 0 0 | |
| 660 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ..

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{G}_2^{(1,0;a)}(A_1)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{21}i}{56} & 0 & \frac{\sqrt{21}}{56} & 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{56} & 0 & -\frac{\sqrt{21}}{56} & 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & \frac{\sqrt{35}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{14} & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| 661 | symmetry | $\sqrt{3}yz$ |
| $\mathbb{G}_{2,0}^{(1,0;a)}(E, 1)$ | | $\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{84} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & \frac{\sqrt{105}}{84} \\ -\frac{\sqrt{105}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} & -\frac{\sqrt{105}}{84} & 0 \\ 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 \\ \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{168} & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & -\frac{\sqrt{21}}{42} & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 \end{bmatrix}$ |
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| | | |
| 662 | symmetry | $-\sqrt{3}xz$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--------------------------|---|
| $\mathbb{G}_{2,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{\sqrt{105}}{84}, \frac{\sqrt{7}i}{56}, 0, 0, 0, 0, 0, 0, \frac{\sqrt{105}i}{168}, 0, 0, 0, 0, \frac{\sqrt{105}i}{84}$ |
| | $-\frac{\sqrt{105}}{84}$ | $0, 0, 0, -\frac{\sqrt{7}i}{56}, 0, 0, 0, 0, 0, -\frac{\sqrt{105}i}{168}, 0, 0, \frac{\sqrt{105}i}{84}, 0$ |
| | 0 | $\frac{\sqrt{35}}{28}, \frac{\sqrt{21}i}{168}, 0, 0, 0, 0, \frac{\sqrt{21}i}{84}, -\frac{\sqrt{35}i}{56}, 0, 0, 0, 0, 0$ |
| | $-\frac{\sqrt{35}}{28}$ | $0, 0, 0, -\frac{\sqrt{21}i}{168}, 0, 0, \frac{\sqrt{21}i}{84}, 0, 0, \frac{\sqrt{35}i}{56}, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{21}}{84}, 0, -\frac{\sqrt{21}i}{42}, 0, 0, 0, \frac{\sqrt{35}}{28}, 0, 0, 0, 0$ |
| | 0 | $0, 0, -\frac{\sqrt{21}}{84}, 0, -\frac{\sqrt{21}i}{42}, 0, 0, 0, -\frac{\sqrt{35}}{28}, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{21}i}{42}, 0, -\frac{\sqrt{21}}{42}, \frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, \frac{\sqrt{21}i}{42}, 0, \frac{\sqrt{21}}{42}, 0, 0, -\frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, 0, -\frac{\sqrt{21}i}{42}, 0, 0, \frac{\sqrt{21}}{84}, 0, 0, 0, 0, 0, -\frac{\sqrt{35}}{28}$ |
| | 0 | $0, 0, 0, 0, 0, \frac{\sqrt{21}i}{42}, -\frac{\sqrt{21}}{84}, 0, 0, 0, 0, 0, \frac{\sqrt{35}}{28}, 0$ |
| 663 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| $\mathbb{G}_{2,0}^{(1,0;a)}(E, 2)$ | 0 | $0, 0, 0, \frac{\sqrt{7}i}{56}, 0, -\frac{\sqrt{7}}{56}, 0, 0, 0, \frac{\sqrt{105}i}{168}, 0, \frac{\sqrt{105}}{168}, \frac{\sqrt{105}i}{42}, 0$ |
| | 0 | $0, 0, \frac{\sqrt{7}i}{56}, 0, \frac{\sqrt{7}}{56}, 0, 0, 0, \frac{\sqrt{105}i}{168}, 0, -\frac{\sqrt{105}}{168}, 0, 0, -\frac{\sqrt{105}i}{42}$ |
| | 0 | $0, 0, 0, \frac{\sqrt{21}i}{168}, 0, \frac{\sqrt{21}}{168}, \frac{\sqrt{21}i}{42}, 0, 0, -\frac{\sqrt{35}i}{56}, 0, \frac{\sqrt{35}}{56}, 0, 0$ |
| | 0 | $0, 0, \frac{\sqrt{21}i}{168}, 0, -\frac{\sqrt{21}}{168}, 0, 0, -\frac{\sqrt{21}i}{42}, -\frac{\sqrt{35}i}{56}, 0, -\frac{\sqrt{35}}{56}, 0, 0$ |
| | 0 | $0, 0, 0, 0, -\frac{\sqrt{21}i}{21}, 0, 0, -\frac{\sqrt{21}}{42}, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, 0, 0, \frac{\sqrt{21}i}{21}, \frac{\sqrt{21}}{42}, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, \frac{\sqrt{21}i}{21}, 0, 0, 0, 0, \frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, -\frac{\sqrt{21}i}{21}, 0, 0, \frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{21}}{42}, 0, -\frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| | 0 | $0, 0, -\frac{\sqrt{21}}{42}, 0, -\frac{\sqrt{21}i}{42}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$ |
| 664 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------|---|
| $\mathbb{G}_{2,1}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} -\frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{42} & \frac{\sqrt{7}}{56} & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & \frac{\sqrt{105}}{168} & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{42} & -\frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{84} & \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & \frac{\sqrt{21}}{42} & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| 665 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |
| $\mathbb{G}_4^{(1,0;a)}(A_1, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{7}i}{112} & 0 & \frac{3\sqrt{7}}{112} & 0 & 0 & 0 & \frac{\sqrt{105}i}{112} & 0 & -\frac{\sqrt{105}}{112} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{7}i}{112} & 0 & -\frac{3\sqrt{7}}{112} & 0 & 0 & 0 & \frac{\sqrt{105}i}{112} & 0 & \frac{\sqrt{105}}{112} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{112} & 0 & -\frac{\sqrt{21}}{112} & 0 & 0 & 0 & \frac{13\sqrt{35}i}{560} & 0 & \frac{13\sqrt{35}}{560} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{112} & 0 & \frac{\sqrt{21}}{112} & 0 & 0 & 0 & \frac{13\sqrt{35}i}{560} & 0 & -\frac{13\sqrt{35}}{560} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} & 0 \\ \frac{\sqrt{35}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{40} & 0 \\ 0 & \frac{\sqrt{35}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} \\ -\frac{\sqrt{35}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{21}}{112} & 0 & \frac{3\sqrt{21}i}{112} & 0 & 0 & 0 & \frac{\sqrt{35}}{80} & 0 & -\frac{\sqrt{35}i}{80} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{21}}{112} & 0 & \frac{3\sqrt{21}i}{112} & 0 & 0 & 0 & -\frac{\sqrt{35}}{80} & 0 & -\frac{\sqrt{35}i}{80} & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| | | |
| 666 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|--------------------------|--|
| $\mathbb{G}_4^{(1,0;a)}(A_1, 2)$ | 0 | $-\frac{\sqrt{6}i}{20}$ 0 0 0 $-\frac{9\sqrt{10}i}{160}$ 0 0 0 0 0 $-\frac{9\sqrt{6}i}{160}$ 0 0 $-\frac{\sqrt{6}}{20}$ |
| | $-\frac{\sqrt{6}i}{20}$ | 0 0 0 0 0 $\frac{9\sqrt{10}i}{160}$ 0 0 0 0 0 $\frac{9\sqrt{6}i}{160}$ $\frac{\sqrt{6}}{20}$ 0 |
| | 0 | $\frac{\sqrt{2}i}{20}$ 0 0 0 $\frac{3\sqrt{30}i}{160}$ 0 0 $\frac{\sqrt{30}}{40}$ 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 $-\frac{\sqrt{2}}{20}$ |
| | $\frac{\sqrt{2}i}{20}$ | 0 0 0 0 0 $-\frac{3\sqrt{30}i}{160}$ $-\frac{\sqrt{30}}{40}$ 0 0 0 0 $\frac{3\sqrt{2}i}{32}$ $\frac{\sqrt{2}}{20}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{30}i}{40}$ 0 $\frac{\sqrt{30}}{160}$ 0 0 0 $\frac{\sqrt{2}i}{20}$ 0 $-\frac{\sqrt{2}}{160}$ $\frac{3\sqrt{2}i}{80}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{30}i}{40}$ 0 $-\frac{\sqrt{30}}{160}$ 0 0 0 $\frac{\sqrt{2}i}{20}$ 0 $\frac{\sqrt{2}}{160}$ 0 0 $-\frac{3\sqrt{2}i}{80}$ |
| | $\frac{3\sqrt{2}i}{80}$ | 0 0 0 $\frac{3\sqrt{30}}{160}$ 0 0 0 0 0 $-\frac{13\sqrt{2}}{160}$ 0 $\frac{\sqrt{2}i}{40}$ 0 0 0 |
| | 0 | $-\frac{3\sqrt{2}i}{80}$ $-\frac{3\sqrt{30}}{160}$ 0 0 0 0 0 $\frac{13\sqrt{2}}{160}$ 0 $\frac{\sqrt{2}i}{40}$ 0 0 0 0 |
| | 0 | $\frac{\sqrt{2}}{20}$ $\frac{3\sqrt{30}i}{160}$ 0 0 0 0 $\frac{\sqrt{30}i}{40}$ $\frac{3\sqrt{2}i}{32}$ 0 0 0 0 $\frac{\sqrt{2}i}{20}$ |
| | $-\frac{\sqrt{2}}{20}$ | 0 0 0 $-\frac{3\sqrt{30}i}{160}$ 0 0 $\frac{\sqrt{30}i}{40}$ 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 0 $\frac{\sqrt{2}i}{20}$ 0 |
| 667 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
| $\mathbb{G}_4^{(1,0;a)}(A_2)$ | 0 | $\frac{\sqrt{6}}{20}$ $\frac{9\sqrt{10}i}{160}$ 0 0 0 0 0 0 $-\frac{9\sqrt{6}i}{160}$ 0 0 0 0 $-\frac{\sqrt{6}i}{20}$ |
| | $-\frac{\sqrt{6}}{20}$ | 0 0 0 $-\frac{9\sqrt{10}i}{160}$ 0 0 0 0 0 $\frac{9\sqrt{6}i}{160}$ 0 0 0 $-\frac{\sqrt{6}i}{20}$ 0 |
| | 0 | $\frac{\sqrt{2}}{20}$ $\frac{3\sqrt{30}i}{160}$ 0 0 0 0 $\frac{\sqrt{30}i}{40}$ $\frac{3\sqrt{2}i}{32}$ 0 0 0 0 $\frac{\sqrt{2}i}{20}$ |
| | $-\frac{\sqrt{2}}{20}$ | 0 0 $-\frac{3\sqrt{30}i}{160}$ 0 0 $\frac{\sqrt{30}i}{40}$ 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 0 $\frac{\sqrt{2}i}{20}$ 0 |
| | $-\frac{3\sqrt{2}i}{80}$ | 0 0 0 0 0 $-\frac{3\sqrt{30}i}{160}$ 0 0 0 $\frac{\sqrt{2}}{40}$ 0 $-\frac{13\sqrt{2}i}{160}$ 0 0 0 |
| | 0 | $\frac{3\sqrt{2}i}{80}$ 0 0 $-\frac{3\sqrt{30}i}{160}$ 0 0 0 $-\frac{\sqrt{2}}{40}$ 0 $-\frac{13\sqrt{2}i}{160}$ 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{30}i}{160}$ 0 $\frac{\sqrt{30}}{40}$ 0 0 0 $-\frac{\sqrt{2}i}{160}$ 0 $\frac{\sqrt{2}}{20}$ $\frac{3\sqrt{2}i}{80}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{30}i}{160}$ 0 $-\frac{\sqrt{30}}{40}$ 0 0 0 $-\frac{\sqrt{2}i}{160}$ 0 $-\frac{\sqrt{2}}{20}$ 0 0 $-\frac{3\sqrt{2}i}{80}$ |
| | 0 | $-\frac{\sqrt{2}i}{20}$ 0 0 0 $-\frac{3\sqrt{30}i}{160}$ 0 0 $-\frac{\sqrt{30}}{40}$ 0 0 0 $\frac{3\sqrt{2}i}{32}$ 0 0 0 $\frac{\sqrt{2}}{20}$ |
| | $-\frac{\sqrt{2}i}{20}$ | 0 0 0 0 0 $\frac{3\sqrt{30}i}{160}$ $\frac{\sqrt{30}}{40}$ 0 0 0 0 $-\frac{3\sqrt{2}i}{32}$ $-\frac{\sqrt{2}}{20}$ 0 |
| 668 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|----------------------------|---|
| $\mathbb{G}_{4,0}^{(1,0;a)}(E, 1)$ | 0 | $-\frac{3\sqrt{42}i}{140}$ |
| | $-\frac{3\sqrt{42}i}{140}$ | 0 |
| | 0 | $-\frac{\sqrt{14}i}{28}$ |
| | $-\frac{\sqrt{14}i}{28}$ | 0 |
| | 0 | $\frac{\sqrt{210}i}{280}$ |
| | 0 | $\frac{\sqrt{210}i}{280}$ |
| | $-\frac{\sqrt{14}i}{80}$ | 0 |
| | 0 | $\frac{\sqrt{14}i}{80}$ |
| | 0 | $-\frac{3\sqrt{210}i}{1120}$ |
| | 0 | $\frac{3\sqrt{210}i}{1120}$ |
| 669 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{G}_{4,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{3\sqrt{42}}{140}$ |
| | $-\frac{3\sqrt{42}}{140}$ | 0 |
| | 0 | $-\frac{\sqrt{14}}{28}$ |
| | $\frac{\sqrt{14}}{28}$ | 0 |
| | $\frac{\sqrt{14}i}{80}$ | 0 |
| | 0 | $-\frac{\sqrt{210}}{70}$ |
| | 0 | $\frac{3\sqrt{210}i}{1120}$ |
| | 0 | $-\frac{3\sqrt{210}i}{1120}$ |
| | 0 | $\frac{3\sqrt{210}i}{1120}$ |
| | 0 | $-\frac{3\sqrt{210}i}{1120}$ |
| 670 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|---|
| $\mathbb{G}_{4,0}^{(1,0;a)}(E, 2)$ | 0 0 0 $-\frac{3\sqrt{5}i}{80}$ 0 $-\frac{3\sqrt{5}}{80}$ 0 0 0 $\frac{3\sqrt{3}i}{80}$ 0 $-\frac{3\sqrt{3}}{80}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{5}i}{80}$ 0 $\frac{3\sqrt{5}}{80}$ 0 0 0 $\frac{3\sqrt{3}i}{80}$ 0 $\frac{3\sqrt{3}}{80}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{15}i}{80}$ 0 $\frac{\sqrt{15}}{80}$ 0 0 0 $-\frac{i}{16}$ 0 $-\frac{1}{16}$ $-\frac{i}{5}$ 0 | |
| | 0 0 $-\frac{\sqrt{15}i}{80}$ 0 $-\frac{\sqrt{15}}{80}$ 0 0 0 $-\frac{i}{16}$ 0 $\frac{1}{16}$ 0 0 $\frac{i}{5}$ | |
| | 0 $\frac{i}{40}$ 0 0 $\frac{\sqrt{15}i}{20}$ 0 0 0 0 $\frac{3i}{20}$ 0 0 0 $\frac{1}{40}$ | |
| | $\frac{i}{40}$ 0 0 0 0 $-\frac{\sqrt{15}i}{20}$ 0 0 0 0 0 $-\frac{3i}{20}$ $-\frac{1}{40}$ 0 | |
| | 0 $\frac{1}{40}$ $\frac{\sqrt{15}i}{20}$ 0 0 0 0 0 $-\frac{3i}{20}$ 0 0 0 0 $-\frac{i}{40}$ | |
| | $-\frac{1}{40}$ 0 0 $-\frac{\sqrt{15}i}{20}$ 0 0 0 0 $\frac{3i}{20}$ 0 0 0 $-\frac{i}{40}$ 0 | |
| | $\frac{i}{5}$ 0 0 $\frac{\sqrt{15}}{80}$ 0 $\frac{\sqrt{15}i}{80}$ 0 0 0 $\frac{1}{16}$ 0 $-\frac{i}{16}$ 0 0 | |
| | 0 $-\frac{i}{5}$ $-\frac{\sqrt{15}}{80}$ 0 $\frac{\sqrt{15}i}{80}$ 0 0 0 $-\frac{i}{16}$ 0 $-\frac{i}{16}$ 0 0 0 | |
| 671 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| $\mathbb{G}_{4,1}^{(1,0;a)}(E, 2)$ | 0 0 0 $-\frac{3\sqrt{5}}{80}$ 0 $\frac{3\sqrt{5}i}{80}$ 0 0 0 $\frac{3\sqrt{3}}{80}$ 0 $\frac{3\sqrt{3}i}{80}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{5}}{80}$ 0 $\frac{3\sqrt{5}i}{80}$ 0 0 0 $-\frac{3\sqrt{3}}{80}$ 0 $\frac{3\sqrt{3}i}{80}$ 0 0 0 | |
| | $-\frac{i}{5}$ 0 0 $-\frac{\sqrt{15}}{80}$ 0 $-\frac{\sqrt{15}i}{80}$ 0 0 0 $-\frac{1}{16}$ 0 $\frac{i}{16}$ 0 0 | |
| | 0 $\frac{i}{5}$ $\frac{\sqrt{15}}{80}$ 0 $-\frac{\sqrt{15}i}{80}$ 0 0 0 $\frac{1}{16}$ 0 $\frac{i}{16}$ 0 0 0 | |
| | 0 $\frac{1}{40}$ $\frac{\sqrt{15}i}{20}$ 0 0 0 0 0 $-\frac{3i}{20}$ 0 0 0 0 $-\frac{i}{40}$ | |
| | $-\frac{1}{40}$ 0 0 $-\frac{\sqrt{15}i}{20}$ 0 0 0 0 $\frac{3i}{20}$ 0 0 0 $-\frac{i}{40}$ 0 | |
| | 0 $-\frac{i}{40}$ 0 0 $-\frac{\sqrt{15}i}{20}$ 0 0 0 0 0 $-\frac{3i}{20}$ 0 0 0 $-\frac{1}{40}$ | |
| | $-\frac{i}{40}$ 0 0 0 0 $\frac{\sqrt{15}i}{20}$ 0 0 0 0 0 $\frac{3i}{20}$ $\frac{1}{40}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{15}i}{80}$ 0 $\frac{\sqrt{15}}{80}$ 0 0 0 $-\frac{i}{16}$ 0 $-\frac{1}{16}$ $-\frac{i}{5}$ 0 | |
| | 0 0 $-\frac{\sqrt{15}i}{80}$ 0 $-\frac{\sqrt{15}}{80}$ 0 0 0 $-\frac{i}{16}$ 0 $\frac{1}{16}$ 0 0 $\frac{i}{5}$ | |
| 672 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|------------------------------|---|
| $\mathbb{G}_{4,0}^{(1,0;a)}(E, 3)$ | $\sqrt{5}xy(x^2+y^2-6z^2)/2$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{35}i}{280} & 0 & \frac{3\sqrt{35}}{280} & 0 & 0 & 0 & \frac{9\sqrt{21}i}{280} & 0 & \frac{9\sqrt{21}}{280} & \frac{\sqrt{21}i}{35} & 0 \\ 0 & 0 & -\frac{3\sqrt{35}i}{280} & 0 & -\frac{3\sqrt{35}}{280} & 0 & 0 & 0 & 0 & \frac{9\sqrt{21}i}{280} & 0 & -\frac{9\sqrt{21}}{280} & 0 & -\frac{\sqrt{21}i}{35} \\ 0 & 0 & 0 & -\frac{\sqrt{105}i}{280} & 0 & -\frac{\sqrt{105}}{280} & -\frac{\sqrt{105}i}{70} & 0 & 0 & \frac{\sqrt{7}i}{280} & 0 & -\frac{\sqrt{7}}{280} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{105}i}{280} & 0 & \frac{\sqrt{105}}{280} & 0 & 0 & 0 & \frac{\sqrt{105}i}{70} & \frac{\sqrt{7}i}{280} & 0 & \frac{\sqrt{7}}{280} & 0 & 0 \\ 0 & \frac{\sqrt{7}i}{20} & 0 & 0 & \frac{\sqrt{105}i}{280} & 0 & 0 & 0 & -\frac{3\sqrt{105}}{280} & 0 & 0 & \frac{\sqrt{7}i}{40} & 0 & 0 \\ \frac{\sqrt{7}i}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{280} & \frac{3\sqrt{105}}{280} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{40} & -\frac{\sqrt{7}}{40} & 0 \\ 0 & -\frac{\sqrt{7}}{20} & -\frac{\sqrt{105}i}{280} & 0 & 0 & 0 & 0 & \frac{3\sqrt{105}i}{280} & \frac{\sqrt{7}i}{40} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{40} & 0 \\ \frac{\sqrt{7}}{20} & 0 & 0 & \frac{\sqrt{105}i}{280} & 0 & 0 & \frac{3\sqrt{105}i}{280} & 0 & 0 & -\frac{\sqrt{7}i}{40} & 0 & 0 & \frac{\sqrt{7}i}{40} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{105}i}{70} & 0 & 0 & 0 & -\frac{\sqrt{7}}{20} & 0 & -\frac{\sqrt{7}i}{20} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{105}i}{70} & 0 & 0 & 0 & \frac{\sqrt{7}}{20} & 0 & -\frac{\sqrt{7}i}{20} & 0 & 0 & 0 \end{bmatrix}$ |
| | 673 | symmetry |
| | $\sqrt{5}xy(x^2+y^2-6z^2)/2$ | $\begin{bmatrix} -\frac{\sqrt{21}i}{35} & 0 & 0 & -\frac{3\sqrt{35}}{112} & 0 & -\frac{3\sqrt{35}i}{112} & 0 & 0 & 0 & \frac{3\sqrt{21}}{560} & 0 & -\frac{3\sqrt{21}i}{560} & 0 & 0 \\ 0 & \frac{\sqrt{21}i}{35} & \frac{3\sqrt{35}}{112} & 0 & -\frac{3\sqrt{35}i}{112} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{21}}{560} & 0 & -\frac{3\sqrt{21}i}{560} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{112} & 0 & \frac{\sqrt{105}i}{112} & 0 & 0 & 0 & -\frac{37\sqrt{7}}{560} & 0 & -\frac{37\sqrt{7}i}{560} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{105}}{112} & 0 & \frac{\sqrt{105}i}{112} & 0 & 0 & 0 & 0 & \frac{37\sqrt{7}}{560} & 0 & -\frac{37\sqrt{7}i}{560} & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{40} & -\frac{\sqrt{105}i}{140} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{105}i}{280} & \frac{\sqrt{7}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{20} \\ \frac{\sqrt{7}}{40} & 0 & 0 & \frac{\sqrt{105}i}{140} & 0 & 0 & 0 & -\frac{3\sqrt{105}i}{280} & 0 & 0 & -\frac{\sqrt{7}i}{140} & 0 & 0 & \frac{\sqrt{7}i}{20} & 0 \\ 0 & -\frac{\sqrt{7}i}{40} & 0 & 0 & -\frac{\sqrt{105}i}{140} & 0 & 0 & -\frac{3\sqrt{105}}{280} & 0 & 0 & 0 & -\frac{\sqrt{7}i}{140} & 0 & 0 & -\frac{\sqrt{7}}{20} \\ -\frac{\sqrt{7}i}{40} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{140} & \frac{3\sqrt{105}}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{140} & \frac{\sqrt{7}}{20} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}i}{560} & 0 & -\frac{\sqrt{105}}{560} & \frac{\sqrt{105}i}{70} & 0 & 0 & \frac{\sqrt{7}i}{80} & 0 & -\frac{\sqrt{7}}{80} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{105}i}{560} & 0 & \frac{\sqrt{105}}{560} & 0 & 0 & -\frac{\sqrt{105}i}{70} & \frac{\sqrt{7}i}{80} & 0 & \frac{\sqrt{7}}{80} & 0 & 0 & 0 \end{bmatrix}$ |
| | 674 | symmetry |
| 1 | | |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------|--|--|
| $\mathbb{G}_0^{(1,1;a)}(A_1)$ | 0 0 0 $-\frac{\sqrt{105}i}{140}$ 0 $-\frac{\sqrt{105}}{140}$ $\frac{\sqrt{105}i}{70}$ 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{105}i}{140}$ 0 $\frac{\sqrt{105}}{140}$ 0 0 $-\frac{\sqrt{105}i}{70}$ $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{35}i}{140}$ 0 $-\frac{3\sqrt{35}}{140}$ 0 0 0 $-\frac{\sqrt{21}i}{84}$ 0 $-\frac{\sqrt{21}}{84}$ $\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 0 $\frac{3\sqrt{35}i}{140}$ 0 $\frac{3\sqrt{35}}{140}$ 0 0 0 $-\frac{\sqrt{21}i}{84}$ 0 $\frac{\sqrt{21}}{84}$ 0 0 $-\frac{\sqrt{21}i}{42}$ | |
| | 0 $\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{70}$ 0 0 $-\frac{\sqrt{35}}{70}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 $-\frac{\sqrt{21}}{42}$ | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 0 $\frac{\sqrt{35}i}{70}$ $\frac{\sqrt{35}}{70}$ 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{21}}{42}$ 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{35}i}{70}$ 0 0 0 0 $-\frac{\sqrt{35}i}{70}$ $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ | |
| | $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}i}{70}$ 0 0 $-\frac{\sqrt{35}i}{70}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}}{70}$ 0 $-\frac{\sqrt{35}i}{70}$ 0 0 0 $\frac{\sqrt{21}}{42}$ 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{35}}{70}$ 0 $-\frac{\sqrt{35}i}{70}$ 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 | |
| 675 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| $\mathbb{G}_2^{(1,1;a)}(A_1)$ | 0 0 0 $-\frac{3\sqrt{35}i}{280}$ 0 $-\frac{3\sqrt{35}}{280}$ $\frac{\sqrt{35}i}{35}$ 0 0 $-\frac{\sqrt{21}i}{56}$ 0 $\frac{\sqrt{21}}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{35}i}{280}$ 0 $\frac{3\sqrt{35}}{280}$ 0 0 $-\frac{\sqrt{35}i}{35}$ $-\frac{\sqrt{21}i}{56}$ 0 $-\frac{\sqrt{21}}{56}$ 0 0 0 | |
| | 0 0 0 $-\frac{11\sqrt{105}i}{840}$ 0 $\frac{11\sqrt{105}}{840}$ 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ $-\frac{\sqrt{7}i}{14}$ 0 | |
| | 0 0 $-\frac{11\sqrt{105}i}{840}$ 0 $-\frac{11\sqrt{105}}{840}$ 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{56}$ 0 0 $\frac{\sqrt{7}i}{14}$ | |
| | 0 $\frac{\sqrt{7}i}{28}$ 0 0 $-\frac{\sqrt{105}i}{280}$ 0 0 $\frac{\sqrt{105}}{210}$ 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 $-\frac{\sqrt{7}}{28}$ | |
| | $\frac{\sqrt{7}i}{28}$ 0 0 0 $\frac{\sqrt{105}i}{280}$ $-\frac{\sqrt{105}}{210}$ 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ $\frac{\sqrt{7}}{28}$ 0 | |
| | 0 $\frac{\sqrt{7}}{28}$ $-\frac{\sqrt{105}i}{280}$ 0 0 0 $\frac{\sqrt{105}i}{210}$ $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ | |
| | $-\frac{\sqrt{7}}{28}$ 0 0 $\frac{\sqrt{105}i}{280}$ 0 0 $\frac{\sqrt{105}}{210}$ 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 | |
| | $-\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{105}}{840}$ 0 $-\frac{\sqrt{105}i}{840}$ 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{7}i}{14}$ $\frac{\sqrt{105}}{840}$ 0 $-\frac{\sqrt{105}i}{840}$ 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 | |
| 676 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--------------------------------|
| $\mathbb{G}_{2,0}^{(1,1;a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{105}i}{140}$ 0 0 $-\frac{\sqrt{105}}{105}$ 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{105}i}{140}$ $\frac{\sqrt{105}}{105}$ 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 | |
| | 0 0 0 0 $\frac{11\sqrt{35}i}{420}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}i}{84}$ 0 0 $\frac{\sqrt{21}}{42}$ | |
| | 0 0 0 0 0 $-\frac{11\sqrt{35}i}{420}$ $-\frac{\sqrt{35}}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{84}$ $-\frac{\sqrt{21}}{42}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{105}$ $\frac{\sqrt{35}i}{105}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 0 $-\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}}{105}$ 0 0 $-\frac{\sqrt{35}i}{105}$ 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}}{420}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $\frac{\sqrt{21}}{28}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{35}}{420}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $-\frac{\sqrt{21}}{28}$ 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{35}i}{420}$ 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{21}i}{28}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}i}{420}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 0 0 | |
| 677 | symmetry | $-\sqrt{3}xz$ |
| $\mathbb{G}_{2,1}^{(1,1;a)}(E, 1)$ | 0 0 $\frac{\sqrt{105}i}{140}$ 0 0 0 0 $\frac{\sqrt{105}i}{105}$ $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{105}i}{140}$ 0 0 $\frac{\sqrt{105}i}{105}$ 0 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 | |
| | 0 0 $\frac{11\sqrt{35}i}{420}$ 0 0 0 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{21}i}{84}$ 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ | |
| | 0 0 0 $-\frac{11\sqrt{35}i}{420}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{84}$ 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 $\frac{\sqrt{35}i}{420}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 | |
| | 0 $\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{35}}{42}$ 0 $\frac{\sqrt{35}i}{420}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{35}i}{105}$ 0 $\frac{\sqrt{35}}{42}$ $-\frac{\sqrt{35}i}{105}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 0 $-\frac{\sqrt{35}i}{105}$ 0 $-\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{35}i}{105}$ $\frac{\sqrt{21}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ | |
| | 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}i}{420}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}i}{28}$ 0 0 0 0 | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 $-\frac{\sqrt{35}i}{420}$ $-\frac{\sqrt{35}}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 | |
| 678 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|---|
| $\mathbb{G}_{2,0}^{(1,1;a)}(E, 2)$ | 0 0 0 $-\frac{11\sqrt{105}i}{840}$ 0 $\frac{11\sqrt{105}}{840}$ 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 | |
| | 0 0 $-\frac{11\sqrt{105}i}{840}$ 0 $-\frac{11\sqrt{105}}{840}$ 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 | |
| | 0 0 0 $\frac{13\sqrt{35}i}{840}$ 0 $\frac{13\sqrt{35}}{840}$ $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{21}i}{56}$ 0 $-\frac{\sqrt{21}}{56}$ 0 0 0 | |
| | 0 0 $\frac{13\sqrt{35}i}{840}$ 0 $-\frac{13\sqrt{35}}{840}$ 0 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{21}i}{56}$ 0 $\frac{\sqrt{21}}{56}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{28}$ 0 0 $-\frac{\sqrt{35}i}{168}$ 0 0 $\frac{\sqrt{35}}{420}$ 0 0 $-\frac{5\sqrt{21}i}{168}$ 0 0 $\frac{\sqrt{21}}{42}$ | |
| | $-\frac{\sqrt{21}i}{28}$ 0 0 0 $\frac{\sqrt{35}i}{168}$ $-\frac{\sqrt{35}}{420}$ 0 0 0 0 $\frac{5\sqrt{21}i}{168}$ $-\frac{\sqrt{21}}{42}$ 0 | |
| | 0 $\frac{\sqrt{21}}{28}$ $\frac{\sqrt{35}i}{168}$ 0 0 0 0 $-\frac{\sqrt{35}i}{420}$ $-\frac{5\sqrt{21}i}{168}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ | |
| | $-\frac{\sqrt{21}}{28}$ 0 0 $-\frac{\sqrt{35}i}{168}$ 0 0 $-\frac{\sqrt{35}i}{420}$ 0 0 $\frac{5\sqrt{21}i}{168}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 0 0 $\frac{\sqrt{35}}{120}$ 0 $-\frac{\sqrt{35}i}{120}$ 0 0 0 $\frac{\sqrt{21}}{168}$ 0 $\frac{\sqrt{21}i}{168}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{35}}{120}$ 0 $-\frac{\sqrt{35}i}{120}$ 0 0 0 $-\frac{\sqrt{21}}{168}$ 0 $\frac{\sqrt{21}i}{168}$ 0 0 0 | |
| 679 | symmetry | $-\sqrt{3}xy$ |
| $\mathbb{G}_{2,1}^{(1,1;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{105}}{60}$ 0 $-\frac{\sqrt{105}i}{60}$ 0 0 0 $\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}}{60}$ 0 $-\frac{\sqrt{105}i}{60}$ 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{35}}{420}$ 0 $-\frac{\sqrt{35}i}{420}$ 0 0 0 $\frac{\sqrt{21}}{84}$ 0 $\frac{\sqrt{21}i}{84}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{35}}{420}$ 0 $-\frac{\sqrt{35}i}{420}$ 0 0 0 $-\frac{\sqrt{21}}{84}$ 0 $\frac{\sqrt{21}i}{84}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{21}}{42}$ $\frac{\sqrt{35}i}{42}$ 0 0 0 0 $\frac{\sqrt{35}i}{420}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{28}$ | |
| | $\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}i}{420}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{28}$ 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}}{420}$ 0 0 0 0 0 $\frac{\sqrt{21}}{28}$ | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{35}}{420}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{28}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}i}{105}$ 0 $-\frac{\sqrt{35}}{105}$ $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{21}}{42}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{35}i}{105}$ 0 $\frac{\sqrt{35}}{105}$ 0 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 | |
| 680 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|--|-------------------|
| $\mathbb{G}_4^{(1,1;a)}(A_1, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{462}i}{616} & 0 & -\frac{3\sqrt{462}}{616} & \frac{5\sqrt{462}i}{462} & 0 & 0 & -\frac{3\sqrt{770}i}{616} & 0 & \frac{3\sqrt{770}}{616} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{462}i}{616} & 0 & \frac{3\sqrt{462}}{616} & 0 & 0 & -\frac{5\sqrt{462}i}{462} & -\frac{3\sqrt{770}i}{616} & 0 & -\frac{3\sqrt{770}}{616} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{154}i}{308} & 0 & -\frac{\sqrt{154}}{308} & 0 & 0 & 0 & \frac{\sqrt{2310}i}{1540} & 0 & \frac{\sqrt{2310}}{1540} & \frac{\sqrt{2310}i}{924} & 0 \\ 0 & 0 & \frac{\sqrt{154}i}{308} & 0 & \frac{\sqrt{154}}{308} & 0 & 0 & 0 & \frac{\sqrt{2310}i}{1540} & 0 & -\frac{\sqrt{2310}}{1540} & 0 & 0 & -\frac{\sqrt{2310}i}{924} \\ 0 & -\frac{\sqrt{2310}i}{770} & 0 & 0 & \frac{5\sqrt{154}i}{616} & 0 & 0 & \frac{\sqrt{154}}{77} & 0 & 0 & -\frac{5\sqrt{2310}i}{1848} & 0 & 0 & \frac{\sqrt{2310}}{770} \\ -\frac{\sqrt{2310}i}{770} & 0 & 0 & 0 & 0 & -\frac{5\sqrt{154}i}{616} & -\frac{\sqrt{154}}{77} & 0 & 0 & 0 & 0 & \frac{5\sqrt{2310}i}{1848} & -\frac{\sqrt{2310}}{770} & 0 \\ 0 & -\frac{\sqrt{2310}}{770} & \frac{5\sqrt{154}i}{616} & 0 & 0 & 0 & 0 & \frac{\sqrt{154}i}{77} & \frac{5\sqrt{2310}i}{1848} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2310}i}{770} \\ \frac{\sqrt{2310}}{770} & 0 & 0 & -\frac{5\sqrt{154}i}{616} & 0 & 0 & \frac{\sqrt{154}i}{77} & 0 & 0 & -\frac{5\sqrt{2310}i}{1848} & 0 & 0 & -\frac{\sqrt{2310}i}{770} & 0 \\ \frac{\sqrt{2310}i}{924} & 0 & 0 & \frac{\sqrt{154}}{616} & 0 & \frac{\sqrt{154}i}{616} & 0 & 0 & 0 & \frac{3\sqrt{2310}}{3080} & 0 & -\frac{3\sqrt{2310}i}{3080} & 0 & 0 \\ 0 & -\frac{\sqrt{2310}i}{924} & -\frac{\sqrt{154}}{616} & 0 & \frac{\sqrt{154}i}{616} & 0 & 0 & 0 & -\frac{3\sqrt{2310}}{3080} & 0 & -\frac{3\sqrt{2310}i}{3080} & 0 & 0 & 0 \end{bmatrix}$ | |
| | 681 | symmetry |
| | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ | |
| | $\begin{bmatrix} 0 & -\frac{3\sqrt{11}i}{220} & 0 & 0 & -\frac{\sqrt{165}i}{165} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{11}i}{55} & 0 & 0 & -\frac{3\sqrt{11}}{220} \\ -\frac{3\sqrt{11}i}{220} & 0 & 0 & 0 & 0 & \frac{\sqrt{165}i}{165} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{11}i}{55} & \frac{3\sqrt{11}}{220} & 0 \\ 0 & \frac{3\sqrt{33}i}{110} & 0 & 0 & -\frac{\sqrt{55}i}{110} & 0 & 0 & -\frac{\sqrt{55}}{220} & 0 & 0 & \frac{\sqrt{33}i}{66} & 0 & 0 & -\frac{3\sqrt{33}}{110} \\ \frac{3\sqrt{33}i}{110} & 0 & 0 & 0 & 0 & \frac{\sqrt{55}i}{110} & \frac{\sqrt{55}}{220} & 0 & 0 & 0 & 0 & -\frac{\sqrt{33}i}{66} & \frac{3\sqrt{33}}{110} & 0 \\ 0 & 0 & 0 & \frac{7\sqrt{55}i}{440} & 0 & -\frac{\sqrt{55}}{55} & 0 & 0 & 0 & -\frac{3\sqrt{33}i}{440} & 0 & -\frac{\sqrt{33}}{110} & \frac{4\sqrt{33}i}{165} & 0 \\ 0 & 0 & 0 & \frac{7\sqrt{55}i}{440} & 0 & \frac{\sqrt{55}}{55} & 0 & 0 & 0 & -\frac{3\sqrt{33}i}{440} & 0 & \frac{\sqrt{33}}{110} & 0 & -\frac{4\sqrt{33}i}{165} \\ \frac{4\sqrt{33}i}{165} & 0 & 0 & -\frac{\sqrt{55}}{110} & 0 & -\frac{\sqrt{55}i}{88} & 0 & 0 & 0 & \frac{\sqrt{33}}{55} & 0 & -\frac{9\sqrt{33}i}{440} & 0 & 0 \\ 0 & -\frac{4\sqrt{33}i}{165} & \frac{\sqrt{55}}{110} & 0 & -\frac{\sqrt{55}i}{88} & 0 & 0 & 0 & -\frac{\sqrt{33}}{55} & 0 & -\frac{9\sqrt{33}i}{440} & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{33}}{110} & -\frac{\sqrt{55}i}{110} & 0 & 0 & 0 & 0 & -\frac{\sqrt{55}i}{220} & -\frac{\sqrt{33}i}{66} & 0 & 0 & 0 & 0 & \frac{3\sqrt{33}i}{110} \\ -\frac{3\sqrt{33}}{110} & 0 & 0 & \frac{\sqrt{55}i}{110} & 0 & 0 & -\frac{\sqrt{55}i}{220} & 0 & 0 & \frac{\sqrt{33}i}{66} & 0 & 0 & \frac{3\sqrt{33}i}{110} & 0 \end{bmatrix}$ | |
| | 682 | symmetry |
| | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ | |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------------------------|---|
| $\mathbb{G}_4^{(1,1;a)}(A_2)$ | 0 | $\frac{3\sqrt{11}}{220} \quad \frac{\sqrt{165}i}{165} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{11}i}{55} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{11}i}{220}$ |
| | $-\frac{3\sqrt{11}}{220}$ | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{165}i}{165} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{11}i}{55} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{11}i}{220} \quad 0$ |
| | 0 | $\frac{3\sqrt{33}}{110} \quad -\frac{\sqrt{55}i}{110} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{55}i}{220} \quad -\frac{\sqrt{33}i}{66} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{33}i}{110} \quad 0$ |
| | $-\frac{3\sqrt{33}}{110}$ | $0 \quad 0 \quad \frac{\sqrt{55}i}{110} \quad 0 \quad 0 \quad -\frac{\sqrt{55}i}{220} \quad 0 \quad 0 \quad \frac{\sqrt{33}i}{66} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{33}i}{110} \quad 0$ |
| | $-\frac{4\sqrt{33}i}{165}$ | $0 \quad 0 \quad \frac{\sqrt{55}}{88} \quad 0 \quad \frac{\sqrt{55}i}{110} \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{33}}{440} \quad 0 \quad \frac{\sqrt{33}i}{55} \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{4\sqrt{33}i}{165} \quad -\frac{\sqrt{55}}{88} \quad 0 \quad \frac{\sqrt{55}i}{110} \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{33}}{440} \quad 0 \quad \frac{\sqrt{33}i}{55} \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{\sqrt{55}i}{55} \quad 0 \quad -\frac{7\sqrt{55}}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{33}i}{110} \quad 0 \quad -\frac{3\sqrt{33}}{440} \quad \frac{4\sqrt{33}i}{165} \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{55}i}{55} \quad 0 \quad \frac{7\sqrt{55}}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{33}i}{110} \quad 0 \quad \frac{3\sqrt{33}}{440} \quad 0 \quad 0 \quad -\frac{4\sqrt{33}i}{165}$ |
| | 0 | $0 \quad -\frac{3\sqrt{33}i}{110} \quad 0 \quad 0 \quad \frac{\sqrt{55}i}{110} \quad 0 \quad 0 \quad \frac{\sqrt{55}}{220} \quad 0 \quad 0 \quad -\frac{\sqrt{33}i}{66} \quad 0 \quad 0 \quad \frac{3\sqrt{33}}{110}$ |
| | $-\frac{3\sqrt{33}i}{110}$ | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{55}i}{110} \quad -\frac{\sqrt{55}}{220} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{33}i}{66} \quad -\frac{3\sqrt{33}}{110} \quad 0$ |
| 683 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{G}_{4,0}^{(1,1;a)}(E, 1)$ | 0 | $\frac{3\sqrt{77}i}{220} \quad 0 \quad 0 \quad -\frac{3\sqrt{1155}i}{770} \quad 0 \quad 0 \quad -\frac{\sqrt{1155}}{231} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{77}i}{154} \quad 0 \quad 0 \quad -\frac{3\sqrt{77}}{220}$ |
| | $\frac{3\sqrt{77}i}{220}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{1155}i}{770} \quad \frac{\sqrt{1155}}{231} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{77}i}{154} \quad \frac{3\sqrt{77}}{220} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{385}i}{385} \quad 0 \quad 0 \quad -\frac{\sqrt{385}}{220} \quad 0 \quad 0 \quad \frac{\sqrt{231}i}{385} \quad 0 \quad 0 \quad -\frac{\sqrt{231}}{462}$ |
| | 0 | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}i}{385} \quad \frac{\sqrt{385}}{220} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{231}i}{385} \quad \frac{\sqrt{231}}{462} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{385}i}{440} \quad 0 \quad -\frac{3\sqrt{385}}{385} \quad \frac{4\sqrt{385}i}{385} \quad 0 \quad 0 \quad -\frac{3\sqrt{231}i}{440} \quad 0 \quad \frac{23\sqrt{231}}{2310} \quad \frac{2\sqrt{231}i}{385} \quad 0$ |
| | 0 | $0 \quad 0 \quad -\frac{\sqrt{385}i}{440} \quad 0 \quad \frac{3\sqrt{385}}{385} \quad 0 \quad 0 \quad -\frac{4\sqrt{385}i}{385} \quad -\frac{3\sqrt{231}i}{440} \quad 0 \quad -\frac{23\sqrt{231}}{2310} \quad 0 \quad 0 \quad -\frac{2\sqrt{231}i}{385}$ |
| | $-\frac{2\sqrt{231}i}{385}$ | $0 \quad 0 \quad \frac{\sqrt{385}}{770} \quad 0 \quad -\frac{\sqrt{385}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{231}}{1155} \quad 0 \quad \frac{3\sqrt{231}i}{440} \quad 0 \quad 0$ |
| | 0 | $\frac{2\sqrt{231}i}{385} \quad -\frac{\sqrt{385}}{770} \quad 0 \quad -\frac{\sqrt{385}i}{440} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{231}}{1155} \quad 0 \quad \frac{3\sqrt{231}i}{440} \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad -\frac{\sqrt{231}}{462} \quad \frac{\sqrt{385}i}{770} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}i}{220} \quad \frac{3\sqrt{231}i}{770} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ |
| | $\frac{\sqrt{231}}{462}$ | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{385}i}{770} \quad 0 \quad 0 \quad \frac{\sqrt{385}i}{220} \quad 0 \quad 0 \quad -\frac{3\sqrt{231}i}{770} \quad 0 \quad 0 \quad 0 \quad 0$ |
| 684 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|------------------------------------|---|
| $\mathbb{G}_{4,1}^{(1,1;a)}(E, 1)$ | 0 | $\begin{bmatrix} 0 & -\frac{3\sqrt{77}}{220} & \frac{3\sqrt{1155}i}{770} & 0 & 0 & 0 & 0 & \frac{\sqrt{1155}i}{231} & \frac{3\sqrt{77}i}{154} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{77}i}{220} \\ \frac{3\sqrt{77}}{220} & 0 & 0 & -\frac{3\sqrt{1155}i}{770} & 0 & 0 & \frac{\sqrt{1155}i}{231} & 0 & 0 & -\frac{3\sqrt{77}i}{154} & 0 & 0 & -\frac{3\sqrt{77}i}{220} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{385}i}{385} & 0 & 0 & 0 & 0 & -\frac{\sqrt{385}i}{220} & -\frac{\sqrt{231}i}{385} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{231}i}{462} \\ 0 & 0 & 0 & \frac{\sqrt{385}i}{385} & 0 & 0 & -\frac{\sqrt{385}i}{220} & 0 & 0 & \frac{\sqrt{231}i}{385} & 0 & 0 & \frac{\sqrt{231}i}{462} & 0 & 0 \\ \frac{2\sqrt{231}i}{385} & 0 & 0 & \frac{\sqrt{385}}{440} & 0 & -\frac{\sqrt{385}i}{770} & 0 & 0 & 0 & \frac{3\sqrt{231}}{440} & 0 & -\frac{\sqrt{231}i}{1155} & 0 & 0 \\ 0 & -\frac{2\sqrt{231}i}{385} & -\frac{\sqrt{385}}{440} & 0 & -\frac{\sqrt{385}i}{770} & 0 & 0 & 0 & -\frac{3\sqrt{231}}{440} & 0 & -\frac{\sqrt{231}i}{1155} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{385}i}{385} & 0 & \frac{\sqrt{385}}{440} & -\frac{4\sqrt{385}i}{385} & 0 & 0 & \frac{23\sqrt{231}i}{2310} & 0 & -\frac{3\sqrt{231}}{440} & \frac{2\sqrt{231}i}{385} & 0 \\ 0 & 0 & \frac{3\sqrt{385}i}{385} & 0 & -\frac{\sqrt{385}}{440} & 0 & 0 & \frac{4\sqrt{385}i}{385} & \frac{23\sqrt{231}i}{2310} & 0 & \frac{3\sqrt{231}}{440} & 0 & 0 & -\frac{2\sqrt{231}i}{385} \\ 0 & \frac{\sqrt{231}i}{462} & 0 & 0 & -\frac{\sqrt{385}i}{770} & 0 & 0 & -\frac{\sqrt{385}}{220} & 0 & 0 & \frac{3\sqrt{231}i}{770} & 0 & 0 & 0 \\ \frac{\sqrt{231}i}{462} & 0 & 0 & 0 & 0 & \frac{\sqrt{385}i}{770} & \frac{\sqrt{385}}{220} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{231}i}{770} & 0 & 0 \end{bmatrix}$ |
| | 685 | symmetry |
| | | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| | $\mathbb{G}_{4,0}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{330}i}{1320} & 0 & -\frac{\sqrt{330}}{1320} & 0 & 0 & 0 & \frac{\sqrt{22}i}{440} & 0 & -\frac{\sqrt{22}}{440} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{330}i}{1320} & 0 & \frac{\sqrt{330}}{1320} & 0 & 0 & 0 & \frac{\sqrt{22}i}{440} & 0 & \frac{\sqrt{22}}{440} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{110}i}{55} & 0 & -\frac{\sqrt{110}}{55} & 0 & 0 & 0 & -\frac{\sqrt{66}i}{66} & 0 & -\frac{\sqrt{66}}{66} & \frac{3\sqrt{66}i}{220} & 0 \\ 0 & 0 & \frac{\sqrt{110}i}{55} & 0 & \frac{\sqrt{110}}{55} & 0 & 0 & 0 & -\frac{\sqrt{66}i}{66} & 0 & \frac{\sqrt{66}}{66} & 0 & 0 & -\frac{3\sqrt{66}i}{220} \\ 0 & \frac{\sqrt{66}i}{330} & 0 & 0 & \frac{3\sqrt{110}i}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{66}i}{440} & 0 & 0 & 0 & \frac{\sqrt{66}}{330} \\ \frac{\sqrt{66}i}{330} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{110}i}{440} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{66}i}{440} & -\frac{\sqrt{66}}{330} & 0 \\ 0 & \frac{\sqrt{66}}{330} & \frac{3\sqrt{110}i}{440} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{66}i}{440} & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}i}{330} \\ -\frac{\sqrt{66}}{330} & 0 & 0 & -\frac{3\sqrt{110}i}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{66}i}{440} & 0 & 0 & 0 & -\frac{\sqrt{66}i}{330} & 0 \\ -\frac{3\sqrt{66}i}{220} & 0 & 0 & \frac{7\sqrt{110}}{440} & 0 & \frac{7\sqrt{110}i}{440} & 0 & 0 & 0 & -\frac{5\sqrt{66}}{264} & 0 & \frac{5\sqrt{66}i}{264} & 0 & 0 \end{bmatrix}$ |
| | | symmetry |
| | | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{G}_{4,1}^{(1,1;a)}(E, 2)$ | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{1320} \quad 0 \quad \frac{\sqrt{330}i}{1320} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{22}}{440} \quad 0 \quad \frac{\sqrt{22}i}{440} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{330}}{1320} \quad 0 \quad \frac{\sqrt{330}i}{1320} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{440} \quad 0 \quad \frac{\sqrt{22}i}{440} \quad 0 \quad 0$ | |
| | $\frac{3\sqrt{66}i}{220} \quad 0 \quad 0 \quad -\frac{7\sqrt{110}}{440} \quad 0 \quad -\frac{7\sqrt{110}i}{440} \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{66}}{264} \quad 0 \quad -\frac{5\sqrt{66}i}{264} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{3\sqrt{66}i}{220} \quad \frac{7\sqrt{110}}{440} \quad 0 \quad -\frac{7\sqrt{110}i}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{5\sqrt{66}}{264} \quad 0 \quad -\frac{5\sqrt{66}i}{264} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{66}}{330} \quad \frac{3\sqrt{110}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{66}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{66}i}{330}$ | |
| | $-\frac{\sqrt{66}}{330} \quad 0 \quad 0 \quad -\frac{3\sqrt{110}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{66}i}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{66}i}{330}$ | |
| | $0 \quad -\frac{\sqrt{66}i}{330} \quad 0 \quad 0 \quad -\frac{3\sqrt{110}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{66}i}{440} \quad 0 \quad 0 \quad -\frac{\sqrt{66}}{330}$ | |
| | $-\frac{\sqrt{66}i}{330} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{110}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{66}i}{440} \quad \frac{\sqrt{66}}{330} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{110}i}{55} \quad 0 \quad -\frac{\sqrt{110}}{55} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{66}i}{66} \quad 0 \quad -\frac{\sqrt{66}}{66} \quad \frac{3\sqrt{66}i}{220} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{110}i}{55} \quad 0 \quad \frac{\sqrt{110}}{55} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{66}i}{66} \quad 0 \quad \frac{\sqrt{66}}{66} \quad 0 \quad 0 \quad -\frac{3\sqrt{66}i}{220}$ | |
| 687 symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ | |
| | $0 \quad 0 \quad 0 \quad \frac{23\sqrt{2310}i}{9240} \quad 0 \quad -\frac{23\sqrt{2310}}{9240} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{154}i}{3080} \quad 0 \quad \frac{\sqrt{154}}{3080} \quad \frac{3\sqrt{154}i}{220} \quad 0$ | |
| | $0 \quad 0 \quad \frac{23\sqrt{2310}i}{9240} \quad 0 \quad \frac{23\sqrt{2310}}{9240} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{154}i}{3080} \quad 0 \quad -\frac{\sqrt{154}}{3080} \quad 0 \quad 0 \quad -\frac{3\sqrt{154}i}{220}$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{9\sqrt{770}i}{3080} \quad 0 \quad -\frac{9\sqrt{770}}{3080} \quad \frac{\sqrt{770}i}{220} \quad 0 \quad 0 \quad -\frac{41\sqrt{462}i}{9240} \quad 0 \quad \frac{41\sqrt{462}}{9240} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{9\sqrt{770}i}{3080} \quad 0 \quad \frac{9\sqrt{770}}{3080} \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{220} \quad -\frac{41\sqrt{462}i}{9240} \quad 0 \quad -\frac{41\sqrt{462}}{9240} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{462}i}{210} \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{220} \quad 0 \quad 0 \quad \frac{\sqrt{770}}{385} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{462}i}{220} \quad 0 \quad 0 \quad \frac{17\sqrt{462}}{2310}$ | |
| | $-\frac{\sqrt{462}i}{210} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{220} \quad -\frac{\sqrt{770}}{385} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{462}i}{220} \quad -\frac{17\sqrt{462}}{2310} \quad 0$ | |
| | $0 \quad \frac{\sqrt{462}}{210} \quad -\frac{\sqrt{770}i}{220} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{385} \quad -\frac{\sqrt{462}i}{220} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{17\sqrt{462}i}{2310}$ | |
| | $-\frac{\sqrt{462}}{210} \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{220} \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{385} \quad 0 \quad 0 \quad \frac{\sqrt{462}i}{220} \quad 0 \quad 0 \quad \frac{17\sqrt{462}i}{2310} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{3\sqrt{770}}{1540} \quad 0 \quad \frac{3\sqrt{770}i}{1540} \quad 0 \quad 0 \quad 0 \quad -\frac{13\sqrt{462}}{4620} \quad 0 \quad -\frac{13\sqrt{462}i}{4620} \quad 0 \quad 0$ | |
| 688 symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ | |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--|
| $\mathbb{G}_{4,1}^{(1,1;a)}(E, 3)$ | $-\frac{3\sqrt{154}i}{220}$ | $0 \quad 0 \quad \frac{\sqrt{2310}}{1848} \quad 0 \quad \frac{\sqrt{2310}i}{1848} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{29\sqrt{154}}{3080} \quad 0 \quad \frac{29\sqrt{154}i}{3080} \quad 0 \quad 0$ |
| | $0 \quad \frac{3\sqrt{154}i}{220}$ | $-\frac{\sqrt{2310}}{1848} \quad 0 \quad \frac{\sqrt{2310}i}{1848} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{29\sqrt{154}}{3080} \quad 0 \quad \frac{29\sqrt{154}i}{3080} \quad 0 \quad 0 \quad 0$ |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{770}}{616} \quad 0 \quad \frac{\sqrt{770}i}{616} \quad 0 \quad 0 \quad 0 \quad -\frac{29\sqrt{462}}{9240} \quad 0 \quad -\frac{29\sqrt{462}i}{9240} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{770}}{616} \quad 0 \quad \frac{\sqrt{770}i}{616} \quad 0 \quad 0 \quad 0 \quad \frac{29\sqrt{462}}{9240} \quad 0 \quad -\frac{29\sqrt{462}i}{9240} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{17\sqrt{462}}{2310} \quad \frac{\sqrt{770}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{385} \quad \frac{3\sqrt{462}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{462}i}{210}$ | |
| | $\frac{17\sqrt{462}}{2310} \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{440} \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{385} \quad 0 \quad 0 \quad -\frac{3\sqrt{462}i}{440} \quad 0 \quad 0 \quad -\frac{\sqrt{462}i}{210} \quad 0$ | |
| | $0 \quad -\frac{17\sqrt{462}i}{2310} \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{440} \quad 0 \quad 0 \quad \frac{\sqrt{770}}{385} \quad 0 \quad 0 \quad -\frac{3\sqrt{462}i}{440} \quad 0 \quad 0 \quad \frac{\sqrt{462}}{210}$ | |
| | $-\frac{17\sqrt{462}i}{2310} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{440} \quad -\frac{\sqrt{770}}{385} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{462}i}{440} \quad -\frac{\sqrt{462}}{210} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{385} \quad 0 \quad \frac{\sqrt{770}}{385} \quad -\frac{\sqrt{770}i}{220} \quad 0 \quad 0 \quad \frac{\sqrt{462}i}{210} \quad 0 \quad -\frac{\sqrt{462}}{210} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{770}i}{385} \quad 0 \quad -\frac{\sqrt{770}}{385} \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{220} \quad \frac{\sqrt{462}i}{210} \quad 0 \quad \frac{\sqrt{462}}{210} \quad 0 \quad 0 \quad 0$ | |
| 689 | symmetry | z |
| $\mathbb{T}_1^{(a)}(A_2)$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{35}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{3\sqrt{35}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{7}i}{14} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{7}i}{14}$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{14} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{14} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}i}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}i}{70} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}i}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $\frac{\sqrt{7}i}{14} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{7}i}{14} \quad 0 \quad 0$ | |
| 690 | symmetry | x |

continued ...

Table 9

| No. | multipole | matrix |
|-----------------------------|---|--------|
| $\mathbb{T}_{1,0}^{(a)}(E)$ | $0 \ 0 \ -\frac{3\sqrt{35}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{21}i}{28} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ -\frac{3\sqrt{35}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{21}i}{28} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ \frac{3\sqrt{105}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{28} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ \frac{3\sqrt{105}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{28} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $\frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ \frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{7}i}{14} \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{7}i}{14}$ | |
| | $0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{14} \ 0 \ 0$ | |
| 691 symmetry | y | |
| | $0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{35}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{21}i}{28} \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{35}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{21}i}{28} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{105}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{28} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{105}i}{140} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{28} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{14} \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{7}i}{14}$ | |
| | $\frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ \frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ -\frac{\sqrt{105}i}{70} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{7}i}{14} \ 0 \ 0 \ 0 \ 0$ | |
| 692 symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ | |

continued ...

Table 9

| No. | multipole | matrix |
|-----|------------------------------|--|
| | $\mathbb{T}_3^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & -\frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 \end{bmatrix}$ |
| 693 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $\mathbb{T}_3^{(a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{15} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{15} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 694 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{T}_3^{(a)}(A_2, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{6}i}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{48} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{48} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} \\ \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{48} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
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| | | |
| 695 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{T}_{3,0}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{10}i}{80} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{10}i}{80} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{11\sqrt{30}i}{240} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{11\sqrt{30}i}{240} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{240} & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{240} & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}i}{16} & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
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| | | |
| | | |
| 696 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|--|----------------------------------|
| $\mathbb{T}_{3,1}^{(a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{10}i}{80}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{10}i}{80}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{11\sqrt{30}i}{240}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{11\sqrt{30}i}{240}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{30}i}{60}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{30}i}{60}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 | |
| | $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{30}i}{240}$ 0 0 0 0 0 $-\frac{3\sqrt{2}i}{16}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}i}{240}$ 0 0 0 0 0 $-\frac{3\sqrt{2}i}{16}$ 0 0 0 0 0 0 0 | |
| 697 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{T}_{3,0}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| 698 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---------------------------------|--|
| $\mathbb{T}_{3,1}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 699 symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ |
| | $\mathbb{T}_5^{(a)}(A_1)$ | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{12} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{15}i}{15} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{15}i}{15} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{15} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{15} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 \end{bmatrix}$ |
| 700 | symmetry | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ |

continued ..

Table 9

| No. | multipole | matrix |
|------------------------------|--|--|
| $\mathbb{T}_5^{(a)}(A_2, 1)$ | 0 0 0 0 0 0 $\frac{\sqrt{210}i}{42}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{210}i}{42}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{42}i}{84}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{42}i}{84}$ | |
| | 0 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 0 $-\frac{5\sqrt{42}i}{168}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $-\frac{5\sqrt{42}i}{168}$ 0 0 | |
| | 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 0 | |
| | $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 701 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ |
| $\mathbb{T}_5^{(a)}(A_2, 2)$ | 0 0 0 0 $-\frac{\sqrt{3}i}{12}$ 0 0 0 0 0 $-\frac{\sqrt{5}i}{20}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{3}i}{12}$ 0 0 0 0 0 $-\frac{\sqrt{5}i}{20}$ 0 0 | |
| | 0 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{15}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{15}$ | |
| | $\frac{\sqrt{15}i}{15}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{15}i}{15}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{i}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 | |
| 702 | symmetry | $\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{T}_{5,0}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| 703 | symmetry | $-\frac{3\sqrt{14}y(5x^4-10x^2y^2+y^4)}{16}$ |
| $\mathbb{T}_{5,1}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| | | |
| 704 | symmetry | $\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---|--|
| $\mathbb{T}_{5,0}^{(a)}(E, 2)$ | 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{140}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{140}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{70}i}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{70}i}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}i}{21}$ 0 0 0 0 0 0 $-\frac{\sqrt{70}i}{70}$ 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}i}{21}$ 0 0 0 0 0 0 $-\frac{\sqrt{70}i}{70}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 0 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 | |
| 705 | symmetry | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |
| $\mathbb{T}_{5,1}^{(a)}(E, 2)$ | 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{140}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{140}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}i}{21}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{70}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}i}{21}$ 0 0 0 0 0 0 $\frac{\sqrt{70}i}{70}$ 0 | |
| | $-\frac{\sqrt{70}i}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{70}i}{70}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 0 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 0 0 0 $\frac{3\sqrt{70}i}{280}$ 0 0 0 0 0 | |
| 706 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|--------------------------------|--|
| | $\mathbb{T}_{5,0}^{(a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 \end{bmatrix}$ |
| 707 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |
| | $\mathbb{T}_{5,1}^{(a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{40} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{40} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{40} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 708 | symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---|--|
| $\mathbb{T}_{5,0}^{(a)}(E, 4)$ | $\frac{\sqrt{30}i}{20} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{30}i}{20} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{6}i}{24} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{24} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{24} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{24} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{40} \quad 0 \quad 0 \quad 0$ | |
| 709 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |
| $\mathbb{T}_{5,1}^{(a)}(E, 4)$ | $0 \quad 0 \quad \frac{\sqrt{30}i}{20} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{30}i}{20}$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{12} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{20} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{20} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{12} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| 710 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----------------------------------|-----------|--|
| $\mathbb{T}_3^{(1,-1;a)}(A_1)$ | | $\begin{bmatrix} 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{28} \\ -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{56} & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
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| | | |
| $\mathbb{T}_3^{(1,-1;a)}(A_2, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{210}i}{280} & 0 & -\frac{\sqrt{210}}{280} & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{210}i}{280} & 0 & -\frac{\sqrt{210}}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 \\ \frac{\sqrt{42}}{28} & 0 & 0 & -\frac{\sqrt{70}i}{280} & 0 & \frac{\sqrt{70}}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{28} & \frac{\sqrt{70}i}{280} & 0 & \frac{\sqrt{70}}{280} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{56} & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{70}}{280} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{70} & \frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{70}}{280} & 0 & 0 & -\frac{\sqrt{70}}{70} & 0 & 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{70}}{280} & 0 & 0 & -\frac{\sqrt{70}i}{70} & 0 & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{70}}{280} & \frac{\sqrt{70}i}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{70}}{70} & 0 & \frac{\sqrt{70}i}{70} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{70}}{70} & 0 & -\frac{\sqrt{70}i}{70} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{28} & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | | |
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| | | |
| | | |
| | | |
| | | |
| 712 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--------------------------|--|
| $\mathbb{T}_3^{(1,-1;a)}(A_2, 2)$ | 0 | $\frac{\sqrt{35}i}{28}$ |
| | $-\frac{\sqrt{35}i}{28}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{35}}{28}$ |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 0 0 0 |
| 713 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{T}_{3,0}^{(1,-1;a)}(E, 1)$ | 0 | $\frac{\sqrt{21}}{84}$ 0 0 $\frac{\sqrt{35}}{70}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{21}i}{84}$ |
| | $\frac{\sqrt{21}}{84}$ | 0 0 0 0 $-\frac{\sqrt{35}}{70}$ 0 0 0 0 0 0 $\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{21}i}{84}$ 0 |
| | 0 | $\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{105}}{210}$ 0 0 0 $\frac{\sqrt{105}i}{420}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 |
| | $\frac{\sqrt{7}}{14}$ | 0 0 0 0 0 $\frac{\sqrt{105}}{210}$ $-\frac{\sqrt{105}i}{420}$ 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}}{168}$ 0 $-\frac{\sqrt{105}i}{210}$ $\frac{2\sqrt{105}}{105}$ 0 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{105}}{168}$ 0 $\frac{\sqrt{105}i}{210}$ 0 0 $-\frac{2\sqrt{105}}{105}$ $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}i}{210}$ 0 $-\frac{\sqrt{105}}{120}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}i}{210}$ 0 $-\frac{\sqrt{105}}{120}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ 0 0 0 |
| | 0 | 0 0 $-\frac{2\sqrt{105}}{105}$ 0 0 0 0 $\frac{\sqrt{105}}{420}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ |
| | 0 | 0 0 0 $\frac{2\sqrt{105}}{105}$ 0 0 $\frac{\sqrt{105}}{420}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 |
| 714 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |

continued ..

Table 9

| No. | multipole | matrix |
|-------------------------------------|--------------------------|---|
| $\mathbb{T}_{3,1}^{(1,-1;a)}(E, 1)$ | 0 | $\frac{\sqrt{21}i}{84} - \frac{\sqrt{35}}{70} 0 0 0 0 0 0 -\frac{\sqrt{21}}{42} 0 0 0 0 -\frac{\sqrt{21}}{84}$ |
| | $-\frac{\sqrt{21}i}{84}$ | $0 0 0 \frac{\sqrt{35}}{70} 0 0 0 0 0 \frac{\sqrt{21}}{42} 0 0 0 -\frac{\sqrt{21}}{84} 0$ |
| | 0 | $-\frac{\sqrt{7}i}{14} -\frac{\sqrt{105}}{210} 0 0 0 0 -\frac{\sqrt{105}}{420} \frac{\sqrt{7}}{14} 0 0 0 0 0 0$ |
| | $\frac{\sqrt{7}i}{14}$ | $0 0 0 \frac{\sqrt{105}}{210} 0 0 -\frac{\sqrt{105}}{420} 0 0 -\frac{\sqrt{7}}{14} 0 0 0 0$ |
| | 0 | $0 0 0 -\frac{\sqrt{105}i}{120} 0 \frac{\sqrt{105}}{210} 0 0 0 -\frac{\sqrt{7}i}{56} 0 0 0 0$ |
| | 0 | $0 0 \frac{\sqrt{105}i}{120} 0 \frac{\sqrt{105}}{210} 0 0 0 \frac{\sqrt{7}i}{56} 0 0 0 0 0$ |
| | 0 | $0 0 0 -\frac{\sqrt{105}}{210} 0 \frac{\sqrt{105}i}{168} -\frac{2\sqrt{105}}{105} 0 0 0 0 -\frac{3\sqrt{7}i}{56} 0 0$ |
| | 0 | $0 0 -\frac{\sqrt{105}}{210} 0 -\frac{\sqrt{105}i}{168} 0 0 \frac{2\sqrt{105}}{105} 0 0 \frac{3\sqrt{7}i}{56} 0 0 0$ |
| | 0 | $0 0 0 0 \frac{2\sqrt{105}}{105} 0 0 \frac{\sqrt{105}i}{420} 0 0 0 0 0 \frac{\sqrt{7}i}{14}$ |
| | 0 | $0 0 0 0 0 -\frac{2\sqrt{105}}{105} -\frac{\sqrt{105}i}{420} 0 0 0 0 0 -\frac{\sqrt{7}i}{14} 0$ |
| 715 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{T}_{3,0}^{(1,-1;a)}(E, 2)$ | 0 | $0 0 0 -\frac{\sqrt{14}}{56} 0 -\frac{\sqrt{14}i}{56} 0 0 0 -\frac{\sqrt{210}}{168} 0 \frac{\sqrt{210}i}{168} \frac{\sqrt{210}}{84} 0$ |
| | 0 | $0 0 -\frac{\sqrt{14}}{56} 0 \frac{\sqrt{14}i}{56} 0 0 0 -\frac{\sqrt{210}}{168} 0 -\frac{\sqrt{210}i}{168} 0 0 0 -\frac{\sqrt{210}}{84}$ |
| | 0 | $0 0 0 -\frac{\sqrt{42}}{168} 0 \frac{\sqrt{42}i}{168} \frac{\sqrt{42}}{84} 0 0 \frac{\sqrt{70}}{56} 0 \frac{\sqrt{70}i}{56} 0 0$ |
| | 0 | $0 0 -\frac{\sqrt{42}}{168} 0 -\frac{\sqrt{42}i}{168} 0 0 -\frac{\sqrt{42}}{84} \frac{\sqrt{70}}{56} 0 -\frac{\sqrt{70}i}{56} 0 0 0$ |
| | 0 | $0 0 0 0 -\frac{\sqrt{42}}{42} 0 0 0 -\frac{\sqrt{42}i}{42} 0 0 0 0 0 0$ |
| | 0 | $0 0 0 0 0 \frac{\sqrt{42}}{42} \frac{\sqrt{42}i}{42} 0 0 0 0 0 0 0$ |
| | 0 | $0 0 \frac{\sqrt{42}}{42} 0 0 0 0 -\frac{\sqrt{42}}{42} 0 0 0 0 0 0$ |
| | 0 | $0 0 0 -\frac{\sqrt{42}}{42} 0 0 -\frac{\sqrt{42}}{42} 0 0 0 0 0 0$ |
| | 0 | $0 0 0 \frac{\sqrt{42}i}{42} 0 \frac{\sqrt{42}}{42} 0 0 0 0 0 0 0 0$ |
| | 0 | $0 0 -\frac{\sqrt{42}i}{42} 0 \frac{\sqrt{42}}{42} 0 0 0 0 0 0 0 0 0$ |
| 716 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|-----------|--|
| $\mathbb{T}_{3,1}^{(1,-1;a)}(E, 2)$ | | $\begin{bmatrix} -\frac{\sqrt{210}}{84} & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{168} & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 \\ 0 & \frac{\sqrt{210}}{84} & \frac{\sqrt{14}i}{56} & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{168} & 0 & -\frac{\sqrt{210}}{168} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}i}{168} & 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & 0 & \frac{\sqrt{70}i}{56} & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}i}{168} & 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}}{168} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{42} & -\frac{\sqrt{70}}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{168} & 0 & 0 & \frac{\sqrt{42}}{42} & 0 & 0 & \frac{\sqrt{70}}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{168} & 0 & 0 & -\frac{\sqrt{42}i}{42} & 0 & 0 & 0 & \frac{\sqrt{70}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{168} & \frac{\sqrt{42}i}{42} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & \frac{\sqrt{42}i}{42} & -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & -\frac{\sqrt{42}i}{42} & 0 & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ |
| | | $\mathbb{T}_5^{(1,-1;a)}(A_1)$ |
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| | | |
| 717 | symmetry | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ |
| 718 | symmetry | |

continued ...

Table 9

| No. | multipole | matrix |
|-----------------------------------|--|--|
| $\mathbb{T}_5^{(1,-1;a)}(A_2, 1)$ | 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 $-\frac{\sqrt{105}i}{168}$ 0 $\frac{\sqrt{105}}{168}$ 0 0 | |
| | 0 0 $\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 $\frac{\sqrt{105}i}{168}$ 0 $\frac{\sqrt{105}}{168}$ 0 0 0 | |
| | $-\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}i}{168}$ 0 $\frac{\sqrt{21}}{168}$ 0 0 0 $-\frac{13\sqrt{35}i}{840}$ 0 $-\frac{13\sqrt{35}}{840}$ 0 0 | |
| | 0 $\frac{\sqrt{35}}{42}$ $\frac{\sqrt{21}i}{168}$ 0 $\frac{\sqrt{21}}{168}$ 0 0 0 $\frac{13\sqrt{35}i}{840}$ 0 $-\frac{13\sqrt{35}}{840}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{35}i}{60}$ $\frac{5\sqrt{21}}{168}$ 0 0 0 0 $-\frac{\sqrt{21}}{42}$ $\frac{5\sqrt{35}}{168}$ 0 0 0 0 $\frac{\sqrt{35}}{60}$ | |
| | $\frac{\sqrt{35}i}{60}$ 0 0 $-\frac{5\sqrt{21}}{168}$ 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 $-\frac{5\sqrt{35}}{168}$ 0 0 0 $\frac{\sqrt{35}}{60}$ 0 | |
| | 0 $-\frac{\sqrt{35}}{60}$ 0 0 $-\frac{5\sqrt{21}}{168}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{5\sqrt{35}}{168}$ 0 0 0 $-\frac{\sqrt{35}i}{60}$ | |
| | $-\frac{\sqrt{35}}{60}$ 0 0 0 0 $\frac{5\sqrt{21}}{168}$ $\frac{\sqrt{21}i}{42}$ 0 0 0 0 $-\frac{5\sqrt{35}}{168}$ $\frac{\sqrt{35}i}{60}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{21}}{56}$ 0 $-\frac{\sqrt{21}i}{56}$ 0 0 0 $-\frac{\sqrt{35}}{120}$ 0 $\frac{\sqrt{35}i}{120}$ $\frac{\sqrt{35}}{42}$ 0 | |
| | 0 0 $-\frac{\sqrt{21}}{56}$ 0 $\frac{\sqrt{21}i}{56}$ 0 0 0 $-\frac{\sqrt{35}}{120}$ 0 $-\frac{\sqrt{35}i}{120}$ 0 0 $-\frac{\sqrt{35}}{42}$ | |
| 719 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ |
| $\mathbb{T}_5^{(1,-1;a)}(A_2, 2)$ | 0 $\frac{\sqrt{6}i}{15}$ $\frac{\sqrt{10}}{20}$ 0 0 0 0 0 $-\frac{\sqrt{6}}{20}$ 0 0 0 0 $\frac{\sqrt{6}}{15}$ | |
| | $-\frac{\sqrt{6}i}{15}$ 0 0 $-\frac{\sqrt{10}}{20}$ 0 0 0 0 0 $\frac{\sqrt{6}}{20}$ 0 0 0 $\frac{\sqrt{6}}{15}$ 0 | |
| | 0 $-\frac{\sqrt{2}i}{60}$ $\frac{\sqrt{30}}{60}$ 0 0 0 0 0 $-\frac{\sqrt{30}}{30}$ $\frac{\sqrt{2}}{12}$ 0 0 0 0 $\frac{\sqrt{2}}{60}$ | |
| | $\frac{\sqrt{2}i}{60}$ 0 0 $-\frac{\sqrt{30}}{60}$ 0 0 $-\frac{\sqrt{30}}{30}$ 0 0 $-\frac{\sqrt{2}}{12}$ 0 0 0 $\frac{\sqrt{2}}{60}$ 0 | |
| | $-\frac{\sqrt{2}}{30}$ 0 0 $\frac{\sqrt{30}i}{48}$ 0 $\frac{\sqrt{30}}{240}$ 0 0 0 $-\frac{7\sqrt{2}i}{240}$ 0 $\frac{11\sqrt{2}}{240}$ 0 0 | |
| | 0 $\frac{\sqrt{2}}{30}$ $-\frac{\sqrt{30}i}{48}$ 0 $\frac{\sqrt{30}}{240}$ 0 0 0 $\frac{7\sqrt{2}i}{240}$ 0 $\frac{11\sqrt{2}}{240}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}}{80}$ 0 $\frac{\sqrt{30}i}{80}$ 0 0 0 0 $\frac{17\sqrt{2}}{240}$ 0 $\frac{\sqrt{2}i}{240}$ $\frac{\sqrt{2}}{30}$ 0 | |
| | 0 0 $-\frac{\sqrt{30}}{80}$ 0 $-\frac{\sqrt{30}i}{80}$ 0 0 0 0 $\frac{17\sqrt{2}}{240}$ 0 $-\frac{\sqrt{2}i}{240}$ 0 0 $-\frac{\sqrt{2}}{30}$ | |
| | 0 $-\frac{\sqrt{2}}{60}$ 0 0 $-\frac{\sqrt{30}}{60}$ 0 0 0 $-\frac{\sqrt{30}i}{30}$ 0 0 0 $\frac{\sqrt{2}}{12}$ 0 0 $-\frac{\sqrt{2}i}{60}$ | |
| | $-\frac{\sqrt{2}}{60}$ 0 0 0 0 $\frac{\sqrt{30}}{60}$ $\frac{\sqrt{30}i}{30}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{12}$ $\frac{\sqrt{2}i}{60}$ 0 | |
| 720 | symmetry | $\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{T}_{5,0}^{(1,-1;a)}(E, 1)$ | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{10}}{20} \quad 0 \quad -\frac{\sqrt{10}i}{20}$ | |
| | $\frac{\sqrt{10}}{20} \quad 0 \quad \frac{\sqrt{10}i}{20} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}}{16} \quad 0 \quad \frac{\sqrt{6}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{10}}{80} \quad 0 \quad \frac{3\sqrt{10}i}{80} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{6}}{16} \quad 0 \quad -\frac{\sqrt{6}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{10}}{80} \quad 0 \quad -\frac{3\sqrt{10}i}{80} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{6}i}{16} \quad 0 \quad \frac{\sqrt{6}}{16} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{80} \quad 0 \quad \frac{3\sqrt{10}}{80} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{6}i}{16} \quad 0 \quad \frac{\sqrt{6}}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{10}i}{80} \quad 0 \quad \frac{3\sqrt{10}}{80} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{10}i}{20} \quad 0 \quad \frac{\sqrt{10}}{20}$ | |
| | $-\frac{\sqrt{10}i}{20} \quad 0 \quad \frac{\sqrt{10}}{20} \quad 0$ | |
| 721 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |
| $\mathbb{T}_{5,1}^{(1,-1;a)}(E, 1)$ | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{10}i}{20} \quad 0 \quad \frac{\sqrt{10}}{20}$ | |
| | $-\frac{\sqrt{10}i}{20} \quad 0 \quad \frac{\sqrt{10}}{20} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{16} \quad 0 \quad -\frac{\sqrt{6}}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{10}i}{80} \quad 0 \quad -\frac{3\sqrt{10}}{80} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{6}i}{16} \quad 0 \quad -\frac{\sqrt{6}}{16} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{10}i}{80} \quad 0 \quad -\frac{3\sqrt{10}}{80} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}}{16} \quad 0 \quad \frac{\sqrt{6}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{10}}{80} \quad 0 \quad \frac{3\sqrt{10}i}{80} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{6}}{16} \quad 0 \quad -\frac{\sqrt{6}i}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{10}}{80} \quad 0 \quad -\frac{3\sqrt{10}i}{80} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{10}}{20} \quad 0 \quad \frac{\sqrt{10}i}{20}$ | |
| | $-\frac{\sqrt{10}}{20} \quad 0 \quad -\frac{\sqrt{10}i}{20} \quad 0$ | |
| 722 | symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--------------------------|---|
| $\mathbb{T}_{5,0}^{(1,-1;a)}(E, 2)$ | 0 | $\frac{\sqrt{7}}{35}, 0, 0, \frac{\sqrt{105}}{140}, 0, 0, 0, 0, -\frac{\sqrt{7}}{28}, 0, 0, \frac{\sqrt{7}i}{35}$ |
| | $\frac{\sqrt{7}}{35}$ | $0, 0, 0, 0, 0, -\frac{\sqrt{105}}{140}, 0, 0, 0, 0, \frac{\sqrt{7}}{28}, -\frac{\sqrt{7}i}{35}, 0$ |
| | 0 | $-\frac{\sqrt{21}}{42}, 0, 0, 0, -\frac{\sqrt{35}}{140}, 0, 0, -\frac{\sqrt{35}i}{70}, 0, 0, \frac{13\sqrt{21}}{420}, 0, 0, 0$ |
| | $-\frac{\sqrt{21}}{42}$ | $0, 0, 0, 0, 0, \frac{\sqrt{35}}{140}, \frac{\sqrt{35}i}{70}, 0, 0, 0, 0, -\frac{13\sqrt{21}}{420}, 0, 0, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{35}}{40}, 0, \frac{\sqrt{35}i}{280}, \frac{\sqrt{35}}{35}, 0, 0, \frac{23\sqrt{21}}{840}, 0, \frac{\sqrt{21}i}{120}, -\frac{\sqrt{21}}{30}, 0$ |
| | 0 | $0, 0, \frac{\sqrt{35}}{40}, 0, -\frac{\sqrt{35}i}{280}, 0, 0, -\frac{\sqrt{35}}{35}, \frac{23\sqrt{21}}{840}, 0, -\frac{\sqrt{21}i}{120}, 0, 0, \frac{\sqrt{21}}{30}$ |
| | $\frac{\sqrt{21}}{30}$ | $0, 0, 0, -\frac{\sqrt{35}i}{280}, 0, -\frac{3\sqrt{35}}{280}, 0, 0, 0, \frac{\sqrt{21}i}{120}, 0, \frac{9\sqrt{21}}{280}, 0, 0, 0$ |
| | 0 | $-\frac{\sqrt{21}}{30}, \frac{\sqrt{35}i}{280}, 0, -\frac{3\sqrt{35}}{280}, 0, 0, 0, -\frac{\sqrt{21}i}{120}, 0, \frac{9\sqrt{21}}{280}, 0, 0, 0$ |
| | 0 | $0, 0, \frac{3\sqrt{35}}{140}, 0, 0, 0, 0, -\frac{\sqrt{35}}{70}, \frac{\sqrt{21}}{60}, 0, 0, 0, 0, \frac{\sqrt{21}}{42}, 0$ |
| | 0 | $0, 0, 0, -\frac{3\sqrt{35}}{140}, 0, 0, -\frac{\sqrt{35}}{70}, 0, 0, -\frac{\sqrt{21}}{60}, 0, 0, 0, \frac{\sqrt{21}}{42}, 0$ |
| 723 | symmetry | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |
| $\mathbb{T}_{5,1}^{(1,-1;a)}(E, 2)$ | 0 | $\frac{\sqrt{7}i}{35}, -\frac{\sqrt{105}}{140}, 0, 0, 0, 0, 0, -\frac{\sqrt{7}}{28}, 0, 0, 0, 0, -\frac{\sqrt{7}}{35}$ |
| | $-\frac{\sqrt{7}i}{35}$ | $0, 0, \frac{\sqrt{105}}{140}, 0, 0, 0, 0, 0, \frac{\sqrt{7}}{28}, 0, 0, 0, -\frac{\sqrt{7}}{35}, 0$ |
| | 0 | $\frac{\sqrt{21}i}{42}, -\frac{\sqrt{35}}{140}, 0, 0, 0, 0, \frac{\sqrt{35}}{70}, -\frac{13\sqrt{21}}{420}, 0, 0, 0, 0, 0, 0$ |
| | $-\frac{\sqrt{21}i}{42}$ | $0, 0, \frac{\sqrt{35}}{140}, 0, 0, \frac{\sqrt{35}}{70}, 0, 0, \frac{13\sqrt{21}}{420}, 0, 0, 0, 0, 0, 0$ |
| | $-\frac{\sqrt{21}}{30}$ | $0, 0, -\frac{3\sqrt{35}i}{280}, 0, -\frac{\sqrt{35}}{280}, 0, 0, 0, -\frac{9\sqrt{21}i}{280}, 0, -\frac{\sqrt{21}}{120}, 0, 0, 0, 0$ |
| | 0 | $\frac{\sqrt{21}}{30}, \frac{3\sqrt{35}i}{280}, 0, -\frac{\sqrt{35}}{280}, 0, 0, 0, \frac{9\sqrt{21}i}{280}, 0, -\frac{\sqrt{21}}{120}, 0, 0, 0, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{35}}{280}, 0, \frac{\sqrt{35}i}{40}, -\frac{\sqrt{35}}{35}, 0, 0, -\frac{\sqrt{21}}{120}, 0, -\frac{23\sqrt{21}i}{840}, -\frac{\sqrt{21}}{30}, 0$ |
| | 0 | $0, 0, \frac{\sqrt{35}}{280}, 0, -\frac{\sqrt{35}i}{40}, 0, 0, \frac{\sqrt{35}}{35}, -\frac{\sqrt{21}}{120}, 0, \frac{23\sqrt{21}i}{840}, 0, 0, \frac{\sqrt{21}}{30}$ |
| | 0 | $0, 0, 0, 0, -\frac{3\sqrt{35}}{140}, 0, 0, -\frac{\sqrt{35}i}{70}, 0, 0, \frac{\sqrt{21}}{60}, 0, 0, -\frac{\sqrt{21}}{42}, 0$ |
| | 0 | $0, 0, 0, 0, 0, \frac{3\sqrt{35}}{140}, \frac{\sqrt{35}i}{70}, 0, 0, 0, 0, -\frac{\sqrt{21}}{60}, \frac{\sqrt{21}i}{42}, 0$ |
| 724 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{T}_{5,0}^{(1,-1;a)}(E, 3)$ | 0 0 0 $-\frac{3\sqrt{5}}{40}$ 0 $\frac{3\sqrt{5}i}{40}$ 0 0 0 $\frac{3\sqrt{3}}{40}$ 0 $\frac{3\sqrt{3}i}{40}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{5}}{40}$ 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 0 $\frac{3\sqrt{3}}{40}$ 0 $-\frac{3\sqrt{3}i}{40}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{8}$ 0 $\frac{i}{8}$ $\frac{1}{10}$ 0 | |
| | 0 0 $-\frac{\sqrt{15}}{40}$ 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 $-\frac{1}{10}$ | |
| | 0 $\frac{1}{20}$ 0 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 0 $-\frac{3}{40}$ 0 0 $-\frac{i}{20}$ | |
| | $\frac{1}{20}$ 0 0 0 0 $\frac{\sqrt{15}}{40}$ 0 0 0 0 0 $\frac{3}{40}$ $\frac{i}{20}$ 0 | |
| | 0 $-\frac{i}{20}$ $-\frac{\sqrt{15}}{40}$ 0 0 0 0 0 $\frac{3}{40}$ 0 0 0 0 $-\frac{1}{20}$ | |
| | $\frac{i}{20}$ 0 0 $\frac{\sqrt{15}}{40}$ 0 0 0 0 $-\frac{3}{40}$ 0 0 $-\frac{1}{20}$ 0 | |
| | $-\frac{1}{10}$ 0 0 $-\frac{\sqrt{15}i}{40}$ 0 $\frac{\sqrt{15}}{40}$ 0 0 0 $-\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 | |
| | 0 $\frac{1}{10}$ $\frac{\sqrt{15}i}{40}$ 0 $\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 | |
| 725 symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ | |
| | 0 0 0 $\frac{3\sqrt{5}i}{40}$ 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 $-\frac{3\sqrt{3}i}{40}$ 0 $\frac{3\sqrt{3}}{40}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{5}i}{40}$ 0 $\frac{3\sqrt{5}}{40}$ 0 0 0 $\frac{3\sqrt{3}i}{40}$ 0 $\frac{3\sqrt{3}}{40}$ 0 0 0 | |
| | $\frac{1}{10}$ 0 0 $\frac{\sqrt{15}i}{40}$ 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 $\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 | |
| | 0 $-\frac{1}{10}$ $-\frac{\sqrt{15}i}{40}$ 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 $-\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 0 | |
| | 0 $-\frac{i}{20}$ $-\frac{\sqrt{15}}{40}$ 0 0 0 0 0 $\frac{3}{40}$ 0 0 0 0 $-\frac{1}{20}$ | |
| | $\frac{i}{20}$ 0 0 $\frac{\sqrt{15}}{40}$ 0 0 0 0 $-\frac{3}{40}$ 0 0 0 $-\frac{1}{20}$ 0 | |
| | 0 $-\frac{1}{20}$ 0 0 $\frac{\sqrt{15}}{40}$ 0 0 0 0 0 $\frac{3}{40}$ 0 0 $\frac{i}{20}$ | |
| | $-\frac{1}{20}$ 0 0 0 0 $-\frac{\sqrt{15}}{40}$ 0 0 0 0 0 $-\frac{3}{40}$ $-\frac{i}{20}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{8}$ 0 $\frac{i}{8}$ $\frac{1}{10}$ 0 | |
| | 0 0 $-\frac{\sqrt{15}}{40}$ 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 $-\frac{1}{10}$ | |
| 726 symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ | |
| | <i>continued ...</i> | |

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|--|
| $\mathbb{T}_{5,0}^{(1,-1;a)}(E, 4)$ | 0 0 0 $-\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{40}$ 0 $\frac{i}{40}$ $\frac{1}{5}$ 0 | |
| | 0 0 $-\frac{\sqrt{15}}{40}$ 0 $\frac{\sqrt{15}i}{40}$ 0 0 0 $-\frac{1}{40}$ 0 $-\frac{i}{40}$ 0 0 $-\frac{1}{5}$ | |
| | 0 0 0 $-\frac{\sqrt{5}}{40}$ 0 $\frac{\sqrt{5}i}{40}$ $-\frac{\sqrt{5}}{10}$ 0 0 $-\frac{3\sqrt{3}}{40}$ 0 $-\frac{3\sqrt{3}i}{40}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{5}}{40}$ 0 $-\frac{\sqrt{5}i}{40}$ 0 0 $\frac{\sqrt{5}}{10}$ $-\frac{3\sqrt{3}}{40}$ 0 $\frac{3\sqrt{3}i}{40}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{3}}{20}$ 0 0 $\frac{\sqrt{5}}{40}$ 0 0 $-\frac{\sqrt{5}i}{20}$ 0 0 $\frac{7\sqrt{3}}{120}$ 0 0 $\frac{\sqrt{3}i}{15}$ | |
| | $-\frac{\sqrt{3}}{20}$ 0 0 0 0 $-\frac{\sqrt{5}}{40}$ $\frac{\sqrt{5}i}{20}$ 0 0 0 0 $-\frac{7\sqrt{3}}{120}$ $-\frac{\sqrt{3}i}{15}$ 0 | |
| | 0 $-\frac{\sqrt{3}i}{20}$ $-\frac{\sqrt{5}}{40}$ 0 0 0 0 $-\frac{\sqrt{5}}{20}$ $\frac{7\sqrt{3}}{120}$ 0 0 0 0 $-\frac{\sqrt{3}}{15}$ | |
| | $\frac{\sqrt{3}i}{20}$ 0 0 $\frac{\sqrt{5}}{40}$ 0 0 $-\frac{\sqrt{5}}{20}$ 0 0 $-\frac{7\sqrt{3}}{120}$ 0 0 0 $-\frac{\sqrt{3}}{15}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{5}i}{40}$ 0 $-\frac{\sqrt{5}}{40}$ 0 0 0 $-\frac{\sqrt{3}i}{120}$ 0 $\frac{\sqrt{3}}{120}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{5}i}{40}$ 0 $-\frac{\sqrt{5}}{40}$ 0 0 0 $\frac{\sqrt{3}i}{120}$ 0 $\frac{\sqrt{3}}{120}$ 0 0 0 | |
| 727 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |
| $\mathbb{T}_{5,1}^{(1,-1;a)}(E, 4)$ | $-\frac{1}{5}$ 0 0 0 0 0 0 0 0 $-\frac{i}{10}$ 0 $-\frac{1}{10}$ 0 0 0 | |
| | 0 $\frac{1}{5}$ 0 0 0 0 0 0 0 $\frac{i}{10}$ 0 $-\frac{1}{10}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{30}$ 0 $\frac{\sqrt{3}}{30}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{3}i}{30}$ 0 $\frac{\sqrt{3}}{30}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{3}i}{15}$ $-\frac{\sqrt{5}}{20}$ 0 0 0 0 $\frac{\sqrt{5}}{20}$ $\frac{\sqrt{3}}{60}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{20}$ | |
| | $\frac{\sqrt{3}i}{15}$ 0 0 $\frac{\sqrt{5}}{20}$ 0 0 $\frac{\sqrt{5}}{20}$ 0 0 $-\frac{\sqrt{3}}{60}$ 0 0 0 $-\frac{\sqrt{3}}{20}$ 0 | |
| | 0 $\frac{\sqrt{3}}{15}$ 0 0 $-\frac{\sqrt{5}}{20}$ 0 0 $-\frac{\sqrt{5}i}{20}$ 0 0 $-\frac{\sqrt{3}}{60}$ 0 0 0 $-\frac{\sqrt{3}i}{20}$ | |
| | $\frac{\sqrt{3}}{15}$ 0 0 0 0 $\frac{\sqrt{5}}{20}$ $\frac{\sqrt{5}i}{20}$ 0 0 0 0 $\frac{\sqrt{3}}{60}$ $\frac{\sqrt{3}i}{20}$ 0 | |
| | 0 0 0 $\frac{\sqrt{5}}{20}$ 0 $-\frac{\sqrt{5}i}{20}$ $\frac{\sqrt{5}}{10}$ 0 0 $\frac{\sqrt{3}}{20}$ 0 $\frac{\sqrt{3}i}{20}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{5}}{20}$ 0 $\frac{\sqrt{5}i}{20}$ 0 0 0 $-\frac{\sqrt{5}}{10}$ $\frac{\sqrt{3}}{20}$ 0 $-\frac{\sqrt{3}i}{20}$ 0 0 0 | |
| 728 | symmetry | z |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------|-----------|---|
| $\mathbb{T}_1^{(1,0;a)}(A_2)$ | x | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{70}i}{280} & 0 & -\frac{3\sqrt{70}}{280} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{56} & 0 & \frac{\sqrt{42}}{56} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{70}i}{280} & 0 & -\frac{3\sqrt{70}}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & \frac{\sqrt{42}}{56} & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{210}i}{280} & 0 & -\frac{3\sqrt{210}}{280} & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{210}i}{280} & 0 & -\frac{3\sqrt{210}}{280} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & -\frac{\sqrt{14}}{56} & 0 & 0 \\ 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} \\ -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 \\ 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} \\ \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 \end{bmatrix}$ |
| | y | |
| | x | |
| | x | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{3\sqrt{70}}{280} & 0 & 0 & -\frac{3\sqrt{70}i}{140} & 0 & 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{70}}{280} & \frac{3\sqrt{70}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{210}}{280} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & 0 & -\frac{\sqrt{14}i}{28} \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{210}}{280} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{56} & \frac{\sqrt{14}i}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{140} & \frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & \frac{\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{14}}{28} \\ -\frac{\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{14}}{28} & -\frac{\sqrt{210}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{28} & \frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}}{140} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{28} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | y | |
| 729 | symmetry | |
| 730 | symmetry | |

continued ...

Table 9

| No. | multipole | matrix |
|---------------------------------|--|----------------------------------|
| $\mathbb{T}_{1,1}^{(1,0;a)}(E)$ | 0 0 $-\frac{3\sqrt{70}}{280}$ 0 0 0 0 $-\frac{3\sqrt{70}}{140}$ $-\frac{\sqrt{42}}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{70}}{280}$ 0 0 $-\frac{3\sqrt{70}}{140}$ 0 0 $\frac{\sqrt{42}}{56}$ 0 0 0 0 0 | |
| | 0 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ | |
| | 0 0 0 $-\frac{3\sqrt{210}}{280}$ 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 | |
| | $\frac{\sqrt{14}}{28}$ 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{210}}{140}$ 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 $\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 $\frac{\sqrt{210}}{140}$ $\frac{\sqrt{14}}{28}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 | |
| | $-\frac{\sqrt{14}}{28}$ 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 0 | |
| | | |
| 731 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| $\mathbb{T}_3^{(1,0;a)}(A_1)$ | 0 0 0 0 $-\frac{5\sqrt{2}}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{5\sqrt{2}}{32}$ 0 0 0 0 0 $\frac{\sqrt{30}}{32}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{6}}{32}$ 0 0 $\frac{\sqrt{6}i}{24}$ 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{6}}{32}$ $-\frac{\sqrt{6}i}{24}$ 0 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ $-\frac{\sqrt{10}}{16}$ 0 | |
| | 0 0 $-\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 $\frac{\sqrt{10}}{16}$ | |
| | $-\frac{\sqrt{10}}{16}$ 0 0 $-\frac{\sqrt{6}i}{96}$ 0 $-\frac{\sqrt{6}}{24}$ 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 $\frac{\sqrt{10}}{16}$ $\frac{\sqrt{6}i}{96}$ 0 $-\frac{\sqrt{6}}{24}$ 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{6}}{32}$ 0 0 0 $-\frac{\sqrt{6}}{24}$ $-\frac{\sqrt{10}}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{6}}{32}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 0 | |
| 732 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|-----------|---|
| $\mathbb{T}_3^{(1,0;a)}(A_2, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{5}i}{80} & 0 & -\frac{3\sqrt{5}}{80} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{16} & 0 & \frac{\sqrt{3}}{16} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{5}i}{80} & 0 & -\frac{3\sqrt{5}}{80} & 0 & 0 & 0 & \frac{\sqrt{3}i}{16} & 0 & \frac{\sqrt{3}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{11\sqrt{15}i}{240} & 0 & \frac{11\sqrt{15}}{240} & 0 & 0 & 0 & -\frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 \\ 0 & 0 & \frac{11\sqrt{15}i}{240} & 0 & \frac{11\sqrt{15}}{240} & 0 & 0 & 0 & \frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 \\ 0 & \frac{i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{60} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{8} \\ -\frac{i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{60} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{8} & 0 \\ 0 & \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{60} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{8} \\ \frac{1}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{60} & 0 & 0 & 0 & 0 & 0 & -\frac{i}{8} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{15}}{240} & 0 & -\frac{\sqrt{15}i}{240} & 0 & 0 & 0 & -\frac{3}{16} & 0 & \frac{3i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{15}}{240} & 0 & \frac{\sqrt{15}i}{240} & 0 & 0 & 0 & -\frac{3}{16} & 0 & -\frac{3i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| $\mathbb{T}_3^{(1,0;a)}(A_2, 2)$ | | $\begin{bmatrix} 0 & 0 & -\frac{5\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{2}}{32} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{32} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{32} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{10}}{16} & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & \frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 \\ 0 & \frac{\sqrt{10}}{16} & -\frac{\sqrt{6}i}{24} & 0 & \frac{\sqrt{6}}{96} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & \frac{\sqrt{10}}{16} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{96} & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{32} & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & \frac{\sqrt{10}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{32} & -\frac{\sqrt{6}i}{24} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{32} & 0 & 0 \end{bmatrix}$ |
| | | $\frac{-\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--------------------------------------|
| $\mathbb{T}_{3,0}^{(1,0;a)}(E, 1)$ | 0 0 0 0 $\frac{\sqrt{30}}{160}$ 0 0 $-\frac{\sqrt{30}i}{30}$ 0 0 $-\frac{\sqrt{2}}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}}{160}$ $\frac{\sqrt{30}i}{30}$ 0 0 0 0 $\frac{\sqrt{2}}{32}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{11\sqrt{10}}{480}$ 0 0 $-\frac{\sqrt{10}i}{24}$ 0 0 $\frac{\sqrt{6}}{96}$ 0 0 $\frac{\sqrt{6}i}{12}$ | |
| | 0 0 0 0 0 $\frac{11\sqrt{10}}{480}$ $\frac{\sqrt{10}i}{24}$ 0 0 0 0 $-\frac{\sqrt{6}}{96}$ $-\frac{\sqrt{6}i}{12}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{10}}{24}$ 0 $\frac{\sqrt{10}i}{480}$ $-\frac{\sqrt{10}}{120}$ 0 0 0 0 $-\frac{7\sqrt{6}i}{96}$ $\frac{\sqrt{6}}{48}$ 0 | |
| | 0 0 $-\frac{\sqrt{10}}{24}$ 0 $-\frac{\sqrt{10}i}{480}$ 0 0 $\frac{\sqrt{10}}{120}$ 0 0 $\frac{7\sqrt{6}i}{96}$ 0 0 $-\frac{\sqrt{6}}{48}$ | |
| | $-\frac{\sqrt{6}}{48}$ 0 0 $\frac{11\sqrt{10}i}{480}$ 0 $-\frac{\sqrt{10}}{24}$ 0 0 0 $-\frac{\sqrt{6}i}{32}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{6}}{48}$ $-\frac{11\sqrt{10}i}{480}$ 0 $-\frac{\sqrt{10}}{24}$ 0 0 0 $\frac{\sqrt{6}i}{32}$ 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{6}i}{12}$ $\frac{\sqrt{10}}{480}$ 0 0 0 0 $-\frac{\sqrt{10}}{24}$ $\frac{\sqrt{6}}{32}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{6}i}{12}$ 0 0 $-\frac{\sqrt{10}}{480}$ 0 0 $-\frac{\sqrt{10}}{24}$ 0 0 $-\frac{\sqrt{6}}{32}$ 0 0 0 0 | |
| 735 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| $\mathbb{T}_{3,1}^{(1,0;a)}(E, 1)$ | 0 0 $-\frac{\sqrt{30}}{160}$ 0 0 0 0 $-\frac{\sqrt{30}}{30}$ $-\frac{\sqrt{2}}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}}{160}$ 0 0 $-\frac{\sqrt{30}}{30}$ 0 0 $\frac{\sqrt{2}}{32}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{11\sqrt{10}}{480}$ 0 0 0 0 $\frac{\sqrt{10}}{24}$ $-\frac{\sqrt{6}}{96}$ 0 0 0 0 $\frac{\sqrt{6}}{12}$ | |
| | 0 0 0 $\frac{11\sqrt{10}}{480}$ 0 0 $\frac{\sqrt{10}}{24}$ 0 0 $\frac{\sqrt{6}}{96}$ 0 0 $\frac{\sqrt{6}}{12}$ 0 | |
| | $\frac{\sqrt{6}}{48}$ 0 0 $-\frac{\sqrt{10}i}{24}$ 0 $\frac{11\sqrt{10}}{480}$ 0 0 0 0 0 $\frac{\sqrt{6}}{32}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{6}}{48}$ $\frac{\sqrt{10}i}{24}$ 0 $\frac{11\sqrt{10}}{480}$ 0 0 0 0 0 $\frac{\sqrt{6}}{32}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{10}}{480}$ 0 $-\frac{\sqrt{10}i}{24}$ $\frac{\sqrt{10}}{120}$ 0 0 $\frac{7\sqrt{6}}{96}$ 0 0 $\frac{\sqrt{6}}{48}$ 0 | |
| | 0 0 $\frac{\sqrt{10}}{480}$ 0 $\frac{\sqrt{10}i}{24}$ 0 0 $-\frac{\sqrt{10}}{120}$ $\frac{7\sqrt{6}}{96}$ 0 0 0 0 $-\frac{\sqrt{6}}{48}$ | |
| | 0 $\frac{\sqrt{6}}{12}$ 0 0 $-\frac{\sqrt{10}}{480}$ 0 0 $-\frac{\sqrt{10}i}{24}$ 0 0 $\frac{\sqrt{6}}{32}$ 0 0 0 0 | |
| | $\frac{\sqrt{6}}{12}$ 0 0 0 0 $\frac{\sqrt{10}}{480}$ $\frac{\sqrt{10}i}{24}$ 0 0 0 0 $-\frac{\sqrt{6}}{32}$ 0 0 0 | |
| 736 | symmetry | $\sqrt{15}xyz$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--|
| $\mathbb{T}_{3,0}^{(1,0;a)}(E, 2)$ | 0 0 0 $\frac{\sqrt{3}}{12}$ 0 $\frac{\sqrt{3}i}{12}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{3}}{12}$ 0 $-\frac{\sqrt{3}i}{12}$ 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{1}{12}$ 0 $-\frac{i}{12}$ $-\frac{1}{6}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{1}{12}$ 0 $\frac{i}{12}$ 0 0 $\frac{1}{6}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{1}{24}$ 0 0 $-\frac{i}{24}$ 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 $\frac{\sqrt{15}i}{24}$ | |
| | 0 0 0 0 0 $\frac{1}{24}$ $\frac{i}{24}$ 0 0 0 0 $\frac{\sqrt{15}}{24}$ $-\frac{\sqrt{15}i}{24}$ 0 | |
| | 0 0 $\frac{1}{24}$ 0 0 0 0 $-\frac{1}{24}$ $-\frac{\sqrt{15}}{24}$ 0 0 0 0 $-\frac{\sqrt{15}}{24}$ | |
| | 0 0 0 $-\frac{1}{24}$ 0 0 $-\frac{1}{24}$ 0 0 $\frac{\sqrt{15}}{24}$ 0 0 $-\frac{\sqrt{15}}{24}$ 0 | |
| | 0 0 0 $\frac{i}{24}$ 0 $\frac{1}{24}$ 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 | |
| | 0 0 $-\frac{i}{24}$ 0 $\frac{1}{24}$ 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 | |
| 737 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |
| $\mathbb{T}_{3,1}^{(1,0;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{5}i}{48}$ 0 $\frac{\sqrt{3}}{48}$ 0 0 0 $\frac{\sqrt{5}i}{16}$ 0 $\frac{\sqrt{5}}{16}$ 0 0 | |
| | 0 0 $\frac{\sqrt{3}i}{48}$ 0 $\frac{\sqrt{3}}{48}$ 0 0 0 $-\frac{\sqrt{5}i}{16}$ 0 $\frac{\sqrt{5}}{16}$ 0 0 0 | |
| | 0 0 0 $\frac{7i}{48}$ 0 $\frac{7}{48}$ 0 0 0 $\frac{\sqrt{15}i}{48}$ 0 $-\frac{\sqrt{15}}{48}$ 0 0 | |
| | 0 0 $-\frac{7i}{48}$ 0 $\frac{7}{48}$ 0 0 0 $-\frac{\sqrt{15}i}{48}$ 0 $-\frac{\sqrt{15}}{48}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{15}i}{24}$ $\frac{1}{6}$ 0 0 0 0 $\frac{1}{24}$ 0 0 0 0 0 0 0 | |
| | $\frac{\sqrt{15}i}{24}$ 0 0 $-\frac{1}{6}$ 0 0 $\frac{1}{24}$ 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{15}}{24}$ 0 0 $\frac{1}{6}$ 0 0 $-\frac{i}{24}$ 0 0 0 0 0 0 0 | |
| | $\frac{\sqrt{15}}{24}$ 0 0 0 0 $-\frac{1}{6}$ $\frac{i}{24}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{1}{48}$ 0 $-\frac{i}{48}$ $\frac{1}{6}$ 0 0 $-\frac{\sqrt{15}}{48}$ 0 $-\frac{\sqrt{15}i}{48}$ 0 0 0 | |
| | 0 0 $\frac{1}{48}$ 0 $\frac{i}{48}$ 0 0 $-\frac{1}{6}$ $-\frac{\sqrt{15}}{48}$ 0 $\frac{\sqrt{15}i}{48}$ 0 0 0 | |
| 738 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ |

continued ..

Table 9

| No. | multipole | matrix |
|-------------------------------|----------------------------------|--|
| $\mathbb{T}_5^{(1,0;a)}(A_1)$ | 0 | $\begin{bmatrix} 0 & \frac{\sqrt{6}}{20} & 0 & 0 & \frac{\sqrt{10}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{40} & 0 & 0 & -\frac{\sqrt{6}i}{20} \\ \frac{\sqrt{6}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{40} & \frac{\sqrt{6}i}{20} & 0 \\ 0 & \frac{3\sqrt{2}}{40} & 0 & 0 & \frac{\sqrt{30}}{80} & 0 & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & \frac{3\sqrt{2}i}{40} \\ \frac{3\sqrt{2}}{40} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{80} & \frac{\sqrt{30}i}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{16} & -\frac{3\sqrt{2}i}{40} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}}{240} & 0 & -\frac{\sqrt{30}i}{240} & 0 & 0 & 0 & -\frac{9\sqrt{2}}{80} & 0 & \frac{7\sqrt{2}i}{80} & -\frac{\sqrt{2}}{10} & 0 \\ 0 & 0 & \frac{\sqrt{30}}{240} & 0 & \frac{\sqrt{30}i}{240} & 0 & 0 & 0 & -\frac{9\sqrt{2}}{80} & 0 & -\frac{7\sqrt{2}i}{80} & 0 & 0 & \frac{\sqrt{2}}{10} \\ -\frac{\sqrt{2}}{10} & 0 & 0 & 0 & \frac{7\sqrt{30}i}{240} & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 & \frac{\sqrt{2}i}{80} & 0 & \frac{3\sqrt{2}}{80} & 0 & 0 \\ 0 & \frac{\sqrt{2}}{10} & -\frac{7\sqrt{30}i}{240} & 0 & -\frac{\sqrt{30}}{48} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{80} & 0 & \frac{3\sqrt{2}}{80} & 0 & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{2}i}{40} & \frac{\sqrt{30}}{80} & 0 & 0 & 0 & \frac{\sqrt{30}}{60} & \frac{\sqrt{2}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{2}}{40} & 0 \\ \frac{3\sqrt{2}i}{40} & 0 & 0 & -\frac{\sqrt{30}}{80} & 0 & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & -\frac{\sqrt{2}}{16} & 0 & 0 & \frac{3\sqrt{2}}{40} & 0 & 0 \end{bmatrix}$ |
| | 739 | $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ |
| | $\mathbb{T}_5^{(1,0;a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & \frac{\sqrt{105}}{56} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & \frac{\sqrt{35}i}{140} & 0 & \frac{\sqrt{35}}{140} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{140} & 0 & \frac{\sqrt{35}}{140} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{35}i}{70} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{70} & 0 \\ \frac{\sqrt{35}i}{70} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{21} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{70} & 0 \\ 0 & -\frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{70} & 0 \\ -\frac{\sqrt{35}}{70} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{70} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{35}}{280} & 0 & -\frac{3\sqrt{35}i}{280} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}}{168} & 0 & -\frac{\sqrt{21}i}{168} & 0 & 0 & 0 & \frac{3\sqrt{35}}{280} & 0 & \frac{3\sqrt{35}i}{280} & 0 & 0 & 0 \end{bmatrix}$ |
| | 740 | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--------------------------|---|
| $\mathbb{T}_5^{(1,0;a)}(A_2, 2)$ | 0 | $-\frac{\sqrt{6}i}{20} \quad \frac{\sqrt{10}}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}}{20}$ |
| | $\frac{\sqrt{6}i}{20}$ | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}}{40} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}}{20} \quad 0$ |
| | 0 | $\frac{3\sqrt{2}i}{40} \quad -\frac{\sqrt{30}}{80} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{60} \quad -\frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{2}}{40}$ |
| | $-\frac{3\sqrt{2}i}{40}$ | $0 \quad 0 \quad \frac{\sqrt{30}}{80} \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{60} \quad 0 \quad 0 \quad \frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{2}}{40} \quad 0$ |
| | $-\frac{\sqrt{2}}{10}$ | $0 \quad 0 \quad \frac{\sqrt{30}i}{48} \quad 0 \quad -\frac{7\sqrt{30}}{240} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{2}i}{80} \quad 0 \quad \frac{\sqrt{2}}{80} \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{2}}{10} \quad -\frac{\sqrt{30}i}{48} \quad 0 \quad -\frac{7\sqrt{30}}{240} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{2}i}{80} \quad 0 \quad \frac{\sqrt{2}}{80} \quad 0 \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{30}}{240} \quad 0 \quad -\frac{\sqrt{30}i}{240} \quad 0 \quad 0 \quad 0 \quad \frac{7\sqrt{2}}{80} \quad 0 \quad -\frac{9\sqrt{2}i}{80} \quad \frac{\sqrt{2}}{10} \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{30}}{240} \quad 0 \quad \frac{\sqrt{30}i}{240} \quad 0 \quad 0 \quad 0 \quad \frac{7\sqrt{2}}{80} \quad 0 \quad \frac{9\sqrt{2}i}{80} \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{10}$ |
| | $\frac{3\sqrt{2}}{40}$ | $0 \quad 0 \quad \frac{\sqrt{30}}{80} \quad 0 \quad 0 \quad -\frac{\sqrt{30}i}{60} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{16} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{2}i}{40}$ |
| | $\frac{3\sqrt{2}}{40}$ | $0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{80} \quad \frac{\sqrt{30}i}{60} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{16} \quad -\frac{3\sqrt{2}i}{40} \quad 0$ |
| 741 | symmetry | $\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$ |
| $\mathbb{T}_{5,0}^{(1,0;a)}(E, 1)$ | 0 | $0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{10}}{40} \quad 0 \quad 0 \quad \frac{5\sqrt{6}}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{16} \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{40}$ |
| | $\frac{\sqrt{10}}{40}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{5\sqrt{6}}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{16} \quad \frac{\sqrt{10}i}{40} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{\sqrt{6}}{48} \quad 0 \quad -\frac{\sqrt{6}i}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{80} \quad 0 \quad -\frac{\sqrt{10}i}{80} \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{6}}{48} \quad 0 \quad \frac{\sqrt{6}i}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{80} \quad 0 \quad \frac{\sqrt{10}i}{80} \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{48} \quad 0 \quad -\frac{\sqrt{6}}{48} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}i}{80} \quad 0 \quad -\frac{\sqrt{10}}{80} \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{6}i}{48} \quad 0 \quad -\frac{\sqrt{6}}{48} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}i}{80} \quad 0 \quad -\frac{\sqrt{10}}{80} \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{10}i}{40} \quad -\frac{5\sqrt{6}}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{16} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{40}$ |
| | $-\frac{\sqrt{10}i}{40}$ | $0 \quad 0 \quad \frac{5\sqrt{6}}{48} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{10}}{16} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{10}}{40} \quad 0$ |
| 742 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{T}_{5,1}^{(1,0;a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{40} & -\frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{40} \\ -\frac{\sqrt{10}i}{40} & 0 & 0 & \frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & \frac{\sqrt{10}}{40} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{48} & 0 & \frac{\sqrt{6}}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{80} & 0 & \frac{\sqrt{10}}{80} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{48} & 0 & \frac{\sqrt{6}}{48} & 0 & 0 & 0 & \frac{\sqrt{10}i}{80} & 0 & \frac{\sqrt{10}}{80} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{48} & 0 & -\frac{\sqrt{6}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}}{80} & 0 & -\frac{\sqrt{10}i}{80} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{48} & 0 & \frac{\sqrt{6}i}{48} & 0 & 0 & 0 & -\frac{\sqrt{10}}{80} & 0 & \frac{\sqrt{10}i}{80} & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & -\frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{10}i}{40} \\ -\frac{\sqrt{10}}{40} & 0 & 0 & 0 & \frac{5\sqrt{6}}{48} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & -\frac{\sqrt{10}i}{40} & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |
| 743 | symmetry | $\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |
| $\mathbb{T}_{5,0}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} 0 & \frac{\sqrt{7}}{20} & 0 & 0 & \frac{\sqrt{105}}{280} & 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{7}i}{20} \\ \frac{\sqrt{7}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{280} & \frac{\sqrt{105}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{56} & -\frac{\sqrt{7}i}{20} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{420} & 0 & 0 & \frac{\sqrt{35}i}{60} & 0 & 0 & -\frac{\sqrt{21}}{420} & 0 & 0 & -\frac{\sqrt{21}i}{84} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{420} & -\frac{\sqrt{35}i}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{420} & \frac{\sqrt{21}i}{84} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{35}}{120} & 0 & -\frac{\sqrt{35}i}{840} & -\frac{\sqrt{35}}{105} & 0 & 0 & -\frac{\sqrt{21}}{40} & 0 & \frac{11\sqrt{21}i}{840} & -\frac{\sqrt{21}}{210} & 0 \\ 0 & 0 & -\frac{\sqrt{35}}{120} & 0 & \frac{\sqrt{35}i}{840} & 0 & 0 & \frac{\sqrt{35}}{105} & -\frac{\sqrt{21}}{40} & 0 & -\frac{11\sqrt{21}i}{840} & 0 & 0 & \frac{\sqrt{21}}{210} \\ \frac{\sqrt{21}}{210} & 0 & 0 & -\frac{29\sqrt{35}i}{840} & 0 & -\frac{\sqrt{35}}{120} & 0 & 0 & 0 & -\frac{13\sqrt{21}i}{280} & 0 & \frac{\sqrt{21}}{40} & 0 & 0 \\ 0 & -\frac{\sqrt{21}}{210} & \frac{29\sqrt{35}i}{840} & 0 & -\frac{\sqrt{35}}{120} & 0 & 0 & 0 & \frac{13\sqrt{21}i}{280} & 0 & \frac{\sqrt{21}}{40} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{21}i}{84} & -\frac{\sqrt{35}}{840} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{60} & -\frac{\sqrt{21}}{280} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{21}i}{84} & 0 & 0 & \frac{\sqrt{35}}{840} & 0 & 0 & \frac{\sqrt{35}}{60} & 0 & 0 & \frac{\sqrt{21}}{280} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{15}y(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|---|
| $\mathbb{T}_{5,1}^{(1,0;a)}(E, 2)$ | $0 \quad \frac{\sqrt{7}i}{20} \quad -\frac{\sqrt{105}}{280} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{42} \quad -\frac{\sqrt{7}}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{20}$ | |
| | $-\frac{\sqrt{7}i}{20} \quad 0 \quad 0 \quad \frac{\sqrt{105}}{280} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{42} \quad 0 \quad 0 \quad \frac{\sqrt{7}}{56} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{20} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{35}}{420} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{60} \quad \frac{\sqrt{21}}{420} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{84}$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{420} \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{420} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{84} \quad 0$ | |
| | $-\frac{\sqrt{21}}{210} \quad 0 \quad 0 \quad -\frac{\sqrt{35}i}{120} \quad 0 \quad -\frac{29\sqrt{35}}{840} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}i}{40} \quad 0 \quad \frac{13\sqrt{21}}{280} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{21}}{210} \quad \frac{\sqrt{35}i}{120} \quad 0 \quad -\frac{29\sqrt{35}}{840} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}i}{40} \quad 0 \quad \frac{13\sqrt{21}}{280} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{840} \quad 0 \quad -\frac{\sqrt{35}i}{120} \quad \frac{\sqrt{21}}{105} \quad 0 \quad 0 \quad -\frac{11\sqrt{21}}{840} \quad 0 \quad \frac{\sqrt{21}i}{40} \quad -\frac{\sqrt{21}}{210} \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{35}}{840} \quad 0 \quad \frac{\sqrt{35}i}{120} \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{105} \quad -\frac{11\sqrt{21}}{840} \quad 0 \quad -\frac{\sqrt{21}i}{40} \quad 0 \quad 0 \quad \frac{\sqrt{21}}{210}$ | |
| | $0 \quad -\frac{\sqrt{21}}{84} \quad 0 \quad 0 \quad \frac{\sqrt{35}}{840} \quad 0 \quad 0 \quad \frac{\sqrt{35}i}{60} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{21}}{280} \quad 0 \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{21}}{84} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{35}}{840} \quad -\frac{\sqrt{35}i}{60} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{21}}{280} \quad 0 \quad 0$ | |
| 745 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ |
| $\mathbb{T}_{5,0}^{(1,0;a)}(E, 3)$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{5}}{40} \quad 0 \quad -\frac{\sqrt{5}i}{40} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{3}}{40} \quad 0 \quad -\frac{\sqrt{3}i}{40} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{5}}{40} \quad 0 \quad \frac{\sqrt{5}i}{40} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{3}}{40} \quad 0 \quad \frac{\sqrt{3}i}{40} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{15}}{120} \quad 0 \quad \frac{\sqrt{15}i}{120} \quad 0 \quad 0 \quad 0 \quad -\frac{1}{8} \quad 0 \quad \frac{i}{8} \quad -\frac{1}{5} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{15}}{120} \quad 0 \quad -\frac{\sqrt{15}i}{120} \quad 0 \quad 0 \quad 0 \quad -\frac{1}{8} \quad 0 \quad -\frac{i}{8} \quad 0 \quad 0 \quad \frac{1}{5}$ | |
| | $0 \quad -\frac{1}{10} \quad 0 \quad 0 \quad -\frac{\sqrt{15}}{30} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{1}{10} \quad 0 \quad 0 \quad 0 \quad \frac{i}{10}$ | |
| | $-\frac{1}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{15}}{30} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{1}{10} \quad -\frac{i}{10} \quad 0$ | |
| | $0 \quad \frac{i}{10} \quad -\frac{\sqrt{15}}{30} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{1}{10} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{1}{10}$ | |
| | $-\frac{i}{10} \quad 0 \quad 0 \quad \frac{\sqrt{15}}{30} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{1}{10} \quad 0 \quad 0 \quad 0 \quad \frac{1}{10} \quad 0$ | |
| | $\frac{1}{5} \quad 0 \quad 0 \quad -\frac{\sqrt{15}i}{30} \quad 0 \quad \frac{\sqrt{15}}{30} \quad 0 \quad 0$ | |
| 746 | symmetry | $\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------|---|
| $\mathbb{T}_{5,1}^{(1,0;a)}(E, 3)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{5}i}{40} & 0 & -\frac{\sqrt{5}}{40} & 0 & 0 & 0 & \frac{\sqrt{3}i}{40} & 0 & -\frac{\sqrt{3}}{40} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{40} & 0 & -\frac{\sqrt{5}}{40} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{40} & 0 & -\frac{\sqrt{3}}{40} & 0 & 0 & 0 \\ -\frac{1}{5} & 0 & 0 & \frac{\sqrt{15}i}{30} & 0 & -\frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{5} & -\frac{\sqrt{15}i}{30} & 0 & -\frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{10} & -\frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{10} & 0 & 0 & 0 & \frac{1}{10} \\ -\frac{i}{10} & 0 & 0 & \frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{10} & 0 & 0 & \frac{1}{10} & 0 \\ 0 & \frac{1}{10} & 0 & 0 & \frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 & 0 & \frac{1}{10} & 0 & 0 & -\frac{i}{10} \\ \frac{1}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{30} & 0 & 0 & 0 & 0 & 0 & -\frac{1}{10} & \frac{i}{10} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{15}}{120} & 0 & \frac{\sqrt{15}i}{120} & 0 & 0 & 0 & -\frac{1}{8} & 0 & \frac{i}{8} & -\frac{1}{5} & 0 \\ 0 & 0 & \frac{\sqrt{15}}{120} & 0 & -\frac{\sqrt{15}i}{120} & 0 & 0 & 0 & -\frac{1}{8} & 0 & -\frac{i}{8} & 0 & 0 & \frac{1}{5} \end{bmatrix}$ |
| | | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ |
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| | | |
| | | |
| | | |
| | | |
| 747 | symmetry | |
| $\mathbb{T}_{5,0}^{(1,0;a)}(E, 4)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{15}}{120} & 0 & \frac{\sqrt{15}i}{120} & 0 & 0 & 0 & \frac{7}{40} & 0 & -\frac{7i}{40} & \frac{1}{10} & 0 \\ 0 & 0 & \frac{\sqrt{15}}{120} & 0 & -\frac{\sqrt{15}i}{120} & 0 & 0 & 0 & \frac{7}{40} & 0 & \frac{7i}{40} & 0 & 0 & -\frac{1}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{120} & 0 & -\frac{\sqrt{5}i}{120} & \frac{\sqrt{5}}{30} & 0 & 0 & \frac{\sqrt{3}}{40} & 0 & \frac{\sqrt{3}i}{40} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{120} & 0 & \frac{\sqrt{5}i}{120} & 0 & 0 & -\frac{\sqrt{5}}{30} & \frac{\sqrt{3}}{40} & 0 & -\frac{\sqrt{3}i}{40} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{10} & 0 & 0 & \frac{\sqrt{5}}{30} & 0 & 0 & -\frac{\sqrt{5}i}{15} & 0 & 0 & -\frac{\sqrt{3}}{30} & 0 & 0 & \frac{\sqrt{3}i}{30} \\ \frac{\sqrt{3}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{30} & \frac{\sqrt{5}i}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{30} & -\frac{\sqrt{3}i}{30} & 0 \\ 0 & \frac{\sqrt{3}i}{10} & -\frac{\sqrt{5}}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{15} & -\frac{\sqrt{3}}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{30} \\ -\frac{\sqrt{3}i}{10} & 0 & 0 & \frac{\sqrt{5}}{30} & 0 & 0 & -\frac{\sqrt{5}}{15} & 0 & 0 & \frac{\sqrt{3}}{30} & 0 & 0 & -\frac{\sqrt{3}}{30} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{30} & 0 & -\frac{\sqrt{5}}{30} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{15} & 0 & \frac{\sqrt{3}}{15} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{30} & 0 & -\frac{\sqrt{5}}{30} & 0 & 0 & 0 & \frac{\sqrt{3}i}{15} & 0 & \frac{\sqrt{3}}{15} & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 748 | symmetry | |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|--------|
| $\mathbb{T}_{5,1}^{(1,0;a)}(E, 4)$ | $\begin{bmatrix} -\frac{1}{10} & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & \frac{3i}{40} & 0 & \frac{3}{40} & 0 & 0 \\ 0 & \frac{1}{10} & -\frac{\sqrt{15}i}{24} & 0 & -\frac{\sqrt{15}}{24} & 0 & 0 & 0 & -\frac{3i}{40} & 0 & \frac{3}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}i}{24} & 0 & -\frac{\sqrt{5}}{24} & 0 & 0 & 0 & -\frac{7\sqrt{3}i}{120} & 0 & \frac{7\sqrt{3}}{120} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{24} & 0 & -\frac{\sqrt{5}}{24} & 0 & 0 & 0 & 0 & \frac{7\sqrt{3}i}{120} & 0 & \frac{7\sqrt{3}}{120} & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{30} & \frac{\sqrt{5}}{60} & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{15} & \frac{\sqrt{3}}{20} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{10} \\ \frac{\sqrt{3}i}{30} & 0 & 0 & -\frac{\sqrt{5}}{60} & 0 & 0 & \frac{\sqrt{5}}{15} & 0 & 0 & -\frac{\sqrt{3}}{20} & 0 & 0 & 0 & \frac{\sqrt{3}}{10} \\ 0 & \frac{\sqrt{3}}{30} & 0 & 0 & \frac{\sqrt{5}}{60} & 0 & 0 & -\frac{\sqrt{5}i}{15} & 0 & 0 & -\frac{\sqrt{3}}{20} & 0 & 0 & \frac{\sqrt{3}i}{10} \\ \frac{\sqrt{3}}{30} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{60} & \frac{\sqrt{5}i}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{20} & -\frac{\sqrt{3}i}{10} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{5}}{60} & 0 & \frac{\sqrt{5}i}{60} & -\frac{\sqrt{5}}{30} & 0 & 0 & -\frac{\sqrt{3}}{60} & 0 & -\frac{\sqrt{3}i}{60} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{60} & 0 & -\frac{\sqrt{5}i}{60} & 0 & 0 & \frac{\sqrt{5}}{30} & -\frac{\sqrt{3}}{60} & 0 & \frac{\sqrt{3}i}{60} & 0 & 0 & 0 \end{bmatrix}$ | |
| | 749 symmetry | z |
| | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{35}i}{280} & 0 & \frac{3\sqrt{35}}{280} & 0 & 0 & 0 & \frac{\sqrt{21}i}{56} & 0 & -\frac{\sqrt{21}}{56} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{35}i}{280} & 0 & \frac{3\sqrt{35}}{280} & 0 & 0 & 0 & -\frac{\sqrt{21}i}{56} & 0 & -\frac{\sqrt{21}}{56} & 0 & 0 & 0 \\ \frac{\sqrt{7}}{14} & 0 & 0 & \frac{\sqrt{105}i}{280} & 0 & -\frac{\sqrt{105}}{280} & 0 & 0 & 0 & -\frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{14} & -\frac{\sqrt{105}i}{280} & 0 & -\frac{\sqrt{105}}{280} & 0 & 0 & 0 & \frac{3\sqrt{7}i}{56} & 0 & -\frac{3\sqrt{7}}{56} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{105}}{140} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{70} & \frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{140} & 0 & 0 & \frac{\sqrt{105}}{70} & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{140} & 0 & 0 & \frac{\sqrt{105}i}{70} & 0 & 0 & \frac{\sqrt{7}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{140} & -\frac{\sqrt{105}i}{70} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & -\frac{\sqrt{105}i}{70} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 \\ 0 & 0 & -\frac{\sqrt{105}}{70} & 0 & \frac{\sqrt{105}i}{70} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{14} \end{bmatrix}$ | |
| | 750 symmetry | x |

continued ...

Table 9

| No. | multipole | matrix |
|---------------------------------|-------------------------|---|
| $\mathbb{T}_{1,0}^{(1,1;a)}(E)$ | 0 | $-\frac{\sqrt{21}}{28}$ 0 0 0 $\frac{3\sqrt{35}}{280}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{56}$ 0 0 $-\frac{\sqrt{21}i}{28}$ |
| | $-\frac{\sqrt{21}}{28}$ | 0 0 0 0 0 $-\frac{3\sqrt{35}}{280}$ 0 0 0 0 0 $\frac{\sqrt{21}}{56}$ $\frac{\sqrt{21}i}{28}$ 0 |
| | 0 | $-\frac{\sqrt{7}}{28}$ 0 0 0 $-\frac{\sqrt{105}}{280}$ 0 0 $-\frac{\sqrt{105}i}{140}$ 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 |
| | $-\frac{\sqrt{7}}{28}$ | 0 0 0 0 0 $\frac{\sqrt{105}}{280}$ $\frac{\sqrt{105}i}{140}$ 0 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{105}i}{70}$ $\frac{\sqrt{105}}{70}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{105}i}{70}$ 0 0 $-\frac{\sqrt{105}}{70}$ $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{105}i}{70}$ 0 $\frac{\sqrt{105}}{140}$ 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{105}i}{70}$ 0 $\frac{\sqrt{105}}{140}$ 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 0 $-\frac{\sqrt{105}}{140}$ 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ |
| | 0 | 0 0 0 $\frac{\sqrt{105}}{70}$ 0 0 $-\frac{\sqrt{105}}{140}$ 0 0 0 0 0 $\frac{\sqrt{7}}{28}$ 0 |
| 751 | symmetry | y |
| $\mathbb{T}_{1,1}^{(1,1;a)}(E)$ | 0 | $-\frac{\sqrt{21}i}{28}$ $-\frac{3\sqrt{35}}{280}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{56}$ 0 0 0 0 $\frac{\sqrt{21}}{28}$ |
| | $\frac{\sqrt{21}i}{28}$ | 0 0 $\frac{3\sqrt{35}}{280}$ 0 0 0 0 0 0 $\frac{\sqrt{21}}{56}$ 0 0 0 $\frac{\sqrt{21}}{28}$ 0 |
| | 0 | $\frac{\sqrt{7}i}{28}$ $-\frac{\sqrt{105}}{280}$ 0 0 0 0 $\frac{\sqrt{105}}{140}$ $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 0 |
| | $-\frac{\sqrt{7}i}{28}$ | 0 0 $\frac{\sqrt{105}}{280}$ 0 0 $\frac{\sqrt{105}}{140}$ 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}i}{140}$ 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}i}{140}$ 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}}{70}$ 0 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{105}}{70}$ 0 0 0 0 $\frac{\sqrt{105}}{70}$ 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{105}}{70}$ 0 0 $-\frac{\sqrt{105}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{105}}{70}$ $\frac{\sqrt{105}i}{140}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 |
| 752 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------|---|----------------------------------|
| $\mathbb{T}_3^{(1,1;a)}(A_1)$ | $0 \frac{\sqrt{210}}{420} 0 0 \frac{\sqrt{14}}{32} 0 0 0 0 0 0 \frac{\sqrt{210}}{160} 0 0 -\frac{\sqrt{210}i}{420}$ | |
| | $\frac{\sqrt{210}}{420} 0 0 0 0 -\frac{\sqrt{14}}{32} 0 0 0 0 0 -\frac{\sqrt{210}}{160} \frac{\sqrt{210}i}{420} 0$ | |
| | $0 \frac{\sqrt{70}}{60} 0 0 -\frac{\sqrt{42}}{96} 0 0 \frac{\sqrt{42}i}{168} 0 0 \frac{\sqrt{70}}{96} 0 0 \frac{\sqrt{70}i}{60}$ | |
| | $\frac{\sqrt{70}}{60} 0 0 0 0 \frac{\sqrt{42}}{96} -\frac{\sqrt{42}i}{168} 0 0 0 -\frac{\sqrt{70}}{96} -\frac{\sqrt{70}i}{60} 0$ | |
| | $0 0 0 -\frac{\sqrt{42}}{56} 0 -\frac{5\sqrt{42}i}{224} 0 0 0 \frac{\sqrt{70}}{84} 0 -\frac{7\sqrt{70}i}{480} -\frac{\sqrt{70}}{240} 0$ | |
| | $0 0 -\frac{\sqrt{42}}{56} 0 \frac{5\sqrt{42}i}{224} 0 0 0 \frac{\sqrt{70}}{84} 0 \frac{7\sqrt{70}i}{480} 0 0 \frac{\sqrt{70}}{240}$ | |
| | $-\frac{\sqrt{70}}{240} 0 0 -\frac{13\sqrt{42}i}{672} 0 \frac{\sqrt{42}}{42} 0 0 0 \frac{\sqrt{70}i}{96} 0 \frac{11\sqrt{70}}{840} 0 0 0$ | |
| | $0 \frac{\sqrt{70}}{240} \frac{13\sqrt{42}i}{672} 0 \frac{\sqrt{42}}{42} 0 0 0 -\frac{\sqrt{70}i}{96} 0 \frac{11\sqrt{70}}{840} 0 0 0$ | |
| | $0 -\frac{\sqrt{70}i}{60} -\frac{\sqrt{42}}{96} 0 0 0 0 -\frac{\sqrt{42}}{168} -\frac{\sqrt{70}}{96} 0 0 0 0 \frac{\sqrt{70}}{60}$ | |
| 753 symmetry | $\frac{\sqrt{70}i}{60} 0 0 \frac{\sqrt{42}}{96} 0 0 -\frac{\sqrt{42}}{168} 0 0 \frac{\sqrt{70}}{96} 0 0 \frac{\sqrt{70}}{60} 0$ | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| | $0 0 0 \frac{\sqrt{35}i}{112} 0 \frac{\sqrt{35}}{112} 0 0 0 \frac{5\sqrt{21}i}{336} 0 -\frac{5\sqrt{21}}{336} 0 0$ | |
| | $0 0 -\frac{\sqrt{35}i}{112} 0 \frac{\sqrt{35}}{112} 0 0 0 -\frac{5\sqrt{21}i}{336} 0 -\frac{5\sqrt{21}}{336} 0 0 0$ | |
| | $-\frac{\sqrt{7}}{21} 0 0 \frac{\sqrt{105}i}{336} 0 -\frac{\sqrt{105}}{336} 0 0 0 \frac{13\sqrt{7}i}{336} 0 \frac{13\sqrt{7}}{336} 0 0$ | |
| | $0 \frac{\sqrt{7}}{21} -\frac{\sqrt{105}i}{336} 0 -\frac{\sqrt{105}}{336} 0 0 0 -\frac{13\sqrt{7}i}{336} 0 \frac{13\sqrt{7}}{336} 0 0 0$ | |
| | $0 \frac{\sqrt{7}i}{24} \frac{\sqrt{105}}{84} 0 0 0 0 \frac{\sqrt{105}}{84} \frac{5\sqrt{7}}{84} 0 0 0 0 -\frac{\sqrt{7}}{24}$ | |
| | $-\frac{\sqrt{7}i}{24} 0 0 -\frac{\sqrt{105}}{84} 0 0 \frac{\sqrt{105}}{84} 0 0 -\frac{5\sqrt{7}}{84} 0 0 0 -\frac{\sqrt{7}}{24} 0$ | |
| | $0 \frac{\sqrt{7}}{24} 0 0 -\frac{\sqrt{105}}{84} 0 0 \frac{\sqrt{105}i}{84} 0 0 0 \frac{5\sqrt{7}}{84} 0 0 0 \frac{\sqrt{7}i}{24}$ | |
| | $\frac{\sqrt{7}}{24} 0 0 0 0 \frac{\sqrt{105}}{84} -\frac{\sqrt{105}i}{84} 0 0 0 0 -\frac{5\sqrt{7}}{84} -\frac{\sqrt{7}i}{24} 0$ | |
| | $0 0 0 \frac{\sqrt{105}}{112} 0 \frac{\sqrt{105}i}{112} 0 0 0 \frac{\sqrt{7}}{48} 0 -\frac{\sqrt{7}i}{48} \frac{\sqrt{7}}{21} 0$ | |
| 754 symmetry | $0 0 \frac{\sqrt{105}}{112} 0 -\frac{\sqrt{105}i}{112} 0 0 0 \frac{\sqrt{7}}{48} 0 \frac{\sqrt{7}i}{48} 0 0 -\frac{\sqrt{7}}{21}$ | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|--------------------------------------|---|
| $\mathbb{T}_3^{(1,1;a)}(A_2, 2)$ | 0 | $-\frac{\sqrt{210}i}{420} \quad \frac{\sqrt{14}}{32} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{420}$ |
| | $\frac{\sqrt{210}i}{420}$ | $0 \quad 0 \quad -\frac{\sqrt{14}}{32} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{210}}{160} \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{420} \quad 0$ |
| | 0 | $\frac{\sqrt{70}i}{60} \quad \frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}}{168} \quad \frac{\sqrt{70}}{96} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{60}$ |
| | $-\frac{\sqrt{70}i}{60}$ | $0 \quad 0 \quad -\frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad \frac{\sqrt{42}}{168} \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{96} \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{60} \quad 0$ |
| | $-\frac{\sqrt{70}}{240}$ | $0 \quad 0 \quad -\frac{\sqrt{42}i}{42} \quad 0 \quad \frac{13\sqrt{42}}{672} \quad 0 \quad 0 \quad 0 \quad \frac{11\sqrt{70}i}{840} \quad 0 \quad \frac{\sqrt{70}}{96} \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{70}}{240} \quad \frac{\sqrt{42}i}{42} \quad 0 \quad \frac{13\sqrt{42}}{672} \quad 0 \quad 0 \quad 0 \quad -\frac{11\sqrt{70}i}{840} \quad 0 \quad \frac{\sqrt{70}}{96} \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{5\sqrt{42}}{224} \quad 0 \quad \frac{\sqrt{42}i}{56} \quad 0 \quad 0 \quad 0 \quad -\frac{7\sqrt{70}}{480} \quad 0 \quad \frac{\sqrt{70}i}{84} \quad \frac{\sqrt{70}}{240} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{5\sqrt{42}}{224} \quad 0 \quad -\frac{\sqrt{42}i}{56} \quad 0 \quad 0 \quad 0 \quad -\frac{7\sqrt{70}}{480} \quad 0 \quad -\frac{\sqrt{70}i}{84} \quad 0 \quad -\frac{\sqrt{70}}{240}$ |
| | $\frac{\sqrt{70}}{60}$ | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad \frac{\sqrt{42}i}{168} \quad 0 \quad 0 \quad \frac{\sqrt{70}}{96} \quad 0 \quad 0 \quad \frac{\sqrt{70}i}{60} \quad 0$ |
| 755 symmetry | $\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ | $0 \quad -\frac{\sqrt{14}}{28} \quad 0 \quad 0 \quad \frac{\sqrt{210}}{224} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{5\sqrt{14}}{224} \quad 0 \quad 0 \quad -\frac{\sqrt{14}i}{28}$ |
| | $-\frac{\sqrt{14}}{28}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{210}}{224} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{14}}{224} \quad \frac{\sqrt{14}i}{28} \quad 0$ |
| | 0 | $\frac{\sqrt{42}}{84} \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{224} \quad 0 \quad 0 \quad \frac{\sqrt{70}i}{56} \quad 0 \quad 0 \quad \frac{13\sqrt{42}}{672} \quad 0 \quad 0 \quad 0$ |
| | $\frac{\sqrt{42}}{84}$ | $0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{70}}{224} \quad -\frac{\sqrt{70}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{13\sqrt{42}}{672} \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{56} \quad 0 \quad -\frac{\sqrt{70}i}{224} \quad \frac{\sqrt{70}}{56} \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{84} \quad 0 \quad -\frac{\sqrt{42}i}{96} \quad -\frac{\sqrt{42}}{48} \quad 0$ |
| | 0 | $0 \quad 0 \quad -\frac{\sqrt{70}}{56} \quad 0 \quad \frac{\sqrt{70}i}{224} \quad 0 \quad 0 \quad -\frac{\sqrt{70}}{56} \quad -\frac{\sqrt{42}}{84} \quad 0 \quad \frac{\sqrt{42}i}{96} \quad 0 \quad 0 \quad \frac{\sqrt{42}}{48}$ |
| | $\frac{\sqrt{42}}{48}$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{70}i}{224} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}i}{96} \quad 0 \quad -\frac{\sqrt{42}}{56} \quad 0 \quad 0 \quad 0$ |
| | 0 | $-\frac{\sqrt{42}}{48} \quad -\frac{\sqrt{70}i}{224} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}i}{96} \quad 0 \quad -\frac{\sqrt{42}}{56} \quad 0 \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{70}}{224} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{70}}{56} \quad \frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{84}$ |
| 756 symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ | $0 \quad \frac{\sqrt{70}}{60} \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{96} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}}{84} \quad 0$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|----------------------------------|
| $\mathbb{T}_{3,1}^{(1,1;a)}(E, 1)$ | $0 - \frac{\sqrt{14}i}{28} - \frac{\sqrt{210}}{224} 0 0 0 0 0 0 - \frac{5\sqrt{14}}{224} 0 0 0 0 \frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}i}{28} 0 0 \frac{\sqrt{210}}{224} 0 0 0 0 0 \frac{5\sqrt{14}}{224} 0 0 0 \frac{\sqrt{14}}{28} 0$ | |
| | $0 - \frac{\sqrt{42}i}{84} - \frac{\sqrt{70}}{224} 0 0 0 0 - \frac{\sqrt{70}}{56} - \frac{13\sqrt{42}}{672} 0 0 0 0 0 0$ | |
| | $\frac{\sqrt{42}i}{84} 0 0 \frac{\sqrt{70}}{224} 0 0 - \frac{\sqrt{70}}{56} 0 0 \frac{13\sqrt{42}}{672} 0 0 0 0$ | |
| | $- \frac{\sqrt{42}}{48} 0 0 0 0 \frac{\sqrt{70}}{224} 0 0 0 \frac{\sqrt{42}i}{56} 0 \frac{\sqrt{42}}{96} 0 0 0$ | |
| | $0 \frac{\sqrt{42}}{48} 0 0 \frac{\sqrt{70}}{224} 0 0 0 - \frac{\sqrt{42}i}{56} 0 \frac{\sqrt{42}}{96} 0 0 0$ | |
| | $0 0 0 - \frac{\sqrt{70}}{224} 0 - \frac{\sqrt{70}i}{56} - \frac{\sqrt{70}}{56} 0 0 \frac{\sqrt{42}}{96} 0 \frac{\sqrt{42}i}{84} - \frac{\sqrt{42}}{48} 0$ | |
| | $0 0 - \frac{\sqrt{70}}{224} 0 \frac{\sqrt{70}i}{56} 0 0 \frac{\sqrt{70}}{56} \frac{\sqrt{42}}{96} 0 - \frac{\sqrt{42}i}{84} 0 0 \frac{\sqrt{42}}{48}$ | |
| | $0 0 0 0 - \frac{3\sqrt{70}}{224} 0 0 0 \frac{\sqrt{70}i}{56} 0 0 \frac{\sqrt{42}}{96} 0 0 \frac{\sqrt{42}i}{84}$ | |
| | $0 0 0 0 0 \frac{3\sqrt{70}}{224} - \frac{\sqrt{70}i}{56} 0 0 0 0 - \frac{\sqrt{42}}{96} - \frac{\sqrt{42}i}{84} 0$ | |
| 757 | symmetry | $\sqrt{15}xyz$ |
| $\mathbb{T}_{3,0}^{(1,1;a)}(E, 2)$ | $0 0 0 \frac{\sqrt{21}}{28} 0 \frac{\sqrt{21}i}{28} 0 0 0 - \frac{\sqrt{35}}{70} 0 \frac{\sqrt{35}i}{70} \frac{\sqrt{35}}{35} 0$ | |
| | $0 0 \frac{\sqrt{21}}{28} 0 - \frac{\sqrt{21}i}{28} 0 0 0 - \frac{\sqrt{35}}{70} 0 - \frac{\sqrt{35}i}{70} 0 0 - \frac{\sqrt{35}}{35}$ | |
| | $0 0 0 \frac{\sqrt{7}}{28} 0 - \frac{\sqrt{7}i}{28} - \frac{\sqrt{7}}{14} 0 0 \frac{\sqrt{105}}{70} 0 \frac{\sqrt{105}i}{70} 0 0$ | |
| | $0 0 \frac{\sqrt{7}}{28} 0 \frac{\sqrt{7}i}{28} 0 0 \frac{\sqrt{7}}{14} \frac{\sqrt{105}}{70} 0 - \frac{\sqrt{105}i}{70} 0 0 0$ | |
| | $0 0 0 0 \frac{\sqrt{7}}{56} 0 0 \frac{\sqrt{7}i}{56} 0 0 \frac{\sqrt{105}}{120} 0 0 - \frac{\sqrt{105}i}{120}$ | |
| | $0 0 0 0 0 - \frac{\sqrt{7}}{56} - \frac{\sqrt{7}i}{56} 0 0 0 0 - \frac{\sqrt{105}}{120} \frac{\sqrt{105}i}{120} 0$ | |
| | $0 0 - \frac{\sqrt{7}}{56} 0 0 0 \frac{\sqrt{7}}{56} \frac{\sqrt{105}}{120} 0 0 0 0 \frac{\sqrt{105}}{120}$ | |
| | $0 0 0 \frac{\sqrt{7}}{56} 0 0 \frac{\sqrt{7}}{56} 0 0 - \frac{\sqrt{105}}{120} 0 0 \frac{\sqrt{105}}{120} 0$ | |
| | $0 0 0 - \frac{\sqrt{7}i}{56} 0 - \frac{\sqrt{7}}{56} 0 0 0 - \frac{\sqrt{105}i}{120} 0 \frac{\sqrt{105}}{120} 0 0$ | |
| | $0 0 \frac{\sqrt{7}i}{56} 0 - \frac{\sqrt{7}}{56} 0 0 0 \frac{\sqrt{105}i}{120} 0 \frac{\sqrt{105}}{120} 0 0$ | |
| 758 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--|
| $\mathbb{T}_{3,1}^{(1,1;a)}(E, 2)$ | $-\frac{\sqrt{35}}{35} \quad 0 \quad 0 \quad -\frac{3\sqrt{21}i}{112} \quad 0 \quad \frac{3\sqrt{21}}{112} \quad 0 \quad 0 \quad 0 \quad \frac{13\sqrt{35}i}{560} \quad 0 \quad \frac{13\sqrt{35}}{560} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{35}}{35} \quad \frac{3\sqrt{21}i}{112} \quad 0 \quad \frac{3\sqrt{21}}{112} \quad 0 \quad 0 \quad 0 \quad -\frac{13\sqrt{35}i}{560} \quad 0 \quad \frac{13\sqrt{35}}{560} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{3\sqrt{7}i}{112} \quad 0 \quad -\frac{3\sqrt{7}}{112} \quad 0 \quad 0 \quad 0 \quad -\frac{11\sqrt{105}i}{1680} \quad 0 \quad \frac{11\sqrt{105}}{1680} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{3\sqrt{7}i}{112} \quad 0 \quad -\frac{3\sqrt{7}}{112} \quad 0 \quad 0 \quad 0 \quad \frac{11\sqrt{105}i}{1680} \quad 0 \quad \frac{11\sqrt{105}}{1680} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{105}i}{120} \quad -\frac{\sqrt{7}}{28} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{56} \quad \frac{\sqrt{105}}{420} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{105}i}{120} \quad 0 \quad 0 \quad \frac{\sqrt{7}}{28} \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{56} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{420} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{105}}{120} \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{28} \quad 0 \quad 0 \quad \frac{\sqrt{7}i}{56} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{420} \quad 0 \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{105}}{120} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{7}}{28} \quad -\frac{\sqrt{7}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{105}}{420} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{5\sqrt{7}}{112} \quad 0 \quad \frac{5\sqrt{7}i}{112} \quad \frac{\sqrt{7}}{14} \quad 0 \quad 0 \quad -\frac{\sqrt{105}}{80} \quad 0 \quad -\frac{\sqrt{105}i}{80} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{5\sqrt{7}}{112} \quad 0 \quad -\frac{5\sqrt{7}i}{112} \quad 0 \quad 0 \quad -\frac{\sqrt{7}}{14} \quad -\frac{\sqrt{105}}{80} \quad 0 \quad \frac{\sqrt{105}i}{80} \quad 0 \quad 0 \quad 0$ | |
| 759 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| $\mathbb{M}_2^{(a)}(A_1)$ | $0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0$ | |
| | $-\frac{\sqrt{70}i}{28} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{70}i}{28} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{42}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{70}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{42}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{70}i}{56} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{70}i}{56} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{42}i}{56} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{70}i}{56} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{70}i}{28} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{70}i}{28}$ | |
| 760 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{M}_{2,0}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{56} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| 761 | symmetry | $-\sqrt{3}xz$ |
| $\mathbb{M}_{2,1}^{(a)}(E, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| | | |
| 762 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---|---|
| $\mathbb{M}_{2,0}^{(a)}(E, 2)$ | $\frac{\sqrt{70}i}{28}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{70}i}{28}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 0 0 |
| 763 | symmetry | $-\sqrt{3}xy$ |
| $\mathbb{M}_{2,1}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\frac{\sqrt{70}i}{28}$ 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\frac{\sqrt{70}i}{28}$ |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 0 0 | 0 |
| | 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 0 | 0 |
| | 0 0 0 0 0 $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 | 0 |
| | 0 0 0 0 0 0 $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 | 0 |
| | 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 | 0 |
| | 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 | 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 |
| 764 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------|-----------|--|
| $\mathbb{M}_4^{(a)}(A_1, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{7}i}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{7}i}{56} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{7}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{7}i}{56} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} \end{bmatrix}$ |
| | | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| | | $\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{30}i}{80} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{30}i}{80} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{40} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{40} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 \end{bmatrix}$ |
| | | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
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| | | |
| 765 | symmetry | |
| 766 | symmetry | |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|---------------------------|--|
| $\mathbb{M}_4^{(a)}(A_2)$ | $-\frac{3\sqrt{2}i}{16}$ | $0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{2}i}{16} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{30}i}{80} \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{2}i}{16} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{30}i}{80} \ 0 \ 0 \ 0$ |
| | $\frac{\sqrt{6}i}{16}$ | $0 \ 0 \ 0 \ 0 \ \frac{\sqrt{6}i}{16} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{10}i}{16} \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{6}i}{16} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{10}i}{16} \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{10}i}{40} \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{10}i}{40}$ |
| | $\frac{\sqrt{10}i}{40}$ | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| 767 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{M}_{4,0}^{(a)}(E, 1)$ | $\frac{3\sqrt{14}i}{112}$ | $0 \ 0 \ \frac{3\sqrt{14}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{210}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{3\sqrt{14}i}{112}$ | $0 \ 0 \ 0 \ \frac{3\sqrt{14}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{210}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{\sqrt{42}i}{112}$ | $0 \ 0 \ \frac{\sqrt{42}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{13\sqrt{70}i}{560} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{\sqrt{42}i}{112}$ | $0 \ 0 \ 0 \ \frac{\sqrt{42}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{13\sqrt{70}i}{560} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{\sqrt{70}i}{40}$ | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | $\frac{\sqrt{70}i}{40}$ | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{42}i}{28} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{70}i}{40} \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{42}i}{28} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{70}i}{40}$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{42}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{70}i}{80} \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{42}i}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{70}i}{80} \ 0 \ 0 \ 0$ |
| 768 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|--|---|
| $\mathbb{M}_{4,1}^{(a)}(E, 1)$ | 0 0 0 0 $\frac{3\sqrt{14}i}{112}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{112}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{14}i}{112}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{112}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{42}i}{112}$ 0 0 0 0 0 $\frac{13\sqrt{70}i}{560}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{42}i}{112}$ 0 0 0 0 0 $\frac{13\sqrt{70}i}{560}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{42}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{40}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{42}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{40}$ | |
| | $\frac{\sqrt{70}i}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{70}i}{40}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{3\sqrt{42}i}{112}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{80}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{42}i}{112}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{80}$ 0 0 0 0 | |
| 769 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| $\mathbb{M}_{4,0}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | $-\frac{\sqrt{5}i}{10}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{5}i}{10}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{3}i}{8}$ 0 0 0 0 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{3}i}{8}$ 0 0 0 0 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{3}i}{8}$ 0 0 0 0 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{3}i}{8}$ 0 0 0 0 0 $-\frac{3\sqrt{5}i}{40}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{5}i}{10}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{5}i}{10}$ | |
| 770 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{M}_{4,1}^{(a)}(E, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}i}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}i}{40} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}i}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}i}{40} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
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| | | |
| | | |
| 771 | symmetry | |
| $\mathbb{M}_{4,0}^{(a)}(E, 3)$ | | $\begin{bmatrix} \frac{\sqrt{105}i}{35} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}i}{35} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{140} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{140} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{140} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{140} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
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| | | |
| | | |
| 772 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| $\mathbb{M}_{4,1}^{(a)}(E, 3)$ | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{35} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{35} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| 773 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| $\mathbb{M}_2^{(1,-1;a)}(A_1)$ | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{210}}{280} & 0 & -\frac{\sqrt{210}i}{280} & \frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{14}}{56} & 0 & \frac{\sqrt{14}i}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{210}}{280} & 0 & \frac{\sqrt{210}i}{280} & 0 & 0 & -\frac{\sqrt{210}}{70} & \frac{\sqrt{14}}{56} & 0 & -\frac{\sqrt{14}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{70}}{280} & 0 & -\frac{3\sqrt{70}i}{280} & 0 & 0 & 0 & \frac{\sqrt{42}}{168} & 0 & -\frac{\sqrt{42}i}{168} & \frac{\sqrt{42}}{42} & 0 \\ 0 & 0 & -\frac{3\sqrt{70}}{280} & 0 & \frac{3\sqrt{70}i}{280} & 0 & 0 & 0 & \frac{\sqrt{42}}{168} & 0 & \frac{\sqrt{42}i}{168} & 0 & 0 & -\frac{\sqrt{42}}{42} \\ 0 & -\frac{\sqrt{42}}{84} & 0 & 0 & -\frac{\sqrt{70}}{70} & 0 & 0 & -\frac{\sqrt{70}i}{140} & 0 & 0 & \frac{\sqrt{42}}{42} & 0 & 0 & -\frac{\sqrt{42}i}{84} \\ -\frac{\sqrt{42}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{70} & \frac{\sqrt{70}i}{140} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & \frac{\sqrt{42}i}{84} & 0 \\ 0 & \frac{\sqrt{42}i}{84} & -\frac{\sqrt{70}}{70} & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{140} & -\frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{84} \\ -\frac{\sqrt{42}i}{84} & 0 & 0 & \frac{\sqrt{70}}{70} & 0 & 0 & \frac{\sqrt{70}}{140} & 0 & 0 & \frac{\sqrt{42}}{42} & 0 & 0 & -\frac{\sqrt{42}}{84} & 0 \\ \frac{\sqrt{42}}{42} & 0 & 0 & -\frac{\sqrt{70}i}{140} & 0 & \frac{\sqrt{70}}{140} & 0 & 0 & 0 & \frac{\sqrt{42}i}{84} & 0 & \frac{\sqrt{42}}{84} & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{42} & \frac{\sqrt{70}i}{140} & 0 & \frac{\sqrt{70}}{140} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{84} & 0 & \frac{\sqrt{42}}{84} & 0 & 0 & 0 \end{bmatrix}$ |
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| | | |
| 774 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--------------------------------|
| $\mathbb{M}_{2,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{70}}{280}$ 0 0 $-\frac{3\sqrt{70}i}{140}$ 0 0 $\frac{\sqrt{42}}{56}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{70}}{280}$ $\frac{3\sqrt{70}i}{140}$ 0 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 | |
| | 0 0 0 0 $-\frac{3\sqrt{210}}{280}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | 0 0 0 0 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ $\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{210}i}{140}$ $-\frac{\sqrt{210}}{140}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ $-\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 $\frac{\sqrt{210}}{140}$ 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 $\frac{\sqrt{14}}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{14}}{28}$ $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{14}i}{28}$ $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 0 0 0 | |
| | $\frac{\sqrt{14}i}{28}$ 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 0 | |
| 775 | symmetry | $-\sqrt{3}xz$ |
| $\mathbb{M}_{2,1}^{(1,-1;a)}(E, 1)$ | 0 0 $\frac{3\sqrt{70}}{280}$ 0 0 0 0 $-\frac{3\sqrt{70}}{140}$ $\frac{\sqrt{42}}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{70}}{280}$ 0 0 $-\frac{3\sqrt{70}}{140}$ 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{210}}{280}$ 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ | |
| | 0 0 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 | |
| | $-\frac{\sqrt{14}}{28}$ 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 | |
| | 0 $\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 $\frac{\sqrt{210}}{140}$ 0 0 $\frac{\sqrt{14}}{28}$ 0 0 $-\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 $-\frac{\sqrt{210}}{140}$ $\frac{\sqrt{14}}{28}$ 0 0 0 $\frac{\sqrt{14}}{28}$ | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 0 0 | |
| | $-\frac{\sqrt{14}}{28}$ 0 0 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 0 | |
| 776 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|---|
| $\mathbb{M}_{2,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 $-\frac{3\sqrt{70}}{280}$ 0 $-\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 $\frac{\sqrt{42}i}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{70}}{280}$ 0 $\frac{3\sqrt{70}i}{280}$ 0 0 0 0 $-\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{210}}{280}$ 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 | |
| | 0 0 $\frac{3\sqrt{210}}{280}$ 0 $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{14}}{28}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ 0 0 0 0 $\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 $\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{14}}{28}$ 0 0 | |
| | 0 0 $\frac{\sqrt{210}i}{140}$ 0 $-\frac{\sqrt{210}}{140}$ 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 | |
| 777 | symmetry | $-\sqrt{3}xy$ |
| $\mathbb{M}_{2,1}^{(1,-1;a)}(E, 2)$ | 0 0 0 $-\frac{3\sqrt{70}i}{280}$ 0 $\frac{3\sqrt{70}}{280}$ 0 0 0 0 $-\frac{\sqrt{42}i}{56}$ 0 $-\frac{\sqrt{42}}{56}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{70}i}{280}$ 0 $\frac{3\sqrt{70}}{280}$ 0 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 $-\frac{\sqrt{42}}{56}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{210}i}{280}$ 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{14}i}{28}$ 0 0 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ 0 0 0 0 $\frac{\sqrt{210}}{140}$ 0 0 0 0 0 0 $\frac{\sqrt{14}}{28}$ 0 | |
| | 0 $-\frac{\sqrt{14}}{28}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{28}$ | |
| | $-\frac{\sqrt{14}}{28}$ 0 0 0 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 0 0 $-\frac{\sqrt{14}i}{28}$ 0 | |
| | 0 0 0 $\frac{\sqrt{210}}{140}$ 0 $-\frac{\sqrt{210}i}{140}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 $-\frac{\sqrt{14}i}{28}$ 0 0 | |
| 778 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------|---|-----------------------------------|
| $M_4^{(1,-1;a)}(A_1, 1)$ | 0 0 0 $\frac{3\sqrt{105}}{560}$ 0 $-\frac{3\sqrt{105}i}{560}$ $\frac{2\sqrt{105}}{105}$ 0 0 $\frac{3\sqrt{7}}{112}$ 0 $\frac{3\sqrt{7}i}{112}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{105}}{560}$ 0 $\frac{3\sqrt{105}i}{560}$ 0 0 $-\frac{2\sqrt{105}}{105}$ $\frac{3\sqrt{7}}{112}$ 0 $-\frac{3\sqrt{7}i}{112}$ 0 0 0 | |
| | 0 0 0 $\frac{11\sqrt{35}}{560}$ 0 $\frac{11\sqrt{35}i}{560}$ 0 0 0 $\frac{\sqrt{21}}{112}$ 0 $-\frac{\sqrt{21}i}{112}$ $-\frac{\sqrt{21}}{21}$ 0 | |
| | 0 0 $\frac{11\sqrt{35}}{560}$ 0 $-\frac{11\sqrt{35}i}{560}$ 0 0 0 $\frac{\sqrt{21}}{112}$ 0 $\frac{\sqrt{21}i}{112}$ 0 0 $\frac{\sqrt{21}}{21}$ | |
| | 0 $-\frac{\sqrt{21}}{56}$ 0 0 $-\frac{\sqrt{35}}{140}$ 0 0 $\frac{\sqrt{35}i}{140}$ 0 0 $\frac{\sqrt{21}i}{84}$ 0 0 $-\frac{\sqrt{21}i}{56}$ | |
| | $-\frac{\sqrt{21}}{56}$ 0 0 0 $\frac{\sqrt{35}}{140}$ $-\frac{\sqrt{35}i}{140}$ 0 0 0 0 $-\frac{\sqrt{21}}{84}$ $\frac{\sqrt{21}i}{56}$ 0 | |
| | 0 $\frac{\sqrt{21}i}{56}$ $-\frac{\sqrt{35}}{140}$ 0 0 0 0 $-\frac{\sqrt{35}}{140}$ $-\frac{\sqrt{21}}{84}$ 0 0 0 0 $-\frac{\sqrt{21}}{56}$ | |
| | $-\frac{\sqrt{21}i}{56}$ 0 0 $\frac{\sqrt{35}}{140}$ 0 0 $-\frac{\sqrt{35}}{140}$ 0 0 $\frac{\sqrt{21}}{84}$ 0 0 $-\frac{\sqrt{21}}{56}$ 0 | |
| | $-\frac{\sqrt{21}}{21}$ 0 0 $-\frac{\sqrt{35}i}{560}$ 0 $\frac{\sqrt{35}}{560}$ 0 0 0 $-\frac{3\sqrt{21}i}{112}$ 0 $-\frac{3\sqrt{21}}{112}$ 0 0 | |
| | 0 $\frac{\sqrt{21}}{21}$ $\frac{\sqrt{35}i}{560}$ 0 $\frac{\sqrt{35}}{560}$ 0 0 0 $\frac{3\sqrt{21}i}{112}$ 0 $-\frac{3\sqrt{21}}{112}$ 0 0 0 | |
| 779 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| $M_4^{(1,-1;a)}(A_1, 2)$ | 0 0 0 0 $\frac{5\sqrt{6}}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{5\sqrt{6}}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{2}}{32}$ 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}}{96}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{2}}{32}$ $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 $\frac{\sqrt{30}}{96}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}}{8}$ 0 $\frac{\sqrt{2}i}{32}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{32}$ $\frac{\sqrt{30}}{48}$ 0 | |
| | 0 0 $-\frac{\sqrt{2}}{8}$ 0 $-\frac{\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 $-\frac{\sqrt{30}}{48}$ | |
| | $\frac{\sqrt{30}}{48}$ 0 0 $-\frac{\sqrt{2}i}{32}$ 0 $-\frac{\sqrt{2}}{8}$ 0 0 0 $\frac{\sqrt{30}i}{32}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{30}}{48}$ $\frac{\sqrt{2}i}{32}$ 0 $-\frac{\sqrt{2}}{8}$ 0 0 0 $-\frac{\sqrt{30}i}{32}$ 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{2}}{32}$ 0 0 0 0 $-\frac{\sqrt{2}}{8}$ $\frac{\sqrt{30}}{96}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}}{32}$ 0 0 $-\frac{\sqrt{2}}{8}$ 0 0 $-\frac{\sqrt{30}}{96}$ 0 0 0 | |
| 780 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|--|
| $\mathbb{M}_4^{(1,-1;a)}(A_2)$ | 0 0 $-\frac{5\sqrt{6}}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{5\sqrt{6}}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{2}}{32}$ 0 0 0 0 $-\frac{\sqrt{2}}{8}$ $\frac{\sqrt{30}}{96}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}}{32}$ 0 0 $-\frac{\sqrt{2}}{8}$ 0 0 $-\frac{\sqrt{30}}{96}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{30}}{48}$ 0 0 $-\frac{\sqrt{2}i}{8}$ 0 $-\frac{\sqrt{2}}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}}{32}$ 0 0 | |
| | 0 $\frac{\sqrt{30}}{48}$ $\frac{\sqrt{2}i}{8}$ 0 $-\frac{\sqrt{2}}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}}{32}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{2}}{32}$ 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 $-\frac{\sqrt{30}}{32}$ 0 0 0 $\frac{\sqrt{30}}{48}$ 0 | |
| | 0 0 $\frac{\sqrt{2}}{32}$ 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 $-\frac{\sqrt{30}}{32}$ 0 0 0 0 $-\frac{\sqrt{30}}{48}$ | |
| | 0 0 0 0 $-\frac{\sqrt{2}}{32}$ 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 $\frac{\sqrt{30}}{96}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{2}}{32}$ $\frac{\sqrt{2}i}{8}$ 0 0 0 $-\frac{\sqrt{30}}{96}$ 0 0 0 | |
| 781 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{3\sqrt{42}}{224}$ 0 0 $-\frac{\sqrt{42}i}{42}$ 0 0 $\frac{3\sqrt{70}}{224}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{42}}{224}$ $\frac{\sqrt{42}i}{42}$ 0 0 0 0 0 $-\frac{3\sqrt{70}}{224}$ 0 0 | |
| | 0 0 0 0 $\frac{11\sqrt{14}}{224}$ 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 $-\frac{\sqrt{210}}{224}$ 0 0 $\frac{\sqrt{210}i}{84}$ | |
| | 0 0 0 0 0 $-\frac{11\sqrt{14}}{224}$ $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 $\frac{\sqrt{210}}{224}$ $-\frac{\sqrt{210}i}{84}$ 0 | |
| | 0 0 0 $\frac{\sqrt{14}}{56}$ 0 $\frac{3\sqrt{14}i}{224}$ $\frac{\sqrt{14}}{56}$ 0 0 0 0 $\frac{\sqrt{210}i}{672}$ $-\frac{\sqrt{210}}{112}$ 0 | |
| | 0 0 $\frac{\sqrt{14}}{56}$ 0 $-\frac{3\sqrt{14}i}{224}$ 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{\sqrt{210}i}{672}$ 0 0 $\frac{\sqrt{210}}{112}$ | |
| | $\frac{\sqrt{210}}{112}$ 0 0 $\frac{\sqrt{14}i}{224}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 0 $\frac{5\sqrt{210}i}{672}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{210}}{112}$ $-\frac{\sqrt{14}i}{224}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 0 $-\frac{5\sqrt{210}i}{672}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{210}i}{84}$ $-\frac{\sqrt{14}}{224}$ 0 0 0 0 $\frac{\sqrt{14}}{56}$ $-\frac{3\sqrt{210}}{224}$ 0 0 0 0 | |
| | $-\frac{\sqrt{210}i}{84}$ 0 0 $\frac{\sqrt{14}}{224}$ 0 0 $\frac{\sqrt{14}}{56}$ 0 0 $\frac{3\sqrt{210}}{224}$ 0 0 0 0 | |
| 782 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|---|
| $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 1)$ | 0 0 $\frac{3\sqrt{42}}{224}$ 0 0 0 0 $-\frac{\sqrt{42}}{42}$ $\frac{3\sqrt{70}}{224}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{42}}{224}$ 0 0 $-\frac{\sqrt{42}}{42}$ 0 0 $-\frac{3\sqrt{70}}{224}$ 0 0 0 0 | |
| | 0 0 $\frac{11\sqrt{14}}{224}$ 0 0 0 0 $-\frac{\sqrt{14}}{56}$ $\frac{\sqrt{210}}{224}$ 0 0 0 0 $\frac{\sqrt{210}}{84}$ | |
| | 0 0 0 $-\frac{11\sqrt{14}}{224}$ 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{\sqrt{210}}{224}$ 0 0 0 $\frac{\sqrt{210}}{84}$ 0 | |
| | $-\frac{\sqrt{210}}{112}$ 0 0 $\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{224}$ 0 0 0 0 0 $-\frac{5\sqrt{210}}{672}$ 0 0 | |
| | 0 $\frac{\sqrt{210}}{112}$ $-\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{224}$ 0 0 0 0 $-\frac{5\sqrt{210}}{672}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{14}}{224}$ 0 $\frac{\sqrt{14}i}{56}$ $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{\sqrt{210}}{672}$ 0 0 0 $-\frac{\sqrt{210}}{112}$ 0 | |
| | 0 0 $\frac{3\sqrt{14}}{224}$ 0 $-\frac{\sqrt{14}i}{56}$ 0 0 $\frac{\sqrt{14}}{56}$ $-\frac{\sqrt{210}}{672}$ 0 0 0 0 $\frac{\sqrt{210}}{112}$ | |
| | 0 $\frac{\sqrt{210}}{84}$ 0 0 $\frac{\sqrt{14}}{224}$ 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 $-\frac{3\sqrt{210}}{224}$ 0 0 0 | |
| | $\frac{\sqrt{210}}{84}$ 0 0 0 0 $-\frac{\sqrt{14}}{224}$ $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 $\frac{3\sqrt{210}}{224}$ 0 0 | |
| 783 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 $-\frac{5\sqrt{3}}{48}$ 0 $\frac{5\sqrt{3}i}{48}$ 0 0 0 $\frac{\sqrt{5}}{16}$ 0 $\frac{\sqrt{5}i}{16}$ 0 0 | |
| | 0 0 $-\frac{5\sqrt{3}}{48}$ 0 $-\frac{5\sqrt{3}i}{48}$ 0 0 0 $\frac{\sqrt{5}}{16}$ 0 $-\frac{\sqrt{5}i}{16}$ 0 0 0 | |
| | 0 0 0 $\frac{1}{16}$ 0 $\frac{i}{16}$ 0 0 0 $\frac{\sqrt{15}}{48}$ 0 $-\frac{\sqrt{15}i}{48}$ 0 0 | |
| | 0 0 $\frac{1}{16}$ 0 $-\frac{i}{16}$ 0 0 0 $\frac{\sqrt{15}}{48}$ 0 $\frac{\sqrt{15}i}{48}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ | |
| | $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 | |
| | 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ | |
| | $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 | |
| | 0 0 0 $\frac{i}{16}$ 0 $-\frac{1}{16}$ 0 0 0 $\frac{\sqrt{15}i}{48}$ 0 $\frac{\sqrt{15}}{48}$ 0 0 | |
| 784 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|-------------------------------------|---|
| | $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{5\sqrt{3}i}{48} & 0 & \frac{5\sqrt{3}}{48} & 0 & 0 & 0 & -\frac{\sqrt{5}i}{16} & 0 & \frac{\sqrt{5}}{16} & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{3}i}{48} & 0 & \frac{5\sqrt{3}}{48} & 0 & 0 & 0 & \frac{\sqrt{5}i}{16} & 0 & \frac{\sqrt{5}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{48} & 0 & -\frac{\sqrt{15}}{48} & 0 & 0 \\ 0 & 0 & \frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 & 0 & \frac{\sqrt{15}i}{48} & 0 & -\frac{\sqrt{15}}{48} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{24} \\ -\frac{\sqrt{15}i}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{24} & 0 \\ 0 & \frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{24} \\ \frac{\sqrt{15}}{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{24} & 0 \\ 0 & 0 & 0 & \frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & 0 & \frac{\sqrt{15}}{48} & 0 & -\frac{\sqrt{15}i}{48} & 0 & 0 \\ 0 & 0 & \frac{1}{16} & 0 & -\frac{i}{16} & 0 & 0 & 0 & \frac{\sqrt{15}}{48} & 0 & \frac{\sqrt{15}i}{48} & 0 & 0 & 0 \end{bmatrix}$ |
| 785 | symmetry | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | $\mathbb{M}_{4,0}^{(1,-1;a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{21}}{168} & 0 & -\frac{\sqrt{21}i}{168} & 0 & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{168} & 0 & \frac{\sqrt{21}i}{168} & 0 & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & -\frac{\sqrt{35}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & \frac{3\sqrt{7}i}{56} & -\frac{\sqrt{7}}{14} & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & -\frac{\sqrt{105}i}{168} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{7}}{56} & 0 & -\frac{3\sqrt{7}i}{56} & 0 & 0 & \frac{\sqrt{7}}{14} & -\frac{\sqrt{105}}{168} & 0 & \frac{\sqrt{105}i}{168} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{7}i}{56} & 0 & 0 & -\frac{\sqrt{105}}{56} & 0 & 0 & -\frac{\sqrt{105}i}{168} \\ \frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{56} & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & \frac{\sqrt{105}i}{168} & 0 \\ 0 & \frac{\sqrt{105}i}{84} & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{56} & -\frac{\sqrt{105}}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{168} \\ -\frac{\sqrt{105}i}{84} & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & 0 & \frac{\sqrt{105}}{168} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}i}{84} & 0 & \frac{\sqrt{105}}{84} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}i}{84} & 0 & \frac{\sqrt{105}}{84} & 0 & 0 & 0 \end{bmatrix}$ |
| 786 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|---|--|
| $\mathbb{M}_{4,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 $-\frac{\sqrt{21}i}{48}$ 0 $\frac{\sqrt{21}}{48}$ 0 0 0 $-\frac{\sqrt{35}i}{112}$ 0 $-\frac{\sqrt{35}}{112}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{21}i}{48}$ 0 $\frac{\sqrt{21}}{48}$ 0 0 0 $\frac{\sqrt{35}i}{112}$ 0 $-\frac{\sqrt{35}}{112}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{5\sqrt{7}i}{112}$ 0 $-\frac{5\sqrt{7}}{112}$ 0 0 0 $-\frac{\sqrt{105}i}{336}$ 0 $\frac{\sqrt{105}}{336}$ 0 0 0 | |
| | 0 0 $\frac{5\sqrt{7}i}{112}$ 0 $-\frac{5\sqrt{7}}{112}$ 0 0 0 $\frac{\sqrt{105}i}{336}$ 0 $\frac{\sqrt{105}}{336}$ 0 0 0 | |
| | 0 $\frac{\sqrt{105}i}{168}$ $\frac{\sqrt{7}}{14}$ 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{105}}{84}$ | |
| | $-\frac{\sqrt{105}i}{168}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{105}}{84}$ 0 | |
| | 0 $-\frac{\sqrt{105}}{168}$ 0 0 $\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{105}i}{84}$ | |
| | $-\frac{\sqrt{105}}{168}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ 0 | |
| | 0 0 0 $\frac{\sqrt{7}}{112}$ 0 $-\frac{\sqrt{7}i}{112}$ $\frac{\sqrt{7}}{14}$ 0 0 $\frac{5\sqrt{105}}{336}$ 0 $\frac{5\sqrt{105}i}{336}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{7}}{112}$ 0 $\frac{\sqrt{7}i}{112}$ 0 0 $-\frac{\sqrt{7}}{14}$ $\frac{5\sqrt{105}}{336}$ 0 $-\frac{5\sqrt{105}i}{336}$ 0 0 0 | |
| 787 | symmetry | $-\frac{5x^6}{16} - \frac{15x^4y^2}{16} + \frac{45x^4z^2}{8} - \frac{15x^2y^4}{16} + \frac{45x^2y^2z^2}{4} - \frac{15x^2z^4}{2} - \frac{5y^6}{16} + \frac{45y^4z^2}{8} - \frac{15y^2z^4}{2} + z^6$ |
| $\mathbb{M}_6^{(1,-1;a)}(A_1, 1)$ | 0 0 0 $\frac{3\sqrt{385}}{616}$ 0 $-\frac{3\sqrt{385}i}{616}$ $\frac{\sqrt{385}}{77}$ 0 0 $\frac{5\sqrt{231}}{616}$ 0 $\frac{5\sqrt{231}i}{616}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{385}}{616}$ 0 $\frac{3\sqrt{385}i}{616}$ 0 0 $-\frac{\sqrt{385}}{77}$ $\frac{5\sqrt{231}}{616}$ 0 $-\frac{5\sqrt{231}i}{616}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{1155}}{924}$ 0 $-\frac{\sqrt{1155}i}{924}$ 0 0 0 $-\frac{\sqrt{77}}{308}$ 0 $\frac{\sqrt{77}i}{308}$ $\frac{\sqrt{77}}{154}$ 0 | |
| | 0 0 $-\frac{\sqrt{1155}}{924}$ 0 $\frac{\sqrt{1155}i}{924}$ 0 0 0 $-\frac{\sqrt{77}}{308}$ 0 $-\frac{\sqrt{77}i}{308}$ 0 0 $-\frac{\sqrt{77}}{154}$ | |
| | 0 $\frac{\sqrt{77}}{154}$ 0 0 $\frac{\sqrt{1155}}{308}$ 0 0 $\frac{\sqrt{1155}i}{231}$ 0 0 0 $-\frac{5\sqrt{77}}{308}$ 0 0 $\frac{\sqrt{77}i}{154}$ | |
| | $\frac{\sqrt{77}}{154}$ 0 0 0 0 $-\frac{\sqrt{1155}}{308}$ $-\frac{\sqrt{1155}i}{231}$ 0 0 0 0 $\frac{5\sqrt{77}}{308}$ $-\frac{\sqrt{77}i}{154}$ 0 | |
| | 0 $-\frac{\sqrt{77}i}{154}$ $\frac{\sqrt{1155}}{308}$ 0 0 0 0 $-\frac{\sqrt{1155}}{231}$ $\frac{5\sqrt{77}}{308}$ 0 0 0 0 $\frac{\sqrt{77}}{154}$ | |
| | $\frac{\sqrt{77}i}{154}$ 0 0 $-\frac{\sqrt{1155}}{308}$ 0 0 $-\frac{\sqrt{1155}}{231}$ 0 0 0 $-\frac{5\sqrt{77}}{308}$ 0 0 $\frac{\sqrt{77}}{154}$ 0 | |
| | $\frac{\sqrt{77}}{154}$ 0 0 $\frac{\sqrt{1155}i}{1848}$ 0 $-\frac{\sqrt{1155}}{1848}$ 0 0 0 $\frac{3\sqrt{77}i}{616}$ 0 $\frac{3\sqrt{77}}{616}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{77}}{154}$ $-\frac{\sqrt{1155}i}{1848}$ 0 $-\frac{\sqrt{1155}}{1848}$ 0 0 0 $-\frac{3\sqrt{77}i}{616}$ 0 $\frac{3\sqrt{77}}{616}$ 0 0 0 | |
| 788 | symmetry | $\frac{\sqrt{462}(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}{32}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|-----------------------------------|--|
| | $\mathbb{M}_6^{(1,-1;a)}(A_1, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 789 | symmetry | $-\frac{\sqrt{210}yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{16}$ |
| | $\mathbb{M}_6^{(1,-1;a)}(A_1, 3)$ | $\begin{bmatrix} 0 & \frac{3\sqrt{110}}{220} & 0 & 0 & -\frac{\sqrt{66}}{88} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{110}}{440} & 0 & 0 & -\frac{3\sqrt{110}i}{220} \\ \frac{3\sqrt{110}}{220} & 0 & 0 & 0 & 0 & \frac{\sqrt{66}}{88} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}}{440} & \frac{3\sqrt{110}i}{220} & 0 \\ 0 & -\frac{\sqrt{330}}{440} & 0 & 0 & -\frac{3\sqrt{22}}{176} & 0 & 0 & -\frac{\sqrt{22}i}{44} & 0 & 0 & \frac{\sqrt{330}}{176} & 0 & 0 & -\frac{\sqrt{330}i}{440} \\ -\frac{\sqrt{330}}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{22}}{176} & \frac{\sqrt{22}i}{44} & 0 & 0 & 0 & 0 & -\frac{\sqrt{330}}{176} & \frac{\sqrt{330}i}{440} & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{22}}{176} & 0 & -\frac{5\sqrt{22}i}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}}{176} & 0 & \frac{3\sqrt{330}i}{880} & \frac{\sqrt{330}}{110} & 0 \\ 0 & 0 & -\frac{3\sqrt{22}}{176} & 0 & \frac{5\sqrt{22}i}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}}{176} & 0 & -\frac{3\sqrt{330}i}{880} & 0 & 0 & -\frac{\sqrt{330}}{110} \\ \frac{\sqrt{330}}{110} & 0 & 0 & \frac{3\sqrt{22}i}{176} & 0 & -\frac{\sqrt{22}}{176} & 0 & 0 & 0 & \frac{\sqrt{330}i}{176} & 0 & \frac{7\sqrt{330}}{880} & 0 & 0 \\ 0 & -\frac{\sqrt{330}}{110} & -\frac{3\sqrt{22}i}{176} & 0 & -\frac{\sqrt{22}}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}i}{176} & 0 & \frac{7\sqrt{330}}{880} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{330}i}{440} & -\frac{3\sqrt{22}}{176} & 0 & 0 & 0 & 0 & \frac{\sqrt{22}}{44} & -\frac{\sqrt{330}}{176} & 0 & 0 & 0 & 0 & -\frac{\sqrt{330}}{440} \\ -\frac{\sqrt{330}i}{440} & 0 & 0 & \frac{3\sqrt{22}}{176} & 0 & 0 & \frac{\sqrt{22}}{44} & 0 & 0 & \frac{\sqrt{330}}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}}{440} \end{bmatrix}$ |
| 790 | symmetry | $\frac{\sqrt{462}xy(x^2-3y^2)(3x^2-y^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-----|-----------------------------------|--|
| | $\mathbb{M}_6^{(1,-1;a)}(A_2, 1)$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}}{16} & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 791 | symmetry | $-\frac{\sqrt{210}xz(x^2-3y^2)(3x^2+3y^2-8z^2)}{16}$ |
| | $\mathbb{M}_6^{(1,-1;a)}(A_2, 2)$ | $\begin{bmatrix} 0 & \frac{3\sqrt{110}i}{220} & \frac{\sqrt{66}}{88} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}}{220} \\ -\frac{3\sqrt{110}i}{220} & 0 & 0 & -\frac{\sqrt{66}}{88} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}}{220} \\ 0 & \frac{\sqrt{330}i}{440} & -\frac{3\sqrt{22}}{176} & 0 & 0 & 0 & 0 & \frac{\sqrt{22}}{44} & -\frac{\sqrt{330}}{176} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{330}}{440} \\ -\frac{\sqrt{330}i}{440} & 0 & 0 & \frac{3\sqrt{22}}{176} & 0 & 0 & \frac{\sqrt{22}}{44} & 0 & 0 & \frac{\sqrt{330}}{176} & 0 & 0 & 0 & -\frac{\sqrt{330}}{440} & 0 \\ -\frac{\sqrt{330}}{110} & 0 & 0 & -\frac{\sqrt{22}i}{176} & 0 & \frac{3\sqrt{22}}{176} & 0 & 0 & 0 & -\frac{7\sqrt{330}i}{880} & 0 & -\frac{\sqrt{330}}{176} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{330}}{110} & \frac{\sqrt{22}i}{176} & 0 & \frac{3\sqrt{22}}{176} & 0 & 0 & 0 & \frac{7\sqrt{330}i}{880} & 0 & -\frac{\sqrt{330}}{176} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{22}}{176} & 0 & -\frac{3\sqrt{22}i}{176} & 0 & 0 & 0 & -\frac{3\sqrt{330}}{880} & 0 & \frac{\sqrt{330}i}{176} & \frac{\sqrt{330}}{110} & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{22}}{176} & 0 & \frac{3\sqrt{22}i}{176} & 0 & 0 & 0 & -\frac{3\sqrt{330}}{880} & 0 & -\frac{\sqrt{330}i}{176} & 0 & 0 & -\frac{\sqrt{330}}{110} & 0 \\ 0 & \frac{\sqrt{330}}{440} & 0 & 0 & \frac{3\sqrt{22}}{176} & 0 & 0 & \frac{\sqrt{22}i}{44} & 0 & 0 & -\frac{\sqrt{330}}{176} & 0 & 0 & 0 & \frac{\sqrt{330}i}{440} \\ \frac{\sqrt{330}}{440} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{22}}{176} & -\frac{\sqrt{22}i}{44} & 0 & 0 & 0 & 0 & \frac{\sqrt{330}}{176} & -\frac{\sqrt{330}i}{440} & 0 & 0 \end{bmatrix}$ |
| 792 | symmetry | $\frac{3\sqrt{154}yz(5x^4-10x^2y^2+y^4)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{M}_{6,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{2}}{8}$ 0 0 0 $-\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 0 $-\frac{\sqrt{2}i}{8}$ | |
| | $\frac{\sqrt{2}}{8}$ 0 0 0 0 $\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}}{16}$ $\frac{\sqrt{2}i}{8}$ 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}}{48}$ 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 $-\frac{\sqrt{2}i}{16}$ 0 0 | |
| | 0 0 $\frac{\sqrt{30}}{48}$ 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}i}{48}$ 0 $-\frac{\sqrt{30}}{48}$ 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 $-\frac{\sqrt{2}}{16}$ 0 0 | |
| | 0 0 $\frac{\sqrt{30}i}{48}$ 0 $-\frac{\sqrt{30}}{48}$ 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 $-\frac{\sqrt{2}}{16}$ 0 0 0 | |
| | 0 $\frac{\sqrt{2}i}{8}$ $\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 0 0 0 $\frac{\sqrt{2}}{8}$ | |
| | $-\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}}{16}$ 0 0 $\frac{\sqrt{2}}{8}$ 0 | |
| 793 | symmetry | $\frac{3\sqrt{154}xz(x^4 - 10x^2y^2 + 5y^4)}{16}$ |
| $\mathbb{M}_{6,1}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{2}i}{8}$ $\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 0 0 0 $\frac{\sqrt{2}}{8}$ | |
| | $-\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}}{16}$ 0 0 $\frac{\sqrt{2}}{8}$ 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 $\frac{\sqrt{30}}{48}$ 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 $\frac{\sqrt{2}}{16}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{30}i}{48}$ 0 $\frac{\sqrt{30}}{48}$ 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 $\frac{\sqrt{2}}{16}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}}{48}$ 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 $-\frac{\sqrt{2}i}{16}$ 0 0 | |
| | 0 0 $\frac{\sqrt{30}}{48}$ 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 $-\frac{\sqrt{2}}{16}$ 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{2}}{8}$ 0 0 $\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}}{16}$ 0 0 $\frac{\sqrt{2}i}{8}$ | |
| | $-\frac{\sqrt{2}}{8}$ 0 0 0 0 $-\frac{\sqrt{30}}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}}{16}$ $-\frac{\sqrt{2}i}{8}$ 0 | |
| 794 | symmetry | $\frac{\sqrt{21}yz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--------------------------|---|
| $\mathbb{M}_{6,0}^{(1,-1;a)}(E, 2)$ | 0 | $-\frac{\sqrt{11}}{44}, 0, 0, -\frac{\sqrt{165}}{88}, 0, 0, -\frac{\sqrt{165}i}{66}, 0, 0, \frac{5\sqrt{11}}{88}, 0, 0, -\frac{\sqrt{11}i}{44}$ |
| | $-\frac{\sqrt{11}}{44}$ | $0, 0, 0, 0, 0, \frac{\sqrt{165}}{88}, \frac{\sqrt{165}i}{66}, 0, 0, 0, 0, -\frac{5\sqrt{11}}{88}, \frac{\sqrt{11}i}{44}, 0$ |
| | 0 | $0, 0, 0, 0, -\frac{\sqrt{55}}{132}, 0, 0, -\frac{\sqrt{55}i}{132}, 0, 0, \frac{\sqrt{33}}{132}, 0, 0, -\frac{\sqrt{33}i}{132}$ |
| | 0 | $0, 0, 0, 0, 0, \frac{\sqrt{55}}{132}, \frac{\sqrt{55}i}{132}, 0, 0, 0, 0, -\frac{\sqrt{33}}{132}, \frac{\sqrt{33}i}{132}, 0$ |
| | 0 | $0, 0, 0, \frac{\sqrt{55}}{264}, 0, -\frac{5\sqrt{55}i}{264}, \frac{\sqrt{55}}{33}, 0, 0, \frac{\sqrt{33}}{88}, 0, \frac{7\sqrt{33}i}{264}, \frac{\sqrt{33}}{66}, 0$ |
| | 0 | $0, 0, \frac{\sqrt{55}}{264}, 0, \frac{5\sqrt{55}i}{264}, 0, 0, -\frac{\sqrt{55}}{33}, \frac{\sqrt{33}}{88}, 0, -\frac{7\sqrt{33}i}{264}, 0, 0, -\frac{\sqrt{33}}{66}$ |
| | $-\frac{\sqrt{33}}{66}$ | $0, 0, -\frac{\sqrt{55}i}{264}, 0, \frac{\sqrt{55}}{264}, 0, 0, 0, 0, -\frac{\sqrt{33}i}{88}, 0, -\frac{\sqrt{33}}{88}, 0, 0$ |
| | 0 | $\frac{\sqrt{33}}{66}, \frac{\sqrt{55}i}{264}, 0, \frac{\sqrt{55}}{264}, 0, 0, 0, \frac{\sqrt{33}i}{88}, 0, -\frac{\sqrt{33}}{88}, 0, 0, 0$ |
| | 0 | $0, -\frac{\sqrt{33}i}{132}, \frac{\sqrt{55}}{264}, 0, 0, 0, -\frac{\sqrt{55}}{132}, \frac{\sqrt{33}}{88}, 0, 0, 0, 0, 0$ |
| | $\frac{\sqrt{33}i}{132}$ | $0, 0, -\frac{\sqrt{55}}{264}, 0, 0, -\frac{\sqrt{55}}{132}, 0, 0, -\frac{\sqrt{33}}{88}, 0, 0, 0, 0$ |
| 795 | symmetry | $-\frac{\sqrt{21}xz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{8}$ |
| $\mathbb{M}_{6,1}^{(1,-1;a)}(E, 2)$ | 0 | $-\frac{\sqrt{11}i}{44}, \frac{\sqrt{165}}{88}, 0, 0, 0, 0, -\frac{\sqrt{165}}{66}, \frac{5\sqrt{11}}{88}, 0, 0, 0, 0, \frac{\sqrt{11}}{44}$ |
| | $\frac{\sqrt{11}i}{44}$ | $0, 0, -\frac{\sqrt{165}}{88}, 0, 0, -\frac{\sqrt{165}}{66}, 0, 0, -\frac{5\sqrt{11}}{88}, 0, 0, \frac{\sqrt{11}}{44}, 0$ |
| | 0 | $0, 0, -\frac{\sqrt{55}}{132}, 0, 0, 0, 0, \frac{\sqrt{55}}{132}, -\frac{\sqrt{33}}{132}, 0, 0, 0, 0, -\frac{\sqrt{33}}{132}$ |
| | 0 | $0, 0, 0, \frac{\sqrt{55}}{132}, 0, 0, \frac{\sqrt{55}}{132}, 0, 0, \frac{\sqrt{33}}{132}, 0, 0, -\frac{\sqrt{33}}{132}, 0$ |
| | $\frac{\sqrt{33}}{66}$ | $0, 0, \frac{\sqrt{55}i}{264}, 0, -\frac{\sqrt{55}}{264}, 0, 0, 0, 0, \frac{\sqrt{33}i}{88}, 0, \frac{\sqrt{33}}{88}, 0, 0$ |
| | 0 | $-\frac{\sqrt{33}}{66}, -\frac{\sqrt{55}i}{264}, 0, -\frac{\sqrt{55}}{264}, 0, 0, 0, -\frac{\sqrt{33}i}{88}, 0, \frac{\sqrt{33}}{88}, 0, 0, 0$ |
| | 0 | $0, 0, 0, -\frac{5\sqrt{55}}{264}, 0, \frac{\sqrt{55}i}{264}, -\frac{\sqrt{55}}{33}, 0, 0, -\frac{7\sqrt{33}}{264}, 0, -\frac{\sqrt{33}i}{88}, \frac{\sqrt{33}}{66}, 0$ |
| | 0 | $0, 0, -\frac{5\sqrt{55}}{264}, 0, -\frac{\sqrt{55}i}{264}, 0, 0, \frac{\sqrt{55}}{33}, -\frac{7\sqrt{33}}{264}, 0, \frac{\sqrt{33}i}{88}, 0, 0, -\frac{\sqrt{33}}{66}$ |
| | 0 | $0, -\frac{\sqrt{33}}{132}, 0, 0, -\frac{\sqrt{55}}{264}, 0, 0, -\frac{\sqrt{55}i}{132}, 0, 0, \frac{\sqrt{33}}{88}, 0, 0, 0$ |
| | $-\frac{\sqrt{33}}{132}$ | $0, 0, 0, 0, \frac{\sqrt{55}}{264}, \frac{\sqrt{55}i}{132}, 0, 0, 0, 0, -\frac{\sqrt{33}}{88}, 0, 0$ |
| 796 | symmetry | $-\frac{3\sqrt{7}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|--|
| $\mathbb{M}_{6,0}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{55}}{88}$ 0 $-\frac{\sqrt{55}i}{88}$ 0 0 0 $-\frac{\sqrt{33}}{88}$ 0 $-\frac{\sqrt{33}i}{88}$ 0 0 | |
| | 0 0 $\frac{\sqrt{55}}{88}$ 0 $\frac{\sqrt{55}i}{88}$ 0 0 0 $-\frac{\sqrt{33}}{88}$ 0 $\frac{\sqrt{33}i}{88}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{165}}{132}$ 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $\frac{\sqrt{11}i}{44}$ $\frac{\sqrt{11}}{22}$ 0 | |
| | 0 0 $-\frac{\sqrt{165}}{132}$ 0 $\frac{\sqrt{165}i}{132}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $-\frac{\sqrt{11}i}{44}$ 0 0 $-\frac{\sqrt{11}}{22}$ | |
| | 0 $-\frac{\sqrt{11}}{22}$ 0 0 $\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $\frac{\sqrt{11}}{44}$ 0 0 $\frac{\sqrt{11}i}{22}$ | |
| | $-\frac{\sqrt{11}}{22}$ 0 0 0 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{44}$ $-\frac{\sqrt{11}i}{22}$ 0 | |
| | 0 $\frac{\sqrt{11}i}{22}$ $\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 0 0 0 $\frac{\sqrt{11}}{22}$ | |
| | $-\frac{\sqrt{11}i}{22}$ 0 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $\frac{\sqrt{11}}{44}$ 0 0 $\frac{\sqrt{11}}{22}$ 0 | |
| | $-\frac{\sqrt{11}}{22}$ 0 0 $-\frac{\sqrt{165}i}{264}$ 0 $\frac{\sqrt{165}}{264}$ 0 0 0 $-\frac{3\sqrt{11}i}{88}$ 0 $-\frac{3\sqrt{11}}{88}$ 0 0 | |
| | 0 $\frac{\sqrt{11}}{22}$ $\frac{\sqrt{165}i}{264}$ 0 $\frac{\sqrt{165}}{264}$ 0 0 0 $\frac{3\sqrt{11}i}{88}$ 0 $-\frac{3\sqrt{11}}{88}$ 0 0 0 | |
| 797 | symmetry | $-\frac{3\sqrt{7}xy(x-y)(x+y)(x^2+y^2-10z^2)}{4}$ |
| $\mathbb{M}_{6,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 $-\frac{\sqrt{55}i}{88}$ 0 $-\frac{\sqrt{55}}{88}$ 0 0 0 $\frac{\sqrt{33}i}{88}$ 0 $-\frac{\sqrt{33}}{88}$ 0 0 | |
| | 0 0 $\frac{\sqrt{55}i}{88}$ 0 $-\frac{\sqrt{55}}{88}$ 0 0 0 $-\frac{\sqrt{33}i}{88}$ 0 $-\frac{\sqrt{33}}{88}$ 0 0 0 | |
| | $\frac{\sqrt{11}}{22}$ 0 0 $\frac{\sqrt{165}i}{264}$ 0 $-\frac{\sqrt{165}}{264}$ 0 0 0 $\frac{3\sqrt{11}i}{88}$ 0 $\frac{3\sqrt{11}}{88}$ 0 0 | |
| | 0 $-\frac{\sqrt{11}}{22}$ $-\frac{\sqrt{165}i}{264}$ 0 $-\frac{\sqrt{165}}{264}$ 0 0 0 $-\frac{3\sqrt{11}i}{88}$ 0 $\frac{3\sqrt{11}}{88}$ 0 0 0 | |
| | 0 $\frac{\sqrt{11}i}{22}$ $\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 0 0 0 $\frac{\sqrt{11}}{22}$ | |
| | $-\frac{\sqrt{11}i}{22}$ 0 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $\frac{\sqrt{11}}{44}$ 0 0 $\frac{\sqrt{11}}{22}$ 0 | |
| | 0 $\frac{\sqrt{11}}{22}$ 0 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{11}i}{22}$ | |
| | $\frac{\sqrt{11}}{22}$ 0 0 0 0 $\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $\frac{\sqrt{11}}{44}$ $\frac{\sqrt{11}i}{22}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{165}}{132}$ 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $\frac{\sqrt{11}i}{44}$ $\frac{\sqrt{11}}{22}$ 0 | |
| | 0 0 $-\frac{\sqrt{165}}{132}$ 0 $\frac{\sqrt{165}i}{132}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $-\frac{\sqrt{11}i}{44}$ 0 0 $-\frac{\sqrt{11}}{22}$ | |
| 798 | symmetry | $\frac{\sqrt{210}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{32}$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------------|--|---|
| $\mathbb{M}_{6,0}^{(1,-1;a)}(E, 4)$ | $0 \ 0 \ 0 \ -\frac{\sqrt{66}}{66} \ 0 \ -\frac{\sqrt{66}i}{66} \ 0 \ 0 \ 0 \ -\frac{\sqrt{110}}{110} \ 0 \ \frac{\sqrt{110}i}{110} \ \frac{\sqrt{110}}{55} \ 0$ | |
| | $0 \ 0 \ -\frac{\sqrt{66}}{66} \ 0 \ \frac{\sqrt{66}i}{66} \ 0 \ 0 \ 0 \ -\frac{\sqrt{110}}{110} \ 0 \ -\frac{\sqrt{110}i}{110} \ 0 \ 0 \ -\frac{\sqrt{110}}{55}$ | |
| | $0 \ 0 \ 0 \ \frac{7\sqrt{22}}{528} \ 0 \ -\frac{7\sqrt{22}i}{528} \ \frac{\sqrt{22}}{33} \ 0 \ 0 \ \frac{3\sqrt{330}}{880} \ 0 \ \frac{3\sqrt{330}i}{880} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ \frac{7\sqrt{22}}{528} \ 0 \ \frac{7\sqrt{22}i}{528} \ 0 \ 0 \ -\frac{\sqrt{22}}{33} \ \frac{3\sqrt{330}}{880} \ 0 \ -\frac{3\sqrt{330}i}{880} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ 0 \ \frac{\sqrt{22}}{33} \ 0 \ 0 \ \frac{\sqrt{22}i}{33} \ 0 \ 0 \ -\frac{\sqrt{330}}{165} \ 0 \ 0 \ \frac{\sqrt{330}i}{165}$ | |
| | $0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{22}}{33} \ -\frac{\sqrt{22}i}{33} \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{330}}{165} \ -\frac{\sqrt{330}i}{165} \ 0$ | |
| | $0 \ 0 \ -\frac{\sqrt{22}}{33} \ 0 \ 0 \ 0 \ \frac{\sqrt{22}}{33} \ -\frac{\sqrt{330}}{165} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{330}}{165}$ | |
| | $0 \ 0 \ 0 \ \frac{\sqrt{22}}{33} \ 0 \ 0 \ \frac{\sqrt{22}}{33} \ 0 \ 0 \ \frac{\sqrt{330}}{165} \ 0 \ 0 \ -\frac{\sqrt{330}}{165} \ 0$ | |
| | $0 \ 0 \ 0 \ -\frac{\sqrt{22}i}{528} \ 0 \ -\frac{\sqrt{22}}{528} \ 0 \ 0 \ 0 \ \frac{\sqrt{330}i}{2640} \ 0 \ -\frac{\sqrt{330}}{2640} \ 0 \ 0$ | |
| | $0 \ 0 \ \frac{\sqrt{22}i}{528} \ 0 \ -\frac{\sqrt{22}}{528} \ 0 \ 0 \ 0 \ -\frac{\sqrt{330}i}{2640} \ 0 \ -\frac{\sqrt{330}}{2640} \ 0 \ 0$ | |
| 799 | symmetry | $-\frac{\sqrt{210}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{16}$ |
| $\mathbb{M}_{6,1}^{(1,-1;a)}(E, 4)$ | $-\frac{\sqrt{110}}{55} \ 0 \ 0 \ -\frac{\sqrt{66}i}{132} \ 0 \ \frac{\sqrt{66}}{132} \ 0 \ 0 \ 0 \ -\frac{3\sqrt{110}i}{220} \ 0 \ -\frac{3\sqrt{110}}{220} \ 0 \ 0$ | |
| | $0 \ \frac{\sqrt{110}}{55} \ \frac{\sqrt{66}i}{132} \ 0 \ \frac{\sqrt{66}}{132} \ 0 \ 0 \ 0 \ \frac{3\sqrt{110}i}{220} \ 0 \ -\frac{3\sqrt{110}}{220} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ \frac{\sqrt{22}i}{528} \ 0 \ \frac{\sqrt{22}}{528} \ 0 \ 0 \ 0 \ -\frac{\sqrt{330}i}{2640} \ 0 \ \frac{\sqrt{330}}{2640} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ -\frac{\sqrt{22}i}{528} \ 0 \ \frac{\sqrt{22}}{528} \ 0 \ 0 \ 0 \ \frac{\sqrt{330}i}{2640} \ 0 \ \frac{\sqrt{330}}{2640} \ 0 \ 0 \ 0$ | |
| | $0 \ -\frac{\sqrt{330}i}{165} \ \frac{\sqrt{22}}{66} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{22}}{33} \ \frac{\sqrt{330}}{110} \ 0 \ 0 \ 0 \ 0 \ 0$ | |
| | $\frac{\sqrt{330}i}{165} \ 0 \ 0 \ -\frac{\sqrt{22}}{66} \ 0 \ 0 \ -\frac{\sqrt{22}}{33} \ 0 \ 0 \ -\frac{\sqrt{330}}{110} \ 0 \ 0 \ 0 \ 0$ | |
| | $0 \ \frac{\sqrt{330}}{165} \ 0 \ 0 \ \frac{\sqrt{22}}{66} \ 0 \ 0 \ \frac{\sqrt{22}i}{33} \ 0 \ 0 \ -\frac{\sqrt{330}}{110} \ 0 \ 0 \ 0$ | |
| | $\frac{\sqrt{330}}{165} \ 0 \ 0 \ 0 \ -\frac{\sqrt{22}}{66} \ -\frac{\sqrt{22}i}{33} \ 0 \ 0 \ 0 \ 0 \ \frac{\sqrt{330}}{110} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ 0 \ -\frac{5\sqrt{22}}{528} \ 0 \ \frac{5\sqrt{22}i}{528} \ -\frac{\sqrt{22}}{33} \ 0 \ 0 \ -\frac{\sqrt{330}}{240} \ 0 \ -\frac{\sqrt{330}i}{240} \ 0 \ 0 \ 0$ | |
| | $0 \ 0 \ -\frac{5\sqrt{22}}{528} \ 0 \ -\frac{5\sqrt{22}i}{528} \ 0 \ 0 \ \frac{\sqrt{22}}{33} \ -\frac{\sqrt{330}}{240} \ 0 \ \frac{\sqrt{330}i}{240} \ 0 \ 0 \ 0$ | |
| 800 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------|------------------------------------|--|
| $\mathbb{M}_2^{(1,0;a)}(A_1)$ | $\sqrt{3}yz$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{21}}{56} & 0 & \frac{\sqrt{21}i}{56} & 0 & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & -\frac{\sqrt{35}i}{56} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{56} & 0 & -\frac{\sqrt{21}i}{56} & 0 & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & \frac{\sqrt{35}i}{56} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & -\frac{\sqrt{7}i}{56} & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & -\frac{\sqrt{105}i}{56} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & \frac{\sqrt{7}i}{56} & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{56} & 0 & \frac{\sqrt{105}i}{56} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | $\sqrt{3}yz$ | |
| | $\mathbb{M}_{2,0}^{(1,0;a)}(E, 1)$ | |
| | $\sqrt{3}yz$ | $\begin{bmatrix} 0 & \frac{\sqrt{105}}{84} & 0 & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & \frac{\sqrt{105}i}{84} \\ \frac{\sqrt{105}}{84} & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}}{56} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{168} & -\frac{\sqrt{105}i}{84} & 0 \\ 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & -\frac{\sqrt{21}}{168} & 0 & 0 & \frac{\sqrt{21}i}{84} & 0 & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 & 0 \\ -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{168} & -\frac{\sqrt{21}i}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{56} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{42} & \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & \frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}i}{42} & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} \\ 0 & 0 & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 \end{bmatrix}$ |
| | $\sqrt{3}yz$ | |
| | $-\sqrt{3}xz$ | |
| | $-\sqrt{3}xz$ | |
| 802 | symmetry | |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|---|---|
| $\mathbb{M}_{2,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{\sqrt{105}i}{84} - \frac{\sqrt{7}}{56} 0 0 0 0 0 0 0 - \frac{\sqrt{105}}{168} 0 0 0 0 - \frac{\sqrt{105}}{84}$ |
| | $-\frac{\sqrt{105}i}{84}$ | $0 0 0 \frac{\sqrt{7}}{56} 0 0 0 0 0 \frac{\sqrt{105}}{168} 0 0 - \frac{\sqrt{105}}{84} 0$ |
| | 0 | $\frac{\sqrt{35}i}{28} - \frac{\sqrt{21}}{168} 0 0 0 0 - \frac{\sqrt{21}}{84} \frac{\sqrt{35}}{56} 0 0 0 0 0$ |
| | $-\frac{\sqrt{35}i}{28}$ | $0 0 0 \frac{\sqrt{21}}{168} 0 0 - \frac{\sqrt{21}}{84} 0 0 - \frac{\sqrt{35}}{56} 0 0 0 0$ |
| | 0 | $0 0 0 \frac{\sqrt{21}i}{84} 0 \frac{\sqrt{21}}{42} 0 0 0 \frac{\sqrt{35}i}{28} 0 0 0 0$ |
| | 0 | $0 0 - \frac{\sqrt{21}i}{84} 0 \frac{\sqrt{21}}{42} 0 0 0 - \frac{\sqrt{35}i}{28} 0 0 0 0 0$ |
| | 0 | $0 0 0 - \frac{\sqrt{21}}{42} 0 - \frac{\sqrt{21}i}{42} - \frac{\sqrt{21}}{42} 0 0 0 0 0 0 0$ |
| | 0 | $0 0 - \frac{\sqrt{21}}{42} 0 \frac{\sqrt{21}i}{42} 0 0 \frac{\sqrt{21}}{42} 0 0 0 0 0 0$ |
| | 0 | $0 0 0 0 \frac{\sqrt{21}}{42} 0 0 0 \frac{\sqrt{21}i}{84} 0 0 0 0 - \frac{\sqrt{35}i}{28}$ |
| | 0 | $0 0 0 0 0 - \frac{\sqrt{21}}{42} - \frac{\sqrt{21}i}{84} 0 0 0 0 0 \frac{\sqrt{35}i}{28} 0$ |
| 803 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |
| $\mathbb{M}_{2,0}^{(1,0;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{7}}{56} 0 -\frac{\sqrt{7}i}{56} 0 0 0 -\frac{\sqrt{105}}{168} 0 \frac{\sqrt{105}i}{168} -\frac{\sqrt{105}}{42} 0$ | |
| | 0 0 $-\frac{\sqrt{7}}{56} 0 \frac{\sqrt{7}i}{56} 0 0 0 -\frac{\sqrt{105}}{168} 0 -\frac{\sqrt{105}i}{168} 0 0 \frac{\sqrt{105}}{42}$ | |
| | 0 0 0 $-\frac{\sqrt{21}}{168} 0 \frac{\sqrt{21}i}{168} -\frac{\sqrt{21}}{42} 0 0 \frac{\sqrt{35}}{56} 0 \frac{\sqrt{35}i}{56} 0 0$ | |
| | 0 0 $-\frac{\sqrt{21}}{168} 0 -\frac{\sqrt{21}i}{168} 0 0 \frac{\sqrt{21}}{42} \frac{\sqrt{35}}{56} 0 -\frac{\sqrt{35}i}{56} 0 0 0$ | |
| | 0 0 0 0 $\frac{\sqrt{21}}{21} 0 0 -\frac{\sqrt{21}i}{42} 0 0 0 0 0 0 0$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{21}}{21} \frac{\sqrt{21}i}{42} 0 0 0 0 0 0 0 0 0$ | |
| | 0 0 $-\frac{\sqrt{21}}{21} 0 0 0 0 -\frac{\sqrt{21}}{42} 0 0 0 0 0 0$ | |
| | 0 0 0 $\frac{\sqrt{21}}{21} 0 0 -\frac{\sqrt{21}}{42} 0 0 0 0 0 0 0$ | |
| | 0 0 0 $\frac{\sqrt{21}i}{42} 0 \frac{\sqrt{21}}{42} 0 0 0 0 0 0 0 0 0$ | |
| | 0 0 $-\frac{\sqrt{21}i}{42} 0 \frac{\sqrt{21}}{42} 0 0 0 0 0 0 0 0 0$ | |
| 804 | symmetry | $-\sqrt{3}xy$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|-----------|---|
| $\mathbb{M}_{2,1}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} \frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{7}i}{56} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & -\frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{42} & \frac{\sqrt{7}i}{56} & 0 & \frac{\sqrt{7}}{56} & 0 & 0 & 0 & \frac{\sqrt{105}i}{168} & 0 & -\frac{\sqrt{105}}{168} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}i}{168} & 0 & -\frac{\sqrt{21}}{168} & 0 & 0 & 0 & \frac{\sqrt{35}i}{56} & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{168} & 0 & -\frac{\sqrt{21}}{168} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{56} & 0 & -\frac{\sqrt{35}}{56} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{42} & \frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{21}}{84} & 0 & 0 & \frac{\sqrt{21}}{42} & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{84} & \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & \frac{\sqrt{21}i}{42} & \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & -\frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | | |
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| | | |
| | | |
| | | |
| 805 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |
| $\mathbb{M}_4^{(1,0;a)}(A_1, 1)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{7}}{112} & 0 & \frac{3\sqrt{7}i}{112} & 0 & 0 & 0 & -\frac{\sqrt{105}}{112} & 0 & -\frac{\sqrt{105}i}{112} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{7}}{112} & 0 & -\frac{3\sqrt{7}i}{112} & 0 & 0 & 0 & -\frac{\sqrt{105}}{112} & 0 & \frac{\sqrt{105}i}{112} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{21}}{112} & 0 & -\frac{\sqrt{21}i}{112} & 0 & 0 & 0 & -\frac{13\sqrt{35}}{560} & 0 & \frac{13\sqrt{35}i}{560} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{112} & 0 & \frac{\sqrt{21}i}{112} & 0 & 0 & 0 & -\frac{13\sqrt{35}}{560} & 0 & -\frac{13\sqrt{35}i}{560} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{35}}{40} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{40} \\ -\frac{\sqrt{35}}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{40} & 0 \\ 0 & \frac{\sqrt{35}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} \\ -\frac{\sqrt{35}i}{40} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{40} & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{21}i}{112} & 0 & -\frac{3\sqrt{21}}{112} & 0 & 0 & 0 & \frac{\sqrt{35}i}{80} & 0 & \frac{\sqrt{35}}{80} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{21}i}{112} & 0 & -\frac{3\sqrt{21}}{112} & 0 & 0 & 0 & -\frac{\sqrt{35}i}{80} & 0 & \frac{\sqrt{35}}{80} & 0 & 0 & 0 \end{bmatrix}$ |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 806 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|-------------------------|--|
| $\mathbb{M}_4^{(1,0;a)}(A_1, 2)$ | 0 | $\frac{\sqrt{6}}{20} \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{10}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{6}}{160} \quad 0 \quad 0 \quad -\frac{\sqrt{6}i}{20}$ |
| | $\frac{\sqrt{6}}{20}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{10}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{6}}{160} \quad \frac{\sqrt{6}i}{20} \quad 0$ |
| | 0 | $- \frac{\sqrt{2}}{20} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad \frac{\sqrt{30}i}{40} \quad 0 \quad 0 \quad \frac{3\sqrt{2}}{32} \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{20}$ |
| | $-\frac{\sqrt{2}}{20}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{30}}{160} \quad -\frac{\sqrt{30}i}{40} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{2}}{32} \quad \frac{\sqrt{2}i}{20} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}}{40} \quad 0 \quad \frac{\sqrt{30}i}{160} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{20} \quad 0 \quad -\frac{\sqrt{2}i}{160} \quad -\frac{3\sqrt{2}}{80} \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{30}}{40} \quad 0 \quad -\frac{\sqrt{30}i}{160} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{20} \quad 0 \quad \frac{\sqrt{2}i}{160} \quad 0 \quad 0 \quad \frac{3\sqrt{2}}{80}$ |
| | $-\frac{3\sqrt{2}}{80}$ | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{30}i}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{13\sqrt{2}i}{160} \quad 0 \quad -\frac{\sqrt{2}}{40} \quad 0 \quad 0$ |
| | 0 | $\frac{3\sqrt{2}}{80} \quad -\frac{3\sqrt{30}i}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{13\sqrt{2}i}{160} \quad 0 \quad -\frac{\sqrt{2}}{40} \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{2}i}{20} \quad -\frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{40} \quad -\frac{3\sqrt{2}}{32} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{20}$ |
| | $-\frac{\sqrt{2}i}{20}$ | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{40} \quad 0 \quad 0 \quad \frac{3\sqrt{2}}{32} \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{20} \quad 0$ |
| 807 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |
| $\mathbb{M}_4^{(1,0;a)}(A_2)$ | 0 | $\frac{\sqrt{6}i}{20} \quad -\frac{9\sqrt{10}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{6}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}}{20}$ |
| | $-\frac{\sqrt{6}i}{20}$ | $0 \quad 0 \quad \frac{9\sqrt{10}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{6}}{160} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{6}}{20} \quad 0$ |
| | 0 | $\frac{\sqrt{2}i}{20} \quad -\frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{40} \quad -\frac{3\sqrt{2}}{32} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{20}$ |
| | $-\frac{\sqrt{2}i}{20}$ | $0 \quad 0 \quad \frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{30}}{40} \quad 0 \quad 0 \quad \frac{3\sqrt{2}}{32} \quad 0 \quad 0 \quad -\frac{\sqrt{2}}{20} \quad 0$ |
| | $\frac{3\sqrt{2}}{80}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{40} \quad 0 \quad \frac{13\sqrt{2}}{160} \quad 0 \quad 0$ |
| | 0 | $-\frac{3\sqrt{2}}{80} \quad 0 \quad 0 \quad \frac{3\sqrt{30}}{160} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{2}i}{40} \quad 0 \quad \frac{13\sqrt{2}}{160} \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{\sqrt{30}}{160} \quad 0 \quad \frac{\sqrt{30}i}{40} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{160} \quad 0 \quad \frac{\sqrt{2}i}{20} \quad -\frac{3\sqrt{2}}{80} \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{30}}{160} \quad 0 \quad -\frac{\sqrt{30}i}{40} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{2}}{160} \quad 0 \quad -\frac{\sqrt{2}i}{20} \quad 0 \quad 0 \quad \frac{3\sqrt{2}}{80}$ |
| | 0 | $\frac{\sqrt{2}}{20} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{30}}{160} \quad \frac{\sqrt{30}i}{40} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{2}}{32} \quad 0 \quad 0 \quad \frac{\sqrt{2}i}{20}$ |
| | $\frac{\sqrt{2}}{20}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{30}}{160} \quad \frac{\sqrt{30}i}{40} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{2}}{32} \quad -\frac{\sqrt{2}i}{20} \quad 0$ |
| 808 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|----------------------------|--|
| $\mathbb{M}_{4,0}^{(1,0;a)}(E, 1)$ | 0 | $\frac{3\sqrt{42}}{140}$ 0 0 0 $\frac{3\sqrt{70}}{1120}$ 0 0 0 0 0 $-\frac{\sqrt{42}}{224}$ 0 0 $\frac{3\sqrt{42}i}{140}$ |
| | $\frac{3\sqrt{42}}{140}$ | 0 0 0 0 0 $-\frac{3\sqrt{70}}{1120}$ 0 0 0 0 0 $\frac{\sqrt{42}}{224}$ $-\frac{3\sqrt{42}i}{140}$ 0 |
| | 0 | $\frac{\sqrt{14}}{28}$ 0 0 0 $-\frac{\sqrt{210}}{1120}$ 0 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 $\frac{13\sqrt{14}}{1120}$ 0 0 0 |
| | $\frac{\sqrt{14}}{28}$ | 0 0 0 0 0 $\frac{\sqrt{210}}{1120}$ $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $-\frac{13\sqrt{14}}{1120}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{210}}{280}$ 0 $\frac{3\sqrt{210}i}{1120}$ $\frac{\sqrt{210}}{280}$ 0 0 $-\frac{\sqrt{14}}{20}$ 0 $\frac{3\sqrt{14}i}{160}$ $-\frac{\sqrt{14}}{80}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{210}}{280}$ 0 $-\frac{3\sqrt{210}i}{1120}$ 0 0 $-\frac{\sqrt{210}}{280}$ $-\frac{\sqrt{14}}{20}$ 0 $-\frac{3\sqrt{14}i}{160}$ 0 0 $\frac{\sqrt{14}}{80}$ |
| | $\frac{\sqrt{14}}{80}$ | 0 0 0 $-\frac{3\sqrt{210}i}{1120}$ 0 $\frac{\sqrt{210}}{70}$ 0 0 0 0 $\frac{3\sqrt{14}i}{160}$ 0 $-\frac{11\sqrt{14}}{280}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{14}}{80}$ $\frac{3\sqrt{210}i}{1120}$ 0 $\frac{\sqrt{210}}{70}$ 0 0 0 $-\frac{3\sqrt{14}i}{160}$ 0 $-\frac{11\sqrt{14}}{280}$ 0 0 0 |
| | 0 | 0 $\frac{3\sqrt{210}}{1120}$ 0 0 0 0 $-\frac{3\sqrt{210}}{280}$ $\frac{\sqrt{14}}{160}$ 0 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 |
| | 0 | 0 0 0 $-\frac{3\sqrt{210}}{1120}$ 0 0 $-\frac{3\sqrt{210}}{280}$ 0 0 $-\frac{\sqrt{14}}{160}$ 0 0 0 $-\frac{\sqrt{14}}{28}$ 0 |
| 809 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{M}_{4,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{3\sqrt{42}i}{140}$ $-\frac{3\sqrt{70}}{1120}$ 0 0 0 0 0 0 $-\frac{\sqrt{42}}{224}$ 0 0 0 0 $-\frac{3\sqrt{42}}{140}$ |
| | $-\frac{3\sqrt{42}i}{140}$ | 0 0 $\frac{3\sqrt{70}}{1120}$ 0 0 0 0 0 0 $\frac{\sqrt{42}}{224}$ 0 0 0 $-\frac{3\sqrt{42}}{140}$ 0 |
| | 0 | $-\frac{\sqrt{14}i}{28}$ $-\frac{\sqrt{210}}{1120}$ 0 0 0 0 0 $\frac{3\sqrt{210}}{280}$ $-\frac{13\sqrt{14}}{1120}$ 0 0 0 0 0 |
| | $\frac{\sqrt{14}i}{28}$ | 0 0 $\frac{\sqrt{210}}{1120}$ 0 0 0 $\frac{3\sqrt{210}}{280}$ 0 0 0 $\frac{13\sqrt{14}}{1120}$ 0 0 0 0 |
| | $-\frac{\sqrt{14}}{80}$ | 0 0 $\frac{\sqrt{210}i}{70}$ 0 $-\frac{3\sqrt{210}}{1120}$ 0 0 0 0 $\frac{11\sqrt{14}i}{280}$ 0 $-\frac{3\sqrt{14}}{160}$ 0 0 0 |
| | 0 | $\frac{\sqrt{14}}{80}$ $-\frac{\sqrt{210}i}{70}$ 0 $-\frac{3\sqrt{210}}{1120}$ 0 0 0 $-\frac{11\sqrt{14}i}{280}$ 0 $-\frac{3\sqrt{14}}{160}$ 0 0 0 |
| | 0 | 0 0 0 $\frac{3\sqrt{210}}{1120}$ 0 $-\frac{\sqrt{210}i}{280}$ $-\frac{\sqrt{210}}{280}$ 0 0 $-\frac{3\sqrt{14}}{160}$ 0 $\frac{\sqrt{14}i}{20}$ $-\frac{\sqrt{14}}{80}$ 0 |
| | 0 | 0 0 $\frac{3\sqrt{210}}{1120}$ 0 $\frac{\sqrt{210}i}{280}$ 0 0 $\frac{\sqrt{210}}{280}$ $-\frac{3\sqrt{14}}{160}$ 0 $-\frac{\sqrt{14}i}{20}$ 0 0 $\frac{\sqrt{14}}{80}$ |
| | 0 | 0 0 0 0 $-\frac{3\sqrt{210}}{1120}$ 0 0 $-\frac{3\sqrt{210}i}{280}$ 0 0 $\frac{\sqrt{14}}{160}$ 0 0 0 $\frac{\sqrt{14}i}{28}$ |
| | 0 | 0 0 0 0 0 $\frac{3\sqrt{210}}{1120}$ $\frac{3\sqrt{210}i}{280}$ 0 0 0 0 $-\frac{\sqrt{14}}{160}$ $-\frac{\sqrt{14}i}{28}$ 0 |
| 810 | symmetry | $\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$ |

continued ..

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--|
| $\mathbb{M}_{4,0}^{(1,0;a)}(E, 2)$ | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{5}}{80} & 0 & -\frac{3\sqrt{5}i}{80} & 0 & 0 & 0 & -\frac{3\sqrt{3}}{80} & 0 & -\frac{3\sqrt{3}i}{80} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{5}}{80} & 0 & \frac{3\sqrt{5}i}{80} & 0 & 0 & 0 & -\frac{3\sqrt{3}}{80} & 0 & \frac{3\sqrt{3}i}{80} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{15}}{80} & 0 & \frac{\sqrt{15}i}{80} & 0 & 0 & 0 & \frac{1}{16} & 0 & -\frac{i}{16} & \frac{1}{5} & 0 \\ 0 & 0 & \frac{\sqrt{15}}{80} & 0 & -\frac{\sqrt{15}i}{80} & 0 & 0 & 0 & \frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & -\frac{1}{5} \\ 0 & -\frac{1}{40} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{3}{20} & 0 & 0 & \frac{i}{40} \\ -\frac{1}{40} & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{3}{20} & -\frac{i}{40} & 0 \\ 0 & \frac{i}{40} & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{3}{20} & 0 & 0 & 0 & 0 & \frac{1}{40} \\ -\frac{i}{40} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{3}{20} & 0 & 0 & \frac{1}{40} & 0 \\ -\frac{1}{5} & 0 & 0 & \frac{\sqrt{15}i}{80} & 0 & -\frac{\sqrt{15}}{80} & 0 & 0 & 0 & \frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 \\ 0 & \frac{1}{5} & -\frac{\sqrt{15}i}{80} & 0 & -\frac{\sqrt{15}}{80} & 0 & 0 & 0 & -\frac{i}{16} & 0 & \frac{1}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ | |
| $\mathbb{M}_{4,1}^{(1,0;a)}(E, 2)$ | $\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{5}i}{80} & 0 & -\frac{3\sqrt{5}}{80} & 0 & 0 & 0 & \frac{3\sqrt{3}i}{80} & 0 & -\frac{3\sqrt{3}}{80} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{5}i}{80} & 0 & -\frac{3\sqrt{5}}{80} & 0 & 0 & 0 & -\frac{3\sqrt{3}i}{80} & 0 & -\frac{3\sqrt{3}}{80} & 0 & 0 & 0 \\ \frac{1}{5} & 0 & 0 & -\frac{\sqrt{15}i}{80} & 0 & \frac{\sqrt{15}}{80} & 0 & 0 & 0 & -\frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 \\ 0 & -\frac{1}{5} & \frac{\sqrt{15}i}{80} & 0 & \frac{\sqrt{15}}{80} & 0 & 0 & 0 & \frac{i}{16} & 0 & -\frac{1}{16} & 0 & 0 & 0 \\ 0 & \frac{i}{40} & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{3}{20} & 0 & 0 & 0 & \frac{1}{40} \\ -\frac{i}{40} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3}{20} & 0 & 0 & \frac{1}{40} \\ 0 & \frac{1}{40} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & \frac{3}{20} & 0 & 0 & -\frac{i}{40} \\ \frac{1}{40} & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 & 0 & 0 & 0 & -\frac{3}{20} & \frac{i}{40} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{15}}{80} & 0 & \frac{\sqrt{15}i}{80} & 0 & 0 & 0 & \frac{1}{16} & 0 & -\frac{i}{16} & \frac{1}{5} & 0 \\ 0 & 0 & \frac{\sqrt{15}}{80} & 0 & -\frac{\sqrt{15}i}{80} & 0 & 0 & 0 & \frac{1}{16} & 0 & \frac{i}{16} & 0 & 0 & -\frac{1}{5} \end{bmatrix}$ |
| | $\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ | |
| 812 | symmetry | $\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--------------------------------------|
| $\mathbb{M}_{4,0}^{(1,0;a)}(E, 3)$ | 0 0 0 $\frac{3\sqrt{35}}{280}$ 0 $\frac{3\sqrt{35}i}{280}$ 0 0 0 0 $-\frac{9\sqrt{21}}{280}$ 0 $\frac{9\sqrt{21}i}{280}$ $-\frac{\sqrt{21}}{35}$ 0 | |
| | 0 0 $\frac{3\sqrt{35}}{280}$ 0 $-\frac{3\sqrt{35}i}{280}$ 0 0 0 $-\frac{9\sqrt{21}}{280}$ 0 $-\frac{9\sqrt{21}i}{280}$ 0 0 $\frac{\sqrt{21}}{35}$ | |
| | 0 0 0 $\frac{\sqrt{105}}{280}$ 0 $-\frac{\sqrt{105}i}{280}$ $\frac{\sqrt{105}}{70}$ 0 0 0 $-\frac{\sqrt{7}}{280}$ 0 $-\frac{\sqrt{7}i}{280}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{105}}{280}$ 0 $\frac{\sqrt{105}i}{280}$ 0 0 0 $-\frac{\sqrt{105}}{70}$ $-\frac{\sqrt{7}}{280}$ 0 $\frac{\sqrt{7}i}{280}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{7}}{20}$ 0 0 $-\frac{\sqrt{105}}{280}$ 0 0 0 $-\frac{3\sqrt{105}i}{280}$ 0 0 $-\frac{\sqrt{7}}{40}$ 0 0 $\frac{\sqrt{7}i}{40}$ | |
| | $-\frac{\sqrt{7}}{20}$ 0 0 0 0 $\frac{\sqrt{105}}{280}$ $\frac{3\sqrt{105}i}{280}$ 0 0 0 0 $\frac{\sqrt{7}}{40}$ $-\frac{\sqrt{7}i}{40}$ 0 | |
| | 0 $-\frac{\sqrt{7}i}{20}$ $\frac{\sqrt{105}}{280}$ 0 0 0 0 $-\frac{3\sqrt{105}}{280}$ $-\frac{\sqrt{7}}{40}$ 0 0 0 0 $-\frac{\sqrt{7}}{40}$ | |
| | $\frac{\sqrt{7}i}{20}$ 0 0 $-\frac{\sqrt{105}}{280}$ 0 0 $-\frac{3\sqrt{105}}{280}$ 0 0 0 $\frac{\sqrt{7}}{40}$ 0 0 $-\frac{\sqrt{7}}{40}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{105}i}{70}$ 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 $-\frac{\sqrt{7}i}{20}$ 0 $\frac{\sqrt{7}}{20}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{105}i}{70}$ 0 $-\frac{\sqrt{105}}{70}$ 0 0 0 $\frac{\sqrt{7}i}{20}$ 0 $\frac{\sqrt{7}}{20}$ 0 0 0 | |
| 813 | symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |
| $\mathbb{M}_{4,1}^{(1,0;a)}(E, 3)$ | $\frac{\sqrt{21}}{35}$ 0 0 $-\frac{3\sqrt{35}i}{112}$ 0 $\frac{3\sqrt{35}}{112}$ 0 0 0 $\frac{3\sqrt{21}i}{560}$ 0 $\frac{3\sqrt{21}}{560}$ 0 0 | |
| | 0 $-\frac{\sqrt{21}}{35}$ $\frac{3\sqrt{35}i}{112}$ 0 $\frac{3\sqrt{35}}{112}$ 0 0 0 $-\frac{3\sqrt{21}i}{560}$ 0 $\frac{3\sqrt{21}}{560}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{105}i}{112}$ 0 $-\frac{\sqrt{105}}{112}$ 0 0 0 $-\frac{37\sqrt{7}i}{560}$ 0 $\frac{37\sqrt{7}}{560}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}i}{112}$ 0 $-\frac{\sqrt{105}}{112}$ 0 0 0 $\frac{37\sqrt{7}i}{560}$ 0 $\frac{37\sqrt{7}}{560}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{7}i}{40}$ $\frac{\sqrt{105}}{140}$ 0 0 0 0 $\frac{3\sqrt{105}}{280}$ $-\frac{\sqrt{7}}{140}$ 0 0 0 0 $-\frac{\sqrt{7}}{20}$ | |
| | $\frac{\sqrt{7}i}{40}$ 0 0 $-\frac{\sqrt{105}}{140}$ 0 0 $\frac{3\sqrt{105}}{280}$ 0 0 $\frac{\sqrt{7}}{140}$ 0 0 $-\frac{\sqrt{7}}{20}$ 0 | |
| | 0 $\frac{\sqrt{7}}{40}$ 0 0 $\frac{\sqrt{105}}{140}$ 0 0 $-\frac{3\sqrt{105}i}{280}$ 0 0 $\frac{\sqrt{7}}{140}$ 0 0 $-\frac{\sqrt{7}i}{20}$ | |
| | $\frac{\sqrt{7}}{40}$ 0 0 0 $-\frac{\sqrt{105}}{140}$ $\frac{3\sqrt{105}i}{280}$ 0 0 0 0 $-\frac{\sqrt{7}}{140}$ $\frac{\sqrt{7}i}{20}$ 0 | |
| | 0 0 0 $\frac{\sqrt{105}}{560}$ 0 $-\frac{\sqrt{105}i}{560}$ $-\frac{\sqrt{105}}{70}$ 0 0 0 $-\frac{\sqrt{7}}{80}$ 0 $-\frac{\sqrt{7}i}{80}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}}{560}$ 0 $\frac{\sqrt{105}i}{560}$ 0 0 0 $\frac{\sqrt{105}}{70}$ $-\frac{\sqrt{7}}{80}$ 0 $\frac{\sqrt{7}i}{80}$ 0 0 0 | |
| 814 | symmetry | 1 |

continued ...

Table 9

| No. | multipole | matrix |
|-------------------------------|---|--|
| $\mathbb{M}_0^{(1,1;a)}(A_1)$ | 0 0 0 $-\frac{\sqrt{105}}{140}$ 0 $\frac{\sqrt{105}i}{140}$ $\frac{\sqrt{105}}{70}$ 0 0 $-\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{105}}{140}$ 0 $-\frac{\sqrt{105}i}{140}$ 0 0 $-\frac{\sqrt{105}}{70}$ $-\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{35}}{140}$ 0 $\frac{3\sqrt{35}i}{140}$ 0 0 0 $-\frac{\sqrt{21}}{84}$ 0 $\frac{\sqrt{21}i}{84}$ $\frac{\sqrt{21}}{42}$ 0 | |
| | 0 0 $\frac{3\sqrt{35}}{140}$ 0 $-\frac{3\sqrt{35}i}{140}$ 0 0 0 $-\frac{\sqrt{21}}{84}$ 0 $-\frac{\sqrt{21}i}{84}$ 0 0 $-\frac{\sqrt{21}}{42}$ | |
| | 0 $\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{35}}{70}$ 0 0 $\frac{\sqrt{35}i}{70}$ 0 0 $\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ | |
| | $\frac{\sqrt{21}}{42}$ 0 0 0 $\frac{\sqrt{35}}{70}$ $-\frac{\sqrt{35}i}{70}$ 0 0 0 $-\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{21}i}{42}$ 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{35}}{70}$ 0 0 0 0 $-\frac{\sqrt{35}}{70}$ $-\frac{\sqrt{21}}{42}$ 0 0 0 0 $\frac{\sqrt{21}}{42}$ | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}}{70}$ 0 0 $-\frac{\sqrt{35}}{70}$ 0 0 $\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 | |
| | $\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}i}{70}$ 0 $-\frac{\sqrt{35}}{70}$ 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{21}}{42}$ 0 0 | |
| | 0 $-\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{35}i}{70}$ 0 $-\frac{\sqrt{35}}{70}$ 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{21}}{42}$ 0 0 0 | |
| 815 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| $\mathbb{M}_2^{(1,1;a)}(A_1)$ | 0 0 0 $-\frac{3\sqrt{35}}{280}$ 0 $\frac{3\sqrt{35}i}{280}$ $\frac{\sqrt{35}}{35}$ 0 0 $-\frac{\sqrt{21}}{56}$ 0 $-\frac{\sqrt{21}i}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{35}}{280}$ 0 $-\frac{3\sqrt{35}i}{280}$ 0 0 $-\frac{\sqrt{35}}{35}$ $-\frac{\sqrt{21}}{56}$ 0 $\frac{\sqrt{21}i}{56}$ 0 0 0 | |
| | 0 0 0 $-\frac{11\sqrt{105}}{840}$ 0 $-\frac{11\sqrt{105}i}{840}$ 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 $-\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}i}{56}$ $-\frac{\sqrt{7}}{14}$ 0 | |
| | 0 0 $-\frac{11\sqrt{105}}{840}$ 0 $\frac{11\sqrt{105}i}{840}$ 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 $-\frac{\sqrt{7}i}{56}$ 0 0 $\frac{\sqrt{7}}{14}$ | |
| | 0 $\frac{\sqrt{7}}{28}$ 0 0 $-\frac{\sqrt{105}}{280}$ 0 0 $-\frac{\sqrt{105}i}{210}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $\frac{\sqrt{7}i}{28}$ 0 | |
| | $\frac{\sqrt{7}}{28}$ 0 0 0 $\frac{\sqrt{105}}{280}$ $\frac{\sqrt{105}i}{210}$ 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}i}{56}$ $-\frac{\sqrt{7}i}{28}$ 0 | |
| | 0 $-\frac{\sqrt{7}i}{28}$ $-\frac{\sqrt{105}}{280}$ 0 0 0 0 $\frac{\sqrt{105}}{210}$ $-\frac{\sqrt{7}}{56}$ 0 0 0 0 $\frac{\sqrt{7}}{28}$ | |
| | $\frac{\sqrt{7}i}{28}$ 0 0 $\frac{\sqrt{105}}{280}$ 0 0 $\frac{\sqrt{105}}{210}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $\frac{\sqrt{7}i}{28}$ 0 | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{105}}{840}$ 0 $-\frac{\sqrt{105}}{840}$ 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{105}i}{840}$ 0 $-\frac{\sqrt{105}}{840}$ 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 | |
| 816 | symmetry | $\sqrt{3}yz$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|--------------------------------|
| $\mathbb{M}_{2,0}^{(1,1;a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{105}}{140}$ 0 0 $\frac{\sqrt{105}i}{105}$ 0 0 $\frac{\sqrt{7}}{28}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{105}}{140}$ $-\frac{\sqrt{105}i}{105}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 0 | |
| | 0 0 0 0 $\frac{11\sqrt{35}}{420}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $-\frac{\sqrt{21}}{84}$ 0 0 $-\frac{\sqrt{21}i}{42}$ | |
| | 0 0 0 0 0 $-\frac{11\sqrt{35}}{420}$ $\frac{\sqrt{35}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}}{84}$ $\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{105}$ $\frac{\sqrt{35}}{105}$ 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{21}}{42}$ 0 | |
| | 0 0 $-\frac{\sqrt{35}}{42}$ 0 $\frac{\sqrt{35}i}{105}$ 0 0 $-\frac{\sqrt{35}}{105}$ 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{21}}{42}$ | |
| | $\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}i}{420}$ 0 $-\frac{\sqrt{35}}{42}$ 0 0 0 $-\frac{\sqrt{21}i}{28}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{35}i}{420}$ 0 $-\frac{\sqrt{35}}{42}$ 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{35}}{420}$ 0 0 0 0 $-\frac{\sqrt{35}}{42}$ $-\frac{\sqrt{21}}{28}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}}{420}$ 0 0 $-\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{21}}{28}$ 0 0 0 0 | |
| 817 | symmetry | $-\sqrt{3}xz$ |
| $\mathbb{M}_{2,1}^{(1,1;a)}(E, 1)$ | 0 0 $\frac{\sqrt{105}}{140}$ 0 0 0 0 $\frac{\sqrt{105}}{105}$ $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{105}}{140}$ 0 0 $\frac{\sqrt{105}}{105}$ 0 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 0 0 | |
| | 0 0 $\frac{11\sqrt{35}}{420}$ 0 0 0 0 $\frac{\sqrt{35}}{42}$ $\frac{\sqrt{21}}{84}$ 0 0 0 0 $-\frac{\sqrt{21}}{42}$ | |
| | 0 0 0 $-\frac{11\sqrt{35}}{420}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}}{84}$ 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 | |
| | $-\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{420}$ 0 0 0 0 0 $\frac{\sqrt{21}}{28}$ 0 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ $\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{420}$ 0 0 0 0 0 $\frac{\sqrt{21}}{28}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{35}}{105}$ 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{35}}{105}$ 0 0 $\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{21}}{42}$ 0 | |
| | 0 0 $-\frac{\sqrt{35}}{105}$ 0 $\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}}{105}$ $\frac{\sqrt{21}}{42}$ 0 0 0 0 $\frac{\sqrt{21}}{42}$ | |
| | 0 $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}}{420}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}}{28}$ 0 0 0 | |
| | $-\frac{\sqrt{21}}{42}$ 0 0 0 0 $-\frac{\sqrt{35}}{420}$ $\frac{\sqrt{35}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}}{28}$ 0 0 | |
| 818 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|---|
| $\mathbb{M}_{2,0}^{(1,1;a)}(E, 2)$ | 0 0 0 $-\frac{11\sqrt{105}}{840}$ 0 $-\frac{11\sqrt{105}i}{840}$ 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 | |
| | 0 0 $-\frac{11\sqrt{105}}{840}$ 0 $\frac{11\sqrt{105}i}{840}$ 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 | |
| | 0 0 0 $\frac{13\sqrt{35}}{840}$ 0 $-\frac{13\sqrt{35}i}{840}$ $-\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{21}}{56}$ 0 $\frac{\sqrt{21}i}{56}$ 0 0 0 | |
| | 0 0 $\frac{13\sqrt{35}}{840}$ 0 $\frac{13\sqrt{35}i}{840}$ 0 0 $\frac{\sqrt{35}}{42}$ $\frac{\sqrt{21}}{56}$ 0 $-\frac{\sqrt{21}i}{56}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{21}}{28}$ 0 0 $-\frac{\sqrt{35}}{168}$ 0 0 $-\frac{\sqrt{35}i}{420}$ 0 0 $-\frac{5\sqrt{21}}{168}$ 0 0 $-\frac{\sqrt{21}i}{42}$ | |
| | $-\frac{\sqrt{21}}{28}$ 0 0 0 0 $\frac{\sqrt{35}}{168}$ $\frac{\sqrt{35}i}{420}$ 0 0 0 0 $\frac{5\sqrt{21}}{168}$ $\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 $-\frac{\sqrt{21}i}{28}$ $\frac{\sqrt{35}}{168}$ 0 0 0 0 $-\frac{\sqrt{35}}{420}$ $-\frac{5\sqrt{21}}{168}$ 0 0 0 0 $\frac{\sqrt{21}}{42}$ | |
| | $\frac{\sqrt{21}i}{28}$ 0 0 $-\frac{\sqrt{35}}{168}$ 0 0 $-\frac{\sqrt{35}}{420}$ 0 0 $\frac{5\sqrt{21}}{168}$ 0 0 $\frac{\sqrt{21}}{42}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}i}{120}$ 0 $-\frac{\sqrt{35}}{120}$ 0 0 0 $-\frac{\sqrt{21}i}{168}$ 0 $\frac{\sqrt{21}}{168}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{35}i}{120}$ 0 $-\frac{\sqrt{35}}{120}$ 0 0 0 $\frac{\sqrt{21}i}{168}$ 0 $\frac{\sqrt{21}}{168}$ 0 0 0 | |
| 819 | symmetry | $-\sqrt{3}xy$ |
| $\mathbb{M}_{2,1}^{(1,1;a)}(E, 2)$ | 0 0 0 $\frac{\sqrt{105}i}{60}$ 0 $-\frac{\sqrt{105}}{60}$ 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{105}i}{60}$ 0 $-\frac{\sqrt{105}}{60}$ 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{35}i}{420}$ 0 $-\frac{\sqrt{35}}{420}$ 0 0 0 $-\frac{\sqrt{21}i}{84}$ 0 $\frac{\sqrt{21}}{84}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{35}i}{420}$ 0 $-\frac{\sqrt{35}}{420}$ 0 0 0 $\frac{\sqrt{21}i}{84}$ 0 $\frac{\sqrt{21}}{84}$ 0 0 0 | |
| | 0 $\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{35}}{42}$ 0 0 0 0 $\frac{\sqrt{35}}{420}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{28}$ | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{35}}{420}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{28}$ 0 | |
| | 0 $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{35}i}{420}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{28}$ | |
| | $-\frac{\sqrt{21}}{42}$ 0 0 0 0 $-\frac{\sqrt{35}}{42}$ $\frac{\sqrt{35}i}{420}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}}{105}$ 0 $\frac{\sqrt{35}i}{105}$ $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}}{42}$ 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{35}}{105}$ 0 $-\frac{\sqrt{35}i}{105}$ 0 0 $-\frac{\sqrt{35}}{42}$ $-\frac{\sqrt{21}}{42}$ 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 | |
| 820 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 9

| No. | multipole | matrix |
|----------------------------------|--|-----------------------------------|
| $\mathbb{M}_4^{(1,1;a)}(A_1, 1)$ | 0 0 0 $-\frac{3\sqrt{462}}{616}$ 0 $\frac{3\sqrt{462}i}{616}$ $\frac{5\sqrt{462}}{462}$ 0 0 $-\frac{3\sqrt{770}}{616}$ 0 $-\frac{3\sqrt{770}i}{616}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{462}}{616}$ 0 $-\frac{3\sqrt{462}i}{616}$ 0 0 $-\frac{5\sqrt{462}}{462}$ $-\frac{3\sqrt{770}}{616}$ 0 $\frac{3\sqrt{770}i}{616}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{154}}{308}$ 0 $\frac{\sqrt{154}i}{308}$ 0 0 0 $\frac{\sqrt{2310}}{1540}$ 0 $-\frac{\sqrt{2310}i}{1540}$ $\frac{\sqrt{2310}}{924}$ 0 | |
| | 0 0 $\frac{\sqrt{154}}{308}$ 0 $-\frac{\sqrt{154}i}{308}$ 0 0 0 $\frac{\sqrt{2310}}{1540}$ 0 $\frac{\sqrt{2310}i}{1540}$ 0 0 $-\frac{\sqrt{2310}}{924}$ | |
| | 0 $-\frac{\sqrt{2310}}{770}$ 0 0 $\frac{5\sqrt{154}}{616}$ 0 0 $-\frac{\sqrt{154}i}{77}$ 0 0 $-\frac{5\sqrt{2310}}{1848}$ 0 0 $-\frac{\sqrt{2310}i}{770}$ | |
| | $-\frac{\sqrt{2310}}{770}$ 0 0 0 $-\frac{5\sqrt{154}}{616}$ $\frac{\sqrt{154}i}{77}$ 0 0 0 0 $\frac{5\sqrt{2310}}{1848}$ $\frac{\sqrt{2310}i}{770}$ 0 | |
| | 0 $\frac{\sqrt{2310}i}{770}$ $\frac{5\sqrt{154}}{616}$ 0 0 0 0 $\frac{\sqrt{154}}{77}$ $\frac{5\sqrt{2310}}{1848}$ 0 0 0 0 $-\frac{\sqrt{2310}}{770}$ | |
| | $-\frac{\sqrt{2310}i}{770}$ 0 0 $-\frac{5\sqrt{154}}{616}$ 0 0 $\frac{\sqrt{154}}{77}$ 0 0 $-\frac{5\sqrt{2310}}{1848}$ 0 0 $-\frac{\sqrt{2310}}{770}$ 0 | |
| | $\frac{\sqrt{2310}}{924}$ 0 0 $-\frac{\sqrt{154}i}{616}$ 0 $\frac{\sqrt{154}}{616}$ 0 0 0 $-\frac{3\sqrt{2310}i}{3080}$ 0 $-\frac{3\sqrt{2310}}{3080}$ 0 0 | |
| | 0 $-\frac{\sqrt{2310}}{924}$ $\frac{\sqrt{154}i}{616}$ 0 $\frac{\sqrt{154}}{616}$ 0 0 0 $\frac{3\sqrt{2310}i}{3080}$ 0 $-\frac{3\sqrt{2310}}{3080}$ 0 0 0 | |
| 821 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |
| $\mathbb{M}_4^{(1,1;a)}(A_1, 2)$ | 0 $-\frac{3\sqrt{11}}{220}$ 0 0 $-\frac{\sqrt{165}}{165}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{55}$ 0 0 $\frac{3\sqrt{11}i}{220}$ | |
| | $-\frac{3\sqrt{11}}{220}$ 0 0 0 0 $\frac{\sqrt{165}}{165}$ 0 0 0 0 0 $\frac{\sqrt{11}}{55}$ $-\frac{3\sqrt{11}i}{220}$ 0 | |
| | 0 $\frac{3\sqrt{33}}{110}$ 0 0 $-\frac{\sqrt{55}}{110}$ 0 0 $\frac{\sqrt{55}i}{220}$ 0 0 $\frac{\sqrt{33}}{66}$ 0 0 $\frac{3\sqrt{33}i}{110}$ | |
| | $\frac{3\sqrt{33}}{110}$ 0 0 0 0 $\frac{\sqrt{55}}{110}$ $-\frac{\sqrt{55}i}{220}$ 0 0 0 0 $-\frac{\sqrt{33}}{66}$ $-\frac{3\sqrt{33}i}{110}$ 0 | |
| | 0 0 0 $\frac{7\sqrt{55}}{440}$ 0 $\frac{\sqrt{55}i}{55}$ 0 0 0 $-\frac{3\sqrt{33}}{440}$ 0 $\frac{\sqrt{33}i}{110}$ $\frac{4\sqrt{33}}{165}$ 0 | |
| | 0 0 $\frac{7\sqrt{55}}{440}$ 0 $-\frac{\sqrt{55}i}{55}$ 0 0 0 $-\frac{3\sqrt{33}}{440}$ 0 $-\frac{\sqrt{33}i}{110}$ 0 0 $-\frac{4\sqrt{33}}{165}$ | |
| | $\frac{4\sqrt{33}}{165}$ 0 0 $\frac{\sqrt{55}i}{110}$ 0 $-\frac{\sqrt{55}}{88}$ 0 0 0 $-\frac{\sqrt{33}i}{55}$ 0 $-\frac{9\sqrt{33}}{440}$ 0 0 0 | |
| | 0 $-\frac{4\sqrt{33}}{165}$ $-\frac{\sqrt{55}i}{110}$ 0 $-\frac{\sqrt{55}}{88}$ 0 0 0 $\frac{\sqrt{33}i}{55}$ 0 $-\frac{9\sqrt{33}}{440}$ 0 0 0 | |
| | 0 $-\frac{3\sqrt{33}i}{110}$ $-\frac{\sqrt{55}}{110}$ 0 0 0 0 $-\frac{\sqrt{55}}{220}$ $-\frac{\sqrt{33}}{66}$ 0 0 0 0 $\frac{3\sqrt{33}}{110}$ | |
| | $\frac{3\sqrt{33}i}{110}$ 0 0 $\frac{\sqrt{55}}{110}$ 0 0 $-\frac{\sqrt{55}}{220}$ 0 0 $\frac{\sqrt{33}}{66}$ 0 0 0 $\frac{3\sqrt{33}}{110}$ 0 | |
| 822 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|----------------------------|---|
| $\mathbb{M}_4^{(1,1;a)}(A_2)$ | 0 | $-\frac{3\sqrt{11}i}{220}$ $\frac{\sqrt{165}}{165}$ 0 0 0 0 0 0 $-\frac{\sqrt{11}}{55}$ 0 0 0 0 $-\frac{3\sqrt{11}}{220}$ |
| | $\frac{3\sqrt{11}i}{220}$ | 0 0 0 $-\frac{\sqrt{165}}{165}$ 0 0 0 0 0 $\frac{\sqrt{11}}{55}$ 0 0 0 $-\frac{3\sqrt{11}}{220}$ 0 |
| | 0 | $-\frac{3\sqrt{33}i}{110}$ $-\frac{\sqrt{55}}{110}$ 0 0 0 0 $-\frac{\sqrt{55}}{220}$ $-\frac{\sqrt{33}}{66}$ 0 0 0 0 $\frac{3\sqrt{33}}{110}$ |
| | $\frac{3\sqrt{33}i}{110}$ | 0 0 $\frac{\sqrt{55}}{110}$ 0 0 $-\frac{\sqrt{55}}{220}$ 0 0 $\frac{\sqrt{33}}{66}$ 0 0 0 $\frac{3\sqrt{33}}{110}$ 0 |
| | $-\frac{4\sqrt{33}}{165}$ | 0 0 $-\frac{\sqrt{55}i}{88}$ 0 $\frac{\sqrt{55}}{110}$ 0 0 0 $\frac{9\sqrt{33}i}{440}$ 0 $\frac{\sqrt{33}}{55}$ 0 0 0 |
| | 0 | $\frac{4\sqrt{33}}{165}$ $\frac{\sqrt{55}i}{88}$ 0 $\frac{\sqrt{55}}{110}$ 0 0 0 $-\frac{9\sqrt{33}i}{440}$ 0 $\frac{\sqrt{33}}{55}$ 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{55}}{55}$ 0 $\frac{7\sqrt{55}i}{440}$ 0 0 0 $-\frac{\sqrt{33}}{110}$ 0 $\frac{3\sqrt{33}i}{440}$ $\frac{4\sqrt{33}}{165}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{55}}{55}$ 0 $-\frac{7\sqrt{55}i}{440}$ 0 0 0 $-\frac{\sqrt{33}}{110}$ 0 $-\frac{3\sqrt{33}i}{440}$ 0 0 $-\frac{4\sqrt{33}}{165}$ |
| | 0 | $-\frac{3\sqrt{33}}{110}$ 0 0 $\frac{\sqrt{55}}{110}$ 0 0 $-\frac{\sqrt{55}i}{220}$ 0 0 $-\frac{\sqrt{33}}{66}$ 0 0 $-\frac{3\sqrt{33}i}{110}$ |
| | $-\frac{3\sqrt{33}}{110}$ | 0 0 0 0 0 $-\frac{\sqrt{55}}{110}$ $\frac{\sqrt{55}i}{220}$ 0 0 0 $\frac{\sqrt{33}}{66}$ $\frac{3\sqrt{33}i}{110}$ 0 |
| 823 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |
| $\mathbb{M}_{4,0}^{(1,1;a)}(E, 1)$ | 0 | $\frac{3\sqrt{77}}{220}$ 0 0 $-\frac{3\sqrt{1155}}{770}$ 0 0 $\frac{\sqrt{1155}i}{231}$ 0 0 $\frac{3\sqrt{77}}{154}$ 0 0 $\frac{3\sqrt{77}i}{220}$ |
| | $\frac{3\sqrt{77}}{220}$ | 0 0 0 0 0 $\frac{3\sqrt{1155}}{770}$ $-\frac{\sqrt{1155}i}{231}$ 0 0 0 0 $-\frac{3\sqrt{77}}{154}$ $-\frac{3\sqrt{77}i}{220}$ 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{385}}{385}$ 0 0 $\frac{\sqrt{385}i}{220}$ 0 0 $\frac{\sqrt{231}}{385}$ 0 0 $\frac{\sqrt{231}i}{462}$ |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{385}}{385}$ $-\frac{\sqrt{385}i}{220}$ 0 0 0 0 $-\frac{\sqrt{231}}{385}$ $-\frac{\sqrt{231}i}{462}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{385}}{440}$ 0 $\frac{3\sqrt{385}i}{385}$ $\frac{4\sqrt{385}}{385}$ 0 0 $-\frac{3\sqrt{231}}{440}$ 0 $-\frac{23\sqrt{231}i}{2310}$ $\frac{2\sqrt{231}}{385}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{385}}{440}$ 0 $-\frac{3\sqrt{385}i}{385}$ 0 0 $-\frac{4\sqrt{385}}{385}$ $-\frac{3\sqrt{231}}{440}$ 0 $\frac{23\sqrt{231}i}{2310}$ 0 0 $-\frac{2\sqrt{231}}{385}$ |
| | $-\frac{2\sqrt{231}}{385}$ | 0 0 $-\frac{\sqrt{385}i}{770}$ 0 $-\frac{\sqrt{385}}{440}$ 0 0 0 0 $\frac{\sqrt{231}i}{1155}$ 0 $\frac{3\sqrt{231}}{440}$ 0 0 |
| | 0 | $\frac{2\sqrt{231}}{385}$ $\frac{\sqrt{385}i}{770}$ 0 $-\frac{\sqrt{385}}{440}$ 0 0 0 $-\frac{\sqrt{231}i}{1155}$ 0 $\frac{3\sqrt{231}}{440}$ 0 0 0 |
| | 0 | $\frac{\sqrt{231}i}{462}$ $\frac{\sqrt{385}}{770}$ 0 0 0 0 $\frac{\sqrt{385}}{220}$ $\frac{3\sqrt{231}}{770}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{231}i}{462}$ | 0 0 $-\frac{\sqrt{385}}{770}$ 0 0 $\frac{\sqrt{385}}{220}$ 0 0 $-\frac{3\sqrt{231}}{770}$ 0 0 0 0 |
| 824 | symmetry | $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|------------------------------------|---|
| $\mathbb{M}_{4,1}^{(1,1;a)}(E, 1)$ | 0 | $\begin{bmatrix} 0 & \frac{3\sqrt{77}i}{220} & \frac{3\sqrt{1155}}{770} & 0 & 0 & 0 & 0 & \frac{\sqrt{1155}}{231} & \frac{3\sqrt{77}}{154} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{77}}{220} \\ -\frac{3\sqrt{77}i}{220} & 0 & 0 & -\frac{3\sqrt{1155}}{770} & 0 & 0 & \frac{\sqrt{1155}}{231} & 0 & 0 & -\frac{3\sqrt{77}}{154} & 0 & 0 & -\frac{3\sqrt{77}}{220} & 0 \\ 0 & 0 & -\frac{\sqrt{385}}{385} & 0 & 0 & 0 & 0 & -\frac{\sqrt{385}}{220} & -\frac{\sqrt{231}}{385} & 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{462} \\ 0 & 0 & 0 & \frac{\sqrt{385}}{385} & 0 & 0 & -\frac{\sqrt{385}}{220} & 0 & 0 & \frac{\sqrt{231}}{385} & 0 & 0 & \frac{\sqrt{231}}{462} & 0 \\ \frac{2\sqrt{231}}{385} & 0 & 0 & -\frac{\sqrt{385}i}{440} & 0 & 0 & -\frac{\sqrt{385}}{770} & 0 & 0 & 0 & -\frac{3\sqrt{231}i}{440} & 0 & -\frac{\sqrt{231}}{1155} & 0 & 0 \\ 0 & -\frac{2\sqrt{231}}{385} & \frac{\sqrt{385}i}{440} & 0 & -\frac{\sqrt{385}}{770} & 0 & 0 & 0 & \frac{3\sqrt{231}i}{440} & 0 & -\frac{\sqrt{231}}{1155} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{385}}{385} & 0 & -\frac{\sqrt{385}i}{440} & -\frac{4\sqrt{385}}{385} & 0 & 0 & \frac{23\sqrt{231}}{2310} & 0 & \frac{3\sqrt{231}i}{440} & \frac{2\sqrt{231}}{385} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{385}}{385} & 0 & \frac{\sqrt{385}i}{440} & 0 & 0 & \frac{4\sqrt{385}}{385} & \frac{23\sqrt{231}}{2310} & 0 & -\frac{3\sqrt{231}i}{440} & 0 & 0 & 0 & -\frac{2\sqrt{231}}{385} \\ 0 & \frac{\sqrt{231}}{462} & 0 & 0 & -\frac{\sqrt{385}}{770} & 0 & 0 & \frac{\sqrt{385}i}{220} & 0 & 0 & \frac{3\sqrt{231}}{770} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{231}}{462} & 0 & 0 & 0 & 0 & \frac{\sqrt{385}}{770} & -\frac{\sqrt{385}i}{220} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{231}}{770} & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 825 | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |
| | $\mathbb{M}_{4,0}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{330}}{1320} & 0 & \frac{\sqrt{330}i}{1320} & 0 & 0 & 0 & \frac{\sqrt{22}}{440} & 0 & \frac{\sqrt{22}i}{440} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{330}}{1320} & 0 & -\frac{\sqrt{330}i}{1320} & 0 & 0 & 0 & \frac{\sqrt{22}}{440} & 0 & -\frac{\sqrt{22}i}{440} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{110}}{55} & 0 & \frac{\sqrt{110}i}{55} & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & \frac{\sqrt{66}i}{66} & \frac{3\sqrt{66}}{220} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{110}}{55} & 0 & -\frac{\sqrt{110}i}{55} & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & -\frac{\sqrt{66}i}{66} & 0 & 0 & 0 & -\frac{3\sqrt{66}}{220} \\ 0 & \frac{\sqrt{66}}{330} & 0 & 0 & \frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{66}}{440} & 0 & 0 & 0 & -\frac{\sqrt{66}i}{330} \\ \frac{\sqrt{66}}{330} & 0 & 0 & 0 & 0 & -\frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{66}}{440} & \frac{\sqrt{66}i}{330} & 0 & 0 \\ 0 & -\frac{\sqrt{66}i}{330} & \frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{66}}{440} & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{330} & 0 & 0 \\ \frac{\sqrt{66}i}{330} & 0 & 0 & -\frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{66}}{440} & 0 & 0 & 0 & -\frac{\sqrt{66}}{330} & 0 & 0 & 0 \\ -\frac{3\sqrt{66}}{220} & 0 & 0 & -\frac{7\sqrt{110}i}{440} & 0 & \frac{7\sqrt{110}}{440} & 0 & 0 & 0 & \frac{5\sqrt{66}i}{264} & 0 & \frac{5\sqrt{66}}{264} & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{66}}{220} & \frac{7\sqrt{110}i}{440} & 0 & \frac{7\sqrt{110}}{440} & 0 & 0 & 0 & -\frac{5\sqrt{66}i}{264} & 0 & \frac{5\sqrt{66}}{264} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 826 | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|------------------------------------|--|---|
| $\mathbb{M}_{4,1}^{(1,1;a)}(E, 2)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{330}i}{1320} & 0 & \frac{\sqrt{330}}{1320} & 0 & 0 & 0 & -\frac{\sqrt{22}i}{440} & 0 & \frac{\sqrt{22}}{440} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{330}i}{1320} & 0 & \frac{\sqrt{330}}{1320} & 0 & 0 & 0 & \frac{\sqrt{22}i}{440} & 0 & \frac{\sqrt{22}}{440} & 0 & 0 & 0 \\ \frac{3\sqrt{66}}{220} & 0 & 0 & \frac{7\sqrt{110}i}{440} & 0 & -\frac{7\sqrt{110}}{440} & 0 & 0 & 0 & -\frac{5\sqrt{66}i}{264} & 0 & -\frac{5\sqrt{66}}{264} & 0 & 0 \\ 0 & -\frac{3\sqrt{66}}{220} & -\frac{7\sqrt{110}i}{440} & 0 & -\frac{7\sqrt{110}}{440} & 0 & 0 & 0 & \frac{5\sqrt{66}i}{264} & 0 & -\frac{5\sqrt{66}}{264} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{66}i}{330} & \frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{66}}{440} & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{330} \\ \frac{\sqrt{66}i}{330} & 0 & 0 & -\frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & \frac{3\sqrt{66}}{440} & 0 & 0 & 0 & -\frac{\sqrt{66}}{330} & 0 \\ 0 & -\frac{\sqrt{66}}{330} & 0 & 0 & -\frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{66}}{440} & 0 & 0 & \frac{\sqrt{66}i}{330} \\ -\frac{\sqrt{66}}{330} & 0 & 0 & 0 & 0 & \frac{3\sqrt{110}}{440} & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{66}}{440} & -\frac{\sqrt{66}i}{330} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{110}}{55} & 0 & \frac{\sqrt{110}i}{55} & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & \frac{\sqrt{66}i}{66} & \frac{3\sqrt{66}}{220} & 0 \\ 0 & 0 & \frac{\sqrt{110}}{55} & 0 & -\frac{\sqrt{110}i}{55} & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & -\frac{\sqrt{66}i}{66} & 0 & 0 & -\frac{3\sqrt{66}}{220} \end{bmatrix}$ | |
| | $827 \quad \text{symmetry}$ | $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ |
| | $\mathbb{M}_{4,0}^{(1,1;a)}(E, 3)$ | $\begin{bmatrix} 0 & 0 & 0 & \frac{23\sqrt{2310}}{9240} & 0 & \frac{23\sqrt{2310}i}{9240} & 0 & 0 & 0 & \frac{\sqrt{154}}{3080} & 0 & -\frac{\sqrt{154}i}{3080} & \frac{3\sqrt{154}}{220} & 0 \\ 0 & 0 & \frac{23\sqrt{2310}}{9240} & 0 & -\frac{23\sqrt{2310}i}{9240} & 0 & 0 & 0 & \frac{\sqrt{154}}{3080} & 0 & \frac{\sqrt{154}i}{3080} & 0 & 0 & -\frac{3\sqrt{154}}{220} \\ 0 & 0 & 0 & -\frac{9\sqrt{770}}{3080} & 0 & \frac{9\sqrt{770}i}{3080} & \frac{\sqrt{770}}{220} & 0 & 0 & -\frac{41\sqrt{462}}{9240} & 0 & -\frac{41\sqrt{462}i}{9240} & 0 & 0 \\ 0 & 0 & -\frac{9\sqrt{770}}{3080} & 0 & -\frac{9\sqrt{770}i}{3080} & 0 & 0 & -\frac{\sqrt{770}}{220} & -\frac{41\sqrt{462}}{9240} & 0 & \frac{41\sqrt{462}i}{9240} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{462}}{210} & 0 & 0 & \frac{\sqrt{770}}{220} & 0 & 0 & -\frac{\sqrt{770}i}{385} & 0 & 0 & -\frac{\sqrt{462}}{220} & 0 & 0 & -\frac{17\sqrt{462}i}{2310} \\ -\frac{\sqrt{462}}{210} & 0 & 0 & 0 & 0 & -\frac{\sqrt{770}}{220} & \frac{\sqrt{770}i}{385} & 0 & 0 & 0 & 0 & \frac{\sqrt{462}}{220} & \frac{17\sqrt{462}i}{2310} & 0 \\ 0 & -\frac{\sqrt{462}i}{210} & -\frac{\sqrt{770}}{220} & 0 & 0 & 0 & 0 & -\frac{\sqrt{770}}{385} & -\frac{\sqrt{462}}{220} & 0 & 0 & 0 & 0 & \frac{17\sqrt{462}}{2310} & 0 \\ \frac{\sqrt{462}i}{210} & 0 & 0 & \frac{\sqrt{770}}{220} & 0 & 0 & -\frac{\sqrt{770}}{385} & 0 & 0 & \frac{\sqrt{462}}{220} & 0 & 0 & \frac{17\sqrt{462}}{2310} & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{770}i}{1540} & 0 & \frac{3\sqrt{770}}{1540} & 0 & 0 & 0 & \frac{13\sqrt{462}i}{4620} & 0 & -\frac{13\sqrt{462}}{4620} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{770}i}{1540} & 0 & \frac{3\sqrt{770}}{1540} & 0 & 0 & 0 & -\frac{13\sqrt{462}i}{4620} & 0 & -\frac{13\sqrt{462}}{4620} & 0 & 0 & 0 \end{bmatrix}$ |
| | $828 \quad \text{symmetry}$ | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |

continued ...

Table 9

| No. | multipole | matrix |
|--------------------------|--|--|
| $M_{4,1}^{(1,1;a)}(E,3)$ | $-\frac{3\sqrt{154}}{220}$ | $0 \quad 0 \quad -\frac{\sqrt{2310}i}{1848} \quad 0 \quad \frac{\sqrt{2310}}{1848} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{29\sqrt{154}i}{3080} \quad 0 \quad \frac{29\sqrt{154}}{3080} \quad 0 \quad 0$ |
| | $0 \quad \frac{3\sqrt{154}}{220} \quad \frac{\sqrt{2310}i}{1848} \quad 0 \quad \frac{\sqrt{2310}}{1848} \quad 0 \quad 0 \quad 0 \quad -\frac{29\sqrt{154}i}{3080} \quad 0 \quad \frac{29\sqrt{154}}{3080} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{770}i}{616} \quad 0 \quad \frac{\sqrt{770}}{616} \quad 0 \quad 0 \quad 0 \quad \frac{29\sqrt{462}i}{9240} \quad 0 \quad -\frac{29\sqrt{462}}{9240} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{770}i}{616} \quad 0 \quad \frac{\sqrt{770}}{616} \quad 0 \quad 0 \quad 0 \quad -\frac{29\sqrt{462}i}{9240} \quad 0 \quad -\frac{29\sqrt{462}}{9240} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{17\sqrt{462}i}{2310} \quad \frac{\sqrt{770}}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{770}}{385} \quad \frac{3\sqrt{462}}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{462}}{210}$ | |
| | $-\frac{17\sqrt{462}i}{2310} \quad 0 \quad 0 \quad -\frac{\sqrt{770}}{440} \quad 0 \quad 0 \quad \frac{\sqrt{770}}{385} \quad 0 \quad 0 \quad -\frac{3\sqrt{462}}{440} \quad 0 \quad 0 \quad -\frac{\sqrt{462}}{210} \quad 0$ | |
| | $0 \quad -\frac{17\sqrt{462}}{2310} \quad 0 \quad 0 \quad \frac{\sqrt{770}}{440} \quad 0 \quad 0 \quad -\frac{\sqrt{770}i}{385} \quad 0 \quad 0 \quad -\frac{3\sqrt{462}}{440} \quad 0 \quad 0 \quad -\frac{\sqrt{462}i}{210}$ | |
| | $-\frac{17\sqrt{462}}{2310} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{770}}{440} \quad \frac{\sqrt{770}i}{385} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{462}}{440} \quad \frac{\sqrt{462}i}{210} \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{770}}{385} \quad 0 \quad -\frac{\sqrt{770}i}{385} \quad -\frac{\sqrt{770}}{220} \quad 0 \quad 0 \quad \frac{\sqrt{462}}{210} \quad 0 \quad \frac{\sqrt{462}i}{210} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{770}}{385} \quad 0 \quad \frac{\sqrt{770}i}{385} \quad 0 \quad 0 \quad \frac{\sqrt{770}}{220} \quad \frac{\sqrt{462}}{210} \quad 0 \quad -\frac{\sqrt{462}i}{210} \quad 0 \quad 0 \quad 0$ | |

bra: $= \langle f_{az}, \uparrow |, \langle f_{az}, \downarrow |, \langle f_1, \uparrow |, \langle f_1, \downarrow |, \langle f_2, \uparrow |, \langle f_2, \downarrow |, \langle f_{3x}, \uparrow |, \langle f_{3x}, \downarrow |, \langle f_{3y}, \uparrow |, \langle f_{3y}, \downarrow |, \langle f_3, \uparrow |, \langle f_3, \downarrow |, \langle f_{bz}, \uparrow |, \langle f_{bz}, \downarrow |$

ket: $= |f_{az}, \uparrow \rangle, |f_{az}, \downarrow \rangle, |f_1, \uparrow \rangle, |f_1, \downarrow \rangle, |f_2, \uparrow \rangle, |f_2, \downarrow \rangle, |f_{3x}, \uparrow \rangle, |f_{3x}, \downarrow \rangle, |f_{3y}, \uparrow \rangle, |f_{3y}, \downarrow \rangle, |f_3, \uparrow \rangle, |f_3, \downarrow \rangle, |f_{bz}, \uparrow \rangle, |f_{bz}, \downarrow \rangle$

Table 10: (f,f) block.

| No. | multipole | matrix |
|-----|-----------|--------|
| 829 | symmetry | 1 |

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|--|--|
| $\mathbb{Q}_0^{(a)}(A_1)$ | $\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| 830 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|-------------------------------|--|
| $\mathbb{Q}_2^{(a)}(A_1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{42} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{21} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{21} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 831 symmetry | $\sqrt{3}yz$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|--------------------------|--|
| $\mathbb{Q}_{2,0}^{(a)}(E, 1)$ | 0 | 0 0 $-\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 |
| | $-\frac{\sqrt{210}}{42}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{14}}{56}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{14}}{56}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{14}}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{14}}{56}$ 0 0 0 |

832 symmetry

 $-\sqrt{3}xz$

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|---|--------------------------------|
| $\mathbb{Q}_{2,1}^{(a)}(E, 1)$ | 0 0 0 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ | |
| | $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 0 0 0 0 0 | |
| 833 | symmetry | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-----------------------------|---|
| $\mathbb{Q}_{2,0}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{42} \\ 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{84} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{42} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 834 symmetry | $-\sqrt{3}xy$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|---|---|
| $\mathbb{Q}_{2,1}^{(a)}(E, 2)$ | 0 0 0 0 0 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 | |
| | 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{14}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 | |
| | $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{210}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{210}}{168}$ 0 0 0 0 0 0 $\frac{5\sqrt{14}}{56}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 835 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------|-------------------------|-----------------------------------|----------------------------|----------------------------|---------------------------|---------------------------|-------------------------|-------------------------|----------------------------|----------------------------|---------------------------|---------------------------|---------------------------|---|---|---|
| $\mathbb{Q}_4^{(a)}(A_1, 1)$ | $-\frac{\sqrt{77}}{22}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{77}}{22}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $\frac{9\sqrt{77}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{9\sqrt{77}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{9\sqrt{77}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{77}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{77}}{77}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{77}}{77}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{88}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{77}}{22}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{77}}{22}$ | 0 | 0 | 0 |
| 836 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|--------------------------|--|
| $\mathbb{Q}_4^{(a)}(A_1, 2)$ | 0 | 0 0 $-\frac{\sqrt{66}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{110}}{88}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{66}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{110}}{88}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{66}}{88}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{66}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{3\sqrt{110}}{88}$ 0 0 0 0 0 0 $-\frac{\sqrt{66}}{88}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{3\sqrt{110}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{66}}{88}$ |
| | 0 | 0 0 0 0 0 $\frac{3\sqrt{110}}{88}$ 0 0 0 0 0 $\frac{3\sqrt{66}}{88}$ 0 0 0 |
| | $-\frac{\sqrt{110}}{88}$ | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{3\sqrt{66}}{88}$ 0 0 |
| | 0 | $-\frac{\sqrt{110}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{3\sqrt{66}}{88}$ 0 0 0 0 0 $\frac{\sqrt{110}}{88}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{3\sqrt{66}}{88}$ 0 0 0 0 0 $\frac{\sqrt{110}}{88}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{66}}{88}$ 0 0 0 0 0 $\frac{\sqrt{110}}{88}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{66}}{88}$ 0 0 0 0 0 $\frac{\sqrt{110}}{88}$ 0 0 0 |

837 symmetry

$$\frac{\sqrt{70}xz(x^2 - 3y^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|--------------------------|--|---------------------------|-------------------------|------------------------|-------------------------|---------------------------|---|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|--------------------------|---|
| $\mathbb{Q}_4^{(a)}(A_2)$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{66}}{88}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{66}}{88}$ | 0 |
| | $\frac{\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{3\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{3\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 |
| | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{88}$ | 0 |
| | 0 | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{66}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| 838 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|--------------------------------|--------------------------|---|--------------------------|--------------------------|----------------------------|---|----------------------------|----------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| $\mathbb{Q}_{4,0}^{(a)}(E, 1)$ | 0 | 0 | $\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 |
| | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 |
| | 0 | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 |
| 839 | symmetry | $\frac{\sqrt{10xz}(3x^2+3y^2-4z^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------|---|---------------------------|---------------------------|--|
| $\mathbb{Q}_{4,1}^{(a)}(E, 1)$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | |
| | $-\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{616}$ | |
| | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{770}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{9\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | |
| $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ | | | | | | | | | | | | | | | |
| 840 | symmetry | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|--------------------------------|-------------------------|-----------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|---|---|---|
| $\mathbb{Q}_{4,0}^{(a)}(E, 2)$ | $-\frac{\sqrt{55}}{22}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{55}}{22}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{55}}{88}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}}{22}$ | 0 | 0 | 0 | 0 |
| 841 | symmetry | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|---|---|--------|
| $\mathbb{Q}_{4,1}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{55}}{22}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{55}}{22}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{33}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | $\frac{\sqrt{55}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{55}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ | | |

842 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------------|--|
| $\mathbb{Q}_{4,0}^{(a)}(E, 3)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{385}}{308} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{385}}{308} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{385}}{308} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{385}}{308} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{231}}{154} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{231}}{154} & 0 \\ 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{385}}{44} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{385}}{44} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{385}}{44} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{231}}{308} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{385}}{44} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{231}}{154} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{231}}{154} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 843 symmetry | $\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|----------------------------|--|
| $\mathbb{Q}_{4,1}^{(a)}(E, 3)$ | 0 | 0 0 0 0 0 0 $\frac{\sqrt{231}}{154}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{231}}{154}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{3\sqrt{385}}{154}$ 0 0 0 0 0 $\frac{\sqrt{231}}{77}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{3\sqrt{385}}{154}$ 0 0 0 0 0 $\frac{\sqrt{231}}{77}$ 0 0 0 |
| | 0 | 0 0 $-\frac{3\sqrt{385}}{154}$ 0 0 0 0 0 $-\frac{\sqrt{231}}{77}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{3\sqrt{385}}{154}$ 0 0 0 0 0 $-\frac{\sqrt{231}}{77}$ 0 0 0 0 |
| | $\frac{\sqrt{231}}{154}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 $\frac{\sqrt{231}}{154}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{231}}{77}$ 0 0 0 0 0 $-\frac{\sqrt{385}}{154}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{231}}{77}$ 0 0 0 0 0 $-\frac{\sqrt{385}}{154}$ 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{231}}{77}$ 0 0 0 0 0 $-\frac{\sqrt{385}}{154}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{231}}{77}$ 0 0 0 0 0 $-\frac{\sqrt{385}}{154}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| 844 | symmetry | $-\frac{5x^6}{16} - \frac{15x^4y^2}{16} + \frac{45x^4z^2}{8} - \frac{15x^2y^4}{16} + \frac{45x^2y^2z^2}{4} - \frac{15x^2z^4}{2} - \frac{5y^6}{16} + \frac{45y^4z^2}{8} - \frac{15y^2z^4}{2} + z^6$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|--|---|
| $\mathbb{Q}_6^{(a)}(A_1, 1)$ | $\frac{\sqrt{462}}{154} 0 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $0 \frac{\sqrt{462}}{154} 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $0 0 -\frac{25\sqrt{462}}{3696} 0 0 0 0 0 0 -\frac{\sqrt{770}}{176} 0 0 0 0 0$ | |
| | $0 0 0 -\frac{25\sqrt{462}}{3696} 0 0 0 0 0 -\frac{\sqrt{770}}{176} 0 0 0 0 0$ | |
| | $0 0 0 0 -\frac{25\sqrt{462}}{3696} 0 0 0 0 0 0 \frac{\sqrt{770}}{176} 0 0 0$ | |
| | $0 0 0 0 0 -\frac{25\sqrt{462}}{3696} 0 0 0 0 0 0 \frac{\sqrt{770}}{176} 0 0$ | |
| | $0 0 0 0 0 0 \frac{5\sqrt{462}}{231} 0 0 0 0 0 0 0 0$ | |
| | $0 0 0 0 0 0 0 \frac{5\sqrt{462}}{231} 0 0 0 0 0 0 0$ | |
| | $0 0 -\frac{\sqrt{770}}{176} 0 0 0 0 0 0 -\frac{13\sqrt{462}}{1232} 0 0 0 0 0$ | |
| | $0 0 0 -\frac{\sqrt{770}}{176} 0 0 0 0 0 0 -\frac{13\sqrt{462}}{1232} 0 0 0 0$ | |
| | $0 0 0 0 \frac{\sqrt{770}}{176} 0 0 0 0 0 0 -\frac{13\sqrt{462}}{1232} 0 0 0$ | |
| | $0 0 0 0 0 \frac{\sqrt{770}}{176} 0 0 0 0 0 0 -\frac{13\sqrt{462}}{1232} 0 0$ | |
| | $0 0 0 0 0 0 0 0 0 0 0 0 0 \frac{\sqrt{462}}{154} 0$ | |
| 845 | symmetry | $\frac{\sqrt{462}(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|-------------------------------|--|
| $\mathbb{Q}_6^{(a)}(A_1, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{5}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{5}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{5}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{5}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 & 0 & \frac{3}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & \frac{3}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3}{16} & 0 & 0 \end{bmatrix}$ |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 846 | symmetry | $-\frac{\sqrt{210}yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|--|---|
| $\mathbb{Q}_6^{(a)}(A_1, 3)$ | 0 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 0 | |
| | $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{55}}{44}$ 0 0 0 0 0 0 $-\frac{3\sqrt{33}}{88}$ 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{55}}{44}$ 0 0 0 0 0 0 $-\frac{3\sqrt{33}}{88}$ | |
| | 0 0 0 0 $-\frac{\sqrt{55}}{44}$ 0 0 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 | |
| | $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 0 $\frac{3\sqrt{55}}{88}$ 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $\frac{3\sqrt{55}}{88}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 0 $\frac{3\sqrt{55}}{88}$ 0 0 0 | |
| 847 | symmetry | $\frac{\sqrt{462}xy(x^2-3y^2)(3x^2-y^2)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|---|--|
| $\mathbb{Q}_6^{(a)}(A_2, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{5}{16}$ 0 0 0 0 0 $-\frac{\sqrt{15}}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{5}{16}$ 0 0 0 0 0 $-\frac{\sqrt{15}}{16}$ 0 0 | |
| | 0 0 $-\frac{5}{16}$ 0 0 0 0 0 $\frac{\sqrt{15}}{16}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{5}{16}$ 0 0 0 0 0 $\frac{\sqrt{15}}{16}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{15}}{16}$ 0 0 0 0 0 $\frac{3}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{15}}{16}$ 0 0 0 0 0 $\frac{3}{16}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{15}}{16}$ 0 0 0 0 0 $\frac{3}{16}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{15}}{16}$ 0 0 0 0 0 $\frac{3}{16}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 848 | symmetry | $-\frac{\sqrt{210}xz(x^2-3y^2)(3x^2+3y^2-8z^2)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|--------------------------|--|
| $\mathbb{Q}_6^{(a)}(A_2, 2)$ | 0 | 0 0 0 0 $\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{55}}{44}$ 0 0 0 0 0 $-\frac{3\sqrt{33}}{88}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{55}}{44}$ 0 0 0 0 0 $-\frac{3\sqrt{33}}{88}$ |
| | $\frac{3\sqrt{33}}{88}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 $\frac{\sqrt{55}}{44}$ 0 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{55}}{44}$ 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ |
| | $-\frac{3\sqrt{55}}{88}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{3\sqrt{33}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{55}}{88}$ 0 0 0 0 |
| 849 | symmetry | $\frac{3\sqrt{154}yz(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-----------------------|---|
| $\mathbb{Q}_{6,0}^{(a)}(E, 1)$ | 0 | 0 $\frac{\sqrt{5}}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{5}}{8}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 0 0 |
| | $\frac{\sqrt{5}}{8}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{5}}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{5}}{8}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{5}}{8}$ |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | $-\frac{\sqrt{3}}{8}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{3}}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{5}}{8}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{5}}{8}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 0 |

850 symmetry

$$\frac{3\sqrt{154}xz(x^4 - 10x^2y^2 + 5y^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{8} \\ \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 \\ \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{8} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 851 | symmetry | $\frac{\sqrt{21}yz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|--------------------------|--|
| $\mathbb{Q}_{6,0}^{(a)}(E, 2)$ | 0 | 0 $\frac{\sqrt{330}}{264}$ 0 0 0 0 0 0 $\frac{3\sqrt{22}}{88}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{330}}{264}$ 0 0 0 0 0 $\frac{3\sqrt{22}}{88}$ 0 0 0 0 0 |
| | $\frac{\sqrt{330}}{264}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{330}}{264}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 0 $-\frac{\sqrt{330}}{132}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 0 $-\frac{\sqrt{330}}{132}$ |
| | 0 | 0 0 0 0 $-\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 $\frac{5\sqrt{330}}{264}$ 0 0 0 0 |
| | $\frac{3\sqrt{22}}{88}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{3\sqrt{22}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{5\sqrt{330}}{264}$ 0 0 0 0 0 $\frac{\sqrt{22}}{44}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{5\sqrt{330}}{264}$ 0 0 0 0 0 $\frac{\sqrt{22}}{44}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{330}}{132}$ 0 0 0 0 0 $\frac{\sqrt{22}}{44}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{330}}{132}$ 0 0 0 0 0 $\frac{\sqrt{22}}{44}$ 0 0 0 |
| 852 symmetry | | $-\frac{\sqrt{21xz}(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|---------------------------|---|
| $\mathbb{Q}_{6,1}^{(a)}(E, 2)$ | 0 | 0 0 0 0 $-\frac{\sqrt{330}}{264}$ 0 0 0 0 0 $\frac{3\sqrt{22}}{88}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{330}}{264}$ 0 0 0 0 0 $\frac{3\sqrt{22}}{88}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{330}}{132}$ 0 |
| | 0 | 0 0 0 0 0 0 $\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{330}}{132}$ |
| | $-\frac{\sqrt{330}}{264}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{330}}{264}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 $\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 0 $\frac{5\sqrt{330}}{264}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{5\sqrt{22}}{88}$ 0 0 0 0 0 $\frac{5\sqrt{330}}{264}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{5\sqrt{330}}{264}$ 0 0 0 0 0 $-\frac{\sqrt{22}}{44}$ 0 |
| | $\frac{3\sqrt{22}}{88}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{3\sqrt{22}}{88}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{330}}{132}$ 0 0 0 0 0 $-\frac{\sqrt{22}}{44}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{330}}{132}$ 0 0 0 0 0 $-\frac{\sqrt{22}}{44}$ 0 0 0 0 0 0 |
| 853 | symmetry | $-\frac{3\sqrt{7}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------|--|
| $\mathbb{Q}_{6,0}^{(a)}(E, 3)$ | $-\frac{\sqrt{66}}{22}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{66}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 $-\frac{5\sqrt{66}}{176}$ 0 0 0 0 0 0 $-\frac{\sqrt{110}}{176}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{5\sqrt{66}}{176}$ 0 0 0 0 0 $-\frac{\sqrt{110}}{176}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{5\sqrt{66}}{176}$ 0 0 0 0 0 $\frac{\sqrt{110}}{176}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{5\sqrt{66}}{176}$ 0 0 0 0 0 $\frac{\sqrt{110}}{176}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{5\sqrt{66}}{176}$ 0 0 0 0 0 $\frac{\sqrt{110}}{176}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{110}}{176}$ 0 0 0 0 $\frac{5\sqrt{66}}{176}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{110}}{176}$ 0 0 0 0 0 $\frac{5\sqrt{66}}{176}$ 0 0 0 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{110}}{176}$ 0 0 0 0 0 0 $\frac{5\sqrt{66}}{176}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{110}}{176}$ 0 0 0 0 0 0 $\frac{5\sqrt{66}}{176}$ 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{66}}{22}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{66}}{22}$ |
| 854 symmetry | | $-\frac{3\sqrt{7}xy(x-y)(x+y)(x^2+y^2-10z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|---|--|
| $\mathbb{Q}_{6,1}^{(a)}(E, 3)$ | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{66}}{22}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{66}}{22}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{110}}{44}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| | $\frac{\sqrt{66}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{66}}{22}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 855 | symmetry | $\frac{\sqrt{210}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------------|---|
| $\mathbb{Q}_{6,0}^{(a)}(E, 4)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 & \frac{17\sqrt{33}}{528} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 & \frac{17\sqrt{33}}{528} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{5\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 & \frac{17\sqrt{33}}{528} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 & \frac{17\sqrt{33}}{528} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 & \frac{17\sqrt{33}}{528} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 & \frac{2\sqrt{33}}{33} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{17\sqrt{33}}{528} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{55}}{176} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{55}}{176} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{55}}{176} & 0 & 0 & 0 \end{bmatrix}$ |
| | 856 symmetry | $-\frac{\sqrt{210}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|---|--|
| $\mathbb{Q}_{6,1}^{(a)}(E, 4)$ | 0 0 0 0 0 0 $-\frac{2\sqrt{33}}{33}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{2\sqrt{33}}{33}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{55}}{176}$ 0 0 0 0 0 $\frac{13\sqrt{33}}{528}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{55}}{176}$ 0 0 0 0 0 $\frac{13\sqrt{33}}{528}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{55}}{176}$ 0 0 0 0 0 0 $-\frac{13\sqrt{33}}{528}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{55}}{176}$ 0 0 0 0 0 0 $-\frac{13\sqrt{33}}{528}$ 0 0 0 | |
| | $-\frac{2\sqrt{33}}{33}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{2\sqrt{33}}{33}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{13\sqrt{33}}{528}$ 0 0 0 0 0 0 $\frac{7\sqrt{55}}{176}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{13\sqrt{33}}{528}$ 0 0 0 0 0 0 $\frac{7\sqrt{55}}{176}$ 0 0 | |
| | 0 0 0 $\frac{13\sqrt{33}}{528}$ 0 0 0 0 0 $\frac{7\sqrt{55}}{176}$ 0 0 0 0 | |
| | 0 0 0 $\frac{13\sqrt{33}}{528}$ 0 0 0 0 0 0 $\frac{7\sqrt{55}}{176}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 857 | symmetry | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|--|--------|
| $\mathbb{Q}_2^{(1,-1;a)}(A_1)$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{21}}{42}$ $\frac{\sqrt{21}i}{21}$ 0 | |
| | 0 0 0 0 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{21}i}{21}$ | |
| | 0 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 0 $\frac{\sqrt{21}}{56}$ 0 0 $\frac{\sqrt{35}i}{28}$ 0 0 $-\frac{\sqrt{35}}{56}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{21}i}{28}$ $-\frac{\sqrt{21}}{56}$ 0 0 0 0 $-\frac{\sqrt{35}i}{28}$ $\frac{\sqrt{35}}{56}$ 0 | |
| | 0 0 $-\frac{\sqrt{21}i}{28}$ 0 0 0 0 $-\frac{\sqrt{21}i}{56}$ $\frac{\sqrt{35}i}{28}$ 0 0 0 0 $-\frac{\sqrt{35}i}{56}$ | |
| | 0 0 0 $\frac{\sqrt{21}i}{28}$ 0 0 $-\frac{\sqrt{21}i}{56}$ 0 0 $-\frac{\sqrt{35}i}{28}$ 0 0 0 $-\frac{\sqrt{35}i}{56}$ | |
| | 0 0 0 $-\frac{\sqrt{21}}{56}$ 0 $\frac{\sqrt{21}i}{56}$ 0 0 0 $-\frac{\sqrt{35}}{56}$ 0 $-\frac{\sqrt{35}i}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{21}}{56}$ 0 $\frac{\sqrt{21}i}{56}$ 0 0 0 $\frac{\sqrt{35}}{56}$ 0 $-\frac{\sqrt{35}i}{56}$ 0 0 0 | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{28}$ 0 0 $\frac{\sqrt{35}}{56}$ 0 0 $-\frac{\sqrt{21}i}{84}$ 0 0 0 $-\frac{\sqrt{21}}{168}$ | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 0 0 $\frac{\sqrt{35}i}{28}$ $-\frac{\sqrt{35}}{56}$ 0 0 0 0 $\frac{\sqrt{21}i}{84}$ $\frac{\sqrt{21}}{168}$ 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{35}i}{28}$ 0 0 0 0 $\frac{\sqrt{35}i}{56}$ $\frac{\sqrt{21}i}{84}$ 0 0 0 0 $\frac{\sqrt{21}i}{168}$ | |
| | $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}i}{28}$ 0 0 $\frac{\sqrt{35}i}{56}$ 0 0 $-\frac{\sqrt{21}i}{84}$ 0 0 0 $\frac{\sqrt{21}i}{168}$ | |
| | $-\frac{\sqrt{21}i}{21}$ 0 0 $\frac{\sqrt{35}}{56}$ 0 $\frac{\sqrt{35}i}{56}$ 0 0 0 $\frac{\sqrt{21}}{168}$ 0 $-\frac{\sqrt{21}i}{168}$ 0 0 | |
| | 0 $\frac{\sqrt{21}i}{21}$ $-\frac{\sqrt{35}}{56}$ 0 $\frac{\sqrt{35}i}{56}$ 0 0 0 $-\frac{\sqrt{21}}{168}$ 0 $-\frac{\sqrt{21}i}{168}$ 0 0 0 | |

858 symmetry

 $\sqrt{3}yz$

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|---------------|
| $\mathbb{Q}_{2,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{7}}{14}$ | |
| | 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ $-\frac{\sqrt{7}}{14}$ 0 | |
| | 0 0 0 0 0 $\frac{3\sqrt{7}}{56}$ $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 $\frac{\sqrt{105}}{56}$ $\frac{\sqrt{105}i}{56}$ 0 | |
| | 0 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 $-\frac{\sqrt{105}i}{56}$ | |
| | 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 0 | |
| | 0 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 0 0 | |
| | 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 $-\frac{\sqrt{7}}{56}$ $\frac{\sqrt{7}i}{56}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}i}{56}$ | |
| | $-\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{7}i}{14}$ $\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 0 | |
| 859 symmetry | | $-\sqrt{3}xz$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|---|--|--|--|--|--|---|--|---|--|--|---|---|--|--|
| $\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 | 0 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 | 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 | 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 $-\frac{\sqrt{105}i}{56}$ 0 | 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 $\frac{3\sqrt{7}i}{56}$ $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 $\frac{\sqrt{105}i}{56}$ | 0 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 | $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | 0 $-\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 $\frac{\sqrt{7}i}{56}$ 0 | 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 $-\frac{\sqrt{105}i}{56}$ $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ | 0 $\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 | $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | | |
| | $\frac{\sqrt{3}(x-y)(x+y)}{2}$ | | | | | | | | | | | | | | |

860 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|---|--|---|---|--|--|--|--|--|--|---|--|--|--|--|
| $\mathbb{Q}_{2,0}^{(1,-1;a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 | 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 | 0 0 0 0 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ | 0 0 0 0 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 | 0 0 0 0 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ | 0 0 0 0 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 | 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 $\frac{\sqrt{105}i}{56}$ 0 0 | 0 0 $\frac{3\sqrt{7}}{56}$ 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 $\frac{\sqrt{105}}{56}$ 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 | 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{56}$ | $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ 0 | 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ | $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 | 0 0 0 $\frac{\sqrt{105}}{56}$ 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 $\frac{\sqrt{7}}{56}$ 0 $\frac{\sqrt{7}i}{56}$ 0 0 | 0 0 $-\frac{\sqrt{105}}{56}$ 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | |
| | $-\sqrt{3}xy$ | | | | | | | | | | | | | | |
| | 861 symmetry | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 $-\frac{\sqrt{7}i}{14}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ | |
| | 0 0 0 0 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 | |
| | 0 0 0 0 0 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ | |
| | 0 0 0 0 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 | |
| | 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 $-\frac{\sqrt{105}}{56}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 $\frac{\sqrt{105}}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 | |
| | 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ | |
| | $\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 | |
| | 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 $\frac{\sqrt{105}}{56}$ 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}i}{56}$ 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{56}$ 0 0 0 | |

862 symmetry

$$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|---|
| $\mathbb{Q}_4^{(1,-1;a)}(A_1, 1)$ | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{56}$ | 0 | $\frac{\sqrt{35}}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | $\frac{\sqrt{21}}{56}$ | $\frac{\sqrt{21}i}{21}$ | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{35}i}{56}$ | 0 | $-\frac{\sqrt{35}}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | $-\frac{\sqrt{21}}{56}$ | 0 | 0 | $-\frac{\sqrt{21}i}{21}$ | |
| | 0 | $\frac{\sqrt{35}i}{56}$ | 0 | 0 | $-\frac{\sqrt{21}i}{21}$ | 0 | 0 | $\frac{\sqrt{21}}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{56}$ | |
| | $\frac{\sqrt{35}i}{56}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}i}{21}$ | $-\frac{\sqrt{21}}{56}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}}{56}$ | 0 | |
| | 0 | $-\frac{\sqrt{35}}{56}$ | $\frac{\sqrt{21}i}{21}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{56}$ | |
| | $\frac{\sqrt{35}}{56}$ | 0 | 0 | $-\frac{\sqrt{21}i}{21}$ | 0 | 0 | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{56}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{21}}{56}$ | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}}{56}$ | 0 | $-\frac{\sqrt{35}i}{56}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{21}}{56}$ | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{35}}{56}$ | 0 | $-\frac{\sqrt{35}i}{56}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{56}$ | 0 | 0 | $\frac{\sqrt{21}i}{21}$ | 0 | 0 | $-\frac{\sqrt{21}}{56}$ | |
| | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}}{56}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{21}$ | $\frac{\sqrt{21}}{56}$ | 0 | |
| | 0 | $-\frac{\sqrt{21}}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{56}$ | $-\frac{\sqrt{21}i}{21}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}i}{56}$ | |
| | $\frac{\sqrt{21}}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{56}$ | 0 | 0 | $\frac{\sqrt{21}i}{21}$ | 0 | 0 | $\frac{\sqrt{21}i}{56}$ | 0 | |
| | $-\frac{\sqrt{21}i}{21}$ | 0 | 0 | $-\frac{\sqrt{35}}{56}$ | 0 | $-\frac{\sqrt{35}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{21}}{56}$ | 0 | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{21}i}{21}$ | $\frac{\sqrt{35}}{56}$ | 0 | $-\frac{\sqrt{35}i}{56}$ | 0 | 0 | 0 | $-\frac{\sqrt{21}}{56}$ | 0 | $-\frac{\sqrt{21}i}{56}$ | 0 | 0 | 0 | 0 |

863 symmetry

$$\frac{\sqrt{70}yz(3x^2-y^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------------|-------------------------|--|
| $\mathbb{Q}_4^{(1,-1;a)}(A_1, 2)$ | 0 | 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 $-\frac{\sqrt{2}}{8}$ 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ $\frac{\sqrt{2}}{8}$ 0 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 $-\frac{\sqrt{2}i}{8}$ 0 $\frac{\sqrt{2}}{8}$ $\frac{\sqrt{2}i}{16}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{30}i}{48}$ $-\frac{\sqrt{2}i}{8}$ 0 $-\frac{\sqrt{2}}{8}$ 0 0 $-\frac{\sqrt{2}i}{16}$ |
| | $-\frac{\sqrt{2}i}{16}$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{2}}{8}$ 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 |
| | 0 | $\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 0 0 $\frac{\sqrt{2}}{8}$ 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 |
| | 0 | $\frac{\sqrt{2}}{8}$ $\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ |
| | $-\frac{\sqrt{2}}{8}$ | 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 $-\frac{\sqrt{2}i}{8}$ |
| | 0 | 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 $\frac{\sqrt{2}}{8}$ $\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{2}i}{8}$ 0 $-\frac{\sqrt{2}}{8}$ 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{48}$ |
| | $\frac{\sqrt{30}i}{48}$ | 0 0 $-\frac{\sqrt{2}}{8}$ 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{30}i}{48}$ $\frac{\sqrt{2}}{8}$ 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 $\frac{\sqrt{2}i}{8}$ $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 |

864 symmetry

$$\frac{\sqrt{70}xz(x^2-3y^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|--------------------------------|--------------------------|-------------------------|------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--------------------------|---|
| $\mathbb{Q}_4^{(1,-1;a)}(A_2)$ | 0 | 0 | $\frac{\sqrt{2}i}{16}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2}i}{8}$ | $\frac{\sqrt{30}i}{48}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{2}i}{16}$ | 0 | 0 | $-\frac{\sqrt{2}i}{8}$ | 0 | 0 | $-\frac{\sqrt{30}i}{48}$ | 0 | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{2}i}{16}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{2}}{8}$ | 0 | $\frac{\sqrt{2}i}{8}$ | 0 | $\frac{\sqrt{2}i}{8}$ | 0 | 0 |
| | 0 | $\frac{\sqrt{2}i}{16}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2}}{8}$ | 0 | $\frac{\sqrt{2}i}{8}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{30}i}{48}$ | 0 | 0 | $-\frac{\sqrt{2}i}{8}$ | 0 | $\frac{\sqrt{2}}{8}$ | $-\frac{\sqrt{2}i}{16}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30}i}{48}$ | $-\frac{\sqrt{2}i}{8}$ | 0 | $-\frac{\sqrt{2}}{8}$ | 0 | 0 | $\frac{\sqrt{2}i}{16}$ | 0 |
| | 0 | $\frac{\sqrt{2}i}{8}$ | 0 | 0 | $\frac{\sqrt{30}i}{48}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{2}i}{16}$ | 0 | 0 | $\frac{\sqrt{2}}{8}$ | 0 |
| | $\frac{\sqrt{2}i}{8}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{30}i}{48}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2}i}{16}$ | $-\frac{\sqrt{2}}{8}$ | 0 | 0 |
| | $-\frac{\sqrt{30}i}{48}$ | 0 | 0 | $-\frac{\sqrt{2}}{8}$ | 0 | $\frac{\sqrt{2}i}{8}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{30}i}{48}$ | $\frac{\sqrt{2}}{8}$ | 0 | $\frac{\sqrt{2}i}{8}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{2}i}{8}$ | 0 | $-\frac{\sqrt{2}}{8}$ | $-\frac{\sqrt{2}i}{16}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30}i}{48}$ | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{2}i}{8}$ | 0 | $\frac{\sqrt{2}}{8}$ | 0 | 0 | $\frac{\sqrt{2}i}{16}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{30}i}{48}$ | 0 |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{2}i}{16}$ | 0 | 0 | $-\frac{\sqrt{2}}{8}$ | 0 | 0 | $-\frac{\sqrt{30}i}{48}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2}i}{16}$ | $\frac{\sqrt{2}}{8}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{30}i}{48}$ | 0 | 0 | 0 |

865 symmetry

$$-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------------|---------------------------|----------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|----------------------------|----------------------------|--------------------------|----------------------------|---------------------------|----------------------------|--|
| $\mathbb{Q}_{4,0}^{(1,-1;a)}(E, 1)$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}i}{112}$ | 0 | 0 | $-\frac{\sqrt{14}}{56}$ | 0 | 0 | $-\frac{\sqrt{210}i}{112}$ | 0 | 0 | $\frac{\sqrt{210}}{84}$ | | |
| | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}i}{112}$ | $\frac{\sqrt{14}}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{210}i}{112}$ | $-\frac{\sqrt{210}}{84}$ | 0 | | | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{210}}{84}$ | $-\frac{\sqrt{210}i}{112}$ | 0 | 0 | $\frac{\sqrt{14}i}{56}$ | 0 | $\frac{\sqrt{14}}{56}$ | $-\frac{5\sqrt{14}i}{112}$ | 0 | | |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{210}}{84}$ | 0 | 0 | $\frac{\sqrt{210}i}{112}$ | $\frac{\sqrt{14}i}{56}$ | 0 | $-\frac{\sqrt{14}}{56}$ | 0 | 0 | $\frac{5\sqrt{14}i}{112}$ | | |
| | $\frac{5\sqrt{14}i}{112}$ | 0 | 0 | $\frac{\sqrt{210}}{84}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{14}}{56}$ | 0 | $\frac{\sqrt{14}i}{56}$ | 0 | 0 | | |
| | 0 | $-\frac{5\sqrt{14}i}{112}$ | $-\frac{\sqrt{210}}{84}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{14}}{56}$ | 0 | $\frac{\sqrt{14}i}{56}$ | 0 | 0 | 0 | | |
| | 0 | $\frac{\sqrt{14}}{56}$ | $\frac{\sqrt{210}i}{112}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}i}{112}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{14}i}{56}$ | | |
| | $-\frac{\sqrt{14}}{56}$ | 0 | 0 | $-\frac{\sqrt{210}i}{112}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}i}{112}$ | 0 | 0 | $\frac{\sqrt{14}i}{56}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{\sqrt{14}i}{56}$ | 0 | $\frac{\sqrt{14}}{56}$ | $-\frac{5\sqrt{14}i}{112}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{210}}{84}$ | $\frac{\sqrt{210}i}{112}$ | 0 | | |
| | 0 | 0 | $-\frac{\sqrt{14}i}{56}$ | 0 | $-\frac{\sqrt{14}}{56}$ | 0 | 0 | $\frac{5\sqrt{14}i}{112}$ | 0 | 0 | $-\frac{\sqrt{210}}{84}$ | 0 | 0 | 0 | $-\frac{\sqrt{210}i}{112}$ | |
| | $\frac{\sqrt{210}i}{112}$ | 0 | 0 | $-\frac{\sqrt{14}}{56}$ | 0 | $-\frac{\sqrt{14}i}{56}$ | 0 | 0 | 0 | $-\frac{\sqrt{210}}{84}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{210}i}{112}$ | $\frac{\sqrt{14}}{56}$ | 0 | $-\frac{\sqrt{14}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{210}}{84}$ | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{210}}{84}$ | $\frac{5\sqrt{14}i}{112}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{14}i}{56}$ | $-\frac{\sqrt{210}i}{112}$ | 0 | 0 | 0 | 0 | 0 | 0 | |
| | $\frac{\sqrt{210}}{84}$ | 0 | 0 | $-\frac{5\sqrt{14}i}{112}$ | 0 | 0 | $-\frac{\sqrt{14}i}{56}$ | 0 | 0 | $\frac{\sqrt{210}i}{112}$ | 0 | 0 | 0 | 0 | 0 | |

866 symmetry

$$\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|---|---|
| $\mathbb{Q}_{4,1}^{(1,-1;a)}(E, 1)$ | 0 0 $-\frac{5\sqrt{14}i}{112}$ 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ $\frac{\sqrt{210}i}{112}$ 0 0 0 0 $-\frac{\sqrt{210}i}{84}$ | |
| | 0 0 0 $\frac{5\sqrt{14}i}{112}$ 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 $-\frac{\sqrt{210}i}{112}$ 0 0 $-\frac{\sqrt{210}i}{84}$ 0 | |
| | $\frac{5\sqrt{14}i}{112}$ 0 0 0 0 $\frac{\sqrt{210}i}{84}$ 0 0 0 $-\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 | |
| | 0 $-\frac{5\sqrt{14}i}{112}$ 0 0 $\frac{\sqrt{210}i}{84}$ 0 0 0 $\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{210}i}{84}$ 0 0 $-\frac{\sqrt{210}i}{112}$ 0 0 $-\frac{\sqrt{14}i}{56}$ 0 $-\frac{\sqrt{14}}{56}$ $\frac{5\sqrt{14}i}{112}$ 0 | |
| | 0 0 $-\frac{\sqrt{210}i}{84}$ 0 0 0 0 $\frac{\sqrt{210}i}{112}$ $-\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{56}$ 0 0 $-\frac{5\sqrt{14}i}{112}$ | |
| | 0 $\frac{\sqrt{14}i}{56}$ 0 0 $\frac{\sqrt{210}i}{112}$ 0 0 0 0 0 $-\frac{5\sqrt{14}i}{112}$ 0 0 $-\frac{\sqrt{14}}{56}$ | |
| | $\frac{\sqrt{14}i}{56}$ 0 0 0 0 $-\frac{\sqrt{210}i}{112}$ 0 0 0 0 0 $\frac{5\sqrt{14}i}{112}$ $\frac{\sqrt{14}}{56}$ 0 | |
| | $-\frac{\sqrt{210}i}{112}$ 0 0 $\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{210}i}{84}$ 0 0 | |
| | 0 $\frac{\sqrt{210}i}{112}$ $-\frac{\sqrt{14}}{56}$ 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 0 $-\frac{\sqrt{210}i}{84}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 $\frac{\sqrt{14}}{56}$ $\frac{5\sqrt{14}i}{112}$ 0 0 $\frac{\sqrt{210}i}{84}$ 0 0 $\frac{\sqrt{210}i}{112}$ 0 | |
| | 0 0 $-\frac{\sqrt{14}i}{56}$ 0 $-\frac{\sqrt{14}}{56}$ 0 0 $-\frac{5\sqrt{14}i}{112}$ $\frac{\sqrt{210}i}{84}$ 0 0 0 0 $-\frac{\sqrt{210}i}{112}$ | |
| | 0 $\frac{\sqrt{210}i}{84}$ 0 0 $-\frac{5\sqrt{14}i}{112}$ 0 0 $\frac{\sqrt{14}}{56}$ 0 0 $-\frac{\sqrt{210}i}{112}$ 0 0 0 | |
| | $\frac{\sqrt{210}i}{84}$ 0 0 0 0 $\frac{5\sqrt{14}i}{112}$ $-\frac{\sqrt{14}}{56}$ 0 0 0 0 $\frac{\sqrt{210}i}{112}$ 0 0 | |
| 867 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--------------------------|---|
| $\mathbb{Q}_{4,0}^{(1,-1;a)}(E, 2)$ | 0 | 0 0 0 $\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 |
| | 0 | 0 0 $\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 |
| | 0 | $-\frac{i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 $-\frac{1}{8}$ |
| | $-\frac{i}{8}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 $\frac{1}{8}$ 0 |
| | 0 | $\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 $-\frac{i}{8}$ |
| | $-\frac{1}{8}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 $-\frac{i}{8}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 $\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 |
| | 0 | 0 $\frac{\sqrt{15}}{24}$ 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 $-\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 0 0 |
| | 0 | $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 $-\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ |
| | $-\frac{\sqrt{15}i}{24}$ | 0 0 0 0 0 0 $\frac{1}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 |
| | 0 | $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ |
| | $\frac{\sqrt{15}}{24}$ | 0 0 0 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 |
| | 0 | 0 0 0 $\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 0 $\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 |
| | 0 | 0 0 $-\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 |

868 symmetry

 $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|-------------------------|---|
| $\mathbb{Q}_{4,1}^{(1,-1;a)}(E, 2)$ | 0 | 0 0 0 $\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 0 $\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 |
| | 0 | 0 0 $-\frac{1}{8}$ 0 $\frac{i}{8}$ 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 |
| | 0 | $-\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 $\frac{i}{8}$ |
| | $\frac{1}{8}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 $\frac{i}{8}$ 0 |
| | 0 | $-\frac{i}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 $-\frac{1}{8}$ |
| | $-\frac{i}{8}$ | 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 $\frac{1}{8}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 0 $-\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 $-\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ |
| | $\frac{\sqrt{15}}{24}$ | 0 0 0 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 |
| | 0 | $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 $-\frac{1}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ |
| | $\frac{\sqrt{15}i}{24}$ | 0 0 0 0 0 0 $\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 |
| | 0 | 0 0 0 $-\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 |
| | 0 | 0 0 $-\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 0 |

869 symmetry

$$-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|--------------------------|--------------------------|-------------------------|--------------------------|---------------------------|---------------------------|--------------------------|--------------------------|---------------------------|---------------------------|--------------------------|--------------------------|---------------------------|---------------------------|-----------------------|
| $\mathbb{Q}_{4,0}^{(1,-1;a)}(E, 3)$ | 0 | 0 | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | $\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | $-\frac{\sqrt{105}i}{84}$ | 0 | $\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | $-\frac{\sqrt{7}}{28}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | $-\frac{\sqrt{105}i}{84}$ | 0 | $-\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | $\frac{\sqrt{7}}{28}$ |
| | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{14}$ | $-\frac{\sqrt{7}}{28}$ | 0 | 0 |
| | 0 | $-\frac{\sqrt{7}}{28}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{84}$ | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | |
| | $\frac{\sqrt{7}}{28}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{84}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | |
| | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | $-\frac{\sqrt{105}}{84}$ | 0 | $-\frac{\sqrt{105}i}{84}$ | 0 | 0 | 0 | $-\frac{\sqrt{7}}{28}$ | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{7}i}{14}$ | $\frac{\sqrt{105}}{84}$ | 0 | $-\frac{\sqrt{105}i}{84}$ | 0 | 0 | 0 | $\frac{\sqrt{7}}{28}$ | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{105}i}{84}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{\sqrt{7}}{28}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{84}$ | |
| | $\frac{\sqrt{105}i}{84}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{14}$ | $-\frac{\sqrt{7}}{28}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | |
| | 0 | $-\frac{\sqrt{105}}{84}$ | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{84}$ | |
| | $\frac{\sqrt{105}}{84}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | $-\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{84}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{7}}{28}$ | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | $\frac{\sqrt{105}i}{84}$ | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{7}}{28}$ | 0 | $\frac{\sqrt{7}i}{28}$ | 0 | 0 | 0 | $-\frac{\sqrt{105}}{84}$ | 0 | $\frac{\sqrt{105}i}{84}$ | 0 | 0 | 0 | |

870 symmetry

$$\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------------|----------------------------|--|----------------------------|----------------------------|---------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------------------------|----------------------------|--------------------------|--|
| $\mathbb{Q}_{4,1}^{(1,-1;a)}(E, 3)$ | 0 | 0 | 0 | $-\frac{3\sqrt{7}}{56}$ | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{105}}{168}$ | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{3\sqrt{7}}{56}$ | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | $-\frac{\sqrt{105}}{168}$ | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{3\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{168}$ | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{7}i}{56}$ | |
| | $-\frac{3\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | 0 | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{168}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{3\sqrt{7}}{56}$ | 0 | |
| | $-\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{168}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{14}$ | $-\frac{3\sqrt{7}}{56}$ | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | $\frac{\sqrt{105}}{168}$ | 0 | 0 | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | $-\frac{3\sqrt{7}}{56}$ | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | $-\frac{\sqrt{105}}{168}$ | 0 | 0 | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | $\frac{3\sqrt{7}}{56}$ | 0 | 0 | $-\frac{\sqrt{7}i}{14}$ | | |
| | 0 | $-\frac{\sqrt{105}}{168}$ | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{168}$ | | |
| | $\frac{\sqrt{105}}{168}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | | |
| | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | 0 | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{3\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{168}$ | |
| | $-\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | $-\frac{3\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{168}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | $-\frac{3\sqrt{7}}{56}$ | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | $-\frac{\sqrt{105}}{168}$ | 0 | 0 | 0 | |
| | 0 | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | $\frac{3\sqrt{7}}{56}$ | 0 | 0 | $\frac{\sqrt{7}i}{14}$ | $\frac{\sqrt{105}i}{168}$ | 0 | $\frac{\sqrt{105}}{168}$ | 0 | 0 | 0 | 0 | |
| 871 | symmetry | $-\frac{5x^6}{16} - \frac{15x^4y^2}{16} + \frac{45x^4z^2}{8} - \frac{15x^2y^4}{16} + \frac{45x^2y^2z^2}{4} - \frac{15x^2z^4}{2} - \frac{5y^6}{16} + \frac{45y^4z^2}{8} - \frac{15y^2z^4}{2} + z^6$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-----------------------------------|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{Q}_6^{(1,-1;a)}(A_1, 1)$ | 0 0 0 $\frac{\sqrt{1155}i}{264}$ 0 $-\frac{\sqrt{1155}}{264}$ 0 0 0 $\frac{5\sqrt{77}i}{616}$ 0 $\frac{5\sqrt{77}}{616}$ $-\frac{2\sqrt{77}i}{77}$ 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{1155}i}{264}$ 0 $\frac{\sqrt{1155}}{264}$ 0 0 0 $\frac{5\sqrt{77}i}{616}$ 0 $-\frac{5\sqrt{77}}{616}$ 0 0 $\frac{2\sqrt{77}i}{77}$ | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{1155}i}{264}$ 0 0 $-\frac{5\sqrt{77}i}{616}$ 0 0 $\frac{5\sqrt{77}}{616}$ 0 0 $\frac{3\sqrt{1155}i}{616}$ 0 0 $\frac{\sqrt{1155}}{924}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{1155}i}{264}$ 0 0 0 $\frac{5\sqrt{77}i}{616}$ $-\frac{5\sqrt{77}}{616}$ 0 0 0 0 $-\frac{3\sqrt{1155}i}{616}$ $-\frac{\sqrt{1155}}{924}$ 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{1155}}{264}$ $\frac{5\sqrt{77}i}{616}$ 0 0 0 $-\frac{5\sqrt{77}i}{616}$ $\frac{3\sqrt{1155}i}{616}$ 0 0 0 0 $\frac{\sqrt{1155}i}{924}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{1155}}{264}$ 0 0 $-\frac{5\sqrt{77}i}{616}$ 0 0 $-\frac{5\sqrt{77}i}{616}$ 0 0 $-\frac{3\sqrt{1155}i}{616}$ 0 0 $\frac{\sqrt{1155}i}{924}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{5\sqrt{77}}{616}$ 0 $\frac{5\sqrt{77}i}{616}$ 0 0 0 $-\frac{5\sqrt{1155}}{1848}$ 0 $-\frac{5\sqrt{1155}i}{1848}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{5\sqrt{77}}{616}$ 0 $\frac{5\sqrt{77}i}{616}$ 0 0 0 $\frac{5\sqrt{1155}}{1848}$ 0 $-\frac{5\sqrt{1155}i}{1848}$ 0 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{5\sqrt{77}i}{616}$ 0 0 $-\frac{3\sqrt{1155}i}{616}$ 0 0 $\frac{5\sqrt{1155}}{1848}$ 0 0 $\frac{\sqrt{77}i}{56}$ 0 0 $\frac{5\sqrt{77}}{308}$ | | | | | | | | | | | | | | |
| | $-\frac{5\sqrt{77}i}{616}$ 0 0 0 $\frac{3\sqrt{1155}i}{616}$ $-\frac{5\sqrt{1155}}{1848}$ 0 0 0 0 $-\frac{\sqrt{77}i}{56}$ $-\frac{5\sqrt{77}}{308}$ 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{5\sqrt{77}}{616}$ $-\frac{3\sqrt{1155}i}{616}$ 0 0 0 0 $\frac{5\sqrt{1155}i}{1848}$ $-\frac{\sqrt{77}i}{56}$ 0 0 0 0 $-\frac{5\sqrt{77}i}{308}$ | | | | | | | | | | | | | | |
| | $\frac{5\sqrt{77}}{616}$ 0 0 $\frac{3\sqrt{1155}i}{616}$ 0 0 $\frac{5\sqrt{1155}i}{1848}$ 0 0 $\frac{\sqrt{77}i}{56}$ 0 0 $-\frac{5\sqrt{77}i}{308}$ 0 | | | | | | | | | | | | | | |
| | $\frac{2\sqrt{77}i}{77}$ 0 0 $-\frac{\sqrt{1155}}{924}$ 0 $-\frac{\sqrt{1155}i}{924}$ 0 0 0 $-\frac{5\sqrt{77}}{308}$ 0 $\frac{5\sqrt{77}i}{308}$ 0 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{2\sqrt{77}i}{77}$ $\frac{\sqrt{1155}}{924}$ 0 $-\frac{\sqrt{1155}i}{924}$ 0 0 0 $\frac{5\sqrt{77}}{308}$ 0 $\frac{5\sqrt{77}i}{308}$ 0 0 0 | | | | | | | | | | | | | | |

$$\frac{\sqrt{462(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}}{32}$$

872 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} \\ -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 \\ \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{16} \\ \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 \\ \frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 873 | symmetry | $-\frac{\sqrt{210}yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|---|--|--------|
| $\mathbb{Q}_6^{(1,-1;a)}(A_1, 3)$ | 0 0 0 0 $\frac{3\sqrt{22}i}{176}$ 0 0 $-\frac{\sqrt{22}}{22}$ 0 0 $-\frac{\sqrt{330}i}{176}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{22}i}{176}$ $\frac{\sqrt{22}}{22}$ 0 0 0 0 $\frac{\sqrt{330}i}{176}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{330}}{352}$ $\frac{\sqrt{330}i}{88}$ 0 0 $\frac{3\sqrt{22}i}{88}$ 0 $-\frac{9\sqrt{22}}{352}$ $\frac{3\sqrt{22}i}{176}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{330}}{352}$ 0 0 $-\frac{\sqrt{330}i}{88}$ $\frac{3\sqrt{22}i}{88}$ 0 $\frac{9\sqrt{22}}{352}$ 0 0 $-\frac{3\sqrt{22}i}{176}$ | |
| | $-\frac{3\sqrt{22}i}{176}$ 0 0 $-\frac{\sqrt{330}}{352}$ 0 0 0 0 $\frac{7\sqrt{22}}{352}$ 0 $\frac{\sqrt{22}i}{88}$ 0 0 0 | |
| | 0 $\frac{3\sqrt{22}i}{176}$ $\frac{\sqrt{330}}{352}$ 0 0 0 0 0 $-\frac{7\sqrt{22}}{352}$ 0 $\frac{\sqrt{22}i}{88}$ 0 0 0 | |
| | 0 $\frac{\sqrt{22}}{22}$ $-\frac{\sqrt{330}i}{88}$ 0 0 0 0 0 $\frac{3\sqrt{22}i}{88}$ 0 0 0 0 $-\frac{\sqrt{22}i}{22}$ | |
| | $-\frac{\sqrt{22}}{22}$ 0 0 $\frac{\sqrt{330}i}{88}$ 0 0 0 0 $-\frac{3\sqrt{22}i}{88}$ 0 0 0 $-\frac{\sqrt{22}i}{22}$ 0 | |
| | 0 0 0 $-\frac{3\sqrt{22}i}{88}$ 0 $-\frac{7\sqrt{22}}{352}$ $-\frac{3\sqrt{22}i}{88}$ 0 0 0 0 $\frac{\sqrt{330}}{352}$ $\frac{\sqrt{330}i}{176}$ 0 | |
| | 0 0 $-\frac{3\sqrt{22}i}{88}$ 0 $\frac{7\sqrt{22}}{352}$ 0 0 $\frac{3\sqrt{22}i}{88}$ 0 0 $-\frac{\sqrt{330}}{352}$ 0 0 0 $-\frac{\sqrt{330}i}{176}$ | |
| | $\frac{\sqrt{330}i}{176}$ 0 0 $\frac{9\sqrt{22}}{352}$ 0 $-\frac{\sqrt{22}i}{88}$ 0 0 0 $-\frac{\sqrt{330}}{352}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{330}i}{176}$ $-\frac{9\sqrt{22}}{352}$ 0 $-\frac{\sqrt{22}i}{88}$ 0 0 0 $\frac{\sqrt{330}}{352}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{22}i}{176}$ 0 0 0 0 $\frac{\sqrt{22}i}{22}$ $-\frac{\sqrt{330}i}{176}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{22}i}{176}$ 0 0 $\frac{\sqrt{22}i}{22}$ 0 0 $\frac{\sqrt{330}i}{176}$ 0 0 0 0 | |
| $\frac{\sqrt{462}xy(x^2-3y^2)(3x^2-y^2)}{16}$ | | |

874 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{\sqrt{6}}{16} & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} \\ \frac{\sqrt{10}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{16} \\ \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} \\ -\frac{\sqrt{6}}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{16} & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{16} \\ \frac{\sqrt{6}i}{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & -\frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & -\frac{\sqrt{6}}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & \frac{\sqrt{10}}{16} & 0 & 0 & 0 & \frac{\sqrt{6}i}{16} & 0 & \frac{\sqrt{6}}{16} & 0 & 0 & 0 \end{bmatrix}$ |
| 875 | symmetry | $-\frac{\sqrt{210}xz(x^2-3y^2)(3x^2+3y^2-8z^2)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------------|---|---|
| $\mathbb{Q}_6^{(1,-1;a)}(A_2, 2)$ | 0 0 $\frac{3\sqrt{22}i}{176}$ 0 0 0 0 $-\frac{\sqrt{22}i}{22}$ $\frac{\sqrt{330}i}{176}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{22}i}{176}$ 0 0 $-\frac{\sqrt{22}i}{22}$ 0 0 $-\frac{\sqrt{330}i}{176}$ 0 0 0 0 0 | |
| | $-\frac{3\sqrt{22}i}{176}$ 0 0 0 0 $-\frac{\sqrt{330}i}{352}$ 0 0 0 $-\frac{\sqrt{22}}{88}$ 0 $-\frac{7\sqrt{22}i}{352}$ 0 0 0 | |
| | 0 $\frac{3\sqrt{22}i}{176}$ 0 0 $-\frac{\sqrt{330}i}{352}$ 0 0 0 $\frac{\sqrt{22}}{88}$ 0 $-\frac{7\sqrt{22}i}{352}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{330}i}{352}$ 0 0 $\frac{\sqrt{330}i}{88}$ 0 0 $\frac{9\sqrt{22}i}{352}$ 0 $-\frac{3\sqrt{22}}{88}$ $-\frac{3\sqrt{22}i}{176}$ 0 | |
| | 0 0 $\frac{\sqrt{330}i}{352}$ 0 0 0 $-\frac{\sqrt{330}i}{88}$ $\frac{9\sqrt{22}i}{352}$ 0 $\frac{3\sqrt{22}}{88}$ 0 0 $\frac{3\sqrt{22}i}{176}$ | |
| | 0 $\frac{\sqrt{22}i}{22}$ 0 0 $-\frac{\sqrt{330}i}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{22}i}{88}$ 0 0 $\frac{\sqrt{22}}{22}$ | |
| | $\frac{\sqrt{22}i}{22}$ 0 0 0 0 $\frac{\sqrt{330}i}{88}$ 0 0 0 0 0 $\frac{3\sqrt{22}i}{88}$ $-\frac{\sqrt{22}}{22}$ 0 | |
| | $-\frac{\sqrt{330}i}{176}$ 0 0 $\frac{\sqrt{22}}{88}$ 0 $-\frac{9\sqrt{22}i}{352}$ 0 0 0 0 0 $-\frac{\sqrt{330}i}{352}$ 0 0 | |
| | 0 $\frac{\sqrt{330}i}{176}$ $-\frac{\sqrt{22}}{88}$ 0 $-\frac{9\sqrt{22}i}{352}$ 0 0 0 0 0 $-\frac{\sqrt{330}i}{352}$ 0 0 0 | |
| | 0 0 0 $\frac{7\sqrt{22}i}{352}$ 0 $\frac{3\sqrt{22}}{88}$ $\frac{3\sqrt{22}i}{88}$ 0 0 $\frac{\sqrt{330}i}{352}$ 0 0 $\frac{\sqrt{330}i}{176}$ 0 | |
| | 0 0 $\frac{7\sqrt{22}i}{352}$ 0 $-\frac{3\sqrt{22}}{88}$ 0 0 $-\frac{3\sqrt{22}i}{88}$ $\frac{\sqrt{330}i}{352}$ 0 0 0 0 $-\frac{\sqrt{330}i}{176}$ | |
| | 0 0 0 0 $\frac{3\sqrt{22}i}{176}$ 0 0 $-\frac{\sqrt{22}}{22}$ 0 0 0 $-\frac{\sqrt{330}i}{176}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{22}i}{176}$ $\frac{\sqrt{22}}{22}$ 0 0 0 0 $\frac{\sqrt{330}i}{176}$ 0 0 | |
| 876 | symmetry | $\frac{3\sqrt{154}yz(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|---|--|--------|
| $\mathbb{Q}_{6,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{5\sqrt{2}}{32}$ 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 $-\frac{\sqrt{30}}{96}$ $-\frac{\sqrt{30}i}{48}$ 0 | |
| | 0 0 0 0 $-\frac{5\sqrt{2}}{32}$ 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 $\frac{\sqrt{30}}{96}$ 0 0 $-\frac{\sqrt{30}i}{48}$ | |
| | $\frac{\sqrt{30}i}{48}$ 0 0 $-\frac{5\sqrt{2}}{32}$ 0 0 0 0 $-\frac{\sqrt{30}}{96}$ 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{30}i}{48}$ $\frac{5\sqrt{2}}{32}$ 0 0 0 0 0 $\frac{\sqrt{30}}{96}$ 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 $\frac{\sqrt{30}}{96}$ 0 0 0 0 0 $\frac{5\sqrt{2}}{32}$ $-\frac{\sqrt{2}i}{16}$ 0 | |
| | 0 0 $\frac{\sqrt{30}i}{24}$ 0 $-\frac{\sqrt{30}}{96}$ 0 0 0 0 0 $-\frac{5\sqrt{2}}{32}$ 0 0 $\frac{\sqrt{2}i}{16}$ | |
| | $\frac{\sqrt{2}i}{16}$ 0 0 $\frac{\sqrt{30}}{96}$ 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 $-\frac{5\sqrt{2}}{32}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{2}i}{16}$ $-\frac{\sqrt{30}}{96}$ 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 $\frac{5\sqrt{2}}{32}$ 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 | |
| $\frac{3\sqrt{154}xz(x^4 - 10x^2y^2 + 5y^4)}{16}$ | | |
| 877 | symmetry | |

continued ...

Table 10

| No. | multipole | matrix |
|--|---|--------|
| $\mathbb{Q}_{6,1}^{(1,-1;a)}(E, 1)$ | 0 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 $\frac{5\sqrt{2}i}{32}$ 0 0 0 $\frac{\sqrt{30}}{24}$ 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 | |
| | 0 $\frac{\sqrt{30}i}{48}$ 0 0 $\frac{5\sqrt{2}i}{32}$ 0 0 0 $-\frac{\sqrt{30}}{24}$ 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 0 | |
| | 0 0 0 $-\frac{5\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{96}$ 0 0 $-\frac{\sqrt{30}}{24}$ $\frac{\sqrt{30}i}{48}$ 0 | |
| | 0 0 $-\frac{5\sqrt{2}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{96}$ 0 $\frac{\sqrt{30}}{24}$ 0 0 $-\frac{\sqrt{30}i}{48}$ | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | $\frac{\sqrt{2}i}{16}$ 0 0 $-\frac{\sqrt{30}}{24}$ 0 $\frac{\sqrt{30}i}{96}$ 0 0 0 0 0 $\frac{5\sqrt{2}i}{32}$ 0 0 | |
| | 0 $-\frac{\sqrt{2}i}{16}$ $\frac{\sqrt{30}}{24}$ 0 $\frac{\sqrt{30}i}{96}$ 0 0 0 0 0 $\frac{5\sqrt{2}i}{32}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{96}$ 0 $\frac{\sqrt{30}}{24}$ 0 0 0 $-\frac{5\sqrt{2}i}{32}$ 0 0 $\frac{\sqrt{2}i}{16}$ 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{96}$ 0 $-\frac{\sqrt{30}}{24}$ 0 0 0 $-\frac{5\sqrt{2}i}{32}$ 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ | |
| | 0 0 0 0 $-\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{30}i}{48}$ 0 0 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 | |
| $\frac{\sqrt{21}yz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$ | | |

878 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|--|
| $\mathbb{Q}_{6,0}^{(1,-1;a)}(E, 2)$ | 0 | 0 | 0 | 0 | $\frac{7\sqrt{55}i}{264}$ | 0 | 0 | $-\frac{\sqrt{55}}{66}$ | 0 | 0 | $-\frac{5\sqrt{33}i}{264}$ | 0 | 0 | $-\frac{\sqrt{33}}{33}$ | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{7\sqrt{55}i}{264}$ | $\frac{\sqrt{55}}{66}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{33}i}{264}$ | $\frac{\sqrt{33}}{33}$ | 0 | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{33}}{528}$ | $-\frac{5\sqrt{33}i}{264}$ | 0 | 0 | $-\frac{\sqrt{55}i}{132}$ | 0 | $\frac{5\sqrt{55}}{528}$ | $-\frac{\sqrt{55}i}{132}$ | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{5\sqrt{33}}{528}$ | 0 | 0 | $\frac{5\sqrt{33}i}{264}$ | $-\frac{\sqrt{55}i}{132}$ | 0 | $-\frac{5\sqrt{55}}{528}$ | 0 | 0 | $\frac{\sqrt{55}i}{132}$ | |
| | $-\frac{7\sqrt{55}i}{264}$ | 0 | 0 | $\frac{5\sqrt{33}}{528}$ | 0 | 0 | 0 | 0 | 0 | $\frac{13\sqrt{55}}{528}$ | 0 | $-\frac{\sqrt{55}i}{132}$ | 0 | 0 | |
| | 0 | $\frac{7\sqrt{55}i}{264}$ | $-\frac{5\sqrt{33}}{528}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{13\sqrt{55}}{528}$ | 0 | $-\frac{\sqrt{55}i}{132}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{55}}{66}$ | $\frac{5\sqrt{33}i}{264}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{55}i}{264}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}i}{66}$ | |
| | $-\frac{\sqrt{55}}{66}$ | 0 | 0 | $-\frac{5\sqrt{33}i}{264}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{55}i}{264}$ | 0 | 0 | $\frac{\sqrt{55}i}{66}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{55}i}{132}$ | 0 | $-\frac{13\sqrt{55}}{528}$ | $-\frac{5\sqrt{55}i}{264}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{33}}{48}$ | $-\frac{5\sqrt{33}i}{132}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{55}i}{132}$ | 0 | $\frac{13\sqrt{55}}{528}$ | 0 | 0 | $\frac{5\sqrt{55}i}{264}$ | 0 | 0 | $-\frac{\sqrt{33}}{48}$ | 0 | 0 | $\frac{5\sqrt{33}i}{132}$ | |
| | $\frac{5\sqrt{33}i}{264}$ | 0 | 0 | $-\frac{5\sqrt{55}}{528}$ | 0 | $\frac{\sqrt{55}i}{132}$ | 0 | 0 | 0 | $-\frac{\sqrt{33}}{48}$ | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{33}i}{264}$ | $\frac{5\sqrt{55}}{528}$ | 0 | $\frac{\sqrt{55}i}{132}$ | 0 | 0 | 0 | $\frac{\sqrt{33}}{48}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{33}}{33}$ | $\frac{\sqrt{55}i}{132}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{55}i}{66}$ | $\frac{5\sqrt{33}i}{132}$ | 0 | 0 | 0 | 0 | 0 | |
| | $-\frac{\sqrt{33}}{33}$ | 0 | 0 | $-\frac{\sqrt{55}i}{132}$ | 0 | 0 | $-\frac{\sqrt{55}i}{66}$ | 0 | 0 | $-\frac{5\sqrt{33}i}{132}$ | 0 | 0 | 0 | 0 | |

$$-\frac{\sqrt{21}xz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$$

879 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|--|--|--------|
| $\mathbb{Q}_{6,1}^{(1,-1;a)}(E, 2)$ | 0 0 $\frac{7\sqrt{55}i}{264}$ 0 0 0 0 $-\frac{\sqrt{55}i}{66}$ $\frac{5\sqrt{33}i}{264}$ 0 0 0 0 $\frac{\sqrt{33}i}{33}$ | |
| | 0 0 0 $-\frac{7\sqrt{55}i}{264}$ 0 0 $-\frac{\sqrt{55}i}{66}$ 0 0 $-\frac{5\sqrt{33}i}{264}$ 0 0 $\frac{\sqrt{33}i}{33}$ 0 | |
| | $-\frac{7\sqrt{55}i}{264}$ 0 0 0 0 $\frac{5\sqrt{33}i}{528}$ 0 0 0 $\frac{\sqrt{55}}{132}$ 0 $-\frac{13\sqrt{55}i}{528}$ 0 0 | |
| | 0 $\frac{7\sqrt{55}i}{264}$ 0 0 $\frac{5\sqrt{33}i}{528}$ 0 0 0 $-\frac{\sqrt{55}}{132}$ 0 $-\frac{13\sqrt{55}i}{528}$ 0 0 | |
| | 0 0 0 $-\frac{5\sqrt{33}i}{528}$ 0 0 $-\frac{5\sqrt{33}i}{264}$ 0 0 $-\frac{5\sqrt{55}i}{528}$ 0 $\frac{\sqrt{55}}{132}$ $\frac{\sqrt{55}i}{132}$ 0 | |
| | 0 0 $-\frac{5\sqrt{33}i}{528}$ 0 0 0 0 $\frac{5\sqrt{33}i}{264}$ $-\frac{5\sqrt{55}i}{528}$ 0 $-\frac{\sqrt{55}}{132}$ 0 0 $-\frac{\sqrt{55}i}{132}$ | |
| | 0 $\frac{\sqrt{55}i}{66}$ 0 0 $\frac{5\sqrt{33}i}{264}$ 0 0 0 0 0 $-\frac{5\sqrt{55}i}{264}$ 0 0 $-\frac{\sqrt{55}}{66}$ | |
| | $\frac{\sqrt{55}i}{66}$ 0 0 0 0 $-\frac{5\sqrt{33}i}{264}$ 0 0 0 0 0 $\frac{5\sqrt{55}i}{264}$ $\frac{\sqrt{55}}{66}$ 0 | |
| | $-\frac{5\sqrt{33}i}{264}$ 0 0 $-\frac{\sqrt{55}}{132}$ 0 $\frac{5\sqrt{55}i}{528}$ 0 0 0 0 0 $-\frac{\sqrt{33}i}{48}$ 0 0 | |
| | 0 $\frac{5\sqrt{33}i}{264}$ $\frac{\sqrt{55}}{132}$ 0 $\frac{5\sqrt{55}i}{528}$ 0 0 0 0 0 $-\frac{\sqrt{33}i}{48}$ 0 0 0 | |
| | 0 0 0 $\frac{13\sqrt{55}i}{528}$ 0 $-\frac{\sqrt{55}}{132}$ $\frac{5\sqrt{55}i}{264}$ 0 0 $\frac{\sqrt{33}i}{48}$ 0 0 $-\frac{5\sqrt{33}i}{132}$ 0 | |
| | 0 0 $\frac{13\sqrt{55}i}{528}$ 0 $\frac{\sqrt{55}}{132}$ 0 0 $-\frac{5\sqrt{55}i}{264}$ $\frac{\sqrt{33}i}{48}$ 0 0 0 0 $\frac{5\sqrt{33}i}{132}$ | |
| | 0 $-\frac{\sqrt{33}i}{33}$ 0 0 $-\frac{\sqrt{55}i}{132}$ 0 0 $\frac{\sqrt{55}}{66}$ 0 0 $\frac{5\sqrt{33}i}{132}$ 0 0 0 | |
| | $-\frac{\sqrt{33}i}{33}$ 0 0 0 0 $\frac{\sqrt{55}i}{132}$ $-\frac{\sqrt{55}}{66}$ 0 0 0 0 $-\frac{5\sqrt{33}i}{132}$ 0 0 | |
| $-\frac{3\sqrt{7}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$ | | |
| 880 | symmetry | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|----------------------------|---|---------------------------|----------------------------|---------------------------|----------------------------|--------------------------|--------------------------|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|----------------------------|--|
| $\mathbb{Q}_{6,0}^{(1,-1;a)}(E, 3)$ | 0 | 0 | 0 | $\frac{\sqrt{165}i}{264}$ | 0 | $-\frac{\sqrt{165}}{264}$ | 0 | 0 | 0 | $\frac{3\sqrt{11}i}{88}$ | 0 | $\frac{3\sqrt{11}}{88}$ | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{165}i}{264}$ | 0 | $\frac{\sqrt{165}}{264}$ | 0 | 0 | 0 | $\frac{3\sqrt{11}i}{88}$ | 0 | $-\frac{3\sqrt{11}}{88}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{165}i}{264}$ | 0 | 0 | $\frac{5\sqrt{11}i}{88}$ | 0 | 0 | $-\frac{5\sqrt{11}}{88}$ | 0 | 0 | $-\frac{\sqrt{165}i}{264}$ | 0 | 0 | $-\frac{\sqrt{165}}{132}$ | |
| | $-\frac{\sqrt{165}i}{264}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{11}i}{88}$ | $\frac{5\sqrt{11}}{88}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{165}i}{264}$ | $\frac{\sqrt{165}}{132}$ | 0 | |
| | 0 | $\frac{\sqrt{165}}{264}$ | $-\frac{5\sqrt{11}i}{88}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{11}i}{88}$ | $-\frac{\sqrt{165}i}{264}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{165}i}{132}$ | |
| | $-\frac{\sqrt{165}}{264}$ | 0 | 0 | $\frac{5\sqrt{11}i}{88}$ | 0 | 0 | $\frac{5\sqrt{11}i}{88}$ | 0 | 0 | $\frac{\sqrt{165}i}{264}$ | 0 | 0 | $-\frac{\sqrt{165}i}{132}$ | 0 | |
| | 0 | 0 | 0 | $\frac{5\sqrt{11}}{88}$ | 0 | $-\frac{5\sqrt{11}i}{88}$ | 0 | 0 | 0 | $-\frac{\sqrt{165}}{88}$ | 0 | $-\frac{\sqrt{165}i}{88}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{5\sqrt{11}}{88}$ | 0 | $-\frac{5\sqrt{11}i}{88}$ | 0 | 0 | 0 | $\frac{\sqrt{165}}{88}$ | 0 | $-\frac{\sqrt{165}i}{88}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{11}i}{88}$ | 0 | 0 | $\frac{\sqrt{165}i}{264}$ | 0 | 0 | $\frac{\sqrt{165}}{88}$ | 0 | 0 | $\frac{5\sqrt{11}i}{88}$ | 0 | 0 | $-\frac{\sqrt{11}}{44}$ | |
| | $-\frac{3\sqrt{11}i}{88}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{165}i}{264}$ | $-\frac{\sqrt{165}}{88}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{11}i}{88}$ | $\frac{\sqrt{11}}{44}$ | 0 | |
| | 0 | $-\frac{3\sqrt{11}}{88}$ | $\frac{\sqrt{165}i}{264}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{165}i}{88}$ | $-\frac{5\sqrt{11}i}{88}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{11}i}{44}$ | |
| | $\frac{3\sqrt{11}}{88}$ | 0 | 0 | $-\frac{\sqrt{165}i}{264}$ | 0 | 0 | $\frac{\sqrt{165}i}{88}$ | 0 | 0 | $\frac{5\sqrt{11}i}{88}$ | 0 | 0 | $\frac{\sqrt{11}i}{44}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{165}}{132}$ | 0 | $\frac{\sqrt{165}i}{132}$ | 0 | 0 | 0 | $\frac{\sqrt{11}}{44}$ | 0 | $-\frac{\sqrt{11}i}{44}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{165}}{132}$ | 0 | $\frac{\sqrt{165}i}{132}$ | 0 | 0 | 0 | $-\frac{\sqrt{11}}{44}$ | 0 | $-\frac{\sqrt{11}i}{44}$ | 0 | 0 | 0 | |
| 881 | symmetry | $-\frac{3\sqrt{7}xy(x-y)(x+y)(x^2+y^2-10z^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|--|--|--------|
| $\mathbb{Q}_{6,1}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{165}}{132}$ 0 $\frac{\sqrt{165}i}{132}$ 0 0 0 0 $\frac{\sqrt{11}}{44}$ 0 $-\frac{\sqrt{11}i}{44}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{165}}{132}$ 0 $\frac{\sqrt{165}i}{132}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $-\frac{\sqrt{11}i}{44}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $\frac{5\sqrt{11}i}{88}$ $-\frac{\sqrt{165}i}{66}$ 0 0 0 0 $\frac{\sqrt{165}i}{264}$ | |
| | $\frac{\sqrt{165}}{132}$ 0 0 0 0 0 $\frac{5\sqrt{11}i}{88}$ 0 0 $\frac{\sqrt{165}i}{66}$ 0 0 $\frac{\sqrt{165}i}{264}$ 0 | |
| | 0 $-\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $\frac{5\sqrt{11}}{88}$ 0 0 $\frac{\sqrt{165}i}{66}$ 0 0 $-\frac{\sqrt{165}}{264}$ | |
| | $-\frac{\sqrt{165}i}{132}$ 0 0 0 0 0 $-\frac{5\sqrt{11}}{88}$ 0 0 0 0 $-\frac{\sqrt{165}i}{66}$ $\frac{\sqrt{165}}{264}$ 0 | |
| | 0 0 0 $-\frac{5\sqrt{11}i}{88}$ 0 $-\frac{5\sqrt{11}}{88}$ 0 0 0 $\frac{\sqrt{165}i}{88}$ 0 $-\frac{\sqrt{165}}{88}$ 0 0 | |
| | 0 0 $-\frac{5\sqrt{11}i}{88}$ 0 $\frac{5\sqrt{11}}{88}$ 0 0 0 $\frac{\sqrt{165}i}{88}$ 0 $\frac{\sqrt{165}}{88}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{11}}{44}$ $\frac{\sqrt{165}i}{66}$ 0 0 0 0 $-\frac{\sqrt{165}i}{88}$ 0 0 0 0 0 $\frac{3\sqrt{11}i}{88}$ | |
| | $\frac{\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{165}i}{66}$ 0 0 $-\frac{\sqrt{165}i}{88}$ 0 0 0 0 0 $\frac{3\sqrt{11}i}{88}$ 0 | |
| | 0 $\frac{\sqrt{11}i}{44}$ 0 0 $-\frac{\sqrt{165}i}{66}$ 0 0 $\frac{\sqrt{165}}{88}$ 0 0 0 0 0 $\frac{3\sqrt{11}}{88}$ | |
| | $\frac{\sqrt{11}i}{44}$ 0 0 0 0 $\frac{\sqrt{165}i}{66}$ $-\frac{\sqrt{165}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{11}}{88}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{165}i}{264}$ 0 $\frac{\sqrt{165}}{264}$ 0 0 0 $-\frac{3\sqrt{11}i}{88}$ 0 $-\frac{3\sqrt{11}}{88}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{165}i}{264}$ 0 $-\frac{\sqrt{165}}{264}$ 0 0 0 $-\frac{3\sqrt{11}i}{88}$ 0 $\frac{3\sqrt{11}}{88}$ 0 0 0 | |
| $\frac{\sqrt{210}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{32}$ | | |

882 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|---|
| $\mathbb{Q}_{6,0}^{(1,-1;a)}(E, 4)$ | 0 0 0 $-\frac{17\sqrt{22}i}{528}$ 0 $-\frac{17\sqrt{22}}{528}$ $-\frac{2\sqrt{22}i}{33}$ 0 0 $-\frac{\sqrt{330}i}{176}$ 0 $\frac{\sqrt{330}}{176}$ 0 0 | |
| | 0 0 $-\frac{17\sqrt{22}i}{528}$ 0 $\frac{17\sqrt{22}}{528}$ 0 0 $\frac{2\sqrt{22}i}{33}$ $-\frac{\sqrt{330}i}{176}$ 0 $-\frac{\sqrt{330}}{176}$ 0 0 0 | |
| | 0 $\frac{17\sqrt{22}i}{528}$ 0 0 0 0 0 0 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 $\frac{\sqrt{22}}{528}$ | |
| | $\frac{17\sqrt{22}i}{528}$ 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{22}i}{33}$ $-\frac{\sqrt{22}}{528}$ 0 | |
| | 0 $\frac{17\sqrt{22}}{528}$ 0 0 0 0 0 0 $\frac{\sqrt{22}i}{33}$ 0 0 0 0 $-\frac{\sqrt{22}i}{528}$ | |
| | $-\frac{17\sqrt{22}}{528}$ 0 0 0 0 0 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 0 $-\frac{\sqrt{22}i}{528}$ 0 | |
| | $\frac{2\sqrt{22}i}{33}$ 0 0 0 0 0 0 0 0 $-\frac{\sqrt{22}}{33}$ 0 $\frac{\sqrt{22}i}{33}$ 0 0 | |
| | 0 $-\frac{2\sqrt{22}i}{33}$ 0 0 0 0 0 0 $\frac{\sqrt{22}}{33}$ 0 $\frac{\sqrt{22}i}{33}$ 0 0 0 | |
| | 0 $\frac{\sqrt{330}i}{176}$ 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 $\frac{\sqrt{22}}{33}$ 0 0 0 0 0 $\frac{\sqrt{330}}{176}$ | |
| | $\frac{\sqrt{330}i}{176}$ 0 0 0 0 $\frac{\sqrt{22}i}{33}$ $-\frac{\sqrt{22}}{33}$ 0 0 0 0 0 $-\frac{\sqrt{330}}{176}$ 0 | |
| | 0 $-\frac{\sqrt{330}}{176}$ $\frac{\sqrt{22}i}{33}$ 0 0 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 0 0 0 $\frac{\sqrt{330}i}{176}$ | |
| | $\frac{\sqrt{330}}{176}$ 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 0 0 0 $\frac{\sqrt{330}i}{176}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{22}}{528}$ 0 $\frac{\sqrt{22}i}{528}$ 0 0 0 $-\frac{\sqrt{330}}{176}$ 0 $-\frac{\sqrt{330}i}{176}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{22}}{528}$ 0 $\frac{\sqrt{22}i}{528}$ 0 0 0 $\frac{\sqrt{330}}{176}$ 0 $-\frac{\sqrt{330}i}{176}$ 0 0 0 | |
| 883 | symmetry | $-\frac{\sqrt{210}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{Q}_{6,1}^{(1,-1;a)}(E, 4)$ | 0 0 0 $\frac{\sqrt{22}}{48}$ 0 $-\frac{\sqrt{22}i}{48}$ 0 0 0 0 $\frac{\sqrt{330}}{528}$ 0 $\frac{\sqrt{330}i}{528}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{22}}{48}$ 0 $-\frac{\sqrt{22}i}{48}$ 0 0 0 $-\frac{\sqrt{330}}{528}$ 0 $\frac{\sqrt{330}i}{528}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{22}}{48}$ 0 0 0 0 0 $\frac{\sqrt{330}i}{132}$ $-\frac{\sqrt{22}i}{33}$ 0 0 0 0 $\frac{7\sqrt{22}i}{528}$ | |
| | $\frac{\sqrt{22}}{48}$ 0 0 0 0 0 $\frac{\sqrt{330}i}{132}$ 0 0 $\frac{\sqrt{22}i}{33}$ 0 0 $\frac{7\sqrt{22}i}{528}$ 0 | |
| | 0 $\frac{\sqrt{22}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{330}}{132}$ 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 $\frac{7\sqrt{22}}{528}$ | |
| | $\frac{\sqrt{22}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{330}}{132}$ 0 0 0 0 $\frac{\sqrt{22}i}{33}$ $-\frac{7\sqrt{22}}{528}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{330}i}{132}$ 0 $\frac{\sqrt{330}}{132}$ 0 0 0 $-\frac{\sqrt{22}i}{132}$ 0 $-\frac{\sqrt{22}}{132}$ $\frac{2\sqrt{22}i}{33}$ 0 | |
| | 0 0 $-\frac{\sqrt{330}i}{132}$ 0 $-\frac{\sqrt{330}}{132}$ 0 0 0 $-\frac{\sqrt{22}i}{132}$ 0 $\frac{\sqrt{22}}{132}$ 0 0 $-\frac{2\sqrt{22}i}{33}$ | |
| | 0 $-\frac{\sqrt{330}}{528}$ $\frac{\sqrt{22}i}{33}$ 0 0 0 0 $\frac{\sqrt{22}i}{132}$ 0 0 0 0 $\frac{5\sqrt{330}i}{528}$ | |
| | $\frac{\sqrt{330}}{528}$ 0 0 $-\frac{\sqrt{22}i}{33}$ 0 0 $\frac{\sqrt{22}i}{132}$ 0 0 0 0 $\frac{5\sqrt{330}i}{528}$ 0 | |
| | 0 $-\frac{\sqrt{330}i}{528}$ 0 0 $\frac{\sqrt{22}i}{33}$ 0 0 $\frac{\sqrt{22}}{132}$ 0 0 0 0 $-\frac{5\sqrt{330}}{528}$ | |
| | $-\frac{\sqrt{330}i}{528}$ 0 0 0 0 $-\frac{\sqrt{22}i}{33}$ $-\frac{\sqrt{22}}{132}$ 0 0 0 0 $\frac{5\sqrt{330}}{528}$ 0 | |
| | 0 0 0 $-\frac{7\sqrt{22}i}{528}$ 0 $-\frac{7\sqrt{22}}{528}$ $-\frac{2\sqrt{22}i}{33}$ 0 0 $-\frac{5\sqrt{330}i}{528}$ 0 $\frac{5\sqrt{330}}{528}$ 0 0 | |
| | 0 0 $-\frac{7\sqrt{22}i}{528}$ 0 $\frac{7\sqrt{22}}{528}$ 0 0 $\frac{2\sqrt{22}i}{33}$ $-\frac{5\sqrt{330}i}{528}$ 0 $-\frac{5\sqrt{330}}{528}$ 0 0 0 | |

884 symmetry

1

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------|--------------------------|---|
| $\mathbb{Q}_0^{(1,1;a)}(A_1)$ | 0 | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{42}i}{42}$ 0 $\frac{\sqrt{42}}{42}$ $\frac{\sqrt{42}i}{42}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 $\frac{\sqrt{42}i}{42}$ 0 $-\frac{\sqrt{42}}{42}$ 0 0 $-\frac{\sqrt{42}i}{42}$ |
| | 0 | 0 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 $-\frac{\sqrt{42}}{56}$ 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 $\frac{\sqrt{70}}{56}$ |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{42}i}{56}$ $\frac{\sqrt{42}}{56}$ 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ $-\frac{\sqrt{70}}{56}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 $\frac{\sqrt{42}i}{56}$ $\frac{\sqrt{70}i}{56}$ 0 0 0 0 $\frac{\sqrt{70}i}{56}$ |
| | 0 | 0 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 $\frac{\sqrt{42}i}{56}$ 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 0 $\frac{\sqrt{70}}{56}$ 0 $\frac{\sqrt{70}i}{56}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{42}}{56}$ 0 $-\frac{\sqrt{42}i}{56}$ 0 0 0 $-\frac{\sqrt{70}}{56}$ 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{42}i}{42}$ 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 $-\frac{\sqrt{70}}{56}$ 0 0 $-\frac{\sqrt{42}i}{168}$ 0 0 $\frac{\sqrt{42}}{168}$ |
| | 0 | $-\frac{\sqrt{42}i}{42}$ 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 $-\frac{\sqrt{70}i}{56}$ $\frac{\sqrt{42}i}{168}$ 0 0 0 0 $-\frac{\sqrt{42}i}{168}$ |
| | $\frac{\sqrt{42}}{42}$ | 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 $-\frac{\sqrt{42}i}{168}$ 0 0 0 $-\frac{\sqrt{42}i}{168}$ 0 |
| | $-\frac{\sqrt{42}i}{42}$ | 0 0 $-\frac{\sqrt{70}}{56}$ 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 $-\frac{\sqrt{42}}{168}$ 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 |
| | 0 | $\frac{\sqrt{42}i}{42}$ $\frac{\sqrt{70}}{56}$ 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 $\frac{\sqrt{42}}{168}$ 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 |

885 symmetry

 $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------|---------------------------|---|
| $\mathbb{Q}_2^{(1,1;a)}(A_1)$ | 0 | 0 0 0 $\frac{\sqrt{105}i}{84}$ 0 $-\frac{\sqrt{105}}{84}$ 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $-\frac{\sqrt{7}}{28}$ $\frac{\sqrt{7}i}{14}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{105}i}{84}$ 0 $\frac{\sqrt{105}}{84}$ 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 $\frac{\sqrt{7}}{28}$ 0 0 $-\frac{\sqrt{7}i}{14}$ |
| | 0 | $-\frac{\sqrt{105}i}{84}$ 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{7}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{84}$ |
| | $-\frac{\sqrt{105}i}{84}$ | 0 0 0 0 $\frac{\sqrt{7}i}{14}$ $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 0 $\frac{\sqrt{105}}{84}$ 0 |
| | 0 | $\frac{\sqrt{105}}{84}$ $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ |
| | $-\frac{\sqrt{105}}{84}$ | 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 $\frac{\sqrt{105}}{84}$ 0 $\frac{\sqrt{105}i}{84}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{7}}{28}$ 0 $-\frac{\sqrt{7}i}{28}$ 0 0 0 $-\frac{\sqrt{105}}{84}$ 0 $\frac{\sqrt{105}i}{84}$ 0 0 |
| | 0 | $\frac{\sqrt{7}i}{28}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{84}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{7}}{28}$ |
| | $\frac{\sqrt{7}i}{28}$ | 0 0 0 0 0 $\frac{\sqrt{105}}{84}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ $-\frac{\sqrt{7}}{28}$ 0 |
| | 0 | $\frac{\sqrt{7}}{28}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 $-\frac{\sqrt{7}i}{28}$ |
| | $-\frac{\sqrt{7}}{28}$ | 0 0 0 0 0 $-\frac{\sqrt{105}i}{84}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 $-\frac{\sqrt{7}i}{28}$ 0 |
| | $-\frac{\sqrt{7}i}{14}$ | 0 0 $\frac{\sqrt{105}}{84}$ 0 $\frac{\sqrt{105}i}{84}$ 0 0 0 $-\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 |
| | 0 | $\frac{\sqrt{7}i}{14}$ $-\frac{\sqrt{105}}{84}$ 0 $\frac{\sqrt{105}i}{84}$ 0 0 0 $\frac{\sqrt{7}}{28}$ 0 $\frac{\sqrt{7}i}{28}$ 0 0 0 |

886 symmetry

 $\sqrt{3}yz$

continued ...

Table 10

| No. | multipole | matrix |
|--|---|---------------|
| $\mathbb{Q}_{2,0}^{(1,1;a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{21}}{42}$ | |
| | 0 0 0 0 0 $\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{35}}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{21}}{42}$ 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}}{42}$ $-\frac{\sqrt{35}i}{42}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ | |
| | $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 0 0 $\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{21}}{42}$ 0 0 0 0 0 $-\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{35}}{42}$ $\frac{\sqrt{21}i}{42}$ 0 0 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ | |
| | $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 | |
| | 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}}{42}$ $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 $-\frac{\sqrt{21}}{42}$ $\frac{\sqrt{21}i}{42}$ 0 | |
| | 0 0 $\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ | |
| | $\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 $\frac{\sqrt{35}i}{42}$ 0 0 0 $\frac{\sqrt{21}}{42}$ 0 0 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{42}$ $-\frac{\sqrt{35}}{42}$ 0 $\frac{\sqrt{35}i}{42}$ 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{21}}{42}$ $\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 | |
| $-\frac{\sqrt{21}}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 0 | | |
| 887 symmetry | | $-\sqrt{3}xz$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|---|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{Q}_{2,1}^{(1,1;a)}(E, 1)$ | 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{21}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 | | | | | | | | | | | | | | |
| | $\frac{\sqrt{35}i}{42}$ 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{35}i}{42}$ 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 0 $\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{35}i}{42}$ 0 | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}}{42}$ $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 $\frac{\sqrt{21}i}{42}$ 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}i}{42}$ 0 0 0 | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{21}i}{42}$ 0 0 0 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{35}}{42}$ 0 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 | | | | | | | | | | | | | | |
| $\frac{\sqrt{3}(x-y)(x+y)}{2}$ | | | | | | | | | | | | | | | |
| 888 | symmetry | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|--------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------|
| $\mathbb{Q}_{2,0}^{(1,1;a)}(E, 2)$ | 0 | 0 | 0 | $\frac{\sqrt{35}i}{84}$ | 0 | $\frac{\sqrt{35}}{84}$ | $-\frac{\sqrt{35}i}{42}$ | 0 | 0 | $\frac{\sqrt{21}i}{28}$ | 0 | $-\frac{\sqrt{21}}{28}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{35}i}{84}$ | 0 | $-\frac{\sqrt{35}}{84}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | $\frac{\sqrt{21}i}{28}$ | 0 | $\frac{\sqrt{21}}{28}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}}{28}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | 0 | $\frac{\sqrt{35}}{84}$ |
| | $-\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}}{28}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{42}$ | $-\frac{\sqrt{35}}{84}$ | 0 | 0 |
| | 0 | $-\frac{\sqrt{35}}{84}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{28}$ | $-\frac{\sqrt{35}i}{42}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{84}$ | 0 |
| | $\frac{\sqrt{35}}{84}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{28}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | $-\frac{\sqrt{35}i}{84}$ | 0 | 0 |
| | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | $\frac{\sqrt{21}}{28}$ | 0 | $\frac{\sqrt{21}i}{28}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}}{84}$ | 0 | $\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{35}i}{42}$ | $-\frac{\sqrt{21}}{28}$ | 0 | $\frac{\sqrt{21}i}{28}$ | 0 | 0 | 0 | $\frac{\sqrt{35}}{84}$ | 0 | $\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{21}i}{28}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | $\frac{\sqrt{35}}{84}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}}{28}$ | 0 |
| | $-\frac{\sqrt{21}i}{28}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{42}$ | $-\frac{\sqrt{35}}{84}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}}{28}$ | 0 | 0 |
| | 0 | $\frac{\sqrt{21}}{28}$ | $-\frac{\sqrt{35}i}{42}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}i}{28}$ | 0 |
| | $-\frac{\sqrt{21}}{28}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | $-\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}i}{28}$ | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{35}}{84}$ | 0 | $\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | $-\frac{\sqrt{21}}{28}$ | 0 | $-\frac{\sqrt{21}i}{28}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{35}}{84}$ | 0 | $\frac{\sqrt{35}i}{84}$ | 0 | 0 | 0 | $\frac{\sqrt{21}}{28}$ | 0 | $-\frac{\sqrt{21}i}{28}$ | 0 | 0 | 0 | 0 |

889 symmetry

 $-\sqrt{3}xy$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--------------------------|---|
| $\mathbb{Q}_{2,1}^{(1,1;a)}(E, 2)$ | 0 | 0 0 0 $\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $\frac{\sqrt{21}}{42}$ 0 $\frac{\sqrt{21}i}{42}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 $\frac{\sqrt{21}i}{42}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{35}}{42}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{42}$ $\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ |
| | $\frac{\sqrt{35}}{42}$ | 0 0 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 |
| | 0 | $\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{35}}{42}$ |
| | $\frac{\sqrt{35}i}{42}$ | 0 0 0 0 0 $\frac{\sqrt{21}}{42}$ 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{35}}{42}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{21}}{42}$ 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{42}$ $\frac{\sqrt{35}i}{42}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{21}}{42}$ 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ |
| | 0 | $-\frac{\sqrt{21}}{42}$ $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ |
| | $\frac{\sqrt{21}}{42}$ | 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{21}i}{42}$ 0 |
| | 0 | $-\frac{\sqrt{21}i}{42}$ 0 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{35}}{42}$ 0 0 0 0 0 $\frac{\sqrt{21}}{42}$ |
| | $-\frac{\sqrt{21}i}{42}$ | 0 0 0 0 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{35}}{42}$ 0 0 0 0 0 $-\frac{\sqrt{21}}{42}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{35}i}{42}$ 0 $\frac{\sqrt{35}}{42}$ $-\frac{\sqrt{35}i}{42}$ 0 0 0 $\frac{\sqrt{21}i}{42}$ 0 $-\frac{\sqrt{21}}{42}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{35}i}{42}$ 0 $-\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{21}i}{42}$ 0 $\frac{\sqrt{21}}{42}$ 0 0 0 |

890 symmetry

$$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|----------------------------------|----------------------------|-----------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|-----------------------------|-----------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|-----------------------------|----------------------------|----------------------------|--|
| $\mathbb{Q}_4^{(1,1;a)}(A_1, 1)$ | 0 | 0 | 0 | $-\frac{\sqrt{154}i}{88}$ | 0 | $\frac{\sqrt{154}}{88}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{616}$ | 0 | $-\frac{\sqrt{2310}}{616}$ | $-\frac{\sqrt{2310}i}{231}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{154}i}{88}$ | 0 | $-\frac{\sqrt{154}}{88}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{616}$ | 0 | $\frac{\sqrt{2310}}{616}$ | 0 | 0 | $\frac{\sqrt{2310}i}{231}$ | | |
| | 0 | $\frac{\sqrt{154}i}{88}$ | 0 | 0 | $-\frac{5\sqrt{2310}i}{3696}$ | 0 | 0 | $-\frac{\sqrt{2310}}{616}$ | 0 | 0 | $\frac{15\sqrt{154}i}{1232}$ | 0 | 0 | 0 | $-\frac{\sqrt{154}}{308}$ | |
| | $\frac{\sqrt{154}i}{88}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{2310}i}{3696}$ | $\frac{\sqrt{2310}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{15\sqrt{154}i}{1232}$ | $\frac{\sqrt{154}}{308}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{154}}{88}$ | $\frac{5\sqrt{2310}i}{3696}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2310}i}{616}$ | $\frac{15\sqrt{154}i}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{154}i}{308}$ | | |
| | $\frac{\sqrt{154}}{88}$ | 0 | 0 | $-\frac{5\sqrt{2310}i}{3696}$ | 0 | 0 | $\frac{\sqrt{2310}i}{616}$ | 0 | 0 | $-\frac{15\sqrt{154}i}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}i}{308}$ | 0 | | |
| | 0 | 0 | 0 | $\frac{\sqrt{2310}}{616}$ | 0 | $-\frac{\sqrt{2310}i}{616}$ | 0 | 0 | 0 | $\frac{5\sqrt{154}}{616}$ | 0 | $\frac{5\sqrt{154}i}{616}$ | 0 | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{2310}}{616}$ | 0 | $-\frac{\sqrt{2310}i}{616}$ | 0 | 0 | 0 | $-\frac{5\sqrt{154}}{616}$ | 0 | $\frac{5\sqrt{154}i}{616}$ | 0 | 0 | 0 | | |
| | 0 | $\frac{\sqrt{2310}i}{616}$ | 0 | 0 | $-\frac{15\sqrt{154}i}{1232}$ | 0 | 0 | $-\frac{5\sqrt{154}}{616}$ | 0 | 0 | $\frac{\sqrt{2310}i}{336}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{308}$ | |
| | $\frac{\sqrt{2310}i}{616}$ | 0 | 0 | 0 | 0 | $\frac{15\sqrt{154}i}{1232}$ | $\frac{5\sqrt{154}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{336}$ | $\frac{\sqrt{2310}}{308}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{2310}}{616}$ | $-\frac{15\sqrt{154}i}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{154}i}{616}$ | $-\frac{\sqrt{2310}i}{336}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2310}i}{308}$ | | |
| | $-\frac{\sqrt{2310}}{616}$ | 0 | 0 | $\frac{15\sqrt{154}i}{1232}$ | 0 | 0 | $-\frac{5\sqrt{154}i}{616}$ | 0 | 0 | $\frac{\sqrt{2310}i}{336}$ | 0 | 0 | $\frac{\sqrt{2310}i}{308}$ | 0 | | |
| | $\frac{\sqrt{2310}i}{231}$ | 0 | 0 | $\frac{\sqrt{154}}{308}$ | 0 | $\frac{\sqrt{154}i}{308}$ | 0 | 0 | 0 | $\frac{\sqrt{2310}}{308}$ | 0 | $-\frac{\sqrt{2310}i}{308}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{2310}i}{231}$ | $-\frac{\sqrt{154}}{308}$ | 0 | $\frac{\sqrt{154}i}{308}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{308}$ | 0 | $-\frac{\sqrt{2310}i}{308}$ | 0 | 0 | 0 | | |
| 891 | symmetry | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|----------------------------------|---------------------------|-----------------------------------|---------------------------|---------------------------|--------------------------|---------------------------|---------------------------|---------------------------|----------------------------|----------------------------|--------------------------|--------------------------|--------------------------|---------------------------|---|
| $\mathbb{Q}_4^{(1,1;a)}(A_1, 2)$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}i}{110}$ | 0 | 0 | $\frac{\sqrt{55}}{110}$ | 0 | 0 | $-\frac{\sqrt{33}i}{66}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{55}i}{110}$ | $-\frac{\sqrt{55}}{110}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{33}i}{66}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{33}}{88}$ | $\frac{\sqrt{33}i}{33}$ | 0 | 0 | $-\frac{7\sqrt{55}i}{220}$ | 0 | $\frac{\sqrt{55}}{88}$ | $\frac{\sqrt{55}i}{110}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{3\sqrt{33}}{88}$ | 0 | 0 | $-\frac{\sqrt{33}i}{33}$ | $-\frac{7\sqrt{55}i}{220}$ | 0 | $-\frac{\sqrt{55}}{88}$ | 0 | 0 | $-\frac{\sqrt{55}i}{110}$ | 0 |
| | $-\frac{\sqrt{55}i}{110}$ | 0 | 0 | $\frac{3\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}}{440}$ | 0 | $\frac{\sqrt{55}i}{44}$ | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{55}i}{110}$ | $-\frac{3\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{55}}{440}$ | 0 | $\frac{\sqrt{55}i}{44}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{55}}{110}$ | $-\frac{\sqrt{33}i}{33}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}i}{55}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}i}{110}$ | 0 |
| | $\frac{\sqrt{55}}{110}$ | 0 | 0 | $\frac{\sqrt{33}i}{33}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{55}i}{55}$ | 0 | 0 | $\frac{\sqrt{55}i}{110}$ | 0 | 0 |
| | 0 | 0 | 0 | $\frac{7\sqrt{55}i}{220}$ | 0 | $-\frac{\sqrt{55}}{440}$ | $-\frac{\sqrt{55}i}{55}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{33}}{88}$ | $\frac{\sqrt{33}i}{66}$ | 0 | 0 |
| | 0 | 0 | $\frac{7\sqrt{55}i}{220}$ | 0 | $\frac{\sqrt{55}}{440}$ | 0 | 0 | $\frac{\sqrt{55}i}{55}$ | 0 | 0 | $\frac{3\sqrt{33}}{88}$ | 0 | 0 | $-\frac{\sqrt{33}i}{66}$ | 0 |
| | $\frac{\sqrt{33}i}{66}$ | 0 | 0 | $-\frac{\sqrt{55}}{88}$ | 0 | $-\frac{\sqrt{55}i}{44}$ | 0 | 0 | 0 | $\frac{3\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{33}i}{66}$ | $\frac{\sqrt{55}}{88}$ | 0 | $-\frac{\sqrt{55}i}{44}$ | 0 | 0 | 0 | $-\frac{3\sqrt{33}}{88}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{55}i}{110}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{55}i}{110}$ | $-\frac{\sqrt{33}i}{66}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{55}i}{110}$ | 0 | 0 | $-\frac{\sqrt{55}i}{110}$ | 0 | 0 | $\frac{\sqrt{33}i}{66}$ | 0 | 0 | 0 | 0 | 0 |
| 892 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------|--|--|
| $\mathbb{Q}_4^{(1,1;a)}(A_2)$ | 0 0 $\frac{\sqrt{55}i}{110}$ 0 0 0 0 $\frac{\sqrt{55}i}{110}$ $\frac{\sqrt{33}i}{66}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{55}i}{110}$ 0 0 $\frac{\sqrt{55}i}{110}$ 0 0 $-\frac{\sqrt{33}i}{66}$ 0 0 0 0 | |
| | $-\frac{\sqrt{55}i}{110}$ 0 0 0 0 $\frac{3\sqrt{33}i}{88}$ 0 0 0 $-\frac{\sqrt{55}}{44}$ 0 $-\frac{\sqrt{55}i}{440}$ 0 0 | |
| | 0 $\frac{\sqrt{55}i}{110}$ 0 0 $\frac{3\sqrt{33}i}{88}$ 0 0 0 $\frac{\sqrt{55}}{44}$ 0 $-\frac{\sqrt{55}i}{440}$ 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{33}i}{88}$ 0 0 $\frac{\sqrt{33}i}{33}$ 0 0 $-\frac{\sqrt{55}i}{88}$ 0 $\frac{7\sqrt{55}}{220}$ $-\frac{\sqrt{55}i}{110}$ 0 | |
| | 0 0 $-\frac{3\sqrt{33}i}{88}$ 0 0 0 0 $-\frac{\sqrt{33}i}{33}$ $-\frac{\sqrt{55}i}{88}$ 0 $-\frac{7\sqrt{55}}{220}$ 0 0 $\frac{\sqrt{55}i}{110}$ | |
| | 0 $-\frac{\sqrt{55}i}{110}$ 0 0 $-\frac{\sqrt{33}i}{33}$ 0 0 0 0 0 $-\frac{\sqrt{55}i}{55}$ 0 0 $-\frac{\sqrt{55}}{110}$ | |
| | $-\frac{\sqrt{55}i}{110}$ 0 0 0 0 $\frac{\sqrt{33}i}{33}$ 0 0 0 0 0 $\frac{\sqrt{55}i}{55}$ $\frac{\sqrt{55}}{110}$ 0 | |
| | $-\frac{\sqrt{33}i}{66}$ 0 0 $\frac{\sqrt{55}}{44}$ 0 $\frac{\sqrt{55}i}{88}$ 0 0 0 0 0 $\frac{3\sqrt{33}i}{88}$ 0 0 | |
| | 0 $\frac{\sqrt{33}i}{66}$ $-\frac{\sqrt{55}}{44}$ 0 $\frac{\sqrt{55}i}{88}$ 0 0 0 0 0 $\frac{3\sqrt{33}i}{88}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{55}i}{440}$ 0 $-\frac{7\sqrt{55}}{220}$ $\frac{\sqrt{55}i}{55}$ 0 0 $-\frac{3\sqrt{33}i}{88}$ 0 0 $\frac{\sqrt{33}i}{66}$ 0 | |
| | 0 0 $\frac{\sqrt{55}i}{440}$ 0 $\frac{7\sqrt{55}}{220}$ 0 0 $-\frac{\sqrt{55}i}{55}$ $-\frac{3\sqrt{33}i}{88}$ 0 0 0 0 $-\frac{\sqrt{33}i}{66}$ | |
| | 0 0 0 0 $\frac{\sqrt{55}i}{110}$ 0 0 $\frac{\sqrt{55}}{110}$ 0 0 $-\frac{\sqrt{33}i}{66}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{55}i}{110}$ $-\frac{\sqrt{55}}{110}$ 0 0 0 0 $\frac{\sqrt{33}i}{66}$ 0 0 | |
| 893 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|---|--|--------|
| $\mathbb{Q}_{4,0}^{(1,1;a)}(E, 1)$ | 0 0 0 0 $\frac{\sqrt{385}i}{110}$ 0 0 $\frac{\sqrt{385}}{110}$ 0 0 $-\frac{\sqrt{231}i}{154}$ 0 0 $\frac{2\sqrt{231}}{231}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{385}i}{110}$ $-\frac{\sqrt{385}}{110}$ 0 0 0 0 $\frac{\sqrt{231}i}{154}$ $-\frac{2\sqrt{231}}{231}$ 0 | |
| | 0 0 0 0 0 $\frac{5\sqrt{231}}{1848}$ $-\frac{\sqrt{231}i}{154}$ 0 0 $\frac{\sqrt{385}i}{220}$ 0 $-\frac{\sqrt{385}}{3080}$ $-\frac{\sqrt{385}i}{385}$ 0 | |
| | 0 0 0 0 $-\frac{5\sqrt{231}}{1848}$ 0 0 $\frac{\sqrt{231}i}{154}$ $\frac{\sqrt{385}i}{220}$ 0 $\frac{\sqrt{385}}{3080}$ 0 0 $\frac{\sqrt{385}i}{385}$ | |
| | $-\frac{\sqrt{385}i}{110}$ 0 0 $-\frac{5\sqrt{231}}{1848}$ 0 0 0 0 $0 -\frac{29\sqrt{385}}{3080}$ 0 $\frac{\sqrt{385}i}{220}$ 0 0 | |
| | 0 $\frac{\sqrt{385}i}{110}$ $\frac{5\sqrt{231}}{1848}$ 0 0 0 0 $\frac{29\sqrt{385}}{3080}$ 0 $\frac{\sqrt{385}i}{220}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{385}}{110}$ $\frac{\sqrt{231}i}{154}$ 0 0 0 0 $\frac{\sqrt{385}i}{154}$ 0 0 0 0 $-\frac{\sqrt{385}i}{110}$ | |
| | $\frac{\sqrt{385}}{110}$ 0 0 $-\frac{\sqrt{231}i}{154}$ 0 0 0 0 $0 -\frac{\sqrt{385}i}{154}$ 0 0 0 $-\frac{\sqrt{385}i}{110}$ | |
| | 0 0 0 $-\frac{\sqrt{385}i}{220}$ 0 $\frac{29\sqrt{385}}{3080}$ $-\frac{\sqrt{385}i}{154}$ 0 0 0 0 $-\frac{\sqrt{231}i}{168}$ $-\frac{\sqrt{231}i}{77}$ 0 | |
| | 0 0 $-\frac{\sqrt{385}i}{220}$ 0 $-\frac{29\sqrt{385}}{3080}$ 0 0 $\frac{\sqrt{385}i}{154}$ 0 0 0 $\frac{\sqrt{231}i}{168}$ 0 0 $\frac{\sqrt{231}i}{77}$ | |
| | $\frac{\sqrt{231}i}{154}$ 0 0 $\frac{\sqrt{385}}{3080}$ 0 $-\frac{\sqrt{385}i}{220}$ 0 0 0 0 $\frac{\sqrt{231}i}{168}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{231}i}{154}$ $-\frac{\sqrt{385}}{3080}$ 0 $-\frac{\sqrt{385}i}{220}$ 0 0 0 $-\frac{\sqrt{231}}{168}$ 0 0 0 0 | |
| | 0 $-\frac{2\sqrt{231}}{231}$ $\frac{\sqrt{385}i}{385}$ 0 0 0 0 $\frac{\sqrt{385}i}{110}$ $\frac{\sqrt{231}i}{77}$ 0 0 0 0 | |
| | $\frac{2\sqrt{231}}{231}$ 0 0 $-\frac{\sqrt{385}i}{385}$ 0 0 $\frac{\sqrt{385}i}{110}$ 0 0 $-\frac{\sqrt{231}i}{77}$ 0 0 0 | |
| $\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$ | | |
| 894 | symmetry | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|----------------------------|---|-------------------------------|-------------------------------|------------------------------|------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------------------------------|------------------------------|-----------------------------|-----------------------------|--|
| $\mathbb{Q}_{4,1}^{(1,1;a)}(E, 1)$ | 0 | 0 | $\frac{\sqrt{385}i}{110}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{385}i}{110}$ | $\frac{\sqrt{231}i}{154}$ | 0 | 0 | 0 | 0 | $-\frac{2\sqrt{231}i}{231}$ | |
| | 0 | 0 | 0 | $-\frac{\sqrt{385}i}{110}$ | 0 | 0 | $\frac{\sqrt{385}i}{110}$ | 0 | 0 | $-\frac{\sqrt{231}i}{154}$ | 0 | 0 | $-\frac{2\sqrt{231}i}{231}$ | 0 | |
| | $-\frac{\sqrt{385}i}{110}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{231}i}{1848}$ | 0 | 0 | 0 | $-\frac{\sqrt{385}}{220}$ | 0 | $\frac{29\sqrt{385}i}{3080}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{385}i}{110}$ | 0 | 0 | $-\frac{5\sqrt{231}i}{1848}$ | 0 | 0 | 0 | $\frac{\sqrt{385}}{220}$ | 0 | $\frac{29\sqrt{385}i}{3080}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{5\sqrt{231}i}{1848}$ | 0 | 0 | $-\frac{\sqrt{231}i}{154}$ | 0 | 0 | $\frac{\sqrt{385}i}{3080}$ | 0 | $-\frac{\sqrt{385}}{220}$ | $\frac{\sqrt{385}i}{385}$ | 0 | |
| | 0 | 0 | $\frac{5\sqrt{231}i}{1848}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{231}i}{154}$ | $\frac{\sqrt{385}i}{3080}$ | 0 | $\frac{\sqrt{385}}{220}$ | 0 | 0 | $-\frac{\sqrt{385}i}{385}$ | |
| | 0 | $-\frac{\sqrt{385}i}{110}$ | 0 | 0 | $\frac{\sqrt{231}i}{154}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}i}{154}$ | 0 | 0 | $\frac{\sqrt{385}}{110}$ | |
| | $-\frac{\sqrt{385}i}{110}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{231}i}{154}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{385}i}{154}$ | $-\frac{\sqrt{385}}{110}$ | 0 | |
| | $-\frac{\sqrt{231}i}{154}$ | 0 | 0 | $\frac{\sqrt{385}}{220}$ | 0 | $-\frac{\sqrt{385}i}{3080}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{231}i}{168}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{231}i}{154}$ | $-\frac{\sqrt{385}}{220}$ | 0 | $-\frac{\sqrt{385}i}{3080}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{231}i}{168}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{29\sqrt{385}i}{3080}$ | 0 | $\frac{\sqrt{385}}{220}$ | $\frac{\sqrt{385}i}{154}$ | 0 | 0 | $-\frac{\sqrt{231}i}{168}$ | 0 | 0 | $-\frac{\sqrt{231}i}{77}$ | 0 | |
| | 0 | 0 | $-\frac{29\sqrt{385}i}{3080}$ | 0 | $-\frac{\sqrt{385}}{220}$ | 0 | 0 | $-\frac{\sqrt{385}i}{154}$ | $-\frac{\sqrt{231}i}{168}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{231}i}{77}$ | |
| | 0 | $\frac{2\sqrt{231}i}{231}$ | 0 | 0 | $-\frac{\sqrt{385}i}{385}$ | 0 | 0 | $-\frac{\sqrt{385}}{110}$ | 0 | 0 | $\frac{\sqrt{231}i}{77}$ | 0 | 0 | 0 | |
| | $\frac{2\sqrt{231}i}{231}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{385}i}{385}$ | $\frac{\sqrt{385}}{110}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{231}i}{77}$ | 0 | 0 | |
| 895 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{Q}_{4,0}^{(1,1;a)}(E, 2)$ | 0 0 0 $\frac{7\sqrt{110}i}{440}$ 0 $-\frac{7\sqrt{110}}{440}$ 0 0 0 0 $-\frac{5\sqrt{66}i}{264}$ 0 $-\frac{5\sqrt{66}}{264}$ 0 0 | |
| | 0 0 $\frac{7\sqrt{110}i}{440}$ 0 $\frac{7\sqrt{110}}{440}$ 0 0 0 $-\frac{5\sqrt{66}i}{264}$ 0 $\frac{5\sqrt{66}}{264}$ 0 0 0 0 | |
| | 0 $-\frac{7\sqrt{110}i}{440}$ 0 0 $\frac{3\sqrt{66}i}{176}$ 0 0 $\frac{\sqrt{66}}{264}$ 0 0 $-\frac{3\sqrt{110}i}{880}$ 0 0 0 $\frac{\sqrt{110}}{55}$ | |
| | $-\frac{7\sqrt{110}i}{440}$ 0 0 0 0 $-\frac{3\sqrt{66}i}{176}$ $-\frac{\sqrt{66}}{264}$ 0 0 0 0 $\frac{3\sqrt{110}i}{880}$ $-\frac{\sqrt{110}}{55}$ 0 | |
| | 0 $\frac{7\sqrt{110}}{440}$ $-\frac{3\sqrt{66}i}{176}$ 0 0 0 0 $-\frac{\sqrt{66}i}{264}$ $-\frac{3\sqrt{110}i}{880}$ 0 0 0 0 $\frac{\sqrt{110}i}{55}$ | |
| | $-\frac{7\sqrt{110}}{440}$ 0 0 $\frac{3\sqrt{66}i}{176}$ 0 0 $-\frac{\sqrt{66}i}{264}$ 0 0 $\frac{3\sqrt{110}i}{880}$ 0 0 0 $\frac{\sqrt{110}i}{55}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{66}}{264}$ 0 $\frac{\sqrt{66}i}{264}$ 0 0 0 $\frac{\sqrt{110}}{440}$ 0 $\frac{\sqrt{110}i}{440}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{66}}{264}$ 0 $\frac{\sqrt{66}i}{264}$ 0 0 0 $-\frac{\sqrt{110}}{440}$ 0 $\frac{\sqrt{110}i}{440}$ 0 0 0 | |
| | 0 $\frac{5\sqrt{66}i}{264}$ 0 0 $\frac{3\sqrt{110}i}{880}$ 0 0 $-\frac{\sqrt{110}}{440}$ 0 0 $\frac{3\sqrt{66}i}{176}$ 0 0 $-\frac{\sqrt{66}}{66}$ | |
| | $\frac{5\sqrt{66}i}{264}$ 0 0 0 0 $-\frac{3\sqrt{110}i}{880}$ $\frac{\sqrt{110}}{440}$ 0 0 0 0 $-\frac{3\sqrt{66}i}{176}$ $\frac{\sqrt{66}}{66}$ 0 | |
| | 0 $\frac{5\sqrt{66}}{264}$ $\frac{3\sqrt{110}i}{880}$ 0 0 0 0 $-\frac{\sqrt{110}i}{440}$ $-\frac{3\sqrt{66}i}{176}$ 0 0 0 0 $\frac{\sqrt{66}i}{66}$ | |
| | $-\frac{5\sqrt{66}}{264}$ 0 0 $-\frac{3\sqrt{110}i}{880}$ 0 0 $-\frac{\sqrt{110}i}{440}$ 0 0 $\frac{3\sqrt{66}i}{176}$ 0 0 0 $\frac{\sqrt{66}i}{66}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{110}}{55}$ 0 $-\frac{\sqrt{110}i}{55}$ 0 0 0 $\frac{\sqrt{66}}{66}$ 0 $-\frac{\sqrt{66}i}{66}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{110}}{55}$ 0 $-\frac{\sqrt{110}i}{55}$ 0 0 0 $-\frac{\sqrt{66}}{66}$ 0 $-\frac{\sqrt{66}i}{66}$ 0 0 0 | |

896 symmetry

 $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$

continued ...

Table 10

| No. | multipole | matrix |
|---|--|--------|
| $\mathbb{Q}_{4,1}^{(1,1;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{110}}{55}$ 0 $-\frac{\sqrt{110}i}{55}$ 0 0 0 $\frac{\sqrt{66}}{66}$ 0 $-\frac{\sqrt{66}i}{66}$ 0 0 | |
| | 0 0 $\frac{\sqrt{110}}{55}$ 0 $-\frac{\sqrt{110}i}{55}$ 0 0 0 $-\frac{\sqrt{66}}{66}$ 0 $-\frac{\sqrt{66}i}{66}$ 0 0 0 | |
| | 0 $\frac{\sqrt{110}}{55}$ 0 0 0 0 0 $-\frac{\sqrt{66}i}{264}$ $-\frac{3\sqrt{110}i}{220}$ 0 0 0 0 $\frac{7\sqrt{110}i}{440}$ | |
| | $-\frac{\sqrt{110}}{55}$ 0 0 0 0 0 $-\frac{\sqrt{66}i}{264}$ 0 0 $\frac{3\sqrt{110}i}{220}$ 0 0 $\frac{7\sqrt{110}i}{440}$ 0 | |
| | 0 $\frac{\sqrt{110}i}{55}$ 0 0 0 0 0 $-\frac{\sqrt{66}}{264}$ 0 0 $\frac{3\sqrt{110}i}{220}$ 0 0 $-\frac{7\sqrt{110}}{440}$ | |
| | $\frac{\sqrt{110}i}{55}$ 0 0 0 0 0 $\frac{\sqrt{66}}{264}$ 0 0 0 0 $-\frac{3\sqrt{110}i}{220}$ $\frac{7\sqrt{110}}{440}$ 0 | |
| | 0 0 0 $\frac{\sqrt{66}i}{264}$ 0 $\frac{\sqrt{66}}{264}$ 0 0 0 $-\frac{\sqrt{110}i}{440}$ 0 $\frac{\sqrt{110}}{440}$ 0 0 | |
| | 0 0 $\frac{\sqrt{66}i}{264}$ 0 $-\frac{\sqrt{66}}{264}$ 0 0 0 $-\frac{\sqrt{110}i}{440}$ 0 $-\frac{\sqrt{110}}{440}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{66}}{66}$ $\frac{3\sqrt{110}i}{220}$ 0 0 0 0 $\frac{\sqrt{110}i}{440}$ 0 0 0 0 0 $-\frac{5\sqrt{66}i}{264}$ | |
| | $\frac{\sqrt{66}}{66}$ 0 0 $-\frac{3\sqrt{110}i}{220}$ 0 0 $\frac{\sqrt{110}i}{440}$ 0 0 0 0 0 $-\frac{5\sqrt{66}i}{264}$ 0 | |
| | 0 $\frac{\sqrt{66}i}{66}$ 0 0 $-\frac{3\sqrt{110}i}{220}$ 0 0 $-\frac{\sqrt{110}}{440}$ 0 0 0 0 0 $-\frac{5\sqrt{66}}{264}$ | |
| | $\frac{\sqrt{66}i}{66}$ 0 0 0 0 $\frac{3\sqrt{110}i}{220}$ $\frac{\sqrt{110}}{440}$ 0 0 0 0 0 $\frac{5\sqrt{66}}{264}$ 0 | |
| | 0 0 0 $-\frac{7\sqrt{110}i}{440}$ 0 $\frac{7\sqrt{110}}{440}$ 0 0 0 $\frac{5\sqrt{66}i}{264}$ 0 $\frac{5\sqrt{66}}{264}$ 0 0 | |
| | 0 0 $-\frac{7\sqrt{110}i}{440}$ 0 $-\frac{7\sqrt{110}}{440}$ 0 0 0 $\frac{5\sqrt{66}i}{264}$ 0 $-\frac{5\sqrt{66}}{264}$ 0 0 0 | |
| $-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$ | | |
| 897 | symmetry | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|-----------------------------|-----------------------------|---------------------------|----------------------------|----------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|-------------------------------|-------------------------------|----------------------------|----------------------------|--|
| $\mathbb{Q}_{4,0}^{(1,1;a)}(E, 3)$ | 0 | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | 0 | $\frac{\sqrt{770}}{220}$ | $-\frac{\sqrt{770}i}{110}$ | 0 | 0 | $\frac{5\sqrt{462}i}{924}$ | 0 | $-\frac{5\sqrt{462}}{924}$ | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | 0 | $-\frac{\sqrt{770}}{220}$ | 0 | 0 | $\frac{\sqrt{770}i}{110}$ | $\frac{5\sqrt{462}i}{924}$ | 0 | $\frac{5\sqrt{462}}{924}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{168}$ | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | $\frac{\sqrt{770}}{616}$ | |
| | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{168}$ | 0 | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | $-\frac{\sqrt{770}}{616}$ | 0 | | |
| | 0 | $-\frac{\sqrt{770}}{220}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}i}{168}$ | $\frac{\sqrt{770}i}{220}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}i}{616}$ | |
| | $\frac{\sqrt{770}}{220}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}i}{168}$ | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | $-\frac{\sqrt{770}i}{616}$ | 0 | |
| | $\frac{\sqrt{770}i}{110}$ | 0 | 0 | $-\frac{\sqrt{462}}{168}$ | 0 | $-\frac{\sqrt{462}i}{168}$ | 0 | 0 | 0 | $\frac{19\sqrt{770}}{3080}$ | 0 | $-\frac{19\sqrt{770}i}{3080}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{770}i}{110}$ | $\frac{\sqrt{462}}{168}$ | 0 | $-\frac{\sqrt{462}i}{168}$ | 0 | 0 | 0 | $-\frac{19\sqrt{770}}{3080}$ | 0 | $-\frac{19\sqrt{770}i}{3080}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{462}i}{924}$ | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | $-\frac{19\sqrt{770}}{3080}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{1848}$ | |
| | $-\frac{5\sqrt{462}i}{924}$ | 0 | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | $\frac{19\sqrt{770}}{3080}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{1848}$ | 0 | |
| | 0 | $\frac{5\sqrt{462}}{924}$ | $\frac{\sqrt{770}i}{220}$ | 0 | 0 | 0 | 0 | $\frac{19\sqrt{770}i}{3080}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}i}{1848}$ | |
| | $-\frac{5\sqrt{462}}{924}$ | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | $\frac{19\sqrt{770}i}{3080}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}i}{1848}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | $\frac{\sqrt{770}i}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{462}}{1848}$ | 0 | $-\frac{\sqrt{462}i}{1848}$ | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | $\frac{\sqrt{770}i}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{462}}{1848}$ | 0 | $-\frac{\sqrt{462}i}{1848}$ | 0 | 0 | 0 | |

898 symmetry

$$\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | |
|------------------------------------|----------------------------|----------------------------|------------------------------|------------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|------------------------------|------------------------------|-----------------------------|------------------------------|-------------------------------|
| $\mathbb{Q}_{4,1}^{(1,1;a)}(E, 3)$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{462}$ | 0 | $\frac{\sqrt{462}i}{462}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{462}$ | 0 | $\frac{\sqrt{462}i}{462}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{462}i}{1848}$ | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{770}i}{3080}$ |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{462}i}{1848}$ | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | 0 | 0 | $-\frac{9\sqrt{770}i}{3080}$ |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{17\sqrt{462}}{1848}$ | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | $-\frac{9\sqrt{770}}{3080}$ |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{462}}{1848}$ | 0 | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | $\frac{9\sqrt{770}}{3080}$ | 0 |
| | 0 | 0 | 0 | $\frac{17\sqrt{462}i}{1848}$ | 0 | $-\frac{17\sqrt{462}}{1848}$ | 0 | 0 | 0 | $-\frac{9\sqrt{770}i}{3080}$ | 0 | $-\frac{9\sqrt{770}}{3080}$ | $\frac{\sqrt{770}i}{110}$ |
| | 0 | 0 | $\frac{17\sqrt{462}i}{1848}$ | 0 | $\frac{17\sqrt{462}}{1848}$ | 0 | 0 | 0 | $-\frac{9\sqrt{770}i}{3080}$ | $\frac{9\sqrt{770}}{3080}$ | 0 | 0 | $-\frac{\sqrt{770}i}{110}$ |
| | 0 | $-\frac{\sqrt{462}}{462}$ | $\frac{\sqrt{770}i}{220}$ | 0 | 0 | 0 | 0 | $\frac{9\sqrt{770}i}{3080}$ | 0 | 0 | 0 | 0 | $-\frac{13\sqrt{462}i}{1848}$ |
| | $\frac{\sqrt{462}}{462}$ | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | 0 | 0 | $\frac{9\sqrt{770}i}{3080}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{13\sqrt{462}i}{1848}$ |
| | 0 | $-\frac{\sqrt{462}i}{462}$ | 0 | 0 | $\frac{\sqrt{770}i}{220}$ | 0 | 0 | $\frac{9\sqrt{770}}{3080}$ | 0 | 0 | 0 | 0 | $\frac{13\sqrt{462}}{1848}$ |
| | $-\frac{\sqrt{462}i}{462}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}i}{220}$ | $-\frac{9\sqrt{770}}{3080}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{13\sqrt{462}}{1848}$ |
| | 0 | 0 | 0 | $\frac{9\sqrt{770}i}{3080}$ | 0 | $\frac{9\sqrt{770}}{3080}$ | $-\frac{\sqrt{770}i}{110}$ | 0 | 0 | $\frac{13\sqrt{462}i}{1848}$ | 0 | $-\frac{13\sqrt{462}}{1848}$ | 0 |
| | 0 | 0 | $\frac{9\sqrt{770}i}{3080}$ | 0 | $-\frac{9\sqrt{770}}{3080}$ | 0 | 0 | $\frac{\sqrt{770}i}{110}$ | $\frac{13\sqrt{462}i}{1848}$ | 0 | $\frac{13\sqrt{462}}{1848}$ | 0 | 0 |

899 symmetry

z

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------|--|--------|
| $\mathbb{G}_1^{(1,0;a)}(A_2)$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ | |
| | 0 0 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 | |
| | 0 0 0 0 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ | |
| | 0 0 0 0 0 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 | |
| | 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 $-\frac{\sqrt{105}}{56}$ 0 0 | |
| | 0 $\frac{3\sqrt{7}i}{56}$ 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 $\frac{\sqrt{105}}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 | |
| | 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ | |
| | $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 $\frac{\sqrt{105}}{56}$ 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{105}i}{56}$ 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{56}$ 0 0 0 | |

900 symmetry

x

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------------|---|--------------------------|--------------------------|--------------------------|---------------------------|-----|---------------------------|-----|------------------------|---------------------------|---------------------------|-------------------------|-----|--------------------------|-----|
| $\mathbb{G}_{1,0}^{(1,0;a)}(E)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $-\frac{\sqrt{7}i}{14}$ | 0 | 0 | $\frac{\sqrt{7}}{14}$ | | | | | | | | | | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\frac{\sqrt{7}i}{14}$ | $-\frac{\sqrt{7}}{14}$ | 0 | 0 | | | | | | | | | | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\frac{3\sqrt{7}}{56}$ | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{56}$ | $-\frac{\sqrt{105}i}{56}$ | 0 | | | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $-\frac{3\sqrt{7}}{56}$ | 0 | 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{105}i}{56}$ | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $-\frac{3\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\frac{3\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $-\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\frac{3\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 | $-\frac{\sqrt{105}}{56}$ | $\frac{\sqrt{105}i}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}}{56}$ | $-\frac{\sqrt{7}i}{56}$ | 0 | | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 | 0 | $\frac{\sqrt{105}}{56}$ | 0 | 0 | $-\frac{\sqrt{105}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{7}}{56}$ | 0 | 0 | $\frac{\sqrt{7}i}{56}$ | |
| | $\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 | $-\frac{\sqrt{105}}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 $-\frac{\sqrt{7}i}{14}$ $\frac{\sqrt{105}}{56}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 $-\frac{\sqrt{7}}{14}$ $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 0 0 0 0 0 0 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{56}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 |

901 symmetry

y

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------------|--|---|--|--|--|--|---|---|---|--|--|--|---|---|--|
| $\mathbb{G}_{1,1}^{(1,0;a)}(E)$ | 0 0 0 0 0 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 | 0 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 | 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 | 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 | 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 $-\frac{3\sqrt{7}i}{56}$ $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ | 0 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 | 0 0 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 | $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | 0 $\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 $-\frac{\sqrt{7}i}{56}$ 0 | 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 $\frac{\sqrt{105}i}{56}$ $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 $\frac{\sqrt{7}i}{56}$ | 0 $\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 | |
| | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ | | | | | | | | | | | | | | |

902 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------|------------------------|--|
| $\mathbb{G}_3^{(1,0;a)}(A_1)$ | 0 | 0 0 0 0 $-\frac{\sqrt{6}i}{16}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{6}i}{16}$ $\frac{\sqrt{6}}{24}$ 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 $-\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{24}$ $-\frac{\sqrt{6}i}{16}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ $-\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}}{24}$ 0 0 $\frac{\sqrt{6}i}{16}$ |
| | $\frac{\sqrt{6}i}{16}$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{6}i}{16}$ 0 0 0 0 0 0 0 $\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 |
| | 0 | $\frac{\sqrt{6}}{24}$ $-\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{16}$ 0 0 0 0 $-\frac{\sqrt{6}i}{24}$ |
| | $-\frac{\sqrt{6}}{24}$ | 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 $-\frac{\sqrt{6}i}{16}$ 0 0 $-\frac{\sqrt{6}i}{24}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{24}$ $-\frac{\sqrt{6}i}{16}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ |
| | 0 | $-\frac{\sqrt{10}i}{16}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{24}$ 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{10}i}{16}$ $\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{24}$ 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{6}i}{16}$ 0 0 0 0 $\frac{\sqrt{6}i}{24}$ $\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{6}i}{16}$ 0 0 $\frac{\sqrt{6}i}{24}$ 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 |
| 903 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|-------------------------|---|
| $\mathbb{G}_3^{(1,0;a)}(A_2, 1)$ | 0 | 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 $\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 |
| | 0 | $\frac{\sqrt{15}}{24}$ 0 0 0 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ |
| | $-\frac{\sqrt{15}}{24}$ | 0 0 0 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 |
| | 0 | $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 $-\frac{1}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ |
| | $\frac{\sqrt{15}i}{24}$ | 0 0 0 0 0 0 $\frac{1}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 |
| | 0 | 0 0 0 $\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 |
| | 0 | 0 $\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 0 |
| | 0 | $-\frac{1}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 $\frac{i}{8}$ |
| | $\frac{1}{8}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 $\frac{i}{8}$ 0 |
| | 0 | $\frac{i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 0 0 0 0 $\frac{1}{8}$ |
| | $\frac{i}{8}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 0 $-\frac{1}{8}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 $-\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 0 $-\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 0 |

904 symmetry

$$\frac{\sqrt{10}y(3x^2 - y^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|--------------------------|--|
| $\mathbb{G}_3^{(1,0;a)}(A_2, 2)$ | 0 | 0 $\frac{\sqrt{6}i}{16}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{24}$ $\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{6}i}{16}$ 0 0 $\frac{\sqrt{6}i}{24}$ 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{6}i}{16}$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 |
| | 0 | $\frac{\sqrt{6}i}{16}$ 0 0 0 0 0 0 0 $\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 $\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}}{24}$ $-\frac{\sqrt{6}i}{16}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ $\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{24}$ 0 0 $\frac{\sqrt{6}i}{16}$ |
| | 0 | $-\frac{\sqrt{6}i}{24}$ 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 $\frac{\sqrt{6}i}{16}$ 0 0 $-\frac{\sqrt{6}}{24}$ |
| | $-\frac{\sqrt{6}i}{24}$ | 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 $-\frac{\sqrt{6}i}{16}$ $\frac{\sqrt{6}}{24}$ 0 |
| | $-\frac{\sqrt{10}i}{16}$ | 0 0 $\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{10}i}{16}$ $-\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{24}$ $-\frac{\sqrt{6}i}{16}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}}{24}$ 0 0 $\frac{\sqrt{6}i}{16}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{6}i}{16}$ $-\frac{\sqrt{6}}{24}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{6}i}{16}$ $-\frac{\sqrt{6}}{24}$ 0 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 |
| 905 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------------|--------------------------|-------------------------|--------------------------|-------------------------|-------------------------|--------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--|--|
| $\mathbb{G}_{3,0}^{(1,0;a)}(E, 1)$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}i}{48}$ | 0 | 0 | $\frac{\sqrt{10}}{24}$ | 0 | 0 | $\frac{\sqrt{6}i}{48}$ | 0 | 0 | $\frac{\sqrt{6}}{12}$ | | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10}i}{48}$ | $-\frac{\sqrt{10}}{24}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{6}i}{48}$ | $-\frac{\sqrt{6}}{12}$ | 0 | | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}i}{48}$ | 0 | 0 | $-\frac{\sqrt{10}i}{24}$ | 0 | $-\frac{\sqrt{10}}{24}$ | $\frac{\sqrt{10}i}{48}$ | 0 | | |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{6}}{12}$ | 0 | 0 | $-\frac{\sqrt{6}i}{48}$ | $-\frac{\sqrt{10}i}{24}$ | 0 | $\frac{\sqrt{10}}{24}$ | 0 | 0 | $-\frac{\sqrt{10}i}{48}$ | | |
| | $-\frac{\sqrt{10}i}{48}$ | 0 | 0 | $\frac{\sqrt{6}}{12}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}}{24}$ | 0 | $-\frac{\sqrt{10}i}{24}$ | 0 | 0 | | |
| | 0 | $\frac{\sqrt{10}i}{48}$ | $-\frac{\sqrt{6}}{12}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10}}{24}$ | 0 | $-\frac{\sqrt{10}i}{24}$ | 0 | 0 | 0 | | |
| | 0 | $-\frac{\sqrt{10}}{24}$ | $-\frac{\sqrt{6}i}{48}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10}i}{48}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10}i}{24}$ | | |
| | $\frac{\sqrt{10}}{24}$ | 0 | 0 | $\frac{\sqrt{6}i}{48}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}i}{48}$ | 0 | 0 | 0 | $-\frac{\sqrt{10}i}{24}$ | | |
| | 0 | 0 | 0 | $\frac{\sqrt{10}i}{24}$ | 0 | $-\frac{\sqrt{10}}{24}$ | $\frac{\sqrt{10}i}{48}$ | 0 | 0 | 0 | $\frac{\sqrt{6}}{12}$ | $-\frac{\sqrt{6}i}{48}$ | 0 | | | |
| | 0 | 0 | $\frac{\sqrt{10}i}{24}$ | 0 | $\frac{\sqrt{10}}{24}$ | 0 | 0 | $-\frac{\sqrt{10}i}{48}$ | 0 | 0 | $-\frac{\sqrt{6}}{12}$ | 0 | 0 | $\frac{\sqrt{6}i}{48}$ | | |
| | $-\frac{\sqrt{6}i}{48}$ | 0 | 0 | $\frac{\sqrt{10}}{24}$ | 0 | $\frac{\sqrt{10}i}{24}$ | 0 | 0 | 0 | $-\frac{\sqrt{6}}{12}$ | 0 | 0 | 0 | 0 | | |
| | 0 | $\frac{\sqrt{6}i}{48}$ | $-\frac{\sqrt{10}}{24}$ | 0 | $\frac{\sqrt{10}i}{24}$ | 0 | 0 | 0 | $\frac{\sqrt{6}}{12}$ | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | $-\frac{\sqrt{6}}{12}$ | $-\frac{\sqrt{10}i}{48}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{10}i}{24}$ | $\frac{\sqrt{6}i}{48}$ | 0 | 0 | 0 | 0 | 0 | | |
| | $\frac{\sqrt{6}}{12}$ | 0 | 0 | $\frac{\sqrt{10}i}{48}$ | 0 | 0 | $\frac{\sqrt{10}i}{24}$ | 0 | 0 | $-\frac{\sqrt{6}i}{48}$ | 0 | 0 | 0 | 0 | | |

906 symmetry

$$-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--------------------------|---|
| $\mathbb{G}_{3,1}^{(1,0;a)}(E, 1)$ | 0 | 0 $\frac{\sqrt{10}i}{48}$ 0 0 0 0 $\frac{\sqrt{10}i}{24}$ $-\frac{\sqrt{6}i}{48}$ 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ |
| | 0 | 0 0 0 $-\frac{\sqrt{10}i}{48}$ 0 0 $\frac{\sqrt{10}i}{24}$ 0 0 $\frac{\sqrt{6}i}{48}$ 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 |
| | $-\frac{\sqrt{10}i}{48}$ | 0 0 0 0 0 $\frac{\sqrt{6}i}{12}$ 0 0 0 $\frac{\sqrt{10}}{24}$ 0 0 $-\frac{\sqrt{10}i}{24}$ 0 0 0 |
| | 0 | $\frac{\sqrt{10}i}{48}$ 0 0 $\frac{\sqrt{6}i}{12}$ 0 0 0 $-\frac{\sqrt{10}}{24}$ 0 0 $-\frac{\sqrt{10}i}{24}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 $\frac{\sqrt{6}i}{48}$ 0 0 $\frac{\sqrt{10}i}{24}$ 0 0 $\frac{\sqrt{10}}{24}$ $-\frac{\sqrt{10}i}{48}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 0 0 $-\frac{\sqrt{6}i}{48}$ $\frac{\sqrt{10}i}{24}$ 0 0 $-\frac{\sqrt{10}}{24}$ 0 0 $\frac{\sqrt{10}i}{48}$ |
| | 0 | $-\frac{\sqrt{10}i}{24}$ 0 0 0 $-\frac{\sqrt{6}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{48}$ 0 0 0 $\frac{\sqrt{10}}{24}$ |
| | $-\frac{\sqrt{10}i}{24}$ | 0 0 0 0 0 $\frac{\sqrt{6}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{48}$ $-\frac{\sqrt{10}}{24}$ 0 |
| | $\frac{\sqrt{6}i}{48}$ | 0 0 $-\frac{\sqrt{10}}{24}$ 0 $-\frac{\sqrt{10}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{6}i}{48}$ $\frac{\sqrt{10}}{24}$ 0 $-\frac{\sqrt{10}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{10}i}{24}$ 0 $-\frac{\sqrt{10}}{24}$ $-\frac{\sqrt{10}i}{48}$ 0 0 0 $\frac{\sqrt{6}i}{12}$ 0 0 0 $-\frac{\sqrt{6}i}{48}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{10}i}{24}$ 0 $\frac{\sqrt{10}}{24}$ 0 0 $\frac{\sqrt{10}i}{48}$ $\frac{\sqrt{6}i}{12}$ 0 0 0 0 $\frac{\sqrt{6}i}{48}$ |
| | $\frac{\sqrt{6}i}{12}$ | 0 0 0 $\frac{\sqrt{10}i}{48}$ 0 0 0 $-\frac{\sqrt{10}}{24}$ 0 0 0 $\frac{\sqrt{6}i}{48}$ 0 0 0 |
| | $\frac{\sqrt{6}i}{12}$ | 0 0 0 0 $-\frac{\sqrt{10}i}{48}$ $\frac{\sqrt{10}}{24}$ 0 0 0 0 $-\frac{\sqrt{6}i}{48}$ 0 0 0 |

907 symmetry

 $\sqrt{15}xyz$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|-----------|--|
| $\mathbb{G}_{3,0}^{(1,0;a)}(E, 2)$ | | $\begin{bmatrix} 0 & 0 & 0 & -\frac{i}{6} & 0 & -\frac{1}{6} & -\frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{6} & 0 & \frac{1}{6} & 0 & 0 & \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{6} & 0 & 0 & -\frac{1}{6} \\ \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{6} & \frac{1}{6} & 0 \\ 0 & \frac{1}{6} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{i}{6} & 0 & 0 & 0 & 0 & 0 & \frac{i}{6} \\ -\frac{1}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{i}{6} & 0 & 0 & 0 & \frac{i}{6} & 0 \\ \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{6} & 0 & -\frac{i}{6} & 0 & 0 & 0 \\ 0 & -\frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{1}{6} & 0 & -\frac{i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{i}{6} & 0 & 0 & -\frac{1}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{6} & \frac{1}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{6} & 0 & 0 & 0 & 0 & \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{6} & 0 & 0 & \frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{6} & 0 & -\frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{6} & 0 & -\frac{i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |

908 symmetry

 $\frac{\sqrt{15}z(x-y)(x+y)}{2}$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|-------------------------|---|
| $\mathbb{G}_{3,1}^{(1,0;a)}(E, 2)$ | 0 | 0 0 0 $\frac{1}{24}$ 0 $-\frac{i}{24}$ 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 |
| | 0 | 0 0 $-\frac{1}{24}$ 0 $-\frac{i}{24}$ 0 0 0 $\frac{\sqrt{15}}{24}$ 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 |
| | 0 | $-\frac{1}{24}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ $\frac{i}{6}$ 0 0 0 0 0 $-\frac{i}{24}$ |
| | $\frac{1}{24}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 $-\frac{i}{6}$ 0 0 $-\frac{i}{24}$ 0 |
| | 0 | $\frac{i}{24}$ 0 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 0 $\frac{i}{6}$ 0 0 $-\frac{1}{24}$ |
| | $\frac{i}{24}$ | 0 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 0 $-\frac{i}{6}$ $\frac{1}{24}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 0 $\frac{i}{24}$ 0 $\frac{1}{24}$ $\frac{i}{6}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 0 $\frac{i}{24}$ 0 $-\frac{1}{24}$ 0 0 $-\frac{i}{6}$ |
| | 0 | $\frac{\sqrt{15}}{24}$ $-\frac{i}{6}$ 0 0 0 0 $-\frac{i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ |
| | $-\frac{\sqrt{15}}{24}$ | 0 0 $\frac{i}{6}$ 0 0 $-\frac{i}{24}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 |
| | 0 | $\frac{\sqrt{15}i}{24}$ 0 0 $-\frac{i}{6}$ 0 0 $-\frac{1}{24}$ 0 0 0 0 0 $-\frac{\sqrt{15}}{24}$ |
| | $\frac{\sqrt{15}i}{24}$ | 0 0 0 0 0 $\frac{i}{6}$ $\frac{1}{24}$ 0 0 0 0 0 $\frac{\sqrt{15}}{24}$ 0 |
| | 0 | 0 0 0 $\frac{i}{24}$ 0 $\frac{1}{24}$ $-\frac{i}{6}$ 0 0 $-\frac{\sqrt{15}i}{24}$ 0 $\frac{\sqrt{15}}{24}$ 0 0 |
| | 0 | 0 0 $\frac{i}{24}$ 0 $-\frac{1}{24}$ 0 0 0 $\frac{i}{6}$ $-\frac{\sqrt{15}i}{24}$ 0 $-\frac{\sqrt{15}}{24}$ 0 0 |

909 symmetry

$$-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|--|-------------------------|---|
| $\mathbb{G}_5^{(1,0;a)}(A_1)$ | 0 | 0 0 0 0 $-\frac{\sqrt{30}i}{80}$ 0 0 $-\frac{\sqrt{30}}{30}$ 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{30}i}{80}$ $\frac{\sqrt{30}}{30}$ 0 0 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{3\sqrt{2}}{32}$ $-\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}i}{120}$ 0 $-\frac{\sqrt{30}}{96}$ $-\frac{\sqrt{30}i}{80}$ 0 |
| | 0 | 0 0 0 0 $\frac{3\sqrt{2}}{32}$ 0 0 $\frac{\sqrt{2}i}{8}$ $-\frac{\sqrt{30}i}{120}$ 0 $\frac{\sqrt{30}}{96}$ 0 0 $\frac{\sqrt{30}i}{80}$ |
| | $\frac{\sqrt{30}i}{80}$ | 0 0 $\frac{3\sqrt{2}}{32}$ 0 0 0 0 0 $\frac{11\sqrt{30}}{480}$ 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{30}i}{80}$ $-\frac{3\sqrt{2}}{32}$ 0 0 0 0 0 $-\frac{11\sqrt{30}}{480}$ 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 |
| | 0 | $\frac{\sqrt{30}}{30}$ $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{40}$ 0 0 0 0 $-\frac{\sqrt{30}i}{30}$ |
| | $-\frac{\sqrt{30}}{30}$ | 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{40}$ 0 0 0 $-\frac{\sqrt{30}i}{30}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{30}i}{120}$ 0 $-\frac{11\sqrt{30}}{480}$ $\frac{\sqrt{30}i}{40}$ 0 0 0 0 $-\frac{3\sqrt{2}}{32}$ $-\frac{\sqrt{2}i}{16}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{30}i}{120}$ 0 $\frac{11\sqrt{30}}{480}$ 0 0 $-\frac{\sqrt{30}i}{40}$ 0 0 0 0 $\frac{3\sqrt{2}}{32}$ 0 0 $\frac{\sqrt{2}i}{16}$ |
| | $-\frac{\sqrt{2}i}{16}$ | 0 0 $\frac{\sqrt{30}}{96}$ 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 $\frac{3\sqrt{2}}{32}$ 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{2}i}{16}$ $-\frac{\sqrt{30}}{96}$ 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 $-\frac{3\sqrt{2}}{32}$ 0 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{30}i}{80}$ 0 0 0 0 $\frac{\sqrt{30}i}{30}$ $\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{30}i}{80}$ 0 0 $\frac{\sqrt{30}i}{30}$ 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 |
| $\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$ | | |

910 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|--------------------------|--|
| $\mathbb{G}_5^{(1,0;a)}(A_2, 1)$ | 0 | 0 0 0 $\frac{\sqrt{21}}{24}$ 0 $\frac{\sqrt{21}i}{24}$ 0 0 0 0 $\frac{\sqrt{35}}{56}$ 0 $-\frac{\sqrt{35}i}{56}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{21}}{24}$ 0 $\frac{\sqrt{21}i}{24}$ 0 0 0 0 $-\frac{\sqrt{35}}{56}$ 0 $-\frac{\sqrt{35}i}{56}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{21}}{24}$ 0 0 0 0 0 0 $-\frac{\sqrt{35}i}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{21}i}{84}$ |
| | $\frac{\sqrt{21}}{24}$ | 0 0 0 0 0 0 $-\frac{\sqrt{35}i}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{21}i}{84}$ 0 |
| | 0 | $-\frac{\sqrt{21}i}{24}$ 0 0 0 0 0 0 $-\frac{\sqrt{35}}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{21}}{84}$ |
| | $-\frac{\sqrt{21}i}{24}$ | 0 0 0 0 0 0 $\frac{\sqrt{35}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{21}}{84}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{35}i}{56}$ 0 $\frac{\sqrt{35}}{56}$ 0 0 0 $\frac{5\sqrt{21}i}{168}$ 0 $-\frac{5\sqrt{21}}{168}$ 0 0 |
| | 0 | 0 $\frac{\sqrt{35}i}{56}$ 0 $-\frac{\sqrt{35}}{56}$ 0 0 0 0 $\frac{5\sqrt{21}i}{168}$ 0 $\frac{5\sqrt{21}}{168}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{35}}{56}$ 0 0 0 0 0 0 $-\frac{5\sqrt{21}i}{168}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{28}$ |
| | $\frac{\sqrt{35}}{56}$ | 0 0 0 0 0 0 $-\frac{5\sqrt{21}i}{168}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{28}$ 0 |
| | 0 | $\frac{\sqrt{35}i}{56}$ 0 0 0 0 0 0 $\frac{5\sqrt{21}}{168}$ 0 0 0 0 0 $-\frac{\sqrt{35}}{28}$ |
| | $\frac{\sqrt{35}i}{56}$ | 0 0 0 0 0 0 $-\frac{5\sqrt{21}}{168}$ 0 0 0 0 0 $\frac{\sqrt{35}}{28}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{21}i}{84}$ 0 $-\frac{\sqrt{21}}{84}$ 0 0 0 $\frac{\sqrt{35}i}{28}$ 0 $\frac{\sqrt{35}}{28}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{21}i}{84}$ 0 $\frac{\sqrt{21}}{84}$ 0 0 0 0 $\frac{\sqrt{35}i}{28}$ 0 $-\frac{\sqrt{35}}{28}$ 0 0 0 |

911 symmetry

$$-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|---|--------|
| $\mathbb{G}_5^{(1,0;a)}(A_2, 2)$ | 0 0 $\frac{\sqrt{30}i}{80}$ 0 0 0 0 $\frac{\sqrt{30}i}{30}$ $\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{30}i}{80}$ 0 0 $\frac{\sqrt{30}i}{30}$ 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 0 0 | |
| | $-\frac{\sqrt{30}i}{80}$ 0 0 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 0 $\frac{\sqrt{30}}{24}$ 0 0 $\frac{11\sqrt{30}i}{480}$ 0 0 | |
| | 0 $\frac{\sqrt{30}i}{80}$ 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 0 $-\frac{\sqrt{30}}{24}$ 0 $\frac{11\sqrt{30}i}{480}$ 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{2}i}{32}$ 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 $-\frac{\sqrt{30}i}{96}$ 0 $-\frac{\sqrt{30}}{120}$ $-\frac{\sqrt{30}i}{80}$ 0 | |
| | 0 0 $\frac{3\sqrt{2}i}{32}$ 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ $-\frac{\sqrt{30}i}{96}$ 0 $\frac{\sqrt{30}}{120}$ 0 0 $\frac{\sqrt{30}i}{80}$ | |
| | 0 $-\frac{\sqrt{30}i}{30}$ 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 $-\frac{\sqrt{30}i}{40}$ 0 0 $-\frac{\sqrt{30}}{30}$ | |
| | $-\frac{\sqrt{30}i}{30}$ 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{40}$ $\frac{\sqrt{30}}{30}$ 0 | |
| | $-\frac{\sqrt{2}i}{16}$ 0 0 $-\frac{\sqrt{30}}{24}$ 0 $\frac{\sqrt{30}i}{96}$ 0 0 0 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 | |
| | 0 $\frac{\sqrt{2}i}{16}$ $\frac{\sqrt{30}}{24}$ 0 $\frac{\sqrt{30}i}{96}$ 0 0 0 0 $-\frac{3\sqrt{2}i}{32}$ 0 0 0 | |
| | 0 0 0 $-\frac{11\sqrt{30}i}{480}$ 0 $\frac{\sqrt{30}}{120}$ $\frac{\sqrt{30}i}{40}$ 0 0 $\frac{3\sqrt{2}i}{32}$ 0 0 $\frac{\sqrt{2}i}{16}$ 0 | |
| | 0 0 $-\frac{11\sqrt{30}i}{480}$ 0 $-\frac{\sqrt{30}}{120}$ 0 0 $-\frac{\sqrt{30}i}{40}$ $\frac{3\sqrt{2}i}{32}$ 0 0 0 $-\frac{\sqrt{2}i}{16}$ | |
| | 0 0 0 0 $\frac{\sqrt{30}i}{80}$ 0 0 $\frac{\sqrt{30}}{30}$ 0 0 $-\frac{\sqrt{2}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{30}i}{80}$ $-\frac{\sqrt{30}}{30}$ 0 0 0 0 $\frac{\sqrt{2}i}{16}$ 0 0 | |

912 symmetry

$$\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--|
| $\mathbb{G}_{5,0}^{(1,0;a)}(E, 1)$ | 0 0 0 0 $\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 $-\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}}{96}$ $-\frac{5\sqrt{6}i}{48}$ 0 | |
| | 0 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 0 $-\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{96}$ 0 0 $\frac{5\sqrt{6}i}{48}$ | |
| | $-\frac{5\sqrt{6}i}{48}$ 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 0 0 $-\frac{\sqrt{6}}{96}$ 0 $\frac{\sqrt{6}i}{24}$ 0 0 0 | |
| | 0 $\frac{5\sqrt{6}i}{48}$ $\frac{\sqrt{10}}{32}$ 0 0 0 0 0 $\frac{\sqrt{6}}{96}$ 0 $\frac{\sqrt{6}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{6}i}{24}$ 0 $\frac{\sqrt{6}}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}}{32}$ $\frac{\sqrt{10}i}{16}$ 0 | |
| | 0 0 $\frac{\sqrt{6}i}{24}$ 0 $-\frac{\sqrt{6}}{96}$ 0 0 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 $-\frac{\sqrt{10}i}{16}$ | |
| | $-\frac{\sqrt{10}i}{16}$ 0 0 $\frac{\sqrt{6}}{96}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 $-\frac{\sqrt{10}}{32}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{10}i}{16}$ $-\frac{\sqrt{6}}{96}$ 0 $-\frac{\sqrt{6}i}{24}$ 0 0 0 $\frac{\sqrt{10}}{32}$ 0 0 0 0 0 | |
| | 0 0 $\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 | |
| 913 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|---|--|
| $\mathbb{G}_{5,1}^{(1,0;a)}(E, 1)$ | 0 0 $-\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 0 0 | |
| | $\frac{5\sqrt{6}i}{48}$ 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 $\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{96}$ 0 0 0 | |
| | 0 $-\frac{5\sqrt{6}i}{48}$ 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 $-\frac{\sqrt{6}}{24}$ 0 $-\frac{\sqrt{6}i}{96}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{6}i}{96}$ 0 $-\frac{\sqrt{6}}{24}$ $-\frac{5\sqrt{6}i}{48}$ 0 | |
| | 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 0 0 $-\frac{\sqrt{6}i}{96}$ 0 $\frac{\sqrt{6}}{24}$ 0 0 $\frac{5\sqrt{6}i}{48}$ | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | $-\frac{\sqrt{10}i}{16}$ 0 0 $-\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 | |
| | 0 $\frac{\sqrt{10}i}{16}$ $\frac{\sqrt{6}}{24}$ 0 $\frac{\sqrt{6}i}{96}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{32}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{6}i}{96}$ 0 $-\frac{\sqrt{6}}{24}$ 0 0 0 $-\frac{\sqrt{10}i}{32}$ 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 | |
| | 0 0 0 0 $\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $\frac{\sqrt{10}i}{16}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{5\sqrt{6}i}{48}$ 0 0 0 0 0 $-\frac{\sqrt{10}i}{16}$ 0 0 0 | |
| | | $\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |

914 symmetry

$$\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------------|---------------------------|--|----------------------------|-----------------------------|----------------------------|-----------------------------|--------------------------|---------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|--------------------------|---------------------------|--|--|
| $\mathbb{G}_{5,0}^{(1,0;a)}(E, 2)$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{120}$ | 0 | 0 | $\frac{\sqrt{35}}{30}$ | 0 | 0 | $\frac{\sqrt{21}i}{168}$ | 0 | 0 | $-\frac{\sqrt{21}}{21}$ | | |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{120}$ | $-\frac{\sqrt{35}}{30}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}i}{168}$ | $\frac{\sqrt{21}}{21}$ | 0 | | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{21}}{336}$ | $\frac{\sqrt{21}i}{168}$ | 0 | 0 | $\frac{\sqrt{35}i}{60}$ | 0 | $\frac{73\sqrt{35}}{1680}$ | $\frac{\sqrt{35}i}{420}$ | 0 | | |
| | 0 | 0 | 0 | 0 | $\frac{5\sqrt{21}}{336}$ | 0 | 0 | $-\frac{\sqrt{21}i}{168}$ | $\frac{\sqrt{35}i}{60}$ | 0 | $-\frac{73\sqrt{35}}{1680}$ | 0 | 0 | $-\frac{\sqrt{35}i}{420}$ | | |
| | $\frac{\sqrt{35}i}{120}$ | 0 | 0 | $\frac{5\sqrt{21}}{336}$ | 0 | 0 | 0 | 0 | 0 | $\frac{17\sqrt{35}}{1680}$ | 0 | $\frac{\sqrt{35}i}{60}$ | 0 | 0 | | |
| | 0 | $-\frac{\sqrt{35}i}{120}$ | $-\frac{5\sqrt{21}}{336}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{35}}{1680}$ | 0 | $\frac{\sqrt{35}i}{60}$ | 0 | 0 | 0 | | |
| | 0 | $-\frac{\sqrt{35}}{30}$ | $-\frac{\sqrt{21}i}{168}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{168}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{30}$ | | |
| | $\frac{\sqrt{35}}{30}$ | 0 | 0 | $\frac{\sqrt{21}i}{168}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{168}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{30}$ | | |
| | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{60}$ | 0 | $-\frac{17\sqrt{35}}{1680}$ | $\frac{\sqrt{35}i}{168}$ | 0 | 0 | 0 | 0 | $\frac{11\sqrt{21}}{336}$ | $\frac{\sqrt{21}i}{84}$ | 0 | | |
| | 0 | 0 | $-\frac{\sqrt{35}i}{60}$ | 0 | $\frac{17\sqrt{35}}{1680}$ | 0 | 0 | $-\frac{\sqrt{35}i}{168}$ | 0 | 0 | $-\frac{11\sqrt{21}}{336}$ | 0 | 0 | $-\frac{\sqrt{21}i}{84}$ | | |
| | $-\frac{\sqrt{21}i}{168}$ | 0 | 0 | $-\frac{73\sqrt{35}}{1680}$ | 0 | $-\frac{\sqrt{35}i}{60}$ | 0 | 0 | 0 | $-\frac{11\sqrt{21}}{336}$ | 0 | 0 | 0 | 0 | | |
| | 0 | $\frac{\sqrt{21}i}{168}$ | $\frac{73\sqrt{35}}{1680}$ | 0 | $-\frac{\sqrt{35}i}{60}$ | 0 | 0 | 0 | $\frac{11\sqrt{21}}{336}$ | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | $\frac{\sqrt{21}}{21}$ | $-\frac{\sqrt{35}i}{420}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}i}{30}$ | $-\frac{\sqrt{21}i}{84}$ | 0 | 0 | 0 | 0 | 0 | | |
| | $-\frac{\sqrt{21}}{21}$ | 0 | 0 | $\frac{\sqrt{35}i}{420}$ | 0 | 0 | $\frac{\sqrt{35}i}{30}$ | 0 | 0 | $\frac{\sqrt{21}i}{84}$ | 0 | 0 | 0 | 0 | | |
| 915 | symmetry | $\frac{\sqrt{15}y(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{G}_{5,1}^{(1,0;a)}(E, 2)$ | 0 0 $-\frac{\sqrt{35}i}{120}$ 0 0 0 0 $\frac{\sqrt{35}i}{30}$ $-\frac{\sqrt{21}i}{168}$ 0 0 0 0 0 $\frac{\sqrt{21}i}{21}$ | |
| | 0 0 0 $\frac{\sqrt{35}i}{120}$ 0 0 $\frac{\sqrt{35}i}{30}$ 0 0 $\frac{\sqrt{21}i}{168}$ 0 0 0 $\frac{\sqrt{21}i}{21}$ 0 | |
| | $\frac{\sqrt{35}i}{120}$ 0 0 0 0 $\frac{5\sqrt{21}i}{336}$ 0 0 0 $-\frac{\sqrt{35}}{60}$ 0 0 $-\frac{17\sqrt{35}i}{1680}$ 0 0 | |
| | 0 $-\frac{\sqrt{35}i}{120}$ 0 0 $\frac{5\sqrt{21}i}{336}$ 0 0 0 $\frac{\sqrt{35}}{60}$ 0 $-\frac{17\sqrt{35}i}{1680}$ 0 0 0 | |
| | 0 0 0 $-\frac{5\sqrt{21}i}{336}$ 0 0 $\frac{\sqrt{21}i}{168}$ 0 0 $-\frac{73\sqrt{35}i}{1680}$ 0 $-\frac{\sqrt{35}}{60}$ $-\frac{\sqrt{35}i}{420}$ 0 | |
| | 0 0 $-\frac{5\sqrt{21}i}{336}$ 0 0 0 $-\frac{\sqrt{21}i}{168}$ $-\frac{73\sqrt{35}i}{1680}$ 0 $\frac{\sqrt{35}}{60}$ 0 0 $\frac{\sqrt{35}i}{420}$ | |
| | 0 $-\frac{\sqrt{35}i}{30}$ 0 0 $-\frac{\sqrt{21}i}{168}$ 0 0 0 0 0 $\frac{\sqrt{35}i}{168}$ 0 0 $\frac{\sqrt{35}}{30}$ | |
| | $-\frac{\sqrt{35}i}{30}$ 0 0 0 0 $\frac{\sqrt{21}i}{168}$ 0 0 0 0 0 $-\frac{\sqrt{35}i}{168}$ $-\frac{\sqrt{35}}{30}$ 0 | |
| | $\frac{\sqrt{21}i}{168}$ 0 0 $\frac{\sqrt{35}}{60}$ 0 $\frac{73\sqrt{35}i}{1680}$ 0 0 0 0 0 $-\frac{11\sqrt{21}i}{336}$ 0 0 | |
| | 0 $-\frac{\sqrt{21}i}{168}$ $-\frac{\sqrt{35}}{60}$ 0 $\frac{73\sqrt{35}i}{1680}$ 0 0 0 0 0 $-\frac{11\sqrt{21}i}{336}$ 0 0 0 | |
| | 0 0 0 $\frac{17\sqrt{35}i}{1680}$ 0 $-\frac{\sqrt{35}}{60}$ 0 0 $\frac{\sqrt{35}i}{168}$ $\frac{11\sqrt{21}i}{336}$ 0 0 0 $\frac{\sqrt{21}i}{84}$ 0 | |
| | 0 0 $\frac{17\sqrt{35}i}{1680}$ 0 0 $\frac{\sqrt{35}i}{420}$ 0 0 $-\frac{\sqrt{35}}{30}$ 0 0 0 $-\frac{\sqrt{21}i}{84}$ 0 0 0 | |
| | $-\frac{\sqrt{21}i}{21}$ 0 0 0 0 $-\frac{\sqrt{35}i}{420}$ $\frac{\sqrt{35}}{30}$ 0 0 0 0 $\frac{\sqrt{21}i}{84}$ 0 0 0 | |

916 symmetry

$$-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|---|
| $\mathbb{G}_{5,0}^{(1,0;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{15}i}{30}$ 0 $-\frac{\sqrt{15}}{30}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{15}i}{30}$ 0 $\frac{\sqrt{15}}{30}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{15}i}{30}$ 0 0 $-\frac{i}{4}$ 0 0 0 $-\frac{1}{8}$ 0 0 $\frac{\sqrt{15}i}{60}$ 0 0 $\frac{\sqrt{15}}{120}$ | |
| | $-\frac{\sqrt{15}i}{30}$ 0 0 0 0 $\frac{i}{4}$ $\frac{1}{8}$ 0 0 0 0 $-\frac{\sqrt{15}i}{60}$ $-\frac{\sqrt{15}}{120}$ 0 | |
| | 0 $\frac{\sqrt{15}}{30}$ $\frac{i}{4}$ 0 0 0 0 0 $\frac{i}{8}$ $\frac{\sqrt{15}i}{60}$ 0 0 0 0 $\frac{\sqrt{15}i}{120}$ | |
| | $-\frac{\sqrt{15}}{30}$ 0 0 $-\frac{i}{4}$ 0 0 0 $\frac{i}{8}$ 0 0 $-\frac{\sqrt{15}i}{60}$ 0 0 $\frac{\sqrt{15}i}{120}$ 0 | |
| | 0 0 0 $\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 0 $-\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 | |
| | 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 0 $\frac{\sqrt{15}}{40}$ 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{15}i}{60}$ 0 0 0 $\frac{\sqrt{15}}{40}$ 0 0 $-\frac{i}{4}$ 0 0 0 $-\frac{1}{8}$ | |
| | 0 0 0 0 0 $\frac{\sqrt{15}i}{60}$ $-\frac{\sqrt{15}}{40}$ 0 0 0 0 $\frac{i}{4}$ $\frac{1}{8}$ 0 | |
| | 0 0 $-\frac{\sqrt{15}i}{60}$ 0 0 0 0 $\frac{\sqrt{15}i}{40}$ $\frac{i}{4}$ 0 0 0 0 $\frac{i}{8}$ | |
| | 0 0 0 $\frac{\sqrt{15}i}{60}$ 0 0 $\frac{\sqrt{15}i}{40}$ 0 0 $-\frac{i}{4}$ 0 0 0 $\frac{i}{8}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{15}}{120}$ 0 $-\frac{\sqrt{15}i}{120}$ 0 0 0 $\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{15}}{120}$ 0 $-\frac{\sqrt{15}i}{120}$ 0 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 0 | |
| 917 | symmetry | $\frac{3\sqrt{35}z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|---|--------|
| $\mathbb{G}_{5,1}^{(1,0;a)}(E, 3)$ | 0 0 0 $-\frac{\sqrt{15}}{120}$ 0 $-\frac{\sqrt{15}i}{120}$ 0 0 0 $\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 | |
| | 0 0 $\frac{\sqrt{15}}{120}$ 0 $-\frac{\sqrt{15}i}{120}$ 0 0 0 $-\frac{1}{8}$ 0 $-\frac{i}{8}$ 0 0 0 | |
| | 0 $\frac{\sqrt{15}}{120}$ 0 0 0 0 0 $\frac{i}{8}$ $\frac{\sqrt{15}i}{15}$ 0 0 0 0 $\frac{\sqrt{15}i}{30}$ | |
| | $-\frac{\sqrt{15}}{120}$ 0 0 0 0 0 $\frac{i}{8}$ 0 0 $-\frac{\sqrt{15}i}{15}$ 0 0 $\frac{\sqrt{15}i}{30}$ 0 | |
| | 0 $\frac{\sqrt{15}i}{120}$ 0 0 0 0 0 $\frac{1}{8}$ 0 0 $-\frac{\sqrt{15}i}{15}$ 0 0 $-\frac{\sqrt{15}}{30}$ | |
| | $\frac{\sqrt{15}i}{120}$ 0 0 0 0 0 $-\frac{1}{8}$ 0 0 0 0 $\frac{\sqrt{15}i}{15}$ $\frac{\sqrt{15}}{30}$ 0 | |
| | 0 0 0 $-\frac{i}{8}$ 0 $-\frac{1}{8}$ 0 0 0 $\frac{\sqrt{15}i}{40}$ 0 $-\frac{\sqrt{15}}{40}$ 0 0 | |
| | 0 0 $-\frac{i}{8}$ 0 $\frac{1}{8}$ 0 0 0 $\frac{\sqrt{15}i}{40}$ 0 $\frac{\sqrt{15}}{40}$ 0 0 0 | |
| | 0 $-\frac{1}{8}$ $-\frac{\sqrt{15}i}{15}$ 0 0 0 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 0 | |
| | $\frac{1}{8}$ 0 0 $\frac{\sqrt{15}i}{15}$ 0 0 $-\frac{\sqrt{15}i}{40}$ 0 0 0 0 0 0 0 | |
| | 0 $\frac{i}{8}$ 0 0 $\frac{\sqrt{15}i}{15}$ 0 0 $\frac{\sqrt{15}}{40}$ 0 0 0 0 0 0 0 | |
| | $\frac{i}{8}$ 0 0 0 0 $-\frac{\sqrt{15}i}{15}$ $-\frac{\sqrt{15}}{40}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{15}i}{30}$ 0 $\frac{\sqrt{15}}{30}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{15}i}{30}$ 0 $-\frac{\sqrt{15}}{30}$ 0 0 0 0 0 0 0 0 0 | |

918 symmetry

$$-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|-------------------------|--|
| $\mathbb{G}_{5,0}^{(1,0;a)}(E, 4)$ | 0 | 0 0 0 $\frac{\sqrt{5}i}{30}$ 0 $\frac{\sqrt{5}}{30}$ $-\frac{\sqrt{5}i}{15}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{5}i}{30}$ 0 $-\frac{\sqrt{5}}{30}$ 0 0 $\frac{\sqrt{5}i}{15}$ 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{5}i}{30}$ 0 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 0 $-\frac{\sqrt{5}i}{30}$ 0 0 $-\frac{\sqrt{5}}{24}$ |
| | $-\frac{\sqrt{5}i}{30}$ | 0 0 0 0 0 0 $\frac{\sqrt{3}}{8}$ 0 0 0 0 $\frac{\sqrt{5}i}{30}$ $\frac{\sqrt{5}}{24}$ 0 |
| | 0 | $-\frac{\sqrt{5}}{30}$ 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{8}$ $\frac{\sqrt{5}i}{30}$ 0 0 0 0 $\frac{\sqrt{5}i}{24}$ |
| | $\frac{\sqrt{5}}{30}$ | 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{8}$ 0 0 $-\frac{\sqrt{5}i}{30}$ 0 0 $\frac{\sqrt{5}i}{24}$ 0 |
| | $\frac{\sqrt{5}i}{15}$ | 0 0 $\frac{\sqrt{3}}{8}$ 0 $\frac{\sqrt{3}i}{8}$ 0 0 0 $-\frac{\sqrt{5}}{120}$ 0 $\frac{\sqrt{5}i}{120}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{5}i}{15}$ $-\frac{\sqrt{3}}{8}$ 0 $\frac{\sqrt{3}i}{8}$ 0 0 0 $\frac{\sqrt{5}}{120}$ 0 $\frac{\sqrt{5}i}{120}$ 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{5}i}{30}$ 0 0 $\frac{\sqrt{5}}{120}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{8}$ |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{5}i}{30}$ $-\frac{\sqrt{5}}{120}$ 0 0 0 0 0 $\frac{\sqrt{3}}{8}$ 0 |
| | 0 | 0 0 $\frac{\sqrt{5}i}{30}$ 0 0 0 0 $-\frac{\sqrt{5}i}{120}$ 0 0 0 0 0 $-\frac{\sqrt{3}i}{8}$ |
| | 0 | 0 0 0 $-\frac{\sqrt{5}i}{30}$ 0 0 $-\frac{\sqrt{5}i}{120}$ 0 0 0 0 0 $-\frac{\sqrt{3}i}{8}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{5}}{24}$ 0 $-\frac{\sqrt{5}i}{24}$ 0 0 0 $\frac{\sqrt{3}}{8}$ 0 $\frac{\sqrt{3}i}{8}$ 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{5}}{24}$ 0 $-\frac{\sqrt{5}i}{24}$ 0 0 0 $-\frac{\sqrt{3}}{8}$ 0 $\frac{\sqrt{3}i}{8}$ 0 0 0 |
| 919 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{G}_{5,1}^{(1,0;a)}(E, 4)$ | 0 0 0 $-\frac{\sqrt{5}}{12}$ 0 $\frac{\sqrt{5}i}{12}$ 0 0 0 $-\frac{\sqrt{3}}{12}$ 0 $-\frac{\sqrt{3}i}{12}$ 0 0 | |
| | 0 0 $\frac{\sqrt{5}}{12}$ 0 $\frac{\sqrt{5}i}{12}$ 0 0 0 $\frac{\sqrt{3}}{12}$ 0 $-\frac{\sqrt{3}i}{12}$ 0 0 0 | |
| | 0 $\frac{\sqrt{5}}{12}$ 0 0 0 0 0 $\frac{\sqrt{3}i}{24}$ $-\frac{\sqrt{5}i}{30}$ 0 0 0 0 $\frac{\sqrt{5}i}{120}$ | |
| | $-\frac{\sqrt{5}}{12}$ 0 0 0 0 0 $\frac{\sqrt{3}i}{24}$ 0 0 $\frac{\sqrt{5}i}{30}$ 0 0 $\frac{\sqrt{5}i}{120}$ 0 | |
| | 0 $-\frac{\sqrt{5}i}{12}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{24}$ 0 0 $-\frac{\sqrt{5}i}{30}$ 0 0 $\frac{\sqrt{5}}{120}$ | |
| | $-\frac{\sqrt{5}i}{12}$ 0 0 0 0 0 $\frac{\sqrt{3}}{24}$ 0 0 0 0 $\frac{\sqrt{5}i}{30}$ $-\frac{\sqrt{5}}{120}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{3}i}{24}$ 0 $\frac{\sqrt{3}}{24}$ 0 0 0 $\frac{11\sqrt{5}i}{120}$ 0 $\frac{11\sqrt{5}}{120}$ $\frac{\sqrt{5}i}{15}$ 0 | |
| | 0 0 $-\frac{\sqrt{3}i}{24}$ 0 $-\frac{\sqrt{3}}{24}$ 0 0 0 $\frac{11\sqrt{5}i}{120}$ 0 $-\frac{11\sqrt{5}}{120}$ 0 0 $-\frac{\sqrt{5}i}{15}$ | |
| | 0 $\frac{\sqrt{3}}{12}$ $\frac{\sqrt{5}i}{30}$ 0 0 0 0 $-\frac{11\sqrt{5}i}{120}$ 0 0 0 0 0 $-\frac{\sqrt{3}i}{24}$ | |
| | $-\frac{\sqrt{3}}{12}$ 0 0 $-\frac{\sqrt{5}i}{30}$ 0 0 $-\frac{11\sqrt{5}i}{120}$ 0 0 0 0 0 $-\frac{\sqrt{3}i}{24}$ 0 | |
| | 0 $\frac{\sqrt{3}i}{12}$ 0 0 $\frac{\sqrt{5}i}{30}$ 0 0 $-\frac{11\sqrt{5}}{120}$ 0 0 0 0 0 $\frac{\sqrt{3}}{24}$ | |
| | $\frac{\sqrt{3}i}{12}$ 0 0 0 0 $-\frac{\sqrt{5}i}{30}$ $\frac{11\sqrt{5}}{120}$ 0 0 0 0 0 $-\frac{\sqrt{3}}{24}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{5}i}{120}$ 0 $-\frac{\sqrt{5}}{120}$ $-\frac{\sqrt{5}i}{15}$ 0 0 $\frac{\sqrt{3}i}{24}$ 0 $-\frac{\sqrt{3}}{24}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{5}i}{120}$ 0 $\frac{\sqrt{5}}{120}$ 0 0 $\frac{\sqrt{5}i}{15}$ $\frac{\sqrt{3}i}{24}$ 0 $\frac{\sqrt{3}}{24}$ 0 0 0 | |

920 symmetry

 $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$

continued ...

Table 10

| No. | multipole | matrix |
|----------------------|--|--------|
| $T_2^{(1,0;a)}(A_1)$ | 0 0 0 $-\frac{\sqrt{105}}{42}$ 0 $-\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{105}}{42}$ 0 $\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{105}i}{168}$ | |
| | $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}i}{168}$ 0 | |
| | 0 $-\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{168}$ | |
| | $\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{168}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 $-\frac{\sqrt{105}i}{168}$ 0 $\frac{\sqrt{105}}{168}$ 0 0 | |
| | 0 0 $\frac{\sqrt{7}i}{56}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 $\frac{\sqrt{105}i}{168}$ 0 $\frac{\sqrt{105}}{168}$ 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{105}i}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{7}i}{56}$ | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{105}i}{168}$ 0 0 0 0 0 $\frac{5\sqrt{7}i}{56}$ | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{105}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{7}}{56}$ | |
| | 0 0 $\frac{\sqrt{105}i}{168}$ 0 $-\frac{\sqrt{105}}{168}$ 0 0 0 $-\frac{5\sqrt{7}i}{56}$ 0 $-\frac{5\sqrt{7}}{56}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{105}i}{168}$ 0 $-\frac{\sqrt{105}}{168}$ 0 0 0 $\frac{5\sqrt{7}i}{56}$ 0 $-\frac{5\sqrt{7}}{56}$ 0 0 | |

921 symmetry

 $\sqrt{3}yz$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{T}_{2,0}^{(1,0;a)}(E, 1)$ | 0 0 0 0 $-\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{35}}{42}$ $\frac{\sqrt{35}i}{42}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{21}i}{168}$ $-\frac{\sqrt{21}}{168}$ 0 0 0 $-\frac{\sqrt{35}}{21}$ 0 $-\frac{\sqrt{35}i}{168}$ $\frac{\sqrt{35}}{168}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{21}i}{168}$ 0 0 $\frac{\sqrt{21}}{168}$ $-\frac{\sqrt{35}}{21}$ 0 $\frac{\sqrt{35}i}{168}$ 0 0 $-\frac{\sqrt{35}}{168}$ | |
| | $-\frac{\sqrt{35}}{42}$ 0 0 $-\frac{\sqrt{21}i}{168}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 0 $\frac{\sqrt{35}i}{168}$ 0 $\frac{\sqrt{35}}{42}$ 0 0 | |
| | 0 $\frac{\sqrt{35}}{42}$ $\frac{\sqrt{21}i}{168}$ 0 $\frac{\sqrt{21}}{21}$ 0 0 0 $-\frac{\sqrt{35}i}{168}$ 0 $\frac{\sqrt{35}}{42}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{35}i}{42}$ $-\frac{\sqrt{21}}{168}$ 0 0 0 0 $-\frac{\sqrt{21}}{21}$ $-\frac{\sqrt{35}}{168}$ 0 0 0 0 $\frac{\sqrt{35}}{42}$ | |
| | $\frac{\sqrt{35}i}{42}$ 0 0 $\frac{\sqrt{21}}{168}$ 0 0 $-\frac{\sqrt{21}}{21}$ 0 0 $\frac{\sqrt{35}}{168}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}}{21}$ 0 $\frac{\sqrt{35}i}{168}$ $-\frac{\sqrt{35}}{168}$ 0 0 0 0 $-\frac{5\sqrt{21}i}{168}$ $-\frac{5\sqrt{21}}{168}$ 0 | |
| | 0 0 $-\frac{\sqrt{35}}{21}$ 0 $-\frac{\sqrt{35}i}{168}$ 0 0 $\frac{\sqrt{35}}{168}$ 0 0 $\frac{5\sqrt{21}i}{168}$ 0 0 $\frac{5\sqrt{21}}{168}$ | |
| | 0 0 0 $-\frac{\sqrt{35}i}{168}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 0 $-\frac{5\sqrt{21}i}{168}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{35}i}{168}$ 0 0 0 0 $\frac{\sqrt{35}}{42}$ $-\frac{5\sqrt{21}}{168}$ 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{35}}{168}$ 0 0 $\frac{\sqrt{35}}{42}$ 0 0 $\frac{5\sqrt{21}}{168}$ 0 0 0 0 | |

922 symmetry

 $-\sqrt{3}xz$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------------|-------------------------|------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|--------------------------|---------------------------|--------------------------|---|---|
| $\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)$ | 0 | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{35}}{42}$ | 0 | 0 | $\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | $-\frac{\sqrt{21}i}{21}$ | 0 | $\frac{\sqrt{21}}{168}$ | 0 | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | $\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{35}}{42}$ | $\frac{\sqrt{21}i}{21}$ | 0 | $\frac{\sqrt{21}}{168}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{42}$ | 0 | $\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{21}}{168}$ | 0 | 0 | $-\frac{\sqrt{21}}{168}$ | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | $-\frac{\sqrt{35}i}{21}$ | $-\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{21}}{168}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}}{168}$ | $-\frac{\sqrt{35}}{168}$ | 0 | $\frac{\sqrt{35}i}{21}$ | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | 0 |
| | 0 | $\frac{\sqrt{35}}{42}$ | 0 | 0 | $-\frac{\sqrt{21}}{168}$ | 0 | 0 | $\frac{\sqrt{21}i}{21}$ | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | 0 |
| | $\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{21}}{168}$ | $-\frac{\sqrt{21}i}{21}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | $-\frac{\sqrt{35}i}{42}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{21}}{168}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{35}i}{42}$ | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{21}}{168}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | $-\frac{\sqrt{35}i}{21}$ | $\frac{\sqrt{35}}{168}$ | 0 | 0 | $\frac{5\sqrt{21}}{168}$ | 0 | 0 | $-\frac{5\sqrt{21}}{168}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | $\frac{\sqrt{35}i}{21}$ | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | $\frac{5\sqrt{21}}{168}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{21}}{168}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | $-\frac{5\sqrt{21}}{168}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{168}$ | $-\frac{\sqrt{35}i}{42}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{21}}{168}$ | 0 | 0 | 0 | 0 |

923 symmetry

 $\frac{\sqrt{3}(x-y)(x+y)}{2}$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{T}_{2,0}^{(1,0;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{35}}{42}$ 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{35}}{21}$ 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{35}}{42}$ 0 $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{35}}{21}$ 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{35}}{42}$ 0 0 $\frac{\sqrt{21}}{84}$ 0 0 $\frac{\sqrt{21}i}{168}$ 0 0 $\frac{\sqrt{35}}{84}$ 0 0 $-\frac{\sqrt{35}i}{168}$ | |
| | $-\frac{\sqrt{35}}{42}$ 0 0 0 0 $-\frac{\sqrt{21}}{84}$ $-\frac{\sqrt{21}i}{168}$ 0 0 0 0 $-\frac{\sqrt{35}}{84}$ $\frac{\sqrt{35}i}{168}$ 0 | |
| | 0 $\frac{\sqrt{35}i}{42}$ $\frac{\sqrt{21}}{84}$ 0 0 0 0 $-\frac{\sqrt{21}}{168}$ $-\frac{\sqrt{35}}{84}$ 0 0 0 0 $-\frac{\sqrt{35}}{168}$ | |
| | $-\frac{\sqrt{35}i}{42}$ 0 0 $-\frac{\sqrt{21}}{84}$ 0 0 $-\frac{\sqrt{21}}{168}$ 0 0 $\frac{\sqrt{35}}{84}$ 0 0 $-\frac{\sqrt{35}}{168}$ 0 | |
| | $\frac{\sqrt{35}}{21}$ 0 0 $\frac{\sqrt{21}i}{168}$ 0 $-\frac{\sqrt{21}}{168}$ 0 0 0 $\frac{\sqrt{35}i}{168}$ 0 $\frac{\sqrt{35}}{168}$ 0 0 | |
| | 0 $-\frac{\sqrt{35}}{21}$ $-\frac{\sqrt{21}i}{168}$ 0 $-\frac{\sqrt{21}}{168}$ 0 0 0 $-\frac{\sqrt{35}i}{168}$ 0 $\frac{\sqrt{35}}{168}$ 0 0 0 | |
| | 0 0 0 0 $-\frac{\sqrt{35}}{84}$ 0 0 $\frac{\sqrt{35}i}{168}$ 0 0 $\frac{5\sqrt{21}}{84}$ 0 0 $\frac{5\sqrt{21}i}{168}$ | |
| | 0 0 0 0 0 $\frac{\sqrt{35}}{84}$ $-\frac{\sqrt{35}i}{168}$ 0 0 0 0 $-\frac{5\sqrt{21}}{84}$ $-\frac{5\sqrt{21}i}{168}$ 0 | |
| | 0 0 $\frac{\sqrt{35}}{84}$ 0 0 0 0 $\frac{\sqrt{35}}{168}$ $\frac{5\sqrt{21}}{84}$ 0 0 0 0 $-\frac{5\sqrt{21}}{168}$ | |
| | 0 0 0 $-\frac{\sqrt{35}}{84}$ 0 0 $\frac{\sqrt{35}}{168}$ 0 0 $-\frac{5\sqrt{21}}{84}$ 0 0 $-\frac{5\sqrt{21}}{168}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{35}i}{168}$ 0 $-\frac{\sqrt{35}}{168}$ 0 0 0 $-\frac{5\sqrt{21}i}{168}$ 0 $-\frac{5\sqrt{21}}{168}$ 0 0 | |
| | 0 0 $\frac{\sqrt{35}i}{168}$ 0 $-\frac{\sqrt{35}}{168}$ 0 0 0 $-\frac{5\sqrt{21}i}{168}$ 0 $-\frac{5\sqrt{21}}{168}$ 0 0 0 | |

924 symmetry

 $-\sqrt{3}xy$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------------|-------------------------|---|--------------------------|--------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|---|
| $\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)$ | 0 | 0 | 0 | $-\frac{\sqrt{35}i}{42}$ | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{35}i}{42}$ | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{35}i}{42}$ | $-\frac{\sqrt{21}}{21}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}}{168}$ | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{168}$ | | |
| | $\frac{\sqrt{35}i}{42}$ | 0 | 0 | $\frac{\sqrt{21}}{21}$ | 0 | 0 | $-\frac{\sqrt{21}}{168}$ | 0 | 0 | $\frac{\sqrt{35}}{42}$ | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | | |
| | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | $\frac{\sqrt{21}}{21}$ | 0 | 0 | $-\frac{\sqrt{21}i}{168}$ | 0 | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | $-\frac{\sqrt{35}i}{168}$ | | |
| | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{21}}{21}$ | $\frac{\sqrt{21}i}{168}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{42}$ | $\frac{\sqrt{35}i}{168}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{\sqrt{21}}{168}$ | 0 | $-\frac{\sqrt{21}i}{168}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | $\frac{\sqrt{35}i}{168}$ | $\frac{\sqrt{35}}{21}$ | 0 | | |
| | 0 | 0 | $-\frac{\sqrt{21}}{168}$ | 0 | $\frac{\sqrt{21}i}{168}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | $-\frac{\sqrt{35}i}{168}$ | 0 | 0 | $-\frac{\sqrt{35}}{21}$ | | |
| | 0 | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{21}}{168}$ | | |
| | 0 | 0 | 0 | $\frac{\sqrt{35}}{42}$ | 0 | 0 | $-\frac{\sqrt{35}}{168}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{21}}{168}$ | 0 | |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{35}}{42}$ | 0 | 0 | $\frac{\sqrt{35}i}{168}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{21}i}{168}$ | |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{35}}{42}$ | $-\frac{\sqrt{35}i}{168}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{21}i}{168}$ | 0 | | |
| | 0 | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | $-\frac{\sqrt{35}i}{168}$ | $\frac{\sqrt{35}}{21}$ | 0 | 0 | $-\frac{5\sqrt{21}}{168}$ | 0 | $-\frac{5\sqrt{21}i}{168}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{35}}{168}$ | 0 | $\frac{\sqrt{35}i}{168}$ | 0 | 0 | $-\frac{\sqrt{35}}{21}$ | $-\frac{5\sqrt{21}}{168}$ | 0 | $\frac{5\sqrt{21}i}{168}$ | 0 | 0 | 0 | 0 | |
| 925 | symmetry | $\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|----------------------------------|----------------------------|---------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|---------------------------|---------------------------|----------------------------|-----------------------------|---|
| $\mathbb{T}_4^{(1,0;a)}(A_1, 1)$ | 0 | 0 | 0 | $\frac{\sqrt{231}}{616}$ | 0 | $\frac{\sqrt{231}i}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{385}}{88}$ | 0 | $\frac{\sqrt{385}i}{88}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{231}}{616}$ | 0 | $-\frac{\sqrt{231}i}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{385}}{88}$ | 0 | $-\frac{\sqrt{385}i}{88}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{385}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{231}i}{616}$ | |
| | $\frac{\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{385}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{231}i}{616}$ | 0 | |
| | 0 | $\frac{\sqrt{231}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{385}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{231}}{616}$ | |
| | $-\frac{\sqrt{231}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{385}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{231}}{616}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{3\sqrt{385}i}{616}$ | 0 | $-\frac{3\sqrt{385}}{616}$ | 0 | 0 | 0 | $-\frac{5\sqrt{231}i}{616}$ | 0 | $\frac{5\sqrt{231}}{616}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{3\sqrt{385}i}{616}$ | 0 | $-\frac{3\sqrt{385}}{616}$ | 0 | 0 | 0 | $\frac{5\sqrt{231}i}{616}$ | 0 | $\frac{5\sqrt{231}}{616}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{385}}{88}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{231}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}i}{616}$ | |
| | $-\frac{\sqrt{385}}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{231}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{385}i}{616}$ | 0 | |
| | 0 | $\frac{\sqrt{385}i}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}}{616}$ | |
| | $-\frac{\sqrt{385}i}{88}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}}{616}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{9\sqrt{231}i}{616}$ | 0 | $\frac{9\sqrt{231}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{385}i}{616}$ | 0 | $-\frac{\sqrt{385}}{616}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{9\sqrt{231}i}{616}$ | 0 | $\frac{9\sqrt{231}}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{385}i}{616}$ | 0 | $-\frac{\sqrt{385}}{616}$ | 0 | 0 | 0 | |

926 symmetry

$$\frac{\sqrt{70}yz(3x^2-y^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|----------------------------|---|
| $\mathbb{T}_4^{(1,0;a)}(A_1, 2)$ | 0 | $\frac{\sqrt{22}}{44} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{330}}{880} \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{440} \quad 0 \quad 0 \quad -\frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad \frac{\sqrt{22}i}{44}$ |
| | $\frac{\sqrt{22}}{44}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{330}}{880} \quad -\frac{\sqrt{330}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{22}}{176} \quad -\frac{\sqrt{22}i}{44} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{22}i}{88} \quad -\frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{440} \quad 0 \quad 0 \quad -\frac{3\sqrt{330}}{880} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{22}i}{88} \quad 0 \quad 0 \quad \frac{9\sqrt{22}}{176} \quad -\frac{\sqrt{330}}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{330}}{880}$ |
| | $\frac{3\sqrt{330}}{880}$ | $0 \quad 0 \quad -\frac{3\sqrt{22}i}{88} \quad 0 \quad -\frac{3\sqrt{22}}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}i}{110} \quad 0 \quad 0 \quad 0 \quad 0$ |
| | 0 | $-\frac{3\sqrt{330}}{880} \quad \frac{3\sqrt{22}i}{88} \quad 0 \quad -\frac{3\sqrt{22}}{88} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{110} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{330}i}{440} \quad -\frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{330}}{880} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}}{440}$ |
| | $-\frac{\sqrt{330}i}{440}$ | $0 \quad 0 \quad \frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{330}}{880} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{440} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{440} \quad 0 \quad -\frac{\sqrt{330}i}{110} \quad \frac{9\sqrt{330}}{880} \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{44} \quad 0 \quad -\frac{\sqrt{22}i}{88} \quad -\frac{3\sqrt{22}}{176} \quad 0$ |
| | $-\frac{3\sqrt{22}}{176}$ | $0 \quad 0 \quad -\frac{\sqrt{22}i}{88} \quad 0 \quad \frac{5\sqrt{22}}{88} \quad 0 \quad 0$ |
| | 0 | $\frac{3\sqrt{22}}{176} \quad 0 \quad \frac{\sqrt{22}i}{88} \quad 0 \quad \frac{5\sqrt{22}}{88} \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{22}i}{44} \quad -\frac{3\sqrt{330}}{880} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}}{440} \quad -\frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{44} \quad 0$ |
| | $-\frac{\sqrt{22}i}{44}$ | $0 \quad 0 \quad \frac{3\sqrt{330}}{880} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{440} \quad 0 \quad 0 \quad \frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{44} \quad 0$ |
| 927 | symmetry | $\frac{\sqrt{70}xz(x^2-3y^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|----------------------|---------------------------|--|
| $T_4^{(1,0;a)}(A_2)$ | 0 | $-\frac{\sqrt{22}i}{44} \quad \frac{3\sqrt{330}}{880} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{440} \quad \frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{22}}{44}$ |
| | $\frac{\sqrt{22}i}{44}$ | $0 \quad 0 \quad -\frac{3\sqrt{330}}{880} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{440} \quad 0 \quad 0 \quad -\frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{44} \quad 0$ |
| | $\frac{3\sqrt{330}}{880}$ | $0 \quad 0 \quad \frac{3\sqrt{22}i}{88} \quad 0 \quad \frac{3\sqrt{22}}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad 0 \quad 0$ |
| | 0 | $-\frac{3\sqrt{330}}{880} \quad -\frac{3\sqrt{22}i}{88} \quad 0 \quad \frac{3\sqrt{22}}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad 0 \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{22}}{88} \quad 0 \quad 0 \quad -\frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}i}{440} \quad \frac{3\sqrt{330}}{880} \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{3\sqrt{22}}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{440} \quad 0 \quad -\frac{3\sqrt{330}}{880}$ |
| | 0 | $-\frac{\sqrt{330}}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{9\sqrt{330}}{880} \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{440}$ |
| | $-\frac{\sqrt{330}}{440}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{9\sqrt{330}}{880} \quad -\frac{\sqrt{330}i}{440} \quad 0$ |
| | $\frac{3\sqrt{22}}{176}$ | $0 \quad 0 \quad -\frac{5\sqrt{22}i}{88} \quad 0 \quad \frac{\sqrt{22}}{88} \quad 0 \quad 0$ |
| | 0 | $-\frac{3\sqrt{22}}{176} \quad 0 \quad \frac{5\sqrt{22}i}{88} \quad 0 \quad \frac{\sqrt{22}}{88} \quad 0 \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad 0 \quad -\frac{\sqrt{330}i}{440} \quad -\frac{9\sqrt{330}}{880} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{88} \quad 0 \quad \frac{\sqrt{22}i}{44} \quad -\frac{3\sqrt{22}}{176} \quad 0$ |
| | 0 | $0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad 0 \quad \frac{\sqrt{330}i}{440} \quad 0 \quad 0 \quad \frac{9\sqrt{330}}{880} \quad \frac{\sqrt{22}}{88} \quad 0 \quad -\frac{\sqrt{22}i}{44} \quad 0 \quad 0 \quad \frac{3\sqrt{22}}{176}$ |
| | 0 | $\frac{\sqrt{22}}{44} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{330}}{880} \quad -\frac{\sqrt{330}i}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad \frac{\sqrt{22}i}{44}$ |
| | $\frac{\sqrt{22}}{44}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{330}}{880} \quad -\frac{\sqrt{330}i}{440} \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{22}}{176} \quad -\frac{\sqrt{22}i}{44} \quad 0$ |
| 928 | symmetry | $-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|------------------------------|---|------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|---|
| $\mathbb{T}_{4,0}^{(1,0;a)}(E, 1)$ | 0 | $\frac{\sqrt{154}}{44}$ | 0 | 0 | $\frac{\sqrt{2310}}{6160}$ | 0 | 0 | $-\frac{3\sqrt{2310}i}{3080}$ | 0 | 0 | $\frac{\sqrt{154}}{176}$ | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{154}}{44}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{6160}$ | $\frac{3\sqrt{2310}i}{3080}$ | 0 | 0 | 0 | $-\frac{\sqrt{154}}{176}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{154}i}{616}$ | $-\frac{3\sqrt{154}}{1232}$ | 0 | 0 | $\frac{\sqrt{2310}}{3080}$ | 0 | $-\frac{3\sqrt{2310}i}{1540}$ | $-\frac{9\sqrt{2310}}{6160}$ | 0 | |
| | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{154}i}{616}$ | 0 | 0 | $\frac{3\sqrt{154}}{1232}$ | $\frac{\sqrt{2310}}{3080}$ | 0 | $\frac{3\sqrt{2310}i}{1540}$ | 0 | 0 | $\frac{9\sqrt{2310}}{6160}$ | |
| | $\frac{\sqrt{2310}}{6160}$ | 0 | 0 | $\frac{9\sqrt{154}i}{616}$ | 0 | $-\frac{9\sqrt{154}}{616}$ | 0 | 0 | 0 | $\frac{3\sqrt{2310}i}{1540}$ | 0 | $-\frac{\sqrt{2310}}{770}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{2310}}{6160}$ | $-\frac{9\sqrt{154}i}{616}$ | 0 | $-\frac{9\sqrt{154}}{616}$ | 0 | 0 | 0 | $-\frac{3\sqrt{2310}i}{1540}$ | 0 | $-\frac{\sqrt{2310}}{770}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{2310}i}{3080}$ | $-\frac{3\sqrt{154}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{154}}{154}$ | $-\frac{\sqrt{2310}}{1232}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{2310}}{3080}$ | |
| | $\frac{3\sqrt{2310}i}{3080}$ | 0 | 0 | $\frac{3\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{3\sqrt{154}}{154}$ | 0 | 0 | $\frac{\sqrt{2310}}{1232}$ | 0 | 0 | $\frac{3\sqrt{2310}}{3080}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{2310}}{3080}$ | 0 | $\frac{3\sqrt{2310}i}{1540}$ | $-\frac{\sqrt{2310}}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}}{44}$ | 0 | $\frac{3\sqrt{154}i}{616}$ | $-\frac{\sqrt{154}}{1232}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{2310}}{3080}$ | 0 | $-\frac{3\sqrt{2310}i}{1540}$ | 0 | 0 | $\frac{\sqrt{2310}}{1232}$ | $-\frac{\sqrt{154}}{44}$ | 0 | $-\frac{3\sqrt{154}i}{616}$ | 0 | 0 | $\frac{\sqrt{154}}{1232}$ | |
| | $\frac{\sqrt{154}}{176}$ | 0 | 0 | $-\frac{3\sqrt{2310}i}{1540}$ | 0 | $-\frac{\sqrt{2310}}{770}$ | 0 | 0 | 0 | $\frac{3\sqrt{154}i}{616}$ | 0 | $\frac{\sqrt{154}}{88}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{154}}{176}$ | $\frac{3\sqrt{2310}i}{1540}$ | 0 | $-\frac{\sqrt{2310}}{770}$ | 0 | 0 | 0 | $-\frac{3\sqrt{154}i}{616}$ | 0 | $\frac{\sqrt{154}}{88}$ | 0 | 0 | 0 | |
| | 0 | 0 | $-\frac{9\sqrt{2310}}{6160}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{2310}}{3080}$ | $-\frac{\sqrt{154}}{1232}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{154}}{44}$ | |
| | 0 | 0 | 0 | $\frac{9\sqrt{2310}}{6160}$ | 0 | 0 | $\frac{3\sqrt{2310}}{3080}$ | 0 | 0 | $\frac{\sqrt{154}}{1232}$ | 0 | 0 | $\frac{\sqrt{154}}{44}$ | 0 | |
| 929 | symmetry | $\frac{\sqrt{10xz}(3x^2+3y^2-4z^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|-----------------------------|---|-----------------------------|-----------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|-------------------------------|------------------------------|---|
| $\mathbb{T}_{4,1}^{(1,0;a)}(E, 1)$ | 0 | $-\frac{\sqrt{154}i}{44}$ | $\frac{\sqrt{2310}}{6160}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{2310}}{3080}$ | $-\frac{\sqrt{154}}{176}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{154}i}{44}$ | 0 | 0 | $-\frac{\sqrt{2310}}{6160}$ | 0 | 0 | $\frac{3\sqrt{2310}}{3080}$ | 0 | 0 | $\frac{\sqrt{154}}{176}$ | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{2310}}{6160}$ | 0 | 0 | $\frac{9\sqrt{154}i}{616}$ | 0 | $-\frac{9\sqrt{154}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{770}$ | 0 | $\frac{3\sqrt{2310}}{1540}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{2310}}{6160}$ | $-\frac{9\sqrt{154}i}{616}$ | 0 | $-\frac{9\sqrt{154}}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{2310}i}{770}$ | 0 | $\frac{3\sqrt{2310}}{1540}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{9\sqrt{154}}{616}$ | 0 | 0 | $-\frac{3\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{3\sqrt{2310}}{1540}$ | 0 | $\frac{\sqrt{2310}i}{3080}$ | $\frac{9\sqrt{2310}}{6160}$ | 0 | 0 |
| | 0 | 0 | $-\frac{9\sqrt{154}}{616}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{154}}{1232}$ | $-\frac{3\sqrt{2310}}{1540}$ | 0 | $-\frac{\sqrt{2310}i}{3080}$ | 0 | 0 | $-\frac{9\sqrt{2310}}{6160}$ | 0 |
| | 0 | $\frac{3\sqrt{2310}}{3080}$ | 0 | 0 | $-\frac{3\sqrt{154}}{1232}$ | 0 | 0 | $\frac{3\sqrt{154}i}{154}$ | 0 | 0 | $\frac{\sqrt{2310}}{1232}$ | 0 | 0 | $\frac{3\sqrt{2310}i}{3080}$ | 0 |
| | $\frac{3\sqrt{2310}}{3080}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{154}}{1232}$ | $-\frac{3\sqrt{154}i}{154}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{1232}$ | $-\frac{3\sqrt{2310}i}{3080}$ | 0 | |
| | $-\frac{\sqrt{154}}{176}$ | 0 | 0 | $-\frac{\sqrt{2310}i}{770}$ | 0 | $-\frac{3\sqrt{2310}}{1540}$ | 0 | 0 | 0 | $-\frac{\sqrt{154}i}{88}$ | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{154}}{176}$ | $\frac{\sqrt{2310}i}{770}$ | 0 | $-\frac{3\sqrt{2310}}{1540}$ | 0 | 0 | 0 | $\frac{\sqrt{154}i}{88}$ | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{3\sqrt{2310}}{1540}$ | 0 | $\frac{\sqrt{2310}i}{3080}$ | $\frac{\sqrt{2310}}{1232}$ | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | $\frac{\sqrt{154}i}{44}$ | $-\frac{\sqrt{154}}{1232}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{9\sqrt{2310}}{6160}$ | 0 | 0 | $\frac{3\sqrt{2310}i}{3080}$ | 0 | 0 | $-\frac{\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}i}{44}$ | 0 |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{2310}}{6160}$ | $-\frac{3\sqrt{2310}i}{3080}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{154}}{1232}$ | $\frac{\sqrt{154}i}{44}$ | 0 | 0 |
| 930 | symmetry | $\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{T}_{4,0}^{(1,0;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{165}}{440}$ 0 $-\frac{\sqrt{165}i}{440}$ 0 0 0 $-\frac{\sqrt{11}}{88}$ 0 $\frac{\sqrt{11}i}{88}$ $-\frac{\sqrt{11}}{11}$ 0 | |
| | 0 0 $-\frac{\sqrt{165}}{440}$ 0 $\frac{\sqrt{165}i}{440}$ 0 0 0 $-\frac{\sqrt{11}}{88}$ 0 $-\frac{\sqrt{11}i}{88}$ 0 0 $\frac{\sqrt{11}}{11}$ | |
| | 0 $-\frac{\sqrt{165}}{440}$ 0 0 0 0 0 $\frac{3\sqrt{11}i}{88}$ 0 0 $\frac{\sqrt{165}}{55}$ 0 0 $\frac{\sqrt{165}i}{440}$ | |
| | $-\frac{\sqrt{165}}{440}$ 0 0 0 0 0 $-\frac{3\sqrt{11}i}{88}$ 0 0 0 0 $-\frac{\sqrt{165}}{55}$ $-\frac{\sqrt{165}i}{440}$ 0 | |
| | 0 $-\frac{\sqrt{165}i}{440}$ 0 0 0 0 0 $\frac{3\sqrt{11}}{88}$ $\frac{\sqrt{165}}{55}$ 0 0 0 0 $-\frac{\sqrt{165}}{440}$ | |
| | $\frac{\sqrt{165}i}{440}$ 0 0 0 0 0 $\frac{3\sqrt{11}}{88}$ 0 0 $-\frac{\sqrt{165}}{55}$ 0 0 $-\frac{\sqrt{165}}{440}$ 0 | |
| | 0 0 0 $\frac{3\sqrt{11}i}{88}$ 0 $\frac{3\sqrt{11}}{88}$ 0 0 0 $-\frac{3\sqrt{165}i}{440}$ 0 $\frac{3\sqrt{165}}{440}$ 0 0 | |
| | 0 0 $-\frac{3\sqrt{11}i}{88}$ 0 $\frac{3\sqrt{11}}{88}$ 0 0 0 $\frac{3\sqrt{165}i}{440}$ 0 $\frac{3\sqrt{165}}{440}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{11}}{88}$ 0 0 $\frac{\sqrt{165}}{55}$ 0 0 $-\frac{3\sqrt{165}i}{440}$ 0 0 0 0 0 $\frac{\sqrt{11}i}{88}$ | |
| | $-\frac{\sqrt{11}}{88}$ 0 0 0 0 $-\frac{\sqrt{165}}{55}$ $\frac{3\sqrt{165}i}{440}$ 0 0 0 0 0 $-\frac{\sqrt{11}i}{88}$ 0 | |
| | 0 $\frac{\sqrt{11}i}{88}$ $\frac{\sqrt{165}}{55}$ 0 0 0 0 $\frac{3\sqrt{165}}{440}$ 0 0 0 0 0 $\frac{\sqrt{11}}{88}$ | |
| | $-\frac{\sqrt{11}i}{88}$ 0 0 $-\frac{\sqrt{165}}{55}$ 0 0 $\frac{3\sqrt{165}}{440}$ 0 0 0 0 0 $\frac{\sqrt{11}}{88}$ 0 | |
| | $-\frac{\sqrt{11}}{11}$ 0 0 $\frac{\sqrt{165}i}{440}$ 0 $-\frac{\sqrt{165}}{440}$ 0 0 0 $\frac{\sqrt{11}i}{88}$ 0 $\frac{\sqrt{11}}{88}$ 0 0 | |
| | 0 $\frac{\sqrt{11}}{11}$ $-\frac{\sqrt{165}i}{440}$ 0 $-\frac{\sqrt{165}}{440}$ 0 0 0 $-\frac{\sqrt{11}i}{88}$ 0 $\frac{\sqrt{11}}{88}$ 0 0 0 | |

931 symmetry

 $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|---|--------|
| $\mathbb{T}_{4,1}^{(1,0;a)}(E, 2)$ | $-\frac{\sqrt{11}}{11} \quad 0 \quad 0 \quad \frac{\sqrt{165}i}{440} \quad 0 \quad -\frac{\sqrt{165}}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{11}i}{88} \quad 0 \quad \frac{\sqrt{11}}{88} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{11}}{11} \quad -\frac{\sqrt{165}i}{440} \quad 0 \quad -\frac{\sqrt{165}}{440} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{11}i}{88} \quad 0 \quad \frac{\sqrt{11}}{88} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{165}i}{440} \quad \frac{3\sqrt{11}}{44} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{11}}{88} \quad \frac{\sqrt{165}}{220} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{165}}{440}$ | |
| | $-\frac{\sqrt{165}i}{440} \quad 0 \quad 0 \quad -\frac{3\sqrt{11}}{44} \quad 0 \quad 0 \quad \frac{3\sqrt{11}}{88} \quad 0 \quad 0 \quad -\frac{\sqrt{165}}{220} \quad 0 \quad 0 \quad \frac{\sqrt{165}}{440} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{165}}{440} \quad 0 \quad 0 \quad \frac{3\sqrt{11}}{44} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{11}i}{88} \quad 0 \quad 0 \quad -\frac{\sqrt{165}}{220} \quad 0 \quad 0 \quad \frac{\sqrt{165}i}{440}$ | |
| | $-\frac{\sqrt{165}}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{11}}{44} \quad \frac{3\sqrt{11}i}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{165}}{220} \quad -\frac{\sqrt{165}i}{440} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{11}}{88} \quad 0 \quad -\frac{3\sqrt{11}i}{88} \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{165}}{440} \quad 0 \quad -\frac{3\sqrt{165}i}{440} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{3\sqrt{11}}{88} \quad 0 \quad \frac{3\sqrt{11}i}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{165}}{440} \quad 0 \quad \frac{3\sqrt{165}i}{440} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{11}i}{88} \quad \frac{\sqrt{165}}{220} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{165}}{440} \quad -\frac{3\sqrt{11}}{44} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{11}}{88}$ | |
| | $-\frac{\sqrt{11}i}{88} \quad 0 \quad 0 \quad -\frac{\sqrt{165}}{220} \quad 0 \quad 0 \quad -\frac{3\sqrt{165}}{440} \quad 0 \quad 0 \quad \frac{3\sqrt{11}}{44} \quad 0 \quad 0 \quad \frac{\sqrt{11}}{88} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{11}}{88} \quad 0 \quad 0 \quad -\frac{\sqrt{165}}{220} \quad 0 \quad 0 \quad -\frac{3\sqrt{165}i}{440} \quad 0 \quad 0 \quad -\frac{3\sqrt{11}}{44} \quad 0 \quad 0 \quad -\frac{\sqrt{11}i}{88}$ | |
| | $\frac{\sqrt{11}}{88} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{165}}{220} \quad \frac{3\sqrt{165}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{11}}{44} \quad \frac{\sqrt{11}i}{88} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{165}}{440} \quad 0 \quad \frac{\sqrt{165}i}{440} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{11}}{88} \quad 0 \quad -\frac{\sqrt{11}i}{88} \quad \frac{\sqrt{11}}{11} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{165}}{440} \quad 0 \quad -\frac{\sqrt{165}i}{440} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{11}}{88} \quad 0 \quad \frac{\sqrt{11}i}{88} \quad 0 \quad 0 \quad -\frac{\sqrt{11}}{11}$ | |

932 symmetry

$$-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|------------------------------|---|
| $\mathbb{T}_{4,0}^{(1,0;a)}(E, 3)$ | 0 | 0 0 0 $-\frac{\sqrt{1155}}{1540}$ 0 $\frac{\sqrt{1155}i}{1540}$ $\frac{\sqrt{1155}}{770}$ 0 0 $-\frac{\sqrt{77}}{44}$ 0 $-\frac{\sqrt{77}i}{44}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{1155}}{1540}$ 0 $-\frac{\sqrt{1155}i}{1540}$ 0 0 $-\frac{\sqrt{1155}}{770}$ $-\frac{\sqrt{77}}{44}$ 0 $\frac{\sqrt{77}i}{44}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{1155}}{1540}$ 0 0 $-\frac{3\sqrt{77}}{154}$ 0 0 $-\frac{3\sqrt{77}i}{308}$ 0 0 $\frac{\sqrt{1155}}{385}$ 0 0 $\frac{\sqrt{1155}i}{308}$ |
| | $-\frac{\sqrt{1155}}{1540}$ | 0 0 0 0 $\frac{3\sqrt{77}}{154}$ $\frac{3\sqrt{77}i}{308}$ 0 0 0 0 $-\frac{\sqrt{1155}}{385}$ $-\frac{\sqrt{1155}i}{308}$ 0 |
| | 0 | $\frac{\sqrt{1155}i}{1540}$ $-\frac{3\sqrt{77}}{154}$ 0 0 0 0 $\frac{3\sqrt{77}}{308}$ $-\frac{\sqrt{1155}}{385}$ 0 0 0 0 $\frac{\sqrt{1155}}{308}$ |
| | $-\frac{\sqrt{1155}i}{1540}$ | 0 0 $\frac{3\sqrt{77}}{154}$ 0 0 $\frac{3\sqrt{77}}{308}$ 0 0 0 $\frac{\sqrt{1155}}{385}$ 0 0 $\frac{\sqrt{1155}}{308}$ 0 |
| | $\frac{\sqrt{1155}}{770}$ | 0 0 $-\frac{3\sqrt{77}i}{308}$ 0 $\frac{3\sqrt{77}}{308}$ 0 0 0 $\frac{9\sqrt{1155}i}{1540}$ 0 $\frac{9\sqrt{1155}}{1540}$ 0 0 |
| | 0 | $-\frac{\sqrt{1155}}{770}$ $\frac{3\sqrt{77}i}{308}$ 0 $\frac{3\sqrt{77}}{308}$ 0 0 0 $-\frac{9\sqrt{1155}i}{1540}$ 0 $\frac{9\sqrt{1155}}{1540}$ 0 0 |
| | 0 | $-\frac{\sqrt{77}}{44}$ 0 0 $-\frac{\sqrt{1155}}{385}$ 0 0 $\frac{9\sqrt{1155}i}{1540}$ 0 0 $-\frac{\sqrt{77}}{154}$ 0 0 $-\frac{\sqrt{77}i}{308}$ |
| | $-\frac{\sqrt{77}}{44}$ | 0 0 0 0 $\frac{\sqrt{1155}}{385}$ $-\frac{9\sqrt{1155}i}{1540}$ 0 0 0 0 $\frac{\sqrt{77}}{154}$ $\frac{\sqrt{77}i}{308}$ 0 |
| | 0 | $-\frac{\sqrt{77}i}{44}$ $\frac{\sqrt{1155}}{385}$ 0 0 0 0 $\frac{9\sqrt{1155}}{1540}$ $-\frac{\sqrt{77}}{154}$ 0 0 0 0 $\frac{\sqrt{77}}{308}$ |
| | $\frac{\sqrt{77}i}{44}$ | 0 0 $-\frac{\sqrt{1155}}{385}$ 0 0 $\frac{9\sqrt{1155}}{1540}$ 0 0 $\frac{\sqrt{77}}{154}$ 0 0 $\frac{\sqrt{77}}{308}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{1155}i}{308}$ 0 $\frac{\sqrt{1155}}{308}$ 0 0 0 $-\frac{\sqrt{77}i}{308}$ 0 $\frac{\sqrt{77}}{308}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{1155}i}{308}$ 0 $\frac{\sqrt{1155}}{308}$ 0 0 0 $\frac{\sqrt{77}i}{308}$ 0 $\frac{\sqrt{77}}{308}$ 0 0 |

933 symmetry

$$\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{T}_{4,1}^{(1,0;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{1155}i}{616}$ 0 $\frac{\sqrt{1155}}{616}$ 0 0 0 $-\frac{\sqrt{77}i}{88}$ 0 $\frac{\sqrt{77}}{88}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{1155}i}{616}$ 0 $\frac{\sqrt{1155}}{616}$ 0 0 0 $\frac{\sqrt{77}i}{88}$ 0 $\frac{\sqrt{77}}{88}$ 0 0 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{1155}i}{616}$ $\frac{3\sqrt{77}}{308}$ 0 0 0 0 $-\frac{15\sqrt{77}}{616}$ $-\frac{\sqrt{1155}}{1540}$ 0 0 0 0 $-\frac{17\sqrt{1155}}{3080}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{1155}i}{616}$ 0 0 $-\frac{3\sqrt{77}}{308}$ 0 0 $-\frac{15\sqrt{77}}{616}$ 0 0 $\frac{\sqrt{1155}}{1540}$ 0 0 $-\frac{17\sqrt{1155}}{3080}$ 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{1155}}{616}$ 0 0 $-\frac{3\sqrt{77}}{308}$ 0 0 $-\frac{15\sqrt{77}i}{616}$ 0 0 $-\frac{\sqrt{1155}}{1540}$ 0 0 $\frac{17\sqrt{1155}i}{3080}$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{1155}}{616}$ 0 0 0 0 $\frac{3\sqrt{77}}{308}$ $\frac{15\sqrt{77}i}{616}$ 0 0 0 0 $\frac{\sqrt{1155}}{1540}$ $-\frac{17\sqrt{1155}i}{3080}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{15\sqrt{77}}{616}$ 0 $-\frac{15\sqrt{77}i}{616}$ 0 0 0 $\frac{3\sqrt{1155}}{3080}$ 0 $-\frac{3\sqrt{1155}i}{3080}$ $\frac{\sqrt{1155}}{770}$ 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{15\sqrt{77}}{616}$ 0 $\frac{15\sqrt{77}i}{616}$ 0 0 0 $\frac{3\sqrt{1155}}{3080}$ 0 $\frac{3\sqrt{1155}i}{3080}$ 0 0 $-\frac{\sqrt{1155}}{770}$ | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{77}i}{88}$ $-\frac{\sqrt{1155}}{1540}$ 0 0 0 0 $\frac{3\sqrt{1155}}{3080}$ $-\frac{\sqrt{77}}{44}$ 0 0 0 0 $-\frac{5\sqrt{77}}{616}$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{77}i}{88}$ 0 0 $\frac{\sqrt{1155}}{1540}$ 0 0 $\frac{3\sqrt{1155}}{3080}$ 0 0 $\frac{\sqrt{77}}{44}$ 0 0 $-\frac{5\sqrt{77}}{616}$ 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{77}}{88}$ 0 0 $-\frac{\sqrt{1155}}{1540}$ 0 0 $-\frac{3\sqrt{1155}i}{3080}$ 0 0 $\frac{\sqrt{77}}{44}$ 0 0 $-\frac{5\sqrt{77}i}{616}$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{77}}{88}$ 0 0 0 0 $\frac{\sqrt{1155}}{1540}$ $\frac{3\sqrt{1155}i}{3080}$ 0 0 0 0 $-\frac{\sqrt{77}}{44}$ $\frac{5\sqrt{77}i}{616}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{17\sqrt{1155}}{3080}$ 0 $\frac{17\sqrt{1155}i}{3080}$ $\frac{\sqrt{1155}}{770}$ 0 0 $-\frac{5\sqrt{77}}{616}$ 0 $-\frac{5\sqrt{77}i}{616}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{17\sqrt{1155}}{3080}$ 0 $-\frac{17\sqrt{1155}i}{3080}$ 0 0 $-\frac{\sqrt{1155}}{770}$ $-\frac{5\sqrt{77}}{616}$ 0 $\frac{5\sqrt{77}i}{616}$ 0 0 0 | | | | | | | | | | | | | | |
| 934 | symmetry | $-\frac{5x^6}{16} - \frac{15x^4y^2}{16} + \frac{45x^4z^2}{8} - \frac{15x^2y^4}{16} + \frac{45x^2y^2z^2}{4} - \frac{15x^2z^4}{2} - \frac{5y^6}{16} + \frac{45y^4z^2}{8} - \frac{15y^2z^4}{2} + z^6$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|--|---|
| $\mathbb{T}_6^{(1,0;a)}(A_1, 1)$ | 0 0 0 $\frac{\sqrt{165}}{264}$ 0 $\frac{\sqrt{165}i}{264}$ 0 0 0 $\frac{3\sqrt{11}}{88}$ 0 $-\frac{3\sqrt{11}i}{88}$ 0 0 | |
| | 0 0 $\frac{\sqrt{165}}{264}$ 0 $-\frac{\sqrt{165}i}{264}$ 0 0 0 $\frac{3\sqrt{11}}{88}$ 0 $\frac{3\sqrt{11}i}{88}$ 0 0 0 | |
| | 0 $\frac{\sqrt{165}}{264}$ 0 0 0 0 0 $-\frac{5\sqrt{11}i}{88}$ 0 0 0 0 0 $\frac{\sqrt{165}i}{132}$ | |
| | $\frac{\sqrt{165}}{264}$ 0 0 0 0 0 $\frac{5\sqrt{11}i}{88}$ 0 0 0 0 0 $-\frac{\sqrt{165}i}{132}$ 0 | |
| | 0 $\frac{\sqrt{165}i}{264}$ 0 0 0 0 0 $-\frac{5\sqrt{11}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{165}}{132}$ | |
| | $-\frac{\sqrt{165}i}{264}$ 0 0 0 0 0 $-\frac{5\sqrt{11}}{88}$ 0 0 0 0 0 $-\frac{\sqrt{165}}{132}$ 0 | |
| | 0 0 0 $-\frac{5\sqrt{11}i}{88}$ 0 $-\frac{5\sqrt{11}}{88}$ 0 0 0 $-\frac{5\sqrt{165}i}{264}$ 0 $\frac{5\sqrt{165}}{264}$ 0 0 | |
| | 0 0 $\frac{5\sqrt{11}i}{88}$ 0 $-\frac{5\sqrt{11}}{88}$ 0 0 0 $\frac{5\sqrt{165}i}{264}$ 0 $\frac{5\sqrt{165}}{264}$ 0 0 0 | |
| | 0 $\frac{3\sqrt{11}}{88}$ 0 0 0 0 0 $-\frac{5\sqrt{165}i}{264}$ 0 0 0 0 0 $\frac{\sqrt{11}i}{44}$ | |
| | $\frac{3\sqrt{11}}{88}$ 0 0 0 0 0 $\frac{5\sqrt{165}i}{264}$ 0 0 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 | |
| | 0 $-\frac{3\sqrt{11}i}{88}$ 0 0 0 0 0 $\frac{5\sqrt{165}}{264}$ 0 0 0 0 0 $\frac{\sqrt{11}}{44}$ | |
| | $\frac{3\sqrt{11}i}{88}$ 0 0 0 0 0 $\frac{5\sqrt{165}}{264}$ 0 0 0 0 0 $\frac{\sqrt{11}}{44}$ 0 | |
| | 0 0 0 $\frac{\sqrt{165}i}{132}$ 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 $\frac{\sqrt{11}}{44}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{165}i}{132}$ 0 $-\frac{\sqrt{165}}{132}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $\frac{\sqrt{11}}{44}$ 0 0 0 | |
| 935 | symmetry | $\frac{\sqrt{462}(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|--------------------------|--|
| $\mathbb{T}_6^{(1,0;a)}(A_1, 2)$ | 0 | $0 \ 0 \ 0 \ \frac{\sqrt{70}}{112} \ 0 \ -\frac{\sqrt{70}i}{112} \ 0 \ 0 \ 0 \ -\frac{\sqrt{42}}{112} \ 0 \ -\frac{\sqrt{42}i}{112} \ 0 \ 0$ |
| | 0 | $0 \ 0 \ \frac{\sqrt{70}}{112} \ 0 \ \frac{\sqrt{70}i}{112} \ 0 \ 0 \ 0 \ -\frac{\sqrt{42}}{112} \ 0 \ \frac{\sqrt{42}i}{112} \ 0 \ 0 \ 0$ |
| | 0 | $\frac{\sqrt{70}}{112} \ 0 \ 0 \ 0 \ \frac{5\sqrt{42}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{70}}{112} \ 0 \ 0 \ -\frac{\sqrt{70}i}{112}$ |
| | $\frac{\sqrt{70}}{112}$ | $0 \ 0 \ 0 \ 0 \ 0 \ -\frac{5\sqrt{42}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{70}}{112} \ \frac{\sqrt{70}i}{112} \ 0$ |
| | 0 | $- \frac{\sqrt{70}i}{112} \ \frac{5\sqrt{42}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{70}}{112} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{70}}{112}$ |
| | $\frac{\sqrt{70}i}{112}$ | $0 \ 0 \ 0 \ -\frac{5\sqrt{42}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{70}}{112} \ 0 \ 0 \ -\frac{\sqrt{70}}{112} \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ |
| | 0 | $- \frac{\sqrt{42}}{112} \ 0 \ 0 \ -\frac{3\sqrt{70}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{42}}{112} \ 0 \ 0 \ \frac{\sqrt{42}i}{112}$ |
| | $-\frac{\sqrt{42}}{112}$ | $0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{70}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{42}}{112} \ -\frac{\sqrt{42}i}{112} \ 0$ |
| | 0 | $- \frac{\sqrt{42}i}{112} \ \frac{3\sqrt{70}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ -\frac{3\sqrt{42}}{112} \ 0 \ 0 \ 0 \ 0 \ -\frac{\sqrt{42}}{112}$ |
| | $\frac{\sqrt{42}i}{112}$ | $0 \ 0 \ 0 \ -\frac{3\sqrt{70}}{112} \ 0 \ 0 \ 0 \ 0 \ 0 \ \frac{3\sqrt{42}}{112} \ 0 \ 0 \ -\frac{\sqrt{42}}{112} \ 0$ |
| | 0 | $0 \ 0 \ 0 \ -\frac{\sqrt{70}i}{112} \ 0 \ -\frac{\sqrt{70}}{112} \ 0 \ 0 \ 0 \ \frac{\sqrt{42}i}{112} \ 0 \ -\frac{\sqrt{42}}{112} \ 0 \ 0$ |
| | 0 | $0 \ 0 \ \frac{\sqrt{70}i}{112} \ 0 \ -\frac{\sqrt{70}}{112} \ 0 \ 0 \ 0 \ -\frac{\sqrt{42}i}{112} \ 0 \ -\frac{\sqrt{42}}{112} \ 0 \ 0 \ 0$ |

936 symmetry

$$-\frac{\sqrt{210}yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{16}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|----------------------------------|------------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|----------------------------|----------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|---|--|
| $\mathbb{T}_6^{(1,0;a)}(A_1, 3)$ | 0 | $\frac{\sqrt{2310}}{308}$ | 0 | 0 | $\frac{9\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}i}{77}$ | 0 | 0 | $-\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | $\frac{\sqrt{2310}i}{308}$ | | |
| | $\frac{\sqrt{2310}}{308}$ | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{154}}{1232}$ | $\frac{\sqrt{154}i}{77}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{2310}}{1232}$ | $-\frac{\sqrt{2310}i}{308}$ | 0 | | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{2464}$ | $\frac{\sqrt{2310}}{616}$ | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | $\frac{3\sqrt{154}i}{224}$ | $-\frac{9\sqrt{154}}{1232}$ | 0 | | |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{2310}i}{2464}$ | 0 | 0 | $-\frac{\sqrt{2310}}{616}$ | $-\frac{3\sqrt{154}}{616}$ | 0 | $-\frac{3\sqrt{154}i}{224}$ | 0 | 0 | $\frac{9\sqrt{154}}{1232}$ | | |
| | $\frac{9\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{\sqrt{2310}i}{2464}$ | 0 | $\frac{5\sqrt{2310}}{1232}$ | 0 | 0 | 0 | $\frac{\sqrt{154}i}{352}$ | 0 | $-\frac{\sqrt{154}}{112}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{9\sqrt{154}}{1232}$ | $\frac{\sqrt{2310}i}{2464}$ | 0 | $\frac{5\sqrt{2310}}{1232}$ | 0 | 0 | 0 | $-\frac{\sqrt{154}i}{352}$ | 0 | $-\frac{\sqrt{154}}{112}$ | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{154}i}{77}$ | $\frac{\sqrt{2310}}{616}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{154}}{77}$ | | |
| | $\frac{\sqrt{154}i}{77}$ | 0 | 0 | $-\frac{\sqrt{2310}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{154}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{154}}{77}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | $\frac{\sqrt{154}i}{352}$ | $-\frac{3\sqrt{154}}{616}$ | 0 | 0 | $-\frac{\sqrt{2310}}{308}$ | 0 | $\frac{\sqrt{2310}i}{352}$ | $-\frac{3\sqrt{2310}}{1232}$ | 0 | | |
| | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | 0 | $-\frac{\sqrt{154}i}{352}$ | 0 | 0 | $\frac{3\sqrt{154}}{616}$ | $-\frac{\sqrt{2310}}{308}$ | 0 | $-\frac{\sqrt{2310}i}{352}$ | 0 | 0 | $\frac{3\sqrt{2310}}{1232}$ | | |
| | $-\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | $\frac{3\sqrt{154}i}{224}$ | 0 | $-\frac{\sqrt{154}}{112}$ | 0 | 0 | 0 | $\frac{\sqrt{2310}i}{352}$ | 0 | $-\frac{\sqrt{2310}}{1232}$ | 0 | 0 | 0 | |
| | 0 | $\frac{3\sqrt{2310}}{1232}$ | $-\frac{3\sqrt{154}i}{224}$ | 0 | $-\frac{\sqrt{154}}{112}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{352}$ | 0 | $-\frac{\sqrt{2310}}{1232}$ | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{2310}i}{308}$ | $-\frac{9\sqrt{154}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{154}}{77}$ | $-\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{308}$ | | |
| | $-\frac{\sqrt{2310}i}{308}$ | 0 | 0 | $\frac{9\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}}{77}$ | 0 | 0 | $\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{308}$ | 0 | |

$$\frac{\sqrt{462}xy(x^2 - 3y^2)(3x^2 - y^2)}{16}$$

937 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|---------------------------|--|
| $\mathbb{T}_6^{(1,0;a)}(A_2, 1)$ | 0 | 0 0 0 $-\frac{\sqrt{70}i}{112}$ 0 $-\frac{\sqrt{70}}{112}$ 0 0 0 $\frac{\sqrt{42}i}{112}$ 0 $-\frac{\sqrt{42}}{112}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{70}i}{112}$ 0 $-\frac{\sqrt{70}}{112}$ 0 0 0 $-\frac{\sqrt{42}i}{112}$ 0 $-\frac{\sqrt{42}}{112}$ 0 0 0 |
| | 0 | $-\frac{\sqrt{70}i}{112}$ $\frac{5\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{3\sqrt{70}}{112}$ 0 0 0 0 $-\frac{\sqrt{70}}{112}$ |
| | $\frac{\sqrt{70}i}{112}$ | 0 0 $-\frac{5\sqrt{42}}{112}$ 0 0 0 0 0 $\frac{3\sqrt{70}}{112}$ 0 0 $-\frac{\sqrt{70}}{112}$ 0 |
| | 0 | $-\frac{\sqrt{70}}{112}$ 0 0 $-\frac{5\sqrt{42}}{112}$ 0 0 0 0 0 $-\frac{3\sqrt{70}}{112}$ 0 0 $\frac{\sqrt{70}i}{112}$ |
| | $-\frac{\sqrt{70}}{112}$ | 0 0 0 0 0 $\frac{5\sqrt{42}}{112}$ 0 0 0 0 0 $\frac{3\sqrt{70}}{112}$ $-\frac{\sqrt{70}i}{112}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{42}i}{112}$ $-\frac{3\sqrt{70}}{112}$ 0 0 0 0 0 $\frac{3\sqrt{42}}{112}$ 0 0 0 0 $\frac{\sqrt{42}}{112}$ |
| | $-\frac{\sqrt{42}i}{112}$ | 0 0 $\frac{3\sqrt{70}}{112}$ 0 0 0 0 0 $-\frac{3\sqrt{42}}{112}$ 0 0 $\frac{\sqrt{42}}{112}$ 0 |
| | 0 | $-\frac{\sqrt{42}}{112}$ 0 0 $-\frac{3\sqrt{70}}{112}$ 0 0 0 0 0 $-\frac{3\sqrt{42}}{112}$ 0 0 $\frac{\sqrt{42}i}{112}$ |
| | $-\frac{\sqrt{42}}{112}$ | 0 0 0 0 0 $\frac{3\sqrt{70}}{112}$ 0 0 0 0 0 $\frac{3\sqrt{42}}{112}$ $-\frac{\sqrt{42}i}{112}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{70}}{112}$ 0 $\frac{\sqrt{70}i}{112}$ 0 0 0 $\frac{\sqrt{42}}{112}$ 0 $\frac{\sqrt{42}i}{112}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{70}}{112}$ 0 $-\frac{\sqrt{70}i}{112}$ 0 0 0 $\frac{\sqrt{42}}{112}$ 0 $-\frac{\sqrt{42}i}{112}$ 0 0 0 |

938 symmetry

$$-\frac{\sqrt{210}xz(x^2 - 3y^2)(3x^2 + 3y^2 - 8z^2)}{16}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|----------------------------------|-----------------------------|------------------------------|------------------------------|-------------------------------|----------------------------|-----------------------------|---------------------------|----------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|--|
| $\mathbb{T}_6^{(1,0;a)}(A_2, 2)$ | 0 | $-\frac{\sqrt{2310}i}{308}$ | $\frac{9\sqrt{154}}{1232}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{154}}{77}$ | $\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2310}}{308}$ | |
| | $\frac{\sqrt{2310}i}{308}$ | 0 | 0 | $-\frac{9\sqrt{154}}{1232}$ | 0 | 0 | $\frac{\sqrt{154}}{77}$ | 0 | 0 | $-\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | $\frac{\sqrt{2310}}{308}$ | 0 | |
| | $\frac{9\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{5\sqrt{2310}i}{1232}$ | 0 | $\frac{\sqrt{2310}}{2464}$ | 0 | 0 | 0 | $-\frac{\sqrt{154}i}{112}$ | 0 | $\frac{\sqrt{154}}{352}$ | 0 | 0 | |
| | 0 | $-\frac{9\sqrt{154}}{1232}$ | $\frac{5\sqrt{2310}i}{1232}$ | 0 | $\frac{\sqrt{2310}}{2464}$ | 0 | 0 | $\frac{\sqrt{154}i}{112}$ | 0 | $\frac{\sqrt{154}}{352}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{2310}}{2464}$ | 0 | 0 | $\frac{\sqrt{2310}}{616}$ | 0 | 0 | $\frac{3\sqrt{154}}{224}$ | 0 | $-\frac{3\sqrt{154}i}{616}$ | $\frac{9\sqrt{154}}{1232}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{2310}}{2464}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{616}$ | $\frac{3\sqrt{154}}{224}$ | 0 | $\frac{3\sqrt{154}i}{616}$ | 0 | 0 | $-\frac{9\sqrt{154}}{1232}$ | |
| | 0 | $\frac{\sqrt{154}}{77}$ | 0 | 0 | $\frac{\sqrt{2310}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{154}}{616}$ | 0 | 0 | $-\frac{\sqrt{154}i}{77}$ | |
| | $\frac{\sqrt{154}}{77}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | $\frac{\sqrt{154}i}{77}$ | 0 | 0 | |
| | $\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}i}{112}$ | 0 | $\frac{3\sqrt{154}}{224}$ | 0 | 0 | 0 | $\frac{\sqrt{2310}i}{1232}$ | 0 | $-\frac{\sqrt{2310}}{352}$ | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{2310}}{1232}$ | $\frac{\sqrt{154}i}{112}$ | 0 | $\frac{3\sqrt{154}}{224}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}i}{1232}$ | 0 | $-\frac{\sqrt{2310}}{352}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{154}}{352}$ | 0 | $-\frac{3\sqrt{154}i}{616}$ | $\frac{3\sqrt{154}}{616}$ | 0 | 0 | $-\frac{\sqrt{2310}}{352}$ | 0 | $\frac{\sqrt{2310}i}{308}$ | $-\frac{3\sqrt{2310}}{1232}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{154}}{352}$ | 0 | $\frac{3\sqrt{154}i}{616}$ | 0 | 0 | $-\frac{3\sqrt{154}}{616}$ | $-\frac{\sqrt{2310}}{352}$ | 0 | $-\frac{\sqrt{2310}i}{308}$ | 0 | 0 | $\frac{3\sqrt{2310}}{1232}$ | |
| | 0 | $\frac{\sqrt{2310}}{308}$ | 0 | 0 | $\frac{9\sqrt{154}}{1232}$ | 0 | 0 | $-\frac{\sqrt{154}i}{77}$ | 0 | 0 | $-\frac{3\sqrt{2310}}{1232}$ | 0 | 0 | $\frac{\sqrt{2310}i}{308}$ | |
| | $\frac{\sqrt{2310}}{308}$ | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{154}}{1232}$ | $\frac{\sqrt{154}i}{77}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{2310}}{1232}$ | $-\frac{\sqrt{2310}i}{308}$ | 0 | |

939 symmetry

$$\frac{3\sqrt{154}yz(5x^4 - 10x^2y^2 + y^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|---------------------------|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|---|---------------------------|----------------------------|----------------------------|----------------------------|---------------------------|---------------------------|----------------------------|--|
| $\mathbb{T}_{6,0}^{(1,0;a)}(E, 1)$ | 0 | $\frac{\sqrt{14}}{28}$ | 0 | 0 | $\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | $-\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}}{112}$ | $\frac{\sqrt{14}i}{28}$ | 0 | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}i}{224}$ | 0 | 0 | 0 | $\frac{\sqrt{210}}{168}$ | 0 | $-\frac{\sqrt{210}i}{96}$ | $\frac{5\sqrt{210}}{336}$ | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}i}{224}$ | 0 | 0 | 0 | $\frac{\sqrt{210}i}{168}$ | 0 | $\frac{\sqrt{210}i}{96}$ | 0 | 0 | $-\frac{5\sqrt{210}}{336}$ | |
| | $\frac{5\sqrt{210}}{336}$ | 0 | 0 | $-\frac{5\sqrt{14}i}{224}$ | 0 | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | 0 | $-\frac{\sqrt{210}i}{672}$ | 0 | $\frac{\sqrt{210}}{336}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{210}}{336}$ | $\frac{5\sqrt{14}i}{224}$ | 0 | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | 0 | $\frac{\sqrt{210}i}{672}$ | 0 | $\frac{\sqrt{210}}{336}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{210}}{168}$ | 0 | $-\frac{\sqrt{210}i}{672}$ | 0 | 0 | 0 | $-\frac{\sqrt{14}}{28}$ | 0 | $\frac{3\sqrt{14}i}{224}$ | $-\frac{5\sqrt{14}}{112}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{210}}{168}$ | 0 | $\frac{\sqrt{210}i}{672}$ | 0 | 0 | 0 | $-\frac{\sqrt{14}}{28}$ | 0 | $-\frac{3\sqrt{14}i}{224}$ | 0 | 0 | $\frac{5\sqrt{14}}{112}$ | |
| | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | $-\frac{\sqrt{210}i}{96}$ | 0 | $\frac{\sqrt{210}}{336}$ | 0 | 0 | 0 | $\frac{3\sqrt{14}i}{224}$ | 0 | $-\frac{\sqrt{14}}{112}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{14}}{112}$ | $\frac{\sqrt{210}i}{96}$ | 0 | $\frac{\sqrt{210}}{336}$ | 0 | 0 | 0 | $-\frac{3\sqrt{14}i}{224}$ | 0 | $-\frac{\sqrt{14}}{112}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{14}i}{28}$ | $\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}}{112}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{14}}{28}$ | | |
| | $\frac{\sqrt{14}i}{28}$ | 0 | 0 | $-\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | 0 | $-\frac{\sqrt{14}}{28}$ | 0 | |

$$\frac{3\sqrt{154}xz(x^4 - 10x^2y^2 + 5y^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|----------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---|--------------------------|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|---------------------------|--|
| $\mathbb{T}_{6,1}^{(1,0;a)}(E, 1)$ | 0 | $\frac{\sqrt{14}i}{28}$ | $-\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{14}}{28}$ | |
| | $-\frac{\sqrt{14}i}{28}$ | 0 | 0 | $\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}}{112}$ | 0 | 0 | $\frac{\sqrt{14}}{28}$ | 0 | 0 | |
| | $-\frac{5\sqrt{210}}{336}$ | 0 | 0 | $\frac{5\sqrt{14}i}{112}$ | 0 | $-\frac{5\sqrt{14}}{224}$ | 0 | 0 | $-\frac{\sqrt{210}i}{336}$ | 0 | $\frac{\sqrt{210}}{672}$ | 0 | 0 | 0 | |
| | 0 | $\frac{5\sqrt{210}}{336}$ | $-\frac{5\sqrt{14}i}{112}$ | 0 | $-\frac{5\sqrt{14}}{224}$ | 0 | 0 | 0 | $\frac{\sqrt{210}i}{336}$ | 0 | $\frac{\sqrt{210}}{672}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{14}}{224}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{210}}{96}$ | 0 | $-\frac{\sqrt{210}i}{168}$ | $\frac{5\sqrt{210}}{336}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{5\sqrt{14}}{224}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{210}i}{96}$ | 0 | $\frac{\sqrt{210}i}{168}$ | 0 | 0 | $-\frac{5\sqrt{210}}{336}$ | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | $-\frac{\sqrt{210}i}{336}$ | 0 | $\frac{\sqrt{210}}{96}$ | 0 | 0 | 0 | $-\frac{\sqrt{14}i}{112}$ | 0 | $\frac{3\sqrt{14}}{224}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{14}}{112}$ | $\frac{\sqrt{210}i}{336}$ | 0 | $\frac{\sqrt{210}}{96}$ | 0 | 0 | 0 | $\frac{\sqrt{14}i}{112}$ | 0 | $\frac{3\sqrt{14}}{224}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{210}}{672}$ | 0 | $-\frac{\sqrt{210}i}{168}$ | 0 | 0 | 0 | $\frac{3\sqrt{14}}{224}$ | 0 | $-\frac{\sqrt{14}i}{28}$ | $\frac{5\sqrt{14}}{112}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{210}}{672}$ | 0 | $\frac{\sqrt{210}i}{168}$ | 0 | 0 | 0 | $\frac{3\sqrt{14}}{224}$ | 0 | $\frac{\sqrt{14}i}{28}$ | 0 | 0 | $-\frac{5\sqrt{14}}{112}$ | |
| | 0 | $\frac{\sqrt{14}}{28}$ | 0 | 0 | $\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{14}}{112}$ | 0 | 0 | 0 | $-\frac{\sqrt{14}i}{28}$ | |
| | $\frac{\sqrt{14}}{28}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{210}}{336}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{14}}{112}$ | $\frac{\sqrt{14}i}{28}$ | 0 | 0 | |

$$\frac{\sqrt{21}yz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$$

941 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|-----------------------------|--|------------------------------|-------------------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------|----------------------------|----------------------------|
| $\mathbb{T}_{6,0}^{(1,0;a)}(E, 2)$ | 0 | $-\frac{\sqrt{231}}{154}$ | 0 | 0 | $\frac{\sqrt{385}}{1848}$ | 0 | 0 | $\frac{2\sqrt{385}i}{231}$ | 0 | 0 | $-\frac{\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{231}}{154}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}}{1848}$ | $-\frac{2\sqrt{385}i}{231}$ | 0 | 0 | 0 | $\frac{\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{231}i}{3696}$ | $-\frac{5\sqrt{231}}{1848}$ | 0 | 0 | $\frac{\sqrt{385}}{924}$ | 0 | $-\frac{13\sqrt{385}i}{3696}$ | $\frac{\sqrt{385}}{924}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{231}i}{3696}$ | 0 | 0 | $\frac{5\sqrt{231}}{1848}$ | $\frac{\sqrt{385}}{924}$ | 0 | $\frac{13\sqrt{385}i}{3696}$ | 0 | 0 | 0 | $-\frac{\sqrt{385}}{924}$ |
| | $\frac{\sqrt{385}}{1848}$ | 0 | 0 | $\frac{5\sqrt{231}i}{3696}$ | 0 | $\frac{25\sqrt{231}}{1848}$ | 0 | 0 | 0 | $\frac{13\sqrt{385}i}{3696}$ | 0 | $-\frac{19\sqrt{385}}{1848}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{385}}{1848}$ | $-\frac{5\sqrt{231}i}{3696}$ | 0 | $\frac{25\sqrt{231}}{1848}$ | 0 | 0 | 0 | $-\frac{13\sqrt{385}i}{3696}$ | 0 | $-\frac{19\sqrt{385}}{1848}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{2\sqrt{385}i}{231}$ | $-\frac{5\sqrt{231}}{1848}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{231}}{231}$ | $-\frac{5\sqrt{385}}{1848}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{2\sqrt{385}}{231}$ |
| | $-\frac{2\sqrt{385}i}{231}$ | 0 | 0 | $\frac{5\sqrt{231}}{1848}$ | 0 | 0 | $-\frac{5\sqrt{231}}{231}$ | 0 | 0 | $\frac{5\sqrt{385}}{1848}$ | 0 | 0 | 0 | $-\frac{2\sqrt{385}}{231}$ | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{385}}{924}$ | 0 | $\frac{13\sqrt{385}i}{3696}$ | $-\frac{5\sqrt{385}}{1848}$ | 0 | 0 | $\frac{\sqrt{231}}{154}$ | 0 | $-\frac{5\sqrt{231}i}{528}$ | $\frac{\sqrt{231}}{924}$ | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{385}}{924}$ | 0 | $-\frac{13\sqrt{385}i}{3696}$ | 0 | 0 | $\frac{5\sqrt{385}}{1848}$ | $\frac{\sqrt{231}}{154}$ | 0 | $\frac{5\sqrt{231}i}{528}$ | 0 | 0 | 0 | $-\frac{\sqrt{231}}{924}$ |
| | $-\frac{\sqrt{231}}{616}$ | 0 | 0 | $-\frac{13\sqrt{385}i}{3696}$ | 0 | $-\frac{19\sqrt{385}}{1848}$ | 0 | 0 | 0 | $-\frac{5\sqrt{231}i}{528}$ | 0 | $\frac{9\sqrt{231}}{616}$ | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{231}}{616}$ | $\frac{13\sqrt{385}i}{3696}$ | 0 | $-\frac{19\sqrt{385}}{1848}$ | 0 | 0 | 0 | $\frac{5\sqrt{231}i}{528}$ | 0 | $\frac{9\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{385}}{924}$ | 0 | 0 | 0 | 0 | $-\frac{2\sqrt{385}}{231}$ | $\frac{\sqrt{231}}{924}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{231}}{154}$ |
| | 0 | 0 | 0 | $-\frac{\sqrt{385}}{924}$ | 0 | 0 | $-\frac{2\sqrt{385}}{231}$ | 0 | 0 | $-\frac{\sqrt{231}}{924}$ | 0 | 0 | 0 | $-\frac{\sqrt{231}}{154}$ | 0 |
| 942 | symmetry | $\frac{\sqrt{21}xz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{8}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------------|----------------------------|--|------------------------------|-------------------------------|------------------------------|------------------------------|-----------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|---|---|
| $\mathbb{T}_{6,1}^{(1,0;a)}(E, 2)$ | 0 | $\frac{\sqrt{231}i}{154}$ | $\frac{\sqrt{385}}{1848}$ | 0 | 0 | 0 | 0 | $-\frac{2\sqrt{385}}{231}$ | $\frac{\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{231}i}{154}$ | 0 | 0 | $-\frac{\sqrt{385}}{1848}$ | 0 | 0 | $-\frac{2\sqrt{385}}{231}$ | 0 | 0 | $-\frac{\sqrt{231}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{385}}{1848}$ | 0 | 0 | $-\frac{25\sqrt{231}i}{1848}$ | 0 | $-\frac{5\sqrt{231}}{3696}$ | 0 | 0 | 0 | $-\frac{19\sqrt{385}i}{1848}$ | 0 | $\frac{13\sqrt{385}}{3696}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{385}}{1848}$ | $\frac{25\sqrt{231}i}{1848}$ | 0 | $-\frac{5\sqrt{231}}{3696}$ | 0 | 0 | 0 | $\frac{19\sqrt{385}i}{1848}$ | 0 | $\frac{13\sqrt{385}}{3696}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{5\sqrt{231}}{3696}$ | 0 | 0 | $-\frac{5\sqrt{231}}{1848}$ | 0 | 0 | $-\frac{13\sqrt{385}}{3696}$ | 0 | $\frac{\sqrt{385}i}{924}$ | $-\frac{\sqrt{385}}{924}$ | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{5\sqrt{231}}{3696}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{231}}{1848}$ | $-\frac{13\sqrt{385}}{3696}$ | 0 | $-\frac{\sqrt{385}i}{924}$ | 0 | 0 | $\frac{\sqrt{385}}{924}$ | 0 | 0 |
| | 0 | $-\frac{2\sqrt{385}}{231}$ | 0 | 0 | $-\frac{5\sqrt{231}}{1848}$ | 0 | 0 | $\frac{5\sqrt{231}i}{231}$ | 0 | 0 | $\frac{5\sqrt{385}}{1848}$ | 0 | 0 | $-\frac{2\sqrt{385}i}{231}$ | 0 | 0 |
| | $-\frac{2\sqrt{385}}{231}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{231}}{1848}$ | $-\frac{5\sqrt{231}i}{231}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{385}}{1848}$ | $\frac{2\sqrt{385}i}{231}$ | 0 | 0 | 0 |
| | $\frac{\sqrt{231}}{616}$ | 0 | 0 | $-\frac{19\sqrt{385}i}{1848}$ | 0 | $-\frac{13\sqrt{385}}{3696}$ | 0 | 0 | 0 | $-\frac{9\sqrt{231}i}{616}$ | 0 | $\frac{5\sqrt{231}}{528}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{231}}{616}$ | $\frac{19\sqrt{385}i}{1848}$ | 0 | $-\frac{13\sqrt{385}}{3696}$ | 0 | 0 | 0 | $\frac{9\sqrt{231}i}{616}$ | 0 | $\frac{5\sqrt{231}}{528}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{13\sqrt{385}}{3696}$ | 0 | $\frac{\sqrt{385}i}{924}$ | $\frac{5\sqrt{385}}{1848}$ | 0 | 0 | 0 | $\frac{5\sqrt{231}}{528}$ | 0 | $-\frac{\sqrt{231}i}{154}$ | $\frac{\sqrt{231}}{924}$ | 0 | 0 |
| | 0 | 0 | $\frac{13\sqrt{385}}{3696}$ | 0 | $-\frac{\sqrt{385}i}{924}$ | 0 | 0 | $-\frac{5\sqrt{385}}{1848}$ | $\frac{5\sqrt{231}}{528}$ | 0 | $\frac{\sqrt{231}i}{154}$ | 0 | 0 | $-\frac{\sqrt{231}}{924}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}}{924}$ | 0 | 0 | $-\frac{2\sqrt{385}i}{231}$ | 0 | 0 | $\frac{\sqrt{231}}{924}$ | 0 | 0 | $\frac{\sqrt{231}i}{154}$ | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{385}}{924}$ | $\frac{2\sqrt{385}i}{231}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{231}}{924}$ | $-\frac{\sqrt{231}i}{154}$ | 0 | 0 |
| 943 | symmetry | $-\frac{3\sqrt{7}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|------------------------------------|------------------------------|---|----------------------------|-----------------------------|------------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|---|--|
| $\mathbb{T}_{6,0}^{(1,0;a)}(E, 3)$ | 0 | 0 | 0 | $\frac{\sqrt{1155}}{1848}$ | 0 | $\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | $-\frac{13\sqrt{77}}{616}$ | 0 | $\frac{13\sqrt{77}i}{616}$ | $-\frac{2\sqrt{77}}{77}$ | 0 | | |
| | 0 | 0 | $\frac{\sqrt{1155}}{1848}$ | 0 | $-\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | $-\frac{13\sqrt{77}}{616}$ | 0 | $-\frac{13\sqrt{77}i}{616}$ | 0 | 0 | $\frac{2\sqrt{77}}{77}$ | | |
| | 0 | $\frac{\sqrt{1155}}{1848}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}i}{616}$ | 0 | 0 | $-\frac{\sqrt{1155}}{231}$ | 0 | 0 | $\frac{5\sqrt{1155}}{924}$ | | |
| | $\frac{\sqrt{1155}}{1848}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{77}i}{616}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{231}$ | $-\frac{5\sqrt{1155}i}{924}$ | 0 | | |
| | 0 | $\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | $-\frac{\sqrt{1155}}{231}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{1155}}{924}$ | | |
| | $-\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{231}$ | 0 | 0 | $-\frac{5\sqrt{1155}}{924}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{77}i}{616}$ | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{1155}i}{616}$ | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{5\sqrt{77}i}{616}$ | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{1155}i}{616}$ | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | | |
| | 0 | $-\frac{13\sqrt{77}}{616}$ | 0 | 0 | $-\frac{\sqrt{1155}}{231}$ | 0 | 0 | $\frac{\sqrt{1155}i}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}i}{308}$ | | |
| | $-\frac{13\sqrt{77}}{616}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{231}$ | $-\frac{\sqrt{1155}i}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{77}i}{308}$ | 0 | |
| | 0 | $\frac{13\sqrt{77}i}{616}$ | $-\frac{\sqrt{1155}}{231}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{308}$ | | |
| | $-\frac{13\sqrt{77}i}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{231}$ | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{308}$ | 0 | |
| | $-\frac{2\sqrt{77}}{77}$ | 0 | 0 | $\frac{5\sqrt{1155}i}{924}$ | 0 | $-\frac{5\sqrt{1155}}{924}$ | 0 | 0 | 0 | $\frac{\sqrt{77}i}{308}$ | 0 | $\frac{\sqrt{77}}{308}$ | 0 | 0 | 0 | |
| 944 symmetry | | $-\frac{3\sqrt{7}xy(x-y)(x+y)(x^2+y^2-10z^2)}{4}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|------------------------------|--|------------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-----------------------------|-----------------------------|------------------------------|---|
| $\mathbb{T}_{6,1}^{(1,0;a)}(E, 3)$ | $-\frac{2\sqrt{77}}{77}$ | 0 | 0 | $\frac{5\sqrt{1155}i}{924}$ | 0 | $-\frac{5\sqrt{1155}}{924}$ | 0 | 0 | 0 | $\frac{\sqrt{77}i}{308}$ | 0 | $\frac{\sqrt{77}}{308}$ | 0 | 0 | 0 |
| | 0 | $\frac{2\sqrt{77}}{77}$ | $-\frac{5\sqrt{1155}i}{924}$ | 0 | $-\frac{5\sqrt{1155}}{924}$ | 0 | 0 | 0 | $-\frac{\sqrt{77}i}{308}$ | 0 | $\frac{\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{5\sqrt{1155}i}{924}$ | $-\frac{5\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | $-\frac{\sqrt{1155}}{924}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{1848}$ | |
| | $-\frac{5\sqrt{1155}i}{924}$ | 0 | 0 | $\frac{5\sqrt{77}}{308}$ | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{\sqrt{1155}}{1848}$ | 0 | |
| | 0 | $-\frac{5\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{5\sqrt{77}}{308}$ | 0 | 0 | $\frac{5\sqrt{77}i}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{\sqrt{1155}i}{1848}$ | |
| | $-\frac{5\sqrt{1155}}{924}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{77}}{308}$ | $-\frac{5\sqrt{77}i}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{924}$ | $\frac{\sqrt{1155}i}{1848}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | $\frac{5\sqrt{77}i}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | $\frac{\sqrt{1155}i}{616}$ | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{77}i}{308}$ | $-\frac{\sqrt{1155}}{924}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | $\frac{5\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | |
| | $-\frac{\sqrt{77}i}{308}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $\frac{\sqrt{1155}}{616}$ | 0 | 0 | $-\frac{5\sqrt{77}}{308}$ | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | 0 | |
| | 0 | $\frac{\sqrt{77}}{308}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $\frac{\sqrt{1155}i}{616}$ | 0 | 0 | $\frac{5\sqrt{77}}{308}$ | 0 | 0 | $-\frac{13\sqrt{77}i}{616}$ | |
| | $\frac{\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{924}$ | $-\frac{\sqrt{1155}i}{616}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{308}$ | $\frac{13\sqrt{77}i}{616}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{1848}$ | 0 | $-\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | 0 | $-\frac{13\sqrt{77}i}{616}$ | $\frac{2\sqrt{77}}{77}$ | 0 | |
| | 0 | 0 | $-\frac{\sqrt{1155}}{1848}$ | 0 | $\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | 0 | $\frac{13\sqrt{77}i}{616}$ | 0 | 0 | $-\frac{2\sqrt{77}}{77}$ | |
| 945 | symmetry | $\frac{\sqrt{210}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{32}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|-------------------------------|--------------------------------|------------------------------|-------------------------------|------------------------------|--------------------------------|--|
| $\mathbb{T}_{6,0}^{(1,0;a)}(E, 4)$ | 0 | 0 | 0 | $-\frac{17\sqrt{154}}{3696}$ | 0 | $\frac{17\sqrt{154}i}{3696}$ | $-\frac{2\sqrt{154}}{231}$ | 0 | 0 | $-\frac{\sqrt{2310}}{1232}$ | 0 | $-\frac{\sqrt{2310}i}{1232}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{17\sqrt{154}}{3696}$ | 0 | $-\frac{17\sqrt{154}i}{3696}$ | 0 | 0 | $\frac{2\sqrt{154}}{231}$ | $-\frac{\sqrt{2310}}{1232}$ | 0 | $\frac{\sqrt{2310}i}{1232}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{17\sqrt{154}}{3696}$ | 0 | 0 | $-\frac{\sqrt{2310}}{3696}$ | 0 | 0 | $\frac{\sqrt{2310}i}{231}$ | 0 | 0 | $\frac{13\sqrt{154}}{3696}$ | 0 | 0 | $-\frac{47\sqrt{154}i}{3696}$ | |
| | $-\frac{17\sqrt{154}}{3696}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2310}}{3696}$ | $-\frac{\sqrt{2310}i}{231}$ | 0 | 0 | 0 | $-\frac{13\sqrt{154}}{3696}$ | $\frac{47\sqrt{154}i}{3696}$ | 0 | 0 | |
| | 0 | $\frac{17\sqrt{154}i}{3696}$ | $-\frac{\sqrt{2310}}{3696}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{231}$ | $-\frac{13\sqrt{154}}{3696}$ | 0 | 0 | 0 | 0 | $-\frac{47\sqrt{154}}{3696}$ | |
| | $-\frac{17\sqrt{154}i}{3696}$ | 0 | 0 | $\frac{\sqrt{2310}}{3696}$ | 0 | 0 | $-\frac{\sqrt{2310}}{231}$ | 0 | 0 | $\frac{13\sqrt{154}}{3696}$ | 0 | 0 | $-\frac{47\sqrt{154}}{3696}$ | 0 | |
| | $-\frac{2\sqrt{154}}{231}$ | 0 | 0 | $\frac{\sqrt{2310}i}{231}$ | 0 | $-\frac{\sqrt{2310}}{231}$ | 0 | 0 | 0 | $\frac{2\sqrt{154}i}{231}$ | 0 | $\frac{2\sqrt{154}}{231}$ | 0 | 0 | |
| | 0 | $\frac{2\sqrt{154}}{231}$ | $-\frac{\sqrt{2310}i}{231}$ | 0 | $-\frac{\sqrt{2310}}{231}$ | 0 | 0 | 0 | $-\frac{2\sqrt{154}i}{231}$ | 0 | $\frac{2\sqrt{154}}{231}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{2310}}{1232}$ | 0 | 0 | $-\frac{13\sqrt{154}}{3696}$ | 0 | 0 | $\frac{2\sqrt{154}i}{231}$ | 0 | 0 | $\frac{\sqrt{2310}}{528}$ | 0 | 0 | $-\frac{13\sqrt{2310}i}{3696}$ | |
| | $-\frac{\sqrt{2310}}{1232}$ | 0 | 0 | 0 | 0 | $\frac{13\sqrt{154}}{3696}$ | $-\frac{2\sqrt{154}i}{231}$ | 0 | 0 | 0 | $-\frac{\sqrt{2310}}{528}$ | $\frac{13\sqrt{2310}i}{3696}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{2310}i}{1232}$ | $\frac{13\sqrt{154}}{3696}$ | 0 | 0 | 0 | 0 | $\frac{2\sqrt{154}}{231}$ | $\frac{\sqrt{2310}}{528}$ | 0 | 0 | 0 | 0 | $\frac{13\sqrt{2310}}{3696}$ | |
| | $\frac{\sqrt{2310}i}{1232}$ | 0 | 0 | $-\frac{13\sqrt{154}}{3696}$ | 0 | 0 | $\frac{2\sqrt{154}}{231}$ | 0 | 0 | $-\frac{\sqrt{2310}}{528}$ | 0 | 0 | $\frac{13\sqrt{2310}}{3696}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{47\sqrt{154}i}{3696}$ | 0 | $-\frac{47\sqrt{154}}{3696}$ | 0 | 0 | 0 | $-\frac{13\sqrt{2310}i}{3696}$ | 0 | $\frac{13\sqrt{2310}}{3696}$ | 0 | 0 | |
| | 0 | 0 | $\frac{47\sqrt{154}i}{3696}$ | 0 | $-\frac{47\sqrt{154}}{3696}$ | 0 | 0 | 0 | $\frac{13\sqrt{2310}i}{3696}$ | 0 | $\frac{13\sqrt{2310}}{3696}$ | 0 | 0 | 0 | |

$$-\frac{\sqrt{210}xy(x^4 + 2x^2y^2 - 16x^2z^2 + y^4 - 16y^2z^2 + 16z^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------------|--|--------|
| $\mathbb{T}_{6,1}^{(1,0;a)}(E, 4)$ | 0 0 0 $\frac{37\sqrt{154}i}{3696}$ 0 $\frac{37\sqrt{154}}{3696}$ 0 0 0 0 $\frac{5\sqrt{2310}i}{1232}$ 0 $-\frac{5\sqrt{2310}}{1232}$ 0 0 | |
| | 0 0 $-\frac{37\sqrt{154}i}{3696}$ 0 $\frac{37\sqrt{154}}{3696}$ 0 0 0 $-\frac{5\sqrt{2310}i}{1232}$ 0 $-\frac{5\sqrt{2310}}{1232}$ 0 0 0 | |
| | 0 $\frac{37\sqrt{154}i}{3696}$ $-\frac{5\sqrt{2310}}{3696}$ 0 0 0 0 $-\frac{\sqrt{2310}}{924}$ $-\frac{17\sqrt{154}}{3696}$ 0 0 0 0 $-\frac{\sqrt{154}}{528}$ | |
| | $-\frac{37\sqrt{154}i}{3696}$ 0 0 $\frac{5\sqrt{2310}}{3696}$ 0 0 $-\frac{\sqrt{2310}}{924}$ 0 0 $\frac{17\sqrt{154}}{3696}$ 0 0 $-\frac{\sqrt{154}}{528}$ 0 | |
| | 0 $\frac{37\sqrt{154}}{3696}$ 0 0 $\frac{5\sqrt{2310}}{3696}$ 0 0 $-\frac{\sqrt{2310}i}{924}$ 0 0 $-\frac{17\sqrt{154}}{3696}$ 0 0 $\frac{\sqrt{154}i}{528}$ | |
| | $\frac{37\sqrt{154}}{3696}$ 0 0 0 0 $-\frac{5\sqrt{2310}}{3696}$ $\frac{\sqrt{2310}i}{924}$ 0 0 0 0 $\frac{17\sqrt{154}}{3696}$ $-\frac{\sqrt{154}i}{528}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{2310}}{924}$ 0 $\frac{\sqrt{2310}i}{924}$ 0 0 0 $-\frac{17\sqrt{154}}{924}$ 0 $-\frac{17\sqrt{154}i}{924}$ 0 0 $\frac{2\sqrt{154}}{231}$ | |
| | 0 $\frac{5\sqrt{2310}i}{1232}$ $-\frac{17\sqrt{154}}{3696}$ 0 0 0 0 $-\frac{17\sqrt{154}}{924}$ $-\frac{\sqrt{2310}}{1232}$ 0 0 0 0 $-\frac{5\sqrt{2310}}{3696}$ | |
| | $-\frac{5\sqrt{2310}i}{1232}$ 0 0 $\frac{17\sqrt{154}}{3696}$ 0 0 $-\frac{17\sqrt{154}}{924}$ 0 0 $\frac{\sqrt{2310}}{1232}$ 0 0 $-\frac{5\sqrt{2310}}{3696}$ 0 | |
| | 0 $-\frac{5\sqrt{2310}}{1232}$ 0 0 $-\frac{17\sqrt{154}}{3696}$ 0 0 $\frac{17\sqrt{154}i}{924}$ 0 0 0 0 $-\frac{\sqrt{2310}}{1232}$ $\frac{5\sqrt{2310}i}{3696}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{154}}{528}$ 0 $-\frac{\sqrt{154}i}{528}$ 0 0 0 $-\frac{5\sqrt{2310}}{3696}$ 0 $-\frac{5\sqrt{2310}i}{3696}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{154}}{528}$ 0 $-\frac{\sqrt{154}i}{528}$ 0 0 0 $\frac{2\sqrt{154}}{231}$ $-\frac{5\sqrt{2310}}{3696}$ 0 $\frac{5\sqrt{2310}i}{3696}$ 0 0 0 | |

947 symmetry

z

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|--------------------------|--|
| $\mathbb{M}_1^{(a)}(A_2)$ | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ |
| | 0 | 0 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 |
| | 0 | 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{14}i}{14}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |

948 symmetry

x

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------|--------------------------|--|
| $\mathbb{M}_{1,0}^{(a)}(E)$ | 0 | 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ |
| | 0 | 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 |
| | $-\frac{\sqrt{14}i}{14}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 0 |

949 symmetry

y

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------|--|----------------------------------|
| $\mathbb{M}_{1,1}^{(a)}(E)$ | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}i}{14}$ 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 | |
| | 0 0 0 0 0 0 0 $-\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{3\sqrt{14}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $\frac{\sqrt{14}i}{56}$ 0 | |
| | $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{14}i}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{210}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{14}i}{56}$ 0 0 0 0 0 0 | |
| 950 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|--------------------------|--|
| $\mathbb{M}_3^{(a)}(A_1)$ | 0 | 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{2}i}{8}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 |
| | $-\frac{\sqrt{30}i}{24}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 |

951 symmetry

$$-\frac{z(3x^2+3y^2-2z^2)}{2}$$

continued ...

Table 10

| No. | multipole | matrix |
|-----|-----------|---|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 952 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|------------------------------|---|--------|
| $\mathbb{M}_3^{(a)}(A_2, 2)$ | 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 | |
| | 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ | |
| | $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 | |
| | $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 | |

953 symmetry

$$-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|--------------------------|--|
| $\mathbb{M}_{3,0}^{(a)}(E, 1)$ | 0 | 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 |
| | $-\frac{\sqrt{30}i}{24}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ |
| | 0 | 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 |
| | $\frac{\sqrt{2}i}{8}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ |
| | 0 | 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 |

954 symmetry

$$-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------|--|
| $\mathbb{M}_{3,1}^{(a)}(E, 1)$ | 0 | 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ |
| | $\frac{\sqrt{30}i}{24}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $\frac{\sqrt{2}i}{8}$ |
| | $\frac{\sqrt{2}i}{8}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{30}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{2}i}{8}$ 0 0 0 0 0 0 |

955 symmetry

 $\sqrt{15}xyz$

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------------|---|
| $\mathbb{M}_{3,0}^{(a)}(E, 2)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 956 symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-----------------------|--|
| $\mathbb{M}_{3,1}^{(a)}(E, 2)$ | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{3}i}{6}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{3}i}{6}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 |
| | $\frac{\sqrt{3}i}{6}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 $\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{3}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 |
| 957 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ |
| | | |

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|--|--|
| $\mathbb{M}_5^{(a)}(A_1)$ | 0 0 $\frac{i}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 | |
| | $-\frac{i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 0 $-\frac{i}{8}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 0 $-\frac{i}{8}$ | |
| | 0 0 0 0 $-\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 $-\frac{i}{4}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 $-\frac{i}{4}$ 0 0 0 | |
| | $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{i}{4}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{i}{4}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ | |
| | 0 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 | |
| 958 | symmetry | $\frac{z(15x^4 + 30x^2y^2 - 40x^2z^2 + 15y^4 - 40y^2z^2 + 8z^4)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--|---|--------|
| $\mathbb{M}_5^{(a)}(A_2, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{42}i}{21}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{42}i}{21}$ 0 | |
| | 0 0 0 0 $-\frac{5\sqrt{42}i}{336}$ 0 0 0 0 0 $\frac{3\sqrt{70}i}{112}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{5\sqrt{42}i}{336}$ 0 0 0 0 0 $\frac{3\sqrt{70}i}{112}$ 0 0 0 | |
| | 0 0 $\frac{5\sqrt{42}i}{336}$ 0 0 0 0 0 $\frac{3\sqrt{70}i}{112}$ 0 0 0 0 0 | |
| | 0 0 0 $\frac{5\sqrt{42}i}{336}$ 0 0 0 0 0 $\frac{3\sqrt{70}i}{112}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 $-\frac{3\sqrt{70}i}{112}$ 0 0 0 0 0 $\frac{11\sqrt{42}i}{336}$ 0 0 0 0 | |
| | 0 0 0 0 0 $-\frac{3\sqrt{70}i}{112}$ 0 0 0 0 0 $\frac{11\sqrt{42}i}{336}$ 0 0 0 0 | |
| | 0 0 $-\frac{3\sqrt{70}i}{112}$ 0 0 0 0 0 $-\frac{11\sqrt{42}i}{336}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{3\sqrt{70}i}{112}$ 0 0 0 0 0 $-\frac{11\sqrt{42}i}{336}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{42}i}{21}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{42}i}{21}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ | | |
| 959 | symmetry | |

continued ...

Table 10

| No. | multipole | matrix |
|---|---|--------|
| $\mathbb{M}_5^{(a)}(A_2, 2)$ | 0 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 0 $\frac{i}{8}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 0 $\frac{i}{8}$ | |
| | $-\frac{i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{i}{8}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 $\frac{i}{4}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{15}i}{12}$ 0 0 0 0 0 $\frac{i}{4}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{i}{4}$ 0 0 0 0 0 0 $\frac{\sqrt{15}i}{24}$ 0 | |
| | $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{i}{8}$ 0 0 0 0 0 $-\frac{\sqrt{15}i}{24}$ 0 0 0 0 0 0 | |
| $\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$ | | |

960 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 \end{bmatrix}$ |
| 961 | symmetry | $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix |
|-----|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}i}{8} & 0 \\ -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{8} & 0 \\ -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}i}{8} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{8} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| 962 | symmetry | $\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|--|--|
| $\mathbb{M}_{5,0}^{(a)}(E, 2)$ | 0 0 $-\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 | |
| | $\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{42}i}{84}$ 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{42}i}{84}$ | |
| | 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 | |
| | $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{5\sqrt{42}i}{168}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{28}$ 0 | |
| | 0 0 0 0 0 0 0 $-\frac{5\sqrt{42}i}{168}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{28}$ | |
| | 0 0 0 0 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{28}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{28}$ 0 0 0 | |
| 963 | symmetry | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------------|--------------------------|---|
| $\mathbb{M}_{5,1}^{(a)}(E, 2)$ | 0 | 0 0 0 0 $\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{42}i}{84}$ 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{42}i}{84}$ |
| | $-\frac{\sqrt{42}i}{24}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{\sqrt{42}i}{24}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $-\frac{5\sqrt{42}i}{168}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{28}$ 0 |
| | $\frac{\sqrt{70}i}{56}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{70}i}{56}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{28}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{42}i}{84}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{28}$ 0 0 0 0 0 0 |
| $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ | | |

964 symmetry

 $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-----------|--|
| | | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| $\mathbb{M}_{5,0}^{(a)}(E, 3)$ | | |
| 965 | symmetry | $\frac{3\sqrt{35}z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------------|---|
| $\mathbb{M}_{5,1}^{(a)}(E, 3)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{16} & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{16} & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{16} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 966 symmetry | $-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-------------------------------|--|
| $\mathbb{M}_{5,0}^{(a)}(E, 4)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 967 symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|-----------------------|---|
| $\mathbb{M}_{5,1}^{(a)}(E, 4)$ | 0 | 0 0 0 0 0 0 $-\frac{\sqrt{6}i}{6}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 $-\frac{\sqrt{6}i}{6}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{6}i}{12}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{6}i}{12}$ 0 0 0 0 |
| | $\frac{\sqrt{6}i}{6}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $\frac{\sqrt{6}i}{6}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 $-\frac{\sqrt{6}i}{12}$ 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{6}i}{12}$ 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| <i>z</i> | | |

968 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------|---|--------|
| $\mathbb{M}_1^{(1,-1;a)}(A_2)$ | $\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{14}}{14} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{14}}{14} \quad 0 \quad 0$ | |
| 969 | symmetry | x |

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|------------------------|--|
| $\mathbb{M}_{1,0}^{(1,-1;a)}(E)$ | 0 | $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | $\frac{\sqrt{14}}{14}$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{14}}{14}$ 0 0 |

970 symmetry

y

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|-------------------------|----------------------------------|
| $\mathbb{M}_{1,1}^{(1,-1;a)}(E)$ | 0 | $-\frac{\sqrt{14}i}{14}$ |
| | $\frac{\sqrt{14}i}{14}$ | 0 |
| | 0 | 0 |
| | 0 | $-\frac{\sqrt{14}i}{14}$ |
| | 0 | 0 |
| | $\frac{\sqrt{14}i}{14}$ | 0 |
| | 0 | 0 |
| | 0 | $-\frac{\sqrt{14}i}{14}$ |
| | 0 | 0 |
| | $\frac{\sqrt{14}i}{14}$ | 0 |
| | 0 | 0 |
| | 0 | $\frac{\sqrt{14}i}{14}$ |
| 971 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|--------------------------------|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|--------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|--------------------------|---|--------------------------|
| $\mathbb{M}_3^{(1,-1;a)}(A_1)$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{105}i}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{7}}{14}$ | 0 | $-\frac{\sqrt{7}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{7}}{14}$ | 0 | $\frac{\sqrt{7}i}{56}$ | 0 | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{7}i}{56}$ | 0 | $-\frac{\sqrt{7}}{14}$ | 0 | 0 | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | $\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{7}i}{56}$ | 0 | $-\frac{\sqrt{7}}{14}$ | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | $\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{105}i}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{42}$ |
| | $\frac{\sqrt{105}i}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{42}$ | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{7}i}{56}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{105}}{84}$ | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{105}i}{168}$ | 0 | $\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 | $-\frac{5\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{105}i}{168}$ | 0 | $\frac{\sqrt{105}}{84}$ | 0 | 0 | 0 | $\frac{5\sqrt{7}i}{56}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{105}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $-\frac{z(3x^2+3y^2-2z^2)}{2}$ | | | | | | | | | | | | | | | |

972 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-----------------------------------|--|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{M}_3^{(1,-1;a)}(A_2, 1)$ | 0 0 0 $-\frac{\sqrt{42}i}{42}$ 0 $\frac{\sqrt{42}}{42}$ 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{42}i}{42}$ 0 $\frac{\sqrt{42}}{42}$ 0 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{42}i}{42}$ $-\frac{\sqrt{70}}{70}$ 0 0 0 0 $\frac{\sqrt{70}}{280}$ $\frac{\sqrt{42}}{28}$ 0 0 0 0 $-\frac{\sqrt{42}}{168}$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{42}i}{42}$ 0 0 $\frac{\sqrt{70}}{70}$ 0 0 $\frac{\sqrt{70}}{280}$ 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 $-\frac{\sqrt{42}}{168}$ 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{42}}{42}$ 0 0 $-\frac{\sqrt{70}}{70}$ 0 0 $-\frac{\sqrt{70}i}{280}$ 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 $-\frac{\sqrt{42}i}{168}$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{42}}{42}$ 0 0 0 0 $\frac{\sqrt{70}}{70}$ $\frac{\sqrt{70}i}{280}$ 0 0 0 0 $\frac{\sqrt{42}}{28}$ $\frac{\sqrt{42}i}{168}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{70}}{280}$ 0 $-\frac{\sqrt{70}i}{280}$ $\frac{\sqrt{70}}{35}$ 0 0 $\frac{\sqrt{42}}{168}$ 0 $\frac{\sqrt{42}i}{168}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{70}}{280}$ 0 $\frac{\sqrt{70}i}{280}$ 0 0 $-\frac{\sqrt{70}}{35}$ $\frac{\sqrt{42}}{168}$ 0 $-\frac{\sqrt{42}i}{168}$ 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{42}}{28}$ 0 0 0 0 $\frac{\sqrt{42}}{168}$ 0 0 0 0 0 $\frac{\sqrt{70}}{56}$ | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 $\frac{\sqrt{42}}{168}$ 0 0 0 0 0 $\frac{\sqrt{70}}{56}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 0 $-\frac{\sqrt{42}}{28}$ 0 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 0 0 $-\frac{\sqrt{70}i}{56}$ | | | | | | | | | | | | | | |
| | 0 0 0 0 0 $\frac{\sqrt{42}}{28}$ $-\frac{\sqrt{42}i}{168}$ 0 0 0 0 0 $\frac{\sqrt{70}i}{56}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{42}}{168}$ 0 $-\frac{\sqrt{42}i}{168}$ 0 0 0 $\frac{\sqrt{70}}{56}$ 0 $-\frac{\sqrt{70}i}{56}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{42}}{168}$ 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 $\frac{\sqrt{70}}{56}$ 0 $\frac{\sqrt{70}i}{56}$ 0 0 0 | | | | | | | | | | | | | | |
| 973 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|--------------------------------------|--|--------|
| $\mathbb{M}_3^{(1,-1;a)}(A_2, 2)$ | 0 0 0 0 0 0 0 $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 $-\frac{\sqrt{105}i}{84}$ 0 $-\frac{\sqrt{105}}{168}$ 0 0 | |
| | 0 0 $\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 $\frac{\sqrt{105}i}{84}$ 0 $-\frac{\sqrt{105}}{168}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 $\frac{\sqrt{105}}{168}$ 0 $-\frac{\sqrt{105}i}{84}$ 0 0 | |
| | 0 0 $-\frac{\sqrt{7}}{56}$ 0 $-\frac{\sqrt{7}i}{14}$ 0 0 0 $\frac{\sqrt{105}}{168}$ 0 $\frac{\sqrt{105}i}{84}$ 0 0 0 | |
| | 0 $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 0 0 0 0 0 0 $\frac{\sqrt{105}i}{42}$ | |
| | $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{105}i}{42}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{105}i}{84}$ 0 $\frac{\sqrt{105}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{7}}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}i}{84}$ 0 $\frac{\sqrt{105}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{7}}{56}$ 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{105}}{168}$ 0 $-\frac{\sqrt{105}i}{84}$ 0 0 0 $-\frac{5\sqrt{7}}{56}$ 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{105}}{168}$ 0 $\frac{\sqrt{105}i}{84}$ 0 0 0 $-\frac{5\sqrt{7}}{56}$ 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 $\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 $-\frac{\sqrt{105}i}{42}$ 0 0 0 0 0 0 0 | |
| $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ | | |

974 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------------|---|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{M}_{3,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 $-\frac{2\sqrt{7}}{21}$ 0 0 $-\frac{\sqrt{7}i}{42}$ 0 0 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 0 0 $\frac{2\sqrt{7}}{21}$ $\frac{\sqrt{7}i}{42}$ 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{105}}{70}$ 0 $-\frac{\sqrt{105}i}{840}$ $-\frac{\sqrt{105}}{210}$ 0 0 $\frac{5\sqrt{7}}{84}$ 0 $-\frac{\sqrt{7}i}{168}$ $\frac{\sqrt{7}}{42}$ 0 | | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{105}}{70}$ 0 $\frac{\sqrt{105}i}{840}$ 0 0 $\frac{\sqrt{105}}{210}$ $\frac{5\sqrt{7}}{84}$ 0 $\frac{\sqrt{7}i}{168}$ 0 0 $-\frac{\sqrt{7}}{42}$ | | | | | | | | | | | | | | | |
| | $-\frac{2\sqrt{7}}{21}$ 0 0 $-\frac{\sqrt{105}i}{840}$ 0 $-\frac{\sqrt{105}}{210}$ 0 0 0 $\frac{\sqrt{7}i}{168}$ 0 $-\frac{\sqrt{7}}{12}$ 0 0 | | | | | | | | | | | | | | | |
| | 0 $\frac{2\sqrt{7}}{21}$ $\frac{\sqrt{105}i}{840}$ 0 $-\frac{\sqrt{105}}{210}$ 0 0 0 $-\frac{\sqrt{7}i}{168}$ 0 $-\frac{\sqrt{7}}{12}$ 0 0 0 | | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{7}i}{42}$ $-\frac{\sqrt{105}}{210}$ 0 0 0 0 $\frac{2\sqrt{105}}{105}$ $-\frac{\sqrt{7}}{42}$ 0 0 0 0 $\frac{\sqrt{7}}{42}$ | | | | | | | | | | | | | | | |
| | $\frac{\sqrt{7}i}{42}$ 0 0 $\frac{\sqrt{105}}{210}$ 0 0 $\frac{2\sqrt{105}}{105}$ 0 0 $\frac{\sqrt{7}}{42}$ 0 0 0 $\frac{\sqrt{7}}{42}$ 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{5\sqrt{7}}{84}$ 0 $\frac{\sqrt{7}i}{168}$ $-\frac{\sqrt{7}}{42}$ 0 0 0 0 $-\frac{\sqrt{105}i}{168}$ $-\frac{\sqrt{105}}{42}$ 0 | | | | | | | | | | | | | | | |
| | 0 0 $\frac{5\sqrt{7}}{84}$ 0 $-\frac{\sqrt{7}i}{168}$ 0 0 $\frac{\sqrt{7}}{42}$ 0 0 $\frac{\sqrt{105}i}{168}$ 0 0 0 $\frac{\sqrt{105}}{42}$ | | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{7}i}{168}$ 0 $-\frac{\sqrt{7}}{12}$ 0 0 0 $-\frac{\sqrt{105}i}{168}$ 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{7}i}{168}$ 0 $-\frac{\sqrt{7}}{12}$ 0 0 0 $\frac{\sqrt{105}i}{168}$ 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{7}}{42}$ 0 0 0 0 $\frac{\sqrt{7}}{42}$ $-\frac{\sqrt{105}}{42}$ 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{7}}{42}$ 0 0 $\frac{\sqrt{7}}{42}$ 0 0 $\frac{\sqrt{105}}{42}$ 0 0 0 0 0 | | | | | | | | | | | | | | | |
| 975 | symmetry | $-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)$ | 0 0 $-\frac{2\sqrt{7}}{21}$ 0 0 0 0 $\frac{\sqrt{7}}{42}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{2\sqrt{7}}{21}$ 0 0 $\frac{\sqrt{7}}{42}$ 0 0 0 0 0 0 0 0 | |
| | $-\frac{2\sqrt{7}}{21}$ 0 0 $\frac{\sqrt{105}i}{210}$ 0 0 $\frac{\sqrt{105}}{840}$ 0 0 0 $-\frac{\sqrt{7}i}{12}$ 0 $\frac{\sqrt{7}}{168}$ 0 0 | |
| | 0 $\frac{2\sqrt{7}}{21}$ $-\frac{\sqrt{105}i}{210}$ 0 $\frac{\sqrt{105}}{840}$ 0 0 0 $\frac{\sqrt{7}i}{12}$ 0 $\frac{\sqrt{7}}{168}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{105}}{840}$ 0 $\frac{\sqrt{105}i}{70}$ $-\frac{\sqrt{105}}{210}$ 0 0 $-\frac{\sqrt{7}}{168}$ 0 $\frac{5\sqrt{7}i}{84}$ $-\frac{\sqrt{7}}{42}$ 0 | |
| | 0 0 $\frac{\sqrt{105}}{840}$ 0 $-\frac{\sqrt{105}i}{70}$ 0 0 $\frac{\sqrt{105}}{210}$ $-\frac{\sqrt{7}}{168}$ 0 $-\frac{5\sqrt{7}i}{84}$ 0 0 $\frac{\sqrt{7}}{42}$ | |
| | 0 $\frac{\sqrt{7}}{42}$ 0 0 $-\frac{\sqrt{105}}{210}$ 0 0 $-\frac{2\sqrt{105}i}{105}$ 0 0 $\frac{\sqrt{7}i}{42}$ 0 0 $\frac{\sqrt{7}i}{42}$ | |
| | $\frac{\sqrt{7}}{42}$ 0 0 0 0 $\frac{\sqrt{105}}{210}$ $\frac{2\sqrt{105}i}{105}$ 0 0 0 0 $-\frac{\sqrt{7}}{42}$ $-\frac{\sqrt{7}i}{42}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{7}i}{12}$ 0 $-\frac{\sqrt{7}}{168}$ 0 0 0 0 0 $\frac{\sqrt{105}}{168}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{7}i}{12}$ 0 $-\frac{\sqrt{7}}{168}$ 0 0 0 0 0 $\frac{\sqrt{105}}{168}$ 0 0 0 | |
| | 0 0 0 $\frac{\sqrt{7}}{168}$ 0 $\frac{5\sqrt{7}i}{84}$ $\frac{\sqrt{7}}{42}$ 0 0 $\frac{\sqrt{105}}{168}$ 0 0 $-\frac{\sqrt{105}}{42}$ 0 | |
| | 0 0 $\frac{\sqrt{7}}{168}$ 0 $-\frac{5\sqrt{7}i}{84}$ 0 0 $-\frac{\sqrt{7}}{42}$ $\frac{\sqrt{105}}{168}$ 0 0 0 0 $\frac{\sqrt{105}}{42}$ | |
| | 0 0 0 0 $-\frac{\sqrt{7}}{42}$ 0 0 $\frac{\sqrt{7}i}{42}$ 0 0 $-\frac{\sqrt{105}}{42}$ 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{7}}{42}$ $-\frac{\sqrt{7}i}{42}$ 0 0 0 0 $\frac{\sqrt{105}}{42}$ 0 0 | |

976 symmetry

 $\sqrt{15}xyz$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | |
|-------------------------------------|--------------------------|-------------------------|---------------------------|--------------------------|--------------------------|--------------------------|---------------------------|---------------------------|----------------------------|--------------------------|---------------------------|--------------------------|----------------------------|---------------------------|
| $\mathbb{M}_{3,0}^{(1,-1;a)}(E, 2)$ | 0 | 0 | 0 | $-\frac{\sqrt{70}}{42}$ | 0 | $\frac{\sqrt{70}i}{42}$ | $-\frac{\sqrt{70}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{70}}{42}$ | 0 | $-\frac{\sqrt{70}i}{42}$ | 0 | 0 | $\frac{\sqrt{70}}{42}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{70}}{42}$ | 0 | 0 | $-\frac{\sqrt{42}}{168}$ | 0 | 0 | $\frac{\sqrt{42}i}{168}$ | 0 | 0 | $-\frac{\sqrt{70}}{168}$ | 0 | 0 | $-\frac{\sqrt{70}i}{168}$ |
| | $-\frac{\sqrt{70}}{42}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{42}}{168}$ | $-\frac{\sqrt{42}i}{168}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{70}}{168}$ | $\frac{\sqrt{70}i}{168}$ | 0 |
| | 0 | $\frac{\sqrt{70}i}{42}$ | $-\frac{\sqrt{42}}{168}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{42}}{168}$ | $\frac{\sqrt{70}}{168}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{70}}{168}$ |
| | $-\frac{\sqrt{70}i}{42}$ | 0 | 0 | $\frac{\sqrt{42}}{168}$ | 0 | 0 | $-\frac{\sqrt{42}}{168}$ | 0 | 0 | $-\frac{\sqrt{70}}{168}$ | 0 | 0 | $-\frac{\sqrt{70}}{168}$ | 0 |
| | $-\frac{\sqrt{70}}{42}$ | 0 | 0 | $\frac{\sqrt{42}i}{168}$ | 0 | $-\frac{\sqrt{42}}{168}$ | 0 | 0 | 0 | $\frac{\sqrt{70}i}{168}$ | 0 | $\frac{\sqrt{70}}{168}$ | 0 | 0 |
| | 0 | $\frac{\sqrt{70}}{42}$ | $-\frac{\sqrt{42}i}{168}$ | 0 | $-\frac{\sqrt{42}}{168}$ | 0 | 0 | 0 | $-\frac{\sqrt{70}i}{168}$ | 0 | $\frac{\sqrt{70}}{168}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{70}}{168}$ | 0 | 0 | $\frac{\sqrt{70}i}{168}$ | 0 | 0 | $-\frac{5\sqrt{42}}{168}$ | 0 | 0 | $\frac{5\sqrt{42}i}{168}$ |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{70}}{168}$ | $-\frac{\sqrt{70}i}{168}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{42}}{168}$ | $-\frac{5\sqrt{42}i}{168}$ | 0 |
| | 0 | 0 | $-\frac{\sqrt{70}}{168}$ | 0 | 0 | 0 | $\frac{\sqrt{70}}{168}$ | $-\frac{5\sqrt{42}}{168}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{42}}{168}$ | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{70}}{168}$ | 0 | 0 | $\frac{\sqrt{70}}{168}$ | 0 | 0 | $\frac{5\sqrt{42}}{168}$ | 0 | 0 | $-\frac{5\sqrt{42}}{168}$ | 0 |
| | 0 | 0 | $-\frac{\sqrt{70}i}{168}$ | 0 | $-\frac{\sqrt{70}}{168}$ | 0 | 0 | 0 | $\frac{5\sqrt{42}i}{168}$ | 0 | $-\frac{5\sqrt{42}}{168}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{70}i}{168}$ | 0 | $-\frac{\sqrt{70}}{168}$ | 0 | 0 | 0 | $-\frac{5\sqrt{42}i}{168}$ | 0 | $-\frac{5\sqrt{42}}{168}$ | 0 | 0 | 0 |

977 symmetry

$$\frac{\sqrt{15}z(x-y)(x+y)}{2}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{70}i}{42}$ 0 $-\frac{\sqrt{70}}{42}$ 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{70}i}{42}$ 0 $-\frac{\sqrt{70}}{42}$ 0 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{70}i}{42}$ $\frac{\sqrt{42}}{42}$ 0 0 0 0 $-\frac{\sqrt{42}}{168}$ $\frac{\sqrt{70}}{84}$ 0 0 0 0 $\frac{\sqrt{70}}{168}$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{70}i}{42}$ 0 0 $-\frac{\sqrt{42}}{42}$ 0 0 $-\frac{\sqrt{42}}{168}$ 0 0 $-\frac{\sqrt{70}}{84}$ 0 0 $\frac{\sqrt{70}}{168}$ 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{70}}{42}$ 0 0 $-\frac{\sqrt{42}}{42}$ 0 0 $-\frac{\sqrt{42}i}{168}$ 0 0 $\frac{\sqrt{70}}{84}$ 0 0 $-\frac{\sqrt{70}i}{168}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{70}}{42}$ 0 0 0 0 $\frac{\sqrt{42}}{42}$ $\frac{\sqrt{42}i}{168}$ 0 0 0 0 $-\frac{\sqrt{70}}{84}$ $\frac{\sqrt{70}i}{168}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{42}}{168}$ 0 $-\frac{\sqrt{42}i}{168}$ 0 0 0 $-\frac{\sqrt{70}}{168}$ 0 $\frac{\sqrt{70}i}{168}$ $-\frac{\sqrt{70}}{42}$ 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{42}}{168}$ 0 $\frac{\sqrt{42}i}{168}$ 0 0 0 $-\frac{\sqrt{70}}{168}$ 0 $-\frac{\sqrt{70}i}{168}$ 0 0 $\frac{\sqrt{70}}{42}$ | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{70}}{84}$ 0 0 0 $-\frac{\sqrt{70}}{168}$ 0 0 0 0 0 0 $-\frac{5\sqrt{42}}{168}$ | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{70}}{84}$ 0 0 $-\frac{\sqrt{70}}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{42}}{168}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 0 $\frac{\sqrt{70}}{84}$ 0 0 $-\frac{\sqrt{70}i}{168}$ 0 0 0 0 0 $-\frac{5\sqrt{42}i}{168}$ | | | | | | | | | | | | | | |
| | 0 0 0 0 0 $-\frac{\sqrt{70}}{84}$ $-\frac{\sqrt{70}i}{168}$ 0 0 0 0 0 $\frac{5\sqrt{42}i}{168}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{70}}{168}$ 0 $-\frac{\sqrt{70}i}{168}$ 0 0 $-\frac{\sqrt{70}}{42}$ $-\frac{5\sqrt{42}}{168}$ 0 $-\frac{5\sqrt{42}i}{168}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{70}}{168}$ 0 $\frac{\sqrt{70}i}{168}$ 0 0 $\frac{\sqrt{70}}{42}$ $-\frac{5\sqrt{42}}{168}$ 0 $\frac{5\sqrt{42}i}{168}$ 0 0 0 | | | | | | | | | | | | | | |
| 978 | symmetry | $-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------|---------------------------|---|
| $M_5^{(1,-1;a)}(A_1)$ | 0 | $\frac{\sqrt{22}}{132} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad -\frac{\sqrt{330}i}{330} \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad \frac{\sqrt{22}i}{132}$ |
| | $\frac{\sqrt{22}}{132}$ | $0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad \frac{\sqrt{330}i}{330} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{22}}{66} \quad -\frac{\sqrt{22}i}{132} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad -\frac{5\sqrt{22}}{176} \quad 0 \quad \frac{\sqrt{22}i}{22} \quad -\frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{880} \quad 0 \quad -\frac{\sqrt{330}i}{132} \quad -\frac{\sqrt{330}}{330} \quad 0$ |
| | 0 | $0 \quad 0 \quad -\frac{5\sqrt{22}}{176} \quad 0 \quad -\frac{\sqrt{22}i}{22} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{22} \quad \frac{\sqrt{330}}{880} \quad 0 \quad \frac{\sqrt{330}i}{132} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{330}$ |
| | $\frac{\sqrt{330}}{330}$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{22}i}{22} \quad 0 \quad \frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{220} \quad 0 \quad \frac{\sqrt{330}}{528} \quad 0 \quad 0$ |
| | 0 | $-\frac{\sqrt{330}}{330} \quad -\frac{\sqrt{22}i}{22} \quad 0 \quad \frac{3\sqrt{22}}{176} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}i}{220} \quad 0 \quad \frac{\sqrt{330}}{528} \quad 0 \quad 0 \quad 0 \quad 0$ |
| | 0 | $-\frac{\sqrt{330}i}{330} \quad -\frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}}{110} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad 0$ |
| | $\frac{\sqrt{330}i}{330}$ | $0 \quad 0 \quad 0 \quad \frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad 0$ |
| | 0 | $0 \quad 0 \quad 0 \quad \frac{\sqrt{330}}{880} \quad 0 \quad \frac{\sqrt{330}i}{220} \quad \frac{\sqrt{330}}{110} \quad 0 \quad 0 \quad \frac{31\sqrt{22}}{528} \quad 0 \quad \frac{\sqrt{22}i}{66} \quad -\frac{\sqrt{22}}{66} \quad 0$ |
| | 0 | $0 \quad 0 \quad \frac{\sqrt{330}}{880} \quad 0 \quad -\frac{\sqrt{330}i}{220} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad \frac{31\sqrt{22}}{528} \quad 0 \quad -\frac{\sqrt{22}i}{66} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{66}$ |
| | $-\frac{\sqrt{22}}{66}$ | $0 \quad 0 \quad -\frac{\sqrt{330}i}{132} \quad 0 \quad \frac{\sqrt{330}}{528} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{22}i}{66} \quad 0 \quad -\frac{25\sqrt{22}}{528} \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{22}}{66} \quad \frac{\sqrt{330}i}{132} \quad 0 \quad \frac{\sqrt{330}}{528} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}i}{66} \quad 0 \quad -\frac{25\sqrt{22}}{528} \quad 0 \quad 0 \quad 0 \quad 0$ |
| | 0 | $\frac{\sqrt{22}i}{132} \quad -\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad -\frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{132} \quad 0$ |
| | $-\frac{\sqrt{22}i}{132}$ | $0 \quad 0 \quad \frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{132} \quad 0$ |

$$\frac{z(15x^4 + 30x^2y^2 - 40x^2z^2 + 15y^4 - 40y^2z^2 + 8z^4)}{8}$$

979 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-----------------------------------|---|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{M}_5^{(1,-1;a)}(A_2, 1)$ | $-\frac{\sqrt{385}}{66} \quad 0 \quad 0 \quad \frac{\sqrt{231}i}{924} \quad 0 \quad -\frac{\sqrt{231}}{924} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{385}i}{132} \quad 0 \quad -\frac{\sqrt{385}}{132} \quad 0 \quad 0 \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad \frac{\sqrt{385}}{66} \quad -\frac{\sqrt{231}i}{924} \quad 0 \quad -\frac{\sqrt{231}}{924} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}i}{132} \quad 0 \quad -\frac{\sqrt{385}}{132} \quad 0 \quad 0 \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad \frac{\sqrt{231}i}{924} \quad \frac{3\sqrt{385}}{616} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}}{308} \quad -\frac{5\sqrt{231}}{1848} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{3\sqrt{231}}{308}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{231}i}{924} \quad 0 \quad 0 \quad -\frac{3\sqrt{385}}{616} \quad 0 \quad 0 \quad \frac{\sqrt{385}}{308} \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{1848} \quad 0 \quad 0 \quad \frac{3\sqrt{231}}{308} \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad -\frac{\sqrt{231}}{924} \quad 0 \quad 0 \quad \frac{3\sqrt{385}}{616} \quad 0 \quad 0 \quad -\frac{\sqrt{385}i}{308} \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{1848} \quad 0 \quad 0 \quad \frac{3\sqrt{231}i}{308} \quad 0$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{231}}{924} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{3\sqrt{385}}{616} \quad \frac{\sqrt{385}i}{308} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{5\sqrt{231}}{1848} \quad -\frac{3\sqrt{231}i}{308} \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{385}}{308} \quad 0 \quad -\frac{\sqrt{385}i}{308} \quad \frac{\sqrt{385}}{77} \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{924} \quad 0 \quad \frac{5\sqrt{231}i}{924} \quad 0 \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad 0 \quad \frac{\sqrt{385}}{308} \quad 0 \quad \frac{\sqrt{385}i}{308} \quad 0 \quad 0 \quad -\frac{\sqrt{385}}{77} \quad \frac{5\sqrt{231}}{924} \quad 0 \quad -\frac{5\sqrt{231}i}{924} \quad 0 \quad 0 \quad 0 \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad -\frac{\sqrt{385}i}{132} \quad -\frac{5\sqrt{231}}{1848} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{924} \quad \frac{\sqrt{385}}{264} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}}{924} \quad 0$ | | | | | | | | | | | | | | |
| | $\frac{\sqrt{385}i}{132} \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{1848} \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{924} \quad 0 \quad 0 \quad -\frac{\sqrt{385}}{264} \quad 0 \quad 0 \quad \frac{\sqrt{385}}{924} \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad -\frac{\sqrt{385}}{132} \quad 0 \quad 0 \quad \frac{5\sqrt{231}}{1848} \quad 0 \quad 0 \quad \frac{5\sqrt{231}i}{924} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}}{264} \quad 0 \quad 0 \quad -\frac{\sqrt{385}i}{924} \quad 0$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{385}}{132} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{5\sqrt{231}}{1848} \quad -\frac{5\sqrt{231}i}{924} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{385}}{264} \quad \frac{\sqrt{385}i}{924} \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad 0 \quad 0 \quad \frac{3\sqrt{231}}{308} \quad 0 \quad \frac{3\sqrt{231}i}{308} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}}{924} \quad 0 \quad -\frac{\sqrt{385}i}{924} \quad -\frac{\sqrt{385}}{66} \quad 0$ | | | | | | | | | | | | | | |
| | $0 \quad 0 \quad \frac{3\sqrt{231}}{308} \quad 0 \quad -\frac{3\sqrt{231}i}{308} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{385}}{924} \quad 0 \quad \frac{\sqrt{385}i}{924} \quad 0 \quad 0 \quad \frac{\sqrt{385}}{66}$ | | | | | | | | | | | | | | |

980 symmetry

$$-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------------|--|---|
| $\mathbb{M}_5^{(1,-1;a)}(A_2, 2)$ | $0 \quad \frac{\sqrt{22}i}{132} \quad -\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad -\frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{132}$ | |
| | $-\frac{\sqrt{22}i}{132} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{132} \quad 0$ | |
| | $-\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad \frac{3\sqrt{22}i}{176} \quad 0 \quad \frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}i}{528} \quad 0 \quad -\frac{\sqrt{330}}{220} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{330}}{330} \quad -\frac{3\sqrt{22}i}{176} \quad 0 \quad \frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{528} \quad 0 \quad -\frac{\sqrt{330}}{220} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad \frac{\sqrt{22}}{22} \quad 0 \quad -\frac{5\sqrt{22}i}{176} \quad \frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{132} \quad 0 \quad -\frac{\sqrt{330}i}{880} \quad -\frac{\sqrt{330}}{330} \quad 0$ | |
| | $0 \quad 0 \quad \frac{\sqrt{22}}{22} \quad 0 \quad \frac{5\sqrt{22}i}{176} \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{22} \quad \frac{\sqrt{330}}{132} \quad 0 \quad \frac{\sqrt{330}i}{880} \quad 0 \quad 0 \quad \frac{\sqrt{330}}{330}$ | |
| | $0 \quad -\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}}{110} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{330}$ | |
| | $-\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{22} \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad -\frac{\sqrt{330}i}{330} \quad 0$ | |
| | $-\frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad -\frac{\sqrt{330}i}{528} \quad 0 \quad \frac{\sqrt{330}}{132} \quad 0 \quad 0 \quad 0 \quad -\frac{25\sqrt{22}i}{528} \quad 0 \quad \frac{\sqrt{22}}{66} \quad 0 \quad 0$ | |
| | $0 \quad \frac{\sqrt{22}}{66} \quad \frac{\sqrt{330}i}{528} \quad 0 \quad \frac{\sqrt{330}}{132} \quad 0 \quad 0 \quad 0 \quad \frac{25\sqrt{22}i}{528} \quad 0 \quad \frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad 0$ | |
| | $0 \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{220} \quad 0 \quad -\frac{\sqrt{330}i}{880} \quad \frac{\sqrt{330}}{110} \quad 0 \quad 0 \quad \frac{\sqrt{22}}{66} \quad 0 \quad \frac{31\sqrt{22}i}{528} \quad \frac{\sqrt{22}}{66} \quad 0$ | |
| | $0 \quad 0 \quad -\frac{\sqrt{330}}{220} \quad 0 \quad \frac{\sqrt{330}i}{880} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{110} \quad \frac{\sqrt{22}}{66} \quad 0 \quad -\frac{31\sqrt{22}i}{528} \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{66}$ | |
| | $0 \quad -\frac{\sqrt{22}}{132} \quad 0 \quad 0 \quad -\frac{\sqrt{330}}{330} \quad 0 \quad 0 \quad \frac{\sqrt{330}i}{330} \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{22}}{66} \quad 0 \quad 0 \quad -\frac{\sqrt{22}i}{132}$ | |
| | $-\frac{\sqrt{22}}{132} \quad 0 \quad 0 \quad 0 \quad 0 \quad \frac{\sqrt{330}}{330} \quad -\frac{\sqrt{330}i}{330} \quad 0 \quad 0 \quad 0 \quad 0 \quad -\frac{\sqrt{22}}{66} \quad \frac{\sqrt{22}i}{132} \quad 0$ | |
| 981 | symmetry | $\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|--|---------------------------|--------------------------|---------------------------|---------------------------|---------------------------|--------------------------|---|---|----------------------------|-------------------------|----------------------------|----------------------------|---------------------------|--------------------------|--|
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 1)$ | 0 | $-\frac{\sqrt{110}}{44}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{110}i}{44}$ | |
| | $-\frac{\sqrt{110}}{44}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}i}{44}$ | 0 | |
| | 0 | 0 | 0 | $\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{66}}{176}$ | 0 | $-\frac{\sqrt{66}i}{44}$ | 0 | 0 | |
| | 0 | 0 | $\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{66}}{176}$ | 0 | $\frac{\sqrt{66}i}{44}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | $-\frac{\sqrt{66}i}{44}$ | 0 | $-\frac{\sqrt{66}}{176}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | $\frac{\sqrt{66}i}{44}$ | 0 | $-\frac{\sqrt{66}}{176}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{66}}{176}$ | 0 | $-\frac{\sqrt{66}i}{44}$ | 0 | 0 | $-\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{66}}{176}$ | 0 | $\frac{\sqrt{66}i}{44}$ | 0 | 0 | 0 | $-\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{66}i}{44}$ | 0 | $-\frac{\sqrt{66}}{176}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{110}}{176}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{66}i}{44}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{110}}{176}$ | 0 | 0 | 0 | |
| | $-\frac{\sqrt{110}i}{44}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{110}}{44}$ | 0 | 0 | 0 | |
| $-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$ | | | | | | | | | | | | | | | |

982 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|--|---------------------------|-----------------------------|----------------------------|-----------------------------|---|------------------------|---------------------------|----------------------------|-----------------------------|-----------------------------|---|--------------------------|--------------------------|--|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 1)$ | 0 | $-\frac{\sqrt{110}i}{44}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{44}$ | |
| | $\frac{\sqrt{110}i}{44}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{110}}{44}$ | 0 | |
| | 0 | 0 | 0 | $\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{66}i}{176}$ | 0 | $\frac{\sqrt{66}}{44}$ | 0 | 0 | 0 | |
| | 0 | 0 | $-\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{66}i}{176}$ | 0 | $\frac{\sqrt{66}}{44}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | $\frac{\sqrt{66}}{44}$ | 0 | $-\frac{\sqrt{66}i}{176}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | $\frac{\sqrt{66}}{44}$ | 0 | $\frac{\sqrt{66}i}{176}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{\sqrt{66}i}{176}$ | 0 | $\frac{\sqrt{66}}{44}$ | 0 | 0 | $-\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{66}i}{176}$ | 0 | $\frac{\sqrt{66}}{44}$ | 0 | 0 | 0 | $\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{66}}{44}$ | 0 | $-\frac{\sqrt{66}i}{176}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{110}i}{176}$ | 0 | 0 | 0 | |
| 983 | $\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ | | | | | | | | | | | | | | |
| | symmetry | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|--|---------------------------|----------------------------|
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 2)$ | 0 | $-\frac{\sqrt{231}}{66}$ |
| | $-\frac{\sqrt{231}}{66}$ | 0 |
| | 0 | 0 |
| | $\frac{5\sqrt{231}}{616}$ | 0 |
| | 0 | $-\frac{\sqrt{231}i}{154}$ |
| | $\frac{\sqrt{385}}{770}$ | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| | 0 | 0 |
| $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ | | |

984 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------------|---------------------------|--------------------------------------|------------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|---------------------------|------------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|---|--|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 2)$ | 0 | $\frac{\sqrt{231}i}{66}$ | $\frac{\sqrt{385}}{770}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{385}}{770}$ | $-\frac{\sqrt{231}}{66}$ | 0 | 0 | 0 | 0 | 0 | 0 | |
| | $-\frac{\sqrt{231}i}{66}$ | 0 | 0 | $-\frac{\sqrt{385}}{770}$ | 0 | 0 | $\frac{\sqrt{385}}{770}$ | 0 | 0 | $\frac{\sqrt{231}}{66}$ | 0 | 0 | 0 | 0 | 0 | |
| | $\frac{\sqrt{385}}{770}$ | 0 | 0 | $-\frac{\sqrt{231}i}{616}$ | 0 | $-\frac{\sqrt{231}}{154}$ | 0 | 0 | 0 | $\frac{3\sqrt{385}i}{3080}$ | 0 | $\frac{\sqrt{385}}{385}$ | 0 | $\frac{\sqrt{385}}{385}$ | 0 | |
| | 0 | $-\frac{\sqrt{385}}{770}$ | $\frac{\sqrt{231}i}{616}$ | 0 | $-\frac{\sqrt{231}}{154}$ | 0 | 0 | 0 | $-\frac{3\sqrt{385}i}{3080}$ | 0 | $\frac{\sqrt{385}}{385}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{231}}{154}$ | 0 | $-\frac{5\sqrt{231}i}{616}$ | $-\frac{\sqrt{231}}{154}$ | 0 | 0 | $-\frac{\sqrt{385}}{385}$ | 0 | $-\frac{\sqrt{385}i}{440}$ | $\frac{9\sqrt{385}}{770}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{231}}{154}$ | 0 | $\frac{5\sqrt{231}i}{616}$ | 0 | 0 | $\frac{\sqrt{231}}{154}$ | $-\frac{\sqrt{385}}{385}$ | 0 | $\frac{\sqrt{385}i}{440}$ | 0 | 0 | $-\frac{9\sqrt{385}}{770}$ | 0 | |
| | 0 | $\frac{\sqrt{385}}{770}$ | 0 | 0 | $-\frac{\sqrt{231}}{154}$ | 0 | 0 | $-\frac{\sqrt{231}i}{77}$ | 0 | 0 | $\frac{\sqrt{385}}{154}$ | 0 | 0 | $\frac{\sqrt{385}i}{770}$ | 0 | |
| | $\frac{\sqrt{385}}{770}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{231}}{154}$ | $\frac{\sqrt{231}i}{77}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{385}}{154}$ | $-\frac{\sqrt{385}i}{770}$ | 0 | | |
| | $-\frac{\sqrt{231}}{66}$ | 0 | 0 | $\frac{3\sqrt{385}i}{3080}$ | 0 | $-\frac{\sqrt{385}}{385}$ | 0 | 0 | 0 | $-\frac{\sqrt{231}i}{88}$ | 0 | $-\frac{\sqrt{231}}{462}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{231}}{66}$ | $-\frac{3\sqrt{385}i}{3080}$ | 0 | $-\frac{\sqrt{385}}{385}$ | 0 | 0 | 0 | $\frac{\sqrt{231}i}{88}$ | 0 | $-\frac{\sqrt{231}}{462}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{385}}{385}$ | 0 | $-\frac{\sqrt{385}i}{440}$ | $\frac{\sqrt{385}}{154}$ | 0 | 0 | $-\frac{\sqrt{231}}{462}$ | 0 | $\frac{\sqrt{231}i}{264}$ | $-\frac{\sqrt{231}}{462}$ | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{385}}{385}$ | 0 | $\frac{\sqrt{385}i}{440}$ | 0 | 0 | $-\frac{\sqrt{385}}{154}$ | $-\frac{\sqrt{231}}{462}$ | 0 | $-\frac{\sqrt{231}i}{264}$ | 0 | 0 | $\frac{\sqrt{231}}{462}$ | 0 | |
| | 0 | 0 | 0 | 0 | $\frac{9\sqrt{385}}{770}$ | 0 | 0 | $\frac{\sqrt{385}i}{770}$ | 0 | 0 | $-\frac{\sqrt{231}}{462}$ | 0 | 0 | $\frac{\sqrt{231}i}{66}$ | 0 | |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{385}}{770}$ | $-\frac{\sqrt{385}i}{770}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{231}}{462}$ | $-\frac{\sqrt{231}i}{66}$ | 0 | | |
| 985 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 3)$ | 0 0 0 $\frac{\sqrt{165}}{220}$ 0 $\frac{\sqrt{165}i}{220}$ 0 0 0 0 $\frac{\sqrt{11}}{44}$ 0 $-\frac{\sqrt{11}i}{44}$ $-\frac{\sqrt{11}}{22}$ 0 | |
| | 0 0 $\frac{\sqrt{165}}{220}$ 0 $-\frac{\sqrt{165}i}{220}$ 0 0 0 $\frac{\sqrt{11}}{44}$ 0 $\frac{\sqrt{11}i}{44}$ 0 0 $\frac{\sqrt{11}}{22}$ | |
| | 0 $\frac{\sqrt{165}}{220}$ 0 0 0 0 0 $-\frac{3\sqrt{11}i}{44}$ 0 0 $\frac{\sqrt{165}}{110}$ 0 0 $-\frac{\sqrt{165}i}{220}$ | |
| | $\frac{\sqrt{165}}{220}$ 0 0 0 0 0 $\frac{3\sqrt{11}i}{44}$ 0 0 0 0 $-\frac{\sqrt{165}}{110}$ $\frac{\sqrt{165}i}{220}$ 0 | |
| | 0 $\frac{\sqrt{165}i}{220}$ 0 0 0 0 0 $-\frac{3\sqrt{11}}{44}$ $\frac{\sqrt{165}}{110}$ 0 0 0 0 $\frac{\sqrt{165}}{220}$ | |
| | $-\frac{\sqrt{165}i}{220}$ 0 0 0 0 0 $-\frac{3\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{165}}{110}$ 0 0 $\frac{\sqrt{165}}{220}$ 0 | |
| | 0 0 0 $-\frac{3\sqrt{11}i}{44}$ 0 $-\frac{3\sqrt{11}}{44}$ 0 0 0 $\frac{3\sqrt{165}i}{220}$ 0 $-\frac{3\sqrt{165}}{220}$ 0 0 | |
| | 0 0 $\frac{3\sqrt{11}i}{44}$ 0 $-\frac{3\sqrt{11}}{44}$ 0 0 0 $-\frac{3\sqrt{165}i}{220}$ 0 $-\frac{3\sqrt{165}}{220}$ 0 0 0 | |
| | 0 $\frac{\sqrt{11}}{44}$ 0 0 $\frac{\sqrt{165}}{110}$ 0 0 0 $\frac{3\sqrt{165}i}{220}$ 0 0 0 0 $-\frac{\sqrt{11}i}{44}$ | |
| | $\frac{\sqrt{11}}{44}$ 0 0 0 0 $-\frac{\sqrt{165}}{110}$ $-\frac{3\sqrt{165}i}{220}$ 0 0 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 | |
| | 0 $-\frac{\sqrt{11}i}{44}$ $\frac{\sqrt{165}}{110}$ 0 0 0 0 $-\frac{3\sqrt{165}}{220}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{44}$ | |
| | $\frac{\sqrt{11}i}{44}$ 0 0 $-\frac{\sqrt{165}}{110}$ 0 0 $-\frac{3\sqrt{165}}{220}$ 0 0 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 | |
| | $-\frac{\sqrt{11}}{22}$ 0 0 $-\frac{\sqrt{165}i}{220}$ 0 $\frac{\sqrt{165}}{220}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $-\frac{\sqrt{11}}{44}$ 0 0 | |
| | 0 $\frac{\sqrt{11}}{22}$ $\frac{\sqrt{165}i}{220}$ 0 $\frac{\sqrt{165}}{220}$ 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 $-\frac{\sqrt{11}}{44}$ 0 0 0 | |

$$\frac{3\sqrt{35}z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$$

986 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|--|---------------------------|--|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 3)$ | $-\frac{\sqrt{11}}{22}$ | 0 0 $-\frac{\sqrt{165}i}{220}$ 0 $\frac{\sqrt{165}}{220}$ 0 0 0 $-\frac{\sqrt{11}i}{44}$ 0 $-\frac{\sqrt{11}}{44}$ 0 0 0 |
| | 0 | $\frac{\sqrt{11}}{22}$ 0 $\frac{\sqrt{165}i}{220}$ 0 $\frac{\sqrt{165}}{220}$ 0 0 0 $\frac{\sqrt{11}i}{44}$ 0 $-\frac{\sqrt{11}}{44}$ 0 0 0 0 |
| | 0 | $-\frac{\sqrt{165}i}{220}$ $\frac{3\sqrt{11}}{88}$ 0 0 0 0 0 $-\frac{3\sqrt{11}}{44}$ $\frac{\sqrt{165}}{440}$ 0 0 0 0 $-\frac{\sqrt{165}}{220}$ |
| | $\frac{\sqrt{165}i}{220}$ | 0 0 $-\frac{3\sqrt{11}}{88}$ 0 0 $-\frac{3\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{165}}{440}$ 0 0 $-\frac{\sqrt{165}}{220}$ 0 |
| | 0 | $\frac{\sqrt{165}}{220}$ 0 0 $\frac{3\sqrt{11}}{88}$ 0 0 0 $\frac{3\sqrt{11}i}{44}$ 0 0 $-\frac{\sqrt{165}}{440}$ 0 0 $-\frac{\sqrt{165}i}{220}$ |
| | $\frac{\sqrt{165}}{220}$ | 0 0 0 0 $-\frac{3\sqrt{11}}{88}$ $-\frac{3\sqrt{11}i}{44}$ 0 0 0 0 $\frac{\sqrt{165}}{440}$ $\frac{\sqrt{165}i}{220}$ 0 |
| | 0 | 0 0 0 $-\frac{3\sqrt{11}}{44}$ 0 $\frac{3\sqrt{11}i}{44}$ 0 0 0 $\frac{3\sqrt{165}}{220}$ 0 $\frac{3\sqrt{165}i}{220}$ 0 0 0 |
| | 0 | 0 $-\frac{3\sqrt{11}}{44}$ 0 $-\frac{3\sqrt{11}i}{44}$ 0 0 0 $\frac{3\sqrt{165}}{220}$ 0 $-\frac{3\sqrt{165}i}{220}$ 0 0 0 0 |
| | 0 | $-\frac{\sqrt{11}i}{44}$ $\frac{\sqrt{165}}{440}$ 0 0 0 0 $\frac{3\sqrt{165}}{220}$ $-\frac{3\sqrt{11}}{88}$ 0 0 0 0 $-\frac{\sqrt{11}}{44}$ |
| | $\frac{\sqrt{11}i}{44}$ | 0 0 $-\frac{\sqrt{165}}{440}$ 0 0 $\frac{3\sqrt{165}}{220}$ 0 0 $\frac{3\sqrt{11}}{88}$ 0 0 $-\frac{\sqrt{11}}{44}$ 0 |
| | 0 | $-\frac{\sqrt{11}}{44}$ 0 0 $-\frac{\sqrt{165}}{440}$ 0 0 $\frac{3\sqrt{165}i}{220}$ 0 0 $-\frac{3\sqrt{11}}{88}$ 0 0 $\frac{\sqrt{11}i}{44}$ |
| | $-\frac{\sqrt{11}}{44}$ | 0 0 0 0 0 $\frac{\sqrt{165}}{440}$ $-\frac{3\sqrt{165}i}{220}$ 0 0 0 0 $\frac{3\sqrt{11}}{88}$ $-\frac{\sqrt{11}i}{44}$ 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{165}}{220}$ 0 $-\frac{\sqrt{165}i}{220}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $\frac{\sqrt{11}i}{44}$ $\frac{\sqrt{11}}{22}$ 0 |
| | 0 | 0 $-\frac{\sqrt{165}}{220}$ 0 $\frac{\sqrt{165}i}{220}$ 0 0 0 $-\frac{\sqrt{11}}{44}$ 0 $-\frac{\sqrt{11}i}{44}$ 0 0 $-\frac{\sqrt{11}}{22}$ |
| <hr/> $987 \quad \text{symmetry} \quad -\frac{\sqrt{105xyz(x^2+y^2-2z^2)}}{2}$ | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | |
|-------------------------------------|--------------------------|---------------------------|--------------------------|-------------------------|--------------------------|---------------------------|---------------------------|--------------------------|---------------------------|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| $\mathbb{M}_{5,0}^{(1,-1;a)}(E, 4)$ | 0 | 0 | 0 | $\frac{\sqrt{55}}{220}$ | 0 | $-\frac{\sqrt{55}i}{220}$ | $-\frac{\sqrt{55}}{110}$ | 0 | 0 | $-\frac{\sqrt{33}}{44}$ | 0 | $-\frac{\sqrt{33}i}{44}$ | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{55}}{220}$ | 0 | $\frac{\sqrt{55}i}{220}$ | 0 | 0 | $\frac{\sqrt{55}}{110}$ | $-\frac{\sqrt{33}}{44}$ | 0 | $\frac{\sqrt{33}i}{44}$ | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{55}}{220}$ | 0 | 0 | $\frac{\sqrt{33}}{22}$ | 0 | 0 | $\frac{\sqrt{33}i}{44}$ | 0 | 0 | $-\frac{\sqrt{55}}{55}$ | 0 | 0 | $\frac{\sqrt{55}i}{44}$ |
| | $\frac{\sqrt{55}}{220}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{22}$ | $-\frac{\sqrt{33}i}{44}$ | 0 | 0 | 0 | $\frac{\sqrt{55}}{55}$ | $-\frac{\sqrt{55}i}{44}$ | 0 | 0 |
| | 0 | $-\frac{\sqrt{55}i}{220}$ | $\frac{\sqrt{33}}{22}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{44}$ | $\frac{\sqrt{55}}{55}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}}{44}$ |
| | $\frac{\sqrt{55}i}{220}$ | 0 | 0 | $-\frac{\sqrt{33}}{22}$ | 0 | 0 | $-\frac{\sqrt{33}}{44}$ | 0 | 0 | $-\frac{\sqrt{55}}{55}$ | 0 | 0 | $\frac{\sqrt{55}}{44}$ | 0 |
| | $-\frac{\sqrt{55}}{110}$ | 0 | 0 | $\frac{\sqrt{33}i}{44}$ | 0 | $-\frac{\sqrt{33}}{44}$ | 0 | 0 | 0 | $\frac{\sqrt{55}i}{220}$ | 0 | $\frac{\sqrt{55}}{220}$ | 0 | 0 |
| | 0 | $\frac{\sqrt{55}}{110}$ | $-\frac{\sqrt{33}i}{44}$ | 0 | $-\frac{\sqrt{33}}{44}$ | 0 | 0 | 0 | $-\frac{\sqrt{55}i}{220}$ | 0 | $\frac{\sqrt{55}}{220}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{33}}{44}$ | 0 | 0 | $\frac{\sqrt{55}}{55}$ | 0 | 0 | $\frac{\sqrt{55}i}{220}$ | 0 | 0 | $\frac{\sqrt{33}}{66}$ | 0 | 0 | $\frac{\sqrt{33}i}{132}$ |
| | $-\frac{\sqrt{33}}{44}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{55}}{55}$ | $-\frac{\sqrt{55}i}{220}$ | 0 | 0 | 0 | $-\frac{\sqrt{33}}{66}$ | $-\frac{\sqrt{33}i}{132}$ | 0 | 0 |
| | 0 | $-\frac{\sqrt{33}i}{44}$ | $-\frac{\sqrt{55}}{55}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{55}}{220}$ | $\frac{\sqrt{33}}{66}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{33}}{132}$ |
| | $\frac{\sqrt{33}i}{44}$ | 0 | 0 | $\frac{\sqrt{55}}{55}$ | 0 | 0 | $\frac{\sqrt{55}}{220}$ | 0 | 0 | $-\frac{\sqrt{33}}{66}$ | 0 | 0 | $-\frac{\sqrt{33}}{132}$ | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{55}i}{44}$ | 0 | $\frac{\sqrt{55}}{44}$ | 0 | 0 | 0 | $\frac{\sqrt{33}i}{132}$ | 0 | $-\frac{\sqrt{33}}{132}$ | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{55}i}{44}$ | 0 | $\frac{\sqrt{55}}{44}$ | 0 | 0 | 0 | $-\frac{\sqrt{33}i}{132}$ | 0 | $-\frac{\sqrt{33}}{132}$ | 0 | 0 | 0 |

988 symmetry

$$-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$$

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|--|--------|
| $\mathbb{M}_{5,1}^{(1,-1;a)}(E, 4)$ | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{33}i}{33}$ 0 $\frac{\sqrt{33}}{33}$ 0 0 | |
| | 0 0 0 0 0 0 0 0 $\frac{\sqrt{33}i}{33}$ 0 $\frac{\sqrt{33}}{33}$ 0 0 0 | |
| | 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 $\frac{\sqrt{55}}{220}$ 0 0 0 0 $-\frac{\sqrt{55}}{55}$ | |
| | 0 0 0 $\frac{\sqrt{33}}{44}$ 0 0 0 0 0 $-\frac{\sqrt{55}}{220}$ 0 0 $-\frac{\sqrt{55}}{55}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{33}}{44}$ 0 0 0 0 0 $\frac{\sqrt{55}}{220}$ 0 0 $\frac{\sqrt{55}i}{55}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{33}}{44}$ 0 0 0 0 0 $-\frac{\sqrt{55}}{220}$ $-\frac{\sqrt{55}i}{55}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{55}}{55}$ 0 $\frac{\sqrt{55}i}{55}$ $-\frac{\sqrt{55}}{110}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 $-\frac{\sqrt{55}}{55}$ 0 $-\frac{\sqrt{55}i}{55}$ 0 0 $\frac{\sqrt{55}}{110}$ | |
| | 0 $-\frac{\sqrt{33}i}{33}$ $\frac{\sqrt{55}}{220}$ 0 0 0 0 0 $-\frac{\sqrt{55}}{55}$ $\frac{7\sqrt{33}}{132}$ 0 0 0 0 | |
| | $\frac{\sqrt{33}i}{33}$ 0 0 $-\frac{\sqrt{55}}{220}$ 0 0 $-\frac{\sqrt{55}}{55}$ 0 0 $-\frac{7\sqrt{33}}{132}$ 0 0 0 0 | |
| | 0 $\frac{\sqrt{33}}{33}$ 0 0 $\frac{\sqrt{55}}{220}$ 0 0 $\frac{\sqrt{55}i}{55}$ 0 0 $-\frac{7\sqrt{33}}{132}$ 0 0 0 0 | |
| | $\frac{\sqrt{33}}{33}$ 0 0 0 0 $-\frac{\sqrt{55}}{220}$ $-\frac{\sqrt{55}i}{55}$ 0 0 0 0 $\frac{7\sqrt{33}}{132}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{55}}{55}$ 0 $\frac{\sqrt{55}i}{55}$ $-\frac{\sqrt{55}}{110}$ 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{55}}{55}$ 0 $-\frac{\sqrt{55}i}{55}$ 0 0 $\frac{\sqrt{55}}{110}$ 0 0 0 0 0 0 | |

989 symmetry

$$\frac{\sqrt{6006xyz(x^2-3y^2)(3x^2-y^2)}}{16}$$

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------------|--|--|
| $\mathbb{M}_7^{(1,-1;a)}(A_1, 1)$ | 0 0 0 $\frac{\sqrt{105}}{56}$ 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}}{56}$ 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 | |
| | 0 $\frac{\sqrt{105}}{56}$ 0 0 $-\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{112}$ 0 0 $-\frac{\sqrt{105}i}{56}$ | |
| | $\frac{\sqrt{105}}{56}$ 0 0 0 0 $\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 $\frac{\sqrt{105}}{112}$ $\frac{\sqrt{105}i}{56}$ 0 | |
| | 0 $-\frac{\sqrt{105}i}{56}$ $-\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 $\frac{\sqrt{105}}{112}$ 0 0 0 0 $-\frac{\sqrt{105}}{56}$ | |
| | $\frac{\sqrt{105}i}{56}$ 0 0 $\frac{5\sqrt{7}}{112}$ 0 0 0 0 $-\frac{\sqrt{105}}{112}$ 0 0 $-\frac{\sqrt{105}}{56}$ 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| | 0 $-\frac{3\sqrt{7}}{56}$ 0 0 $\frac{\sqrt{105}}{112}$ 0 0 0 0 $\frac{3\sqrt{7}}{112}$ 0 0 $\frac{3\sqrt{7}i}{56}$ | |
| | $-\frac{3\sqrt{7}}{56}$ 0 0 0 0 $-\frac{\sqrt{105}}{112}$ 0 0 0 0 0 $-\frac{3\sqrt{7}}{112}$ $-\frac{3\sqrt{7}i}{56}$ 0 | |
| | 0 $-\frac{3\sqrt{7}i}{56}$ $-\frac{\sqrt{105}}{112}$ 0 0 0 0 0 $\frac{3\sqrt{7}}{112}$ 0 0 0 0 $-\frac{3\sqrt{7}}{56}$ | |
| | $\frac{3\sqrt{7}i}{56}$ 0 0 $\frac{\sqrt{105}}{112}$ 0 0 0 0 $-\frac{3\sqrt{7}}{112}$ 0 0 $-\frac{3\sqrt{7}}{56}$ 0 | |
| | 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 $-\frac{3\sqrt{7}}{56}$ 0 0 | |
| | 0 0 $\frac{\sqrt{105}i}{56}$ 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 $-\frac{3\sqrt{7}}{56}$ 0 0 0 | |
| 990 | symmetry | $\frac{\sqrt{21}x(x^2-3y^2)(3x^4+6x^2y^2-60x^2z^2+3y^4-60y^2z^2+80z^4)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-----------------------------------|-------------------------------|-------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------------|-------------------------------|------------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|-------------------------------|-------------------------------|---|--|
| $\mathbb{M}_7^{(1,-1;a)}(A_1, 2)$ | 0 | $\frac{3\sqrt{2002}}{2002}$ | 0 | 0 | $\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | $\frac{\sqrt{30030}i}{1001}$ | 0 | 0 | $-\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | $-\frac{3\sqrt{2002}i}{2002}$ | | |
| | $\frac{3\sqrt{2002}}{2002}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{30030}}{4004}$ | $-\frac{\sqrt{30030}i}{1001}$ | 0 | 0 | 0 | 0 | $\frac{15\sqrt{2002}}{4004}$ | $-\frac{3\sqrt{2002}i}{2002}$ | 0 | | |
| | 0 | 0 | 0 | $\frac{15\sqrt{2002}}{4576}$ | 0 | $\frac{15\sqrt{2002}i}{32032}$ | $\frac{5\sqrt{2002}}{2002}$ | 0 | 0 | $\frac{19\sqrt{30030}}{32032}$ | 0 | $-\frac{5\sqrt{30030}i}{32032}$ | $-\frac{3\sqrt{30030}}{4004}$ | 0 | | |
| | 0 | 0 | $\frac{15\sqrt{2002}}{4576}$ | 0 | $-\frac{15\sqrt{2002}i}{32032}$ | 0 | 0 | $-\frac{5\sqrt{2002}}{2002}$ | $\frac{19\sqrt{30030}}{32032}$ | 0 | $\frac{5\sqrt{30030}i}{32032}$ | 0 | 0 | $\frac{3\sqrt{30030}}{4004}$ | | |
| | $\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | $\frac{15\sqrt{2002}i}{32032}$ | 0 | $-\frac{45\sqrt{2002}}{32032}$ | 0 | 0 | 0 | $\frac{3\sqrt{30030}i}{4576}$ | 0 | $\frac{15\sqrt{30030}}{32032}$ | 0 | 0 | | |
| | 0 | $-\frac{3\sqrt{30030}}{4004}$ | $-\frac{15\sqrt{2002}i}{32032}$ | 0 | $-\frac{45\sqrt{2002}}{32032}$ | 0 | 0 | 0 | $-\frac{3\sqrt{30030}i}{4576}$ | 0 | $\frac{15\sqrt{30030}}{32032}$ | 0 | 0 | 0 | | |
| | 0 | $\frac{\sqrt{30030}i}{1001}$ | $\frac{5\sqrt{2002}}{2002}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{30030}}{2002}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{30030}}{1001}$ | | |
| | $-\frac{\sqrt{30030}i}{1001}$ | 0 | 0 | $-\frac{5\sqrt{2002}}{2002}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30030}}{2002}$ | 0 | 0 | $\frac{\sqrt{30030}}{1001}$ | 0 | | |
| | 0 | 0 | 0 | $\frac{19\sqrt{30030}}{32032}$ | 0 | $\frac{3\sqrt{30030}i}{4576}$ | $-\frac{\sqrt{30030}}{2002}$ | 0 | 0 | $\frac{15\sqrt{2002}}{32032}$ | 0 | $-\frac{15\sqrt{2002}i}{4576}$ | $-\frac{15\sqrt{2002}}{4004}$ | 0 | | |
| | 0 | 0 | $\frac{19\sqrt{30030}}{32032}$ | 0 | $-\frac{3\sqrt{30030}i}{4576}$ | 0 | 0 | $\frac{\sqrt{30030}}{2002}$ | $\frac{15\sqrt{2002}}{32032}$ | 0 | $\frac{15\sqrt{2002}i}{4576}$ | 0 | 0 | $\frac{15\sqrt{2002}}{4004}$ | | |
| | $-\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | $-\frac{5\sqrt{30030}i}{32032}$ | 0 | $\frac{15\sqrt{30030}}{32032}$ | 0 | 0 | 0 | $-\frac{15\sqrt{2002}i}{4576}$ | 0 | $-\frac{75\sqrt{2002}}{32032}$ | 0 | 0 | | |
| | 0 | $\frac{15\sqrt{2002}}{4004}$ | $\frac{5\sqrt{30030}i}{32032}$ | 0 | $\frac{15\sqrt{30030}}{32032}$ | 0 | 0 | 0 | $\frac{15\sqrt{2002}i}{4576}$ | 0 | $-\frac{75\sqrt{2002}}{32032}$ | 0 | 0 | 0 | | |
| | 0 | $\frac{3\sqrt{2002}i}{2002}$ | $-\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{30030}}{1001}$ | $-\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{2002}}{2002}$ | | |
| | $-\frac{3\sqrt{2002}i}{2002}$ | 0 | 0 | $\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | $\frac{\sqrt{30030}}{1001}$ | 0 | 0 | $\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | 0 | $-\frac{3\sqrt{2002}}{2002}$ | 0 | |

$$\frac{z(35x^6 + 105x^4y^2 - 210x^4z^2 + 105x^2y^4 - 420x^2y^2z^2 + 168x^2z^4 + 35y^6 - 210y^4z^2 + 168y^2z^4 - 16z^6)}{16}$$

991 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-----------------------------------|------------------------------|---|------------------------------|-----------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|-----------------------------|-------------------------------|------------------------------|----------------------------|-----------------------------|--|
| $\mathbb{M}_7^{(1,-1;a)}(A_2, 1)$ | $\frac{\sqrt{858}}{286}$ | 0 | 0 | $\frac{\sqrt{1430}i}{1144}$ | 0 | $-\frac{\sqrt{1430}}{1144}$ | 0 | 0 | 0 | $\frac{3\sqrt{858}i}{1144}$ | 0 | $\frac{3\sqrt{858}}{1144}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{858}}{286}$ | $-\frac{\sqrt{1430}i}{1144}$ | 0 | $-\frac{\sqrt{1430}}{1144}$ | 0 | 0 | 0 | $-\frac{3\sqrt{858}i}{1144}$ | 0 | $\frac{3\sqrt{858}}{1144}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{1430}i}{1144}$ | $-\frac{25\sqrt{858}}{6864}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{858}}{1144}$ | $-\frac{7\sqrt{1430}}{2288}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1430}}{572}$ | |
| | $-\frac{\sqrt{1430}i}{1144}$ | 0 | 0 | $\frac{25\sqrt{858}}{6864}$ | 0 | 0 | $\frac{5\sqrt{858}}{1144}$ | 0 | 0 | $\frac{7\sqrt{1430}}{2288}$ | 0 | 0 | $-\frac{\sqrt{1430}}{572}$ | 0 | |
| | 0 | $-\frac{\sqrt{1430}}{1144}$ | 0 | 0 | $-\frac{25\sqrt{858}}{6864}$ | 0 | 0 | $-\frac{5\sqrt{858}i}{1144}$ | 0 | 0 | $\frac{7\sqrt{1430}}{2288}$ | 0 | 0 | $-\frac{\sqrt{1430}i}{572}$ | |
| | $-\frac{\sqrt{1430}}{1144}$ | 0 | 0 | 0 | 0 | $\frac{25\sqrt{858}}{6864}$ | $\frac{5\sqrt{858}i}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{7\sqrt{1430}}{2288}$ | $\frac{\sqrt{1430}i}{572}$ | 0 | |
| | 0 | 0 | 0 | $\frac{5\sqrt{858}}{1144}$ | 0 | $-\frac{5\sqrt{858}i}{1144}$ | $\frac{5\sqrt{858}}{429}$ | 0 | 0 | $\frac{5\sqrt{1430}}{1144}$ | 0 | $\frac{5\sqrt{1430}i}{1144}$ | 0 | 0 | |
| | 0 | 0 | $\frac{5\sqrt{858}}{1144}$ | 0 | $\frac{5\sqrt{858}i}{1144}$ | 0 | 0 | $-\frac{5\sqrt{858}}{429}$ | $\frac{5\sqrt{1430}}{1144}$ | 0 | $-\frac{5\sqrt{1430}i}{1144}$ | 0 | 0 | 0 | |
| | 0 | $\frac{3\sqrt{858}i}{1144}$ | $-\frac{7\sqrt{1430}}{2288}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{1430}}{1144}$ | $-\frac{\sqrt{858}}{176}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{858}}{572}$ | |
| | $-\frac{3\sqrt{858}i}{1144}$ | 0 | 0 | $\frac{7\sqrt{1430}}{2288}$ | 0 | 0 | $\frac{5\sqrt{1430}}{1144}$ | 0 | 0 | $\frac{\sqrt{858}}{176}$ | 0 | 0 | $-\frac{\sqrt{858}}{572}$ | 0 | |
| | 0 | $\frac{3\sqrt{858}}{1144}$ | 0 | 0 | $\frac{7\sqrt{1430}}{2288}$ | 0 | 0 | $\frac{5\sqrt{1430}i}{1144}$ | 0 | 0 | $-\frac{\sqrt{858}}{176}$ | 0 | 0 | $\frac{\sqrt{858}i}{572}$ | |
| | $\frac{3\sqrt{858}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{7\sqrt{1430}}{2288}$ | $-\frac{5\sqrt{1430}i}{1144}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{858}}{176}$ | $-\frac{\sqrt{858}i}{572}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{1430}}{572}$ | 0 | $-\frac{\sqrt{1430}i}{572}$ | 0 | 0 | 0 | $-\frac{\sqrt{858}}{572}$ | 0 | $\frac{\sqrt{858}i}{572}$ | $\frac{\sqrt{858}}{286}$ | 0 | |
| | 0 | 0 | $-\frac{\sqrt{1430}}{572}$ | 0 | $\frac{\sqrt{1430}i}{572}$ | 0 | 0 | 0 | $-\frac{\sqrt{858}}{572}$ | 0 | $-\frac{\sqrt{858}i}{572}$ | 0 | 0 | $-\frac{\sqrt{858}}{286}$ | |
| 992 | symmetry | $\frac{\sqrt{6006z(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}}{32}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|-----------------------------------|---------------------------|--|
| $\mathbb{M}_7^{(1,-1;a)}(A_2, 2)$ | 0 | 0 0 0 $\frac{\sqrt{105}i}{56}$ 0 $\frac{\sqrt{105}}{56}$ 0 0 0 $-\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 |
| | 0 | 0 0 $-\frac{\sqrt{105}i}{56}$ 0 $\frac{\sqrt{105}}{56}$ 0 0 0 $\frac{3\sqrt{7}i}{56}$ 0 $\frac{3\sqrt{7}}{56}$ 0 0 0 |
| | 0 | $\frac{\sqrt{105}i}{56}$ $\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 0 $-\frac{\sqrt{105}}{112}$ 0 0 0 0 $\frac{\sqrt{105}}{56}$ |
| | $-\frac{\sqrt{105}i}{56}$ | 0 0 0 $-\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 $\frac{\sqrt{105}}{112}$ 0 0 $\frac{\sqrt{105}}{56}$ 0 |
| | 0 | $\frac{\sqrt{105}}{56}$ 0 0 0 $-\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{112}$ 0 0 $-\frac{\sqrt{105}i}{56}$ |
| | $\frac{\sqrt{105}}{56}$ | 0 0 0 0 0 $\frac{5\sqrt{7}}{112}$ 0 0 0 0 0 0 $\frac{\sqrt{105}}{112}$ $\frac{\sqrt{105}i}{56}$ 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| | 0 | $-\frac{3\sqrt{7}i}{56}$ $-\frac{\sqrt{105}}{112}$ 0 0 0 0 0 0 $\frac{3\sqrt{7}}{112}$ 0 0 0 0 $-\frac{3\sqrt{7}}{56}$ |
| | $\frac{3\sqrt{7}i}{56}$ | 0 0 $\frac{\sqrt{105}}{112}$ 0 0 0 0 0 0 $-\frac{3\sqrt{7}}{112}$ 0 0 $-\frac{3\sqrt{7}}{56}$ 0 |
| | 0 | $\frac{3\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{105}}{112}$ 0 0 0 0 0 0 $-\frac{3\sqrt{7}}{112}$ 0 0 $-\frac{3\sqrt{7}i}{56}$ |
| | $\frac{3\sqrt{7}}{56}$ | 0 0 0 0 0 $\frac{\sqrt{105}}{112}$ 0 0 0 0 0 0 $\frac{3\sqrt{7}}{112}$ $\frac{3\sqrt{7}i}{56}$ 0 |
| | 0 | 0 0 0 $\frac{\sqrt{105}}{56}$ 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 $-\frac{3\sqrt{7}i}{56}$ 0 0 |
| | 0 | 0 0 $\frac{\sqrt{105}}{56}$ 0 $\frac{\sqrt{105}i}{56}$ 0 0 0 $-\frac{3\sqrt{7}}{56}$ 0 $\frac{3\sqrt{7}i}{56}$ 0 0 0 |
| 993 | symmetry | $\frac{\sqrt{21}y(3x^2-y^2)(3x^4+6x^2y^2-60x^2z^2+3y^4-60y^2z^2+80z^4)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-----------------------------------|-------------------------------|------------------------------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|------------------------------|---------------------------------|--------------------------------|----------------------------------|---------------------------------|----------------------------------|-------------------------------|-------------------------------|---|
| $\mathbb{M}_7^{(1,-1;a)}(A_2, 3)$ | 0 | $\frac{3\sqrt{2002}i}{2002}$ | $-\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | 0 | $\frac{\sqrt{30030}}{1001}$ | $-\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{2002}}{2002}$ | |
| | $-\frac{3\sqrt{2002}i}{2002}$ | 0 | 0 | $\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | $\frac{\sqrt{30030}}{1001}$ | 0 | 0 | $\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | 0 | $-\frac{3\sqrt{2002}}{2002}$ | 0 |
| | $-\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | $-\frac{45\sqrt{2002}i}{32032}$ | 0 | $\frac{15\sqrt{2002}}{32032}$ | 0 | 0 | 0 | $-\frac{15\sqrt{30030}i}{32032}$ | 0 | $-\frac{3\sqrt{30030}}{4576}$ | 0 | 0 | |
| | 0 | $\frac{3\sqrt{30030}}{4004}$ | $\frac{45\sqrt{2002}i}{32032}$ | 0 | $\frac{15\sqrt{2002}}{32032}$ | 0 | 0 | $\frac{15\sqrt{30030}i}{32032}$ | 0 | $-\frac{3\sqrt{30030}}{4576}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{15\sqrt{2002}}{32032}$ | 0 | $\frac{15\sqrt{2002}i}{4576}$ | $-\frac{5\sqrt{2002}}{2002}$ | 0 | 0 | $\frac{5\sqrt{30030}}{32032}$ | 0 | $-\frac{19\sqrt{30030}i}{32032}$ | $-\frac{3\sqrt{30030}}{4004}$ | 0 | |
| | 0 | 0 | $\frac{15\sqrt{2002}}{32032}$ | 0 | $-\frac{15\sqrt{2002}i}{4576}$ | 0 | 0 | $\frac{5\sqrt{2002}}{2002}$ | $\frac{5\sqrt{30030}}{32032}$ | 0 | $\frac{19\sqrt{30030}i}{32032}$ | 0 | 0 | $\frac{3\sqrt{30030}}{4004}$ | |
| | 0 | $\frac{\sqrt{30030}}{1001}$ | 0 | 0 | $-\frac{5\sqrt{2002}}{2002}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{30030}{2002}$ | 0 | 0 | $-\frac{\sqrt{30030}i}{1001}$ | |
| | $\frac{\sqrt{30030}}{1001}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{2002}}{2002}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{30030}}{2002}$ | $\frac{\sqrt{30030}i}{1001}$ | 0 | |
| | $-\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | $-\frac{15\sqrt{30030}i}{32032}$ | 0 | $\frac{5\sqrt{30030}}{32032}$ | 0 | 0 | 0 | $-\frac{75\sqrt{2002}i}{32032}$ | 0 | $-\frac{15\sqrt{2002}}{4576}$ | 0 | 0 | |
| | 0 | $\frac{15\sqrt{2002}}{4004}$ | $\frac{15\sqrt{30030}i}{32032}$ | 0 | $\frac{5\sqrt{30030}}{32032}$ | 0 | 0 | 0 | $\frac{75\sqrt{2002}i}{32032}$ | 0 | $-\frac{15\sqrt{2002}}{4576}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{3\sqrt{30030}}{4576}$ | 0 | $-\frac{19\sqrt{30030}i}{32032}$ | $-\frac{\sqrt{30030}}{2002}$ | 0 | 0 | $-\frac{15\sqrt{2002}}{4576}$ | 0 | $\frac{15\sqrt{2002}i}{32032}$ | $\frac{15\sqrt{2002}}{4004}$ | 0 | |
| | 0 | 0 | $-\frac{3\sqrt{30030}}{4576}$ | 0 | $\frac{19\sqrt{30030}i}{32032}$ | 0 | 0 | $\frac{\sqrt{30030}}{2002}$ | $-\frac{15\sqrt{2002}}{4576}$ | 0 | $-\frac{15\sqrt{2002}i}{32032}$ | 0 | 0 | $-\frac{15\sqrt{2002}}{4004}$ | |
| | 0 | $-\frac{3\sqrt{2002}}{2002}$ | 0 | 0 | $-\frac{3\sqrt{30030}}{4004}$ | 0 | 0 | $-\frac{\sqrt{30030}i}{1001}$ | 0 | 0 | $\frac{15\sqrt{2002}}{4004}$ | 0 | 0 | $-\frac{3\sqrt{2002}i}{2002}$ | |
| | $-\frac{3\sqrt{2002}}{2002}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{30030}}{4004}$ | $\frac{\sqrt{30030}i}{1001}$ | 0 | 0 | 0 | 0 | $-\frac{15\sqrt{2002}}{4004}$ | $\frac{3\sqrt{2002}i}{2002}$ | 0 | |

$$\frac{\sqrt{429x(x^6 - 21x^4y^2 + 35x^2y^4 - 7y^6)}}{32}$$

994 symmetry

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|-------------------------------|--|
| $\mathbb{M}_{7,0}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{2}}{32} & 0 & -\frac{5\sqrt{2}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & -\frac{\sqrt{30}i}{32} & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{2}}{32} & 0 & \frac{5\sqrt{2}i}{32} & 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{2}i}{32} & 0 & -\frac{5\sqrt{2}}{32} & 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{2}i}{32} & 0 & -\frac{5\sqrt{2}}{32} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & \frac{3\sqrt{2}i}{32} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & \frac{3\sqrt{2}i}{32} & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{32} & 0 & -\frac{3\sqrt{2}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 995 symmetry | $\frac{\sqrt{429y}(7x^6 - 35x^4y^2 + 21x^2y^4 - y^6)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|-------------------------------|--|
| $\mathbb{M}_{7,1}^{(1,-1;a)}(E, 1)$ | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{2}i}{32} & 0 & -\frac{5\sqrt{2}}{32} & 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{2}i}{32} & 0 & -\frac{5\sqrt{2}}{32} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & -\frac{\sqrt{30}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{2}}{32} & 0 & \frac{5\sqrt{2}i}{32} & 0 & 0 & 0 & \frac{\sqrt{30}}{32} & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{2}}{32} & 0 & -\frac{5\sqrt{2}i}{32} & 0 & 0 & 0 & \frac{\sqrt{30}}{32} & 0 & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}i}{32} & 0 & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & -\frac{3\sqrt{2}i}{32} & 0 & \frac{3\sqrt{2}}{32} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}i}{32} & 0 & \frac{\sqrt{30}}{32} & 0 & 0 & 0 & \frac{3\sqrt{2}i}{32} & 0 & \frac{3\sqrt{2}}{32} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & \frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & \frac{3\sqrt{2}i}{32} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{32} & 0 & -\frac{\sqrt{30}i}{32} & 0 & 0 & 0 & \frac{3\sqrt{2}}{32} & 0 & -\frac{3\sqrt{2}i}{32} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| | 996 symmetry | $-\frac{\sqrt{231}x(x^2+y^2-12z^2)(x^4-10x^2y^2+5y^4)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix |
|-------------------------------------|---|---|
| $\mathbb{M}_{7,0}^{(1,-1;a)}(E, 2)$ | $0 - \frac{3\sqrt{182}}{182}$ | $0 0 \frac{\sqrt{2730}}{364} 0 0 0 0 0 0 \frac{3\sqrt{182}}{364} 0 0 \frac{3\sqrt{182}}{182} i$ |
| | $-\frac{3\sqrt{182}}{182} 0 0 0 0 -\frac{\sqrt{2730}}{364} 0 0 0 0 0 -\frac{3\sqrt{182}}{364} -\frac{3\sqrt{182}}{182} 0$ | |
| | $0 0 0 -\frac{5\sqrt{182}}{416} 0 -\frac{5\sqrt{182}i}{2912} 0 0 0 -\frac{\sqrt{2730}}{2912} 0 \frac{\sqrt{2730}i}{416} \frac{\sqrt{2730}}{364} 0$ | |
| | $0 0 -\frac{5\sqrt{182}}{416} 0 \frac{5\sqrt{182}i}{2912} 0 0 0 -\frac{\sqrt{2730}}{2912} 0 -\frac{\sqrt{2730}i}{416} 0 0 -\frac{\sqrt{2730}}{364}$ | |
| | $\frac{\sqrt{2730}}{364} 0 0 -\frac{5\sqrt{182}i}{2912} 0 -\frac{25\sqrt{182}}{2912} 0 0 0 \frac{9\sqrt{2730}i}{2912} 0 \frac{3\sqrt{2730}}{2912} 0 0$ | |
| | $0 -\frac{\sqrt{2730}}{364} \frac{5\sqrt{182}i}{2912} 0 -\frac{25\sqrt{182}}{2912} 0 0 0 -\frac{9\sqrt{2730}i}{2912} 0 \frac{3\sqrt{2730}}{2912} 0 0 0$ | |
| | $0 0 0 0 0 0 0 0 0 0 0 0 0 0 0$ | |
| | $0 0 0 -\frac{\sqrt{2730}}{2912} 0 \frac{9\sqrt{2730}i}{2912} 0 0 0 \frac{27\sqrt{182}}{2912} 0 \frac{3\sqrt{182}i}{2912} -\frac{3\sqrt{182}}{364} 0$ | |
| | $0 0 -\frac{\sqrt{2730}}{2912} 0 -\frac{9\sqrt{2730}i}{2912} 0 0 0 \frac{27\sqrt{182}}{2912} 0 -\frac{3\sqrt{182}i}{2912} 0 0 \frac{3\sqrt{182}}{364}$ | |
| | $\frac{3\sqrt{182}}{364} 0 0 \frac{\sqrt{2730}i}{416} 0 \frac{3\sqrt{2730}}{2912} 0 0 0 \frac{3\sqrt{182}i}{2912} 0 \frac{33\sqrt{182}}{2912} 0 0$ | |
| | $0 -\frac{3\sqrt{182}}{364} -\frac{\sqrt{2730}i}{416} 0 \frac{3\sqrt{2730}}{2912} 0 0 0 -\frac{3\sqrt{182}i}{2912} 0 \frac{33\sqrt{182}}{2912} 0 0 0$ | |
| | $0 \frac{3\sqrt{182}i}{182} \frac{\sqrt{2730}}{364} 0 0 0 0 -\frac{3\sqrt{182}}{364} 0 0 0 0 0 \frac{3\sqrt{182}}{182}$ | |
| | $-\frac{3\sqrt{182}i}{182} 0 0 -\frac{\sqrt{2730}}{364} 0 0 0 0 0 \frac{3\sqrt{182}}{364} 0 0 \frac{3\sqrt{182}}{182} 0$ | |
| 997 | symmetry | $\frac{\sqrt{231}y(x^2+y^2-12z^2)(5x^4-10x^2y^2+y^4)}{32}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|----------------------------|-----------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|---|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|---|
| $\mathbb{M}_{7,1}^{(1,-1;a)}(E, 2)$ | 0 | $-\frac{3\sqrt{182}i}{182}$ | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{182}}{364}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{182}$ | |
| | $\frac{3\sqrt{182}i}{182}$ | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{182}$ | 0 | |
| | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | $-\frac{25\sqrt{182}i}{2912}$ | 0 | $-\frac{5\sqrt{182}}{2912}$ | 0 | 0 | $-\frac{3\sqrt{2730}i}{2912}$ | 0 | $-\frac{9\sqrt{2730}}{2912}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{2730}}{364}$ | $\frac{25\sqrt{182}i}{2912}$ | 0 | $-\frac{5\sqrt{182}}{2912}$ | 0 | 0 | $\frac{3\sqrt{2730}i}{2912}$ | 0 | $-\frac{9\sqrt{2730}}{2912}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{182}}{2912}$ | 0 | $-\frac{5\sqrt{182}i}{416}$ | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{416}$ | 0 | $\frac{\sqrt{2730}i}{2912}$ | $\frac{\sqrt{2730}}{364}$ | 0 | |
| | 0 | 0 | $-\frac{5\sqrt{182}}{2912}$ | 0 | $\frac{5\sqrt{182}i}{416}$ | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{416}$ | 0 | $-\frac{\sqrt{2730}i}{2912}$ | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | $\frac{3\sqrt{182}}{364}$ | 0 | 0 | $-\frac{3\sqrt{2730}i}{2912}$ | 0 | $-\frac{\sqrt{2730}}{416}$ | 0 | 0 | 0 | $\frac{33\sqrt{182}i}{2912}$ | 0 | $\frac{3\sqrt{182}}{2912}$ | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{182}}{364}$ | $\frac{3\sqrt{2730}i}{2912}$ | 0 | $-\frac{\sqrt{2730}}{416}$ | 0 | 0 | 0 | $-\frac{33\sqrt{182}i}{2912}$ | 0 | $\frac{3\sqrt{182}}{2912}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{9\sqrt{2730}}{2912}$ | 0 | $\frac{\sqrt{2730}i}{2912}$ | 0 | 0 | 0 | $\frac{3\sqrt{182}}{2912}$ | 0 | $\frac{27\sqrt{182}i}{2912}$ | $\frac{3\sqrt{182}}{364}$ | 0 | |
| | 0 | 0 | $-\frac{9\sqrt{2730}}{2912}$ | 0 | $-\frac{\sqrt{2730}i}{2912}$ | 0 | 0 | 0 | $\frac{3\sqrt{182}}{2912}$ | 0 | $-\frac{27\sqrt{182}i}{2912}$ | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | |
| | 0 | $-\frac{3\sqrt{182}}{182}$ | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{182}}{364}$ | 0 | 0 | $\frac{3\sqrt{182}i}{182}$ | |
| | $-\frac{3\sqrt{182}}{182}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | $-\frac{3\sqrt{182}i}{182}$ | 0 | |

998 symmetry

$$\frac{\sqrt{7}x(5x^6 + 15x^4y^2 - 120x^4z^2 + 15x^2y^4 - 240x^2y^2z^2 + 240x^2z^4 + 5y^6 - 120y^4z^2 + 240y^2z^4 - 64z^6)}{32}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|---|-------------------------------|------------------------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|------------------------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|-----------------------------|------------------------------|---|---|
| $\mathbb{M}_{7,0}^{(1,-1;a)}(E, 3)$ | 0 | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 | $\frac{\sqrt{10010}}{2002}$ | 0 | 0 | $\frac{\sqrt{10010i}}{1001}$ | 0 | 0 | $-\frac{3\sqrt{6006}}{2002}$ | 0 | 0 | 0 | 0 | |
| | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{2002}$ | $-\frac{\sqrt{10010i}}{1001}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{6006}}{2002}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{25\sqrt{6006}}{13728}$ | 0 | $\frac{5\sqrt{6006i}}{32032}$ | $-\frac{5\sqrt{6006}}{2002}$ | 0 | 0 | $-\frac{45\sqrt{10010}}{32032}$ | 0 | $-\frac{\sqrt{10010i}}{2464}$ | $\frac{\sqrt{10010}}{1001}$ | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{25\sqrt{6006}}{13728}$ | 0 | $-\frac{5\sqrt{6006i}}{32032}$ | 0 | 0 | $\frac{5\sqrt{6006}}{2002}$ | $-\frac{45\sqrt{10010}}{32032}$ | 0 | $\frac{\sqrt{10010i}}{2464}$ | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | |
| | $\frac{\sqrt{10010}}{2002}$ | 0 | 0 | $\frac{5\sqrt{6006i}}{32032}$ | 0 | $-\frac{25\sqrt{6006}}{96096}$ | 0 | 0 | 0 | $\frac{\sqrt{10010i}}{2464}$ | 0 | $\frac{\sqrt{10010}}{2912}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{10010}}{2002}$ | $-\frac{5\sqrt{6006i}}{32032}$ | 0 | $-\frac{25\sqrt{6006}}{96096}$ | 0 | 0 | 0 | $-\frac{\sqrt{10010i}}{2464}$ | 0 | $\frac{\sqrt{10010}}{2912}$ | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{10010i}}{1001}$ | $-\frac{5\sqrt{6006}}{2002}$ | 0 | 0 | 0 | 0 | $\frac{10\sqrt{6006}}{3003}$ | $-\frac{5\sqrt{10010}}{2002}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | |
| | $-\frac{\sqrt{10010i}}{1001}$ | 0 | 0 | $\frac{5\sqrt{6006}}{2002}$ | 0 | 0 | $\frac{10\sqrt{6006}}{3003}$ | 0 | 0 | $\frac{5\sqrt{10010}}{2002}$ | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{45\sqrt{10010}}{32032}$ | 0 | $\frac{\sqrt{10010i}}{2464}$ | $-\frac{5\sqrt{10010}}{2002}$ | 0 | 0 | $-\frac{67\sqrt{6006}}{32032}$ | 0 | $-\frac{5\sqrt{6006i}}{4576}$ | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{45\sqrt{10010}}{32032}$ | 0 | $-\frac{\sqrt{10010i}}{2464}$ | 0 | 0 | $\frac{5\sqrt{10010}}{2002}$ | $-\frac{67\sqrt{6006}}{32032}$ | 0 | $\frac{5\sqrt{6006i}}{4576}$ | 0 | 0 | $-\frac{\sqrt{6006}}{1001}$ | 0 | |
| 999 | $-\frac{3\sqrt{6006}}{2002}$ | 0 | 0 | $-\frac{\sqrt{10010i}}{2464}$ | 0 | $\frac{\sqrt{10010}}{2912}$ | 0 | 0 | 0 | $-\frac{5\sqrt{6006i}}{4576}$ | 0 | $-\frac{37\sqrt{6006}}{32032}$ | 0 | 0 | 0 | |
| | 0 | $\frac{3\sqrt{6006}}{2002}$ | $\frac{\sqrt{10010i}}{2464}$ | 0 | $\frac{\sqrt{10010}}{2912}$ | 0 | 0 | 0 | $\frac{5\sqrt{6006i}}{4576}$ | 0 | $-\frac{37\sqrt{6006}}{32032}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{10010}}{1001}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{6006}}{1001}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 | $-\frac{\sqrt{6006}}{1001}$ | 0 | 0 | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 | |
| symmetry | | | | | | | | | | | | | | | | |
| $-\frac{\sqrt{7}y(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6)}{32}$ | | | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|------------------------------|--|---------------------------------|--------------------------------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|---------------------------------|--------------------------------|---------------------------------|----------------------------------|------------------------------|-------------------------------|---|
| $\mathbb{M}_{7,1}^{(1,-1;a)}(E, 3)$ | 0 | $-\frac{\sqrt{6006}i}{1001}$ | $\frac{\sqrt{10010}}{2002}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | $\frac{3\sqrt{6006}}{2002}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{6006}i}{1001}$ | 0 | 0 | $-\frac{\sqrt{10010}}{2002}$ | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 | $-\frac{3\sqrt{6006}}{2002}$ | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{10010}}{2002}$ | 0 | 0 | $\frac{25\sqrt{6006}i}{96096}$ | 0 | $-\frac{5\sqrt{6006}}{32032}$ | 0 | 0 | 0 | $\frac{\sqrt{10010}i}{2912}$ | 0 | $\frac{\sqrt{10010}}{2464}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{10010}}{2002}$ | $-\frac{25\sqrt{6006}i}{96096}$ | 0 | $-\frac{5\sqrt{6006}}{32032}$ | 0 | 0 | 0 | $-\frac{\sqrt{10010}i}{2912}$ | 0 | $\frac{\sqrt{10010}}{2464}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{5\sqrt{6006}}{32032}$ | 0 | $\frac{25\sqrt{6006}i}{13728}$ | $-\frac{5\sqrt{6006}}{2002}$ | 0 | 0 | $-\frac{\sqrt{10010}}{2464}$ | 0 | $-\frac{45\sqrt{10010}i}{32032}$ | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 |
| | 0 | 0 | $-\frac{5\sqrt{6006}}{32032}$ | 0 | $-\frac{25\sqrt{6006}i}{13728}$ | 0 | 0 | $\frac{5\sqrt{6006}}{2002}$ | $-\frac{\sqrt{10010}}{2464}$ | 0 | $\frac{45\sqrt{10010}i}{32032}$ | 0 | 0 | $\frac{\sqrt{10010}}{1001}$ | |
| | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 | $-\frac{5\sqrt{6006}}{2002}$ | 0 | 0 | $-\frac{10\sqrt{6006}i}{3003}$ | 0 | 0 | $\frac{5\sqrt{10010}}{2002}$ | 0 | 0 | $-\frac{\sqrt{10010}i}{1001}$ | |
| | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{6006}}{2002}$ | $\frac{10\sqrt{6006}i}{3003}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{10010}}{2002}$ | $\frac{\sqrt{10010}i}{1001}$ | 0 | |
| | $\frac{3\sqrt{6006}}{2002}$ | 0 | 0 | $\frac{\sqrt{10010}i}{2912}$ | 0 | $-\frac{\sqrt{10010}}{2464}$ | 0 | 0 | 0 | $\frac{37\sqrt{6006}i}{32032}$ | 0 | $\frac{5\sqrt{6006}}{4576}$ | 0 | 0 | 0 |
| | 0 | $-\frac{3\sqrt{6006}}{2002}$ | $-\frac{\sqrt{10010}i}{2912}$ | 0 | $-\frac{\sqrt{10010}}{2464}$ | 0 | 0 | 0 | $-\frac{37\sqrt{6006}i}{32032}$ | 0 | $\frac{5\sqrt{6006}}{4576}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{10010}}{2464}$ | 0 | $-\frac{45\sqrt{10010}i}{32032}$ | $\frac{5\sqrt{10010}}{2002}$ | 0 | 0 | $\frac{5\sqrt{6006}}{4576}$ | 0 | $\frac{67\sqrt{6006}i}{32032}$ | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{10010}}{2464}$ | 0 | $\frac{45\sqrt{10010}i}{32032}$ | 0 | 0 | $-\frac{5\sqrt{10010}}{2002}$ | $\frac{5\sqrt{6006}}{4576}$ | 0 | $-\frac{67\sqrt{6006}i}{32032}$ | 0 | 0 | $-\frac{\sqrt{6006}}{1001}$ | |
| | 0 | 0 | 0 | 0 | $-\frac{\sqrt{10010}}{1001}$ | 0 | 0 | $-\frac{\sqrt{10010}i}{1001}$ | 0 | 0 | $\frac{\sqrt{6006}}{1001}$ | 0 | 0 | $-\frac{\sqrt{6006}i}{1001}$ | |
| | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{10010}}{1001}$ | $\frac{\sqrt{10010}i}{1001}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{6006}}{1001}$ | $\frac{\sqrt{6006}i}{1001}$ | 0 | |
| 1000 | symmetry | $\frac{\sqrt{231xyz(x-y)(x+y)(3x^2+3y^2-10z^2)}}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | | |
|-------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|-----------------------------|---|--|
| $\mathbb{M}_{7,0}^{(1,-1;a)}(E, 4)$ | 0 | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | $\frac{\sqrt{2730}i}{364}$ | 0 | 0 | 0 | $\frac{3\sqrt{182}}{364}$ | 0 | $-\frac{3\sqrt{182}i}{364}$ | $-\frac{3\sqrt{182}}{182}$ | 0 | | | |
| | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | $-\frac{\sqrt{2730}i}{364}$ | 0 | 0 | 0 | $\frac{3\sqrt{182}}{364}$ | 0 | $\frac{3\sqrt{182}i}{364}$ | 0 | 0 | $\frac{3\sqrt{182}}{182}$ | | | |
| | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{182}i}{728}$ | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | $-\frac{\sqrt{2730}i}{728}$ | | |
| | $\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{182}i}{728}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | $\frac{\sqrt{2730}i}{728}$ | $\frac{\sqrt{2730}i}{728}$ | 0 | | |
| | 0 | $\frac{\sqrt{2730}i}{364}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{182}}{728}$ | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2730}}{728}$ | | | |
| | $-\frac{\sqrt{2730}i}{364}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{182}}{728}$ | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | 0 | $\frac{\sqrt{2730}}{728}$ | | | | |
| | 0 | 0 | 0 | $\frac{5\sqrt{182}i}{728}$ | 0 | $\frac{5\sqrt{182}}{728}$ | 0 | 0 | 0 | $-\frac{\sqrt{2730}i}{728}$ | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | | |
| | 0 | 0 | $-\frac{5\sqrt{182}i}{728}$ | 0 | $\frac{5\sqrt{182}}{728}$ | 0 | 0 | 0 | $\frac{\sqrt{2730}i}{728}$ | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | 0 | | |
| | 0 | $\frac{3\sqrt{182}}{364}$ | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | $-\frac{\sqrt{2730}i}{728}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{182}i}{728}$ | | |
| | $\frac{3\sqrt{182}}{364}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | $\frac{\sqrt{2730}i}{728}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{9\sqrt{182}i}{728}$ | 0 | | |
| | 0 | $-\frac{3\sqrt{182}i}{364}$ | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{182}}{728}$ | | |
| | $\frac{3\sqrt{182}i}{364}$ | 0 | 0 | $\frac{\sqrt{2730}}{364}$ | 0 | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{182}}{728}$ | 0 | |
| | $-\frac{3\sqrt{182}}{182}$ | 0 | 0 | $-\frac{\sqrt{2730}i}{728}$ | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | $-\frac{9\sqrt{182}i}{728}$ | 0 | $-\frac{9\sqrt{182}}{728}$ | 0 | 0 | 0 | | |
| | 0 | $\frac{3\sqrt{182}}{182}$ | $\frac{\sqrt{2730}i}{728}$ | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | $\frac{9\sqrt{182}i}{728}$ | 0 | $-\frac{9\sqrt{182}}{728}$ | 0 | 0 | 0 | 0 | | |

$$\frac{\sqrt{231}z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)(3x^2 + 3y^2 - 10z^2)}{16}$$

1001 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------------|----------------------------|---|------------------------------|-----------------------------|------------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|-----------------------------|----------------------------|
| $\mathbb{M}_{7,1}^{(1,-1;a)}(E, 4)$ | $-\frac{3\sqrt{182}}{182}$ | 0 | 0 | $-\frac{\sqrt{2730}i}{728}$ | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | $-\frac{9\sqrt{182}i}{728}$ | 0 | $-\frac{9\sqrt{182}}{728}$ | 0 | 0 | 0 |
| | 0 | $\frac{3\sqrt{182}}{182}$ | $\frac{\sqrt{2730}i}{728}$ | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | $\frac{9\sqrt{182}i}{728}$ | 0 | $-\frac{9\sqrt{182}}{728}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{2730}i}{728}$ | $-\frac{15\sqrt{182}}{1456}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{182}}{728}$ | $-\frac{\sqrt{2730}}{1456}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ |
| | $\frac{\sqrt{2730}i}{728}$ | 0 | 0 | $\frac{15\sqrt{182}}{1456}$ | 0 | 0 | $\frac{5\sqrt{182}}{728}$ | 0 | 0 | $\frac{\sqrt{2730}}{1456}$ | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | 0 | 0 |
| | 0 | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | $-\frac{15\sqrt{182}}{1456}$ | 0 | 0 | $-\frac{5\sqrt{182}i}{728}$ | 0 | 0 | $\frac{\sqrt{2730}}{1456}$ | 0 | 0 | $-\frac{\sqrt{2730}i}{364}$ | 0 |
| | $\frac{\sqrt{2730}}{728}$ | 0 | 0 | 0 | 0 | $\frac{15\sqrt{182}}{1456}$ | $\frac{5\sqrt{182}i}{728}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{1456}$ | $\frac{\sqrt{2730}i}{364}$ | 0 | 0 |
| | 0 | 0 | 0 | $\frac{5\sqrt{182}}{728}$ | 0 | $-\frac{5\sqrt{182}i}{728}$ | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{728}$ | 0 | $-\frac{\sqrt{2730}i}{728}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{5\sqrt{182}}{728}$ | 0 | $\frac{5\sqrt{182}i}{728}$ | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{728}$ | 0 | $\frac{\sqrt{2730}i}{728}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{9\sqrt{182}i}{728}$ | $-\frac{\sqrt{2730}}{1456}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{728}$ | $\frac{15\sqrt{182}}{1456}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | 0 |
| | $\frac{9\sqrt{182}i}{728}$ | 0 | 0 | $\frac{\sqrt{2730}}{1456}$ | 0 | 0 | $-\frac{\sqrt{2730}}{728}$ | 0 | 0 | $-\frac{15\sqrt{182}}{1456}$ | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | 0 | 0 |
| | 0 | $-\frac{9\sqrt{182}}{728}$ | 0 | 0 | $\frac{\sqrt{2730}}{1456}$ | 0 | 0 | $-\frac{\sqrt{2730}i}{728}$ | 0 | 0 | $\frac{15\sqrt{182}}{1456}$ | 0 | 0 | $\frac{3\sqrt{182}i}{364}$ | 0 |
| | $-\frac{9\sqrt{182}}{728}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{1456}$ | $\frac{\sqrt{2730}i}{728}$ | 0 | 0 | 0 | 0 | $-\frac{15\sqrt{182}}{1456}$ | $-\frac{3\sqrt{182}i}{364}$ | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | 0 | $-\frac{\sqrt{2730}i}{364}$ | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | 0 | $\frac{3\sqrt{182}i}{364}$ | $\frac{3\sqrt{182}}{182}$ | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{2730}}{364}$ | 0 | $\frac{\sqrt{2730}i}{364}$ | 0 | 0 | 0 | $-\frac{3\sqrt{182}}{364}$ | 0 | $-\frac{3\sqrt{182}i}{364}$ | 0 | 0 | $-\frac{3\sqrt{182}}{182}$ | 0 |
| 1002 | symmetry | $\frac{\sqrt{42xyz}(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4)}{16}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------------|-------------------------------|---|-------------------------------|--------------------------------|-------------------------------|--------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|---|
| $\mathbb{M}_{7,0}^{(1,-1;a)}(E, 5)$ | 0 | 0 | 0 | $\frac{5\sqrt{15015}}{8008}$ | 0 | $-\frac{5\sqrt{15015}i}{8008}$ | $\frac{2\sqrt{15015}}{1001}$ | 0 | 0 | $\frac{3\sqrt{1001}}{728}$ | 0 | $\frac{3\sqrt{1001}i}{728}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{5\sqrt{15015}}{8008}$ | 0 | $\frac{5\sqrt{15015}i}{8008}$ | 0 | 0 | $-\frac{2\sqrt{15015}}{1001}$ | $\frac{3\sqrt{1001}}{728}$ | 0 | $-\frac{3\sqrt{1001}i}{728}$ | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{5\sqrt{15015}}{8008}$ | 0 | 0 | $\frac{15\sqrt{1001}}{16016}$ | 0 | 0 | $\frac{5\sqrt{1001}i}{2002}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1232}$ | 0 | 0 | 0 | $-\frac{\sqrt{15015}i}{8008}$ | 0 |
| | $\frac{5\sqrt{15015}}{8008}$ | 0 | 0 | 0 | 0 | $-\frac{15\sqrt{1001}}{16016}$ | $-\frac{5\sqrt{1001}i}{2002}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{15015}}{1232}$ | $\frac{\sqrt{15015}i}{8008}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{15015}i}{8008}$ | $\frac{15\sqrt{1001}}{16016}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{2002}$ | $\frac{\sqrt{15015}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | |
| | $\frac{5\sqrt{15015}i}{8008}$ | 0 | 0 | $-\frac{15\sqrt{1001}}{16016}$ | 0 | 0 | $-\frac{5\sqrt{1001}}{2002}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1232}$ | 0 | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | |
| | $\frac{2\sqrt{15015}}{1001}$ | 0 | 0 | $\frac{5\sqrt{1001}i}{2002}$ | 0 | $-\frac{5\sqrt{1001}}{2002}$ | 0 | 0 | 0 | $\frac{3\sqrt{15015}i}{2002}$ | 0 | $\frac{3\sqrt{15015}}{2002}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{2\sqrt{15015}}{1001}$ | $-\frac{5\sqrt{1001}i}{2002}$ | 0 | $-\frac{5\sqrt{1001}}{2002}$ | 0 | 0 | 0 | $-\frac{3\sqrt{15015}i}{2002}$ | 0 | $\frac{3\sqrt{15015}}{2002}$ | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{3\sqrt{1001}}{728}$ | 0 | 0 | $\frac{\sqrt{15015}}{1232}$ | 0 | 0 | $\frac{3\sqrt{15015}i}{2002}$ | 0 | 0 | $-\frac{15\sqrt{1001}}{2288}$ | 0 | 0 | 0 | $\frac{3\sqrt{1001}i}{8008}$ | 0 |
| | $\frac{3\sqrt{1001}}{728}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1232}$ | $-\frac{3\sqrt{15015}i}{2002}$ | 0 | 0 | 0 | $\frac{15\sqrt{1001}}{2288}$ | $-\frac{3\sqrt{1001}i}{8008}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{3\sqrt{1001}i}{728}$ | $-\frac{\sqrt{15015}}{1232}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{15015}}{2002}$ | $-\frac{15\sqrt{1001}}{2288}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | |
| | $-\frac{3\sqrt{1001}i}{728}$ | 0 | 0 | $\frac{\sqrt{15015}}{1232}$ | 0 | 0 | $\frac{3\sqrt{15015}}{2002}$ | 0 | 0 | $\frac{15\sqrt{1001}}{2288}$ | 0 | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{15015}i}{8008}$ | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | 0 | $\frac{3\sqrt{1001}i}{8008}$ | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{15015}i}{8008}$ | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | 0 | $-\frac{3\sqrt{1001}i}{8008}$ | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | 0 | 0 | |
| 1003 | symmetry | $\frac{\sqrt{42z(x-y)(x+y)(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4)}}{32}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------------|-------------------------------|-------------------------------|--------------------------------|---------------------------------|--------------------------------|---------------------------------|-------------------------------|-------------------------------|--------------------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------|-------------------------------|-------------------------------|--|
| $\mathbb{M}_{7,1}^{(1,-1;a)}(E, 5)$ | 0 | 0 | 0 | $-\frac{\sqrt{15015}i}{8008}$ | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | 0 | $\frac{3\sqrt{1001}i}{8008}$ | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{\sqrt{15015}i}{8008}$ | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | 0 | $-\frac{3\sqrt{1001}i}{8008}$ | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{15015}i}{8008}$ | $\frac{75\sqrt{1001}}{16016}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{1001}$ | $\frac{17\sqrt{15015}}{16016}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | |
| | $\frac{\sqrt{15015}i}{8008}$ | 0 | 0 | $-\frac{75\sqrt{1001}}{16016}$ | 0 | 0 | $-\frac{5\sqrt{1001}}{1001}$ | 0 | 0 | $-\frac{17\sqrt{15015}}{16016}$ | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | $-\frac{75\sqrt{1001}}{16016}$ | 0 | 0 | $-\frac{5\sqrt{1001}i}{1001}$ | 0 | 0 | $\frac{17\sqrt{15015}}{16016}$ | 0 | 0 | 0 | $-\frac{\sqrt{15015}i}{1144}$ | |
| | $-\frac{\sqrt{15015}}{8008}$ | 0 | 0 | 0 | 0 | $\frac{75\sqrt{1001}}{16016}$ | $\frac{5\sqrt{1001}i}{1001}$ | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{15015}}{16016}$ | $\frac{\sqrt{15015}i}{1144}$ | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{1001}$ | 0 | $-\frac{5\sqrt{1001}i}{1001}$ | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1001}$ | 0 | $\frac{\sqrt{15015}i}{1001}$ | $\frac{2\sqrt{15015}}{1001}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{1001}}{1001}$ | 0 | $\frac{5\sqrt{1001}i}{1001}$ | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1001}$ | 0 | $-\frac{\sqrt{15015}i}{1001}$ | 0 | 0 | 0 | $-\frac{2\sqrt{15015}}{1001}$ | | |
| | 0 | $\frac{3\sqrt{1001}i}{8008}$ | $\frac{17\sqrt{15015}}{16016}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1001}$ | $\frac{45\sqrt{1001}}{16016}$ | 0 | 0 | 0 | 0 | $\frac{27\sqrt{1001}}{8008}$ | | |
| | $-\frac{3\sqrt{1001}i}{8008}$ | 0 | 0 | $-\frac{17\sqrt{15015}}{16016}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1001}$ | 0 | 0 | $-\frac{45\sqrt{1001}}{16016}$ | 0 | 0 | $\frac{27\sqrt{1001}}{8008}$ | 0 | | |
| | 0 | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | $\frac{17\sqrt{15015}}{16016}$ | 0 | 0 | $\frac{\sqrt{15015}i}{1001}$ | 0 | 0 | $-\frac{45\sqrt{1001}}{16016}$ | 0 | 0 | $\frac{27\sqrt{1001}i}{8008}$ | | |
| | $-\frac{3\sqrt{1001}}{8008}$ | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{15015}}{16016}$ | $-\frac{\sqrt{15015}i}{1001}$ | 0 | 0 | 0 | 0 | $\frac{45\sqrt{1001}}{16016}$ | $-\frac{27\sqrt{1001}i}{8008}$ | 0 | | |
| | 0 | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | $-\frac{\sqrt{15015}i}{1144}$ | $\frac{2\sqrt{15015}}{1001}$ | 0 | 0 | $\frac{27\sqrt{1001}}{8008}$ | 0 | $\frac{27\sqrt{1001}i}{8008}$ | 0 | 0 | | |
| | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | $\frac{\sqrt{15015}i}{1144}$ | 0 | 0 | $-\frac{2\sqrt{15015}}{1001}$ | $\frac{27\sqrt{1001}}{8008}$ | 0 | $-\frac{27\sqrt{1001}i}{8008}$ | 0 | 0 | 0 | | |

1004 symmetry

z

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------|---|--------|--|--|--|--|--|--|--|--|--|--|--|--|---|
| $\mathbb{M}_1^{(1,1;a)}(A_2)$ | 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{7}i}{14}$ $-\frac{\sqrt{105}}{105}$ 0 0 0 0 $-\frac{\sqrt{105}}{280}$ $\frac{\sqrt{7}}{14}$ 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{105}}{105}$ 0 0 $-\frac{\sqrt{105}}{280}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{105}}{105}$ 0 0 $\frac{\sqrt{105}i}{280}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}i}{56}$ 0 | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 0 0 $\frac{\sqrt{105}}{105}$ $-\frac{\sqrt{105}i}{280}$ 0 0 0 0 $\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{7}i}{56}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{105}}{280}$ 0 $\frac{\sqrt{105}i}{280}$ $\frac{2\sqrt{105}}{105}$ 0 0 $-\frac{\sqrt{7}}{56}$ 0 $-\frac{\sqrt{7}i}{56}$ 0 0 | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{105}}{280}$ 0 $-\frac{\sqrt{105}i}{280}$ 0 0 $-\frac{2\sqrt{105}}{105}$ $-\frac{\sqrt{7}}{56}$ 0 $\frac{\sqrt{7}i}{56}$ 0 0 0 | | | | | | | | | | | | | | |
| | 0 0 $\frac{\sqrt{7}}{14}$ 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 | | | | | | | | | | | | | | |
| | 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 0 $\frac{\sqrt{105}i}{56}$ | | | | | | | | | | | | | | |
| | 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ $\frac{\sqrt{7}i}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 $\frac{\sqrt{105}i}{56}$ 0 | | | | | | | | | | | | | | |
| 1005 | symmetry | | | | | | | | | | | | | | x |

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------------|--|--------|
| $\mathbb{M}_{1,0}^{(1,1;a)}(E)$ | 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 0 0 | |
| | 0 0 0 0 0 $\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{7}i}{14}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 0 $\frac{2\sqrt{105}}{105}$ 0 $\frac{\sqrt{105}i}{280}$ $-\frac{\sqrt{105}}{280}$ 0 0 0 0 0 $\frac{\sqrt{7}i}{56}$ $\frac{\sqrt{7}}{56}$ 0 | |
| | 0 0 $\frac{2\sqrt{105}}{105}$ 0 $-\frac{\sqrt{105}i}{280}$ 0 0 $\frac{\sqrt{105}}{280}$ 0 0 $-\frac{\sqrt{7}i}{56}$ 0 0 $-\frac{\sqrt{7}}{56}$ | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{105}i}{280}$ 0 $-\frac{\sqrt{105}}{105}$ 0 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 | |
| | 0 $\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{105}i}{280}$ 0 $-\frac{\sqrt{105}}{105}$ 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 | |
| | 0 $\frac{\sqrt{7}i}{14}$ $-\frac{\sqrt{105}}{280}$ 0 0 0 0 $-\frac{\sqrt{105}}{105}$ $-\frac{\sqrt{7}}{56}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ | |
| | $-\frac{\sqrt{7}i}{14}$ 0 0 $\frac{\sqrt{105}}{280}$ 0 0 $-\frac{\sqrt{105}}{105}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 | |
| | 0 0 0 0 0 $-\frac{\sqrt{7}i}{56}$ $-\frac{\sqrt{7}}{56}$ 0 0 0 0 $\frac{\sqrt{105}i}{56}$ $-\frac{\sqrt{105}}{56}$ 0 | |
| | 0 0 0 0 $\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 $\frac{\sqrt{105}}{56}$ | |
| | 0 0 $-\frac{\sqrt{7}i}{56}$ 0 $\frac{\sqrt{7}}{14}$ 0 0 0 $-\frac{\sqrt{105}i}{56}$ 0 0 0 0 0 | |
| | 0 0 $\frac{\sqrt{7}}{56}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{105}}{56}$ 0 0 0 0 0 | |
| | 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{105}}{56}$ 0 0 0 0 | |

1006 symmetry

y

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|---------------------------------|--|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| $\mathbb{M}_{1,1}^{(1,1;a)}(E)$ | 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{7}}{14}$ 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 $\frac{\sqrt{105}i}{105}$ 0 $-\frac{\sqrt{105}}{280}$ 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 | | | | | | | | | | | | | | | |
| | 0 $\frac{\sqrt{7}}{14}$ $-\frac{\sqrt{105}i}{105}$ 0 $-\frac{\sqrt{105}}{280}$ 0 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{105}}{280}$ 0 $-\frac{2\sqrt{105}i}{105}$ $-\frac{\sqrt{105}}{280}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}}{56}$ 0 | | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{105}}{280}$ 0 $\frac{2\sqrt{105}i}{105}$ 0 0 $\frac{\sqrt{105}}{280}$ $\frac{\sqrt{7}}{56}$ 0 0 0 0 $\frac{\sqrt{7}}{56}$ | | | | | | | | | | | | | | | |
| | 0 $-\frac{\sqrt{7}}{14}$ 0 0 $-\frac{\sqrt{105}}{280}$ 0 0 $\frac{\sqrt{105}i}{105}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}i}{14}$ | | | | | | | | | | | | | | | |
| | $-\frac{\sqrt{7}}{14}$ 0 0 0 0 $\frac{\sqrt{105}}{280}$ $-\frac{\sqrt{105}i}{105}$ 0 0 0 0 $-\frac{\sqrt{7}}{56}$ $\frac{\sqrt{7}i}{14}$ 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 | | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{7}i}{14}$ 0 $\frac{\sqrt{7}}{56}$ 0 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 $\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 $-\frac{\sqrt{105}}{56}$ 0 | | | | | | | | | | | | | | | |
| | 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 0 0 $-\frac{\sqrt{7}}{56}$ $-\frac{\sqrt{105}}{56}$ 0 0 0 0 $\frac{\sqrt{105}}{56}$ | | | | | | | | | | | | | | | |
| | 0 0 0 0 $-\frac{\sqrt{7}}{56}$ 0 0 $-\frac{\sqrt{7}i}{14}$ 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 | | | | | | | | | | | | | | | |
| | 0 0 0 0 0 $\frac{\sqrt{7}}{56}$ $\frac{\sqrt{7}i}{14}$ 0 0 0 0 $-\frac{\sqrt{105}}{56}$ 0 0 0 | | | | | | | | | | | | | | | |
| 1007 | symmetry | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|-------------------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|----------------------------|--|
| $\mathbb{M}_3^{(1,1;a)}(A_1)$ | 0 | $-\frac{\sqrt{770}}{132}$ | 0 | 0 | $\frac{\sqrt{462}}{528}$ | 0 | 0 | $\frac{\sqrt{462}i}{1848}$ | 0 | 0 | $-\frac{\sqrt{770}}{528}$ | 0 | 0 | $-\frac{\sqrt{770}i}{132}$ | |
| | $-\frac{\sqrt{770}}{132}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{528}$ | $-\frac{\sqrt{462}i}{1848}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{528}$ | $\frac{\sqrt{770}i}{132}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{770}}{154}$ | 0 | $-\frac{\sqrt{770}i}{616}$ | $-\frac{\sqrt{770}}{176}$ | 0 | 0 | $\frac{\sqrt{462}}{616}$ | 0 | $\frac{2\sqrt{462}i}{231}$ | $-\frac{\sqrt{462}}{528}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{770}}{154}$ | 0 | $\frac{\sqrt{770}i}{616}$ | 0 | 0 | $\frac{\sqrt{770}}{176}$ | $\frac{\sqrt{462}}{616}$ | 0 | $-\frac{2\sqrt{462}i}{231}$ | 0 | 0 | $\frac{\sqrt{462}}{528}$ | |
| | $\frac{\sqrt{462}}{528}$ | 0 | 0 | $-\frac{\sqrt{770}i}{616}$ | 0 | $\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{462}i}{154}$ | 0 | $-\frac{\sqrt{462}}{462}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{462}}{528}$ | $\frac{\sqrt{770}i}{616}$ | 0 | $\frac{3\sqrt{770}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{462}i}{154}$ | 0 | $-\frac{\sqrt{462}}{462}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{462}i}{1848}$ | $-\frac{\sqrt{770}}{176}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{176}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{1848}$ | |
| | $-\frac{\sqrt{462}i}{1848}$ | 0 | 0 | $\frac{\sqrt{770}}{176}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{176}$ | 0 | 0 | $\frac{\sqrt{462}}{1848}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{462}}{616}$ | 0 | $\frac{\sqrt{462}i}{154}$ | $\frac{\sqrt{462}}{176}$ | 0 | 0 | $-\frac{\sqrt{770}}{132}$ | 0 | $-\frac{\sqrt{770}i}{1848}$ | $-\frac{\sqrt{770}}{528}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{462}}{616}$ | 0 | $-\frac{\sqrt{462}i}{154}$ | 0 | 0 | $-\frac{\sqrt{462}}{176}$ | $-\frac{\sqrt{770}}{132}$ | 0 | $\frac{\sqrt{770}i}{1848}$ | 0 | 0 | $\frac{\sqrt{770}}{528}$ | |
| | $-\frac{\sqrt{770}}{528}$ | 0 | 0 | $\frac{2\sqrt{462}i}{231}$ | 0 | $-\frac{\sqrt{462}}{462}$ | 0 | 0 | 0 | $-\frac{\sqrt{770}i}{1848}$ | 0 | $-\frac{\sqrt{770}}{264}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{770}}{528}$ | $-\frac{2\sqrt{462}i}{231}$ | 0 | $-\frac{\sqrt{462}}{462}$ | 0 | 0 | 0 | $\frac{\sqrt{770}i}{1848}$ | 0 | $-\frac{\sqrt{770}}{264}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{770}i}{132}$ | $-\frac{\sqrt{462}}{528}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{1848}$ | $-\frac{\sqrt{770}}{528}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{132}$ | |
| | $\frac{\sqrt{770}i}{132}$ | 0 | 0 | $\frac{\sqrt{462}}{528}$ | 0 | 0 | $\frac{\sqrt{462}}{1848}$ | 0 | 0 | $\frac{\sqrt{770}}{528}$ | 0 | 0 | $\frac{\sqrt{770}}{132}$ | 0 | |
| 1008 | symmetry | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|----------------------------------|-----------------------------|----------------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|-------------------------------|----------------------------|------------------------------|-----------------------------|-------------------------------|-----------------------------|------------------------------|---|--|
| $\mathbb{M}_3^{(1,1;a)}(A_2, 1)$ | $-\frac{\sqrt{77}}{33}$ | 0 | 0 | $-\frac{\sqrt{1155}i}{1848}$ | 0 | $\frac{\sqrt{1155}}{1848}$ | 0 | 0 | 0 | $\frac{5\sqrt{77}i}{264}$ | 0 | $\frac{5\sqrt{77}}{264}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{77}}{33}$ | $\frac{\sqrt{1155}i}{1848}$ | 0 | $\frac{\sqrt{1155}}{1848}$ | 0 | 0 | 0 | $-\frac{5\sqrt{77}i}{264}$ | 0 | $\frac{5\sqrt{77}}{264}$ | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{1155}i}{1848}$ | $\frac{3\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | $-\frac{\sqrt{1155}}{924}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | | |
| | $\frac{\sqrt{1155}i}{1848}$ | 0 | 0 | $-\frac{3\sqrt{77}}{308}$ | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | 0 | | |
| | 0 | $\frac{\sqrt{1155}}{1848}$ | 0 | 0 | $\frac{3\sqrt{77}}{308}$ | 0 | 0 | $\frac{5\sqrt{77}i}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{3\sqrt{1155}i}{616}$ | | |
| | $\frac{\sqrt{1155}}{1848}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{77}}{308}$ | $-\frac{5\sqrt{77}i}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{924}$ | $\frac{3\sqrt{1155}i}{616}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | $\frac{5\sqrt{77}i}{616}$ | $\frac{2\sqrt{77}}{77}$ | 0 | 0 | $-\frac{5\sqrt{1155}}{1848}$ | 0 | $-\frac{5\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{77}}{616}$ | 0 | $-\frac{5\sqrt{77}i}{616}$ | 0 | 0 | $-\frac{2\sqrt{77}}{77}$ | $-\frac{5\sqrt{1155}}{1848}$ | 0 | $\frac{5\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | 0 | | |
| | 0 | $\frac{5\sqrt{77}i}{264}$ | $-\frac{\sqrt{1155}}{924}$ | 0 | 0 | 0 | $-\frac{5\sqrt{1155}}{1848}$ | $\frac{\sqrt{77}}{132}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{1848}$ | | | |
| | $-\frac{5\sqrt{77}i}{264}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{5\sqrt{1155}}{1848}$ | 0 | 0 | $-\frac{\sqrt{77}}{132}$ | 0 | 0 | $-\frac{5\sqrt{77}}{1848}$ | 0 | | |
| | 0 | $\frac{5\sqrt{77}}{264}$ | 0 | 0 | $\frac{\sqrt{1155}}{924}$ | 0 | 0 | $-\frac{5\sqrt{1155}i}{1848}$ | 0 | 0 | $\frac{\sqrt{77}}{132}$ | 0 | 0 | $\frac{5\sqrt{77}i}{1848}$ | | |
| | $\frac{5\sqrt{77}}{264}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{924}$ | $\frac{5\sqrt{1155}i}{1848}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{77}}{132}$ | $-\frac{5\sqrt{77}i}{1848}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | 0 | $-\frac{3\sqrt{1155}i}{616}$ | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{1848}$ | 0 | $\frac{5\sqrt{77}i}{1848}$ | $-\frac{\sqrt{77}}{33}$ | 0 | | |
| | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | 0 | $\frac{3\sqrt{1155}i}{616}$ | 0 | 0 | 0 | $-\frac{5\sqrt{77}}{1848}$ | 0 | $-\frac{5\sqrt{77}i}{1848}$ | 0 | 0 | $\frac{\sqrt{77}}{33}$ | | |
| 1009 | symmetry | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|----------------------------------|---------------------------|--|
| $\mathbb{M}_3^{(1,1;a)}(A_2, 2)$ | 0 | $-\frac{\sqrt{770}i}{132}$ $-\frac{\sqrt{462}}{528}$ 0 0 0 0 $\frac{\sqrt{462}}{1848}$ $-\frac{\sqrt{770}}{528}$ 0 0 0 0 $\frac{\sqrt{770}}{132}$ |
| | $\frac{\sqrt{770}i}{132}$ | 0 0 $\frac{\sqrt{462}}{528}$ 0 0 $\frac{\sqrt{462}}{1848}$ 0 0 $\frac{\sqrt{770}}{528}$ 0 0 0 $\frac{\sqrt{770}}{132}$ 0 |
| | $-\frac{\sqrt{462}}{528}$ | 0 0 0 $\frac{3\sqrt{770}i}{616}$ 0 $-\frac{\sqrt{770}}{616}$ 0 0 0 $\frac{\sqrt{462}i}{462}$ 0 $-\frac{\sqrt{462}}{154}$ 0 0 |
| | 0 | $\frac{\sqrt{462}}{528}$ $-\frac{3\sqrt{770}i}{616}$ 0 $-\frac{\sqrt{770}}{616}$ 0 0 0 $-\frac{\sqrt{462}i}{462}$ 0 $-\frac{\sqrt{462}}{154}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{770}}{616}$ 0 $\frac{\sqrt{770}i}{154}$ $\frac{\sqrt{770}}{176}$ 0 0 $-\frac{2\sqrt{462}}{231}$ 0 $-\frac{\sqrt{462}i}{616}$ $-\frac{\sqrt{462}}{528}$ 0 |
| | 0 | 0 0 $-\frac{\sqrt{770}}{616}$ 0 $-\frac{\sqrt{770}i}{154}$ 0 0 $-\frac{\sqrt{770}}{176}$ $-\frac{2\sqrt{462}}{231}$ 0 $\frac{\sqrt{462}i}{616}$ 0 0 $\frac{\sqrt{462}}{528}$ |
| | 0 | $\frac{\sqrt{462}}{1848}$ 0 0 $\frac{\sqrt{770}}{176}$ 0 0 0 0 $\frac{\sqrt{462}}{176}$ 0 0 0 $-\frac{\sqrt{462}i}{1848}$ 0 |
| | $\frac{\sqrt{462}}{1848}$ | 0 0 0 0 $-\frac{\sqrt{770}}{176}$ 0 0 0 0 0 $-\frac{\sqrt{462}i}{176}$ $\frac{\sqrt{462}i}{1848}$ 0 |
| | $-\frac{\sqrt{770}}{528}$ | 0 0 $\frac{\sqrt{462}i}{462}$ 0 $-\frac{2\sqrt{462}}{231}$ 0 0 0 $-\frac{\sqrt{770}i}{264}$ 0 $-\frac{\sqrt{770}}{1848}$ 0 0 |
| | 0 | $\frac{\sqrt{770}}{528}$ $-\frac{\sqrt{462}i}{462}$ 0 $-\frac{2\sqrt{462}}{231}$ 0 0 0 $\frac{\sqrt{770}i}{264}$ 0 $-\frac{\sqrt{770}}{1848}$ 0 0 0 |
| | 0 | 0 0 0 $-\frac{\sqrt{462}}{154}$ 0 $-\frac{\sqrt{462}i}{616}$ $\frac{\sqrt{462}}{176}$ 0 0 $-\frac{\sqrt{770}}{1848}$ 0 $-\frac{\sqrt{770}i}{132}$ $\frac{\sqrt{770}}{528}$ 0 |
| | 0 | $\frac{\sqrt{770}}{132}$ 0 0 $-\frac{\sqrt{462}}{528}$ 0 0 $-\frac{\sqrt{462}i}{1848}$ 0 0 $\frac{\sqrt{770}}{528}$ 0 0 $\frac{\sqrt{770}i}{132}$ |
| | $\frac{\sqrt{770}}{132}$ | 0 0 0 0 $\frac{\sqrt{462}}{528}$ $\frac{\sqrt{462}i}{1848}$ 0 0 0 $-\frac{\sqrt{770}}{528}$ $-\frac{\sqrt{770}i}{132}$ 0 |
| 1010 | symmetry | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|----------------------------|--------------------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|----------------------------|--|
| $M_{3,0}^{(1,1;a)}(E, 1)$ | 0 | $\frac{\sqrt{462}}{132}$ | 0 | 0 | $\frac{\sqrt{770}}{1232}$ | 0 | 0 | $\frac{\sqrt{770}i}{616}$ | 0 | 0 | $\frac{5\sqrt{462}}{528}$ | 0 | 0 | 0 | |
| | $\frac{\sqrt{462}}{132}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{1232}$ | $-\frac{\sqrt{770}i}{616}$ | 0 | 0 | 0 | $-\frac{5\sqrt{462}}{528}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{462}}{154}$ | 0 | $-\frac{5\sqrt{462}i}{616}$ | $-\frac{5\sqrt{462}}{1232}$ | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | $\frac{\sqrt{770}i}{308}$ | $-\frac{9\sqrt{770}}{1232}$ | 0 | |
| | 0 | 0 | $-\frac{\sqrt{462}}{154}$ | 0 | $\frac{5\sqrt{462}i}{616}$ | 0 | 0 | $\frac{5\sqrt{462}}{1232}$ | $\frac{\sqrt{770}}{616}$ | 0 | $-\frac{\sqrt{770}i}{308}$ | 0 | 0 | $\frac{9\sqrt{770}}{1232}$ | |
| | $\frac{\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{5\sqrt{462}i}{616}$ | 0 | $\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{770}i}{308}$ | 0 | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{770}}{1232}$ | $\frac{5\sqrt{462}i}{616}$ | 0 | $\frac{\sqrt{462}}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{770}i}{308}$ | 0 | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{770}i}{616}$ | $-\frac{5\sqrt{462}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{462}}{154}$ | $-\frac{5\sqrt{770}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | |
| | $-\frac{\sqrt{770}i}{616}$ | 0 | 0 | $\frac{5\sqrt{462}}{1232}$ | 0 | 0 | $-\frac{\sqrt{462}}{154}$ | 0 | 0 | $\frac{5\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | $-\frac{\sqrt{770}i}{308}$ | $-\frac{5\sqrt{770}}{1232}$ | 0 | 0 | $\frac{\sqrt{462}}{132}$ | 0 | $-\frac{5\sqrt{462}i}{1848}$ | $-\frac{5\sqrt{462}}{3696}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{770}}{616}$ | 0 | $\frac{\sqrt{770}i}{308}$ | 0 | 0 | $\frac{5\sqrt{770}}{1232}$ | $\frac{\sqrt{462}}{132}$ | 0 | $\frac{5\sqrt{462}i}{1848}$ | 0 | 0 | $\frac{5\sqrt{462}}{3696}$ | |
| | $\frac{5\sqrt{462}}{528}$ | 0 | 0 | $\frac{\sqrt{770}i}{308}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{462}i}{1848}$ | 0 | $-\frac{\sqrt{462}}{88}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{462}}{528}$ | $-\frac{\sqrt{770}i}{308}$ | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}i}{1848}$ | 0 | $-\frac{\sqrt{462}}{88}$ | 0 | 0 | 0 | |
| | 0 | 0 | $-\frac{9\sqrt{770}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | $-\frac{5\sqrt{462}}{3696}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{462}}{132}$ | |
| | 0 | 0 | 0 | $\frac{9\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | 0 | $\frac{5\sqrt{462}}{3696}$ | 0 | 0 | $\frac{\sqrt{462}}{132}$ | 0 | |
| 1011 | symmetry | $-\frac{\sqrt{6y(x^2+y^2-4z^2)}}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | |
|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|
| $M_{3,1}^{(1,1;a)}(E, 1)$ | 0 | $-\frac{\sqrt{462}i}{132}$ | $\frac{\sqrt{770}}{1232}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | $-\frac{5\sqrt{462}}{528}$ | 0 | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{462}i}{132}$ | 0 | 0 | $-\frac{\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | 0 | $\frac{5\sqrt{462}}{528}$ | 0 | 0 | 0 | 0 |
| | $\frac{\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{\sqrt{462}i}{616}$ | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{308}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{770}}{1232}$ | $\frac{\sqrt{462}i}{616}$ | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{770}}{308}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | $\frac{\sqrt{462}i}{154}$ | $-\frac{5\sqrt{462}}{1232}$ | 0 | 0 | $\frac{\sqrt{770}}{308}$ | 0 | $\frac{\sqrt{770}i}{616}$ | $\frac{9\sqrt{770}}{1232}$ | 0 |
| | 0 | 0 | $\frac{5\sqrt{462}}{616}$ | 0 | $-\frac{\sqrt{462}i}{154}$ | 0 | 0 | $\frac{5\sqrt{462}}{1232}$ | $\frac{\sqrt{770}}{308}$ | 0 | $-\frac{\sqrt{770}i}{616}$ | 0 | 0 | $-\frac{9\sqrt{770}}{1232}$ |
| | 0 | $-\frac{\sqrt{770}}{616}$ | 0 | 0 | $-\frac{5\sqrt{462}}{1232}$ | 0 | 0 | $\frac{\sqrt{462}i}{154}$ | 0 | 0 | $\frac{5\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{\sqrt{770}i}{616}$ |
| | $-\frac{\sqrt{770}}{616}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{462}}{1232}$ | $-\frac{\sqrt{462}i}{154}$ | 0 | 0 | 0 | $-\frac{5\sqrt{770}}{1232}$ | $\frac{\sqrt{770}i}{616}$ | 0 | |
| | $-\frac{5\sqrt{462}}{528}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{770}}{308}$ | 0 | 0 | 0 | $\frac{\sqrt{462}i}{88}$ | 0 | $\frac{5\sqrt{462}}{1848}$ | 0 | 0 |
| | 0 | $\frac{5\sqrt{462}}{528}$ | 0 | 0 | $\frac{\sqrt{770}}{308}$ | 0 | 0 | 0 | $-\frac{\sqrt{462}i}{88}$ | 0 | $\frac{5\sqrt{462}}{1848}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{770}}{308}$ | 0 | $\frac{\sqrt{770}i}{616}$ | $\frac{5\sqrt{770}}{1232}$ | 0 | 0 | $\frac{5\sqrt{462}}{1848}$ | 0 | $-\frac{\sqrt{462}i}{132}$ | $-\frac{5\sqrt{462}}{3696}$ | 0 |
| | 0 | 0 | $-\frac{\sqrt{770}}{308}$ | 0 | $-\frac{\sqrt{770}i}{616}$ | 0 | 0 | $-\frac{5\sqrt{770}}{1232}$ | $\frac{5\sqrt{462}}{1848}$ | 0 | $\frac{\sqrt{462}i}{132}$ | 0 | 0 | $\frac{5\sqrt{462}}{3696}$ |
| | 0 | 0 | 0 | 0 | $\frac{9\sqrt{770}}{1232}$ | 0 | 0 | $-\frac{\sqrt{770}i}{616}$ | 0 | 0 | $-\frac{5\sqrt{462}}{3696}$ | 0 | 0 | $-\frac{\sqrt{462}i}{132}$ |
| | 0 | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{770}}{1232}$ | $\frac{\sqrt{770}i}{616}$ | 0 | 0 | 0 | $\frac{5\sqrt{462}}{3696}$ | $\frac{\sqrt{462}i}{132}$ | 0 | |

1012 symmetry

 $\sqrt{15}xyz$

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|---|----------------------------------|
| $M_{3,0}^{(1,1;a)}(E, 2)$ | 0 0 0 $-\frac{\sqrt{77}}{154}$ 0 $\frac{\sqrt{77}i}{154}$ $-\frac{\sqrt{77}}{154}$ 0 0 0 0 0 0 0 0 | |
| | 0 0 $-\frac{\sqrt{77}}{154}$ 0 $-\frac{\sqrt{77}i}{154}$ 0 0 $\frac{\sqrt{77}}{154}$ 0 0 0 0 0 0 0 | |
| | 0 $-\frac{\sqrt{77}}{154}$ 0 0 $\frac{\sqrt{1155}}{154}$ 0 0 $-\frac{\sqrt{1155}i}{154}$ 0 0 $-\frac{\sqrt{77}}{77}$ 0 0 $-\frac{\sqrt{77}i}{77}$ | |
| | $-\frac{\sqrt{77}}{154}$ 0 0 0 0 $-\frac{\sqrt{1155}}{154}$ $\frac{\sqrt{1155}i}{154}$ 0 0 0 0 $\frac{\sqrt{77}}{77}$ $\frac{\sqrt{77}i}{77}$ 0 | |
| | 0 $\frac{\sqrt{77}i}{154}$ $\frac{\sqrt{1155}}{154}$ 0 0 0 0 $\frac{\sqrt{1155}}{154}$ $\frac{\sqrt{77}}{77}$ 0 0 0 0 $-\frac{\sqrt{77}}{77}$ | |
| | $-\frac{\sqrt{77}i}{154}$ 0 0 $-\frac{\sqrt{1155}}{154}$ 0 0 $\frac{\sqrt{1155}}{154}$ 0 0 $-\frac{\sqrt{77}}{77}$ 0 0 $-\frac{\sqrt{77}}{77}$ 0 | |
| | $-\frac{\sqrt{77}}{154}$ 0 0 $-\frac{\sqrt{1155}i}{154}$ 0 $\frac{\sqrt{1155}}{154}$ 0 0 0 $\frac{\sqrt{77}i}{77}$ 0 $\frac{\sqrt{77}}{77}$ 0 0 | |
| | 0 $\frac{\sqrt{77}}{154}$ $\frac{\sqrt{1155}i}{154}$ 0 $\frac{\sqrt{1155}}{154}$ 0 0 0 $-\frac{\sqrt{77}i}{77}$ 0 $\frac{\sqrt{77}}{77}$ 0 0 0 | |
| | 0 0 0 0 $\frac{\sqrt{77}}{77}$ 0 0 $\frac{\sqrt{77}i}{77}$ 0 0 $\frac{\sqrt{1155}}{462}$ 0 0 $-\frac{\sqrt{1155}i}{462}$ | |
| | 0 0 0 0 0 $-\frac{\sqrt{77}}{77}$ $-\frac{\sqrt{77}i}{77}$ 0 0 0 0 $-\frac{\sqrt{1155}}{462}$ $\frac{\sqrt{1155}i}{462}$ 0 | |
| | 0 0 $-\frac{\sqrt{77}}{77}$ 0 0 0 0 $\frac{\sqrt{77}}{77}$ $\frac{\sqrt{1155}}{462}$ 0 0 0 0 $\frac{\sqrt{1155}}{462}$ | |
| | 0 0 0 $\frac{\sqrt{77}}{77}$ 0 0 $\frac{\sqrt{77}}{77}$ 0 0 $-\frac{\sqrt{1155}}{462}$ 0 0 $\frac{\sqrt{1155}}{462}$ 0 0 | |
| | 0 0 0 $-\frac{\sqrt{77}i}{77}$ 0 $-\frac{\sqrt{77}}{77}$ 0 0 0 $-\frac{\sqrt{1155}i}{462}$ 0 $\frac{\sqrt{1155}}{462}$ 0 0 0 | |
| | 0 0 $\frac{\sqrt{77}i}{77}$ 0 $-\frac{\sqrt{77}}{77}$ 0 0 0 $\frac{\sqrt{1155}i}{462}$ 0 $\frac{\sqrt{1155}}{462}$ 0 0 0 | |
| 1013 | symmetry | $\frac{\sqrt{15}z(x-y)(x+y)}{2}$ |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-------------------------|
| $M_{3,1}^{(1,1;a)}(E, 2)$ | 0 | 0 | 0 | $\frac{3\sqrt{77}i}{616}$ | 0 | $\frac{3\sqrt{77}}{616}$ | 0 | 0 | 0 | $\frac{\sqrt{1155}i}{264}$ | 0 | $-\frac{\sqrt{1155}}{264}$ | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{3\sqrt{77}i}{616}$ | 0 | $\frac{3\sqrt{77}}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{1155}i}{264}$ | 0 | $-\frac{\sqrt{1155}}{264}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{3\sqrt{77}i}{616}$ | $-\frac{\sqrt{1155}}{308}$ | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | $\frac{\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{77}}{616}$ |
| | $-\frac{3\sqrt{77}i}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{308}$ | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | 0 | 0 | $-\frac{\sqrt{77}}{308}$ | 0 | 0 | $\frac{\sqrt{77}}{616}$ | 0 | 0 |
| | 0 | $\frac{3\sqrt{77}}{616}$ | 0 | 0 | $\frac{\sqrt{1155}}{308}$ | 0 | 0 | $-\frac{3\sqrt{1155}i}{616}$ | 0 | 0 | $\frac{\sqrt{77}}{308}$ | 0 | 0 | $-\frac{\sqrt{77}i}{616}$ | |
| | $\frac{3\sqrt{77}}{616}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{308}$ | $\frac{3\sqrt{1155}i}{616}$ | 0 | 0 | 0 | $-\frac{\sqrt{77}}{308}$ | $\frac{\sqrt{77}i}{616}$ | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | 0 | $-\frac{3\sqrt{1155}i}{616}$ | 0 | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | 0 | $-\frac{13\sqrt{77}i}{616}$ | $-\frac{\sqrt{77}}{154}$ | 0 | 0 |
| | 0 | 0 | $-\frac{3\sqrt{1155}}{616}$ | 0 | $\frac{3\sqrt{1155}i}{616}$ | 0 | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | 0 | $\frac{13\sqrt{77}i}{616}$ | 0 | 0 | $\frac{\sqrt{77}}{154}$ | |
| | 0 | $\frac{\sqrt{1155}i}{264}$ | $\frac{\sqrt{77}}{308}$ | 0 | 0 | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | $\frac{\sqrt{1155}}{132}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | |
| | $-\frac{\sqrt{1155}i}{264}$ | 0 | 0 | $-\frac{\sqrt{77}}{308}$ | 0 | 0 | $\frac{13\sqrt{77}}{616}$ | 0 | 0 | $-\frac{\sqrt{1155}}{132}$ | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | |
| | 0 | $-\frac{\sqrt{1155}}{264}$ | 0 | 0 | $\frac{\sqrt{77}}{308}$ | 0 | 0 | $-\frac{13\sqrt{77}i}{616}$ | 0 | 0 | $-\frac{\sqrt{1155}}{132}$ | 0 | 0 | $-\frac{\sqrt{1155}i}{616}$ | |
| | $-\frac{\sqrt{1155}}{264}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{77}}{308}$ | $\frac{13\sqrt{77}i}{616}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{1155}}{132}$ | $\frac{\sqrt{1155}i}{616}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{77}}{616}$ | 0 | $-\frac{\sqrt{77}i}{616}$ | $-\frac{\sqrt{77}}{154}$ | 0 | 0 | $-\frac{\sqrt{1155}}{616}$ | 0 | $-\frac{\sqrt{1155}i}{616}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{77}}{616}$ | 0 | $\frac{\sqrt{77}i}{616}$ | 0 | 0 | $\frac{\sqrt{77}}{154}$ | $-\frac{\sqrt{1155}}{616}$ | 0 | $\frac{\sqrt{1155}i}{616}$ | 0 | 0 | 0 | 0 |

$$-\frac{\sqrt{70}x(x^2 - 3y^2)(x^2 + y^2 - 8z^2)}{16}$$

1014 symmetry

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|-------------------------------|------------------------------|--|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-----------------------------|------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|------------------------------|------------------------------|--|--|
| $\mathbb{M}_5^{(1,1;a)}(A_1)$ | 0 | $-\frac{3\sqrt{1430}}{572}$ | 0 | 0 | $\frac{9\sqrt{858}}{2288}$ | 0 | 0 | $-\frac{\sqrt{858}i}{429}$ | 0 | 0 | $-\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | $-\frac{3\sqrt{1430}i}{572}$ | | |
| | $-\frac{3\sqrt{1430}}{572}$ | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{858}}{2288}$ | $\frac{\sqrt{858}i}{429}$ | 0 | 0 | 0 | 0 | $\frac{9\sqrt{1430}}{2288}$ | $\frac{3\sqrt{1430}i}{572}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{1430}}{1144}$ | 0 | $-\frac{\sqrt{1430}i}{4576}$ | $\frac{3\sqrt{1430}}{1144}$ | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | $-\frac{47\sqrt{858}i}{13728}$ | $-\frac{9\sqrt{858}}{2288}$ | 0 | | |
| | 0 | 0 | $-\frac{5\sqrt{1430}}{1144}$ | 0 | $\frac{\sqrt{1430}i}{4576}$ | 0 | 0 | $-\frac{3\sqrt{1430}}{1144}$ | $-\frac{\sqrt{858}}{429}$ | 0 | $\frac{47\sqrt{858}i}{13728}$ | 0 | 0 | $\frac{9\sqrt{858}}{2288}$ | | |
| | $\frac{9\sqrt{858}}{2288}$ | 0 | 0 | $-\frac{\sqrt{1430}i}{4576}$ | 0 | $-\frac{5\sqrt{1430}}{2288}$ | 0 | 0 | 0 | $-\frac{73\sqrt{858}i}{13728}$ | 0 | $-\frac{\sqrt{858}}{6864}$ | 0 | 0 | | |
| | 0 | $-\frac{9\sqrt{858}}{2288}$ | $\frac{\sqrt{1430}i}{4576}$ | 0 | $-\frac{5\sqrt{1430}}{2288}$ | 0 | 0 | 0 | $\frac{73\sqrt{858}i}{13728}$ | 0 | $-\frac{\sqrt{858}}{6864}$ | 0 | 0 | 0 | | |
| | 0 | $-\frac{\sqrt{858}i}{429}$ | $\frac{3\sqrt{1430}}{1144}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{858}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | | |
| | $\frac{\sqrt{858}i}{429}$ | 0 | 0 | $-\frac{3\sqrt{1430}}{1144}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{858}}{1144}$ | 0 | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | | |
| | 0 | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | $-\frac{73\sqrt{858}i}{13728}$ | $-\frac{3\sqrt{858}}{1144}$ | 0 | 0 | $\frac{3\sqrt{1430}}{1144}$ | 0 | $\frac{7\sqrt{1430}i}{4576}$ | $-\frac{9\sqrt{1430}}{2288}$ | 0 | | |
| | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | $\frac{73\sqrt{858}i}{13728}$ | 0 | 0 | $\frac{3\sqrt{858}}{1144}$ | $\frac{3\sqrt{1430}}{1144}$ | 0 | $-\frac{7\sqrt{1430}i}{4576}$ | 0 | 0 | $\frac{9\sqrt{1430}}{2288}$ | | |
| | $-\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | $-\frac{47\sqrt{858}i}{13728}$ | 0 | $-\frac{\sqrt{858}}{6864}$ | 0 | 0 | 0 | $\frac{7\sqrt{1430}i}{4576}$ | 0 | $\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | | |
| | 0 | $\frac{9\sqrt{1430}}{2288}$ | $\frac{47\sqrt{858}i}{13728}$ | 0 | $-\frac{\sqrt{858}}{6864}$ | 0 | 0 | 0 | $-\frac{7\sqrt{1430}i}{4576}$ | 0 | $\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | 0 | | |
| | 0 | $-\frac{3\sqrt{1430}i}{572}$ | $-\frac{9\sqrt{858}}{2288}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | $-\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{1430}}{572}$ | | |
| | $\frac{3\sqrt{1430}i}{572}$ | 0 | 0 | $\frac{9\sqrt{858}}{2288}$ | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | 0 | $\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | $\frac{3\sqrt{1430}}{572}$ | 0 | | |
| 1015 | symmetry | $\frac{z(15x^4 + 30x^2y^2 - 40x^2z^2 + 15y^4 - 40y^2z^2 + 8z^4)}{8}$ | | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|----------------------------------|------------------------------|--|-------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|--------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------|------------------------------|--|
| $\mathbb{M}_5^{(1,1;a)}(A_2, 1)$ | $\frac{3\sqrt{1001}}{1001}$ | 0 | 0 | $-\frac{\sqrt{15015}i}{3432}$ | 0 | $\frac{\sqrt{15015}}{3432}$ | 0 | 0 | 0 | $-\frac{3\sqrt{1001}i}{1144}$ | 0 | $-\frac{3\sqrt{1001}}{1144}$ | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{1001}}{1001}$ | $\frac{\sqrt{15015}i}{3432}$ | 0 | $\frac{\sqrt{15015}}{3432}$ | 0 | 0 | 0 | $\frac{3\sqrt{1001}i}{1144}$ | 0 | $-\frac{3\sqrt{1001}}{1144}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{15015}i}{3432}$ | $-\frac{25\sqrt{1001}}{8008}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{1144}$ | $-\frac{\sqrt{15015}}{1144}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{15015}}{1716}$ | |
| | $\frac{\sqrt{15015}i}{3432}$ | 0 | 0 | $\frac{25\sqrt{1001}}{8008}$ | 0 | 0 | $-\frac{5\sqrt{1001}}{1144}$ | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | $\frac{\sqrt{15015}}{1716}$ | 0 | |
| | 0 | $\frac{\sqrt{15015}}{3432}$ | 0 | 0 | $-\frac{25\sqrt{1001}}{8008}$ | 0 | 0 | $\frac{5\sqrt{1001}i}{1144}$ | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | $\frac{\sqrt{15015}i}{1716}$ | |
| | $\frac{\sqrt{15015}}{3432}$ | 0 | 0 | 0 | 0 | $\frac{25\sqrt{1001}}{8008}$ | $-\frac{5\sqrt{1001}i}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1144}$ | $-\frac{\sqrt{15015}i}{1716}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{1144}$ | 0 | $\frac{5\sqrt{1001}i}{1144}$ | $\frac{10\sqrt{1001}}{1001}$ | 0 | 0 | $-\frac{5\sqrt{15015}}{3432}$ | 0 | $-\frac{5\sqrt{15015}i}{3432}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{5\sqrt{1001}}{1144}$ | 0 | $-\frac{5\sqrt{1001}i}{1144}$ | 0 | 0 | $-\frac{10\sqrt{1001}}{1001}$ | $-\frac{5\sqrt{15015}}{3432}$ | 0 | $\frac{5\sqrt{15015}i}{3432}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{3\sqrt{1001}i}{1144}$ | $-\frac{\sqrt{15015}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{15015}}{3432}$ | $-\frac{3\sqrt{1001}}{616}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{1001}}{572}$ | |
| | $\frac{3\sqrt{1001}i}{1144}$ | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | $-\frac{5\sqrt{15015}}{3432}$ | 0 | 0 | $\frac{3\sqrt{1001}}{616}$ | 0 | 0 | $\frac{\sqrt{1001}}{572}$ | 0 | |
| | 0 | $-\frac{3\sqrt{1001}}{1144}$ | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | $-\frac{5\sqrt{15015}i}{3432}$ | 0 | 0 | $-\frac{3\sqrt{1001}}{616}$ | 0 | 0 | $-\frac{\sqrt{1001}i}{572}$ | |
| | $-\frac{3\sqrt{1001}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1144}$ | $\frac{5\sqrt{15015}i}{3432}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{1001}}{616}$ | $\frac{\sqrt{1001}i}{572}$ | 0 | |
| | 0 | 0 | 0 | $\frac{\sqrt{15015}}{1716}$ | 0 | $\frac{\sqrt{15015}i}{1716}$ | 0 | 0 | 0 | $\frac{\sqrt{1001}}{572}$ | 0 | $-\frac{\sqrt{1001}i}{572}$ | $\frac{3\sqrt{1001}}{1001}$ | 0 | |
| | 0 | 0 | $\frac{\sqrt{15015}}{1716}$ | 0 | $-\frac{\sqrt{15015}i}{1716}$ | 0 | 0 | 0 | $\frac{\sqrt{1001}}{572}$ | 0 | $\frac{\sqrt{1001}i}{572}$ | 0 | 0 | $-\frac{3\sqrt{1001}}{1001}$ | |
| 1016 | symmetry | $-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|----------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|----------------------------|--|
| $\mathbb{M}_5^{(1,1;a)}(A_2, 2)$ | 0 | $-\frac{3\sqrt{1430}i}{572}$ | $-\frac{9\sqrt{858}}{2288}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | $-\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{1430}}{572}$ | |
| | $\frac{3\sqrt{1430}i}{572}$ | 0 | 0 | $\frac{9\sqrt{858}}{2288}$ | 0 | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | 0 | $\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | $\frac{3\sqrt{1430}}{572}$ | 0 | 0 | |
| | $-\frac{9\sqrt{858}}{2288}$ | 0 | 0 | $-\frac{5\sqrt{1430}i}{2288}$ | 0 | $-\frac{\sqrt{1430}}{4576}$ | 0 | 0 | 0 | $\frac{\sqrt{858}i}{6864}$ | 0 | $\frac{73\sqrt{858}}{13728}$ | 0 | 0 | 0 | |
| | 0 | $\frac{9\sqrt{858}}{2288}$ | $\frac{5\sqrt{1430}i}{2288}$ | 0 | $-\frac{\sqrt{1430}}{4576}$ | 0 | 0 | 0 | $-\frac{\sqrt{858}i}{6864}$ | 0 | $\frac{73\sqrt{858}}{13728}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{1430}}{4576}$ | 0 | $-\frac{5\sqrt{1430}i}{1144}$ | $-\frac{3\sqrt{1430}}{1144}$ | 0 | 0 | $\frac{47\sqrt{858}}{13728}$ | 0 | $\frac{\sqrt{858}i}{429}$ | $-\frac{9\sqrt{858}}{2288}$ | 0 | 0 | |
| | 0 | 0 | $-\frac{\sqrt{1430}}{4576}$ | 0 | $\frac{5\sqrt{1430}i}{1144}$ | 0 | 0 | $\frac{3\sqrt{1430}}{1144}$ | $\frac{47\sqrt{858}}{13728}$ | 0 | $-\frac{\sqrt{858}i}{429}$ | 0 | 0 | $\frac{9\sqrt{858}}{2288}$ | 0 | |
| | 0 | $-\frac{\sqrt{858}}{429}$ | 0 | 0 | $-\frac{3\sqrt{1430}}{1144}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{3\sqrt{858}}{1144}$ | 0 | 0 | $\frac{\sqrt{858}i}{429}$ | 0 | |
| | $-\frac{\sqrt{858}}{429}$ | 0 | 0 | 0 | 0 | $\frac{3\sqrt{1430}}{1144}$ | 0 | 0 | 0 | 0 | 0 | $\frac{3\sqrt{858}}{1144}$ | $-\frac{\sqrt{858}i}{429}$ | 0 | 0 | |
| | $-\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | $\frac{\sqrt{858}i}{6864}$ | 0 | $\frac{47\sqrt{858}}{13728}$ | 0 | 0 | 0 | $\frac{9\sqrt{1430}i}{2288}$ | 0 | $\frac{7\sqrt{1430}}{4576}$ | 0 | 0 | 0 | |
| | 0 | $\frac{9\sqrt{1430}}{2288}$ | $-\frac{\sqrt{858}i}{6864}$ | 0 | $\frac{47\sqrt{858}}{13728}$ | 0 | 0 | 0 | $-\frac{9\sqrt{1430}i}{2288}$ | 0 | $\frac{7\sqrt{1430}}{4576}$ | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{73\sqrt{858}}{13728}$ | 0 | $\frac{\sqrt{858}i}{429}$ | $-\frac{3\sqrt{858}}{1144}$ | 0 | 0 | $\frac{7\sqrt{1430}}{4576}$ | 0 | $\frac{3\sqrt{1430}i}{1144}$ | $\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | |
| | 0 | $\frac{73\sqrt{858}}{13728}$ | 0 | $-\frac{\sqrt{858}i}{429}$ | 0 | 0 | $\frac{3\sqrt{858}}{1144}$ | $\frac{7\sqrt{1430}}{4576}$ | 0 | $-\frac{3\sqrt{1430}i}{1144}$ | 0 | 0 | $-\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | |
| | 0 | $\frac{3\sqrt{1430}}{572}$ | 0 | 0 | $-\frac{9\sqrt{858}}{2288}$ | 0 | 0 | $\frac{\sqrt{858}i}{429}$ | 0 | 0 | $\frac{9\sqrt{1430}}{2288}$ | 0 | 0 | $\frac{3\sqrt{1430}i}{572}$ | 0 | |
| | $\frac{3\sqrt{1430}}{572}$ | 0 | 0 | 0 | 0 | $\frac{9\sqrt{858}}{2288}$ | $-\frac{\sqrt{858}i}{429}$ | 0 | 0 | 0 | 0 | $-\frac{9\sqrt{1430}}{2288}$ | $-\frac{3\sqrt{1430}i}{572}$ | 0 | 0 | |

1017 symmetry

$$\frac{3\sqrt{14}x(x^4 - 10x^2y^2 + 5y^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|---------------------------|----------------------------|---------------------------------|--------------------------------|--------------------------------|---------------------------------|---|---|--------------------------------|---------------------------------|---------------------------------|--------------------------------|---------------------------|----------------------------|---|
| $\mathbb{M}_{5,0}^{(1,1;a)}(E, 1)$ | 0 | $\frac{\sqrt{286}}{572}$ | 0 | 0 | $\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{286}}{208}$ | 0 | 0 | $-\frac{\sqrt{286}i}{572}$ | |
| | $\frac{\sqrt{286}}{572}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{286}}{208}$ | $\frac{\sqrt{286}i}{572}$ | 0 | |
| | 0 | 0 | 0 | $\frac{15\sqrt{286}}{1144}$ | 0 | $\frac{5\sqrt{286}i}{416}$ | 0 | 0 | 0 | $-\frac{\sqrt{4290}}{429}$ | 0 | $\frac{29\sqrt{4290}i}{13728}$ | $\frac{\sqrt{4290}}{624}$ | 0 | |
| | 0 | 0 | $\frac{15\sqrt{286}}{1144}$ | 0 | $-\frac{5\sqrt{286}i}{416}$ | 0 | 0 | 0 | $-\frac{\sqrt{4290}}{429}$ | 0 | $-\frac{29\sqrt{4290}i}{13728}$ | 0 | 0 | $-\frac{\sqrt{4290}}{624}$ | |
| | $\frac{\sqrt{4290}}{624}$ | 0 | 0 | $\frac{5\sqrt{286}i}{416}$ | 0 | $-\frac{25\sqrt{286}}{2288}$ | 0 | 0 | 0 | $-\frac{37\sqrt{4290}i}{13728}$ | 0 | $-\frac{17\sqrt{4290}}{6864}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{4290}}{624}$ | $-\frac{5\sqrt{286}i}{416}$ | 0 | $-\frac{25\sqrt{286}}{2288}$ | 0 | 0 | 0 | $\frac{37\sqrt{4290}i}{13728}$ | 0 | $-\frac{17\sqrt{4290}}{6864}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{4290}}{429}$ | 0 | $-\frac{37\sqrt{4290}i}{13728}$ | 0 | 0 | 0 | $\frac{7\sqrt{286}}{1144}$ | 0 | $-\frac{3\sqrt{286}i}{416}$ | $-\frac{\sqrt{286}}{208}$ | 0 | |
| | 0 | 0 | $-\frac{\sqrt{4290}}{429}$ | 0 | $\frac{37\sqrt{4290}i}{13728}$ | 0 | 0 | 0 | $\frac{7\sqrt{286}}{1144}$ | 0 | $\frac{3\sqrt{286}i}{416}$ | 0 | 0 | $\frac{\sqrt{286}}{208}$ | |
| | $\frac{\sqrt{286}}{208}$ | 0 | 0 | $\frac{29\sqrt{4290}i}{13728}$ | 0 | $-\frac{17\sqrt{4290}}{6864}$ | 0 | 0 | 0 | $-\frac{3\sqrt{286}i}{416}$ | 0 | $-\frac{19\sqrt{286}}{2288}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{286}}{208}$ | $-\frac{29\sqrt{4290}i}{13728}$ | 0 | $-\frac{17\sqrt{4290}}{6864}$ | 0 | 0 | 0 | $\frac{3\sqrt{286}i}{416}$ | 0 | $-\frac{19\sqrt{286}}{2288}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{\sqrt{286}i}{572}$ | $\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{286}}{208}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{286}}{572}$ | |
| | $\frac{\sqrt{286}i}{572}$ | 0 | 0 | $-\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{286}}{208}$ | 0 | 0 | $-\frac{\sqrt{286}}{572}$ | 0 | 0 | |

1018 symmetry

$$-\frac{3\sqrt{14}y(5x^4 - 10x^2y^2 + y^4)}{16}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|------------------------------------|----------------------------|---------------------------|--------------------------------|-------------------------------|--------------------------------|--------------------------------|---|---|--------------------------------|--------------------------------|-------------------------------|-----------------------------|---------------------------|----------------------------|--|
| $\mathbb{M}_{5,1}^{(1,1;a)}(E, 1)$ | 0 | $\frac{\sqrt{286}i}{572}$ | $-\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{286}}{208}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{286}}{572}$ | |
| | $-\frac{\sqrt{286}i}{572}$ | 0 | 0 | $\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{286}}{208}$ | 0 | 0 | $\frac{\sqrt{286}}{572}$ | 0 | 0 | |
| | $-\frac{\sqrt{4290}}{624}$ | 0 | 0 | $-\frac{25\sqrt{286}i}{2288}$ | 0 | $\frac{5\sqrt{286}}{416}$ | 0 | 0 | $\frac{17\sqrt{4290}i}{6864}$ | 0 | $\frac{37\sqrt{4290}}{13728}$ | 0 | 0 | 0 | |
| | 0 | $\frac{\sqrt{4290}}{624}$ | $\frac{25\sqrt{286}i}{2288}$ | 0 | $\frac{5\sqrt{286}}{416}$ | 0 | 0 | 0 | $-\frac{17\sqrt{4290}i}{6864}$ | 0 | $\frac{37\sqrt{4290}}{13728}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{5\sqrt{286}}{416}$ | 0 | $\frac{15\sqrt{286}i}{1144}$ | 0 | 0 | 0 | $-\frac{29\sqrt{4290}}{13728}$ | 0 | $\frac{\sqrt{4290}i}{429}$ | $\frac{\sqrt{4290}}{624}$ | 0 | |
| | 0 | 0 | $\frac{5\sqrt{286}}{416}$ | 0 | $-\frac{15\sqrt{286}i}{1144}$ | 0 | 0 | 0 | $-\frac{29\sqrt{4290}}{13728}$ | 0 | $-\frac{\sqrt{4290}i}{429}$ | 0 | 0 | $-\frac{\sqrt{4290}}{624}$ | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | $\frac{\sqrt{286}}{208}$ | 0 | 0 | $\frac{17\sqrt{4290}i}{6864}$ | 0 | $-\frac{29\sqrt{4290}}{13728}$ | 0 | 0 | 0 | $-\frac{19\sqrt{286}i}{2288}$ | 0 | $-\frac{3\sqrt{286}}{416}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{286}}{208}$ | $-\frac{17\sqrt{4290}i}{6864}$ | 0 | $-\frac{29\sqrt{4290}}{13728}$ | 0 | 0 | 0 | $\frac{19\sqrt{286}i}{2288}$ | 0 | $-\frac{3\sqrt{286}}{416}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{37\sqrt{4290}}{13728}$ | 0 | $\frac{\sqrt{4290}i}{429}$ | 0 | 0 | 0 | $-\frac{3\sqrt{286}}{416}$ | 0 | $\frac{7\sqrt{286}i}{1144}$ | $\frac{\sqrt{286}}{208}$ | 0 | |
| | 0 | 0 | $\frac{37\sqrt{4290}}{13728}$ | 0 | $-\frac{\sqrt{4290}i}{429}$ | 0 | 0 | 0 | $-\frac{3\sqrt{286}}{416}$ | 0 | $-\frac{7\sqrt{286}i}{1144}$ | 0 | 0 | $-\frac{\sqrt{286}}{208}$ | |
| | 0 | $\frac{\sqrt{286}}{572}$ | 0 | 0 | $\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | $\frac{\sqrt{286}}{208}$ | 0 | 0 | 0 | $-\frac{\sqrt{286}i}{572}$ | |
| | $\frac{\sqrt{286}}{572}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{4290}}{624}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{286}}{208}$ | $\frac{\sqrt{286}i}{572}$ | 0 | 0 | |

1019 symmetry

$$\frac{\sqrt{15}x(x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{8}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|------------------------------|--|-------------------------------|-------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|------------------------------|------------------------------|---|
| $M_{5,0}^{(1,1;a)}(E, 2)$ | 0 | $-\frac{\sqrt{15015}}{2002}$ | 0 | 0 | $\frac{5\sqrt{1001}}{3432}$ | 0 | 0 | $-\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1144}$ | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{15015}}{2002}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{3432}$ | $\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | 0 | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | 0 | |
| | 0 | 0 | 0 | $\frac{5\sqrt{15015}}{4004}$ | 0 | $-\frac{\sqrt{15015}i}{6864}$ | $-\frac{5\sqrt{15015}}{3432}$ | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | $\frac{\sqrt{1001}i}{528}$ | $\frac{5\sqrt{1001}}{1716}$ | 0 | |
| | 0 | 0 | $\frac{5\sqrt{15015}}{4004}$ | 0 | $\frac{\sqrt{15015}i}{6864}$ | 0 | 0 | $\frac{5\sqrt{15015}}{3432}$ | $\frac{2\sqrt{1001}}{429}$ | 0 | $-\frac{\sqrt{1001}i}{528}$ | 0 | 0 | $-\frac{5\sqrt{1001}}{1716}$ | |
| | $\frac{5\sqrt{1001}}{3432}$ | 0 | 0 | $-\frac{\sqrt{15015}i}{6864}$ | 0 | $-\frac{5\sqrt{15015}}{24024}$ | 0 | 0 | 0 | $-\frac{\sqrt{1001}i}{528}$ | 0 | $\frac{\sqrt{1001}}{3432}$ | 0 | 0 | |
| | 0 | $-\frac{5\sqrt{1001}}{3432}$ | $\frac{\sqrt{15015}i}{6864}$ | 0 | $-\frac{5\sqrt{15015}}{24024}$ | 0 | 0 | 0 | $\frac{\sqrt{1001}i}{528}$ | 0 | $\frac{\sqrt{1001}}{3432}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{2\sqrt{1001}i}{429}$ | $-\frac{5\sqrt{15015}}{3432}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{15015}}{3003}$ | $-\frac{25\sqrt{1001}}{3432}$ | 0 | 0 | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | |
| | $\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | $\frac{5\sqrt{15015}}{3432}$ | 0 | 0 | $-\frac{5\sqrt{15015}}{3003}$ | 0 | 0 | $\frac{25\sqrt{1001}}{3432}$ | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | |
| | 0 | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | $-\frac{\sqrt{1001}i}{528}$ | $-\frac{25\sqrt{1001}}{3432}$ | 0 | 0 | $\frac{5\sqrt{15015}}{4004}$ | 0 | $\frac{7\sqrt{15015}i}{6864}$ | $\frac{\sqrt{15015}}{1716}$ | 0 | |
| | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | $\frac{\sqrt{1001}i}{528}$ | 0 | 0 | $\frac{25\sqrt{1001}}{3432}$ | $\frac{5\sqrt{15015}}{4004}$ | 0 | $-\frac{7\sqrt{15015}i}{6864}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1716}$ | |
| | $-\frac{\sqrt{15015}}{1144}$ | 0 | 0 | $\frac{\sqrt{1001}i}{528}$ | 0 | $\frac{\sqrt{1001}}{3432}$ | 0 | 0 | 0 | $\frac{7\sqrt{15015}i}{6864}$ | 0 | $\frac{3\sqrt{15015}}{8008}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{15015}}{1144}$ | $-\frac{\sqrt{1001}i}{528}$ | 0 | $\frac{\sqrt{1001}}{3432}$ | 0 | 0 | 0 | $-\frac{7\sqrt{15015}i}{6864}$ | 0 | $\frac{3\sqrt{15015}}{8008}$ | 0 | 0 | 0 | |
| | 0 | 0 | $\frac{5\sqrt{1001}}{1716}$ | 0 | 0 | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | $\frac{\sqrt{15015}}{1716}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{2002}$ | |
| | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{1716}$ | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1716}$ | 0 | 0 | $-\frac{\sqrt{15015}}{2002}$ | 0 | |
| 1020 | symmetry | $\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|-------------------------------|--------------------------------------|---------------------------------|--------------------------------|-------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|------------------------------|---|
| $M_{5,1}^{(1,1;a)}(E, 2)$ | 0 | $\frac{\sqrt{15015}i}{2002}$ | $\frac{5\sqrt{1001}}{3432}$ | 0 | 0 | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | $-\frac{\sqrt{15015}i}{2002}$ | 0 | 0 | $-\frac{5\sqrt{1001}}{3432}$ | 0 | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1144}$ | 0 | 0 | 0 | 0 | 0 |
| | $\frac{5\sqrt{1001}}{3432}$ | 0 | 0 | $\frac{5\sqrt{15015}i}{24024}$ | 0 | $\frac{\sqrt{15015}}{6864}$ | 0 | 0 | 0 | $\frac{\sqrt{1001}i}{3432}$ | 0 | $-\frac{\sqrt{1001}}{528}$ | 0 | 0 | 0 |
| | 0 | $-\frac{5\sqrt{1001}}{3432}$ | $-\frac{5\sqrt{15015}i}{24024}$ | 0 | $\frac{\sqrt{15015}}{6864}$ | 0 | 0 | 0 | $-\frac{\sqrt{1001}i}{3432}$ | 0 | $-\frac{\sqrt{1001}}{528}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $\frac{\sqrt{15015}}{6864}$ | 0 | $-\frac{5\sqrt{15015}i}{4004}$ | $-\frac{5\sqrt{15015}}{3432}$ | 0 | 0 | $\frac{\sqrt{1001}}{528}$ | 0 | $\frac{2\sqrt{1001}i}{429}$ | $-\frac{5\sqrt{1001}}{1716}$ | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{15015}}{6864}$ | 0 | $\frac{5\sqrt{15015}i}{4004}$ | 0 | 0 | $\frac{5\sqrt{15015}}{3432}$ | $\frac{\sqrt{1001}}{528}$ | 0 | $-\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | $\frac{5\sqrt{1001}}{1716}$ | 0 |
| | 0 | $\frac{2\sqrt{1001}}{429}$ | 0 | 0 | $-\frac{5\sqrt{15015}}{3432}$ | 0 | 0 | $\frac{5\sqrt{15015}i}{3003}$ | 0 | 0 | $\frac{25\sqrt{1001}}{3432}$ | 0 | 0 | $\frac{2\sqrt{1001}i}{429}$ | 0 |
| | $\frac{2\sqrt{1001}}{429}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{15015}}{3432}$ | $-\frac{5\sqrt{15015}i}{3003}$ | 0 | 0 | 0 | 0 | $-\frac{25\sqrt{1001}}{3432}$ | $-\frac{2\sqrt{1001}i}{429}$ | 0 | |
| | $\frac{\sqrt{15015}}{1144}$ | 0 | 0 | $\frac{\sqrt{1001}i}{3432}$ | 0 | $\frac{\sqrt{1001}}{528}$ | 0 | 0 | 0 | $-\frac{3\sqrt{15015}i}{8008}$ | 0 | $-\frac{7\sqrt{15015}}{6864}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{15015}}{1144}$ | $-\frac{\sqrt{1001}i}{3432}$ | 0 | $\frac{\sqrt{1001}}{528}$ | 0 | 0 | 0 | $\frac{3\sqrt{15015}i}{8008}$ | 0 | $-\frac{7\sqrt{15015}}{6864}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{1001}}{528}$ | 0 | $\frac{2\sqrt{1001}i}{429}$ | $\frac{25\sqrt{1001}}{3432}$ | 0 | 0 | $-\frac{7\sqrt{15015}}{6864}$ | 0 | $-\frac{5\sqrt{15015}i}{4004}$ | $\frac{\sqrt{15015}}{1716}$ | 0 | 0 |
| | 0 | 0 | $-\frac{\sqrt{1001}}{528}$ | 0 | $-\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | $-\frac{25\sqrt{1001}}{3432}$ | $-\frac{7\sqrt{15015}}{6864}$ | 0 | $\frac{5\sqrt{15015}i}{4004}$ | 0 | 0 | $-\frac{\sqrt{15015}}{1716}$ | 0 |
| | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{1001}}{1716}$ | 0 | 0 | $\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | $\frac{\sqrt{15015}}{1716}$ | 0 | 0 | $\frac{\sqrt{15015}i}{2002}$ | 0 |
| | 0 | 0 | 0 | 0 | 0 | $\frac{5\sqrt{1001}}{1716}$ | $-\frac{2\sqrt{1001}i}{429}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{15015}}{1716}$ | $-\frac{\sqrt{15015}i}{2002}$ | 0 | |
| 1021 | symmetry | $-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | | |
|---------------------------|----------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|----------------------------|----------------------------|------------------------------|------------------------------|-------------------------------|---|
| $M_{5,0}^{(1,1;a)}(E, 3)$ | 0 | 0 | 0 | $-\frac{4\sqrt{429}}{429}$ | 0 | $-\frac{4\sqrt{429}i}{429}$ | 0 | 0 | 0 | $\frac{\sqrt{715}}{286}$ | 0 | $-\frac{\sqrt{715}i}{286}$ | $-\frac{\sqrt{715}}{143}$ | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{4\sqrt{429}}{429}$ | 0 | $\frac{4\sqrt{429}i}{429}$ | 0 | 0 | 0 | $\frac{\sqrt{715}}{286}$ | 0 | $\frac{\sqrt{715}i}{286}$ | 0 | 0 | $\frac{\sqrt{715}}{143}$ | 0 | 0 |
| | 0 | $-\frac{4\sqrt{429}}{429}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{715}i}{1144}$ | 0 | 0 | $-\frac{5\sqrt{429}}{858}$ | 0 | 0 | 0 | $-\frac{23\sqrt{429}i}{3432}$ | 0 |
| | $-\frac{4\sqrt{429}}{429}$ | 0 | 0 | 0 | 0 | 0 | $\frac{\sqrt{715}i}{1144}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{429}}{858}$ | $\frac{23\sqrt{429}i}{3432}$ | 0 | 0 | 0 |
| | 0 | $-\frac{4\sqrt{429}i}{429}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{715}}{1144}$ | $-\frac{5\sqrt{429}}{858}$ | 0 | 0 | 0 | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 |
| | $\frac{4\sqrt{429}i}{429}$ | 0 | 0 | 0 | 0 | 0 | $-\frac{\sqrt{715}}{1144}$ | 0 | 0 | $\frac{5\sqrt{429}}{858}$ | 0 | 0 | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{\sqrt{715}i}{1144}$ | 0 | $-\frac{\sqrt{715}}{1144}$ | 0 | 0 | 0 | $\frac{\sqrt{429}i}{1144}$ | 0 | $-\frac{\sqrt{429}}{1144}$ | 0 | 0 | 0 | 0 |
| | 0 | 0 | $\frac{\sqrt{715}i}{1144}$ | 0 | $-\frac{\sqrt{715}}{1144}$ | 0 | 0 | 0 | $-\frac{\sqrt{429}i}{1144}$ | 0 | $-\frac{\sqrt{429}}{1144}$ | 0 | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{715}}{286}$ | 0 | 0 | $-\frac{5\sqrt{429}}{858}$ | 0 | 0 | $\frac{\sqrt{429}i}{1144}$ | 0 | 0 | 0 | 0 | 0 | $\frac{7\sqrt{715}i}{1144}$ | 0 | 0 |
| | $\frac{\sqrt{715}}{286}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{429}}{858}$ | $-\frac{\sqrt{429}i}{1144}$ | 0 | 0 | 0 | 0 | 0 | 0 | $-\frac{7\sqrt{715}i}{1144}$ | 0 | 0 |
| | 0 | $-\frac{\sqrt{715}i}{286}$ | $-\frac{5\sqrt{429}}{858}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{429}}{1144}$ | 0 | 0 | 0 | 0 | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 |
| | $\frac{\sqrt{715}i}{286}$ | 0 | 0 | $\frac{5\sqrt{429}}{858}$ | 0 | 0 | $-\frac{\sqrt{429}}{1144}$ | 0 | 0 | 0 | 0 | 0 | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 |
| | $-\frac{\sqrt{715}}{143}$ | 0 | 0 | $-\frac{23\sqrt{429}i}{3432}$ | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 | 0 | $\frac{7\sqrt{715}i}{1144}$ | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 | 0 | 0 |
| | 0 | $\frac{\sqrt{715}}{143}$ | $\frac{23\sqrt{429}i}{3432}$ | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 | 0 | $-\frac{7\sqrt{715}i}{1144}$ | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 | 0 | 0 | 0 |

1022 symmetry

$$\frac{3\sqrt{35}z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$$

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|------------------------------|--|------------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|--|
| $M_{5,1}^{(1,1;a)}(E, 3)$ | $-\frac{\sqrt{715}}{143}$ | 0 | 0 | $-\frac{23\sqrt{429}i}{3432}$ | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 | 0 | $\frac{7\sqrt{715}i}{1144}$ | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 | |
| | 0 | $\frac{\sqrt{715}}{143}$ | $\frac{23\sqrt{429}i}{3432}$ | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 | 0 | $-\frac{7\sqrt{715}i}{1144}$ | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 | 0 | |
| | 0 | $-\frac{23\sqrt{429}i}{3432}$ | $-\frac{5\sqrt{715}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{715}}{1144}$ | $-\frac{5\sqrt{429}}{3432}$ | 0 | 0 | 0 | 0 | $\frac{4\sqrt{429}}{429}$ | |
| | $\frac{23\sqrt{429}i}{3432}$ | 0 | 0 | $\frac{5\sqrt{715}}{1144}$ | 0 | 0 | $-\frac{\sqrt{715}}{1144}$ | 0 | 0 | $\frac{5\sqrt{429}}{3432}$ | 0 | 0 | $\frac{4\sqrt{429}}{429}$ | 0 | |
| | 0 | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 | $-\frac{5\sqrt{715}}{1144}$ | 0 | 0 | $\frac{\sqrt{715}i}{1144}$ | 0 | 0 | $\frac{5\sqrt{429}}{3432}$ | 0 | 0 | $\frac{4\sqrt{429}i}{429}$ | |
| | $\frac{23\sqrt{429}}{3432}$ | 0 | 0 | 0 | 0 | $\frac{5\sqrt{715}}{1144}$ | $-\frac{\sqrt{715}i}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{429}}{3432}$ | $-\frac{4\sqrt{429}i}{429}$ | 0 | |
| | 0 | 0 | 0 | $-\frac{\sqrt{715}}{1144}$ | 0 | $\frac{\sqrt{715}i}{1144}$ | 0 | 0 | 0 | $\frac{\sqrt{429}}{1144}$ | 0 | $\frac{\sqrt{429}i}{1144}$ | 0 | 0 | |
| | 0 | $-\frac{\sqrt{715}}{1144}$ | 0 | $-\frac{\sqrt{715}i}{1144}$ | 0 | 0 | 0 | $\frac{\sqrt{429}}{1144}$ | 0 | $-\frac{\sqrt{429}i}{1144}$ | 0 | 0 | 0 | 0 | |
| | 0 | $\frac{7\sqrt{715}i}{1144}$ | $-\frac{5\sqrt{429}}{3432}$ | 0 | 0 | 0 | $\frac{\sqrt{429}}{1144}$ | $\frac{5\sqrt{715}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{715}}{286}$ | | |
| | $-\frac{7\sqrt{715}i}{1144}$ | 0 | 0 | $\frac{5\sqrt{429}}{3432}$ | 0 | 0 | $\frac{\sqrt{429}}{1144}$ | 0 | 0 | $-\frac{5\sqrt{715}}{1144}$ | 0 | 0 | $-\frac{\sqrt{715}}{286}$ | 0 | |
| | 0 | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 | $\frac{5\sqrt{429}}{3432}$ | 0 | 0 | $\frac{\sqrt{429}i}{1144}$ | 0 | 0 | $\frac{5\sqrt{715}}{1144}$ | 0 | 0 | $\frac{\sqrt{715}i}{286}$ | |
| | $\frac{7\sqrt{715}}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{429}}{3432}$ | $-\frac{\sqrt{429}i}{1144}$ | 0 | 0 | 0 | 0 | $-\frac{5\sqrt{715}}{1144}$ | $-\frac{\sqrt{715}i}{286}$ | 0 | |
| | 0 | 0 | 0 | $\frac{4\sqrt{429}}{429}$ | 0 | $\frac{4\sqrt{429}i}{429}$ | 0 | 0 | 0 | $-\frac{\sqrt{715}}{286}$ | 0 | $\frac{\sqrt{715}i}{286}$ | $\frac{\sqrt{715}}{143}$ | 0 | |
| | 0 | 0 | $\frac{4\sqrt{429}}{429}$ | 0 | $-\frac{4\sqrt{429}i}{429}$ | 0 | 0 | 0 | $-\frac{\sqrt{715}}{286}$ | 0 | $-\frac{\sqrt{715}i}{286}$ | 0 | 0 | $-\frac{\sqrt{715}}{143}$ | |
| 1023 | symmetry | $-\frac{\sqrt{105xyz(x^2+y^2-2z^2)}}{2}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix | | | | | | | | | | | | | |
|---------------------------|-----------------------------|--|------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|
| $M_{5,0}^{(1,1;a)}(E, 4)$ | 0 | 0 | 0 | $-\frac{4\sqrt{143}}{429}$ | 0 | $\frac{4\sqrt{143}i}{429}$ | $\frac{8\sqrt{143}}{429}$ | 0 | 0 | $-\frac{\sqrt{2145}}{286}$ | 0 | $-\frac{\sqrt{2145}i}{286}$ | 0 | 0 | 0 |
| | 0 | 0 | $-\frac{4\sqrt{143}}{429}$ | 0 | $-\frac{4\sqrt{143}i}{429}$ | 0 | 0 | $-\frac{8\sqrt{143}}{429}$ | $-\frac{\sqrt{2145}}{286}$ | 0 | $\frac{\sqrt{2145}i}{286}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{4\sqrt{143}}{429}$ | 0 | 0 | $\frac{\sqrt{2145}}{1716}$ | 0 | 0 | $\frac{\sqrt{2145}i}{3432}$ | 0 | 0 | $-\frac{\sqrt{143}}{132}$ | 0 | 0 | 0 | $-\frac{17\sqrt{143}i}{3432}$ |
| | $-\frac{4\sqrt{143}}{429}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2145}}{1716}$ | $-\frac{\sqrt{2145}i}{3432}$ | 0 | 0 | 0 | $\frac{\sqrt{143}}{132}$ | $\frac{17\sqrt{143}i}{3432}$ | 0 | 0 | 0 |
| | 0 | $\frac{4\sqrt{143}i}{429}$ | $\frac{\sqrt{2145}}{1716}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{2145}}{3432}$ | $\frac{\sqrt{143}}{132}$ | 0 | 0 | 0 | 0 | $-\frac{17\sqrt{143}}{3432}$ | |
| | $-\frac{4\sqrt{143}i}{429}$ | 0 | 0 | $-\frac{\sqrt{2145}}{1716}$ | 0 | 0 | $-\frac{\sqrt{2145}}{3432}$ | 0 | 0 | $-\frac{\sqrt{143}}{132}$ | 0 | 0 | $-\frac{17\sqrt{143}}{3432}$ | 0 | 0 |
| | $\frac{8\sqrt{143}}{429}$ | 0 | 0 | $\frac{\sqrt{2145}i}{3432}$ | 0 | $-\frac{\sqrt{2145}}{3432}$ | 0 | 0 | 0 | $-\frac{43\sqrt{143}i}{3432}$ | 0 | $-\frac{43\sqrt{143}}{3432}$ | 0 | 0 | 0 |
| | 0 | $-\frac{8\sqrt{143}}{429}$ | $-\frac{\sqrt{2145}i}{3432}$ | 0 | $-\frac{\sqrt{2145}}{3432}$ | 0 | 0 | 0 | $\frac{43\sqrt{143}i}{3432}$ | 0 | $-\frac{43\sqrt{143}}{3432}$ | 0 | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{2145}}{286}$ | 0 | 0 | $\frac{\sqrt{143}}{132}$ | 0 | 0 | $-\frac{43\sqrt{143}i}{3432}$ | 0 | 0 | $-\frac{7\sqrt{2145}}{1716}$ | 0 | 0 | 0 | $-\frac{7\sqrt{2145}i}{3432}$ |
| | $-\frac{\sqrt{2145}}{286}$ | 0 | 0 | 0 | 0 | $-\frac{\sqrt{143}}{132}$ | $\frac{43\sqrt{143}i}{3432}$ | 0 | 0 | 0 | $\frac{7\sqrt{2145}}{1716}$ | $\frac{7\sqrt{2145}i}{3432}$ | 0 | 0 | 0 |
| | 0 | $-\frac{\sqrt{2145}i}{286}$ | $-\frac{\sqrt{143}}{132}$ | 0 | 0 | 0 | 0 | $-\frac{43\sqrt{143}}{3432}$ | $-\frac{7\sqrt{2145}}{1716}$ | 0 | 0 | 0 | 0 | $\frac{7\sqrt{2145}}{3432}$ | |
| | $\frac{\sqrt{2145}i}{286}$ | 0 | 0 | $\frac{\sqrt{143}}{132}$ | 0 | 0 | $-\frac{43\sqrt{143}}{3432}$ | 0 | 0 | $\frac{7\sqrt{2145}}{1716}$ | 0 | 0 | $\frac{7\sqrt{2145}}{3432}$ | 0 | 0 |
| | 0 | 0 | 0 | $-\frac{17\sqrt{143}i}{3432}$ | 0 | $-\frac{17\sqrt{143}}{3432}$ | 0 | 0 | 0 | $-\frac{7\sqrt{2145}i}{3432}$ | 0 | $\frac{7\sqrt{2145}}{3432}$ | 0 | 0 | 0 |
| | 0 | 0 | $\frac{17\sqrt{143}i}{3432}$ | 0 | $-\frac{17\sqrt{143}}{3432}$ | 0 | 0 | 0 | $\frac{7\sqrt{2145}i}{3432}$ | 0 | $\frac{7\sqrt{2145}}{3432}$ | 0 | 0 | 0 | 0 |
| 1024 | symmetry | $-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$ | | | | | | | | | | | | | |

continued ...

Table 10

| No. | multipole | matrix |
|---------------------------|-----------|--|
| $M_{5,1}^{(1,1;a)}(E, 4)$ | 0 | $\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{143}i}{156} & 0 & \frac{\sqrt{143}}{156} & 0 & 0 & 0 & \frac{\sqrt{2145}i}{572} & 0 & -\frac{\sqrt{2145}}{572} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{143}i}{156} & 0 & \frac{\sqrt{143}}{156} & 0 & 0 & 0 & -\frac{\sqrt{2145}i}{572} & 0 & -\frac{\sqrt{2145}}{572} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{143}i}{156} & \frac{5\sqrt{2145}}{1716} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2145}}{312} & \frac{17\sqrt{143}}{1716} & 0 & 0 & 0 & 0 & -\frac{37\sqrt{143}}{3432} \\ -\frac{\sqrt{143}i}{156} & 0 & 0 & -\frac{5\sqrt{2145}}{1716} & 0 & 0 & \frac{\sqrt{2145}}{312} & 0 & 0 & -\frac{17\sqrt{143}}{1716} & 0 & 0 & -\frac{37\sqrt{143}}{3432} & 0 \\ 0 & \frac{\sqrt{143}}{156} & 0 & 0 & -\frac{5\sqrt{2145}}{1716} & 0 & 0 & \frac{\sqrt{2145}i}{312} & 0 & 0 & \frac{17\sqrt{143}}{1716} & 0 & 0 & \frac{37\sqrt{143}i}{3432} \\ \frac{\sqrt{143}}{156} & 0 & 0 & 0 & 0 & \frac{5\sqrt{2145}}{1716} & -\frac{\sqrt{2145}i}{312} & 0 & 0 & 0 & 0 & -\frac{17\sqrt{143}}{1716} & -\frac{37\sqrt{143}i}{3432} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2145}}{312} & 0 & \frac{\sqrt{2145}i}{312} & 0 & 0 & 0 & \frac{7\sqrt{143}}{3432} & 0 & -\frac{7\sqrt{143}i}{3432} & \frac{8\sqrt{143}}{429} & 0 \\ 0 & 0 & \frac{\sqrt{2145}}{312} & 0 & -\frac{\sqrt{2145}i}{312} & 0 & 0 & 0 & \frac{7\sqrt{143}}{3432} & 0 & \frac{7\sqrt{143}i}{3432} & 0 & 0 & -\frac{8\sqrt{143}}{429} \\ 0 & \frac{\sqrt{2145}i}{572} & \frac{17\sqrt{143}}{1716} & 0 & 0 & 0 & 0 & \frac{7\sqrt{143}}{3432} & \frac{\sqrt{2145}}{572} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2145}}{312} \\ -\frac{\sqrt{2145}i}{572} & 0 & 0 & -\frac{17\sqrt{143}}{1716} & 0 & 0 & \frac{7\sqrt{143}}{3432} & 0 & 0 & -\frac{\sqrt{2145}}{572} & 0 & 0 & -\frac{\sqrt{2145}}{312} & 0 \\ 0 & -\frac{\sqrt{2145}}{572} & 0 & 0 & \frac{17\sqrt{143}}{1716} & 0 & 0 & -\frac{7\sqrt{143}i}{3432} & 0 & 0 & -\frac{\sqrt{2145}}{572} & 0 & 0 & -\frac{\sqrt{2145}i}{312} \\ -\frac{\sqrt{2145}}{572} & 0 & 0 & 0 & 0 & -\frac{17\sqrt{143}}{1716} & \frac{7\sqrt{143}i}{3432} & 0 & 0 & 0 & 0 & \frac{\sqrt{2145}}{572} & \frac{\sqrt{2145}i}{312} & 0 \\ 0 & 0 & 0 & -\frac{37\sqrt{143}}{3432} & 0 & \frac{37\sqrt{143}i}{3432} & \frac{8\sqrt{143}}{429} & 0 & 0 & -\frac{\sqrt{2145}}{312} & 0 & -\frac{\sqrt{2145}i}{312} & 0 & 0 \\ 0 & 0 & -\frac{37\sqrt{143}}{3432} & 0 & -\frac{37\sqrt{143}i}{3432} & 0 & 0 & -\frac{8\sqrt{143}}{429} & -\frac{\sqrt{2145}}{312} & 0 & \frac{\sqrt{2145}i}{312} & 0 & 0 & 0 \end{pmatrix}$ |
| | 1 | |
| | 2 | |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| | 8 | |
| | 9 | |
| | 10 | |
| | 11 | |
| | 12 | |