PG No. 31 T_{d} $\bar{4}3m$ [cubic] (lg basis)

bra: $= \langle s|$
ket: $= |s\rangle$

Table 1: (s,s) block.

No.	multipole	matrix
1	symmetry	1
	$\mathbb{Q}_0^{(a)}(A_1)$	$\begin{bmatrix} 1 \end{bmatrix}$

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

Table 2: (s,p) block.

No.	multipole	matrix
2	symmetry	x
	$\mathbb{Q}_{1,0}^{(a)}(T_2)$	$\begin{bmatrix} \frac{\sqrt{2}}{2} & 0 & 0 \end{bmatrix}$
3	symmetry	y
	$\mathbb{Q}_{1,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 \end{bmatrix}$
4	symmetry	z
	$\mathbb{Q}_{1,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{2} \end{bmatrix}$
5	symmetry	x
	$\mathbb{T}_{1,0}^{(a)}(T_2)$	$\begin{bmatrix} \frac{\sqrt{2}i}{2} & 0 & 0 \end{bmatrix}$
6	symmetry	y
	$\mathbb{T}_{1,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}i}{2} & 0 \end{bmatrix}$
7	symmetry	z
	$\mathbb{T}_{1,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{2} \end{bmatrix}$

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

Table 3: (s,d) block.

No.	multipole	matrix
8	symmetry	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
	$\mathbb{Q}^{(a)}_{2,0}(E)$	$\begin{bmatrix} \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$
9	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 \end{bmatrix}$
10	symmetry	$\sqrt{3}yz$
	$\mathbb{Q}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{2} & 0 & 0 \end{bmatrix}$
11	symmetry	$\sqrt{3}xz$
	$\mathbb{Q}^{(a)}_{2,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}}{2} & 0 \end{bmatrix}$
12	symmetry	$\sqrt{3}xy$
	$\mathbb{Q}^{(a)}_{2,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} \end{bmatrix}$
13	symmetry	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
	$\mathbb{T}^{(a)}_{2,0}(E)$	$\begin{bmatrix} \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$
14	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{T}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 \end{bmatrix}$
15	symmetry	$\sqrt{3}yz$
	$\mathbb{T}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{2} & 0 & 0 \end{bmatrix}$
16	symmetry	$\sqrt{3}xz$
	$\mathbb{T}^{(a)}_{2,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{2} & 0 \end{bmatrix}$
17	symmetry	$\sqrt{3}xy$
	$\mathbb{T}^{(a)}_{2,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} \end{bmatrix}$

bra: $= \langle s|$
ket: $= |f_3\rangle, |f_{ax}\rangle, |f_{ay}\rangle, |f_{az}\rangle, |f_{bx}\rangle, |f_{by}\rangle, |f_{bz}\rangle$

Table 4: (s,f) block.

No.	multipole	matrix
18	symmetry	$\sqrt{15}xyz$
	$\mathbb{Q}_3^{(a)}(A_1)$	$\begin{bmatrix} \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
19	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{Q}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} & 0 & 0 \end{bmatrix}$
20	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{Q}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} & 0 \end{bmatrix}$
21	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{Q}_{3,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} \end{bmatrix}$
22	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{Q}_{3,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
23	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{Q}_{3,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$
24	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
	$\mathbb{Q}_{3,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 \end{bmatrix}$
25	symmetry	$\sqrt{15}xyz$
	$\mathbb{T}_3^{(a)}(A_1)$	$\begin{bmatrix} \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
26	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{T}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} & 0 & 0 \end{bmatrix}$
27	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{T}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} & 0 \end{bmatrix}$
28	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{T}_{3,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} \end{bmatrix}$
29	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{T}_{3,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
30	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{T}_{3,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$
31	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$

continued ...

Table 4

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{3,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 \end{bmatrix}$

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

Table 5: (p,p) block.

No.	multipole	matrix
32	symmetry	1
	$\mathbb{Q}^{(a)}_0(A_1)$	$\begin{bmatrix} \frac{\sqrt{3}}{3} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & \frac{\sqrt{3}}{3} \end{bmatrix}$
33	symmetry	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
	$\mathbb{Q}^{(a)}_{2,0}(E)$	$\begin{bmatrix} -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & \frac{\sqrt{6}}{3} \end{bmatrix}$
34	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{2,1}(E)$	$\begin{bmatrix} \frac{\sqrt{2}}{2} & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 0 \end{bmatrix}$
35	symmetry	$\sqrt{3}yz$
	$\mathbb{Q}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{2} \\ 0 & \frac{\sqrt{2}}{2} & 0 \end{bmatrix}$
36	symmetry	$\sqrt{3}xz$
	$\mathbb{Q}^{(a)}_{2,1}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{2} \\ 0 & 0 & 0 \\ \frac{\sqrt{2}}{2} & 0 & 0 \end{bmatrix}$

continued ...

Table 5

No.	multipole	matrix
37	symmetry	$\sqrt{3}xy$
	$\mathbb{Q}^{(a)}_{2,2}(T_2)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 \\ \frac{\sqrt{2}}{2} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$
38	symmetry	x
	$\mathbb{M}^{(a)}_{1,0}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{2} \\ 0 & \frac{\sqrt{2}i}{2} & 0 \end{bmatrix}$
39	symmetry	y
	$\mathbb{M}^{(a)}_{1,1}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{2}i}{2} \\ 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{2} & 0 & 0 \end{bmatrix}$
40	symmetry	z
	$\mathbb{M}^{(a)}_{1,2}(T_1)$	$\begin{bmatrix} 0 & -\frac{\sqrt{2}i}{2} & 0 \\ \frac{\sqrt{2}i}{2} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

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

Table 6: (p,d) block.

No.	multipole	matrix
41	symmetry	x
	$\mathbb{Q}^{(a)}_{1,0}(T_2)$	$\begin{bmatrix} -\frac{\sqrt{5}}{10} & \frac{\sqrt{15}}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{10} \\ 0 & 0 & 0 & \frac{\sqrt{15}}{10} & 0 \end{bmatrix}$
42	symmetry	y

continued ...

Table 6

No.	multipole	matrix
	$\mathbb{Q}_{1,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{10} \\ -\frac{\sqrt{5}}{10} & -\frac{\sqrt{15}}{10} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{15}}{10} & 0 & 0 \end{bmatrix}$
43	symmetry	z
	$\mathbb{Q}_{1,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{15}}{10} & 0 \\ 0 & 0 & \frac{\sqrt{15}}{10} & 0 & 0 \\ \frac{\sqrt{5}}{5} & 0 & 0 & 0 & 0 \end{bmatrix}$
44	symmetry	$\sqrt{15}xyz$
	$\mathbb{Q}_{3}^{(a)}(A_1)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{bmatrix}$
45	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{Q}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} -\frac{\sqrt{2}}{4} & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \end{bmatrix}$
46	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{Q}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ \frac{\sqrt{2}}{4} & -\frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \end{bmatrix}$
47	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{Q}_{3,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \end{bmatrix}$
48	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{Q}_{3,0}^{(a)}(T_2)$	$\begin{bmatrix} -\frac{\sqrt{30}}{20} & \frac{3\sqrt{10}}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{10} \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{10} & 0 \end{bmatrix}$
49	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$

continued ...

Table 6

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{3,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{10} \\ -\frac{\sqrt{30}}{20} & -\frac{3\sqrt{10}}{20} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{10} & 0 & 0 \end{bmatrix}$
50	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
	$\mathbb{Q}^{(a)}_{3,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{10}}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{10} & 0 & 0 \\ \frac{\sqrt{30}}{10} & 0 & 0 & 0 & 0 \end{bmatrix}$
51	symmetry	$-\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{G}^{(a)}_{2,0}(E)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} \end{bmatrix}$
52	symmetry	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
	$\mathbb{G}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
53	symmetry	$\sqrt{3}yz$
	$\mathbb{G}^{(a)}_{2,0}(T_1)$	$\begin{bmatrix} -\frac{1}{2} & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \end{bmatrix}$
54	symmetry	$\sqrt{3}xz$
	$\mathbb{G}^{(a)}_{2,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ \frac{1}{2} & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \end{bmatrix}$
55	symmetry	$\sqrt{3}xy$
	$\mathbb{G}^{(a)}_{2,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{3} & 0 & 0 & 0 \end{bmatrix}$
56	symmetry	x

continued ...

Table 6

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{1,0}(T_2)$	$\begin{bmatrix} -\frac{\sqrt{5}i}{10} & \frac{\sqrt{15}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{15}i}{10} & 0 \end{bmatrix}$
57	symmetry	y
	$\mathbb{T}^{(a)}_{1,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} \\ -\frac{\sqrt{5}i}{10} & -\frac{\sqrt{15}i}{10} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{15}i}{10} & 0 & 0 \end{bmatrix}$
58	symmetry	z
	$\mathbb{T}^{(a)}_{1,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{15}i}{10} & 0 \\ 0 & 0 & \frac{\sqrt{15}i}{10} & 0 & 0 \\ \frac{\sqrt{5}i}{5} & 0 & 0 & 0 & 0 \end{bmatrix}$
59	symmetry	$\sqrt{15}xyz$
	$\mathbb{T}^{(a)}_{3}(A_1)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \end{bmatrix}$
60	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{T}^{(a)}_{3,0}(T_1)$	$\begin{bmatrix} -\frac{\sqrt{2}i}{4} & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{bmatrix}$
61	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{T}^{(a)}_{3,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ \frac{\sqrt{2}i}{4} & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \end{bmatrix}$
62	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{T}^{(a)}_{3,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \end{bmatrix}$
63	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$

continued ...

Table 6

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{3,0}(T_2)$	$\begin{bmatrix} -\frac{\sqrt{30}i}{20} & \frac{3\sqrt{10}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 \end{bmatrix}$
64	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{3,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} \\ -\frac{\sqrt{30}i}{20} & -\frac{3\sqrt{10}i}{20} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \end{bmatrix}$
65	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{3,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \\ \frac{\sqrt{30}i}{10} & 0 & 0 & 0 & 0 \end{bmatrix}$
66	symmetry	$-\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{M}^{(a)}_{2,0}(E)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{3} \end{bmatrix}$
67	symmetry	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
	$\mathbb{M}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
68	symmetry	$\sqrt{3}yz$
	$\mathbb{M}^{(a)}_{2,0}(T_1)$	$\begin{bmatrix} \frac{i}{2} & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \end{bmatrix}$
69	symmetry	$\sqrt{3}xz$
	$\mathbb{M}^{(a)}_{2,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ -\frac{i}{2} & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \end{bmatrix}$
70	symmetry	$\sqrt{3}xy$

continued ...

Table 6

No.	multipole	matrix
	$\mathbb{M}^{(a)}_{2,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{3} & 0 & 0 & 0 \end{bmatrix}$

bra: $= \langle p_x| , \langle p_y| , \langle p_z|$
ket: $= |f_3\rangle , |f_{ax}\rangle , |f_{ay}\rangle , |f_{az}\rangle , |f_{bx}\rangle , |f_{by}\rangle , |f_{bz}\rangle$

Table 7: (p,f) block.

No.	multipole	matrix
71	symmetry	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
	$\mathbb{Q}^{(a)}_{2,0}(E)$	$\begin{bmatrix} 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & \frac{\sqrt{70}}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 \end{bmatrix}$
72	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & \frac{3\sqrt{14}}{28} & 0 & 0 & -\frac{\sqrt{210}}{84} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{14}}{28} & 0 & 0 & -\frac{\sqrt{210}}{84} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{42} \end{bmatrix}$
73	symmetry	$\sqrt{3}yz$
	$\mathbb{Q}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} \frac{\sqrt{210}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & -\frac{\sqrt{210}}{42} \\ 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & \frac{\sqrt{210}}{42} & 0 \end{bmatrix}$
74	symmetry	$\sqrt{3}xz$
	$\mathbb{Q}^{(a)}_{2,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & \frac{\sqrt{210}}{42} \\ \frac{\sqrt{210}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & -\frac{\sqrt{210}}{42} & 0 & 0 \end{bmatrix}$
75	symmetry	$\sqrt{3}xy$

continued ...

Table 7

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{2,2}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & -\frac{\sqrt{210}}{42} & 0 \\ 0 & -\frac{\sqrt{14}}{14} & 0 & 0 & \frac{\sqrt{210}}{42} & 0 & 0 \\ \frac{\sqrt{210}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
76	symmetry	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
	$\mathbb{Q}^{(a)}_{4}(A_1)$	$\begin{bmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \end{bmatrix}$
77	symmetry	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$
	$\mathbb{Q}^{(a)}_{4,0}(E)$	$\begin{bmatrix} 0 & -\frac{\sqrt{210}}{84} & 0 & 0 & \frac{3\sqrt{14}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{210}}{84} & 0 & 0 & -\frac{3\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{210}}{42} & 0 & 0 & 0 \end{bmatrix}$
78	symmetry	$\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
	$\mathbb{Q}^{(a)}_{4,1}(E)$	$\begin{bmatrix} 0 & \frac{\sqrt{70}}{28} & 0 & 0 & \frac{\sqrt{42}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & \frac{\sqrt{42}}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{14} \end{bmatrix}$
79	symmetry	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$
	$\mathbb{Q}^{(a)}_{4,0}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{8} \\ 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 \end{bmatrix}$
80	symmetry	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$
	$\mathbb{Q}^{(a)}_{4,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 \end{bmatrix}$
81	symmetry	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{4,2}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 \\ 0 & \frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
82	symmetry	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$

continued ...

Table 7

No.	multipole	matrix
	$\mathbb{Q}_{4,0}^{(a)}(T_2)$	$\begin{bmatrix} \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & \frac{3\sqrt{42}}{56} \\ 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & -\frac{3\sqrt{42}}{56} & 0 \end{bmatrix}$
83	symmetry	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$
	$\mathbb{Q}_{4,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & -\frac{3\sqrt{42}}{56} \\ \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & \frac{3\sqrt{42}}{56} & 0 & 0 \end{bmatrix}$
84	symmetry	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
	$\mathbb{Q}_{4,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & \frac{3\sqrt{42}}{56} & 0 \\ 0 & -\frac{\sqrt{70}}{56} & 0 & 0 & -\frac{3\sqrt{42}}{56} & 0 & 0 \\ \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
85	symmetry	$\sqrt{15}xyz$
	$\mathbb{G}_{3}^{(a)}(A_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{bmatrix}$
86	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{G}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & \frac{\sqrt{10}}{8} \\ 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & \frac{\sqrt{10}}{8} & 0 \end{bmatrix}$
87	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{G}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & \frac{\sqrt{10}}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 \end{bmatrix}$
88	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
	$\mathbb{G}_{3,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}}{8} & 0 & 0 & \frac{\sqrt{10}}{8} & 0 \\ 0 & \frac{\sqrt{6}}{8} & 0 & 0 & \frac{\sqrt{10}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
89	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$

continued ...

Table 7

No.	multipole	matrix
	$\mathbb{G}^{(a)}_{3,0}(T_2)$	$\begin{bmatrix} -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & \frac{\sqrt{6}}{24} \\ 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 \end{bmatrix}$
90	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{G}^{(a)}_{3,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{24} \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 \end{bmatrix}$
91	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{G}^{(a)}_{3,2}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 \\ 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
92	symmetry	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
	$\mathbb{T}^{(a)}_{2,0}(E)$	$\begin{bmatrix} 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & \frac{\sqrt{70}i}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{14} & 0 & 0 & 0 \end{bmatrix}$
93	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{T}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & \frac{3\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{42} \end{bmatrix}$
94	symmetry	$\sqrt{3}yz$
	$\mathbb{T}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} \frac{\sqrt{210}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & -\frac{\sqrt{210}i}{42} \\ 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & \frac{\sqrt{210}i}{42} & 0 \end{bmatrix}$
95	symmetry	$\sqrt{3}xz$
	$\mathbb{T}^{(a)}_{2,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & \frac{\sqrt{210}i}{42} \\ \frac{\sqrt{210}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & -\frac{\sqrt{210}i}{42} & 0 & 0 \end{bmatrix}$
96	symmetry	$\sqrt{3}xy$

continued ...

Table 7

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{2,2}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & -\frac{\sqrt{210}i}{42} & 0 \\ 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & \frac{\sqrt{210}i}{42} & 0 & 0 \\ \frac{\sqrt{210}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
97	symmetry	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
	$\mathbb{T}^{(a)}_{4}(A_1)$	$\begin{bmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \end{bmatrix}$
98	symmetry	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$
	$\mathbb{T}^{(a)}_{4,0}(E)$	$\begin{bmatrix} 0 & -\frac{\sqrt{210}i}{84} & 0 & 0 & \frac{3\sqrt{14}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{210}i}{84} & 0 & 0 & -\frac{3\sqrt{14}i}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{210}i}{42} & 0 & 0 & 0 \end{bmatrix}$
99	symmetry	$\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
	$\mathbb{T}^{(a)}_{4,1}(E)$	$\begin{bmatrix} 0 & \frac{\sqrt{70}i}{28} & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{42}i}{14} \end{bmatrix}$
100	symmetry	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$
	$\mathbb{T}^{(a)}_{4,0}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} \\ 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 \end{bmatrix}$
101	symmetry	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$
	$\mathbb{T}^{(a)}_{4,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 \end{bmatrix}$
102	symmetry	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
	$\mathbb{T}^{(a)}_{4,2}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 \\ 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
103	symmetry	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$

continued ...

Table 7

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{4,0}(T_2)$	$\begin{bmatrix} \frac{\sqrt{42}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & \frac{3\sqrt{42}i}{56} \\ 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & -\frac{3\sqrt{42}i}{56} & 0 \end{bmatrix}$
104	symmetry	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{4,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & -\frac{3\sqrt{42}i}{56} \\ \frac{\sqrt{42}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & \frac{3\sqrt{42}i}{56} & 0 & 0 \end{bmatrix}$
105	symmetry	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{4,2}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & \frac{3\sqrt{42}i}{56} & 0 \\ 0 & -\frac{\sqrt{70}i}{56} & 0 & 0 & -\frac{3\sqrt{42}i}{56} & 0 & 0 \\ \frac{\sqrt{42}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
106	symmetry	$\sqrt{15}xyz$
	$\mathbb{M}^{(a)}_{3}(A_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \end{bmatrix}$
107	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{M}^{(a)}_{3,0}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{8} \\ 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 \end{bmatrix}$
108	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{M}^{(a)}_{3,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 \end{bmatrix}$
109	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
	$\mathbb{M}^{(a)}_{3,2}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 \\ 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
110	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$

continued ...

Table 7

No.	multipole	matrix
	$\mathbb{M}_{3,0}^{(a)}(T_2)$	$\begin{bmatrix} \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{24} \\ 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 \end{bmatrix}$
111	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{M}_{3,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & \frac{\sqrt{6}i}{24} \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 \end{bmatrix}$
112	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{M}_{3,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 \\ 0 & \frac{\sqrt{10}i}{8} & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

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

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

Table 8: (d,d) block.

No.	multipole	matrix
113	symmetry	1
	$\mathbb{Q}_0^{(a)}(A_1)$	$\begin{bmatrix} \frac{\sqrt{5}}{5} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{5} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{5} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{5} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{5} \end{bmatrix}$
114	symmetry	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$

continued ...

Table 8

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{2,0}(E)$	$\begin{bmatrix} \frac{\sqrt{14}}{7} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{7} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{7} \end{bmatrix}$
115	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & -\frac{\sqrt{14}}{7} & 0 & 0 & 0 \\ -\frac{\sqrt{14}}{7} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{14} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
116	symmetry	$\sqrt{3}yz$
	$\mathbb{Q}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{14} & 0 & 0 \\ \frac{\sqrt{14}}{14} & -\frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 \end{bmatrix}$
117	symmetry	$\sqrt{3}xz$
	$\mathbb{Q}^{(a)}_{2,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} \\ \frac{\sqrt{14}}{14} & \frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 \end{bmatrix}$
118	symmetry	$\sqrt{3}xy$

continued ...

Table 8

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{2,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{7} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 \\ 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 \\ -\frac{\sqrt{14}}{7} & 0 & 0 & 0 & 0 \end{bmatrix}$
119	symmetry	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
	$\mathbb{Q}^{(a)}_{4}(A_1)$	$\begin{bmatrix} \frac{\sqrt{30}}{10} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{10} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{15} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{15} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{15} \end{bmatrix}$
120	symmetry	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$
	$\mathbb{Q}^{(a)}_{4,0}(E)$	$\begin{bmatrix} \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{21} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{21} & 0 \\ 0 & 0 & 0 & 0 & \frac{2\sqrt{42}}{21} \end{bmatrix}$
121	symmetry	$\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
	$\mathbb{Q}^{(a)}_{4,1}(E)$	$\begin{bmatrix} 0 & -\frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ -\frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{7} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{14}}{7} & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
122	symmetry	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$

continued ...

Table 8

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{4,0}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}}{4} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{6}}{4} & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
123	symmetry	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$
	$\mathbb{Q}^{(a)}_{4,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}}{4} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{4} & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
124	symmetry	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{4,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 \end{bmatrix}$
125	symmetry	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$
	$\mathbb{Q}^{(a)}_{4,0}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{14}}{28} & 0 & 0 \\ -\frac{\sqrt{42}}{28} & \frac{3\sqrt{14}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{7} \\ 0 & 0 & 0 & \frac{\sqrt{14}}{7} & 0 \end{bmatrix}$
126	symmetry	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$

continued ...

Table 8

No.	multipole	matrix
	$\mathbb{Q}_{4,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{42}}{28} & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{7} \\ -\frac{\sqrt{42}}{28} & -\frac{3\sqrt{14}}{28} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{7} & 0 & 0 \end{bmatrix}$
127	symmetry	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
	$\mathbb{Q}_{4,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{7} & 0 \\ 0 & 0 & \frac{\sqrt{14}}{7} & 0 & 0 \\ \frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 \end{bmatrix}$
128	symmetry	x
	$\mathbb{M}_{1,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{30}i}{10} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 \\ -\frac{\sqrt{30}i}{10} & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 \end{bmatrix}$
129	symmetry	y
	$\mathbb{M}_{1,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{30}i}{10} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} \\ \frac{\sqrt{30}i}{10} & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 \end{bmatrix}$
130	symmetry	z

continued ...

Table 8

No.	multipole	matrix
	$\mathbb{M}_{1,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{5} \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{5} & 0 & 0 & 0 \end{bmatrix}$
131	symmetry	$\sqrt{15}xyz$
	$\mathbb{M}_{3}^{(a)}(A_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{2}i}{2} & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
132	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{M}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{5} \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{5} & 0 \end{bmatrix}$
133	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{M}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{5} \\ -\frac{\sqrt{30}i}{20} & \frac{\sqrt{10}i}{20} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{5} & 0 & 0 \end{bmatrix}$
134	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$

continued ...

Table 8

No.	multipole	matrix
	$\mathbb{M}_{3,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{10}i}{5} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{5} & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 \end{bmatrix}$
135	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{M}_{3,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{4} & 0 & 0 \\ \frac{\sqrt{2}i}{4} & -\frac{\sqrt{6}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
136	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{M}_{3,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & \frac{\sqrt{6}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
137	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{M}_{3,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$

bra: $= \langle d_u| , \langle d_v| , \langle d_{yz}| , \langle d_{xz}| , \langle d_{xy}|$
ket: $= |f_3\rangle , |f_{ax}\rangle , |f_{ay}\rangle , |f_{az}\rangle , |f_{bx}\rangle , |f_{by}\rangle , |f_{bz}\rangle$

Table 9: (d,f) block.

No.	multipole	matrix
138	symmetry	x
	$\mathbb{Q}^{(a)}_{1,0}(T_2)$	$\begin{bmatrix} 0 & -\frac{3\sqrt{70}}{140} & 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 \\ 0 & \frac{3\sqrt{210}}{140} & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 & 0 \\ \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{14}}{14} \\ 0 & 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 \end{bmatrix}$
139	symmetry	y
	$\mathbb{Q}^{(a)}_{1,1}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{70}}{140} & 0 & 0 & \frac{\sqrt{42}}{28} & 0 \\ 0 & 0 & -\frac{3\sqrt{210}}{140} & 0 & 0 & -\frac{\sqrt{14}}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & -\frac{\sqrt{14}}{14} \\ \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 \end{bmatrix}$
140	symmetry	z
	$\mathbb{Q}^{(a)}_{1,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{70}}{70} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{14} \\ 0 & 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & \frac{\sqrt{14}}{14} & 0 \\ 0 & -\frac{\sqrt{210}}{70} & 0 & 0 & -\frac{\sqrt{14}}{14} & 0 & 0 \\ \frac{\sqrt{14}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
141	symmetry	$\sqrt{15}xyz$
	$\mathbb{Q}^{(a)}_{3}(A_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 \end{bmatrix}$
142	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{Q}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{8} \\ 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 \end{bmatrix}$
143	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{Q}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 \end{bmatrix}$
144	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{Q}_{3,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 \\ 0 & \frac{\sqrt{6}}{24} & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
145	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{Q}_{3,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & \frac{\sqrt{10}}{10} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & \frac{\sqrt{6}}{24} \\ 0 & 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 \end{bmatrix}$
146	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{Q}_{3,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & -\frac{\sqrt{10}}{10} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & -\frac{\sqrt{6}}{24} \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 \end{bmatrix}$
147	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
	$\mathbb{Q}_{3,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{30}}{15} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & \frac{\sqrt{6}}{24} & 0 \\ 0 & -\frac{\sqrt{10}}{40} & 0 & 0 & -\frac{\sqrt{6}}{24} & 0 & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
148	symmetry	$-\frac{\sqrt{105}xyz\left(x^2+y^2-2z^2\right)}{2}$
	$\mathbb{Q}_{5,0}^{(a)}(E)$	$\begin{bmatrix} \frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & -\frac{3\sqrt{5}}{20} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & \frac{3\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \end{bmatrix}$
149	symmetry	$\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$
	$\mathbb{Q}_{5,1}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & 0 & -\frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{10} \end{bmatrix}$
150	symmetry	$\frac{\sqrt{105}x(y-z)(y+z)\left(2x^2-y^2-z^2\right)}{4}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{Q}_{5,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & -\frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & \frac{3\sqrt{5}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \end{bmatrix}$
151	symmetry	$\frac{\sqrt{105}y(x-z)(x+z)\left(x^2-2y^2+z^2\right)}{4}$
	$\mathbb{Q}_{5,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{12} & 0 & 0 & -\frac{3\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \end{bmatrix}$
152	symmetry	$-\frac{\sqrt{105}z(x-y)(x+y)\left(x^2+y^2-2z^2\right)}{4}$
	$\mathbb{Q}_{5,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{10} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
153	symmetry	$\frac{x\left(8x^4-40x^2y^2-40x^2z^2+15y^4+30y^2z^2+15z^4\right)}{8}$
	$\mathbb{Q}_{5,0}^{(a)}(T_2,1)$	$\begin{bmatrix} 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 \\ 0 & \frac{\sqrt{35}}{14} & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 & 0 \\ \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & -\frac{5\sqrt{21}}{84} \\ 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & \frac{5\sqrt{21}}{84} & 0 \end{bmatrix}$
154	symmetry	$\frac{y\left(15x^4-40x^2y^2+30x^2z^2+8y^4-40y^2z^2+15z^4\right)}{8}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{Q}_{5,1}^{(a)}(T_2,1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & \frac{\sqrt{7}}{28} & 0 \\ 0 & 0 & -\frac{\sqrt{35}}{14} & 0 & 0 & -\frac{\sqrt{21}}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & \frac{5\sqrt{21}}{84} \\ \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}}{28} & 0 & 0 & -\frac{5\sqrt{21}}{84} & 0 & 0 \end{bmatrix}$
155	symmetry	$\frac{z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{8}$
	$\mathbb{Q}_{5,2}^{(a)}(T_2,1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{105}}{21} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{42} \\ 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 & -\frac{5\sqrt{21}}{84} & 0 \\ 0 & \frac{\sqrt{35}}{28} & 0 & 0 & \frac{5\sqrt{21}}{84} & 0 & 0 \\ \frac{\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
156	symmetry	$\frac{3\sqrt{35}x\left(y^2-2yz-z^2\right)\left(y^2+2yz-z^2\right)}{8}$
	$\mathbb{Q}_{5,0}^{(a)}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ -\frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & \frac{\sqrt{15}}{20} \\ 0 & 0 & \frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \end{bmatrix}$
157	symmetry	$\frac{3\sqrt{35}y\left(x^2-2xz-z^2\right)\left(x^2+2xz-z^2\right)}{8}$
	$\mathbb{Q}_{5,1}^{(a)}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 \\ 0 & 0 & 0 & \frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} \\ -\frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{4} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 & 0 \end{bmatrix}$
158	symmetry	$\frac{3\sqrt{35}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)}{8}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{5,2}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}}{10} \\ 0 & 0 & \frac{1}{4} & 0 & 0 & \frac{\sqrt{15}}{20} & 0 \\ 0 & \frac{1}{4} & 0 & 0 & -\frac{\sqrt{15}}{20} & 0 & 0 \\ -\frac{\sqrt{15}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
159	symmetry	$-\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{G}^{(a)}_{2,0}(E)$	$\begin{bmatrix} \frac{\sqrt{35}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{105}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 \end{bmatrix}$
160	symmetry	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
	$\mathbb{G}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{35}}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{21}}{28} & 0 & 0 & \frac{\sqrt{35}}{28} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & \frac{\sqrt{35}}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}}{14} \end{bmatrix}$
161	symmetry	$\sqrt{3}yz$
	$\mathbb{G}^{(a)}_{2,0}(T_1)$	$\begin{bmatrix} 0 & -\frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{105}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 \end{bmatrix}$
162	symmetry	$\sqrt{3}xz$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{G}_{2,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{\sqrt{21}}{28} & 0 & 0 & -\frac{\sqrt{35}}{28} & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}}{28} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
163	symmetry	$\sqrt{3}xy$
	$\mathbb{G}_{2,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}}{14} \\ 0 & 0 & 0 & \frac{\sqrt{7}}{14} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
164	symmetry	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
	$\mathbb{G}_{4}^{(a)}(A_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{bmatrix}$
165	symmetry	$-\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
	$\mathbb{G}_{4,0}^{(a)}(E)$	$\begin{bmatrix} -\frac{\sqrt{210}}{35} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & \frac{\sqrt{70}}{140} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 & -\frac{\sqrt{70}}{140} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 \end{bmatrix}$
166	symmetry	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{G}_{4,1}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{210}}{35} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{210}}{420} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{14}}{28} & 0 & 0 & \frac{\sqrt{210}}{420} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}}{210} \end{bmatrix}$
167	symmetry	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$
	$\mathbb{G}_{4,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & \frac{3\sqrt{14}}{28} & 0 & 0 & -\frac{\sqrt{210}}{70} & 0 & 0 \\ 0 & \frac{\sqrt{42}}{28} & 0 & 0 & \frac{3\sqrt{70}}{70} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & \frac{\sqrt{70}}{40} \\ 0 & 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & \frac{\sqrt{70}}{40} & 0 \end{bmatrix}$
168	symmetry	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$
	$\mathbb{G}_{4,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{14}}{28} & 0 & 0 & -\frac{\sqrt{210}}{70} & 0 \\ 0 & 0 & \frac{\sqrt{42}}{28} & 0 & 0 & -\frac{3\sqrt{70}}{70} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & \frac{\sqrt{70}}{40} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}}{56} & 0 & 0 & \frac{\sqrt{70}}{40} & 0 & 0 \end{bmatrix}$
169	symmetry	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
	$\mathbb{G}_{4,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}}{35} \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}}{56} & 0 & 0 & \frac{\sqrt{70}}{40} & 0 \\ 0 & -\frac{\sqrt{42}}{56} & 0 & 0 & \frac{\sqrt{70}}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
170	symmetry	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{G}^{(a)}_{4,0}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 & 0 \\ \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & \frac{3\sqrt{10}}{40} \\ 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & -\frac{3\sqrt{10}}{40} & 0 \end{bmatrix}$
171	symmetry	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$
	$\mathbb{G}^{(a)}_{4,1}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{20} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & -\frac{3\sqrt{10}}{40} \\ \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{8} & 0 & 0 & \frac{3\sqrt{10}}{40} & 0 & 0 \end{bmatrix}$
172	symmetry	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
	$\mathbb{G}^{(a)}_{4,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}}{10} \\ 0 & 0 & \frac{\sqrt{6}}{8} & 0 & 0 & \frac{3\sqrt{10}}{40} & 0 \\ 0 & \frac{\sqrt{6}}{8} & 0 & 0 & -\frac{3\sqrt{10}}{40} & 0 & 0 \\ \frac{\sqrt{10}}{10} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
173	symmetry	x
	$\mathbb{T}^{(a)}_{1,0}(T_2)$	$\begin{bmatrix} 0 & -\frac{3\sqrt{70}i}{140} & 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 \\ 0 & \frac{3\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 & 0 \\ \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & \frac{\sqrt{14}i}{14} \\ 0 & 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 \end{bmatrix}$
174	symmetry	y

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{1,1}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{3\sqrt{70}i}{140} & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 \\ 0 & 0 & -\frac{3\sqrt{210}i}{140} & 0 & 0 & -\frac{\sqrt{14}i}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & -\frac{\sqrt{14}i}{14} \\ \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 \end{bmatrix}$
175	symmetry	z
	$\mathbb{T}^{(a)}_{1,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{70}i}{70} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{14}i}{14} \\ 0 & 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 \\ 0 & -\frac{\sqrt{210}i}{70} & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 \\ \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
176	symmetry	$\sqrt{15}xyz$
	$\mathbb{T}^{(a)}_{3}(A_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \end{bmatrix}$
177	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{T}^{(a)}_{3,0}(T_1)$	$\begin{bmatrix} 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{8} \\ 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 \end{bmatrix}$
178	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{3,1}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 \end{bmatrix}$
179	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
	$\mathbb{T}^{(a)}_{3,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 \\ 0 & \frac{\sqrt{6}i}{24} & 0 & 0 & -\frac{\sqrt{10}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
180	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{3,0}(T_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{30}i}{30} & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & \frac{\sqrt{6}i}{24} \\ 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 \end{bmatrix}$
181	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{3,1}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{30}i}{30} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & -\frac{\sqrt{6}i}{24} \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 & 0 \end{bmatrix}$
182	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{3,2}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & \frac{\sqrt{6}i}{24} & 0 \\ 0 & -\frac{\sqrt{10}i}{40} & 0 & 0 & -\frac{\sqrt{6}i}{24} & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
183	symmetry	$-\frac{\sqrt{105}xyz\left(x^2+y^2-2z^2\right)}{2}$
	$\mathbb{T}^{(a)}_{5,0}(E)$	$\begin{bmatrix} \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & -\frac{3\sqrt{5}i}{20} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & \frac{3\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{bmatrix}$
184	symmetry	$\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$
	$\mathbb{T}^{(a)}_{5,1}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & 0 & -\frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} \end{bmatrix}$
185	symmetry	$\frac{\sqrt{105}x(y-z)(y+z)\left(2x^2-y^2-z^2\right)}{4}$
	$\mathbb{T}^{(a)}_{5,0}(T_1)$	$\begin{bmatrix} 0 & -\frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & \frac{3\sqrt{5}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}i}{10} \\ 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 \end{bmatrix}$
186	symmetry	$\frac{\sqrt{105}y(x-z)(x+z)\left(x^2-2y^2+z^2\right)}{4}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{5,1}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{12} & 0 & 0 & -\frac{3\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \end{bmatrix}$
187	symmetry	$-\frac{\sqrt{105}z(x-y)(x+y)\left(x^2+y^2-2z^2\right)}{4}$
	$\mathbb{T}^{(a)}_{5,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
188	symmetry	$\frac{x\left(8x^4-40x^2y^2-40x^2z^2+15y^4+30y^2z^2+15z^4\right)}{8}$
	$\mathbb{T}^{(a)}_{5,0}(T_2,1)$	$\begin{bmatrix} 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{14} & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 & 0 \\ \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & -\frac{5\sqrt{21}i}{84} \\ 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & \frac{5\sqrt{21}i}{84} & 0 \end{bmatrix}$
189	symmetry	$\frac{y\left(15x^4-40x^2y^2+30x^2z^2+8y^4-40y^2z^2+15z^4\right)}{8}$
	$\mathbb{T}^{(a)}_{5,1}(T_2,1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{105}i}{42} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 \\ 0 & 0 & -\frac{\sqrt{35}i}{14} & 0 & 0 & -\frac{\sqrt{21}i}{84} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & \frac{5\sqrt{21}i}{84} \\ \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & -\frac{5\sqrt{21}i}{84} & 0 & 0 \end{bmatrix}$
190	symmetry	$\frac{z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{8}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{T}^{(a)}_{5,2}(T_2,1)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{105}i}{21} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}i}{42} \\ 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & -\frac{5\sqrt{21}i}{84} & 0 \\ 0 & \frac{\sqrt{35}i}{28} & 0 & 0 & \frac{5\sqrt{21}i}{84} & 0 & 0 \\ \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
191	symmetry	$\frac{3\sqrt{35}x\left(y^2-2yz-z^2\right)\left(y^2+2yz-z^2\right)}{8}$
	$\mathbb{T}^{(a)}_{5,0}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{3\sqrt{5}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ -\frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & \frac{\sqrt{15}i}{20} \\ 0 & 0 & \frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \end{bmatrix}$
192	symmetry	$\frac{3\sqrt{35}y\left(x^2-2xz-z^2\right)\left(x^2+2xz-z^2\right)}{8}$
	$\mathbb{T}^{(a)}_{5,1}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{5}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 \\ 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} \\ -\frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{4} & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 & 0 \end{bmatrix}$
193	symmetry	$\frac{3\sqrt{35}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)}{8}$
	$\mathbb{T}^{(a)}_{5,2}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{15}i}{10} \\ 0 & 0 & \frac{i}{4} & 0 & 0 & \frac{\sqrt{15}i}{20} & 0 \\ 0 & \frac{i}{4} & 0 & 0 & -\frac{\sqrt{15}i}{20} & 0 & 0 \\ -\frac{\sqrt{15}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
194	symmetry	$-\frac{\sqrt{3}(x-y)(x+y)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{M}^{(a)}_{2,0}(E)$	$\begin{bmatrix} -\frac{\sqrt{35}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 \end{bmatrix}$
195	symmetry	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
	$\mathbb{M}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{35}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & -\frac{\sqrt{35}i}{28} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{35}i}{14} \end{bmatrix}$
196	symmetry	$\sqrt{3}yz$
	$\mathbb{M}^{(a)}_{2,0}(T_1)$	$\begin{bmatrix} 0 & \frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 & 0 \\ 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}i}{7} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 \end{bmatrix}$
197	symmetry	$\sqrt{3}xz$
	$\mathbb{M}^{(a)}_{2,1}(T_1)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{21}i}{28} & 0 & 0 & \frac{\sqrt{35}i}{28} & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
198	symmetry	$\sqrt{3}xy$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{M}_{2,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{35}i}{14} \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
199	symmetry	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
	$\mathbb{M}_{4}^{(a)}(A_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \end{bmatrix}$
200	symmetry	$-\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
	$\mathbb{M}_{4,0}^{(a)}(E)$	$\begin{bmatrix} \frac{\sqrt{210}i}{35} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & -\frac{\sqrt{70}i}{140} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & \frac{\sqrt{70}i}{140} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}i}{14} & 0 & 0 & 0 \end{bmatrix}$
201	symmetry	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$
	$\mathbb{M}_{4,1}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{210}i}{35} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}i}{420} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{14}i}{28} & 0 & 0 & -\frac{\sqrt{210}i}{420} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{210}i}{210} \end{bmatrix}$
202	symmetry	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{M}_{4,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & -\frac{3\sqrt{14}i}{28} & 0 & 0 & \frac{\sqrt{210}i}{70} & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & -\frac{3\sqrt{70}i}{70} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{70}i}{40} \\ 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{70}i}{40} & 0 \end{bmatrix}$
203	symmetry	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$
	$\mathbb{M}_{4,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & \frac{3\sqrt{14}i}{28} & 0 & 0 & \frac{\sqrt{210}i}{70} & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & \frac{3\sqrt{70}i}{70} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{70}i}{40} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{70}i}{40} & 0 & 0 \end{bmatrix}$
204	symmetry	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
	$\mathbb{M}_{4,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{210}i}{35} \\ 0 & 0 & 0 & \frac{\sqrt{42}i}{14} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{70}i}{40} & 0 \\ 0 & \frac{\sqrt{42}i}{56} & 0 & 0 & -\frac{\sqrt{70}i}{40} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
205	symmetry	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$
	$\mathbb{M}_{4,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 & 0 \\ -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{3\sqrt{10}i}{40} \\ 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & \frac{3\sqrt{10}i}{40} & 0 \end{bmatrix}$
206	symmetry	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$

continued ...

Table 9

No.	multipole	matrix
	$\mathbb{M}_{4,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & \frac{3\sqrt{10}i}{40} \\ -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{3\sqrt{10}i}{40} & 0 & 0 \end{bmatrix}$
207	symmetry	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
	$\mathbb{M}_{4,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}i}{10} \\ 0 & 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & -\frac{3\sqrt{10}i}{40} & 0 \\ 0 & -\frac{\sqrt{6}i}{8} & 0 & 0 & \frac{3\sqrt{10}i}{40} & 0 & 0 \\ -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

bra: $= \langle f_3| \, , \langle f_{ax}| \, , \langle f_{ay}| \, , \langle f_{az}| \, , \langle f_{bx}| \, , \langle f_{by}| \, , \langle f_{bz}|$

ket: $= |f_3\rangle \, , |f_{ax}\rangle \, , |f_{ay}\rangle \, , |f_{az}\rangle \, , |f_{bx}\rangle \, , |f_{by}\rangle \, , |f_{bz}\rangle$

Table 10: (f,f) block.

No.	multipole	matrix
208	symmetry	1
	$\mathbb{Q}_0^{(a)}(A_1)$	$\begin{bmatrix} \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} \end{bmatrix}$
209	symmetry	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{2,0}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{21}}{21} & 0 & 0 & \frac{\sqrt{35}}{14} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{21}}{21} & 0 & 0 & -\frac{\sqrt{35}}{14} & 0 \\ 0 & 0 & 0 & \frac{2\sqrt{21}}{21} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{35}}{14} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{35}}{14} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
210	symmetry	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
	$\mathbb{Q}^{(a)}_{2,1}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{7} & 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{7} & 0 & 0 & \frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{21} \\ 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{105}}{42} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{21} & 0 & 0 & 0 \end{bmatrix}$
211	symmetry	$\sqrt{3}yz$
	$\mathbb{Q}^{(a)}_{2,0}(T_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{105}}{21} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{105}}{21} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}}{84} \\ 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{105}}{84} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{5\sqrt{7}}{28} \\ 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & -\frac{5\sqrt{7}}{28} & 0 \end{bmatrix}$
212	symmetry	$\sqrt{3}xz$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_{2,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{105}}{21} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{105}}{84} \\ -\frac{\sqrt{105}}{21} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & -\frac{5\sqrt{7}}{28} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{5\sqrt{7}}{28} & 0 & 0 \end{bmatrix}$
213	symmetry	$\sqrt{3}xy$
	$\mathbb{Q}_{2,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{105}}{21} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & -\frac{\sqrt{105}}{84} & 0 \\ 0 & -\frac{\sqrt{7}}{28} & 0 & 0 & \frac{\sqrt{105}}{84} & 0 & 0 \\ -\frac{\sqrt{105}}{21} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{105}}{84} & 0 & 0 & -\frac{5\sqrt{7}}{28} & 0 \\ 0 & -\frac{\sqrt{105}}{84} & 0 & 0 & -\frac{5\sqrt{7}}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
214	symmetry	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
	$\mathbb{Q}_4^{(a)}(A_1)$	$\begin{bmatrix} -\frac{\sqrt{66}}{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{66}}{22} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} \end{bmatrix}$
215	symmetry	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}^{(a)}_{4,0}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2310}}{308} & 0 & 0 & -\frac{3\sqrt{154}}{308} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2310}}{308} & 0 & 0 & \frac{3\sqrt{154}}{308} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2310}}{154} & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{154}}{308} & 0 & 0 & \frac{\sqrt{2310}}{132} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{154}}{308} & 0 & 0 & \frac{\sqrt{2310}}{132} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2310}}{66} \end{bmatrix}$
216	symmetry	$\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
	$\mathbb{Q}^{(a)}_{4,1}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{770}}{308} & 0 & 0 & -\frac{\sqrt{462}}{308} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{770}}{308} & 0 & 0 & -\frac{\sqrt{462}}{308} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{462}}{154} \\ 0 & -\frac{\sqrt{462}}{308} & 0 & 0 & -\frac{\sqrt{770}}{44} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{462}}{308} & 0 & 0 & \frac{\sqrt{770}}{44} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{462}}{154} & 0 & 0 & 0 \end{bmatrix}$
217	symmetry	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$
	$\mathbb{Q}^{(a)}_{4,0}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{110}}{22} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 \\ \frac{\sqrt{110}}{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 \end{bmatrix}$
218	symmetry	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_{4,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{110}}{22} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 \\ \frac{\sqrt{110}}{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
219	symmetry	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
	$\mathbb{Q}_{4,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{110}}{22} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{110}}{22} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
220	symmetry	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$
	$\mathbb{Q}_{4,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{462}}{154} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{462}}{154} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{770}}{154} & 0 & 0 & -\frac{\sqrt{462}}{77} \\ 0 & 0 & \frac{3\sqrt{770}}{154} & 0 & 0 & \frac{\sqrt{462}}{77} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{462}}{77} & 0 & 0 & \frac{\sqrt{770}}{154} \\ 0 & 0 & -\frac{\sqrt{462}}{77} & 0 & 0 & \frac{\sqrt{770}}{154} & 0 \end{bmatrix}$
221	symmetry	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_{4,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{462}}{154} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{770}}{154} & 0 & 0 & \frac{\sqrt{462}}{77} \\ -\frac{\sqrt{462}}{154} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{770}}{154} & 0 & 0 & -\frac{\sqrt{462}}{77} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{462}}{77} & 0 & 0 & \frac{\sqrt{770}}{154} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{462}}{77} & 0 & 0 & \frac{\sqrt{770}}{154} & 0 & 0 \end{bmatrix}$
222	symmetry	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
	$\mathbb{Q}_{4,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{462}}{154} & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{770}}{154} & 0 & 0 & -\frac{\sqrt{462}}{77} & 0 \\ 0 & \frac{3\sqrt{770}}{154} & 0 & 0 & \frac{\sqrt{462}}{77} & 0 & 0 \\ -\frac{\sqrt{462}}{154} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{462}}{77} & 0 & 0 & \frac{\sqrt{770}}{154} & 0 \\ 0 & -\frac{\sqrt{462}}{77} & 0 & 0 & \frac{\sqrt{770}}{154} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
223	symmetry	$\frac{\sqrt{2}\left(2x^6-15x^4y^2-15x^4z^2-15x^2y^4+180x^2y^2z^2-15x^2z^4+2y^6-15y^4z^2-15y^2z^4+2z^6\right)}{8}$
	$\mathbb{Q}_6^{(a)}(A_1)$	$\begin{bmatrix} \frac{2\sqrt{462}}{77} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{5\sqrt{462}}{462} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{462}}{462} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{462}}{462} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{462}}{154} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{462}}{154} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{462}}{154} \end{bmatrix}$
224	symmetry	$-\frac{\sqrt{2310}(x-y)(x+y)(x-z)(x+z)(y-z)(y+z)}{8}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_6^{(a)}(A_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 \end{bmatrix}$
225	symmetry	$-\frac{\sqrt{14}\left(x^6-15x^4z^2+15x^2z^4+y^6-15y^4z^2+15y^2z^4-2z^6\right)}{8}$
	$\mathbb{Q}_{6,0}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{5\sqrt{66}}{132} & 0 & 0 & -\frac{\sqrt{110}}{44} & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{66}}{132} & 0 & 0 & \frac{\sqrt{110}}{44} & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{66}}{66} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{110}}{44} & 0 & 0 & -\frac{\sqrt{66}}{44} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{110}}{44} & 0 & 0 & -\frac{\sqrt{66}}{44} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{66}}{22} \end{bmatrix}$
226	symmetry	$\frac{\sqrt{42}(x-y)(x+y)\left(x^4-9x^2y^2-5x^2z^2+y^4-5y^2z^2+5z^4\right)}{8}$
	$\mathbb{Q}_{6,1}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{5\sqrt{22}}{44} & 0 & 0 & -\frac{\sqrt{330}}{132} & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{22}}{44} & 0 & 0 & -\frac{\sqrt{330}}{132} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{330}}{66} \\ 0 & -\frac{\sqrt{330}}{132} & 0 & 0 & \frac{3\sqrt{22}}{44} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{330}}{132} & 0 & 0 & -\frac{3\sqrt{22}}{44} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{330}}{66} & 0 & 0 & 0 \end{bmatrix}$
227	symmetry	$\frac{3\sqrt{7}yz(y-z)(y+z)\left(10x^2-y^2-z^2\right)}{4}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_{6,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{33}}{11} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 \\ \frac{\sqrt{33}}{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 & 0 \end{bmatrix}$
228	symmetry	$\frac{3\sqrt{7}xz(x-z)(x+z)\left(x^2-10y^2+z^2\right)}{4}$
	$\mathbb{Q}_{6,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{33}}{11} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 \\ \frac{\sqrt{33}}{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
229	symmetry	$-\frac{3\sqrt{7}xy(x-y)(x+y)\left(x^2+y^2-10z^2\right)}{4}$
	$\mathbb{Q}_{6,2}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{33}}{11} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{33}}{11} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
230	symmetry	$\frac{\sqrt{462}yz\left(y^2-3z^2\right)\left(3y^2-z^2\right)}{16}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_{6,0}^{(a)}(T_2,1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{30}}{16} \\ 0 & 0 & -\frac{5\sqrt{2}}{16} & 0 & 0 & \frac{\sqrt{30}}{16} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & \frac{3\sqrt{2}}{16} \\ 0 & 0 & -\frac{\sqrt{30}}{16} & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 \end{bmatrix}$
231	symmetry	$\frac{\sqrt{462}xz\left(x^2-3z^2\right)\left(3x^2-z^2\right)}{16}$
	$\mathbb{Q}_{6,1}^{(a)}(T_2,1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{2}}{16} & 0 & 0 & \frac{\sqrt{30}}{16} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{5\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{30}}{16} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{16} & 0 & 0 & \frac{3\sqrt{2}}{16} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{16} & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 \end{bmatrix}$
232	symmetry	$\frac{\sqrt{462}xy\left(x^2-3y^2\right)\left(3x^2-y^2\right)}{16}$
	$\mathbb{Q}_{6,2}^{(a)}(T_2,1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{2}}{16} & 0 & 0 & -\frac{\sqrt{30}}{16} & 0 \\ 0 & -\frac{5\sqrt{2}}{16} & 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{30}}{16} & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 \\ 0 & -\frac{\sqrt{30}}{16} & 0 & 0 & \frac{3\sqrt{2}}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
233	symmetry	$\frac{\sqrt{210}yz\left(16x^4-16x^2y^2-16x^2z^2+y^4+2y^2z^2+z^4\right)}{16}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{Q}_{6,0}^{(a)}(T_2,2)$	$\begin{bmatrix} 0 & \frac{2\sqrt{66}}{33} & 0 & 0 & 0 & 0 & 0 \\ \frac{2\sqrt{66}}{33} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{110}}{176} & 0 & 0 & -\frac{13\sqrt{66}}{528} \\ 0 & 0 & \frac{\sqrt{110}}{176} & 0 & 0 & \frac{13\sqrt{66}}{528} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{13\sqrt{66}}{528} & 0 & 0 & -\frac{7\sqrt{110}}{176} \\ 0 & 0 & -\frac{13\sqrt{66}}{528} & 0 & 0 & -\frac{7\sqrt{110}}{176} & 0 \end{bmatrix}$
234	symmetry	$\frac{\sqrt{210}xz\left(x^4-16x^2y^2+2x^2z^2+16y^4-16y^2z^2+z^4\right)}{16}$
	$\mathbb{Q}_{6,1}^{(a)}(T_2,2)$	$\begin{bmatrix} 0 & 0 & \frac{2\sqrt{66}}{33} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{110}}{176} & 0 & 0 & \frac{13\sqrt{66}}{528} \\ \frac{2\sqrt{66}}{33} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{110}}{176} & 0 & 0 & -\frac{13\sqrt{66}}{528} & 0 & 0 \\ 0 & 0 & 0 & -\frac{13\sqrt{66}}{528} & 0 & 0 & -\frac{7\sqrt{110}}{176} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{13\sqrt{66}}{528} & 0 & 0 & -\frac{7\sqrt{110}}{176} & 0 & 0 \end{bmatrix}$
235	symmetry	$\frac{\sqrt{210}xy\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{16}$
	$\mathbb{Q}_{6,2}^{(a)}(T_2,2)$	$\begin{bmatrix} 0 & 0 & 0 & \frac{2\sqrt{66}}{33} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{110}}{176} & 0 & 0 & -\frac{13\sqrt{66}}{528} & 0 \\ 0 & \frac{\sqrt{110}}{176} & 0 & 0 & \frac{13\sqrt{66}}{528} & 0 & 0 \\ \frac{2\sqrt{66}}{33} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{13\sqrt{66}}{528} & 0 & 0 & -\frac{7\sqrt{110}}{176} & 0 \\ 0 & -\frac{13\sqrt{66}}{528} & 0 & 0 & -\frac{7\sqrt{110}}{176} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
236	symmetry	x

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}^{(a)}_{1,0}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{7} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} \\ 0 & 0 & -\frac{3\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} & 0 \\ -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 & -\frac{\sqrt{7}i}{28} \\ 0 & 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 \end{bmatrix}$
237	symmetry	y
	$\mathbb{M}^{(a)}_{1,1}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{7} & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 & \frac{\sqrt{7}i}{28} \\ -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 & 0 \end{bmatrix}$
238	symmetry	z
	$\mathbb{M}^{(a)}_{1,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{7} \\ 0 & 0 & \frac{3\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} & 0 \\ 0 & -\frac{3\sqrt{7}i}{28} & 0 & 0 & \frac{\sqrt{105}i}{28} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 & -\frac{\sqrt{7}i}{28} & 0 \\ 0 & -\frac{\sqrt{105}i}{28} & 0 & 0 & \frac{\sqrt{7}i}{28} & 0 & 0 \\ -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
239	symmetry	$\sqrt{15}xyz$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}_3^{(a)}(A_2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \end{bmatrix}$
240	symmetry	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
	$\mathbb{M}_{3,0}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{bmatrix}$
241	symmetry	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
	$\mathbb{M}_{3,1}^{(a)}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \end{bmatrix}$
242	symmetry	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}^{(a)}_{3,2}(T_1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
243	symmetry	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
	$\mathbb{M}^{(a)}_{3,0}(T_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \end{bmatrix}$
244	symmetry	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
	$\mathbb{M}^{(a)}_{3,1}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
245	symmetry	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}_{3,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
246	symmetry	$\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$
	$\mathbb{M}_{5,0}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
247	symmetry	$\frac{\sqrt{105}xyz\left(x^2+y^2-2z^2\right)}{2}$
	$\mathbb{M}_{5,1}^{(a)}(E)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{3} \\ 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{3} & 0 & 0 & 0 \end{bmatrix}$
248	symmetry	$\frac{x\left(8x^4-40x^2y^2-40x^2z^2+15y^4+30y^2z^2+15z^4\right)}{8}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}^{(a)}_{5,0}(T_1,1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{2\sqrt{21}i}{21} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{3\sqrt{35}i}{56} \\ 0 & 0 & \frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{3\sqrt{35}i}{56} & 0 \\ \frac{2\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{35}i}{56} & 0 & 0 & \frac{11\sqrt{21}i}{168} \\ 0 & 0 & -\frac{3\sqrt{35}i}{56} & 0 & 0 & -\frac{11\sqrt{21}i}{168} & 0 \end{bmatrix}$
249	symmetry	$\frac{y\left(15x^4-40x^2y^2+30x^2z^2+8y^4-40y^2z^2+15z^4\right)}{8}$
	$\mathbb{M}^{(a)}_{5,1}(T_1,1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{2\sqrt{21}i}{21} & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{3\sqrt{35}i}{56} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{3\sqrt{35}i}{56} & 0 & 0 \\ 0 & 0 & 0 & -\frac{3\sqrt{35}i}{56} & 0 & 0 & -\frac{11\sqrt{21}i}{168} \\ \frac{2\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{35}i}{56} & 0 & 0 & \frac{11\sqrt{21}i}{168} & 0 & 0 \end{bmatrix}$
250	symmetry	$\frac{z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{8}$
	$\mathbb{M}^{(a)}_{5,2}(T_1,1)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{2\sqrt{21}i}{21} \\ 0 & 0 & -\frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{3\sqrt{35}i}{56} & 0 \\ 0 & \frac{5\sqrt{21}i}{168} & 0 & 0 & \frac{3\sqrt{35}i}{56} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{35}i}{56} & 0 & 0 & \frac{11\sqrt{21}i}{168} & 0 \\ 0 & -\frac{3\sqrt{35}i}{56} & 0 & 0 & -\frac{11\sqrt{21}i}{168} & 0 & 0 \\ \frac{2\sqrt{21}i}{21} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
251	symmetry	$\frac{3\sqrt{35}x\left(y^2-2yz-z^2\right)\left(y^2+2yz-z^2\right)}{8}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}_{5,0}^{(a)}(T_1,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{15}i}{8} & 0 & 0 & -\frac{i}{8} \\ 0 & 0 & -\frac{\sqrt{15}i}{8} & 0 & 0 & -\frac{i}{8} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{8} & 0 & 0 & \frac{\sqrt{15}i}{8} \\ 0 & 0 & \frac{i}{8} & 0 & 0 & -\frac{\sqrt{15}i}{8} & 0 \end{bmatrix}$
252	symmetry	$\frac{3\sqrt{35}y\left(x^2-2xz-z^2\right)\left(x^2+2xz-z^2\right)}{8}$
	$\mathbb{M}_{5,1}^{(a)}(T_1,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{15}i}{8} & 0 & 0 & -\frac{i}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{8} & 0 & 0 & -\frac{i}{8} & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{8} & 0 & 0 & -\frac{\sqrt{15}i}{8} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{8} & 0 & 0 & \frac{\sqrt{15}i}{8} & 0 & 0 \end{bmatrix}$
253	symmetry	$\frac{3\sqrt{35}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)}{8}$
	$\mathbb{M}_{5,2}^{(a)}(T_1,2)$	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{15}i}{8} & 0 & 0 & -\frac{i}{8} & 0 \\ 0 & -\frac{\sqrt{15}i}{8} & 0 & 0 & -\frac{i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{i}{8} & 0 & 0 & \frac{\sqrt{15}i}{8} & 0 \\ 0 & \frac{i}{8} & 0 & 0 & -\frac{\sqrt{15}i}{8} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
254	symmetry	$\frac{\sqrt{105}x(y-z)(y+z)\left(2x^2-y^2-z^2\right)}{4}$

continued ...

Table 10

No.	multipole	matrix
	$\mathbb{M}_{5,0}^{(a)}(T_2)$	$\begin{bmatrix} 0 & -\frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \end{bmatrix}$
255	symmetry	$\frac{\sqrt{105}y(x-z)(x+z)\left(x^2-2y^2+z^2\right)}{4}$
	$\mathbb{M}_{5,1}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & -\frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ \frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
256	symmetry	$-\frac{\sqrt{105}z(x-y)(x+y)\left(x^2+y^2-2z^2\right)}{4}$
	$\mathbb{M}_{5,2}^{(a)}(T_2)$	$\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{3}i}{3} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$