

SAMB for “Th”

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- Group: No. 29 T_h $m - 3$ [cubic]
- Generation condition
 - model type: **tight_binding**
 - time-reversal type: **electric**
 - irrep: [Ag]
 - **spinful**

- Kets: dimension = 64

Table 1: Hilbert space for full matrix.

| No. | ket | No. | ket | No. | ket | No. | ket | No. | ket |
|-----|-------------------------|-----|-------------------------|-----|-------------------------|-----|-------------------------|-----|-------------------------|
| 1 | $(s, \uparrow)@A_1$ | 2 | $(s, \downarrow)@A_1$ | 3 | $(p_x, \uparrow)@A_1$ | 4 | $(p_x, \downarrow)@A_1$ | 5 | $(p_y, \uparrow)@A_1$ |
| 6 | $(p_y, \downarrow)@A_1$ | 7 | $(p_z, \uparrow)@A_1$ | 8 | $(p_z, \downarrow)@A_1$ | 9 | $(s, \uparrow)@A_2$ | 10 | $(s, \downarrow)@A_2$ |
| 11 | $(p_x, \uparrow)@A_2$ | 12 | $(p_x, \downarrow)@A_2$ | 13 | $(p_y, \uparrow)@A_2$ | 14 | $(p_y, \downarrow)@A_2$ | 15 | $(p_z, \uparrow)@A_2$ |
| 16 | $(p_z, \downarrow)@A_2$ | 17 | $(s, \uparrow)@A_3$ | 18 | $(s, \downarrow)@A_3$ | 19 | $(p_x, \uparrow)@A_3$ | 20 | $(p_x, \downarrow)@A_3$ |
| 21 | $(p_y, \uparrow)@A_3$ | 22 | $(p_y, \downarrow)@A_3$ | 23 | $(p_z, \uparrow)@A_3$ | 24 | $(p_z, \downarrow)@A_3$ | 25 | $(s, \uparrow)@A_4$ |
| 26 | $(s, \downarrow)@A_4$ | 27 | $(p_x, \uparrow)@A_4$ | 28 | $(p_x, \downarrow)@A_4$ | 29 | $(p_y, \uparrow)@A_4$ | 30 | $(p_y, \downarrow)@A_4$ |
| 31 | $(p_z, \uparrow)@A_4$ | 32 | $(p_z, \downarrow)@A_4$ | 33 | $(s, \uparrow)@A_5$ | 34 | $(s, \downarrow)@A_5$ | 35 | $(p_x, \uparrow)@A_5$ |
| 36 | $(p_x, \downarrow)@A_5$ | 37 | $(p_y, \uparrow)@A_5$ | 38 | $(p_y, \downarrow)@A_5$ | 39 | $(p_z, \uparrow)@A_5$ | 40 | $(p_z, \downarrow)@A_5$ |
| 41 | $(s, \uparrow)@A_6$ | 42 | $(s, \downarrow)@A_6$ | 43 | $(p_x, \uparrow)@A_6$ | 44 | $(p_x, \downarrow)@A_6$ | 45 | $(p_y, \uparrow)@A_6$ |
| 46 | $(p_y, \downarrow)@A_6$ | 47 | $(p_z, \uparrow)@A_6$ | 48 | $(p_z, \downarrow)@A_6$ | 49 | $(s, \uparrow)@A_7$ | 50 | $(s, \downarrow)@A_7$ |
| 51 | $(p_x, \uparrow)@A_7$ | 52 | $(p_x, \downarrow)@A_7$ | 53 | $(p_y, \uparrow)@A_7$ | 54 | $(p_y, \downarrow)@A_7$ | 55 | $(p_z, \uparrow)@A_7$ |
| 56 | $(p_z, \downarrow)@A_7$ | 57 | $(s, \uparrow)@A_8$ | 58 | $(s, \downarrow)@A_8$ | 59 | $(p_x, \uparrow)@A_8$ | 60 | $(p_x, \downarrow)@A_8$ |
| 61 | $(p_y, \uparrow)@A_8$ | 62 | $(p_y, \downarrow)@A_8$ | 63 | $(p_z, \uparrow)@A_8$ | 64 | $(p_z, \downarrow)@A_8$ | | |

- Sites in (primitive) unit cell:

Table 2: Site-clusters.

| | site | position | mapping |
|--------------------------|----------------|--|------------|
| S ₁ [8b: .3.] | A ₁ | $\begin{pmatrix} 1 & 1 & 1 \end{pmatrix}$ | [1,5,9] |
| | A ₂ | $\begin{pmatrix} -1 & -1 & 1 \end{pmatrix}$ | [2,6,11] |
| | A ₃ | $\begin{pmatrix} 1 & -1 & -1 \end{pmatrix}$ | [3,7,12] |
| | A ₄ | $\begin{pmatrix} -1 & 1 & -1 \end{pmatrix}$ | [4,8,10] |
| | A ₅ | $\begin{pmatrix} -1 & -1 & -1 \end{pmatrix}$ | [13,17,21] |
| | A ₆ | $\begin{pmatrix} 1 & 1 & -1 \end{pmatrix}$ | [14,18,23] |
| | A ₇ | $\begin{pmatrix} -1 & 1 & 1 \end{pmatrix}$ | [15,19,24] |
| | A ₈ | $\begin{pmatrix} 1 & -1 & 1 \end{pmatrix}$ | [16,20,22] |

- Bonds in (primitive) unit cell:

Table 3: Bond-clusters.

| | bond | tail | head | n | $\#$ | $\mathbf{b@c}$ | mapping |
|---------------------------|-----------------|----------------|----------------|-----|------|--|----------|
| B ₁ [12c: m..] | b ₁ | A ₆ | A ₁ | 1 | 1 | $\begin{pmatrix} 0 & 0 & -2 \end{pmatrix} @ \begin{pmatrix} 1 & 1 & 0 \end{pmatrix}$ | [1,-14] |
| | b ₂ | A ₅ | A ₂ | 1 | 1 | $\begin{pmatrix} 0 & 0 & -2 \end{pmatrix} @ \begin{pmatrix} -1 & -1 & 0 \end{pmatrix}$ | [2,-13] |
| | b ₃ | A ₈ | A ₃ | 1 | 1 | $\begin{pmatrix} 0 & 0 & 2 \end{pmatrix} @ \begin{pmatrix} 1 & -1 & 0 \end{pmatrix}$ | [3,-16] |
| | b ₄ | A ₇ | A ₄ | 1 | 1 | $\begin{pmatrix} 0 & 0 & 2 \end{pmatrix} @ \begin{pmatrix} -1 & 1 & 0 \end{pmatrix}$ | [4,-15] |
| | b ₅ | A ₇ | A ₁ | 1 | 1 | $\begin{pmatrix} -2 & 0 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & 1 & 1 \end{pmatrix}$ | [5,-19] |
| | b ₆ | A ₈ | A ₂ | 1 | 1 | $\begin{pmatrix} 2 & 0 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & -1 & 1 \end{pmatrix}$ | [6,-20] |
| | b ₇ | A ₅ | A ₃ | 1 | 1 | $\begin{pmatrix} -2 & 0 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & -1 & -1 \end{pmatrix}$ | [7,-17] |
| | b ₈ | A ₆ | A ₄ | 1 | 1 | $\begin{pmatrix} 2 & 0 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & 1 & -1 \end{pmatrix}$ | [8,-18] |
| | b ₉ | A ₈ | A ₁ | 1 | 1 | $\begin{pmatrix} 0 & -2 & 0 \end{pmatrix} @ \begin{pmatrix} 1 & 0 & 1 \end{pmatrix}$ | [9,-22] |
| | b ₁₀ | A ₅ | A ₄ | 1 | 1 | $\begin{pmatrix} 0 & -2 & 0 \end{pmatrix} @ \begin{pmatrix} -1 & 0 & -1 \end{pmatrix}$ | [10,-21] |
| | b ₁₁ | A ₇ | A ₂ | 1 | 1 | $\begin{pmatrix} 0 & 2 & 0 \end{pmatrix} @ \begin{pmatrix} -1 & 0 & 1 \end{pmatrix}$ | [11,-24] |

continued ...

Table 3

| bond | tail | head | n | # | $\mathbf{b@c}$ | mapping |
|-------------------|----------------|----------------|-----|---|--|----------|
| \mathbf{b}_{12} | \mathbf{A}_6 | \mathbf{A}_3 | 1 | 1 | $\begin{pmatrix} 0 & 2 & 0 \end{pmatrix} @ \begin{pmatrix} 1 & 0 & -1 \end{pmatrix}$ | [12,-23] |

- SAMB:

$$\boxed{\text{No. 1}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\mathbf{M}_1, \mathbf{S}_1]$$

$$\hat{\mathbb{Z}}_1 = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_g)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_g)}]$$

$$\boxed{\text{No. 2}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\mathbf{M}_2, \mathbf{S}_1]$$

$$\hat{\mathbb{Z}}_2 = \frac{\sqrt{3}\mathbb{X}_5[\mathbb{Q}_{1,0}^{(a, Tu)}] \otimes \mathbb{U}_2[\mathbb{Q}_{1,0}^{(s, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[\mathbb{Q}_{1,1}^{(a, Tu)}] \otimes \mathbb{U}_3[\mathbb{Q}_{1,1}^{(s, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{1,2}^{(a, Tu)}] \otimes \mathbb{U}_4[\mathbb{Q}_{1,2}^{(s, Tu)}]}{3}$$

$$\boxed{\text{No. 3}} \quad \hat{\mathbb{Q}}_0^{(A_g)} (1, 0) [\mathbf{M}_2, \mathbf{S}_1]$$

$$\hat{\mathbb{Z}}_3 = \frac{\sqrt{3}\mathbb{X}_{10}[\mathbb{Q}_{1,2}^{(a, Tu)}(1, 0)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,2}^{(s, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_{1,0}^{(a, Tu)}(1, 0)] \otimes \mathbb{U}_2[\mathbb{Q}_{1,0}^{(s, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_{1,1}^{(a, Tu)}(1, 0)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,1}^{(s, Tu)}]}{3}$$

$$\boxed{\text{No. 4}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, -1) [\mathbf{M}_2, \mathbf{S}_1]$$

$$\hat{\mathbb{Z}}_4 = \frac{\sqrt{3}\mathbb{X}_{11}[\mathbb{G}_{2,0}^{(a, Tu)}(1, -1)] \otimes \mathbb{U}_2[\mathbb{Q}_{1,0}^{(s, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{12}[\mathbb{G}_{2,1}^{(a, Tu)}(1, -1)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,1}^{(s, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{13}[\mathbb{G}_{2,2}^{(a, Tu)}(1, -1)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,2}^{(s, Tu)}]}{3}$$

$$\boxed{\text{No. 5}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, 1) [\mathbf{M}_2, \mathbf{S}_1]$$

$$\hat{\mathbb{Z}}_5 = \mathbb{X}_{26}[\mathbb{G}_0^{(a, Au)}(1, 1)] \otimes \mathbb{U}_8[\mathbb{Q}_3^{(s, Au)}]$$

$$\boxed{\text{No. 6}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\mathbf{M}_3, \mathbf{S}_1]$$

$$\hat{\mathbb{Z}}_6 = \mathbb{X}_{27}[\mathbb{Q}_0^{(a, A_g)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_g)}]$$

$$\boxed{\text{No. 7}} \quad \hat{\mathbb{Q}}_0^{(A_g)}(1, 1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_7 = \mathbb{X}_{28}[\mathbb{Q}_0^{(a, A_g)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_g)}]$$

$$\boxed{\text{No. 8}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_8 = \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{Q}_{2,0}^{(a, T_g)}] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{32}[\mathbb{Q}_{2,1}^{(a, T_g)}] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{33}[\mathbb{Q}_{2,2}^{(a, T_g)}] \otimes \mathbb{U}_7[\mathbb{Q}_{2,2}^{(s, T_g)}]}{3}$$

$$\boxed{\text{No. 9}} \quad \hat{\mathbb{Q}}_0^{(A_g)}(1, -1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_9 = \frac{\sqrt{3}\mathbb{X}_{36}[\mathbb{Q}_{2,0}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{37}[\mathbb{Q}_{2,1}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{38}[\mathbb{Q}_{2,2}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_7[\mathbb{Q}_{2,2}^{(s, T_g)}]}{3}$$

$$\boxed{\text{No. 10}} \quad \hat{\mathbb{G}}_3^{(A_g)}(1, 0) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{10} = \frac{\sqrt{3}\mathbb{X}_{39}[\mathbb{G}_{1,0}^{(a, T_g)}(1, 0)] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{40}[\mathbb{G}_{1,1}^{(a, T_g)}(1, 0)] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{41}[\mathbb{G}_{1,2}^{(a, T_g)}(1, 0)] \otimes \mathbb{U}_7[\mathbb{Q}_{2,2}^{(s, T_g)}]}{3}$$

$$\boxed{\text{No. 11}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{11} = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_g)}] \otimes \mathbb{U}_9[\mathbb{Q}_0^{(u, A_g)}]$$

$$\boxed{\text{No. 12}} \quad \hat{\mathbb{G}}_3^{(A_g)}(1, -1) [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{12} = \frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_{1,0}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,1}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u, T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,2}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u, T_g)}]}{3}$$

$$\boxed{\text{No. 13}} \quad \hat{\mathbb{Q}}_4^{(A_g)}(1, -1) [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{13} = -\frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_{1,0}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u, T_g, 1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,1}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u, T_g, 1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,2}^{(a, T_g)}(1, -1)] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u, T_g, 1)}]}{3}$$

$$\boxed{\text{No. 14}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{14} = \frac{\sqrt{3}\mathbb{X}_5[\mathbb{Q}_{1,0}^{(a, T_u)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,0}^{(u, T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[\mathbb{Q}_{1,1}^{(a, T_u)}] \otimes \mathbb{U}_{11}[\mathbb{Q}_{1,1}^{(u, T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{1,2}^{(a, T_u)}] \otimes \mathbb{U}_{12}[\mathbb{Q}_{1,2}^{(u, T_u)}]}{3}$$

$$\boxed{\text{No. 15}} \quad \hat{\mathbb{Q}}_4^{(Ag)} [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{15} = \frac{\sqrt{3}\mathbb{X}_5[\mathbb{Q}_{1,0}^{(a,T_u)}] \otimes \mathbb{U}_{18}[\mathbb{Q}_{3,0}^{(u,T_u,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[\mathbb{Q}_{1,1}^{(a,T_u)}] \otimes \mathbb{U}_{19}[\mathbb{Q}_{3,1}^{(u,T_u,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{1,2}^{(a,T_u)}] \otimes \mathbb{U}_{20}[\mathbb{Q}_{3,2}^{(u,T_u,1)}]}{3}$$

$$\boxed{\text{No. 16}} \quad \hat{\mathbb{Q}}_0^{(Ag)} (1, 0) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{16} = \frac{\sqrt{3}\mathbb{X}_{10}[\mathbb{Q}_{1,2}^{(a,T_u)}(1, 0)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{1,2}^{(u,T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_{1,0}^{(a,T_u)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,0}^{(u,T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_{1,1}^{(a,T_u)}(1, 0)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{1,1}^{(u,T_u)}]}{3}$$

$$\boxed{\text{No. 17}} \quad \hat{\mathbb{Q}}_4^{(Ag)} (1, 0) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{17} = \frac{\sqrt{3}\mathbb{X}_{10}[\mathbb{Q}_{1,2}^{(a,T_u)}(1, 0)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{3,2}^{(u,T_u,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_{1,0}^{(a,T_u)}(1, 0)] \otimes \mathbb{U}_{18}[\mathbb{Q}_{3,0}^{(u,T_u,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_{1,1}^{(a,T_u)}(1, 0)] \otimes \mathbb{U}_{19}[\mathbb{Q}_{3,1}^{(u,T_u,1)}]}{3}$$

$$\boxed{\text{No. 18}} \quad \hat{\mathbb{G}}_3^{(Ag)} (1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{18} = \frac{\sqrt{3}\mathbb{X}_{11}[\mathbb{G}_{2,0}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,0}^{(u,T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{12}[\mathbb{G}_{2,1}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{1,1}^{(u,T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{13}[\mathbb{G}_{2,2}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{1,2}^{(u,T_u)}]}{3}$$

$$\boxed{\text{No. 19}} \quad \hat{\mathbb{G}}_3^{(Ag)} (1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{19} = -\frac{\sqrt{3}\mathbb{X}_{11}[\mathbb{G}_{2,0}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{Q}_{3,0}^{(u,T_u,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{12}[\mathbb{G}_{2,1}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{19}[\mathbb{Q}_{3,1}^{(u,T_u,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{13}[\mathbb{G}_{2,2}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{3,2}^{(u,T_u,1)}]}{3}$$

$$\boxed{\text{No. 20}} \quad \hat{\mathbb{G}}_3^{(Ag)} (1, 1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{20} = \mathbb{X}_{14}[\mathbb{M}_0^{(a,A_u)}(1, 1)] \otimes \mathbb{U}_{27}[\mathbb{T}_3^{(u,A_u)}]$$

$$\boxed{\text{No. 21}} \quad \hat{\mathbb{G}}_3^{(Ag)} (1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{21} = \frac{\sqrt{3}\mathbb{X}_{17}[\mathbb{M}_{2,0}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{21}[\mathbb{T}_{1,0}^{(u,T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{18}[\mathbb{M}_{2,1}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_{1,1}^{(u,T_u)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{19}[\mathbb{M}_{2,2}^{(a,T_u)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,2}^{(u,T_u)}]}{3}$$

$$\boxed{\text{No. 22}} \quad \hat{\mathbb{G}}_3^{(Ag)} (1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{22} = -\frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{M}_{2,0}^{(a,E_u)}(1, -1)] \otimes \mathbb{U}_{32}[\mathbb{T}_{5,1}^{(u,E_u)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{M}_{2,1}^{(a,E_u)}(1, -1)] \otimes \mathbb{U}_{31}[\mathbb{T}_{5,0}^{(u,E_u)}]}{2}$$

$$\boxed{\text{No. 23}} \quad \hat{\mathbb{Q}}_4^{(A_g)}(1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{23} = -\frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{M}_{2,0}^{(a, Eu)}(1, -1)] \otimes \mathbb{U}_{31}[\mathbb{T}_{5,0}^{(u, Eu)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{M}_{2,1}^{(a, Eu)}(1, -1)] \otimes \mathbb{U}_{32}[\mathbb{T}_{5,1}^{(u, Eu)}]}{2}$$

$$\boxed{\text{No. 24}} \quad \hat{\mathbb{Q}}_0^{(A_g)}(1, 0) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{24} = \frac{\sqrt{3}\mathbb{X}_{20}[\mathbb{T}_{1,0}^{(a, Tu)}(1, 0)] \otimes \mathbb{U}_{21}[\mathbb{T}_{1,0}^{(u, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{T}_{1,1}^{(a, Tu)}(1, 0)] \otimes \mathbb{U}_{22}[\mathbb{T}_{1,1}^{(u, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{T}_{1,2}^{(a, Tu)}(1, 0)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,2}^{(u, Tu)}]}{3}$$

$$\boxed{\text{No. 25}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{25} = \frac{\sqrt{3}\mathbb{X}_{23}[\mathbb{T}_{1,0}^{(a, Tu)}] \otimes \mathbb{U}_{21}[\mathbb{T}_{1,0}^{(u, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{24}[\mathbb{T}_{1,1}^{(a, Tu)}] \otimes \mathbb{U}_{22}[\mathbb{T}_{1,1}^{(u, Tu)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{T}_{1,2}^{(a, Tu)}] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,2}^{(u, Tu)}]}{3}$$

$$\boxed{\text{No. 26}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{26} = \mathbb{X}_{27}[\mathbb{Q}_0^{(a, A_g)}] \otimes \mathbb{U}_9[\mathbb{Q}_0^{(u, A_g)}]$$

$$\boxed{\text{No. 27}} \quad \hat{\mathbb{Q}}_0^{(A_g)}(1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{27} = \mathbb{X}_{28}[\mathbb{Q}_0^{(a, A_g)}(1, 1)] \otimes \mathbb{U}_9[\mathbb{Q}_0^{(u, A_g)}]$$

$$\boxed{\text{No. 28}} \quad \hat{\mathbb{Q}}_0^{(A_g)} [\text{M}_3, \text{B}_1]$$

$$\begin{aligned} \hat{\mathbb{Z}}_{28} = & \frac{\sqrt{5}\mathbb{X}_{29}[\mathbb{Q}_{2,0}^{(a, Eg)}] \otimes \mathbb{U}_{13}[\mathbb{Q}_{2,0}^{(u, Eg)}]}{5} + \frac{\sqrt{5}\mathbb{X}_{30}[\mathbb{Q}_{2,1}^{(a, Eg)}] \otimes \mathbb{U}_{14}[\mathbb{Q}_{2,1}^{(u, Eg)}]}{5} + \frac{\sqrt{5}\mathbb{X}_{31}[\mathbb{Q}_{2,0}^{(a, Tg)}] \otimes \mathbb{U}_{15}[\mathbb{Q}_{2,0}^{(u, Tg)}]}{5} \\ & + \frac{\sqrt{5}\mathbb{X}_{32}[\mathbb{Q}_{2,1}^{(a, Tg)}] \otimes \mathbb{U}_{16}[\mathbb{Q}_{2,1}^{(u, Tg)}]}{5} + \frac{\sqrt{5}\mathbb{X}_{33}[\mathbb{Q}_{2,2}^{(a, Tg)}] \otimes \mathbb{U}_{17}[\mathbb{Q}_{2,2}^{(u, Tg)}]}{5} \end{aligned}$$

$$\boxed{\text{No. 29}} \quad \hat{\mathbb{G}}_3^{(A_g)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{29} = \frac{\sqrt{2}\mathbb{X}_{29}[\mathbb{Q}_{2,0}^{(a, Eg)}] \otimes \mathbb{U}_{14}[\mathbb{Q}_{2,1}^{(u, Eg)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{30}[\mathbb{Q}_{2,1}^{(a, Eg)}] \otimes \mathbb{U}_{13}[\mathbb{Q}_{2,0}^{(u, Eg)}]}{2}$$

$$\boxed{\text{No. 30}} \quad \hat{\mathbb{Q}}_4^{(A_g)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{30} = \frac{\sqrt{30}\mathbb{X}_{29}[\mathbb{Q}_{2,0}^{(a,E_g)}] \otimes \mathbb{U}_{13}[\mathbb{Q}_{2,0}^{(u,E_g)}]}{10} + \frac{\sqrt{30}\mathbb{X}_{30}[\mathbb{Q}_{2,1}^{(a,E_g)}] \otimes \mathbb{U}_{14}[\mathbb{Q}_{2,1}^{(u,E_g)}]}{10} - \frac{\sqrt{30}\mathbb{X}_{31}[\mathbb{Q}_{2,0}^{(a,T_g)}] \otimes \mathbb{U}_{15}[\mathbb{Q}_{2,0}^{(u,T_g)}]}{15} \\ - \frac{\sqrt{30}\mathbb{X}_{32}[\mathbb{Q}_{2,1}^{(a,T_g)}] \otimes \mathbb{U}_{16}[\mathbb{Q}_{2,1}^{(u,T_g)}]}{15} - \frac{\sqrt{30}\mathbb{X}_{33}[\mathbb{Q}_{2,2}^{(a,T_g)}] \otimes \mathbb{U}_{17}[\mathbb{Q}_{2,2}^{(u,T_g)}]}{15}$$

$$\boxed{\text{No. 31}} \quad \hat{\mathbb{Q}}_0^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{31} = \frac{\sqrt{5}\mathbb{X}_{34}[\mathbb{Q}_{2,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{U}_{13}[\mathbb{Q}_{2,0}^{(u,E_g)}]}{5} + \frac{\sqrt{5}\mathbb{X}_{35}[\mathbb{Q}_{2,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{Q}_{2,1}^{(u,E_g)}]}{5} + \frac{\sqrt{5}\mathbb{X}_{36}[\mathbb{Q}_{2,0}^{(a,T_g)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{Q}_{2,0}^{(u,T_g)}]}{5} \\ + \frac{\sqrt{5}\mathbb{X}_{37}[\mathbb{Q}_{2,1}^{(a,T_g)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{Q}_{2,1}^{(u,T_g)}]}{5} + \frac{\sqrt{5}\mathbb{X}_{38}[\mathbb{Q}_{2,2}^{(a,T_g)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{Q}_{2,2}^{(u,T_g)}]}{5}$$

$$\boxed{\text{No. 32}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{32} = \frac{\sqrt{2}\mathbb{X}_{34}[\mathbb{Q}_{2,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{Q}_{2,1}^{(u,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{35}[\mathbb{Q}_{2,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{U}_{13}[\mathbb{Q}_{2,0}^{(u,E_g)}]}{2}$$

$$\boxed{\text{No. 33}} \quad \hat{\mathbb{Q}}_4^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{33} = \frac{\sqrt{30}\mathbb{X}_{34}[\mathbb{Q}_{2,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{U}_{13}[\mathbb{Q}_{2,0}^{(u,E_g)}]}{10} + \frac{\sqrt{30}\mathbb{X}_{35}[\mathbb{Q}_{2,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{Q}_{2,1}^{(u,E_g)}]}{10} - \frac{\sqrt{30}\mathbb{X}_{36}[\mathbb{Q}_{2,0}^{(a,T_g)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{Q}_{2,0}^{(u,T_g)}]}{15} \\ - \frac{\sqrt{30}\mathbb{X}_{37}[\mathbb{Q}_{2,1}^{(a,T_g)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{Q}_{2,1}^{(u,T_g)}]}{15} - \frac{\sqrt{30}\mathbb{X}_{38}[\mathbb{Q}_{2,2}^{(a,T_g)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{Q}_{2,2}^{(u,T_g)}]}{15}$$

$$\boxed{\text{No. 34}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{34} = \frac{\sqrt{3}\mathbb{X}_{39}[\mathbb{G}_{1,0}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{15}[\mathbb{Q}_{2,0}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{40}[\mathbb{G}_{1,1}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{16}[\mathbb{Q}_{2,1}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{41}[\mathbb{G}_{1,2}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{17}[\mathbb{Q}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 35}} \quad \hat{\mathbb{G}}_3^{(A_g)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{35} = \frac{\sqrt{3}\mathbb{X}_{42}[\mathbb{M}_{1,0}^{(a,T_g)}] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{43}[\mathbb{M}_{1,1}^{(a,T_g)}] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{44}[\mathbb{M}_{1,2}^{(a,T_g)}] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 36}} \quad \hat{\mathbb{Q}}_4^{(A_g)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{36} = -\frac{\sqrt{3}\mathbb{X}_{42}[\mathbb{M}_{1,0}^{(a,T_g)}] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{43}[\mathbb{M}_{1,1}^{(a,T_g)}] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{44}[\mathbb{M}_{1,2}^{(a,T_g)}] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u,T_g,1)}]}{3}$$

$$\boxed{\text{No. 37}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{37} = \frac{\sqrt{3}\mathbb{X}_{45}[\mathbb{M}_{1,0}^{(a,T_g)} (1, 1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{46}[\mathbb{M}_{1,1}^{(a,T_g)} (1, 1)] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{47}[\mathbb{M}_{1,2}^{(a,T_g)} (1, 1)] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 38}} \quad \hat{\mathbb{Q}}_4^{(A_g)} (1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{38} = -\frac{\sqrt{3}\mathbb{X}_{45}[\mathbb{M}_{1,0}^{(a,T_g)} (1, 1)] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{46}[\mathbb{M}_{1,1}^{(a,T_g)} (1, 1)] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{47}[\mathbb{M}_{1,2}^{(a,T_g)} (1, 1)] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u,T_g,1)}]}{3}$$

$$\boxed{\text{No. 39}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{39} = \frac{\sqrt{3}\mathbb{X}_{48}[\mathbb{M}_{1,0}^{(a,T_g)} (1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{49}[\mathbb{M}_{1,1}^{(a,T_g)} (1, -1)] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{50}[\mathbb{M}_{1,2}^{(a,T_g)} (1, -1)] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 40}} \quad \hat{\mathbb{Q}}_4^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{40} = -\frac{\sqrt{3}\mathbb{X}_{48}[\mathbb{M}_{1,0}^{(a,T_g)} (1, -1)] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{49}[\mathbb{M}_{1,1}^{(a,T_g)} (1, -1)] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{50}[\mathbb{M}_{1,2}^{(a,T_g)} (1, -1)] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u,T_g,1)}]}{3}$$

$$\boxed{\text{No. 41}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{41} = -\frac{\sqrt{3}\mathbb{X}_{51}[\mathbb{M}_{3,0}^{(a,T_g,1)} (1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u,T_g)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{52}[\mathbb{M}_{3,1}^{(a,T_g,1)} (1, -1)] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u,T_g)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{53}[\mathbb{M}_{3,2}^{(a,T_g,1)} (1, -1)] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 42}} \quad \hat{\mathbb{Q}}_4^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{42} = -\frac{\sqrt{3}\mathbb{X}_{54}[\mathbb{M}_{3,0}^{(a,T_g,2)} (1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u,T_g)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{55}[\mathbb{M}_{3,1}^{(a,T_g,2)} (1, -1)] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u,T_g)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{56}[\mathbb{M}_{3,2}^{(a,T_g,2)} (1, -1)] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 43}} \quad \hat{\mathbb{G}}_3^{(A_g)} (1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{43} = \frac{\sqrt{3}\mathbb{X}_{54}[\mathbb{M}_{3,0}^{(a,T_g,2)} (1, -1)] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u,T_g,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{55}[\mathbb{M}_{3,1}^{(a,T_g,2)} (1, -1)] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u,T_g,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{56}[\mathbb{M}_{3,2}^{(a,T_g,2)} (1, -1)] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u,T_g,1)}]}{3}$$

$$\boxed{\text{No. 44}} \quad \hat{\mathbb{Q}}_4^{(A_g)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{44} = \frac{\sqrt{3}\mathbb{X}_{51}[\mathbb{M}_{3,0}^{(a,T_g,1)}(1, -1)] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u,T_g,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{52}[\mathbb{M}_{3,1}^{(a,T_g,1)}(1, -1)] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u,T_g,1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{53}[\mathbb{M}_{3,2}^{(a,T_g,1)}(1, -1)] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u,T_g,1)}]}{3}$$

$$\boxed{\text{No. 45}} \quad \hat{\mathbb{Q}}_0^{(A_g)}(1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{45} = \frac{\sqrt{3}\mathbb{X}_{57}[\mathbb{T}_{2,0}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{24}[\mathbb{T}_{2,0}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{58}[\mathbb{T}_{2,1}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{25}[\mathbb{T}_{2,1}^{(u,T_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{59}[\mathbb{T}_{2,2}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{26}[\mathbb{T}_{2,2}^{(u,T_g)}]}{3}$$

$$\boxed{\text{No. 46}} \quad \hat{\mathbb{G}}_3^{(A_g)}(1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{46} = -\frac{\sqrt{3}\mathbb{X}_{57}[\mathbb{T}_{2,0}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{28}[\mathbb{T}_{4,0}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{58}[\mathbb{T}_{2,1}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{29}[\mathbb{T}_{4,1}^{(u,T_g,1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{59}[\mathbb{T}_{2,2}^{(a,T_g)}(1, 0)] \otimes \mathbb{U}_{30}[\mathbb{T}_{4,2}^{(u,T_g,1)}]}{3}$$

Table 4: Atomic SAMB group.

| group | bra | ket |
|----------------|--|--|
| M ₁ | (s, ↑), (s, ↓) | (s, ↑), (s, ↓) |
| M ₂ | (s, ↑), (s, ↓) | (p _x , ↑), (p _x , ↓), (p _y , ↑), (p _y , ↓), (p _z , ↑), (p _z , ↓) |
| M ₃ | (p _x , ↑), (p _x , ↓), (p _y , ↑), (p _y , ↓), (p _z , ↑), (p _z , ↓) | (p _x , ↑), (p _x , ↓), (p _y , ↑), (p _y , ↓), (p _z , ↑), (p _z , ↓) |

Table 5: Atomic SAMB.

| symbol | type | group | form |
|----------------|-------------------------------------|----------------|---|
| X ₁ | $\mathbb{Q}_0^{(a,A_g)}$ | M ₁ | $\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \end{pmatrix}$ |
| X ₂ | $\mathbb{M}_{1,0}^{(a,T_g)}(1, -1)$ | M ₁ | $\begin{pmatrix} 0 & \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & 0 \end{pmatrix}$ |
| X ₃ | $\mathbb{M}_{1,1}^{(a,T_g)}(1, -1)$ | M ₁ | $\begin{pmatrix} 0 & -\frac{\sqrt{2}i}{2} \\ \frac{\sqrt{2}i}{2} & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|-------------------------------------|-------|--|
| \mathbb{X}_4 | $\mathbb{M}_{1,2}^{(a,T_g)}(1, -1)$ | M_1 | $\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & -\frac{\sqrt{2}}{2} \end{pmatrix}$ |
| \mathbb{X}_5 | $\mathbb{Q}_{1,0}^{(a,T_u)}$ | M_2 | $\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_6 | $\mathbb{Q}_{1,1}^{(a,T_u)}$ | M_2 | $\begin{pmatrix} 0 & 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{2} & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_7 | $\mathbb{Q}_{1,2}^{(a,T_u)}$ | M_2 | $\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{2} \end{pmatrix}$ |
| \mathbb{X}_8 | $\mathbb{Q}_{1,0}^{(a,T_u)}(1, 0)$ | M_2 | $\begin{pmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & \frac{i}{2} & -\frac{1}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_9 | $\mathbb{Q}_{1,1}^{(a,T_u)}(1, 0)$ | M_2 | $\begin{pmatrix} \frac{i}{2} & 0 & 0 & 0 & 0 & -\frac{i}{2} \\ 0 & -\frac{i}{2} & 0 & 0 & -\frac{i}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{10} | $\mathbb{Q}_{1,2}^{(a,T_u)}(1, 0)$ | M_2 | $\begin{pmatrix} 0 & -\frac{1}{2} & 0 & \frac{i}{2} & 0 & 0 \\ \frac{1}{2} & 0 & \frac{i}{2} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{11} | $\mathbb{G}_{2,0}^{(a,T_u)}(1, -1)$ | M_2 | $\begin{pmatrix} 0 & 0 & \frac{i}{2} & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & -\frac{i}{2} & -\frac{1}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{12} | $\mathbb{G}_{2,1}^{(a,T_u)}(1, -1)$ | M_2 | $\begin{pmatrix} \frac{i}{2} & 0 & 0 & 0 & 0 & \frac{i}{2} \\ 0 & -\frac{i}{2} & 0 & 0 & \frac{i}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{13} | $\mathbb{G}_{2,2}^{(a,T_u)}(1, -1)$ | M_2 | $\begin{pmatrix} 0 & \frac{1}{2} & 0 & \frac{i}{2} & 0 & 0 \\ -\frac{1}{2} & 0 & \frac{i}{2} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{14} | $\mathbb{M}_0^{(a,A_u)}(1, 1)$ | M_2 | $\begin{pmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & -\frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{6} & 0 \\ \frac{\sqrt{6}}{6} & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{6} \end{pmatrix}$ |
| \mathbb{X}_{15} | $\mathbb{M}_{2,0}^{(a,E_u)}(1, -1)$ | M_2 | $\begin{pmatrix} 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & \frac{\sqrt{3}}{3} & 0 \\ -\frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{3} \end{pmatrix}$ |
| \mathbb{X}_{16} | $\mathbb{M}_{2,1}^{(a,E_u)}(1, -1)$ | M_2 | $\begin{pmatrix} 0 & \frac{1}{2} & 0 & \frac{i}{2} & 0 & 0 \\ \frac{1}{2} & 0 & -\frac{i}{2} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{17} | $\mathbb{M}_{2,0}^{(a,T_u)}(1, -1)$ | M_2 | $\begin{pmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & 0 & -\frac{1}{2} & \frac{i}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{18} | $\mathbb{M}_{2,1}^{(a,T_u)}(1, -1)$ | M_2 | $\begin{pmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & -\frac{1}{2} & 0 & 0 & \frac{1}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{19} | $\mathbb{M}_{2,2}^{(a,T_u)}(1, -1)$ | M_2 | $\begin{pmatrix} 0 & -\frac{i}{2} & 0 & \frac{1}{2} & 0 & 0 \\ \frac{i}{2} & 0 & \frac{1}{2} & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|-----------------------------------|-------|--|
| \mathbb{X}_{20} | $\mathbb{T}_{1,0}^{(a,T_u)}(1,0)$ | M_2 | $\begin{pmatrix} 0 & 0 & -\frac{1}{2} & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & 0 & \frac{1}{2} & \frac{i}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{21} | $\mathbb{T}_{1,1}^{(a,T_u)}(1,0)$ | M_2 | $\begin{pmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & -\frac{1}{2} \\ 0 & -\frac{1}{2} & 0 & 0 & -\frac{1}{2} & 0 \end{pmatrix}$ |
| \mathbb{X}_{22} | $\mathbb{T}_{1,2}^{(a,T_u)}(1,0)$ | M_2 | $\begin{pmatrix} 0 & \frac{i}{2} & 0 & \frac{1}{2} & 0 & 0 \\ -\frac{i}{2} & 0 & \frac{1}{2} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{23} | $\mathbb{T}_{1,0}^{(a,T_u)}$ | M_2 | $\begin{pmatrix} \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{24} | $\mathbb{T}_{1,1}^{(a,T_u)}$ | M_2 | $\begin{pmatrix} 0 & 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{2} & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{25} | $\mathbb{T}_{1,2}^{(a,T_u)}$ | M_2 | $\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} \end{pmatrix}$ |
| \mathbb{X}_{26} | $\mathbb{G}_0^{(a,A_u)}(1,1)$ | M_2 | $\begin{pmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{6} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{6} \end{pmatrix}$ |
| \mathbb{X}_{27} | $\mathbb{Q}_0^{(a,A_g)}$ | M_3 | $\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{pmatrix}$ |
| \mathbb{X}_{28} | $\mathbb{Q}_0^{(a,A_g)}(1,1)$ | M_3 | $\begin{pmatrix} 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}}{6} & 0 \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{29} | $\mathbb{Q}_{2,0}^{(a,E_g)}$ | M_3 | $\begin{pmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|-------------------------------------|-------|--|
| \mathbb{X}_{30} | $\mathbb{Q}_{2,1}^{(a,E_g)}$ | M_3 | $\begin{pmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{31} | $\mathbb{Q}_{2,0}^{(a,T_g)}$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{32} | $\mathbb{Q}_{2,1}^{(a,T_g)}$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{33} | $\mathbb{Q}_{2,2}^{(a,T_g)}$ | M_3 | $\begin{pmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{34} | $\mathbb{Q}_{2,0}^{(a,E_g)}(1, -1)$ | M_3 | $\begin{pmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|------------------------------------|-------|--|
| \mathbb{X}_{35} | $\mathbb{Q}_{2,1}^{(a,E_g)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{36} | $\mathbb{Q}_{2,0}^{(a,T_g)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{37} | $\mathbb{Q}_{2,1}^{(a,T_g)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{38} | $\mathbb{Q}_{2,2}^{(a,T_g)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{39} | $\mathbb{G}_{1,0}^{(a,T_g)}(1,0)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|-----------------------------------|-------|--|
| \mathbb{X}_{40} | $\mathbb{G}_{1,1}^{(a,T_g)}(1,0)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{41} | $\mathbb{G}_{1,2}^{(a,T_g)}(1,0)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{42} | $M_{1,0}^{(a,T_g)}$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{43} | $M_{1,1}^{(a,T_g)}$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{44} | $M_{1,2}^{(a,T_g)}$ | M_3 | $\begin{pmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|------------------------------------|-------|--|
| \mathbb{X}_{45} | $\mathbb{M}_{1,0}^{(a,T_g)}(1,1)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{30}}{15} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{15} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{30} & 0 \end{pmatrix}$ |
| \mathbb{X}_{46} | $\mathbb{M}_{1,1}^{(a,T_g)}(1,1)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{30}i}{30} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \\ -\frac{\sqrt{30}i}{30} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{15} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & \frac{\sqrt{30}i}{30} \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & -\frac{\sqrt{30}i}{30} & 0 \end{pmatrix}$ |
| \mathbb{X}_{47} | $\mathbb{M}_{1,2}^{(a,T_g)}(1,1)$ | M_3 | $\begin{pmatrix} -\frac{\sqrt{30}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & \frac{\sqrt{30}}{30} & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{30}i}{20} \\ 0 & 0 & 0 & \frac{\sqrt{30}}{30} & \frac{\sqrt{30}i}{20} & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{15} & 0 \\ \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{15} \end{pmatrix}$ |
| \mathbb{X}_{48} | $\mathbb{M}_{1,0}^{(a,T_g)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{pmatrix}$ |
| \mathbb{X}_{49} | $\mathbb{M}_{1,1}^{(a,T_g)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|--------------------------------------|-------|---|
| \mathbb{X}_{50} | $\mathbb{M}_{1,2}^{(a,T_g)}(1,-1)$ | M_3 | $\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \end{pmatrix}$ |
| \mathbb{X}_{51} | $\mathbb{M}_{3,0}^{(a,T_g,1)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{5}}{5} & 0 & \frac{\sqrt{5}i}{10} & -\frac{\sqrt{5}}{10} & 0 \\ \frac{\sqrt{5}}{5} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \end{pmatrix}$ |
| \mathbb{X}_{52} | $\mathbb{M}_{3,1}^{(a,T_g,1)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{5} & -\frac{\sqrt{5}}{10} & 0 \\ -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{5} & 0 & 0 & \frac{\sqrt{5}}{10} \\ 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 \end{pmatrix}$ |
| \mathbb{X}_{53} | $\mathbb{M}_{3,2}^{(a,T_g,1)}(1,-1)$ | M_3 | $\begin{pmatrix} -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{10} & \frac{\sqrt{5}}{5} & 0 \\ -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}}{5} \end{pmatrix}$ |
| \mathbb{X}_{54} | $\mathbb{M}_{3,0}^{(a,T_g,2)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \end{pmatrix}$ |

continued ...

Table 5

| symbol | type | group | form |
|-------------------|--------------------------------------|-------|--|
| \mathbb{X}_{55} | $\mathbb{M}_{3,1}^{(a,T_g,2)}(1,-1)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \end{pmatrix}$ |
| \mathbb{X}_{56} | $\mathbb{M}_{3,2}^{(a,T_g,2)}(1,-1)$ | M_3 | $\begin{pmatrix} \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{X}_{57} | $\mathbb{T}_{2,0}^{(a,T_g)}(1,0)$ | M_3 | $\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \end{pmatrix}$ |
| \mathbb{X}_{58} | $\mathbb{T}_{2,1}^{(a,T_g)}(1,0)$ | M_3 | $\begin{pmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$ |
| \mathbb{X}_{59} | $\mathbb{T}_{2,2}^{(a,T_g)}(1,0)$ | M_3 | $\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$ |

Table 6: Uniform SAMB.

| symbol | type | cluster | form |
|----------------|-------------------------------|---------|--|
| \mathbb{U}_1 | $\mathbb{Q}_0^{(s, A_g)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \end{pmatrix}$ |
| \mathbb{U}_2 | $\mathbb{Q}_{1,0}^{(s, T_u)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \end{pmatrix}$ |
| \mathbb{U}_3 | $\mathbb{Q}_{1,1}^{(s, T_u)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \end{pmatrix}$ |
| \mathbb{U}_4 | $\mathbb{Q}_{1,2}^{(s, T_u)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|----------------|------------------------------|---------|--|
| \mathbb{U}_5 | $\mathbb{Q}_{2,0}^{(s,T_g)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \end{pmatrix}$ |
| \mathbb{U}_6 | $\mathbb{Q}_{2,1}^{(s,T_g)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \end{pmatrix}$ |
| \mathbb{U}_7 | $\mathbb{Q}_{2,2}^{(s,T_g)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \end{pmatrix}$ |
| \mathbb{U}_8 | $\mathbb{Q}_3^{(s,A_u)}$ | S_1 | $\begin{pmatrix} \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|-------------------|-------------------------------|---------|--|
| \mathbb{U}_9 | $\mathbb{Q}_0^{(u, A_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{10} | $\mathbb{Q}_{1,0}^{(u, T_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{26}}{52} & 0 & \frac{\sqrt{26}}{26} \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}}{52} & 0 & -\frac{\sqrt{26}}{26} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}}{26} & 0 & \frac{3\sqrt{26}}{52} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}}{26} & 0 & -\frac{3\sqrt{26}}{52} & 0 \\ 0 & -\frac{3\sqrt{26}}{52} & 0 & -\frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}}{52} & 0 & \frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{26}}{26} & 0 & -\frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}}{26} & 0 & \frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{11} | $\mathbb{Q}_{1,1}^{(u, T_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}}{26} & \frac{3\sqrt{26}}{52} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}}{26} & 0 & 0 & -\frac{3\sqrt{26}}{52} \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}}{52} & 0 & 0 & -\frac{\sqrt{26}}{26} \\ 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{26}}{52} & \frac{\sqrt{26}}{26} & 0 \\ 0 & -\frac{\sqrt{26}}{26} & -\frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}}{26} & 0 & 0 & \frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}}{52} & 0 & 0 & \frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{26}}{52} & -\frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{12} | $\mathbb{Q}_{1,2}^{(u, T_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}}{26} & \frac{3\sqrt{26}}{52} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{3\sqrt{26}}{52} & \frac{\sqrt{26}}{26} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}}{26} & -\frac{3\sqrt{26}}{52} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}}{52} & -\frac{\sqrt{26}}{26} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{26}}{26} & -\frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{26}}{52} & -\frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}}{26} & \frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}}{52} & \frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|-------------------|------------------------------|---------|--|
| \mathbb{U}_{13} | $\mathbb{Q}_{2,0}^{(u,E_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{11\sqrt{3}}{84} & -\frac{\sqrt{3}}{42} & \frac{13\sqrt{3}}{84} \\ 0 & 0 & 0 & 0 & -\frac{11\sqrt{3}}{84} & 0 & \frac{13\sqrt{3}}{84} & -\frac{\sqrt{3}}{42} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{42} & \frac{13\sqrt{3}}{84} & 0 & -\frac{11\sqrt{3}}{84} \\ 0 & 0 & 0 & 0 & \frac{13\sqrt{3}}{84} & -\frac{\sqrt{3}}{42} & -\frac{11\sqrt{3}}{84} & 0 \\ 0 & -\frac{11\sqrt{3}}{84} & -\frac{\sqrt{3}}{42} & \frac{13\sqrt{3}}{84} & 0 & 0 & 0 & 0 \\ -\frac{11\sqrt{3}}{84} & 0 & \frac{13\sqrt{3}}{84} & -\frac{\sqrt{3}}{42} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{3}}{42} & \frac{13\sqrt{3}}{84} & 0 & -\frac{11\sqrt{3}}{84} & 0 & 0 & 0 & 0 \\ \frac{13\sqrt{3}}{84} & -\frac{\sqrt{3}}{42} & -\frac{11\sqrt{3}}{84} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{14} | $\mathbb{Q}_{2,1}^{(u,E_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{5}{28} & -\frac{2}{7} & \frac{3}{28} \\ 0 & 0 & 0 & 0 & \frac{5}{28} & 0 & \frac{3}{28} & -\frac{2}{7} \\ 0 & 0 & 0 & 0 & -\frac{2}{7} & \frac{3}{28} & 0 & \frac{5}{28} \\ 0 & 0 & 0 & 0 & \frac{3}{28} & -\frac{2}{7} & \frac{5}{28} & 0 \\ 0 & \frac{5}{28} & -\frac{2}{7} & \frac{3}{28} & 0 & 0 & 0 & 0 \\ \frac{5}{28} & 0 & \frac{3}{28} & -\frac{2}{7} & 0 & 0 & 0 & 0 \\ -\frac{2}{7} & \frac{3}{28} & 0 & \frac{5}{28} & 0 & 0 & 0 & 0 \\ \frac{3}{28} & -\frac{2}{7} & \frac{5}{28} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{15} | $\mathbb{Q}_{2,0}^{(u,T_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{16} | $\mathbb{Q}_{2,1}^{(u,T_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|-------------------|--------------------------------|---------|--|
| \mathbb{U}_{17} | $\mathbb{Q}_{2,2}^{(u,T_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{18} | $\mathbb{Q}_{3,0}^{(u,T_u,1)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}}{26} & 0 & -\frac{3\sqrt{26}}{52} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}}{26} & 0 & \frac{3\sqrt{26}}{52} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}}{52} & 0 & \frac{\sqrt{26}}{26} \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}}{52} & 0 & -\frac{\sqrt{26}}{26} & 0 \\ 0 & -\frac{\sqrt{26}}{26} & 0 & \frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}}{26} & 0 & -\frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{3\sqrt{26}}{52} & 0 & -\frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 \\ -\frac{3\sqrt{26}}{52} & 0 & \frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{19} | $\mathbb{Q}_{3,1}^{(u,T_u,1)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}}{52} & \frac{\sqrt{26}}{26} & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}}{52} & 0 & 0 & -\frac{\sqrt{26}}{26} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}}{26} & 0 & 0 & \frac{3\sqrt{26}}{52} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}}{26} & -\frac{3\sqrt{26}}{52} & 0 \\ 0 & \frac{3\sqrt{26}}{52} & -\frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 & 0 \\ -\frac{3\sqrt{26}}{52} & 0 & 0 & \frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}}{26} & 0 & 0 & -\frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{26}}{26} & \frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{20} | $\mathbb{Q}_{3,2}^{(u,T_u,1)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}}{52} & \frac{\sqrt{26}}{26} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}}{26} & -\frac{3\sqrt{26}}{52} \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}}{52} & -\frac{\sqrt{26}}{26} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}}{26} & \frac{3\sqrt{26}}{52} & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{26}}{52} & -\frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{26}}{26} & \frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 \\ -\frac{3\sqrt{26}}{52} & \frac{\sqrt{26}}{26} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}}{26} & -\frac{3\sqrt{26}}{52} & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|-------------------|------------------------------|---------|--|
| \mathbb{U}_{21} | $\mathbb{T}_{1,0}^{(u,T_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{22} | $\mathbb{T}_{1,1}^{(u,T_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{23} | $\mathbb{T}_{1,2}^{(u,T_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{24} | $\mathbb{T}_{2,0}^{(u,T_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{26}i}{26} & 0 & -\frac{3\sqrt{26}i}{52} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{26}i}{26} & 0 & \frac{3\sqrt{26}i}{52} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}i}{52} & 0 & -\frac{\sqrt{26}i}{26} \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}i}{52} & 0 & \frac{\sqrt{26}i}{26} & 0 \\ 0 & -\frac{\sqrt{26}i}{26} & 0 & -\frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}i}{26} & 0 & \frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{26}i}{52} & 0 & -\frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}i}{52} & 0 & \frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|-------------------|--------------------------------|---------|--|
| \mathbb{U}_{25} | $\mathbb{T}_{2,1}^{(u,T_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}i}{52} & -\frac{\sqrt{26}i}{26} & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}i}{52} & 0 & 0 & \frac{\sqrt{26}i}{26} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{26}i}{26} & 0 & 0 & \frac{3\sqrt{26}i}{52} \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} & 0 \\ 0 & -\frac{3\sqrt{26}i}{52} & -\frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}i}{52} & 0 & 0 & \frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}i}{26} & 0 & 0 & \frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{26} | $\mathbb{T}_{2,2}^{(u,T_g)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}i}{52} & -\frac{\sqrt{26}i}{26} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}i}{52} & \frac{\sqrt{26}i}{26} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{26}i}{26} & \frac{3\sqrt{26}i}{52} & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{26}i}{52} & -\frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}i}{52} & \frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{26}i}{26} & \frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{27} | $\mathbb{T}_3^{(u,A_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| \mathbb{U}_{28} | $\mathbb{T}_{4,0}^{(u,T_g,1)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}i}{52} & 0 & \frac{\sqrt{26}i}{26} \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}i}{52} & 0 & -\frac{\sqrt{26}i}{26} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}i}{26} & 0 & -\frac{3\sqrt{26}i}{52} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}i}{26} & 0 & \frac{3\sqrt{26}i}{52} & 0 \\ 0 & -\frac{3\sqrt{26}i}{52} & 0 & \frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}i}{52} & 0 & -\frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{26}i}{26} & 0 & -\frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{26}i}{26} & 0 & \frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

continued ...

Table 6

| symbol | type | cluster | form |
|----------|--------------------------------|---------|--|
| U_{29} | $\mathbb{T}_{4,1}^{(u,T_g,1)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}i}{26} & 0 & 0 & \frac{3\sqrt{26}i}{52} \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}i}{52} & 0 & 0 & -\frac{\sqrt{26}i}{26} \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}i}{52} & \frac{\sqrt{26}i}{26} & 0 \\ 0 & \frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{26}i}{26} & 0 & 0 & \frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}i}{52} & 0 & 0 & -\frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 \\ 0 & -\frac{3\sqrt{26}i}{52} & \frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| U_{30} | $\mathbb{T}_{4,2}^{(u,T_g,1)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{26}i}{52} & \frac{\sqrt{26}i}{26} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{26}i}{26} & \frac{3\sqrt{26}i}{52} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{26}i}{52} & -\frac{\sqrt{26}i}{26} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{26}i}{26} & -\frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{26}i}{52} & \frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{26}i}{26} & \frac{3\sqrt{26}i}{52} & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{26}i}{52} & -\frac{\sqrt{26}i}{26} & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| U_{31} | $\mathbb{T}_{5,0}^{(u,E_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{5i}{28} & \frac{2i}{7} & -\frac{3i}{28} \\ 0 & 0 & 0 & 0 & -\frac{5i}{28} & 0 & -\frac{3i}{28} & \frac{2i}{7} \\ 0 & 0 & 0 & 0 & \frac{2i}{7} & -\frac{3i}{28} & 0 & -\frac{5i}{28} \\ 0 & 0 & 0 & 0 & -\frac{3i}{28} & \frac{2i}{7} & -\frac{5i}{28} & 0 \\ 0 & \frac{5i}{28} & -\frac{2i}{7} & \frac{3i}{28} & 0 & 0 & 0 & 0 \\ \frac{5i}{28} & 0 & \frac{3i}{28} & -\frac{2i}{7} & 0 & 0 & 0 & 0 \\ -\frac{2i}{7} & \frac{3i}{28} & 0 & \frac{5i}{28} & 0 & 0 & 0 & 0 \\ \frac{3i}{28} & -\frac{2i}{7} & \frac{5i}{28} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |
| U_{32} | $\mathbb{T}_{5,1}^{(u,E_u)}$ | B_1 | $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{11\sqrt{3}i}{84} & -\frac{\sqrt{3}i}{42} & \frac{13\sqrt{3}i}{84} \\ 0 & 0 & 0 & 0 & -\frac{11\sqrt{3}i}{84} & 0 & \frac{13\sqrt{3}i}{84} & -\frac{\sqrt{3}i}{42} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{42} & \frac{13\sqrt{3}i}{84} & 0 & -\frac{11\sqrt{3}i}{84} \\ 0 & 0 & 0 & 0 & \frac{13\sqrt{3}i}{84} & -\frac{\sqrt{3}i}{42} & -\frac{11\sqrt{3}i}{84} & 0 \\ 0 & \frac{11\sqrt{3}i}{84} & \frac{\sqrt{3}i}{42} & -\frac{13\sqrt{3}i}{84} & 0 & 0 & 0 & 0 \\ \frac{11\sqrt{3}i}{84} & 0 & -\frac{13\sqrt{3}i}{84} & \frac{\sqrt{3}i}{42} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}i}{42} & -\frac{13\sqrt{3}i}{84} & 0 & \frac{11\sqrt{3}i}{84} & 0 & 0 & 0 & 0 \\ -\frac{13\sqrt{3}i}{84} & \frac{\sqrt{3}i}{42} & \frac{11\sqrt{3}i}{84} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ |

Table 7: Polar harmonics.

| No. | symbol | rank | irrep. | mul. | comp. | form |
|-----|------------------------------|------|--------|------|-------|---|
| 1 | $\mathbb{Q}_0^{(A_g)}$ | 0 | A_g | — | — | 1 |
| 2 | $\mathbb{Q}_{1,0}^{(T_u)}$ | 1 | T_u | — | 0 | x |
| 3 | $\mathbb{Q}_{1,1}^{(T_u)}$ | 1 | T_u | — | 1 | y |
| 4 | $\mathbb{Q}_{1,2}^{(T_u)}$ | 1 | T_u | — | 2 | z |
| 5 | $\mathbb{Q}_{2,0}^{(E_g)}$ | 2 | E_g | — | 0 | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| 6 | $\mathbb{Q}_{2,1}^{(E_g)}$ | 2 | E_g | — | 1 | $\frac{\sqrt{3}(x^2 - y^2)}{2}$ |
| 7 | $\mathbb{Q}_{2,0}^{(T_g)}$ | 2 | T_g | — | 0 | $\sqrt{3}yz$ |
| 8 | $\mathbb{Q}_{2,1}^{(T_g)}$ | 2 | T_g | — | 1 | $\sqrt{3}xz$ |
| 9 | $\mathbb{Q}_{2,2}^{(T_g)}$ | 2 | T_g | — | 2 | $\sqrt{3}xy$ |
| 10 | $\mathbb{Q}_3^{(A_u)}$ | 3 | A_u | — | — | $\sqrt{15}xyz$ |
| 11 | $\mathbb{Q}_{3,0}^{(T_u,1)}$ | 3 | T_u | 1 | 0 | $\frac{x(2x^2 - 3y^2 - 3z^2)}{2}$ |
| 12 | $\mathbb{Q}_{3,1}^{(T_u,1)}$ | 3 | T_u | 1 | 1 | $-\frac{y(3x^2 - 2y^2 + 3z^2)}{2}$ |
| 13 | $\mathbb{Q}_{3,2}^{(T_u,1)}$ | 3 | T_u | 1 | 2 | $-\frac{z(3x^2 + 3y^2 - 2z^2)}{2}$ |
| 14 | $\mathbb{Q}_{4,0}^{(T_g,1)}$ | 4 | T_g | 1 | 0 | $\frac{\sqrt{35}yz(y-z)(y+z)}{2}$ |
| 15 | $\mathbb{Q}_{4,1}^{(T_g,1)}$ | 4 | T_g | 1 | 1 | $-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$ |
| 16 | $\mathbb{Q}_{4,2}^{(T_g,1)}$ | 4 | T_g | 1 | 2 | $\frac{\sqrt{35}xy(x-y)(x+y)}{2}$ |
| 17 | $\mathbb{Q}_{5,0}^{(E_u)}$ | 5 | E_u | — | 0 | $\frac{3\sqrt{35}xyz(x^2 - y^2)}{2}$ |
| 18 | $\mathbb{Q}_{5,1}^{(E_u)}$ | 5 | E_u | — | 1 | $\frac{\sqrt{105}xyz(x^2 + y^2 - 2z^2)}{2}$ |

Table 8: Axial harmonics.

| No. | symbol | rank | irrep. | mul. | comp. | form |
|-----|------------------------|------|--------|------|-------|------|
| 1 | $\mathbb{G}_0^{(A_u)}$ | 0 | A_u | — | — | 1 |

continued ...

Table 8

| No. | symbol | rank | irrep. | mul. | comp. | form |
|-----|------------------------------|------|--------|------|-------|--|
| 2 | $\mathbb{G}_{1,0}^{(T_g)}$ | 1 | T_g | — | 0 | X |
| 3 | $\mathbb{G}_{1,1}^{(T_g)}$ | 1 | T_g | — | 1 | Y |
| 4 | $\mathbb{G}_{1,2}^{(T_g)}$ | 1 | T_g | — | 2 | Z |
| 5 | $\mathbb{G}_{2,0}^{(E_u)}$ | 2 | E_u | — | 0 | $-\frac{X^2}{2} - \frac{Y^2}{2} + Z^2$ |
| 6 | $\mathbb{G}_{2,1}^{(E_u)}$ | 2 | E_u | — | 1 | $\frac{\sqrt{3}(X^2 - Y^2)}{2}$ |
| 7 | $\mathbb{G}_{2,0}^{(T_u)}$ | 2 | T_u | — | 0 | $\sqrt{3}YZ$ |
| 8 | $\mathbb{G}_{2,1}^{(T_u)}$ | 2 | T_u | — | 1 | $\sqrt{3}XZ$ |
| 9 | $\mathbb{G}_{2,2}^{(T_u)}$ | 2 | T_u | — | 2 | $\sqrt{3}XY$ |
| 10 | $\mathbb{G}_{3,0}^{(T_g,1)}$ | 3 | T_g | 1 | 0 | $\frac{X(2X^2 - 3Y^2 - 3Z^2)}{2}$ |
| 11 | $\mathbb{G}_{3,1}^{(T_g,1)}$ | 3 | T_g | 1 | 1 | $-\frac{Y(3X^2 - 2Y^2 + 3Z^2)}{2}$ |
| 12 | $\mathbb{G}_{3,2}^{(T_g,1)}$ | 3 | T_g | 1 | 2 | $-\frac{Z(3X^2 + 3Y^2 - 2Z^2)}{2}$ |
| 13 | $\mathbb{G}_{3,0}^{(T_g,2)}$ | 3 | T_g | 2 | 0 | $\frac{\sqrt{15}X(Y - Z)(Y + Z)}{2}$ |
| 14 | $\mathbb{G}_{3,1}^{(T_g,2)}$ | 3 | T_g | 2 | 1 | $-\frac{\sqrt{15}Y(X - Z)(X + Z)}{2}$ |
| 15 | $\mathbb{G}_{3,2}^{(T_g,2)}$ | 3 | T_g | 2 | 2 | $\frac{\sqrt{15}Z(X - Y)(X + Y)}{2}$ |

-
- Group info.: Generator = 2_{001} , 2_{010} , 3_{111}^+ , -1

Table 9: Conjugacy class.

| rep. SO | symmetry operations |
|--------------|---|
| 1 | 1 |
| 2_{001} | 2_{001} , 2_{100} , 2_{010} |
| 3_{111}^+ | 3_{111}^+ , 3_{1-1-1}^+ , 3_{-11-1}^+ , 3_{-1-11}^+ |
| 3_{111}^- | 3_{111}^- , 3_{1-1-1}^- , 3_{-11-1}^- , 3_{-1-11}^- |
| -1 | -1 |
| m_{001} | m_{001} , m_{100} , m_{010} |
| -3_{111}^+ | -3_{111}^+ , -3_{1-1-1}^+ , -3_{-11-1}^+ , -3_{-1-11}^+ |

continued ...

Table 9

| rep. SO | symmetry operations |
|--------------|---|
| -3_{111}^- | -3_{111}^- , -3_{1-1-1}^- , -3_{-11-1}^- , -3_{-1-11}^- |

Table 10: Symmetry operations.

| No. | SO | No. | SO | No. | SO | No. | SO | No. | SO |
|-----|---------------|-----|----------------|-----|----------------|-----|----------------|-----|----------------|
| 1 | 1 | 2 | 2_{001} | 3 | 2_{100} | 4 | 2_{010} | 5 | 3_{111}^+ |
| 6 | 3_{1-1-1}^+ | 7 | 3_{-11-1}^+ | 8 | 3_{-1-11}^+ | 9 | 3_{111}^- | 10 | 3_{1-1-1}^- |
| 11 | 3_{-11-1}^- | 12 | 3_{-1-11}^- | 13 | -1 | 14 | m_{001} | 15 | m_{100} |
| 16 | m_{010} | 17 | -3_{111}^+ | 18 | -3_{1-1-1}^+ | 19 | -3_{-11-1}^+ | 20 | -3_{-1-11}^+ |
| 21 | -3_{111}^- | 22 | -3_{1-1-1}^- | 23 | -3_{-11-1}^- | 24 | -3_{-1-11}^- | | |

Table 11: Character table.

| | 1 | 2_{001} | 3_{111}^+ | 3_{111}^- | -1 | m_{001} | -3_{111}^+ | -3_{111}^- |
|-------------|---|-----------|-------------|-------------|----|-----------|--------------|--------------|
| A_g | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| $E_g^{(a)}$ | 1 | 1 | ω^* | ω | 1 | 1 | ω^* | ω |
| $E_g^{(b)}$ | 1 | 1 | ω | ω^* | 1 | 1 | ω | ω^* |
| T_g | 3 | -1 | 0 | 0 | 3 | -1 | 0 | 0 |
| A_u | 1 | 1 | 1 | 1 | -1 | -1 | -1 | -1 |
| $E_u^{(a)}$ | 1 | 1 | ω^* | ω | -1 | -1 | $-\omega^*$ | $-\omega$ |
| $E_u^{(b)}$ | 1 | 1 | ω | ω^* | -1 | -1 | $-\omega$ | $-\omega^*$ |
| T_u | 3 | -1 | 0 | 0 | -3 | 1 | 0 | 0 |

Table 12: Parity conversion.

| \leftrightarrow | \leftrightarrow | \leftrightarrow | \leftrightarrow | \leftrightarrow |
|-----------------------------|-----------------------------|-----------------------------|-------------------|-------------------|
| A_g (A_u) | $E_g^{(a)}$ ($E_u^{(a)}$) | $E_g^{(b)}$ ($E_u^{(b)}$) | T_g (T_u) | A_u (A_g) |
| $E_u^{(a)}$ ($E_g^{(a)}$) | $E_u^{(b)}$ ($E_g^{(b)}$) | T_u (T_g) | | |

 Table 13: Symmetric product, $[\Gamma \otimes \Gamma']_+$.

| | A_g | $E_g^{(a)}$ | $E_g^{(b)}$ | T_g | A_u | $E_u^{(a)}$ | $E_u^{(b)}$ | T_u |
|-------------|-------|-------------|-------------|-------------------------------------|-------------|-------------|-------------|--------------------------------------|
| A_g | A_g | $E_g^{(a)}$ | $E_g^{(b)}$ | T_g | A_u | $E_u^{(a)}$ | $E_u^{(b)}$ | T_u |
| $E_g^{(a)}$ | | $E_g^{(b)}$ | A_g | T_g | $E_u^{(a)}$ | $E_u^{(b)}$ | A_u | T_u |
| $E_g^{(b)}$ | | | $E_g^{(a)}$ | T_g | $E_u^{(b)}$ | A_u | $E_u^{(a)}$ | T_u |
| T_g | | | | $A_g + E_g^{(a)} + E_g^{(b)} + T_g$ | T_u | T_u | T_u | $A_u + E_u^{(a)} + E_u^{(b)} + 2T_u$ |
| A_u | | | | | A_g | $E_g^{(a)}$ | $E_g^{(b)}$ | T_g |
| $E_u^{(a)}$ | | | | | | $E_g^{(b)}$ | A_g | T_g |
| $E_u^{(b)}$ | | | | | | | $E_g^{(a)}$ | T_g |
| T_u | | | | | | | | $A_g + E_g^{(a)} + E_g^{(b)} + T_g$ |

 Table 14: Anti-symmetric product, $[\Gamma \otimes \Gamma]_-$.

| A_g | $E_g^{(a)}$ | $E_g^{(b)}$ | T_g | A_u | $E_u^{(a)}$ | $E_u^{(b)}$ | T_u |
|-------|-------------|-------------|-------|-------|-------------|-------------|-------|
| $-$ | $-$ | $-$ | T_g | $-$ | $-$ | $-$ | T_g |

Table 15: Virtual-cluster sites.

| No. | position | No. | position | No. | position | No. | position |
|-----|--|-----|---|-----|---|-----|---|
| 1 | $\begin{pmatrix} 3 & 2 & 1 \end{pmatrix}$ | 2 | $\begin{pmatrix} -3 & -2 & 1 \end{pmatrix}$ | 3 | $\begin{pmatrix} 3 & -2 & -1 \end{pmatrix}$ | 4 | $\begin{pmatrix} -3 & 2 & -1 \end{pmatrix}$ |
| 5 | $\begin{pmatrix} 1 & 3 & 2 \end{pmatrix}$ | 6 | $\begin{pmatrix} -1 & -3 & 2 \end{pmatrix}$ | 7 | $\begin{pmatrix} 1 & -3 & -2 \end{pmatrix}$ | 8 | $\begin{pmatrix} -1 & 3 & -2 \end{pmatrix}$ |
| 9 | $\begin{pmatrix} 2 & 1 & 3 \end{pmatrix}$ | 10 | $\begin{pmatrix} -2 & 1 & -3 \end{pmatrix}$ | 11 | $\begin{pmatrix} -2 & -1 & 3 \end{pmatrix}$ | 12 | $\begin{pmatrix} 2 & -1 & -3 \end{pmatrix}$ |
| 13 | $\begin{pmatrix} -3 & -2 & -1 \end{pmatrix}$ | 14 | $\begin{pmatrix} 3 & 2 & -1 \end{pmatrix}$ | 15 | $\begin{pmatrix} -3 & 2 & 1 \end{pmatrix}$ | 16 | $\begin{pmatrix} 3 & -2 & 1 \end{pmatrix}$ |
| 17 | $\begin{pmatrix} -1 & -3 & -2 \end{pmatrix}$ | 18 | $\begin{pmatrix} 1 & 3 & -2 \end{pmatrix}$ | 19 | $\begin{pmatrix} -1 & 3 & 2 \end{pmatrix}$ | 20 | $\begin{pmatrix} 1 & -3 & 2 \end{pmatrix}$ |
| 21 | $\begin{pmatrix} -2 & -1 & -3 \end{pmatrix}$ | 22 | $\begin{pmatrix} 2 & -1 & 3 \end{pmatrix}$ | 23 | $\begin{pmatrix} 2 & 1 & -3 \end{pmatrix}$ | 24 | $\begin{pmatrix} -2 & 1 & 3 \end{pmatrix}$ |

Table 16: Virtual-cluster basis.

| symbol | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|------------------------|-------------------------|-------------------------|
| $Q_0^{(A_g)}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ |
| | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ |
| | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | $\frac{\sqrt{6}}{12}$ | | | | | | |
| $Q_{1,0}^{(T_u)}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ |
| | $-\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ |
| | $-\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | | | | | | |
| $Q_{1,1}^{(T_u)}$ | $\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ |
| | $-\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ |
| | $-\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | | | | | | |
| $Q_{1,2}^{(T_u)}$ | $\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ |
| | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $\frac{\sqrt{7}}{28}$ | $-\frac{\sqrt{7}}{14}$ | $-\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ | $\frac{\sqrt{7}}{14}$ |
| | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | $-\frac{3\sqrt{7}}{28}$ | $\frac{3\sqrt{7}}{28}$ | | | | | | |
| $Q_{2,0}^{(E_g)}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{\sqrt{3}}{42}$ | $-\frac{\sqrt{3}}{42}$ | $-\frac{\sqrt{3}}{42}$ | $-\frac{\sqrt{3}}{42}$ | $\frac{13\sqrt{3}}{84}$ | $\frac{13\sqrt{3}}{84}$ |
| | $\frac{13\sqrt{3}}{84}$ | $\frac{13\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{11\sqrt{3}}{84}$ | $-\frac{\sqrt{3}}{42}$ | $-\frac{\sqrt{3}}{42}$ | $-\frac{\sqrt{3}}{42}$ | $-\frac{\sqrt{3}}{42}$ |
| | $\frac{13\sqrt{3}}{84}$ | $\frac{13\sqrt{3}}{84}$ | $\frac{13\sqrt{3}}{84}$ | $\frac{13\sqrt{3}}{84}$ | | | | | | |
| $Q_{2,1}^{(E_g)}$ | $\frac{5}{28}$ | $\frac{5}{28}$ | $\frac{5}{28}$ | $\frac{5}{28}$ | $-\frac{2}{7}$ | $-\frac{2}{7}$ | $-\frac{2}{7}$ | $-\frac{2}{7}$ | $\frac{3}{28}$ | $\frac{3}{28}$ |

continued ...

Table 16

[illegible]

continued ...

