

SAMB for “D3”

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- Group: No. 18 $D_3 - 1$ 321 (321 setting) [trigonal]

- Generation condition
 - model type: **tight_binding**
 - time-reversal type: **electric**
 - irrep: [A1]
 - **spinful**

- Kets: dimension = 48

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	$(p_z, \downarrow)@A_1$				

- Sites in (primitive) unit cell:

Table 2: Site-clusters.

site	position	mapping
S ₁ A ₁	$\begin{pmatrix} 1 & 0 & 1 \end{pmatrix}$	[1]
A ₂	$\begin{pmatrix} 1 & 0 & -1 \end{pmatrix}$	[2]
A ₃	$\begin{pmatrix} -1 & -1 & -1 \end{pmatrix}$	[3]
A ₄	$\begin{pmatrix} 0 & 1 & -1 \end{pmatrix}$	[4]

continued ...

Table 2

site	position	mapping
A ₅	$\begin{pmatrix} 0 & 1 & 1 \end{pmatrix}$	[5]
A ₆	$\begin{pmatrix} -1 & -1 & 1 \end{pmatrix}$	[6]

- Bonds in (primitive) unit cell:

Table 3: Bond-clusters.

	bond	tail	head	n	#	$\mathbf{b@c}$	mapping
B ₁	b ₁	A ₁	A ₅	1	1	$\begin{pmatrix} -1 & 1 & 0 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 1 \end{pmatrix}$	[1]
	b ₂	A ₂	A ₃	1	1	$\begin{pmatrix} -2 & -1 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & -\frac{1}{2} & -1 \end{pmatrix}$	[2]
	b ₃	A ₃	A ₄	1	1	$\begin{pmatrix} 1 & 2 & 0 \end{pmatrix} @ \begin{pmatrix} -\frac{1}{2} & 0 & -1 \end{pmatrix}$	[3]
	b ₄	A ₂	A ₄	1	1	$\begin{pmatrix} -1 & 1 & 0 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & -1 \end{pmatrix}$	[-4]
	b ₅	A ₅	A ₆	1	1	$\begin{pmatrix} -1 & -2 & 0 \end{pmatrix} @ \begin{pmatrix} -\frac{1}{2} & 0 & 1 \end{pmatrix}$	[5]
	b ₆	A ₁	A ₆	1	1	$\begin{pmatrix} -2 & -1 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & -\frac{1}{2} & 1 \end{pmatrix}$	[-6]
B ₂	b ₇	A ₁	A ₂	2	1	$\begin{pmatrix} 0 & 0 & -2 \end{pmatrix} @ \begin{pmatrix} 1 & 0 & 0 \end{pmatrix}$	[1,-2]
	b ₈	A ₃	A ₆	2	1	$\begin{pmatrix} 0 & 0 & 2 \end{pmatrix} @ \begin{pmatrix} -1 & -1 & 0 \end{pmatrix}$	[3,-6]
	b ₉	A ₄	A ₅	2	1	$\begin{pmatrix} 0 & 0 & 2 \end{pmatrix} @ \begin{pmatrix} 0 & 1 & 0 \end{pmatrix}$	[4,-5]

- SAMB:

$$\boxed{\text{No. 1}} \quad \hat{Q}_0^{(A_1)} [M_1, S_1]$$

$$\hat{Z}_1 = \mathbb{X}_1[Q_0^{(a,A_1)}] \otimes \mathbb{U}_1[Q_0^{(s,A_1)}]$$

$$\boxed{\text{No. 2}} \quad \hat{Q}_0^{(A_1)} [M_2, S_1]$$

$$\hat{Z}_2 = \frac{\sqrt{3}\mathbb{X}_5[Q_1^{(a,A_2)}] \otimes \mathbb{U}_2[Q_1^{(s,A_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[Q_{1,0}^{(a,E)}] \otimes \mathbb{U}_3[Q_{1,0}^{(s,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[Q_{1,1}^{(a,E)}] \otimes \mathbb{U}_4[Q_{1,1}^{(s,E)}]}{3}$$

$$\boxed{\text{No. 3}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_2, \text{S}_1]$$

$$\hat{\mathbb{Z}}_3 = \frac{\sqrt{6}\mathbb{X}_5[\mathbb{Q}_1^{(a,A_2)}] \otimes \mathbb{U}_2[\mathbb{Q}_1^{(s,A_2)}]}{3} - \frac{\sqrt{6}\mathbb{X}_6[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_7[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{6}$$

$$\boxed{\text{No. 4}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_2, \text{S}_1]$$

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

$$\boxed{\text{No. 5}} \quad \hat{\mathbb{Q}}_0^{(A_1)} (1, 0) [\text{M}_2, \text{S}_1]$$

$$\hat{\mathbb{Z}}_5 = \frac{\sqrt{3}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_2[\mathbb{Q}_1^{(s,A_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{3}$$

$$\boxed{\text{No. 6}} \quad \hat{\mathbb{Q}}_2^{(A_1)} (1, 0) [\text{M}_2, \text{S}_1]$$

$$\hat{\mathbb{Z}}_6 = -\frac{\sqrt{6}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{6} + \frac{\sqrt{6}\mathbb{X}_8[\mathbb{Q}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_2[\mathbb{Q}_1^{(s,A_2)}]}{3} - \frac{\sqrt{6}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{6}$$

$$\boxed{\text{No. 7}} \quad \hat{\mathbb{G}}_2^{(A_1)} (1, 0) [\text{M}_2, \text{S}_1]$$

$$\hat{\mathbb{Z}}_7 = \frac{\sqrt{2}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s,E,1)}]}{2}$$

$$\boxed{\text{No. 8}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_8 = \mathbb{X}_{17}[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}]$$

$$\boxed{\text{No. 9}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_9 = \mathbb{X}_{18}[\mathbb{Q}_2^{(a,A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}]$$

$$\boxed{\text{No. 10}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{10} = -\frac{\sqrt{2}\mathbb{X}_{21}[\mathbb{Q}_{2,0}^{(a,E,1)}] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{22}[\mathbb{Q}_{2,1}^{(a,E,1)}] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{2}$$

$$\boxed{\text{No. 11}} \quad \hat{\mathbb{Q}}_3^{(A_1)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{11} = \frac{\sqrt{2}\mathbb{X}_{23}[\mathbb{Q}_{2,0}^{(a,E,2)}] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{24}[\mathbb{Q}_{2,1}^{(a,E,2)}] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{2}$$

$$\boxed{\text{No. 12}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{12} = \frac{\sqrt{2}\mathbb{X}_{21}[\mathbb{Q}_{2,0}^{(a,E,1)}] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{22}[\mathbb{Q}_{2,1}^{(a,E,1)}] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s,E,1)}]}{2}$$

$$\boxed{\text{No. 13}} \quad \hat{\mathbb{G}}_3^{(A_1)} [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{13} = \frac{\sqrt{2}\mathbb{X}_{23}[\mathbb{Q}_{2,0}^{(a,E,2)}] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{24}[\mathbb{Q}_{2,1}^{(a,E,2)}] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s,E,1)}]}{2}$$

$$\boxed{\text{No. 14}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{14} = \mathbb{X}_{19}[\mathbb{Q}_0^{(a,A_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}]$$

$$\boxed{\text{No. 15}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{15} = \mathbb{X}_{20}[\mathbb{Q}_2^{(a,A_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}]$$

$$\boxed{\text{No. 16}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{16} = -\frac{\sqrt{2}\mathbb{X}_{25}[\mathbb{Q}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{26}[\mathbb{Q}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{2}$$

$$\boxed{\text{No. 17}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{17} = \frac{\sqrt{2}\mathbb{X}_{27}[\mathbb{Q}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{28}[\mathbb{Q}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{2}$$

$$\boxed{\text{No. 18}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, -1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{18} = \frac{\sqrt{2}\mathbb{X}_{25}[\mathbb{Q}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{26}[\mathbb{Q}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s,E,1)}]}{2}$$

$$\boxed{\text{No. 19}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{19} = \frac{\sqrt{2}\mathbb{X}_{27}[\mathbb{Q}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{28}[\mathbb{Q}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s,E,1)}]}{2}$$

$$\boxed{\text{No. 20}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 0) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{20} = -\frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{52}[\mathbb{G}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_2[\mathbb{Q}_1^{(s,A_2)}]}{3}$$

$$\boxed{\text{No. 21}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 0) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{21} = \frac{\sqrt{6}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_4[\mathbb{Q}_{1,1}^{(s,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_3[\mathbb{Q}_{1,0}^{(s,E)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{52}[\mathbb{G}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_2[\mathbb{Q}_1^{(s,A_2)}]}{3}$$

$$\boxed{\text{No. 22}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, 0) [\text{M}_3, \text{S}_1]$$

$$\hat{\mathbb{Z}}_{22} = -\frac{\sqrt{2}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_6[\mathbb{Q}_{2,1}^{(s,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_5[\mathbb{Q}_{2,0}^{(s,E,1)}]}{2}$$

$$\boxed{\text{No. 23}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{23} = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_7[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 24}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{24} = \frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_1^{(a,A_2)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 25}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{25} = \frac{\sqrt{6}\mathbb{X}_2[\mathbb{M}_1^{(a,A_2)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 26}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{26} = -\frac{\sqrt{2}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 27}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{27} = \frac{\sqrt{3}\mathbb{X}_5[\mathbb{Q}_1^{(a,A_2)}] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 28}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{28} = \frac{\sqrt{6}\mathbb{X}_5[\mathbb{Q}_1^{(a,A_2)}] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} - \frac{\sqrt{6}\mathbb{X}_6[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_7[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 29}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{29} = \frac{\sqrt{2}\mathbb{X}_6[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_7[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 30}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 0) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{30} = \frac{\sqrt{3}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 31}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, 0) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{31} = -\frac{\sqrt{6}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{6} + \frac{\sqrt{6}\mathbb{X}_8[\mathbb{Q}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} - \frac{\sqrt{6}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 32}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 0) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{32} = \frac{\sqrt{2}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 33}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{33} = \mathbb{X}_{16}[\mathbb{M}_2^{(a,A_1)}(1, -1)] \otimes \mathbb{U}_{13}[\mathbb{T}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 34}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{34} = \frac{\sqrt{2}\mathbb{X}_{11}[\mathbb{M}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{12}[\mathbb{M}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 35}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{35} = -\frac{\sqrt{2}\mathbb{X}_{13}[\mathbb{M}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{14}[\mathbb{M}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 36}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{36} = -\frac{\sqrt{2}\mathbb{X}_{11}[\mathbb{M}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{12}[\mathbb{M}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 37}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{37} = -\frac{\sqrt{2}\mathbb{X}_{13}[\mathbb{M}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{14}[\mathbb{M}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 38}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 1) [\text{M}_2, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{38} = \mathbb{X}_{15}[\mathbb{M}_0^{(a,A_1)}(1, 1)] \otimes \mathbb{U}_{13}[\mathbb{T}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 39}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{39} = \frac{\sqrt{3}\mathbb{X}_{53}[\mathbb{Q}_1^{(a,A_2)}] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{54}[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{55}[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 40}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{40} = \frac{\sqrt{6}\mathbb{X}_{53}[\mathbb{Q}_1^{(a,A_2)}] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} - \frac{\sqrt{6}\mathbb{X}_{54}[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{55}[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 41}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{41} = \frac{\sqrt{2}\mathbb{X}_{54}[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{55}[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 42}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 0) [\text{M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{42} = \frac{\sqrt{3}\mathbb{X}_{56}[\mathbb{Q}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{57}[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{58}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 43}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, 0) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{43} = \frac{\sqrt{6}\mathbb{X}_{56}[\mathbb{Q}_1^{(a, A_2)}(1, 0)] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u, A_2)}]}{3} - \frac{\sqrt{6}\mathbb{X}_{57}[\mathbb{Q}_{1,0}^{(a, E)}(1, 0)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u, E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{58}[\mathbb{Q}_{1,1}^{(a, E)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u, E)}]}{6}$$

$$\boxed{\text{No. 44}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 0) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{44} = \frac{\sqrt{2}\mathbb{X}_{57}[\mathbb{Q}_{1,0}^{(a, E)}(1, 0)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u, E, 1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{58}[\mathbb{Q}_{1,1}^{(a, E)}(1, 0)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u, E, 1)}]}{2}$$

$$\boxed{\text{No. 45}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{45} = \mathbb{X}_{64}[\mathbb{M}_2^{(a, A_1)}(1, -1)] \otimes \mathbb{U}_{13}[\mathbb{T}_0^{(u, A_1)}]$$

$$\boxed{\text{No. 46}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{46} = \frac{\sqrt{2}\mathbb{X}_{59}[\mathbb{M}_{2,0}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u, E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{60}[\mathbb{M}_{2,1}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u, E)}]}{2}$$

$$\boxed{\text{No. 47}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{47} = -\frac{\sqrt{2}\mathbb{X}_{61}[\mathbb{M}_{2,0}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u, E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{62}[\mathbb{M}_{2,1}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u, E)}]}{2}$$

$$\boxed{\text{No. 48}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{48} = -\frac{\sqrt{2}\mathbb{X}_{59}[\mathbb{M}_{2,0}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u, E, 1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{60}[\mathbb{M}_{2,1}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u, E, 1)}]}{2}$$

$$\boxed{\text{No. 49}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{49} = -\frac{\sqrt{2}\mathbb{X}_{61}[\mathbb{M}_{2,0}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u, E, 1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{62}[\mathbb{M}_{2,1}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u, E, 1)}]}{2}$$

$$\boxed{\text{No. 50}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 1) \text{ [M}_4, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{50} = \mathbb{X}_{63}[\mathbb{M}_0^{(a, A_1)}(1, 1)] \otimes \mathbb{U}_{13}[\mathbb{T}_0^{(u, A_1)}]$$

$$\boxed{\text{No. 51}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{51} = \mathbb{X}_{17}[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_7[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 52}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{52} = \mathbb{X}_{18}[\mathbb{Q}_2^{(a,A_1)}] \otimes \mathbb{U}_7[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 53}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{53} = -\frac{\sqrt{2}\mathbb{X}_{21}[\mathbb{Q}_{2,0}^{(a,E,1)}] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{22}[\mathbb{Q}_{2,1}^{(a,E,1)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 54}} \quad \hat{\mathbb{Q}}_3^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{54} = \frac{\sqrt{2}\mathbb{X}_{23}[\mathbb{Q}_{2,0}^{(a,E,2)}] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{24}[\mathbb{Q}_{2,1}^{(a,E,2)}] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 55}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{55} = \frac{\sqrt{2}\mathbb{X}_{21}[\mathbb{Q}_{2,0}^{(a,E,1)}] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{22}[\mathbb{Q}_{2,1}^{(a,E,1)}] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 56}} \quad \hat{\mathbb{G}}_3^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{56} = \frac{\sqrt{2}\mathbb{X}_{23}[\mathbb{Q}_{2,0}^{(a,E,2)}] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{24}[\mathbb{Q}_{2,1}^{(a,E,2)}] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 57}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{57} = \mathbb{X}_{19}[\mathbb{Q}_0^{(a,A_1)}(1, 1)] \otimes \mathbb{U}_7[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 58}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{58} = \mathbb{X}_{20}[\mathbb{Q}_2^{(a,A_1)}(1, -1)] \otimes \mathbb{U}_7[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 59}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{59} = -\frac{\sqrt{2}\mathbb{X}_{25}[\mathbb{Q}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{26}[\mathbb{Q}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 60}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{60} = \frac{\sqrt{2}\mathbb{X}_{27}[\mathbb{Q}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{28}[\mathbb{Q}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 61}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{61} = \frac{\sqrt{2}\mathbb{X}_{25}[\mathbb{Q}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{26}[\mathbb{Q}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 62}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{62} = \frac{\sqrt{2}\mathbb{X}_{27}[\mathbb{Q}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{28}[\mathbb{Q}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 63}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{63} = -\frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{52}[\mathbb{G}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3}$$

$$\boxed{\text{No. 64}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{64} = \frac{\sqrt{6}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{10}[\mathbb{Q}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_9[\mathbb{Q}_{1,0}^{(u,E)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{52}[\mathbb{G}_1^{(a,A_2)}(1, 0)] \otimes \mathbb{U}_8[\mathbb{Q}_1^{(u,A_2)}]}{3}$$

$$\boxed{\text{No. 65}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{65} = -\frac{\sqrt{2}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{12}[\mathbb{Q}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{11}[\mathbb{Q}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 66}} \quad \hat{\mathbb{G}}_0^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{66} = \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{M}_1^{(a,A_2)}] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{32}[\mathbb{M}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{33}[\mathbb{M}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 67}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{67} = \frac{\sqrt{6}\mathbb{X}_{31}[\text{M}_1^{(a,A_2)}] \otimes \text{U}_{14}[\text{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_{32}[\text{M}_{1,0}^{(a,E)}] \otimes \text{U}_{16}[\text{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{33}[\text{M}_{1,1}^{(a,E)}] \otimes \text{U}_{15}[\text{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 68}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{68} = -\frac{\sqrt{2}\mathbb{X}_{32}[\text{M}_{1,0}^{(a,E)}] \otimes \text{U}_{18}[\text{T}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{33}[\text{M}_{1,1}^{(a,E)}] \otimes \text{U}_{17}[\text{T}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 69}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{69} = \frac{\sqrt{3}\mathbb{X}_{34}[\text{M}_1^{(a,A_2)}(1, 1)] \otimes \text{U}_{14}[\text{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{38}[\text{M}_{1,0}^{(a,E)}(1, 1)] \otimes \text{U}_{16}[\text{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{39}[\text{M}_{1,1}^{(a,E)}(1, 1)] \otimes \text{U}_{15}[\text{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 70}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{70} = \frac{\sqrt{6}\mathbb{X}_{34}[\text{M}_1^{(a,A_2)}(1, 1)] \otimes \text{U}_{14}[\text{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_{38}[\text{M}_{1,0}^{(a,E)}(1, 1)] \otimes \text{U}_{16}[\text{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{39}[\text{M}_{1,1}^{(a,E)}(1, 1)] \otimes \text{U}_{15}[\text{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 71}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, 1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{71} = -\frac{\sqrt{2}\mathbb{X}_{38}[\text{M}_{1,0}^{(a,E)}(1, 1)] \otimes \text{U}_{18}[\text{T}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{39}[\text{M}_{1,1}^{(a,E)}(1, 1)] \otimes \text{U}_{17}[\text{T}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 72}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{72} = \frac{\sqrt{3}\mathbb{X}_{35}[\text{M}_1^{(a,A_2)}(1, -1)] \otimes \text{U}_{14}[\text{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{40}[\text{M}_{1,0}^{(a,E)}(1, -1)] \otimes \text{U}_{16}[\text{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{41}[\text{M}_{1,1}^{(a,E)}(1, -1)] \otimes \text{U}_{15}[\text{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 73}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{73} = \frac{\sqrt{6}\mathbb{X}_{35}[\text{M}_1^{(a,A_2)}(1, -1)] \otimes \text{U}_{14}[\text{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_{40}[\text{M}_{1,0}^{(a,E)}(1, -1)] \otimes \text{U}_{16}[\text{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{41}[\text{M}_{1,1}^{(a,E)}(1, -1)] \otimes \text{U}_{15}[\text{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 74}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{74} = -\frac{\sqrt{2}\mathbb{X}_{40}[\text{M}_{1,0}^{(a,E)}(1, -1)] \otimes \text{U}_{18}[\text{T}_{2,1}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{41}[\text{M}_{1,1}^{(a,E)}(1, -1)] \otimes \text{U}_{17}[\text{T}_{2,0}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 75}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{75} = \mathbb{X}_{50}[\mathbb{M}_3^{(a, A_1)}(1, -1)] \otimes \mathbb{U}_{13}[\mathbb{T}_0^{(u, A_1)}]$$

$$\boxed{\text{No. 76}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{76} = \frac{\sqrt{21}\mathbb{X}_{36}[\mathbb{M}_3^{(a, A_2, 1)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u, A_2)}]}{7} - \frac{\sqrt{14}\mathbb{X}_{42}[\mathbb{M}_{3,0}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u, E)}]}{7} + \frac{\sqrt{14}\mathbb{X}_{43}[\mathbb{M}_{3,1}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u, E)}]}{7}$$

$$\boxed{\text{No. 77}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{77} = \frac{\sqrt{3}\mathbb{X}_{37}[\mathbb{M}_3^{(a, A_2, 2)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u, A_2)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{44}[\mathbb{M}_{3,0}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u, E)}]}{4} + \frac{\sqrt{2}\mathbb{X}_{45}[\mathbb{M}_{3,1}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u, E)}]}{4}$$

$$\boxed{\text{No. 78}} \quad \hat{\mathbb{G}}_4^{(A_1, 1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{78} = \frac{2\sqrt{7}\mathbb{X}_{36}[\mathbb{M}_3^{(a, A_2, 1)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u, A_2)}]}{7} + \frac{\sqrt{42}\mathbb{X}_{42}[\mathbb{M}_{3,0}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u, E)}]}{14} - \frac{\sqrt{42}\mathbb{X}_{43}[\mathbb{M}_{3,1}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u, E)}]}{14}$$

$$\boxed{\text{No. 79}} \quad \hat{\mathbb{G}}_4^{(A_1, 2)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{79} = \frac{\mathbb{X}_{37}[\mathbb{M}_3^{(a, A_2, 2)}(1, -1)] \otimes \mathbb{U}_{14}[\mathbb{T}_1^{(u, A_2)}]}{2} + \frac{\sqrt{6}\mathbb{X}_{44}[\mathbb{M}_{3,0}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u, E)}]}{4} - \frac{\sqrt{6}\mathbb{X}_{45}[\mathbb{M}_{3,1}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u, E)}]}{4}$$

$$\boxed{\text{No. 80}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{80} = -\frac{\sqrt{2}\mathbb{X}_{42}[\mathbb{M}_{3,0}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u, E, 1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{43}[\mathbb{M}_{3,1}^{(a, E, 1)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u, E, 1)}]}{2}$$

$$\boxed{\text{No. 81}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{81} = -\frac{\sqrt{2}\mathbb{X}_{44}[\mathbb{M}_{3,0}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u, E, 1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{45}[\mathbb{M}_{3,1}^{(a, E, 2)}(1, -1)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u, E, 1)}]}{2}$$

$$\boxed{\text{No. 82}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, 0) [\text{M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{82} = \mathbb{X}_{51}[\mathbb{T}_2^{(a, A_1)}(1, 0)] \otimes \mathbb{U}_{13}[\mathbb{T}_0^{(u, A_1)}]$$

$$\boxed{\text{No. 83}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 0) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{83} = -\frac{\sqrt{2}\mathbb{X}_{46}[\mathbb{T}_{2,0}^{(a,E,1)}(1, 0)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{47}[\mathbb{T}_{2,1}^{(a,E,1)}(1, 0)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 84}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, 0) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{84} = \frac{\sqrt{2}\mathbb{X}_{48}[\mathbb{T}_{2,0}^{(a,E,2)}(1, 0)] \otimes \mathbb{U}_{15}[\mathbb{T}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{49}[\mathbb{T}_{2,1}^{(a,E,2)}(1, 0)] \otimes \mathbb{U}_{16}[\mathbb{T}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 85}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 0) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{85} = \frac{\sqrt{2}\mathbb{X}_{46}[\mathbb{T}_{2,0}^{(a,E,1)}(1, 0)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{47}[\mathbb{T}_{2,1}^{(a,E,1)}(1, 0)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 86}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, 0) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{86} = \frac{\sqrt{2}\mathbb{X}_{48}[\mathbb{T}_{2,0}^{(a,E,2)}(1, 0)] \otimes \mathbb{U}_{17}[\mathbb{T}_{2,0}^{(u,E,1)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{49}[\mathbb{T}_{2,1}^{(a,E,2)}(1, 0)] \otimes \mathbb{U}_{18}[\mathbb{T}_{2,1}^{(u,E,1)}]}{2}$$

$$\boxed{\text{No. 87}} \quad \hat{\mathbb{Q}}_0^{(A_1)} \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{87} = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_{19}[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 88}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{88} = \frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_1^{(a,A_2)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 89}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{89} = \frac{\sqrt{6}\mathbb{X}_2[\mathbb{M}_1^{(a,A_2)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 90}} \quad \hat{\mathbb{Q}}_0^{(A_1)} \text{ [M}_2, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{90} = \frac{\sqrt{2}\mathbb{X}_6[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_7[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 91}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 0) [\mathbb{M}_2, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{91} = \frac{\sqrt{2}\mathbb{X}_{10}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_9[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 92}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\mathbb{M}_2, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{92} = \frac{\sqrt{2}\mathbb{X}_{11}[\mathbb{M}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{12}[\mathbb{M}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 93}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\mathbb{M}_2, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{93} = -\frac{\sqrt{2}\mathbb{X}_{13}[\mathbb{M}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{14}[\mathbb{M}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 94}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\mathbb{M}_4, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{94} = \frac{\sqrt{2}\mathbb{X}_{54}[\mathbb{Q}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{55}[\mathbb{Q}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 95}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 0) [\mathbb{M}_4, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{95} = \frac{\sqrt{2}\mathbb{X}_{57}[\mathbb{Q}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{58}[\mathbb{Q}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 96}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\mathbb{M}_4, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{96} = \frac{\sqrt{2}\mathbb{X}_{59}[\mathbb{M}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{60}[\mathbb{M}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 97}} \quad \hat{\mathbb{G}}_3^{(A_1)}(1, -1) [\mathbb{M}_4, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{97} = -\frac{\sqrt{2}\mathbb{X}_{61}[\mathbb{M}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{62}[\mathbb{M}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 98}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\mathbb{M}_3, \mathbb{B}_2]$$

$$\hat{\mathbb{Z}}_{98} = \mathbb{X}_{17}[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_{19}[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 99}} \quad \hat{\mathbb{Q}}_2^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{99} = \mathbb{X}_{18}[\mathbb{Q}_2^{(a,A_1)}] \otimes \mathbb{U}_{19}[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 100}} \quad \hat{\mathbb{G}}_2^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{100} = -\frac{\sqrt{2}\mathbb{X}_{21}[\mathbb{Q}_{2,0}^{(a,E,1)}] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{22}[\mathbb{Q}_{2,1}^{(a,E,1)}] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 101}} \quad \hat{\mathbb{Q}}_3^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{101} = \frac{\sqrt{2}\mathbb{X}_{23}[\mathbb{Q}_{2,0}^{(a,E,2)}] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{24}[\mathbb{Q}_{2,1}^{(a,E,2)}] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 102}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{102} = \mathbb{X}_{19}[\mathbb{Q}_0^{(a,A_1)}(1, 1)] \otimes \mathbb{U}_{19}[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 103}} \quad \hat{\mathbb{Q}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{103} = \mathbb{X}_{20}[\mathbb{Q}_2^{(a,A_1)}(1, -1)] \otimes \mathbb{U}_{19}[\mathbb{Q}_0^{(u,A_1)}]$$

$$\boxed{\text{No. 104}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{104} = -\frac{\sqrt{2}\mathbb{X}_{25}[\mathbb{Q}_{2,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{26}[\mathbb{Q}_{2,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 105}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{105} = \frac{\sqrt{2}\mathbb{X}_{27}[\mathbb{Q}_{2,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{28}[\mathbb{Q}_{2,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 106}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 0) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{106} = -\frac{\sqrt{2}\mathbb{X}_{29}[\mathbb{G}_{1,0}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{21}[\mathbb{Q}_{1,1}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{30}[\mathbb{G}_{1,1}^{(a,E)}(1, 0)] \otimes \mathbb{U}_{20}[\mathbb{Q}_{1,0}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 107}} \quad \hat{\mathbb{G}}_0^{(A_1)} [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{107} = \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{M}_1^{(a,A_2)}] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{32}[\mathbb{M}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{33}[\mathbb{M}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 108}} \quad \hat{\mathbb{G}}_2^{(A_1)} [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{108} = \frac{\sqrt{6}\mathbb{X}_{31}[\mathbb{M}_1^{(a,A_2)}] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_{32}[\mathbb{M}_{1,0}^{(a,E)}] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{33}[\mathbb{M}_{1,1}^{(a,E)}] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 109}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 1) [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{109} = \frac{\sqrt{3}\mathbb{X}_{34}[\mathbb{M}_1^{(a,A_2)}(1, 1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{38}[\mathbb{M}_{1,0}^{(a,E)}(1, 1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{39}[\mathbb{M}_{1,1}^{(a,E)}(1, 1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 110}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 1) [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{110} = \frac{\sqrt{6}\mathbb{X}_{34}[\mathbb{M}_1^{(a,A_2)}(1, 1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_{38}[\mathbb{M}_{1,0}^{(a,E)}(1, 1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{39}[\mathbb{M}_{1,1}^{(a,E)}(1, 1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 111}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{111} = \frac{\sqrt{3}\mathbb{X}_{35}[\mathbb{M}_1^{(a,A_2)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{40}[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{41}[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{3}$$

$$\boxed{\text{No. 112}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{112} = \frac{\sqrt{6}\mathbb{X}_{35}[\mathbb{M}_1^{(a,A_2)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{3} + \frac{\sqrt{6}\mathbb{X}_{40}[\mathbb{M}_{1,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{41}[\mathbb{M}_{1,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{6}$$

$$\boxed{\text{No. 113}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, -1) [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{113} = \frac{\sqrt{21}\mathbb{X}_{36}[\mathbb{M}_3^{(a,A_2,1)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{7} - \frac{\sqrt{14}\mathbb{X}_{42}[\mathbb{M}_{3,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{7} + \frac{\sqrt{14}\mathbb{X}_{43}[\mathbb{M}_{3,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{7}$$

$$\boxed{\text{No. 114}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, -1) [M_3, B_2]$$

$$\hat{\mathbb{Z}}_{114} = \frac{\sqrt{3}\mathbb{X}_{37}[\mathbb{M}_3^{(a,A_2,2)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{44}[\mathbb{M}_{3,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{4} + \frac{\sqrt{2}\mathbb{X}_{45}[\mathbb{M}_{3,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{4}$$

$$\boxed{\text{No. 115}} \quad \hat{\mathbb{G}}_4^{(A_1,1)}(1, -1) \text{ [M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{115} = \frac{2\sqrt{7}\mathbb{X}_{36}[\mathbb{M}_3^{(a,A_2,1)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{7} + \frac{\sqrt{42}\mathbb{X}_{42}[\mathbb{M}_{3,0}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{14} - \frac{\sqrt{42}\mathbb{X}_{43}[\mathbb{M}_{3,1}^{(a,E,1)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{14}$$

$$\boxed{\text{No. 116}} \quad \hat{\mathbb{G}}_4^{(A_1,2)}(1, -1) \text{ [M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{116} = \frac{\mathbb{X}_{37}[\mathbb{M}_3^{(a,A_2,2)}(1, -1)] \otimes \mathbb{U}_{22}[\mathbb{T}_1^{(u,A_2)}]}{2} + \frac{\sqrt{6}\mathbb{X}_{44}[\mathbb{M}_{3,0}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{4} - \frac{\sqrt{6}\mathbb{X}_{45}[\mathbb{M}_{3,1}^{(a,E,2)}(1, -1)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{4}$$

$$\boxed{\text{No. 117}} \quad \hat{\mathbb{G}}_2^{(A_1)}(1, 0) \text{ [M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{117} = -\frac{\sqrt{2}\mathbb{X}_{46}[\mathbb{T}_{2,0}^{(a,E,1)}(1, 0)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{47}[\mathbb{T}_{2,1}^{(a,E,1)}(1, 0)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{2}$$

$$\boxed{\text{No. 118}} \quad \hat{\mathbb{Q}}_3^{(A_1)}(1, 0) \text{ [M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{118} = \frac{\sqrt{2}\mathbb{X}_{48}[\mathbb{T}_{2,0}^{(a,E,2)}(1, 0)] \otimes \mathbb{U}_{23}[\mathbb{T}_{1,0}^{(u,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{49}[\mathbb{T}_{2,1}^{(a,E,2)}(1, 0)] \otimes \mathbb{U}_{24}[\mathbb{T}_{1,1}^{(u,E)}]}{2}$$

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 , ↓)
M ₄	(p _x , ↑), (p _x , ↓), (p _y , ↑), (p _y , ↓), (p _z , ↑), (p _z , ↓)	(s, ↑), (s, ↓)

Table 5: Atomic SAMB.

symbol	type	group	form
\mathbb{X}_1	$\mathbb{Q}_0^{(a,A_1)}$	M_1	$\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \end{pmatrix}$
\mathbb{X}_2	$\mathbb{M}_1^{(a,A_2)}(1, -1)$	M_1	$\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & -\frac{\sqrt{2}}{2} \end{pmatrix}$
\mathbb{X}_3	$\mathbb{M}_{1,0}^{(a,E)}(1, -1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}i}{2} \\ -\frac{\sqrt{2}i}{2} & 0 \end{pmatrix}$
\mathbb{X}_4	$\mathbb{M}_{1,1}^{(a,E)}(1, -1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & 0 \end{pmatrix}$
\mathbb{X}_5	$\mathbb{Q}_1^{(a,A_2)}$	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}_6	$\mathbb{Q}_{1,0}^{(a,E)}$	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}_7	$\mathbb{Q}_{1,1}^{(a,E)}$	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}_8	$\mathbb{Q}_1^{(a,A_2)}(1, 0)$	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}_9	$\mathbb{Q}_{1,0}^{(a,E)}(1, 0)$	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}_{10}	$\mathbb{Q}_{1,1}^{(a,E)}(1, 0)$	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}_{11}	$\mathbb{M}_{2,0}^{(a,E,1)}(1, -1)$	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}_{12}	$\mathbb{M}_{2,1}^{(a,E,1)}(1, -1)$	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}_{13}	$\mathbb{M}_{2,0}^{(a,E,2)}(1, -1)$	M_2	$\begin{pmatrix} 0 & -\frac{i}{2} & 0 & \frac{1}{2} & 0 & 0 \\ \frac{i}{2} & 0 & \frac{1}{2} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{14}	$\mathbb{M}_{2,1}^{(a,E,2)}(1, -1)$	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}_{15}	$\mathbb{M}_0^{(a,A_1)}(1, 1)$	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}_{16}	$\mathbb{M}_2^{(a,A_1)}(1, -1)$	M_2	$\begin{pmatrix} 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & \frac{\sqrt{3}}{3} & 0 \\ -\frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{3} \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{17}	$\mathbb{Q}_0^{(a,A_1)}$	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}_{18}	$\mathbb{Q}_2^{(a,A_1)}$	M_3	$\begin{pmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} \end{pmatrix}$
\mathbb{X}_{19}	$\mathbb{Q}_0^{(a,A_1)}(1,1)$	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}_{20}	$\mathbb{Q}_2^{(a,A_1)}(1,-1)$	M_3	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{21}	$\mathbb{Q}_{2,0}^{(a,E,1)}$	M_3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{22}	$\mathbb{Q}_{2,1}^{(a,E,1)}$	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}_{23}	$\mathbb{Q}_{2,0}^{(a,E,2)}$	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}_{24}	$\mathbb{Q}_{2,1}^{(a,E,2)}$	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}_{25}	$\mathbb{Q}_{2,0}^{(a,E,1)}(1, -1)$	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}_{26}	$\mathbb{Q}_{2,1}^{(a,E,1)}(1, -1)$	M_3	$\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{27}	$\mathbb{Q}_{2,0}^{(a,E,2)}(1,-1)$	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}_{28}	$\mathbb{Q}_{2,1}^{(a,E,2)}(1,-1)$	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}_{29}	$\mathbb{G}_{1,0}^{(a,E)}(1,0)$	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}_{30}	$\mathbb{G}_{1,1}^{(a,E)}(1,0)$	M_3	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{31}	$M_1^{(a,A_2)}$	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}_{32}	$\mathbb{M}_{1,0}^{(a,E)}$	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}_{33}	$\mathbb{M}_{1,1}^{(a,E)}$	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}_{34}	$\mathbb{M}_1^{(a,A_2)}(1,1)$	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}_{35}	$\mathbb{M}_1^{(a,A_2)}(1,-1)$	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}_{36}	$\mathbb{M}_3^{(a,A_2,1)}(1,-1)$	M_3	$\begin{pmatrix} -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{10} & \frac{\sqrt{5}}{5} & 0 \\ -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}}{5} \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{37}	$\mathbb{M}_3^{(a, A_2, 2)}(1, -1)$	M_3	$\begin{pmatrix} 0 & -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{38}	$\mathbb{M}_{1,0}^{(a, E)}(1, 1)$	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}_{39}	$\mathbb{M}_{1,1}^{(a, E)}(1, 1)$	M_3	$\begin{pmatrix} 0 & \frac{\sqrt{30}}{15} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{15} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}i}{30} & 0 \end{pmatrix}$
\mathbb{X}_{40}	$\mathbb{M}_{1,0}^{(a, E)}(1, -1)$	M_3	$\begin{pmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$
\mathbb{X}_{41}	$\mathbb{M}_{1,1}^{(a, E)}(1, -1)$	M_3	$\begin{pmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{42}	$\mathbb{M}_{3,0}^{(a,E,1)}(1,-1)$	M_3	$\begin{pmatrix} 0 & -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 \\ \frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{30}i}{20} & -\frac{\sqrt{30}}{15} & 0 \\ \frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & \frac{\sqrt{30}}{15} \\ 0 & 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & \frac{\sqrt{30}i}{15} \\ 0 & 0 & 0 & \frac{\sqrt{30}}{15} & -\frac{\sqrt{30}i}{15} & 0 \end{pmatrix}$
\mathbb{X}_{43}	$\mathbb{M}_{3,1}^{(a,E,1)}(1,-1)$	M_3	$\begin{pmatrix} 0 & -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{15} & 0 \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{15} \\ 0 & \frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{15} \\ 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & \frac{\sqrt{30}}{15} & 0 \end{pmatrix}$
\mathbb{X}_{44}	$\mathbb{M}_{3,0}^{(a,E,2)}(1,-1)$	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}_{45}	$\mathbb{M}_{3,1}^{(a,E,2)}(1,-1)$	M_3	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ 0 & \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{46}	$\mathbb{T}_{2,0}^{(a,E,1)}(1,0)$	M_3	$\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{47}	$\mathbb{T}_{2,1}^{(a,E,1)}(1,0)$	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}_{48}	$\mathbb{T}_{2,0}^{(a,E,2)}(1,0)$	M_3	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{49}	$\mathbb{T}_{2,1}^{(a,E,2)}(1,0)$	M_3	$\begin{pmatrix} -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{50}	$\mathbb{M}_3^{(a,A_1)}(1,-1)$	M_3	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{51}	$\mathbb{T}_2^{(a,A_1)}(1,0)$	M_3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{52}	$\mathbb{G}_1^{(a,A_2)}(1,0)$	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}_{53}	$\mathbb{Q}_1^{(a,A_2)}$	M_4	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \end{pmatrix}$
\mathbb{X}_{54}	$\mathbb{Q}_{1,0}^{(a,E)}$	M_4	$\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$
\mathbb{X}_{55}	$\mathbb{Q}_{1,1}^{(a,E)}$	M_4	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \\ \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$
\mathbb{X}_{56}	$\mathbb{Q}_1^{(a,A_2)}(1,0)$	M_4	$\begin{pmatrix} 0 & \frac{1}{2} \\ -\frac{1}{2} & 0 \\ 0 & -\frac{i}{2} \\ -\frac{i}{2} & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{57}	$\mathbb{Q}_{1,0}^{(a,E)}(1,0)$	M_4	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \\ \frac{i}{2} & 0 \\ 0 & -\frac{i}{2} \\ 0 & -\frac{1}{2} \\ \frac{1}{2} & 0 \end{pmatrix}$
\mathbb{X}_{58}	$\mathbb{Q}_{1,1}^{(a,E)}(1,0)$	M_4	$\begin{pmatrix} -\frac{i}{2} & 0 \\ 0 & \frac{i}{2} \\ 0 & 0 \\ 0 & 0 \\ 0 & \frac{i}{2} \\ \frac{i}{2} & 0 \end{pmatrix}$
\mathbb{X}_{59}	$\mathbb{M}_{2,0}^{(a,E,1)}(1,-1)$	M_4	$\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ 0 & \frac{1}{2} \\ \frac{1}{2} & 0 \end{pmatrix}$
\mathbb{X}_{60}	$\mathbb{M}_{2,1}^{(a,E,1)}(1,-1)$	M_4	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \\ \frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \\ 0 & -\frac{i}{2} \\ \frac{i}{2} & 0 \end{pmatrix}$
\mathbb{X}_{61}	$\mathbb{M}_{2,0}^{(a,E,2)}(1,-1)$	M_4	$\begin{pmatrix} 0 & -\frac{i}{2} \\ \frac{i}{2} & 0 \\ 0 & \frac{1}{2} \\ \frac{1}{2} & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
\mathbb{X}_{62}	$\mathbb{M}_{2,1}^{(a,E,2)}(1,-1)$	M_4	$\begin{pmatrix} 0 & \frac{1}{2} \\ \frac{1}{2} & 0 \\ 0 & \frac{i}{2} \\ -\frac{i}{2} & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$
\mathbb{X}_{63}	$\mathbb{M}_0^{(a,A_1)}(1,1)$	M_4	$\begin{pmatrix} 0 & \frac{\sqrt{6}}{6} \\ \frac{\sqrt{6}}{6} & 0 \\ 0 & -\frac{\sqrt{6}i}{6} \\ \frac{\sqrt{6}i}{6} & 0 \\ \frac{\sqrt{6}}{6} & 0 \\ 0 & -\frac{\sqrt{6}}{6} \end{pmatrix}$
\mathbb{X}_{64}	$\mathbb{M}_2^{(a,A_1)}(1,-1)$	M_4	$\begin{pmatrix} 0 & -\frac{\sqrt{3}}{6} \\ -\frac{\sqrt{3}}{6} & 0 \\ 0 & \frac{\sqrt{3}i}{6} \\ -\frac{\sqrt{3}i}{6} & 0 \\ \frac{\sqrt{3}}{3} & 0 \\ 0 & -\frac{\sqrt{3}}{3} \end{pmatrix}$

Table 6: Uniform SAMB.

symbol	type	cluster	form
\mathbb{U}_1	$\mathbb{Q}_0^{(s,A_1)}$	S_1	$\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{pmatrix}$

continued ...

Table 6

symbol	type	cluster	form
\mathbb{U}_2	$\mathbb{Q}_1^{(s,A_2)}$	S_1	$\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{pmatrix}$
\mathbb{U}_3	$\mathbb{Q}_{1,0}^{(s,E)}$	S_1	$\begin{pmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} \end{pmatrix}$
\mathbb{U}_4	$\mathbb{Q}_{1,1}^{(s,E)}$	S_1	$\begin{pmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{3} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \end{pmatrix}$
\mathbb{U}_5	$\mathbb{Q}_{2,0}^{(s,E,1)}$	S_1	$\begin{pmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{3} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \end{pmatrix}$
\mathbb{U}_6	$\mathbb{Q}_{2,1}^{(s,E,1)}$	S_1	$\begin{pmatrix} -\frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \end{pmatrix}$

continued ...

Table 6

symbol	type	cluster	form
\mathbb{U}_7	$\mathbb{Q}_0^{(u,A_1)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} \\ 0 & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \end{pmatrix}$
\mathbb{U}_8	$\mathbb{Q}_1^{(u,A_2)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} \\ 0 & 0 & -\frac{\sqrt{3}}{6} & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \end{pmatrix}$
\mathbb{U}_9	$\mathbb{Q}_{1,0}^{(u,E)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} \\ 0 & 0 & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{10}	$\mathbb{Q}_{1,1}^{(u,E)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & -\frac{\sqrt{6}}{12} \\ 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{12} & 0 & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & \frac{\sqrt{6}}{12} & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{pmatrix}$
\mathbb{U}_{11}	$\mathbb{Q}_{2,0}^{(u,E,1)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} & -\frac{\sqrt{6}}{12} \\ 0 & 0 & -\frac{\sqrt{6}}{12} & -\frac{\sqrt{6}}{12} & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{12} & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ -\frac{\sqrt{6}}{12} & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	cluster	form
\mathbb{U}_{12}	$\mathbb{Q}_{2,1}^{(u,E,1)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} \\ 0 & 0 & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{13}	$\mathbb{T}_0^{(u,A_1)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \end{pmatrix}$
\mathbb{U}_{14}	$\mathbb{T}_1^{(u,A_2)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & -\frac{\sqrt{3}i}{6} & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \end{pmatrix}$
\mathbb{U}_{15}	$\mathbb{T}_{1,0}^{(u,E)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{16}	$\mathbb{T}_{1,1}^{(u,E)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} \\ 0 & 0 & \frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	cluster	form
\mathbb{U}_{17}	$\mathbb{T}_{2,0}^{(u,E,1)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & \frac{\sqrt{6}i}{12} & 0 & 0 \\ 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$
\mathbb{U}_{18}	$\mathbb{T}_{2,1}^{(u,E,1)}$	B_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{19}	$\mathbb{Q}_0^{(u,A_1)}$	B_2	$\begin{pmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{20}	$\mathbb{Q}_{1,0}^{(u,E)}$	B_2	$\begin{pmatrix} 0 & \frac{\sqrt{3}}{3} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}}{3} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{21}	$\mathbb{Q}_{1,1}^{(u,E)}$	B_2	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{2} \\ 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \\ 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	cluster	form
\mathbb{U}_{22}	$\mathbb{T}_1^{(u, A_2)}$	B_2	$\begin{pmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{23}	$\mathbb{T}_{1,0}^{(u, E)}$	B_2	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 & 0 \\ 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{U}_{24}	$\mathbb{T}_{1,1}^{(u, E)}$	B_2	$\begin{pmatrix} 0 & -\frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{pmatrix}$

Table 7: Polar harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{Q}_0^{(A_1)}$	0	A_1	—	—	1
2	$\mathbb{Q}_1^{(A_2)}$	1	A_2	—	—	z
3	$\mathbb{Q}_{1,0}^{(E)}$	1	E	—	0	x
4	$\mathbb{Q}_{1,1}^{(E)}$	1	E	—	1	y
5	$\mathbb{Q}_2^{(A_1)}$	2	A_1	—	—	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
6	$\mathbb{Q}_{2,0}^{(E,1)}$	2	E	1	0	$\sqrt{3}yz$

continued ...

Table 7

No.	symbol	rank	irrep.	mul.	comp.	form
7	$\mathbb{Q}_{2,1}^{(E,1)}$	2	E	1	1	$-\sqrt{3}xz$
8	$\mathbb{Q}_{2,0}^{(E,2)}$	2	E	2	0	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
9	$\mathbb{Q}_{2,1}^{(E,2)}$	2	E	2	1	$-\sqrt{3}xy$

Table 8: Axial harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{G}_0^{(A_1)}$	0	A_1	—	—	1
2	$\mathbb{G}_1^{(A_2)}$	1	A_2	—	—	Z
3	$\mathbb{G}_{1,0}^{(E)}$	1	E	—	0	$-Y$
4	$\mathbb{G}_{1,1}^{(E)}$	1	E	—	1	X
5	$\mathbb{G}_2^{(A_1)}$	2	A_1	—	—	$-\frac{X^2}{2} - \frac{Y^2}{2} + Z^2$
6	$\mathbb{G}_{2,0}^{(E,1)}$	2	E	1	0	$\sqrt{3}XZ$
7	$\mathbb{G}_{2,1}^{(E,1)}$	2	E	1	1	$\sqrt{3}YZ$
8	$\mathbb{G}_{2,0}^{(E,2)}$	2	E	2	0	$\sqrt{3}XY$
9	$\mathbb{G}_{2,1}^{(E,2)}$	2	E	2	1	$\frac{\sqrt{3}(X-Y)(X+Y)}{2}$
10	$\mathbb{G}_3^{(A_1)}$	3	A_1	—	—	$\frac{\sqrt{10}X(X^2-3Y^2)}{4}$
11	$\mathbb{G}_3^{(A_2,1)}$	3	A_2	1	—	$-\frac{Z(3X^2+3Y^2-2Z^2)}{4}$
12	$\mathbb{G}_3^{(A_2,2)}$	3	A_2	2	—	$\frac{\sqrt{10}Y(3X^2-Y^2)}{4}$
13	$\mathbb{G}_{3,0}^{(E,1)}$	3	E	1	0	$\frac{\sqrt{6}Y(X^2+Y^2-4Z^2)}{4}$
14	$\mathbb{G}_{3,1}^{(E,1)}$	3	E	1	1	$-\frac{\sqrt{6}X(X^2+Y^2-4Z^2)}{4}$
15	$\mathbb{G}_{3,0}^{(E,2)}$	3	E	2	0	$\frac{\sqrt{15}Z(X-Y)(X+Y)}{2}$
16	$\mathbb{G}_{3,1}^{(E,2)}$	3	E	2	1	$-\sqrt{15}XYZ$

-
- Group info.: Generator = 3_{001}^+ , 2_{110}

Table 9: Conjugacy class.

rep. SO	symmetry operations
1	1
2_{100}	$2_{100}, 2_{010}, 2_{110}$
3_{001}^+	$3_{001}^+, 3_{001}^-$

Table 10: Symmetry operations.

No.	SO	No.	SO	No.	SO	No.	SO	No.	SO
1	1	2	2_{100}	3	2_{010}	4	2_{110}	5	3_{001}^+
6	3_{001}^-								

Table 11: Character table.

	1	2_{100}	3_{001}^+
A_1	1	1	1
A_2	1	-1	1
E	2	0	-1

Table 12: Parity conversion.

\leftrightarrow	\leftrightarrow	\leftrightarrow
$A_1 (A_1)$	$A_2 (A_2)$	$E (E)$

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

	A_1	A_2	E
A_1	A_1	A_2	E
A_2		A_1	E
E			$A_1 + E$

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

A_1	A_2	E
$-$	$-$	A_2

Table 15: Virtual-cluster sites.

No.	position	No.	position	No.	position	No.	position
1	$\begin{pmatrix} 1 & -1 & 1 \end{pmatrix}$	2	$\begin{pmatrix} 2 & 1 & -1 \end{pmatrix}$	3	$\begin{pmatrix} -1 & -2 & -1 \end{pmatrix}$	4	$\begin{pmatrix} -1 & 1 & -1 \end{pmatrix}$
5	$\begin{pmatrix} 1 & 2 & 1 \end{pmatrix}$	6	$\begin{pmatrix} -2 & -1 & 1 \end{pmatrix}$				

Table 16: Virtual-cluster basis.

symbol	1	2	3	4	5	6
$\mathbb{Q}_0^{(A_1)}$	$\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$
$\mathbb{Q}_1^{(A_2)}$	$\frac{\sqrt{6}}{6}$	$-\frac{\sqrt{6}}{6}$	$-\frac{\sqrt{6}}{6}$	$-\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$	$\frac{\sqrt{6}}{6}$
$\mathbb{Q}_{1,0}^{(E)}$	$\frac{1}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	0	$-\frac{1}{2}$
$\mathbb{Q}_{1,1}^{(E)}$	$-\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{6}$	$-\frac{\sqrt{3}}{3}$	$\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{3}$	$-\frac{\sqrt{3}}{6}$

continued ...

Table 16

symbol	1	2	3	4	5	6
$Q_{2,0}^{(E,1)}$	$-\frac{\sqrt{3}}{6}$	$-\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{3}$	$-\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{3}$	$-\frac{\sqrt{3}}{6}$
$Q_{2,1}^{(E,1)}$	$-\frac{1}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	0	$\frac{1}{2}$