

SAMB for “01”

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- Group: No. 207 O^1 $P432$ [cubic]
 - Associated point group: No. 30 O 432 [cubic]
 - Generation condition
 - model type: **tight_binding**
 - time-reversal type: **electric**
 - irrep: [A1]
 - **spinful**
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- Unit cell:
 - $a = 1.0$, $b = 1.0$, $c = 1.0$, $\alpha = 90.0$, $\beta = 90.0$, $\gamma = 90.0$
- Lattice vectors:
 - $\mathbf{a}_1 = (1.0 \ 0 \ 0)$
 - $\mathbf{a}_2 = (0 \ 1.0 \ 0)$
 - $\mathbf{a}_3 = (0 \ 0 \ 1.0)$

Table 1: High-symmetry line: Γ -X.

symbol	position	symbol	position
Γ	$\begin{pmatrix} 0 & 0 & 0 \end{pmatrix}$	X	$\begin{pmatrix} \frac{1}{2} & 0 & 0 \end{pmatrix}$

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- Kets: dimension = 8

Table 2: 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 3: Site-clusters.

site	position	mapping
S_1 A_1	$\begin{pmatrix} 0 & 0 & 0 \end{pmatrix}$	$[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24]$

- Bonds in (primitive) unit cell:

Table 4: Bond-clusters.

	bond	tail	head	n	#	$\mathbf{b@c}$	mapping
B_1	b_1	A_1	A_1	1	1	$\begin{pmatrix} 0 & 0 & 1 \end{pmatrix} @ \begin{pmatrix} 0 & 0 & \frac{1}{2} \end{pmatrix}$	$[1, 2, -3, -4, -5, -8, 19, 22]$
	b_2	A_1	A_1	1	1	$\begin{pmatrix} 1 & 0 & 0 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & 0 & 0 \end{pmatrix}$	$[6, -9, 11, -12, 13, -14, 21, -24]$
	b_3	A_1	A_1	1	1	$\begin{pmatrix} 0 & 1 & 0 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{2} & 0 \end{pmatrix}$	$[7, -10, 15, 16, -17, -18, -20, 23]$
B_2	b_4	A_1	A_1	2	1	$\begin{pmatrix} 0 & 1 & 1 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{2} \end{pmatrix}$	$[1, -3, 7, -10]$
	b_5	A_1	A_1	2	1	$\begin{pmatrix} 0 & 1 & -1 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{2} \end{pmatrix}$	$[-2, 4, -20, 23]$
	b_6	A_1	A_1	2	1	$\begin{pmatrix} 1 & 0 & -1 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{2} \end{pmatrix}$	$[5, -12, 13, -19]$
	b_7	A_1	A_1	2	1	$\begin{pmatrix} 1 & -1 & 0 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$	$[6, -16, 18, -24]$
	b_8	A_1	A_1	2	1	$\begin{pmatrix} 1 & 0 & 1 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{2} \end{pmatrix}$	$[-8, 11, -14, 22]$
	b_9	A_1	A_1	2	1	$\begin{pmatrix} 1 & 1 & 0 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$	$[-9, 15, -17, 21]$

- SAMB:

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

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

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

$$\boxed{\text{No. 2}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\mathbb{M}_3, \mathbb{S}_1]$$

$$\hat{\mathbb{Z}}_2 = \mathbb{X}_8[\mathbb{Q}_0^{(a, A_1)}] \otimes \mathbb{Y}_1[\mathbb{Q}_0^{(s, A_1)}]$$

$$\hat{\mathbb{Z}}_2(\mathbf{k}) = \mathbb{X}_8[\mathbb{Q}_0^{(a, A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}]$$

$$\boxed{\text{No. 3}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 1) [\mathbb{M}_3, \mathbb{S}_1]$$

$$\hat{\mathbb{Z}}_3 = \mathbb{X}_9[\mathbb{Q}_0^{(a, A_1)}(1, 1)] \otimes \mathbb{Y}_1[\mathbb{Q}_0^{(s, A_1)}]$$

$$\hat{\mathbb{Z}}_3(\mathbf{k}) = \mathbb{X}_9[\mathbb{Q}_0^{(a, A_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}]$$

$$\boxed{\text{No. 4}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\mathbb{M}_1, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_4 = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_1)}] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(b, A_1)}]$$

$$\hat{\mathbb{Z}}_4(\mathbf{k}) = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_1[\mathbb{Q}_0^{(k, A_1)}]$$

$$\boxed{\text{No. 5}} \quad \hat{\mathbb{Q}}_4^{(A_1)}(1, -1) [\mathbb{M}_1, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_5 = -\frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_{1,0}^{(a, T_1)}(1, -1)] \otimes \mathbb{Y}_5[\mathbb{T}_{4,0}^{(b, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,1}^{(a, T_1)}(1, -1)] \otimes \mathbb{Y}_6[\mathbb{T}_{4,1}^{(b, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,2}^{(a, T_1)}(1, -1)] \otimes \mathbb{Y}_7[\mathbb{T}_{4,2}^{(b, T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_5(\mathbf{k}) = -\frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_{1,0}^{(a, T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_4[\mathbb{T}_{4,0}^{(k, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,1}^{(a, T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_5[\mathbb{T}_{4,1}^{(k, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,2}^{(a, T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_6[\mathbb{T}_{4,2}^{(k, T_1)}]}{3}$$

$$\boxed{\text{No. 6}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\mathbb{M}_3, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_6 = \mathbb{X}_8[\mathbb{Q}_0^{(a, A_1)}] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(b, A_1)}]$$

$$\hat{\mathbb{Z}}_6(\mathbf{k}) = \mathbb{X}_8[\mathbb{Q}_0^{(a, A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_1[\mathbb{Q}_0^{(k, A_1)}]$$

$$\boxed{\text{No. 7}} \quad \hat{\mathbb{Q}}_0^{(A_1)} (1, 1) [\mathbb{M}_3, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_7 = \mathbb{X}_9[\mathbb{Q}_0^{(a, A_1)} (1, 1)] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(b, A_1)}]$$

$$\hat{\mathbb{Z}}_7(\mathbf{k}) = \mathbb{X}_9[\mathbb{Q}_0^{(a, A_1)} (1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_1[\mathbb{Q}_0^{(k, A_1)}]$$

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

$$\hat{\mathbb{Z}}_8 = \frac{\sqrt{2}\mathbb{X}_{10}[\mathbb{Q}_{2,0}^{(a,E)}] \otimes \mathbb{Y}_3[\mathbb{Q}_{2,0}^{(b,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{11}[\mathbb{Q}_{2,1}^{(a,E)}] \otimes \mathbb{Y}_4[\mathbb{Q}_{2,1}^{(b,E)}]}{2}$$

$$\hat{\mathbb{Z}}_8(\mathbf{k}) = \frac{\sqrt{2}\mathbb{X}_{10}[\mathbb{Q}_{2,0}^{(a,E)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_2[\mathbb{Q}_{2,0}^{(k,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{11}[\mathbb{Q}_{2,1}^{(a,E)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_3[\mathbb{Q}_{2,1}^{(k,E)}]}{2}$$

$$\boxed{\text{No. 9}} \quad \hat{\mathbb{Q}}_0^{(A_1)} (1, -1) [\mathbb{M}_3, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_9 = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{Q}_{2,0}^{(a,E)} (1, -1)] \otimes \mathbb{Y}_3[\mathbb{Q}_{2,0}^{(b,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{Q}_{2,1}^{(a,E)} (1, -1)] \otimes \mathbb{Y}_4[\mathbb{Q}_{2,1}^{(b,E)}]}{2}$$

$$\hat{\mathbb{Z}}_9(\mathbf{k}) = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{Q}_{2,0}^{(a,E)} (1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_2[\mathbb{Q}_{2,0}^{(k,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{Q}_{2,1}^{(a,E)} (1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_3[\mathbb{Q}_{2,1}^{(k,E)}]}{2}$$

$$\boxed{\text{No. 10}} \quad \hat{\mathbb{Q}}_4^{(A_1)} [\mathbb{M}_3, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_{10} = -\frac{\sqrt{3}\mathbb{X}_{20}[\mathbb{M}_{1,0}^{(a, T_1)}] \otimes \mathbb{Y}_5[\mathbb{T}_{4,0}^{(b, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{1,1}^{(a, T_1)}] \otimes \mathbb{Y}_6[\mathbb{T}_{4,1}^{(b, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{1,2}^{(a, T_1)}] \otimes \mathbb{Y}_7[\mathbb{T}_{4,2}^{(b, T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{10}(\mathbf{k}) = -\frac{\sqrt{3}\mathbb{X}_{20}[\mathbb{M}_{1,0}^{(a, T_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_4[\mathbb{T}_{4,0}^{(k, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{1,1}^{(a, T_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_5[\mathbb{T}_{4,1}^{(k, T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{1,2}^{(a, T_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s, A_1)}] \otimes \mathbb{F}_6[\mathbb{T}_{4,2}^{(k, T_1)}]}{3}$$

$$\boxed{\text{No. 11}} \quad \hat{\mathbb{Q}}_4^{(A_1)}(1, 1) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{11} = -\frac{\sqrt{3}\mathbb{X}_{23}[\mathbb{M}_{1,0}^{(a,T_1)}(1, 1)] \otimes \mathbb{Y}_5[\mathbb{T}_{4,0}^{(b,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{24}[\mathbb{M}_{1,1}^{(a,T_1)}(1, 1)] \otimes \mathbb{Y}_6[\mathbb{T}_{4,1}^{(b,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{M}_{1,2}^{(a,T_1)}(1, 1)] \otimes \mathbb{Y}_7[\mathbb{T}_{4,2}^{(b,T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{11}(\mathbf{k}) = -\frac{\sqrt{3}\mathbb{X}_{23}[\mathbb{M}_{1,0}^{(a,T_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_4[\mathbb{T}_{4,0}^{(k,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{24}[\mathbb{M}_{1,1}^{(a,T_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_5[\mathbb{T}_{4,1}^{(k,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{M}_{1,2}^{(a,T_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_6[\mathbb{T}_{4,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 12}} \quad \hat{\mathbb{Q}}_4^{(A_1)}(1, -1) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{12} = -\frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{M}_{1,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_5[\mathbb{T}_{4,0}^{(b,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{27}[\mathbb{M}_{1,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_6[\mathbb{T}_{4,1}^{(b,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{28}[\mathbb{M}_{1,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_7[\mathbb{T}_{4,2}^{(b,T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{12}(\mathbf{k}) = -\frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{M}_{1,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_4[\mathbb{T}_{4,0}^{(k,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{27}[\mathbb{M}_{1,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_5[\mathbb{T}_{4,1}^{(k,T_1)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{28}[\mathbb{M}_{1,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_6[\mathbb{T}_{4,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 13}} \quad \hat{\mathbb{Q}}_4^{(A_1)}(1, -1) \text{ [M}_3, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{13} = \frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{M}_{3,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_5[\mathbb{T}_{4,0}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{M}_{3,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_6[\mathbb{T}_{4,1}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{M}_{3,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_7[\mathbb{T}_{4,2}^{(b,T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{13}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{M}_{3,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_4[\mathbb{T}_{4,0}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{M}_{3,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_5[\mathbb{T}_{4,1}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{M}_{3,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_6[\mathbb{T}_{4,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 14}} \quad \hat{\mathbb{Q}}_0^{(A_1)} \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{14} = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{Y}_8[\mathbb{Q}_0^{(b,A_1)}]$$

$$\hat{\mathbb{Z}}_{14}(\mathbf{k}) = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_7[\mathbb{Q}_0^{(k,A_1)}]$$

$$\boxed{\text{No. 15}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{15} = \frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_{1,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_{14}[\mathbb{T}_{1,0}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_{15}[\mathbb{T}_{1,1}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_{16}[\mathbb{T}_{1,2}^{(b,T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{15}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_2[\mathbb{M}_{1,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{13}[\mathbb{T}_{1,0}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_3[\mathbb{M}_{1,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{14}[\mathbb{T}_{1,1}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_4[\mathbb{M}_{1,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{15}[\mathbb{T}_{1,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 16}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) [\text{M}_2, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{16} = \frac{\sqrt{3}\mathbb{X}_5[\text{M}_{2,0}^{(a,T_2)}(1, -1)] \otimes \mathbb{Y}_{17}[\text{T}_{2,0}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[\text{M}_{2,1}^{(a,T_2)}(1, -1)] \otimes \mathbb{Y}_{18}[\text{T}_{2,1}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\text{M}_{2,2}^{(a,T_2)}(1, -1)] \otimes \mathbb{Y}_{19}[\text{T}_{2,2}^{(b,T_2)}]}{3}$$

$$\hat{\mathbb{Z}}_{16}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_5[\text{M}_{2,0}^{(a,T_2)}(1, -1)] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_{16}[\text{T}_{2,0}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_6[\text{M}_{2,1}^{(a,T_2)}(1, -1)] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_{17}[\text{T}_{2,1}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\text{M}_{2,2}^{(a,T_2)}(1, -1)] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_{18}[\text{T}_{2,2}^{(k,T_2)}]}{3}$$

$$\boxed{\text{No. 17}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{17} = \mathbb{X}_8[\text{Q}_0^{(a,A_1)}] \otimes \mathbb{Y}_8[\text{Q}_0^{(b,A_1)}]$$

$$\hat{\mathbb{Z}}_{17}(\mathbf{k}) = \mathbb{X}_8[\text{Q}_0^{(a,A_1)}] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_7[\text{Q}_0^{(k,A_1)}]$$

$$\boxed{\text{No. 18}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, 1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{18} = \mathbb{X}_9[\text{Q}_0^{(a,A_1)}(1, 1)] \otimes \mathbb{Y}_8[\text{Q}_0^{(b,A_1)}]$$

$$\hat{\mathbb{Z}}_{18}(\mathbf{k}) = \mathbb{X}_9[\text{Q}_0^{(a,A_1)}(1, 1)] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_7[\text{Q}_0^{(k,A_1)}]$$

$$\boxed{\text{No. 19}} \quad \hat{\mathbb{Q}}_0^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{19} = \frac{\sqrt{2}\mathbb{X}_{10}[\text{Q}_{2,0}^{(a,E)}] \otimes \mathbb{Y}_9[\text{Q}_{2,0}^{(b,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{11}[\text{Q}_{2,1}^{(a,E)}] \otimes \mathbb{Y}_{10}[\text{Q}_{2,1}^{(b,E)}]}{2}$$

$$\hat{\mathbb{Z}}_{19}(\mathbf{k}) = \frac{\sqrt{2}\mathbb{X}_{10}[\text{Q}_{2,0}^{(a,E)}] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_8[\text{Q}_{2,0}^{(k,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{11}[\text{Q}_{2,1}^{(a,E)}] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_9[\text{Q}_{2,1}^{(k,E)}]}{2}$$

$$\boxed{\text{No. 20}} \quad \hat{\mathbb{G}}_4^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{20} = \frac{\sqrt{3}\mathbb{X}_{12}[\text{Q}_{2,0}^{(a,T_2)}] \otimes \mathbb{Y}_{11}[\text{Q}_{3,0}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{13}[\text{Q}_{2,1}^{(a,T_2)}] \otimes \mathbb{Y}_{12}[\text{Q}_{3,1}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{14}[\text{Q}_{2,2}^{(a,T_2)}] \otimes \mathbb{Y}_{13}[\text{Q}_{3,2}^{(b,T_2)}]}{3}$$

$$\hat{\mathbb{Z}}_{20}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{12}[\text{Q}_{2,0}^{(a,T_2)}] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_{10}[\text{Q}_{3,0}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{13}[\text{Q}_{2,1}^{(a,T_2)}] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_{11}[\text{Q}_{3,1}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{14}[\text{Q}_{2,2}^{(a,T_2)}] \otimes \text{U}_1[\text{Q}_0^{(s,A_1)}] \otimes \text{F}_{12}[\text{Q}_{3,2}^{(k,T_2)}]}{3}$$

$$\boxed{\text{No. 21}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1, -1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{21} = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{Q}_{2,0}^{(a,E)}(1, -1)] \otimes \mathbb{Y}_9[\mathbb{Q}_{2,0}^{(b,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{Q}_{2,1}^{(a,E)}(1, -1)] \otimes \mathbb{Y}_{10}[\mathbb{Q}_{2,1}^{(b,E)}]}{2}$$

$$\hat{\mathbb{Z}}_{21}(\mathbf{k}) = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{Q}_{2,0}^{(a,E)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_8[\mathbb{Q}_{2,0}^{(k,E)}]}{2} + \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{Q}_{2,1}^{(a,E)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_9[\mathbb{Q}_{2,1}^{(k,E)}]}{2}$$

$$\boxed{\text{No. 22}} \quad \hat{\mathbb{G}}_4^{(A_1)}(1, -1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{22} = \frac{\sqrt{3}\mathbb{X}_{17}[\mathbb{Q}_{2,0}^{(a,T_2)}(1, -1)] \otimes \mathbb{Y}_{11}[\mathbb{Q}_{3,0}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{18}[\mathbb{Q}_{2,1}^{(a,T_2)}(1, -1)] \otimes \mathbb{Y}_{12}[\mathbb{Q}_{3,1}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{19}[\mathbb{Q}_{2,2}^{(a,T_2)}(1, -1)] \otimes \mathbb{Y}_{13}[\mathbb{Q}_{3,2}^{(b,T_2)}]}{3}$$

$$\begin{aligned} \hat{\mathbb{Z}}_{22}(\mathbf{k}) \\ = \frac{\sqrt{3}\mathbb{X}_{17}[\mathbb{Q}_{2,0}^{(a,T_2)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{10}[\mathbb{Q}_{3,0}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{18}[\mathbb{Q}_{2,1}^{(a,T_2)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{11}[\mathbb{Q}_{3,1}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{19}[\mathbb{Q}_{2,2}^{(a,T_2)}(1, -1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{12}[\mathbb{Q}_{3,2}^{(k,T_2)}]}{3} \end{aligned}$$

$$\boxed{\text{No. 23}} \quad \hat{\mathbb{G}}_0^{(A_1)} [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{23} = \frac{\sqrt{3}\mathbb{X}_{20}[\mathbb{M}_{1,0}^{(a,T_1)}] \otimes \mathbb{Y}_{14}[\mathbb{T}_{1,0}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{1,1}^{(a,T_1)}] \otimes \mathbb{Y}_{15}[\mathbb{T}_{1,1}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{1,2}^{(a,T_1)}] \otimes \mathbb{Y}_{16}[\mathbb{T}_{1,2}^{(b,T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{23}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{20}[\mathbb{M}_{1,0}^{(a,T_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{13}[\mathbb{T}_{1,0}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{1,1}^{(a,T_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{14}[\mathbb{T}_{1,1}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{1,2}^{(a,T_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{15}[\mathbb{T}_{1,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 24}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, 1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{24} = \frac{\sqrt{3}\mathbb{X}_{23}[\mathbb{M}_{1,0}^{(a,T_1)}(1, 1)] \otimes \mathbb{Y}_{14}[\mathbb{T}_{1,0}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{24}[\mathbb{M}_{1,1}^{(a,T_1)}(1, 1)] \otimes \mathbb{Y}_{15}[\mathbb{T}_{1,1}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{M}_{1,2}^{(a,T_1)}(1, 1)] \otimes \mathbb{Y}_{16}[\mathbb{T}_{1,2}^{(b,T_1)}]}{3}$$

$$\hat{\mathbb{Z}}_{24}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{23}[\mathbb{M}_{1,0}^{(a,T_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{13}[\mathbb{T}_{1,0}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{24}[\mathbb{M}_{1,1}^{(a,T_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{14}[\mathbb{T}_{1,1}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{M}_{1,2}^{(a,T_1)}(1, 1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{15}[\mathbb{T}_{1,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 25}} \quad \hat{\mathbb{G}}_0^{(A_1)}(1, -1) [\text{M}_3, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{25} = \frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{M}_{1,0}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_{14}[\mathbb{T}_{1,0}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{27}[\mathbb{M}_{1,1}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_{15}[\mathbb{T}_{1,1}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{28}[\mathbb{M}_{1,2}^{(a,T_1)}(1, -1)] \otimes \mathbb{Y}_{16}[\mathbb{T}_{1,2}^{(b,T_1)}]}{3}$$

$$\hat{Z}_{25}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{M}_{1,0}^{(a,T_1)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{13}[\mathbb{T}_{1,0}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{27}[\mathbb{M}_{1,1}^{(a,T_1)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{14}[\mathbb{T}_{1,1}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{28}[\mathbb{M}_{1,2}^{(a,T_1)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{15}[\mathbb{T}_{1,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 26}} \quad \hat{\mathbb{G}}_4^{(A_1)}(1,-1) [\mathbb{M}_3, \mathbb{B}_2]$$

$$\hat{Z}_{26} = \frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{M}_{3,0}^{(a,T_1)}(1,-1)] \otimes \mathbb{Y}_{14}[\mathbb{T}_{1,0}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{M}_{3,1}^{(a,T_1)}(1,-1)] \otimes \mathbb{Y}_{15}[\mathbb{T}_{1,1}^{(b,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{M}_{3,2}^{(a,T_1)}(1,-1)] \otimes \mathbb{Y}_{16}[\mathbb{T}_{1,2}^{(b,T_1)}]}{3}$$

$$\hat{Z}_{26}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{M}_{3,0}^{(a,T_1)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{13}[\mathbb{T}_{1,0}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{M}_{3,1}^{(a,T_1)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{14}[\mathbb{T}_{1,1}^{(k,T_1)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{31}[\mathbb{M}_{3,2}^{(a,T_1)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{15}[\mathbb{T}_{1,2}^{(k,T_1)}]}{3}$$

$$\boxed{\text{No. 27}} \quad \hat{\mathbb{Q}}_4^{(A_1)}(1,-1) [\mathbb{M}_3, \mathbb{B}_2]$$

$$\hat{Z}_{27} = -\frac{\sqrt{3}\mathbb{X}_{32}[\mathbb{M}_{3,0}^{(a,T_2)}(1,-1)] \otimes \mathbb{Y}_{17}[\mathbb{T}_{2,0}^{(b,T_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{33}[\mathbb{M}_{3,1}^{(a,T_2)}(1,-1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,1}^{(b,T_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{34}[\mathbb{M}_{3,2}^{(a,T_2)}(1,-1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,2}^{(b,T_2)}]}{3}$$

$$\hat{Z}_{27}(\mathbf{k}) = -\frac{\sqrt{3}\mathbb{X}_{32}[\mathbb{M}_{3,0}^{(a,T_2)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{16}[\mathbb{T}_{2,0}^{(k,T_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{33}[\mathbb{M}_{3,1}^{(a,T_2)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{17}[\mathbb{T}_{2,1}^{(k,T_2)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{34}[\mathbb{M}_{3,2}^{(a,T_2)}(1,-1)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{18}[\mathbb{T}_{2,2}^{(k,T_2)}]}{3}$$

$$\boxed{\text{No. 28}} \quad \hat{\mathbb{Q}}_0^{(A_1)}(1,0) [\mathbb{M}_3, \mathbb{B}_2]$$

$$\hat{Z}_{28} = \frac{\sqrt{3}\mathbb{X}_{35}[\mathbb{T}_{2,0}^{(a,T_2)}(1,0)] \otimes \mathbb{Y}_{17}[\mathbb{T}_{2,0}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{36}[\mathbb{T}_{2,1}^{(a,T_2)}(1,0)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,1}^{(b,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{37}[\mathbb{T}_{2,2}^{(a,T_2)}(1,0)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,2}^{(b,T_2)}]}{3}$$

$$\hat{Z}_{28}(\mathbf{k}) = \frac{\sqrt{3}\mathbb{X}_{35}[\mathbb{T}_{2,0}^{(a,T_2)}(1,0)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{16}[\mathbb{T}_{2,0}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{36}[\mathbb{T}_{2,1}^{(a,T_2)}(1,0)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{17}[\mathbb{T}_{2,1}^{(k,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{37}[\mathbb{T}_{2,2}^{(a,T_2)}(1,0)] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}] \otimes \mathbb{F}_{18}[\mathbb{T}_{2,2}^{(k,T_2)}]}{3}$$

Table 5: Atomic SAMB group.

group	bra	ket
M ₁	$(s, \uparrow), (s, \downarrow)$	$(s, \uparrow), (s, \downarrow)$
M ₂	$(s, \uparrow), (s, \downarrow)$	$(p_x, \uparrow), (p_x, \downarrow), (p_y, \uparrow), (p_y, \downarrow), (p_z, \uparrow), (p_z, \downarrow)$
M ₃	$(p_x, \uparrow), (p_x, \downarrow), (p_y, \uparrow), (p_y, \downarrow), (p_z, \uparrow), (p_z, \downarrow)$	$(p_x, \uparrow), (p_x, \downarrow), (p_y, \uparrow), (p_y, \downarrow), (p_z, \uparrow), (p_z, \downarrow)$

Table 6: 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	$\mathbb{M}_{1,0}^{(a, T_1)}(1, -1)$	M ₁	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & 0 \end{pmatrix}$
\mathbb{X}_3	$\mathbb{M}_{1,1}^{(a, T_1)}(1, -1)$	M ₁	$\begin{pmatrix} 0 & -\frac{\sqrt{2}i}{2} \\ \frac{\sqrt{2}i}{2} & 0 \end{pmatrix}$
\mathbb{X}_4	$\mathbb{M}_{1,2}^{(a, T_1)}(1, -1)$	M ₁	$\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & -\frac{\sqrt{2}}{2} \end{pmatrix}$
\mathbb{X}_5	$\mathbb{M}_{2,0}^{(a, T_2)}(1, -1)$	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}_6	$\mathbb{M}_{2,1}^{(a, T_2)}(1, -1)$	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}_7	$\mathbb{M}_{2,2}^{(a, T_2)}(1, -1)$	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}_8	$\mathbb{Q}_0^{(a, A_1)}$	M ₃	$\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_9	$\mathbb{Q}_0^{(a,A_1)}(1,1)$	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}_{10}	$\mathbb{Q}_{2,0}^{(a,E)}$	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}_{11}	$\mathbb{Q}_{2,1}^{(a,E)}$	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}_{12}	$\mathbb{Q}_{2,0}^{(a,T_2)}$	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}_{13}	$\mathbb{Q}_{2,1}^{(a,T_2)}$	M_3	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{14}	$\mathbb{Q}_{2,2}^{(a,T_2)}$	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}_{15}	$\mathbb{Q}_{2,0}^{(a,E)}(1,-1)$	M_3	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{16}	$\mathbb{Q}_{2,1}^{(a,E)}(1,-1)$	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}_{17}	$\mathbb{Q}_{2,0}^{(a,T_2)}(1,-1)$	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}_{18}	$\mathbb{Q}_{2,1}^{(a,T_2)}(1,-1)$	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 6

symbol	type	group	form
\mathbb{X}_{19}	$\mathbb{Q}_{2,2}^{(a,T_2)}(1, -1)$	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}_{20}	$M_{1,0}^{(a,T_1)}$	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}_{21}	$M_{1,1}^{(a,T_1)}$	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}_{22}	$M_{1,2}^{(a,T_1)}$	M_3	$\begin{pmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{23}	$M_{1,0}^{(a,T_1)}(1, 1)$	M_3	$\begin{pmatrix} 0 & \frac{\sqrt{30}}{15} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{15} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{30} & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{24}	$M_{1,1}^{(a,T_1)}(1,1)$	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}_{25}	$M_{1,2}^{(a,T_1)}(1,1)$	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}_{26}	$M_{1,0}^{(a,T_1)}(1,-1)$	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}_{27}	$M_{1,1}^{(a,T_1)}(1,-1)$	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}_{28}	$M_{1,2}^{(a,T_1)}(1,-1)$	M_3	$\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{29}	$\mathbb{M}_{3,0}^{(a,T_1)}(1,-1)$	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}_{30}	$\mathbb{M}_{3,1}^{(a,T_1)}(1,-1)$	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}_{31}	$\mathbb{M}_{3,2}^{(a,T_1)}(1,-1)$	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}_{32}	$\mathbb{M}_{3,0}^{(a,T_2)}(1,-1)$	M_3	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \end{pmatrix}$
\mathbb{X}_{33}	$\mathbb{M}_{3,1}^{(a,T_2)}(1,-1)$	M_3	$\begin{pmatrix} 0 & \frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{34}	$\mathbb{M}_{3,2}^{(a,T_2)}(1, -1)$	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}_{35}	$\mathbb{T}_{2,0}^{(a,T_2)}(1, 0)$	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}_{36}	$\mathbb{T}_{2,1}^{(a,T_2)}(1, 0)$	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}_{37}	$\mathbb{T}_{2,2}^{(a,T_2)}(1, 0)$	M_3	$\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$

Table 7: Cluster SAMB.

symbol	type	cluster	form
\mathbb{Y}_1	$\mathbb{Q}_0^{(s,A_1)}$	S_1	$\begin{pmatrix} 1 \end{pmatrix}$

continued ...

Table 7

symbol	type	cluster	form
\mathbb{Y}_2	$\mathbb{Q}_0^{(b,A_1)}$	B_1	$\begin{pmatrix} \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} \end{pmatrix}$
\mathbb{Y}_3	$\mathbb{Q}_{2,0}^{(b,E)}$	B_1	$\begin{pmatrix} -\frac{\sqrt{6}}{3} & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{6} \end{pmatrix}$
\mathbb{Y}_4	$\mathbb{Q}_{2,1}^{(b,E)}$	B_1	$\begin{pmatrix} 0 & -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix}$
\mathbb{Y}_5	$\mathbb{T}_{4,0}^{(b,T_1)}$	B_1	$\begin{pmatrix} 0 & i & 0 \end{pmatrix}$
\mathbb{Y}_6	$\mathbb{T}_{4,1}^{(b,T_1)}$	B_1	$\begin{pmatrix} 0 & 0 & i \end{pmatrix}$
\mathbb{Y}_7	$\mathbb{T}_{4,2}^{(b,T_1)}$	B_1	$\begin{pmatrix} i & 0 & 0 \end{pmatrix}$
\mathbb{Y}_8	$\mathbb{Q}_0^{(b,A_1)}$	B_2	$\begin{pmatrix} \frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{6} \end{pmatrix}$
\mathbb{Y}_9	$\mathbb{Q}_{2,0}^{(b,E)}$	B_2	$\begin{pmatrix} -\frac{\sqrt{3}}{6} & -\frac{\sqrt{3}}{6} & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{3} & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{3} \end{pmatrix}$
\mathbb{Y}_{10}	$\mathbb{Q}_{2,1}^{(b,E)}$	B_2	$\begin{pmatrix} \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} & 0 & -\frac{1}{2} & 0 \end{pmatrix}$
\mathbb{Y}_{11}	$\mathbb{Q}_{3,0}^{(b,T_2)}$	B_2	$\begin{pmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{Y}_{12}	$\mathbb{Q}_{3,1}^{(b,T_2)}$	B_2	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{2}}{2} & 0 & \frac{\sqrt{2}}{2} & 0 \end{pmatrix}$
\mathbb{Y}_{13}	$\mathbb{Q}_{3,2}^{(b,T_2)}$	B_2	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{2} & 0 & \frac{\sqrt{2}}{2} \end{pmatrix}$
\mathbb{Y}_{14}	$\mathbb{T}_{1,0}^{(b,T_1)}$	B_2	$\begin{pmatrix} 0 & 0 & \frac{i}{2} & \frac{i}{2} & \frac{i}{2} & \frac{i}{2} \end{pmatrix}$
\mathbb{Y}_{15}	$\mathbb{T}_{1,1}^{(b,T_1)}$	B_2	$\begin{pmatrix} \frac{i}{2} & \frac{i}{2} & 0 & -\frac{i}{2} & 0 & \frac{i}{2} \end{pmatrix}$
\mathbb{Y}_{16}	$\mathbb{T}_{1,2}^{(b,T_1)}$	B_2	$\begin{pmatrix} \frac{i}{2} & -\frac{i}{2} & -\frac{i}{2} & 0 & \frac{i}{2} & 0 \end{pmatrix}$
\mathbb{Y}_{17}	$\mathbb{T}_{2,0}^{(b,T_2)}$	B_2	$\begin{pmatrix} 0 & 0 & \frac{i}{2} & -\frac{i}{2} & \frac{i}{2} & -\frac{i}{2} \end{pmatrix}$
\mathbb{Y}_{18}	$\mathbb{T}_{2,1}^{(b,T_2)}$	B_2	$\begin{pmatrix} -\frac{i}{2} & -\frac{i}{2} & 0 & -\frac{i}{2} & 0 & \frac{i}{2} \end{pmatrix}$
\mathbb{Y}_{19}	$\mathbb{T}_{2,2}^{(b,T_2)}$	B_2	$\begin{pmatrix} \frac{i}{2} & -\frac{i}{2} & \frac{i}{2} & 0 & -\frac{i}{2} & 0 \end{pmatrix}$

Table 8: Uniform SAMB.

symbol	type	cluster	form
\mathbb{U}_1	$\mathbb{Q}_0^{(s,A_1)}$	S_1	$\begin{pmatrix} 1 \end{pmatrix}$

Table 9: Structure SAMB.

symbol	type	cluster	form
F ₁	$Q_0^{(k,A_1)}$	B ₁	$\frac{\sqrt{6}c_{001}}{3} + \frac{\sqrt{6}c_{002}}{3} + \frac{\sqrt{6}c_{003}}{3}$
F ₂	$Q_{2,0}^{(k,E)}$	B ₁	$-\frac{2\sqrt{3}c_{001}}{3} + \frac{\sqrt{3}c_{002}}{3} + \frac{\sqrt{3}c_{003}}{3}$
F ₃	$Q_{2,1}^{(k,E)}$	B ₁	$-c_{002} + c_{003}$
F ₄	$T_{4,0}^{(k,T_1)}$	B ₁	$\sqrt{2}s_{002}$
F ₅	$T_{4,1}^{(k,T_1)}$	B ₁	$\sqrt{2}s_{003}$
F ₆	$T_{4,2}^{(k,T_1)}$	B ₁	$\sqrt{2}s_{001}$
F ₇	$Q_0^{(k,A_1)}$	B ₂	$\frac{\sqrt{3}c_{004}}{3} + \frac{\sqrt{3}c_{005}}{3} + \frac{\sqrt{3}c_{006}}{3} + \frac{\sqrt{3}c_{007}}{3} + \frac{\sqrt{3}c_{008}}{3} + \frac{\sqrt{3}c_{009}}{3}$
F ₈	$Q_{2,0}^{(k,E)}$	B ₂	$-\frac{\sqrt{6}c_{004}}{6} - \frac{\sqrt{6}c_{005}}{6} - \frac{\sqrt{6}c_{006}}{6} + \frac{\sqrt{6}c_{007}}{3} - \frac{\sqrt{6}c_{008}}{6} + \frac{\sqrt{6}c_{009}}{3}$
F ₉	$Q_{2,1}^{(k,E)}$	B ₂	$\frac{\sqrt{2}c_{004}}{2} + \frac{\sqrt{2}c_{005}}{2} - \frac{\sqrt{2}c_{006}}{2} - \frac{\sqrt{2}c_{008}}{2}$
F ₁₀	$Q_{3,0}^{(k,T_2)}$	B ₂	$c_{004} - c_{005}$
F ₁₁	$Q_{3,1}^{(k,T_2)}$	B ₂	$-c_{006} + c_{008}$
F ₁₂	$Q_{3,2}^{(k,T_2)}$	B ₂	$-c_{007} + c_{009}$
F ₁₃	$T_{1,0}^{(k,T_1)}$	B ₂	$\frac{\sqrt{2}s_{006}}{2} + \frac{\sqrt{2}s_{007}}{2} + \frac{\sqrt{2}s_{008}}{2} + \frac{\sqrt{2}s_{009}}{2}$
F ₁₄	$T_{1,1}^{(k,T_1)}$	B ₂	$\frac{\sqrt{2}s_{004}}{2} + \frac{\sqrt{2}s_{005}}{2} - \frac{\sqrt{2}s_{007}}{2} + \frac{\sqrt{2}s_{009}}{2}$
F ₁₅	$T_{1,2}^{(k,T_1)}$	B ₂	$\frac{\sqrt{2}s_{004}}{2} - \frac{\sqrt{2}s_{005}}{2} - \frac{\sqrt{2}s_{006}}{2} + \frac{\sqrt{2}s_{008}}{2}$
F ₁₆	$T_{2,0}^{(k,T_2)}$	B ₂	$\frac{\sqrt{2}s_{006}}{2} - \frac{\sqrt{2}s_{007}}{2} + \frac{\sqrt{2}s_{008}}{2} - \frac{\sqrt{2}s_{009}}{2}$
F ₁₇	$T_{2,1}^{(k,T_2)}$	B ₂	$-\frac{\sqrt{2}s_{004}}{2} - \frac{\sqrt{2}s_{005}}{2} - \frac{\sqrt{2}s_{007}}{2} + \frac{\sqrt{2}s_{009}}{2}$
F ₁₈	$T_{2,2}^{(k,T_2)}$	B ₂	$\frac{\sqrt{2}s_{004}}{2} - \frac{\sqrt{2}s_{005}}{2} + \frac{\sqrt{2}s_{006}}{2} - \frac{\sqrt{2}s_{008}}{2}$

Table 10: Polar harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$Q_0^{(A_1)}$	0	A_1	—	—	1
2	$Q_{1,0}^{(T_1)}$	1	T_1	—	0	x
3	$Q_{1,1}^{(T_1)}$	1	T_1	—	1	y
4	$Q_{1,2}^{(T_1)}$	1	T_1	—	2	z

continued ...

Table 10

No.	symbol	rank	irrep.	mul.	comp.	form
5	$\mathbb{Q}_{2,0}^{(E)}$	2	E	—	0	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
6	$\mathbb{Q}_{2,1}^{(E)}$	2	E	—	1	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
7	$\mathbb{Q}_{2,0}^{(T_2)}$	2	T_2	—	0	$\sqrt{3}yz$
8	$\mathbb{Q}_{2,1}^{(T_2)}$	2	T_2	—	1	$\sqrt{3}xz$
9	$\mathbb{Q}_{2,2}^{(T_2)}$	2	T_2	—	2	$\sqrt{3}xy$
10	$\mathbb{Q}_{3,0}^{(T_2)}$	3	T_2	—	0	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
11	$\mathbb{Q}_{3,1}^{(T_2)}$	3	T_2	—	1	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$
12	$\mathbb{Q}_{3,2}^{(T_2)}$	3	T_2	—	2	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
13	$\mathbb{Q}_{4,0}^{(T_1)}$	4	T_1	—	0	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$
14	$\mathbb{Q}_{4,1}^{(T_1)}$	4	T_1	—	1	$-\frac{\sqrt{35}xz(x-z)(x+z)}{2}$
15	$\mathbb{Q}_{4,2}^{(T_1)}$	4	T_1	—	2	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$

Table 11: Axial harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{G}_{1,0}^{(T_1)}$	1	T_1	—	0	X
2	$\mathbb{G}_{1,1}^{(T_1)}$	1	T_1	—	1	Y
3	$\mathbb{G}_{1,2}^{(T_1)}$	1	T_1	—	2	Z
4	$\mathbb{G}_{2,0}^{(T_2)}$	2	T_2	—	0	$\sqrt{3}YZ$
5	$\mathbb{G}_{2,1}^{(T_2)}$	2	T_2	—	1	$\sqrt{3}XZ$
6	$\mathbb{G}_{2,2}^{(T_2)}$	2	T_2	—	2	$\sqrt{3}XY$
7	$\mathbb{G}_{3,0}^{(T_1)}$	3	T_1	—	0	$\frac{X(2X^2-3Y^2-3Z^2)}{2}$
8	$\mathbb{G}_{3,1}^{(T_1)}$	3	T_1	—	1	$-\frac{Y(3X^2-2Y^2+3Z^2)}{2}$
9	$\mathbb{G}_{3,2}^{(T_1)}$	3	T_1	—	2	$-\frac{Z(3X^2+3Y^2-2Z^2)}{2}$
10	$\mathbb{G}_{3,0}^{(T_2)}$	3	T_2	—	0	$\frac{\sqrt{15}X(Y-Z)(Y+Z)}{2}$
11	$\mathbb{G}_{3,1}^{(T_2)}$	3	T_2	—	1	$-\frac{\sqrt{15}Y(X-Z)(X+Z)}{2}$
12	$\mathbb{G}_{3,2}^{(T_2)}$	3	T_2	—	2	$\frac{\sqrt{15}Z(X-Y)(X+Y)}{2}$

- Group info.: Generator = $\{2_{001}|0\}$, $\{2_{010}|0\}$, $\{3_{111}^+|0\}$, $\{2_{110}|0\}$

Table 12: Conjugacy class (point-group part).

rep. SO	symmetry operations
$\{1 0\}$	$\{1 0\}$
$\{2_{001} 0\}$	$\{2_{001} 0\}$, $\{2_{100} 0\}$, $\{2_{010} 0\}$
$\{2_{110} 0\}$	$\{2_{110} 0\}$, $\{2_{101} 0\}$, $\{2_{011} 0\}$, $\{2_{1-10} 0\}$, $\{2_{-101} 0\}$, $\{2_{01-1} 0\}$
$\{3_{111}^+ 0\}$	$\{3_{111}^+ 0\}$, $\{3_{1-1-1}^+ 0\}$, $\{3_{-11-1}^+ 0\}$, $\{3_{-1-11}^+ 0\}$, $\{3_{-111}^- 0\}$, $\{3_{1-1-1}^- 0\}$, $\{3_{-11-1}^- 0\}$, $\{3_{-1-11}^- 0\}$
$\{4_{001}^+ 0\}$	$\{4_{001}^+ 0\}$, $\{4_{100}^+ 0\}$, $\{4_{010}^+ 0\}$, $\{4_{001}^- 0\}$, $\{4_{100}^- 0\}$, $\{4_{010}^- 0\}$

Table 13: Symmetry operations.

No.	SO	No.	SO	No.	SO	No.	SO	No.	SO
1	$\{1 0\}$	2	$\{2_{001} 0\}$	3	$\{2_{100} 0\}$	4	$\{2_{010} 0\}$	5	$\{2_{110} 0\}$
6	$\{2_{101} 0\}$	7	$\{2_{011} 0\}$	8	$\{2_{1-10} 0\}$	9	$\{2_{-101} 0\}$	10	$\{2_{01-1} 0\}$
11	$\{3_{111}^+ 0\}$	12	$\{3_{1-1-1}^+ 0\}$	13	$\{3_{-11-1}^+ 0\}$	14	$\{3_{-1-11}^+ 0\}$	15	$\{3_{-111}^- 0\}$
16	$\{3_{1-1-1}^- 0\}$	17	$\{3_{-11-1}^- 0\}$	18	$\{3_{-1-11}^- 0\}$	19	$\{4_{001}^+ 0\}$	20	$\{4_{100}^+ 0\}$
21	$\{4_{010}^+ 0\}$	22	$\{4_{001}^- 0\}$	23	$\{4_{100}^- 0\}$	24	$\{4_{010}^- 0\}$		

Table 14: Character table (point-group part).

	1	2_{001}	2_{110}	3_{111}^+	4_{001}^+
A_1	1	1	1	1	1
A_2	1	1	-1	1	-1
E	2	2	0	-1	0
T_1	3	-1	-1	0	1
T_2	3	-1	1	0	-1

Table 15: Parity conversion.

\leftrightarrow	\leftrightarrow	\leftrightarrow	\leftrightarrow	\leftrightarrow
$A_1 (A_1)$	$A_2 (A_2)$	$E (E)$	$T_1 (T_1)$	$T_2 (T_2)$

Table 16: Symmetric product, $[\Gamma \otimes \Gamma']_+$.

	A_1	A_2	E	T_1	T_2
A_1	A_1	A_2	E	T_1	T_2
A_2		A_1	E	T_2	T_1
E			$A_1 + E$	$T_1 + T_2$	$T_1 + T_2$
T_1				$A_1 + E + T_2$	$A_2 + E + T_1 + T_2$
T_2					$A_1 + E + T_2$

Table 17: Anti-symmetric product, $[\Gamma \otimes \Gamma']_-$.

A_1	A_2	E	T_1	T_2
$-$	$-$	A_2	T_1	T_1

Table 18: Virtual-cluster sites.

No.	position	No.	position	No.	position	No.	position
1	$\begin{pmatrix} 2 & 1 & 0 \end{pmatrix}$	2	$\begin{pmatrix} -2 & -1 & 0 \end{pmatrix}$	3	$\begin{pmatrix} 2 & -1 & 0 \end{pmatrix}$	4	$\begin{pmatrix} -2 & 1 & 0 \end{pmatrix}$
5	$\begin{pmatrix} 1 & 2 & 0 \end{pmatrix}$	6	$\begin{pmatrix} 0 & -1 & 2 \end{pmatrix}$	7	$\begin{pmatrix} -2 & 0 & 1 \end{pmatrix}$	8	$\begin{pmatrix} -1 & -2 & 0 \end{pmatrix}$
9	$\begin{pmatrix} 0 & -1 & -2 \end{pmatrix}$	10	$\begin{pmatrix} -2 & 0 & -1 \end{pmatrix}$	11	$\begin{pmatrix} 0 & 2 & 1 \end{pmatrix}$	12	$\begin{pmatrix} 0 & -2 & 1 \end{pmatrix}$
13	$\begin{pmatrix} 0 & -2 & -1 \end{pmatrix}$	14	$\begin{pmatrix} 0 & 2 & -1 \end{pmatrix}$	15	$\begin{pmatrix} 1 & 0 & 2 \end{pmatrix}$	16	$\begin{pmatrix} -1 & 0 & -2 \end{pmatrix}$

continued ...

Table 18

No.	position	No.	position	No.	position	No.	position
17	$\begin{pmatrix} -1 & 0 & 2 \end{pmatrix}$	18	$\begin{pmatrix} 1 & 0 & -2 \end{pmatrix}$	19	$\begin{pmatrix} -1 & 2 & 0 \end{pmatrix}$	20	$\begin{pmatrix} 2 & 0 & 1 \end{pmatrix}$
21	$\begin{pmatrix} 0 & 1 & -2 \end{pmatrix}$	22	$\begin{pmatrix} 1 & -2 & 0 \end{pmatrix}$	23	$\begin{pmatrix} 2 & 0 & -1 \end{pmatrix}$	24	$\begin{pmatrix} 0 & 1 & 2 \end{pmatrix}$

Table 19: Virtual-cluster basis.

symbol	1	2	3	4	5	6	7	8	9	10
$\mathbb{Q}_0^{(A_1)}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{1,0}^{(T_1)}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$
	0	0	0	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$
	0	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0						
$\mathbb{Q}_{1,1}^{(T_1)}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0
	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	0	0	0	0	$\frac{\sqrt{10}}{10}$	0
	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$						
$\mathbb{Q}_{1,2}^{(T_1)}$	0	0	0	0	0	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$
	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$
	$-\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$						
$\mathbb{Q}_{2,0}^{(E)}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$	$-\frac{5\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$
	$-\frac{\sqrt{39}}{78}$	$-\frac{\sqrt{39}}{78}$	$-\frac{\sqrt{39}}{78}$	$-\frac{\sqrt{39}}{78}$	$\frac{7\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$
	$\frac{7\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$	$\frac{7\sqrt{39}}{156}$						
$\mathbb{Q}_{2,1}^{(E)}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$-\frac{3\sqrt{13}}{52}$	$-\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{13}$	$-\frac{3\sqrt{13}}{52}$	$-\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{13}$
	$-\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{13}$	$\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$-\frac{3\sqrt{13}}{52}$	$\frac{\sqrt{13}}{13}$
	$-\frac{\sqrt{13}}{52}$	$-\frac{3\sqrt{13}}{52}$	$\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{52}$						
$\mathbb{Q}_{2,0}^{(T_2)}$	0	0	0	0	0	$-\frac{\sqrt{2}}{4}$	0	0	$\frac{\sqrt{2}}{4}$	0
	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	0	0	0	0	0	0

continued ...

Table 19

symbol	1	2	3	4	5	6	7	8	9	10
	$-\frac{\sqrt{2}}{4}$	0	0	$\frac{\sqrt{2}}{4}$						
$\mathbb{Q}_{2,1}^{(T_2)}$	0	0	0	0	0	0	$-\frac{\sqrt{2}}{4}$	0	0	$\frac{\sqrt{2}}{4}$
	0	0	0	0	$\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	0	$\frac{\sqrt{2}}{4}$
	0	0	$-\frac{\sqrt{2}}{4}$	0						
$\mathbb{Q}_{2,2}^{(T_2)}$	$\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	0	0	$\frac{\sqrt{2}}{4}$	0	0
	0	0	0	0	0	0	0	0	$-\frac{\sqrt{2}}{4}$	0
	0	$-\frac{\sqrt{2}}{4}$	0	0						
$\mathbb{Q}_{3,0}^{(T_1)}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$
	0	0	0	0	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$
	0	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0						
$\mathbb{Q}_{3,1}^{(T_1)}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0
	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	0	0	0	0	$\frac{\sqrt{10}}{20}$	0
	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$						
$\mathbb{Q}_{3,2}^{(T_1)}$	0	0	0	0	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$
	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$
	$-\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$						
$\mathbb{Q}_{3,0}^{(T_2)}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$
	0	0	0	0	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$
	0	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0						
$\mathbb{Q}_{3,1}^{(T_2)}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0
	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	0	0	0	0	$-\frac{\sqrt{10}}{20}$	0
	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$						
$\mathbb{Q}_{3,2}^{(T_2)}$	0	0	0	0	0	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$
	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$
	$\frac{\sqrt{10}}{20}$	0	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$						
$\mathbb{Q}_{4,0}^{(E)}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$-\frac{\sqrt{13}}{13}$	$\frac{3\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$-\frac{\sqrt{13}}{13}$
	$-\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{13}$	$-\frac{\sqrt{13}}{13}$	$\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$\frac{\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$-\frac{\sqrt{13}}{13}$
	$\frac{\sqrt{13}}{52}$	$\frac{3\sqrt{13}}{52}$	$-\frac{\sqrt{13}}{13}$	$\frac{\sqrt{13}}{52}$						
$\mathbb{Q}_{4,1}^{(E)}$	$\frac{5\sqrt{39}}{156}$	$\frac{5\sqrt{39}}{156}$	$\frac{5\sqrt{39}}{156}$	$\frac{5\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$	$-\frac{5\sqrt{39}}{156}$	$\frac{7\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$

continued ...

Table 19

symbol	1	2	3	4	5	6	7	8	9	10
	$\frac{\sqrt{39}}{78}$	$\frac{\sqrt{39}}{78}$	$\frac{\sqrt{39}}{78}$	$\frac{\sqrt{39}}{78}$	$-\frac{7\sqrt{39}}{156}$	$-\frac{7\sqrt{39}}{156}$	$-\frac{7\sqrt{39}}{156}$	$-\frac{7\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$
	$\frac{7\sqrt{39}}{156}$	$-\frac{5\sqrt{39}}{156}$	$-\frac{\sqrt{39}}{78}$	$\frac{7\sqrt{39}}{156}$						
$\mathbb{Q}_{4,0}^{(T_1)}$	0	0	0	0	0	$\frac{\sqrt{2}}{4}$	0	0	$-\frac{\sqrt{2}}{4}$	0
	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	0	0	0	0	0	0
	$\frac{\sqrt{2}}{4}$	0	0	$-\frac{\sqrt{2}}{4}$						
$\mathbb{Q}_{4,1}^{(T_1)}$	0	0	0	0	0	0	$\frac{\sqrt{2}}{4}$	0	0	$-\frac{\sqrt{2}}{4}$
	0	0	0	0	$\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	0	$-\frac{\sqrt{2}}{4}$
	0	0	$\frac{\sqrt{2}}{4}$	0						
$\mathbb{Q}_{4,2}^{(T_1)}$	$\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	$-\frac{\sqrt{2}}{4}$	0	0	$-\frac{\sqrt{2}}{4}$	0	0
	0	0	0	0	0	0	0	0	$\frac{\sqrt{2}}{4}$	0
	0	$\frac{\sqrt{2}}{4}$	0	0						
$\mathbb{Q}_{5,0}^{(T_2)}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$
	0	0	0	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$
	0	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	0						
$\mathbb{Q}_{5,1}^{(T_2)}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	0
	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	0	0	0	0	$-\frac{\sqrt{10}}{10}$	0
	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$						
$\mathbb{Q}_{5,2}^{(T_2)}$	0	0	0	0	0	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	0	$\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$
	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	0	$-\frac{\sqrt{10}}{20}$
	$\frac{\sqrt{10}}{10}$	0	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$						
$\mathbb{Q}_6^{(A_2)}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$
	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$						