

SAMB for “CeCoSi”

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- Group: No. 129 D_{4h}^7 $P4/nmm$ [tetragonal]
 - Associated point group: No. 15 D_{4h} $4/mmm$ [tetragonal]
 - Generation condition
 - model type: **tight_binding**
 - time-reversal type: **electric**
 - irrep: **[A1g]**
 - **spinful**
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- Unit cell:
 $a = 4.057$, $b = 4.057$, $c = 6.987$, $\alpha = 90.0$, $\beta = 90.0$, $\gamma = 90.0$
- Lattice vectors:
 $\mathbf{a}_1 = (4.057 \ 0 \ 0)$
 $\mathbf{a}_2 = (0 \ 4.057 \ 0)$
 $\mathbf{a}_3 = (0 \ 0 \ 6.987)$

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 = 36

Table 2: Hilbert space for full matrix.

No.	ket	No.	ket	No.	ket	No.	ket	No.	ket
1	$(p_x, \uparrow)@Ce_1$	2	$(p_x, \downarrow)@Ce_1$	3	$(p_y, \uparrow)@Ce_1$	4	$(p_y, \downarrow)@Ce_1$	5	$(p_z, \uparrow)@Ce_1$
6	$(p_z, \downarrow)@Ce_1$	7	$(p_x, \uparrow)@Ce_2$	8	$(p_x, \downarrow)@Ce_2$	9	$(p_y, \uparrow)@Ce_2$	10	$(p_y, \downarrow)@Ce_2$
11	$(p_z, \uparrow)@Ce_2$	12	$(p_z, \downarrow)@Ce_2$	13	$(p_x, \uparrow)@Co_1$	14	$(p_x, \downarrow)@Co_1$	15	$(p_y, \uparrow)@Co_1$
16	$(p_y, \downarrow)@Co_1$	17	$(p_z, \uparrow)@Co_1$	18	$(p_z, \downarrow)@Co_1$	19	$(p_x, \uparrow)@Co_2$	20	$(p_x, \downarrow)@Co_2$
21	$(p_y, \uparrow)@Co_2$	22	$(p_y, \downarrow)@Co_2$	23	$(p_z, \uparrow)@Co_2$	24	$(p_z, \downarrow)@Co_2$	25	$(p_x, \uparrow)@Si_1$
26	$(p_x, \downarrow)@Si_1$	27	$(p_y, \uparrow)@Si_1$	28	$(p_y, \downarrow)@Si_1$	29	$(p_z, \uparrow)@Si_1$	30	$(p_z, \downarrow)@Si_1$
31	$(p_x, \uparrow)@Si_2$	32	$(p_x, \downarrow)@Si_2$	33	$(p_y, \uparrow)@Si_2$	34	$(p_y, \downarrow)@Si_2$	35	$(p_z, \uparrow)@Si_2$
36	$(p_z, \downarrow)@Si_2$								

- Sites in (primitive) unit cell:

Table 3: Site-clusters.

	site	position	mapping
S ₁ [2c: 4mm]	Ce ₁	$\begin{pmatrix} \frac{1}{4} & \frac{1}{4} & 0.678 \end{pmatrix}$	[1,2,7,8,11,12,13,14]
	Ce ₂	$\begin{pmatrix} \frac{3}{4} & \frac{3}{4} & 0.322 \end{pmatrix}$	[3,4,5,6,9,10,15,16]
S ₂ [2a: -4m2]	Co ₁	$\begin{pmatrix} \frac{1}{4} & \frac{3}{4} & 0 \end{pmatrix}$	[1,2,5,6,11,12,15,16]
	Co ₂	$\begin{pmatrix} \frac{3}{4} & \frac{1}{4} & 0 \end{pmatrix}$	[3,4,7,8,9,10,13,14]
S ₃ [2c: 4mm]	Si ₁	$\begin{pmatrix} \frac{1}{4} & \frac{1}{4} & 0.178 \end{pmatrix}$	[1,2,7,8,11,12,13,14]
	Si ₂	$\begin{pmatrix} \frac{3}{4} & \frac{3}{4} & 0.822 \end{pmatrix}$	[3,4,5,6,9,10,15,16]

- Bonds in (primitive) unit cell:

Table 4: Bond-clusters.

	bond	tail	head	n	#	$b@c$	mapping
B ₁ [8i: .m.]	b ₁	Co ₁	Ce ₁	1	1	$\begin{pmatrix} 0 & -\frac{1}{2} & 0.322 \end{pmatrix} @ \begin{pmatrix} \frac{1}{4} & 0 & 0.839 \end{pmatrix}$	[1,11]
	b ₂	Co ₁	Ce ₁	1	1	$\begin{pmatrix} 0 & \frac{1}{2} & 0.322 \end{pmatrix} @ \begin{pmatrix} \frac{1}{4} & \frac{1}{2} & 0.839 \end{pmatrix}$	[2,12]
	b ₃	Co ₂	Ce ₂	1	1	$\begin{pmatrix} 0 & \frac{1}{2} & -0.322 \end{pmatrix} @ \begin{pmatrix} \frac{3}{4} & 0 & 0.161 \end{pmatrix}$	[3,9]
	b ₄	Co ₂	Ce ₂	1	1	$\begin{pmatrix} 0 & -\frac{1}{2} & -0.322 \end{pmatrix} @ \begin{pmatrix} \frac{3}{4} & \frac{1}{2} & 0.161 \end{pmatrix}$	[4,10]
	b ₅	Co ₁	Ce ₂	1	1	$\begin{pmatrix} -\frac{1}{2} & 0 & -0.322 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{3}{4} & 0.161 \end{pmatrix}$	[5,15]
	b ₆	Co ₁	Ce ₂	1	1	$\begin{pmatrix} \frac{1}{2} & 0 & -0.322 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{3}{4} & 0.161 \end{pmatrix}$	[6,16]
	b ₇	Co ₂	Ce ₁	1	1	$\begin{pmatrix} \frac{1}{2} & 0 & 0.322 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{4} & 0.839 \end{pmatrix}$	[7,13]
	b ₈	Co ₂	Ce ₁	1	1	$\begin{pmatrix} -\frac{1}{2} & 0 & 0.322 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{4} & 0.839 \end{pmatrix}$	[8,14]
B ₂ [8j: .m.]	b ₉	Si ₂	Ce ₁	1	1	$\begin{pmatrix} -\frac{1}{2} & -\frac{1}{2} & 0.144 \end{pmatrix} @ \begin{pmatrix} 0 & 0 & \frac{3}{4} \end{pmatrix}$	[1,14]
	b ₁₀	Si ₂	Ce ₁	1	1	$\begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0.144 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & \frac{3}{4} \end{pmatrix}$	[2,13]
	b ₁₁	Si ₁	Ce ₂	1	1	$\begin{pmatrix} -\frac{1}{2} & \frac{1}{2} & -0.144 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{4} \end{pmatrix}$	[3,15]
	b ₁₂	Si ₁	Ce ₂	1	1	$\begin{pmatrix} \frac{1}{2} & -\frac{1}{2} & -0.144 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{4} \end{pmatrix}$	[4,16]
	b ₁₃	Si ₁	Ce ₂	1	1	$\begin{pmatrix} -\frac{1}{2} & -\frac{1}{2} & -0.144 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{4} \end{pmatrix}$	[5,10]
	b ₁₄	Si ₁	Ce ₂	1	1	$\begin{pmatrix} \frac{1}{2} & \frac{1}{2} & -0.144 \end{pmatrix} @ \begin{pmatrix} 0 & 0 & \frac{1}{4} \end{pmatrix}$	[6,9]
	b ₁₅	Si ₂	Ce ₁	1	1	$\begin{pmatrix} \frac{1}{2} & -\frac{1}{2} & 0.144 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & 0 & \frac{3}{4} \end{pmatrix}$	[7,11]
	b ₁₆	Si ₂	Ce ₁	1	1	$\begin{pmatrix} -\frac{1}{2} & \frac{1}{2} & 0.144 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{2} & \frac{3}{4} \end{pmatrix}$	[8,12]
B ₃ [8i: .m.]	b ₁₇	Si ₁	Co ₁	1	1	$\begin{pmatrix} 0 & \frac{1}{2} & 0.178 \end{pmatrix} @ \begin{pmatrix} \frac{1}{4} & 0 & 0.089 \end{pmatrix}$	[1,11]
	b ₁₈	Si ₁	Co ₁	1	1	$\begin{pmatrix} 0 & -\frac{1}{2} & 0.178 \end{pmatrix} @ \begin{pmatrix} \frac{1}{4} & \frac{1}{2} & 0.089 \end{pmatrix}$	[2,12]
	b ₁₉	Si ₂	Co ₂	1	1	$\begin{pmatrix} 0 & -\frac{1}{2} & -0.178 \end{pmatrix} @ \begin{pmatrix} \frac{3}{4} & 0 & 0.911 \end{pmatrix}$	[3,9]
	b ₂₀	Si ₂	Co ₂	1	1	$\begin{pmatrix} 0 & \frac{1}{2} & -0.178 \end{pmatrix} @ \begin{pmatrix} \frac{3}{4} & \frac{1}{2} & 0.911 \end{pmatrix}$	[4,10]
	b ₂₁	Si ₂	Co ₁	1	1	$\begin{pmatrix} \frac{1}{2} & 0 & -0.178 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{3}{4} & 0.911 \end{pmatrix}$	[5,15]
	b ₂₂	Si ₂	Co ₁	1	1	$\begin{pmatrix} -\frac{1}{2} & 0 & -0.178 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{3}{4} & 0.911 \end{pmatrix}$	[6,16]
	b ₂₃	Si ₁	Co ₂	1	1	$\begin{pmatrix} -\frac{1}{2} & 0 & 0.178 \end{pmatrix} @ \begin{pmatrix} \frac{1}{2} & \frac{1}{4} & 0.089 \end{pmatrix}$	[7,13]
	b ₂₄	Si ₁	Co ₂	1	1	$\begin{pmatrix} \frac{1}{2} & 0 & 0.178 \end{pmatrix} @ \begin{pmatrix} 0 & \frac{1}{4} & 0.089 \end{pmatrix}$	[8,14]

- SAMB:

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

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

$$\boxed{\text{No. 2}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\mathbb{M}_1, \mathbb{S}_1]$$

$$\hat{\mathbb{Z}}_2 = \mathbb{X}_2[\mathbb{Q}_2^{(a, A_{1g})}] \otimes \mathbb{Y}_1[\mathbb{Q}_0^{(s, A_{1g})}]$$

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

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

$$\boxed{\text{No. 4}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\mathbb{M}_1, \mathbb{S}_1]$$

$$\hat{\mathbb{Z}}_4 = \mathbb{X}_4[\mathbb{Q}_2^{(a, A_{1g})}(1, -1)] \otimes \mathbb{Y}_1[\mathbb{Q}_0^{(s, A_{1g})}]$$

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

$$\hat{\mathbb{Z}}_5 = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_{1g})}] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(s, A_{1g})}]$$

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

$$\hat{\mathbb{Z}}_6 = \mathbb{X}_2[\mathbb{Q}_2^{(a, A_{1g})}] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(s, A_{1g})}]$$

$$\boxed{\text{No. 7}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1, 1) [\mathbb{M}_1, \mathbb{S}_2]$$

$$\hat{\mathbb{Z}}_7 = \mathbb{X}_3[\mathbb{Q}_0^{(a, A_{1g})}(1, 1)] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(s, A_{1g})}]$$

$$\boxed{\text{No. 8}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\mathbb{M}_1, \mathbb{S}_2]$$

$$\hat{\mathbb{Z}}_8 = \mathbb{X}_4[\mathbb{Q}_2^{(a, A_{1g})}(1, -1)] \otimes \mathbb{Y}_2[\mathbb{Q}_0^{(s, A_{1g})}]$$

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

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

$$\boxed{\text{No. 10}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\text{M}_1, \text{S}_3]$$

$$\hat{\mathbb{Z}}_{10} = \mathbb{X}_2[\mathbb{Q}_2^{(a, A_{1g})}] \otimes \mathbb{Y}_3[\mathbb{Q}_0^{(s, A_{1g})}]$$

$$\boxed{\text{No. 11}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} (1, 1) [\text{M}_1, \text{S}_3]$$

$$\hat{\mathbb{Z}}_{11} = \mathbb{X}_3[\mathbb{Q}_0^{(a, A_{1g})} (1, 1)] \otimes \mathbb{Y}_3[\mathbb{Q}_0^{(s, A_{1g})}]$$

$$\boxed{\text{No. 12}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} (1, -1) [\text{M}_1, \text{S}_3]$$

$$\hat{\mathbb{Z}}_{12} = \mathbb{X}_4[\mathbb{Q}_2^{(a, A_{1g})} (1, -1)] \otimes \mathbb{Y}_3[\mathbb{Q}_0^{(s, A_{1g})}]$$

$$\boxed{\text{No. 13}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{13} = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_{1g})}] \otimes \mathbb{Y}_4[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 14}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{14} = \mathbb{X}_2[\mathbb{Q}_2^{(a, A_{1g})}] \otimes \mathbb{Y}_4[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 15}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{15} = \frac{\sqrt{3}\mathbb{X}_5[\mathbb{Q}_2^{(a, B_{1g})}] \otimes \mathbb{Y}_5[\mathbb{Q}_2^{(b, B_{1g})}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{2,0}^{(a, E_g)}] \otimes \mathbb{Y}_6[\mathbb{Q}_{2,0}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_{2,1}^{(a, E_g)}] \otimes \mathbb{Y}_7[\mathbb{Q}_{2,1}^{(b, E_g)}]}{3}$$

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

$$\hat{\mathbb{Z}}_{16} = -\frac{\sqrt{6}\mathbb{X}_5[\mathbb{Q}_2^{(a, B_{1g})}] \otimes \mathbb{Y}_5[\mathbb{Q}_2^{(b, B_{1g})}]}{3} + \frac{\sqrt{6}\mathbb{X}_7[\mathbb{Q}_{2,0}^{(a, E_g)}] \otimes \mathbb{Y}_6[\mathbb{Q}_{2,0}^{(b, E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_8[\mathbb{Q}_{2,1}^{(a, E_g)}] \otimes \mathbb{Y}_7[\mathbb{Q}_{2,1}^{(b, E_g)}]}{6}$$

$$\boxed{\text{No. 17}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} (1, 1) [\text{M}_1, \text{B}_1]$$

$$\hat{\mathbb{Z}}_{17} = \mathbb{X}_3[\mathbb{Q}_0^{(a, A_{1g})} (1, 1)] \otimes \mathbb{Y}_4[\mathbb{Q}_0^{(b, A_{1g})}]$$

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

$$\hat{\mathbb{Z}}_{18} = \mathbb{X}_4[\mathbb{Q}_2^{(a, A_{1g})} (1, -1)] \otimes \mathbb{Y}_4[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 19}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1, -1) [\mathbb{M}_1, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_{19} = \frac{\sqrt{3}\mathbb{X}_{11}[\mathbb{Q}_{2,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_6[\mathbb{Q}_{2,0}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{12}[\mathbb{Q}_{2,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_7[\mathbb{Q}_{2,1}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_2^{(a,B_{1g})}(1, -1)] \otimes \mathbb{Y}_5[\mathbb{Q}_2^{(b,B_{1g})}]}{3}$$

$$\boxed{\text{No. 20}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\mathbb{M}_1, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_{20} = \frac{\sqrt{6}\mathbb{X}_{11}[\mathbb{Q}_{2,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_6[\mathbb{Q}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{12}[\mathbb{Q}_{2,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_7[\mathbb{Q}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{6}\mathbb{X}_9[\mathbb{Q}_2^{(a,B_{1g})}(1, -1)] \otimes \mathbb{Y}_5[\mathbb{Q}_2^{(b,B_{1g})}]}{3}$$

$$\boxed{\text{No. 21}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, 0) [\mathbb{M}_1, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_{21} = \frac{\sqrt{2}\mathbb{X}_{13}[\mathbb{G}_{1,0}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_6[\mathbb{Q}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{14}[\mathbb{G}_{1,1}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_7[\mathbb{Q}_{2,1}^{(b,E_g)}]}{2}$$

$$\boxed{\text{No. 22}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\mathbb{M}_1, \mathbb{B}_1]$$

$$\hat{\mathbb{Z}}_{22} = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{M}_{1,0}^{(a,E_g)}] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{M}_{1,1}^{(a,E_g)}] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

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

$$\hat{\mathbb{Z}}_{23} = \frac{\sqrt{2}\mathbb{X}_{17}[\mathbb{M}_{1,0}^{(a,E_g)}(1, 1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{18}[\mathbb{M}_{1,1}^{(a,E_g)}(1, 1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

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

$$\hat{\mathbb{Z}}_{24} = \frac{\sqrt{2}\mathbb{X}_{19}[\mathbb{M}_{1,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{20}[\mathbb{M}_{1,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

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

$$\begin{aligned} \hat{\mathbb{Z}}_{25} = & -\frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{3,0}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{3,1}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{5}\mathbb{X}_{23}[\mathbb{M}_{3,0}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} \\ & + \frac{\sqrt{5}\mathbb{X}_{24}[\mathbb{M}_{3,1}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{5}\mathbb{X}_{27}[\mathbb{M}_3^{(a,B_{1g})}(1, -1)] \otimes \mathbb{Y}_9[\mathbb{T}_2^{(b,B_{1g})}]}{3} \end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 26}} \quad \hat{\mathbb{Q}}_4^{(A_{1g},1)}(1,-1) [\text{M}_1, \text{B}_1] \\
\hat{\mathbb{Z}}_{26} &= \frac{\sqrt{195}\mathbb{X}_{21}[\text{M}_{3,0}^{(a,E_g,1)}(1,-1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{78} - \frac{\sqrt{195}\mathbb{X}_{22}[\text{M}_{3,1}^{(a,E_g,1)}(1,-1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{78} - \frac{\sqrt{13}\mathbb{X}_{23}[\text{M}_{3,0}^{(a,E_g,2)}(1,-1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} \\
&+ \frac{\sqrt{13}\mathbb{X}_{24}[\text{M}_{3,1}^{(a,E_g,2)}(1,-1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} + \frac{5\sqrt{13}\mathbb{X}_{27}[\text{M}_3^{(a,B_{1g})}(1,-1)] \otimes \mathbb{Y}_9[\mathbb{T}_2^{(b,B_{1g})}]}{39}
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 27}} \quad \hat{\mathbb{Q}}_4^{(A_{1g},2)}(1,-1) [\text{M}_1, \text{B}_1] \\
\hat{\mathbb{Z}}_{27} &= -\frac{\sqrt{65}\mathbb{X}_{21}[\text{M}_{3,0}^{(a,E_g,1)}(1,-1)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{13} + \frac{\sqrt{65}\mathbb{X}_{22}[\text{M}_{3,1}^{(a,E_g,1)}(1,-1)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{13} + \frac{\sqrt{39}\mathbb{X}_{27}[\text{M}_3^{(a,B_{1g})}(1,-1)] \otimes \mathbb{Y}_9[\mathbb{T}_2^{(b,B_{1g})}]}{13}
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 28}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1,0) [\text{M}_1, \text{B}_1] \\
\hat{\mathbb{Z}}_{28} &= \mathbb{X}_{31}[\mathbb{T}_2^{(a,A_{1g})}(1,0)] \otimes \mathbb{Y}_8[\mathbb{T}_0^{(b,A_{1g})}]
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 29}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1,0) [\text{M}_1, \text{B}_1] \\
\hat{\mathbb{Z}}_{29} &= \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{T}_{2,0}^{(a,E_g)}(1,0)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{T}_{2,1}^{(a,E_g)}(1,0)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{28}[\mathbb{T}_2^{(a,B_{1g})}(1,0)] \otimes \mathbb{Y}_9[\mathbb{T}_2^{(b,B_{1g})}]}{3}
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 30}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1,0) [\text{M}_1, \text{B}_1] \\
\hat{\mathbb{Z}}_{30} &= \frac{\sqrt{6}\mathbb{X}_{25}[\mathbb{T}_{2,0}^{(a,E_g)}(1,0)] \otimes \mathbb{Y}_{10}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{26}[\mathbb{T}_{2,1}^{(a,E_g)}(1,0)] \otimes \mathbb{Y}_{11}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{28}[\mathbb{T}_2^{(a,B_{1g})}(1,0)] \otimes \mathbb{Y}_9[\mathbb{T}_2^{(b,B_{1g})}]}{3}
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 31}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} [\text{M}_1, \text{B}_2] \\
\hat{\mathbb{Z}}_{31} &= \mathbb{X}_1[\mathbb{Q}_0^{(a,A_{1g})}] \otimes \mathbb{Y}_{12}[\mathbb{Q}_0^{(b,A_{1g})}]
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 32}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\text{M}_1, \text{B}_2] \\
\hat{\mathbb{Z}}_{32} &= \mathbb{X}_2[\mathbb{Q}_2^{(a,A_{1g})}] \otimes \mathbb{Y}_{12}[\mathbb{Q}_0^{(b,A_{1g})}]
\end{aligned}$$

$$\begin{aligned}
& \boxed{\text{No. 33}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} [\text{M}_1, \text{B}_2] \\
\hat{\mathbb{Z}}_{33} &= \frac{\sqrt{3}\mathbb{X}_6[\mathbb{Q}_2^{(a,B_{2g})}] \otimes \mathbb{Y}_{13}[\mathbb{Q}_2^{(b,B_{2g})}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{2,0}^{(a,E_g)}] \otimes \mathbb{Y}_{14}[\mathbb{Q}_{2,0}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_{2,1}^{(a,E_g)}] \otimes \mathbb{Y}_{15}[\mathbb{Q}_{2,1}^{(b,E_g)}]}{3}
\end{aligned}$$

$$\boxed{\text{No. 34}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [M_1, B_2]$$

$$\hat{Z}_{34} = -\frac{\sqrt{6}\mathbb{X}_6[\mathbb{Q}_2^{(a, B_{2g})}] \otimes \mathbb{Y}_{13}[\mathbb{Q}_2^{(b, B_{2g})}]}{3} + \frac{\sqrt{6}\mathbb{X}_7[\mathbb{Q}_{2,0}^{(a, E_g)}] \otimes \mathbb{Y}_{14}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_8[\mathbb{Q}_{2,1}^{(a, E_g)}] \otimes \mathbb{Y}_{15}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{6}$$

$$\boxed{\text{No. 35}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} (1, 1) [M_1, B_2]$$

$$\hat{Z}_{35} = \mathbb{X}_3[\mathbb{Q}_0^{(a, A_{1g})} (1, 1)] \otimes \mathbb{Y}_{12}[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 36}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} (1, -1) [M_1, B_2]$$

$$\hat{Z}_{36} = \mathbb{X}_4[\mathbb{Q}_2^{(a, A_{1g})} (1, -1)] \otimes \mathbb{Y}_{12}[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 37}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} (1, -1) [M_1, B_2]$$

$$\hat{Z}_{37} = \frac{\sqrt{3}\mathbb{X}_{10}[\mathbb{Q}_2^{(a, B_{2g})} (1, -1)] \otimes \mathbb{Y}_{13}[\mathbb{Q}_2^{(b, B_{2g})}]}{3} + \frac{\sqrt{3}\mathbb{X}_{11}[\mathbb{Q}_{2,0}^{(a, E_g)} (1, -1)] \otimes \mathbb{Y}_{14}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{12}[\mathbb{Q}_{2,1}^{(a, E_g)} (1, -1)] \otimes \mathbb{Y}_{15}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{3}$$

$$\boxed{\text{No. 38}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} (1, -1) [M_1, B_2]$$

$$\hat{Z}_{38} = -\frac{\sqrt{6}\mathbb{X}_{10}[\mathbb{Q}_2^{(a, B_{2g})} (1, -1)] \otimes \mathbb{Y}_{13}[\mathbb{Q}_2^{(b, B_{2g})}]}{3} + \frac{\sqrt{6}\mathbb{X}_{11}[\mathbb{Q}_{2,0}^{(a, E_g)} (1, -1)] \otimes \mathbb{Y}_{14}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{12}[\mathbb{Q}_{2,1}^{(a, E_g)} (1, -1)] \otimes \mathbb{Y}_{15}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{6}$$

$$\boxed{\text{No. 39}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} (1, 0) [M_1, B_2]$$

$$\hat{Z}_{39} = \frac{\sqrt{2}\mathbb{X}_{13}[\mathbb{G}_{1,0}^{(a, E_g)} (1, 0)] \otimes \mathbb{Y}_{14}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{14}[\mathbb{G}_{1,1}^{(a, E_g)} (1, 0)] \otimes \mathbb{Y}_{15}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{2}$$

$$\boxed{\text{No. 40}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [M_1, B_2]$$

$$\hat{Z}_{40} = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{M}_{1,0}^{(a, E_g)}] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b, E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{M}_{1,1}^{(a, E_g)}] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b, E_g)}]}{2}$$

$$\boxed{\text{No. 41}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} (1, 1) [M_1, B_2]$$

$$\hat{Z}_{41} = \frac{\sqrt{2}\mathbb{X}_{17}[\mathbb{M}_{1,0}^{(a, E_g)} (1, 1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b, E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{18}[\mathbb{M}_{1,1}^{(a, E_g)} (1, 1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b, E_g)}]}{2}$$

$$\boxed{\text{No. 42}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{42} = \frac{\sqrt{2}\mathbb{X}_{19}[\mathbb{M}_{1,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{20}[\mathbb{M}_{1,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

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

$$\begin{aligned} \hat{\mathbb{Z}}_{43} = & -\frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{3,0}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{3,1}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{5}\mathbb{X}_{23}[\mathbb{M}_{3,0}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} \\ & + \frac{\sqrt{5}\mathbb{X}_{24}[\mathbb{M}_{3,1}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} + \frac{\sqrt{5}\mathbb{X}_{29}[\mathbb{M}_3^{(a,B_{2g})}(1, -1)] \otimes \mathbb{Y}_{17}[\mathbb{T}_2^{(b,B_{2g})}]}{3} \end{aligned}$$

$$\boxed{\text{No. 44}} \quad \hat{\mathbb{Q}}_4^{(A_{1g,1})}(1, -1) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{44} = -\frac{\sqrt{3}\mathbb{X}_{23}[\mathbb{M}_{3,0}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{24}[\mathbb{M}_{3,1}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{3} - \frac{\sqrt{3}\mathbb{X}_{29}[\mathbb{M}_3^{(a,B_{2g})}(1, -1)] \otimes \mathbb{Y}_{17}[\mathbb{T}_2^{(b,B_{2g})}]}{3}$$

$$\boxed{\text{No. 45}} \quad \hat{\mathbb{Q}}_4^{(A_{1g,2})}(1, -1) \text{ [M}_1, \text{B}_2]$$

$$\begin{aligned} \hat{\mathbb{Z}}_{45} = & -\frac{\sqrt{15}\mathbb{X}_{21}[\mathbb{M}_{3,0}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{15}\mathbb{X}_{22}[\mathbb{M}_{3,1}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} \\ & + \frac{\mathbb{X}_{23}[\mathbb{M}_{3,0}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} - \frac{\mathbb{X}_{24}[\mathbb{M}_{3,1}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\mathbb{X}_{29}[\mathbb{M}_3^{(a,B_{2g})}(1, -1)] \otimes \mathbb{Y}_{17}[\mathbb{T}_2^{(b,B_{2g})}]}{3} \end{aligned}$$

$$\boxed{\text{No. 46}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, 0) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{46} = \mathbb{X}_{31}[\mathbb{T}_2^{(a,A_{1g})}(1, 0)] \otimes \mathbb{Y}_{16}[\mathbb{T}_0^{(b,A_{1g})}]$$

$$\boxed{\text{No. 47}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1, 0) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{47} = \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{T}_{2,0}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{T}_{2,1}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{30}[\mathbb{T}_2^{(a,B_{2g})}(1, 0)] \otimes \mathbb{Y}_{17}[\mathbb{T}_2^{(b,B_{2g})}]}{3}$$

$$\boxed{\text{No. 48}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, 0) \text{ [M}_1, \text{B}_2]$$

$$\hat{\mathbb{Z}}_{48} = \frac{\sqrt{6}\mathbb{X}_{25}[\mathbb{T}_{2,0}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_{18}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{26}[\mathbb{T}_{2,1}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_{19}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{30}[\mathbb{T}_2^{(a,B_{2g})}(1, 0)] \otimes \mathbb{Y}_{17}[\mathbb{T}_2^{(b,B_{2g})}]}{3}$$

$$\boxed{\text{No. 49}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{49} = \mathbb{X}_1[\mathbb{Q}_0^{(a, A_{1g})}] \otimes \mathbb{Y}_{20}[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 50}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{50} = \mathbb{X}_2[\mathbb{Q}_2^{(a, A_{1g})}] \otimes \mathbb{Y}_{20}[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 51}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})} [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{51} = \frac{\sqrt{3}\mathbb{X}_5[\mathbb{Q}_2^{(a, B_{1g})}] \otimes \mathbb{Y}_{21}[\mathbb{Q}_2^{(b, B_{1g})}]}{3} + \frac{\sqrt{3}\mathbb{X}_7[\mathbb{Q}_{2,0}^{(a, E_g)}] \otimes \mathbb{Y}_{22}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_8[\mathbb{Q}_{2,1}^{(a, E_g)}] \otimes \mathbb{Y}_{23}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{3}$$

$$\boxed{\text{No. 52}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})} [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{52} = -\frac{\sqrt{6}\mathbb{X}_5[\mathbb{Q}_2^{(a, B_{1g})}] \otimes \mathbb{Y}_{21}[\mathbb{Q}_2^{(b, B_{1g})}]}{3} + \frac{\sqrt{6}\mathbb{X}_7[\mathbb{Q}_{2,0}^{(a, E_g)}] \otimes \mathbb{Y}_{22}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_8[\mathbb{Q}_{2,1}^{(a, E_g)}] \otimes \mathbb{Y}_{23}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{6}$$

$$\boxed{\text{No. 53}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1, 1) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{53} = \mathbb{X}_3[\mathbb{Q}_0^{(a, A_{1g})}(1, 1)] \otimes \mathbb{Y}_{20}[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 54}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{54} = \mathbb{X}_4[\mathbb{Q}_2^{(a, A_{1g})}(1, -1)] \otimes \mathbb{Y}_{20}[\mathbb{Q}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 55}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{55} = \frac{\sqrt{3}\mathbb{X}_{11}[\mathbb{Q}_{2,0}^{(a, E_g)}(1, -1)] \otimes \mathbb{Y}_{22}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{12}[\mathbb{Q}_{2,1}^{(a, E_g)}(1, -1)] \otimes \mathbb{Y}_{23}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_9[\mathbb{Q}_2^{(a, B_{1g})}(1, -1)] \otimes \mathbb{Y}_{21}[\mathbb{Q}_2^{(b, B_{1g})}]}{3}$$

$$\boxed{\text{No. 56}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{56} = \frac{\sqrt{6}\mathbb{X}_{11}[\mathbb{Q}_{2,0}^{(a, E_g)}(1, -1)] \otimes \mathbb{Y}_{22}[\mathbb{Q}_{2,0}^{(b, E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{12}[\mathbb{Q}_{2,1}^{(a, E_g)}(1, -1)] \otimes \mathbb{Y}_{23}[\mathbb{Q}_{2,1}^{(b, E_g)}]}{6} - \frac{\sqrt{6}\mathbb{X}_9[\mathbb{Q}_2^{(a, B_{1g})}(1, -1)] \otimes \mathbb{Y}_{21}[\mathbb{Q}_2^{(b, B_{1g})}]}{3}$$

$$\boxed{\text{No. 57}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, 0) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{57} = \frac{\sqrt{2}\mathbb{X}_{13}[\mathbb{G}_{1,0}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_{22}[\mathbb{Q}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{14}[\mathbb{G}_{1,1}^{(a,E_g)}(1, 0)] \otimes \mathbb{Y}_{23}[\mathbb{Q}_{2,1}^{(b,E_g)}]}{2}$$

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

$$\hat{\mathbb{Z}}_{58} = \frac{\sqrt{2}\mathbb{X}_{15}[\mathbb{M}_{1,0}^{(a,E_g)}] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{16}[\mathbb{M}_{1,1}^{(a,E_g)}] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

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

$$\hat{\mathbb{Z}}_{59} = \frac{\sqrt{2}\mathbb{X}_{17}[\mathbb{M}_{1,0}^{(a,E_g)}(1, 1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{18}[\mathbb{M}_{1,1}^{(a,E_g)}(1, 1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

$$\boxed{\text{No. 60}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{60} = \frac{\sqrt{2}\mathbb{X}_{19}[\mathbb{M}_{1,0}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{2} - \frac{\sqrt{2}\mathbb{X}_{20}[\mathbb{M}_{1,1}^{(a,E_g)}(1, -1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{2}$$

$$\boxed{\text{No. 61}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\begin{aligned} \hat{\mathbb{Z}}_{61} = & -\frac{\sqrt{3}\mathbb{X}_{21}[\mathbb{M}_{3,0}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} + \frac{\sqrt{3}\mathbb{X}_{22}[\mathbb{M}_{3,1}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{5}\mathbb{X}_{23}[\mathbb{M}_{3,0}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} \\ & + \frac{\sqrt{5}\mathbb{X}_{24}[\mathbb{M}_{3,1}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} - \frac{\sqrt{5}\mathbb{X}_{27}[\mathbb{M}_3^{(a,B_{1g})}(1, -1)] \otimes \mathbb{Y}_{25}[\mathbb{T}_2^{(b,B_{1g})}]}{3} \end{aligned}$$

$$\boxed{\text{No. 62}} \quad \hat{\mathbb{Q}}_4^{(A_{1g,1})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\begin{aligned} \hat{\mathbb{Z}}_{62} = & \frac{\sqrt{195}\mathbb{X}_{21}[\mathbb{M}_{3,0}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{78} - \frac{\sqrt{195}\mathbb{X}_{22}[\mathbb{M}_{3,1}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{78} - \frac{\sqrt{13}\mathbb{X}_{23}[\mathbb{M}_{3,0}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{6} \\ & + \frac{\sqrt{13}\mathbb{X}_{24}[\mathbb{M}_{3,1}^{(a,E_g,2)}(1, -1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{6} + \frac{5\sqrt{13}\mathbb{X}_{27}[\mathbb{M}_3^{(a,B_{1g})}(1, -1)] \otimes \mathbb{Y}_{25}[\mathbb{T}_2^{(b,B_{1g})}]}{39} \end{aligned}$$

$$\boxed{\text{No. 63}} \quad \hat{\mathbb{Q}}_4^{(A_{1g,2})}(1, -1) [\text{M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{63} = -\frac{\sqrt{65}\mathbb{X}_{21}[\mathbb{M}_{3,0}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b,E_g)}]}{13} + \frac{\sqrt{65}\mathbb{X}_{22}[\mathbb{M}_{3,1}^{(a,E_g,1)}(1, -1)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b,E_g)}]}{13} + \frac{\sqrt{39}\mathbb{X}_{27}[\mathbb{M}_3^{(a,B_{1g})}(1, -1)] \otimes \mathbb{Y}_{25}[\mathbb{T}_2^{(b,B_{1g})}]}{13}$$

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

$$\hat{\mathbb{Z}}_{64} = \mathbb{X}_{31}[\mathbb{T}_2^{(a, A_{1g})}(1, 0)] \otimes \mathbb{Y}_{24}[\mathbb{T}_0^{(b, A_{1g})}]$$

$$\boxed{\text{No. 65}} \quad \hat{\mathbb{Q}}_0^{(A_{1g})}(1, 0) \text{ [M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{65} = \frac{\sqrt{3}\mathbb{X}_{25}[\mathbb{T}_{2,0}^{(a, E_g)}(1, 0)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{26}[\mathbb{T}_{2,1}^{(a, E_g)}(1, 0)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b, E_g)}]}{3} + \frac{\sqrt{3}\mathbb{X}_{28}[\mathbb{T}_2^{(a, B_{1g})}(1, 0)] \otimes \mathbb{Y}_{25}[\mathbb{T}_2^{(b, B_{1g})}]}{3}$$

$$\boxed{\text{No. 66}} \quad \hat{\mathbb{Q}}_2^{(A_{1g})}(1, 0) \text{ [M}_1, \text{B}_3]$$

$$\hat{\mathbb{Z}}_{66} = \frac{\sqrt{6}\mathbb{X}_{25}[\mathbb{T}_{2,0}^{(a, E_g)}(1, 0)] \otimes \mathbb{Y}_{26}[\mathbb{T}_{2,0}^{(b, E_g)}]}{6} + \frac{\sqrt{6}\mathbb{X}_{26}[\mathbb{T}_{2,1}^{(a, E_g)}(1, 0)] \otimes \mathbb{Y}_{27}[\mathbb{T}_{2,1}^{(b, E_g)}]}{6} - \frac{\sqrt{6}\mathbb{X}_{28}[\mathbb{T}_2^{(a, B_{1g})}(1, 0)] \otimes \mathbb{Y}_{25}[\mathbb{T}_2^{(b, B_{1g})}]}{3}$$

Table 5: Atomic SAMB group.

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

Table 6: Atomic SAMB.

symbol	type	group	form
\mathbb{X}_1	$\mathbb{Q}_0^{(a, A_{1g})}$	M 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	group	form
\mathbb{X}_2	$\mathbb{Q}_2^{(a, A_{1g})}$	M_1	$\begin{pmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} \end{pmatrix}$
\mathbb{X}_3	$\mathbb{Q}_0^{(a, A_{1g})}(1, 1)$	M_1	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}}{6} & 0 \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_4	$\mathbb{Q}_2^{(a, A_{1g})}(1, -1)$	M_1	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_5	$\mathbb{Q}_2^{(a, B_{1g})}$	M_1	$\begin{pmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_6	$\mathbb{Q}_2^{(a, B_{2g})}$	M_1	$\begin{pmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_7	$\mathbb{Q}_{2,0}^{(a,E_g)}$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \end{pmatrix}$
\mathbb{X}_8	$\mathbb{Q}_{2,1}^{(a,E_g)}$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_9	$\mathbb{Q}_2^{(a,B_{1g})}(1,-1)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{10}	$\mathbb{Q}_2^{(a,B_{2g})}(1,-1)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{11}	$\mathbb{Q}_{2,0}^{(a,E_g)}(1,-1)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{12}	$\mathbb{Q}_{2,1}^{(a,E_g)}(1,-1)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{pmatrix}$
\mathbb{X}_{13}	$\mathbb{G}_{1,0}^{(a,E_g)}(1,0)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{14}	$\mathbb{G}_{1,1}^{(a,E_g)}(1,0)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{pmatrix}$
\mathbb{X}_{15}	$\mathbb{M}_{1,0}^{(a,E_g)}$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 & 0 \end{pmatrix}$
\mathbb{X}_{16}	$\mathbb{M}_{1,1}^{(a,E_g)}$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & \frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{i}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{i}{2} & 0 & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{17}	$\mathbb{M}_{1,0}^{(a,E_g)}(1,1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{30}}{15} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{15} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{30} & 0 \end{pmatrix}$
\mathbb{X}_{18}	$\mathbb{M}_{1,1}^{(a,E_g)}(1,1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{30}i}{30} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 \\ -\frac{\sqrt{30}i}{30} & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{15} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{15} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & 0 & \frac{\sqrt{30}}{20} & 0 & 0 & \frac{\sqrt{30}i}{30} \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{20} & -\frac{\sqrt{30}i}{30} & 0 \end{pmatrix}$
\mathbb{X}_{19}	$\mathbb{M}_{1,0}^{(a,E_g)}(1,-1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{pmatrix}$
\mathbb{X}_{20}	$\mathbb{M}_{1,1}^{(a,E_g)}(1,-1)$	M_1	$\begin{pmatrix} 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$
\mathbb{X}_{21}	$\mathbb{M}_{3,0}^{(a,E_g,1)}(1,-1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{5}}{5} & 0 & \frac{\sqrt{5}i}{10} & -\frac{\sqrt{5}}{10} & 0 \\ \frac{\sqrt{5}}{5} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & \frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{22}	$\mathbb{M}_{3,1}^{(a,E_g,1)}(1,-1)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 \\ -\frac{\sqrt{5}i}{10} & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{5} & -\frac{\sqrt{5}}{10} & 0 \\ -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{5} & 0 & 0 & \frac{\sqrt{5}}{10} \\ 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 \end{pmatrix}$
\mathbb{X}_{23}	$\mathbb{M}_{3,0}^{(a,E_g,2)}(1,-1)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \end{pmatrix}$
\mathbb{X}_{24}	$\mathbb{M}_{3,1}^{(a,E_g,2)}(1,-1)$	M_1	$\begin{pmatrix} 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 \end{pmatrix}$
\mathbb{X}_{25}	$\mathbb{T}_{2,0}^{(a,E_g)}(1,0)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$
\mathbb{X}_{26}	$\mathbb{T}_{2,1}^{(a,E_g)}(1,0)$	M_1	$\begin{pmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}i}{6} & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
\mathbb{X}_{27}	$\mathbb{M}_3^{(a, B_{1g})}(1, -1)$	M_1	$\begin{pmatrix} 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{28}	$\mathbb{T}_2^{(a, B_{1g})}(1, 0)$	M_1	$\begin{pmatrix} 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{29}	$\mathbb{M}_3^{(a, B_{2g})}(1, -1)$	M_1	$\begin{pmatrix} \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{30}	$\mathbb{T}_2^{(a, B_{2g})}(1, 0)$	M_1	$\begin{pmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{pmatrix}$
\mathbb{X}_{31}	$\mathbb{T}_2^{(a, A_{1g})}(1, 0)$	M_1	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{pmatrix}$

Table 7: Cluster SAMB.

[illegible]

Table 8: Polar harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{Q}_0^{(A_{1g})}$	0	A_{1g}	—	—	1
2	$\mathbb{Q}_2^{(A_{1g})}$	2	A_{1g}	—	—	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
3	$\mathbb{Q}_2^{(B_{1g})}$	2	B_{1g}	—	—	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
4	$\mathbb{Q}_2^{(B_{2g})}$	2	B_{2g}	—	—	$\sqrt{3}xy$
5	$\mathbb{Q}_{2,0}^{(E_g)}$	2	E_g	—	0	$\sqrt{3}yz$
6	$\mathbb{Q}_{2,1}^{(E_g)}$	2	E_g	—	1	$\sqrt{3}xz$

Table 9: Axial harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{G}_{1,0}^{(E_g)}$	1	E_g	—	0	X
2	$\mathbb{G}_{1,1}^{(E_g)}$	1	E_g	—	1	Y
3	$\mathbb{G}_3^{(B_{1g})}$	3	B_{1g}	—	—	$\sqrt{15}XYZ$
4	$\mathbb{G}_3^{(B_{2g})}$	3	B_{2g}	—	—	$\frac{\sqrt{15}Z(X-Y)(X+Y)}{2}$
5	$\mathbb{G}_{3,0}^{(E_g,1)}$	3	E_g	1	0	$\frac{X(2X^2-3Y^2-3Z^2)}{2}$
6	$\mathbb{G}_{3,1}^{(E_g,1)}$	3	E_g	1	1	$-\frac{Y(3X^2-2Y^2+3Z^2)}{2}$
7	$\mathbb{G}_{3,0}^{(E_g,2)}$	3	E_g	2	0	$\frac{\sqrt{15}X(Y-Z)(Y+Z)}{2}$
8	$\mathbb{G}_{3,1}^{(E_g,2)}$	3	E_g	2	1	$\frac{\sqrt{15}Y(X-Z)(X+Z)}{2}$

- Group info.: Generator = $\{2_{001}|\frac{1}{2}\frac{1}{2}0\}$, $\{4_{001}^+|\frac{1}{2}00\}$, $\{2_{010}|0\frac{1}{2}0\}$, $\{-1|0\}$

Table 10: Conjugacy class (point-group part).

rep. SO	symmetry operations
$\{1 0\}$	$\{1 0\}$
$\{2_{001} \frac{1}{2}\frac{1}{2}0\}$	$\{2_{001} \frac{1}{2}\frac{1}{2}0\}$
$\{2_{100} \frac{1}{2}00\}$	$\{2_{100} \frac{1}{2}00\}, \{2_{010} 0\frac{1}{2}0\}$
$\{2_{110} \frac{1}{2}\frac{1}{2}0\}$	$\{2_{110} \frac{1}{2}\frac{1}{2}0\}, \{2_{1-10} 0\}$
$\{4_{001}^+ \frac{1}{2}00\}$	$\{4_{001}^+ \frac{1}{2}00\}, \{4_{001}^- 0\frac{1}{2}0\}$
$\{-1 0\}$	$\{-1 0\}$
$\{m_{001} \frac{1}{2}\frac{1}{2}0\}$	$\{m_{001} \frac{1}{2}\frac{1}{2}0\}$
$\{m_{100} \frac{1}{2}00\}$	$\{m_{100} \frac{1}{2}00\}, \{m_{010} 0\frac{1}{2}0\}$
$\{m_{110} \frac{1}{2}\frac{1}{2}0\}$	$\{m_{110} \frac{1}{2}\frac{1}{2}0\}, \{m_{1-10} 0\}$
$\{-4_{001}^+ \frac{1}{2}00\}$	$\{-4_{001}^+ \frac{1}{2}00\}, \{-4_{001}^- 0\frac{1}{2}0\}$

Table 11: Symmetry operations.

No.	SO	No.	SO	No.	SO	No.	SO	No.	SO
1	$\{1 0\}$	2	$\{2_{001} \frac{1}{2}\frac{1}{2}0\}$	3	$\{2_{100} \frac{1}{2}00\}$	4	$\{2_{010} 0\frac{1}{2}0\}$	5	$\{2_{110} \frac{1}{2}\frac{1}{2}0\}$
6	$\{2_{1-10} 0\}$	7	$\{4_{001}^+ \frac{1}{2}00\}$	8	$\{4_{001}^- 0\frac{1}{2}0\}$	9	$\{-1 0\}$	10	$\{m_{001} \frac{1}{2}\frac{1}{2}0\}$
11	$\{m_{100} \frac{1}{2}00\}$	12	$\{m_{010} 0\frac{1}{2}0\}$	13	$\{m_{110} \frac{1}{2}\frac{1}{2}0\}$	14	$\{m_{1-10} 0\}$	15	$\{-4_{001}^+ \frac{1}{2}00\}$
16	$\{-4_{001}^- 0\frac{1}{2}0\}$								

Table 12: Character table (point-group part).

	1	2_{001}	2_{100}	2_{110}	4_{001}^+	-1	m_{001}	m_{100}	m_{110}	-4_{001}^+
A_{1g}	1	1	1	1	1	1	1	1	1	1
A_{2g}	1	1	-1	-1	1	1	1	-1	-1	1
B_{1g}	1	1	1	-1	-1	1	1	1	-1	-1
B_{2g}	1	1	-1	1	-1	1	1	-1	1	-1
E_g	2	-2	0	0	0	2	-2	0	0	0

continued ...

Table 12

	1	2 ₀₀₁	2 ₁₀₀	2 ₁₁₀	4 ₀₀₁ ⁺	-1	m ₀₀₁	m ₁₀₀	m ₁₁₀	-4 ₀₀₁ ⁺
A_{1u}	1	1	1	1	1	-1	-1	-1	-1	-1
A_{2u}	1	1	-1	-1	1	-1	-1	1	1	-1
B_{1u}	1	1	1	-1	-1	-1	-1	-1	1	1
B_{2u}	1	1	-1	1	-1	-1	-1	1	-1	1
E_u	2	-2	0	0	0	-2	2	0	0	0

Table 13: Parity conversion.

\leftrightarrow	\leftrightarrow	\leftrightarrow	\leftrightarrow	\leftrightarrow
$A_{1g} (A_{1u})$	$B_{1g} (B_{1u})$	$E_g (E_u)$	$A_{2g} (A_{2u})$	$B_{2g} (B_{2u})$
$A_{1u} (A_{1g})$	$B_{1u} (B_{1g})$	$E_u (E_g)$	$A_{2u} (A_{2g})$	$B_{2u} (B_{2g})$

Table 14: Symmetric product, $[\Gamma \otimes \Gamma']_+$.

	A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_g	A_{1u}	A_{2u}	B_{1u}	B_{2u}	E_u
A_{1g}	A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_g	A_{1u}	A_{2u}	B_{1u}	B_{2u}	E_u
A_{2g}		A_{1g}	B_{2g}	B_{1g}	E_g	A_{2u}	A_{1u}	B_{2u}	B_{1u}	E_u
B_{1g}			A_{1g}	A_{2g}	E_g	B_{1u}	B_{2u}	A_{1u}	A_{2u}	E_u
B_{2g}				A_{1g}	E_g	B_{2u}	B_{1u}	A_{2u}	A_{1u}	E_u
E_g					$A_{1g} + B_{1g} + B_{2g}$	E_u	E_u	E_u	E_u	$A_{1u} + A_{2u} + B_{1u} + B_{2u}$
A_{1u}						A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_g
A_{2u}							A_{1g}	B_{2g}	B_{1g}	E_g
B_{1u}								A_{1g}	A_{2g}	E_g
B_{2u}									A_{1g}	E_g
E_u										$A_{1g} + B_{1g} + B_{2g}$

Table 15: Anti-symmetric product, $[\Gamma \otimes \Gamma]_-$.

A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_g	A_{1u}	A_{2u}	B_{1u}	B_{2u}	E_u
—	—	—	—	A_{2g}	—	—	—	—	A_{2g}

Table 16: Virtual-cluster sites.

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

Table 17: Virtual-cluster basis.

symbol	1	2	3	4	5	6	7	8	9	10
$\mathbb{Q}_0^{(A_{1g})}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\mathbb{Q}_1^{(A_{2u})}$	$\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$
$\mathbb{Q}_{1,0}^{(E_u)}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$
$\mathbb{Q}_{1,1}^{(E_u)}$	$\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{10}$	$-\frac{\sqrt{10}}{20}$	$\frac{\sqrt{10}}{20}$
$\mathbb{Q}_2^{(B_{1g})}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

continued ...

[illegible]