SAMB for “`graphene`”

Generated on 2023-09-27 17:44 by MultiPie 1.1.15

- Group: No. 191 D_{6h}^{1} $P6/mmm$ [hexagonal]
- Associated point group: No. 27 D_{6h} $6/mmm$ [hexagonal]

- Generation condition
  - model type: `tight_binding`
  - time-reversal type: `electric`
  - irrep: `[A1g, A2g, B1g, B2g, E1g, E2g, A1u, A2u, B1u, B2u, E1u, E2u]`
  - `spinful`

- Unit cell:
  $a = 1.0,\ b = 1.0,\ c = 1.0,\ \alpha = 90.0,\ \beta = 90.0,\ \gamma = 120.0$
- Lattice vectors:
  $\boldsymbol{a}_1 = \begin{pmatrix} 1.0 & 0 & 0 \end{pmatrix}$
  $\boldsymbol{a}_2 = \begin{pmatrix} -0.5 & 0.86602540378444 & 0 \end{pmatrix}$
  $\boldsymbol{a}_3 = \begin{pmatrix} 0 & 0 & 1.0 \end{pmatrix}$

Table 1: High-symmetry line: Γ-M-K-Γ-K’.

symbol	position	symbol	position	symbol	position
Γ	$\begin{pmatrix} 0 & 0 & 0 \end{pmatrix}$	M	$\begin{pmatrix} \frac{1}{2} & 0 & 0 \end{pmatrix}$	K	$\begin{pmatrix} \frac{1}{3} & \frac{1}{3} & 0 \end{pmatrix}$
K’	$\begin{pmatrix} -\frac{1}{3} & -\frac{1}{3} & 0 \end{pmatrix}$				

- Kets: dimension = 4

Table 2: Hilbert space for full matrix.

	No.	ket	No.	ket	No.	ket	No.	ket
	1	$(p_z,\uparrow)$@A_1	2	$(p_z,\downarrow)$@A_1	3	$(p_z,\uparrow)$@A_2	4	$(p_z,\downarrow)$@A_2

- Sites in (primitive) unit cell:

Table 3: Site-clusters.

	site	position	mapping
S_1 [2c: -6m2]	A_1	$\begin{pmatrix} \frac{1}{3} & \frac{2}{3} & 0 \end{pmatrix}$	[1,6,7,8,9,10,14,15,16,17,23,24]
	A_2	$\begin{pmatrix} \frac{2}{3} & \frac{1}{3} & 0 \end{pmatrix}$	[2,3,4,5,11,12,13,18,19,20,21,22]

- Bonds in (primitive) unit cell:

Table 4: Bond-clusters.

	bond	tail	head	n	#	$\boldsymbol{b}$@$\boldsymbol{c}$	mapping
B_1 [3f: mmm]	b_1	A_2	A_1	1	1	$\begin{pmatrix} \frac{1}{3} & \frac{2}{3} & 0 \end{pmatrix}$ @ $\begin{pmatrix} \frac{1}{2} & 0 & 0 \end{pmatrix}$	[1,-2,-3,6,-13,14,17,-18]
	b_2	A_2	A_1	1	1	$\begin{pmatrix} \frac{1}{3} & -\frac{1}{3} & 0 \end{pmatrix}$ @ $\begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$	[-4,7,10,-11,15,-19,-22,23]
	b_3	A_2	A_1	1	1	$\begin{pmatrix} -\frac{2}{3} & -\frac{1}{3} & 0 \end{pmatrix}$ @ $\begin{pmatrix} 0 & \frac{1}{2} & 0 \end{pmatrix}$	[-5,8,9,-12,16,-20,-21,24]

- SAMB:

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

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

$\boxed{\text{No. 2}}$ $\hat{\mathbb{Q}}_0^{(A_{1g})}$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_2 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_{1g})}] \otimes \mathbb{Y}_3[\mathbb{Q}_0^{(b,A_{1g})}]$$

$\boxed{\text{No. 3}}$ $\hat{\mathbb{Q}}_{2,0}^{(E_{2g})}$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_3 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_{1g})}] \otimes \mathbb{Y}_4[\mathbb{Q}_{2,0}^{(b,E_{2g})}]$$

$\boxed{\text{No. 4}}$ $\hat{\mathbb{Q}}_{2,1}^{(E_{2g})}$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_4 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_{1g})}] \otimes \mathbb{Y}_5[\mathbb{Q}_{2,1}^{(b,E_{2g})}]$$

$\boxed{\text{No. 5}}$ $\hat{\mathbb{G}}_0^{(A_{1u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

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

$\boxed{\text{No. 6}}$ $\hat{\mathbb{Q}}_1^{(A_{2u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_6 = \frac{\sqrt{2}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_6[\mathbb{T}_{1,0}^{(b,E_{1u})}]}{2} + \frac{\sqrt{2}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_7[\mathbb{T}_{1,1}^{(b,E_{1u})}]}{2}$$

$\boxed{\text{No. 7}}$ $\hat{\mathbb{Q}}_3^{(B_{1u})}$ $[\mathrm{M}_1, \mathrm{S}_1]$

$$\hat{\mathbb{Z}}_7 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_{1g})}] \otimes \mathbb{Y}_2[\mathbb{Q}_3^{(s,B_{1u})}]$$

$\boxed{\text{No. 8}}$ $\hat{\mathbb{Q}}_3^{(B_{2u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_8 = -\mathbb{X}_2[\mathbb{M}_1^{(a,A_{2g})}(1,1)] \otimes \mathbb{Y}_8[\mathbb{T}_3^{(b,B_{1u})}]$$

$\boxed{\text{No. 9}}$ $\hat{\mathbb{Q}}_{1,0}^{(E_{1u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_9 = -\mathbb{X}_2[\mathbb{M}_1^{(a,A_{2g})}(1,1)] \otimes \mathbb{Y}_7[\mathbb{T}_{1,1}^{(b,E_{1u})}]$$

$\boxed{\text{No. 10}}$ $\hat{\mathbb{Q}}_{1,1}^{(E_{1u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_{10} = \mathbb{X}_2[\mathbb{M}_1^{(a,A_{2g})}(1,1)] \otimes \mathbb{Y}_6[\mathbb{T}_{1,0}^{(b,E_{1u})}]$$

$\boxed{\text{No. 11}}$ $\hat{\mathbb{G}}_{2,0}^{(E_{2u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_{11} = -\frac{\sqrt{2}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_6[\mathbb{T}_{1,0}^{(b,E_{1u})}]}{2} + \frac{\sqrt{2}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_7[\mathbb{T}_{1,1}^{(b,E_{1u})}]}{2}$$

$\boxed{\text{No. 12}}$ $\hat{\mathbb{G}}_{2,1}^{(E_{2u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_{12} = \frac{\sqrt{2}\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_7[\mathbb{T}_{1,1}^{(b,E_{1u})}]}{2} + \frac{\sqrt{2}\mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_6[\mathbb{T}_{1,0}^{(b,E_{1u})}]}{2}$$

$\boxed{\text{No. 13}}$ $\hat{\mathbb{G}}_{2,0}^{(E_{2u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_{13} = \mathbb{X}_4[\mathbb{M}_{1,1}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_8[\mathbb{T}_{3}^{(b,B_{1u})}]$$

$\boxed{\text{No. 14}}$ $\hat{\mathbb{G}}_{2,1}^{(E_{2u})}(1,1)$ $[\mathrm{M}_1, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_{14} = -\mathbb{X}_3[\mathbb{M}_{1,0}^{(a,E_{1g})}(1,1)] \otimes \mathbb{Y}_8[\mathbb{T}_{3}^{(b,B_{1u})}]$$

Table 5: Atomic SAMB group.

group	bra	ket
M_1	$(p_z,\uparrow),(p_z,\downarrow)$	$(p_z,\uparrow),(p_z,\downarrow)$

Table 6: Atomic SAMB.

symbol	type	group	form
$\mathbb{X}_1$	$\mathbb{Q}_0^{(a,A_{1g})}$	M_1	$\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \end{pmatrix}$
$\mathbb{X}_2$	$\mathbb{M}_1^{(a,A_{2g})}(1,1)$	M_1	$\begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & -\frac{\sqrt{2}}{2} \end{pmatrix}$

continued ...

Table 6

symbol	type	group	form
$\mathbb{X}_3$	$\mathbb{M}_{1,0}^{(a,E_{1g})}(1,1)$	M_1	$\begin{pmatrix} 0 & -\frac{\sqrt{2}i}{2} \\ \frac{\sqrt{2}i}{2} & 0 \end{pmatrix}$
$\mathbb{X}_4$	$\mathbb{M}_{1,1}^{(a,E_{1g})}(1,1)$	M_1	$\begin{pmatrix} 0 & -\frac{\sqrt{2}}{2} \\ -\frac{\sqrt{2}}{2} & 0 \end{pmatrix}$

Table 7: Cluster SAMB.

symbol	type	cluster	form
$\mathbb{Y}_1$	$\mathbb{Q}_0^{(s,A_{1g})}$	S_1	$\begin{pmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix}$
$\mathbb{Y}_2$	$\mathbb{Q}_3^{(s,B_{1u})}$	S_1	$\begin{pmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} \end{pmatrix}$
$\mathbb{Y}_3$	$\mathbb{Q}_0^{(b,A_{1g})}$	B_1	$\begin{pmatrix} \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} \end{pmatrix}$
$\mathbb{Y}_4$	$\mathbb{Q}_{2,0}^{(b,E_{2g})}$	B_1	$\begin{pmatrix} \frac{\sqrt{6}}{3} & -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}}{6} \end{pmatrix}$
$\mathbb{Y}_5$	$\mathbb{Q}_{2,1}^{(b,E_{2g})}$	B_1	$\begin{pmatrix} 0 & -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix}$
$\mathbb{Y}_6$	$\mathbb{T}_{1,0}^{(b,E_{1u})}$	B_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}i}{2} & -\frac{\sqrt{2}i}{2} \end{pmatrix}$
$\mathbb{Y}_7$	$\mathbb{T}_{1,1}^{(b,E_{1u})}$	B_1	$\begin{pmatrix} \frac{\sqrt{6}i}{3} & -\frac{\sqrt{6}i}{6} & -\frac{\sqrt{6}i}{6} \end{pmatrix}$
$\mathbb{Y}_8$	$\mathbb{T}_3^{(b,B_{1u})}$	B_1	$\begin{pmatrix} \frac{\sqrt{3}i}{3} & \frac{\sqrt{3}i}{3} & \frac{\sqrt{3}i}{3} \end{pmatrix}$

Table 8: Polar harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{Q}_0^{(A_{1g})}$	0	A_{1g}	–	–	1
2	$\mathbb{Q}_{1,0}^{(E_{1u})}$	1	E_{1u}	–	0	x
3	$\mathbb{Q}_{1,1}^{(E_{1u})}$	1	E_{1u}	–	1	y

continued ...

Table 8

No.	symbol	rank	irrep.	mul.	comp.	form
4	$\mathbb{Q}_{2,0}^{(E_{2g})}$	2	E_{2g}	–	0	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
5	$\mathbb{Q}_{2,1}^{(E_{2g})}$	2	E_{2g}	–	1	$-\sqrt{3}xy$
6	$\mathbb{Q}_{3}^{(B_{1u})}$	3	B_{1u}	–	–	$\frac{\sqrt{10}y\left(3x^2-y^2\right)}{4}$

Table 9: Axial harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{G}_{1}^{(A_{2g})}$	1	A_{2g}	–	–	Z
2	$\mathbb{G}_{1,0}^{(E_{1g})}$	1	E_{1g}	–	0	$-Y$
3	$\mathbb{G}_{1,1}^{(E_{1g})}$	1	E_{1g}	–	1	X

- Group info.: Generator = $\{3^{+}_{001}|0\}$, $\{2_{001}|0\}$, $\{2_{110}|0\}$, $\{-1|0\}$

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

rep. SO	symmetry operations
$\{1|0\}$	$\{1|0\}$
$\{2_{001}|0\}$	$\{2_{001}|0\}$
$\{2_{100}|0\}$	$\{2_{100}|0\}$, $\{2_{010}|0\}$, $\{2_{110}|0\}$
$\{2_{120}|0\}$	$\{2_{120}|0\}$, $\{2_{210}|0\}$, $\{2_{1-10}|0\}$
$\{3^{+}_{001}|0\}$	$\{3^{+}_{001}|0\}$, $\{3^{-}_{001}|0\}$
$\{6^{+}_{001}|0\}$	$\{6^{+}_{001}|0\}$, $\{6^{-}_{001}|0\}$
$\{-1|0\}$	$\{-1|0\}$
$\{\mathrm{m}_{100}|0\}$	$\{\mathrm{m}_{100}|0\}$, $\{\mathrm{m}_{010}|0\}$, $\{\mathrm{m}_{110}|0\}$

continued ...

Table 10

rep. SO	symmetry operations
$\{m_{001}\|0\}$	$\{m_{001}\|0\}$
$\{m_{120}\|0\}$	$\{m_{120}\|0\}$, $\{m_{210}\|0\}$, $\{m_{1-10}\|0\}$
$\{-3^{+}_{001}\|0\}$	$\{-3^{+}_{001}\|0\}$, $\{-3^{-}_{001}\|0\}$
$\{-6^{+}_{001}\|0\}$	$\{-6^{+}_{001}\|0\}$, $\{-6^{-}_{001}\|0\}$

Table 11: 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	$\{2_{120}\|0\}$	7	$\{2_{210}\|0\}$	8	$\{2_{1-10}\|0\}$	9	$\{3^{+}_{001}\|0\}$	10	$\{3^{-}_{001}\|0\}$
11	$\{6^{+}_{001}\|0\}$	12	$\{6^{-}_{001}\|0\}$	13	$\{-1\|0\}$	14	$\{m_{100}\|0\}$	15	$\{m_{010}\|0\}$
16	$\{m_{110}\|0\}$	17	$\{m_{001}\|0\}$	18	$\{m_{120}\|0\}$	19	$\{m_{210}\|0\}$	20	$\{m_{1-10}\|0\}$
21	$\{-3^{+}_{001}\|0\}$	22	$\{-3^{-}_{001}\|0\}$	23	$\{-6^{+}_{001}\|0\}$	24	$\{-6^{-}_{001}\|0\}$		

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

	1	2_{001}	2_{100}	2_{120}	3^{+}_{001}	6^{+}_{001}	-1	m_{100}	m_{001}	m_{120}	-3^{+}_{001}	-6^{+}_{001}
A_{1g}	1	1	1	1	1	1	1	1	1	1	1	1
A_{2g}	1	1	−1	−1	1	1	1	−1	1	−1	1	1
B_{1g}	1	−1	−1	1	1	−1	1	−1	−1	1	1	−1
B_{2g}	1	−1	1	−1	1	−1	1	1	−1	−1	1	−1
E_{1g}	2	−2	0	0	−1	1	2	0	−2	0	−1	1
E_{2g}	2	2	0	0	−1	−1	2	0	2	0	−1	−1
A_{1u}	1	1	1	1	1	1	−1	−1	−1	−1	−1	−1
A_{2u}	1	1	−1	−1	1	1	−1	1	−1	1	−1	−1
B_{1u}	1	−1	−1	1	1	−1	−1	1	1	−1	−1	1
B_{2u}	1	−1	1	−1	1	−1	−1	−1	1	1	−1	1
E_{1u}	2	−2	0	0	−1	1	−2	0	2	0	1	−1
E_{2u}	2	2	0	0	−1	−1	−2	0	−2	0	1	1

Table 13: Parity conversion.

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

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

	A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_{1g}	E_{2g}	A_{1u}	A_{2u}	B_{1u}	B_{2u}	E_{1u}	E_{2u}
A_{1g}	A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_{1g}	E_{2g}	A_{1u}	A_{2u}	B_{1u}	B_{2u}	E_{1u}	E_{2u}
A_{2g}		A_{1g}	B_{2g}	B_{1g}	E_{1g}	E_{2g}	A_{2u}	A_{1u}	B_{2u}	B_{1u}	E_{1u}	E_{2u}
B_{1g}			A_{1g}	A_{2g}	E_{2g}	E_{1g}	B_{1u}	B_{2u}	A_{1u}	A_{2u}	E_{2u}	E_{1u}
B_{2g}				A_{1g}	E_{2g}	E_{1g}	B_{2u}	B_{1u}	A_{2u}	A_{1u}	E_{2u}	E_{1u}
E_{1g}					$A_{1g}+E_{2g}$	$B_{1g}+B_{2g}+E_{1g}$	E_{1u}	E_{1u}	E_{2u}	E_{2u}	$A_{1u}+A_{2u}+E_{2u}$	$B_{1u}+B_{2u}+E_{1u}$
E_{2g}						$A_{1g}+E_{2g}$	E_{2u}	E_{2u}	E_{1u}	E_{1u}	$B_{1u}+B_{2u}+E_{1u}$	$A_{1u}+A_{2u}+E_{2u}$
A_{1u}							A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_{1g}	E_{2g}
A_{2u}								A_{1g}	B_{2g}	B_{1g}	E_{1g}	E_{2g}
B_{1u}									A_{1g}	A_{2g}	E_{2g}	E_{1g}
B_{2u}										A_{1g}	E_{2g}	E_{1g}
E_{1u}											$A_{1g}+E_{2g}$	$B_{1g}+B_{2g}+E_{1g}$
E_{2u}												$A_{1g}+E_{2g}$

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

A_{1g}	A_{2g}	B_{1g}	B_{2g}	E_{1g}	E_{2g}	A_{1u}	A_{2u}	B_{1u}	B_{2u}	E_{1u}	E_{2u}
–	–	–	–	A_{2g}	A_{2g}	–	–	–	–	A_{2g}	A_{2g}

Table 16: Virtual-cluster sites.

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

Table 17: Virtual-cluster basis.

symbol	1	2	3	4	5	6	7	8	9	10
$\mathbb{Q}_0^{(A_{1g})}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_1^{(A_{2u})}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{1,0}^{(E_{1u})}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$
	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$
	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{1,1}^{(E_{1u})}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$
	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$
	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{2,0}^{(E_{1g})}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$
	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$
	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{2,1}^{(E_{1g})}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$

continued ...

Table 17

symbol	1	2	3	4	5	6	7	8	9	10
	$\frac{\sqrt{6}}{24} + \frac{\sqrt{2}}{8}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{24} + \frac{\sqrt{2}}{8}$	$- \frac{\sqrt{6}}{24} + \frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{2}}{8} - \frac{\sqrt{6}}{24}$	$- \frac{\sqrt{2}}{8} + \frac{\sqrt{6}}{24}$	$- \frac{\sqrt{2}}{8} + \frac{\sqrt{6}}{24}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24} + \frac{\sqrt{2}}{8}$
	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{2}}{8} - \frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24} + \frac{\sqrt{2}}{8}$	$- \frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{2,0}^{(E_{2g})}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	0	$- \frac{1}{4}$	$\frac{1}{4}$	0	$- \frac{1}{4}$	0	$- \frac{1}{4}$
	$- \frac{1}{4}$	0	$\frac{1}{4}$	$\frac{1}{4}$	0	$- \frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	0	$- \frac{1}{4}$
	0	$- \frac{1}{4}$	$- \frac{1}{4}$	0						
$\mathbb{Q}_{2,1}^{(E_{2g})}$	$- \frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$- \frac{\sqrt{3}}{12}$
	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$
	$\frac{\sqrt{3}}{6}$	$- \frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$						
$\mathbb{Q}_{3}^{(B_{1u})}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$
	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{3}^{(B_{2u})}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{3,0}^{(E_{2u})}$	$\frac{1}{4}$	$\frac{1}{4}$	$- \frac{1}{4}$	0	$\frac{1}{4}$	$- \frac{1}{4}$	0	$\frac{1}{4}$	0	$- \frac{1}{4}$
	$- \frac{1}{4}$	0	$- \frac{1}{4}$	$\frac{1}{4}$	0	$- \frac{1}{4}$	$- \frac{1}{4}$	$\frac{1}{4}$	0	$- \frac{1}{4}$
	0	$\frac{1}{4}$	$\frac{1}{4}$	0						
$\mathbb{Q}_{3,1}^{(E_{2u})}$	$- \frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$- \frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$- \frac{\sqrt{3}}{12}$
	$- \frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$
	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$						
$\mathbb{Q}_{4}^{(B_{1g})}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{4}^{(B_{2g})}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$	$- \frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{4,0}^{(E_{2g},1)}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$
	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$
	$- \frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$- \frac{\sqrt{3}}{6}$						

continued ...

Table 17

symbol	1	2	3	4	5	6	7	8	9	10
$\mathbb{Q}_{4,1}^{(E_{2g},1)}$	$\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	0	$-\frac{1}{4}$
	$-\frac{1}{4}$	0	$\frac{1}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$
	0	$-\frac{1}{4}$	$-\frac{1}{4}$	0						
$\mathbb{Q}_{5,0}^{(E_{1u},1)}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$
	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$
	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{5,1}^{(E_{1u},1)}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$
	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$
	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{5,0}^{(E_{2u},1)}$	$\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$-\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$	$-\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$
	$\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{6}$	$-\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{6}$	$\frac{\sqrt{3}}{12}$
	$\frac{\sqrt{3}}{6}$	$-\frac{\sqrt{3}}{12}$	$-\frac{\sqrt{3}}{12}$	$\frac{\sqrt{3}}{6}$						
$\mathbb{Q}_{5,1}^{(E_{2u},1)}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	0	$-\frac{1}{4}$	$\frac{1}{4}$	0	$-\frac{1}{4}$	0	$-\frac{1}{4}$
	$-\frac{1}{4}$	0	$-\frac{1}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$
	0	$\frac{1}{4}$	$\frac{1}{4}$	0						
$\mathbb{Q}_{6}^{(A_{2g})}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{6,0}^{(E_{1g},1)}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$
	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$
	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{6,1}^{(E_{1g},1)}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$
	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{2}}{8}-\frac{\sqrt{6}}{24}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$
	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{24}+\frac{\sqrt{2}}{8}$	$-\frac{\sqrt{2}}{8}+\frac{\sqrt{6}}{24}$	$-\frac{\sqrt{6}}{12}$						
$\mathbb{Q}_{7}^{(A_{1u})}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$
	$\frac{\sqrt{6}}{12}$	$\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$
	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$	$-\frac{\sqrt{6}}{12}$						