SAMB for "CM"

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- Group: No. 31 T_d $-43m$ [cubic]

- Generation condition
  - model type: `tight_binding`
  - time-reversal type: `electric`
  - irrep: `[A1]`
  - `spinless`

- Kets: dimension = 8

Table 1: Hilbert space for full matrix.

	No.	ket	No.	ket	No.	ket	No.	ket	No.	ket
	1	s@C_1	2	p_x@C_1	3	p_y@C_1	4	p_z@C_1	5	s@H_1
	6	s@H_2	7	s@H_3	8	s@H_4				

- Sites in (primitive) unit cell:

Table 2: Site-clusters.

	site	position	mapping
S_1	C_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]
S_2	H_1	$\begin{pmatrix} \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \end{pmatrix}$	[1,5,9,16,17,18]
	H_2	$\begin{pmatrix} -\frac{1}{3} & -\frac{1}{3} & \frac{1}{3} \end{pmatrix}$	[2,6,11,13,21,23]
	H_3	$\begin{pmatrix} \frac{1}{3} & -\frac{1}{3} & -\frac{1}{3} \end{pmatrix}$	[3,7,12,15,19,24]

continued ...

Table 2

site	position	mapping
H_4	$\begin{pmatrix} -\frac{1}{3} & \frac{1}{3} & -\frac{1}{3} \end{pmatrix}$	[4,8,10,14,20,22]

- Bonds in (primitive) unit cell:

Table 3: Bond-clusters.

	bond	tail	head	n	#	$\boldsymbol{b}$@$\boldsymbol{c}$	mapping
B_1	b_1	H_1	C_1	1	1	$\begin{pmatrix} \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \end{pmatrix}$@$\begin{pmatrix} \frac{1}{6} & \frac{1}{6} & \frac{1}{6} \end{pmatrix}$	[1,5,9,16,17,18]
	b_2	H_2	C_1	1	1	$\begin{pmatrix} -\frac{1}{3} & -\frac{1}{3} & \frac{1}{3} \end{pmatrix}$@$\begin{pmatrix} -\frac{1}{6} & -\frac{1}{6} & \frac{1}{6} \end{pmatrix}$	[2,6,11,13,21,23]
	b_3	H_3	C_1	1	1	$\begin{pmatrix} \frac{1}{3} & -\frac{1}{3} & -\frac{1}{3} \end{pmatrix}$@$\begin{pmatrix} \frac{1}{6} & -\frac{1}{6} & -\frac{1}{6} \end{pmatrix}$	[3,7,12,15,19,24]
	b_4	H_4	C_1	1	1	$\begin{pmatrix} -\frac{1}{3} & \frac{1}{3} & -\frac{1}{3} \end{pmatrix}$@$\begin{pmatrix} -\frac{1}{6} & \frac{1}{6} & -\frac{1}{6} \end{pmatrix}$	[4,8,10,14,20,22]
B_2	b_5	H_2	H_1	1	1	$\begin{pmatrix} -\frac{2}{3} & -\frac{2}{3} & 0 \end{pmatrix}$@$\begin{pmatrix} 0 & 0 & \frac{1}{3} \end{pmatrix}$	[1,-2,-13,16]
	b_6	H_4	H_3	1	1	$\begin{pmatrix} -\frac{2}{3} & \frac{2}{3} & 0 \end{pmatrix}$@$\begin{pmatrix} 0 & 0 & -\frac{1}{3} \end{pmatrix}$	[3,-4,19,-22]
	b_7	H_3	H_1	1	1	$\begin{pmatrix} 0 & -\frac{2}{3} & -\frac{2}{3} \end{pmatrix}$@$\begin{pmatrix} \frac{1}{3} & 0 & 0 \end{pmatrix}$	[5,-7,17,-24]
	b_8	H_4	H_2	1	1	$\begin{pmatrix} 0 & \frac{2}{3} & -\frac{2}{3} \end{pmatrix}$@$\begin{pmatrix} -\frac{1}{3} & 0 & 0 \end{pmatrix}$	[6,-8,-14,21]
	b_9	H_4	H_1	1	1	$\begin{pmatrix} -\frac{2}{3} & 0 & -\frac{2}{3} \end{pmatrix}$@$\begin{pmatrix} 0 & \frac{1}{3} & 0 \end{pmatrix}$	[9,-10,18,-20]
	b_{10}	H_3	H_2	1	1	$\begin{pmatrix} \frac{2}{3} & 0 & -\frac{2}{3} \end{pmatrix}$@$\begin{pmatrix} 0 & -\frac{1}{3} & 0 \end{pmatrix}$	[11,-12,-15,23]

- SAMB:

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

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

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

$\hat{\mathbb{Z}}_2 = \mathbb{X}_5[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_1[\mathbb{Q}_0^{(s,A_1)}]$

No. 3 $\hat{\mathbb{Q}}_0^{(A_1)}$ $[\mathrm{M}_1, \mathrm{S}_2]$

$$\hat{\mathbb{Z}}_3 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_2[\mathbb{Q}_0^{(s,A_1)}]$$

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

$$\hat{\mathbb{Z}}_4 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_3[\mathbb{Q}_0^{(u,A_1)}]$$

No. 5 $\hat{\mathbb{Q}}_0^{(A_1)}$ $[\mathrm{M}_2, \mathrm{B}_1]$

$$\hat{\mathbb{Z}}_5 = \frac{\sqrt{3}\mathbb{X}_2[\mathbb{Q}_{1,0}^{(a,T_2)}] \otimes \mathbb{U}_4[\mathbb{Q}_{1,0}^{(u,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_3[\mathbb{Q}_{1,1}^{(a,T_2)}] \otimes \mathbb{U}_5[\mathbb{Q}_{1,1}^{(u,T_2)}]}{3} + \frac{\sqrt{3}\mathbb{X}_4[\mathbb{Q}_{1,2}^{(a,T_2)}] \otimes \mathbb{U}_6[\mathbb{Q}_{1,2}^{(u,T_2)}]}{3}$$

No. 6 $\hat{\mathbb{Q}}_0^{(A_1)}$ $[\mathrm{M}_1, \mathrm{B}_2]$

$$\hat{\mathbb{Z}}_6 = \mathbb{X}_1[\mathbb{Q}_0^{(a,A_1)}] \otimes \mathbb{U}_7[\mathbb{Q}_0^{(u,A_1)}]$$

Table 4: Atomic SAMB group.

group	bra	ket
M_1	s	s
M_2	s	p_x, p_y, p_z
M_3	p_x, p_y, p_z	p_x, p_y, p_z

Table 5: Atomic SAMB.

symbol	type	group	form
$\mathbb{X}_1$	$\mathbb{Q}_0^{(a,A_1)}$	M_1	$\begin{pmatrix} 1 \end{pmatrix}$
$\mathbb{X}_2$	$\mathbb{Q}_{1,0}^{(a,T_2)}$	M_2	$\begin{pmatrix} 1 & 0 & 0 \end{pmatrix}$
$\mathbb{X}_3$	$\mathbb{Q}_{1,1}^{(a,T_2)}$	M_2	$\begin{pmatrix} 0 & 1 & 0 \end{pmatrix}$
$\mathbb{X}_4$	$\mathbb{Q}_{1,2}^{(a,T_2)}$	M_2	$\begin{pmatrix} 0 & 0 & 1 \end{pmatrix}$

continued ...

Table 5

symbol	type	group	form
$\mathbb{X}_5$	$\mathbb{Q}_0^{(a,A_1)}$	M_3	$\begin{pmatrix} \frac{\sqrt{3}}{3} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & \frac{\sqrt{3}}{3} \end{pmatrix}$

Table 6: Uniform SAMB.

symbol	type	cluster	form
$\mathbb{U}_1$	$\mathbb{Q}_0^{(s,A_1)}$	S_1	$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\mathbb{U}_2$	$\mathbb{Q}_0^{(s,A_1)}$	S_2	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{2} \end{pmatrix}$
$\mathbb{U}_3$	$\mathbb{Q}_0^{(u,A_1)}$	B_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$
$\mathbb{U}_4$	$\mathbb{Q}_{1,0}^{(u,T_2)}$	B_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$

continued ...

Table 6

symbol	type	cluster	form
$\mathbb{U}_5$	$\mathbb{Q}_{1,1}^{(u,T_2)}$	B_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$
$\mathbb{U}_6$	$\mathbb{Q}_{1,2}^{(u,T_2)}$	B_1	$\begin{pmatrix} 0 & \frac{\sqrt{2}}{4} & \frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}}{4} \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \end{pmatrix}$
$\mathbb{U}_7$	$\mathbb{Q}_0^{(u,A_1)}$	B_2	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & 0 \end{pmatrix}$

Table 7: Polar harmonics.

No.	symbol	rank	irrep.	mul.	comp.	form
1	$\mathbb{Q}_0^{(A_1)}$	0	A_1	–	–	1
2	$\mathbb{Q}_{1,0}^{(T_2)}$	1	T_2	–	0	x
3	$\mathbb{Q}_{1,1}^{(T_2)}$	1	T_2	–	1	y
4	$\mathbb{Q}_{1,2}^{(T_2)}$	1	T_2	–	2	z

- Group info.: Generator = $2_{001},\ 2_{010},\ 3^+_{111},\ \mathrm{m}_{1-10}$

Table 8: Conjugacy class.

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

Table 9: Symmetry operations.

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

Table 10: Character table.

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

Table 11: Parity conversion.

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

Table 12: 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 13: Anti-symmetric product, $[\Gamma \otimes \Gamma]_-$.

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

Table 14: 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	$\begin{pmatrix} 0 & 2 & 1 \end{pmatrix}$	6	$\begin{pmatrix} 0 & -2 & 1 \end{pmatrix}$	7	$\begin{pmatrix} 0 & -2 & -1 \end{pmatrix}$	8	$\begin{pmatrix} 0 & 2 & -1 \end{pmatrix}$
9	$\begin{pmatrix} 1 & 0 & 2 \end{pmatrix}$	10	$\begin{pmatrix} -1 & 0 & -2 \end{pmatrix}$	11	$\begin{pmatrix} -1 & 0 & 2 \end{pmatrix}$	12	$\begin{pmatrix} 1 & 0 & -2 \end{pmatrix}$
13	$\begin{pmatrix} -1 & -2 & 0 \end{pmatrix}$	14	$\begin{pmatrix} 0 & 1 & -2 \end{pmatrix}$	15	$\begin{pmatrix} 2 & 0 & -1 \end{pmatrix}$	16	$\begin{pmatrix} 1 & 2 & 0 \end{pmatrix}$

continued ...

Table 14

No.	position	No.	position	No.	position	No.	position
17	$\begin{pmatrix}0 & 1 & 2\end{pmatrix}$	18	$\begin{pmatrix}2 & 0 & 1\end{pmatrix}$	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 15: Virtual-cluster basis.

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

continued ...

Table 15

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

continued ...

Table 15

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