

No. 32  $O_h$   $m - 3m$  [ cubic ] (polar)

表 1 rank 0

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
1	$A_{1g}$	<b>A1g</b>	—	—	$\mathbb{Q}_0^{(h, A_{1g})}$	<b>Qh(0, A1g, , )</b>	$C_0$

表 2 rank 1

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
2	$T_{1u}$	<b>T1u</b>	—	0	$\mathbb{Q}_{1,0}^{(h, T_{1u})}$	<b>Qh(1, T1u, , 0)</b>	$C_1$
3	$T_{1u}$	<b>T1u</b>	—	1	$\mathbb{Q}_{1,1}^{(h, T_{1u})}$	<b>Qh(1, T1u, , 1)</b>	$S_1$
4	$T_{1u}$	<b>T1u</b>	—	2	$\mathbb{Q}_{1,2}^{(h, T_{1u})}$	<b>Qh(1, T1u, , 2)</b>	$C_0$

表 3 rank 2

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
5	$E_g$	<b>Eg</b>	—	0	$\mathbb{Q}_{2,0}^{(h, E_g)}$	<b>Qh(2, Eg, , 0)</b>	$C_0$
6	$E_g$	<b>Eg</b>	—	1	$\mathbb{Q}_{2,1}^{(h, E_g)}$	<b>Qh(2, Eg, , 1)</b>	$C_2$
7	$T_{2g}$	<b>T2g</b>	—	0	$\mathbb{Q}_{2,0}^{(h, T_{2g})}$	<b>Qh(2, T2g, , 0)</b>	$S_1$
8	$T_{2g}$	<b>T2g</b>	—	1	$\mathbb{Q}_{2,1}^{(h, T_{2g})}$	<b>Qh(2, T2g, , 1)</b>	$C_1$
9	$T_{2g}$	<b>T2g</b>	—	2	$\mathbb{Q}_{2,2}^{(h, T_{2g})}$	<b>Qh(2, T2g, , 2)</b>	$S_2$

表 4 rank 3

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
10	$A_{2u}$	<b>A2u</b>	—	—	$\mathbb{Q}_3^{(h, A_{2u})}$	<b>Qh(3, A2u, , )</b>	$S_2$
11	$T_{1u}$	<b>T1u</b>	—	0	$\mathbb{Q}_{3,0}^{(h, T_{1u})}$	<b>Qh(3, T1u, , 0)</b>	$-\frac{\sqrt{6}C_1}{4} + \frac{\sqrt{10}C_3}{4}$
12	$T_{1u}$	<b>T1u</b>	—	1	$\mathbb{Q}_{3,1}^{(h, T_{1u})}$	<b>Qh(3, T1u, , 1)</b>	$-\frac{\sqrt{6}S_1}{4} - \frac{\sqrt{10}S_3}{4}$
13	$T_{1u}$	<b>T1u</b>	—	2	$\mathbb{Q}_{3,2}^{(h, T_{1u})}$	<b>Qh(3, T1u, , 2)</b>	$C_0$
14	$T_{2u}$	<b>T2u</b>	—	0	$\mathbb{Q}_{3,0}^{(h, T_{2u})}$	<b>Qh(3, T2u, , 0)</b>	$-\frac{\sqrt{10}C_1}{4} - \frac{\sqrt{6}C_3}{4}$
15	$T_{2u}$	<b>T2u</b>	—	1	$\mathbb{Q}_{3,1}^{(h, T_{2u})}$	<b>Qh(3, T2u, , 1)</b>	$\frac{\sqrt{10}S_1}{4} - \frac{\sqrt{6}S_3}{4}$
16	$T_{2u}$	<b>T2u</b>	—	2	$\mathbb{Q}_{3,2}^{(h, T_{2u})}$	<b>Qh(3, T2u, , 2)</b>	$C_2$

表 5 rank 4

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
17	$A_{1g}$	<b>A1g</b>	—	—	$\mathbb{Q}_4^{(h, A_{1g})}$	<b>Qh(4, A1g, , )</b>	$\frac{\sqrt{21}C_0}{6} + \frac{\sqrt{15}C_4}{6}$
18	$E_g$	<b>Eg</b>	—	0	$\mathbb{Q}_{4,0}^{(h, E_g)}$	<b>Qh(4, Eg, , 0)</b>	$\frac{\sqrt{15}C_0}{6} - \frac{\sqrt{21}C_4}{6}$
19	$E_g$	<b>Eg</b>	—	1	$\mathbb{Q}_{4,1}^{(h, E_g)}$	<b>Qh(4, Eg, , 1)</b>	$-C_2$
20	$T_{1g}$	<b>T1g</b>	—	0	$\mathbb{Q}_{4,0}^{(h, T_{1g})}$	<b>Qh(4, T1g, , 0)</b>	$-\frac{\sqrt{14}S_1}{4} - \frac{\sqrt{2}S_3}{4}$
21	$T_{1g}$	<b>T1g</b>	—	1	$\mathbb{Q}_{4,1}^{(h, T_{1g})}$	<b>Qh(4, T1g, , 1)</b>	$\frac{\sqrt{14}C_1}{4} - \frac{\sqrt{2}C_3}{4}$
22	$T_{1g}$	<b>T1g</b>	—	2	$\mathbb{Q}_{4,2}^{(h, T_{1g})}$	<b>Qh(4, T1g, , 2)</b>	$S_4$
23	$T_{2g}$	<b>T2g</b>	—	0	$\mathbb{Q}_{4,0}^{(h, T_{2g})}$	<b>Qh(4, T2g, , 0)</b>	$-\frac{\sqrt{2}S_1}{4} + \frac{\sqrt{14}S_3}{4}$
24	$T_{2g}$	<b>T2g</b>	—	1	$\mathbb{Q}_{4,1}^{(h, T_{2g})}$	<b>Qh(4, T2g, , 1)</b>	$-\frac{\sqrt{2}C_1}{4} - \frac{\sqrt{14}C_3}{4}$
25	$T_{2g}$	<b>T2g</b>	—	2	$\mathbb{Q}_{4,2}^{(h, T_{2g})}$	<b>Qh(4, T2g, , 2)</b>	$S_2$

表 6 rank 5

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
26	$E_u$	<b>Eu</b>	—	0	$\mathbb{Q}_{5,0}^{(h,E_u)}$	$\text{Qh}(5, \text{Eu}, , 0)$	$S_4$
27	$E_u$	<b>Eu</b>	—	1	$\mathbb{Q}_{5,1}^{(h,E_u)}$	$\text{Qh}(5, \text{Eu}, , 1)$	$-S_2$
28	$T_{1u}$	<b>T1u</b>	1	0	$\mathbb{Q}_{5,0}^{(h,T_{1u},1)}$	$\text{Qh}(5, \text{T1u}, 1, 0)$	$\frac{\sqrt{15}C_1}{8} - \frac{\sqrt{70}C_3}{16} + \frac{3\sqrt{14}C_5}{16}$
29	$T_{1u}$	<b>T1u</b>	1	1	$\mathbb{Q}_{5,1}^{(h,T_{1u},1)}$	$\text{Qh}(5, \text{T1u}, 1, 1)$	$\frac{\sqrt{15}S_1}{8} + \frac{\sqrt{70}S_3}{16} + \frac{3\sqrt{14}S_5}{16}$
30	$T_{1u}$	<b>T1u</b>	1	2	$\mathbb{Q}_{5,2}^{(h,T_{1u},1)}$	$\text{Qh}(5, \text{T1u}, 1, 2)$	$C_0$
31	$T_{1u}$	<b>T1u</b>	2	0	$\mathbb{Q}_{5,0}^{(h,T_{1u},2)}$	$\text{Qh}(5, \text{T1u}, 2, 0)$	$\frac{\sqrt{21}C_1}{8} + \frac{9\sqrt{2}C_3}{16} + \frac{\sqrt{10}C_5}{16}$
32	$T_{1u}$	<b>T1u</b>	2	1	$\mathbb{Q}_{5,1}^{(h,T_{1u},2)}$	$\text{Qh}(5, \text{T1u}, 2, 1)$	$\frac{\sqrt{21}S_1}{8} - \frac{9\sqrt{2}S_3}{16} + \frac{\sqrt{10}S_5}{16}$
33	$T_{1u}$	<b>T1u</b>	2	2	$\mathbb{Q}_{5,2}^{(h,T_{1u},2)}$	$\text{Qh}(5, \text{T1u}, 2, 2)$	$C_4$
34	$T_{2u}$	<b>T2u</b>	—	0	$\mathbb{Q}_{5,0}^{(h,T_{2u})}$	$\text{Qh}(5, \text{T2u}, , 0)$	$\frac{\sqrt{7}C_1}{4} - \frac{\sqrt{6}C_3}{8} - \frac{\sqrt{30}C_5}{8}$
35	$T_{2u}$	<b>T2u</b>	—	1	$\mathbb{Q}_{5,1}^{(h,T_{2u})}$	$\text{Qh}(5, \text{T2u}, , 1)$	$-\frac{\sqrt{7}S_1}{4} - \frac{\sqrt{6}S_3}{8} + \frac{\sqrt{30}S_5}{8}$
36	$T_{2u}$	<b>T2u</b>	—	2	$\mathbb{Q}_{5,2}^{(h,T_{2u})}$	$\text{Qh}(5, \text{T2u}, , 2)$	$C_2$

表 7 rank 6

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
37	$A_{1g}$	<b>A1g</b>	—	—	$\mathbb{Q}_6^{(h,A_{1g})}$	$\text{Qh}(6, \text{A1g}, , )$	$\frac{\sqrt{2}C_0}{4} - \frac{\sqrt{14}C_4}{4}$
38	$A_{2g}$	<b>A2g</b>	—	—	$\mathbb{Q}_6^{(h,A_{2g})}$	$\text{Qh}(6, \text{A2g}, , )$	$\frac{\sqrt{11}C_2}{4} - \frac{\sqrt{5}C_6}{4}$
39	$E_g$	<b>Eg</b>	—	0	$\mathbb{Q}_{6,0}^{(h,E_g)}$	$\text{Qh}(6, \text{Eg}, , 0)$	$\frac{\sqrt{14}C_0}{4} + \frac{\sqrt{2}C_4}{4}$
40	$E_g$	<b>Eg</b>	—	1	$\mathbb{Q}_{6,1}^{(h,E_g)}$	$\text{Qh}(6, \text{Eg}, , 1)$	$\frac{\sqrt{5}C_2}{4} + \frac{\sqrt{11}C_6}{4}$
41	$T_{1g}$	<b>T1g</b>	—	0	$\mathbb{Q}_{6,0}^{(h,T_{1g})}$	$\text{Qh}(6, \text{T1g}, , 0)$	$\frac{\sqrt{3}S_1}{4} - \frac{\sqrt{30}S_3}{8} - \frac{\sqrt{22}S_5}{8}$
42	$T_{1g}$	<b>T1g</b>	—	1	$\mathbb{Q}_{6,1}^{(h,T_{1g})}$	$\text{Qh}(6, \text{T1g}, , 1)$	$-\frac{\sqrt{3}C_1}{4} - \frac{\sqrt{30}C_3}{8} + \frac{\sqrt{22}C_5}{8}$
43	$T_{1g}$	<b>T1g</b>	—	2	$\mathbb{Q}_{6,2}^{(h,T_{1g})}$	$\text{Qh}(6, \text{T1g}, , 2)$	$S_4$
44	$T_{2g}$	<b>T2g</b>	1	0	$\mathbb{Q}_{6,0}^{(h,T_{2g},1)}$	$\text{Qh}(6, \text{T2g}, 1, 0)$	$\frac{3\sqrt{22}S_1}{16} + \frac{\sqrt{55}S_3}{16} + \frac{\sqrt{3}S_5}{16}$
45	$T_{2g}$	<b>T2g</b>	1	1	$\mathbb{Q}_{6,1}^{(h,T_{2g},1)}$	$\text{Qh}(6, \text{T2g}, 1, 1)$	$\frac{3\sqrt{22}C_1}{16} - \frac{\sqrt{55}C_3}{16} + \frac{\sqrt{3}C_5}{16}$
46	$T_{2g}$	<b>T2g</b>	1	2	$\mathbb{Q}_{6,2}^{(h,T_{2g},1)}$	$\text{Qh}(6, \text{T2g}, 1, 2)$	$S_6$
47	$T_{2g}$	<b>T2g</b>	2	0	$\mathbb{Q}_{6,0}^{(h,T_{2g},2)}$	$\text{Qh}(6, \text{T2g}, 2, 0)$	$\frac{\sqrt{10}S_1}{16} - \frac{9S_3}{16} + \frac{\sqrt{165}S_5}{16}$
48	$T_{2g}$	<b>T2g</b>	2	1	$\mathbb{Q}_{6,1}^{(h,T_{2g},2)}$	$\text{Qh}(6, \text{T2g}, 2, 1)$	$\frac{\sqrt{10}C_1}{16} + \frac{9C_3}{16} + \frac{\sqrt{165}C_5}{16}$
49	$T_{2g}$	<b>T2g</b>	2	2	$\mathbb{Q}_{6,2}^{(h,T_{2g},2)}$	$\text{Qh}(6, \text{T2g}, 2, 2)$	$S_2$

表 8 rank 7

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
50	$A_{2u}$	A2u	—	—	$Q_7^{(h,A_{2u})}$	Qh(7, A2u, , )	$\frac{\sqrt{78}S_2}{12} + \frac{\sqrt{66}S_6}{12}$
51	$E_u$	Eu	—	0	$Q_{7,0}^{(h,E_u)}$	Qh(7, Eu, , 0)	$S_4$
52	$E_u$	Eu	—	1	$Q_{7,1}^{(h,E_u)}$	Qh(7, Eu, , 1)	$\frac{\sqrt{66}S_2}{12} - \frac{\sqrt{78}S_6}{12}$
53	$T_{1u}$	T1u	1	0	$Q_{7,0}^{(h,T_{1u},1)}$	Qh(7, T1u, 1, 0)	$-\frac{5\sqrt{7}C_1}{32} + \frac{3\sqrt{21}C_3}{32} - \frac{\sqrt{231}C_5}{32} + \frac{\sqrt{429}C_7}{32}$
54	$T_{1u}$	T1u	1	1	$Q_{7,1}^{(h,T_{1u},1)}$	Qh(7, T1u, 1, 1)	$-\frac{5\sqrt{7}S_1}{32} - \frac{3\sqrt{21}S_3}{32} - \frac{\sqrt{231}S_5}{32} - \frac{\sqrt{429}S_7}{32}$
55	$T_{1u}$	T1u	1	2	$Q_{7,2}^{(h,T_{1u},1)}$	Qh(7, T1u, 1, 2)	$C_0$
56	$T_{1u}$	T1u	2	0	$Q_{7,0}^{(h,T_{1u},2)}$	Qh(7, T1u, 2, 0)	$-\frac{3\sqrt{33}C_1}{32} - \frac{\sqrt{11}C_3}{32} + \frac{25C_5}{32} + \frac{\sqrt{91}C_7}{32}$
57	$T_{1u}$	T1u	2	1	$Q_{7,1}^{(h,T_{1u},2)}$	Qh(7, T1u, 2, 1)	$-\frac{3\sqrt{33}S_1}{32} + \frac{\sqrt{11}S_3}{32} + \frac{25S_5}{32} - \frac{\sqrt{91}S_7}{32}$
58	$T_{1u}$	T1u	2	2	$Q_{7,2}^{(h,T_{1u},2)}$	Qh(7, T1u, 2, 2)	$C_4$
59	$T_{2u}$	T2u	1	0	$Q_{7,0}^{(h,T_{2u},1)}$	Qh(7, T2u, 1, 0)	$-\frac{\sqrt{858}C_1}{64} - \frac{3\sqrt{286}C_3}{64} - \frac{5\sqrt{26}C_5}{64} - \frac{\sqrt{14}C_7}{64}$
60	$T_{2u}$	T2u	1	1	$Q_{7,1}^{(h,T_{2u},1)}$	Qh(7, T2u, 1, 1)	$\frac{\sqrt{858}S_1}{64} - \frac{3\sqrt{286}S_3}{64} + \frac{5\sqrt{26}S_5}{64} - \frac{\sqrt{14}S_7}{64}$
61	$T_{2u}$	T2u	1	2	$Q_{7,2}^{(h,T_{2u},1)}$	Qh(7, T2u, 1, 2)	$C_6$
62	$T_{2u}$	T2u	2	0	$Q_{7,0}^{(h,T_{2u},2)}$	Qh(7, T2u, 2, 0)	$-\frac{15\sqrt{6}C_1}{64} + \frac{19\sqrt{2}C_3}{64} - \frac{\sqrt{22}C_5}{64} - \frac{\sqrt{2002}C_7}{64}$
63	$T_{2u}$	T2u	2	1	$Q_{7,1}^{(h,T_{2u},2)}$	Qh(7, T2u, 2, 1)	$\frac{15\sqrt{6}S_1}{64} + \frac{19\sqrt{2}S_3}{64} + \frac{\sqrt{22}S_5}{64} - \frac{\sqrt{2002}S_7}{64}$
64	$T_{2u}$	T2u	2	2	$Q_{7,2}^{(h,T_{2u},2)}$	Qh(7, T2u, 2, 2)	$C_2$

表 9 rank 8

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
65	$A_{1g}$	A1g	—	—	$Q_8^{(h,A_{1g})}$	Qh(8, A1g, , )	$\frac{\sqrt{33}C_0}{8} + \frac{\sqrt{21}C_4}{12} + \frac{\sqrt{195}C_8}{24}$
66	$E_g$	Eg	1	0	$Q_{8,0}^{(h,E_g,1)}$	Qh(8, Eg, 1, 0)	$-\frac{\sqrt{286}C_0}{32} + \frac{\sqrt{182}C_4}{16} + \frac{\sqrt{10}C_8}{32}$
67	$E_g$	Eg	1	1	$Q_{8,1}^{(h,E_g,1)}$	Qh(8, Eg, 1, 1)	$C_6$
68	$E_g$	Eg	2	0	$Q_{8,0}^{(h,E_g,2)}$	Qh(8, Eg, 2, 0)	$-\frac{\sqrt{210}C_0}{32} - \frac{\sqrt{330}C_4}{48} + \frac{\sqrt{6006}C_8}{96}$
69	$E_g$	Eg	2	1	$Q_{8,1}^{(h,E_g,2)}$	Qh(8, Eg, 2, 1)	$C_2$
70	$T_{1g}$	T1g	1	0	$Q_{8,0}^{(h,T_{1g},1)}$	Qh(8, T1g, 1, 0)	$-\frac{\sqrt{715}S_1}{32} - \frac{\sqrt{273}S_3}{32} - \frac{\sqrt{35}S_5}{32} - \frac{S_7}{32}$
71	$T_{1g}$	T1g	1	1	$Q_{8,1}^{(h,T_{1g},1)}$	Qh(8, T1g, 1, 1)	$\frac{\sqrt{715}C_1}{32} - \frac{\sqrt{273}C_3}{32} + \frac{\sqrt{35}C_5}{32} - \frac{C_7}{32}$
72	$T_{1g}$	T1g	1	2	$Q_{8,2}^{(h,T_{1g},1)}$	Qh(8, T1g, 1, 2)	$S_8$
73	$T_{1g}$	T1g	2	0	$Q_{8,0}^{(h,T_{1g},2)}$	Qh(8, T1g, 2, 0)	$-\frac{\sqrt{77}S_1}{32} + \frac{5\sqrt{15}S_3}{32} - \frac{3\sqrt{13}S_5}{32} - \frac{\sqrt{455}S_7}{32}$
74	$T_{1g}$	T1g	2	1	$Q_{8,1}^{(h,T_{1g},2)}$	Qh(8, T1g, 2, 1)	$\frac{\sqrt{77}C_1}{32} + \frac{5\sqrt{15}C_3}{32} + \frac{3\sqrt{13}C_5}{32} - \frac{\sqrt{455}C_7}{32}$
75	$T_{1g}$	T1g	2	2	$Q_{8,2}^{(h,T_{1g},2)}$	Qh(8, T1g, 2, 2)	$S_4$
76	$T_{2g}$	T2g	1	0	$Q_{8,0}^{(h,T_{2g},1)}$	Qh(8, T2g, 1, 0)	$-\frac{\sqrt{858}S_1}{64} + \frac{\sqrt{910}S_3}{64} + \frac{7\sqrt{42}S_5}{64} + \frac{3\sqrt{30}S_7}{64}$
77	$T_{2g}$	T2g	1	1	$Q_{8,1}^{(h,T_{2g},1)}$	Qh(8, T2g, 1, 1)	$-\frac{\sqrt{858}C_1}{64} - \frac{\sqrt{910}C_3}{64} + \frac{7\sqrt{42}C_5}{64} - \frac{3\sqrt{30}C_7}{64}$
78	$T_{2g}$	T2g	1	2	$Q_{8,2}^{(h,T_{2g},1)}$	Qh(8, T2g, 1, 2)	$S_6$
79	$T_{2g}$	T2g	2	0	$Q_{8,0}^{(h,T_{2g},2)}$	Qh(8, T2g, 2, 0)	$-\frac{\sqrt{70}S_1}{64} + \frac{3\sqrt{66}S_3}{64} - \frac{\sqrt{1430}S_5}{64} + \frac{\sqrt{2002}S_7}{64}$
80	$T_{2g}$	T2g	2	1	$Q_{8,1}^{(h,T_{2g},2)}$	Qh(8, T2g, 2, 1)	$-\frac{\sqrt{70}C_1}{64} - \frac{3\sqrt{66}C_3}{64} - \frac{\sqrt{1430}C_5}{64} - \frac{\sqrt{2002}C_7}{64}$
81	$T_{2g}$	T2g	2	2	$Q_{8,2}^{(h,T_{2g},2)}$	Qh(8, T2g, 2, 2)	$S_2$

表 10 rank 9

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
82	$A_{1u}$	A1u	—	—	$Q_9^{(h,A_{1u})}$	Qh(9, A1u, , )	$\frac{\sqrt{102}S_4}{12} - \frac{\sqrt{42}S_8}{12}$
83	$A_{2u}$	A2u	—	—	$Q_9^{(h,A_{2u})}$	Qh(9, A2u, , )	$\frac{\sqrt{3}S_2}{4} - \frac{\sqrt{13}S_6}{4}$
84	$E_u$	Eu	—	0	$Q_{9,0}^{(h,E_u)}$	Qh(9, Eu, , 0)	$\frac{\sqrt{42}S_4}{12} + \frac{\sqrt{102}S_8}{12}$
85	$E_u$	Eu	—	1	$Q_{9,1}^{(h,E_u)}$	Qh(9, Eu, , 1)	$-\frac{\sqrt{13}S_2}{4} - \frac{\sqrt{3}S_6}{4}$
86	$T_{1u}$	T1u	1	0	$Q_{9,0}^{(h,T_{1u},1)}$	Qh(9, T1u, 1, 0)	$\frac{21\sqrt{5}C_1}{128} - \frac{\sqrt{2310}C_3}{128} + \frac{3\sqrt{286}C_5}{128} - \frac{3\sqrt{1430}C_7}{256} + \frac{\sqrt{24310}C_9}{256}$
87	$T_{1u}$	T1u	1	1	$Q_{9,1}^{(h,T_{1u},1)}$	Qh(9, T1u, 1, 1)	$\frac{21\sqrt{5}S_1}{128} + \frac{\sqrt{2310}S_3}{128} + \frac{3\sqrt{286}S_5}{128} + \frac{3\sqrt{1430}S_7}{256} + \frac{\sqrt{24310}S_9}{256}$
88	$T_{1u}$	T1u	1	2	$Q_{9,2}^{(h,T_{1u},1)}$	Qh(9, T1u, 1, 2)	$C_0$
89	$T_{1u}$	T1u	2	0	$Q_{9,0}^{(h,T_{1u},2)}$	Qh(9, T1u, 2, 0)	$\frac{\sqrt{2431}C_1}{128} + \frac{\sqrt{9282}C_3}{128} + \frac{5\sqrt{170}C_5}{128} + \frac{7\sqrt{34}C_7}{256} + \frac{3\sqrt{2}C_9}{256}$
90	$T_{1u}$	T1u	2	1	$Q_{9,1}^{(h,T_{1u},2)}$	Qh(9, T1u, 2, 1)	$\frac{\sqrt{2431}S_1}{128} - \frac{\sqrt{9282}S_3}{128} + \frac{5\sqrt{170}S_5}{128} - \frac{7\sqrt{34}S_7}{256} + \frac{3\sqrt{2}S_9}{256}$
91	$T_{1u}$	T1u	2	2	$Q_{9,2}^{(h,T_{1u},2)}$	Qh(9, T1u, 2, 2)	$C_8$
92	$T_{1u}$	T1u	3	0	$Q_{9,0}^{(h,T_{1u},3)}$	Qh(9, T1u, 3, 0)	$\frac{\sqrt{1001}C_1}{64} - \frac{\sqrt{78}C_3}{64} - \frac{3\sqrt{70}C_5}{64} + \frac{23\sqrt{14}C_7}{128} + \frac{3\sqrt{238}C_9}{128}$
93	$T_{1u}$	T1u	3	1	$Q_{9,1}^{(h,T_{1u},3)}$	Qh(9, T1u, 3, 1)	$\frac{\sqrt{1001}S_1}{64} + \frac{\sqrt{78}S_3}{64} - \frac{3\sqrt{70}S_5}{64} - \frac{23\sqrt{14}S_7}{128} + \frac{3\sqrt{238}S_9}{128}$
94	$T_{1u}$	T1u	3	2	$Q_{9,2}^{(h,T_{1u},3)}$	Qh(9, T1u, 3, 2)	$C_4$
95	$T_{2u}$	T2u	1	0	$Q_{9,0}^{(h,T_{2u},1)}$	Qh(9, T2u, 1, 0)	$\frac{\sqrt{858}C_1}{64} + \frac{\sqrt{91}C_3}{32} - \frac{5\sqrt{15}C_5}{32} - \frac{21\sqrt{3}C_7}{64} - \frac{\sqrt{51}C_9}{64}$
96	$T_{2u}$	T2u	1	1	$Q_{9,1}^{(h,T_{2u},1)}$	Qh(9, T2u, 1, 1)	$-\frac{\sqrt{858}S_1}{64} + \frac{\sqrt{91}S_3}{32} + \frac{5\sqrt{15}S_5}{32} - \frac{21\sqrt{3}S_7}{64} + \frac{\sqrt{51}S_9}{64}$
97	$T_{2u}$	T2u	1	2	$Q_{9,2}^{(h,T_{2u},1)}$	Qh(9, T2u, 1, 2)	$C_6$
98	$T_{2u}$	T2u	2	0	$Q_{9,0}^{(h,T_{2u},2)}$	Qh(9, T2u, 2, 0)	$\frac{7\sqrt{22}C_1}{64} - \frac{3\sqrt{21}C_3}{32} + \frac{\sqrt{65}C_5}{32} + \frac{\sqrt{13}C_7}{64} - \frac{3\sqrt{221}C_9}{64}$
99	$T_{2u}$	T2u	2	1	$Q_{9,1}^{(h,T_{2u},2)}$	Qh(9, T2u, 2, 1)	$-\frac{7\sqrt{22}S_1}{64} - \frac{3\sqrt{21}S_3}{32} - \frac{\sqrt{65}S_5}{32} + \frac{\sqrt{13}S_7}{64} + \frac{3\sqrt{221}S_9}{64}$
100	$T_{2u}$	T2u	2	2	$Q_{9,2}^{(h,T_{2u},2)}$	Qh(9, T2u, 2, 2)	$C_2$

表 11 rank 10

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
101	$A_{1g}$	A1g	—	—	$Q_{10}^{(h,A_{1g})}$	Qh(10, A1g, , )	$\frac{\sqrt{390}C_0}{48} - \frac{\sqrt{22}C_4}{8} - \frac{\sqrt{1122}C_8}{48}$
102	$A_{2g}$	A2g	—	—	$Q_{10}^{(h,A_{2g})}$	Qh(10, A2g, , )	$-\frac{\sqrt{85}C_{10}}{16} + \frac{\sqrt{1482}C_2}{48} + \frac{\sqrt{57}C_6}{48}$
103	$E_g$	Eg	1	0	$Q_{10,0}^{(h,E_g,1)}$	Qh(10, Eg, 1, 0)	$\frac{11\sqrt{420189}C_0}{8988} + \frac{\sqrt{827645}C_4}{1498} - \frac{\sqrt{146055}C_8}{8988}$
104	$E_g$	Eg	1	1	$Q_{10,1}^{(h,E_g,1)}$	Qh(10, Eg, 1, 1)	$\frac{\sqrt{370006}C_{10}}{749} + \frac{\sqrt{190995}C_2}{749}$
105	$E_g$	Eg	2	0	$Q_{10,0}^{(h,E_g,2)}$	Qh(10, Eg, 2, 0)	$\frac{3\sqrt{3213210}C_0}{11984} - \frac{83\sqrt{1498}C_4}{5992} + \frac{31\sqrt{76398}C_8}{11984}$
106	$E_g$	Eg	2	1	$Q_{10,1}^{(h,E_g,2)}$	Qh(10, Eg, 2, 1)	$\frac{\sqrt{1209635}C_{10}}{11984} - \frac{19\sqrt{58422}C_2}{35952} + \frac{\sqrt{2247}C_6}{48}$
107	$T_{1g}$	T1g	1	0	$Q_{10,0}^{(h,T_{1g},1)}$	Qh(10, T1g, 1, 0)	$\frac{\sqrt{221}S_1}{32} - \frac{\sqrt{102}S_3}{32} - \frac{\sqrt{510}S_5}{32} - \frac{11\sqrt{6}S_7}{64} - \frac{\sqrt{38}S_9}{64}$
108	$T_{1g}$	T1g	1	1	$Q_{10,1}^{(h,T_{1g},1)}$	Qh(10, T1g, 1, 1)	$-\frac{\sqrt{221}C_1}{32} - \frac{\sqrt{102}C_3}{32} + \frac{\sqrt{510}C_5}{32} - \frac{11\sqrt{6}C_7}{64} + \frac{\sqrt{38}C_9}{64}$
109	$T_{1g}$	T1g	1	2	$Q_{10,2}^{(h,T_{1g},1)}$	Qh(10, T1g, 1, 2)	$S_8$
110	$T_{1g}$	T1g	2	0	$Q_{10,0}^{(h,T_{1g},2)}$	Qh(10, T1g, 2, 0)	$\frac{\sqrt{39}S_1}{32} - \frac{11\sqrt{2}S_3}{32} + \frac{5\sqrt{10}S_5}{32} - \frac{\sqrt{34}S_7}{64} - \frac{\sqrt{1938}S_9}{64}$
111	$T_{1g}$	T1g	2	1	$Q_{10,1}^{(h,T_{1g},2)}$	Qh(10, T1g, 2, 1)	$-\frac{\sqrt{39}C_1}{32} - \frac{11\sqrt{2}C_3}{32} - \frac{5\sqrt{10}C_5}{32} - \frac{\sqrt{34}C_7}{64} + \frac{\sqrt{1938}C_9}{64}$
112	$T_{1g}$	T1g	2	2	$Q_{10,2}^{(h,T_{1g},2)}$	Qh(10, T1g, 2, 2)	$S_4$
113	$T_{2g}$	T2g	1	0	$Q_{10,0}^{(h,T_{2g},1)}$	Qh(10, T2g, 1, 0)	$\frac{\sqrt{41990}S_1}{256} + \frac{\sqrt{4845}S_3}{128} + \frac{\sqrt{969}S_5}{128} + \frac{\sqrt{285}S_7}{256} + \frac{\sqrt{5}S_9}{256}$
114	$T_{2g}$	T2g	1	1	$Q_{10,1}^{(h,T_{2g},1)}$	Qh(10, T2g, 1, 1)	$\frac{\sqrt{41990}C_1}{256} - \frac{\sqrt{4845}C_3}{128} + \frac{\sqrt{969}C_5}{128} - \frac{\sqrt{285}C_7}{256} + \frac{\sqrt{5}C_9}{256}$
115	$T_{2g}$	T2g	1	2	$Q_{10,2}^{(h,T_{2g},1)}$	Qh(10, T2g, 1, 2)	$S_{10}$
116	$T_{2g}$	T2g	2	0	$Q_{10,0}^{(h,T_{2g},2)}$	Qh(10, T2g, 2, 0)	$\frac{9\sqrt{78}S_1}{256} - \frac{69S_3}{128} - \frac{\sqrt{5}S_5}{256} + \frac{43\sqrt{17}S_7}{256} + \frac{3\sqrt{969}S_9}{256}$
117	$T_{2g}$	T2g	2	1	$Q_{10,1}^{(h,T_{2g},2)}$	Qh(10, T2g, 2, 1)	$\frac{9\sqrt{78}C_1}{256} + \frac{69C_3}{128} - \frac{\sqrt{5}C_5}{128} - \frac{43\sqrt{17}C_7}{256} + \frac{3\sqrt{969}C_9}{256}$
118	$T_{2g}$	T2g	2	2	$Q_{10,2}^{(h,T_{2g},2)}$	Qh(10, T2g, 2, 2)	$S_6$
119	$T_{2g}$	T2g	3	0	$Q_{10,0}^{(h,T_{2g},3)}$	Qh(10, T2g, 3, 0)	$\frac{7\sqrt{3}S_1}{128} - \frac{7\sqrt{26}S_3}{128} + \frac{5\sqrt{130}S_5}{128} - \frac{7\sqrt{442}S_7}{256} + \frac{\sqrt{25194}S_9}{256}$
120	$T_{2g}$	T2g	3	1	$Q_{10,1}^{(h,T_{2g},3)}$	Qh(10, T2g, 3, 1)	$\frac{7\sqrt{3}C_1}{128} + \frac{7\sqrt{26}C_3}{128} + \frac{5\sqrt{130}C_5}{128} + \frac{7\sqrt{442}C_7}{256} + \frac{\sqrt{25194}C_9}{256}$
121	$T_{2g}$	T2g	3	2	$Q_{10,2}^{(h,T_{2g},3)}$	Qh(10, T2g, 3, 2)	$S_2$

表 12 rank 11

No.	irrep.	(tag)	mul.	comp.	harmonics	(tag)	definition
122	$A_{2u}$	A2u	—	—	$\mathbb{Q}_{11}^{(h,A_{2u})}$	Qh(11, A2u, , )	$\frac{\sqrt{798}S_{10}}{48} + \frac{\sqrt{255}S_2}{24} + \frac{3\sqrt{6}S_6}{16}$
123	$E_u$	Eu	1	0	$\mathbb{Q}_{11,0}^{(h,E_u,1)}$	Qh(11, Eu, 1, 0)	$S_8$
124	$E_u$	Eu	1	1	$\mathbb{Q}_{11,1}^{(h,E_u,1)}$	Qh(11, Eu, 1, 1)	$-\frac{\sqrt{210}S_{10}}{96} + \frac{\sqrt{969}S_2}{48} - \frac{\sqrt{570}S_6}{32}$
125	$E_u$	Eu	2	0	$\mathbb{Q}_{11,0}^{(h,E_u,2)}$	Qh(11, Eu, 2, 0)	$S_4$
126	$E_u$	Eu	2	1	$\mathbb{Q}_{11,1}^{(h,E_u,2)}$	Qh(11, Eu, 2, 1)	$-\frac{\sqrt{646}S_{10}}{32} + \frac{\sqrt{35}S_2}{16} + \frac{\sqrt{238}S_6}{32}$
127	$T_{1u}$	T1u	1	0	$\mathbb{Q}_{11,0}^{(h,T_{1u},1)}$	Qh(11, T1u, 1, 0)	$-\frac{21\sqrt{66}C_1}{512} + \frac{\sqrt{88179}C_{11}}{512} + \frac{\sqrt{30030}C_3}{512} - \frac{15\sqrt{143}C_5}{512} + \frac{\sqrt{36465}C_7}{512} - \frac{\sqrt{46189}C_9}{512}$
128	$T_{1u}$	T1u	1	1	$\mathbb{Q}_{11,1}^{(h,T_{1u},1)}$	Qh(11, T1u, 1, 1)	$-\frac{21\sqrt{66}S_1}{512} - \frac{\sqrt{88179}S_{11}}{512} - \frac{\sqrt{30030}S_3}{512} - \frac{15\sqrt{143}S_5}{512} - \frac{\sqrt{36465}S_7}{512} - \frac{\sqrt{46189}S_9}{512}$
129	$T_{1u}$	T1u	1	2	$\mathbb{Q}_{11,2}^{(h,T_{1u},1)}$	Qh(11, T1u, 1, 2)	$C_0$
130	$T_{1u}$	T1u	2	0	$\mathbb{Q}_{11,0}^{(h,T_{1u},2)}$	Qh(11, T1u, 2, 0)	$-\frac{\sqrt{41990}C_1}{512} + \frac{\sqrt{385}C_{11}}{512} - \frac{3\sqrt{4522}C_3}{512} + \frac{3\sqrt{4845}C_5}{512} + \frac{77\sqrt{19}C_7}{512} + \frac{39\sqrt{15}C_9}{512}$
131	$T_{1u}$	T1u	2	1	$\mathbb{Q}_{11,1}^{(h,T_{1u},2)}$	Qh(11, T1u, 2, 1)	$-\frac{\sqrt{41990}S_1}{512} - \frac{\sqrt{385}S_{11}}{512} + \frac{3\sqrt{4522}S_3}{512} + \frac{3\sqrt{4845}S_5}{512} - \frac{77\sqrt{19}S_7}{512} + \frac{39\sqrt{15}S_9}{512}$
132	$T_{1u}$	T1u	2	2	$\mathbb{Q}_{11,2}^{(h,T_{1u},2)}$	Qh(11, T1u, 2, 2)	$C_8$
133	$T_{1u}$	T1u	3	0	$\mathbb{Q}_{11,0}^{(h,T_{1u},3)}$	Qh(11, T1u, 3, 0)	$-\frac{5\sqrt{546}C_1}{256} + \frac{\sqrt{10659}C_{11}}{256} + \frac{11\sqrt{30}C_3}{256} + \frac{13\sqrt{7}C_5}{256} - \frac{3\sqrt{1785}C_7}{256} + \frac{3\sqrt{2261}C_9}{256}$
134	$T_{1u}$	T1u	3	1	$\mathbb{Q}_{11,1}^{(h,T_{1u},3)}$	Qh(11, T1u, 3, 1)	$-\frac{5\sqrt{546}S_1}{256} - \frac{\sqrt{10659}S_{11}}{256} - \frac{11\sqrt{30}S_3}{256} + \frac{13\sqrt{7}S_5}{256} + \frac{3\sqrt{1785}S_7}{256} + \frac{3\sqrt{2261}S_9}{256}$
135	$T_{1u}$	T1u	3	2	$\mathbb{Q}_{11,2}^{(h,T_{1u},3)}$	Qh(11, T1u, 3, 2)	$C_4$
136	$T_{2u}$	T2u	1	0	$\mathbb{Q}_{11,0}^{(h,T_{2u},1)}$	Qh(11, T2u, 1, 0)	$-\frac{\sqrt{29393}C_1}{512} - \frac{\sqrt{22}C_{11}}{1024} - \frac{9\sqrt{1615}C_3}{512} - \frac{5\sqrt{13566}C_5}{1024} - \frac{7\sqrt{1330}C_7}{1024} - \frac{9\sqrt{42}C_9}{1024}$
137	$T_{2u}$	T2u	1	1	$\mathbb{Q}_{11,1}^{(h,T_{2u},1)}$	Qh(11, T2u, 1, 1)	$\frac{\sqrt{29393}S_1}{512} - \frac{\sqrt{22}S_{11}}{1024} - \frac{9\sqrt{1615}S_3}{512} + \frac{5\sqrt{13566}S_5}{1024} - \frac{7\sqrt{1330}S_7}{1024} + \frac{9\sqrt{42}S_9}{1024}$
138	$T_{2u}$	T2u	1	2	$\mathbb{Q}_{11,2}^{(h,T_{2u},1)}$	Qh(11, T2u, 1, 2)	$C_{10}$
139	$T_{2u}$	T2u	2	0	$\mathbb{Q}_{11,0}^{(h,T_{2u},2)}$	Qh(11, T2u, 2, 0)	$-\frac{15\sqrt{221}C_1}{512} - \frac{3\sqrt{2926}C_{11}}{1024} - \frac{\sqrt{595}C_3}{512} + \frac{53\sqrt{102}C_5}{1024} - \frac{105\sqrt{10}C_7}{1024} - \frac{61\sqrt{114}C_9}{1024}$
140	$T_{2u}$	T2u	2	1	$\mathbb{Q}_{11,1}^{(h,T_{2u},2)}$	Qh(11, T2u, 2, 1)	$\frac{15\sqrt{221}S_1}{512} - \frac{3\sqrt{2926}S_{11}}{1024} - \frac{\sqrt{595}S_3}{512} - \frac{53\sqrt{102}S_5}{1024} - \frac{105\sqrt{10}S_7}{1024} + \frac{61\sqrt{114}S_9}{1024}$
141	$T_{2u}$	T2u	2	2	$\mathbb{Q}_{11,2}^{(h,T_{2u},2)}$	Qh(11, T2u, 2, 2)	$C_6$
142	$T_{2u}$	T2u	3	0	$\mathbb{Q}_{11,0}^{(h,T_{2u},3)}$	Qh(11, T2u, 3, 0)	$-\frac{21\sqrt{130}C_1}{512} - \frac{\sqrt{124355}C_{11}}{512} + \frac{57\sqrt{14}C_3}{512} - \frac{41\sqrt{15}C_5}{512} + \frac{17\sqrt{17}C_7}{512} + \frac{\sqrt{4845}C_9}{512}$
143	$T_{2u}$	T2u	3	1	$\mathbb{Q}_{11,1}^{(h,T_{2u},3)}$	Qh(11, T2u, 3, 1)	$\frac{21\sqrt{130}S_1}{512} - \frac{\sqrt{124355}S_{11}}{512} + \frac{57\sqrt{14}S_3}{512} + \frac{41\sqrt{15}S_5}{512} + \frac{17\sqrt{17}S_7}{512} - \frac{\sqrt{4845}S_9}{512}$
144	$T_{2u}$	T2u	3	2	$\mathbb{Q}_{11,2}^{(h,T_{2u},3)}$	Qh(11, T2u, 3, 2)	$C_2$