

PG No. 21 C_6 6 [hexagonal]

Table 1 Harmonics for rank 0.

No.	multipole	expression
1	$\mathbb{Q}_0(A)$	1

Table 2 Harmonics for rank 1.

No.	multipole	expression
2	$\mathbb{Q}_1(A)$	z
3	$\mathbb{Q}_{1,1}(E_1)$	x
4	$\mathbb{Q}_{1,2}(E_1)$	y

Table 3 Harmonics for rank 2.

No.	multipole	expression
5	$\mathbb{Q}_2(A)$	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
6	$\mathbb{Q}_{2,1}(E_1)$	$\sqrt{3}yz$
7	$\mathbb{Q}_{2,2}(E_1)$	$-\sqrt{3}xz$
8	$\mathbb{Q}_{2,1}(E_2)$	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
9	$\mathbb{Q}_{2,2}(E_2)$	$-\sqrt{3}xy$

Table 4 Harmonics for rank 3.

No.	multipole	expression
10	$\mathbb{Q}_3(A)$	$-\frac{z(3x^2+3y^2-2z^2)}{2}$
11	$\mathbb{Q}_3(B, 1)$	$\frac{\sqrt{10}y(3x^2-y^2)}{4}$
12	$\mathbb{Q}_3(B, 2)$	$\frac{\sqrt{10}x(x^2-3y^2)}{4}$
13	$\mathbb{Q}_{3,1}(E_1)$	$-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$
14	$\mathbb{Q}_{3,2}(E_1)$	$-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$
15	$\mathbb{Q}_{3,1}(E_2)$	$\sqrt{15}xyz$
16	$\mathbb{Q}_{3,2}(E_2)$	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$

Table 5 Harmonics for rank 4.

No.	multipole	expression
17	$\mathbb{Q}_4(A)$	$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$
18	$\mathbb{Q}_4(B, 1)$	$\frac{\sqrt{70}xz(x^2-3y^2)}{4}$
19	$\mathbb{Q}_4(B, 2)$	$\frac{\sqrt{70}yz(3x^2-y^2)}{4}$
20	$\mathbb{Q}_{4,1}(E_1)$	$-\frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4}$
21	$\mathbb{Q}_{4,2}(E_1)$	$\frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4}$
22	$\mathbb{Q}_{4,1}(E_2, 1)$	$\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$
23	$\mathbb{Q}_{4,2}(E_2, 1)$	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
24	$\mathbb{Q}_{4,1}(E_2, 2)$	$-\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$
25	$\mathbb{Q}_{4,2}(E_2, 2)$	$\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$

Table 6 Harmonics for rank 5.

No.	multipole	expression
26	$\mathbb{Q}_5(A)$	$\frac{z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{8}$
27	$\mathbb{Q}_5(B, 1)$	$-\frac{\sqrt{70}y(3x^2-y^2)(x^2+y^2-8z^2)}{16}$
28	$\mathbb{Q}_5(B, 2)$	$-\frac{\sqrt{70}x(x^2-3y^2)(x^2+y^2-8z^2)}{16}$
29	$\mathbb{Q}_{5,1}(E_1, 1)$	$\frac{3\sqrt{14}x(x^4-10x^2y^2+5y^4)}{16}$
30	$\mathbb{Q}_{5,2}(E_1, 1)$	$-\frac{3\sqrt{14}y(5x^4-10x^2y^2+y^4)}{16}$
31	$\mathbb{Q}_{5,1}(E_1, 2)$	$\frac{\sqrt{15}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$
32	$\mathbb{Q}_{5,2}(E_1, 2)$	$\frac{\sqrt{15}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{8}$
33	$\mathbb{Q}_{5,1}(E_2, 1)$	$-\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$
34	$\mathbb{Q}_{5,2}(E_2, 1)$	$\frac{3\sqrt{35}z(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$
35	$\mathbb{Q}_{5,1}(E_2, 2)$	$-\frac{\sqrt{105}xyz(x^2+y^2-2z^2)}{2}$
36	$\mathbb{Q}_{5,2}(E_2, 2)$	$-\frac{\sqrt{105}z(x-y)(x+y)(x^2+y^2-2z^2)}{4}$

Table 7 Harmonics for rank 6.

No.	multipole	expression
37	$\mathbb{Q}_6(A, 1)$	$-\frac{5x^6}{16} - \frac{15x^4y^2}{16} + \frac{45x^4z^2}{8} - \frac{15x^2y^4}{16} + \frac{45x^2y^2z^2}{4} - \frac{15x^2z^4}{2} - \frac{5y^6}{16} + \frac{45y^4z^2}{8} - \frac{15y^2z^4}{2} + z^6$
38	$\mathbb{Q}_6(A, 2)$	$\frac{\sqrt{462}(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}{32}$
39	$\mathbb{Q}_6(A, 3)$	$\frac{\sqrt{462}xy(x^2-3y^2)(3x^2-y^2)}{16}$
40	$\mathbb{Q}_6(B, 1)$	$-\frac{\sqrt{210}xz(x^2-3y^2)(3x^2+3y^2-8z^2)}{16}$
41	$\mathbb{Q}_6(B, 2)$	$-\frac{\sqrt{210}yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{16}$
42	$\mathbb{Q}_{6,1}(E_1, 1)$	$\frac{3\sqrt{154}yz(5x^4-10x^2y^2+y^4)}{16}$
43	$\mathbb{Q}_{6,2}(E_1, 1)$	$\frac{3\sqrt{154}xz(x^4-10x^2y^2+5y^4)}{16}$
44	$\mathbb{Q}_{6,1}(E_1, 2)$	$\frac{\sqrt{21}yz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{8}$
45	$\mathbb{Q}_{6,2}(E_1, 2)$	$-\frac{\sqrt{21}xz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{8}$
46	$\mathbb{Q}_{6,1}(E_2, 1)$	$-\frac{3\sqrt{7}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$
47	$\mathbb{Q}_{6,2}(E_2, 1)$	$-\frac{3\sqrt{7}xy(x-y)(x+y)(x^2+y^2-10z^2)}{4}$
48	$\mathbb{Q}_{6,1}(E_2, 2)$	$\frac{\sqrt{210}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{32}$
49	$\mathbb{Q}_{6,2}(E_2, 2)$	$-\frac{\sqrt{210}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{16}$

Table 8 Harmonics for rank 7.

No.	multipole	expression
50	$\mathbb{Q}_7(A, 1)$	$\frac{\sqrt{6006}xyz(x^2-3y^2)(3x^2-y^2)}{16}$
51	$\mathbb{Q}_7(A, 2)$	$-\frac{z(35x^6+105x^4y^2-210x^4z^2+105x^2y^4-420x^2y^2z^2+168x^2z^4+35y^6-210y^4z^2+168y^2z^4-16z^6)}{16}$
52	$\mathbb{Q}_7(A, 3)$	$\frac{\sqrt{6006}z(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)}{32}$
53	$\mathbb{Q}_7(B, 1)$	$\frac{\sqrt{21}y(3x^2-y^2)(3x^4+6x^2y^2-60x^2z^2+3y^4-60y^2z^2+80z^4)}{32}$
54	$\mathbb{Q}_7(B, 2)$	$\frac{\sqrt{21}x(x^2-3y^2)(3x^4+6x^2y^2-60x^2z^2+3y^4-60y^2z^2+80z^4)}{32}$
55	$\mathbb{Q}_{7,1}(E_1, 1)$	$\frac{\sqrt{429}x(x^6-21x^4y^2+35x^2y^4-7y^6)}{32}$
56	$\mathbb{Q}_{7,2}(E_1, 1)$	$\frac{\sqrt{429}y(7x^6-35x^4y^2+21x^2y^4-y^6)}{32}$
57	$\mathbb{Q}_{7,1}(E_1, 2)$	$-\frac{\sqrt{231}x(x^2+y^2-12z^2)(x^4-10x^2y^2+5y^4)}{32}$
58	$\mathbb{Q}_{7,2}(E_1, 2)$	$\frac{\sqrt{231}y(x^2+y^2-12z^2)(5x^4-10x^2y^2+y^4)}{32}$
59	$\mathbb{Q}_{7,1}(E_1, 3)$	$-\frac{\sqrt{7}x(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6)}{32}$
60	$\mathbb{Q}_{7,2}(E_1, 3)$	$-\frac{\sqrt{7}y(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6)}{32}$
61	$\mathbb{Q}_{7,1}(E_2, 1)$	$\frac{\sqrt{231}xyz(x-y)(x+y)(x^2+3y^2-10z^2)}{4}$
62	$\mathbb{Q}_{7,2}(E_2, 1)$	$-\frac{\sqrt{231}z(x^2-2xy-y^2)(x^2+2xy-y^2)(3x^2+3y^2-10z^2)}{16}$
63	$\mathbb{Q}_{7,1}(E_2, 2)$	$\frac{\sqrt{42}xyz(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4)}{16}$
64	$\mathbb{Q}_{7,2}(E_2, 2)$	$\frac{\sqrt{42}z(x-y)(x+y)(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4)}{32}$

Table 9 Harmonics for rank 8.

No.	multipole	expression
65	$\mathbb{Q}_8(A, 1)$	$\frac{35x^8}{128} + \frac{35x^6y^2}{32} - \frac{35x^6z^2}{4} + \frac{105x^4y^4}{64} - \frac{105x^4y^2z^2}{4} + \frac{105x^4z^4}{4} + \frac{35x^2y^6}{32} - \frac{105x^2y^4z^2}{4} + \frac{105x^2y^2z^4}{2} - 14x^2z^6 + \frac{35y^8}{128} - \frac{35y^6z^2}{4} + \frac{105y^4z^4}{4} - 14y^2z^6 + z^8$
66	$\mathbb{Q}_8(A, 2)$	$-\frac{\sqrt{858}(x-y)(x+y)(x^2+y^2-14z^2)(x^2-4xy+y^2)(x^2+4xy+y^2)}{64}$
67	$\mathbb{Q}_8(A, 3)$	$-\frac{\sqrt{858}xy(x^2-3y^2)(3x^2-y^2)(x^2+y^2-14z^2)}{32}$
68	$\mathbb{Q}_8(B, 1)$	$\frac{\sqrt{1155}xz(x^2-3y^2)(3x^4+6x^2y^2-20x^2z^2+3y^4-20y^2z^2+16z^4)}{32}$
69	$\mathbb{Q}_8(B, 2)$	$\frac{\sqrt{1155}yz(3x^2-y^2)(3x^4+6x^2y^2-20x^2z^2+3y^4-20y^2z^2+16z^4)}{32}$
70	$\mathbb{Q}_{8,1}(E_1, 1)$	$\frac{3\sqrt{715}yz(7x^6-35x^4y^2+21x^2y^4-y^6)}{32}$
71	$\mathbb{Q}_{8,2}(E_1, 1)$	$-\frac{3\sqrt{715}xz(x^6-21x^4y^2+35x^2y^4-7y^6)}{32}$
72	$\mathbb{Q}_{8,1}(E_1, 2)$	$-\frac{3\sqrt{1001}yz(x^2+y^2-4z^2)(5x^4-10x^2y^2+y^4)}{32}$
73	$\mathbb{Q}_{8,2}(E_1, 2)$	$-\frac{3\sqrt{1001}xz(x^2+y^2-4z^2)(x^4-10x^2y^2+5y^4)}{32}$
74	$\mathbb{Q}_{8,1}(E_1, 3)$	$-\frac{3yz(35x^6+105x^4y^2-280x^4z^2+105x^2y^4-560x^2y^2z^2+336x^2z^4+35y^6-280y^4z^2+336y^2z^4-64z^6)}{32}$
75	$\mathbb{Q}_{8,2}(E_1, 3)$	$\frac{3xz(35x^6+105x^4y^2-280x^4z^2+105x^2y^4-560x^2y^2z^2+336x^2z^4+35y^6-280y^4z^2+336y^2z^4-64z^6)}{32}$
76	$\mathbb{Q}_{8,1}(E_2, 1)$	$\frac{3\sqrt{715}(x^4-4x^3y-6x^2y^2+4xy^3+y^4)(x^4+4x^3y-6x^2y^2-4xy^3+y^4)}{128}$
77	$\mathbb{Q}_{8,2}(E_2, 1)$	$-\frac{3\sqrt{715}xy(x-y)(x+y)(x^2-2xy-y^2)(x^2+2xy-y^2)}{16}$
78	$\mathbb{Q}_{8,1}(E_2, 2)$	$\frac{3\sqrt{77}(x^2-2xy-y^2)(x^2+2xy-y^2)(x^4+2x^2y^2-24x^2z^2+y^4-24y^2z^2+40z^4)}{64}$
79	$\mathbb{Q}_{8,2}(E_2, 2)$	$\frac{3\sqrt{77}xy(x-y)(x+y)(x^4+2x^2y^2-24x^2z^2+y^4-24y^2z^2+40z^4)}{16}$
80	$\mathbb{Q}_{8,1}(E_2, 3)$	$-\frac{3\sqrt{70}(x-y)(x+y)(x^6+3x^4y^2-30x^4z^2+3x^2y^4-60x^2y^2z^2+80x^2z^4+y^6-30y^4z^2+80y^2z^4-32z^6)}{64}$
81	$\mathbb{Q}_{8,2}(E_2, 3)$	$\frac{3\sqrt{70}xy(x^6+3x^4y^2-30x^4z^2+3x^2y^4-60x^2y^2z^2+80x^2z^4+y^6-30y^4z^2+80y^2z^4-32z^6)}{32}$

Table 10 Harmonics for rank 9.

No.	multipole	expression
82	$\mathbb{Q}_9(A, 1)$	$\frac{-\sqrt{4290xyz(x^2-3y^2)(3x^2-y^2)(3x^2+3y^2-14z^2)}}{32}$
83	$\mathbb{Q}_9(A, 2)$	$\frac{z(315x^8+1260x^6y^2-3360x^6z^2+1890x^4y^4-10080x^4y^2z^2+6048x^4z^4+1260x^2y^6-10080x^2y^4z^2+12096x^2y^2z^4-2304x^2z^6+315y^8-3360y^6z^2+6048y^4z^4-2304y^2z^6+128z^8)}{128}$
84	$\mathbb{Q}_9(A, 3)$	$\frac{-\sqrt{4290z(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)(3x^2+3y^2-14z^2)}}{64}$
85	$\mathbb{Q}_9(B, 1)$	$\frac{\sqrt{24310y}(3x^2-y^2)(3x^6-27x^4y^2+33x^2y^4-y^6)}{256}$
86	$\mathbb{Q}_9(B, 2)$	$\frac{-\sqrt{2310y}(3x^2-y^2)(x^6+3x^4y^2-36x^4z^2+3x^2y^4-72x^2y^2z^2+120x^2z^4+y^6-36y^4z^2+120y^2z^4-64z^6)}{128}$
87	$\mathbb{Q}_9(B, 3)$	$\frac{\sqrt{24310x}(x^2-3y^2)(x^6-33x^4y^2+27x^2y^4-3y^6)}{256}$
88	$\mathbb{Q}_9(B, 4)$	$\frac{-\sqrt{2310x}(x^2-3y^2)(x^6+3x^4y^2-36x^4z^2+3x^2y^4-72x^2y^2z^2+120x^2z^4+y^6-36y^4z^2+120y^2z^4-64z^6)}{128}$
89	$\mathbb{Q}_{9,1}(E_1, 1)$	$\frac{-3\sqrt{1430x}(x^2+y^2-16z^2)(x^6-21x^4y^2+35x^2y^4-7y^6)}{256}$
90	$\mathbb{Q}_{9,2}(E_1, 1)$	$\frac{-3\sqrt{1430y}(x^2+y^2-16z^2)(7x^6-35x^4y^2+21x^2y^4-y^6)}{256}$
91	$\mathbb{Q}_{9,1}(E_1, 2)$	$\frac{3\sqrt{286x}(x^4-10x^2y^2+5y^4)(x^4+2x^2y^2-28x^2z^2+y^4-28y^2z^2+56z^4)}{128}$
92	$\mathbb{Q}_{9,2}(E_1, 2)$	$\frac{-3\sqrt{286y}(5x^4-10x^2y^2+y^4)(x^4+2x^2y^2-28x^2z^2+y^4-28y^2z^2+56z^4)}{128}$
93	$\mathbb{Q}_{9,1}(E_1, 3)$	$\frac{3\sqrt{5x}(7x^8+28x^6y^2-280x^6z^2+42x^4y^4-840x^4y^2z^2+1120x^4z^4+28x^2y^6-840x^2y^4z^2+2240x^2y^2z^4-896x^2z^6+7y^8-280y^6z^2+1120y^4z^4-896y^2z^6+128z^8)}{128}$
94	$\mathbb{Q}_{9,2}(E_1, 3)$	$\frac{3\sqrt{5y}(7x^8+28x^6y^2-280x^6z^2+42x^4y^4-840x^4y^2z^2+1120x^4z^4+28x^2y^6-840x^2y^4z^2+2240x^2y^2z^4-896x^2z^6+7y^8-280y^6z^2+1120y^4z^4-896y^2z^6+128z^8)}{128}$
95	$\mathbb{Q}_{9,1}(E_2, 1)$	$\frac{3\sqrt{12155xyz(x-y)(x^2-2xy-y^2)(x^2+2xy-y^2)}}{16}$
96	$\mathbb{Q}_{9,2}(E_2, 1)$	$\frac{3\sqrt{12155z}(x^4-4x^3y-6x^2y^2+4xy^3+y^4)(x^4+4x^3y-6x^2y^2-4xy^3+y^4)}{128}$
97	$\mathbb{Q}_{9,1}(E_2, 2)$	$\frac{-3\sqrt{5005xyz(x-y)(x+y)(x^4+2x^2y^2-8x^2z^2+y^4-8y^2z^2+8z^4)}}{16}$
98	$\mathbb{Q}_{9,2}(E_2, 2)$	$\frac{3\sqrt{5005z}(x^2-2xy-y^2)(x^2+2xy-y^2)(x^4+2x^2y^2-8x^2z^2+y^4-8y^2z^2+8z^4)}{64}$
99	$\mathbb{Q}_{9,1}(E_2, 3)$	$\frac{-3\sqrt{110xyz}(7x^6+21x^4y^2-70x^4z^2+21x^2y^4-140x^2y^2z^2+112x^2z^4+7y^6-70y^4z^2+112y^2z^4-32z^6)}{32}$
100	$\mathbb{Q}_{9,2}(E_2, 3)$	$\frac{-3\sqrt{110z(x-y)(x+y)(7x^6+21x^4y^2-70x^4z^2+21x^2y^4-140x^2y^2z^2+112x^2z^4+7y^6-70y^4z^2+112y^2z^4-32z^6)}{64}$

Table 11 Harmonics for rank 10.

No.	multipole	expression
101	$\mathbb{Q}_{10}(A, 1)$	$-\frac{63x^{10}}{256} - \frac{315x^8y^2}{256} + \frac{1575x^8z^2}{128} - \frac{315x^6y^4}{128} + \frac{1575x^6y^2z^2}{32} - \frac{525x^6z^4}{8} - \frac{315x^4y^6}{128} + \frac{4725x^4y^4z^2}{64} - \frac{1575x^4y^2z^4}{8} + \frac{315x^4z^6}{4} - \frac{315x^2y^8}{256} + \frac{1575x^2y^6z^2}{32} - \frac{1575x^2y^4z^4}{8} + \frac{315x^2y^2z^6}{2} - \frac{45x^2z^8}{2} - \frac{63y^{10}}{256} + \frac{1575y^8z^2}{128} - \frac{525y^6z^4}{8} + \frac{315y^4z^6}{4} - \frac{45y^2z^8}{2} + z^{10}$
102	$\mathbb{Q}_{10}(A, 2)$	$\frac{\sqrt{4290}(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)(3x^4+6x^2y^2-96x^2z^2+3y^4-96y^2z^2+224z^4)}{512}$
103	$\mathbb{Q}_{10}(A, 3)$	$\frac{\sqrt{4290}xy(x^2-3y^2)(3x^2-y^2)(3x^4+6x^2y^2-96x^2z^2+3y^4-96y^2z^2+224z^4)}{256}$
104	$\mathbb{Q}_{10}(B, 1)$	$\frac{\sqrt{461890}xz(x^2-3y^2)(x^6-33x^4y^2+27x^2y^4-3y^6)}{256}$
105	$\mathbb{Q}_{10}(B, 2)$	$-\frac{\sqrt{4290}xz(x^2-3y^2)(7x^6+21x^4y^2-84x^4z^2+21x^2y^4-168x^2y^2z^2+168x^2z^4+7y^6-84y^4z^2+168y^2z^4-64z^6)}{128}$
106	$\mathbb{Q}_{10}(B, 3)$	$\frac{\sqrt{461890}yz(x^2-y^2)(3x^6-27x^4y^2+33x^2y^4-y^6)}{256}$
107	$\mathbb{Q}_{10}(B, 4)$	$-\frac{\sqrt{4290}yz(x^2-y^2)(7x^6+21x^4y^2-84x^4z^2+21x^2y^4-168x^2y^2z^2+168x^2z^4+7y^6-84y^4z^2+168y^2z^4-64z^6)}{128}$
108	$\mathbb{Q}_{10,1}(E_1, 1)$	$-\frac{\sqrt{72930}yz(x^2+3y^2-16z^2)(7x^6-35x^4y^2+21x^2y^4-y^6)}{256}$
109	$\mathbb{Q}_{10,2}(E_1, 1)$	$\frac{\sqrt{72930}xz(x^2+3y^2-16z^2)(x^6-21x^4y^2+35x^2y^4-7y^6)}{256}$
110	$\mathbb{Q}_{10,1}(E_1, 2)$	$\frac{\sqrt{858}yz(5x^4-10x^2y^2+y^4)(15x^4+30x^2y^2-140x^2z^2+15y^4-140y^2z^2+168z^4)}{128}$
111	$\mathbb{Q}_{10,2}(E_1, 2)$	$\frac{\sqrt{858}xz(x^4-10x^2y^2+5y^4)(15x^4+30x^2y^2-140x^2z^2+15y^4-140y^2z^2+168z^4)}{128}$
112	$\mathbb{Q}_{10,1}(E_1, 3)$	$\frac{\sqrt{55}yz(63x^8+252x^6y^2-840x^6z^2+378x^4y^4-2520x^4y^2z^2+2016x^4z^4+252x^2y^6-2520x^2y^4z^2+4032x^2y^2z^4-1152x^2z^6+63y^8-840y^6z^2+2016y^4z^4-1152y^2z^6+128z^8)}{128}$
113	$\mathbb{Q}_{10,2}(E_1, 3)$	$-\frac{\sqrt{55}xz(63x^8+252x^6y^2-840x^6z^2+378x^4y^4-2520x^4y^2z^2+2016x^4z^4+252x^2y^6-2520x^2y^4z^2+4032x^2y^2z^4-1152x^2z^6+63y^8-840y^6z^2+2016y^4z^4-1152y^2z^6+128z^8)}{128}$
114	$\mathbb{Q}_{10,1}(E_2, 1)$	$\frac{\sqrt{92378}(x-y)(x+y)(x^4-4x^3y-14x^2y^2-4xy^3+y^4)(x^4+4x^3y-14x^2y^2+4xy^3+y^4)}{512}$
115	$\mathbb{Q}_{10,2}(E_2, 1)$	$\frac{\sqrt{92378}xy(x^4-10x^2y^2+5y^4)(5x^4-10x^2y^2+y^4)}{256}$
116	$\mathbb{Q}_{10,1}(E_2, 2)$	$-\frac{\sqrt{12155}(x^2+y^2-18z^2)(x^4-4x^3y-6x^2y^2+4xy^3+y^4)(x^4+4x^3y-6x^2y^2-4xy^3+y^4)}{256}$
117	$\mathbb{Q}_{10,2}(E_2, 2)$	$\frac{\sqrt{12155}xy(x-y)(x^2+y^2-18z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{32}$
118	$\mathbb{Q}_{10,1}(E_2, 3)$	$-\frac{\sqrt{2145}(x^2-2xy-y^2)(x^2+2xy-y^2)(x^6+3x^4y^2-42x^4z^2+3x^2y^4-84x^2y^2z^2+168x^2z^4+y^6-42y^4z^2+168y^2z^4-112z^6)}{128}$
119	$\mathbb{Q}_{10,2}(E_2, 3)$	$-\frac{\sqrt{2145}xy(x-y)(x+y)(x^6+3x^4y^2-42x^4z^2+3x^2y^4-84x^2y^2z^2+168x^2z^4+y^6-42y^4z^2+168y^2z^4-112z^6)}{32}$
120	$\mathbb{Q}_{10,1}(E_2, 4)$	$\frac{\sqrt{165}(x-y)(x+y)(7x^8+28x^6y^2-336x^6z^2+42x^4y^4-1008x^4y^2z^2+1680x^4z^4+28x^2y^6-1008x^2y^4z^2+3360x^2y^2z^4-1792x^2z^6+7y^8-336y^6z^2+1680y^4z^4-1792y^2z^6+384z^8)}{256}$
121	$\mathbb{Q}_{10,2}(E_2, 4)$	$-\frac{\sqrt{165}xy(7x^8+28x^6y^2-336x^6z^2+42x^4y^4-1008x^4y^2z^2+1680x^4z^4+28x^2y^6-1008x^2y^4z^2+3360x^2y^2z^4-1792x^2z^6+7y^8-336y^6z^2+1680y^4z^4-1792y^2z^6+384z^8)}{128}$

Table 12 Harmonics for rank 11.

No.	multipole	expression
122	$\mathbb{Q}_{11}(A, 1)$	$\frac{\sqrt{14586xyz(x^2-3y^2)(3x^2-y^2)(15x^4+30x^2y^2-160x^2z^2+15y^4-160y^2z^2+224z^4)}}{256}$
123	$\mathbb{Q}_{11}(A, 2)$	$-\frac{z(693x^{10}+3465x^8y^2-11550x^8z^2+6930x^6y^4-46200x^6y^2z^2+36960x^6z^4+6930x^4y^6-69300x^4y^4z^2+110880x^4y^2z^4-31680x^4z^6+3465x^2y^8-46200x^2y^6z^2+110880x^2y^4z^4-63360x^2y^2z^6+7040x^2z^8+693y^{10}-11550y^8z^2+36960y^6z^4-31680y^4z^6+7040y^2z^8-256z^{10})}{256}$
124	$\mathbb{Q}_{11}(A, 3)$	$\frac{\sqrt{14586z(x-y)(x+y)(x^2-4xy+y^2)(x^2+4xy+y^2)(15x^4+30x^2y^2-160x^2z^2+15y^4-160y^2z^2+224z^4)}}{512}$
125	$\mathbb{Q}_{11}(B, 1)$	$-\frac{\sqrt{46189y}(3x^2-y^2)(x^2+y^2-20z^2)(3x^6-27x^4y^2+33x^2y^4-y^6)}{512}$
126	$\mathbb{Q}_{11}(B, 2)$	$\frac{\sqrt{30030y}(3x^2-y^2)(x^8+4x^6y^2-56x^6z^2+6x^4y^4-168x^4y^2z^2+336x^4z^4+4x^2y^6-168x^2y^4z^2+672x^2y^2z^4-448x^2z^6+y^8-56y^6z^2+336y^4z^4-448y^2z^6+128z^8)}{512}$
127	$\mathbb{Q}_{11}(B, 3)$	$-\frac{\sqrt{46189x}(x^2-3y^2)(x^2+y^2-20z^2)(x^6-33x^4y^2+27x^2y^4-3y^6)}{512}$
128	$\mathbb{Q}_{11}(B, 4)$	$\frac{\sqrt{30030x}(x^2-3y^2)(x^8+4x^6y^2-56x^6z^2+6x^4y^4-168x^4y^2z^2+336x^4z^4+4x^2y^6-168x^2y^4z^2+672x^2y^2z^4-448x^2z^6+y^8-56y^6z^2+336y^4z^4-448y^2z^6+128z^8)}{512}$
129	$\mathbb{Q}_{11,1}(E_1, 1)$	$\frac{\sqrt{88179x}(x^{10}-55x^8y^2+330x^6y^4-462x^4y^6+165x^2y^8-11y^{10})}{512}$
130	$\mathbb{Q}_{11,2}(E_1, 1)$	$-\frac{\sqrt{88179y}(11x^{10}-165x^8y^2+462x^6y^4-330x^4y^6+55x^2y^8-y^{10})}{512}$
131	$\mathbb{Q}_{11,1}(E_1, 2)$	$\frac{\sqrt{36465x}(x^6-21x^4y^2+35x^2y^4-7y^6)(x^4+2x^2y^2-36x^2z^2+y^4-36y^2z^2+96z^4)}{512}$
132	$\mathbb{Q}_{11,2}(E_1, 2)$	$\frac{\sqrt{36465y}(7x^6-35x^4y^2+21x^2y^4-y^6)(x^4+2x^2y^2-36x^2z^2+y^4-36y^2z^2+96z^4)}{512}$
133	$\mathbb{Q}_{11,1}(E_1, 3)$	$-\frac{3\sqrt{143x}(x^4-10x^2y^2+5y^4)(5x^6+15x^4y^2-240x^4z^2+15x^2y^4-480x^2y^2z^2+1120x^2z^4+5y^6-240y^4z^2+1120y^2z^4-896z^6)}{512}$
134	$\mathbb{Q}_{11,2}(E_1, 3)$	$3\sqrt{143y}(5x^4-10x^2y^2+y^4)(5x^6+15x^4y^2-240x^4z^2+15x^2y^4-480x^2y^2z^2+1120x^2z^4+5y^6-240y^4z^2+1120y^2z^4-896z^6)$
135	$\mathbb{Q}_{11,1}(E_1, 4)$	$-\frac{\sqrt{66x}(21x^{10}+105x^8y^2-1260x^8z^2+210x^6y^4-5040x^6y^2z^2+8400x^6z^4+210x^4y^6-7560x^4y^4z^2+25200x^4y^2z^4-13440x^4z^6+105x^2y^8-5040x^2y^6z^2+25200x^2y^4z^4-26880x^2y^2z^6+5760x^2z^8+21y^{10}-1260y^8z^2+8400y^6z^4-13440y^4z^6+5760y^2z^8-512z^{10})}{512}$
136	$\mathbb{Q}_{11,2}(E_1, 4)$	$-\frac{\sqrt{66y}(21x^{10}+105x^8y^2-1260x^8z^2+210x^6y^4-5040x^6y^2z^2+8400x^6z^4+210x^4y^6-7560x^4y^4z^2+25200x^4y^2z^4-13440x^4z^6+105x^2y^8-5040x^2y^6z^2+25200x^2y^4z^4-26880x^2y^2z^6+5760x^2z^8+21y^{10}-1260y^8z^2+8400y^6z^4-13440y^4z^6+5760y^2z^8-512z^{10})}{512}$
137	$\mathbb{Q}_{11,1}(E_2, 1)$	$\frac{\sqrt{1939938xyz}(x^4-10x^2y^2+5y^4)(5x^4-10x^2y^2+y^4)}{256}$
138	$\mathbb{Q}_{11,2}(E_2, 1)$	$\frac{\sqrt{1939938z}(x-y)(x+y)(x^4-4x^3y-14x^2y^2-4xy^3+y^4)(x^4+4x^3y-14x^2y^2+4xy^3+y^4)}{512}$
139	$\mathbb{Q}_{11,1}(E_2, 2)$	$-\frac{\sqrt{692835xyz}(x-y)(x+y)(x^2+y^2-6z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{32}$
140	$\mathbb{Q}_{11,2}(E_2, 2)$	$-\frac{\sqrt{692835z}(x^2+y^2-6z^2)(x^4-4x^3y-6x^2y^2+4xy^3+y^4)(x^4+4x^3y-6x^2y^2-4xy^3+y^4)}{256}$
141	$\mathbb{Q}_{11,1}(E_2, 3)$	$\frac{3\sqrt{1001xyz}(x-y)(x+y)(5x^6+15x^4y^2-70x^4z^2+15x^2y^4-140x^2y^2z^2+168x^2z^4+5y^6-70y^4z^2+168y^2z^4-80z^6)}{32}$
142	$\mathbb{Q}_{11,2}(E_2, 3)$	$-\frac{3\sqrt{1001z}(x^2-2xy-y^2)(x^2+2xy-y^2)(5x^6+15x^4y^2-70x^4z^2+15x^2y^4-140x^2y^2z^2+168x^2z^4+5y^6-70y^4z^2+168y^2z^4-80z^6)}{128}$
143	$\mathbb{Q}_{11,1}(E_2, 4)$	$\frac{\sqrt{2145xyz}(21x^8+84x^6y^2-336x^6z^2+126x^4y^4-1008x^4y^2z^2+1008x^4z^4+84x^2y^6-1008x^2y^4z^2+2016x^2y^2z^4-768x^2z^6+21y^8-336y^6z^2+1008y^4z^4-768y^2z^6+128z^8)}{128}$
144	$\mathbb{Q}_{11,2}(E_2, 4)$	$\frac{\sqrt{2145z}(x-y)(x+y)(21x^8+84x^6y^2-336x^6z^2+126x^4y^4-1008x^4y^2z^2+1008x^4z^4+84x^2y^6-1008x^2y^4z^2+2016x^2y^2z^4-768x^2z^6+21y^8-336y^6z^2+1008y^4z^4-768y^2z^6+128z^8)}{256}$