

PSALTer results panel

Wave operator and propagator

$1^+ \mathcal{A}_a \parallel_{ab} 1^+ \mathcal{A}_a \perp^+ ab$ $\partial^b \partial^+ \parallel +$	$1^+ \mathcal{H}^+ a$	$1^+ \mathcal{A}_a \parallel a$	$1^+ \mathcal{A}_a \perp^+ a$	$1^+ \mathcal{S}_5 \perp^+ a$	$1^+ \mathcal{S}_5 \parallel^+ a$	$1^+ \mathcal{S}_5 \perp^b a$
$\frac{a_{-0}}{4}$	0	0	0	0	0	0
$-\frac{a_{-0}}{2 \sqrt{2}}$	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	$\frac{f_{a,k}}{36 \sqrt{2}}$	$-\frac{f_{a,k}}{4 \sqrt{6}}$	$-\frac{f_{a,k}}{4 \sqrt{6}}$	$\frac{1}{4} i \sqrt{\frac{5}{6}} a_{-0} k$	$\frac{5 f_{a,k}}{12 \sqrt{6}}$
0	0	$-\frac{f_{a,k}}{36 \sqrt{2}}$	$-\frac{a_{-0}}{18 \sqrt{2}}$	$-\frac{a_{-0}}{3 \sqrt{3}}$	$-\frac{1}{3} \sqrt{\frac{2}{3}} a_{-0}$	$-\frac{2 a_{-0}}{3 \sqrt{3}}$
0	0	$-\frac{1}{9} f_{a,k}$	$\frac{2 a_{-0}}{9}$	$\frac{a_{-0}}{3 \sqrt{6}}$	$\frac{a_{-0}}{3 \sqrt{3}}$	$\frac{1}{3} \sqrt{\frac{2}{3}} a_{-0}$
0	0	$\frac{f_{a,k}}{4 \sqrt{6}}$	$-\frac{a_{-0}}{3 \sqrt{3}}$	$\frac{1}{3} \sqrt{\frac{5}{6}} a_{-0}$	$\frac{1}{6} \sqrt{5} (a_{-0} - 2 c_{-1} k^2)$	$\frac{1}{6} \sqrt{5} (a_{-0} - 4 c_{-1} k^2)$
0	0	$-\frac{f_{a,k}}{12 \sqrt{3}}$	$-\frac{5 f_{a,k}}{12 \sqrt{6}}$	$-\frac{1}{4} i \sqrt{\frac{5}{6}} a_{-0} k$	$\frac{1}{3} (a_{-0} - 5 c_{-1} k^2)$	$\frac{1}{6} \sqrt{\frac{5}{2}} (a_{-0} - 4 c_{-1} k^2)$
0	0	$-\frac{5 f_{a,k}}{12 \sqrt{6}}$	$-\frac{a_{-0}}{12 \sqrt{3}}$	$-\frac{1}{12} \sqrt{\frac{5}{3}} a_{-0}$	$\frac{1}{6} \sqrt{\frac{5}{2}} (a_{-0} - 4 c_{-1} k^2)$	$\frac{1}{3} \sqrt{\frac{5}{2}} (a_{-0} - 2 c_{-1} k^2)$
0	0	$-\frac{5 f_{a,k}}{12 \sqrt{6}}$	$-\frac{a_{-0}}{12 \sqrt{3}}$	$-\frac{1}{12} \sqrt{\frac{5}{3}} a_{-0}$	$\frac{1}{6} \sqrt{\frac{5}{2}} (a_{-0} - 4 c_{-1} k^2)$	$\frac{1}{3} \sqrt{\frac{5}{2}} (a_{-0} - 2 c_{-1} k^2)$

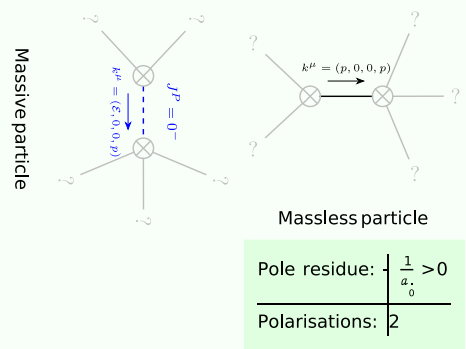
Spin-parity form	Covariant form	Multiplicities
$2 k \circ^+ \mathcal{W}_5 \perp^b + 6 \ell \circ^+ \mathcal{J}^+ = k \circ^+ \mathcal{W}_5 \parallel$	$3 \partial_\chi \partial_\beta \partial_a \mathcal{W}^{abx} + \partial_\chi \partial^x \partial_c \mathcal{W}^{cab} =$ $2 (3 \partial_\beta \partial_c \mathcal{J}^{cab} +$ $\partial_\chi \partial^x \partial_\beta \mathcal{W}^{a \beta} + \partial_\chi \partial^x \partial_\beta \mathcal{W}^{ab} )$	1
$k \circ^+ \mathcal{W}_5 \perp^+ + 2 \ell \circ^+ \mathcal{J}^+ = 0$	$2 \partial_\beta \partial_c \mathcal{J}^{cab} = \partial_\beta \partial_\beta \partial_c \mathcal{W}^{abx}$	1
$6 k \circ^+ \mathcal{W}_5 \perp^a + 2 k \circ^+ \mathcal{W}_5 \parallel^a +$ $k \circ^+ \mathcal{W}_5 \perp^+ a + 12 \ell \circ^+ \mathcal{J}^+ a = k \circ^+ \mathcal{W}_5 \parallel^a a$	$12 \partial_\chi \partial_\beta \partial^a \mathcal{J}^{b \chi} + 2 \partial_\beta \partial^a \partial_\chi \mathcal{W}^{b \chi} +$ $2 \partial_\beta \partial^a \partial_\chi \mathcal{W}^{b \chi} + 6 \partial_\beta \partial^a \partial_\chi \partial_\beta \mathcal{W}^{b a \chi} +$ $\partial_\beta \partial^a \partial_\chi \mathcal{W}^{ab \beta} = 12 \partial_\chi \partial^x \partial_\beta \mathcal{J}^{ab} +$ $6 \partial_\beta \partial_\chi \partial_\beta \partial^a \mathcal{W}^{b \chi} + \partial_\beta \partial^a \partial_\beta \partial^x \mathcal{W}^{b \chi} +$ $2 \partial_\beta \partial^a \partial_\chi \mathcal{W}^{b a \chi} + 2 \partial_\beta \partial^a \partial_\chi \mathcal{W}^{b \beta} a$	3
$3 k \circ^+ \mathcal{W}_5 \perp^a + k \circ^+ \mathcal{W}_5 \perp^+ a + 6 \ell \circ^+ \mathcal{J}^+ a = k \circ^+ \mathcal{W}_5 \parallel^a a$	$2 \partial_\chi \partial_\beta \partial^a \mathcal{J}^{b \chi} + \partial_\beta \partial^a \partial_\chi \partial_\beta \mathcal{W}^{b a \chi} =$ $2 \partial_\chi \partial_\beta \partial^a \mathcal{J}^{ab} + \partial_\beta \partial_\chi \partial_\beta \mathcal{W}^{b \chi} a$	3
Total expected gauge generators:		
		8

$$\mathcal{W}_5 \parallel + a \partial \chi$$
$$\mathcal{W}_5 \parallel + a \partial \chi$$
$$\mathcal{W}_5 \parallel + a \partial \chi$$

Massive and massless spectra

Pole residue:	$\frac{1}{6 c_{-1}} > 0$
Square mass:	$-\frac{a_{-0}}{12 c_{-1}} > 0$
Spin:	0
Parity:	Odd

Pole residue:	$\frac{1}{6 c_{-1}} > 0$
Square mass:	$-\frac{a_{-0}}{12 c_{-1}} > 0$
Spin:	0
Parity:	Odd



Unitarity conditions

$$a_{-0} < 0 \&\& c_{-1} > 0$$

$\circ^+ \mathcal{J}^+ \perp$	$\circ^+ \mathcal{J}^+ \parallel$	$\circ^+ \mathcal{W}_5 \parallel$	$\circ^+ \mathcal{W}_5 \perp^+$	$\circ^+ \mathcal{W}_5 \perp^b$	$\circ^+ \mathcal{W}_5 \parallel^+$
$-\frac{68 k^2}{a_{-0} (16+3 k^2)^2}$	$-\frac{4}{\sqrt{3} (16 a_{-0} + 3 a_{-0} k^2)}$	$\frac{2 i \sqrt{6} k}{16 a_{-0} + 3 a_{-0} k^2}$	$\frac{136 i k}{a_{-0} (16+3 k^2)^2}$	$\frac{8 i \sqrt{2} k (-1+3 k^2)}{3 a_{-0} (16+3 k^2)^2}$	0
$-\frac{4}{\sqrt{3} (16 a_{-0} + 3 a_{-0} k^2)}$	$\frac{4}{a_{-0} k^2}$	$\frac{2 i \sqrt{2}}{a_{-0} k}$	$-\frac{8 i (5+k^2)}{\sqrt{3} (16 a_{-0} k + 3 a_{-0} k^3)}$	$-\frac{4 i \sqrt{\frac{2}{3}} (6+k^2)}{a_{-0} k (16+3 k^2)}$	0
$-\frac{2 i \sqrt{6} k}{16 a_{-0} + 3 a_{-0} k^2}$	$-\frac{2 i \sqrt{2}}{a_{-0} k}$	0	$\frac{4 \sqrt{\frac{2}{3}}}{16 a_{-0} + 3 a_{-0} k^2}$	$\frac{8}{\sqrt{3} (16 a_{-0} + 3 a_{-0} k^2)}$	0
$\frac{136 i k}{a_{-0} (16+3 k^2)^2}$	$\frac{8 i}{\sqrt{3} (16 a_{-0} k + 3 a_{-0} k^3)}$	$\frac{4 \sqrt{6}}{16 a_{-0} + 3 a_{-0} k^2}$	$-\frac{272}{a_{-0} (16+3 k^2)^2}$	$\frac{16 \sqrt{2} (-1+3 k^2)}{3 a_{-0} (16+3 k^2)^2}$	0
$-\frac{8 i k (49+6 k^2)}{3 a_{-0} (16+3 k^2)^2}$	$-\frac{8 i (5+k^2)}{\sqrt{3} a_{-0} k (16+3 k^2)}$	$-\frac{4 \sqrt{\frac{2}{3}}}{16 a_{-0} + 3 a_{-0} k^2}$	$\frac{16 (27+4 k^2)}{3 a_{-0} (16+3 k^2)^2}$	$\frac{16 \sqrt{2} (11+k^2)}{3 a_{-0} (16+3 k^2)^2}$	0
$\frac{8 i \sqrt{2} k (1+3 k^2)}{3 a_{-0} (16+3 k^2)^2}$	$\frac{4 i \sqrt{\frac{2}{3}} (6+k^2)}{a_{-0} k (16+3 k^2)}$	$\frac{8}{\sqrt{3} (16 a_{-0} + 3 a_{-0} k^2)}$	$\frac{16 \sqrt{2} (-1+3 k^2)}{3 a_{-0} (16+3 k^2)^2}$	$\frac{32 (5+2 k^2)}{3 a_{-0} (16+3 k^2)^2}$	0
0	0	0	0	0	$-\frac{2}{a_{-0} + 12 c_{-1} k^2}$

$\circ^+ \mathcal{H}^+ \perp$	$\circ^+ \mathcal{H}^+ \parallel$	$\circ^+ \mathcal{A}_a \parallel$	$\circ^+ \mathcal{A}_a \perp^+$	$\circ^+ \mathcal{A}_5 \parallel$	$\circ^+ \mathcal{A}_5 \perp^b$
0	0	$\frac{f_{a,k}}{2 \sqrt{6}}$	0	$\frac{f_{a,k}}{4}$	$\frac{f_{a,k}}{4 \sqrt{2}}$
0	0	$\frac{f_{a,k}}{3 \sqrt{2}}$	0	$-\frac{f_{a,k}}{4 \sqrt{3}}$	$\frac{f_{a,k}}{4 \sqrt{6}}$
$\frac{f_{a,k}}{2 \sqrt{6}}$	$-\frac{f_{a,k}}{3 \sqrt{2}}$	$\frac{a_{-0}}{6}$	$\frac{a_{-0}}{\sqrt{6}}$	$\frac{a_{-0}}{\sqrt{6}}$	$\frac{a_{-0}}{\sqrt{3}}$
0	0	$\frac{a_{-0}}{\sqrt{6}}$	0	$\frac{a_{-0}}{2}$	$\frac{a_{-0}}{2 \sqrt{2}}$
$-\frac{1}{4} \frac{f_{a,k}}{4}$	$\frac{f_{a,k}}{4 \sqrt{3}}$	$\frac{a_{-0}}{\sqrt{6}}$	0	$\frac{a_{-0}}{2}$	0
$-\frac{f_{a,k}}{4 \sqrt{2}}$	$\frac{f_{a,k}}{4 \sqrt{6}}$	$\frac{a_{-0}}{\sqrt{3}}$	$\frac{a_{-0}}{2 \sqrt{2}}$	$\frac{a_{-0}}{2}$	0
0	0	0	0	0	$\frac{a_{-0}}{2} - 6 c_{-1} k^2$

$$\iiint (\mathcal{A}^{ab\chi} \mathcal{W}_{ab\chi} + \mathcal{J}^{ab} h_{ab} + \frac{1}{36} a_{-0} (8 \mathcal{A}_a^{\chi} \mathcal{A}^{ab}_{\beta} - 18 \mathcal{A}^{ab\chi} \mathcal{A}_{\beta\chi a} -$$
  
 $8 \mathcal{A}_a^{\alpha \beta} \mathcal{A}_{\beta \chi}^{\chi} + 16 \mathcal{A}^{ab}_{\alpha} \mathcal{A}_{\beta \chi}^{\chi} +$   
 $2 \mathcal{A}_a^{\alpha \beta} \mathcal{A}_{\beta \chi}^{\chi} + 4 \mathcal{A}^{ab}_{\beta} \partial_a h^{\chi}_{\chi} - 9 h^{\chi}_{\chi} \partial_{\beta} \mathcal{A}^{\alpha \beta}_{\alpha} +$   
 $9 h^{\chi}_{\chi} \partial_{\beta} \mathcal{A}^{ab}_{\alpha} - 18 h_{a\chi} \partial_{\beta} \mathcal{A}^{ab\chi} -$   
 $4 \mathcal{A}_a^{\alpha \beta} \partial_{\beta} h^{\chi}_{\chi} - 16 \mathcal{A}^{ab}_{\beta} \partial_{\chi} h^{\chi}_{\alpha} +$   
 $16 \mathcal{A}_a^{\alpha \beta} \partial_{\chi} h^{\chi}_{\beta} + 18 h_{\beta\chi} \partial^{\chi} \mathcal{A}^{\alpha \beta}_{\alpha}) +$   
 $c_1 (\partial_a \mathcal{A}_{\chi \mu}^{\mu} \partial^{\chi} \mathcal{A}^{ab}_{\beta} - \partial_{\chi} \mathcal{A}_{a \mu}^{\mu} \partial^{\chi} \mathcal{A}^{ab}_{\beta} +$   
 $(2 \partial_a \mathcal{A}_{\beta \chi \mu} - 2 \partial_a \mathcal{A}_{\beta \mu \chi} - 2 \partial_a \mathcal{A}_{\chi \beta \mu} + 2 \partial_a \mathcal{A}_{\chi \mu \beta} +$   
 $\partial_a \mathcal{A}_{\mu \beta \chi} - \partial_a \mathcal{A}_{\mu \chi \beta} - 2 \partial_{\beta} \mathcal{A}_{\alpha \chi \mu} + \partial_{\beta} \mathcal{A}_{a \mu \chi} -$   
 $\partial_{\beta} \mathcal{A}_{\chi \mu a} + \partial_{\chi} \mathcal{A}_{a \beta \mu} - \partial_{\chi} \mathcal{A}_{\beta a \mu} + 2 \partial_{\chi} \mathcal{A}_{\beta \mu a} -$   
 $\partial_{\mu} \mathcal{A}_{a \beta \chi} + \partial_{\mu} \mathcal{A}_{\alpha \chi \beta} + \partial_{\mu} \mathcal{A}_{\beta a \chi} - 2 \partial_{\mu} \mathcal{A}_{\beta \chi a} +$   
 $\partial_{\mu} \mathcal{A}_{\chi \beta a}) \partial^{\mu} \mathcal{A}^{ab\chi} )) [t, x, y, z] d z d y d x d t$

$2^+ \mathcal{H}^+ ab$	$2^+ \mathcal{A}_a \parallel ab$	$2^+ \mathcal{A}_5 \parallel ab$	$2^+ \mathcal{A}_5 \perp^+ ab$	$2^+ \mathcal{A}_5 \perp^b ab$	$2^+ \mathcal{A}_5 \parallel^+ ab$
0	$-\frac{f_{a,k}}{4 \sqrt{2}}$	$\frac{f_{a,k}}{4 \sqrt{3}}$	$\frac{f_{a,k}}{4 \sqrt{6}}$	0	0
$\frac{f_{a,k}}{4 \sqrt{2}}$	$\frac{a_{-0}}{4}$	0	0	0	0
$\frac{f_{a,k}}{4 \sqrt{3}}$	0	$-\frac{a_{-0}}{2}$	0	0	0
$\frac{f_{a,k}}{4 \sqrt{6}}$	0	0	$\frac{a_{-0}}{4}$	0	0
0	0	0	0	$\frac{a_{-0}}{4}$	0
0	0	0	0	0	$\frac{a_{-0}}{4}$

$2^+ \mathcal{J}^+ \perp^+ ab$	$2^+ \mathcal{W}_5 \parallel ab$	$2^+ \mathcal{W}_5 \perp^+ ab$	$2^+ \mathcal{W}_5 \perp^b ab$	$2^+ \mathcal{W}_5 \parallel^+ ab$
$-\frac{8}{a_{-0} k^2}$	$-\frac{4 i \sqrt{2}}{a_{-0} k}$	$\frac{4 i}{\sqrt{3} a_{-0} k}$	$\frac{4 i \sqrt{\frac{2}{3}}}{a_{-0} k}$	0
$\frac{4 i \sqrt{2}}{a_{-0} k}$	0	$2 \sqrt{\frac{2}{3}} \frac{a_{-0}}{a_{-0}}$	$\frac{4}{\sqrt{3} a_{-0}}$	0
$-\frac{4 i}{\sqrt{3} a_{-0} k}$	$2 \sqrt{\frac{2}{3}} \frac{a_{-0}}{a_{-0}}$	$-\frac{8}{3 a_{-0}}$	$-\frac{2 \sqrt{2}}{3 a_{-0}}$	0
$\frac{4 i \sqrt{\frac{2}{3}}}{a_{-0} k}$	$\frac{4}{\sqrt{3} a_{-0}}$	$-\frac{2 \sqrt{2}}{3 a_{-0}}$	$\frac{8}{3 a_{-0}}$	0
0	0	0	0	$\frac{4}{a_{-0}}$
0	0	0	0	$\frac{4}{a_{-0}}$