

PSALter results panel

$$S = \iiint \left(\frac{1}{4} \left(2 a_0 \, \mathcal{T}_0^{\alpha \, \beta} \, \mathcal{T}_{\beta X}^{\chi} + \mathcal{T}^{\alpha \beta X} \left(-2 a_0 \, \mathcal{T}_{\rho X \alpha} + 4 \, \mathcal{W}_{\alpha \beta X} \right) + 4 \, \mathcal{T}^{\alpha \beta} \, h_{\alpha \beta} - a_0 \, h_X^{\chi} \, \partial_{\beta} \mathcal{T}_0^{\alpha \, \beta} + a_0 \, h_X^{\chi} \, \partial_{\beta} \mathcal{T}^{\alpha \beta} - 2 a_0 \, h_{\alpha X} \, \partial_{\beta} \mathcal{T}^{\alpha \beta X} + 2 a_0 \, h_{\rho X} \, \partial^{\chi} \mathcal{T}_0^{\alpha \, \beta} + c_2 \, \partial_{\beta} \mathcal{T}_0^{\delta} \, \partial^{\chi} \mathcal{T}_0^{\alpha \, \beta} - c_2 \, \partial_{\beta} \mathcal{T}^{\alpha \beta X} \, \partial_{\delta} \mathcal{T}_0^{\delta} \, h_X^{\chi} - 2 c_2 \, \partial^{\chi} \mathcal{T}_0^{\alpha \, \beta} \, \partial_{\beta} \mathcal{T}_X^{\delta} + c_2 \, \partial_{\beta} \mathcal{T}^{\alpha \beta X} \, \partial_{\delta} \mathcal{T}_X^{\delta} + 2 c_2 \, \partial^{\chi} \mathcal{T}_0^{\alpha \, \beta} \, \partial_{\beta} \mathcal{T}_{X \, \beta}^{\delta} \right) t; \, x, \, y, \, z \Big] dz \, dy \, dx \, dt$$

Wave operator

$\mathcal{O}^{\gamma} \mathcal{H}^{\pm}$	$\mathcal{O}^{\gamma} \mathcal{H}^{\parallel}$	$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm}$	$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm t}$	$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm}$	$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm h}$	$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm}$
$\mathcal{O}^{\gamma} \mathcal{H}^+ \uparrow$	0	0	0	$\frac{i a_2 \cdot k}{4}$	$-\frac{i a_2 \cdot k}{4 \sqrt{2}}$	0
$\mathcal{O}^{\gamma} \mathcal{H}^{\parallel} \uparrow$	0	0	$\frac{i a_2 \cdot k}{2 \sqrt{2}}$	0	$-\frac{i a_2 \cdot k}{4 \sqrt{3}}$	$\frac{i a_2 \cdot k}{4 \sqrt{6}}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow$	0	$-\frac{i a_2 \cdot k}{2 \sqrt{2}}$	$-\frac{a_2}{2}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm t} \uparrow$	0	0	0	0	$\frac{a_2}{2}$	$-\frac{a_2}{2 \sqrt{2}}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow$	$\frac{1}{4} i a_0 \cdot k$	$\frac{i a_2 \cdot k}{4 \sqrt{3}}$	0	$\frac{a_2}{2}$	0	$-\frac{a_2}{2 \sqrt{2}}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm h} \uparrow$	$\frac{i a_2 \cdot k}{4 \sqrt{2}}$	$-\frac{i a_2 \cdot k}{4 \sqrt{6}}$	0	$-\frac{a_2}{2 \sqrt{2}}$	$-\frac{a_2}{2 \sqrt{2}}$	$\frac{a_2}{2}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow$	0	0	0	0	0	$-\frac{a_2}{2}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow^{a \beta}$	$\frac{1}{4} \left(-a_0 - c_2 \cdot k^2 \right)$	$-\frac{a_2}{2 \sqrt{2}}$	$-\frac{c_2 \cdot k^2}{4}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^+ \uparrow^{a \beta}$	$-\frac{a_2}{2 \sqrt{2}}$	0	0	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^+ \uparrow^{a \beta}$	$-\frac{c_2 \cdot k^2}{4}$	0	$\frac{1}{4} \left(a_0 - c_2 \cdot k^2 \right)$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{H}^+ \uparrow^a$	0	0	0	0	$\frac{i a_2 \cdot k}{4 \sqrt{2}}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow^a$	0	0	0	$-\frac{i a_2 \cdot k}{4 \sqrt{2}}$	$\frac{1}{4} \left(-a_0 - c_2 \cdot k^2 \right)$	$\frac{a_2}{2 \sqrt{2}}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow^a$	0	0	0	0	$\frac{a_2}{2 \sqrt{2}}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm t} \uparrow^a$	0	0	0	$\frac{i a_2 \cdot k}{4 \sqrt{6}}$	$-\frac{c_2 \cdot k^2}{4 \sqrt{3}}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow^a$	0	0	0	$-\frac{1}{4} i \sqrt{\frac{5}{6}} a_0 \cdot k$	$-\frac{1}{4} \sqrt{\frac{3}{2}} c_2 \cdot k^2$	$\frac{1}{12} \sqrt{5} \left(2 a_0 - c_2 \cdot k^2 \right)$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm h} \uparrow^a$	0	0	0	$\frac{i a_2 \cdot k}{4 \sqrt{3}}$	$-\frac{c_2 \cdot k^2}{2 \sqrt{6}}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm h} \uparrow^a$	0	0	0	$\frac{i a_2 \cdot k}{4 \sqrt{6}}$	$\frac{c_2 \cdot k^2}{4 \sqrt{3}}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow^{a \beta X}$	$\frac{1}{4} \left(-a_0 - c_2 \cdot k^2 \right)$	$-\frac{a_2}{2 \sqrt{2}}$	$-\frac{c_2 \cdot k^2}{4}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow^{a \beta X}$	$-\frac{a_2}{2 \sqrt{2}}$	0	0	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^+ \uparrow^{a \beta X}$	$-\frac{c_2 \cdot k^2}{4}$	0	$\frac{1}{4} \left(a_0 - c_2 \cdot k^2 \right)$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{H}^+ \uparrow^{a \beta X}$	0	$-\frac{i a_2 \cdot k}{4 \sqrt{2}}$	$-\frac{i a_2 \cdot k}{4 \sqrt{3}}$	$\frac{i a_2 \cdot k}{4 \sqrt{6}}$	$-\frac{i a_2 \cdot k}{4 \sqrt{6}}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow^{a \beta X}$	$\frac{i a_2 \cdot k}{4 \sqrt{2}}$	$\frac{a_2}{4 \sqrt{2}}$	0	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow^{a \beta X}$	$\frac{i a_2 \cdot k}{4 \sqrt{3}}$	0	$-\frac{a_2}{2}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow^{a \beta X}$	$-\frac{i a_2 \cdot k}{4 \sqrt{6}}$	0	0	$\frac{a_2}{4}$	0	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow^{a \beta X}$	0	0	0	0	$\frac{a_2}{4}$	0
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\parallel} \uparrow^{a \beta X}$	0	0	0	0	0	$\frac{a_2}{4}$
$\mathcal{O}^{\gamma} \mathcal{T}_0^{\pm} \uparrow^{a \beta X}$	0	0	0	0	0	$-\frac{a_2}{2}$

Saturated propagator

$\mathcal{O}^{\gamma} \mathcal{T}^{\pm}$	$\mathcal{O}^{\gamma} \mathcal{T}^{\parallel}$	$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm}$	$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm t}$	$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm}$	$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm h}$	$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm}$	
$\mathcal{O}^{\gamma} \mathcal{T}^+ \uparrow$	$-\frac{36 k^2}{a_0 (16+3 k^2)^2}$	$-\frac{4 \sqrt{3}}{16 a_0 + 3 a_0 k^2}$	$\frac{2 i \sqrt{6} k}{16 a_0 + 3 a_0 k^2}$	$-\frac{72 i k}{a_0 (16+3 k^2)^2}$	$\frac{8 i k (19+3 k^2)}{a_0 (16+3 k^2)^2}$	$-\frac{4 i \sqrt{2} k (19+3 k^2)}{a_0 (16+3 k^2)^2}$	0
$\mathcal{O}^{\gamma} \mathcal{T}^{\parallel} \uparrow$	$\frac{4 \sqrt{3}}{16 a_0 + 3 a_0 k^2}$	$-\frac{4}{a_0 k^2}$	$\frac{2 i \sqrt{2}}{a_0 k}$	$-\frac{8 i \sqrt{3}}{16 a_0 + 3 a_0 k^2}$	$-\frac{8 i}{\sqrt{3} (16 a_0 + 3 a_0 k^2)}$	$-\frac{8 i \sqrt{\frac{3}{2}}}{16 a_0 + 3 a_0 k^2}$	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow$	$-\frac{2 i \sqrt{6} k}{16 a_0 + 3 a_0 k^2}$	$-\frac{2 i \sqrt{2}}{a_0 k}$	0	$-\frac{4 \sqrt{6}}{16 a_0 + 3 a_0 k^2}$	$-\frac{4 \sqrt{\frac{3}{2}}}{16 a_0 + 3 a_0 k^2}$	$-\frac{8}{\sqrt{3} (16 a_0 + 3 a_0 k^2)}$	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm t} \uparrow$	$\frac{72 i k}{a_0 (16+3 k^2)^2}$	$-\frac{8 i \sqrt{3}}{16 a_0 + 3 a_0 k^2}$	$\frac{4 \sqrt{6}}{16 a_0 + 3 a_0 k^2}$	$-\frac{144}{a_0 (16+3 k^2)^2}$	$\frac{16 (19+3 k^2)}{a_0 (16+3 k^2)^2}$	$\frac{8 \sqrt{2} (19+3 k^2)}{a_0 (16+3 k^2)^2}$	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow$	$\frac{8 i k (19+3 k^2)}{a_0 (16+3 k^2)^2}$	$-\frac{8 i}{\sqrt{3} (16 a_0 + 3 a_0 k^2)}$	$-\frac{4 \sqrt{\frac{3}{2}}}{16 a_0 + 3 a_0 k^2}$	$\frac{16 (19+3 k^2)}{a_0 (16+3 k^2)^2}$	$\frac{16 (35+6 k^2)}{3 a_0 (16+3 k^2)^2}$	$\frac{8 \sqrt{2} (22+3 k^2)}{3 a_0 (16+3 k^2)^2}$	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^{\pm h} \uparrow$	$\frac{4 i \sqrt{2} k (19+3 k^2)}{a_0 (16+3 k^2)^2}$	$\frac{8 i \sqrt{\frac{3}{2}}}{16 a_0 + 3 a_0 k^2}$	$-\frac{8}{\sqrt{3} (16 a_0 + 3 a_0 k^2)}$	$-\frac{8 \sqrt{2} (19+3 k^2)}{a_0 (16+3 k^2)^2}$	$-\frac{8 \sqrt{2} (22+3 k^2)}{3 a_0 (16+3 k^2)^2}$	$\frac{32 (13+3 k^2)}{3 a_0 (16+3 k^2)^2}$	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow$	0	0	0	0	0	0	$-\frac{2}{a_0}$
$\mathcal{O}^{\gamma} \mathcal{H}_0^+ \uparrow^{\alpha \beta}$	0	$-\frac{2 \sqrt{2}}{a_0}$	0	0	0	0	0
$\mathcal{O}^{\gamma} \mathcal{H}_0^+ \uparrow^{\alpha \beta}$	$-\frac{2 \sqrt{2}}{a_0}$	$\frac{2}{a_0 - c_2 k^2}$	$-\frac{2 \sqrt{2} c_2 k^2}{a_0^2 - a_0 c_2 k^2}$	0	0	0	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha \beta}$	0	$-\frac{2 \sqrt{2} c_2 k^2}{a_0^2 - a_0 c_2 k^2}$	$\frac{4}{a_0 - c_2 k^2}$	0	0	0	0
$\mathcal{O}^{\gamma} \mathcal{T}^+ \uparrow^{\alpha}$	0	0	0	$-\frac{2 k^2}{a_0 (2+k^2)^2}$	$\frac{2 i \sqrt{2} k}{2 a_0 + a_0 k^2}$	$\frac{i k (4+k^2)}{a_0 (2+k^2)^2}$	$-\frac{i \sqrt{\frac{3}{2}} k (4+3 k^2)}{a_0 (2+k^2)^2}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	$-\frac{2 i \sqrt{2} k}{2 a_0 + a_0 k^2}$	0	$\frac{\sqrt{2} (4+k^2)}{a_0 (2+k^2)^2}$	$-\frac{\sqrt{\frac{3}{2}} k^2}{2 a_0 + a_0 k^2}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	$-\frac{i k (4+k^2)}{a_0 (2+k^2)^2}$	$\frac{\sqrt{2} (4+k^2)}{a_0 (2+k^2)^2}$	$\frac{(4+k^2)^2}{2 a_0 (2+k^2)^2}$	$-\frac{\sqrt{\frac{18}{3}}}{a_0}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	$\frac{i \sqrt{\frac{3}{2}} k (4+3 k^2)}{a_0 (2+k^2)^2}$	$-\frac{2 k^2}{\sqrt{3} (2 a_0 + a_0 k^2)}$	$-\frac{8+8 k^2+k^4}{\sqrt{6} a_0 (2+k^2)^2}$	$\frac{1}{3} \left(-\frac{1}{c_2 k^2} + \frac{-16-8 k^2+k^4}{a_0 (2+k^2)^2} \right)$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	0	0	$-\frac{\sqrt{\frac{18}{3}}}{a_0}$	$-\frac{\sqrt{5} (a_0-2 c_2 k^2)}{3 a_0}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	0	0	$-\frac{4}{3 a_0}$	$-\frac{5}{3 c_2 k^2}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	$\frac{i k (8+3 k^2)}{\sqrt{3} a_0 (2+k^2)^2}$	$\frac{\sqrt{\frac{3}{2}} k^2}{2 a_0 + a_0 k^2}$	$-\frac{-16-4 k^2+k^4}{2 \sqrt{3} a_0 (2+k^2)^2}$	$-\frac{\sqrt{10} (a_0+c_2 k^2)}{3 a_0 c_2 k^2}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	0	0	$-\frac{2}{c_2 k^2} + \frac{-32+16 k^2+k^4}{a_0 (2+k^2)^2}$	$\frac{1}{6} \left(-\frac{4}{c_2 k^2} + \frac{32+16 k^2+k^4}{a_0 (2+k^2)^2} \right)$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha}$	0	0	0	0	0	$-\frac{2 \sqrt{\frac{3}{2}} (a_0+c_2 k^2)}{3 a_0 c_2 k^2}$	$-\frac{2 \sqrt{2} (a_0+c_2 k^2)}{3 a_0 c_2 k^2}$
$\mathcal{O}^{\gamma} \mathcal{T}^+ \uparrow^{\alpha \beta}$	$-\frac{8}{a_0 k^2}$	$-\frac{4 i \sqrt{2}}{a_0 k}$	$\frac{4 i}{\sqrt{3} a_0 k}$	$\frac{4 i \sqrt{\frac{3}{2}}}{a_0 k}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha \beta}$	$\frac{4 i \sqrt{2}}{a_0 k}$	0	$\frac{2 \sqrt{\frac{3}{2}}}{a_0}$	$-\frac{4}{\sqrt{3} a_0}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha \beta}$	$-\frac{4 i}{\sqrt{3} a_0 k}$	$\frac{2 \sqrt{\frac{3}{2}}}{a_0}$	$-\frac{8}{3 a_0}$	$\frac{2 \sqrt{2}}{3 a_0}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha \beta}$	$-\frac{4 i \sqrt{\frac{3}{2}}}{a_0 k}$	$\frac{4}{\sqrt{3} a_0}$	$-\frac{2 \sqrt{2}}{3 a_0}$	$\frac{8}{3 a_0}$	0	0	0
$\mathcal{O}^{\gamma} \mathcal{H}_0^+ \uparrow^{\alpha \beta X}$	0	0	0	0	$\frac{4}{a_0}$	0	0
$\mathcal{O}^{\gamma} \mathcal{H}_0^+ \uparrow^{\alpha \beta X}$	0	0	0	0	0	$\frac{4}{a_0}$	$\frac{3}{4} \mathcal{W}_0^+ \uparrow^{\alpha \beta X}$
$\mathcal{O}^{\gamma} \mathcal{W}_0^+ \uparrow^{\alpha \beta X}$	0	0	0	0	0	$-\frac{2}{a_0}$	$-\frac{2}{a_0}$

Source constraints

Spin-parity form	Covariant form	Multiplicities
$k^{\mu} \mathcal{O}^{\gamma} \mathcal{W}_0^{\pm} + 2 \, k^{\mu} \mathcal{O}^{\gamma} \mathcal{W}_0^{\pm h} - 6 \, i \, \mathcal{O}^{\gamma} \mathcal{T}^{\pm} \equiv 0$	$2 \, \partial_{\beta} \partial_{\alpha} \mathcal{T}^{\alpha \beta} + \partial_{\chi} \partial_{\alpha} \mathcal{W}^{\alpha \beta}{}_{\beta} \equiv \partial_{\alpha} \partial_{\beta} \partial_{\alpha} \mathcal{W}^{\alpha \beta X}$	1
$k^{\mu} \mathcal{O}^{\gamma} \mathcal{W}_0^{\pm t} + 2 \, i \, \mathcal{O}^{\gamma} \mathcal{T}^{\pm} \equiv 0$	$2 \, \partial_{\beta} \partial_{\alpha} \mathcal{T}^{\alpha \beta} \equiv \partial_{\beta} \partial_{\beta} \mathcal{W}^{\alpha \beta X}$	1
$k^{\frac{1}{2}} \mathcal{O}^{\gamma} \mathcal{W}_0^{\pm h t} - 6 \, i \, \mathcal{O}^{\gamma} \mathcal{T}^{\pm t} \equiv k \left(3 \, \mathcal{O}^{\gamma} \mathcal{W}_0^{\pm t} + \mathcal{O}^{\gamma} \mathcal{W}_0^{\pm t t} \right)$	$2 \, \partial_{\alpha} \partial_{\beta} \mathcal{T}^{\alpha \beta X} + \partial_{\beta} \partial^{\alpha} \partial_{\alpha} \mathcal{W}^{\beta \alpha X} \equiv 2 \, \partial_{\chi} \partial^{\alpha} \partial_{\beta} \mathcal{T}^{\alpha \beta} + \partial_{\beta} \partial_{\alpha} \partial_{\beta} \mathcal{W}^{\alpha X \delta}$	3
Total expected gauge generators:		5

Massive spectrum

Massive particle

Pole residue:	$-\frac{6}{c_2} > 0$
Square mass:	$\frac{a_2}{c_2} > 0$
Spin:	1
Parity:	Even

Massless spectrum

Massless particle

Pole residue:	$-\frac{6}{c_0} > 0$
Polarisations:	2

Massless particle

Pole residue:	$\frac{1}{c_2} + \frac{8 c_2 k^4}{a_0} > 0$
Polarisations:	2

Gauge symmetries

(Not yet implemented in PSALter)

Unitarity conditions

(Unitarity is demonstrably impossible)

Validity assumptions

(Not yet implemented in PSALter)