

PSALTer results panel

$$S = \iiint \iiint ( \frac{1}{4} ( 2 a_{\phantom{0}0} \mathcal{A}_{\phantom{\alpha} \alpha}^{\phantom{\alpha} \beta} \mathcal{A}_{\phantom{\beta} \beta \chi}^{\phantom{\beta} \chi} + \mathcal{A}^{a \beta \chi}_{\phantom{\alpha} \alpha} (- 2 a_{\phantom{0}0} \mathcal{A}_{\phantom{\beta} \beta \chi \alpha} + 4 \mathcal{W}_{a \beta \chi}) + 4 \mathcal{T}^{a \beta} h_{a \beta} - a_{\phantom{0}0} h_{\phantom{\chi} \chi}^{\phantom{\chi} \chi} \partial_{\beta} \mathcal{A}_{\phantom{\alpha} \alpha}^{\phantom{\alpha} \beta} + a_{\phantom{0}0} h_{\phantom{\chi} \chi}^{\phantom{\chi} \chi} \partial_{\beta} \mathcal{A}_{\phantom{\alpha} \alpha}^{a \beta} - 2 a_{\phantom{0}0} h_{a \chi} \partial_{\beta} \mathcal{A}^{a \beta \chi}_{\phantom{\alpha} \alpha} + 2 a_{\phantom{0}0} h_{\beta \chi} \partial^{\alpha} \mathcal{A}_{\phantom{\alpha} \alpha}^{\phantom{\alpha} \beta} ) ) [ t, x, y, z ] d z d y d x d t$$

Wave operator

$0^+ h^{\perp}$	$0^+ h^{\parallel}$	$0^+ \mathcal{A}_0^{\parallel}$	$0^+ \mathcal{A}_5^{\perp t}$	$0^+ \mathcal{A}_5^{\parallel}$	$0^+ \mathcal{A}_5^{t h}$	$0^+ \mathcal{A}_5^{\parallel}$	
$0^+ h^{\perp} \dagger$	0	0	0	0	$\frac{i a_{\phantom{0}0} k}{4}$	$-\frac{\frac{a_{\phantom{0}0}}{2}}{4 \sqrt{2}}$	0
$0^+ h^{\parallel} \dagger$	0	0	$\frac{i a_{\phantom{0}0} k}{2 \sqrt{2}}$	0	$-\frac{i a_{\phantom{0}0} k}{4 \sqrt{3}}$	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{6}}$	0
$0^+ \mathcal{A}_0^{\parallel} \dagger$	0	$-\frac{i a_{\phantom{0}0} k}{2 \sqrt{2}}$	$-\frac{a_{\phantom{0}0}}{2}$	0	0	0	0
$0^+ \mathcal{A}_5^{\perp t} \dagger$	0	0	0	0	$\frac{a_{\phantom{0}0}}{2}$	$-\frac{\frac{a_{\phantom{0}0}}{2}}{2 \sqrt{2}}$	0
$0^+ \mathcal{A}_5^{\parallel} \dagger$	$-\frac{1}{4} i a_{\phantom{0}0} k$	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{3}}$	0	$\frac{a_{\phantom{0}0}}{2}$	0	$-\frac{a_{\phantom{0}0}}{2 \sqrt{2}}$	0
$0^+ \mathcal{A}_5^{t h} \dagger$	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{2}}$	$-\frac{i a_{\phantom{0}0} k}{4 \sqrt{6}}$	0	$-\frac{a_{\phantom{0}0}}{2 \sqrt{2}}$	$-\frac{\frac{a_{\phantom{0}0}}{2}}{2 \sqrt{2}}$	$\frac{a_{\phantom{0}0}}{2}$	0
$0^+ \mathcal{A}_5^{\parallel} \dagger$	0	0	0	0	0	0	$-\frac{a_{\phantom{0}0}}{2}$
$1^+ \mathcal{A}_0^{\parallel} \dagger^{a \beta}$	$-\frac{a_{\phantom{0}0}}{4}$	$-\frac{\frac{a_{\phantom{0}0}}{2}}{2 \sqrt{2}}$	0	0	0	0	0
$1^+ \mathcal{A}_0^{\perp} \dagger^{a \beta}$	$-\frac{\frac{a_{\phantom{0}0}}{2}}{2 \sqrt{2}}$	0	0	0	0	0	0
$1^+ \mathcal{A}_5^{\perp} \dagger^{a \beta}$	0	0	$-\frac{a_{\phantom{0}0}}{4}$	0	0	0	0
$1^+ h^{\perp} \dagger^{\alpha}$	0	0	0	0	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{2}}$	0	$\frac{1}{4} i \sqrt{\frac{5}{6}} a_{\phantom{0}0} k$
$1^+ \mathcal{A}_0^{\parallel} \dagger^{\alpha}$	0	0	0	0	$-\frac{i a_{\phantom{0}0} k}{4 \sqrt{2}}$	$-\frac{\frac{a_{\phantom{0}0}}{2}}{4}$	$\frac{a_{\phantom{0}0}}{2 \sqrt{2}}$
$1^+ \mathcal{A}_0^{\perp} \dagger^{\alpha}$	0	0	0	0	0	0	0
$1^+ \mathcal{A}_5^{\perp t} \dagger^{\alpha}$	0	0	0	0	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{6}}$	0	$-\frac{\frac{a_{\phantom{0}0}}{2}}{6}$
$1^+ \mathcal{A}_5^{\parallel t} \dagger^{\alpha}$	0	0	0	0	$-\frac{1}{4} i \sqrt{\frac{5}{6}} a_{\phantom{0}0} k$	0	$-\frac{\sqrt{5} a_{\phantom{0}0}}{6}$
$1^+ \mathcal{A}_5^{t h} \dagger^{\alpha}$	0	0	0	0	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{3}}$	0	$-\frac{\frac{a_{\phantom{0}0}}{2}}{6 \sqrt{2}}$
$1^+ \mathcal{A}_5^{\parallel h} \dagger^{\alpha}$	0	0	0	0	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{6}}$	0	$-\frac{\frac{a_{\phantom{0}0}}{2}}{6}$
$2^+ h^{\perp} \dagger^{a \beta}$	0	$-\frac{i a_{\phantom{0}0} k}{4 \sqrt{2}}$	$-\frac{i a_{\phantom{0}0} k}{4 \sqrt{3}}$	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{6}}$	0	0	0
$2^+ \mathcal{A}_0^{\parallel} \dagger^{a \beta}$	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{2}}$	$\frac{a_{\phantom{0}0}}{4}$	0	0	0	0	0
$2^+ \mathcal{A}_5^{\perp} \dagger^{a \beta}$	$\frac{i a_{\phantom{0}0} k}{4 \sqrt{3}}$	0	$-\frac{a_{\phantom{0}0}}{2}$	0	0	0	0
$2^+ \mathcal{A}_5^{\perp} \dagger^{a \beta}$	$-\frac{i a_{\phantom{0}0} k}{4 \sqrt{6}}$	0	0	$\frac{a_{\phantom{0}0}}{4}$	0	0	0
$2^+ \mathcal{A}_0^{\parallel} \dagger^{a \beta \chi}$	0	0	0	0	$\frac{a_{\phantom{0}0}}{4}$	0	0
$2^+ \mathcal{A}_5^{\parallel} \dagger^{a \beta \chi}$	0	0	0	0	0	$\frac{a_{\phantom{0}0}}{4}$	$\frac{3}{2} \mathcal{A}_5^{\parallel} \dagger^{a \beta \chi}$
$3^+ \mathcal{A}_5^{\parallel} \dagger^{a \beta \chi}$							$\frac{a_{\phantom{0}0}}{2}$

Saturated propagator

$0^+ \mathcal{T}^{\perp}$	$0^+ \mathcal{T}^{\parallel}$	$0^+ \mathcal{W}_0^{\parallel}$	$0^+ \mathcal{W}_5^{\perp t}$	$0^+ \mathcal{W}_5^{\parallel}$	$0^+ \mathcal{W}_5^{t h}$	$0^+ \mathcal{W}_5^{\parallel}$	
$0^+ \mathcal{T}^{\perp} \dagger$	$-\frac{36 k^2}{a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{4 \sqrt{3}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$\frac{2 i \sqrt{6} k}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$-\frac{72 i k}{a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{8 i k (19+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	$-\frac{4 i \sqrt{2} k (10+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	0
$0^+ \mathcal{T}^{\parallel} \dagger$	$\frac{4 \sqrt{3}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$\frac{4}{a_{\phantom{0}0} k^2}$	$\frac{2 i \sqrt{2}}{a_{\phantom{0}0} k}$	$\frac{8 i \sqrt{3}}{16 a_{\phantom{0}0} k+3 a_{\phantom{0}0} k^3}$	$-\frac{8 i}{\sqrt{3} (16 a_{\phantom{0}0} k+3 a_{\phantom{0}0} k^3)}$	$\frac{8 i \sqrt{\frac{2}{3}}}{16 a_{\phantom{0}0} k+3 a_{\phantom{0}0} k^3}$	0
$0^+ \mathcal{W}_0^{\parallel} \dagger$	$-\frac{2 i \sqrt{6} k}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$\frac{2 i \sqrt{2}}{a_{\phantom{0}0} k}$	0	$\frac{4 \sqrt{6}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$-\frac{4 \sqrt{\frac{2}{3}}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$-\frac{8}{\sqrt{3} (16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2)}$	0
$0^+ \mathcal{W}_5^{\perp t} \dagger$	$\frac{72 i k}{a_{\phantom{0}0} (16+3 k^2)^2}$	$-\frac{8 i \sqrt{3}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^3}$	$\frac{4 \sqrt{6}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$-\frac{144}{a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{16 (19+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	$-\frac{8 \sqrt{2} (10+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	0
$0^+ \mathcal{W}_5^{\parallel} \dagger$	$-\frac{8 i k (19+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{8 i}{\sqrt{3} (16 a_{\phantom{0}0} k+3 a_{\phantom{0}0} k^3)}$	$-\frac{4 \sqrt{\frac{2}{3}}}{16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2}$	$\frac{16 (19+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	$-\frac{16 (35+6 k^2)}{3 a_{\phantom{0}0} (16+3 k^2)^2}$	$-\frac{8 \sqrt{2} (22+3 k^2)}{3 a_{\phantom{0}0} (16+3 k^2)^2}$	0
$0^+ \mathcal{W}_5^{t h} \dagger$	$\frac{4 i \sqrt{2} k (10+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{8 i \sqrt{\frac{2}{3}}}{16 a_{\phantom{0}0} k+3 a_{\phantom{0}0} k^3}$	$-\frac{8}{\sqrt{3} (16 a_{\phantom{0}0}+3 a_{\phantom{0}0} k^2)}$	$\frac{8 \sqrt{2} (10+3 k^2)}{a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{8 \sqrt{2} (22+3 k^2)}{3 a_{\phantom{0}0} (16+3 k^2)^2}$	$\frac{32 (13+3 k^2)}{3 a_{\phantom{0}0} (16+3 k^2)^2}$	0
$0^+ \mathcal{W}_0^{\parallel} \dagger$	0	0	0	0	0	$-\frac{2}{a_{\phantom{0}0}}$	$1^+ \mathcal{W}_0^{\parallel} \dagger^{a \beta}$
$1^+ \mathcal{W}_0^{\parallel} \dagger^{a \beta}$	0	$-\frac{2 \sqrt{2}}{a_{\phantom{0}0}}$	0	0	0	0	0
$1^+ \mathcal{W}_0^{\perp} \dagger^{a \beta}$	$-\frac{2 \sqrt{2}}{a_{\phantom{0}0}}$	$\frac{2}{a_{\phantom{0}0}}$	0	0	0	0	0
$1^+ \mathcal{W}_5^{\perp} \dagger^{a \beta}$	0	0	$\frac{4}{a_{\phantom{0}0}}$	0	0	0	0
$1^+ \mathcal{T}^{\perp} \dagger^{\alpha}$	0	0	0	0	$\frac{2 k^2}{a_{\phantom{0}0} (2+k^2)^2}$	$\frac{2 i \sqrt{2} k}{a_{\phantom{0}0} (2+k^2)}$	$\frac{i k (4+k^2)}{a_{\phantom{0}0} (2+k^2)^2}$
$1^+ \mathcal{W}_0^{\parallel} \dagger^{\alpha}$	0	0	0	0	$-\frac{2 i \sqrt{2} k}{a_{\phantom{0}0} (2+k^2)}$	0	$\frac{\sqrt{2} (4+k^2)}{a_{\phantom{0}0} (2+k^2)}$
$1^+ \mathcal{W}_0^{\perp} \dagger^{\alpha}$	0	0	0	0	$-\frac{i k (4+k^2)}{a_{\phantom{0}0} (2+k^2)^2}$	$\frac{\sqrt{2} (4+k^2)}{a_{\phantom{0}0} (2+k^2)}$	$-\frac{(4+k^2)^2}{2 a_{\phantom{0}0} (2+k^2)^2}$
$1^+ \mathcal{W}_5^{\perp t} \dagger^{\alpha}$	0	0	0	0	$\frac{i k (6+5 k^2)}{\sqrt{6} a_{\phantom{0}0} (2+k^2)^2}$	$\frac{2 k^2}{\sqrt{3} a_{\phantom{0}0} (2+k^2)}$	$\frac{k^2 (2+k^2)}{2 \sqrt{6} a_{\phantom{0}0} (2+k^2)^2}$
$1^+ \mathcal{W}_5^{\parallel t} \dagger^{\alpha}$	0	0	0	0	$-\frac{\sqrt{\frac{5}{6}} k^2}{4 a_{\phantom{0}0}+2 a_{\phantom{0}0} k^2}$	$\frac{\sqrt{5} (10+3 k^2)}{12 a_{\phantom{0}0}}$	$\frac{1}{3 \sqrt{2} a_{\phantom{0}0} (2+k^2)^2}$
$1^+ \mathcal{W}_5^{t h} \dagger^{\alpha}$	0	0	0	0	$\frac{2 i k (3+k^2)}{\sqrt{3} a_{\phantom{0}0} (2+k^2)^2}$	$\frac{\sqrt{\frac{5}{3}} k^2}{a_{\phantom{0}0} (2+k^2)}$	$\frac{k^2 (5+2 k^2)}{\sqrt{3} a_{\phantom{0}0} (2+k^2)^2}$
$1^+ \mathcal{W}_5^{\parallel h} \dagger^{\alpha}$	0	0	0	0	$-\frac{i \sqrt{\frac{2}{3}} k}{a_{\phantom{0}0} (2+k^2)}$	0	$-\frac{\frac{1}{2} a_{\phantom{0}0} s_{\alpha \alpha}}{2+3 k^2}$
$2^+ \mathcal{T}^{\perp} \dagger^{a \beta}$	$-\frac{8}{a_{\phantom{0}0} k^2}$	$-\frac{4 i \sqrt{2}}{a_{\phantom{0}0} k}$	$\frac{4 i}{\sqrt{3} a_{\phantom{0}0} k}$	$-\frac{8}{3 a_{\phantom{0}0}}$	$-\frac{2 \sqrt{2}}{3 a_{\phantom{0}0}}$	$\frac{8}{3 a_{\phantom{0}0}}$	0
$2^+ \mathcal{W}_0^{\parallel} \dagger^{a \beta}$	$\frac{4 i \sqrt{2}}{a_{\phantom{0}0} k}$	0	$\frac{2 \sqrt{\frac{2}{3}}}{a_{\phantom{0}0}}$	$-\frac{4}{\sqrt{3} a_{\phantom{0}0}}$	0	0	0
$2^+ \mathcal{W}_5^{\perp} \dagger^{a \beta}$	$-\frac{4 i}{\sqrt{3} a_{\phantom{0}0} k}$	$\frac{2 \sqrt{\frac{2}{3}}}{a_{\phantom{0}0}}$	$-\frac{8}{3 a_{\phantom{0}0}}$	$-\frac{2 \sqrt{2}}{3 a_{\phantom{0}0}}$	0	0	0
$2^+ \mathcal{W}_5^{\perp} \dagger^{a \beta}$	$-\frac{4 i \sqrt{\frac{2}{3}}}{a_{\phantom{0}0} k}$	$\frac{4}{\sqrt{3} a_{\phantom{0}0}}$	$\frac{2 \sqrt{2}}{3 a_{\phantom{0}0}}$	$-\frac{8}{3 a_{\phantom{0}0}}$	0	0	0
$2^+ \mathcal{W}_0^{\parallel} \dagger^{a \beta \chi}$	0	0	0	0	$\frac{4}{a_{\phantom{0}0}}$	0	0
$2^+ \mathcal{W}_5^{\parallel} \dagger^{a \beta \chi}$	0	0	0	0	0	$\frac{4}{a_{\phantom{0}0}}$	$\frac{3}{2} \mathcal{W}_5^{\parallel} \dagger^{a \beta \chi}$
$3^+ \mathcal{W}_5^{\parallel} \dagger^{a \beta \chi}$							$-\frac{2}{a_{\phantom{0}0}}$

Source constraints

Spin-parity form	Covariant form	Multiplicities
$k^0 1^+ \mathcal{W}_5^{\parallel} + 2 k^0 1^+ \mathcal{W}_5^{t h} - 6 i^0 1^+ \mathcal{T}^{\perp} = 0$	$2 \partial_{\beta} \partial_{\alpha} \mathcal{T}^{a \beta} + \partial_{\chi} \partial^{\chi} \partial_{\alpha} \mathcal{W}^{a \beta}_{\phantom{\alpha} \beta} = \partial_{\chi} \partial_{\beta} \partial_{\alpha} \mathcal{W}^{a \beta \chi}$	1
$k^0 1^+ \mathcal{W}_5^{t t} + 2 i^0 1^+ \mathcal{T}^{\perp} = 0$	$2 \partial_{\beta} \partial_{\alpha} \mathcal{T}^{a \beta} = \partial_{\chi} \partial_{\beta} \partial_{\alpha} \mathcal{W}^{a \beta \chi}$	1
$6 k^1 1^+ \mathcal{W}_5^{t \alpha} + 2 k^1 1^+ \mathcal{W}_5^{\parallel t \alpha} + k^1 1^+ \mathcal{W}_5^{\parallel t \alpha} + 3 k^1 1^+ \mathcal{W}_5^{t t \alpha} + 12 i^1 1^+ \mathcal{T}^{\perp \alpha} = 0$	$4 \partial_{\chi} \partial_{\beta} \partial^{\alpha \gamma} \mathcal{T}^{\beta \chi} + 2 \partial_{\beta} \partial^{\beta} \partial_{\chi} \partial_{\beta} \mathcal{W}^{\beta \alpha \chi} + \partial_{\beta} \partial^{\beta} \partial_{\chi} \partial^{\alpha} \mathcal{W}^{a \beta}_{\phantom{\alpha} \beta} = 4 \partial_{\chi} \partial^{\chi} \partial_{\beta} \mathcal{T}^{a \beta} + 2 \partial_{\beta} \partial_{\chi} \partial_{\beta} \partial^{\alpha} \mathcal{W}^{\beta \chi \delta} + \partial_{\beta} \partial^{\beta} \partial_{\beta} \partial^{\alpha} \mathcal{W}^{\beta \chi}_{\phantom{\alpha} \chi}$	3
$k^1 1^+ \mathcal{W}_5^{t h \alpha} - 6 i^1 1^+ \mathcal{T}^{\perp \alpha} = k (3 1^+ \mathcal{W}_0^{t \alpha} + 1^+ \mathcal{W}_5^{t t \alpha})$	$2 \partial_{\chi} \partial_{\beta} \partial^{\alpha \gamma} \mathcal{T}^{\beta \chi} + \partial_{\beta} \partial^{\beta} \partial_{\chi} \partial_{\beta} \mathcal{W}^{\beta \alpha \chi} = 2 \partial_{\chi} \partial^{\chi} \partial_{\beta} \mathcal{T}^{a \beta} + \partial_{\beta} \partial_{\chi} \partial_{\beta} \partial^{\alpha} \mathcal{W}^{\beta \chi \delta}$	3
Total expected gauge generators:		8

Massive spectrum

(No particles)

Massless spectrum



Massless particle

Pole residue:  $-\frac{p^2}{a_{\phantom{0}0}} > 0$

Polarisations: 2

Unitarity conditions

$a_{\phantom{0}0} < 0$