

PSALter results panel

$$S = \iiint \int \frac{1}{8} (-4 a_0 \mathcal{A}_{\alpha\chi\beta} \mathcal{A}^{\alpha\beta\chi} + 4 a_0 \mathcal{A}^{\alpha}{}_{\alpha} \mathcal{A}^{\chi}{}_{\beta\chi} + 8 \mathcal{A}^{\alpha\beta\chi} \mathcal{W}_{\alpha\beta\chi} + 8 \mathcal{T}^{\alpha\beta} h_{\alpha\beta} + 4 a_0 h^{\alpha\beta} \partial_{\beta} \mathcal{A}^{\chi}{}_{\alpha\chi} - 4 a_0 h^{\alpha\beta} \partial_{\chi} \mathcal{A}_{\alpha}{}^{\chi}{}_{\beta} - 2 a_0 h^{\alpha}{}_{\alpha} \partial_{\chi} \mathcal{A}^{\beta}{}_{\beta}{}^{\chi} + 2 a_0 h^{\alpha}{}_{\alpha} \partial_{\chi} \mathcal{A}^{\beta\chi}{}_{\beta} -$$
$$h_{\frac{2}{3}} \partial_{\chi} \mathcal{A}_{\beta}{}^{\delta} \partial^{\chi} \mathcal{A}^{\alpha}{}_{\alpha}{}^{\beta} - 2 h_{\frac{2}{3}} \partial_{\chi} \mathcal{A}^{\delta}{}_{\beta\delta} \partial^{\chi} \mathcal{A}^{\alpha}{}_{\alpha}{}^{\beta} - h_{\frac{2}{3}} \partial_{\chi} \mathcal{A}^{\delta}{}_{\beta\delta} \partial^{\chi} \mathcal{A}^{\alpha\beta}{}_{\alpha} - h_{\frac{2}{3}} \partial_{\beta} \mathcal{A}^{\alpha\beta\chi} \partial_{\delta} \mathcal{A}_{\alpha}{}^{\delta}{}_{\chi} - 2 h_{\frac{2}{3}} \partial_{\alpha} \mathcal{A}^{\alpha\beta\chi} \partial_{\delta} \mathcal{A}_{\beta}{}^{\delta}{}_{\chi} + 2 h_{\frac{2}{3}} \partial^{\chi} \mathcal{A}^{\alpha}{}_{\alpha}{}^{\beta} \partial_{\delta} \mathcal{A}_{\beta}{}^{\delta}{}_{\chi} + 2 h_{\frac{2}{3}} \partial^{\chi} \mathcal{A}^{\alpha\beta}{}_{\alpha} \partial_{\delta} \mathcal{A}_{\beta}{}^{\delta}{}_{\chi} - h_{\frac{2}{3}} \partial_{\alpha} \mathcal{A}^{\alpha\beta\chi} \partial_{\delta} \mathcal{A}_{\chi\beta}{}^{\delta} + 2 h_{\frac{2}{3}} \partial^{\chi} \mathcal{A}^{\alpha}{}_{\alpha}{}^{\beta} \partial_{\delta} \mathcal{A}_{\chi\beta}{}^{\delta} + 2 h_{\frac{2}{3}} \partial^{\chi} \mathcal{A}^{\alpha\beta}{}_{\alpha} \partial_{\delta} \mathcal{A}_{\chi\beta}{}^{\delta})) [t, x, y, z] dz dy dx dt$$

Wave operator

$0^+ h^{\perp}$	$0^+ h^{\parallel}$	$0^+ \mathcal{A}_S^{\perp t}$	$0^+ \mathcal{A}_S^{\perp l}$	$0^+ \mathcal{A}_S^{\perp h}$	
$0^+ h^{\perp} \uparrow$	0	0	$\frac{ia_0k}{4}$	$\frac{ia_0k}{8\sqrt{2}}$	
$0^+ h^{\parallel} \uparrow$	0	0	$\frac{ia_0k}{4\sqrt{3}}$	$\frac{5ia_0k}{8\sqrt{6}}$	
$0^+ \mathcal{A}_S^{\perp t} \uparrow$	0	0	$\frac{a_0}{2}$	$\frac{a_0}{4\sqrt{2}}$	
$0^+ \mathcal{A}_S^{\perp l} \uparrow$	$-\frac{1}{4}ia_0k$	$\frac{ia_0k}{4\sqrt{3}}$	$\frac{a_0}{2}$	$\frac{2k^2h_3}{3}$	$\frac{3a_0-4k^2h_3}{12\sqrt{2}}$
$0^+ \mathcal{A}_S^{\perp h} \uparrow$	$-\frac{ia_0k}{8\sqrt{2}}$	$-\frac{5ia_0k}{8\sqrt{6}}$	$\frac{a_0}{4\sqrt{2}}$	$\frac{3a_0-4k^2h_3}{12\sqrt{2}}$	$\frac{1}{12}(-3a_0-k^2h_3)$
	$1^+ \mathcal{A}_S^{\perp} \uparrow^{a\beta}$	$1^+ h^{\perp}_{\alpha}$	$1^+ \mathcal{A}_S^{\perp t}_{\alpha}$	$1^+ \mathcal{A}_S^{\perp l}_{\alpha}$	$1^+ \mathcal{A}_S^{\perp h}_{\alpha}$
$1^+ \mathcal{A}_S^{\perp} \uparrow^{a\beta}$	$\frac{1}{16}(4a_0-k^2h_3)$	0	0	0	0
$1^+ h^{\perp} \uparrow^a$	0	0	$-\frac{ia_0k}{4\sqrt{6}}$	$\frac{1}{4}i\sqrt{\frac{5}{6}}a_0k$	$\frac{ia_0k}{8\sqrt{3}}$
$1^+ \mathcal{A}_S^{\perp t} \uparrow^a$	0	$\frac{ia_0k}{4\sqrt{6}}$	$\frac{1}{6}(-2a_0-k^2h_3)$	$\frac{\sqrt{5}a_0}{6}$	$\frac{a_0+2k^2h_3}{12\sqrt{2}}$
$1^+ \mathcal{A}_S^{\perp l} \uparrow^a$	0	$\frac{1}{4}i\sqrt{\frac{5}{6}}a_0k$	$\frac{\sqrt{5}a_0}{6}$	$\frac{1}{6}(2a_0-5k^2h_3)$	$\frac{1}{12}\sqrt{\frac{5}{2}}a_0$
$1^+ \mathcal{A}_S^{\perp h} \uparrow^a$	0	$-\frac{ia_0k}{8\sqrt{3}}$	$\frac{a_0+2k^2h_3}{12\sqrt{2}}$	$\frac{1}{12}\sqrt{\frac{5}{2}}a_0$	$\frac{1}{12}(a_0-k^2h_3)$
$1^+ \mathcal{A}_S^{\perp h} \uparrow^a$	0	$\frac{ia_0k}{4\sqrt{6}}$	$\frac{a_0}{12}$	$\frac{1}{12}\sqrt{5}(a_0-k^2h_3)$	$-\frac{a_0}{3\sqrt{2}}$
	$2^+ h^{\parallel} \uparrow^{a\beta}$	$2^+ \mathcal{A}_S^{\parallel} \uparrow^{a\beta}$	$2^+ \mathcal{A}_S^{\perp} \uparrow^{a\beta}$	$2^+ \mathcal{A}_S^{\parallel} \uparrow^{a\beta\chi}$	
$2^+ h^{\parallel} \uparrow^{a\beta}$	0	$-\frac{ia_0k}{4\sqrt{3}}$	$-\frac{ia_0k}{2\sqrt{6}}$	0	
$2^+ \mathcal{A}_S^{\parallel} \uparrow^{a\beta}$	$\frac{ia_0k}{4\sqrt{3}}$	$\frac{1}{6}(-3a_0-k^2h_3)$	$-\frac{k^2h_3}{12\sqrt{2}}$	0	
$2^+ \mathcal{A}_S^{\perp} \uparrow^{a\beta}$	$\frac{ia_0k}{2\sqrt{6}}$	$-\frac{k^2h_3}{12\sqrt{2}}$	$\frac{a_0}{4}-\frac{k^2h_3}{48}$	0	
$2^+ \mathcal{A}_S^{\parallel} \uparrow^{a\beta\chi}$	0	0	0	$\frac{a_0}{4}$	$3^+ \mathcal{A}_S^{\parallel} \uparrow^{a\beta\chi}$
				$3^+ \mathcal{A}_S^{\parallel} \uparrow^{a\beta\chi}$	$\frac{a_0}{2}$

Saturated propagator

$0^+ \mathcal{T}^{\perp}$	$0^+ \mathcal{T}^{\parallel}$	$0^+ \mathcal{W}_S^{\perp t}$	$0^+ \mathcal{W}_S^{\perp l}$	$0^+ \mathcal{W}_S^{\perp h}$	
$0^+ \mathcal{T}^{\perp} \uparrow$	$-\frac{4k^2(a_0-8k^2h_3)}{3a_0^2(4+k^2)^2}$	0	$-\frac{8ik(a_0-8k^2h_3)}{3a_0^2(4+k^2)^2}$	$\frac{10ik}{12a_0+3a_0k^2}$	$\frac{4i\sqrt{2}k}{12a_0+3a_0k^2}$
$0^+ \mathcal{T}^{\parallel} \uparrow$	0	$\frac{4}{a_0k^2}$	0	$-\frac{2i}{\sqrt{3}a_0k}$	$\frac{4i\sqrt{\frac{2}{3}}}{a_0k}$
$0^+ \mathcal{W}_S^{\perp t} \uparrow$	$\frac{8ik(a_0-8k^2h_3)}{3a_0^2(4+k^2)^2}$	0	$-\frac{16(a_0-8k^2h_3)}{3a_0^2(4+k^2)^2}$	$\frac{20}{12a_0+3a_0k^2}$	$\frac{8\sqrt{2}}{12a_0+3a_0k^2}$
$0^+ \mathcal{W}_S^{\perp l} \uparrow$	$-\frac{10ik}{12a_0+3a_0k^2}$	$\frac{2i}{\sqrt{3}a_0k}$	$\frac{20}{12a_0+3a_0k^2}$	0	0
$0^+ \mathcal{W}_S^{\perp h} \uparrow$	$-\frac{4i\sqrt{2}k}{12a_0+3a_0k^2}$	$-\frac{4i\sqrt{\frac{2}{3}}}{a_0k}$	$\frac{8\sqrt{2}}{12a_0+3a_0k^2}$	0	0
	$1^+ \mathcal{W}_S^{\perp} \uparrow^{a\beta}$	$1^+ \mathcal{T}^{\perp}_{\alpha}$	$1^+ \mathcal{W}_S^{\perp t}_{\alpha}$	$1^+ \mathcal{W}_S^{\perp l}_{\alpha}$	$1^+ \mathcal{W}_S^{\perp h}_{\alpha}$
$1^+ \mathcal{W}_S^{\perp} \uparrow^{a\beta}$	$\frac{16}{4a_0-k^2h_3}$	0	0	0	0
$1^+ \mathcal{T}^{\perp} \uparrow^a$	0	$\frac{4(6a_0^2k^2+2a_0k^4h_3-8k^6h_3^2)}{a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4i\sqrt{\frac{2}{3}}k(-6a_0^2(1+k^2)+a_0k^2(19+9k^2)h_3-8k^4h_3^2)}{a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{2i\sqrt{\frac{10}{3}}k(6a_0^2-3a_0k^2h_3-2k^4h_3^2)}{a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4ik(-6a_0^2(4+k^2)+a_0k^2(16+9k^2)h_3+16k^4h_3^2)}{\sqrt{3}a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$
$1^+ \mathcal{W}_S^{\perp t} \uparrow^a$	0	$\frac{4i\sqrt{\frac{2}{3}}k(6a_0^2(1+k^2)+a_0k^2(19+9k^2)h_3+8k^4h_3^2)}{a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{8(-2a_0^2(13+10k^2+k^4)+a_0k^2(57+38k^2+5k^4)h_3-8k^4h_3^2)}{3a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4\sqrt{5}(2a_0^2(5+k^2)+a_0k^2(-1+k^2)h_3-2k^4h_3^2)}{3a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4\sqrt{2}(2a_0^2(4+k^2+k^4)+a_0k^4(11+5k^2)h_3-16k^4h_3^2)}{3a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$
$1^+ \mathcal{W}_S^{\perp l} \uparrow^a$	0	$\frac{2i\sqrt{\frac{10}{3}}k(-6a_0^2+3a_0k^2h_3+2k^4h_3^2)}{a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4\sqrt{5}(2a_0^2(5+k^2)+a_0k^2(-1+k^2)h_3-2k^4h_3^2)}{3a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{1}{-\frac{3i^2h_3}{2}+\frac{5}{3}a_0(1+\frac{a_0}{14a_0+5i^2h_3})}$	$\frac{2\sqrt{10}(2a_0^2(-4+k^2)+a_0k^2(8+k^2)h_3+4k^4h_3^2)}{3a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$
$1^+ \mathcal{W}_S^{\perp h} \uparrow^a$	0	$\frac{4ik(-6a_0^2(4+k^2)+a_0k^2(16+9k^2)h_3+16k^4h_3^2)}{\sqrt{3}a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4\sqrt{2}(2a_0^2(4+k^2+k^4)+a_0k^4(11+5k^2)h_3-16k^4h_3^2)}{3a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{2\sqrt{10}(2a_0^2(-4+k^2)+a_0k^2(8+k^2)h_3+4k^4h_3^2)}{3a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4(2a_0^2(-32-8k^2+k^4)+a_0k^2(48+16k^2-5k^4)h_3+32k^4h_3^2)}{3a_0(2+k^2)^2(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$
$1^+ \mathcal{W}_S^{\perp h} \uparrow^a$	0	$\frac{4i\sqrt{\frac{2}{3}}k(12a_0^2-9a_0k^2h_3-10k^4h_3^2)}{a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{8(a_0^2(4+8k^2)+a_0k^2(1+5k^2)h_3+10k^4h_3^2)}{3a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{4\sqrt{5}(-8a_0^2(5+k^2)+a_0k^2(28+5k^2)h_3+20k^4h_3^2)}{3a_0(2+k^2)(12a_0^2-10a_0k^2h_3-5k^4h_3^2)}$	$\frac{16(a_0-5k^2h_3)}{3(-12a_0^2+10a_0k^2h_3+5k^4h_3^2)}$
	$2^+ \mathcal{T}^{\parallel} \uparrow^{a\beta}$	$2^+ \mathcal{W}_S^{\parallel} \uparrow^{a\beta}$	$2^+ \mathcal{W}_S^{\perp} \uparrow^{a\beta}$	$2^+ \mathcal{W}_S^{\parallel} \uparrow^{a\beta\chi}$	
$2^+ \mathcal{T}^{\parallel} \uparrow^{a\beta}$	$-\frac{8}{a_0k^2}$	$\frac{4i}{\sqrt{3}a_0k}$	$-\frac{8i\sqrt{\frac{2}{3}}}{a_0k}$	0	
$2^+ \mathcal{W}_S^{\parallel} \uparrow^{a\beta}$	$-\frac{4i}{\sqrt{3}a_0k}$	$-\frac{32}{12a_0+3k^2h_3}$	$\frac{16\sqrt{2}}{12a_0+3k^2h_3}$	0	
$2^+ \mathcal{W}_S^{\perp} \uparrow^{a\beta}$	$\frac{8i\sqrt{\frac{2}{3}}}{a_0k}$	$\frac{16\sqrt{2}}{12a_0+3k^2h_3}$	$-\frac{16}{12a_0+3k^2h_3}$	0	
$2^+ \mathcal{W}_S^{\parallel} \uparrow^{a\beta\chi}$	0	0	0	$\frac{4}{a_0}$	$3^+ \mathcal{W}_S^{\parallel} \uparrow^{a\beta\chi}$
				$3^+ \mathcal{W}_S^{\parallel} \uparrow^{a\beta\chi}$	$-\frac{2}{a_0}$

Source constraints

Spin-parity form	Covariant form	Multiplicities
$k\,0^+\mathcal{W}_S^{\perp t}+2\,i\,0^+\mathcal{T}^{\perp}=0$	$2\,\partial_{\beta}\partial_{\alpha}\mathcal{T}^{\alpha\beta}=\partial_{\chi}\partial_{\beta}\partial_{\alpha}\mathcal{W}^{\alpha\beta\chi}$	1
$2\,k\,1^+\mathcal{W}_S^{\perp h}+k\,1^+\mathcal{W}_S^{\perp t}+6\,i\,1^+\mathcal{T}^{\perp}=0$	$2\,\partial_{\chi}\partial_{\beta}\partial^{\alpha}\mathcal{T}^{\beta\chi}+\partial_{\alpha}\partial^{\delta}\partial_{\delta}\partial_{\beta}\mathcal{W}^{\beta\alpha\chi}=2\,\partial_{\chi}\partial^{\chi}\partial_{\beta}\mathcal{T}^{\alpha\beta}+\partial_{\alpha}\partial_{\chi}\partial_{\beta}\partial^{\alpha}\mathcal{W}^{\beta\chi\delta}$	3
Total expected gauge generators:		4

Massive spectrum

$J^P = 1^+$
 $k^{\mu} = (E, 0, 0, p)$

$J^P = 1^-$
 $k^{\mu} = (E, 0, 0, p)$

Massive particle	Massive particle
Pole residue: $-\frac{16}{h_3} > 0$	Pole residue: $\frac{560a_0-52\sqrt{85}a_0-572h_3+84\sqrt{85}h_3}{85a_0h_3-5\sqrt{85}a_0h_3+10\sqrt{85}h_3^2} > 0$
Square mass: $\frac{4a_0}{h_3} > 0$	Square mass: $\frac{(-5+\sqrt{85})a_0}{5h_3} > 0$
Spin: 1	Spin: 1
Parity: Even	Parity: Odd

$J^P = 2^+$
 $k^{\mu} = (E, 0, 0, p)$

Massive particle
Pole residue: $-\frac{16}{h_3} > 0$
Square mass: $-\frac{8}{h_3} > 0$
Spin: 2
Parity: Even

Massless spectrum

$k^{\mu} = (p, 0, 0, p)$

Massless particle
Pole residue: $-\frac{c^2}{a_0} > 0$
Polarisations: 2

Unitarity conditions

(Demonstrably impossible)