PSALTer results panel

Wave operator and propagator

$$\mathcal{S} == \iiiint \Big(\tfrac{1}{8}\big(8\,\mathcal{T}^{\alpha\beta}\,h_{\alpha\beta} - \ldots\big) \ldots\Big)[t,x,y,z]\,dz\,dy\,dx\,dt$$

[illegible]

	$1^+\mathcal{A}_a{}^{\parallel}{}_{\alpha\beta}$	$1^+\mathcal{A}_a{}^{\perp}{}_{\alpha\beta}$	$1^+\mathcal{A}_s{}^{\perp}{}_{\alpha\beta}$	$1^-h^{\perp}{}_{\alpha}$	$1^-\mathcal{A}_a{}^{\parallel}{}_{\alpha}$	$1^-\mathcal{A}_a{}^{\perp}{}_{\alpha}$	$1^-\mathcal{A}_s{}^{\perp t}{}_{\alpha}$	$1^-\mathcal{A}_s{}^{\parallel t}{}_{\alpha}$	$1^-\mathcal{A}_s{}^{\perp h}{}_{\alpha}$	$1^-\mathcal{A}_s{}^{\parallel h}{}_{\alpha}$
$1^+\mathcal{A}_a{}^{\parallel}\dagger^{\alpha\beta}$	$\frac{1}{4}(-a_0+(c_{10}+c_{11}-c_{12}-c_7+c_8-c_9)k^2)$	$-\frac{a_0}{2\sqrt{2}}$	$\frac{1}{4}(-c_{10}-c_7+c_8+c_9)k^2$	0	0	0	0	0	0	0
$1^+\mathcal{A}_a{}^{\perp}\dagger^{\alpha\beta}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0	0	0	0
$1^+\mathcal{A}_s{}^{\perp}\dagger^{\alpha\beta}$	$\frac{1}{4}(-c_{10}-c_7+c_8+c_9)k^2$	0	$\frac{1}{4}(a_0+(c_{10}-c_{11}+c_{12}-c_7+c_8-c_9)k^2)$	0	0	0	0	0	0	0
$1^-h^{\perp}\dagger^{\alpha}$	0	0	0	0	0	0	0	0	0	0
$1^-\mathcal{A}_a{}^{\parallel}\dagger^{\alpha}$	0	0	0	0	$\frac{1}{4}(-a_0+2(c_{11}-c_7-c_9)k^2)$	$\frac{a_0}{2\sqrt{2}}$	$\frac{(-2c_{10}+c_{14}-c_{15}+2c_8)k^2}{4\sqrt{3}}$	$\frac{1}{4}\sqrt{\frac{5}{3}}(c_{14}-c_{15}-2c_7+2c_9)k^2$	$\frac{(-2c_{10}+c_{14}-c_{15}+2c_8)k^2}{2\sqrt{6}}$	$\frac{(c_{14}-c_{15}+c_7-c_9)k^2}{2\sqrt{3}}$
$1^-\mathcal{A}_a{}^{\perp}\dagger^{\alpha}$	0	0	0	0	$\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0
$1^-\mathcal{A}_s{}^{\perp t}\dagger^{\alpha}$	0	0	0	0	$\frac{(-2c_{10}+c_{14}-c_{15}+2c_8)k^2}{4\sqrt{3}}$	0	$\frac{1}{6}(-2a_0-(c_{11}+2c_{13}-c_{14}-c_{15}+c_7+c_9)k^2)$	$\frac{1}{6}\sqrt{5}(a_0+(c_{10}+c_{12}-2c_{13}+c_{14}+c_{15}+c_8)k^2)$	$\frac{-a_0-2(c_{11}+2c_{13}-c_{14}-c_{15}+c_7+c_9)k^2}{6\sqrt{2}}$	$\frac{1}{12}(-2a_0+(-2c_{10}-2c_{12}-8c_{13}+c_{14}+c_{15}-2c_8)k^2)$
$1^-\mathcal{A}_s{}^{\parallel t}\dagger^{\alpha}$	0	0	0	0	$\frac{1}{4}\sqrt{\frac{5}{3}}(c_{14}-c_{15}-2c_7+2c_9)k^2$	0	$\frac{1}{6}\sqrt{5}(a_0+(c_{10}+c_{12}-2c_{13}+c_{14}+c_{15}+c_8)k^2)$	$\frac{1}{6}(2a_0-5(c_{11}+2c_{13}+c_{14}+c_{15}+c_7+c_9)k^2)$	$-\frac{1}{6}\sqrt{\frac{5}{2}}(a_0-2(c_{10}+c_{12}-2c_{13}+c_{14}+c_{15}+c_8)k^2)$	$\frac{1}{12}\sqrt{5}(-2a_0+(2c_{11}-8c_{13}+c_{14}+c_{15}+2(c_7+c_9))k^2)$
$1^-\mathcal{A}_s{}^{\perp h}\dagger^{\alpha}$	0	0	0	0	$\frac{(-2c_{10}+c_{14}-c_{15}+2c_8)k^2}{2\sqrt{6}}$	0	$\frac{-a_0-2(c_{11}+2c_{13}-c_{14}-c_{15}+c_7+c_9)k^2}{6\sqrt{2}}$	$-\frac{1}{6}\sqrt{\frac{5}{2}}(a_0-2(c_{10}+c_{12}-2c_{13}+c_{14}+c_{15}+c_8)k^2)$	$\frac{1}{3}(a_0-(c_{11}+2c_{13}-c_{14}-c_{15}+c_7+c_9)k^2)$	$\frac{a_0+(-2c_{10}-2c_{12}-8c_{13}+c_{14}+c_{15}-2c_8)k^2}{6\sqrt{2}}$
$1^-\mathcal{A}_s{}^{\parallel h}\dagger^{\alpha}$	0	0	0	0	$\frac{(c_{14}-c_{15}+c_7-c_9)k^2}{2\sqrt{3}}$	0	$\frac{1}{12}(-2a_0+(-2c_{10}-2c_{12}-8c_{13}+c_{14}+c_{15}-2c_8)k^2)$	$\frac{1}{12}\sqrt{5}(-2a_0+(2c_{11}-8c_{13}+c_{14}+c_{15}+2(c_7+c_9))k^2)$	$\frac{a_0+(-2c_{10}-2c_{12}-8c_{13}+c_{14}+c_{15}-2c_8)k^2}{6\sqrt{2}}$	$\frac{1}{12}(5a_0-(2c_{11}+8c_{13}+c_{14}+c_{15}+2(c_7+c_9))k^2)$

	$0^+\mathcal{T}^{\perp}$	$0^+\mathcal{T}^{\parallel}$	$0^+\mathcal{W}_s{}^{\parallel}$	$0^+\mathcal{W}_s{}^{\perp t}$	$0^+\mathcal{W}_s{}^{\parallel}$	$0^+\mathcal{W}_s{}^{\perp h}$	$0^-\mathcal{W}_a{}^{\parallel}$
$0^+\mathcal{T}^{\perp}\dagger$	0	0	0	0	0	0	0
$0^+\mathcal{T}^{\parallel}\dagger$	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
$0^+\mathcal{W}_s{}^{\parallel}\dagger$	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
$0^+\mathcal{W}_s{}^{\perp t}\dagger$	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
$0^+\mathcal{W}_s{}^{\parallel}\dagger$	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
$0^+\mathcal{W}_s{}^{\perp h}\dagger$	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
$0^-\mathcal{W}_a{}^{\parallel}\dagger$	0	0	0	0	0	0	$-\frac{2}{a_0}$

	$0^+h^{\perp}$	$0^+h^{\parallel}$	$0^+\mathcal{A}_s{}^{\parallel}$	$0^+\mathcal{A}_s{}^{\perp t}$	$0^+\mathcal{A}_s{}^{\parallel}$	$0^+\mathcal{A}_s{}^{\perp h}$	$0^-\mathcal{A}_a{}^{\parallel}$
$0^+h^{\perp}\dagger$	0	0	0 0		0	0	0
$0^+h^{\parallel}\dagger$	0	[illegible]	[illegible]	0	[illegible]	[illegible]	0
[illegible]	0	[illegible]	[illegible]	0	[illegible]	[illegible]	0
$0^+\mathcal{A}_s{}^{\perp t}\dagger$	0	0	0 0		$\frac{a_0}{2}$	$-\frac{a_0}{2\sqrt{2}}$	0
$0^+\mathcal{A}_s{}^{\parallel}\dagger$	0	[illegible]	[illegible]	$\frac{a_0}{2}$	[illegible]	[illegible]	0
$0^+\mathcal{A}_s{}^{\perp h}\dagger$	0	[illegible]	[illegible]	$-\frac{a_0}{2\sqrt{2}}$	[illegible]	[illegible]	0
$0^-\mathcal{A}_a{}^{\parallel}\dagger$	0	0	0 0		0	0	$-\frac{a_0}{2}$

	$2^+h^{\parallel}{}_{\alpha\beta}$	$2^+\mathcal{A}_a{}^{\parallel}{}_{\alpha\beta}$	$2^+\mathcal{A}_s{}^{\parallel}{}_{\alpha\beta}$	$2^+\mathcal{A}_s{}^{\perp}{}_{\alpha\beta}$	$2^-\mathcal{A}_a{}^{\parallel}{}_{\alpha\beta\chi}$	$2^-\mathcal{A}_s{}^{\parallel}{}_{\alpha\beta\chi}$
$2^+h^{\parallel}\dagger^{\alpha\beta}$	$-\frac{1}{8}k^2(a_0+(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9)k^2)$	$-\frac{i(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9)k^3}{4\sqrt{2}}$	$\frac{i(c_{10}-c_7-c_8+c_9)k^3}{4\sqrt{3}}$	$-\frac{i(c_{10}-c_7-c_8+c_9)k^3}{4\sqrt{6}}$	0	0
$2^+\mathcal{A}_a{}^{\parallel}\dagger^{\alpha\beta}$	$\frac{i(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9)k^3}{4\sqrt{2}}$	$\frac{1}{4}(a_0-(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9)k^2)$	$\frac{(c_{10}-c_7-c_8+c_9)k^2}{2\sqrt{6}}$	$\frac{(-c_{10}+c_7+c_8-c_9)k^2}{4\sqrt{3}}$	0	0
$2^+\mathcal{A}_s{}^{\parallel}\dagger^{\alpha\beta}$	$-\frac{i(c_{10}-c_7-c_8+c_9)k^3}{4\sqrt{3}}$	$\frac{(c_{10}-c_7-c_8+c_9)k^2}{2\sqrt{6}}$	$\frac{1}{6}(-3a_0-(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2)$	$\frac{(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2}{6\sqrt{2}}$	0	0
$2^+\mathcal{A}_s{}^{\perp}\dagger^{\alpha\beta}$	$\frac{i(c_{10}-c_7-c_8+c_9)k^3}{4\sqrt{6}}$	$\frac{(-c_{10}+c_7+c_8-c_9)k^2}{4\sqrt{3}}$	$\frac{(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2}{6\sqrt{2}}$	$\frac{1}{12}(3a_0-(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2)$	0	0
$2^-\mathcal{A}_a{}^{\parallel}\dagger^{\alpha\beta\chi}$	0	0	0	0	$\frac{a_0}{4}$	0
$2^-\mathcal{A}_s{}^{\parallel}\dagger^{\alpha\beta\chi}$	0	0	0	0	0	$\frac{a_0}{4}$

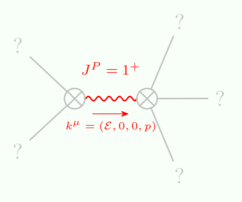
	$2^+\mathcal{T}^{\parallel}{}_{\alpha\beta}$	$2^+\mathcal{W}_a{}^{\parallel}{}_{\alpha\beta}$	$2^+\mathcal{W}_s{}^{\parallel}{}_{\alpha\beta}$	$2^+\mathcal{W}_s{}^{\perp}{}_{\alpha\beta}$	$2^-\mathcal{W}_a{}^{\parallel}{}_{\alpha\beta\chi}$	$2^-\mathcal{W}_s{}^{\parallel}{}_{\alpha\beta\chi}$
$2^+\mathcal{T}^{\parallel}\dagger^{\alpha\beta}$	$\frac{8(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9-\frac{a_0}{k^2})}{a_0^2}$	$-\frac{4i\sqrt{2}(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9)k}{a_0^2}$	$-\frac{4i(c_{10}-c_7-c_8+c_9)k}{\sqrt{3}a_0^2}$	$-\frac{4i\sqrt{\frac{2}{3}}(c_{10}-c_7-c_8+c_9)k}{a_0^2}$	0	0
$2^+\mathcal{W}_a{}^{\parallel}\dagger^{\alpha\beta}$	$-\frac{4i\sqrt{2}(-c_{10}+c_{11}+c_{12}-c_7-c_8-c_9)k}{a_0^2}$	$\frac{4(a_0+(c_{10}-c_{11}-c_{12}+c_7+c_8+c_9)k^2)}{a_0^2}$	$\frac{2\sqrt{\frac{2}{3}}(c_{10}-c_7-c_8+c_9)k^2}{a_0^2}$	$\frac{4(c_{10}-c_7-c_8+c_9)k^2}{\sqrt{3}a_0^2}$	0	0
$2^+\mathcal{W}_s{}^{\parallel}\dagger^{\alpha\beta}$	$-\frac{4i(-c_{10}+c_7+c_8-c_9)k}{\sqrt{3}a_0^2}$	$-\frac{2\sqrt{\frac{2}{3}}(-c_{10}+c_7+c_8-c_9)k^2}{a_0^2}$	$\frac{2(-3a_0+(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2)}{3a_0^2}$	$\frac{2\sqrt{2}(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2}{3a_0^2}$	0	0
$2^+\mathcal{W}_s{}^{\perp}\dagger^{\alpha\beta}$	$-\frac{4i\sqrt{\frac{2}{3}}(-c_{10}+c_7+c_8-c_9)k}{a_0^2}$	$-\frac{4(-c_{10}+c_7+c_8-c_9)k^2}{\sqrt{3}a_0^2}$	$\frac{2\sqrt{2}(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2}{3a_0^2}$	$\frac{4(3a_0+(c_{10}+c_{11}+c_{12}+c_7+c_8+c_9)k^2)}{3a_0^2}$	0	0
$2^-\mathcal{W}_a{}^{\parallel}\dagger^{\alpha\beta\chi}$	0	0	0	0	$\frac{4}{a_0}$	0
$2^-\mathcal{W}_s{}^{\parallel}\dagger^{\alpha\beta\chi}$	0	0	0	0	0	$\frac{4}{a_0}$

Spin-parity form	Covariant form	Multiplicities
$0^+\mathcal{W}_s{}^{\parallel} + 2\,0^+\mathcal{W}_s{}^{\perp h} + 3\,0^+\mathcal{W}_s{}^{\perp t} == 0$	$\partial_\alpha\mathcal{W}^{\alpha\beta}{}_{\beta} == 0$	1
$0^+\mathcal{T}^{\perp} == 0$	$\partial_\beta\partial_\alpha\mathcal{T}^{\alpha\beta} == 0$	1
$1^-\mathcal{T}^{\perp\alpha} == 0$	$\partial_\chi\partial_\beta\partial^\alpha\mathcal{T}^{\beta\chi} == \partial_\chi\partial^\chi\partial_\beta\mathcal{T}^{\alpha\beta}$	3
Total expected gauge generators:		5

	$3^-\mathcal{W}_s{}^{\parallel}{}_{\alpha\beta\chi}$
$3^-\mathcal{W}_s{}^{\parallel}\dagger^{\alpha\beta\chi}$	$-\frac{2}{a_0}$

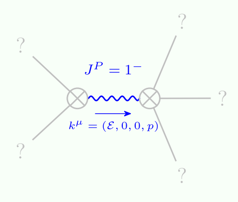
	$3^-\mathcal{A}_s{}^{\parallel}{}_{\alpha\beta\chi}$
$3^-\mathcal{A}_s{}^{\parallel}\dagger^{\alpha\beta\chi}$	$-\frac{a_0}{2}$

Massive and massless spectra



Massive particle

Poleresidue:	$\frac{1}{(c_{10}-c_{11}+c_{12}-c_7+c_8-c_9)^3}(6c_{10}^2+4c_{11}^2+4c_{12}^2-8c_{12}c_7+6c_7^2+8c_{12}c_8-12c_7c_8+6c_8^2-8c_{11}(c_{12}-c_7+c_8-c_9)-8c_{12}c_9+4c_7c_9-4c_8c_9+6c_9^2-4c_{10}(2c_{11}-2c_{12}+c_7-c_8+3c_9))>0$
Square mass:	$-\frac{a_0}{c_{10}-c_{11}+c_{12}-c_7+c_8-c_9}>0$
Spin:	1
Parity:	Even

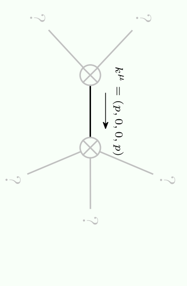


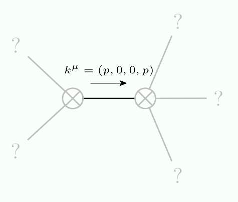
Massive particle

Pole residue:	(Hidden for brevity)
Square mass:	$\frac{a_0(c_{10}-c_{11}+c_{12}-16c_{13}+4c_{14}+4c_{15}-c_7+c_8-c_9)}{5(4c_{10}c_{13}-4c_{11}c_{13}+4c_{12}c_{13}+c_{14}^2+2c_{14}c_{15}+c_{15}^2-4c_{13}c_7+4c_{13}c_8-4c_{13}c_9)}>0$
Spin:	1
Parity:	Odd

Poleresidue:	$\frac{9+a_0^2}{a_0^2(-c_{10}+c_{11}-c_{12}+16c_{13}-4c_{14}-4c_{15}+c_7-c_8+c_9)}>0$
Polarisations:	2

Massless particle





Massless particle

Pole residue:	$-\frac{1}{a_0}>0$
Polarisations:	2

Unitarity conditions

(Timeout after 20 seconds)