PSALTer results panel

$$S = \iiiint \left(\frac{1}{3} \left(3\, t_1\, \mathcal{A}^{\alpha i}{}_\alpha\, \mathcal{A}_{i}{}^{\theta}{}_{\theta} + 3\, \mathcal{A}^{\alpha\beta\chi}\, \sigma_{\alpha\beta\chi} + 3\, f^{\alpha\beta}{}_\tau\, (\Delta + \mathcal{K})_{\alpha\beta} - 6\, t_1\, \mathcal{A}_{\alpha}{}^{\theta}{}_{\theta}\, \partial_i f^{\alpha i} - 6\, r_1\, \partial_\beta \mathcal{A}_{i}{}^{\theta}{}_{\theta} \partial^i \mathcal{A}^{\alpha\beta}{}_\alpha + 6\, r_1\, \partial_\beta \mathcal{A}_{i}{}^{\theta}{}_{\theta} \partial^i \mathcal{A}^{\alpha\beta}{}_\alpha + \right. \right.$$

(equation continues — dense covariant Lagrangian expression) $\left. \left. \ldots \right)\right)[t, x, y, z]\, dz\, dy\, dx\, dt$

Wave operator

(Matrix — spin-parity block 0^+, 1^-, 2^+ sectors)

	$0^+\mathcal{A}^\parallel$	$0^+f^\parallel$	$0^-f^\perp$	$0^-\mathcal{A}^\parallel$
$0^+\mathcal{A}^\parallel\uparrow$	$-t_1$	$i\sqrt{2}\,k\,t_1$	0	0
$0^+f^\parallel\uparrow$	$-i\sqrt{2}\,k\,t_1$	$-2\,k^2\,t_1$	0	0
$0^-f^\perp\uparrow$	0	0	0	0
$0^-\mathcal{A}^\parallel\uparrow$	0	0	0	$k^2\,r_2$

	$1^+\mathcal{A}^\parallel{}_{\alpha\beta}$	$1^+\mathcal{A}^\perp{}_{\alpha\beta}$	$1^+f^\parallel{}_{\alpha\beta}$	$1^-\mathcal{A}^\parallel{}_\alpha$	$1^-\mathcal{A}^\perp{}_\alpha$	$1^-f^\parallel{}_\alpha$	$1^-f^\perp{}_\alpha$
$1^+\mathcal{A}^\parallel\uparrow^{\alpha\beta}$	$\frac{t_1}{6}$	$-\frac{t_1}{3\sqrt{2}}$	$-\frac{i\,k\,t_1}{3\sqrt{2}}$	0	0	0	0
$1^+\mathcal{A}^\perp\uparrow^{\alpha\beta}$	$-\frac{t_1}{3\sqrt{2}}$	$-\frac{t_1}{3}$	$\frac{i\,k\,t_1}{3}$	0	0	0	0
$1^+f^\parallel\uparrow^{\alpha\beta}$	$\frac{i\,k\,t_1}{3\sqrt{2}}$	$-\frac{1}{3}\,i\,k\,t_1$	$\frac{k^2\,t_1}{3}$	0	0	0	0
$1^-\mathcal{A}^\parallel\uparrow^{\alpha}$	0	0	0	$-k^2\,r_1 - \frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	$i\,k\,t_1$	
$1^-\mathcal{A}^\perp\uparrow^{\alpha}$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	0
$1^-f^\parallel\uparrow^{\alpha}$	0	0	0	0	0	0	0
$1^-f^\perp\uparrow^{\alpha}$	0	0	0	$-i\,k\,t_1$	0	0	0

	$2^+\mathcal{A}^\parallel{}_{\alpha\beta}$	$2^+f^\parallel{}_{\alpha\beta}$	$2^-\mathcal{A}^\parallel{}_{\alpha\beta\chi}$
$2^+\mathcal{A}^\parallel\uparrow^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{i\,k\,t_1}{\sqrt{2}}$	0
$2^+f^\parallel\uparrow^{\alpha\beta}$	$\frac{i\,k\,t_1}{\sqrt{2}}$	$k^2\,t_1$	0
$2^-\mathcal{A}^\parallel\uparrow^{\alpha\beta\chi}$	0	0	$k^2\,r_1 - \frac{t_1}{2}$

Saturated propagator

	$0^+\sigma^\parallel$	$0^+\tau^\parallel$	$0^-\tau^\perp$	$0^-\sigma^\parallel$
$0^+\sigma^\parallel\uparrow$	$-\frac{1}{(1+2k^2)^2 t_1}$	$\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	0	0
$0^+\tau^\parallel\uparrow$	$-\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	$-\frac{2k^2}{(1+2k^2)^2 t_1}$	0	0
$0^-\tau^\perp\uparrow$	0	0	0	0
$0^-\sigma^\parallel\uparrow$	0	0	0	$\frac{1}{k^2\,r_2}$

	$1^+\sigma^\parallel{}_{\alpha\beta}$	$1^+\sigma^\perp{}_{\alpha\beta}$	$1^+\tau^\parallel{}_{\alpha\beta}$	$1^-\sigma^\parallel{}_\alpha$	$1^-\sigma^\perp{}_\alpha$	$1^-\tau^\parallel{}_\alpha$	$1^-\tau^\perp{}_\alpha$
$1^+\sigma^\parallel\uparrow^{\alpha\beta}$	$\frac{6}{(3+2k^2)^2 t_1}$	$-\frac{6\sqrt{2}}{(3+2k^2)^2 t_1}$	$-\frac{6i\sqrt{2}\,k}{(3+2k^2)^2 t_1}$	0	0	0	0
$1^+\sigma^\perp\uparrow^{\alpha\beta}$	$\frac{6\sqrt{2}}{(3+2k^2)^2 t_1}$	$-\frac{12}{(3+2k^2)^2 t_1}$	$\frac{12i\,k}{(3+2k^2)^2 t_1}$	0	0	0	0
$1^+\tau^\parallel\uparrow^{\alpha\beta}$	$\frac{6i\sqrt{2}\,k}{(3+2k^2)^2 t_1}$	$-\frac{12i\,k}{(3+2k^2)^2 t_1}$	$\frac{12k^2}{(3+2k^2)^2 t_1}$	0	0	0	0
$1^-\sigma^\parallel\uparrow^{\alpha}$	0	0	0	0	$\frac{\sqrt{2}}{t_1 + 2k^2 t_1}$	0	$\frac{2i\,k}{t_1 + 2k^2 t_1}$
$1^-\sigma^\perp\uparrow^{\alpha}$	0	0	0	$-\frac{\sqrt{2}}{t_1 + 2k^2 t_1}$	$\frac{2k^2 r_1 + t_1}{(t_1 + 2k^2 t_1)^2}$	0	$\frac{i\sqrt{2}\,k(2k^2 r_1 + t_1)}{(t_1 + 2k^2 t_1)^2}$
$1^-\tau^\parallel\uparrow^{\alpha}$	0	0	0	0	0	0	0
$1^-\tau^\perp\uparrow^{\alpha}$	0	0	0	$-\frac{2i\,k}{t_1 + 2k^2 t_1}$	$-\frac{i\sqrt{2}\,k(2k^2 r_1 + t_1)}{(t_1 + 2k^2 t_1)^2}$	0	$\frac{2k^2(2k^2 r_1 + t_1)}{(t_1 + 2k^2 t_1)^2}$

	$2^+\sigma^\parallel{}_{\alpha\beta}$	$2^+\tau^\parallel{}_{\alpha\beta}$	$2^-\sigma^\parallel{}_{\alpha\beta\chi}$
$2^+\sigma^\parallel\uparrow^{\alpha\beta}$	$\frac{2}{(1+2k^2)^2 t_1}$	$-\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	0
$2^+\tau^\parallel\uparrow^{\alpha\beta}$	$\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	$\frac{4k^2}{(1+2k^2)^2 t_1}$	0
$2^-\sigma^\parallel\uparrow^{\alpha\beta\chi}$	0	0	$\frac{2}{2k^2 r_1 + t_1}$

Source constraints

Spin-parity form	Covariant form	Multiplicities
$0^-\tau^\perp == 0$	$\partial_\beta\partial_{\alpha\tau}(\Delta+\mathcal{K})^{\alpha\beta} == 0$	1
$-2\,i\,k\,0^+\sigma^\parallel + 0^+\tau^\parallel == 0$	$\partial_\beta\partial_{\alpha\tau}(\Delta+\mathcal{K})^{\alpha\beta} == \partial_\beta\partial^\beta\tau(\Delta+\mathcal{K})_\alpha{}^\alpha + 2\,\partial_\chi\partial^\chi\partial_\beta\sigma_\alpha{}^{\alpha\beta}$	1
$2\,i\,k\,1^-\sigma^\perp{}_\alpha + 1^-\tau^\perp{}_\alpha == 0$	$\partial_\chi\partial_\beta\partial^\alpha\tau(\Delta+\mathcal{K})^{\beta\chi} == \partial_\chi\partial^\chi\partial_{\beta\tau}(\Delta+\mathcal{K})^{\alpha\beta} + 2\,\partial_\chi\partial^\chi\partial_\beta\sigma^{\beta\alpha\chi}$	3
$1^-\tau^\parallel{}_\alpha == 0$	$\partial_\chi\partial_\beta\partial^\alpha\tau(\Delta+\mathcal{K})^{\beta\chi} == \partial_\chi\partial^\chi\partial_{\beta\tau}(\Delta+\mathcal{K})^{\beta\alpha}$	3
$-2\,i\,k\,1^+\sigma^\parallel{}_{\alpha\beta} + 1^+\tau^\parallel{}_{\alpha\beta} == 0$	$\partial_\chi\partial_\tau(\Delta+\mathcal{K})^{\beta\chi}{}_\alpha + \partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\chi\alpha} + \partial_\chi\partial^\chi\partial_\tau(\Delta+\mathcal{K})^{\alpha\beta} + 2\,\partial_\theta\partial^\theta\partial_\chi\sigma^{\beta\alpha\chi} == \partial_\chi\partial^\alpha\tau(\Delta+\mathcal{K})^{\chi\beta} + \partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\alpha\chi} + \partial_\chi\partial^\chi\partial_\tau(\Delta+\mathcal{K})^{\beta\alpha} + 2\,\partial_\theta\partial^\theta\partial^\chi\sigma^{\chi\alpha\beta} + 2\,\partial_\theta\partial^\theta\partial_\chi\sigma^{\alpha\beta\chi}$	3
$2\,1^+\sigma^\parallel{}_{\alpha\beta} + 1^-\sigma^\perp{}_\alpha == 0$	$\partial_\chi\sigma^{\alpha\beta\chi} + \partial_\chi\sigma^{\chi\alpha\beta} == \partial_\chi\sigma^{\beta\alpha\chi}$	3
$-2\,i\,k\,2^-\sigma^\parallel{}^{\alpha\beta} + 2^+\tau^\parallel{}^{\alpha\beta} == 0$	$-i\left(4\,\partial_\theta\partial_\chi\partial^\theta\partial^\alpha\tau(\Delta+\mathcal{K})^{\chi\delta} + 2\,\partial_\theta\partial^\theta\partial^\theta\partial_\tau(\Delta+\mathcal{K})^\chi{}_\chi - 3\,\partial_\theta\partial^\theta\partial_\chi\partial^\alpha\tau(\Delta+\mathcal{K})^{\beta\chi} - 3\,\partial_\theta\partial^\theta\partial_\chi\partial^\alpha\tau(\Delta+\mathcal{K})^{\chi\beta} - 3\,\partial_\theta\partial^\theta\partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\alpha\chi} - 3\,\partial_\theta\partial^\theta\partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\chi\alpha} + 3\,\partial_\theta\partial^\theta\partial_\chi\partial^\chi\tau(\Delta+\mathcal{K})^{\alpha\beta} + 3\,\partial_\theta\partial^\theta\partial_\chi\partial^\chi\tau(\Delta+\mathcal{K})^{\beta\alpha} + 4\,i\,k^\chi\,\partial_\theta\partial_\chi\partial^\theta\partial^\alpha\sigma^\delta{}_\delta{}^\epsilon - 6\,i\,k^\chi\,\partial_\theta\partial_\theta\partial^\alpha\sigma^{\delta\beta\epsilon} - 6\,i\,k^\chi\,\partial_\theta\partial_\theta\partial^\beta\sigma^{\delta\alpha\epsilon} + 6\,i\,k^\chi\,\partial_\theta\partial_\chi\partial^\alpha\sigma^{\beta\delta} + 6\,i\,k^\chi\,\partial_\theta\partial^\epsilon\partial_\theta\partial^\chi\sigma^{\beta\alpha\delta} + 2\,\eta^{\alpha\beta}\,\partial_\epsilon\partial^\epsilon\partial_\theta\partial_\chi\tau(\Delta+\mathcal{K})^\chi{}_\chi - 2\,\eta^{\alpha\beta}\,\partial_\epsilon\partial^\epsilon\partial_\theta\partial^\chi\tau(\Delta+\mathcal{K})^\chi{}_\chi - 4\,i\,\eta^{\alpha\beta}\,k^\chi\,\partial_\theta\partial^\theta\partial_\theta\partial_\chi\sigma^\delta{}_\delta{}^\epsilon\right) == 0$	5
Total expected gauge generators:		19

Massive spectrum

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

Massive particle

Pole residue:	$-\frac{1}{r_1} > 0$
Square mass:	$-\frac{t_1}{2\,r_1} > 0$
Spin:	2
Parity:	Odd

Massless spectrum

(There are no massless particles)

Gauge symmetries

(Not yet implemented in PSALTer)

Unitarity conditions

$r_1 < 0\ \&\&\ t_1 > 0$

Validity assumptions

(Not yet implemented in PSALTer)