

PSALTER results panel

Wave operator and propagator

	$0^+ \mathcal{B}$	$0^+ \phi$	$0^+ \mathcal{A}^{\parallel}$	$0^+ f^{\parallel}$	$0^+ f^{\perp}$	$0^+ \mathcal{A}^{\perp}$
$0^+ \mathcal{B} \dagger$	0	0	0	0	0	0
$0^+ \phi \dagger$	0	0	0	0	0	0
$0^+ \mathcal{A}^{\parallel} \dagger$	0	0	$-\lambda. + \frac{v.}{12} + 2 \; k^2 \; (r_{\underset{1}{1}} - r_{\underset{3}{3}} + 2 \; r_{\underset{4}{4}})$	$\frac{i \; k(12 \; \lambda. - v.)}{6 \; \sqrt{2}}$	0	0
$0^+ f^{\parallel} \dagger$	0	0	$-\frac{i \; k(12 \; \lambda. - v.)}{6 \; \sqrt{2}}$	$\frac{k^2 \; v.}{6}$	0	0
$0^+ f^{\perp} \dagger$	0	0	0	0	0	0
$0^+ \mathcal{A}^{\perp} \dagger$	0	0	0	0	$-2 \lambda. + k^2 \; r_{\underset{2}{2}} + t_{\underset{2}{2}}$	0

$2^+ \sigma^{\delta}{}_{\alpha \beta}$	$2^+ \tau^{\delta}{}_{\alpha \beta}$	$2^+ \sigma^{\delta}{}_{\alpha \beta \chi}$
$\frac{k^2 (\lambda. + t_{\underset{1}{1}})}{k^4 (2 \; r_{\underset{1}{1}} - 2 \; r_{\underset{3}{3}} + r_{\underset{4}{4}})(\lambda. + t_{\underset{1}{1}}) - \frac{1}{2} \; k^2 \; \lambda. (2 \; \lambda. + t_{\underset{1}{1}})}$	$\frac{i \; \sqrt{2} (2 \; \lambda. + t_{\underset{1}{1}})}{2 \; k^3 (2 \; r_{\underset{1}{1}} - 2 \; r_{\underset{3}{3}} + r_{\underset{4}{4}})(\lambda. + t_{\underset{1}{1}}) - k \; \lambda. (2 \; \lambda. + t_{\underset{1}{1}})}$	0
$\frac{i \; \sqrt{2} (2 \; \lambda. + t_{\underset{1}{1}})}{2 \; k^3 (2 \; r_{\underset{1}{1}} - 2 \; r_{\underset{3}{3}} + r_{\underset{4}{4}})(\lambda. + t_{\underset{1}{1}}) - k \; \lambda. (2 \; \lambda. + t_{\underset{1}{1}})}$	$\frac{\lambda. + k^2 (2 \; r_{\underset{1}{1}} - 2 \; r_{\underset{3}{3}} + r_{\underset{4}{4}}) - \frac{t_{\underset{1}{1}}}{2}}{k^4 (2 \; r_{\underset{1}{1}} - 2 \; r_{\underset{3}{3}} + r_{\underset{4}{4}})(\lambda. + t_{\underset{1}{1}}) - \frac{1}{2} \; k^2 \; \lambda. (2 \; \lambda. + t_{\underset{1}{1}})}$	0
0	0	$\frac{1}{\lambda. + k^2 \; r_{\underset{1}{1}} + \frac{t_{\underset{1}{1}}}{2}}$

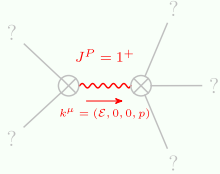
$$S = \iiint \frac{1}{18} (18 \phi \; \rho + 18 \; \sigma^{\alpha \beta \chi} \; \mathcal{A}_{\alpha \beta \chi} + 36 \; \lambda. \; \mathcal{A}_{\alpha \beta} \; \mathcal{A}^{\alpha \beta \chi} + 6 \; t_{\underset{1}{1}} \; \mathcal{A}_{\alpha \beta} \; \mathcal{A}^{\alpha \beta \chi} - 12 \; t_{\underset{2}{2}} \; \mathcal{A}_{\alpha \beta} \; \mathcal{A}^{\alpha \beta \chi} + 24 \; \lambda. \; \mathcal{A}_{\beta \chi}^{\alpha} \; \mathcal{A}_{\alpha}^{\beta \chi} - v. \; \mathcal{A}_{\beta \chi}^{\alpha} \; \mathcal{A}_{\alpha}^{\beta \chi} + 6 \; t_{\underset{1}{1}} \; \mathcal{A}_{\beta \chi}^{\alpha} \; \mathcal{A}_{\alpha}^{\beta \chi} + 18 \; \tau^{\alpha \beta} \; f_{\alpha \beta} + 18 \; \mathcal{J}^{\alpha} \; \mathcal{B}_{\alpha} + 36 \; \lambda. \; f^{\alpha \beta} \; \partial_{\beta} \mathcal{A}_{\alpha}^{\beta \chi} - 12 \; \lambda. \; \mathcal{A}_{\alpha}^{\beta \chi} \; \partial_{\beta} f^{\alpha \beta} + 2 \; v. \; \mathcal{A}_{\alpha}^{\beta \chi} \; \partial_{\beta} f^{\alpha \beta} - 2 \; v. \; \mathcal{A}_{\beta \chi}^{\alpha} \; \partial_{\alpha} f^{\beta \chi} - 2 \; v. \; \mathcal{A}_{\beta \chi}^{\alpha} \; \partial_{\alpha} f^{\beta \chi} + 12 \; \lambda. \; \mathcal{A}_{\beta \chi}^{\alpha} \; \partial_{\alpha} f^{\beta \chi} + 12 \; t_{\underset{1}{1}} \; \mathcal{A}_{\beta \chi}^{\alpha} \; \partial_{\alpha} f^{\beta \chi} - 6 \; \lambda. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} + v. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} - 6 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} - 36 \; \lambda. \; f^{\alpha \beta} \; \partial_{\chi} \mathcal{A}_{\alpha \beta}^{\chi} + 36 \; \lambda. \; f^{\alpha} \; \partial_{\chi} \mathcal{A}_{\alpha \beta}^{\beta \chi} - 6 \; \lambda. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} + v. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} - 6 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} + 12 \; \lambda. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} + 12 \; \lambda. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} - 2 \; v. \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} + 12 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\chi}^{\alpha} \; \partial^{\beta} f^{\alpha} - 18 \; r_{\underset{4}{4}} \; \partial_{\chi} \mathcal{A}_{\beta}^{\delta} \; \partial^{\chi} \mathcal{A}_{\alpha}^{\beta \delta} - 18 \; r_{\underset{2}{2}} \; \partial_{\chi} \mathcal{A}_{\beta}^{\delta} \; \partial^{\chi} \mathcal{A}_{\alpha}^{\beta \delta} - 18 \; r_{\underset{2}{2}} \; \partial_{\chi} \mathcal{A}_{\beta}^{\delta} \; \partial^{\chi} \mathcal{A}_{\alpha}^{\beta \delta} + 36 \; \lambda. \; \mathcal{A}_{\alpha \beta} \; \partial^{\chi} f^{\alpha \beta} + 24 \; t_{\underset{1}{1}} \; \mathcal{A}_{\alpha \beta} \; \partial^{\chi} f^{\alpha \beta} - 12 \; t_{\underset{2}{2}} \; \mathcal{A}_{\alpha \beta} \; \partial^{\chi} f^{\alpha \beta} + 12 \; t_{\underset{1}{1}} \; \mathcal{A}_{\beta \alpha} \; \partial^{\chi} f^{\alpha \beta} + 12 \; t_{\underset{1}{1}} \; \mathcal{A}_{\beta \alpha} \; \partial^{\chi} f^{\alpha \beta} - 18 \; \lambda. \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 12 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 9 \; \lambda. \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 12 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 3 \; t_{\underset{2}{2}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} + 9 \; \lambda. \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} + 6 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 3 \; t_{\underset{2}{2}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} + 9 \; \lambda. \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} + 12 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} + 12 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 12 \; t_{\underset{1}{1}} \; \partial_{\beta} f_{\alpha}^{\chi} \; \partial^{\beta} f^{\alpha \chi} - 12 \; r_{\underset{1}{1}} \; \partial_{\chi} \mathcal{A}_{\alpha \beta \delta} \; \partial^{\delta} \mathcal{A}^{\alpha \beta \chi} - 6 \; r_{\underset{2}{2}} \; \partial_{\chi} \mathcal{A}_{\alpha \beta \delta} \; \partial^{\delta} \mathcal{A}^{\alpha \beta \chi} + 12 \; r_{\underset{1}{1}} \; \partial_{\chi} \mathcal{A}_{\alpha \beta \delta} \; \partial^{\delta} \mathcal{A}^{\alpha \beta \chi} + 12 \; r_{\underset{1}{1}} \; \partial_{\chi} \mathcal{A}_{\alpha \beta \delta} \; \partial^{\delta} \mathcal{A}^{\alpha \beta \chi} + 12 \; r_{\underset{1}{1}} \; \partial_{\chi} \mathcal{A}_{\alpha \beta \delta} \; \partial^{\delta} \mathcal{A}^{\alpha \beta \chi} - 12 \; r_{\underset{2}{2}} \; \partial_{\chi} \mathcal{A}_{\alpha \beta \delta} \; \partial^{\delta} \mathcal{A}^{\alpha \beta \chi}) (t, x, y, z) d x d y d z d t$$

$0^+ \mathcal{J} \dagger$	$0^+ \rho$	$0^+ \tau^{\delta}$	$0^+ \tau^{\delta}$	$0^+ \tau^{\delta}$	$0^+ \tau^{\delta}$
0	0	0	0	0	0
$0^+ \rho \dagger$	0	0	0	0	0
$0^+ \tau^{\delta} \dagger$	0	0	$\frac{i \; \sqrt{2} \; k (\lambda. + t_{\underset{1}{1}} - \frac{2 \; \lambda. \; v. (-r_{\underset{3}{3}} + 2 \; r_{\underset{4}{4}})}{-12 \; \lambda. + v. + 2 \; k^2 \; v. (r_{\underset{1}{1}} - r_{\underset{3}{3}} + 2 \; r_{\underset{4}{4}})})}{\sqrt{2} \; k (\lambda. + t_{\underset{1}{1}} - \frac{2 \; \lambda. \; v. (-r_{\underset{3}{3}} + 2 \; r_{\underset{4}{4}})}{-12 \; \lambda. + v. + 2 \; k^2 \; v. (r_{\underset{1}{1}} - r_{\underset{3}{3}} + 2 \; r_{\underset{4}{4}})})}$	0	0
$0^+ \tau^{\delta} \dagger$	0	0	0	0	0
$0^+ \tau^{\delta} \dagger$	0	0	0	0	0
$0^+ \tau^{\delta} \dagger$	0	0	0	0	$\frac{1}{-2 \; \lambda. + k^2 \; r_{\underset{2}{2}} + t_{\underset{2}{2}}}$

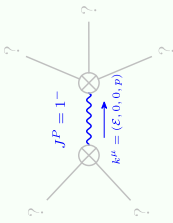
$1^+ \mathcal{J}^{\parallel}{}_{\alpha \beta}$	$1^+ \mathcal{J}^{\perp}{}_{\alpha \beta}$	$1^+ \mathcal{J}^{\parallel}{}_{\alpha \beta}$	$1^+ \mathcal{J}^{\perp}{}_{\alpha \beta}$	$1^+ \mathcal{J}^{\parallel}{}_{\alpha}$	$1^+ \mathcal{J}^{\perp}{}_{\alpha}$	$1^+ \mathcal{J}^{\parallel}{}_{\alpha}$	$1^+ \mathcal{J}^{\perp}{}_{\alpha}$
$\frac{1}{18} (-6 \lambda. + 6 \; k^2 (2 \; r_{\underset{3}{3}} + r_{\underset{4}{4}}) + t_{\underset{1}{1}} + 4 \; t_{\underset{2}{2}})$	$-\frac{6 \; \lambda. + t_{\underset{1}{1}} - 2 \; t_{\underset{2}{2}}}{3 \; \sqrt{2}}$	$\frac{i \; k(6 \; \lambda. + t_{\underset{1}{1}} - 2 \; t_{\underset{2}{2}})}{3 \; \sqrt{2}}$	0	0	0	0	0
$1^+ \mathcal{J}^{\parallel}{}_{\alpha \beta} \dagger^{\alpha \beta}$	$-\frac{6 \; \lambda. + t_{\underset{1}{1}} - 2 \; t_{\underset{2}{2}}}{3 \; \sqrt{2}}$	$\frac{t_{\underset{1}{1}} + t_{\underset{2}{2}}}{3}$	$\frac{1}{3} i \; k(t_{\underset{1}{1}} + t_{\underset{2}{2}})$	0	0	0	0
$1^+ f^{\parallel}{}_{\alpha \beta} \dagger^{\alpha \beta}$	$-\frac{1}{3} i \; k(t_{\underset{1}{1}} + t_{\underset{2}{2}})$	$\frac{1}{3} k^2 (t_{\underset{1}{1}} + t_{\underset{2}{2}})$	0	0	0	0	0
$1^+ \mathcal{B} \dagger^{\alpha}$	0	0	0	0	0	0	0
$1^+ \mathcal{A}^{\parallel}{}_{\alpha} \dagger^{\alpha}$	0	0	0	0	$\frac{1}{18} (-6 \lambda. + v. + 3(6 \; k^2 (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}}) + t_{\underset{1}{1}}))$	$\frac{24 \; \lambda. - v. + 6 \; t_{\underset{1}{1}}}{18 \; \sqrt{2}}$	0
$1^+ \mathcal{A}^{\perp}{}_{\alpha} \dagger^{\alpha}$	0	0	0	0	$\frac{24 \; \lambda. - v. + 6 \; t_{\underset{1}{1}}}{18 \; \sqrt{2}}$	$\frac{1}{36} (12 \lambda. + v. + 12 \; t_{\underset{1}{1}})$	0
$1^+ f^{\perp}{}_{\alpha} \dagger^{\alpha}$	0	0	0	0	$-\frac{1}{18} i \; k(24 \lambda. - v. + 6 \; t_{\underset{1}{1}})$	$-\frac{i \; k(12 \lambda. + v. + 12 \; t_{\underset{1}{1}})}{18 \; \sqrt{2}}$	$\frac{1}{18} k^2 (12 \lambda. + v. + 12 \; t_{\underset{1}{1}})$

Spin-parity	form	Covariant form	Multiplicities
$0^+ \tau^{\delta} == 0$	$\partial_{\beta} \partial_{\alpha} \tau^{\alpha \beta} == 0$		1
$0^+ \rho == 0$	$\rho == 0$		1
$0^+ \mathcal{J} == 0$	$\partial_{\alpha} \mathcal{J}^{\alpha} == 0$		1
$2 \; i \; k \; i^{\alpha} \partial^{\alpha} \tau^{\beta \chi} + \partial_{\chi} \partial^{\beta} \tau^{\alpha \chi} + 2 \; \partial_{\beta} \partial^{\delta} \partial_{\chi} \partial_{\delta} \rho^{\alpha \chi}$			3
$1^+ \tau^{\alpha} == 0$	$\partial_{\chi} \partial_{\beta} \partial^{\alpha} \tau^{\beta \chi} == \partial_{\beta} \partial^{\delta} \partial_{\chi} \partial_{\delta} \rho^{\alpha \chi}$		3
$1^+ \mathcal{J}^{\alpha} == 0$	$\partial_{\beta} \partial^{\alpha} \mathcal{J}^{\beta} == \partial_{\beta} \partial^{\delta} \mathcal{J}^{\alpha}$		3
$i \; k \; i^{\alpha} \partial^{\alpha} \tau^{\beta \chi} + \partial_{\chi} \partial^{\beta} \tau^{\alpha \chi} + \partial_{\alpha} \partial^{\chi} \tau^{\alpha \beta} + 2 \; \partial_{\beta} \partial^{\delta} \partial_{\chi} \partial_{\delta} \rho^{\alpha \beta}$			3
Total expected gauge generators:			15

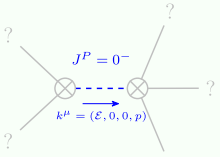
Massive and massless spectra



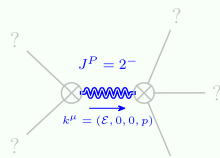
Poleresidue:	$\frac{3(r_{\underset{1}{1}} t_{\underset{1}{1}}^2 t_{\underset{2}{2}}^2 + 2 r_{\underset{3}{3}} t_{\underset{1}{1}}^2 t_{\underset{2}{2}}^2 + 4 \lambda^2 (6 r_{\underset{3}{3}} + 3 r_{\underset{4}{4}} + t_{\underset{1}{1}} + t_{\underset{2}{2}}) + 2 \lambda. (2 r_{\underset{1}{1}} t_{\underset{1}{1}} + t_{\underset{2}{2}}^2 + 4 r_{\underset{3}{3}} (t_{\underset{1}{1}} - 2 t_{\underset{2}{2}}) - 4 r_{\underset{3}{3}} t_{\underset{1}{1}} t_{\underset{2}{2}}^2) + 2 r_{\underset{3}{3}} (t_{\underset{1}{1}}^2 + 2 t_{\underset{2}{2}}^2))}{(2 r_{\underset{3}{3}} + r_{\underset{4}{4}})(t_{\underset{1}{1}} + t_{\underset{2}{2}})(12 \lambda^2 + 2 r_{\underset{1}{1}} t_{\underset{1}{1}} + 6 \lambda. (t_{\underset{1}{1}} t_{\underset{2}{2}} + 2 r_{\underset{1}{1}} t_{\underset{2}{2}} - 3 t_{\underset{1}{1}} t_{\underset{2}{2}} + 4 r_{\underset{3}{3}} (t_{\underset{1}{1}} + t_{\underset{2}{2}}))} > 0$
Square mass:	$\frac{3(2 \lambda. + t_{\underset{1}{1}})(2 \lambda. - t_{\underset{2}{2}})}{2(2 r_{\underset{3}{3}} + r_{\underset{4}{4}})(t_{\underset{1}{1}} + t_{\underset{2}{2}})} > 0$
Spin:	1
Parity:	Even



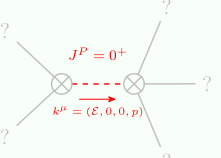
Pole residue:	$-\{ (3 (288 \lambda^3 + v.^2 (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}} - t_{\underset{1}{1}}) - 12 v. t_{\underset{1}{1}}^2 + 72 (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}}) t_{\underset{1}{1}}^2 + 432 \lambda^2 (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}} + t_{\underset{1}{1}}) - 2 \lambda. (v.^2 + 12 v. (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}} + t_{\underset{1}{1}}) - 72 t_{\underset{1}{1}} (2 r_{\underset{1}{1}} + 2 r_{\underset{4}{4}} + 2 r_{\underset{5}{5}} + t_{\underset{1}{1}}))) / ((r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}})(12 \lambda. + v. + 12 t_{\underset{1}{1}})(72 \lambda^2 + v. (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}} - 3 t_{\underset{1}{1}}) + 12 (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}}) t_{\underset{1}{1}} - 6 \lambda. (v. - 2 (r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}} + 3 t_{\underset{1}{1}})))) > 0$
Square mass:	$\frac{3(12 \lambda. - v.) (2 \lambda. + t_{\underset{1}{1}})}{2(r_{\underset{1}{1}} + r_{\underset{4}{4}} + r_{\underset{5}{5}})(12 \lambda. + v. + 12 t_{\underset{1}{1}})} > 0$
Spin:	1
Parity:	Odd



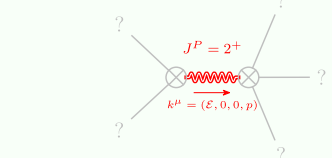
Massive particle	
Pole residue:	$\frac{1}{r_{\underset{2}{2}}} > 0$
Square mass:	$\frac{2 \lambda. - t_{\underset{2}{2}}}{r_{\underset{2}{2}}} > 0$
Spin:	0
Parity:	Odd



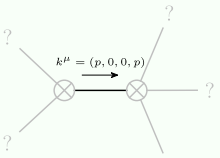
Massive particle	
Pole residue:	$\frac{1}{r_{\underset{1}{1}}} > 0$
Square mass:	$-\frac{2 \lambda. + t_{\underset{1}{1}}}{2 r_{\underset{1}{1}}} > 0$
Spin:	2
Parity:	Odd



Massive particle	
Poleresidue:	$\frac{v. (-r_{\underset{1}{1}} - r_{\underset{3}{3}} - 2 r_{\underset{4}{4}}) + \lambda. (v. + 12 (r_{\underset{1}{1}} - r_{\underset{3}{3}} + 2 r_{\underset{4}{4}}))}{2 \lambda. v. (r_{\underset{1}{1}} - r_{\underset{3}{3}} + 2 r_{\underset{4}{4}})} > 0$
Square mass:	$\frac{12 \lambda.^2 - \lambda. v.}{2 v. r_{\underset{1}{1}} - 2 v. r_{\underset{3}{3}} + 4 v. r_{\underset{4}{4}}} > 0$
Spin:	0
Parity:	Even



Massive particle	
Pole residue:	$\frac{\lambda.^2 + (2 r_{\underset{1}{1}} - 2 r_{\underset{3}{3}} + r_{\underset{4}{4}}) t_{\underset{1}{1}} + \lambda. (4 r_{\underset{1}{1}} - 4 r_{\underset{3}{3}} + 2 r_{\underset{4}{4}} + t_{\underset{1}{1}})}{\lambda. (2 r_{\underset{1}{1}} - 2 r_{\underset{3}{3}} + r_{\underset{4}{4}})(\lambda. + t_{\underset{1}{1}})} > 0$
Square mass:	$\frac{\lambda. (2 \lambda. + t_{\underset{1}{1}})}{2(2 r_{\underset{1}{1}} - 2 r_{\underset{3}{3}} + r_{\underset{4}{4}})(\lambda. + t_{\underset{1}{1}})} > 0$
Spin:	2
Parity:	Even



Massless particle	
Pole residue:	$\frac{1}{\lambda.} > 0$
Polarisations:	2

Unitarity conditions

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