

Particle spectrograph

Wave operator and propagator

	$\sigma_{1+}^{\#1}{}^{\alpha\beta}$	$\sigma_{1+}^{\#2}{}^{\alpha\beta}$	$\tau_{1+}^{\#1}{}^{\alpha\beta}$	$\sigma_{1+}^{\#1}{}^{\alpha}$	$\sigma_{1+}^{\#2}{}^{\alpha}$	$\tau_{1+}^{\#1}{}^{\alpha}$	$\tau_{1+}^{\#2}{}^{\alpha}$
$\sigma_{1+}^{\#1}{}^{\alpha\beta}$	$\frac{1}{\frac{3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)}{16\left(\beta_1+2\beta_3\right)}+\left(\alpha_2+\alpha_5\right)k^2}$	$-\frac{2\sqrt{2}\left(3\alpha_0-4\beta_1+16\beta_3\right)}{\left(1+k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	$-\frac{2i\sqrt{2}\left(3\alpha_0-4\beta_1+16\beta_3\right)k}{\left(1+k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	0	0	0	0
$\sigma_{1+}^{\#2}{}^{\alpha\beta}$	$-\frac{2\sqrt{2}\left(3\alpha_0-4\beta_1+16\beta_3\right)}{\left(1+k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	$\frac{6\alpha_0+8\left(\beta_1+8\beta_3+3\left(\alpha_2+\alpha_5\right)k^2\right)}{\left(1+k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	$\frac{2ik\left(3\alpha_0+4\left(\beta_1+8\beta_3+3\left(\alpha_2+\alpha_5\right)k^2\right)\right)}{\left(1+k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	0	0	0	0
$\tau_{1+}^{\#1}{}^{\alpha\beta}$	$\frac{2i\sqrt{2}\left(3\alpha_0-4\beta_1+16\beta_3\right)k}{\left(1+k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	$-\frac{2ik\left(3\alpha_0+4\left(\beta_1+8\beta_3+3\left(\alpha_2+\alpha_5\right)k^2\right)\right)}{\left(1+k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	$\frac{2k^2\left(3\alpha_0+4\left(\beta_1+8\beta_3+3\left(\alpha_2+\alpha_5\right)k^2\right)\right)}{\left(1+k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)+16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)k^2\right)}$	0	0	0	0
$\sigma_{1+}^{\#1}{}^{\alpha}$	0	0	0	$\frac{1}{\frac{3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)}{8\left(2\beta_1+\beta_2\right)}+\left(\alpha_4+\alpha_5\right)k^2}$	$\frac{2\sqrt{2}\left(3\alpha_0-4\beta_1+4\beta_2\right)}{\left(1+2k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$	0	$\frac{4i\left(3\alpha_0-4\beta_1+4\beta_2\right)k}{\left(1+2k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$
$\sigma_{1+}^{\#2}{}^{\alpha}$	0	0	0	$\frac{2\sqrt{2}\left(3\alpha_0-4\beta_1+4\beta_2\right)}{\left(1+2k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$	$\frac{6\alpha_0+8\left(\beta_1+2\beta_2+3\left(\alpha_4+\alpha_5\right)k^2\right)}{\left(1+2k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$	0	$\frac{2i\sqrt{2}k\left(3\alpha_0+4\left(\beta_1+2\beta_2+3\left(\alpha_4+\alpha_5\right)k^2\right)\right)}{\left(1+2k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$
$\tau_{1+}^{\#1}{}^{\alpha}$	0	0	0	0	0	0	0
$\tau_{1+}^{\#2}{}^{\alpha}$	0	0	0	$-\frac{4i\left(3\alpha_0-4\beta_1+4\beta_2\right)k}{\left(1+2k^2\right)\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$	$-\frac{2i\sqrt{2}k\left(3\alpha_0+4\left(\beta_1+2\beta_2+3\left(\alpha_4+\alpha_5\right)k^2\right)\right)}{\left(1+2k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$	0	$\frac{4k^2\left(3\alpha_0+4\left(\beta_1+2\beta_2+3\left(\alpha_4+\alpha_5\right)k^2\right)\right)}{\left(1+2k^2\right)^2\left(-3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)+8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)k^2\right)}$

S==
[[[[[$\frac{1}{6}(-3\alpha_0\omega_{\alpha}^{\alpha\beta}\omega_{\beta}^{\alpha}X+4\beta_1\omega_{\alpha}^{\alpha\beta}\omega_{\beta}^{\alpha}X-4\beta_2\omega_{\alpha}^{\alpha\beta}\omega_{\beta}^{\alpha}X+6f^{\alpha\beta}\tau_{\alpha\beta}^{\alpha}+6\omega_{\alpha\beta}^{\alpha}C_{\alpha\beta\chi}-8\beta_1\omega_{\alpha}^{\alpha}X\partial_{\beta}f^{\alpha\beta}+8\beta_2\omega_{\alpha}^{\alpha}X\partial_{\beta}f^{\alpha\beta}-6\alpha_0f^{\alpha\beta}\partial_{\beta}\omega_{\alpha}^{\alpha}X+6\alpha_0\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\omega_{\beta}^{\alpha}X+8\beta_1\omega_{\beta}^{\alpha}X\partial_{\beta}f^{\alpha\alpha}-8\beta_2\omega_{\beta}^{\alpha}X\partial_{\beta}f^{\alpha\alpha}-4\beta_1\partial_{\beta}f^{\alpha}X\partial_{\beta}f^{\alpha\alpha}+4\beta_2\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha}X+4\beta_1\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha}X+4\beta_2\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha}X+8\beta_1\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha}X+8\beta_2\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha}X+6\alpha_0f^{\alpha\beta}\partial_{\chi}f^{\alpha\beta}+6\alpha_0\partial_{\chi}f^{\alpha\beta}\partial_{\beta}f^{\alpha}X+16\beta_1\omega_{\beta}^{\alpha}X\partial_{\beta}f^{\alpha\beta}+16\beta_2\omega_{\beta}^{\alpha}X\partial_{\beta}f^{\alpha\beta}-8\beta_1\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha\beta}-4\beta_3\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha\beta}+4\beta_1\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha\beta}+8\beta_2\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha\beta}+4\beta_3\partial_{\beta}f^{\alpha\beta}\partial_{\chi}f^{\alpha\beta}-4\beta_3\partial_{\chi}f^{\alpha\beta}\partial_{\beta}f^{\alpha\beta}+4\beta_1\partial_{\chi}f^{\alpha\beta}\partial_{\beta}f^{\alpha\beta}-4\beta_3\partial_{\chi}f^{\alpha\beta}\partial_{\beta}f^{\alpha\beta}+4\left(\beta_1+2\beta_3\right)\omega_{\alpha\beta\chi}\left(\omega^{\alpha\beta\chi}+2\partial^{\chi}f^{\alpha\beta}\right)+\omega_{\alpha\beta\chi}\left(-3\alpha_0+4\beta_1-16\beta_3\right)\omega^{\alpha\beta\chi}+16\left(\beta_1-\beta_3\right)\partial^{\chi}f^{\alpha\beta}\right)+\partial_{\delta}\omega_{\beta}^{\delta}X+6\alpha_2\partial_{\alpha}\omega^{\alpha\beta\chi}\partial_{\delta}\omega_{\chi}^{\delta}X-6\alpha_4\partial_{\alpha}\omega^{\alpha\beta\chi}\partial_{\delta}\omega_{\beta}^{\delta}X-6\alpha_5\partial_{\alpha}\omega^{\alpha\beta\chi}\partial_{\delta}\omega_{\chi}^{\delta}X-12\alpha_1\partial_{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X-12\alpha_2\partial^{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X+12\alpha_4\partial^{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X+12\alpha_5\partial^{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+8\alpha_1\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+4\alpha_2\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+4\alpha_3\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+4\alpha_4\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+4\alpha_5\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+8\alpha_1\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+8\alpha_2\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+8\alpha_3\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+8\alpha_4\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+8\alpha_5\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X+12\alpha_1\partial_{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X+12\alpha_2\partial^{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X+12\alpha_4\partial^{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X+12\alpha_5\partial^{\chi}\omega^{\alpha\beta}\partial_{\delta}\omega_{\beta}^{\delta}X-12\alpha_2\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X-12\alpha_4\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X-12\alpha_5\partial_{\beta}\omega_{\alpha}^{\alpha\beta}\partial_{\delta}\omega_{\chi}^{\delta}X-4\alpha_1\partial_{\chi}\omega_{\alpha\delta\beta}\partial^{\delta}\omega^{\alpha\beta\chi}-4\alpha_2\partial_{\chi}\omega_{\alpha\delta\beta}\partial^{\delta}\omega^{\alpha\beta\chi}-2\alpha_3\partial_{\chi}\omega_{\alpha\delta\beta}\partial^{\delta}\omega^{\alpha\beta\chi}-2\alpha_4\partial_{\chi}\omega_{\alpha\delta\beta}\partial^{\delta}\omega^{\alpha\beta\chi}+4\alpha_1\partial_{\delta}\omega_{\alpha\beta\chi}\partial^{\delta}\omega^{\alpha\beta\chi}+6\alpha_2\partial_{\delta}\omega_{\alpha\beta\chi}\partial^{\delta}\omega^{\alpha\beta\chi}+4\alpha_3\partial_{\delta}\omega_{\alpha\beta\chi}\partial^{\delta}\omega^{\alpha\beta\chi}+4\alpha_4\partial_{\delta}\omega_{\alpha\beta\chi}\partial^{\delta}\omega^{\alpha\beta\chi}+4\alpha_5\partial_{\delta}\omega_{\alpha\beta\chi}\partial^{\delta}\omega^{\alpha\beta\chi})][[x,y,z]]dzdydxdt$

$\sigma_{0+}^{\#1}{}^{\alpha\beta}$

$\sigma_{0+}^{\#1}{}^{\alpha}$

$\tau_{0+}^{\#1}{}^{\alpha\beta}$

$\tau_{0+}^{\#1}{}^{\alpha}$

$\sigma_{0+}^{\#2}{}^{\alpha\beta}$

$\sigma_{0+}^{\#2}{}^{\alpha}$

$\omega_{2+}^{\#1}{}^{\alpha\beta}$

$\omega_{2+}^{\#1}{}^{\alpha}$

$f_{2+}^{\#1}{}^{\alpha\beta}$

$f_{2+}^{\#1}{}^{\alpha}$

$\omega_{2+}^{\#2}{}^{\alpha\beta}$

$\omega_{2+}^{\#2}{}^{\alpha}$

$\omega_{0+}^{\#1}{}^{\alpha\beta}$

$\omega_{0+}^{\#1}{}^{\alpha}$

$f_{0+}^{\#1}{}^{\alpha\beta}$

$f_{0+}^{\#1}{}^{\alpha}$

$\omega_{0+}^{\#2}{}^{\alpha\beta}$

$\omega_{0+}^{\#2}{}^{\alpha}$

$\sigma_{2+}^{\#1}{}^{\alpha\beta}$

$\sigma_{2+}^{\#1}{}^{\alpha}$

$\tau_{2+}^{\#1}{}^{\alpha\beta}$

$\tau_{2+}^{\#1}{}^{\alpha}$

$\sigma_{2+}^{\#2}{}^{\alpha\beta}$

$\sigma_{2+}^{\#2}{}^{\alpha}$

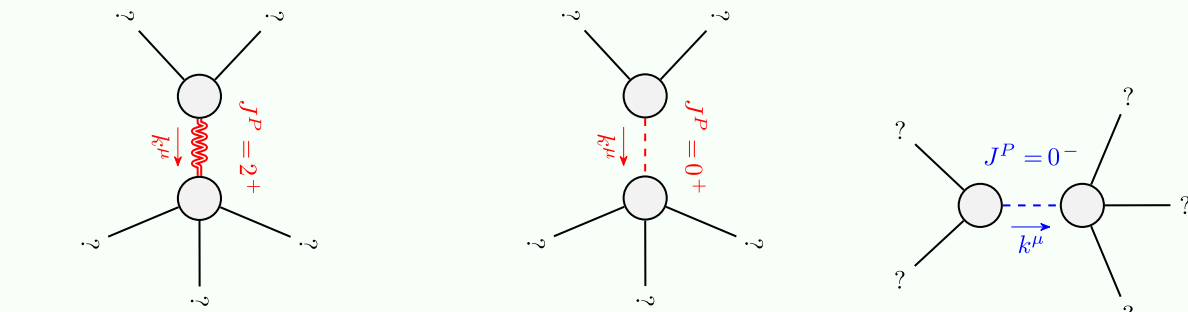
Source constraints		
SO(3) irreps	Fundamental fields	Multiplicities
$\tau_{0+}^{\#2} == 0$	$\partial_{\beta}\partial_{\alpha}\tau^{\alpha\beta} == 0$	1
$\tau_{1+}^{\#2\alpha} + 2ik\sigma_{1+}^{\#2\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} == \partial_{\chi}\partial^{\alpha}\partial_{\beta}\tau^{\alpha\beta} + 2\partial_{\delta}\partial^{\delta}\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi}$	3
$\tau_{1+}^{\#1\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} == \partial_{\chi}\partial^{\alpha}\partial_{\beta}\tau^{\beta\alpha}$	3
$\tau_{1+}^{\#1\alpha\beta} + i k \sigma_{1+}^{\#2\alpha\beta} == 0$	$\partial_{\chi}\partial^{\alpha}\tau^{\beta\chi} + \partial_{\chi}\partial^{\beta}\tau^{\alpha\chi} + \partial_{\chi}\partial^{\chi}\tau^{\alpha\beta} + 2\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta} + 2\partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\beta\chi} == \partial_{\chi}\partial^{\alpha}\tau^{\chi\beta} + \partial_{\chi}\partial^{\beta}\tau^{\alpha\chi} + \partial_{\chi}\partial^{\chi}\tau^{\beta\alpha} + 2\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}$	3
Total constraints/gauge generators:		10

Massive and massless spectra



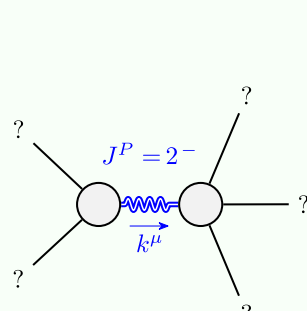
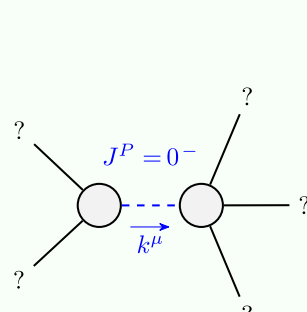
Massive particle	
Pole residue:	$(3\left(\alpha_0^2\left(3\alpha_2+3\alpha_5+2\beta_1+4\beta_3\right)-8\alpha_0\left(\beta_1^2+\alpha_2\left(\beta_1-4\beta_3\right)+\alpha_5\left(\beta_1-4\beta_3\right)-4\beta_3^2\right)+16\left(-4\beta_1\beta_3\left(\beta_1+2\beta_3\right)+\alpha_2\left(\beta_1^2+8\beta_3^2\right)+\alpha_5\left(\beta_1^2+8\beta_3^2\right)\right)\right)/\left(2\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)\left(3\alpha_0^2-12\alpha_0\left(\beta_1-2\beta_3\right)+16\left(\alpha_5\beta_1+2\alpha_5\beta_3-6\beta_1\beta_3+\alpha_2\left(\beta_1+2\beta_3\right)\right)\right)\right)>0$
Polarisations:	3
Square mass:	$\frac{3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+8\beta_3\right)}{16\left(\alpha_2+\alpha_5\right)\left(\beta_1+2\beta_3\right)}>0$
Spin:	1
Parity:	Even

Massive particle	
Pole residue:	$-((3\left(\alpha_0^2\left(3\alpha_4+3\alpha_5+4\beta_1+2\beta_2\right)+4\alpha_0\left(-2\alpha_4\beta_1-2\alpha_5\beta_1-4\beta_1^2+2\alpha_4\beta_2+2\alpha_5\beta_2+\beta_2^2\right)+8\left(-2\beta_1\beta_2\left(2\beta_1+\beta_2\right)+\alpha_4\left(2\beta_1^2+\beta_2^2\right)+\alpha_5\left(2\beta_1^2+\beta_2^2\right)\right)\right)/\left(2\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)\left(3\alpha_0^2+6\alpha_0\left(-2\beta_1+\beta_2\right)+4\left(2\alpha_5\beta_1+\alpha_5\beta_2-6\beta_1\beta_2+\alpha_4\left(2\beta_1+\beta_2\right)\right)\right)\right)>0$
Polarisations:	3
Square mass:	$\frac{3\left(\alpha_0-4\beta_1\right)\left(\alpha_0+2\beta_2\right)}{8\left(\alpha_4+\alpha_5\right)\left(2\beta_1+\beta_2\right)}>0$
Spin:	1
Parity:	Odd



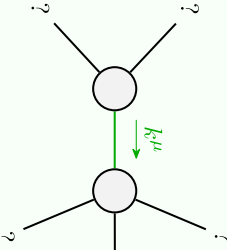
Massive particle	
Pole residue:	$-\frac{2}{\alpha_0}+\frac{\alpha_1+\alpha_4+2\beta_1}{2\alpha_1\beta_1+2\alpha_4\beta_1}>0$
Polarisations:	5
Square mass:	$\frac{\alpha_0\left(\alpha_0+2\beta_2\right)}{16\left(\alpha_1+\alpha_4\right)\beta_1}>0$
Spin:	2
Parity:	Even

Massive particle	
Pole residue:	$\frac{1}{\alpha_0}+\frac{\alpha_4+\alpha_6+2\beta_2}{2\alpha_4\beta_2+2\alpha_6\beta_2}>0$
Polarisations:	1
Square mass:	$\frac{\alpha_0\left(\alpha_0+2\beta_2\right)}{4\left(\alpha_4+\alpha_6\right)\beta_2}>0$
Spin:	0
Parity:	Even



Massive particle	
Pole residue:	$-\frac{1}{\alpha_2+\alpha_3}>0$
Polarisations:	1
Square mass:	$-\frac{\alpha_0+8\beta_3}{2\left(\alpha_2+\alpha_3\right)}>0$
Spin:	0
Parity:	Odd

Massive particle	
Pole residue:	$-\frac{1}{\alpha_1+\alpha_2}>0$
Polarisations:	5
Square mass:	$\frac{\alpha_0-4\beta_1}{4\left(\alpha_1+\alpha_2\right)}>0$
Spin:	2
Parity:	Odd



Quadratic pole	
Pole residue:	$\frac{1}{\alpha_0}>0$
Polarisations:	2

Unitarity conditions

(Unitarity is demonstrably impossible)