Particle spectrograph

Wave operator and propagator

Spin-parity form	Covariant form	Multiplicities
$\overset{\#1}{0^+}\sigma == 0$	$\partial_\beta \sigma^{\alpha\beta}{}_\alpha == 0$	1
$\overset{\#1}{0^+}\tau == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == \partial_\beta \partial^\beta \tau^\alpha{}_\alpha$	1
$\overset{\#2}{0^+}\tau == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == 0$	1
$\overset{\#2}{1^-}\tau^\alpha + 2\, i\, k\, \overset{\#2}{1^-}\sigma^\alpha == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^\chi \partial_\beta \tau^{\alpha\beta} + 2\, \partial_\delta \partial^\delta \partial_\chi \partial_\beta \sigma^{\alpha\beta\chi}$	3
$\overset{\#1}{1^-}\tau^\alpha == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^\chi \partial_\beta \tau^{\beta\alpha}$	3
$\overset{\#1}{1^+}\tau^{\alpha\beta} + i\, k\, \overset{\#2}{1^+}\sigma^{\alpha\beta} == 0$	$\partial_\chi \partial^\alpha \tau^{\beta\chi} + \partial_\chi \partial^\beta \tau^{\chi\alpha} + \partial_\chi \partial^\chi \tau^{\alpha\beta} + 2\, \partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\chi\delta} + 2\, \partial_\delta \partial^\delta \partial_\chi \sigma^{\alpha\beta\chi} == \partial_\chi \partial^\alpha \tau^{\chi\beta} + \partial_\chi \partial^\beta \tau^{\alpha\chi} + \partial_\chi \partial^\chi \tau^{\beta\alpha} + 2\, \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\chi\delta}$	3
$\overset{\#1}{2^+}\tau^{\alpha\beta} - 2\, i\, k\, \overset{\#1}{2^+}\sigma^{\alpha\beta} == 0$	$-i\,(4\, \partial_\delta \partial_\chi \partial^\beta \partial^\alpha \tau^{\chi\delta} + 2\, \partial_\delta \partial^\delta \partial^\beta \partial^\alpha \tau^\chi{}_\chi - 3\, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\beta\chi} - 3\, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\chi\beta} - 3\, \partial_\delta \partial^\delta \partial_\chi \partial^\beta \tau^{\alpha\chi} - 3\, \partial_\delta \partial^\delta \partial_\chi \partial^\beta \tau^{\chi\alpha} + 3\, \partial_\delta \partial^\delta \partial_\chi \partial^\chi \tau^{\alpha\beta} + 3\, \partial_\delta \partial^\delta \partial_\chi \partial^\chi \tau^{\beta\alpha} + 4\, i\, k^\chi\, \partial_\epsilon \partial_\chi \partial^\beta \partial^\alpha \sigma^{\delta\epsilon}{}_\delta - 6\, i\, k^\chi\, \partial_\epsilon \partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\delta\epsilon} - 6\, i\, k^\chi\, \partial_\epsilon \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\delta\epsilon} + 2\, \eta^{\alpha\beta}\, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \tau^{\chi\delta} + 6\, i\, k^\chi\, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \sigma^{\alpha\delta\beta} + 6\, i\, k^\chi\, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \sigma^{\beta\delta\alpha} - 2\, \eta^{\alpha\beta}\, \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\delta \tau^\chi{}_\chi - 4\, i\, \eta^{\alpha\beta}\, k^\chi\, \partial_\phi \partial^\phi \partial_\epsilon \partial_\chi \sigma^{\delta\epsilon}{}_\delta) == 0$	5
Total expected gauge generators:		17

	$\overset{\#1}{1^+}\sigma_{\alpha\beta}$	$\overset{\#2}{1^+}\sigma_{\alpha\beta}$	$\overset{\#1}{1^+}\tau_{\alpha\beta}$	$\overset{\#1}{1^-}\sigma_\alpha$	$\overset{\#2}{1^-}\sigma_\alpha$	$\overset{\#1}{1^-}\tau_\alpha$	$\overset{\#2}{1^-}\tau_\alpha$
$\overset{\#1}{1^+}\sigma^\dagger{}^{\alpha\beta}$	0	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$-\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	0	0	0	0
$\overset{\#2}{1^+}\sigma^\dagger{}^{\alpha\beta}$	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$\frac{-2k^2 r_5+t_1}{(1+k^2)^2 t_1^2}$	$-\frac{i(2k^3 r_5-k t_1)}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\overset{\#1}{1^+}\tau^\dagger{}^{\alpha\beta}$	$\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	$\frac{i(2k^3 r_5-k t_1)}{(1+k^2)^2 t_1^2}$	$\frac{-2k^4 r_5+k^2 t_1}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\overset{\#1}{1^-}\sigma^\dagger{}^\alpha$	0	0	0	$\frac{1}{k^2 r_5}$	$-\frac{1}{\sqrt{2}(k^2 r_5+2k^4 r_5)}$	0	$-\frac{i}{k r_5+2k^3 r_5}$
$\overset{\#2}{1^-}\sigma^\dagger{}^\alpha$	0	0	0	$-\frac{1}{\sqrt{2}(k^2 r_5+2k^4 r_5)}$	$\frac{6k^2 r_5+t_1}{2(k+2k^3)^2 r_5 t_1}$	0	$\frac{i(6k^2 r_5+t_1)}{\sqrt{2}\,k(1+2k^2)^2 r_5 t_1}$
$\overset{\#1}{1^-}\tau^\dagger{}^\alpha$	0	0	0	0	0	0	0
$\overset{\#2}{1^-}\tau^\dagger{}^\alpha$	0	0	0	$\frac{i}{k r_5+2k^3 r_5}$	$-\frac{i(6k^2 r_5+t_1)}{\sqrt{2}\,k(1+2k^2)^2 r_5 t_1}$	0	$\frac{6k^2 r_5+t_1}{(1+2k^2)^2 r_5 t_1}$

	$\overset{\#1}{2^+}\sigma_{\alpha\beta}$	$\overset{\#1}{2^+}\tau_{\alpha\beta}$	$\overset{\#1}{2^-}\sigma_{\alpha\beta\chi}$
$\overset{\#1}{2^+}\sigma^\dagger{}^{\alpha\beta}$	$\frac{2}{(1+2k^2)^2 t_1}$	$-\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	0
$\overset{\#1}{2^+}\tau^\dagger{}^{\alpha\beta}$	$\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	$\frac{4k^2}{(1+2k^2)^2 t_1}$	0
$\overset{\#1}{2^-}\sigma^\dagger{}^{\alpha\beta\chi}$	0	0	$\frac{2}{t_1}$

	$\overset{\#1}{0^+}\sigma$	$\overset{\#1}{0^+}\tau$	$\overset{\#2}{0^+}\tau$	$\overset{\#1}{0^-}\sigma$
$\overset{\#1}{0^+}\sigma^\dagger$	0	0	0	0
$\overset{\#1}{0^+}\tau^\dagger$	0	0	0	0
$\overset{\#2}{0^+}\tau^\dagger$	0	0	0	0
$\overset{\#1}{0^-}\sigma^\dagger$	0	0	0	$-\frac{1}{t_1}$

	$\overset{\#1}{2^+}\mathcal{A}_{\alpha\beta}$	$\overset{\#1}{2^+}f_{\alpha\beta}$	$\overset{\#1}{2^-}\mathcal{A}_{\alpha\beta\chi}$
$\overset{\#1}{2^+}\mathcal{A}^\dagger{}^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{i\,k\,t_1}{\sqrt{2}}$	0
$\overset{\#1}{2^+}f^\dagger{}^{\alpha\beta}$	$\frac{i\,k\,t_1}{\sqrt{2}}$	$k^2 t_1$	0
$\overset{\#1}{2^-}\mathcal{A}^\dagger{}^{\alpha\beta\chi}$	0	0	$\frac{t_1}{2}$

	$\overset{\#1}{0^+}\mathcal{A}$	$\overset{\#1}{0^+}f$	$\overset{\#2}{0^+}f$	$\overset{\#1}{0^-}\mathcal{A}$
$\overset{\#1}{0^+}\mathcal{A}^\dagger$	0	0	0	0
$\overset{\#1}{0^+}f^\dagger$	0	0	0	0
$\overset{\#2}{0^+}f^\dagger$	0	0	0	0
$\overset{\#1}{0^-}\mathcal{A}^\dagger$	0	0	0	$-t_1$

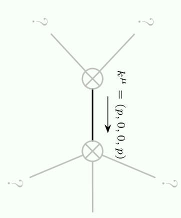
	$\overset{\#1}{1^+}\mathcal{A}_{\alpha\beta}$	$\overset{\#2}{1^+}\mathcal{A}_{\alpha\beta}$	$\overset{\#1}{1^+}f_{\alpha\beta}$	$\overset{\#1}{1^-}\mathcal{A}_\alpha$	$\overset{\#2}{1^-}\mathcal{A}_\alpha$	$\overset{\#1}{1^-}f_\alpha$	$\overset{\#2}{1^-}f_\alpha$
$\overset{\#1}{1^+}\mathcal{A}^\dagger{}^{\alpha\beta}$	$k^2 r_5-\frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$-\frac{i\,k\,t_1}{\sqrt{2}}$	0	0	0	0
$\overset{\#2}{1^+}\mathcal{A}^\dagger{}^{\alpha\beta}$	$-\frac{t_1}{\sqrt{2}}$	0	0	0	0	0	0
$\overset{\#1}{1^+}f^\dagger{}^{\alpha\beta}$	$\frac{i\,k\,t_1}{\sqrt{2}}$	0	0	0	0	0	0
$\overset{\#1}{1^-}\mathcal{A}^\dagger{}^\alpha$	0	0	0	$k^2 r_5+\frac{t_1}{6}$	$\frac{t_1}{3\sqrt{2}}$	0	$\frac{i\,k\,t_1}{3}$
$\overset{\#2}{1^-}\mathcal{A}^\dagger{}^\alpha$	0	0	0	$\frac{t_1}{3\sqrt{2}}$	$\frac{t_1}{3}$	0	$\frac{1}{3}\,i\sqrt{2}\,k\,t_1$
$\overset{\#1}{1^-}f^\dagger{}^\alpha$	0	0	0	0	0	0	0
$\overset{\#2}{1^-}f^\dagger{}^\alpha$	0	0	0	$-\frac{1}{3}\,i\,k\,t_1$	$-\frac{1}{3}\,i\sqrt{2}\,k\,t_1$	0	$\frac{2k^2 t_1}{3}$

$$\mathcal{S} == \iiiint (f^{\alpha\beta}\,\tau_{\alpha\beta} + \mathcal{A}^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} + \tfrac{1}{6}t_1(2\,\mathcal{A}^{\alpha\iota}{}_\alpha\,\mathcal{A}_\iota{}^\theta{}_\theta - 4\,\mathcal{A}_\alpha{}^\theta{}_\theta\,\partial_\iota f^{\alpha\iota} + 4\,\mathcal{A}_\iota{}^\theta{}_\theta\,\partial^\iota f^\alpha{}_\alpha - 2\,\partial_\iota f^\theta{}_\theta\,\partial^\iota f^\alpha{}_\alpha - 2\,\partial_\iota f^{\alpha\iota}\,\partial_\theta f_\alpha{}^\theta + 4\,\partial^\iota f^\alpha{}_\alpha\,\partial_\theta f_\iota{}^\theta - 6\,\partial_\alpha f_{\iota\theta}\,\partial^\theta f^{\alpha\iota} - 3\,\partial_\alpha f_{\theta\iota}\,\partial^\theta f^{\alpha\iota} + 3\,\partial_\iota f_{\alpha\theta}\,\partial^\theta f^{\alpha\iota} + 3\,\partial_\theta f_{\alpha\iota}\,\partial^\theta f^{\alpha\iota} + 3\,\partial_\theta f_{\iota\alpha}\,\partial^\theta f^{\alpha\iota} + 6\,\mathcal{A}_{\alpha\theta\iota}\,(\mathcal{A}^{\alpha\iota\theta} + 2\,\partial^\theta f^{\alpha\iota})) + r_5(\partial_\iota\mathcal{A}_\theta{}^\kappa{}_\kappa\,\partial^\theta\mathcal{A}^{\alpha\iota}{}_\alpha - \partial_\theta\mathcal{A}_\iota{}^\kappa{}_\kappa\,\partial^\theta\mathcal{A}^{\alpha\iota}{}_\alpha - (\partial_\alpha\mathcal{A}^{\alpha\iota\theta} - 2\,\partial^\theta\mathcal{A}^{\alpha\iota}{}_\alpha)(\partial_\kappa\mathcal{A}_\iota{}^\kappa{}_\theta - \partial_\kappa\mathcal{A}_\theta{}^\kappa{}_\iota)))[t,x,y,z]\,dz\,dy\,dx\,dt$$

Massive and massless spectra

Polarisations:	2
Pole residue:	$-\frac{1}{r_5 t_1^2} > 0$

Massless particle



(No particles)

Unitarity conditions