Particle spectrograph

Wave operator and propagator

	$\omega^{\#1}_{1^+\,\alpha\beta}$	$\omega^{\#2}_{1^+\,\alpha\beta}$	$f^{\#1}_{1^+\,\alpha\beta}$	$\omega^{\#1}_{1^-\,\alpha}$	$\omega^{\#2}_{1^-\,\alpha}$	$f^{\#1}_{1^-\,\alpha}$	$f^{\#2}_{1^-\,\alpha}$
$\omega^{\#1}_{1^+}\dagger^{\alpha\beta}$	$k^2\,(2\,r_3+r_5)+\frac{2\,t_2}{3}$	$\frac{\sqrt{2}\,t_2}{3}$	$\frac{1}{3}\,i\,\sqrt{2}\,k\,t_2$	0	0	0	0
$\omega^{\#2}_{1^+}\dagger^{\alpha\beta}$	$\frac{\sqrt{2}\,t_2}{3}$	$\frac{t_2}{3}$	$\frac{i\,k\,t_2}{3}$	0	0	0	0
$f^{\#1}_{1^+}\dagger^{\alpha\beta}$	$-\frac{1}{3}\,i\,\sqrt{2}\,k\,t_2$	$-\frac{1}{3}\,i\,k\,t_2$	$\frac{k^2\,t_2}{3}$	0	0	0	0
$\omega^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	$k^2\,(\frac{r_3}{2}+r_5)+\frac{2\,t_3}{3}$	$-\frac{\sqrt{2}\,t_3}{3}$	0	$-\frac{2}{3}\,i\,k\,t_3$
$\omega^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$-\frac{\sqrt{2}\,t_3}{3}$	$\frac{t_3}{3}$	0	$\frac{1}{3}\,i\,\sqrt{2}\,k\,t_3$
$f^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	0	0	0	0
$f^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{2\,i\,k\,t_3}{3}$	$-\frac{1}{3}\,i\,\sqrt{2}\,k\,t_3$	0	$\frac{2\,k^2\,t_3}{3}$

	$\sigma^{\#1}_{0^+}\dagger$	$\tau^{\#1}_{0^+}\dagger$	$\tau^{\#2}_{0^+}\dagger$	$\sigma^{\#1}_{0^-}\dagger$
$\sigma^{\#1}_{0^+}\dagger$	$\frac{1}{(1+2\,k^2)^2\,t_3}$	$-\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$	0	$\frac{1}{t_2}$
$\tau^{\#1}_{0^+}\dagger$	$\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$	$\frac{2\,k^2}{(1+2\,k^2)^2\,t_3}$	0	0
$\tau^{\#2}_{0^+}\dagger$	0	0	0	0
$\sigma^{\#1}_{0^-}\dagger$	0	0	0	0

	$\omega^{\#1}_{0^+}\dagger$	$f^{\#1}_{0^+}\dagger$	$f^{\#2}_{0^+}\dagger$	$\omega^{\#1}_{0^-}\dagger$
$\omega^{\#1}_{0^+}\dagger$	t_3	$-i\,\sqrt{2}\,k\,t_3$	0	t_2
$f^{\#1}_{0^+}\dagger$	$i\,\sqrt{2}\,k\,t_3$	$2\,k^2\,t_3$	0	0
$f^{\#2}_{0^+}\dagger$	0	0	0	0
$\omega^{\#1}_{0^-}\dagger$	0	0	0	0

	$\omega^{\#1}_{2^+\,\alpha\beta\chi}\dagger^{\alpha\beta}$	$f^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	$\omega^{\#1}_{2^-\,\alpha\beta\chi}\dagger^{\alpha\beta\chi}$
$\omega^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	$-\frac{3\,k^2\,r_3}{2}$	0	0
$f^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	0	0	0
$\omega^{\#1}_{2^-\,\alpha\beta\chi}\dagger^{\alpha\beta\chi}$	0	0	0

	$\sigma^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	$\tau^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	$\sigma^{\#1}_{2^-\,\alpha\beta\chi}\dagger^{\alpha\beta\chi}$
$\sigma^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	$-\frac{2}{3\,k^2\,r_3}$	0	0
$\tau^{\#1}_{2^+\,\alpha\beta}\dagger^{\alpha\beta}$	0	0	0
$\sigma^{\#1}_{2^-\,\alpha\beta\chi}\dagger^{\alpha\beta\chi}$	0	0	0

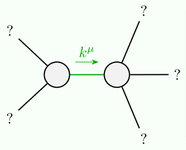
Source constraints	Multiplicities
SO(3) irreps	Fundamental fields
$\tau^{\#2}_{0^+}==0$	$\partial_\beta\partial_\alpha\tau^{\alpha\beta}==0$
$\tau^{\#1}_{0^+}-2\,i\,k\,\sigma^{\#1}_{0^+}==0$	$\partial_\beta\partial_\alpha\tau^{\alpha\beta}==\partial_\beta\partial^\beta\tau^{\alpha}{}_{\alpha}+2\,\partial_\chi\partial^\chi\partial_\beta\sigma^{\alpha\beta}{}_{\alpha}$
$\tau^{\#2\,\alpha}_{1^-}+2\,i\,k\,\sigma^{\#2\,\alpha}_{1^-}==0$	$\partial_\chi\partial_\beta\partial^\alpha\tau^{\beta\chi}==\partial_\chi\partial^\chi\partial_\beta\tau^{\alpha\beta}+2\,\partial_\delta\partial^\chi\partial_\beta\partial^\alpha\sigma^{\beta\delta}{}_{\chi}$
$\tau^{\#1\,\alpha}_{1^-}==0$	$\partial_\chi\partial_\beta\partial^\alpha\tau^{\beta\chi}==\partial_\chi\partial^\chi\partial_\beta\tau^{\alpha\beta}$
$\tau^{\#1\,\alpha\beta}_{1^+}+i\,k\,\sigma^{\#2\,\alpha\beta}_{1^+}==0$	$\partial_\chi\partial_\alpha\tau^{\beta\chi}+\partial_\chi\partial^\beta\tau^{\chi\alpha}+\partial_\chi\partial^\chi\tau^{\alpha\beta}+$ $2\,\partial_\delta\partial_\chi\partial^\alpha\sigma^{\beta\chi\delta}+2\,\partial_\delta\partial^\delta\partial_\chi\sigma^{\alpha\beta\chi}==$ $\partial_\chi\partial^\alpha\tau^{\chi\beta}+\partial_\chi\partial^\beta\tau^{\alpha\chi}+$ $\partial_\chi\partial^\chi\tau^{\beta\alpha}+2\,\partial_\delta\partial_\chi\partial^\beta\sigma^{\alpha\chi\delta}$
$\sigma^{\#1\,\alpha\beta\chi}_{2^-}==0$	$3\,\partial_\epsilon\partial_\delta\partial^\chi\partial^\alpha\sigma^{\beta\delta\epsilon}+3\,\partial_\epsilon\partial^\epsilon\partial^\chi\partial^\alpha\sigma^{\beta\delta}{}_{\delta}+$ $2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\alpha\chi\delta}+4\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\alpha\beta\chi}+$ $2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\chi\sigma^{\alpha\delta\beta}+4\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\alpha\chi\beta}+$ $2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\chi\sigma^{\beta\delta\alpha}+2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\beta\chi\alpha}+$ $3\,\eta^{\beta\chi}\,\partial_\phi\partial^\phi\partial_\epsilon\partial^\alpha\sigma^{\delta\epsilon}{}_{\delta}+$ $3\,\eta^{\alpha\chi}\,\partial_\phi\partial^\phi\partial_\epsilon\partial^\beta\sigma^{\delta\epsilon}{}_{\delta}+$ $3\,\eta^{\beta\chi}\,\partial_\phi\partial^\phi\partial_\epsilon\partial^\epsilon\sigma^{\alpha\delta}{}_{\delta}==$ $3\,\partial_\epsilon\partial_\delta\partial^\chi\partial^\beta\sigma^{\alpha\delta\epsilon}+3\,\partial_\epsilon\partial^\epsilon\partial^\chi\partial^\beta\sigma^{\alpha\delta}{}_{\delta}+$ $2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\beta\chi\delta}+4\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\beta\alpha\chi}+$ $2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\chi\sigma^{\beta\delta\alpha}+2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\beta\alpha\chi}+$ $4\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\alpha\beta\chi}+2\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\sigma^{\alpha\chi\beta}+$ $3\,\eta^{\alpha\chi}\,\partial_\phi\partial^\phi\partial_\epsilon\partial^\beta\sigma^{\delta\epsilon}{}_{\delta}+$ $3\,\eta^{\beta\chi}\,\partial_\phi\partial^\phi\partial_\epsilon\partial_\delta\sigma^{\alpha\delta\epsilon}+$ $3\,\eta^{\alpha\chi}\,\partial_\phi\partial^\phi\partial_\epsilon\partial^\epsilon\sigma^{\beta\delta}{}_{\delta}$
$\tau^{\#1\,\alpha\beta}_{2^+}==0$	$4\,\partial_\delta\partial_\chi\partial^\beta\partial^\alpha\tau^{\chi\delta}+2\,\partial_\delta\partial^\delta\partial^\beta\partial^\alpha\tau^{\chi}{}_{\chi}+$ $3\,\partial_\delta\partial^\delta\partial_\chi\partial^\chi\tau^{\alpha\beta}+3\,\partial_\delta\partial^\delta\partial_\chi\partial^\chi\tau^{\beta\alpha}+$ $2\,\eta^{\alpha\beta}\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial_\chi\tau^{\chi\delta}==$ $3\,\partial_\delta\partial^\delta\partial_\chi\partial^\alpha\tau^{\beta\chi}+3\,\partial_\delta\partial^\delta\partial_\chi\partial^\alpha\tau^{\chi\beta}+$ $3\,\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\chi}+3\,\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\alpha}+$ $2\,\eta^{\alpha\beta}\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\tau^{\chi}{}_{\chi}$
Total constraints/gauge generators:	21

Quadratic (free) action

$$S == \iiiint\left(\frac{1}{6}\,(-4\,t_3\;\omega^{\alpha\prime}{}_{\alpha}\;\omega_{\prime}{}^{\kappa}{}_{\kappa}+6\;f^{\alpha\beta}\;\tau_{\alpha\beta}+6\;\omega^{\alpha\beta\chi}\;\sigma_{\alpha\beta\chi}+8\,t_3\;\omega_{\alpha}{}^{\kappa}{}_{\kappa}\;\partial_\prime f^{\alpha\prime}-\right.$$
$$8\,t_3\;\omega_{\prime}{}^{\kappa}{}_{\kappa}\;\partial^\prime f^{\alpha}{}_{\alpha}+4\,t_3\,\partial_\prime f^{\kappa}{}_{\kappa}\,\partial^\prime f^{\alpha}{}_{\alpha}-3\,r_3\,\partial_\beta\omega_{\prime}{}^{\theta}{}_{\theta}\,\partial^\prime\omega^{\alpha\beta}{}_{\alpha}-$$
$$3\,r_3\,\partial_\prime\omega_{\beta}{}^{\theta}{}_{\theta}\,\partial^\prime\omega^{\alpha\beta}{}_{\alpha}-3\,r_3\,\partial_\alpha\omega^{\alpha\beta\prime}\,\partial_\theta\omega_{\beta}{}^{\theta}{}_{\prime}+$$
$$6\,r_3\,\partial^\prime\omega^{\alpha\beta}{}_{\alpha}\,\partial_\theta\omega_{\beta}{}^{\theta}{}_{\prime}-3\,r_3\,\partial_\alpha\omega^{\alpha\beta\prime}\,\partial_\theta\omega_{\prime}{}^{\theta}{}_{\beta}+$$
$$6\,r_3\,\partial^\prime\omega^{\alpha\beta}{}_{\alpha}\,\partial_\theta\omega_{\prime}{}^{\theta}{}_{\beta}+4\,t_2\;\omega_{\prime\theta\alpha}\,\partial^\theta f^{\alpha\prime}+2\,t_2\,\partial_\alpha f_{\prime\theta}\,\partial^\theta f^{\alpha\prime}-$$
$$t_2\,\partial_\alpha f_{\theta\prime}\,\partial^\theta f^{\alpha\prime}-t_2\,\partial_\prime f_{\alpha\theta}\,\partial^\theta f^{\alpha\prime}+t_2\,\partial_\theta f_{\alpha\prime}\,\partial^\theta f^{\alpha\prime}-$$
$$t_2\,\partial_\theta f_{\prime\alpha}\,\partial^\theta f^{\alpha\prime}-4\,t_2\;\omega_{\alpha\theta\prime}\,(\omega^{\alpha\prime\theta}+\partial^\theta f^{\alpha\prime})+$$
$$2\,t_2\;\omega_{\alpha\prime\theta}\,(\omega^{\alpha\prime\theta}+2\,\partial^\theta f^{\alpha\prime})-24\,r_3\,\partial_\beta\omega_{\prime\theta\alpha}\,\partial^\theta\omega^{\alpha\beta\prime}+$$
$$6\,r_5\,\partial_\prime\omega_{\theta}{}^{\kappa}{}_{\kappa}\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha}-6\,r_5\,\partial_\theta\omega_{\prime}{}^{\kappa}{}_{\kappa}\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha}+$$
$$4\,t_3\,\partial_\prime f^{\alpha\prime}\,\partial_\kappa f_{\alpha}{}^{\kappa}-8\,t_3\,\partial^\prime f^{\alpha}{}_{\alpha}\,\partial_\kappa f_{\prime}{}^{\kappa}-6\,r_5\,\partial_\alpha\omega^{\alpha\prime\theta}\,\partial_\kappa\omega_{\prime}{}^{\kappa}{}_{\theta}+$$
$$12\,r_5\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha}\,\partial_\kappa\omega_{\prime}{}^{\kappa}{}_{\theta}+6\,r_5\,\partial_\alpha\omega^{\alpha\prime\theta}\,\partial_\kappa\omega_{\theta}{}^{\kappa}{}_{\prime}-$$
$$\left.12\,r_5\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha}\,\partial_\kappa\omega_{\theta}{}^{\kappa}{}_{\prime}\right))[t,\,x,\,y,\,z]\,dt\,dz\,dy\,dx\,dt$$

	$\sigma^{\#1}_{1^+\,\alpha\beta}$	$\sigma^{\#2}_{1^+\,\alpha\beta}$	$\tau^{\#1}_{1^+\,\alpha\beta}$	$\sigma^{\#1}_{1^-\,\alpha}$	$\sigma^{\#2}_{1^-\,\alpha}$	$\tau^{\#1}_{1^-\,\alpha}$	$\tau^{\#2}_{1^-\,\alpha}$
$\sigma^{\#1}_{1^+}\dagger^{\alpha\beta}$	$\frac{1}{k^2\,(2\,r_3+r_5)}$	$-\frac{\sqrt{2}}{k^2\,(1+k^2)\,(2\,r_3+r_5)}$	$-\frac{i\,\sqrt{2}}{k\,(1+k^2)\,(2\,r_3+r_5)}$	0	0	0	0
$\sigma^{\#2}_{1^+}\dagger^{\alpha\beta}$	$-\frac{\sqrt{2}}{k^2\,(1+k^2)\,(2\,r_3+r_5)}$	$\frac{3\,k^2\,(2\,r_3+r_5)+2\,t_2}{(k+k^3)^2\,(2\,r_3+r_5)\,t_2}$	$\frac{i\,(3\,k^2\,(2\,r_3+r_5)+2\,t_2)}{k\,(1+k^2)^2\,(2\,r_3+r_5)\,t_2}$	0	0	0	0
$\tau^{\#1}_{1^+}\dagger^{\alpha\beta}$	$\frac{i\,\sqrt{2}}{k\,(1+k^2)\,(2\,r_3+r_5)}$	$-\frac{i\,(3\,k^2\,(2\,r_3+r_5)+2\,t_2)}{k\,(1+k^2)^2\,(2\,r_3+r_5)\,t_2}$	$\frac{3\,k^2\,(2\,r_3+r_5)+2\,t_2}{(1+k^2)^2\,(2\,r_3+r_5)\,t_2}$	0	0	0	0
$\sigma^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{2}{k^2\,(r_3+2\,r_5)}$	$\frac{2\,\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_3+2\,r_5)}$	0	$\frac{4\,i}{k\,(1+2\,k^2)\,(r_3+2\,r_5)}$
$\sigma^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{2\,\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_3+2\,r_5)}$	$\frac{3\,k^2\,(r_3+2\,r_5)+4\,t_3}{(k+2\,k^3)^2\,(r_3+2\,r_5)\,t_3}$	0	$\frac{i\,\sqrt{2}\,(3\,k^2\,(r_3+2\,r_5)+4\,t_3)}{k\,(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$
$\tau^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	0	0	0	0
$\tau^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$-\frac{4\,i}{k\,(1+2\,k^2)\,(r_3+2\,r_5)}$	$-\frac{i\,\sqrt{2}\,(3\,k^2\,(r_3+2\,r_5)+4\,t_3)}{k\,(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$	0	$\frac{6\,k^2\,(r_3+2\,r_5)+8\,t_3}{(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$

Massive and massless spectra



Quadratic pole

Pole residue:	$-\frac{1}{r_3\,(2\,r_3+r_5)\,(r_3+2\,r_5)\,p^2} > 0$
Polarisations:	2

(No massive particles)

Unitarity conditions

$$r_3 < 0\;\&\&\;(r_5 < -\frac{r_3}{2}\;||\;r_5 > -2\,r_3)\;||\;r_3 > 0\;\&\&\;-2\,r_3 < r_5 < -\frac{r_3}{2}$$