Particle spectrograph

Wave operator and propagator

	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$	$\tau_{1^-}^{\#1}{}_{\alpha}$	$\tau_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}{}_{\alpha\beta}$	0	0	0	0
$\sigma_{1^+}^{\#2}{}_{\alpha\beta}$	0	0	0	0
$\tau_{1^+}^{\#1}{}_{\alpha\beta}$	0	0	0	0
$\sigma_{1^-}^{\#1}{}^{\alpha}$	0	0	0	$\frac{2ik}{t_1+2k^2t_1}$
$\sigma_{1^-}^{\#2}{}^{\alpha}$	0	0	0	$\frac{i\sqrt{2}\,k(2k^2r_5-t_1)}{(t_1+2k^2t_1)^2}$
$\tau_{1^-}^{\#1}{}^{\alpha}$	0	0	0	0
$\tau_{1^-}^{\#2}{}^{\alpha}$	0	0	0	$\frac{-4k^4r_5+2k^2t_1}{(t_1+2k^2t_1)^2}$

	$\tau_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^+}^{\#2}{}_{\alpha\beta}$	$\sigma_{1^+}^{\#1}{}_{\alpha\beta}$
$\sigma_{1^+}^{\#1}{}^{\alpha\beta}$	$-\frac{i\sqrt{2}\,k}{t_1+k^2t_1}$	$-\frac{\sqrt{2}}{t_1+k^2t_1}$	0
$\sigma_{1^+}^{\#2}{}^{\alpha\beta}$	$-\frac{i(2k^3r_5-kt_1)}{(1+k^2)^2t_1^2}$	$-\frac{-2k^2r_5+t_1}{(1+k^2)^2t_1^2}$	$-\frac{\sqrt{2}}{t_1+k^2t_1}$
$\tau_{1^+}^{\#1}{}^{\alpha\beta}$	$\frac{-2k^4r_5+k^2t_1}{(1+k^2)^2t_1^2}$	$\frac{i(2k^3r_5-kt_1)}{(1+k^2)^2t_1^2}$	$\frac{i\sqrt{2}\,k}{t_1+k^2t_1}$
$\sigma_{1^-}^{\#1}{}^{\alpha}$	0	0	0
$\sigma_{1^-}^{\#2}{}^{\alpha}$	0	0	0
$\tau_{1^-}^{\#1}{}^{\alpha}$	0	0	0
$\tau_{1^-}^{\#2}{}^{\alpha}$	0	0	0

Quadratic (free) action

$$S == \iiint\Big(f^{\alpha\beta}\,\tau_{\alpha\beta} + \omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} + \frac{1}{2}t_1\,(2\,\omega^{\alpha\prime}{}_{\alpha}{}^{\theta}\,\omega_{\prime\theta}{}^{\theta} - 4\,\omega_{\alpha}{}^{\theta}{}_{\theta}\,\partial_\prime f^{\alpha\prime} + 4\,\omega_{\prime}{}^{\theta}{}_{\theta}\,\partial^\prime f^{\alpha}{}_{\alpha} - 2\,\partial_\prime f^{\theta}{}_{\theta}\,\partial^\prime f^{\alpha}{}_{\alpha} - 2\,\partial_\prime f^{\alpha\prime}\,\partial_\theta f^{\theta}{}_{\alpha} + 4\,\partial^\prime f^{\alpha}{}_{\alpha}\,\partial_\theta f_{\prime}{}^{\theta} - 2\,\partial_\alpha f_{\prime\theta}\,\partial^\theta f^{\alpha\prime} - \partial_\alpha f_{\theta\prime}\,\partial^\theta f^{\alpha\prime} + \partial_\theta f_{\prime\alpha}\,\partial^\theta f^{\alpha\prime} + 2\,\omega_{\alpha\theta\prime}\,(\omega^{\alpha\prime\theta} + 2\,\partial^\theta f^{\alpha\prime})) + \frac{1}{3}r_2\,(4\,\partial_\beta\omega_{\alpha\prime\theta} - 2\,\partial_\beta\omega_{\alpha\theta\prime} + 2\,\partial_\theta\omega_{\alpha\beta\prime} - 2\,\partial_\theta\omega_{\alpha\beta\prime} + \partial^\theta\omega^{\alpha\beta\prime} + r_5\,(\partial_\prime\omega_{\theta}{}^{\kappa}{}_{\kappa}\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha} - \partial_\theta\omega_{\prime}{}^{\kappa}{}_{\kappa}\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha} - 2\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha} - (\partial_\alpha\omega^{\alpha\prime\theta} - 2\,\partial^\theta\omega^{\alpha\prime}{}_{\alpha})\,(\partial_\kappa\omega_{\prime}{}^{\kappa}{}_{\theta} - \partial_\kappa\omega_{\theta\prime}{}^{\kappa}))\Big)\Big[t, x, y, z\Big]\,dz\,dy\,dx\,dt$$

	$\sigma_{0^+}^{\#1}$	$\tau_{0^+}^{\#1}$	$\tau_{0^+}^{\#2}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}\,\dagger$	$-\frac{1}{(1+2k^2)^2t_1}$	$\frac{i\sqrt{2}\,k}{(1+2k^2)^2t_1}$	0	0
$\tau_{0^+}^{\#1}\,\dagger$	$-\frac{i\sqrt{2}\,k}{(1+2k^2)^2t_1}$	$-\frac{2k^2}{(1+2k^2)^2t_1}$	0	0
$\tau_{0^+}^{\#2}\,\dagger$	0	0	0	0
$\sigma_{0^-}^{\#1}\,\dagger$	0	0	0	$\frac{1}{k^2r_2-t_1}$

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

	$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$f_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\omega_{2^+}^{\#1}\,\dagger^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{ikt_1}{\sqrt{2}}$	0
$f_{2^+}^{\#1}\,\dagger^{\alpha\beta}$	$\frac{ikt_1}{\sqrt{2}}$	k^2t_1	0
$\omega_{2^-}^{\#1}\,\dagger^{\alpha\beta\chi}$	0	0	$\frac{t_1}{2}$

	$\omega_{0^+}^{\#1}$	$f_{0^+}^{\#1}$	$f_{0^+}^{\#2}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}\,\dagger$	$-t_1$	$i\sqrt{2}\,kt_1$	0	0
$f_{0^+}^{\#1}\,\dagger$	$-i\sqrt{2}\,kt_1$	$-2k^2t_1$	0	0
$f_{0^+}^{\#2}\,\dagger$	0	0	0	0
$\omega_{0^-}^{\#1}\,\dagger$	0	0	0	$k^2r_2-t_1$

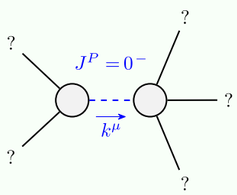
	$\omega_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	0	0	0	0
$f_{1^+}^{\#1}{}_{\alpha\beta}$	0	0	0	0
$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	0	0	0	0
$\omega_{1^+}^{\#1}{}^{\alpha\beta}$	0	0	0	0
$f_{1^+}^{\#1}{}^{\alpha\beta}$	0	0	0	0
$\omega_{1^+}^{\#2}{}^{\alpha\beta}$	0	0	0	0
$f_{1^+}^{\#1}{}^{\alpha\beta}$	0	0	0	0
$\omega_{1^-}^{\#1}{}^{\alpha}$	ikt_1	0	0	0
$\omega_{1^-}^{\#2}{}^{\alpha}$	$\frac{t_1}{\sqrt{2}}$	0	0	0
$f_{1^-}^{\#1}{}^{\alpha}$	0	0	0	0
$f_{1^-}^{\#2}{}^{\alpha}$	0	0	0	0

	$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$
$\omega_{1^+}^{\#1}{}^{\alpha\beta}$	$k^2r_5-\frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$\frac{ikt_1}{\sqrt{2}}$
$\omega_{1^+}^{\#2}{}^{\alpha\beta}$	$-\frac{t_1}{\sqrt{2}}$	0	0
$f_{1^+}^{\#1}{}^{\alpha\beta}$	$\frac{ikt_1}{\sqrt{2}}$	0	0
$\omega_{1^-}^{\#1}{}^{\alpha}$	0	0	0
$\omega_{1^-}^{\#2}{}^{\alpha}$	0	0	0
$f_{1^-}^{\#1}{}^{\alpha}$	0	0	0
$f_{1^-}^{\#2}{}^{\alpha}$	0	0	0

Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\tau_{0^+}^{\#2} == 0$	1
$\tau_{0^+}^{\#1} - 2\,i\,k\,\sigma_{0^+}^{\#1} == 0$	1
$\tau_{1^-}^{\#2\,\alpha} + 2\,i\,k\,\sigma_{1^-}^{\#2\,\alpha} == 0$	3
$\tau_{1^-}^{\#1\,\alpha} == 0$	3
$\tau_{1^+}^{\#1\,\alpha\beta} + i\,k\,\sigma_{1^+}^{\#2\,\alpha\beta} == 0$	3
$\tau_{2^+}^{\#1\,\alpha\beta} - 2\,i\,k\,\sigma_{2^+}^{\#1\,\alpha\beta} == 0$	5
Total constraints:	16

Massive and massless spectra



Massive particle	
Pole residue:	$-\frac{1}{r_2} > 0$
Polarisations:	1
Square mass:	$\frac{t_1}{r_2} > 0$
Spin:	0
Parity:	Odd

(No massless particles)

Unitarity conditions

$r_2 < 0 \;\&\&\; t_1 < 0$