Particle spectrograph

Wave operator and propagator

	$\sigma_{1^+}^{\#1}{}_{\alpha\beta}$	$\tau_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$	$\tau_{1^-}^{\#1}{}_{\alpha}$	$\tau_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}{}_{\alpha\beta}\,\dagger$	0	$-\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	0	0	0	0
$\sigma_{1^+}^{\#2}{}_{\alpha\beta}\,\dagger$	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$-\frac{i(2k^3 r_1+k t_1)}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\tau_{1^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	$\frac{-2k^4 r_1+k^2 t_1}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\sigma_{1^-}^{\#1}{}_{\alpha}\,\dagger$	0	0	0	$\frac{\sqrt{2}}{t_1+2k^2 t_1}$	0	$\frac{2ik}{t_1+2k^2 t_1}$
$\sigma_{1^-}^{\#2}{}_{\alpha}\,\dagger$	0	0	0	$\frac{1}{(1+2k^2)^2 t_1}$	0	$\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$
$\tau_{1^-}^{\#1}{}_{\alpha}\,\dagger$	0	0	0	0	0	$\frac{2k^2}{(1+2k^2)^2 t_1}$
$\tau_{1^-}^{\#2}{}_{\alpha}\,\dagger$	0	0	0	$-\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	$-\frac{2ik}{t_1+2k^2 t_1}$	0

Quadratic (free) action

$$S == \iiint (f^{\alpha\beta}\,\tau_{\alpha\beta} + \omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} + \frac{1}{2}t_1(2\,\omega^{\alpha\prime}{}_{\alpha}{}^{\theta}\,\omega_{\prime}{}_{\theta} - 4\,\omega_{\alpha}{}^{\theta}{}_{\theta}\,\partial_{\prime}f^{\alpha\prime} + 4\,\omega_{\prime}{}^{\theta}{}_{\theta}\,\partial^{\prime}f^{\alpha}{}_{\alpha} - 2\,\partial_{\prime}f^{\theta}{}_{\theta}\,\partial^{\prime}f^{\alpha}{}_{\alpha} - 2\,\partial_{\alpha}f_{\prime\theta}\,\partial^{\theta}f^{\alpha\prime} + 4\,\partial^{\prime}f^{\alpha}{}_{\alpha}\,\partial_{\theta}f_{\prime}{}^{\theta} - 2\,\partial_{\alpha}f_{\prime\theta}\,\partial^{\theta}f^{\alpha\prime} + \partial_{\theta}f_{\prime\alpha}\,\partial^{\theta}f^{\alpha\prime} + 2\,\omega_{\alpha\theta\prime}\,(\omega^{\alpha\prime\theta} + 2\,\partial^{\theta}f^{\alpha\prime})) - \frac{1}{3}r_1(3\,\partial_{\beta}\omega_{\prime}{}^{\theta}{}_{\theta}\,\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha} - 3\,\partial_{\alpha}\omega^{\alpha\beta\prime}\,\partial_{\theta}\omega_{\beta}{}^{\theta}{}_{\prime} + 6\,\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha}\,\partial_{\theta}\omega_{\prime}{}^{\theta}{}_{\beta} - 6\,\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha}\,\partial_{\theta}\omega_{\prime}{}^{\theta}{}_{\beta} + 4\,\partial_{\beta}\omega_{\alpha\prime\theta}\,\partial^{\theta}\omega^{\alpha\beta\prime} + 8\,\partial_{\rho}\omega_{\prime\theta\alpha}\,\partial^{\theta}\omega^{\alpha\beta\prime} + 2\,\partial_{\prime}\omega_{\alpha\beta\theta}\,\partial^{\theta}\omega^{\alpha\beta\prime} - 2\,\partial_{\theta}\omega_{\alpha\beta\prime}\,\partial^{\theta}\omega^{\alpha\beta\prime} - 2\,\partial_{\theta}\omega_{\alpha\prime\beta}\,\partial^{\theta}\omega^{\alpha\beta\prime} - 2\,\partial_{\theta}\omega_{\alpha\beta\prime}\,\partial^{\theta}\omega^{\alpha\beta\prime}))[t, x, y, z]\,dz\,dy\,dx\,dt$$

	$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$k^2 r_1 - \frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$\frac{ikt_1}{\sqrt{2}}$	0	0	0	0
$\omega_{1^+}^{\#2}{}_{\alpha\beta}\,\dagger$	$-\frac{t_1}{\sqrt{2}}$	0	0	0	0	0	0
$f_{1^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$-\frac{ikt_1}{\sqrt{2}}$	0	0	0	0	0	0
$\omega_{1^-}^{\#1}{}_{\alpha}\,\dagger$	0	0	0	$-\frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	$-ikt_1$
$\omega_{1^-}^{\#2}{}_{\alpha}\,\dagger$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	0
$f_{1^-}^{\#1}{}_{\alpha}\,\dagger$	0	0	0	ikt_1	0	0	0
$f_{1^-}^{\#2}{}_{\alpha}\,\dagger$	0	0	0	0	0	0	0

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

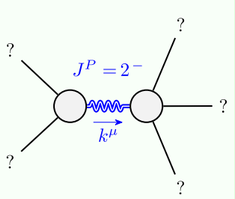
	$\sigma_{2^+}^{\#1}{}_{\alpha\beta}$	$\tau_{2^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\sigma_{2^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$\frac{2}{(1+2k^2)^2 t_1}$	$-\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	0
$\tau_{2^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	$\frac{4k^2}{(1+2k^2)^2 t_1}$	0
$\sigma_{2^-}^{\#1}{}_{\alpha\beta\chi}\,\dagger$	0	0	$\frac{2}{2k^2 r_1 + t_1}$

	$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$f_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\omega_{2^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$\frac{t_1}{2}$	$-\frac{ikt_1}{\sqrt{2}}$	0
$f_{2^+}^{\#1}{}_{\alpha\beta}\,\dagger$	$\frac{ikt_1}{\sqrt{2}}$	$k^2 t_1$	0
$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}\,\dagger$	0	0	$k^2 r_1 + \frac{t_1}{2}$

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

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

Massive and massless spectra



Massive particle	
Pole residue:	$-\frac{1}{r_1} > 0$
Polarisations:	5
Square mass:	$-\frac{t_1}{2r_1} > 0$
Spin:	2
Parity:	Odd

(No massless particles)

Unitarity conditions

$r_1 < 0 \;\&\&\; t_1 > 0$