Particle spectrograph

Wave operator and propagator

	$\sigma_{1^+}^{\#2}{}_{\alpha\beta}$	$\tau_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$	$\tau_{1^-}^{\#1}{}_{\alpha}$	$\tau_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	$\frac{6}{(3+k^2)^2 t_2}$	$\frac{3 i \sqrt{2}\, k}{(3+k^2)^2 t_2}$	$\frac{6}{(3+2k^2)^2 t_3}$	$-\frac{3\sqrt{2}}{(3+2k^2)^2 t_3}$	0	$-\frac{6 i k}{(3+2k^2)^2 t_3}$
$\sigma_{1^+}^{\#2}{}^{\dagger}{}^{\alpha\beta}$	$\frac{3\sqrt{2}}{(3+k^2)^2 t_2}$	$\frac{3 i k}{(3+k^2)^2 t_2}$	$-\frac{3\sqrt{2}}{(3+2k^2)^2 t_3}$	$\frac{3}{(3+2k^2)^2 t_3}$	0	$\frac{3 i \sqrt{2}\, k}{(3+2k^2)^2 t_3}$
$\tau_{1^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	$-\frac{3 i \sqrt{2}\, k}{(3+k^2)^2 t_2}$	$\frac{3 k^2}{(3+k^2)^2 t_2}$	0	0	0	$\frac{6 k^2}{(3+2k^2)^2 t_3}$
$\sigma_{1^-}^{\#1}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0
$\sigma_{1^-}^{\#2}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0
$\tau_{1^-}^{\#1}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0
$\tau_{1^-}^{\#2}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0

	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	$\frac{2 t_2}{3}$	$\frac{1}{3} i \sqrt{2}\, k t_2$	$\frac{2 t_3}{3}$	$-\frac{\sqrt{2}\, t_3}{3}$	$-\frac{2}{3} i k t_3$	0
$\omega_{1^+}^{\#2}{}^{\dagger}{}^{\alpha\beta}$	$\frac{\sqrt{2}\, t_2}{3}$	$\frac{i k t_2}{3}$	$-\frac{\sqrt{2}\, t_3}{3}$	$\frac{t_3}{3}$	$\frac{1}{3} i \sqrt{2}\, k t_3$	0
$f_{1^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	$-\frac{1}{3} i \sqrt{2}\, k t_2$	$\frac{k^2 t_2}{3}$	$-\frac{1}{3} i \sqrt{2}\, k t_3$	0	0	$\frac{2 k^2 t_3}{3}$
$\omega_{1^-}^{\#1}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0
$\omega_{1^-}^{\#2}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0
$f_{1^-}^{\#1}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0
$f_{1^-}^{\#2}{}^{\dagger}{}^{\alpha}$	0	0	0	0	0	0

Quadratic (free) action

$$S = \iiint\!\!\iint \left(-\tfrac{1}{6}(-4 t_3\, \omega^{\alpha\iota}{}_{\alpha}\, \omega^{\kappa}{}_{\iota\kappa} + 6 f^{\alpha\beta}\, \tau_{\alpha\beta} + 6\, \omega^{\alpha\beta\chi}\, \sigma_{\alpha\beta\chi} + 8 t_3\, \omega^{\kappa}{}_{\alpha\kappa}\, \partial_{\iota} f^{\alpha\iota} - 8 t_3\, \omega^{\kappa}{}_{\iota\kappa}\right.$$
$$\partial^{\prime} f^{\alpha}{}_{\alpha} + 4 t_3\, \partial_{\iota} f^{\kappa}{}_{\kappa}\, \partial^{\prime} f^{\alpha}{}_{\alpha} + 4 t_2\, \omega_{\iota\theta\alpha}\, \partial^{\theta} f^{\alpha\iota} + 2 t_2\, \partial_{\iota} f_{\iota\theta}\, \partial^{\theta} f^{\alpha\iota} - t_2\, \partial_{\alpha} f_{\theta\iota}\, \partial^{\theta} f^{\alpha\iota} -$$
$$t_2\, \partial_{\iota} f_{\alpha\theta}\, \partial^{\theta} f^{\alpha\iota} + t_2\, \partial_{\theta} f_{\iota\alpha}\, \partial^{\theta} f^{\alpha\iota} - 4 t_2\, \omega_{\alpha\theta\iota}\, (\omega^{\alpha\iota\theta} + \partial^{\theta} f^{\alpha\iota}) +$$
$$2 t_2\, \omega_{\alpha\iota\theta}\, (\omega^{\alpha\iota\theta} + 2\, \partial^{\theta} f^{\alpha\iota}) + 8 r_2\, \partial_{\beta} \omega_{\alpha\iota\theta}\, \partial^{\theta} \omega^{\alpha\beta\iota} - 4 r_2\, \partial_{\beta} \omega_{\alpha\theta\iota}\, \partial^{\theta} \omega^{\alpha\beta\iota} +$$
$$4 r_2\, \partial_{\beta} \omega_{\iota\theta\alpha}\, \partial^{\theta} \omega^{\alpha\beta\iota} - 2 r_2\, \partial_{\iota} \omega_{\alpha\beta\theta}\, \partial^{\theta} \omega^{\alpha\beta\iota} + 2 r_2\, \partial_{\theta} \omega_{\alpha\beta\iota}\, \partial^{\theta} \omega^{\alpha\beta\iota} -$$
$$\left.4 r_2\, \partial_{\theta} \omega_{\alpha\iota\beta}\, \partial^{\theta} \omega^{\alpha\beta\iota} + 4 t_3\, \partial_{\iota} f^{\alpha\iota}\, \partial_{\kappa} f^{\alpha}{}_{\alpha}\, \partial^{\prime} f^{\alpha}{}_{\alpha}\, \partial_{\kappa} f^{\kappa}{}_{\iota} - 8 t_3\, \partial^{\prime} f^{\alpha}{}_{\alpha}\, \partial_{\kappa} f^{\kappa}{}_{\iota})\right)[t, x, y, z]\, dz\, dy\, dx\, dt$$

	$\omega_{0^+}^{\#1}$	$f_{0^+}^{\#1}$	$f_{0^+}^{\#2}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}{}^{\dagger}$	t_3	$-i \sqrt{2}\, k t_3$	0	0
$f_{0^+}^{\#1}{}^{\dagger}$	$i \sqrt{2}\, k t_3$	$2 k^2 t_3$	0	0
$f_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\omega_{0^-}^{\#1}{}^{\dagger}$	0	0	0	$k^2 r_2 + t_2$

	$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$f_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\omega_{2^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	0	0	0
$f_{2^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	0	0	0
$\omega_{2^-}^{\#1}{}^{\dagger}{}^{\alpha\beta\chi}$	0	0	0

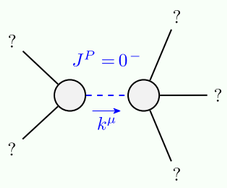
Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\tau_{0^+}^{\#2} == 0$	1
$\tau_{0^+}^{\#1} - 2 i k\, \sigma_{0^+}^{\#1} == 0$	1
$\tau_{1^-}^{\#2\,\alpha} - i k\, \sigma_{1^-}^{\#1\,\alpha} == 0$	3
$\tau_{1^-}^{\#1\,\alpha} == 0$	3
$\sigma_{1^-}^{\#1\,\alpha} + 2\, \sigma_{1^-}^{\#2\,\alpha} == 0$	3
$\tau_{1^+}^{\#1\,\alpha\beta} + i k\, \sigma_{1^+}^{\#1\,\alpha\beta} == 0$	3
$\sigma_{1^+}^{\#1\,\alpha\beta} == \sigma_{1^+}^{\#2\,\alpha\beta}$	3
$\sigma_{2^-}^{\#1\,\alpha\beta\chi} == 0$	5
$\tau_{2^+}^{\#1\,\alpha\beta} == 0$	5
$\sigma_{2^+}^{\#1\,\alpha\beta} == 0$	5
Total constraints:	32

	$\sigma_{0^+}^{\#1}$	$\tau_{0^+}^{\#1}$	$\tau_{0^+}^{\#2}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}{}^{\dagger}$	$\frac{1}{(1+2k^2)^2 t_3}$	$-\frac{i \sqrt{2}\, k}{(1+2k^2)^2 t_3}$	0	0
$\tau_{0^+}^{\#1}{}^{\dagger}$	$\frac{i \sqrt{2}\, k}{(1+2k^2)^2 t_3}$	$\frac{2 k^2}{(1+2k^2)^2 t_3}$	0	0
$\tau_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\sigma_{0^-}^{\#1}{}^{\dagger}$	0	0	0	$\frac{1}{k^2 r_2 + t_2}$

	$\sigma_{2^+}^{\#1}{}_{\alpha\beta}$	$\tau_{2^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\sigma_{2^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	0	0	0
$\tau_{2^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	0	0	0
$\sigma_{2^-}^{\#1}{}^{\dagger}{}^{\alpha\beta\chi}$	0	0	0

Massive and massless spectra



Massive particle	
Pole residue:	$-\frac{1}{r_2} > 0$
Polarisations:	1
Square mass:	$-\frac{t_2}{r_2} > 0$
Spin:	0
Parity:	Odd

(No massless particles)

Unitarity conditions

$r_2 < 0$ && $t_2 > 0$