Particle spectrograph

Wave operator and propagator

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

	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1\,\alpha\beta\,\dagger}$	$\frac{2t_2}{3}$	$\frac{1}{3}i\sqrt{2}\,kt_2$	$\frac{2t_3}{3}$	$-\frac{\sqrt{2}\,t_3}{3}$	0	$-\frac{2}{3}ikt_3$
$\omega_{1^+}^{\#2\,\alpha\beta\,\dagger}$	$\frac{\sqrt{2}\,t_2}{3}$	$\frac{t_2}{3}$	$-\frac{\sqrt{2}\,t_3}{3}$	$\frac{t_3}{3}$	0	$\frac{1}{3}i\sqrt{2}\,kt_3$
$f_{1^+}^{\#1\,\alpha\beta\,\dagger}$	$-\frac{1}{3}i\sqrt{2}\,kt_2$	$-\frac{ikt_2}{3}$	$\frac{2ikt_3}{3}$	$-\frac{1}{3}i\sqrt{2}\,kt_3$	0	$\frac{2k^2t_3}{3}$
$\omega_{1^-}^{\#1\,\alpha\,\dagger}$	0	0	0	0	0	0
$\omega_{1^-}^{\#2\,\alpha\,\dagger}$	0	0	0	0	0	0
$f_{1^-}^{\#1\,\alpha\,\dagger}$	0	0	0	0	0	0
$f_{1^-}^{\#2\,\alpha\,\dagger}$	0	0	0	0	0	0

Quadratic (free) Lagrangian density

$$\frac{2}{3}t_3\,\omega_{\prime}{}^{\alpha\prime}\,\omega_{\kappa\alpha}{}^{\kappa}+\frac{2}{3}t_2\,\omega_{\prime}{}^{\kappa\lambda\,\prime}\,\omega_{\kappa\lambda}{}^{\prime}+\frac{1}{3}t_2\,\omega_{\kappa\lambda}{}^{\prime}\,\omega^{\kappa\lambda}{}_{\prime}+$$
$$f^{\alpha\beta}\,\tau_{\alpha\beta}+\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}+\frac{2}{3}r_2\,\partial^{\beta}\omega^{\theta\alpha}\,\partial_{\theta}\omega_{\kappa\,\alpha\beta}{}^{\kappa}-\frac{1}{3}r_2\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\alpha\beta\theta}-$$
$$\frac{2}{3}r_2\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\theta\alpha\beta}+\frac{1}{6}t_2\,\partial^{\alpha}f_{\kappa\theta}\,\partial^{\kappa}f_{\alpha}{}^{\theta}-\frac{1}{6}t_2\,\partial^{\alpha}f_{\kappa\theta}\,\partial^{\kappa}f_{\alpha}{}^{\theta}+\frac{1}{6}t_2\,\partial^{\alpha}f^{\lambda}{}_{\kappa}\,\partial^{\kappa}f_{\alpha\lambda}-$$
$$\frac{2}{3}t_3\,\omega_{\kappa\lambda}{}^{\lambda}\,\partial^{\kappa}f_{\prime}{}^{\alpha}-\frac{4}{3}t_3\,\partial^{\alpha}f_{\kappa\alpha}\,\partial^{\kappa}f^{\prime}+\frac{2}{3}t_3\,\partial_{\kappa}f^{\lambda}{}_{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\prime}+$$
$$\frac{2}{3}t_2\,\omega_{\iota\kappa\theta}\,\partial^{\kappa}f^{\iota\theta}-\frac{1}{3}t_2\,\omega_{\theta\iota\kappa}\,\partial^{\kappa}f^{\iota\theta}+\frac{2}{3}t_2\,\omega_{\theta\kappa\prime}\,\partial^{\kappa}f^{\prime\theta}+$$
$$\frac{2}{3}t_3\,\omega_{\iota\lambda}{}^{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\kappa}-\frac{1}{6}t_2\,\partial^{\alpha}f^{\lambda}{}_{\kappa}\,\partial^{\kappa}f_{\lambda\alpha}-\frac{1}{6}t_2\,\partial_{\kappa}f^{\lambda}{}_{\theta}\,\partial^{\kappa}f_{\lambda}{}^{\theta}+$$
$$\frac{2}{3}t_3\,\partial^{\alpha}f^{\lambda}{}_{\kappa}\,\partial^{\kappa}f_{\lambda}{}^{\theta}+\frac{1}{3}r_2\,\partial_{\kappa}\omega^{\alpha\beta\theta}\,\partial^{\kappa}\omega_{\alpha\beta\theta}+$$
$$\frac{2}{3}r_2\,\partial_{\kappa}\omega^{\theta\alpha\beta}\,\partial^{\kappa}\omega_{\alpha\beta\theta}-\frac{2}{3}r_2\,\partial^{\beta}\omega_{\prime}{}^{\alpha\lambda}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime}+\frac{2}{3}r_2\,\partial^{\beta}\omega_{\prime}{}^{\lambda\alpha}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime}$$

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

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

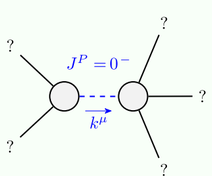
Source constraints/gauge generators

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

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

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

$r_2 < 0 \;\&\&\; t_2 > 0$