Particle spectrograph

Wave operator and propagator

	$\sigma_{1^+}^{\#1}{}^{\alpha\beta}$	$\tau_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$	$\tau_{1^-}^{\#1}{}_{\alpha}$	$\tau_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	0	$-\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	0	0	0	0
$\sigma_{1^+}^{\#2}{}^{\dagger\alpha\beta}$	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$-\frac{i(2k^3 r_1+k t_1)}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\tau_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	$\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	$\frac{i(2k^3 r_1-k t_1)}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\sigma_{1^-}^{\#1}{}^{\dagger\alpha}$	0	$\frac{-2k^4 r_1+k^2 t_1}{(1+k^2)^2 t_1^2}$	$\frac{6}{(3+4k^2)^2 t_1}$	$\frac{6\sqrt{2}}{(3+4k^2)^2 t_1}$	$-\frac{12ik}{(3+4k^2)^2 t_1}$	$\frac{24k^2}{(3+4k^2)^2 t_1}$
$\sigma_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	$\frac{6\sqrt{2}}{(3+4k^2)^2 t_1}$	$\frac{12}{(3+4k^2)^2 t_1}$	0	$\frac{12i\sqrt{2}\,k}{(3+4k^2)^2 t_1}$
$\tau_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	0	0	0
$\tau_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	$-\frac{12i\sqrt{2}\,k}{(3+4k^2)^2 t_1}$	$-\frac{12i\sqrt{2}\,k}{(3+4k^2)^2 t_1}$	0	$\frac{24k^2}{(3+4k^2)^2 t_1}$

Quadratic (free) action

$$\mathcal{S} == \iiint\Big(\tfrac{1}{6}\big(2\,t_1\,\omega^{\alpha\prime}{}_{\alpha}{}^{\theta}\,\omega_{\prime}{}^{\theta}{}_{\theta}+6\,f^{\alpha\beta}\,\tau_{\alpha\beta}+6\,\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}-4\,t_1\,\omega_{\alpha}{}^{\theta}{}_{\theta}\,\partial_{\prime}f^{\alpha\prime}+4\,t_1\,\omega_{\prime}{}^{\theta}{}_{\theta}$$
$$\partial^{\prime}f^{\alpha}{}_{\alpha}-2\,t_1\,\partial_{\prime}f^{\theta}{}_{\theta}\partial^{\prime}f^{\alpha}{}_{\alpha}-6\,r_1\,\partial_{\beta}\omega_{\prime}{}^{\theta}{}_{\theta}\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha}+6\,r_1\,\partial_{\prime}\omega_{\beta}{}^{\theta}{}_{\theta}\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha}-$$
$$2\,t_1\,\partial_{\prime}f^{\alpha\prime}{}_{\alpha}\partial_{\theta}f^{\alpha}{}_{\theta}+6\,r_1\,\partial_{\alpha}\omega^{\alpha\beta\prime}\partial_{\theta}\omega_{\beta}{}^{\theta}{}_{\prime}-12\,r_1\,\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha}\partial_{\theta}\omega_{\beta}{}^{\theta}{}_{\prime}-$$
$$6\,r_1\,\partial_{\alpha}\omega^{\alpha\beta\prime}\partial_{\theta}\omega_{\prime}{}^{\theta}{}_{\beta}+12\,r_1\,\partial^{\prime}\omega^{\alpha\beta}{}_{\alpha}\partial_{\theta}\omega_{\prime}{}^{\theta}{}_{\beta}-6\,t_1\,\partial_{\alpha}f_{\prime\theta}\partial^{\theta}f^{\alpha\prime}-3\,t_1\,\partial_{\alpha}f_{\theta\prime}\partial^{\theta}f^{\alpha\prime}+3$$
$$t_1\,\partial_{\prime}f_{\alpha\theta}\partial^{\theta}f^{\alpha\prime}+3\,t_1\,\partial_{\theta}f_{\alpha\prime}\partial^{\theta}f^{\alpha\prime}+6\,t_1\,\omega_{\alpha\theta\prime}\,(\,\omega^{\alpha\prime\theta}+2\,\partial^{\theta}f^{\alpha\prime})-$$
$$8\,r_1\,\partial_{\beta}\omega_{\alpha\prime\theta}\partial^{\theta}\omega^{\alpha\beta\prime}+4\,r_1\,\partial_{\beta}\omega_{\alpha\theta\prime}\partial^{\theta}\omega^{\alpha\beta\prime}-16\,r_1\,\partial_{\beta}\omega_{\prime\theta\alpha}\partial^{\theta}\omega^{\alpha\beta\prime}-4\,r_1\,\partial_{\prime}\omega_{\alpha\beta\theta}$$
$$\partial_{\theta}\omega_{\alpha\beta\prime}\partial^{\theta}\omega^{\alpha\beta\prime}+4\,r_1\,\partial_{\theta}\omega_{\alpha\prime\beta}\partial^{\theta}\omega^{\alpha\beta\prime}\big)\big)[t,\,x,\,y,\,z]\,dz\,dy\,dx\,dt$$

	$\omega_{1^+}^{\#1}{}^{\alpha\beta}$	$\omega_{1^+}^{\#2}{}^{\alpha\beta}$	$f_{1^+}^{\#1}{}^{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	0	0	0	0	0	0	0
$\omega_{1^+}^{\#2}{}^{\dagger\alpha\beta}$	0	0	0	0	0	0	0
$f_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	0	0	0	$\frac{t_1}{6}$	$\frac{t_1}{3\sqrt{2}}$	0	$-\frac{i k t_1}{\sqrt{2}}$
$\omega_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	$\frac{t_1}{6}$	$k^2 r_1-\frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$\frac{i k t_1}{\sqrt{2}}$	0
$\omega_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	$\frac{t_1}{3\sqrt{2}}$	$-\frac{t_1}{\sqrt{2}}$	$\frac{t_1}{3}$	$\frac{1}{3}i\sqrt{2}\,k t_1$	0
$f_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	$\frac{i k t_1}{\sqrt{2}}$	$\frac{1}{3}i\sqrt{2}\,k t_1$	0	$\frac{2k^2 t_1}{3}$
$f_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	0	0	0	$\frac{2k^2 t_1}{3}$	0

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

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

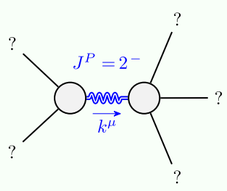
Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\sigma_{0^+}^{\#1} == 0$	1
$\tau_{0^+}^{\#1} == 0$	1
$\tau_{0^+}^{\#2} == 0$	1
$\tau_{1^-}^{\#2\,\alpha}+2\,i\,k\,\sigma_{1^-}^{\#1\,\alpha} == 0$	3
$\tau_{1^-}^{\#1\,\alpha} == 0$	3
$\sigma_{1^-}^{\#1\,\alpha} == \sigma_{1^-}^{\#2\,\alpha}$	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:	20

	$\omega_{0^+}^{\#1}$	$f_{0^+}^{\#1}$	$f_{0^+}^{\#2}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}{}^{\dagger}$	0	0	0	$-t_1$
$f_{0^+}^{\#1}{}^{\dagger}$	0	0	0	0
$f_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\omega_{0^-}^{\#1}{}^{\dagger}$	0	0	0	0

	$\sigma_{0^+}^{\#1}$	$\tau_{0^+}^{\#1}$	$\tau_{0^+}^{\#2}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}{}^{\dagger}$	0	0	0	0
$\tau_{0^+}^{\#1}{}^{\dagger}$	0	0	0	0
$\tau_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\sigma_{0^-}^{\#1}{}^{\dagger}$	0	0	0	$-\frac{1}{t_1}$

Massive and massless spectra



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

(No massless particles)

Unitarity conditions

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