Particle spectrograph

Wave operator and propagator

	$\sigma^{\#1}_{1^+}{}_{\alpha\beta}$	$\sigma^{\#2}_{1^+}{}_{\alpha\beta}$	$\tau^{\#1}_{1^+}{}_{\alpha\beta}$	$\sigma^{\#1}_{1^-}{}_{\alpha}$	$\sigma^{\#2}_{1^-}{}_{\alpha}$	$\tau^{\#1}_{1^-}{}_{\alpha}$	$\tau^{\#2}_{1^-}{}_{\alpha}$
$\sigma^{\#1}_{1^+}\dagger^{\alpha\beta}$	0	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$-\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	0	0	0	0
$\sigma^{\#2}_{1^+}\dagger^{\alpha\beta}$	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$\frac{1}{(1+k^2)^2 t_1}$	$\frac{i k}{(1+k^2)^2 t_1}$	0	0	0	0
$\tau^{\#1}_{1^+}\dagger^{\alpha\beta}$	$\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	$-\frac{i k}{(1+k^2)^2 t_1}$	$\frac{k^2}{(1+k^2)^2 t_1}$	0	0	0	0
$\sigma^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{2(t_1+t_3)}{3 t_1 t_3}$	$-\frac{\sqrt{2}(t_1-2t_3)}{3(1+2k^2)t_1 t_3}$	0	$-\frac{2 i k t_1-4 i k t_3}{3 t_1 t_3+6 k^2 t_1 t_3}$
$\sigma^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$-\frac{\sqrt{2}(t_1-2t_3)}{3(1+2k^2)t_1 t_3}$	$\frac{t_1+4t_3}{3(1+2k^2)^2 t_1 t_3}$	0	$\frac{i\sqrt{2}\,k(t_1+4t_3)}{3(1+2k^2)^2 t_1 t_3}$
$\tau^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	0	0	0	0
$\tau^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{2 i k t_1-4 i k t_3}{3 t_1 t_3+6 k^2 t_1 t_3}$	$-\frac{i\sqrt{2}\,k(t_1+4t_3)}{3(1+2k^2)^2 t_1 t_3}$	0	$\frac{2k^2(t_1+4t_3)}{3(1+2k^2)^2 t_1 t_3}$

	$\omega^{\#1}_{1^+}{}_{\alpha\beta}$	$\omega^{\#2}_{1^+}{}_{\alpha\beta}$	$f^{\#1}_{1^+}{}_{\alpha\beta}$	$\omega^{\#1}_{1^-}{}_{\alpha}$	$\omega^{\#2}_{1^-}{}_{\alpha}$	$f^{\#1}_{1^-}{}_{\alpha}$	$f^{\#2}_{1^-}{}_{\alpha}$
$\omega^{\#1}_{1^+}\dagger^{\alpha\beta}$	$-\frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$-\frac{i k t_1}{\sqrt{2}}$	0	0	0	0
$\omega^{\#2}_{1^+}\dagger^{\alpha\beta}$	$-\frac{t_1}{\sqrt{2}}$	0	0	0	0	0	0
$f^{\#1}_{1^+}\dagger^{\alpha\beta}$	$\frac{i k t_1}{\sqrt{2}}$	0	0	0	0	0	0
$\omega^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{1}{6}(t_1+4t_3)$	$\frac{t_1-2t_3}{3\sqrt{2}}$	0	$\frac{1}{3} i k (t_1-2t_3)$
$\omega^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{t_1-2t_3}{3\sqrt{2}}$	$\frac{t_1+t_3}{3}$	0	$\frac{1}{3} i\sqrt{2}\,k(t_1+t_3)$
$f^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	0	0	0	0
$f^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$-\frac{1}{3} i k (t_1-2t_3)$	$-\frac{1}{3} i\sqrt{2}\,k(t_1+t_3)$	0	$\frac{2}{3}k^2(t_1+t_3)$

Quadratic (free) Lagrangian density

$$-\frac{1}{3}t_1\,\omega_\iota{}^{\alpha\iota}\,\omega_{\kappa\alpha}{}^{\kappa}+\frac{2}{3}t_3\,\omega_\iota{}^{\alpha\iota}\,\omega_{\kappa\alpha}{}^{\kappa}-t_1\,\omega_\iota{}^{\kappa\lambda}\,\omega_{\kappa\lambda}{}^{\iota}+ f^{\alpha\beta}\,\tau_{\alpha\beta}+\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}+\frac{2}{3}r_2\,\partial^\beta\omega^{\theta\alpha}{}_{\kappa}\,\partial_\theta\omega_{\alpha\beta}{}^{\kappa}-\frac{1}{3}r_2\,\partial_\theta\omega_{\alpha\beta}{}^{\kappa}\,\partial_\kappa\omega^{\alpha\beta\theta}-$$
$$\frac{2}{3}r_2\,\partial_\theta\omega_{\alpha\beta}{}^{\kappa}\,\partial_\kappa\omega^{\theta\alpha\beta}-\frac{1}{2}t_1\,\partial^\alpha f_{\theta\kappa}\,\partial^\kappa f_\alpha{}^{\theta}-\frac{1}{2}t_1\,\partial^\alpha f_{\kappa\theta}\,\partial^\kappa f_\alpha{}^{\theta}-\frac{1}{2}t_1\,\partial^\alpha f^\lambda{}_\kappa\,\partial^\kappa f_{\alpha\lambda}+$$
$$\frac{1}{3}t_1\,\omega_{\kappa\alpha}{}^{\alpha}\,\partial^\kappa f^\iota{}_\iota-\frac{2}{3}t_3\,\omega_{\kappa\alpha}{}^{\alpha}\,\partial^\kappa f^\iota{}_\iota+\frac{1}{3}t_1\,\omega_{\kappa\lambda}{}^{\lambda}\,\partial^\kappa f^\iota{}_\iota-\frac{2}{3}t_3\,\omega_{\kappa\lambda}{}^{\lambda}\,\partial^\kappa f^\iota{}_\iota+$$
$$\frac{2}{3}t_1\,\partial^\alpha f_{\kappa\alpha}\,\partial^\kappa f^\iota{}_\iota-\frac{4}{3}t_3\,\partial^\alpha f_{\kappa\alpha}\,\partial^\kappa f^\iota{}_\iota-\frac{1}{3}t_1\,\partial_\kappa f^\lambda{}_\lambda\,\partial^\kappa f^\iota{}_\iota+\frac{2}{3}t_3\,\partial_\kappa f^\lambda{}_\lambda\,\partial^\kappa f^\iota{}_\iota+$$
$$2t_1\,\omega_{\iota\kappa\theta}\,\partial^\kappa f^{\iota\theta}-\frac{1}{3}t_1\,\omega_{\iota\alpha}{}^{\alpha}\,\partial^\kappa f^\iota{}_\kappa+\frac{2}{3}t_3\,\omega_{\iota\alpha}{}^{\alpha}\,\partial^\kappa f^\iota{}_\kappa-\frac{1}{3}t_1\,\omega_{\iota\lambda}{}^{\lambda}\,\partial^\kappa f^\iota{}_\kappa+$$
$$\frac{2}{3}t_3\,\omega_{\iota\lambda}{}^{\lambda}\,\partial^\kappa f^\iota{}_\kappa+\frac{1}{2}t_1\,\partial^\alpha f^\lambda{}_\kappa\,\partial^\kappa f_{\lambda\alpha}+\frac{1}{2}t_1\,\partial_\kappa f_\theta{}^{\lambda}\,\partial^\kappa f_\lambda{}^{\theta}+\frac{1}{2}t_1\,\partial_\kappa f^\lambda{}_\theta\,\partial^\kappa f_\lambda{}^{\theta}-$$
$$\frac{1}{3}t_1\,\partial^\alpha f^\lambda{}_\alpha\,\partial^\kappa f_{\lambda\kappa}+\frac{2}{3}t_3\,\partial^\alpha f^\lambda{}_\alpha\,\partial^\kappa f_{\lambda\kappa}+\frac{1}{3}r_2\,\partial_\kappa\omega^{\alpha\beta\theta}\,\partial^\kappa\omega_{\alpha\beta\theta}+$$
$$\frac{2}{3}r_2\,\partial_\kappa\omega^{\theta\alpha\beta}\,\partial^\kappa\omega_{\alpha\beta\theta}-\frac{2}{3}r_2\,\partial^\beta\omega_\iota{}^{\alpha\lambda}\,\partial_\lambda\omega_{\alpha\beta}{}^{\iota}+\frac{2}{3}r_2\,\partial^\beta\omega_\iota{}^{\lambda\alpha}\,\partial_\lambda\omega_{\alpha\beta}{}^{\iota}$$

	$\sigma^{\#1}_{0^+}$	$\tau^{\#1}_{0^+}$	$\tau^{\#2}_{0^+}$	$\sigma^{\#1}_{0^-}$
$\sigma^{\#1}_{0^+}\dagger$	$\frac{1}{(1+2k^2)^2 t_3}$	$-\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_3}$	0	0
$\tau^{\#1}_{0^+}\dagger$	$\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_3}$	$\frac{2k^2}{(1+2k^2)^2 t_3}$	0	0
$\tau^{\#2}_{0^+}\dagger$	0	0	0	0
$\sigma^{\#1}_{0^-}\dagger$	0	0	0	$\frac{1}{k^2 r_2-t_1}$

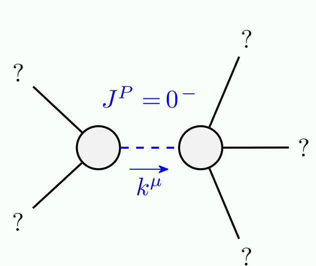
	$\sigma^{\#1}_{2^+}{}_{\alpha\beta}$	$\tau^{\#1}_{2^+}{}_{\alpha\beta}$	$\sigma^{\#1}_{2^-}{}_{\alpha\beta\chi}$
$\sigma^{\#1}_{2^+}\dagger^{\alpha\beta}$	$\frac{2}{(1+2k^2)^2 t_1}$	$-\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	0
$\tau^{\#1}_{2^+}\dagger^{\alpha\beta}$	$\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$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

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

Source constraints/gauge generators	
SO(3) irreps	Multiplicities
$\tau^{\#2}_{0^+}==0$	1
$\tau^{\#1}_{0^+}-2 i k\,\sigma^{\#1}_{0^+}==0$	1
$\tau^{\#2}_{1^-}{}^{\alpha}+2 i k\,\sigma^{\#2}_{1^-}{}^{\alpha}==0$	3
$\tau^{\#1}_{1^-}{}^{\alpha}==0$	3
$\tau^{\#1}_{1^+}{}^{\alpha\beta}+i k\,\sigma^{\#2}_{1^+}{}^{\alpha\beta}==0$	3
$\tau^{\#1}_{2^+}{}^{\alpha\beta}-2 i k\,\sigma^{\#1}_{2^+}{}^{\alpha\beta}==0$	5
Total constraints:	16

	$\omega^{\#1}_{0^+}$	$f^{\#1}_{0^+}$	$f^{\#2}_{0^+}$	$\omega^{\#1}_{0^-}$
$\omega^{\#1}_{0^+}\dagger$	t_3	$-i\sqrt{2}\,k t_3$	0	0
$f^{\#1}_{0^+}\dagger$	$i\sqrt{2}\,k t_3$	$2k^2 t_3$	0	0
$f^{\#2}_{0^+}\dagger$	0	0	0	0
$\omega^{\#1}_{0^-}\dagger$	0	0	0	$k^2 r_2-t_1$

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

$r_2<0$ && $t_1<0$