Particle spectrograph

Wave operator and propagator

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

Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\tau^{\#2}_{0^+} == 0$	1
$\tau^{\#1}_{0^+} == 0$	1
$\sigma^{\#1}_{0^+} == 0$	1
$\tau^{\#2\,\alpha}_{1^-} == 0$	3
$\tau^{\#1\,\alpha}_{1^-} == 0$	3
$\sigma^{\#2\,\alpha}_{1^-} == 0$	3
$\sigma^{\#1\,\alpha}_{1^-} == 0$	3
$\tau^{\#1\,\alpha\beta}_{1^+} + i\,k\,\sigma^{\#1\,\alpha\beta}_{1^+} == 0$	3
$\sigma^{\#1\,\alpha\beta}_{1^+} == \sigma^{\#2\,\alpha\beta}_{1^+}$	3
$\sigma^{\#1\,\alpha\beta\chi}_{2^-} == 0$	5
$\tau^{\#1\,\alpha\beta}_{2^+} == 0$	5
$\sigma^{\#1\,\alpha\beta}_{2^+} == 0$	5
Total constraints:	36

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

Quadratic (free) Lagrangian density

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

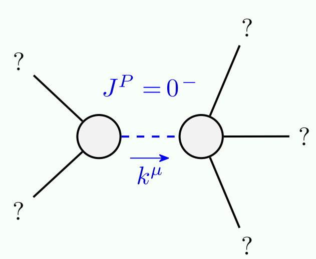
	$\sigma^{\#1}_{2^+\,\alpha\beta}$	$\tau^{\#1}_{2^+\,\alpha\beta}$	$\sigma^{\#1}_{2^-\,\alpha\beta\chi}$
$\sigma^{\#1}_{2^+}\dagger^{\alpha\beta}$	0	0	0
$\tau^{\#1}_{2^+}\dagger^{\alpha\beta}$	0	0	0
$\sigma^{\#1}_{2^-}\dagger^{\alpha\beta\chi}$	0	0	0

	$\sigma^{\#1}_{0^+}$	$\tau^{\#1}_{0^+}$	$\tau^{\#2}_{0^+}$	$\sigma^{\#1}_{0^-}$
$\sigma^{\#1}_{0^+}\dagger$	0	0	0	0
$\tau^{\#1}_{0^+}\dagger$	0	0	0	0
$\tau^{\#2}_{0^+}\dagger$	0	0	0	0
$\sigma^{\#1}_{0^-}\dagger$	0	0	0	$\frac{1}{k^2\,r_2+t_2}$

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

	$\omega^{\#1}_{0^+}$	$f^{\#1}_{0^+}$	$f^{\#2}_{0^+}$	$\omega^{\#1}_{0^-}$
$\omega^{\#1}_{0^+}\dagger$	0	0	0	0
$f^{\#1}_{0^+}\dagger$	0	0	0	0
$f^{\#2}_{0^+}\dagger$	0	0	0	0
$\omega^{\#1}_{0^-}\dagger$	0	0	0	$k^2\,r_2+t_2$

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

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