Particle spectrograph

Wave operator and propagator

	$\tau_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$	$\tau_{1^-}^{\#1}{}_{\alpha}$	$\tau_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	$-\frac{i\sqrt{2}\,k}{t_1+k^2 t_1}$	0	0	0	0
$\sigma_{1^+}^{\#2}{}^{\dagger\alpha\beta}$	$-\frac{-2k^2(2r_1+r_5)+it_1}{(1+k^2)^2 t_1{}^2}$	0	0	0	0
$\tau_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	$-\frac{-2k^4(2r_1+r_5)+k^2 t_1}{(1+k^2)^2 t_1{}^2}$	0	0	0	0
$\sigma_{1^-}^{\#1}{}^{\dagger\alpha}$	0	$\frac{\sqrt{2}}{t_1+2k^2 t_1}$	$\frac{\sqrt{2}}{t_1+2k^2 t_1}$	0	$\frac{2ik}{t_1+2k^2 t_1}$
$\sigma_{1^-}^{\#2}{}^{\dagger\alpha}$	0	$\frac{\sqrt{2}}{t_1+2k^2 t_1}$	$\frac{-2k^2(r_1+r_5)+t_1}{(t_1+2k^2 t_1)^2}$	$-\frac{i\sqrt{2}\,k(2k^2(r_1+r_5)-t_1)}{(t_1+2k^2 t_1)^2}$	
$\tau_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	0	0
$\tau_{1^-}^{\#2}{}^{\dagger\alpha}$	0	$-\frac{2ik}{t_1+2k^2 t_1}$	$\frac{i\sqrt{2}\,k(2k^2(r_1+r_5)+2k^2 t_1}{(t_1+2k^2 t_1)^2}$	0	$\frac{-4k^4(r_1+r_5)+2k^2 t_1}{(t_1+2k^2 t_1)^2}$

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

	$\omega_{0^+}^{\#1}$	$f_{0^+}^{\#1}$	$f_{0^+}^{\#2}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}{}^{\dagger}$	$-t_1$	$i\sqrt{2}\,k t_1$	0	0
$f_{0^+}^{\#1}{}^{\dagger}$	$-i\sqrt{2}\,k t_1$	$-2k^2 t_1$	0	0
$f_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\omega_{0^-}^{\#1}{}^{\dagger}$	0	0	0	$-t_1$

Quadratic (free) action

$$\mathcal{S}_F == \int\int\int\int(\tfrac{1}{6}(-6t_1\,\omega_{\iota}^{\alpha\prime}\,\omega_{\kappa\alpha}{}^{\kappa}-6t_1\,\omega_{\iota}^{\kappa\lambda}\,\omega_{\kappa\lambda}{}^{\prime}+6\,\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}-6r_5\,\partial_\iota\omega^{\kappa\lambda}{}_{\kappa}+6\,f^{\alpha\beta}\,\tau_{\alpha\beta}+6\,\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}-6r_5\,\partial_\iota\omega^{\kappa\lambda}{}_{\kappa}$$
$$\partial^\prime\omega_{\lambda}{}^{\alpha}{}_{\alpha}-4r_1\,\partial^\beta\omega^{\theta\alpha}{}_{\kappa}\,\partial_\theta\omega_{\alpha\beta}{}^{\kappa}-4r_1\,\partial_\theta\omega_{\alpha\beta}{}^{\kappa}\,\partial_\kappa\omega^{\theta\alpha\beta}-$$
$$6r_5\,\partial_\alpha\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_\kappa\omega^{\theta\kappa\lambda}+6r_5\,\partial_\alpha\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_\kappa\omega^{\kappa\lambda\theta}+$$
$$12r_5\,\partial_\theta\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_\kappa\omega^{\kappa\lambda\theta}-3t_1\,\partial^\alpha f_{\theta\kappa}\,\partial^\kappa f_{\alpha}{}^{\theta}-3t_1\,\partial^\alpha f^{\lambda}{}_{\kappa}\,\partial^\kappa f_{\alpha\lambda}+$$
$$6t_1\,\omega_{\kappa\alpha}{}^{\alpha}\,\partial^\kappa f^{\prime}{}_{\iota}+6t_1\,\omega_{\kappa\lambda}{}^{\lambda}\,\partial^\kappa f^{\prime}{}_{\iota}+12t_1\,\partial^\alpha f_{\kappa\alpha}\,\partial^\kappa f^{\prime}{}_{\iota}-6t_1\,\partial_\kappa f^{\lambda}{}_{\lambda}\,\partial^\kappa f^{\prime}{}_{\iota}+$$
$$12t_1\,\omega_{\iota\kappa\theta}\,\partial^\kappa f^{\prime\theta}-6t_1\,\omega_{\iota\alpha}{}^{\alpha}\,\partial^\kappa f^{\prime}{}_{\kappa}-6t_1\,\omega_{\iota\lambda}{}^{\lambda}\,\partial^\kappa f^{\prime}{}_{\kappa}+3t_1\,\partial^\alpha f^{\lambda}{}_{\kappa}\,\partial^\kappa f_{\lambda\alpha}+$$
$$3t_1\,\partial_\kappa f_{\theta}{}^{\lambda}\,\partial^\kappa f_{\lambda}{}^{\theta}+3t_1\,\partial_\kappa f^{\lambda}{}_{\theta}\,\partial^\kappa f_{\lambda}{}^{\theta}-6t_1\,\partial^\alpha f^{\lambda}{}_{\alpha}\,\partial^\kappa f_{\lambda\kappa}+4r_1\,\partial_\kappa\omega^{\alpha\beta\theta}\,\partial^\kappa\omega_{\alpha\beta\theta}-$$
$$4r_1\,\partial_\kappa\omega^{\theta\alpha\beta}\,\partial^\kappa\omega_{\alpha\beta\theta}+4r_1\,\partial^\beta\omega_{\iota}^{\alpha\lambda}\,\partial_\lambda\omega_{\alpha\beta}{}^{\prime}+$$
$$6r_5\,\partial_\alpha\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial^\lambda\omega^{\theta\kappa}{}_{\kappa}-16r_1\,\partial^\beta\omega_{\iota}^{\lambda\alpha}\,\partial_\lambda\omega_{\alpha\beta}{}^{\prime}+$$
$$6r_5\,\partial_\alpha\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial^\lambda\omega^{\theta\kappa}{}_{\kappa})[t,x,y,z]\,dz\,dy\,dx\,dt$$

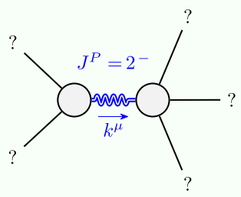
	$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$f_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\omega_{2^+}^{\#1}{}^{\dagger\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{ikt_1}{\sqrt{2}}$	0
$f_{2^+}^{\#1}{}^{\dagger\alpha\beta}$	$\frac{ikt_1}{\sqrt{2}}$	$k^2 t_1$	0
$\omega_{2^-}^{\#1}{}^{\dagger\alpha\beta\chi}$	0	0	$k^2 r_1+\frac{t_1}{2}$

	$\sigma_{0^+}^{\#1}$	$\tau_{0^+}^{\#1}$	$\tau_{0^+}^{\#2}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}{}^{\dagger}$	$-\frac{1}{(1+2k^2)^2 t_1}$	$-\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	0	0
$\tau_{0^+}^{\#1}{}^{\dagger}$	$-\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$	$-\frac{2k^2}{(1+2k^2)^2 t_1}$	0	0
$\tau_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\sigma_{0^-}^{\#1}{}^{\dagger}$	0	0	0	$-\frac{1}{t_1}$

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

	$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	$k^2(2r_1+r_5)-\frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$-\frac{ikt_1}{\sqrt{2}}$	0	0	0	0
$\omega_{1^+}^{\#2}{}^{\dagger\alpha\beta}$	$-\frac{t_1}{\sqrt{2}}$	0	0	0	0	0	0
$f_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	$\frac{ikt_1}{\sqrt{2}}$	0	0	0	0	0	0
$\omega_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	$k^2(r_1+r_5)-\frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	$ik t_1$
$\omega_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	0
$f_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	0	0	0	0
$f_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	0	$-ik t_1$	0	0	0

Massive and massless spectra



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

(No massless particles)

Unitarity conditions

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