Particle spectrograph

Wave operator and propagator

|	$\omega^{\#1}_{1^+\,\alpha\beta}$	$\omega^{\#2}_{1^+\,\alpha\beta}$	$f^{\#1}_{1^+\,\alpha\beta}$	$\omega^{\#1}_{1^-\,\alpha}$	$\omega^{\#2}_{1^-\,\alpha}$	$f^{\#1}_{1^-\,\alpha}$	$f^{\#2}_{1^-\,\alpha}$
$\omega^{\#1}_{1^+}\dagger^{\alpha\beta}$	$\frac{1}{6}\left(6\,k^2\,r_5+t_1+4\,t_2\right)$	$-\frac{t_1-2\,t_2}{3\,\sqrt{2}}$	$-\frac{i\,k\,(t_1-2\,t_2)}{3\,\sqrt{2}}$	0	0	0	0
$\omega^{\#2}_{1^+}\dagger^{\alpha\beta}$	$-\frac{t_1-2\,t_2}{3\,\sqrt{2}}$	$\frac{t_1+t_2}{3}$	$\frac{1}{3}\,i\,k\,(t_1+t_2)$	0	0	0	0
$f^{\#1}_{1^+}\dagger^{\alpha\beta}$	$\frac{i\,k\,(t_1-2\,t_2)}{3\,\sqrt{2}}$	$-\frac{1}{3}\,i\,k\,(t_1+t_2)$	$\frac{1}{3}\,k^2\,(t_1+t_2)$	0	0	0	0
$\omega^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	$k^2\,r_5-\frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	$i\,k\,t_1$
$\omega^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	0
$f^{\#1}_{1^-}\dagger^{\alpha}$	0	0	0	0	0	0	0
$f^{\#2}_{1^-}\dagger^{\alpha}$	0	0	0	$-i\,k\,t_1$	0	0	0

(left large combined table — wave operator blocks for $\sigma^{\#1}_{1^+}$, $\sigma^{\#2}_{1^+}$, $\tau^{\#1}_{1^+}$, $\sigma^{\#1}_{1^-}$, $\sigma^{\#1}_{1^-}$, $\tau^{\#1}_{1^-}$, $\tau^{\#1}_{1^-}$, $\tau^{\#2}_{1^-}$ …)

	$\omega^{\#1}_{0^+}$	$f^{\#2}_{0^+}$	$f^{\#1}_{0^+}$	$\omega^{\#1}_{0^-}$
$\omega^{\#1}_{0^+}\dagger$	0	0	0	$k^2\,r_2+t_2$
$f^{\#2}_{0^+}\dagger$	0	0	0	0
$f^{\#1}_{0^+}\dagger$	$i\,\sqrt{2}\,k\,t_1$	$-2\,k^2\,t_1$	0	0
$\omega^{\#1}_{0^-}\dagger$	$-t_1$	$-i\,\sqrt{2}\,k\,t_1$	0	0

	$\sigma^{\#1}_{0^+}$	$\tau^{\#1}_{0^+}$	$\tau^{\#2}_{0^+}$	$\sigma^{\#1}_{0^-}$
$\sigma^{\#1}_{0^+}\dagger$	$-\frac{1}{(1+2\,k^2)^2\,t_1}$	$\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_1}$	0	0
$\tau^{\#1}_{0^+}\dagger$	$-\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_1}$	$-\frac{2\,k^2}{(1+2\,k^2)^2\,t_1}$	0	0
$\tau^{\#2}_{0^+}\dagger$	0	0	0	0
$\sigma^{\#1}_{0^-}\dagger$	0	0	0	$\frac{1}{k^2\,r_2+t_2}$

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

Quadratic (free) Lagrangian density

(large Lagrangian density expression)

Source constraints/gauge generators

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

Massive and massless spectra
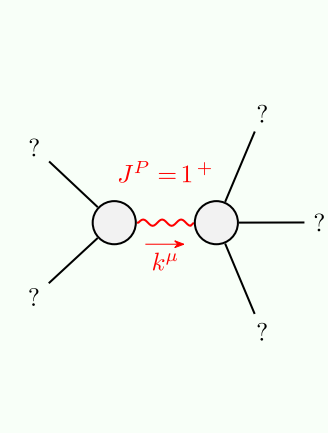
Massive particle	
Pole residue:	$\frac{-3\,t_1\,t_2\,(t_1+t_2)+3\,r_5\,(t_1{}^2+2\,t_2{}^2)}{r_5\,(t_1+t_2)\,(-3\,t_1\,t_2+2\,r_5\,(t_1+t_2))}>0$
Polarisations:	3
Square mass:	$-\frac{3\,t_1\,t_2}{2\,r_5\,t_1+2\,r_5\,t_2}>0$
Spin:	1
Parity:	Even

$J^P=1^+$
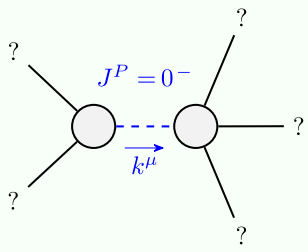
Massive particle	
Pole residue:	$-\frac{1}{r_2}>0$
Polarisations:	1
Square mass:	$-\frac{t_2}{r_2}>0$
Spin:	0
Parity:	Odd

$J^P=0^-$

(No massless particles)

Unitarity conditions

$r_2<0\ \&\&\ r_5>0\ \&\&\ t_1<0\ \&\&\ t_2>-t_1$