

Particle spectrograph

Wave operator and propagator

	$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#1}{}_{\alpha}$	$\omega_{1^+}^{\#2}{}_{\alpha}$	$f_{1^+}^{\#1}{}_{\alpha}$	$f_{1^+}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}_{\dagger}{}^{\alpha\beta}$	$k^2(2r_3+r_5)+\frac{2t_2}{3}$	$\frac{\sqrt{2}t_2}{3}$	$\frac{1}{3}i\sqrt{2}kt_2$	0	0	0	0
$\omega_{1^+}^{\#2}{}_{\dagger}{}^{\alpha\beta}$	$\frac{\sqrt{2}t_2}{3}$	$\frac{t_2}{3}$	$\frac{ikt_2}{3}$	0	0	0	0
$f_{1^+}^{\#1}{}_{\dagger}{}^{\alpha\beta}$	$-\frac{1}{3}i\sqrt{2}kt_2$	$-\frac{1}{3}ikt_2$	$\frac{k^2t_2}{3}$	0	0	0	0
$\omega_{1^+}^{\#1}{}_{\dagger}{}^{\alpha}$	0	0	0	$k^2(\frac{r_3}{2}+r_5)+\frac{2t_3}{3}$	$-\frac{\sqrt{2}t_3}{3}$	0	$-\frac{2}{3}ikt_3$
$\omega_{1^+}^{\#2}{}_{\dagger}{}^{\alpha}$	0	0	0	$-\frac{\sqrt{2}t_3}{3}$	$\frac{t_3}{3}$	0	$\frac{1}{3}i\sqrt{2}kt_3$
$f_{1^+}^{\#1}{}_{\dagger}{}^{\alpha}$	0	0	0	0	0	0	0
$f_{1^+}^{\#2}{}_{\dagger}{}^{\alpha}$	0	0	0	$\frac{2ikt_3}{3}$	$-\frac{1}{3}i\sqrt{2}kt_3$	0	$\frac{2k^2t_3}{3}$

$\sigma_0^{\#1}{}_{\dagger}$	$\tau_0^{\#1}{}_{\dagger}$	$\tau_0^{\#2}{}_{\dagger}$	$\sigma_0^{\#1}$
$\frac{1}{(1+2k^2)^2}t_3$	$-\frac{i\sqrt{2}k}{(1+2k^2)^2}t_3$	0	0
$\frac{i\sqrt{2}k}{(1+2k^2)^2}t_3$	$\frac{2k^2}{(1+2k^2)^2}t_3$	0	0
0	0	0	0
0	0	0	$\frac{1}{k^2r_2+t_2}$

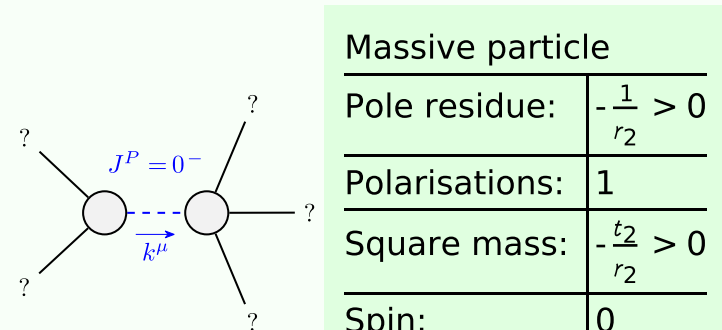
$\omega_0^{\#1}{}_{\dagger}$	$f_0^{\#1}{}_{\dagger}$	$f_0^{\#2}{}_{\dagger}$	$\omega_0^{\#1}$
$t_3$	$-i\sqrt{2}kt_3$	0	0
$i\sqrt{2}kt_3$	$2k^2t_3$	0	0
0	0	0	0
0	0	0	$k^2r_2+t_2$

$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$f_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^+}^{\#2}{}_{\alpha\beta\chi}$
$\frac{3k^2r_3}{2}$	0	0
0	0	0
0	0	0

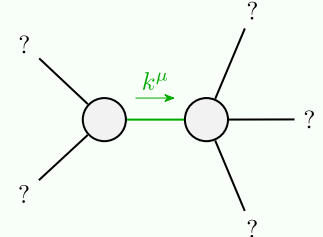
$\sigma_{2^+}^{\#1}{}_{\alpha\beta}$	$\tau_{2^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{2^+}^{\#1}{}_{\alpha\beta\chi}$
$-\frac{2}{3k^2r_3}$	0	0
0	0	0
0	0	0

Source constraints	Fundamental fields	Multiplicities
SO(3) irreps		
$\tau_{0^+}^{\#2} == 0$	$\partial_\beta\partial_\alpha\tau^{\alpha\beta} == 0$	1
$\tau_{0^+}^{\#1}{}_{\alpha\beta} - 2i k \sigma_{0^+}^{\#1}{}_{\alpha\beta} == 0$	$\partial_\beta\partial_\alpha\tau^{\alpha\beta} == \partial_\beta\partial^\beta\tau^{\alpha}_{\alpha} + 2\partial_\chi\partial^{\chi}\partial_\beta\sigma^{\alpha\beta}_{\alpha}$	1
$\tau_{1^+}^{\#2\alpha} + 2i k \sigma_{1^+}^{\#2\alpha} == 0$	$\partial_\chi\partial_\beta\partial^\alpha\tau^{\beta\chi} == \partial_\chi\partial^{\chi}\partial_\beta\tau^{\alpha\beta} + 2\partial_\delta\partial^\delta\partial_\chi\partial_\beta\sigma^{\alpha\beta\chi}$	3
$\tau_{1^+}^{\#1\alpha} == 0$	$\partial_\chi\partial_\beta\partial^\alpha\tau^{\beta\chi} == \partial_\chi\partial^{\chi}\partial_\beta\tau^{\beta\alpha}$	3
$\tau_{1^+}^{\#1\alpha\beta} + i k \sigma_{1^+}^{\#2\alpha\beta} == 0$	$\partial_\chi\partial^{\alpha,\beta\chi} + \partial_\chi\partial^{\beta,\chi\alpha} + \partial_\chi\partial^{\chi,\alpha\beta} + 2\partial_\delta\partial^\delta\partial_\chi\sigma^{\alpha\beta\chi} == \partial_\chi\partial^\alpha\tau^{\chi\beta} + \partial_\chi\partial^\beta\tau^{\chi\alpha} + \partial_\chi\partial^\chi\tau^{\alpha\chi} + \partial_\chi\partial^{\chi,\beta\alpha} + 2\partial_\delta\partial^\delta\partial_\chi\partial^\beta\sigma^{\alpha\chi\delta}$	3
$\sigma_{2^+}^{\#1\alpha\beta\chi} == 0$	$3\partial_\epsilon\partial_\delta\partial^{\chi}\partial^{\alpha}\sigma^{\beta\delta\epsilon} + 3\partial_\epsilon\partial^\epsilon\partial^{\chi}\partial^{\alpha}\sigma^{\beta\delta}_{\delta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\alpha\chi\delta} + 4\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\alpha\delta\chi} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\chi\delta\alpha} + 4\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\chi\delta\beta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\alpha\beta\delta} + 4\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\alpha\delta\beta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\beta\sigma^{\alpha\chi\beta} + 3\eta^{\alpha\chi}\partial_\phi\partial^{\phi}\partial_\epsilon\partial^\beta\sigma^{\delta\epsilon}_{\delta} + 3\eta^{\alpha\chi}\partial_\phi\partial^{\phi}\partial_\epsilon\partial_\delta\sigma^{\alpha\delta\epsilon} + 3\eta^{\beta\chi}\partial_\phi\partial^{\phi}\partial_\epsilon\partial^\delta\sigma^{\alpha\delta}_{\delta} == 3\partial_\epsilon\partial_\delta\partial^{\chi}\partial^\beta\sigma^{\alpha\delta\epsilon} + 3\partial_\epsilon\partial^\epsilon\partial^{\chi}\partial^\beta\sigma^{\alpha\delta}_{\delta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\beta\chi\delta} + 4\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\beta\chi\delta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\chi\delta\beta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\chi\delta\delta} + 4\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\beta\delta\alpha} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\beta\delta\beta} + 2\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\alpha\sigma^{\alpha\chi\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\delta} + 2\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\chi} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\delta} + 2\eta^{\alpha\beta}\partial_\epsilon\partial^\epsilon\partial_\delta\partial_\chi\tau^{\chi\delta} == 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\chi} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\delta}$	5
$\tau_{2^+}^{\#1\alpha\beta} == 0$	$4\partial_\delta\partial_\chi\partial^\beta\partial^{\alpha}\tau^{\chi\delta} + 2\partial_\delta\partial^\delta\partial_\chi\partial^\beta\partial^{\alpha}\tau^{\chi}_{\chi} + 3\partial_\delta\partial^\delta\partial_\chi\partial^{\alpha}\tau^{\chi\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^{\alpha}\tau^{\beta\chi} + 2\eta^{\alpha\beta}\partial_\epsilon\partial^\epsilon\partial_\delta\partial_\chi\tau^{\chi\delta} == 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\chi} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\alpha\beta} + 3\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau^{\chi\delta}$	5
Total constraints/gauge generators:		21

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



Quadratic pole	
Pole residue:	$-\frac{1}{r_3(2r_3+r_5)(r_3+2r_5)p^2} > 0$
Polarisations:	2

Unitarity conditions

$r_2 < 0 \&\& r_3 < 0 \&\& r_5 < -\frac{r_3}{2} \&\& t_2 > 0 \parallel r_2 < 0 \&\& r_3 < 0 \&\& r_5 > -2r_3 \&\& t_2 > 0 \parallel r_2 < 0 \&\& r_3 > 0 \&\& -2r_3 < r_5 < -\frac{r_3}{2} \&\& t_2 > 0$