Particle spectrograph

Wave operator and propagator

$$S = \int\int\int\int (\beta\, \mathcal{B}_{\alpha\beta}\, \mathcal{B}^{\alpha\beta} + f^{\alpha\beta}\, \tau_{\alpha\beta} + \mathcal{B}^{\alpha\beta}\, \mathcal{T}_{\alpha\beta} - \frac{1}{3}\,\alpha\,(2\,\partial_\alpha \mathcal{B}_{\alpha\chi} - \partial_\chi \mathcal{B}_{\alpha\beta})\,\partial^\chi \mathcal{B}^{\alpha\beta} - 2\,c_1\,(\partial_\beta f^{\chi}{}_{\alpha}\,\partial^\beta f^{\alpha}{}_{\chi} - 2\,\partial^\beta f^{\alpha}{}_{\alpha}\,\partial_\chi f_\beta{}^{\chi} + \partial_\beta f^{\alpha\beta}\,(\partial_\chi f^{\chi}{}_{\alpha} + 2\,\partial_\chi \mathcal{B}_\alpha{}^{\chi}) - \partial_\alpha \mathcal{B}^{\alpha\beta}\,\partial_\chi \mathcal{B}_\beta{}^{\chi} - 2\,\partial^\alpha f^{\alpha}{}_{\alpha}\,\partial_\chi \mathcal{B}_\beta{}^{\chi} + \partial_\alpha f_\chi{}^{\alpha}\,\partial^\chi f^{\alpha\beta} - 2\,\partial_\alpha \mathcal{B}_{\beta\chi}\,\partial^\chi f^{\alpha\beta} - \partial_\chi f_{\alpha\beta}\,\partial^\chi f^{\alpha\beta} - 2\,\partial_\chi \mathcal{B}_{\alpha\beta}\,\partial^\chi \mathcal{B}^{\alpha\beta}) + c_2\,(-2\,\partial_\beta f^{\alpha}{}_{\alpha}\,\partial^\beta f^{\chi}{}_{\chi} + 2\,\partial^\beta f^{\alpha}{}_{\alpha}\,\partial_\chi f_\beta{}^{\chi} - \partial_\alpha f_\chi{}^{\alpha}\,\partial^\chi f^{\alpha\beta} + 2\,\partial_\chi \mathcal{B}_\alpha{}^{\chi}) + \partial_\alpha \mathcal{B}^{\alpha\beta}\,\partial_\chi \mathcal{B}_\beta{}^{\chi} + 2\,\partial^\beta f^{\alpha}{}_{\alpha} - 2\,\partial_\chi f^{\alpha\beta}\,\partial^\chi f_{\alpha\beta} + 4\,\partial_\beta \mathcal{B}_{\alpha\chi}\,\partial^\chi f^{\alpha\beta} + \partial_\chi f_{\beta\alpha}\,\partial^\chi f^{\alpha\beta} - 2\,\partial_\chi f^{\alpha\beta}\,\partial^\chi \mathcal{B}_{\alpha\beta} + 3\,\partial_\beta \mathcal{B}_{\alpha\chi}\,\partial^\chi \mathcal{B}^{\alpha\beta} - \partial_\chi \mathcal{B}_{\alpha\beta}\,\partial^\chi \mathcal{B}^{\alpha\beta})\,)[t, x, y, z]\,dt\,dz\,dy\,dx\,dt$$

Spin-parity form	Covariant form	Multiplicities
$0^+\,\tau == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == 0$	1
$1^-\,\tau^\alpha == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^\chi \partial_\beta \tau^{\alpha\beta}$	3
$1^-\,\tau^\alpha == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^\chi \partial_\beta \tau^{\beta\alpha}$	3
Total expected gauge generators:		7

$2^+\,f_{\alpha\beta}$ (#1): $(2\,c_1 + c_2)\,k^2$ — $2^+\,\tau^{\alpha\beta}$ (#1): $\frac{1}{(2\,c_1+c_2)\,k^2}$

$2^+\,f^{\alpha\beta}$ (#1) — $2^+\,\tau^{\alpha\beta}$ (#1)

	$1^+\,\mathcal{J}_{\alpha\beta}$ (#1)	$1^+\,\tau_{\alpha\beta}$ (#1)	$1^-\,\mathcal{J}_\alpha$ (#1)	$1^-\,\tau_\alpha$ (#1)	$1^-\,\tau_\alpha$ (#2)
$1^+\,\mathcal{J}^{\alpha\beta}$ (#1)	$\frac{1}{\frac{k^2\,\alpha}{3}+\beta}$	$-\frac{3}{k^2\,\alpha+3\,\beta}$	0	0	0
$1^+\,\tau^{\alpha\beta}$ (#1)	$-\frac{3}{k^2\,\alpha+3\,\beta}$	$\frac{1}{(2\,c_1-c_2)\,k^2} + \frac{1}{\frac{k^2\,\alpha}{3}+\beta}$	0	0	0
$1^-\,\mathcal{J}^\alpha$ (#1)	0	0	$\frac{1}{\beta}$	0	0
$1^-\,\tau^\alpha$ (#1)	0	0	0	0	0
$1^-\,\tau^\alpha$ (#2)	0	0	0	0	0

	$1^+\,\mathcal{B}_{\alpha\beta}$ (#1)	$1^+\,f_{\alpha\beta}$ (#1)	$1^-\,\mathcal{B}_\alpha$ (#1)	$1^-\,f_\alpha$ (#1)	$1^-\,f_\alpha$ (#2)
$1^+\,\mathcal{B}^{\alpha\beta}$ (#1)	$\frac{1}{3}\,k^2\,(6\,c_1 - 3\,c_2 + \alpha) + \beta$	$(2\,c_1 - c_2)\,k^2$	0	0	0
$1^+\,f^{\alpha\beta}$ (#1)	$(2\,c_1 - c_2)\,k^2$	$(2\,c_1 - c_2)\,k^2$	0	0	0
$1^-\,\mathcal{B}^\alpha$ (#1)	0	0	β	0	0
$1^-\,f^\alpha$ (#1)	0	0	0	0	0
$1^-\,f^\alpha$ (#2)	0	0	0	0	0

	$0^+\,\tau$ (#1)	$0^+\,\tau$ (#2)
$0^+\,\tau^\dagger$ (#1)	$-\frac{1}{2\,(2\,c_1+c_2)\,k^2}$	0
$0^+\,\tau^\dagger$ (#2)	0	0

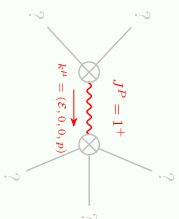
	$0^+\,f$ (#2)	
$0^+\,f$ (#1)	0	0
	$-2\,(2\,c_1 + c_2)\,k^2$	0

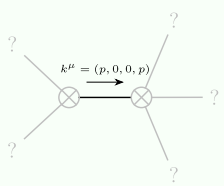
$0^+\,f^\dagger$ (#1) — $0^+\,f^\dagger$ (#2)

Massive and massless spectra

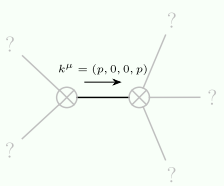
Massive particle

Parity:	Even
Spin:	1
Square mass:	$-\frac{3\,\beta}{\alpha} < 0$
Poleresidue:	$\frac{6}{\alpha} > 0$





Massless particle



Massless particle

Poleresidue:	$\frac{1}{2\,c_1+c_2} > 0$
Polarisations:	2

Poleresidue:	$\frac{1}{2\,c_1-c_2} > 0$
Polarisations:	1

Unitarity conditions