Particle spectrograph

Wave operator and propagator

Quadratic (free) action

$$S == \int\int\int\int (h^{\alpha\beta}\,\mathcal{T}_{\alpha\beta} + \beta\,\partial_\alpha h^{\alpha\beta}\,\partial_\chi h_\beta{}^\chi + \tfrac{1}{2}\,\alpha\,(\partial_\beta h^\chi{}_\chi\,\partial^\beta h^\alpha{}_\alpha - 2\,\partial^\beta h^\alpha{}_\alpha\,\partial_\chi h_\beta{}^\chi - \partial_\chi h_{\alpha\beta}\,\partial^\chi h^{\alpha\beta}))[t, x, y, z]\,dz\,dy\,dx\,dt$$

	$\mathcal{T}_{0^+}^{\#2}\dagger$	$\mathcal{T}_{0^+}^{\#1}\dagger$
$\mathcal{T}_{0^+}^{\#2}$	0	$\frac{1}{\alpha k^2}$
$\mathcal{T}_{0^+}^{\#1}$	$\frac{1}{(-\alpha+\beta)\,k^2}$	0

	$h_{0^+}^{\#1}$	$h_{0^+}^{\#2}$
$h_{0^+}^{\#1}\dagger$	$\alpha\,k^2$	0
$h_{0^+}^{\#2}\dagger$	0	$(-\alpha+\beta)\,k^2$

	$h_{1^-}^{\#1}{}_\alpha$
$h_{1^-}^{\#1}\dagger^\alpha$	$\frac{1}{2}\,(-\alpha+\beta)\,k^2$

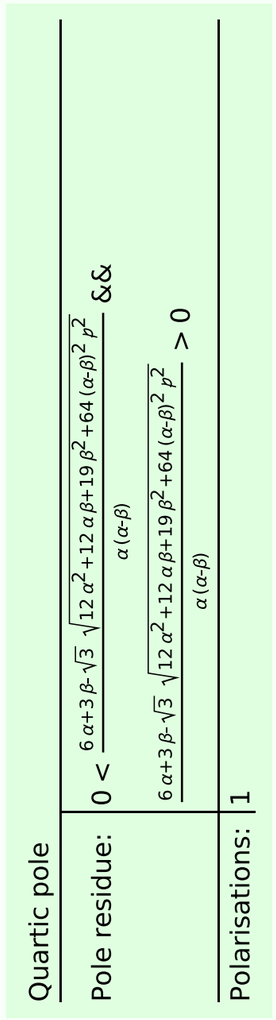
	$\mathcal{T}_{1^-}^{\#1}{}_\alpha$
$\mathcal{T}_{1^-}^{\#1}\dagger^\alpha$	$-\frac{2}{(\alpha-\beta)\,k^2}$

	$h_{2^+}^{\#1}{}_{\alpha\beta}$
$h_{2^+}^{\#1}\dagger^{\alpha\beta}$	$-\frac{\alpha\,k^2}{2}$

	$\mathcal{T}_{2^+}^{\#1}{}_{\alpha\beta}$
$\mathcal{T}_{2^+}^{\#1}\dagger^{\alpha\beta}$	$-\frac{2}{\alpha\,k^2}$

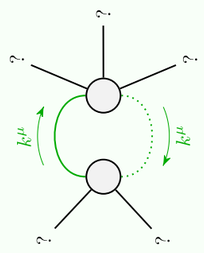
(No source constraints)

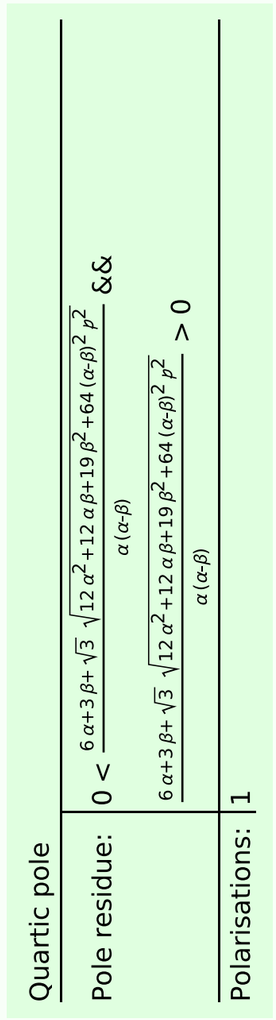
Massive and massless spectra



Quartic pole

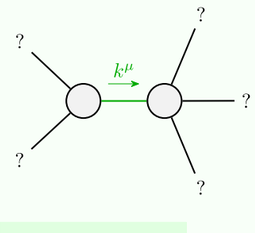
Pole residue:	$0 < \frac{6\,\alpha+3\,\beta-\sqrt{3}\,\sqrt{12\,\alpha^2+12\,\alpha\,\beta+19\,\beta^2+64\,(\alpha-\beta)^2\,p^2}}{\alpha\,(\alpha-\beta)}$ && $\frac{6\,\alpha+3\,\beta-\sqrt{3}\,\sqrt{12\,\alpha^2+12\,\alpha\,\beta+19\,\beta^2+64\,(\alpha-\beta)^2\,p^2}}{\alpha\,(\alpha-\beta)} > 0$
Polarisations:	1





Quartic pole

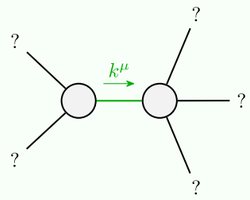
Pole residue:	$0 < \frac{6\,\alpha+3\,\beta+\sqrt{3}\,\sqrt{12\,\alpha^2+12\,\alpha\,\beta+19\,\beta^2+64\,(\alpha-\beta)^2\,p^2}}{\alpha\,(\alpha-\beta)}$ && $\frac{6\,\alpha+3\,\beta+\sqrt{3}\,\sqrt{12\,\alpha^2+12\,\alpha\,\beta+19\,\beta^2+64\,(\alpha-\beta)^2\,p^2}}{\alpha\,(\alpha-\beta)} > 0$
Polarisations:	1



Quadratic pole

Pole residue:	$-\frac{2\,\alpha-\beta+\sqrt{20\,\alpha^2-36\,\alpha\,\beta+17\,\beta^2}}{\alpha^2-\alpha\,\beta} > 0$
Polarisations:	1

(No massive particles)



Quadratic pole

Pole residue:	$-\frac{1}{\alpha} > 0$
Polarisations:	2

Quadratic pole

Pole residue:	$\frac{-2\,\alpha+\beta+\sqrt{20\,\alpha^2-36\,\alpha\,\beta+17\,\beta^2}}{\alpha\,(\alpha-\beta)} > 0$
Polarisations:	1

Quadratic pole

Pole residue:	$-\frac{1}{\alpha} + \frac{5}{-\alpha+\beta} > 0$
Polarisations:	1

Quadratic pole

Pole residue:	$\frac{1}{\alpha} + \frac{1}{\alpha-\beta} > 0$
Polarisations:	2

Quadratic pole

Pole residue:	$\frac{1}{\alpha} + \frac{5}{\alpha-\beta} > 0$
Polarisations:	1

Hexic pole

Pole residue:	$0 < \frac{2\,\alpha+\beta}{\alpha^2-\alpha\,\beta}$ && $\frac{2\,\alpha+\beta}{\alpha^2-\alpha\,\beta} > 0$
Polarisations:	1

Quartic pole

Pole residue:	$0 < \frac{\beta}{\alpha^2-\alpha\,\beta}$ && $\frac{\beta}{\alpha^2-\alpha\,\beta} > 0$
Polarisations:	2

Quadratic pole

Pole residue:	$-\frac{1}{\alpha} + \frac{1}{-\alpha+\beta} > 0$
Polarisations:	2

Unitarity conditions

(Unitarity is demonstrably impossible)