Particle spectrograph

Wave operator and propagator

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

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

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

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

(No source constraints)

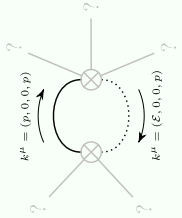
	${}^{\#1}2^+\mathcal{T}\dagger{}^{\alpha\beta}$
${}^{\#1}2^+\mathcal{T}_{\alpha\beta}$	$-\frac{2}{\alpha\ k^2}$

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

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

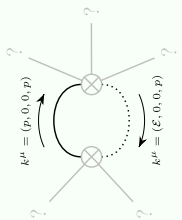
Massive and massless spectra

(No particles)



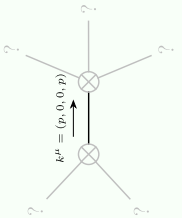
Quartic pole

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



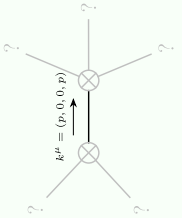
Quartic pole

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



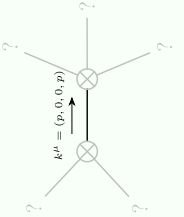
Massless particle

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



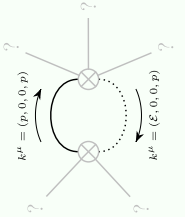
Massless particle

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



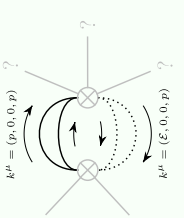
Massless particle

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



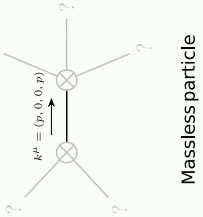
Quartic pole

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



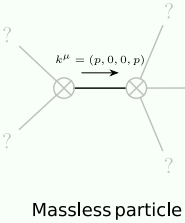
Hexic pole

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



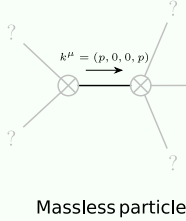
Massless particle

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



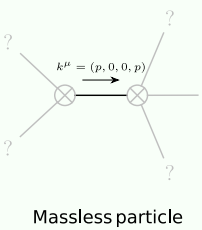
Massless particle

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



Massless particle

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



Massless particle

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

Unitarity conditions