

Particle spectrograph

Wave operator and propagator

Quadratic (free) action

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

Source constraints

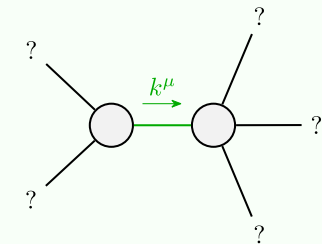
SO(3) irreps	Fundamental fields	Multiplicities
$\mathcal{T}^{\#2}_{0^+} == 0$	$\partial_\beta \partial_\alpha \mathcal{T}^{\alpha\beta} == 0$	1
$\mathcal{T}^{\#1\alpha}_{1^-} == 0$	$\partial_\chi \partial_\beta \partial^\alpha \mathcal{T}^{\beta\chi} == \partial_\chi \partial^\chi \partial_\beta \mathcal{T}^{\alpha\beta}$	3
Total constraints/gauge generators:		4

$$\begin{array}{c} \mathcal{T}^{\#1\alpha}_{1^-} \\ \mathcal{T}^{\#1\alpha}_{1^-} \uparrow \alpha \end{array} \begin{array}{|c|} \hline 0 \\ \hline \end{array} \begin{array}{c} h^{\#1}_{1^-} \\ h^{\#1}_{1^-} \uparrow \alpha \end{array} \begin{array}{|c|} \hline 0 \\ \hline \end{array} \begin{array}{c} h^{\#1}_{1^-} \end{array}$$

$$\begin{array}{c} \mathcal{T}^{\#1}_{0^+} \quad \mathcal{T}^{\#2}_{0^+} \\ \mathcal{T}^{\#1}_{0^+} \uparrow \alpha\beta \quad \mathcal{T}^{\#2}_{0^+} \uparrow \alpha\beta \end{array} \begin{array}{|c|c|} \hline \frac{1}{\alpha k^2} & 0 \\ \hline 0 & 0 \\ \hline \end{array} \begin{array}{c} \mathcal{T}^{\#1}_{2^+} \uparrow \alpha\beta \\ \mathcal{T}^{\#1}_{2^+} \uparrow \alpha\beta \end{array} \begin{array}{|c|} \hline -\frac{2}{\alpha k^2} \\ \hline \end{array}$$

$$\begin{array}{c} h^{\#1}_{0^+} \quad h^{\#2}_{0^+} \\ h^{\#1}_{0^+} \uparrow \alpha\beta \quad h^{\#2}_{0^+} \uparrow \alpha\beta \end{array} \begin{array}{|c|c|} \hline \alpha k^2 & 0 \\ \hline 0 & 0 \\ \hline \end{array} \begin{array}{c} h^{\#1}_{2^+} \uparrow \alpha\beta \\ h^{\#1}_{2^+} \uparrow \alpha\beta \end{array} \begin{array}{|c|} \hline -\frac{\alpha k^2}{2} \\ \hline \end{array}$$

Massive and massless spectra



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

(No massive particles)

Unitarity conditions

$$\alpha < 0$$