

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

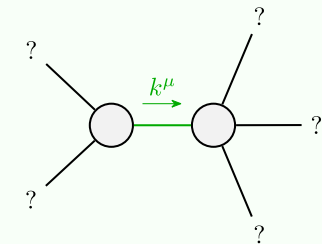
| SO(3) irreps | Fundamental fields | Multiplicities |
|--------------------------------------|--|----------------|
| $\mathcal{T}^{\#2}_{0^+} == 0$ | $\partial_\beta \partial_\alpha \mathcal{T}^{\alpha\beta} == 0$ | 1 |
| $\mathcal{T}^{\#1\alpha}_{1^-} == 0$ | $\partial_\chi \partial_\beta \partial^\alpha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

$$\begin{array}{cc} \mathcal{T}^{\#1\alpha}_{1^-} & h^{\#1}_{1^-} \\ \mathcal{T}^{\#1}_{1^-} + \alpha & h^{\#1}_{1^-} + \alpha \\ \boxed{0} & \boxed{0} \end{array}$$

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

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

Massive and massless spectra



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

(No massive particles)

Unitarity conditions

$$\alpha < 0$$