

Particle spectrograph

Wave operator and propagator

Quadratic (free) action

$$S_{==}$$

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

Diagram illustrating the construction of a linear system matrix (2x2 blocks) for the case with no source constraints. The matrix is composed of four blocks, each representing a 2x2 sub-matrix of variables.

Top-Left Block (Red): Variables $h_0^{#1}$ and $h_0^{#2}$ are constrained by the equations:

$$\begin{bmatrix} -2\beta + \alpha k^2 & -\sqrt{3}\beta \\ -\sqrt{3}\beta & 0 \end{bmatrix} \begin{bmatrix} h_0^{#1} \\ h_0^{#2} \end{bmatrix} = \begin{bmatrix} \tau_{2^+}^{#1} + \alpha\beta \\ \tau_{2^+}^{#1} + \alpha\beta \end{bmatrix}$$

Top-Right Block (Blue): Variables $h_2^{#1}$ and $h_2^{#2}$ are constrained by the equations:

$$\begin{bmatrix} \frac{1}{\beta - \frac{\alpha k^2}{2}} & \frac{1}{\beta - \frac{\alpha k^2}{2}} \\ \frac{1}{\beta - \frac{\alpha k^2}{2}} & \frac{1}{\beta - \frac{\alpha k^2}{2}} \end{bmatrix} \begin{bmatrix} h_2^{#1} \\ h_2^{#2} \end{bmatrix} = \begin{bmatrix} \tau_{1^+}^{#1} + \alpha \\ \tau_{1^+}^{#1} + \alpha \end{bmatrix}$$

Bottom-Left Block (Blue): Variables $h_1^{#1}$ and $h_1^{#2}$ are constrained by the equations:

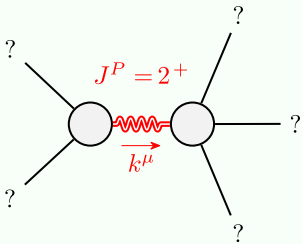
$$\begin{bmatrix} \frac{1}{\beta} & \frac{1}{\beta} \\ \frac{1}{\beta} & \frac{1}{\beta} \end{bmatrix} \begin{bmatrix} h_1^{#1} \\ h_1^{#2} \end{bmatrix} = \begin{bmatrix} \tau_{0^+}^{#1} + \tau_{0^+}^{#2} \\ \tau_{0^+}^{#1} + \tau_{0^+}^{#2} \end{bmatrix}$$

Bottom-Right Block (Red): Variables $h_0^{#1}$ and $h_0^{#2}$ are constrained by the equations:

$$\begin{bmatrix} -\frac{1}{\sqrt{3}\beta} & 0 \\ \frac{2\beta\alpha k^2}{3\beta^2} & -\frac{1}{\sqrt{3}\beta} \end{bmatrix} \begin{bmatrix} h_0^{#1} \\ h_0^{#2} \end{bmatrix} = \begin{bmatrix} \tau_{0^+}^{#1} + \tau_{0^+}^{#2} \\ \tau_{0^+}^{#1} + \tau_{0^+}^{#2} \end{bmatrix}$$

The entire system is subject to the constraint: (No source constraints).

Massive and massless spectra



Massive particle	
Pole residue:	$-\frac{2}{\alpha} > 0$
Polarisations:	5
Square mass:	$\frac{2\beta}{\alpha} > 0$
Spin:	2
Parity:	Even

(No massless particles)

Unitarity conditions

$$\alpha < 0 \ \&\& \ \beta < 0$$