

# Particle spectrograph

## Wave operator and propagator

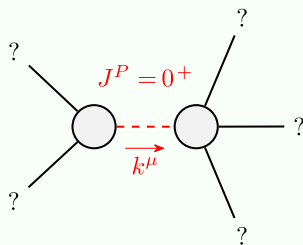
Quadratic (free) action

$$S = \iiint \int (\gamma \mathcal{B}_\alpha \mathcal{B}^\alpha + \mathcal{B}^\alpha \mathcal{J}_\alpha + \beta \partial_\alpha \mathcal{B}^\alpha \partial_\beta \mathcal{B}^\beta) [t, x, y, z] dz dy dx dt$$

(No source constraints)

$$\mathcal{J}_0^{\#1} + \boxed{\frac{1}{\gamma + \beta k^2}} \mathcal{B}_1^{\#1} + \alpha \boxed{\gamma} \mathcal{B}_1^{\#1} + \alpha \boxed{\gamma} \mathcal{B}_1^{\#1} + \alpha \boxed{\gamma + \beta k^2} \mathcal{B}_0^{\#1}$$

## Massive and massless spectra



Massive particle

Pole residue:	$\frac{1}{\beta} > 0$
Polarisations:	1
Square mass:	$-\frac{\gamma}{\beta} > 0$
Spin:	0
Parity:	Even

(No massless particles)

## Unitarity conditions

$$\beta > 0 \ \&\& \ \gamma < 0$$