

# Particle spectrograph

## Wave operator and propagator

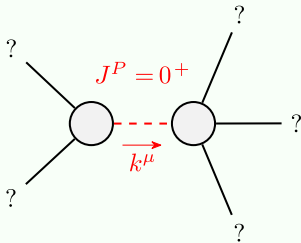
Quadratic (free) action

$$S = \iiint (\phi(-\beta\phi + \rho) + \alpha \partial_\alpha \phi \partial^\alpha \phi) [t, x, y, z] dz dy dx dt$$

(No source constraints)

$$\phi_{0+}^{\#1} \dagger \boxed{-\beta + \alpha k^2} \rho_{0+}^{\#1} \dagger \boxed{\frac{1}{-\beta + \alpha k^2}}$$

## Massive and massless spectra



Massive particle

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

(No massless particles)

## Unitarity conditions

$$\alpha > 0 \ \&\& \ \beta > 0$$