

# Particle spectrograph

## Wave operator and propagator

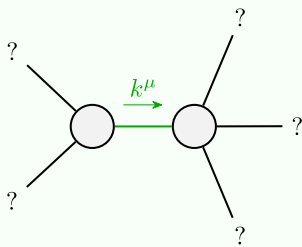
Quadratic (free) action

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

(No source constraints)

$$\phi_0^{\#1} \dagger \boxed{\alpha k^2} \phi_0^{\#1}$$
$$\rho_0^{\#1} \dagger \boxed{\frac{1}{\alpha k^2}} \rho_0^{\#1}$$

## Massive and massless spectra



Quadratic pole

Pole residue:	$\frac{1}{\alpha} > 0$
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Polarisations:	1
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(No massive particles)

## Unitarity conditions

$$\alpha > 0$$