

Particle spectrograph

Wave operator and propagator

Quadratic (free) action

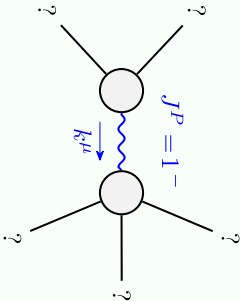
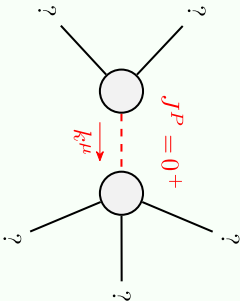
$$S = \iiint (\mathcal{V} \mathcal{B}_\alpha \mathcal{B}^\alpha + \mathcal{B}^\alpha \mathcal{J}_\alpha + \beta \partial_\alpha \mathcal{B}^\alpha \partial_\beta \mathcal{B}^\beta + \alpha \partial_\beta \mathcal{B}_\alpha \partial^\beta \mathcal{B}^\alpha) [t, x, y, z] dz dy dx dt$$

$\mathcal{B}_{0+}^{\#1} + \boxed{\gamma + (\alpha + \beta) k^2}$

(No source constraints)

$\mathcal{J}_{0+}^{\#1} + \boxed{\frac{1}{\gamma + (\alpha + \beta) k^2}}$
 $\mathcal{B}_{1-}^{\#1} + \alpha \boxed{\gamma + \alpha k^2}$
 $\mathcal{J}_{1-}^{\#1} + \alpha \boxed{\frac{1}{\gamma + \alpha k^2}}$
 $\mathcal{J}_{1-}^{\#1}$

Massive and massless spectra



(No massless particles)

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

| Massive particle | |
|------------------|------------------------------|
| Pole residue: | $-\frac{1}{\alpha} > 0$ |
| Polarisations: | 3 |
| Square mass: | $-\frac{\gamma}{\alpha} > 0$ |
| Spin: | 1 |
| Parity: | Odd |

Unitarity conditions

(Unitarity is demonstrably impossible)