

Interacting Fields

In real world, fields interact!

We will require that:

- (A) Interactions are local:
products of fields at some space-time point.

$$H_{int} = \int d^3x \mathcal{H}_{int}[\phi(x)] = - \int d^3x \mathcal{L}_{int}[\phi(x)]$$

(Otherwise violate causality.)

- (B) Here we will focus on $\mathcal{H}_{int} = -\mathcal{L}_{int}$
that are functions of fields only, not derivatives.
(many interesting systems don't satisfy this...)

EXAMPLE 4

$$\mathcal{L} = \frac{1}{2} (\partial_\mu \phi)^2 - \frac{1}{2} m^2 \phi^2 - \frac{\lambda}{4!} \phi^4$$

(lambda phi fourth theory)

Consider dimensional analysis