Coleman Lecture 10: Model III, Mass Renormalization, Feynman Diagrams

December-22-11
3:59 PM

$\mathcal{H}_I = g \psi^* \psi \phi f(t)$

"The effective mass of a balloon in a fluid is half the mass of the fluid displaced by it"
See Wikipedia: "Added mass", "Basset force".

Also, "Abrahams work on the electron theory of Lorentz" describes a renormalization of the mass of the electron due to the motion its own motion induces on the E-M field.

$\mathcal{L}_F = (\partial^\mu \phi \partial_\mu \phi - \mu_0^2 \phi^2) + \ldots$

The physical mass of a meson will <u>not</u> be μ_0

$\mathcal{L} \mapsto \mathcal{L} + \underbrace{f(t)(a + b\phi^2 + c\psi^*\psi)}_{\text{counter terms}}$

a is determined by $\langle 0|S|0\rangle = 1$

b —||— no phase mismatches for one mesons.

c —||— .... one nucleon.

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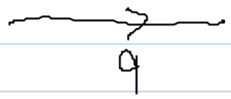
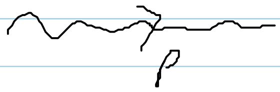
Continued Jan 10, 2012:

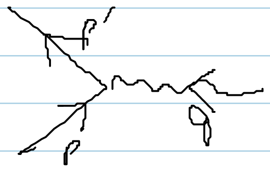
Feynman rules for $g\phi\psi^*\psi$



$\longrightarrow \int \frac{d^4q}{(2\pi)^4} \frac{i}{q^2-\mu^2+i\epsilon}$



$\longrightarrow$ same w/ p



$\longrightarrow -ig(2\pi)^4\,\delta(p'-(p+q))$

+ mass counterterms $ic\,\delta(p'-p)$

$ib\,\delta(q'-q)$

A discussion of all Feynman diagrams up to order g^2.