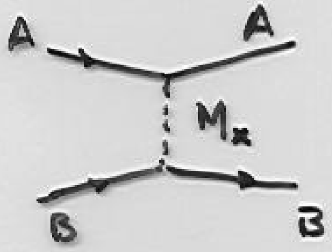
AMPLITUDE DE DIFUSÃO NO POTENCIAL DE YUKAWA

Potencial : $V(r) = -\frac{g^2}{4\pi}\frac{e^{-r/R}}{r}$ $\quad R = \hbar/M_x$



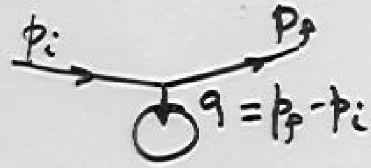
constante de acoplamento

$$\alpha_x = \frac{g^2}{4\pi\hbar c}$$

Teoria de perturbações ($1^{\underline{a}}$ ordem) : (troca de uma partícula)

amplitude de difusão no potencial $V(x)$

$$\mathcal{M}(\vec{q}) = \int d^3x\, V(x)\, \exp\left[i\vec{q}\cdot\vec{x}/\hbar\right]$$



Temos : $\vec{q}\cdot\vec{x} = |q|\, r\cos\theta$

$$d^3x = r^2 \operatorname{sen}\theta\, d\theta\, dr\, d\phi$$

Result.:

$$\mathcal{M}(\vec{q}) = \frac{-g^2\hbar^2}{|q|^2 + M_x^2 c^2}$$

Quando $M_x^2 c^2 >> |q|^2$: $\equiv$ (Alcance << λ de Broglie)

$$\frac{\hbar}{M_x c} << \frac{\hbar}{q}$$

$$\mathcal{M}(\vec{q}) = -G = -\frac{g^2\hbar^2}{M_x^2 c^2}$$

Define-se :

$$\frac{G}{(\hbar c)^3} = \frac{1}{\hbar c}\left(\frac{g}{M_x c^2}\right)^2 = \frac{4\pi\alpha_x}{(M_x c^2)^2}$$

dimensão E^{-2}

Constante de Fermi das interacções fracas

$$\frac{G_F}{(\hbar c)^3} = 1.166\times 10^{-5}\ \text{GeV}^{-2}$$