Il processo $e^+e^- \to \mu^+\mu^-$ in approssimazione di Born nel Modello Standard

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ABSTRACT

I Introduzione

$$|\mathcal{M}|^2 = |\mathcal{M}_1 + \mathcal{M}_2 + \mathcal{M}_3 + \mathcal{M}_4|^2 \tag{1}$$

II L'interazione con il campo scalare

$$\mathcal{L}_s = (D_\mu \Phi)^\dagger D^\mu \Phi + \frac{\lambda}{4!}\left(|\Phi|^2 + F^2\right)^2, \quad \lambda > 0 \tag{2}$$

$$\Phi = \begin{pmatrix} 0 \\ F \end{pmatrix} + \begin{pmatrix} \phi_1 \\ \phi_2 \end{pmatrix} = \begin{pmatrix} 0 \\ F \end{pmatrix} + \frac{1}{\sqrt{2}} \begin{pmatrix} \sqrt{2}\phi_1 \\ H + i\phi^0 \end{pmatrix} \tag{3}$$

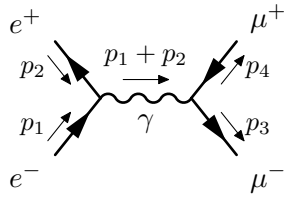
$$\mathcal{L}_{sf} = \sum_{i=e,\mu} y_i \bar{\psi}_{i,L} \Phi \psi_{i,R} + h.c. \tag{4}$$

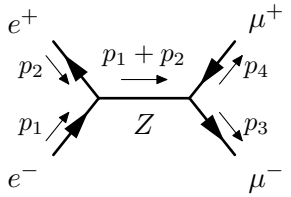
$$y_j = \frac{1}{\sqrt{2}} g \frac{m_j}{M_W} \tag{5}$$

$$\begin{aligned} \mathcal{L}_{sf} \Longrightarrow & \frac{y_j}{\sqrt{2}} \begin{pmatrix} \bar{\nu}_j & \bar{\ell}_j \end{pmatrix} \left(\frac{1+\gamma^5}{2}\right) \begin{pmatrix} - \\ \sqrt{2}F + H + i\phi^0 \end{pmatrix} \left(\frac{1+\gamma^5}{2}\right) \ell_j + h.c. \\ = & y_j \bar{\ell}_j F \ell_j + \frac{y_j}{\sqrt{2}} \bar{\ell}_j H \ell_j + i \frac{y_j}{\sqrt{2}} \bar{\ell}_j \gamma^5 \phi^0 \ell_j \end{aligned} \tag{6}$$

$$\frac{m_\mu}{M_W} \simeq 10^{-3} \tag{7}$$

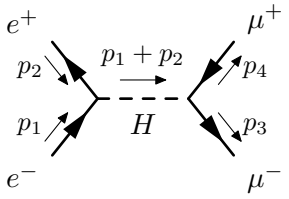
III La sezione d'urto differenziale





$$\begin{aligned} \frac{1}{4}\sum_{Spin}|\mathcal{M}_1|^2 = & \frac{1}{4}e^4 \frac{1}{(p_1+p_2)^2} \mathrm{tr}\left\{\left(\not{p}_2 + m_e\right)\gamma^\nu\left(\not{p}_1 - m_e\right)\gamma^\mu\right\} \\ & \times \mathrm{tr}\left\{\left(\not{p}_4 - m_\mu\right)\gamma_\nu\left(\not{p}_3 + m_\mu\right)\gamma_\mu\right\} \end{aligned} \tag{8}$$

IV L'ampiezza del diagramma con linea interna di Higgs



Riferimenti bibliografici

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