The $e^+e^- \to \mu^+\mu^-$ Cross Section in the Standard Model

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Abstract

The Standard Model's (SM) prediction of particles beyond those initially considered by quantum electrodynamics (QED) has yielded excellent results. The Super Proton Synchrotron (SPS) at CERN recently detected both the W bosons and the Z boson via the $p\bar{p}$ mechanism (Rubbia, van der Meer et al.). We performed a numerical integration of the differential cross section of the $e^+e^- \to \mu^+\mu^-$ scattering process which may produce Z bosons in the hope that the proposed Large Electron-Positron collider (LEP) will verify this channel of Z production. A distinct Z resonance around the Z mass of 91.8GeV was found with a cross section $\sigma = 9.4\text{nb}^{-1}$.

1   Introduction

The proposition of three mediators of the weak nuclear force, the W^+, W^- and Z bosons, has been all but proven by the current team at CERN operating the SPS. The suggestion of Z production via electron-positron pairs is now becoming of interest to experimentalists. The process itself manifests itself by an electron-position pair (e^-e^+) annihilating, forming either a virtual photon or Z boson, then a muon-antimuon pair $(\mu^-\mu^+)$ being produced.

1.1   History

History.

2   LaTeX

TeX

2.1   Usage

Usage.

References