PRECISION MEASUREMENTS OF THE $e^+e^- \to \pi^+\pi^-(\gamma)$ CROSS SECTION WITH THE KLOE DETECTOR

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Abstract

The muon anomalous magnetic moment is one of the most precisely measured quantities in particle physics and a persistent discrepancy of about 3 σ between standard model (SM) prediction and the experimental measurement has been observed. The leading order contribution $a_\mu^{\rm hlo}$ is actually the main source of uncertainty in the theoretical evaluation of the muon anomaly. It is obtained by a dispersion integral using the precision measurement of hadronic cross section. The KLOE experiment at the DAFNE $\phi - factory$ in Frascati was the first to exploit Initial State Radiation (ISR) processes to obtain the $e^+e^- \to \pi^+\pi^-(\gamma)$ cross section below 1 GeV, that accounts for most (70%) of the leading order contribution to the muon anomaly. In year 2005 and 2008 the KLOE-collaboration has published two measurements of the $\pi^+\pi^-$ cross section with the photon in the initial state emitted at small angle, and an independent measurement with the photon emitted at large angle was finalized in year 2011. These measurements were normalized to the DAFNE luminosity. In the last years, a new analysis of KLOE data has been performed for obtaining the pion form factor directly from the bin-by-bin $\pi^+\pi\gamma$ to $\mu^+\mu\gamma$ ratio. We present the final results of this new measurement, showing the comparison with our previous measurements, and its impact on the hadronic contribution to the muon anomaly.