Contribution ID : **8** Type : **Oral presentation**

Mesurement of the π+π- cross section at BESIII

Wednesday, 17 June 2015 08:25 (0:20)

Content

Precise hadronic cross section measurements are an important input for the standard model prediction of $(g-2)_\mu$.
Especially, the most important hadronic cross section as input for $(g-2)\mu$, $\sigma_{\pi\pi} = \sigma(e^+e^- \to \pi^+\pi^-)$, has been measured over decades with ever increasing accuracy at accelerators in Novosibirsk, Orsay, and Frascati. More recently, the two most accurate measurements have been obtained by the KLOE collaboration in Frascati, and the BABAR collaboration at SLAC. Both experiments claim an accuracy of better than 1% in the energy range below 1 GeV, in which the $\rho(770)$ resonance is dominating the hadronic cross section. However, a discrepancy of approximately 3% on the peak of the $\rho(770)$ resonance is observed. The discrepancy is even increasing towards higher energies.
Unfortunately, this discrepancy is limiting our current knowledge of $a_\mu \equiv (g-2)\mu/2$, which is a famous precision observable of the Standard Model (SM). The accuracy of the SM prediction of $(g-2)\mu$, is entirely limited by the knowledge of the hadronic vacuum polarization contribution, which is obtained in a dispersive framework by using experimental R-ratio data on $\sigma(e^+e^- \to \text{hadrons})$. The cross section $\sigma_{\pi\pi}$ contributes more than 70% to this dispersion relation and, hence, is the by far most important exclusive hadronic channel of the total hadronic cross section. Currently, a discrepancy of 3.6 standard deviations is found between the direct measurement of a_μ and its SM prediction. However, the discrepancy reduces to 2.4σ, when only BABAR data is used as input to the dispersion relation, which shows the need for a new measurement. In this talk, we are presenting a new measurement of the cross section $\sigma_{\pi\pi}$ at the BESIII experiment in Beijing.

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Session Classification : Muon g-2