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Contact Person: L. Afanasyev
Institute: Joint Institute for Nuclear Research, Dubna, Russi
Email: Leonid.Afanasev@cern.ch

Measurement of $\pi^+\pi^-$ atom lifetime at DIRAC

L. Afanasyev, on behalf of DIRAC Collaboration

Abstract

The DIRAC experiment aims to measure the lifetime of $\pi^+\pi^-$ atoms in the ground state with 10% precision, using the 24 GeV/c proton beam of the CERN Proton Synchrotron. As the value of the above lifetime of order 10^{-15}s is dictated by a strong interaction at low energy, the precise measurement of this quantity enables to determine a combination of S-wave pion scattering lengths to 5%. Pion scattering lengths have been calculated in the framework of chiral perturbation theory with high precision. Thus the accurate measurement of these values would submit the understanding of chiral symmetry breaking of QCD to a crucial test. The results on the $\pi^+\pi^-$ atom detection and the preliminary estimation of their lifetime are presented.

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