The DIRAC Experiment at CERN

J. Smolik for DIRAC Experiment
Institute of Physics ASCR, Czech Republic
e-mail: smolik@fzu.cz

Abstract

The purpose of the DIRAC experiment is to determine the difference between the isoscalar and isotensor S-wave $\pi\pi$ scattering lengths from a measurement of the lifetime of an exotic $\pi^+\pi^-$ atom ($A_{2\pi}$). One aims at an improved relative precision from its present value of 20% to 5%. An accurate measurement of $|a_0 - a_2|$ will submit the current understanding of chiral symmetry breaking of QCD to a crucial test and will provide useful information about the size of the two-flavour quark condensate.

The DIRAC experiment, currently operating at the CERN PS, is a double-arm magnetic spectrometer designed to measure π^+ π^- pairs of low invariant mass. The apparatus was commissioned at the end of 1998 and, since then, has been collecting useful data.

A preliminary analysis of data collected in 1999 and 2000 with Ni and Pt targets has shown good detector performances, excellent momentum resolution and evidence of an increased yield of highly correlated π^+ π^- pairs at low relative momentum (Q<5 MeV/c). Coulomb interaction in the final state is responsible for such enhancement.

The procedure to detect π^+ π^- atom will be described in detail, and a preliminary evidence of a signal associated to atomic pairs coming from the ionization of $A_{2\pi}$ atoms in the nuclear target will be shown.

Finally, the future perspective of the experiment will be reviewed to achieve the final accuracy on the determination of $|a_0 - a_2|$.