Contribution ID : **4** Type : **plenary talk**

The investigation of $K^+\pi^-$, π^+K^- and $\pi^+\pi^-$ atoms

Monday, 6 June 2016 09:00 (0:30)

Collaboration

DIRAC

Abstract content

Theory, using Low Energy QCD, predicts with high precision the pion-pion and pion-kaon scattering lengths. There is accurate relation between $\pi^+\pi^-$ atom lifetime and a difference of S-wave pion-pion scattering lengths with isospin 0 (a_0) and 2 (a_2). Similar relation exists for $K^+\pi^-$ and π^+K^- atoms lifetime and pion-kaon scattering lengths with isospin 1/2 ($a_{1/2}$) and 3/2 ($a_{3/2}$). Experiment DIRAC at CERN PS detects 345 ± 61 pairs from $K^+\pi^-$ and π^+K^- atoms breakup. It allows to achieve the first observation of exotic atoms consisted of pion and kaon. Measured values of πK atom lifetime and corresponding pion-kaon scattering length difference are presented. It is shown, that experimental accuracy for pion-kaon scattering length difference could be significantly improved with an experiment at SPS energy.

The experimental observation of the long-lived $\pi^+\pi^-$ atoms is shown. The scheme to use the obtained data for the long-lived atom lifetime measurement will be described. Possibility of the long-lived $\pi^+\pi^-$ atom Lamb shift measurement and evaluation of pion-pion scattering length new combination ($|2 \cdot a_0 + a_2|$) is discussed.

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