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Last results of DIRAC experiment on study hadronic hydrogen-like atoms at PS CERN.

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Results on study the hydrogen-like atoms consisting of charged pions and Kaons are presented. The first measurement of $K^+\pi^-$ and $K^-\pi^+$ atoms lifetime was fulfilled basing on identification of 178 ± 49 $K\pi$ pairs from the atom breakup. The measured lifetime is $\tau = 2.5 \times (-1.8)^{+3.0} \text{ fs}$. This value is dictated by properties of the strong πK -interaction at low energy, namely S -wave πK scattering length. The first experimental value of the isospin-odd combination of S -wave πK scattering length was obtained $|a_{0^-} - 1/3(a_{1/2} - a_{3/2})| = (0.11 \pm 0.04)^{+0.09} \text{ M}_\pi^{-1}$.

A dedicated experiment with $\pi^+\pi^-$ atoms allows further study of these already observed atoms. The preliminary results on observation of the long-lived (metastable) states of $\pi^+\pi^-$ atoms are presented. The observation of long-lived states opens the possibility to measure the energy difference between n_s and n_p states – the Lamb shift.

Summary

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