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First πK atom lifetime and πK scattering length measurements

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Theory, using Low Energy QCD, calculated with high precision the $\pi\pi$ and πK scattering length. Because these calculations are
using the chiral symmetry that describe quarks, gluons, and the QCD
vacuum property, the experimental check of these predictions is important. To check the theoretical calculations for the process
including also s quarks we must measure the πK atom lifetime
that is connected to the πK scattering lengths by a precise
relation. The results of the search for hydrogen-like atoms consisting
of $\pi^- K^+$ and $\pi^+ K-$ mesons are presented. Evidence for πK
atoms production, using a 24 GeV/c protons beam from CERN PS
interacting with a nickel target, is reported here. From the analysis
of Coulomb final state interaction πK pairs was evaluated the
number of produced πK atoms $N_A = 653 \pm 42$ together with the
value of the πK pairs from atoms that breakup in the same target
$N_a = 178 \pm 49$. Using these results the analysis yields to a first
value for the πK atom lifetime of $t = 2.5^{+3.0}_{-1.8}$ fs and a
first model-independent measurement of the S-wave isospin-odd πK
scattering length $|a0 - | = 1/3|a_{1/2} - a_{3/2}| = 0.11^{+0.09}_{-0.04}\ 1/M_\pi$ (the I in a_I stands for isospin).

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