

Systematic studies of deeply-bound pionic atoms at the RIKEN RIBF facility

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Collaboration

Abstract content

Spectroscopy of deeply-bound pionic atoms using the $(d, ^3\text{He})$ reaction has been shown to be a powerful tool to study the pion in-medium modification. The $1s$ binding energies of medium-heavy pionic atoms can be related to the “partial restoration” of chiral condensate with the Tomozawa-Weinberg and the Gell-Mann-Oakes-Renner relations, as was demonstrated in our previous experiment carried out at GSI [1]. There remain however systematic errors in determining the magnitude of chiral condensate due to the uncertainties in the neutron-to-proton density difference near the nuclear surface. At the RIKEN RIBF facility, systematic studies of deeply-bound pionic atoms are underway; we plan to explore a wider range of isotopes and isotones around the Sn region, so as to disentangle the QCD effect from the nuclear effect. Results of recent “pilot” experiment and near-future plans are presented.

[1] K. Suzuki, et al., Physical Review Letters 92, 072302 (2004); T. Yamazaki, et al., Physics Reports 514, 1 - 87 (2012).

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