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Precision Spectroscopy of Antiprotonic Atoms for Investigation of Low-energy Antinucleon–nucleus Interactions

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Spectroscopy of hadronic atoms, where a negatively charged hadron such as π^-, K^-, or $\bar{p}$ replaces an electron, offers a unique way to study the strong interaction. Among them, x-ray spectroscopy of antiprotonic atoms provides in-formation on antinucleon–nucleus interactions at low energy. Although a model exists based on global fits to data acquired up to the 1980s, it is limited by uncertainties in nucleon distributions in nuclei [1]. We propose new measurements using calcium isotopes, for which nucleon densities are well known, to reduce these uncertainties. Superconducting microcalorimeter transition-edge sensors offer a resolution of 50–70 eV, which will allow us to determine strong-interaction shifts and widths with an order-of-magnitude improvement over previous studies [2]. The results will refine antinucleon–nucleus optical potential models and have implications for future experiments searching for neutron–antineutron os-
cillations [3, 4].
In this contribution the background of the research will be described, and the status of the recent test experiments will be reported.

References

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