

Probing the neutron skin in Kr and Xe isotopes by exclusive anti Λ and anti $\Lambda\Sigma^-$ production with antiprotons

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The distribution of neutrons with respect to protons in heavy nuclei is strongly related to isospin dependence of the nuclear equation of state. There exist several experimental methods to determine the neutron skin thickness in these nuclei: scattering of hadronic probes like π , p , and α particles on nuclei, antiproton-nucleus scattering or absorption, the electromagnetic dipole strength, and coherent π^0 photoproduction. Large systematic uncertainties of these methods are mainly related to the isospin insensitivity of these reactions. This problem can be avoided by studying the parity violation in longitudinally polarized elastic electron scattering on nuclei. However, this process exhibits an extremely small cross section asymmetry and, therefore, requires very long measuring periods.

In this contribution, we propose a new method using the pair production of hyperon-antihyperon pairs in antiproton-nucleus interactions which can be explored at PANDA@FAIR. The measurement relies on the isospin selectivity of the exclusive $\bar{p} + p \rightarrow \bar{\Lambda} + \Lambda$ and $\bar{p} + n \rightarrow \bar{\Lambda} + \Sigma^-$ channels, which can be detected in parallel at beam momenta close to their production threshold. Besides the isospin selectivity, these reactions exhibit large cross sections. Using GiBUU simulations, we have studied the sensitivity of these cross sections and their ratios to variations of the neutron skin thickness along Kr and Xe isotope chains.

Primary authors: CHRISTIANSEN, Martin (University Mainz); STEINEN, Marcell (Helmholtz-Institut Mainz); SCHUPP, Falk (Helmholtz-Institut Mainz); POCHODZALLA, Josef (University Mainz); BÖLTING, Michael (Helmholtz-Institut Mainz); ACHENBACH, Patrick (University Mainz)

Presenter: SCHUPP, Falk (Helmholtz-Institut Mainz)

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