

Exploring the potential of antihyperons in nuclei with antiprotons

J. Pochodzalla and the PS185 Collaboration¹

Johannes Gutenberg-Universität Mainz, Institut für Kernphysik, D-55099 Germany

The potential of antibaryons in nuclei may help to elucidate the role of the quark-gluon structure of baryons for the short-range baryon-baryon force. Quantitative information on the difference between baryon and antibaryon potentials and hence on the potential of antibaryons may be obtained via exclusive antibaryon-baryon pairs produced close to threshold after an antiproton-proton annihilation within a complex nucleus. Once these hyperons leave the nucleus and are detected, their asymptotic transverse momentum asymmetries will reflect the depth of the respective potentials. The main advantage is the quasi stationary system having a reasonably well defined geometry and the fact that the kinematics is determined essentially by energy and momentum conservation of a (nearly) two-body reaction.

A schematic Monte Carlo simulation is used to illustrate the sensitivities of the proposed method for the case of $\Lambda\bar{\Lambda}$ production in $\bar{p}^{12}\text{C}$ interactions at 1.66 GeV/ c . For this reaction and with the expected $\Lambda\bar{\Lambda}$ detection rates at the PANDA experiment at FAIR measurement periods of a few minutes will be sufficient to reach a relative statistical uncertainty of better than 10% for the transverse momentum asymmetry. For D-meson pairs the sensitivity of the transverse momenta will probably be too small to deduce differences between the potentials for D^+ and D^- mesons while for $\Xi\bar{\Xi}$ pairs the asymmetry is quite sensitive to differences between the Ξ and $\bar{\Xi}$ potentials.

Existing PS185 data and the experimental prospects at FAIR in Darmstadt will be discussed.

Work support by the Bundesministerium für Bildung und Forschung (bmb+f) under contract number 06MZ225I.

¹See Phys. Rev. C **74**, 015206 (2006) for a collaboration list.