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Meson Production in Antinucleon Annihilation on Nuclei

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A central activity of the upcoming FAIR@GSI facility will be the use of antiprotons for a large variety of investigations at PANDA detector and AIC storage ring. The focus of the studies is on the one hand to understand antimatter-matter interactions and on the other hand to use antiproton beams for spectroscopic studies of hadrons. The aim of our work is to understand antinucleon-nucleon (NbarN) and antinucleon-nucleus (NbarA) interactions theoretically. A consistent theoretical description for the whole reaction process is desired. This includes the initial state interactions, the particle production in the reaction stage and the interactions of the emitted mesons with the residual nucleus. For the initial state interaction we use the t-rho approximation, where the NbarN t-matrix is folded with microscopical densities taken from self-consistent Hartree-Fock Bogoliubov (HFB) calculations. To describe the NbarN t-matrix we closely follow existing approaches, e. g. the Juelich-Bonn model and the Paris model. The final state meson-nucleus interactions are described with optical potentials. Adopting this ansatz we presently focus on two meson, particularly two pion production in the exit channel. Since they are required over wide energy ranges, we have extended the pion optical potentials by explicitly including nucleon resonances beyond the Delta(1232)-resonance. Results for NbarA elastic scattering and PiA elastic scattering, reaction cross sections and meson production on neutron- or proton-rich nuclei are presented. As an interesting mechanism for single meson production Pontecorvo-type reactions are discussed.

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