ANTIBARYON INTERACTIONS WITH THE NUCLEAR MEDIUM

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Interactions of antibaryons (antiprotons in particular) with the nuclear medium have attracted considerable interest in recent years in view of future activities at FAIR.

This contribution deals with our recent study of antibaryon interactions with the nuclear medium within the relativistic mean-field approach using $\bar{B}$ coupling constants consistent with available experimental data. We performed calculations of $\bar{B}$ bound states ($\bar{B} = \bar{p}, \bar{\Lambda}, \bar{\Sigma}, \bar{\Xi}$) in selected nuclei and confirmed substantial polarization of the nuclear core caused by the extra $\bar{B}$. Moreover, we studied spin symmetry in the calculated $\bar{B}$ spectra and found the energies of spin doublets to be nearly degenerate.

Due to the lack of information on the in-medium antihyperon annihilation near threshold only the $\bar{p}$ absorption was considered. It was described by the imaginary part of a phenomenological optical potential fitted to $\bar{p}$-atom data. The annihila- tion was treated dynamically, taking into account explicitly the reduced phase space for annihilation products in the nuclear medium, as well as the compressed nuclear density due to the antiproton. The energy available for the annihilation products was evaluated self-consistently, considering additional energy shift due to particle momenta in the $\bar{p}$-nucleus system. Corresponding $\bar{p}$ widths were sig- nificantly reduced, however, they still remain sizable.

Next, the $\bar{p}$-nucleus interaction was constructed using the latest version of the Paris $\bar{N}N$ potential. Related scattering amplitudes were used to define the complex optical potential in the nuclear medium. We discuss energy dependence of the potential, the role of the P-wave interaction and the implications for bound $\bar{p}$-nucleus states.