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Interaction of antiproton with nuclei

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\noindent Interaction of antiproton with nuclei \\
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This contribution reports on our recent, first fully self-consistent calculations of $\bar{p}$ bound states in selected nuclei, performed within the relativistic mean-field (RMF) model using optical $\bar{p}$-nucleus potential.
Current interest in the $\bar{p}$-nucleus interaction is motivated by future activities at FAIR [1-3].\\
First, the G-parity motivated antiproton-meson coupling constants were employed and possible deviations from the G-parity values were taken into account by introducing a scaling factor [1]. Our calculations confirmed large polarization effects of the nuclear core caused by the presence of the antiproton and revealed significant effect of the $\bar{p}$ self-interaction which was not considered in previous RMF calculations.\\
Next, we applied a $\bar{p}$-nucleus potential consistent with $\bar{p}$-atomic data [4]. The imaginary part of the phenomenological optical potential was introduced to describe absorption of the $\bar{p}$ in the nuclear medium and all relevant decay channels were included. The reduction of the phase space for the annihilation products for deeply bound $\bar{p}$ states was taken into account while treating fully self-consistently energy and density dependencies of the corresponding suppression factors. As a result, the $\bar{p}$ absorption widths significantly decrease when the phase space suppression is considered. \\

\noindent[1] I.N. Mishustin et al., Phys. Rev. C 71 (2005) 035201.

\noindent[2] A.B. Larionov et al., Phys. Rev. C 78 (2008) 014604.

\noindent[3] T. Gaitanos, M. Kaskulov, H. Lenske, Phys. Lett. B 703 (2011) 193.

\noindent[4] E. Friedman, A. Gal, J. Mare\v{s}, Nucl. Phys. A 761 (2005) 283.
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