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Antinucleon-nucleon interaction and the related hadron physics

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The recent development of the antinucleon-nucleon (N-bar N) interaction in chiral effective field theory [1] will be reported and the phenomenological meson-exchange models (taking Julich model as an example) will be mentioned as well. With such potentials and the distorted-wave Born approximation, we examine the influence of the antiproton-proton (p-bar p) interaction on the mass spectrum in various reactions containing the antip p pair, e.g., $J/\psi \rightarrow \gamma^- pp$, $\omega^- pp$, $\pi 0^- pp$ and $e+e-\leftrightarrow$ p-bar p. It turns out that the low-energy mass spectra up to excess energy of 100 MeV for all the mentioned processes can be described by our treatment of the final or initial state (p-bar p) interactions. In $J/\psi \rightarrow \gamma$ p-bar p the quite prominent peak near p-bar p threshold is observed in BES experiment, and to describe it, a bound state in isospin-1 1S0 is needed in our calculation [2]. The electromagnetic form factors of the proton in the time-like region are also predicted [3]. The role of N-bar N intermediate states played in the ractions $e+e-\rightarrow$ multi-pions will be also discussed, which concerns for the dip structure observed around N-bar N threshold in the experiments.

References
1. X.-W. Kang, J. Haidenbauer and U. G. Meißner, JHEP 1402, 113 (2014).
2. X.-W. Kang, J. Haidenbauer and U. G. Meißner, arXiv:1502.00880 [nucl-th].
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