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Antiproton Low Energy Collisions with Ps-atoms and True Muonium Atoms

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Recently created, very low energy antiprotons are of great interest because of possible formation of ultraslow anti-hydrogen atoms [1,2]. In this work we compute the cross sections and rates of the anti-hydrogen and muonic anti-hydrogen atom three-body formation reactions at low and very low collision energies. The muonic anti-hydrogen is a bound state of an antiproton and a positive muon. In work [3] it was already pointed out that this exotic antimatter atom may also be of significant future interest in the field of matter-antimatter physics [3]. In the current work, a quantum-mechanical few-body method based on the coupled two-component Faddeev-Hahn-type equations is applied [4]. New results for low energy production reactions of anti-hydrogen and muonic anti-hydrogen atoms will be presented and discussed together with test results for the three-body muon transfer reactions from one hydrogen isotope to another heavier hydrogen isotope.

1. G.B. Andresen et al., (ALPHA Collaboration), Phys. Rev. Lett. 105, 013003 (2010).
2. G. Gabrielse et al., (ATRAP Collaboration), Phys. Rev. Lett. 106, 073002 (2011).
3. K. Nagamine, AIP Conf. Proc. 793, 159 (2005).
4. R.A. Sultanov and D. Guster, arXiv:1304.2434v1 [phys.atom-ph].

Summary

We just recently published online our new preprint about the anti-hydrogen formation reactions. This is the reference #4 in the abstract. We would like to present these results at the LEAP 2013.

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