Abstract for an Invited Paper
for the DAMOP07 Meeting of
The American Physical Society

Forming, trapping, and cooling neutral antimatter: strongly magnetized highly excited antihydrogen atoms[1]

HOSSEIN SADEGHPOUR, Harvard-Smithsonian Center for Astrophysics

A theoretical framework for the formation of Rydberg atoms in strongly magnetized nonneutral plasma is described with an eye toward the production of highly excited Rydberg antihydrogen atoms at CERN. A number of challenges hindering a quantitative understanding of how Hbar atoms are formed- the details of velocity and field ionization spectra- are overcome. It is shown that a cooling technique due to spontaneous decay efficiently brings the Rydberg atoms to their ground state. The long-time dynamics in strong inhomogeneous magnetic field traps is numerically investigated using classical techniques, whereas the atomic state-specific structure is fully described quantum mechanically. Analytical expressions for the two limits of cooling- adiabatic and sudden cascades- as a function of trapping magnetic multipole order will be given.

[1]NSF