APR05-2005-000607

Abstract for an Invited Paper
for the APR05 Meeting of
the American Physical Society

Casting Light on Neutron Halo Nuclei

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Laser spectroscopic measurements of atomic isotope shifts provide unique access to the nuclear charge distribution of short-lived isotopes. In this talk, I will present a new high-resolution technique based on laser spectroscopy of single atoms cooled and confined in a magneto-optical trap. The isotopes of interest are ^{6}He ($t_{1/2}$ = 807 ms) and ^{8}He ($t_{1/2}$ = 119 ms), which exhibit a loosely bound neutron halo around a ^{4}He-like core. I will report on our recent high-precision measurement of the ^{6}He nuclear charge radius and the progress in extending this investigation to ^{8}He. Charge radii measurements of both isotopes provide corroboration for their halo structure and test theoretical models of light nuclei.