

APR17-2016-000092

Abstract for an Invited Paper
for the APR17 Meeting of
the American Physical Society

Measurements of neutron skin in calcium and lead¹

ROBERT MICHAELS, Thomas Jefferson National Accelerator Facility

Measurement of the parity-violating electron scattering asymmetry from ^{208}Pb has demonstrated a new opportunity at Jefferson Lab to measure the weak charge form factor and hence pin down the neutron radius in nuclei in a relatively clean and model-independent way. This is because the Z boson of the weak interaction couples primarily to neutrons. We will describe the PREX and CREX experiments on ^{208}Pb and ^{48}Ca respectively. PREX-I ran in 2010, and CREX and a second run of PREX are currently in preparation. These are both doubly-magic nuclei whose first excited state can be discriminated by the high resolution spectrometers at JLab. The heavier lead nucleus, with a neutron excess, provides an interpretation of the neutron skin thickness in terms of properties of bulk neutron matter. For the lighter ^{48}Ca nucleus, which is also rich in neutrons, microscopic nuclear theory calculations are feasible and are sensitive to poorly constrained 3-neutron forces. The measurements are a fundamental test of nuclear structure with applications to heavy ion research and neutron stars.

¹Jefferson Science Associates, LLC, which operates Jefferson Lab for the U.S. DOE under U.S. DOE contract DE-AC05-06OR23177