Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Atomic and Nuclear Physics with Radioactive Isotopes Y. NATALI MARTINEZ DE ESCOBAR, Los Alamos National Laboratory, E. BOND, A. MOODY, R. RUNDBERG, J. TORGERSON, D.J. VIEIRA, X. ZHAO — Capabilities in laser cooling and trapping, isotope production and nuclear chemistry enable us to pursue a variety of far-reaching experiments at the interface of atomic and nuclear physics with radioactive isotopes. Here we highlight both recent precision polarization measurements of Rb isotopes in an optical dipole trap for a new-generation β-asymmetry measurement and our progress on characterizing the ^{229}Th nuclear isomer. Optical pumping allows us to prepare a dipole-trapped Rb atom sample with an initial polarization of 0.972(2), measured using resolved microwave transitions. The spin polarization further purifies to 0.987(1) in 10 seconds and remains above 0.99 when the two-body collision loss rate between atoms in mixed spin states is greater than the one-body trap loss rate [1]. We also describe our progress toward directly characterizing the ^{229}Th nuclear isomer transition and discuss our results in comparison to other published measurements. The isomer transition in ^{229}Th (indirectly-measured transition wavelength near 160 nm [2]) promises to be the first nuclear transition excitable with coherent laser sources. Its estimated narrow linewidth (natural lifetime $\tau \sim 7$ hr.) and wavelength make it a prime candidate to use for a nuclear clock and applicable in fields such as cosmology and metrology. [1] PRA **83**, 013416 (2011). [2] PRL **98**, 142501 (2007).

Yenny Martinez de Escobar
Los Alamos National Laboratory

Date submitted: 28 Feb 2011 Electronic form version 1.4