

Abstract Submitted  
for the DNP16 Meeting of  
The American Physical Society

**Quadrupole Moments of odd-A  $^{53-63}\text{Mn}$ : First use of optical pumping in the ISOLDE cooler/buncher** CARLA BABCOCK, TRIUMF, COLLAPS COLLABORATION — The technique of optical pumping has been used in the ISOLDE (CERN) cooler/buncher ion trap in order to study the previously inaccessible quadrupole moments of neutron-rich manganese ions via collinear laser spectroscopy. Previously, the insensitivity of the ground state atomic transitions to the quadrupole interaction prevented the determination of the electric quadrupole moment with any reasonable accuracy. Instead, a transition from an ionic metastable state was used and this state was populated via optical pumping. This was done in the bunching region of the ion trap, to allow multiple laser-ion interactions. Spectroscopic quadrupole moments were measured for the odd-even isotopes in the range  $^{53-63}\text{Mn}$ . They were compared to the predictions of three modern shell model effective interactions. The inclusion of both the  $1\nu g_{9/2}$  and  $2\nu d_{5/2}$  orbitals in the model space was thus shown to be necessary to reproduce the observed increase in the quadrupole deformation from  $N = 36$  onwards. Specifically, the inclusion of the  $2\nu d_{5/2}$  orbital induces an increase in neutron and proton excitations across the proposed gaps at  $N = 40$  and  $Z = 28$ , leading to an increase in deformation in the more neutron-rich isotopes.

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Date submitted: 29 Jun 2016

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