

Abstract Submitted  
for the DNP19 Meeting of  
The American Physical Society

**Status of an Apparatus to Measure the Parity-odd Neutron Spin Rotation in  $^4\text{He}$** <sup>1</sup> JERALD BALTA, Indiana University Bloomington, NSR COLLABORATION — The weak interaction between nucleons is sensitive to quark-quark correlations in the nucleon and provides an opportunity to test the Standard Model in the low energy strongly interacting limit. Recent advances in theory [1] [2] coupled to the measurement of the weak pion exchange component of the NN weak interaction imply predictions for parity-odd neutron spin rotation in  $^4\text{He}$  of  $d\phi/dz = 9 \pm 3 \times 10^{-7}$  rad/m. The previous measurement of  $d\phi/dz = [+2.1 \pm 8.3(\text{stat.}) \pm 2.9(\text{sys.})] \times 10^{-7}$  rad/m [3] lies just outside the theoretical value. A new non-magnetic pump and target system and other upgrades to the NSR apparatus can enable an experimental sensitivity approaching  $< [\pm 1.0(\text{stat.}) \pm 1.0(\text{sys.})] \times 10^{-7}$  rad/m [4] on the NG-C beam at NIST. This would constitute the first Standard Model test of strangeness-conserving nonleptonic weak interactions. The status of the NSR apparatus will be presented.

[1] S. Gardner, W. C. Haxton, and B. R. Holstein, *Ann. Rev. Nucl. Part. Sci.* **67**, 69, 024001, (2017).

[2] R. Lazauskas and Y.-H Song, *Phys. Rev. C* **99**, 054002 (2019).

[3] H. E. Swanson, *et al.*, Accepted to *Phys. Rev. C.*, (2019).

[4] W. M. Snow, *et al.*, *Rev. Sci. Inst.* **94**, 055101, (2015).

<sup>1</sup>This work is supported by NSF grant PHY-1614545.

Jerald Balta  
Indiana University Bloomington

Date submitted: 01 Jul 2019

Electronic form version 1.4