Abstract Submitted
for the APR14 Meeting of
The American Physical Society

Limits on Possible Mesoscopic Spin-Dependent Forces using Neutron Spin Rotation CHRIS HADDOCK, Indiana University, NSR COLLABORATION — We discuss experiments using polarized slow neutrons to investigate possible spin-dependent forces of "mesoscopic"range (millimeters to microns). We describe the limits on two potentials that could give rise to such forces (Dobrescu, 2006). The first is proportional to $g_V g_A \vec{\sigma} \cdot \vec{p}$, with σ and p the neutron spin and momentum, respectively. This interaction would lead to a phase difference in the amplitude of positive and negative helicity states, causing the spin of transversely polarized neutrons to rotate through an angle ϕ_{PNC}. A search for neuron spin rotation in ^{4}He provides the current limit on the product of vector and axial couplings $g_v g_A < 10^{-32}$ at 1 mm (Yan and Snow, 2013). The second potential is proportional to ${g_A}^2 \vec{\sigma} \cdot (\vec{p} \times \vec{r})$, where r is the distance between the neutrons and the bulk material. We discuss an apparatus to search for this interaction using thin sheets of various mass densities made to rotate about a longitudinal symmetry axis as a target. The current limit on the product of axial vector couplings is ${g_A}^2 < 6 \times 10^{-13}$ (Piegsa and Pignol, 2012), which we hope to improve by at least two orders of magnitude.

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Date submitted: 10 Jan 2014 Electronic form version 1.4