Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

A K-Rb-Ne Co-magnetometer[1] LAWRENCE CHEUK, MICHAEL ROMALIS, Princeton University — An atomic co-magnetometer consists of coupled spin ensembles of alkali atoms and noble gas atoms. With an appropriate external field, the noble gas polarization cancels external magnetic fields, rendering the co-magnetometer a sensitive probe for non-magnetic spin couplings. In the past we have used a K-^{3}He co-magnetometer as a gyroscope and to search for spin interactions beyond the Standard Model. In this work, we explore a K-Rb-Ne co-magnetometer. Due to a lower gyromagnetic ratio, the use of ^{21}Ne provides a ten-fold increase in sensitivity to non-magnetic interactions compared to K-^{3}He co-magnetometers. We also use hybrid-pumping to polarize a K-Rb mixture ($n_{Rb}/n_K \sim 100$). The K atoms are optically pumped, while the Rb atoms are polarized via spin-exchange collisions. The relatively low n_K allows uniform polarization of K atoms. In turn, a uniform polarization of a dense Rb vapor ($\sim 10^{15}$cm^{-3}) is achieved. With the ten-fold increase in alkali density, the K-Rb-Ne co-magnetometer is expected to provide up to two orders of magnitude of improvement in inertial rotation sensing and searches for new physics. In addition, since ^{21}Ne has nuclear spin $I = 3/2$, it is sensitive to anomalous tensorial spin couplings that violate Lorentz symmetry but preserve CPT symmetry.

[1]This work was supported by NSF grant PHY-0653433.

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Date submitted: 26 Jan 2010 Electronic form version 1.4