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Development of a compact atomic co-magnetometer G. VASILAKIS, T.W. KORNACK, R.K. GHOSH, S.J. SMULLIN, M.V. ROMALIS, Princeton University — We have developed a high-sensitivity atomic co-magnetometer for tests of Lorentz and CPT symmetries. It also may be used as a gyroscope. Optical pumping of a high-density alkali metal vapor creates a spin-exchange relaxation free (SERF) magnetometer. The noble gas atoms in the cell are polarized by the alkali atoms. With an appropriate applied field, the polarized noble gas atoms cancel transverse magnetic fields, leaving the system sensitive only to non-magnetic spin interactions and rotation. We have performed a test of CPT and Lorentz symmetries by looking for a sidereal signal in the lab frame. To avoid long term drift, we are designing a small version of the magnetometer on a rotary platform. The smaller system will be more sensitive to the Johnson noise generated by thermal currents in the magnetic shields. In order to reduce this noise, we will use ferrite, rather than mu-metal, for the innermost layer of magnetic shielding. It is expected that sensitivity will also be increased by enclosing the optics in a vacuum chamber and using ^{21}Ne instead of ^{3}He as the noble gas.

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