

Abstract Submitted
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Tests of Fundamental Symmetries Using a Compact, Rotating Co-Magnetometer¹ JUSTIN BROWN, SYLVIA SMULLIN, THOMAS KORNACK, MICHAEL ROMALIS, Princeton University — A K-³He co-magnetometer contains overlapping, coupled ensembles of high-density polarized K vapor and polarized ³He nuclei. An appropriately applied magnetic field cancels the ³He magnetization allowing for magnetometer operation in the highly sensitive spin-exchange relaxation free (SERF) regime. The resulting co-magnetometer is insensitive to magnetic fields, but sensitive to electron and neutron couplings to anomalous fields. The compact, second generation co-magnetometer is mounted on a rotary platform for reorientation of the sensitive direction in the lab frame. We present data in which we periodically rotate the experimental apparatus 180° every ≈ 1 min in search of CPT and Lorentz violating fields passing through our celestial frame. We discuss important systematic effects involved with reversals of the entire experiment such as axial tilt and a gyroscope signal from Earth's rotation. The compact assembly also facilitates searches for proposed long range spin-dependent forces. A polarized electron spin source containing $\approx 10^{25}$ spins can be placed ≈ 25 cm from the co-magnetometer and rotated every ≈ 20 s to search for new spin-dependent forces between electrons.

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