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Precision Magnetometry with Spin-Polarized Xenon SKYLER DEGENKOLB, AARON LEANHARDT, TIM CHUPP, University of Michigan — Atomic magnetometer sensitivity is a limiting factor in precision measurements, medical imaging, and industrial applications. In particular, searches for permanent electric dipole moments (EDMs) require sensitive magnetometers which interact minimally with the primary samples. Techniques based on spin-polarized gases have been very successful in this capacity, but it remains difficult to perform correct spatial and temporal averages. Previous magnetometers (e.g. alkalis or ^{199}Hg) also suffer from material problems at the high voltages and low temperatures common in EDM experiments. We propose as a remedy real-time optical magnetometry based on spectroscopy of two-photon transitions in spin-polarized ^{129}Xe. Thermal, diffusive, and dielectric properties of xenon allow sensitive measurements in a wide range of electromagnetic field strengths and sample volumes, while long spin coherence times and a low neutron capture cross-section are favorable in neutron EDM experiments. We report on preliminary work validating the technique in ^{171}Yb and a parallel effort measuring the ^{129}Xe EDM, and discuss applications to contemporary neutron EDM measurements.

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