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Prospects for Two-Photon Optical Magnetometry E.A. ALDEN, S.M. DEGENKOLB, T.E. CHUPP, A.E. LEANHARDT, Department of Physics, University of Michigan, Ann Arbor, MI 48109-1040 USA — The $^1S_0 \rightarrow {}^3D_2$ two-photon transition has been driven in an atomic ytterbium vapor using a pair of degenerate photons at 808 nm. Population in the excited state was detected via the $^3D_2 \rightarrow {}^3P_1 \rightarrow {}^1S_0$ cascade decay, which emits photons at 1479 nm and 556 nm, respectively. For Yb isotopes with nuclear spin, e.g. ^{171}Yb with I=$\frac{1}{2}$, the transition rate is sensitive to the nuclear spin orientation and the laser polarization, which allows for possibility of performing two-photon optical magnetometry using the nuclear spin of a closed shell atom in its electronic ground state. While there are sufficiently accessible one-photon transitions in Yb to perform single-photon optical magnetometry, our technique generalizes to the noble gases, e.g. ^{129}Xe with I=$\frac{1}{2}$, where reading out the ground state nuclear spin orientation is significantly more challenging. Relevance to ongoing permanent electric dipole moment experiments will be discussed.

E. A. Alden
Department of Physics, University of Michigan,
Ann Arbor, MI 48109-1040 USA

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