Abstract Submitted
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A cold, slow beam of TlF molecules for an improved probe for the nuclear Schiff moment DANIEL MCCARRON, EUSTACE EDWARDS, MATTHEW STEINECKER, Yale University, STEPHEN PECK, LARRY HUNTER, Amherst College, DAVID DEMILLE, Yale University — We present a new experimental effort to search for the nuclear Schiff moment (SM) using thallium fluoride (TlF) molecules. Our approach capitalizes on the strong internal electric field present in a polarized molecule to amplify the effect of the SM. We project a 25-fold improvement over the current state of the art sensitivity to certain underlying mechanisms such as the CP-violating QCD θ-parameter [1]. Our recent measurements indicate that optical cycling is possible on the $X^1\Sigma^+ \rightarrow B^3\Pi_1$ electronic transition of TlF [2]. Here a single laser will enable 100 photons to be scattered before an excited vibrational level is populated. This is sufficient for unit-efficiency fluorescence detection, rotational cooling, and state preparation. With a single repump laser, ˜10^4 photons could be scattered, sufficient for transverse laser cooling that could substantially increase the brightness of the molecular beam. We report on the production of a cold and slow beam of TlF molecules from a cryogenic buffer gas beam source and present flux measurements for a range of TlF vaporization techniques. We also present our progress towards understanding the hyperfine structure in the $B^3\Pi_1$ state and its role in optical cycling. [1] B. Graner, Y. Chen, E. G. Lindahl, and B.R. Heckel, Reduced limit on the Permanent Electric Dipole Moment of ^{199}Hg, arXiv:1601.04339. [2] L. R. Hunter, S. K. Peck, A. S. Greenspon, S. Saad Alam, and D. DeMille, Prospects for laser cooling TlF, *Phys. Rev. A*, **85**, 012511 (2012).

Daniel McCarron
Yale University

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