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Upgrading the ACME electron EDM search with a molecular lens XING WU, Yale University, DANIEL ANG, COLE MEISENHELDER, CRISTIAN PANDA, Harvard University, ZACK LASNER, Yale University, NICHOLAS HUTZLER, California Institute of Technology, GERALD GABRIELSE, Northwestern University, JOHN DOYLE, Harvard University, DAVID DEMILLE, Yale University, ACME COLLABORATION — The search for an electron electric dipole moment (EDM) sheds light on physics beyond the Standard Model. The most stringent limit on the electron EDM, $|d_e| < 1.1 \times 10^{-29}$e·cm, was recently set by the ACME collaboration [Nature 562, pages355–360 (2018)], constraining new time-reversal-symmetry (T) violating physics for a broad class of proposed models at the $3 \sim 30$TeV energy scale. A next generation of ACME is now underway, aimed at improving the sensitivity to $\mathrm{d_e}$ by at least another order of magnitude. A major improvement in statistics can be obtained using a molecular lens to focus our cold beam of Thorium Monoxide (ThO) molecules into the EDM measurement region. The Q $^3\Delta_2$ electronic state of ThO, which should have long lifetime as well as large electric and magnetic polarizability, appears ideal for molecular lensing. Here, we report the first measurements of relevant properties of the Q state. Also, we demonstrate a double-STIRAP procedure that transfers population into and out of the Q state with high efficiency. These results, combined with trajectory simulations on the performance of a molecular lens, lead us to project a signal rate improvement by an order of magnitude relative to our latest result.

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