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New H-state lifetime measurement for the ACME electron EDM search[1] DANIEL ANG, Harvard University, JAMES CHOW, DAVID DEMILLE, Yale University, JOHN DOYLE, Harvard University, GERALD GABRIELSE, Northwestern University, ZHEN HAN, Yale University, BINGJIE HAO, Northwestern University, PEIRAN HU, Yale University, NICHOLAS HUTZLER, California Institute of Technology, DANIEL LASCAR, SIYUAN LIU, Northwestern University, TAKAHIKO MASUDA, Okayama University, COLE MEISENHELDER, Harvard University, CRISTIAN PANDA, University of California, Berkeley, NOBURO SASUO, SATOSHI UETAKE, Okayama University, XING WU, Harvard University, KOJI YOSHIMURA, Okayama University, ACME COLLABORATION —
The search for an electron electric dipole moment (EDM) probes physics beyond the Standard Model at high energy. The ACME II experiment recently set the most stringent limit on the electron EDM, $|d_e| < 1.1 \times 10^{-29}\ e \cdot cm$ (Nature 562 (2018), 355-360). The next generation of the experiment is now being developed. A major improvement in statistics can be obtained if the spin precession time is extended to near the natural lifetime of the $H^3\Delta_1$ state of the thorium monoxide (ThO) molecule, which is the EDM experimental state. Here we report recent progress in measuring the lifetime of the H-state using a cold molecular beam of ThO. We find that the lifetime is significantly longer than spin precession time τ used in ACME II, allowing for the possibility of increasing τ by a factor of $\approx$5 in the next generation of ACME. Together with other improvements, this provides us with a path towards an order of magnitude statistical improvement.

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Daniel Ang
Harvard University

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