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Thermochemical Beam Source of ThO for Measuring the Electric Dipole Moment of the Electron[1] ELIZABETH PETRIK, JACOB BARON, NICK HUTZLER, Harvard University, ZACK LASNER, BRENDON O'LEARY, Yale University, CRISTIAN PANDA, ADAM WEST, GREY WILBURN, Harvard University, DAVID DEMILLE, Yale University, GERALD GABRIELSE, JOHN DOYLE, Harvard University — The observation of an electron electric dipole moment (eEDM) would reveal new sources of time-reversal symmetry violation, potentially shedding light on the excess of matter over antimatter in the universe. Certain heavy polar molecules have a large interaction between the nuclear electric field and the eEDM that can be interrogated in the lab, making them ideal for eEDM searches. This molecular feature allowed our measurement with thorium monoxide (ThO) to set the most stringent upper limit on the eEDM to date [1]. Producing enough such molecules in the gas phase to perform a precision measurement is challenging because of their reactivity and low vapor pressure. Thus, a cryo buffer gas beam source yielding a high flux (10^{13}/s) of cold (4 K), slow (170 m/s) ThO via laser ablation of ThO_2 [2] was critical to our success. We now report on progress towards an improved beam source, which relies on favorable thorium-oxygen chemistry to produce gas-phase ThO via laser heating of a mixture of ThO_2 and Th. This new source has an average beam flux > 5 times larger than in [2] and will contribute to a future eEDM measurement with greatly improved statistics. [1] ACME, Science 343, (2014) 269. [2] N. Hutzler et al., PCCP 13, (2011) 18976.

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