Abstract Submitted
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The Search for Fundamental Symmetry Violation in Radium Nuclei[1] MATTHEW DIETRICH, MICHAEL BISHOF, KEVIN BAILEY, JOHN GREENE, PETER MUELLER, THOMAS O'CONNOR, Argonne National Laboratory, Argonne, Illinois 60439, USA, ZHENG-TIAN LU, University of Science and Technology of China, Hefei, China, TENZIN RABGA, ROY READY, JAIDEEP SINGH, Michigan State University, East Lansing, Michigan 48824, USA — Electric dipole moments (EDMs) are signatures of time-reversal, parity, and charge-parity (CP) violation, which makes them a sensitive probe of expected new physics beyond the Standard Model. Due to its large nuclear octupole deformation and high atomic mass, the radioactive Ra-225 isotope is a favorable EDM case; it is particularly sensitive to CP-violating interactions in the nuclear medium. We have developed a cold-atom approach of measuring the atomic EDM of atoms held stationary in an optical dipole trap, which we have used to place the only upper limit on the EDM of radium, |d(225Ra)|<1.4e-23 e-cm. This is not only the first time laser-cooled atoms have been used to measure an EDM, but also the first time the EDM of any octupole deformed species has been measured. We will present results on a new approach to spin detection that we expect to improve our EDM sensitivity by a factor of 20. Combined with upcoming improvements to our electric field generation, the next measurement should be competitive with the best neutron EDM result, in terms of sensitivity to CP-violating interactions. This work is supported by the U.S. DOE, Office of Science, Office of Nuclear Physics, under contract DE-AC02-06CH11357.

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