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Laser trapping of radium for an electric dipole moment measurement P. MUELLER, I.A. SULAI, W. TRIMBLE, I. AHMAD, K. BAILEY, M. BISHOF, J.P. GREENE, J.R. GUEST, R.J. HOLT, Z.-T. LU, T.P. O'CONNOR, Argonne National Laboratory, H.A. GOULD, Lawrence Berkeley National Laboratory — The best limits on time-reversal violation in the nuclear sector are currently set through electric dipole moment (EDM) searches on the neutron and Hg-199. Recent theoretical calculations predict that atomic EDM measurements of certain octupole-deformed nuclei, e.g., in the radium isotopic chain, are two to three orders of magnitude more sensitive to the underlying time-reversal violation than the one in Hg-199. Ra-225, with nuclear spin 1/2 and a radioactive half-life of 15 days, is a particularly attractive candidate for a tabletop EDM measurement based on a laser-cooling and trapping approach. Towards this end, we have successfully cooled and trapped atoms of Ra-225 and Ra-226 in a magneto-optical trap – a first for this rare element – and have identified black-body radiation as a beneficial source of optical repumping. We will present our laser cooling scheme and ongoing measurements of atomic level energies, lifetimes, isotope shifts and hyperfine structure in radium and discuss our progress towards an EDM measurement of Ra-225 based on an optical dipole trap. This work is supported by DOE, Office of Nuclear Physics, under contract No. DE-AC02-06CH11357.

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