Abstract Submitted
for the APR18 Meeting of
The American Physical Society

Improving the Optical Trapping Efficiency in the ^{225}Ra Electric Dipole Moment Experiment via Monte Carlo Simulation[1] STEVEN A. FROMM, J. T. SINGH, Michigan State Univ., K. BAILEY, M. BISHOF, M. R. DIETRICH, J. P. GREENE, R. J. HOLT, M. R. KALITA, P. MUELLER, T. P. O'CONNOR, R. H. PARKER, D. H. POTTERVELD, Argonne Nat'l Lab., N. D. LEMKE, Air Force Research Lab., W. KORSCH, Univ. of Kentucky — In an effort to study and improve the optical trapping efficiency of the ^{225}Ra Electric Dipole Moment experiment, a fully parallelized Monte Carlo simulation of the laser cooling and trapping apparatus was created at Argonne National Laboratory and now maintained and upgraded at Michigan State University. The simulation allows us to study optimizations and upgrades without having to use limited quantities of ^{225}Ra (15 day half-life) in the experiment's apparatus. It predicts a trapping efficiency that differs from the observed value in the experiment by approximately a factor of thirty. The effects of varying oven geometry, background gas interactions, laboratory magnetic fields, MOT laser beam configurations and laser frequency noise were studied and ruled out as causes of the discrepancy between measured and predicted values of the overall trapping efficiency. Presently, the simulation is being used to help optimize a planned blue slower laser upgrade in the experiment's apparatus, which will increase the overall trapping efficiency by up to two orders of magnitude.

[1]This work is supported by Michigan State Univ., the Director's Research Scholars Program at the NSCL, and the U.S. DOE, Office of Science, Office of Nuclear Physics, under contract DE-AC02-06CH11357.

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Date submitted: 12 Jan 2018 Electronic form version 1.4