

# The Electric Dipole Moment of the Electron: Probing TeV Physics with using AMO Techniques

Peifeng Liu

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## Abstract

We review the latest experimental effort to determine the electric dipole moment (EDM) of the electron by Hudson et al. We first review the theoretical importance of the EDM of the electron. Although the Standard Model prediction is about 11 orders of magnitude smaller than the experimental sensitivity, various models, including some supersymmetric models with new particles with mass of several hundred GeV predict a much larger value, rendering them hard to reconcile with the latest experimental result obtained by studying an energy shift at the attoelectronvolt ( $10^{-18}$  eV) scale. In this sense, TeV scale physics is probed using attoelectronvolt scale techniques.

For the rest of the talk we go over the apparatus and procedure of Hudson et al.'s experiment in some detail. This experiment is based on interferometry using YbF molecules at two hyperfine levels. The authors measured the electron EDM to be  $d_e = -2.4 \pm 5.7_{stat} \pm 1.5_{syst}$  e cm, which is consistent with zero, and got an upper bound  $|d_e| < 10.5 \times 10^{-28}$  e cm with 90% confidence. The largest contribution to the statistical uncertainty is from a correction for the magnetic field, while that of systematic uncertainty is from imperfect E field reversion. The final result is improved by a modest factor of 1.5 compared to the previous 2002 results using Tl atoms by Regan et al., although further improvement is in progress.