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Search for a permanent electric dipole moment of the mercury atom

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There has been exciting progress in recent years in the search for a spin-aligned electric dipole moment (EDM) of atoms, molecules, and the neutron. Although such a time-reversal violating dipole has not yet been detected, highly touted theories of possible new physics, such as Supersymmetry, predict the existence of EDMs within reach of modern experiments. In 2001 our group published a precise limit on the EDM of the ^{199}Hg atom: $|d(\mathrm{Hg})| < 2.1 \times 10^{-28}$ e cm. To further refine these measurements, we switched from two to a stack of four nuclear-spin-polarized Hg vapor cells. Two lie in parallel magnetic and anti-parallel electric fields, resulting in EDM-sensitive spin precession; the other two cells, at zero electric field, serve to cancel magnetic gradient noise and limit systematics due to magnetic impurities or leakage currents. To date, the statistical uncertainty for the new EDM data is1.7×10^{-29} e cm. Constraining systematics to similar levels will thus yield an order of magnitude improvement over our previous measurement. The talk will highlight recent work and show our current results.
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