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Improved Measurement of the Permanent Electric Dipole Moment of ^{199}Hg

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This talk will cover the latest results on the permanent electric dipole moment (EDM) of neutral ^{199}Hg atoms. The EDM is manifested as a small perturbation to the Larmor precession frequency due to the interaction energy of the electric dipole with a static electric field. The atoms are prepared in four separate glass vapor cells using optical pumping with resonant 254 nm laser light and allowed to precess in a common magnetic field and oppositely-directed electric fields. The precession frequency difference in a pair of cells is derived from the accumulated phase difference between two probe periods separated in time. Using this technique, we find the EDM projection onto the nuclear spin axis d_{Hg}=(2.20 ± 2.75$_{stat}$ ± 1.48$_{syst}$)·10^{-30} e·cm. While consistent with zero, this result places a new upper limit on the EDM $|d_{Hg}|$<7.4·10^{-30} e·cm (95\% C.L.), improving the previous best limit by a factor of >4. ^{199}Hg continues to have the most stringent limits for the EDM of any atomic or molecular system. The new limit constrains theories of physics beyond the Standard Model which incorporate new sources of time-reversal or CP symmetry violation.

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