The search for permanent electric dipole moments

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Nonzero permanent electric dipole moments (EDM) of fundamental systems like particles, nuclei, atoms or molecules violate parity and time reversal invariance. Invoking the CPT theorem, time reversal violation implies CP violation. Although CP-violation is implemented in the standard electro-weak theory, EDM generated this way remain undetectably small. However, the known CP-violation appears to fail explaining the observed baryon asymmetry of our universe. The inherent CP violating phase of the strong interaction is bounded to be small by the experimental limits on the neutron and the Hg-199 EDM. Extensions of the standard theory usually include new CP violating phases which again are bounded by experiments searching for the EDM of atoms, neutrons or nuclei and, so far, not finding any. EDM searches in different systems are complementary and various efforts worldwide are underway to further improve experimental sensitivities.

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