

Searches for Atomic Electric Dipole Moments

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Based on fundamental symmetries, we would naively expect the permanent electric dipole moment (EDM) of atoms to be identically zero. This is because EDMs are symmetric under time reversal, while the spin of the atom is not, and so any particle having spin and an EDM correlated to that spin would violate time reversal symmetry, as well as parity. Due to the CPT theorem, EDMs also violate CP-symmetry, which is the combination of charge-conjugation and parity symmetries. However, the baryon asymmetry of the universe strongly suggests that there are yet undiscovered sources of CP-violation in nature. Thus, theories of physics beyond the Standard Model generically anticipate new sources of CP-violation to explain the existence of matter, and consequently also predict non-zero EDMs. Thus, searches for EDMs are sensitive tests of new physics models. As there are many possible ways to add CP-violation to the Standard Model, it is critical to have many parallel searches to properly constrain the phase space. Here, I will give an overview of some of those searches, their impact on searches for BSM physics, and discuss some future directions. My work is supported by the U.S. DOE, Office of Science, Office of Nuclear Physics, under contract DE-AC02-06CH11357.

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