“A tabletop-scale probe for TeV physics: the electric dipole moment of the electron”

David DeMille, Yale University

Time-reversal (T) symmetry is observed to be broken in K- and B-meson decays, in a manner consistent with the Standard Model (SM) of particle physics. Violation of T-invariance can also cause elementary particles such as the electron to have an electric dipole moment (EDM) along their spin axis. Although the SM prediction for the electron EDM is too small to detect, extensions to the SM frequently predict EDMs near the current limit. I will describe the ACME experiment, which uses methods of atomic and molecular physics to detect the electron’s EDM. Our recent results are consistent with a zero value for the EDM, but set a limit an order of magnitude smaller than previous work. The result of this tabletop-scale experiment sets strong constraints on the existence of new physics at energies at or above the TeV scale, and has a substantial impact on theories of physics beyond the SM.