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The search for electric dipole moment of charged particles using storage rings

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The Standard Model (SM) of Particle Physics cannot explain the matter-antimatter asymmetry in the Universe, which is why physics beyond the SM must be pursued. The search for permanent Electric Dipole Moments (EDMs) of elementary particles can be a powerful tool to probe new sources of CP-violation. Finding an EDM would be a convincing indicator for physics beyond the SM.

Storage rings make it possible to measure EDMs of charged particles by observing the effect of the EDM on the spin motion in the ring. The Cooler Synchrotron COSY at the Forschungszentrum Jülich provides polarized protons and deuterons with momenta up to 3.7 GeV/s, which is an ideal testing ground and starting point for such an experimental program. The analysis of the first direct (precursor) measurement of the deuteron EDM in COSY is currently ongoing. Due to the complexity of storage rings, this study requires precision in measurements and thorough understanding of systematics. Beyond that, the design report of the prototype EDM storage ring is the next milestone of the JEDI (Jülich Electric Dipole moment Investigations) research program. In this talk, I will present the current status of the JEDI program for the measurement of proton and deuteron EDMs, discuss the various technical developments, and show recent results.

Category

Polarization Applications for Fundamental Symmetry Tests

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