

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

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One of the major problems of modern particle physics is the inability of the Standard Model (SM) of Particle Physics to explain the matter-antimatter asymmetry in the Universe. Therefore, the pursuit of physics beyond the SM is required and one of the necessary conditions for the appearance of the matter-antimatter asymmetry is the violation of the CP symmetry. Permanent electric dipole moments (EDMs) of particles violate both time reversal and parity invariance and, via the CPT-theorem they also violate the combined CP symmetry. Hence, EDM measurements of fundamental particles are capable to probe new sources of CP-violation.

Storage rings provides possibility 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 the JEDI collaboration (Jülich Electric Dipole moment Investigations) for such an experimental program.

The talk will present recent results of the first direct (precursor) measurements of the deuteron EDM in COSY.