Search for electric dipole moments in storage rings

Frank Rathmann (for the JEDI collaboration)
Institut für Kernphysik, Forschungszentrum Jülich 52425 Jülich, Germany
email: f.rathmann@fz-juelich.de

The Standard Model (SM) of Particle Physics is not capable to account for the apparent matter-antimatter asymmetry of our Universe. Physics beyond the SM is required and is searched for by *(i)* employing highest energies (e.g., at LHC), and *(ii)* striving for ultimate precision and sensitivity (e.g., in the search for electric dipole moments (EDMs)). Permanent EDMs of particles violate both time reversal (T) and parity (P) invariance, and are via the CPT-theorem also CP-violating. Finding an EDM would be a strong indication for physics beyond the SM, and pushing upper limits further provides crucial tests for any corresponding theoretical model, e.g., SUSY. Direct searches of proton and deuteron EDMs bear the potential to reach sensitivities beyond 10^{-29} e·cm. For an all-electric proton storage ring, this goal is pursued by the US-based **srEDM** collaboration, while the recently founded Jülich-based **JEDI** collaboration is in addition pursuing an approach using a combined electric-magnetic lattice which shall allow access to protons, deuterons, and ^{3}He ions in the same machine. In addition, JEDI has proposed first direct measurements of proton and deuteron EDMs based on an rf Wien filter with horizontal electric field that shall be carried out at the conventional magnetic storage ring COSY.

The talk will highlight recent achievements from the JEDI R&D program at COSY, and emphasize one of the most spectacular possibilities in modern science: Finding a signal for new physics beyond the Standard Model through the detection of permanent electric dipole moments in a storage ring.