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Storage ring proton Electric Dipole Moment Experiment with $10^{-29}\ e{\cdot}\mathrm{cm}$ sensitivity

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The electric dipole moment (EDM) of fundamental particles, when induced by the particle internal spin, violates separately the parity (P) and time (T) reversal symmetries. Due to CPT conservation, T-violation also means CP-violation and it is a sensitive probe of Physics beyond the standard model (SM).
The storage ring EDM (srEDM) collaboration and the Juelich electric dipole investigations (JEDI) collaboration joined forces together with CERN scientists as part of the CERN initiative of Physics Beyond Colliders (PBC) to put together a study of the storage ring proton EDM method under the combined name charged particle EDM (CPEDM). The goal is to evaluate its feasibility, as well as to come up with a cost estimate for a ring with a goal of $10^{-29}\ e{\cdot}\mathrm{cm}$, making it the best sensitivity hadronic EDM experiment, with a mass-scale reach for new, SUSY-like Physics of order 10^3 TeV.
The method requires an all-electric storage ring between 400m-500m in circumference, simultaneous storage of counter-rotating, longitudinally polarized proton beams, magnetic field shielding below 10nT, state of the art SQUID-based beam position monitors, high efficiency with high analyzing power proton polarimeters, high precision beam/spin dynamics tracking simulators, and the development of reliable and cost effective electric field plates capable of sustaining 10MV/m with 3cm plate separation. Several polarimeter and beam polarization concepts have already been tested using polarized beams at the COSY ring in Juelich/Germany. I will present the current status towards the realization of this experiment.

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