

Search for the muon electric dipole moment using a compact storage ring

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Recently a new technique for the measurement of electric dipole moments (EDM) of muons and other charged particles in storage rings has been proposed. The $g-2$ precession of longitudinally polarized muons can be cancelled by the application of a radial electric field. An electric dipole moment would interact with the relativistic $v \times B$ field seen in the rest frame of the muon and would rotate the spin vector out of the plane of the storage ring. An observable up-down asymmetry in the muon decay would build up with time. We discuss the feasibility of such a measurement at PSI. An existing muon beam with a small diameter storage ring (~ 80 cm) could be used with one muon per time in the ring. We estimate a sensitivity of $5 \times 10^{-23} e \cdot \text{cm}$ for one year of running, this is about 4 orders of magnitude improvement compared to the present limit. The experiment could resolve ambiguities with the muon $g-2$ discrepancy and start to tackle possible theoretical scenarios without linear mass scaling for the lepton EDMs.