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Measurement of Permanent Electric Dipole Moments of Proton, Deuteron and Light Nuclei in Storage Rings

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Permanent Electric Dipole Moments (EDMs) of fundamental particles violate both time invariance and parity. Assuming the CPT theorem, this implies CP violation. The CP violation of the Standard Model is orders of magnitude too small to be observed experimentally in EDMs in the foreseeable future. It is also way too small to explain the asymmetry in abundance of matter and anti-mattter in our universe.
Hence, other mechanisms outside the realm of the Standard Model are searched for and could result in measurable EDMs.

EDM experiments with charged hadrons are proposed at storage rings where polarized particles are exposed to an electric field.
If an electric dipole moment exists the spin vector will experience a torque resulting in a change of the original spin direction which can be determined with the help of a polarimeter.
Although the principle of the measurement is simple, the smallness of the expected effect makes this a challenging experiment requiring new developments in various experimental areas.

Complementary efforts to measure EDMs of proton, deuteron and light nuclei are pursued at Brookhaven National Laboratory and at Forschungszentrum J\"ulich with with an ultimate goal to reach a sensitivity of $10^{-29} e$·cm.

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