

Polarimetry for an Electric-Dipole-Moment measurement at COSY and beyond

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Understanding the origin of the matter-antimatter imbalance in the universe is one of the grand challenges of modern physics. One of the necessary conditions is the violation of CP symmetry. Predictions given by the Standard Model fails to explain the observed preponderance of matter by orders of magnitude. Therefore, new sources of CP violation, coming from outside the Standard Model, are needed. They can manifest in Electric Dipole Moments (EDM) of elementary particles.

The efforts of the Jülich Electric Dipole Moment Investigations (JEDI) Collaboration concentrate on a direct measurement of the EDM of charged hadrons (protons and deuterons). Currently, the focus of the project is on the development of the required technologies for a dedicated storage-ring experiment and the preparation of a first precursor measurement at the Cooler Synchrotron (COSY).

The principle of the EDM measurement is based on the observation of the time development of the miniscule vertical-polarization buildup of the horizontally-polarized beam, due to the interaction of a finite EDM with a radial electric field. The key challenge is a sensitive and efficient determination of the tiny change of the polarization.

The polarization measurement exploits elastic scattering of the beam particles on a carbon target. The design of the dedicated polarimeter requires a solid database. The corresponding measurements have been started at COSY, and preliminary results from the experiment on deuteron-carbon scattering will be shown.

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