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Polarimeter and Spin Coherence Time Developments at COSY for a Storage Ring EDM Search

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The Cooler Synchrotron (COSY) at Juelich offers an ideal environment for pursuing major feasibility questions associated with the possibility to search for electric dipole moments (EDM) on charged, polarized particles traveling in circulating beams. The first, whose analysis was completed in 2010, demonstrated that it is possible to correct for the geometric and rate systematic errors of a polarimeter mounted on an EDM ring to better than one part per million. Such a correction, which can be made in real time, requires a prior calibration of the sensitivity of the polarimeter to errors and the use of combinations of the measured counting rates as measures of the size of the error driving terms. This study also demonstrated the possibility to extract stored beam onto a thick target, thereby raising the efficiency of an EDM polarimeter to about 1% (particles used for a measurement divided by particles lost from the beam) with an effective analyzing power of at least 0.5. Second, the exploration of the use of higher order (sextupole) fields to reduce the decoherence of the required horizontally polarized beam has begun with the study of beam polarization manipulations using an RF solenoid. Already, coherence times of the order of minutes have been observed for electron-cooled deuteron beams.

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