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Search for a muon EDM at PSI using the frozen-spin technique

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Permanent electric dipole moment (EDM) of a fundamental particle breaks both parity (P) and time-reversal (T) symmetries, implying the violation of charge-parity (CP) symmetry, assuming CPT invariance. With the current experimental sensitivities, an observation of a non-zero muon EDM would indicate new CP violating sources from physics beyond the Standard Model. The experiment at the Paul Scherrer Institute (PSI) will search for the muon EDM employing the frozen-spin technique for the first time. The muons will orbit in a solenoid storage ring with the radial electric field applied such that it cancels the g-2 precession. A non-zero EDM would result in the muon spin precession in the plane orthogonal to the muon motion and the signal would manifest as the upstream-downstream (with respect to the magnetic field) asymmetry in the decay positron counts versus time. The experiment is expected to reach the sensitivity of $6 \times 10^{-23} e$ cm using $p = 125$ MeV/c muons, thus improving the current direct limit by more than three orders of magnitude. This talk will summarize the principle, current status and timeline of the experiment at PSI.

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