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muEDM: Search for a Muon Electric Dipole Moment at PSI

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We are studying in detail the feasibility of a dedicated search for a permanent electric dipole moment (EDM) of the muon at PSI. This would be the first dedicated search with a potential sensitivity of $5 \times 10^{-23}\ e \cdot \mathrm{cm}$ employing the frozen-spin method in a compact magnetic storage ring. Such an experiment is an excellent probe for physics beyond the Standard Model (SM) and would provide an explanation of the matter-dominated Universe. In the past, the muon EDM has always been measured parasitically in storage rings designed for the highest precision measurements of the anomalous magnetic moment "(g-2)" of the muon. This leaves the muon EDM as one of the least tested areas of the SM. In the light of recent observed tensions with the SM in B decays as well as (g-2) of the electron and the muon, a dedicated muon EDM search is very attractive to further push EDM searches beyond the first generation of fundamental particles.

Towards the precision muon EDM measurement, several R&D studies are underway. Recently, we performed the characterisation of the μE1 beam line at PSI, a potential beam line to host the experiment. The phase space and the polarisation were studied for different beam tunes up to 125 MeV/c. This will provide essential input parameters for ongoing GEANT4 simulations of the experiment as well as injection studies. To establish a novel muon decay positron tracking scheme, detectors are being prepared using the MALTA CMOS pixel detector. This poster will present and discuss the current status and prospects of the muEDM experiment.

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