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muEDM: Towards a search for the muon electric dipole moment at PSI using the frozen-spin technique

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We propose an experiment to search for the permanent electric dipole moment (EDM) of the muon at the Paul Scherrer Institute (PSI), Switzerland, by employing the frozen-spin technique with a potential sensitivity of $6 \times 10^{-23} \text{ e} \cdot \text{cm}$ [1]. A muon EDM would violate CP symmetry and lepton flavor universality which makes the search an excellent test for physics beyond the Standard Model (SM). In the light of the recently reported combined 4.2σ deviation from the SM in the muon ($g - 2$) together with observed tensions in B decays, a dedicated muon EDM experiment is very attractive not only to further push EDM searches beyond to the first generation of fundamental particles, but also to probe the role of the lepton flavour universality in nature.

Several R&D studies are underway at PSI in preparation for a high precision experiment to measure the muon EDM. In 2019, the characterisation of the πE1 and μE1 beamlines at PSI, two potential beamlines to develop and host the experiment, were performed. The transverse phase space as well as polarisation of the μ^+ beam were measured up to $125 \text{ MeV}/c$ to extract essential input parameters for ongoing Geant4 simulations of the proposed experiment. Multiple scattering of muon decay positrons would potentially influence strongly the design of the positron tracking scheme. Therefore, Coulomb multiple scattering of positrons in the momentum range below $85 \text{ MeV}/c$ was studied in 2020 with a telescope consisting of 3 planes of MALTA CMOS pixel detectors. In this talk, I will present and discuss the current status and prospects of the muEDM experiment at PSI.

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[1] A. Adelmann *et al.*, Search for a muon EDM using the frozen-spin technique, arXiv:2102.08838 [hep-ex] (2021).

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