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Development of a muon entrance detector for the muEDM experiment at PSI

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The muEDM experiment, currently under development at the Paul Scherrer Institute (PSI) in Switzerland, aims to probe the muon electric dipole moment (EDM) using the frozen-spin technique within a solenoidal storage ring. This experiment seeks to achieve a muon EDM sensitivity of 6×10⁻²³ e·cm, which is three orders of magnitude more precise than the current limit set by the BNL Muon g-2 collaboration. The experiment proceeds by injecting a muon into a solenoid via a superconducting channel. The muon then transverses an entrance detector which, upon detecting the muon, swiftly triggers a pulsed magnetic field to confine the muon within the solenoid's central region. This entrance detector has been designed to reject muons that exceed the solenoid's storage acceptance without causing notable multiple scatterings. We have developed a prototype detector equipped with a thin scintillator for identifying incoming muons, supplemented by four wall scintillators acting as veto detectors. These scintillators are light-readout using silicon photomultiplier. We evaluated the performance of the prototype using 27.5 MeV/c muons at PSI's pi;E1 beamline. This poster presents an overview of the prototype detector, discusses measured relative event rates for varying event topologies, and illustrates the distribution of detected photoelectrons for the veto detectors.

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