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Development of a Cherenkov Radiation–Based Beam Profile Monitor for a Muon Linear Accelerator

Tuesday 9 September 2025 16:00 (2 hours)

In order to test the Standard Model through a precision measurement of the muon anomalous magnetic moment, a 212 MeV muon accelerator is being developed and constructed for the J-PARC muon g−2/EDM experiment. During the early stage of commissioning, the number of muons per pulse could be fewer than 100, necessitating a highly sensitive monitor. In addition, muon identification must be performed in the presence of dark current from the accelerating structure. In this study, we are developing a beam position monitor that utilizes Cherenkov radiation to select the muon beam and measure its profile. To focus only the Cherenkov light originating from muons onto the light detection system, we have designed a beam profile monitor based on an Offner relay optical system, consisting of a convex and a concave mirror. This monitor enables the detection of ultra-low-charge muon bunches, which are extremely difficult to observe with conventional beam position or profile monitors. We report on the detailed design of a monitor optimized for kinetic energy of 40 MeV, along with the fabrication and testing of a prototype.

Footnotes

Funding Agency

I have read and accept the Conference Policies

Yes

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