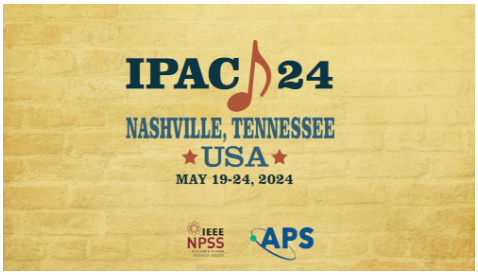

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Calibration of the Mu2e momentum scale using π+ ⟶ e+nu_e decays

Wednesday, 22 May 2024 16:00 (2 hours)

The Mu2e experiment at Fermilab will search for neutrinoless muon-to-electron conversion in the nuclear field using an Al target to stop μ^-. Muons are produced by a resonantly extracted 8 GeV proton beam from the Fermilab delivery ring. The experimental signature of $\mu^- \rightarrow e^-$ conversion on Al is mono-energetic conversion electrons with 104.97 MeV energy*. Rejection of one of the most important experimental backgrounds coming from muon Decays-In-Orbit (DIO) requires a momentum resolution of <1% FWHM and a momentum scale calibrated to an accuracy of better than 0.1% or 0.1 MeV. Among other momentum scale calibration techniques, the collaboration is considering using 68.9 MeV e+ from π+ ⟶ e+nu_e decays of stopped π+. This momentum calibration measurement has a significant background dominated by the muon decays in flight affecting the calibration accuracy. The background can be reduced by placing a thin Ti degrader in front of the stopping target and properly choosing the timing of the measurement. We discuss optimization of the π+ ⟶ e+nu_e momentum calibration measurement and present the results.

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