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Emittance Measurement in Muon Ionization Cooling Experiment

Saturday 6 August 2016 18:00 (2 hours)

The goal of the international Muon Ionization Cooling Experiment (MICE) is to demonstrate transverse emittance reduction of a muon beam using a lattice cell that could be a component of a Neutrino Factory and a Muon Collider. In MICE Step IV configuration, the muon beam passes through a low-Z absorber material for reducing its transverse emittance through ionization energy loss and the position and momentum of individual muons are reconstructed inside two scintillating fiber tracking detectors, upstream and downstream of the absorber for measuring the transverse emittance to about 0.1% accuracy. Two spectrometer solenoid modules each made of five superconducting coils house the two trackers. Three coils of each spectrometer are responsible for producing uniform magnetic field at the locations of trackers and the two other coils for matching the beam entering and leaving the absorber. However, due to existence of non-linear effects in the beam optics, transverse emittance growth can be observed and therefore it is important to develop algorithms which can prevent this apparent emittance growth. A review of emittance measurement techniques in MICE including emittance exchange and other analysis tool sets for measuring the phase space volume of MICE muon beam will be presented.

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