

Analysis of Multiple Coulomb Scattering of Muons in the MICE Liquid H₂ Absorber

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It is anticipated that high brightness muon beams will be needed primarily in two types of accelerators, a muon collider and a neutrino factory. The primary challenge posed by using muons for the working particle of an accelerator complex, and the reason they have not been used extensively, is the muon's short life-time ($2.2\mu\text{s}$ at rest) and the relatively long cooling periods required by conventional beam cooling techniques. The Muon Ionization Cooling Experiment (MICE) is a multi-national accelerator physics initiative which has demonstrated Ionization Cooling (IC); a new, rapid beam-cooling technique suitable for the short-lived muon. The performance of IC depends on two key processes - energy loss due to collisional ionization, and Multiple Coulomb Scattering (MCS) - for which accurate models are crucial in parametrizing the method and enabling quantitative design of future muon accelerators. Experimental measurements of MCS of positive straight-track muons with momenta in the range 170-240 MeV/c in liquid H₂ are reported in this study.

Working group

WG3

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