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Muon Ionization Cooling Experiment (MICE): Results & Prospects

A neutrino source based on decay of an intense muon beam would be ideal for measurement of neutrino oscillation parameters. A high-energy muon collider could be the most powerful and cost-effective collider approach in the multi-TeV regime. Muon beams may be created through the decay of pions produced in the interaction of a proton beam with a target. The muons are subsequently accelerated and injected into a storage ring where they decay producing a beam of neutrinos, or collide with counter-rotating antimuons. Cooling of the muon beam would enable more muons to be accelerated resulting in a more intense neutrino source and higher collider luminosity. Ionization cooling is the novel technique by which it is proposed to cool the beam. The Muon Ionization Cooling Experiment collaboration has constructed a section of an ionization cooling cell and used it to provide the first demonstration of ionization cooling. Here the observation of ionization cooling is described. The cooling performance is studied for a variety of beam and magnetic field configurations. The future outlook for muon ionization cooling demonstrations is discussed.

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