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High efficiency muonium beam source

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A highly efficient muonium source will enable fundamental muon and precision measurements, including sensitive symmetry-violation searches. There are no U.S. muonium sources, nor available muon beams. Muonium sources internationally are significantly oversubscribed. The intense 800 MeV PIP-II linac under construction at Fermilab is capable of providing world-class muon and muonium beams with unparalleled intensity to drive the next generation of precision muon-physics experiments at the intensity frontier. Timing is critical to initiate the prerequisite R&D necessary to prepare for the PIP-II era. This paper describes a muonium beam for experiments such as measurement of antilepton gravity and improved searches for muonium–antimuonium mixing. The low-energy μ^+ and μ^- beams can also support muon spin-rotation applications to material science including critical surface studies of quantum computing devices, precision muon experiments, muon-cooling studies for a future muon collider, muon-catalyzed-fusion R&D, and unique studies of semiconductor device physics.

Footnotes

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