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Proposal for a proton-bunch compression experiment at IOTA in the strong space-charge regime

The longitudinal compression of intense proton bunches with strong space-charge force is an essential component of a proton-based muon source for a muon collider. This paper discusses a proton-bunch compression experiment at the Integrable Optics Test Accelerator (IOTA) storage ring at Fermilab to explore optimal radio frequency (RF) cavity and lattice configurations. IOTA is a compact fixed-energy storage ring that can circulate a 2.5-MeV proton beam with varying beam parameters and lattice configurations. The study will aim to demonstrate a bunch-compression factor of at least 2 in the IOTA ring while examining the impact of intense space-charge effects on the compression process.

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