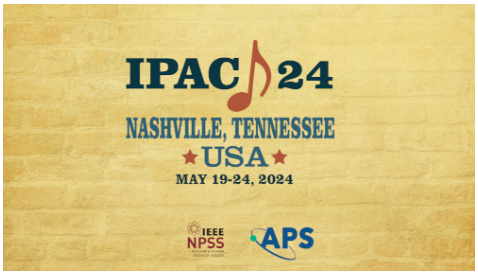

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Lattice design of a pulsed synchrotron for a muon collider fitting within the Fermilab site boundary

Monday, 20 May 2024 16:00 (2 hours)

A muon collider allows one to have a high energy reach for physics studies while having a relatively compact footprint. Ideally such a machine would accelerate muon beams to about 5 TeV. We present a preliminary lattice design for a pulsed synchrotron that will accelerate muon beams to their maximum collision energy and having a circumference of 16.5 km, which would allow it to fit just within the Fermilab site boundary. We wish to estimate the maximum energy that muons can be accelerated to on the Fermilab site based on a realistic lattice layout. To achieve a high average bend field, superconducting fixed field dipoles are interleaved with iron-dominated dipoles whose field is rapidly ramped from negative to positive field. Multiple RF stations are required to ensure that the beam energy and the dipole fields are reasonably well synchronized and to avoid longitudinal losses due to the large synchrotron tune. We use FODO arc cells with dispersion suppressed into the RF straights. We will discuss tradeoffs between maximum energy, energy range, and muon decays. We will consider whether to mix superconducting and iron quadrupoles like the dipoles.

Footnotes

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