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Magnetic and mechanical design of large-aperture HTS superconducting dipoles for the Muon Collider accelerator ring

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To push the boundaries of physics beyond the capabilities of the LHC and its High-Luminosity Upgrade (HL-LHC), particle physicists are exploring advanced accelerators to enable more precise measurements and achieve higher energies. Following the recommendation of the Updated European Strategy for Particle Physics (ESPP), the International Muon Collider Collaboration has been established to assess the feasibility of a muon collider facility with a center-of-mass energy of 10 TeV. This initiative faces significant technical challenges, primarily due to the short muon lifetime at rest of just 2.2 µs. Overcoming this constraint requires the development of cutting-edge technologies, including complex magnets, RF systems, targets, shielding, and cooling techniques. This work focuses on optimizing the electromagnetic and mechanical design of high-temperature superconducting (HTS) dipoles with a large rectangular aperture for the accelerator ring, capable of generating a bore field of 10 T, using finite element methods. Key objectives include achieving precise magnetic field uniformity, conducting an initial assessment of the mechanical behavior of the HTS coils and a preliminary study of hysteretic losses. This research aligns with the ESPP's emphasis on technological advancements, particularly in high-field superconducting magnets, which are essential components for future circular colliders.

What category does your poster fit in?

Acceleration

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