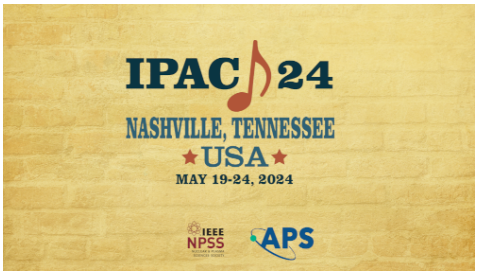

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Design of an 805 MHz cavity with thin beryllium windows and distributed coupling for muon ionization cooling

Tuesday, 21 May 2024 16:00 (2 hours)

For the future multi-TeV muon collider, ionization cooling is a critical step to achieve the required beam emittance for a proton-driven muon beam. Ionization cooling of intense muon beams requires the operation of high-gradient, normal-conducting RF structures in the presence of strong magnetic fields. The MAP modular cavity study at Fermilab has demonstrated the RF breakdown threshold at 13 MV/m for copper surface and 50 MV/m for beryllium surface in a 3 T solenoid B field. Based on these surface E field limits, we design a new 805 MHz copper cavity with thin curved beryllium windows that can achieve a gradient (without the transit time factor) of ˜27 MV/m, which is comparable to the current 6D cooling lattice design. We also explore the distributed coupling for feeding the RF power to multiple cavities in the cooling lattice to accommodate the tight space in the superconducting solenoids. This cavity design study can be applied to the muon collider demonstrator program to experimentally evaluate the 6D muon emittance cooling.

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