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Recent Progresses Regarding Enclosed RF Cavities for Future Muon Collider Cooling Channel

Tuesday 12 August 2025 16:00 (2 hours)

The muon collider (MuC) holds strong potential for reaching the 10 TeV energy frontier but introduces several technical challenges. Ionization cooling is essential to reduce beam emittance and achieve required luminosities. As muons lose energy in absorbers, normal-conducting RF cavities restore it. However, strong magnetic fields—needed for beam focusing—increase the risk of RF cavity breakdowns. Thin beam windows are used to reduce breakdown probability and improve shunt impedance. In this paper, we present some recent studies on these cavities, including: 1) evaluating emittance growth due to particle scattering in the beam windows made of Be and Al by GEANT4, 2) calculating the beam loading effect in the presence of the beam windows with CST wakeifeld solver and Particle-In-Cell solver, 3) deriving the breakdown thresholds for different cavity materials in strong B fields based on a thermal-mechanical model.

Please consider my poster for contributed oral presentation

Yes

Would you like to submit this poster in student poster session on Sunday (August 10th)

Yes

Footnotes

Funding Agency

DoE SCGSR program contract number DE-SC0014664.

I have read and accept the Privacy Policy Statement

Yes

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