

Muon Collider 6D Cooling Simulations

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In the current Muon Collider design the muon beam 6D phase space volume must be reduced several orders in magnitude in order to be able to further accelerate it and inject it into the storage ring. Ionization cooling is currently the only feasible option for cooling the beam within the muon lifetime. The RFOFO ring is one of the feasible options currently under active investigation along with other designs. The RFOFO ring provides a significant reduction in the six-dimensional emittance in a small number of turns with a relatively low particle loss factor. However, the injection and extraction are challenging, and the overheating of the absorbers is an issue.

Two lattices mitigating these issues are simulated and analyzed: the RFOFO helix, also known as the Guggenheim channel, and the open cell lattice. The open cavity lattice is aimed at resolving another important problem, namely, the RF cavity breakdown in the presence of strong magnetic fields.

To demonstrate the six-dimensional cooling, it is proposed to use a wedge absorber in Step IV of the international Muon Ionization Cooling Experiment. Relevant beam tracking studies are presented.

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