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# Calculation of Longitudinal and Transverse Emittance Tradeoffs in a Rectilinear Cooling Channel

An important challenge in designing a muon collider is cooling the captured muon beam in an efficient and cost-effective manner. One approach to muon cooling consists of a multi-stage scheme in which the particle beam is passed through a rectilinear cooling channel made up of repeating cells each consisting of alternating radio frequency cavities and wedge absorbers. This scheme was studied in detail in [1]. However, analysis across multiple decision variables was outside of the work's scope. In this work, we combine multi-objective genetic optimization with realistic simulations of the rectilinear cooling channel in order to analyze the trade-off between transverse emittance, and longitudinal emittance, while constraining the percent of beam loss, of the muon beam during its first passage through the cooling lattice. We present the initial results of this optimization, which has achieved a balance between the two objectives that minimizes both beyond the results reported in [1].

[1] Stratakis, D., & Palmer, R. B. (2015). Physical Review Special Topics - Accelerators and Beams, 18(3), 031003

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