

Inaugural US Muon Collider Meeting

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Electron Cooling for a Muon Collider

Electron cooling of muons has the potential to enable an enormous increase in muon beam phase space density. At low energy and with a high electron current, evaluation of the cooling process indicates that the muon phase space can be reduced by a factor of about one hundred billion during several microseconds of cooling time. To achieve the needed high electron currents at low energy, we propose filamentation of the original muon beam into many smaller beams; each filamentary cooler will need only a small fraction of the total electron beam current. To mitigate against space charge induced instability in the electron beams, we further propose to neutralize the electron beam space charge in each filamentary cooler by trapping ions within the beam drift region. After cooling in one stage, the muon beam can be coalesced and focused (increasing its velocity spread) which allows further cooling in a subsequent cooling stage.

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