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Physics Potential of a TeV-Scale Muon-Ion Collider

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A TeV muon-ion collider could be established if a high energy muon beam that is appropriately cooled and accelerated to the TeV scale is brought into collision with a high energy hadron beam using facilities such as at Brookhaven National Lab, Fermilab, or CERN. Such a collider opens up a new regime for deep inelastic scattering studies as well as facilitates precision QCD and electroweak measurements and searches for beyond Standard Model physics, in an alternative and complementary way to the proposed LHC-electron collider. It offers a compelling science program as a target for a first TeV scale muon accelerator demonstrator, on the path toward a O(10) TeV muon collider energy frontier machine. We discuss the potential physics program of such a muon-ion collider and some of its experimental challenges.

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