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A Future Muon-Ion Collider at Brookhaven National Laboratory

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There has been significant discussion in the community regarding a future $\mu^+\mu^-$ collider. While such a facility is still decades away from realization, it is also understood that significant technological development and feasibility demonstrations are necessary at lower beam energies. Here we propose such a possibility coupled with a rich physics program. We propose a future Muon-Ion Collider that would serve as a natural extension to the EIC program currently planned in the 2030's and 40's. We envision this collider would be implemented as an upgrade to the EIC, with μ beam energies between 18 GeV and 200 GeV. In this presentation we discuss the physics reach of such a collider, which could reach $x \approx 10^{-5}$ with a luminosity approaching 10^{34} cm^{-2} s^{-1}. We argue that the physics reach of such a program is excellent and comparable to the LHeC (some measurements would be beyond the reach of the EIC), and it will facilitate accelerator technology development for the future muon collider.

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Submitted on behalf of a Collaboration?

No

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