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Longitudinal laser shaping at the EIC cooler injector

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Intra-beam scattering and other mechanisms can degrade the beam quality in the EIC Hadron Storage Ring. Strong hadron cooling will maintain the beam brightness and high luminosity during long collision experiments. An Energy Recovery Linac is used to deliver the high-current high-brightness electron beam for cooling. The best cooling rate is realized when the electron beam has low emittance, small energy spread, and uniform longitudinal distribution in the cooling section. Therefore, the initial distribution needs must be optimized to achieve a good cooling distribution. The longitudinal beam distribution at the cathode can be shaped by varying the temporal profile of the laser. The cathode distribution is tracked numerically through the cooler lattice to find the resulting cooling distribution. In this work, we demonstrate the optimization of the cathode longitudinal beam distribution to achieve a uniform longitudinal cooling distribution while maintaining a small emittance. Space charge and cathode image fields are included in the beam tracking.

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Footnotes

I have read and accept the Privacy Policy Statement

Yes

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