

Energy Recovery Linac Design and Studies for Electron Cooling of EIC Hadron Beams

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The baseline scheme for hadron beam cooling in the Electron Ion Collider (EIC) calls for Coherent electron Cooling (CeC) of the hadrons with non-magnetized electrons at high energy (150 MeV electrons), and additional cooling via conventional bunched beam cooling using a pre-cooler system. The electron beam parameters for these concepts are at or beyond the current state of the art, with electron bunch charges of the order of 1 nC and average currents on the order of 100 mA and require an Energy Recovery Linac (ERL)-based accelerator to produce such beams. Using specifications provided by BNL and Jefferson Lab, physicists and engineers at Xelera Research are working on a complete design of an ERL system capable of satisfying such a cooler. This work includes designs for the injector, merger, multi-pass Linac, merger into the cooling section, demerger into the return line (which includes 180-degree arcs), and final extraction of the energy-recovered beam, beam breakup simulations, tolerance studies, start-to-end simulations, and beam halo studies.

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