

Electron Cooling and Luminosity of EIC*

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Abstract

We report on results of recent studies of optimum optic conditions and beam transports for colliding beams and electron cooling (EC) of EIC. The integrated bunch to bunch luminosity is calculated as function of ion beam energy at a given luminosity lifetime for ion beam under EC, taking into account the multiple and Touscheck intra-beam scattering (IBS) in ion beam. EC in a ring with non-coupled optics leads to a flat equilibrium beam. It is found that the flat colliding beams will benefit one with reduction of the IBS rates at a given beam area. We also will describe newly developed electron beam transport principles for high energy EC that include a circulator ring, strong quadrupole focusing of e-beam in cooling section, optimal scanning the e-beam about the ion beam, and use of a staged cooling. With references to the recently developed concepts for stacking the intense, low emittance ion beams in boosters, a possibility to attain a luminosity level of $10^{35}/\text{cm}^2\text{s}$ in a “green field” built EIC will be illustrated.

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