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Estimates of the recombination rate for the strong hadron cooling system in the EIC

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The strong hadron cooling system (SHC) for the electron-ion collider (EIC) consists of the modulator, the microbunching amplifier and the kicker section. In the modulator and the kicker section, the electrons are co-moving with the protons. If the relative velocity of an electron with respect to a proton is small enough, it can be captured by the proton and the resulting neutral particle, i.e. a hydrogen atom, will deviate from the designed trajectory and get lost around the cooling section. Since the probability of a proton capturing an electron depends on the relative velocity between them, one can align the energy of the two beams based on the number of hydrogen atoms detected by a recombination monitor. In this work, we estimate the rate at which the hydrogen atoms produced by the recombination process for the SHC in EIC.

Footnotes

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