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Thu-Af-Or22-07: Optimization of an Interaction Region Quadrupole Magnet for Future Electron-Ion Collider at Jefferson Lab

Thursday 26 September 2019 18:00 (15 minutes)

The Jefferson Lab Electron Ion Collider (JLEIC) is a proposed new machine for nuclear physics research. It uses the existing CEBAF accelerator as a full energy injector to deliver 3 to 11 GeV electrons into a new electron collider ring. An all new ion accelerator and collider complex will deliver up to 200 GeV protons. The machine has luminosity goals of 10ˆ34 cmˆ-2 secˆ-1. The whole detector region including forward detection covers about 80 meters of the JLEIC complex. The lattice file for the machine has changed to accommodate the higher energy; this change requires all the magnets in the interaction region to change. This paper will describe the requirements for both the ion and electron beam superconducting magnets around the interaction point. All the Final Focusing Quadrupole (FFQ) magnets now have preliminary designs. This paper will describe the optimization process for one of these FFQs. The optimization is performed using the optimization module of Opera FEA. An analytical design tool has also been developed to estimate the peak field in the coils. The quadrupole is optimized for peak field in the coils, magnetic length and integrated multipole components.

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