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IR design

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The Interaction Region (IR) Machine Detector Interface (MDI) for an electron-hadron collider such as the LHeC/FCC-eh combines challenging aspects of both hadron and e+e- colliders. High-field superconducting magnets are needed to provide strong focusing and deflection fields for handling a stiff high-rigidity hadron beam. But we must also protect the electrons from seeing any such large magnetic fields that can lead to excessive synchrotron radiation (synrad) to strike cryogenic components or to cause detector background. In addition to their focusing function, the hadron IR quadrupoles must provide a septum-like function for passing the electron beam and possibly a non-colliding hadron beam (e.g. 3-beam mode). Generating some synrad near the IP is unavoidable due to the LHeC using a beam separation dipole, in contrast to the eRHIC layout that employs a crossing angle scheme. While protection collimators and masks will be used to protect LHeC IR magnets from synrad, HERA-II experience shows that extreme care must be taken in order to ensure acceptable experimental background conditions. We should avoid both direct synrad backscatter albedo from protection devices and beam scattering off of desorbed gasses from hitting sensitive detector components. In this presentation we review LHeC MDI challenges in the context of HERA-II experience and the ongoing eRHIC IR design effort and present some newly developed IR magnet design options to address anticipated LHeC/FCC-eh MDI issues.

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