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Beam Dynamics for Concurrent Operation of the LHeC and the HL-LHC

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The Large Hadron Electron Collider (LHeC) is a study at CERN to construct an energy recovery linear accelerator (ERL) tangentially to the High Luminosity Large Hadron Collider (HL-LHC). This would enable deep inelastic scattering collisions between electrons and protons in the ALICE interaction region (IR2). In this design, one of the two proton beams of the HL-LHC collides with the electron beam in IR2, while the second proton beam avoids this collision. This way, the e-p collisions can take place concurrently with p-p collisions in ATLAS, CMS and LHCb. The LHeC/ALICE interaction region is laid out for alternate e-p and p-p data, using a common detector, suitable for this novel way of interaction. It therefore requires a highly precise beam optics and orbit for the three beams: the two proton beams of the HL-LHC, as well as the electron beam from the ERL. The highly asymmetric optics and orbits of the two proton beams, allowing concurrent operation of the HL-LHC experiments and e-p collisions, have been investigated with MAD-X. The impact of an optimized electron mini-beta insertion, focusing and bending the electrons, on the proton beam dynamics has been considered.

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Footnotes

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Yes

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