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# Magnetic design of the commutational magnet and quadrupoles for PERLE accelerator

*Monday, 8 May 2023 16:30 (2 hours)*

PERLE (Powerful Energy Recovery LINAC for Experiment) is a high-power Energy Recovery LINAC (ERL) facility with 20 mA beam current and beam energy from 250 MeV to 500 MeV featuring three passes through two cryomodules. It is a hub for validation of the ERL technology development towards future energy and intensity frontier machines. Design challenges of PERLE and its beam parameters make it a testbed to validate multi-turn high current ERL operation for the LHeC. It will be the first ERL for some pioneering experiment of the eN interaction with radioactive nuclei.
In this work, design and optimization of the commutational magnet (B-com) used to spread/combine the three beams and one series of the quadrupole magnet is discussed. It gives the design parameters including: yoke geometry, pole profile, and material, and calculation of the excitation current needed to drive the magnet, the coil parameters and the number of turns.
The B-com magnet is optimized for a 30° bending angle with magnetic field of 0.88 T along the magnet length and a harmonic content of 0.036%. The quadrupole magnet is designed for a gradient field of 34.15 T/m and experiences saturation above this value. Further studies to avoid saturation and achieve the maximum gradient of 44.1 T/m required by the beam dynamics is undergoing.

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## Footnotes

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