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Magnetic and mechanical design of a 16 T common coil dipole for FCC

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EuroCirCol is a conceptual design study for a post-LHC research infrastructure based on an energy-frontier 100 TeV circular hadron collider. In the frame of the high-field accelerator magnet design work package of this study, the feasibility of a 16-T dipole in common coil configuration is being studied. This paper shows the electromagnetic calculations performed to achieve the required field quality while minimizing the superconductor volume and taking into account the input parameters and assumptions of EuroCirCol study. FEM models have been used to analyze the stress distribution and deformations under the large Lorentz forces due to the very high magnetic field. Several iterations have been necessary to obtain a feasible magnet design. 3-D electromagnetic calculations are also included in this paper.

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