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Conceptual design of a 16 T cosθ bending dipole for the Future Circular Collider

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After LHC will be turned off, a new accelerator machine will be needed in order to explore unknown high-energy Physics regions. For this reason, the project FCC (Future Circular Collider) has started at CERN, with the target of studying the feasibility of a very large hadron collider with 50 TeV proton beams in a 100 km circumference. The EuroCirCol project is part of the FCC study under European Community leadership. In particular, it has the outcome of producing a conceptual design of the FCC within 2019. One of the main activities is the development of a superconducting dipole able to produce a bore field of 16 T, in order to bend the beams within energy and size constraints. Here we present the conceptual design of a Nb3Sn cosθ dipole layout, in a double-aperture configuration (LHC style). We show that it is possible to produce a bore field of 16 T with a good field quality, with reasonable assumptions on the conductor features, and with a reasonable amount of cable. A bladders and keys mechanical structure is also presented, proving that the electromagnetic forces can be maintained, keeping the stress within the coils under a safe limit. Finally, we present a preliminary quench study, showing that the magnet can be protected using well-known technologies.

Submitters Country

Italy

Primary author: MARINOZZI, Vittorio (University of Milan / INFN)

Co-authors: BELLOMO, giovanni; Dr CAIFFI, Barbara (INFN Sezione di Genova); FABBRICATORE, Pasquale (Universita e INFN Genova (IT)); FARINON, Stefania (Universita e INFN Genova (IT)); Mr RICCI, Alessandro (INFN Genova); SORBI, massimo (Milan University & INFN-LASA)

Presenter: MARINOZZI, Vittorio (University of Milan / INFN)

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