MT 26
International Conference on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **1745** Type: **Poster Presentation**

Mon-Mo-Po1.04-03 [37]: Engineering Design and Digital Twin of the Nb3Sn 16T main dipole magnet of the FCC accelerator

Monday, 23 September 2019 09:15 (2 hours)

Superconducting accelerator dipole magnets, based on Nb3Sn technology, with a nominal operation field of 16 T in a 50 mm aperture are being considered for the Future Circular Collider (FCC) with a center-of-mass energy of 100 TeV and a circumference in the range of 100 km, or an energy upgrade of the LHC (HE-LHC) to 27 TeV. To demonstrate the feasibility of such magnets, a twin-aperture 16T Nb3Sn dipole demonstrator based on a 4-layer cos-theta coil with 50 mm aperture and cold iron yoke is developed in the frame of the EuroCirCol program. The main design challenges for 16 T magnets include large Lorentz forces at this field level while maintaining accelerator requirements. To counteract the electromagnetic forces, an innovative mechanical structure based on the bladder-and-key concept, incorporating asymmetric coils and both aluminum and stainless steel skins, has been developed at INFN and further studied in collaboration with the University of Patras. This paper describes the design concept of the 16 T twin-aperture dipole magnet and the fully 2D & 3D parametric multi-physics finite & boundary element model (FEM & BEM), including the end regions. The design optimization is described and the optimized assembly parameters are presented.
**Work is supported by CERN, under contract No. FCC-GOV-CC-0141.*

Primary author: Mr KOKKINOS, Charilaos (FEAC Engineering P.C. & University of Patras)

Co-authors: PAMPALONI, Alessandra; CAIFFI, BARBARA (INFN - National Institute for Nuclear Physics); SCHOERLING, Daniel (CERN); TOMMASINI, Davide (CERN); Dr POLYZOS, Demosthenes (University of Patras); Dr RODOPOULOS, Dimitrios (FEAC Engineering P.C. & University of Patras); Mr LOUKAS, Konstantinos (FEAC Engineering & University of Patras); Mr KOKKINOS, Sotiris (FEAC Engineering P.C. & University of Patras); FARINON, Stefania (INFN e Universita Genova (IT)); Dr GORTSAS, Theodoros (FEAC Engineering P.C. & University of Patras)

Presenter: Mr KOKKINOS, Charilaos (FEAC Engineering P.C. & University of Patras)

Session Classification: Mon-Mo-Po1.04 - High Field Magnets for Future Colliders