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Updated Conceptual Design of the DTT magnet system

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DTT is the acronym of "Divertor Tokamak Test" facility, a project for a compact but flexible tokamak reactor which has been conceived in the framework of the European Fusion Roadmap. It will be built in Italy and shall act as a satellite experimental facility to integrate the extrapolation of the ITER results to the EU-DEMO machine. It is thus mainly aimed at the exploration of different divertor solutions for power and particles exhaust, and to study the plasma-material interaction scaled to long pulse operation. The magnet system conceptual design was originally performed in the 2015, but further investigations lead to the final design presented in this paper. The machine layout and size has been changed: the major plasma radius has been modified from 215 cm of the 2015 design to 208 cm of the present one. The overall magnet system is superconducting and it is based on NbTi and Nb3Sn Cable-in-Conduit Conductors. It consists of 18 Toroidal Field (TF), 6 Poloidal Field (PF) and 6 Central Solenoid (CS) stacked and independently energized module coils. In order to cope with the machine requirements, the Nb3Sn TF coil is characterized by a peak field of 11.8 T on the conductor, operating at 33 kA; the Nb3Sn CS modules are characterized by a peak field of about 13 T, with a conductor operating current of 27 kA; the PF coils are wound using NbTi conductors operating at a maximum peak field of 4.0 T, with operating currents ranging from 20 kA to 30 kA, depending on the PF coil.
In the present work, a general description of the updated Conceptual Design of the DTT magnet system is reported, along with the main outcomes of the analyses and the main design choices which lead to this solution.

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