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DTT: a challenging framework for a sound superconducting magnets design

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At the ENEA's research center of Frascati, the DTT (Divertor Tokamak Test) facility is currently under construction. The activity of this experimental nuclear fusion reactor, will be focused on the optimization of the power exhaust management in view of DEMO. The project has been started during year 2014, when also the superconducting magnet system has been initially designed, basing on the available inputs coming from physics and on the desired goals for the machine. At present, the coils engineering design has almost been completed and the production of crucial components, such as the superconducting strands, conductors, toroidal and poloidal field coils, have already been started. For the remaining superconducting elements, the engineering design is being finalized. The result is a compact and flexible tokamak, with highly demanding requirements in terms of superconducting and structural performances, sometime close to the intrinsic mechanical limits of the adopted materials. Tight constraints on time, budget and resources forced the design team to walk through a complex path in these years for reaching a sound and satisfactory design of the complete magnet system. In fact, it was not possible to rely entirely on state-of-the-art and already assessed superconducting technologies, as was initially assumed. In particular, the trade-off between limiting the R&D phase and extending the performance demonstrated in other projects to the specific DTT requirements, pushed the team to take some risks, while providing a robust and fully performing magnet system design.

Primary authors: DI ZENOBIO, Aldo (ENEA); ANEMONA, Alessandro (ENEA); BONIFETTO, Roberto (Politecnico di Torino); ANTONIO, Cucchiaro (DTT Scarl); DELLA CORTE, Antonio (Enea); DE MARZI, Gianluca (ENEA, 00044 Frascati, Italy); FIAMOZZI ZIGNANI, Chiarasole (ENEA); GIANNINI, Lorenzo (ENEA); Dr GIORGETTI, Francesco (Università Tuscia); INDRIGO, Dennis (ENI S.p.A.); MESSINA, Giuseppe (ENEA); MORICI, Luigi (ENEA); MUZZI, Luigi (ENEA); PIZZUTO, Aldo (DTT Scarl); POLLI, Gian Mario (DTT Scarl); RAMOGIDA, Giuseppe (DTT Scarl); ROMANELLI, Gherardo (ENEA); SAVOLDI, Laura (Politecnico di Torino); SIMONETTA, Turtù (ENEA); ZANINO, Roberto (Politecnico di Torino); ZAPPATORE, Andrea (Politecnico di Torino); ZOBOLI, Lorenzo (ENEA & Università Tor Vergata)

Presenter: DI ZENOBIO, Aldo (ENEA)

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