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Design and progress status of the ITER Magnet Cold Test Bench to test TF and PF1 coils (fusion, DTT, ITER)

Tuesday 1 April 2025 09:00 (30 minutes)

Oral presentation (20 min) + Q&A (10 min)

The 19 Toroidal Field (TF) coils, including one spare, have been manufactured by Japan and Europe and have been delivered on ITER site. The PF1, procured by Russia has also arrived on site. The delay in the ITER machine assembly has led the Project to take the opportunity to build a magnet test bench (MCTB) on site in order to test some of the ITER TF coils and the PF1 coil taking into account the new assembly schedule. The most complete magnet integrated tests will be performed by the teams to gain experience for the tokamak commissioning.

The main objective of the tests is to check the overall magnet performance (joint resistance, mechanical deformation, operating conditions). One major risk mitigation is the check of the ground insulation and ground protection. The TF coils and PF1 coils will be energized at full current, 68 kA for TF and 48 kA for PF1, and will be cooled with supercritical helium at 4.75 K and 0.46 MPa.

Most of the components of the test facility will be ITER relevant and will allow the test of the instrumentation chains and control logics foreseen for the ITER operation. An ITER Cold Terminal Box will be connected to the coil for the helium and electrical supplies. The cryogenic system will provide enough refrigeration capacity with one out of the three ITER refrigeration cold boxes and will supply supercritical helium to the TF winding pack, casing and busbars. One important system to be tested will be the magnet protection system to demonstrate the quench detection capabilities (primary, secondary and safety class detection).

A 21 m - 11 m large and 6 m height cryostat is being manufactured to position horizontally either a TF coil or PF1 coil. A dedicated power supply will energize the coil and a Fast Discharge Unit will protect the coil in case of Fast discharge and quench.

The presentation will give an overview of the design of the test facility, the progress status of the main components and the testing program.

“The views and opinions expressed herein do not necessarily reflect those of the ITER Organization”

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