MIFI - MAGNET INFRASTRUCTURE FACILITIES FOR ITER: DESCRIPTION AND ACTIVITIES OVERVIEW

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Introduction

ITER magnets are in the manufacturing and preassembly phases. Depending on the progress status of each component, the Magnet team expressed the need for labs and workshops in order to:

- Perform R&D to validate and improve design and technical choices
- Manage the reception, the acceptance, the temporary storage and the shipment of the Magnets instrumentation components
- Qualify, inspect and test the Magnets instrumentation components
- Prepare and qualify assembly procedures and tooling
- Train the operators involved in the assembly

CEA's support to ITER

CEA-IRFM signed the MIFI Agreement (Magnet Infrastructure Facilities for ITER) with ITER Organization to provide technical support structure to the ITER Magnet team:

- A core team of technicians
- Additional expertise from CEA-IRFM labs when needed
- Support and logistics
- The premises to host large mockups, a storage area and 4 technical laboratories

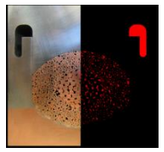
High Voltage lab

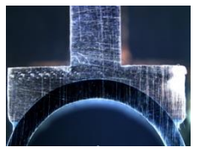
This lab is able to reproduce the standard voltage waveforms: 100 kV_{rms} AC, 135 kV DC, switching and lightning impulse voltage, to perform partial discharges and paschen tests.

Low Voltage & Instrumentation lab

This lab is set up to qualify and test the single instrumentation components but also the full measurement chains and the assembly procedures.






Superconductor, Cryogenics & Impregnation lab

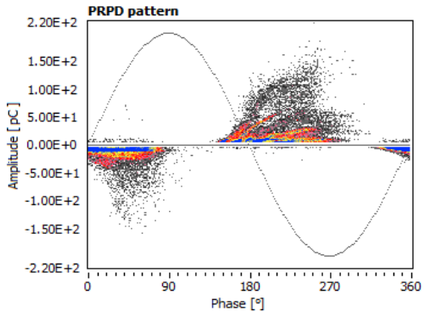
This lab is dedicated to chemical activities, material processing, macroscopic examination, cryogenic tests and Vacuum Pressure Impregnations

Machining & Mechanical Assembly lab

This lab is involved in almost all the activities of the other labs but also directly in charge of entire activities linked to the assembly process

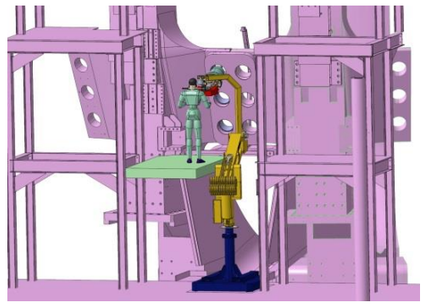
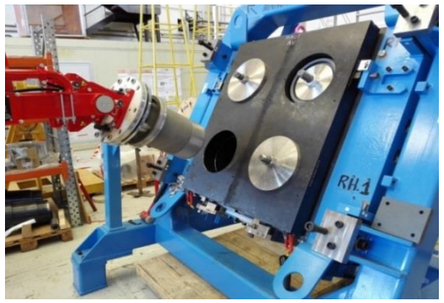
Focus on high voltage insulation manufacturing and testing

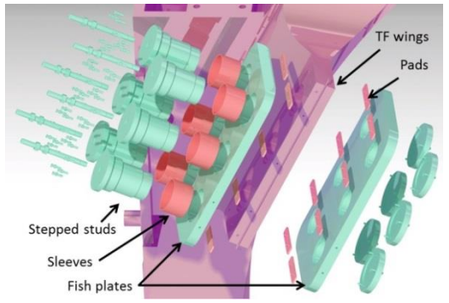
MIFI has the role to support IO by providing a platform to develop, improve and qualify processes. This short sample insulation is composed of 9 half overlapped prepreg Glass/Kapton (GK) layers. Compaction and pressure to the GK during the curing cycle is given by a silicone tape wound underneath the heater tape.
One of the tests done on this sample is Partial Discharge and the acceptance criteria is : PD magnitude below 10 nC at 10 kVrms with negative slope over the test time.

Focus on Intermediate Outer Intercoil Structures (IOIS) test bench

Due to its size, weight, manufacturing processes, and environmental constraints, the ITER magnet system has to cope with numerous mechanical and assembly challenges and IOIS is a good example.
Challenge is to accept shear load up to 2500 tons, mispositionning between Toroïdal Field (TF) coils up to 12.7 mm in horizontal direction and 5 mm in vertical direction and strictly avoid any movement.
The full assembly procedure is simulated on a scale one mock-up in MIFI.

Conclusion

In MIFI, IO and CEA have succeeded in building a common technical platform to develop, improve and qualify manufactured components and assembly processes. Through this platform, IO is at the same time ensuring a high level of industrial production quality control and preparing the challenging steps of assembly phase. The agreement runs until mid-2019 and foresees an increasing number of activities and large mockups, as well as real ITER magnet components site-acceptance testing like the PF4 Cryostat Feed-Through, which will be the first large magnet component to be shipped to IO.
Soon, the first training of assembly staff should also start in MIFI, using the mockups from the qualification phase.