Institute for Magnetic Fusion Research

WEST Newsletter N°12 - March 2016

A well done brazing by the chairman of CEA, Daniel Verwaerde

During his recent visit at Cadarache, the CEA chairman was hired to carry out, inside the vacuum vessel of WEST, one of the 140 brazed joints necessary to build the divertor coil winding.

The winding of the divertor coils accounting for 32 turns has to be performed in the restricted space of the vacuum vessel. Each turn is typically constituted of four 90 ° parts brazed together and to a joggle connecting the next turn. The success of each joint requires to carefully follow a 9-step procedure:

1-In-situ measurement and adjustment of the length of the conductor,
2-acid etching of the end of the conductors,
3-alignment of the end of the two conductors, positioning of the silver joint and induction brazing,
4-grinding and polishing of the brazing droplets,
5-readjustement of the conductor curvature after brazing,
6-helium tightness test,
7-fiber glass tape insulation of the joint area,
8-positioning of the conductor in the casing,
9-shimming and electrical insulation test.

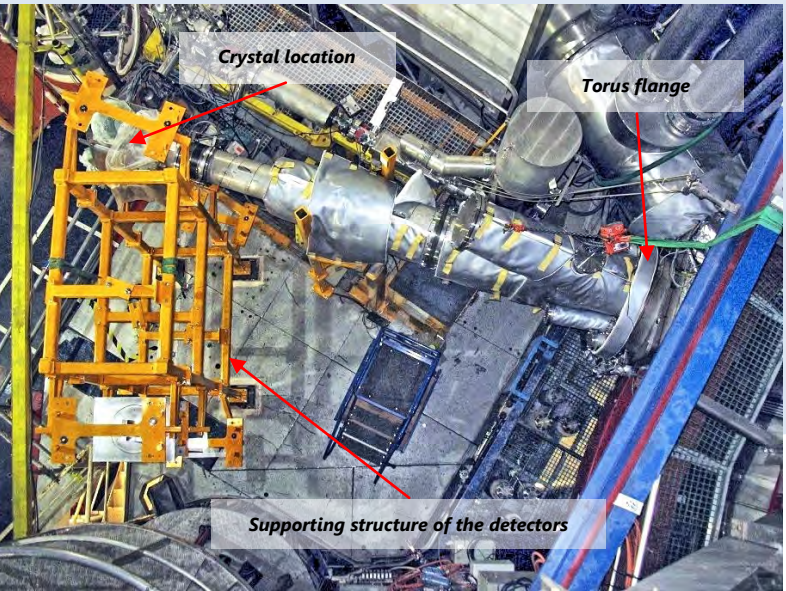
The first upper divertor coil winding is now completed and the second is underway. Both windings will be embedded in the upper casing before tackling the two lower divertor coils. Resin impregnation will be performed once the upper and lower casings have been tightly closed and evacuated (primary vacuum conditions required).

D. Verwaerde at work inside the vacuum vessel

A cutting edge X-Imaging Crystal Spectroscopy diagnostic

A spatially resolving high resolution x-ray spectrometer is a key tool that provides continuous high resolution ion and electron temperature, ion density and plasma rotation measurements on WEST.

This instrument utilizes spherically bent crystals and two dimensional x-ray detectors in which the detector and crystal are arranged on the Rowland circle to image the vertical plasma cross section with a spatial resolution of about few centimeters.



The spectrometer has been designed to measure H-like or He-like emission from injected argon or intrinsic iron. Using spectral tomographic techniques the line integrated spectra can be inverted to infer profiles of impurity emissivity, velocity, and temperature.

The diagnostic is partly funded by the Provence-Alpes-Côte-d'Azur Region and the Aix-Marseille University (A*Midex foundation). The Institute of Plasma Research (IPR, India) contributes to the diagnostic procurement providing the bottom channel and the detectors of the top channel. The IPR will also participate to the diagnostic installation and exploitation.

The specific new flange that will hold the diagnostic, the 3 channels supporting structure and the first part of the central channel have already being mounted on the machine, while the diagnostic utilities are under preparation. The central channel is expected to be ready for the first plasma campaign while the top and bottom channels will be equipped later on.

One way to measure tungsten erosion by fusion plasma

In December 2015, in the framework of the EUROfusion work program, eight plasma facing components (PFC) have been sent to Finland (VTT laboratory) to be equipped with erosion marker.

Measurement of the tungsten (W) erosion by fusion plasma is one of the objectives and challenges of the WEST scientific program especially because of the long pulse capabilities of the tokamak. Based on its experience from marker coatings in ASDEX Upgrade and JET, a collaboration with VTT laboratory has been set up in the frame of the EUROfusion PFC work program. The first goal is to demonstrate the feasibility of the marker layer process on WEST PFC which are larger due to active cooling.

Marker coatings were deposited on eight PFC of the WEST divertor in January 2016. The thin marker layers have been produced by arc-discharge deposition at the facilities of DIARC-Technology Ltd. Thickness of the W coating was found to be ~900 nm and that of the molybdenum (Mo) interlayer ~100 nm (reference layer) which is conform to the specifications. Adhesion of the coatings was tested with sticky tapes. All the samples survived this standard test. The thickness and elemental composition have been estimated from SIMS depth profiles, the impurity signals remaining several orders of magnitude lower than that of the main constituent. The dismantling of the PFCs with marked layer is scheduled after a few hours of plasma exposure. The resulting measured erosion will allow developing optimized marker layers for the following experimental campaigns.

PFC with erosion marker during grazing light inspection

EUROfusion VTT

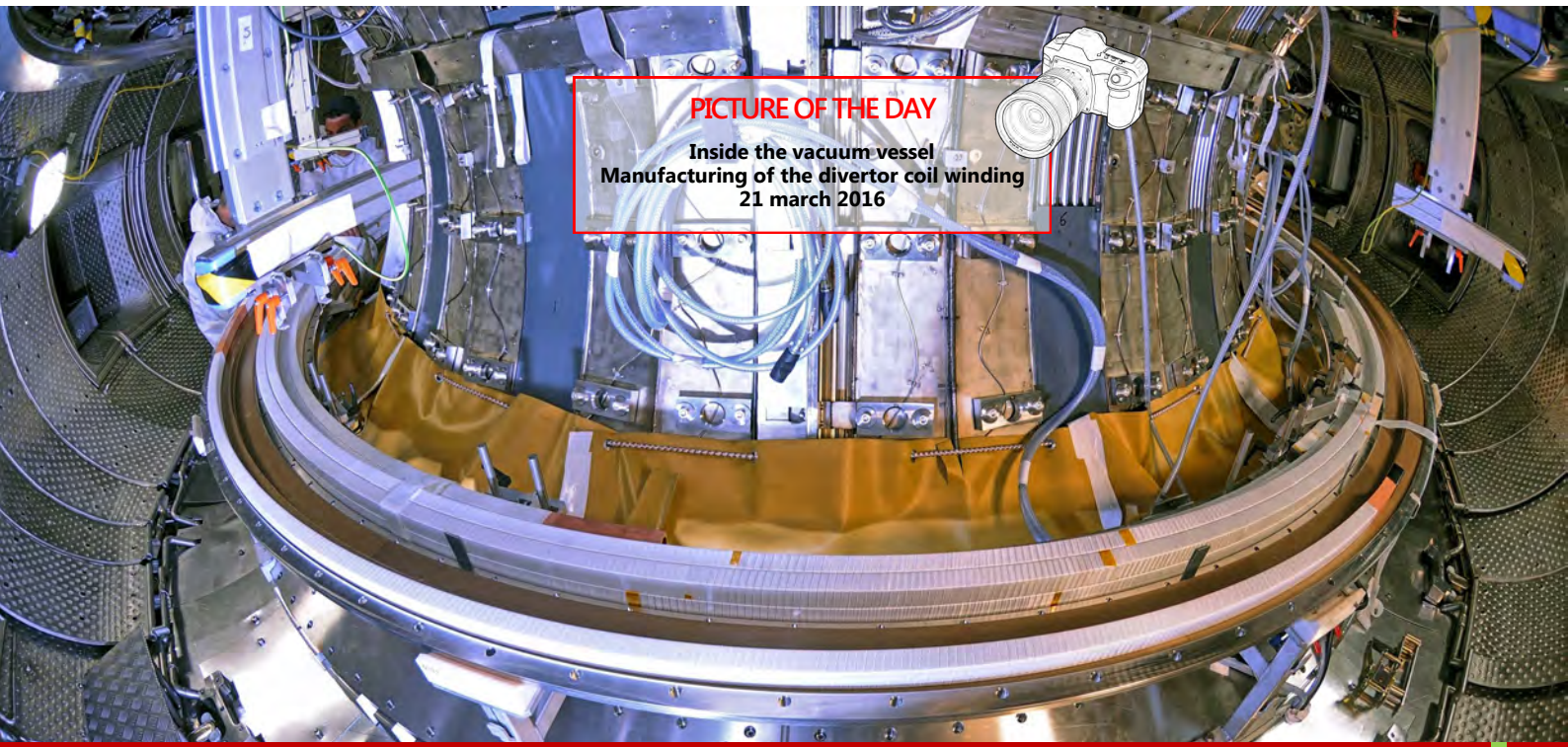
Looking forward to the first WEST Experiment Planning Meeting

The WEST international call for modelling and experimental proposals has been successfully completed on March 15, 2016 with more than 150 proposals received. They will be discussed during this workshop on April 18-20, 2016.

The first WEST international call for proposals has been launched on January 22, 2016 as a basis to the coming common scientific exploitation of the platform. More than 150 proposals have been received from ITER Organization, Europe, USA, China, Japan, India, Korea and Russia. All the contributions are gathered on the WEST wiki pages https://westusers.partenaires.cea.fr.

The next step will be the first WEST Experiment Planning Meeting on April 18-20, 2016 at CEA Cadarache, where the prioritization of experimental and modelling proposals and a timeline for the 2016-2017 WEST experimental campaigns will be discussed (see http://west.cea.fr/WPM1 for more information).

The experimental program will be established along the output of the workshop and submitted for approval to the 3rd WEST Governing Board meeting, planned on May 12, 2016. A call for participation will then be issued to provide the detailed manning for WEST experimental campaigns.



PICTURE OF THE DAY

Inside the vacuum vessel
Manufacturing of the divertor coil winding
21 march 2016

Institute for Magnetic Fusion Research
DRF/IRFM
CEA Cadarache
13108 Saint Paul lez Durance Cedex France

http://west.cea.fr
Contact Newsletter
Sylvie Gibert
sylvie.gibert@cea.fr