Institute for Magnetic Fusion Research

WEST Newsletter N°13 - June 2016

3rd Governing Board at Cadarache

The 3rd WEST Governing Board commended the steady project progress towards first plasma and approved the 2016-2018 experimental timeline.

The Governing Board was held on May 12, 2016, gathering the international partners of the project. The meeting was chaired by Maria Faury, the CEA Sciences Division head for international relations, and was attended by ITER Organization, the French Research Federation on Magnetic Fusion, F4E, EUROfusion and various EU fusion institutes (IPP.CR, IPP, IPPLM, IFA, DIFFER), QST (Japan), SWIP (China), ASIPP (China), IPR (India), UNIST (Korea), US Department of Energy and ORNL (USA).

D.J. Campbell, head of the IO Science and Operation Department, introduced the meeting by presenting the high level deliverables that ITER expects from WEST, based on the output of a common IO-CEA working group. These will be key drivers for the WEST scientific program.

The CEA and the WEST partners then gave an overview of the progress achieved over the last year. A first important milestone was reached with the upper divertor coil now assembled in the vessel, and work has started on the lower coil assembly. Major components have been manufactured at WEST partners and are now ready for shipping. The first ITER like Plasma Facing Units have been produced by QST and ASIPP. Progress in diagnostics and plasma control system was also reported with a large number of laboratories involved.

Finally, the timeline for the 2016-2018 scientific program, based on the output from the WEST international call for proposals and the subsequent WEST experiment planning meeting, was approved. 4 experimental campaigns are foreseen up to 2018 concentrating respectively on heat load pattern, H mode transition, preparing long pulse operation and helium operation with metallic walls.

The Governing Board Chair concluded the meeting by congratulating the WEST international team for the collective progress achieved and looking forward to first plasma.

Divertor Coils Power Supplies leaving China

SWIP, Southwestern Institute of Physics in Chengdu, first WEST partner to sign an agreement in January 2013, has completed and sent the expected power supplies.

The NERCC Company (National Engineering Research Center of Converters) was selected by SWIP in April 2014 to manufacture the two divertor coils power supplies. Manufacturing was completed in December 2015 followed by several months of factory tests that lead to significant changes in the filter inductor. These tests verified that the technical requirements including the thermal behavior of the actively water cooled component were fully achieved in the 20 kA current range.

The power supplies were disassembled and prepared for sea transportation in NERCC premises. They are now in Shanghai waiting for their ship to Cadarache.

SWIPP Power Supplies at NERCC

WEST ICRH antenna celebration at ASIPP-Hefei Institute

From EAST to WEST: ICRH antenna flying to Cadarache

On April 25th, the Associated Laboratory CAS/ASIPP-CEA/IRFM celebrated in Hefei the successful realization of a world-class ITER relevant ion cyclotron resonant heating (ICRH) antenna in the presence of the official authority and media.

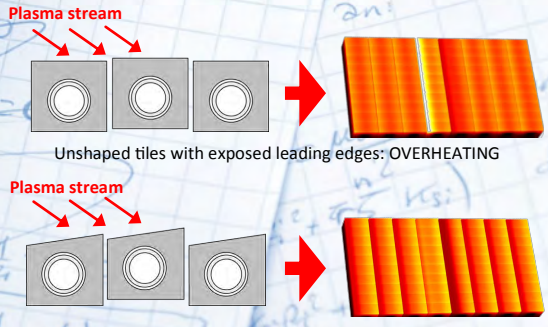
This actively cooled antenna - the first of 3 WEST antennas procured by ASIPP – will be able to inject up to 3 MW of power into the plasmas in long pulse operation, and the condition of plasma edge instability (Edge Localized Modes).
After two years of detailed drawings, and more than one year of manufacturing, the joined team ASIPP/IRFM has raised a satisfying result. More than 2000 components have been machined, controlled, mounted and more than 200 intermediate tests have been done, following complex processes, in order to qualify assembling and welding.
After the blank assembly in Hefei, the antenna is being shipped to IRFM.

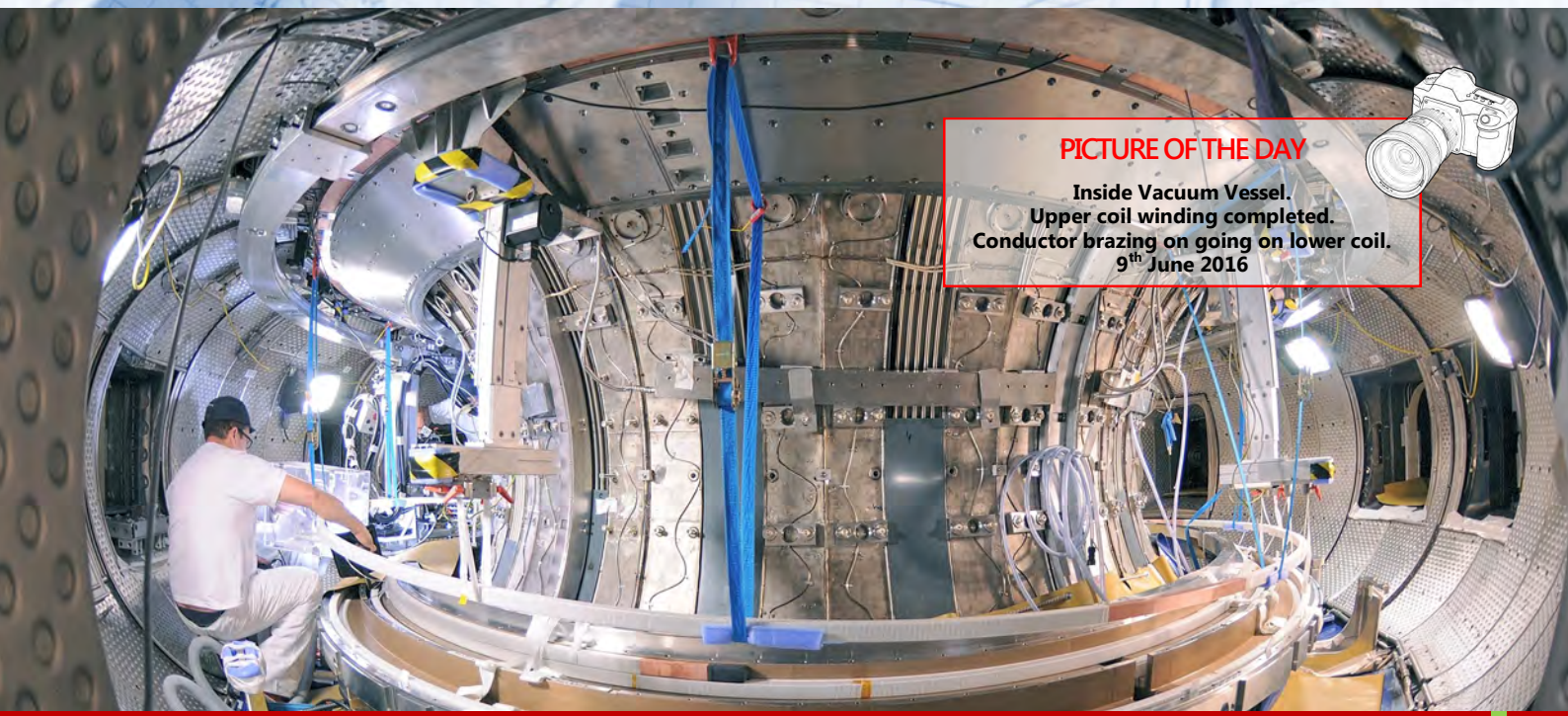
WEST Science — On the shaping of the plasma facing components


Space shuttle entering the earth atmosphere

In a tokamak fusion reactor, the plasma causes intense heating of the divertor, similar to that encountered by a space shuttle when it re-enters the Earth's atmosphere. The belly of the shuttle must be protected by special heat tiles. In the same way, the divertor surface is made of small tungsten tiles that are tilted at a grazing angle with respect to the plasma stream. The edges of the tiles, like the nose and wings of the shuttle, are subject to very intense heat flux. The engineering tolerances of the tiles are tight, less than half a millimetre, but nonetheless, it is possible that some tiles could protrude more than their neighbours. There is a risk that such tiles could be damaged or even melt. For that reason, the tops of the tiles have to be sloped at a 1° angle in order to hide all leading edges from the plasma stream. It is hoped that this shaping solution will extend the lifetime of the divertor. In order to validate this technology for ITER, both shaped and unshaped tungsten divertor components will be tested in the WEST tokamak in order to demonstrate their performance.

THERMAL SIMULATION





PICTURE OF THE DAY

Inside Vacuum Vessel.
Upper coil winding completed.
Conductor brazing on going on lower coil.
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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