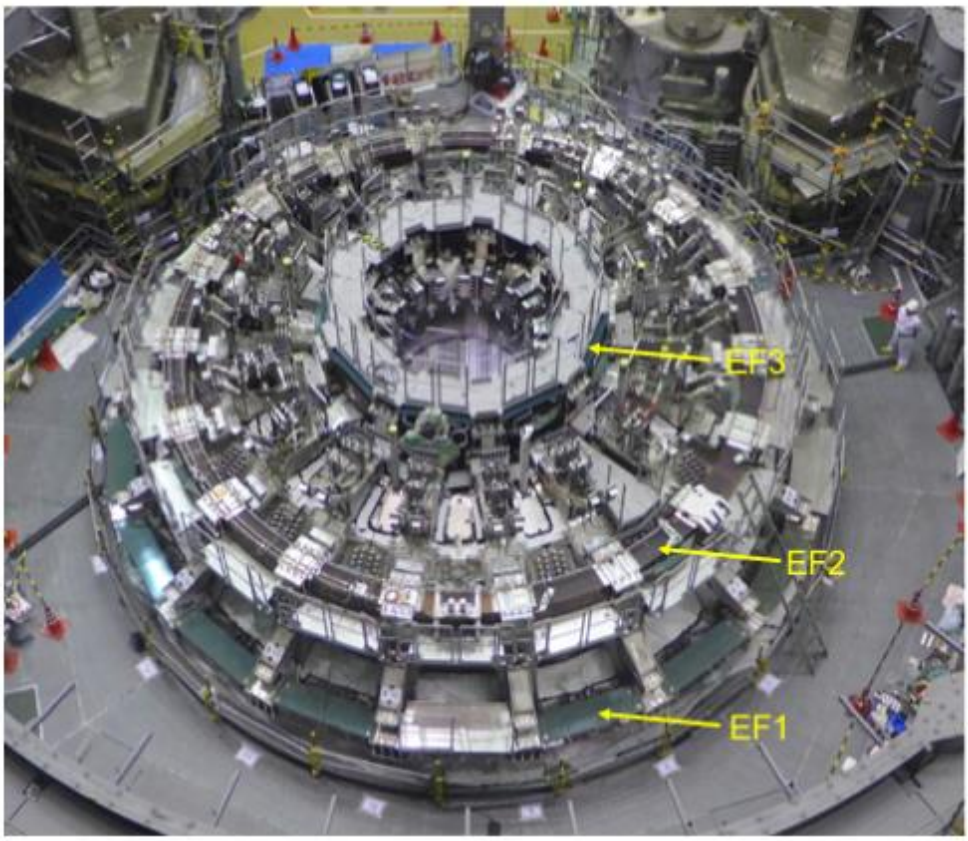
JT-60SA Newsletter
No. 103, September 2018

Headline

Installation of equilibrium field coils



Installation of the upper coils, EF1, EF2 and EF3

The welding of the final sector of the JT-60SA vacuum vessel (VV) was completed in the middle of July 2018, and all the VV sectors were completely connected. The soundness of the welding was confirmed by radiographic testing.

Then the assembly of equilibrium field (EF) coils started. The EF4, EF5 and EF6 coils had been placed temporarily before the installation of the VV. These have now been raised and installed in their final positions. In addition, the EF1, EF2 and EF3 coils were installed from the end of July to August.

For their installation, the positions of the EF coils were determined with laser trackers. Based on these measurements, the dimensions of the mounting bracket to attach the EF coils to the toroidal field (TF) coils were decided. The final positions were adjusted using thin plates. As a result, the EF coils were positioned and mounted successfully with a precision of ± 2.0 mm.

News

19th TF coil delivered

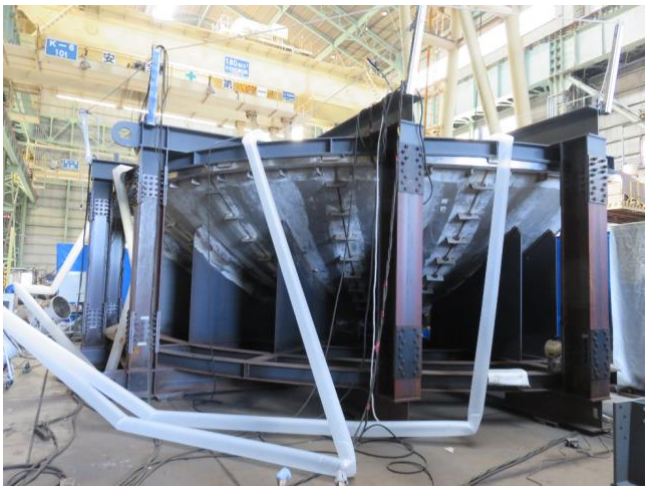
19th TF coil delivered

The 19th toroidal field (TF) coil “Francesca”, produced under contract to ENEA by ASG, arrived at the Port of Hitachi, Japan on 10 September 2018 and was delivered to the QST Naka site on 14 September.

This TF coil is a spare one and is temporarily stored in the JT-60SA storage area, where the acceptance test will be carried out.

News

Manufacturing of cryostat top lid



The cryostat top lid is procured by the National Institutes for Quantum and Radiological Science and Technology (QST) through a contract with Kimura Chemical Plants Co., Ltd. The lid is being manufactured at the factory in two 180˚ modules. Then they will be transported to the QST Naka site and integrated in the torus hall.

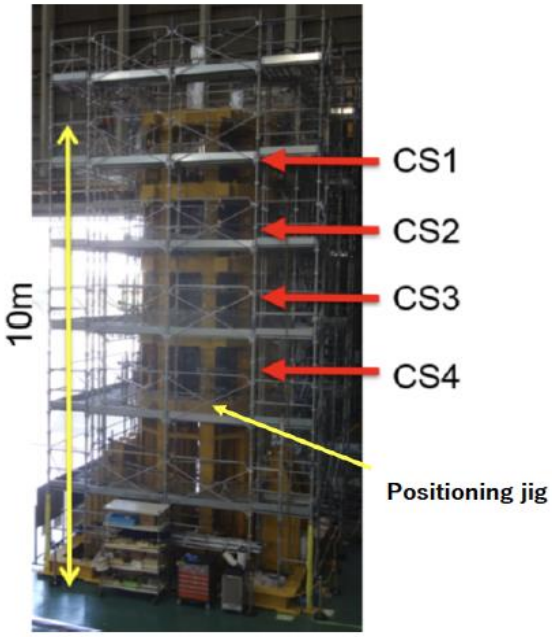
So far, eighteen 20°sectors have been manufactured, nine of which have been installed to form one module with the designated jig. Groove alignment for the welding has been completed and the welding between the sectors is progressing.

As for the other module, the positions of the 20°sectors are being adjusted, and groove alignment is in progress.

Cryostat top lid is being manufactured.

News

Stacking of CS modules completed



The central solenoid (CS) coil is composed of four modules. The stacking of CS1–4 modules vertically started in April 2018, and was completed in July 2018 (Figure).

For the integration of the CS, the centres of current in the four modules needed to be arranged with a horizontal deviation of not more than ± 2 mm. Current centres were determined by conductor positions measured by laser trackers after winding. Considering the manufacturing precision of each module, the inner diameter of the four modules need to be arranged within a range of not more than ± 1 mm.

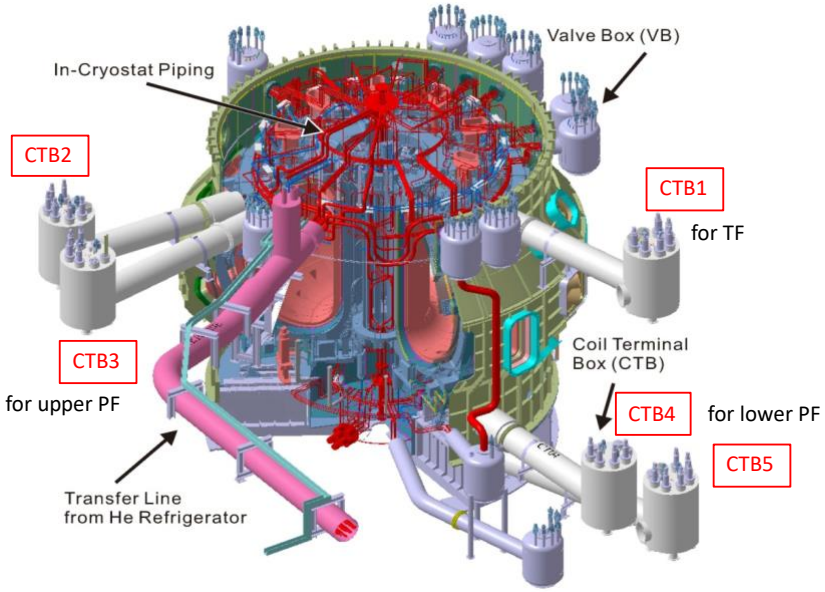
The dedicated cylindrical guide for positioning the modules was used to stack them vertically with a precision of not more than ± 1 mm.

For the delivery in December 2018, a set of tie plates will be installed to integrate the modules by fixing them to each other.

Stacked CS modules

News

Status of coil terminal box assembly



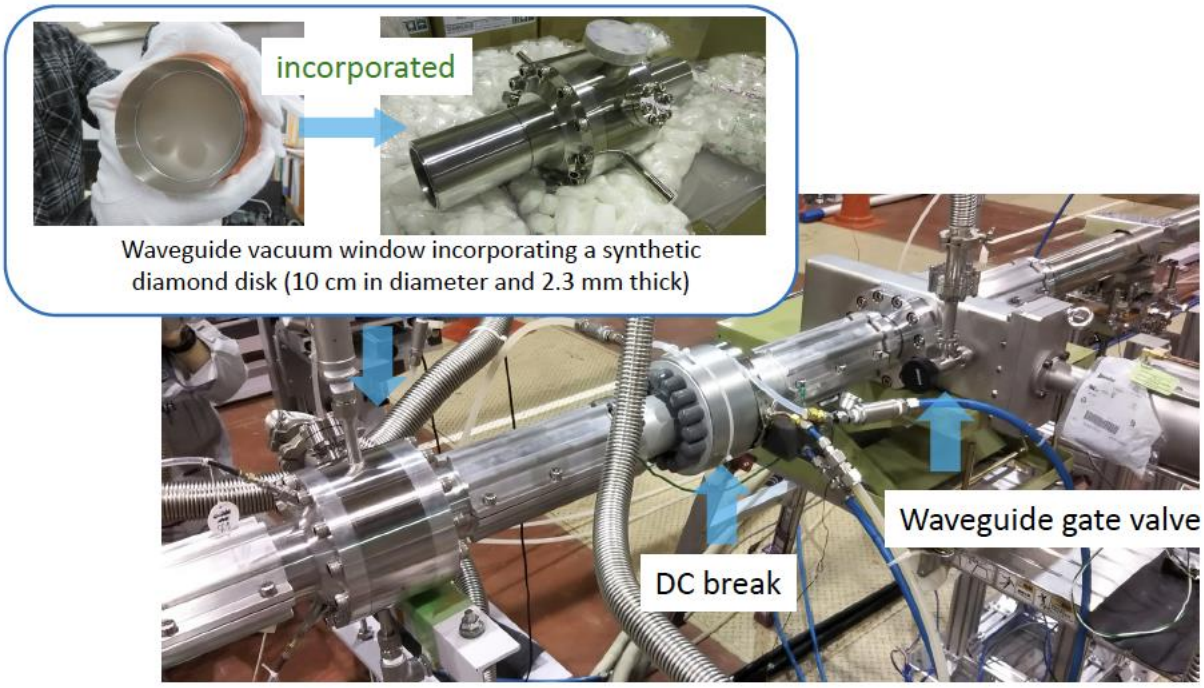
Progress has been made with the coil terminal box (CTB) assembly.

The CTB1 for the toroidal field (TF) coils, and CTB4 and CTB5 for the lower poloidal field (PF) coils, were delivered in 2017. In-cryostat feeders for the upper PF coils were completed in May 2018. More recently, installation of feeders into the cryostat vessel body for CTB2 for the upper PF coils has been finished. Preparation of the horizontal cryostat vessel connection for CTB3 for the upper PF coils has been finished. Installation of high temperature superconductor current leads (HTSCLs) on CTB2 and CTB3 is ongoing in the factory. They will be completed and delivered to Naka in October 2018.

A cold test of CTB1 was performed in June 2018. Joint resistance of mid-joints (joints between CTB feeders and in-cryostat feeders) was measured and confirmed to be smaller than the requirement of 5 nΩ.

The CTBs and feeders will be installed to the JT-60SA tokamak in the middle of 2019.

Performance test of ECRF system



Transmission test circuit simulating the neighbourhood of the launcher

As a performance confirmation test of the waveguide transmission lines for carrying 1 MW radio frequency (RF) power, under the Procurement Arrangement (PA) for the electron cyclotron range of frequency (ECRF) system for JT-60SA, a transmission test was carried out at 450 kW for 20 s for the vacuum pumping waveguide and the DC break with waveguide gaps.

It was confirmed that the RF leakage from waveguide gaps is ≤0.1% of the transmission power, and there is no problem such as electric discharge in gaps, and the absorber (titanium dioxide) is able to absorb leakage RF. The results show that these devices are thermally usable during the first plasma (FP) operation of 1 MW/5 s.

The test circuit, including the waveguide vacuum window incorporating a synthetic diamond disk (10 cm in diameter), the waveguide gate valve, and the DC break, was set up (Figure), and the high-power transmission test of the transmission line simulating the neighbourhood of the actual launcher has started. This synthetic diamond disk is 2.3 mm thick, an integral multiple of half-wave lengths so that the millimetre waves of the three frequencies (82 GHz, 110 GHz and 138 GHz) can permeate it. It is one of the most important devices needed for the multi-frequency ECRF system to work.

These devices will be confirmed to be available for use in FP operation, and prepared for the installation of the ECRF system transmission line in the torus hall planned in 2019.

Tests of the RWM control coil PS

Figure 1: System at the E.E.I. premises for the routine and integrated tests of the RWM PS

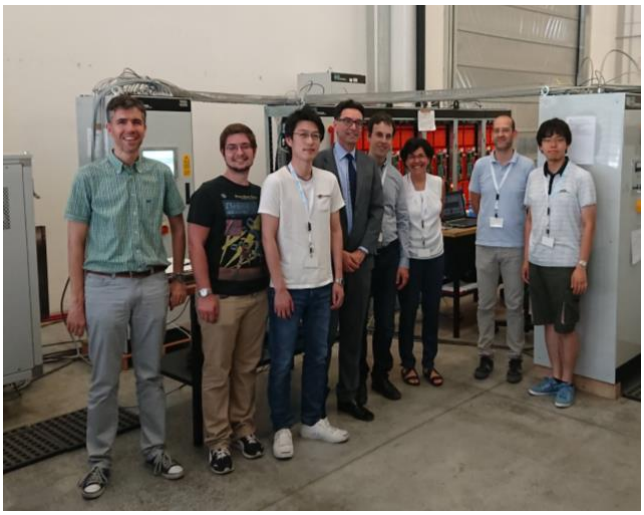


Figure 2: Picture taken during the RWM PS integrated tests at E.E.I. premises

Figure 3: Participants in the Design Review Meeting

The power supply (PS) system for the active control of the resistive wall mode (RWM) instabilities of JT-60SA, procured by Consorzio RFX through a contract with Equipaggiamenti Elettronici Industriali S.p.A. (E.E.I.), has successfully passed the factory tests, including both routine tests and integrated tests.

The complete system, composed of one AC disconnector, one transformer, two AC/DC converters, 18 fast inverters and one local control cubicle, was installed at the E.E.I. premises in Vicenza, Italy adopting a layout resembling the final one, to perform the factory tests in a condition reproducing the final installation configuration (Figure 1).

The routine tests, aimed at checking the correct manufacturing of each component, have been performed since May 2018. Integrated tests have been successfully performed in July in the presence of representatives from QST, Fusion for Energy (F4E) and Consorzio RFX, proving the correct integrated operation of the different components (Figure 2). The RWM PS system proved not only able to fulfil all the requirements but also to be highly reliable, as no failure occurred during the entire duration of the tests, despite the demanding testing conditions.

The Design Review Meeting (DRM-MPS34-RWM PS) was held on 22 August 2018 with the participation of representatives from E.E.I., Consorzio RFX, F4E and QST (Figure 3) to comment the reports on the routine and integrated factory tests issued by E.E.I. in July. Only minor comments were raised and the success of the tests was appreciated by the participants.

All the components of the RWM PS have been already packed, loaded in a container and shipped to Japan, where they are expected to arrive in the middle of September 2018.

Calendar

19 October 2018
23rd Meeting of the STP Project Committee (PC-23)
Naka, Japan

22–27 October 2018
27th IAEA Fusion Energy Conference (FEC 2018)
Gandhinagar, India

12−17, November 2018
2nd Asia-Pacific Conference on Plasma Physics (AAPPS-DPP 2018)
Kanazawa, Japan

19–22, November 2018
The 27th International Toki Conference on Plasma and Fusion Research
& The 13th Asia Pacific Plasma Theory Conference (ITC & APPTC 2018)
Toki, Gifu, Japan

21 and 22 November 2018
31st Technical Coordination Meeting (TCM-31)
Naka, Japan

Contact Us

The JT-60 Newsletter is released monthly by the JT-60SA Project Team.

Suggestions and comments are welcome and can be sent to newsletter@jt60sa.org.

For more information, please visit the website: http://www.jt60sa.org/.