JT-60SA Newsletter
No. 50, 28 February 2014

Headline

Delivery and temporary installation of lower EF coils

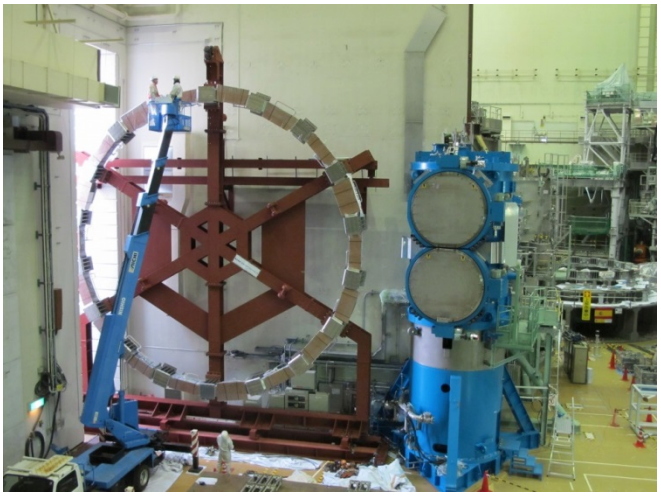


Figure 1: EF6 entering the assembly hall

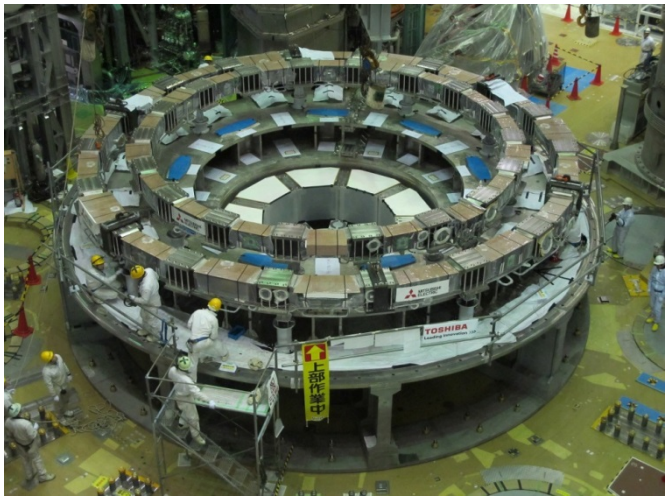


Figure 2: Coils temporarily installed on the cryostat base

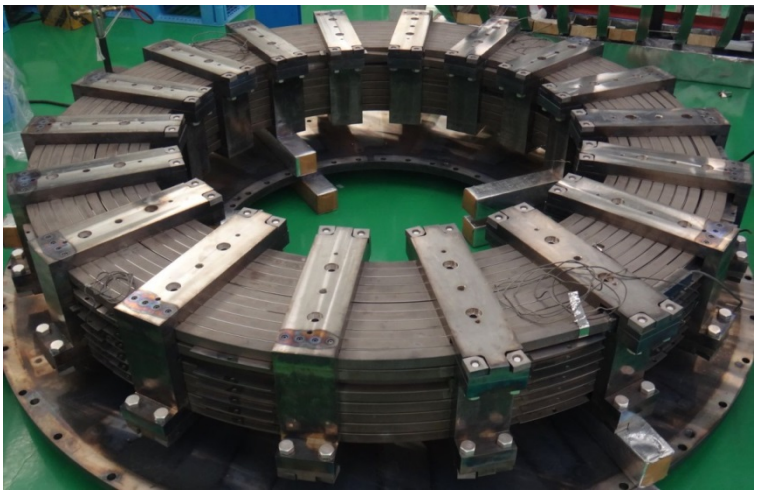
From 16 to 22 January, the three lower equilibrium field (EF) coils, EF4 (outer diameter: 4.4 m, weight: 30 t), EF5 (outer diameter: 8.1 m, weight: 23 t) and EF6 (outer diameter: 10.5 m, weight: 33 t) were transported from the superconducting coil winding building into the torus hall.

The coil transport began with EF4, the smallest coil of the three, and it was carried into the torus hall using the existing delivery entrance. However EF5 and EF6, the world's largest superconducting coils, were stood upright using a transport jig and set on the two rails. The coils were then pulled, by a winch and a wire rope, on the rails to the inside of the torus hall through the special delivery entrance (Figure 1). After the delivery, all three coils were lifted by a suspending jig and temporarily installed on the cryostat base (Figure 2).

The coil position after the temporary installation was measured using a laser tracker and it was confirmed that both the coil centre position and coil clamp position are within the tolerance of ±2 mm.

News

Successful heat treatment of central solenoid octa-pancake



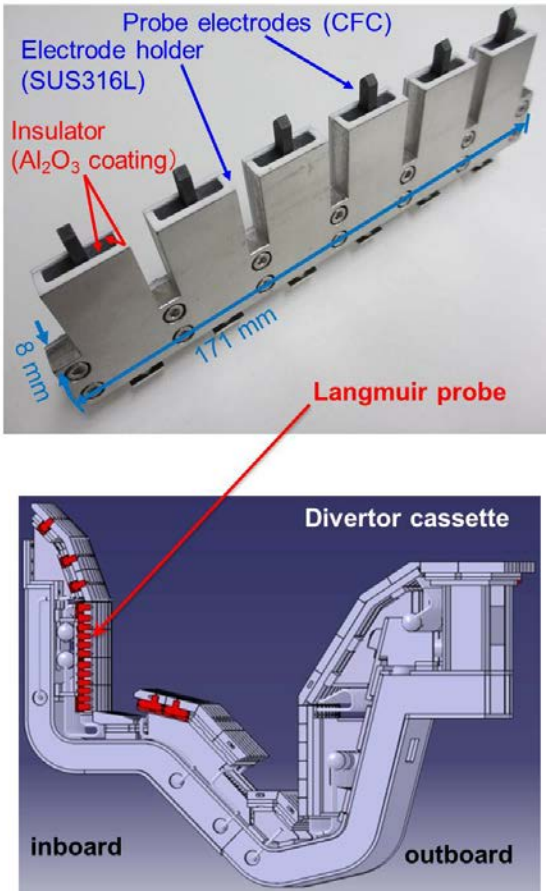
Heat-treated octa-pancake

In the central solenoid (CS) manufacturing process, heat treatment after fabrication is required to make the conductor form a Nb_3Sn superconductor. The CS model coil was wound, heat treated and insulated without trouble (see Newsletter No. 43). Since all the manufacturing processes were confirmed, the mass production of CS has been started.

In January, the very first heat treatment was performed for the octa-pancake (OP2) of the CS1. The heat treatment, increasing the temperature from 570℃ to 650℃ over 90 hours, then keeping the temperature at 650℃ for 100 hours, with an accuracy of ±5℃, was successfully accomplished.

News

Divertor Langmuir probe developed



Details of Langmuir probe

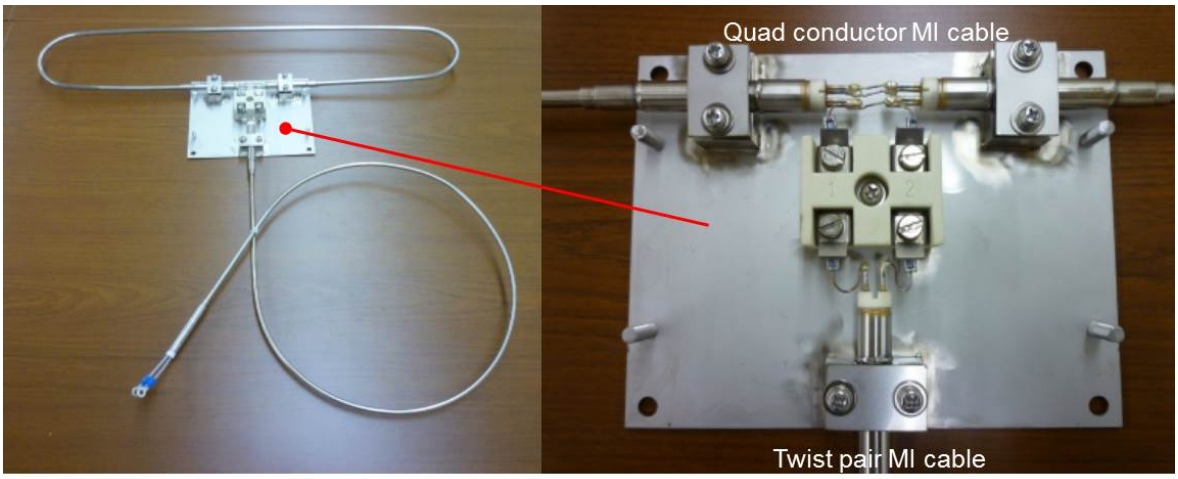
In JT-60SA, a large fraction of the diagnostic components which were used in JT-60U, such as optical fibres and spectrometers, will be reused. However, some will have to be newly developed, including the Langmuir probe. Recently, the Langmuir probes to be installed in the lower divertor region have been developed by JAEA in Naka, Japan, to adapt to the advanced divertor configuration and to meet the wide range of challenges expected in the exploration of JT-60SA.

This system measures the plasma parameters with a high spatial resolution in the divertor region, such as the electron density and temperature, floating potential and ion saturation current. It will be a powerful tool to control detachment of divertor plasmas, equilibrium of plasmas, and transport of neutral particles and impurities. Studies on plasma-material interaction, such as erosion and deposition of wall materials and retention and recycling of fuel particles, also need this system.

The probes on the diverter targets are required to withstand high heat fluxes (1 and 10 MW/m^2 for 100 s and 5 s, respectively) and to measure the plasma parameters precisely on JT-60SA. In order to satisfy the requirements, R&D has been carried out iteratively. As a result, the required heat resistance has now been achieved by increasing the volume of the probe electrode that is not directly exposed to the plasma (see figure). Not to degrade the heat removal performance of the divertor, the probes are installed in the toroidal gap with a width of 10 mm between the divertor cassettes, without embedding them in the divertor tiles. The probes can be replaced by removing the divertor cassettes from the vacuum vessel by remote handling.

News

Development of diamagnetic loop in progress



Prototypes of a diamagnetic loop (left) and the joint part (right)

A diamagnetic loop will be installed inside the vacuum vessel in the poloidal plane to measure the stored energy in the tokamak plasma. Considering the feasibility of cable connection inside the vacuum vessel, prototypes of the diamagnetic loop and the joint part of the signal line, which have almost the same structure, were manufactured.

The diamagnetic loop has four turns and consists of a quad conductor mineral insulated (MI) cable, connected to a twist pair MI cable for signal transmission (see figure). The cable end is equipped with a ceramic terminal and the connection between the cables has a screw fastening structure to make the connection work easier. The cable insulation characteristics (withstand voltage: 1,500 V, heat-resistance: 200℃) have now been confirmed, paving the way for using the above method in JT-60SA.

Meetings

Design Review Meeting on magnet shared components

The first Design Review Meeting (DRM-MS01) on the magnet shared components (MSC) was held by videoconference on 17 December 2013 with attendance of 21 experts from Germany (F4E Garching), France (CEA Grenoble), Spain (CIEMAT) and Japan (JAEA Naka).

During this meeting, JAEA presented the technical specifications and design basis of MSC, the results of stress analysis on feeders and cooling pipes, and the draft Procurement Arrangement (PA), which covers the MSC of the toroidal field magnet.

Following comprehensive presentations and useful discussions further clarifications on the interface for all MSC will be done in the next Technical Coordination Meeting (TCM). It was agreed to start the review process of the draft PA documents after reflecting the comments from the attendees.

Meetings

Design Review Meeting on TFC pre-assembly

The first Design Review Meeting for toroidal field coil (TFC) pre-assembly for JT-60SA (DRM-TF03) was held by videoconference on 6 February 2014 with the attendance of 15 experts from Germany (F4E Garching), France (CEA Saclay and Cadarache) and Japan (JAEA Naka and Project Team (PT)).

The purpose of the meeting was to agree the technical requirements and the responsibilities of each party for the pre-assembly of the TF coils. S. Davis, F4E explained that there should be only one technical specification for the work, which is the Annex B to the Procurement Arrangement (PA). G. Disset, CEA presented the outline schedule for the work to be managed by CEA. Preparations for the pre-assembly of the TF coils are expected to be complete at CEA Saclay in January 2015.

A number of details of the technical specification and the schedule were discussed. The geometric surveys for the final acceptance tests were also discussed. Some points were clarified such as the inclusion of the equilibrium field coil No.1 brackets when the coils are delivered to Japan and the lifting tools to be provided.

The PA documents were summarised in the meeting and it was agreed that the review of the PA for the TFC pre-assembly should commence as soon as it had been updated according to the comments from the attendees.

News

JT-60SA Research Plan version 3.1 issued

The JT-60SA Research Plan version 3.1 (SARP version 3.1) was issued on 20 December 2013 following the approval of the Project Leader, S. Ishida, and published on the JT-60SA public web site. Version 3.0, the first Japan-Europe collaboration version, was published on 22 December 2011, and over 300 scientists, 150 from Japan (76 JAEA, 74 JA-Universities (15 institutes)), 176 from Europe (10 countries, 24 institutes), and 5 from the Project Team have addressed this new update of the SARP.

The scientific assessments were made by European and Japanese collaborative work. The observations were discussed in the Research Coordination Meetings (RCMs), and then the enhancements were incorporated into the SARP. The main revisions are as follows: (i) disruption section is extended with particular attention to related diagnostics, halo current, runaway electrons and mitigation of the heat load to the divertor; (ii) operational regimes with a scan of electron heating ratio have been evaluated using transport models; (iii) predicted pedestal pressure and temperature in basic scenarios have been evaluated using a model;(iv) the radiative divertor scenario is revised to be consistent with a low density operation scenario with two impurities (C and Ar); (v) detailed discussion on a comparison and modelling of JT-60U and JET plasmas has been made in order to develop a model for JT-60SA predictions.

Calendar

March 18, 2014
14th Meeting of the STP Project Committee (PC-14)
Naka, Japan

April 10, 2014
14th Meeting of the BA Steering Committee (SC-14)
Rokkasho, Japan

May 26-30, 2014
21st International Conference on Plasma Surface Interactions (PSI-21)
Kanazawa, Japan

June 4-5, 2014
20th Technical Coordination Meeting (TCM-20)
Naka, Japan

June 23-27, 2014
41st European Physical Society Conference on Plasma Physics (EPS-CPP-41)
Berlin, Germany

Contact Us

The JT-60SA Newsletter is released monthly by the JT-60SA Project Team.
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For more information please visit the website: http://www.jt60sa.org/