JT-60SA Newsletter
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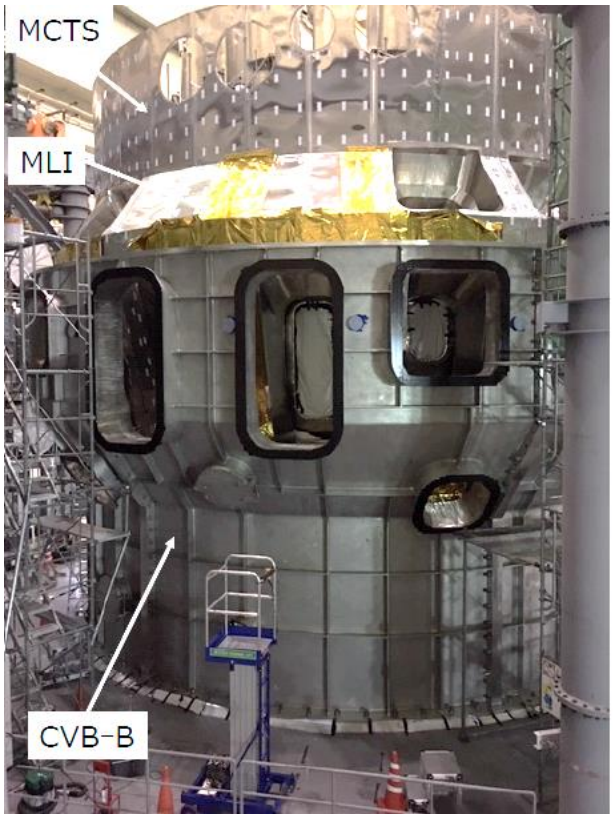
Headline

MCTS and lower CVB installed



MCTS and lower CVB installed

In July, 10 middle cryostat thermal shields (MCTSs) were installed. In August, the clamps to connect the MCTSs and the radiation shield cover were installed, and the installation of all 18 MCTSs was completed. At present, multilayer insulation (MLI) is being arranged on the outside of the MCTSs.

The cryostat vessel body (CVB) is composed of 12 segments: 8 in the lower part and 4 in the upper part. The reinforcement ribs of the lower part were welded and connected to all the openings of 15 ports, 10 instrument feedthrough (IF) boxes and 8 blank flanges. The parts were then brought in to the torus hall sequentially. Each segment of the lower CVB was clamped by bolts and the assembly was completed in September, reaching a major milestone in the construction process.

The shape measurement of the position of the ports will now be carried out, seal-welding of the inner surface of the junctions of the segments will be executed to form a vacuum boundary, and the external surface will also be welded for reinforcement. An installation accuracy of < 8 mm has been achieved for all of the eight segments in the lower part.

News

Combination test of SCM power supplies

QST, F4E, Consorzio RFX and EU suppliers undertaking the combination test of SCM power supplies

The combination test of superconducting magnet power supplies (SCMPSs) has started in a cooperation between QST, Fusion for Energy (F4E), Consorzio RFX and European suppliers (JEMA, OCEM and Nidec ASI).

In the test, instead of the actual superconducting coils, the dummy load is used and superconducting coil PSs energise each system. The PS systems tested are the four for the central solenoid (CS) (SCMPS for CS1–4), six for the equilibrium field (EF) coils (SCMPS for EF1–6) and one for the toroidal field (TF) coil (SCMPS for TF). Each system is composed of SCMPS, switching network unit (SNU) for generating high voltage, and Quench Protection Circuits (QPC), supplied by Europe.

From 3 June, the combination energisation test of the SCMPS, SNU and QPC started for the first system, the PS for CS3. While confirming the operation of the device, the current demand value was gradually increased from low current to ± 20 kA which is the highest CS current planned in the discharge experiment of JT-60SA. During the 120-second energisation, it was confirmed that there was no temperature abnormality in the PS device, and sound basic operation of the PS was confirmed. From now on, the combination test of all the systems will be carried out in sequence to also confirm their control response.

News

Annual operation of cryogenic system

JT−60SA cryogenic operation team involved on site in annual operation

The JT−60SA cryogenic system operation team of QST has performed the annual one month plant operation to check and maintain its systems. Cooling down of the cryogenic system was started on 17 June and warming up was completed on 14 July. This is the last cryogenic system operation before the integrated commissioning test with magnets and thermal shields which will start from March 2020. This annual operation focussed on the training for operators and control loop parameter tuning to solve issues which were identified in the previous operations. The annual operation plan was reviewed by F4E and CEA cryogenic experts and the technical feedback from them was included in the plan. In addition, to obtain technical support from F4E remotely and in a timely fashion, the sharing system of the operation console screen to F4E was tested. Splitting the video output signal from the cryogenic control system, and sending it to the PC with the video capture system over the mobile WiFi system provided by F4E, it was confirmed that the four screens of the QST cryogenic control system could be shared with F4E in Garching remotely.

Prior to the annual operation, three QST staff members completed an engineering training course on the process control system (SIMATIC PCS7) so as to be able to modify the cryogenic control system if needed. Based on the knowledge, the control system and control loop parameters were modified by them during the annual operation.

One of the important operator training goals is to be able to recover from an emergency condition, such as an unplanned stop of turbines and warm compressors due to momentary power failure. In the training, the turbines and warm compressors were stopped manually, artificially creating the emergency condition, and the recovery operation was started. In order to recover to a normal operation condition, the operators re-started the turbines and compressors carefully taking account of allowable temperature and pressure balance condition in the cold box, and established again a helium flow in the cryogenic system.

Since pulsed heat loads generated in superconducting magnets will create a disturbance in the cold box and induce an unstable condition on the turbines and warm compressors, valve and cold compressor control parameters were tuned to regulate return helium gas from the liquid helium tank containing heat exchangers for magnets and cryopump cooling loops. After tuning of these loop parameters, it was confirmed that the system could regulate return flow smoothly for various magnitudes of pulsed heat loads (pulse peak: 1.5 kW to 5 kW, duration: 1000 s) created by an electrical heater, and the disturbance in the cold box could be mitigated without stopping the turbines and warm compressors.

As a result, the training for normal operation including gas purification, cooling down and warming up, and recovery operation and control parameter modification, has been successfully completed. The JT-60SA cryogenic operation team has now acquired enough experience on the operation of the cryogenic system ready for the integrated operation with magnets and thermal shields. The knowledge and experience gained from this annual plant operation will be reflected in the operation manual.

News

EDICAM delivered to Naka

EDICAM delivery to Naka on 22 July 2019

The Event Detection Intelligent Camera (EDICAM), procured by Wigner Research Centre for Physics (Wigner RCP), Hungary, arrived at the Naka site on 22 July 2019.

Two EDICAM experts visited QST Naka site from Wigner RCP and, under their supervision, various acceptance tests (vacuum leak, airtightness of water-cooled tube line, air cooling line, thermocouple, shutter mechanism operation and camera installation) were carried out. The communication test between the EDICAM and the control computer was carried out and data transfer was confirmed.

News

Cryostat top lid completed

The manufacturing of the cryostat top lid in JT-60SA in two 180° modules and its testing were completed in July. The manufacturing of 50 clamps to connect the cryostat top lid with the cryostat vessel body was completed in September. The manufactured top lid along with the attachments, including the parts of the port stubs to be attached onsite, arrived at the Port of Hitachi, Japan on 26 August, and were delivered to the QST Naka site on 3 September.

The cryostat top lid is 11.5 m in diameter and weighs 50 t. It is made of stainless steel. The outer shell is a section of a sphere with a radius of 8 m, and the dimensional tolerance achieved was 8 m ± 8 mm. The two modules will be integrated in March 2020.

Cryostat top lid completed in the factory

Meeting

8th Research Coordination Meeting (RCM-8)

Group photo of TCM and RCM participants taken in front of the upgraded main screen in the central control building

The 8th Research Coordination Meeting (RCM-8) was held at the QST Naka site on 24–26 June 2019. About 60 experts participated: 27 from Europe, 32 from Japan and 2 from the Project Team. According to the final version 4.0 of the JT-60SA Research Plan published in September 2018, they discussed the progress in research activities in the past year, and plans for future collaborations and papers.

Dr. Tim Luce, Head of ITER Science & Operations Department, participated in the meeting via videoconference, and made a presentation entitled "Proposal of Collaboration between ITER and JT-60SA". He stressed that the ITER Organisation had identified 16 topics for collaboration, which would make a large contribution to ITER, and highlighted eight topics that give an indication of the value of the JT-60SA research.

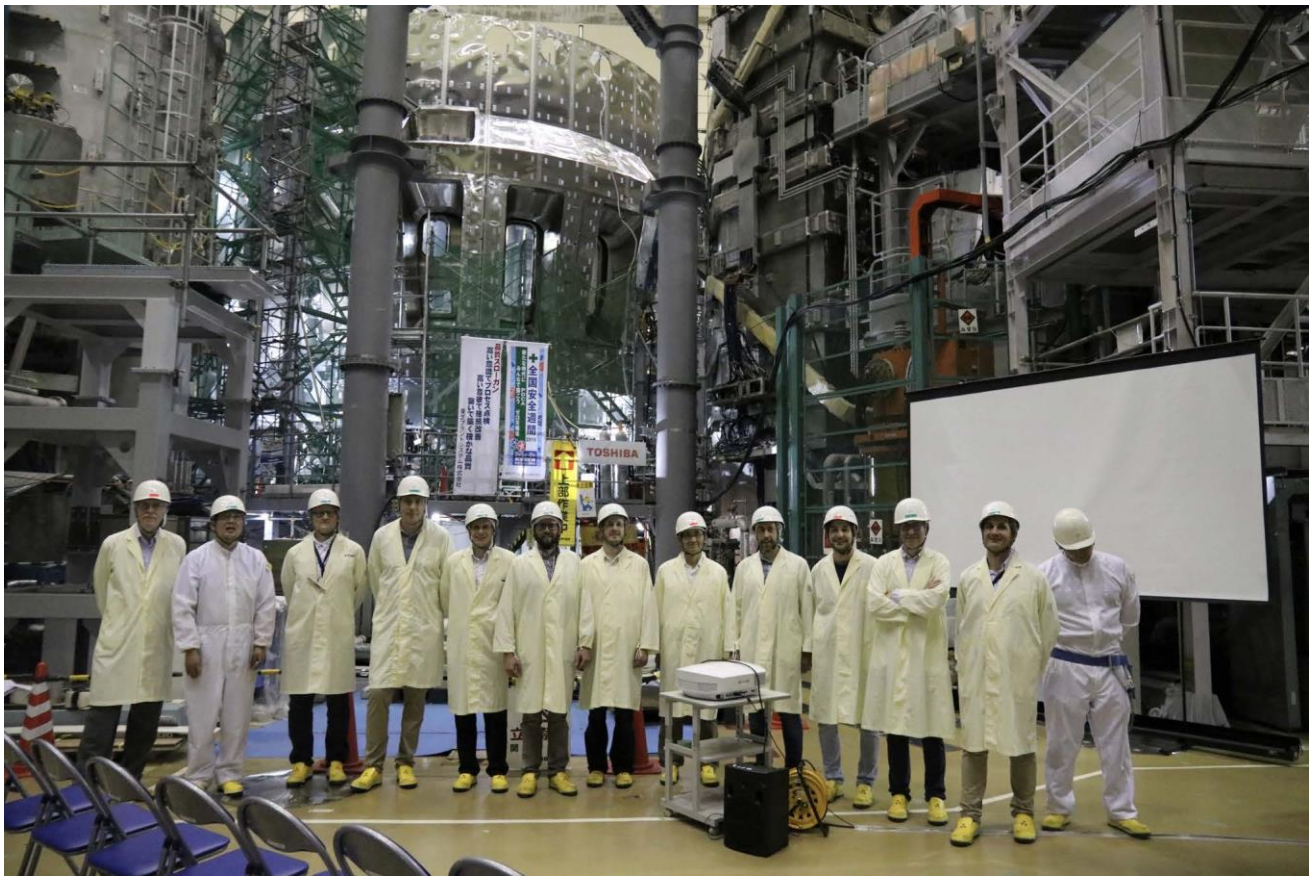
In the breakout sessions, the participants discussed research items, such as plasma simulation, data and operation, and tungsten studies, as well as strategy and organisation. During the meeting, they visited the torus hall to observe the construction status of the JT-60SA device.

Since the final version of the JT-60SA Research Plan has been published and the research activities will be taken over by the JT-60SA experimental team after its setup, the next onsite meeting is planned for 2021 as the last RCM. A short version of the RCM will be held several times via videoconference until the last RCM.

Participants in RCM-8

Meeting

33rd Technical Coordination Meeting



Group photo taken in the JT-60SA torus hall

Mr. Hikaru Massaki, the Mayor of Naka city (left) giving his greetings to the participants

The 33rd Technical Coordination Meeting (TCM-33) took place on 26–28 June 2019 at the QST Naka Fusion Institute in Japan. A total of 90 experts attended the meeting in person or via video-conference: 37 from the European Home Team (France,

Germany, Hungary, Italy, Spain and U.K.), 42 from the Japanese Home Team, 5 from the Project Team and 6 invited from the National Institute for Fusion Science (NIFS), Kyoto University and EUROfusion. TCM-33 was jointly held with the 8th Research Coordination Meeting (RCM-8) in the same week at Naka site. Thus this TCM-33 had a special emphasis on the completion of tokamak assembly and the first plasma and was conducted in collaboration with the Research Unit members.

At the beginning of the meeting, Yutaka Kamada, the Project Leader (PL) of the Satellite Tokamak Programme (STP), reported the recent conclusion at the BASC-24 that "The Steering Committee (SC) commended the Project Team, both Implementing Agencies and the Voluntary Contributors for their efforts in the many achievements and steady progress of procurements, assembly, installation and commissioning activities of the STP Project". He emphasised that the JT-60SA Integrated Project Team will be entering the BA Phase II from April 2020 as the reinforced Integrated Project Team covering enhancement, preparation and experiments.

The secretariat of the TCM explained the Action List to be updated at TCM-33 to clarify each Home Team's responsibility related to each interface item. Then the European Project Manager (PM) briefly reported the achievements of Europe since the former TCM, and the Japanese Deputy Project Managers (DPMs) also reported the achievements of Japan and overviewed the schedule to the first plasma. The Japanese DPM explained that a significant effort had been made to recover unforeseen delays in order to keep the schedule of the on-site assembly.

The PL presented "Collaboration between ITER and JT-60SA" the subject of the new agreement to be signed between the ITER Organisation, F4E and QST. He explained that the collaboration was welcomed by the BASC. Tim Luce, the Head of ITER Science & Operations Department, presented more details in his "Proposal of collaboration between ITER and JT-60SA" with its conclusion "JT-60SA will play a valuable role in pioneering the path to ITER operations".

During the meeting on the second day, the present status of assembly for JT-60SA including in-vessel components was presented, and the steady progress of manufacturing of central solenoid (CS), cryostat top lid and vacuum pumping system was also presented. The installation procedures of the cryostat vessel body, superconducting feeders and jumpers, and valve box and main cryogenic transfer line were introduced. The present status of Japan's activities related to power supplies (PS) was reported and the European activity (the completion of the superconducting magnet power supplies (SCMPSs) commissioning) was also reported. Also the status of the database system for JT-60SA discharge data and plant monitoring data, toroidal field coil (TFC) sensor, tokamak simulator and EDICAM was presented. A technical tour of the tokamak hall, where JT-60SA is installed, was organised to realise the significant progress in JT-60SA assembly. In addition, a tour of the radio-frequency (RF) amplifier room, where the electron cyclotron range of frequency (ECRF) system is installed, was also organised.

On the third day, the following items were reported and discussed from the view point of hardware for maintenance and enhancement: in-vessel components, neutral beam system, fast-ion loss detector, cryopumps, massive gas injection, resistive wall mode control coils power supply, vacuum-ultra-violet divertor spectrometer, Thomson scattering, and pellet launching system. The status of the preparation for the integrated commissioning and plasma operation commissioning was explained and discussed. The status of the ECRF power supply system to be transported and the ECRF system to be installed was reported. Stray EC waves were discussed from the perspective of the protection of components against EC power. The Plant Integration Document (PID) updating and the update of the Action List was summarised as well.

Mr. Hikaru Massaki, the Mayor of Naka city, gave his greetings to the participants of TCM-33.

Finally, the PL announced that the next meeting (TCM-34) would be held in Garching, Germany on 29 and 30 October 2019.

Calendar

16 October 2019
25th Meeting of the STP Project Committee (PC-25)
Naka, Japan

29–30 October 2019
34th Technical Coordination Meeting (TCM-34)
Garching, Germany

17 March 2020
26th Meeting of the STP Project Committee (PC-26)
Naka, Japan

April 2020
26th Meeting of the BA Steering Committee (SC-26)
Naka, Japan

April 2020
35th Technical Coordination Meeting (TCM-35)
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.