JT-60SA Newsletter
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Headline

RWM control coil PS prototype passes type tests

Figure 1: RWM-PS type test set-up at E.E.I.: the LCC, ac/dc rectifier cubicle, fast inverter cubicle, and equivalent capacitor bank (from left to right)

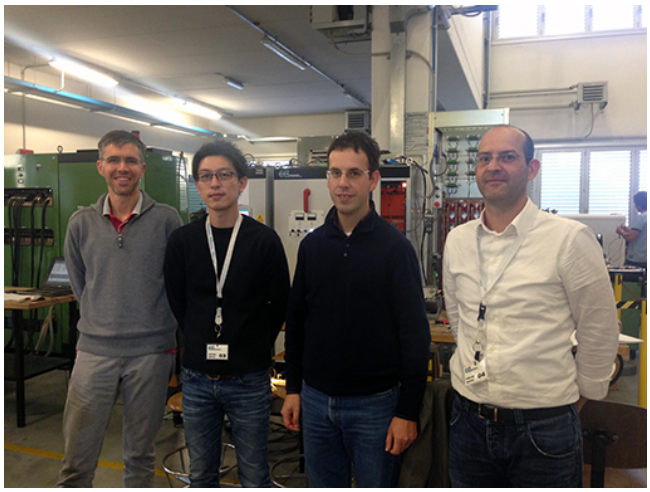

Figure 2: Representatives of E.E.I., QST, Consorzio RFX, and F4E (from left to right) during the factory type tests at E.E.I. premises

The resistive wall mode (RWM) is a kind of magnetohydrodynamic instability in magnetically confined, high-pressure tokamak plasmas. It occurs due to the influence of electrical resistivity in the conductive first wall, and limits the plasma performance. The RWM control coil system was designed to suppress this instability by detecting the perturbed magnetic field from the plasma and applying a cancelling magnetic field as feedback through RWM control coils by adjusting its power supply (PS) input, thereby attaining high performance plasma in the JT-60SA device.

Since the procurement contract for the PS system to control RWM instability (RWM-PS) was awarded by Consorzio RFX to an Italian company, Equipaggiamenti Elettronici Industriali S.p.A. (E.E.I.) in March 2016, the activities have been proceeding smoothly on schedule.

After the completion of the design phase at the end of 2016, E.E.I. developed and manufactured a prototype for type tests, which has been available since June 2017. It includes a cubicle with one ac/dc converter, a cubicle with one fast inverter, and a local control cubicle (LCC) (Figure 1).

Following the completion of the preliminary tests, performed by E.E.I. in June and August 2017, the official type tests were undertaken in October 2017 with the participation of Consorzio RFX, F4E, and QST representatives (Figure 2). All the parties were fully satisfied with the test results. The RWM-PS system proved that it fulfilled all the requirements, in particular, the challenging performance concerning latency (<50 μs) and bandwidth (3 kHz).

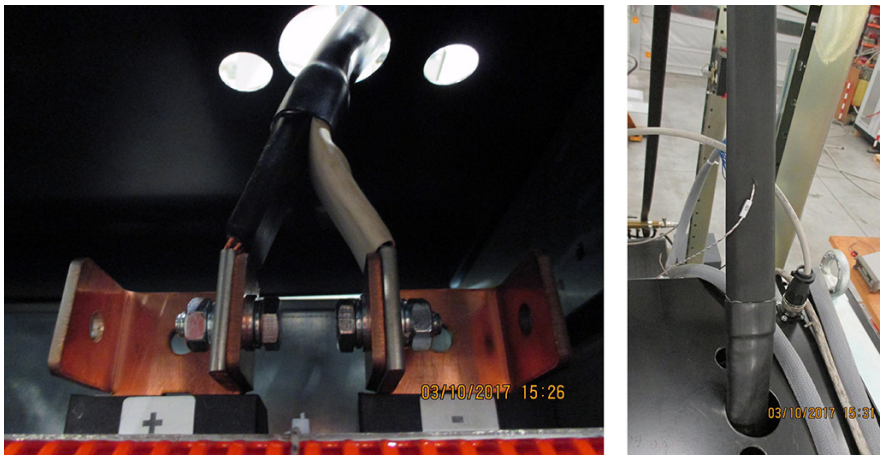

Figure 3: Special flat cable connected to the inverter for thermal test

During the type test campaign, a special flat cable to connect the inverters with the RWM coil feeders, which was selected and provided by QST, was installed and its thermal behaviour was successfully verified as well (Figure 3).

A Design Review Meeting (DRM-MPS32-RWMPS) was held on 26 October 2017 with the participation of E.E.I., Consorzio RFX, F4E, and QST representatives to review the Factory Type Test Report issued by E.E.I. (Figure 4). Only minor comments were raised, and the success in the tests was again recognised by the participants.

The next phase of the RWM-PS project is the series production and test as a completed system. The delivery date of the RWM-PS to Japan will be confirmed around September 2018, as originally planned.

Figure 4: Participants in the DRM on 26 October 2017 (via videoconference)

News

Cryoline installation progressing well

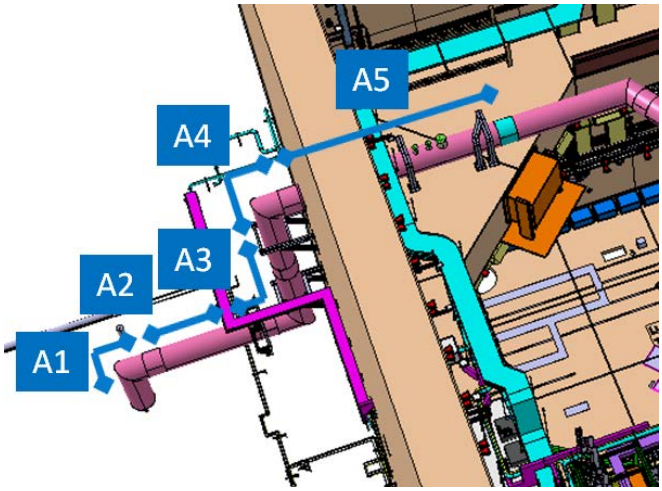

Figure 1: CryoL-A layout

Figure 2: CryoL-A1 and CryoL-A2 in the cryogenic hall

Figure 3: CryoL-A3 between the torus hall and cryogenic hall

Figure 4: CryoL-A4 in the toroidal field coil power supply room

The cryoline (CryoL), a multiple vacuum heat-insulated pipe to connect the auxiliary cold box of the cryogenic system and the cryostat, is composed of 10 sectors. The 5 sectors on the cryogenic system side are referred to as CryoL-A1~5 (Figure 1).

All of the 5 CryoL-A sectors, produced by Taiyo Nippon Sanso Corporation, have already been delivered to the QST Naka site.

In addition to the CryoL-A5 installed in October 2017, all of the remaining CryoL-A1~4 have been temporarily placed in their respective locations to have their positions finely tuned (Figure 2-4). Joining of the adjacent sectors with welding, and leak testing, are being carried out now.

The CryoL-A installation will be completed in January 2018.

News

Installation of ENEA power supplies starts

Installed FPPC coil transformers

Unpacking the CS module 1, 4 PS packages

The superconducting magnet power supplies (SCMPSs) for JT-60SA are provided as in-kind contribution by CEA (France) and ENEA (Italy) through F4E.

With the celebrations for the successful Site Acceptance Tests (SATs) for the equilibrium field (EF) coil 2-5 and toroidal field coil PSs (CEA contribution) still vivid in the memory, the on-site activities (for the ENEA contribution) are now once again underway.

In October 2017, the Spanish supplier, Jema Energy S.A. (JEMA), to whom F4E awarded a direct contract, started installation of ENEA-supplied PSs including the fast plasma position control (FPPC) coil PSs, in addition to the SCMPSs of the ENEA contribution: the EF1, 6 coil and central solenoid (CS) module 1-4 PSs.

For those systems, ENEA's involvement is limited until successful acceptance of the components by F4E at the port of entry (Yokohama, Japan), and F4E will manage and lead the installation, commissioning, and SATs at the QST Naka site.

At the moment, not all the equipment is available at the Naka site, as the shipments, containing the CS module 2, 3 and EF1, 6 coil PS components, are currently on their way to Yokohama port. Their arrival at the QST Naka site will be at the beginning of December 2017, while the final shipment from Italy, including all necessary cables, is now in preparation.

In the meantime, installation of the FPPC coil transformers, unpacking of the CS module PSs, and so on, are being carried out in the rectifier building (see figures).

The baseline schedule of installation, commissioning and SATs for the ENEA PSs has been carefully tailored to overcome any constraints on timely accomplishment, optimising workflow with a great spirit of cooperation among QST, F4E, and JEMA. The on-site activities will be continued all through the year 2018.

News

VIPs visit QST Naka site

Mr. Yoichi Itoh

Mr. Thomas Klinger (centre) and Mr. Peter Kurz (right)

Mr. George Hutchinson Neilson

Mr. Roger Cashmore (centre)

In October 2017, the following people visited the QST Naka site to see the progress of JT-60SA construction and to discuss fusion research and development.

On 6 October:

- Mr. Yoichi Itoh (Ministry of Education, Culture, Sports, Science and Technology, Japan);
- Mr. Thomas Klinger and Mr. Peter Kurz (Max Planck Institute of Plasma Physics).

On 10 October:

- Mr. George Hutchinson Neilson (Princeton Plasma Physics Laboratory).

On 13 October:

- Mr. Roger Cashmore (United Kingdom Atomic Energy Authority).

Representatives of QST welcomed and guided them on a tour of the JT-60SA device, including the toroidal field coils being assembled in the torus hall.

Meeting

13th International Symposium on Fusion Nuclear Technology

M. Hanada delivering his invited talk

The 13th International Symposium on Fusion Nuclear Technology (ISFNT-13) was held from 25-29 September 2017 in Kyoto, Japan.

The ISFNT-13 addresses technology for both near-term fusion device development and long-term reactor realisation, encouraging contributions related to science, engineering, experiments, facilities, modelling, analysis, design, and safety. More than 600 participants attended the conference.

M. Hanada from QST presented an invited talk entitled “Progress and Development of Assembly and Manufacturing of Tokamak Devices in JT-60 Super Advanced”. In the talk, the technologies newly developed for the JT-60SA manufacturing and on-site work were reported. He also showed the good progress in the manufacturing and on-site assembly, with significant project milestones being met. The participants expressed their appreciation of the technology developed and the progress made in the construction of the JT-60SA device.

In total, 5 contributions from the JT-60SA EU and JA Home Teams were presented as follows (only presenters and titles are shown):

- Invited presentation (1)
    1. M. Hanada, Progress and Development of Assembly and Manufacturing of Tokamak Devices in JT-60 Super Advanced.

- Poster presentations (4)
    1. X. Luo, Assessment of the JT-60SA Divertor Cryopump Performance;
    2. S. Asano, Design, Manufacturing and Installation of the JT-60SA Vacuum Vessel Gravity Support;
    3. S. Nakamura, Structural Design of Vacuum Interfaces between Vacuum Vessel and Cryostat in JT-60SA Superconducting Tokamak;
    4. P. Rossi, Completion of ENEA’s Casing Procurement for JT-60SA Toroidal Field Coils.

Those presentations attracted many participants and were well received.

Meeting

21st STP Project Committee Meeting

Group photo at the 21st STP-PC meeting

Participants from Europe and Japan via videoconference

Making an intensive discussion

The 21st meeting of the Satellite Tokamak Programme Project Committee (STP-PC) was held on 17 October 2017. A total of 37 participants joined the meeting also by videoconference. There were 6 members from the STP-PC, the Project Leader (PL), 5 experts from the Project Team, and 25 experts from the EU and JA Home Teams (HTs).

At the meeting, the PL overviewed the project status and presented the “Work Programme 2018”, to be submitted to the 21st Broader Approach Steering Committee (SC-21) on 13 December 2017. The latest status of procurement and assembly was also reported in detail by the Project Managers of the EU and JA HTs.

The STP-PC expressed satisfaction with the achievements and the progress in both EU and JA procurements as well as the installation, commissioning, and assembly since the last STP-PC. Those included completion of the casings for all (18 production plus 2 spares) toroidal field (TF) coils, delivery of 16 TF coils to the cold test facility in Saclay, completion of the cold test on 14 TF coils, delivery of 12 TF coils to the QST Naka site, completion and delivery of all of 18 error field correction coils and 11 valve boxes (VBs), completion of all of 26 high temperature superconductor current leads (16 have already been delivered to the QST Naka site) and cryostat vessel body cylindrical section, progress of fabrication of the last central solenoid 3 module, cryostat and port thermal shields (TSs), coil terminal boxes (CTBs), resistive wall mode control coil power supply (PS), electron cyclotron range of frequency (ECRF) PS and system components, progress of installation and commissioning of the superconducting magnet PSs and switching network units (SNUs), and the steady progress of the TF coil assembly onto the 340° torus.

The STP-PC appreciated the completion of the Cryogenic System Procurement Arrangement (PA) and the SNU PA as scheduled, as well as conclusion of the Main Components Assembly PA. The STP-PC commended strenuous efforts of both Implementing Agencies and Voluntary Contributors for the steady progress of the project.

The STP-PC recommended the "Work Programme 2018" to the SC-21 with some amendment implemented through written procedure after the meeting.

Before the meeting, 3 PC members and 2 experts participated in a tour of the JT-60SA device, including inspection of the TF coils being assembled in the torus hall, delivered CTB and VBs in the superconducting coil winding building, and the cryogenic system in the compressor building and cryogenic hall.

The STP-PC decided that the next STP-PC meeting (PC-21) would be held on 7 March 2018.

At the tour of the JT-60SA device in the torus hall

QST expert explaining to the PC chair and member

Local

KOCHIA turns red

Kochia bushes in summer

Kochia bushes in autumn (at Miharashi hill in Hitachi Seaside Park)

At Hitachi Seaside Park which is located about 9 km to the southeast of the QST Naka site, foliage of kochia bushes change colour from light green in summer, then to gradations of green and red at the end of September, and finally to vivid red in the middle of October. Approximately 32,000 kochia bushes completely paint the slopes of the Miharashi ("lookout" in Japanese) hill in brilliant red.

Kochia (bassia scoparia) is annual grass. Young kochia in light green looks like a full-orbed yoga ball, while the old one in its dead leaf brown reminds one of harsh animals such as a hedgehog. It is also fascinating to discover that every kochia has a unique size and shape although they all look the same when seen from a distance. The red kochia bushes look different from hour to hour as well. They are fresh in the morning light, and more glowing red with the setting sun.

Noted for the spectacular mass planting of nemophila (baby blue eyes) in spring and kochia in autumn, and offering entertainment with its seasonal flower display, Hitachi Seaside Park is now a popular destination for tourists from all over the world.

Calendar

5 - 8 December 2017
Joint meeting of the 26th International Toki Conference and the 11th Asia Plasma and Fusion Association Conference (ITC-26 & APFA-11)
Toki, Japan

13 December 2017
21st Meeting of the BA Steering Committee (SC-21)
Mol, Belgium

17 - 18 January 2018
29th Technical Coordination Meeting (TCM-29)
Saclay, France

13 March 2018
22nd Meeting of the STP Project Committee (PC-22)
Naka, Japan

26 April 2018
22nd Meeting of the BA Steering Committee (SC-22)
Naka, Japan

Contact Us

The JT-60SA 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/.