JT-60SA Newsletter
No. 102, August 2018

Headline

Change at the helm of JT-60SA project

New PL, Y. Kamada (left) and former PL, H. Shirai (right)

At the 22nd Broader Approach Steering Committee (BASC) held at the QST Naka site on 26 April 2018, it was decided that Yutaka Kamada, the Japanese Project Manager, would take on the role of Project Leader (PL) of the Satellite Tokamak Programme (STP) project to replace Hiroshi Shirai. The new and the former PLs exchanged views on the JT-60SA project, in particular the prospect of the construction and commissioning towards the first plasma and the future EU-Japan collaborative activities through the operation phase.

Hiroshi Shirai had acted as PL since 2014. He recalled his service for over four years. In 2014, when he first visited Alstom (presently GE) and ASG, they were just fabricating winding packs for their own first toroidal field (TF) coil. Other components and systems such as the poloidal field coils, high temperature superconductor current leads, cryogenic system, vacuum vessel sectors, thermal shields, cryostat vessel body cylindrical section and power supply systems were also being energetically manufactured by European and Japanese companies.

Thanks to the great efforts exerted by the numerous JT-60SA contributors: institutes, universities and manufacturers in both EU and Japan, over these years, their products have been transported to the QST Naka site one by one. "It has been a great pleasure for me to realise the day-by-day progress of the project." he said.

Due to a number of difficulties inherent in the first-of-a-kind components and systems of JT-60SA, the first plasma date was shifted in 2017 by one year and a half to September 2020. He said, "This schedule shift has been kept to a minimum by the strenuous efforts of both implementing agencies. JT-60SA has taken and will take pioneering initiatives for the ITER project and DEMO design activities. I am really proud of it."

Now he is back in ITER business taking on the role of Vice-Chair of the Management Advisory Committee of the ITER Council. Both the JT-60SA project and the ITER project are a pair of wheels working together for an early realisation of fusion energy. He is looking forward to seeing the completion of the JT-60SA assembly, commissioning and operation according to schedule.

The new PL, Yutaka Kamada, is Deputy Director General of Naka Fusion Institute, QST. He is the Japanese member of the ITER Science and Technology Advisory Committee (STAC) and the Japanese representative for the International Tokamak Physics Activity (ITPA) Coordinating Committee.

He is a fusion plasma experimentalist with the main research field of development of steady-state high integrated performance plasmas, study on high beta plasmas, and study on pedestal and edge physics.

As for his experience of international community leadership, he was Chair of the ITER-STAC from 2016 to 2017, Chair of the Program Committee of the 25th IAEA Fusion Energy Conference, Chair of the ITPA Coordinating Committee from 2010 to 2013, and Chair of the ITPA Pedestal and Edge Physics Topical Group from 1999 to 2006.

Yutaka Kamada has also been the Japanese Project Manager of the Satellite Tokamak Programme since 2008. He said, ”In these 10 years, I learned a lot in this project. I found so many friends and enjoyed a lot of beer in this project. The Integrated Project Team of JT-60SA formed by Europe and Japan is a very strong team in which all the team members share the same objectives, milestones, issues, and ways to solve problems based on mutual trust. In particular, I deeply respect European colleagues. Their strong efforts cover the procurement of each component. They are always thinking about assembly and operation. I have confidence that JT-60SA will reach its first plasma in September 2020 and, after that, JT-60SA will become the strongest experimental device for ITER and DEMO. This device is constructed for young fusion researchers who are taking leading roles in ITER and DEMO. I deeply hope they will enjoy many challenges in JT-60SA.”

Welding of final sector of vacuum vessel begins

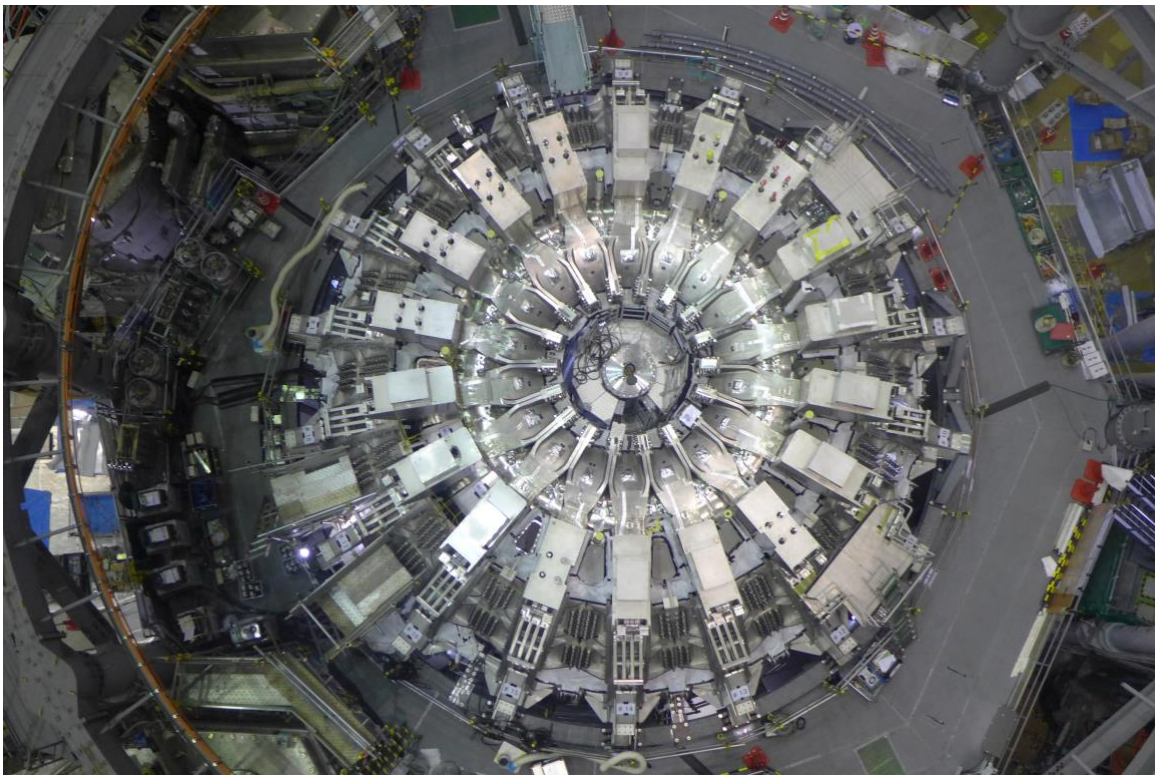

Figure 1: Torus after removal of rotating crane

Welding of the final sector of the double-walled vacuum vessel (VV) is in progress. The final sector has been welded to the neighbouring VV sectors using adjustment plates with the same thickness (18 mm) as the outer wall.

Generally, when welding is to be performed, inert gas such as argon is blown onto the back side of the weld points so as to avoid uptake of air (oxygen) and quality deterioration due to oxidation of the metal. Because the thermal shields are situated just outside the outer wall (the back side of the weld points), inert gas cannot be blown there. Therefore, plates were attached on the back side of the weld points to prevent air from entering those points. This prevents a defect such as a blowhole from happening; thus high quality welding is realised. So far, a total of 10 layers have been welded and the welding of the outer wall has been completed.

In other recent activities, the jig to erect the toroidal field (TF) coils has been dismantled, and the rotary crane for the TF coil installation has been taken away (Figure 1). Furthermore, the shear plates fastening the 18 TF coils together have been installed, as has the vacuum vessel gravity support (VVGS) for the 18th TF coil.

EDICAM PA signed

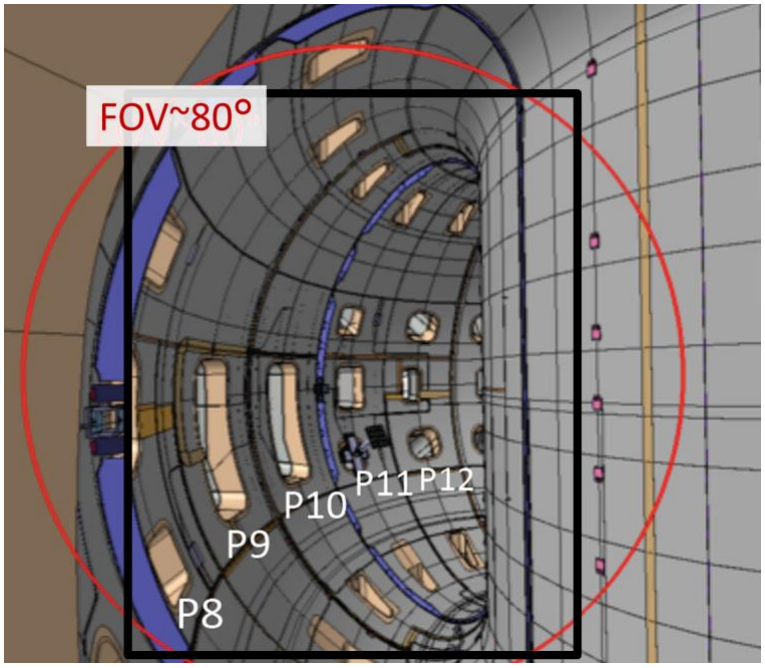

Figure 1: EDICAM camera view

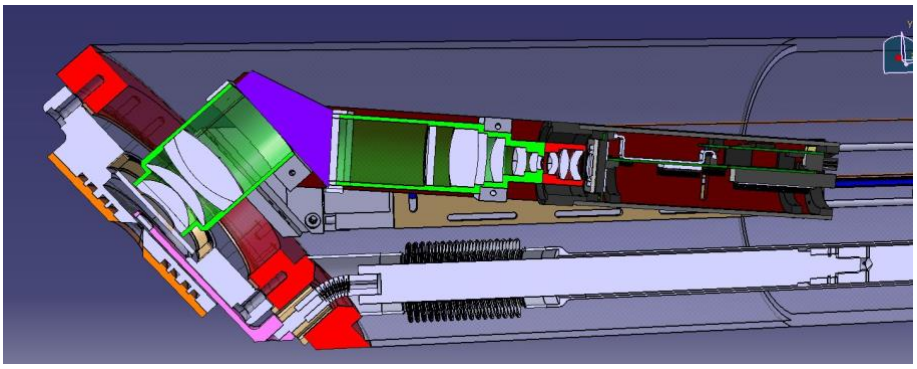

Figure 2: Head structure of EDICAM system

The Procurement Arrangement (PA) for the EDICAM (Event Detection Intelligent Camera) was signed in Naka on 29 June 2018 by Mr. Kenichi Kurihara (Director General of Naka Fusion Institute, QST) and Mr. Pietro Barabaschi (Deputy Project Leader (PL) and EU Project Manager (PM)), witnessed by Mr. Yutaka Kamada (PL and Japanese PM).

The fast wide-angle visible video diagnostic system will measure the visible light from the plasma to monitor the recycling and impurity influx, and also the visible light emission associated with fast phenomena such as plasma start-up, disruptions or gas and pellet injection. The EDICAM system, including data acquisition and control software, optics, mechanics, as well as the vacuum port plug and protective measures such as a pin-hole heat shield and shutter, will be manufactured by Wigner Research Centre for Physics (Wigner RCP), Hungary. Before transport to Japan, all components of the system will be tested in the vacuum test facility at Wigner RCP.

The EDICAM diagnostic will be located in port 18 (P-18) of JT-60SA, which has a tangential view into the torus. Equipped with wide-angle optics, the field of view is of the order of 80°; thus the camera view can see about one-fifth of the plasma vessel (Figure 1). Utilizing a fast field-programmable gate array (FPGA) chip, the EDICAM system is capable of real-time data processing, and can autonomously detect user-defined events. Events can be programmed to trigger actions, such as changing the camera frame rate, turning data storage on/off, or signalling external devices.

Completion of ECRF PS manufacturing

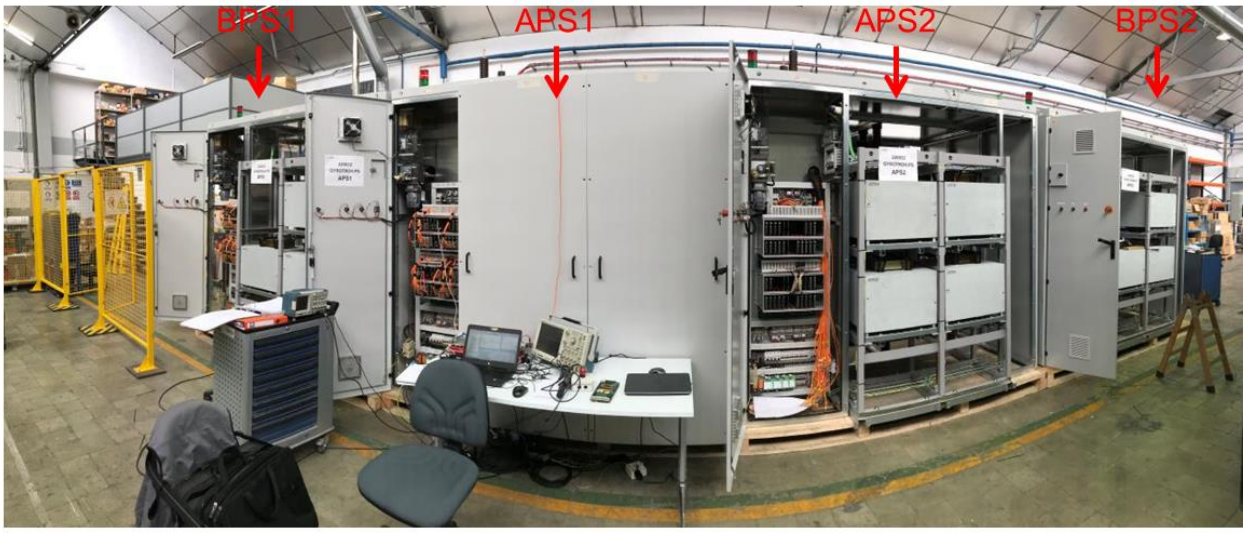

Figure 1: Panoramic view of the APSs and BPSs installed in the JEMA testing area

Figure 2: HVMPS Container (closed and opened)

Figure 3: HVMPS transformers

The manufacturing of the five power supplies (PSs) feeding two gyrotrons of the electron cyclotron range of frequency (ECRF) system of JT-60SA has been completed by JEMA in June 2018.

One high voltage main power supply (HVMPS), two anode power supplies (APSs) and two body power supplies (BPSs) have been prepared in the testing area of JEMA, reproducing as far as possible the same layout as the actual installation in Naka, in order to perform the factory acceptance tests in conditions similar to the final ones.

The two APSs and two BPSs, with a total length of 10 m, have been prepared in the large testing room (Figure 1), while the container for the HVMPS modules and the related heavy transformers have been located in the adjacent testing room (Figures 2 and 3).

Preliminary tests have been already performed in JEMA, in particular proving the correct manufacturing of the different power modules composing each PS. Some optimisations and tunings have been performed, and the official factory tests are planned from September 2018.

The first factory tests will check the operation of the individual PS while connected on a dummy load, to verify the fulfilment of the stringent specific requirements in terms of voltage accuracy, overshoot and fast ramp-up. Finally, some integrated tests with the simultaneous operation of the five PSs will be performed to verify that the overall system is able to fulfil the demanding requirements needed to operate the JT-60SA gyrotrons.

The delivery of the components in Japan is expected in February 2019.

News

CS manufacturing finalised

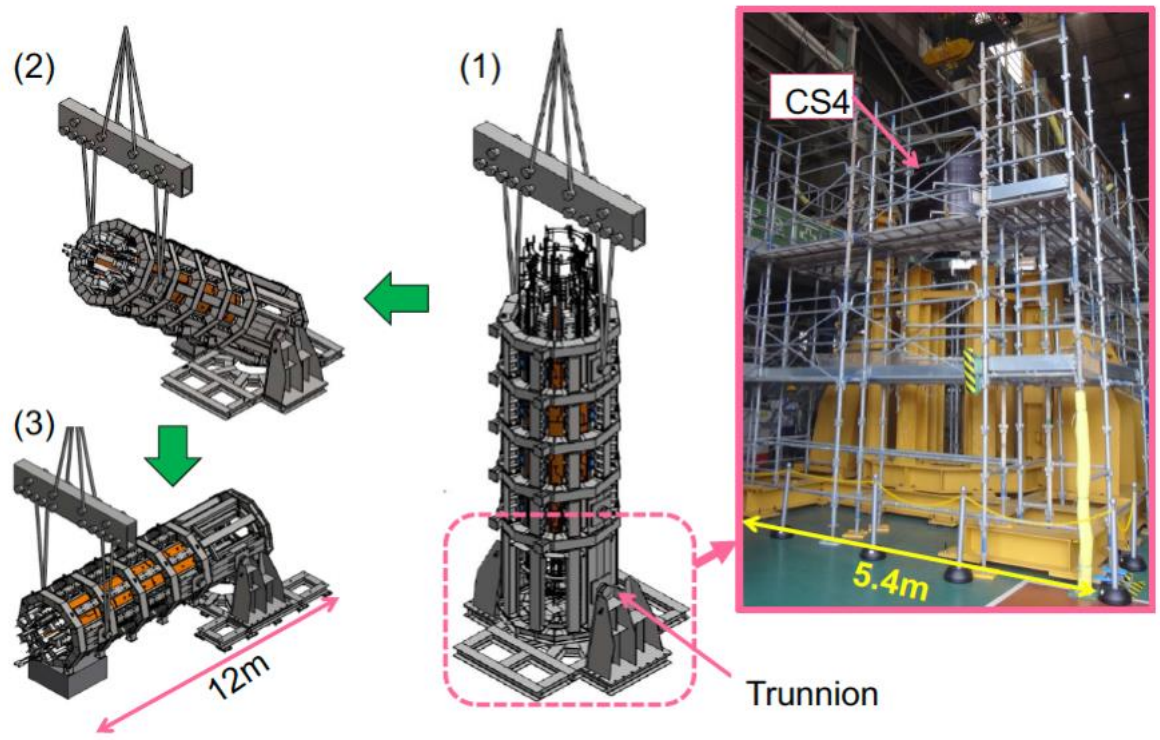

Figure 1: Jig for stacking modules and transporting CS

The manufacturing of the last central solenoid (CS) module (CS3) has been completed. All four modules have been manufactured. At present, they are being prepared for integration. The four CS modules will be integrated and transported to the QST Naka site. The integrated CS weighs 100 t and is 11 m high. It will be laid down to be transported horizontally, rotated vertically again in the assembly hall of the JT-60 experimental building and then installed inside JT-60SA.

The jig to vertically stack the modules, lay the CS down, transport and rotate the integrated CS back vertically has been manufactured (Figure 1). The lower part of the jig is equipped with a trunnion receiver to support the integrated CS in its two positions. Now, the CS4 module positioned at the lowest part of the CS is being installed on the jig.

Meeting

7th Research Coordination Meeting (RCM-7)

The 7th Research Coordination Meeting (RCM-7) was held at the QST Naka site on 4–8 June 2018. About 60 experts participated: 23 from Europe, 36 from Japan and 1 from the Project Team (Figure 1). They discussed the draft of the JT-60SA Research Plan version 4.0, 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 "ITER R&D in JT-60SA and the ITER Research Plan". He stressed that the commissioning test in JT-60SA would be a large contribution to ITER commissioning tests, and the JT-60SA operation would provide many opportunities to validate ITER simulation codes in preparation for ITER operations.

Breakout sessions discussed research items, such as plasma simulation, data and operation, and tungsten studies, as well as strategy and organisation. During the meeting, the participants visited the torus hall to observe the construction status of the JT-60SA device (Figure 2). The publication of the JT-60SA Research Plan version 4.0 is scheduled for the middle of 2018.

The next onsite meeting is planned in the autumn of 2019, probably in the same week as TCM-32. A short version of RCM will be held once every three months via videoconference.

Figure 1: Group photo taken in front of the JT-60 control building

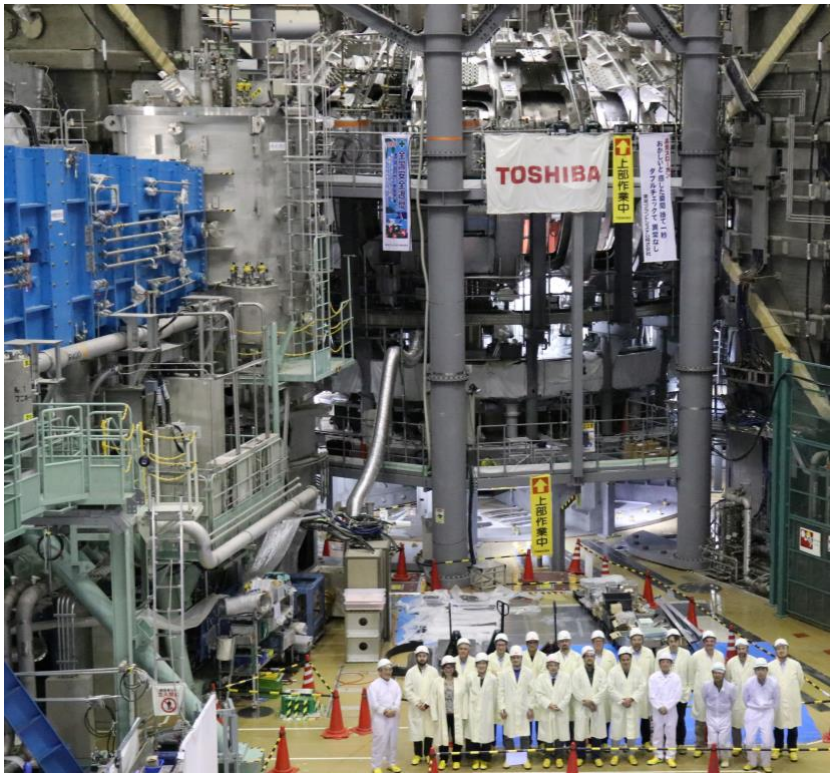

Figure 2: Technical tour in the torus hall during the RCM-7

Meeting

30th Technical Coordination Meeting in Naka

The 30th Technical Coordination Meeting (TCM-30) took place on 27 and 28 June 2018 at the QST Naka Fusion Institute in Japan. A total of 78 experts attended the meeting in person or via video-conference: 24 from the EU Home Team (France, Germany and Italy), 43 from the JA Home Team, 6 from the Project Team, and 5 invited from Contributor/EUROfusion.

At the beginning of the meeting, Y. Kamada, the new Project Leader (PL), made an opening presentation. He emphasised that the JT-60SA project was entering the next phase, namely the manufacturing of components was almost completed and the assembly work was approaching the final stage according to schedule.

After the secretariat introduced the logistics and agenda as usual, he explained that the Action List would be updated at the TCM-30 towards the next phase. Then EU and Japanese Deputy Project Managers (DPMs) briefly explained each achievement since the last TCM.

The Japanese DPM also explained the overall schedule for the first plasma and assembly sequence: QST would continuously make an effort to complete the JT-60SA construction in March 2020.

During the meeting on the first day, the substantial progress in manufacturing of the thermal shields, central solenoid, coil terminal boxes, cryodistribution, cryostat top lid and in-vessel components was presented. The present status of activities related to the magnet power supplies (PSs), superconducting magnet power supplies (SCMPSs), electron cyclotron range of frequency (ECRF) PS and ECRF system for the first plasma was also introduced. And the current status of the magnetic sensors, diagnostics for the first plasma, torus vacuum pumping system, SCSDAS (Supervisory Control System and Data Acquisition System) and EDICAM (Event Detection Intelligent Camera) was explained. In addition, a technical tour was organised by QST to see the tokamak assembly in the torus hall, the acceptance test of the SCMPS in the JT-60 rectifier building (Figure 1) and the completed upper equilibrium field (EF) coils in the superconducting coil winding building.

On the second day, the following items were reported and discussed towards the next phase including machine enhancement: the lower divertor, fast plasma position control coils, error field correction coils and resistive wall mode control coils (RWMCC), stabilizing plates, ECRF systems, RWMCC PS, enhanced diagnostics by EU and Japan, cryopump, pellet injector and massive gas injection. The configuration control models, Plant Integration Document (PID) updating status and updates of the Action List were summarised as well.

During the second day of the meeting, the group photo of the participants was taken in front of the main monitor screen in the central control building (Figure 2). In addition, certificates of appreciation for the completion of the TF magnet were presented by K. Kurihara (Director General of Naka Fusion Institute) to A. Cucchiaro of ENEA, representing the ENEA and CEA TFC teams (Figure 3), and certificates of appreciation for the completion of the Cryogenic Test Facility and TFC Cold Test were also presented to J-C. Vallet of CEA, representing the CEA teams (Figure 4). Furthermore, the JT-60SA Newsletter Awards were presented by the PL to the top contributors from July 2017 to April 2018 (1st: K. Masaki of QST, 2nd: G. Frello of F4E, K. Kizu of QST and K. Natsume of QST) (Figure 5).

Finally, the PL announced that the next meeting, TCM-31 would be held in Naka, Japan on 21 and 22 November 2018.

Figure 1: Technical tour in the JT-60 rectifier building where the acceptance test was progressing

Figure 2: Group photo taken in front of the main monitor screen in the central control building

Figure 3: Certificates of appreciation for TF magnet completion to the ENEA and CEA TFC teams

Figure 4: Certificates of appreciation for completion of Cryogenic Test Facility and TFC Cold Test to the CEA teams

Figure 5: Winners of the JT-60SA Newsletter Awards

Calendar

16–21 September 2018
30th Symposium on Fusion Technology (SOFT 2018)
Giardini Naxos, Italy

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

5 December 2018
23rd Meeting of the BA Steering Committee (SC-23)
Grenoble, France

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/.