

Headline

French Apéro for completion of cryogenic system



Figure 1: French Apéro on 13 October 2016 in celebration of the end of the cryogenic tests

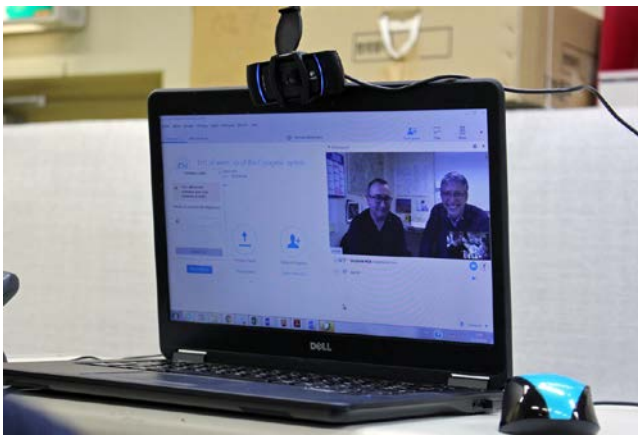


Figure 2: F4E and CEA colleagues joined via videoconference



Figure 3: Green and black olives, dried tomato tapenades and caviar d'aubergine

The commissioning and tests of the cryogenic system were successfully completed in September 2016.

7 months were needed to perform all the cryogenic tests. Dedicated heaters and bypass circuits in the auxiliary cold box were used to simulate the thermal loads from the cryogenic users during the JT-60SA operations. The commissioning activities lasted for 1 year overall, with a shift of only 2 months in the schedule, thanks to the fruitful collaboration among the manufacturer, Air Liquide Advanced Technology (AL-aT) and CEA, F4E, QST.

The successful completion of the acceptance test of the cryogenic system was achieved during the third cool down/warm up campaign in September. In particular, the pulse operation demonstration on 27 and 28 September was very challenging (Figure 4). However, after tremendous efforts, the cryogenic team on site could get through and enjoy some moments of comfort!

To celebrate this achievement, a French "apéro" (aperitif) was organized in the cryogenic control room on 13 October, when the warm up from 4.4 K to 300K ended (Figure 1). F4E (Garching, Germany) and CEA (Grenoble and Cadarache, France) colleagues also participated in this friendly moment via videoconference (Figure 2). CEA invited QST Japanese colleagues to taste some French delicacies (Figure 3). For the occasion, J. C. Vallet, CEA project coordinator, brought marinated black and

green olives, tapenades (pureed olives, capers, anchovies and olive oil), caviar d'aubergine (baked aubergines mixed with garlic, tomatoes, parsley, lemon juice, and olive oil), a large variety of cheese (made from goat, sheep and cow's milk), foie gras de canard (duck livers), saucissons (a variety of thick, dry cured sausage), baguettes and pains toastés (toasted baguettes and bread) from Provence (Southern France). Everyone was delighted.

J. C. Vallet made a short speech to recall the final design meeting held in Grenoble in 2013, and showed the history of the 3-year-long and steady "ascent to the cryogenic system mountain", which was as tough as climbing to the summit of Mt. Fuji in winter. All the cryogenic team on site from AL-aT, CEA, F4E and QST were warmly thanked for their continuous involvement in the commissioning. The team could climb together the cryogenic system mountain, namely "JT-60-San" ("san" means "mountain" in Japanese, also see Figure 5).

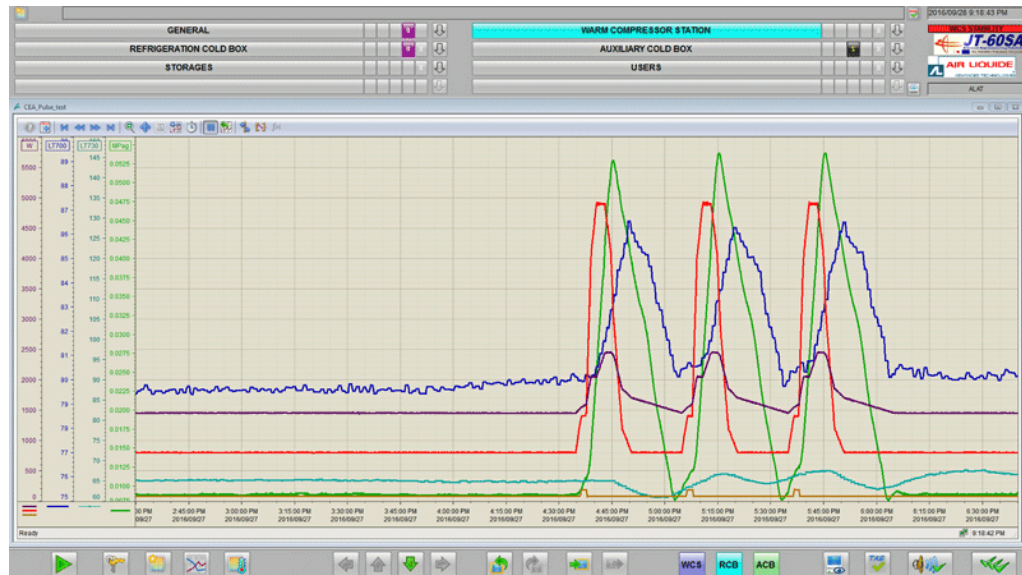


Figure 4: 3 consecutive 1800 s pulse test validation on 27 September 2016



Figure 5: Artistic photo montage of the photos of Fuji-san (Mt. Fuji) and the cryogenic system team (F4E/CEA/AL-aT) at the base camp in Grenoble before the 3 year ascent to the summit of the cryogenic system project - JT-60-SAN -

CS SNUs delivered to Japan



Figure 1: Group photo in front of the SNU boxes just arrived at the QST Naka site

On Sunday, 2 October 2016, the switching network units (SNUs) for the central solenoid (CS) of JT-60SA were delivered to Japan.

The components of the 4 CS SNUs, procured by ENEA through a contract with the Italian supplier, OCEM Energy Technology S.r.L., were shipped in 52 wooden boxes enclosed in 5 freight containers.

The SNU's voyage was longer than expected, with 1 week of departure delay due to overbooking of the ship cargo at the embarkation port, La Spezia (Italy), and an unexpected detour on the Yellow Sea to escape from a dangerous typhoon in the Shanghai region (Figure 2). But they were finally and safely delivered to the port of Yokohama in Japan.

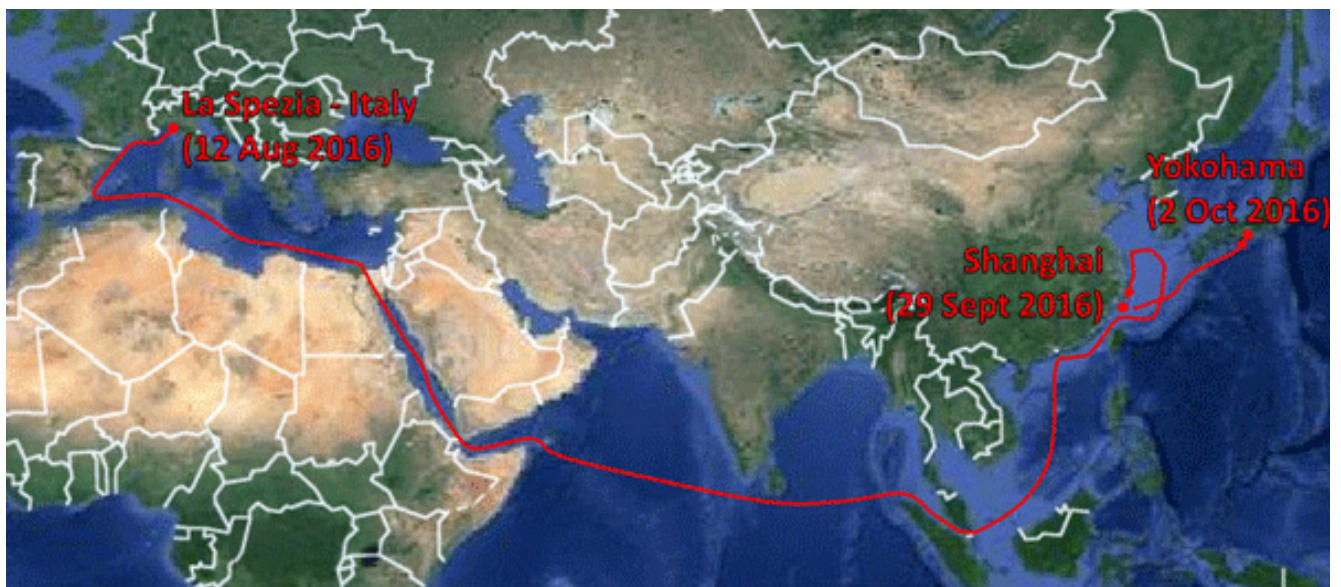


Figure 2: Itinerary of the SNUs from Italy to Japan

There, on 7 October 2016, the seals of the 5 containers with the SNU components were opened, and the status of the boxes was jointly checked by all the involved stakeholders: representatives of OCEM, ENEA, F4E and QST (Figure 3, 4 and 5). They performed an accurate check of the boxes verifying the status of the attached shock detectors. More than 100 detectors were checked, and only 3 of them were found to be tripped. Anyway, the further detailed inspection on the questioned boxes did not show any evident damage, giving reassurance of the good status of the SNU components.



Figure 3: Check of the SNU boxes at Yokohama port



Figure 4: Participants in the box reception at Yokohama port



Figure 5: Panoramic view of the SNU boxes at Yokohama port

After the check, the responsibility for the component transportation was transferred from Europe to Japan. The transportation from Yokohama port to the QST Naka site was performed by Utoc Corporation contracted by QST. The boxes arrived at the Naka site on 11 October 2016 (Figure 1), and, in the next few days, they were lifted up into the rectifier building with the help of a movable crane and temporary scaffolds (Figure 6), and positioned near the final installation place in the rectifier room (Figure 7).

Finally, the second joint check of the boxes was performed at the Naka site, proving that no accidents happened during the road transportation before returning the responsibility for the components from Japan to Europe.

The installation of the SNU components started on 17 October 2016, and it is foreseen to be completed by the end of December 2016.



Figure 6: Lifting the SNU boxes into the rectifier building



Figure 7: SNU boxes stored in the rectifier room

News

Inner intercoil structure assembly dry run

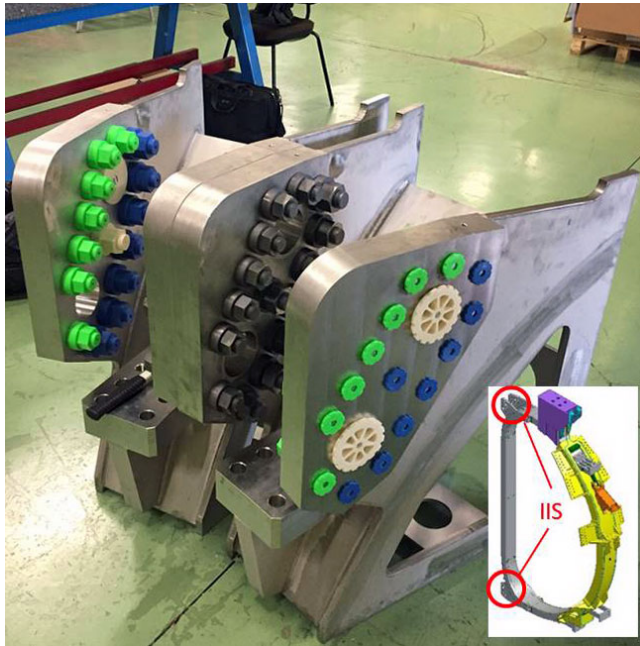


Figure 1: IIS prototypes at CEA Saclay



Figure 2: Training for the pin insertion

The inner intercoil structures (IISs) are the fixtures mounted on the top and bottom inboard corners of the D-shaped toroidal field (TF) coils (see 3D image in Figure 1). They will link the adjacent TF coils to each other in the upcoming TF coil assembly at the QST Naka site.

The actual joining at both upper and lower IISs requires difficult operations to fasten 14 Inconel® bolts in a small space. In addition, 2 Inconel® pins with a complex eccentric bush fitting structure need to be inserted into each IIS to maintain a more tight integration.

Therefore, on 21 October 2016, S. Davis (F4E), K. Masaki (QST), and Mr. S. Mizumaki (a representative of the Japanese contractor for the TF coil assembly) visited CEA Saclay in France. They used a pair of IIS prototypes (Figure 1), and identified the difficulties foreseen in the actual operations in such a limited workspace. They had training to insert the pins as well (Figure 2), and finally confirmed the overall IIS integration procedures.

Meeting

IAEA FEC 2016



JT-60SA overview presentation by H. Shirai



The 26th IAEA Fusion Energy Conference (FEC) was held from 17 to 22 October 2016 at Kyoto International Conference Centre, Japan, which was the same venue as for the 11th FEC in 1986 just after the achievement of the first plasma of the former JT-60. This conference covered the latest topics on overall fusion research and development in various fields such as magnetic confinement experiments, theory and modelling, inertial fusion experiments and theory, plasma overall performance and control, fusion nuclear physics and technology, fusion engineering, integration and power plant design, materials physics and technology, innovative confinement concepts, and safety, environmental and economic aspects of fusion. The programmes consisted of plenary sessions, oral and poster presentations. About 1100 participants in total attended the conference.

H. Shirai from the JT-60SA Project Team presented an invited talk entitled “Recent Progress of JT-60SA Project” giving an overview of the JT-60SA construction, future plans of its exploitation, research collaboration among members of the Integrated Project Team and fusion communities of Europe and Japan, and so on. He emphasised that JT-60SA was progressing steadily towards the operation in 2019. The audience listened with interest and asked several questions regarding ITER and DEMO related matters in the JT-60SA project plan.

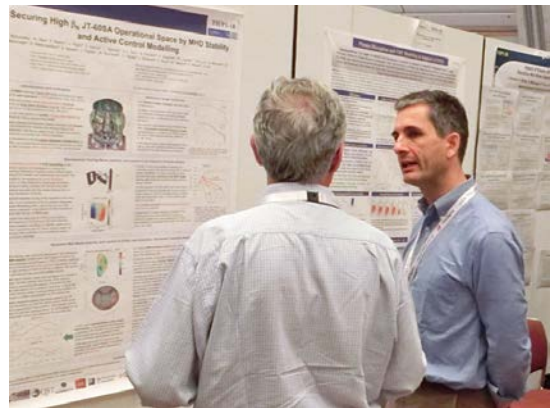
Presentations related to the JT-60SA Project from the JT-60SA EU and JA Home Teams were given as follows (only presenters and titles are shown):

- Overview presentation (1)
 1. H. Shirai, Recent Progress of JT-60SA Project.
- Oral presentations (2)
 1. J. Hiratsuka, Long-Pulse Acceleration of 1 MeV Negative Ion Beams toward ITER and JT-60SA Neutral Beam Injectors;
 2. Y. Shibama, Assembly Technologies of the Superconducting Tokamak on JT-60SA.
- Poster presentations (9)
 1. T. Bolzonella, Securing High- β_N JT-60SA Operational Space by MHD Stability and Active Control Modelling;
 2. N. Hayashi, Core-Edge Coupled Predictive Modelling of JT-60SA High- β_N Steady-State Plasma with Impurity Accumulation;
 3. M. Romanelli, Investigation of Sustainable Reduced-Power Noninductive Scenarios on JT-60SA;
 4. C. Day, Assessment of the Operational Window for JT-60SA Divertor Pumping under Consideration of the Effects from Neutral-Neutral Collisions;
 5. R. Zagorski, Numerical Analyses of Baseline JT-60SA Design Concepts with the COREDIV Code;
 6. G. Giruzzi, Physics and Operation Oriented Activities in Preparation of the JT-60SA Tokamak Exploitation;
 7. J.-C. Vallet, Towards the Completion of the CEA Contributions to the Broader Approach Projects;
 8. D. Douai, Development of Helium Electron Cyclotron Wall Conditioning on TCV for the Operation of JT-60SA;
 9. P. Decool, JT-60SA TF Coil Manufacture, Test and Preassembly by CEA.

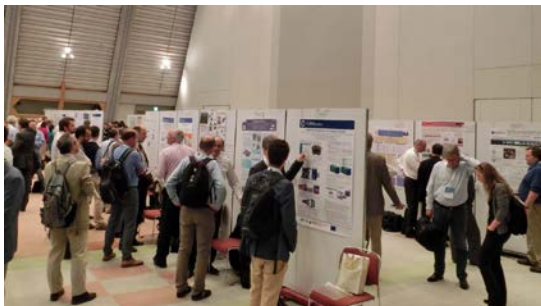
The next IAEA FEC will be held in Ahmedabad, India, in October 2018.



Y. Shibama in discussion over his poster presentation



T. Bolzonella in discussion over his poster presentation



Poster presentations in Annex Hall



Garden in the conference centre

Meeting

19th STP Project Committee Meeting



Group photo at the STP PC-19 meeting

On 11 October 2016, the 19th Meeting of the Satellite Tokamak Programme Project Committee (STP-PC) was held between Europe and Japan at the QST Naka site. A total of 33 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 21 experts from the EU and JA Home Teams.

At the meeting, the PL reviewed the project status and presented the "Work Programme 2017" and "Update of the Project Team", to be submitted to the 19th Broader Approach Steering Committee meeting on 14 December 2016. The latest status of procurement and assembly was also reported in detail by the Project Managers of the EU and JA Home Teams.

The STP-PC expressed satisfaction with the achievements and the progress in both EU and JA procurements as well as the assembly, installation and commissioning. Those included completion of all (18 production plus 2 spare) toroidal field (TF) coil winding packs fabrication, delivery of 7 TF coils to the cold test facility, completion of the cold test on 6 TF coils, delivery of 2 TF coils to the Naka site, completion of tests on 12 high temperature superconductor current leads for the poloidal field (PF) coils, start of installation of the superconducting magnet power supplies (SCMPSs) and delivery of the switching network unit components to the site, progress of the cryostat vessel body cylindrical section fabrication, completion of the equilibrium field (EF) 1 - 3 coil fabrication, completion of the central solenoid 1 module and its delivery to the National Institute for Fusion Science (NIFS) for a cold test, progress of the vacuum vessel thermal shields (VVTSSs) assembly onto the 340° VV, and, especially, commissioning of the cryogenic system completed in the middle of October 2016 after one year on-site work by European staff. The STP-PC appreciated the completion of the PF conductor Procurement Arrangement as scheduled. The STP-PC also commended strenuous efforts to accelerate the TF coil manufacturing by the EU Implementing Agency, Voluntary Contributors and related European manufactures, which had led to steady fabrication and delivery progress.



PL explaining the assembly progress to the STP-PC in the torus hall

Before the meeting, the PC chair and some of the PC members attended a site tour to see the progress of the JT-60SA construction including the TF coil #10 and #11 delivered from Europe, EF1 - 3 coils completed at the Naka site as well as the VVTSSs in assembly, the cryogenic system and SCMPSs in commissioning.

The STP-PC decided that the next STP-PC meeting (PC-20) would be held on 21 March 2017.



STP-PC inspecting the EF1 – 3 coils in the superconducting coil winding building



STP-PC listening to the SCMPs status in the rectifier building



STP-PC with the delivered TF coil in the engineering test building



STP-PC listening to the explanation for the cryogenic system

Meeting

ITPA meeting 2016 in Naka

The International Tokamak Physics Activity (ITPA) meeting 2016 of 4 topical groups: transport and confinement (TC), integrated operation scenarios (IOS), pedestal and edge physics (PEP), and scrape-off-layer and divertor (DivSol), was held in Naka, Ibaraki, Japan, from 24 to 28 October 2016. These ITPA meetings underpin the joint planning of ITER and JT-60SA operation. A total of 175 scientists participated in the meeting. Almost all participants at Naka in person took a site tour to see the JT-60SA tokamak device under construction. An outline of the work of each group at the meeting is described below.

- TC group



The 17th TC group meeting was held with 42 participants.

In the meeting, the following topics were mainly discussed: ITER database revision, edge shortfall physics, intrinsic rotation database, profile stiffness and threshold physics, i-mode database, impurity transport physics, plasma simulation development with neural network, transport modelling in the current rise, isotope effect study, and joint experimental activities.

A member of the ITER Organization Central Team provided the revised schedule and research items of ITER, which were important to TC topical group.

- IOS group



The 17th IOS group meeting was held with 33 participants.

In the meeting, the following topics were mainly discussed: joint experiments of ITER baseline scenario demonstration, joint research activity on plasma termination protocols, integration of particle transport modelling into simulations, helium experiments in support of the ITER low-activation operation phase, development of control strategies, and use of integrated modelling and analysis suite (IMAS) protocols for experimental and simulation data sharing.

The models of particle transport and the pedestal required for operation scenario modelling were discussed in joint meetings with the TC and PEP topical groups.

- PEP group



The 30th PEP group meeting was held with 36 participants.

In the meeting, the flowing topics were mainly discussed: edge local mode (ELM) suppression and mitigation with resonant magnetic perturbation (RMP) coils, H-mode pedestal structure, L-H and H-L transition physics, i-mode studies, ELM pacing with pellets. They are the most important issues for ITER.

The schedule to update the ITER physics basis was discussed as well.

- DivSol group



The 23rd DivSol group meeting was held with 64 participants.

In the meeting, the following topics were mainly discussed as usual: modelling (fluid code, Monte-Carlo code, etc.), and plasma-wall interactions (dust, damaged-tungsten, vapour shielding, etc.).

One of the highlights of this meeting was the joint session with the PEP group to discuss effects of the seeded impurities on pedestal plasmas and impacts of the SoL characteristics on pedestal fuelling. Since the last DivSol meeting, a session on "effects of three-dimensional fields on divertor heat flux" had been held to discuss changes of the divertor heat flux profiles caused by rotating RMP, as it is important for ITER.

Local

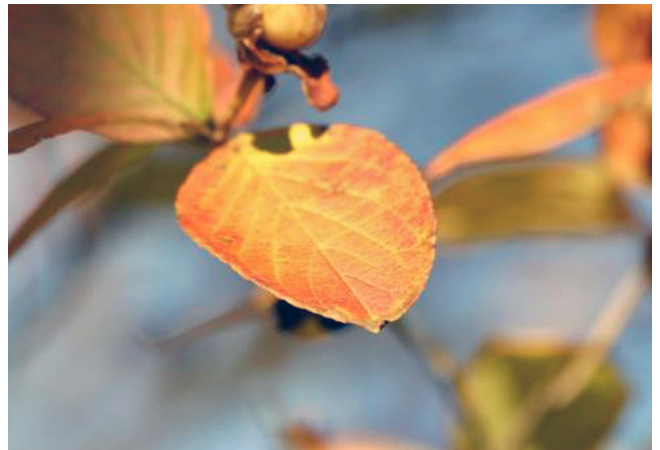
Autumn leaves at Naka site



The chirping of summer's cicadas is over at Naka institute, and the lengthened shade of autumn is thrown over the people as they commute. Here in Naka, it sometimes drops down to 10 °C in late October and early November, and the sunlight is milder and the air is chillier.

Only in this brief period of the year at the QST Naka site, leaves of maple, stewartia and zelkova turn red and yellow, and the margins of the asphalt lanes look like a gorgeous bed and pillow.

While the JT-60SA construction is progressing at a high pace, why don't you come and enjoy this brief autumn atmosphere at this nice place?





Calendar

14 December 2016

19th Meeting of the [BA Steering Committee](#) (SC-19)
Madrid, Spain

22 – 23 February 2017

27th Technical Coordination Meeting (TCM-27)
Karlsruhe, Germany

21 March 2017

20th Meeting of the [STP Project Committee](#) (PC-20)
Naka, Japan

27 April 2017

20th Meeting of the [BA Steering Committee](#) (SC-20)
Rokkasho, Japan

14 – 18 May 2017

[25th International conference on Nuclear Engineering](#) (ICONE 2017)
Shanghai, China

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/>.