# JT-60SA Newsletter No. 78, 30 June 2016



## **Headline**

### First TF coil sails for Japan



Figure 1: Loading the first TF coil on board at the port of Zeebrugge on 29 May 2016

Of all the complex systems making up the JT-60SA tokamak, none have required as much integration effort from the Integrated Project Team as the toroidal field (TF) coil. While most systems are the subject of a single Procurement Arrangement and are integrated by a primary industrial contractor, the many contributions to the TF coil have required particular attention to ensure their successful assembly and operation together.

It is for this reason that the quiet departure of the NYK liner "Metis Leader" from the Belgian port of Zeebrugge early on 30 May 2016 (Figure 1) marked such a significant step on the long journey to first plasma in JT-60SA. Carrying <u>the first of the 18</u> <u>TF coils to be tested and pre-assembled with its outer intercoil structure (OIS)</u>, it is the first of 20 voyages planned to carry the TF coils for the tokamak and their spares to the installation site, QST Naka Fusion Institute in Japan.

Transporting the TF magnet to Hitachi port, approximately 10 km away from the site, is the last of Europe's formal responsibilities in its supply, and is managed by F4E contractor, DAHER. Carefully packed by CEA for sea transport with her OIS, coil 10 ("Annie") weighs 33 t and is 5.6 m wide – much wider than the limits for normal road transport. Having left Saclay, France on 17 May, so as to reach the port of Zeebrugge, she had to be escorted over 300 km around Paris, across 10 French départements and through western Belgium, usually travelling by night.

Early on 20 May, a small crowd gathered in the rain at the ICO Bastenaken terminal to witness her transfer from the road truck to a specialised "Mafi" trailer, ready to be wheeled into the roll-on roll-off (Ro-Ro) ship (Figure 2). Representatives from F4E, DAHER, Scales (haulier), NYK (shipping line) and the terminal operator were present, as she was gently lifted and then lashed securely to the Mafi. F4E chose to use Ro-Ro vessels for the transport, due to their reliable sailing schedules giving regular access to a deep-water quay at Hitachi port.

Annie is expected to arrive at Hitachi port on 9 July 2016, and will be assembled in the torus hall at the QST Naka site by the end of the year.



Figure 2: Transfer of "Annie" from the road truck to the Mafi trailer at Bastenaken terminal on 20 May 2016

### <u>News</u>

## F4E management visits GE Belfort



Figure 1: F4E, CEA and GE teams with TF coil 12 (Paschen tank and transportation frame on the right-hand side, covers in the back)

On 12 May 2016, JT-60SA management at F4E, P. Barabaschi (the Project Manager (PM) of the EU Home Team (EU-HT)) and E. Di Pietro (the Deputy PM of the EU-HT), joined CEA management in a visit to the GE factory in Belfort, France. F4E and CEA management reviewed, with the GE team, the status of the progress of the <u>toroidal field (TF) coils</u> manufacture

under CEA's responsibility. On the same day, the factory acceptance tests of TF coil 12 were completed (Figure 1). The coil was then prepared for shipment from the GE workshop to the <u>TF coil cold test facility (TFCTF)</u> in Saclay, France, which was successfully carried out at the end of May.

During the visit, F4E and CEA teams also viewed the 7 remaining coils at their various manufacturing stages, from coil 20 having just entered production at the winding preparation workstation, to coil 13 at the final impregnation workstation. They also examined GE's quality management system, implemented all along the manufacturing process.

Both P. Barabaschi and E. Di Pietro, as well as CEA team, warmly congratulated GE for the steady progress achieved on the TF coil manufacturing for the French contribution, which had, at that date, been approximately 50% completed, and also for the successful test results, which had been obtained for the coil 10 and 11 at the TFCTF in Saclay.

On 17 May, the TF coil 10 "Annie" left Saclay for her long journey to the QST Naka site in Japan (Figure 2). On 18 May, the TF coil C-11 was formally named "Brigitte" and "crowned" with her outer intercoil structure (OIS) (Figure 3).





Figure 2: TF coil 10 "Annie" leaving Saclay on 17 May 2016

Figure 3: TF coil 11 "Brigitte" crowned with her OIS in Saclay

#### **News**

## Spain-Japan workshop on Fusion and Accelerators



A workshop on "Collaboration Opportunities on Fusion and Accelerator Technologies and Projects, between Spanish and Japanese Organizations" was held on 13 May 2016 at the Spanish Embassy in Tokyo.

Dr. Shinichi Ishida, Deputy Director General of QST Naka Fusion Institute and former Project Leader of the Satellite Tokamak Project, made an overall presentation about the fusion field, entitled "Fusion Projects and Activities in QST and Japanese-Spanish Potential Collaborations". In his presentation, Spanish contributions to the procurement of components and systems in Broader Approach activities were highlighted: e.g. <u>cryostat</u> base, cryostat vessel body cylindrical section, and <u>power supply systems</u> for the <u>toroidal field coils</u>, equilibrium field coils and <u>fast plasma position control coils</u> for the Satellite Tokamak Project, as well as the components for the IFMIF prototype accelerator. The presentation attracted many participants and was well received.

The other main topic of the workshop was the present status of the International Linear Collider project.



### **News**

## **CEA SCMPSs shipped to Japan**



bags







Figure 3: Packed dc reactors

On 7 May 2016, after the successful completion of the factory tests, the <u>power supply (PS) systems</u> for the <u>toroidal field (TF)</u> <u>coils and equilibrium field (EF) coil 2-5</u> were packed and loaded onto a ship, starting their long travel from the port of Bilbao in Spain to the QST Naka site in Japan.

The 5 converters that supply power to the TF and EF2-5 superconducting coils of the JT-60SA device (a part of the superconducting magnet power supplies (SCMPSs)) are procured by CEA through a contract with a Spanish supplier, Jema Energy S.A. (JEMA).

The manufacturing of these converters started in the second half of 2014. As soon as the manufacture was completed, they were individually tested at full power at the factory from July 2015.

The factory test having been successfully completed, the converters were packed in antistatic moisture barrier bags to prevent damage to electronic components during the trans-oceanic shipment (Figure 1), and then enclosed in 39 large wooden boxes, with a total weight of about 64 t (Figure 2). The boxes were equipped with shock detectors to easily detect possible mishandling of the components during the transportation.

At the port of Bilbao, the boxes were stored in 7 tall containers, which were loaded onto a container ship named "Wehr ALSTER". The ship left the Bilbao port on 7 May 2016, and reached the Algeciras port (Spain) on 11 May. Here, the containers were transferred onto another container ship, named "MSC SVEVA", which left for Shanghai port on 18 May. The containers were finally loaded in the third ship "GEORG MAERSK" in Shanghai, which reached the port of Yokohama on 19 June.

After reaching Japan, the containers were opened and the shock detectors set on the boxes were checked and confirmed no mishandling had occurred during the transportation. The SCMPS boxes were then safely delivered to the QST Naka site by truck under QST's responsibility, and their long journey finally and successfully drew to a close.

#### **News**

## Assembly scenario of magnet shared components



The assembly scenarios for <u>the valve boxes (VBs)</u>, <u>coil terminal boxes (CTBs)</u>, <u>cryolines and current feeder lines</u> were reviewed in detail. Basically, all those components will be assembled by adjusting the angle and length of extension ducts to link each component with the corresponding nozzle stub, attached in advance to the penetrations in the cryostat vessel body cylindrical section (CVBCS).

The figures above and the corresponding text below show the VB assembly as an example.

- 1. Pre-assembling the top section of the CVBCS (CVB-T) in the assembly hall, and installing a temporary assembly stage around the CVB-T.
- 2. Notching stiffening ribs around the penetrations on the CVB-T.
- 3. Welding nozzle stubs to the penetrations, and surveying their end face shapes by means of reflector measurements.
- 4. Transferring and mounting the CVB-T onto the CVBCS in the torus hall.
- 5. Adapting the extension duct to the end geometry of the corresponding nozzle stub measured in step 3, welding the duct to the stub, and calculating the duct centre from the reflector measurements.
- 6. Welding the VB duct to the extension duct and measuring with a laser tracker, so that the central axes of the VB housing and extension duct cross at right angles, then welding the other end to the duct from the CVB-T in the same manner.

The above processes have been integrated into the specifications for the 3rd assembly phase.

#### **News**

#### JT-60SA research plan version 3.3 released



The JT-60SA Research Plan was renewed to version 3.3 in March 2016 by a total of 378 co-authors: 213 scientists from Europe (14 countries, 20 institutes), 160 from Japan (16 institutes), and 5 from the Project Team.

In this version, the EU-DEMO regimes, as well as the JA-DEMO's, have been added. JT-60SA is responsible for a variety of research areas needed to design steady-state DEMO devices.

Version 3.3 is now available on-line here.

#### Meeting

## 5th Research Coordination Meeting (RCM-5)



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

The 5th Research Coordination Meeting (RCM-5) was held at the QST Naka site on 16 - 20 May 2016, in which 55 experts participated - 19 from Europe, 35 from Japan and 1 from the Project Team (Figure 1). They discussed the progress in research activities in the past year, plans for future collaboration, and papers to be presented at the 26th IAEA Fusion Energy Conference to be held in Kyoto in October 2016.

Dr. David Campbell, Director of the Science and Operations Department of the ITER Organization, remotely participated in the meeting via videoconference, and made a presentation entitled "ITER Research Plan and Physics R&D Priorities for JT-60SA". He stressed that JT-60SA would be well equipped to address the majority of issues in ITER and to provide integrated solutions for ITER.

In breakout sessions, research items, such as plasma simulation, plasma operations, fuelling/pumping, and diagnostics, were discussed. During the meeting, the participants visited the torus hall to observe the construction status of the JT-60SA device. They agreed on future revision of the <u>JT-60SA Research Plan</u> in line with the ITER Research Plan, which is planned to be updated.

The next meeting is planned in May 2017.



Figure 2: Participants in discussions during the RCM-5

## **Calendar**

4 – 8 July 2016 <u>43rd European Physics Society Conference on Plasma Physics</u> (EPS 2016) Leuven, Belgium

6 – 7 July 2016 25th Technical Coordination Meeting (TCM-25) Avilés, Spain

5 – 9 September 2016 29th Symposium on Fusion Technology (SOFT 2016) Prague, Czech Republic

11 October 2016 19th Meeting of the <u>STP Project Committee</u> (PC-19) Naka, Japan

17 – 22 October 2016 26th IAEA Fusion Energy Conference (FEC 2016) Kyoto, 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 <u>newsletter@jt60sa.org</u>.

For more information, please visit the website: http://www.jt60sa.org/.