

Headline

Coils reach jet speed



Figure 1: Princesses “Isabelle” and “Jeanne” being escorted to the specially chartered “Antonov An-124” (Paris, France)

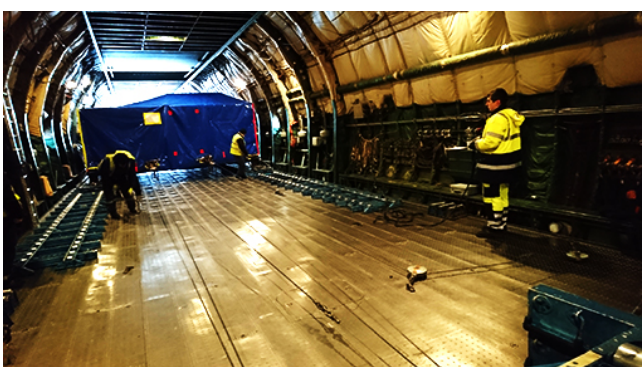


Figure 2: Welcome aboard, please fasten the seatbelt



Figure 3: Have a wonderful flight and see you again in Japan

First plasma in 2020 is a tough target for the JT-60SA team - but it is very serious, and it can't be achieved without a full set of the 18 toroidal field (TF) coils. After battling technical problems and supply chain challenges, the JT-60SA superconducting magnet team needed to save time to avoid disrupting the tokamak assembly steadily proceeding at the QST Naka site - so it was decided to send the last 2 TF coils - “Isabelle” and “Jeanne” (respectively, coil #17 and #20 in the overall TF coil numbering system of JT-60SA) - to Japan by air. “It's not cheap,” admitted S. Davis (F4E). “Those coils weigh 64 t! But it's cheaper than being late - we can save over 6 weeks with this flight.”

Such a transport was an engineering challenge in its own right, requiring the exclusive charter of an Antonov An-124, one of the biggest planes in the world. “It's the only one with a wide enough door,” explained Davis. “The coils are over 5.5 m wide on their transport frames”. F4E engineers carefully reviewed their packaging in the light of the higher forces that can occur during flight and CEA implemented the necessary enhancements after they had tested the coils and pre-assembled them with their outer intercoil structures in Saclay, France.

The preparation was not without its challenges - at T-minus 1 week, heavy snow around Paris prevented many staff from reaching the Saclay site and trucks were banned from the roads. Luckily, the next week was snow free. After being escorted to the airport, the coils were lifted onto an inclined plane assembled in front of the Antonov to allow them to be winched inside through its nose (Figure 1 and 2). 33 hours after take-off (Figure 3), having stopped in Turkmenistan and in China for rest and refuelling, and having burned 183 t of kerosene, the 19 crew and their precious cargo touched down at the Chubu Centrair International Airport in Aichi, Japan (Figure 4).

There they were enthusiastically welcomed by QST staff - but much work remained to be done to unload them from the plane and to load them onto a small ship for transfer to Hitachi Port, only 10 km from the Naka site. Chubu Centrair Airport is built on an artificial island, allowing large cargo to be transferred easily between aircraft and ships. This is why it was selected for the 2 coils to take their first steps into Japan. They are too big to transport by road from, say, Narita International Airport to Naka (more than 100 km crawling).

Strong winds made the lifting more challenging - and everyone rather cold! With the gusts getting stronger and stronger, there was just time to lift the coils from the ramp in front of the plane (Figure 5) before the nose door had to be closed for its protection. Since customs pre-clearance was completed the day before during the flight, the coils could be moved to the quay immediately and, as soon as the mobile crane was ready, they were lowered into the hold of the ship - "Sun Queen (Figure 6)" - and safely covered by the deck. "Sun Queen" left without further ado for the 30-hour voyage to Hitachi.

After unloading at Hitachi Port on Monday, 19 February 2018, both coils reached Naka on Wednesday 21 February - just over a week after leaving Saclay. The road routes from Hitachi Port to Naka for oversize JT-60SA components are well established and have already been used for the cryostat base (2013), cryogenic system (2015), cryostat vessel body (2018) and the preceding TF coils (since 2016).

Soon "Isabelle" and "Jeanne" will join their sisters in the torus hall. Thanks to their 800km/h "jump", the assembly schedule is back on track!



Figure 4: Early morning light welcomed "Isabelle" and "Jeanne" just arrived at Chubu Centrair Airport (Aichi, Japan)



Figure 5: "Isabelle" and "Jeanne" leaving the aircraft under gusty conditions



Figure 6: "Sun Queen" waiting to escort her guests to Hitachi Port

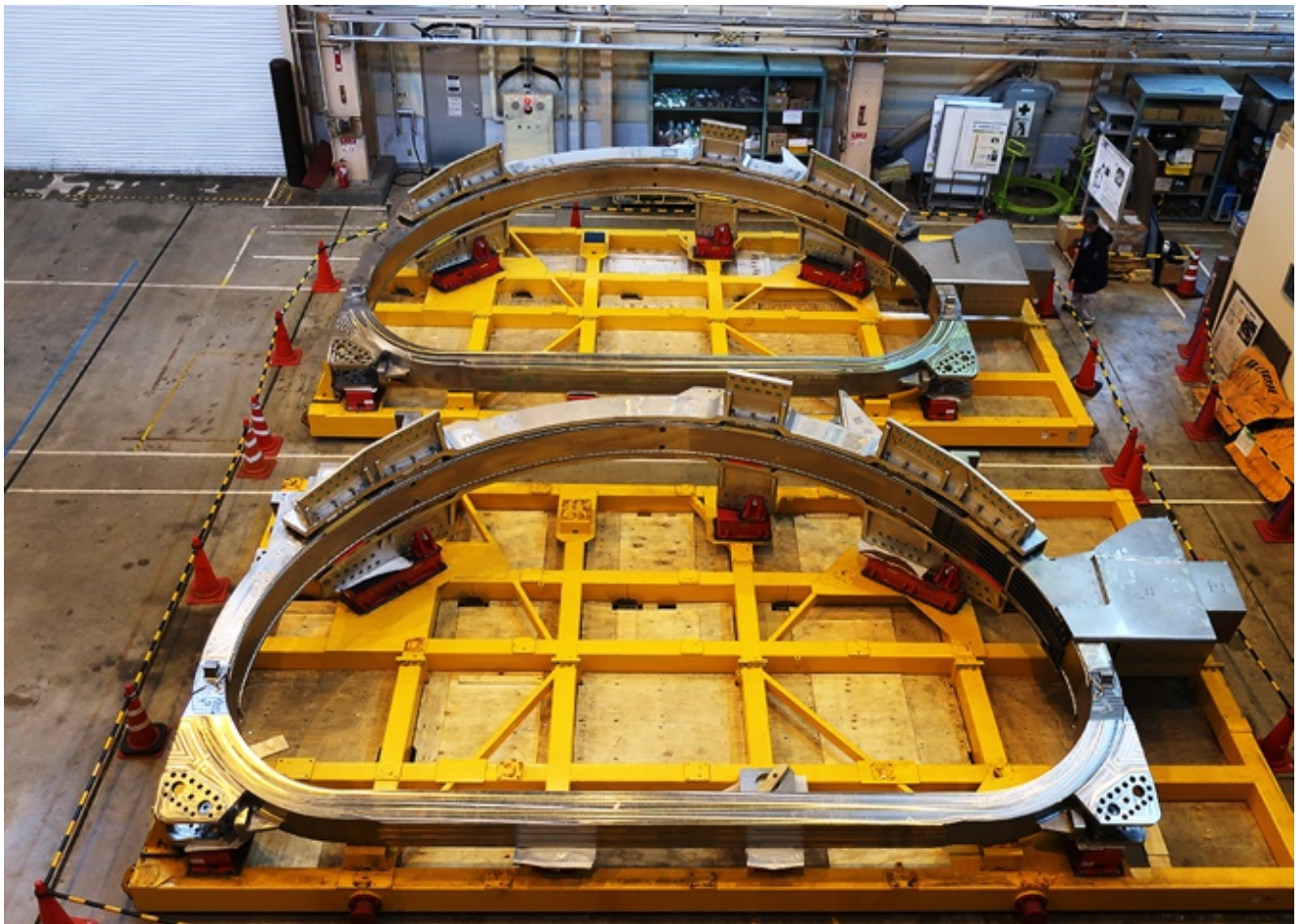
TF coils “Isabelle” and “Jeanne” arrive at Naka site



TF coil “Jeanne” on arrival at the QST Naka site

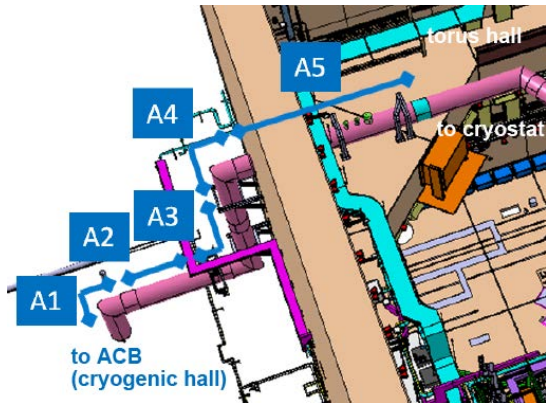
On 17 February 2018, QST broadcast the arrival and trans-shipment of the 2 toroidal field (TF) coils at Chubu Centrair International Airport live on the Niconico live stream via internet during almost the entire day, helping to advertise the JT-60SA project. An audience of 50,854 watched and 35,914 comments were posted to the programme, demonstrating that many people were interested in the JT-60SA project.

Hitachi Transport System, Ltd. took responsibility for transferring the 2 TF coils - “Isabelle” and “Jeanne” (coil #17 and #20) - from the Antonov aircraft to the cargo vessel at the airport, and the subsequent marine and land transport to the QST Naka site. The 2 TF coils were delivered in safety to Hitachi port on 19 February, and then to the QST Naka site on 21 February 2018 (see figures). “Isabelle” was unpacked and inspected straight away while “Jeanne” waited for its turn.



TF coils “Isabelle” and “Jeanne” stored in the engineering experiment building

Cryoline A connects torus and cryogenic halls



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

The installation and leak test of the CryoL-A sectors, which were produced by Taiyo Nippon Sanso Corporation, were successfully completed in January 2018 (Figure 2 and 3). The remaining 5 sectors will be installed once the cryostat is assembled.

Figure 1 (left): CryoL-A layout



Figure 2: Completed CryoL-A1 and A2



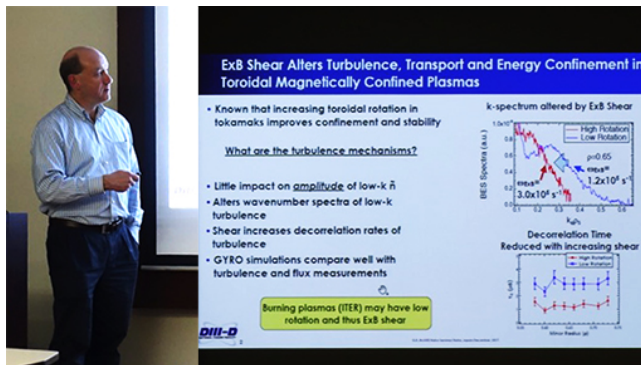
Figure3: Completed CryoL-A3, A4 and A5

News

Experts and students visit QST Naka site



Visitors from Thailand Institute of Nuclear Technology



Mr. George R. McKee and his presentation



Mr. Promod Kumar Sharuma (right)



Ms. Costanza Maggi and her presentation



Mr. Yasuaki Kishimoto and his presentation

In November and December 2017, the following people visited the QST Naka site to discuss fusion research and development, give lectures for the QST Large Tokamak Seminar, and see the progress of JT-60SA construction.

On 30 November:

- a researcher and students of the Thailand Institute of Nuclear Technology (11 people in total).

On 4 December:

- Mr. George R. McKee (University of Wisconsin-Madison), giving a presentation entitled "Turbulence of Decorrelation via Controlled ExB Shear in Hybrid H-Mode Plasmas".

On 11 December:

- Mr. Promod Kumar Sharuma (Institute for Plasma Research, India).

On 12 December:

- Ms. Costanza Maggi (EUROfusion Consortium, JET, Culham Science Centre), giving a presentation entitled "Recent JET results and future plans".

On 20 December:

- Mr. Yasuaki Kishimoto (Graduate School of Energy Science and Institute of Advanced Energy, Kyoto University), giving a presentation entitled "Development of GKNET and its application to the study of structure and dynamics in flux-driven turbulent transport".

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

News

JT-60SA contributor panels - 2 updated and 7 newly added



Panels hung on the display board in the entrance hall (updated: blue highlight, newly added: red highlight)

The panels of the JT-60SA key contributors have been hung on the wall in the entrance hall of the JT-60 control building since 2014. 2 existing panels were recently updated due to those contributors' organizational changes. 7 newer contributors also have recently provided their panels. Their panels and names are shown in the figure and the following list.

Updated panels (in blue highlight):

- National Institutes for Quantum and Radiological Science and Technology (QST), updated from Japan Atomic Energy Agency (JAEA)
- General Electric Company (GE), updated from Alstom S.A.

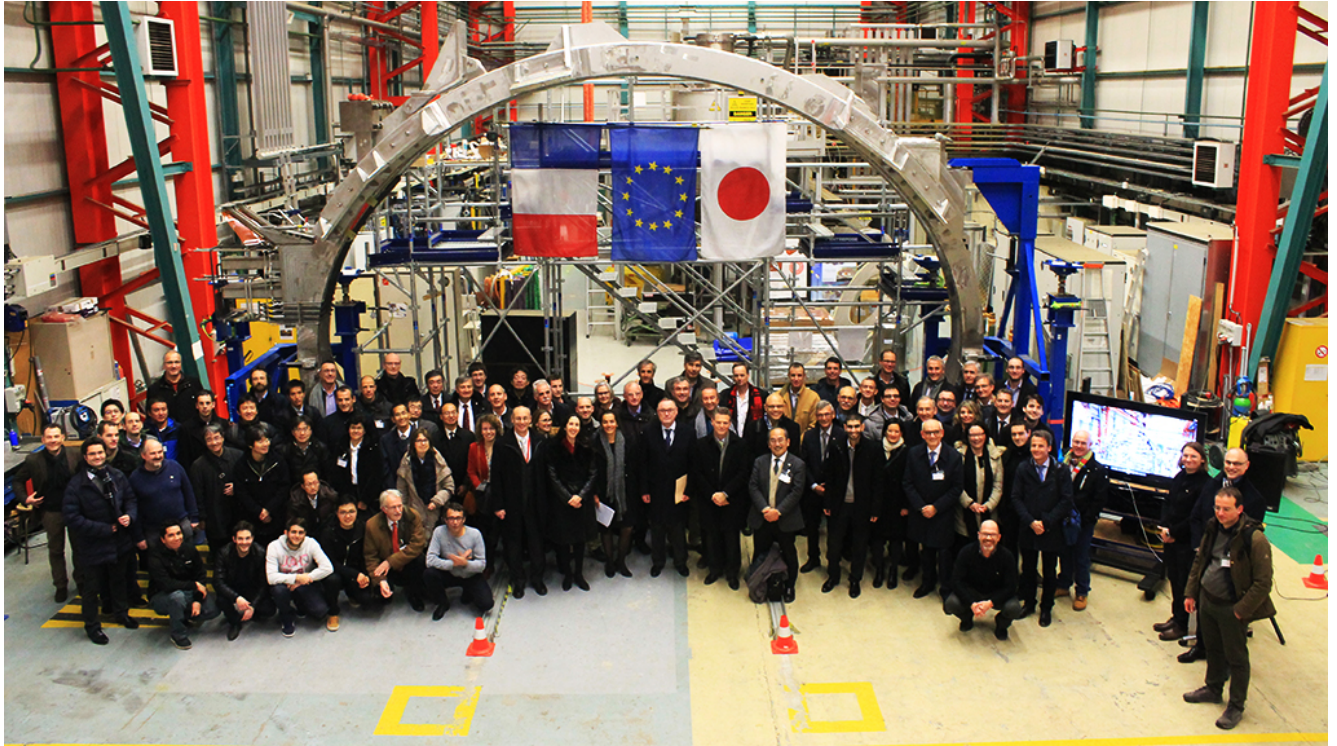
New panels (in red highlight):

- European Consortium for the Development of Fusion Energy (EUROfusion)
- Tesla Engineering Ltd.
- ULVAC, Inc.
- KITASHIBA ELECTRIC Co., Ltd.
- Kuriharant Co., Ltd.
- JECC TORISHA Co., Ltd.
- TAIYO NIPPON SANSO CORPORATION

Please check them out when you visit the QST Naka Fusion Institute.

Meeting

Technical Coordination Meeting 29



Participants in the TCM-29 in front of the TF coil "Isabelle" in the pre-assembly hall



With the cryostat of the TF coil cold test facility

The 29th Technical Coordination Meeting (TCM-29) took place on 17 and 18 January 2018 at CEA Saclay, France. A total of 87 experts attended the meeting in person or via videoconference: 52 from the EU Home Team (HT), 30 from the JA HT, 5 from the Project Team, and 2 invited from EUROfusion.

At the beginning of the meeting, H. Shirai, the Project Leader of the Satellite Tokamak Programme (STP), made an opening presentation including the results of the latest meeting of the Broader Approach Steering Committee ([BASC-21](#)) held on 13 December 2017. He explained that the SC had approved the Work Programme 2018 of the STP Project. He also showed the summary table of milestone achievement for each Procurement Arrangement (PA). In addition to the [high temperature superconductor current lead](#) (HTS CL) PA completed in January 2018, 8 more PAs are expected to be completed in 2018 on the approval of their final reports.

After the secretariat introduced the agenda and Action List from the last [TCM-28](#) as usual, the updates of the Plant Integration Document were reviewed. Then, the overall status of the procurement, assembly, research and development of the EU and JA HTs were presented.

During the meeting, the status and actions in the following areas were reported and discussed: manufacturing of the cryostat vessel body cylindrical section, HTS CLs, toroidal field (TF) coils, cryostat top lid, thermal shields, cryodistribution components, magnet controller, coil terminal boxes, and progress of the TF coil assembly. The EU and JA Project Managers presented "Machine status, operation and organization of JT-60SA in the BA Phase II".

In addition, a ceremony celebrating the completion of almost all commitments by CEA was organised in the pre-assembly hall. Group photos were taken in front of the TF coil "Isabelle" and the [cryostat of the TF coil cold test facility](#) (see figures).

Local

Praying for JT-60SA construction safety



Figure 1: Participants in New Year's ritual at Shizu Shrine



Figure 2: Praying for safety and success of the project in 2018



Figure 3: Confirming motivation toward the project success with sake



Figure 4: European teammates also participated

On 25 January 2018, the annual ritual of praying for JT-60SA construction safety was held at the Shizu Shrine in Naka, Japan. About 40 representatives of the QST Naka Fusion Institute, JT-60SA Integrated Project Team, European and Japanese industrial partners visited the shrine to pray for safety on the JT-60SA construction site (Figure 1).

The ritual was performed in traditional Shinto style, beginning with a Shinto prayer recited by the chief priest. Sitting up straight and facing in the same direction to pray, the participants made a fresh resolution to lead the JT-60SA project to success (Figure 2). At the end, all the participants cleansed their bodies and souls with spiritual sake (Figure 3).

Japanese occasionally pray to the gods (mostly mythical and real ancestors) for divine protection in the Shinto style of worship regardless of their own religious faith. They not only ask for help but also give thanks for past achievement, recalling that every success results from the interaction of people both directly and indirectly involved. Therefore, the European members (the on-site representative of F4E and engineers of Jema Energy S.A., who were working on the commissioning of the superconducting magnet power supplies) were invited to share in this event (Figure 4).

This annual ritual is intended to work, along with each team member's strong safety commitment, to underpin the safe and steady progress of the JT-60SA project with which it has been blessed in previous years.

Calendar

26 April 2018

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

4 - 8 June 2018

7th Research Coordination Meeting (RCM-7)
Naka, Japan

1 - 6 July 2018

45th European Physical Society Conference on Plasma Physics (EPS 2018)
Prague, Czech Republic

27 - 28 June 2018

30th Technical Coordination Meeting (TCM-30)
Naka, Japan

16 - 21 September 2018

30th Symposium on Fusion Technology (SOFT 2018)
Giardini Naxos, Italy

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/>.