

Headline

More HTS CLs ready



Figure 1: Installing the cold end of a HTS CL pair



Figure 2: Testing a pair of HTS CLs

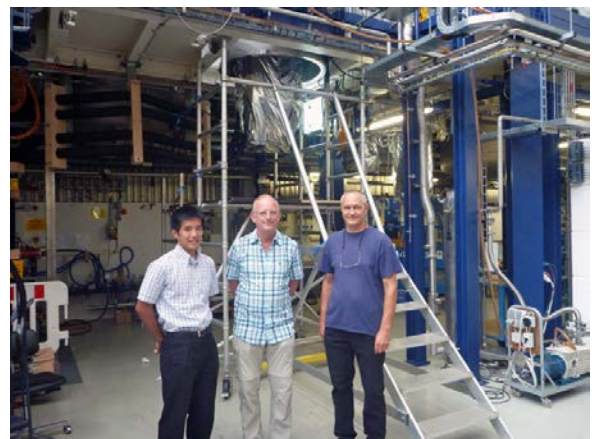


Figure 3: During the training at KIT

In October 2015, 6 high temperature superconductor current leads (HTS CLs) for the JT-60SA toroidal field (TF) coils were delivered to the QST Naka site, and these are presently being integrated into the first coil terminal box. Now, another batch of the CLs, this time for the poloidal field (PF) coils, has been finished at Karlsruhe Institute of Technology (KIT), the institution designated as a German Voluntary Contributor to the JT-60SA project.

In total, KIT has to deliver 20 more HTS CLs for the superconducting PF coils. The PF coils consist of the 4 central solenoid modules and 6 equilibrium field coils of the JT-60SA magnet system.

In terms of design, the PF CLs are very similar to the TF CLs for the JT-60SA project, and the CLs for the Wendelstein 7-X project, which were successfully constructed and are now in operation. While the CLs for the TF coils have to carry a continuous current of 25.7 kA, the PF CLs are operated discontinuously with a maximum current of 20 kA. Due to the lower current, less heat needs to be exchanged with the helium coolant. As a result, the PF CLs are somewhat smaller than the TF CLs.

To date, 8 PF coil CLs have been completed. During the cryogenic testing, a pair of CLs is short-circuited by a length of superconductor, and cooled with a flow of supercritical helium at a temperature of about 4 K and another flow at 50 K. The test facility at KIT allows 2 pairs of CLs to be cooled simultaneously and operated in sequence. During installation of one of the CL pairs (Figure 1), representatives of QST and Mitsubishi Electric Corporation visited KIT to get trained and to learn about the necessary tools for the later integration activities in Japan (Figure 3).

During fabrication, all CLs underwent a series of tests, i.e. leak and pressure tests, Paschen tests, check of the coolant pressure drop during a cool-down to helium temperatures, operation at nominal current, check of the cold contact resistance, and check of the available shut-down period after a loss of coolant flow. So far, all CLs have passed the tests without

problems. In order to simulate the discontinuous operation of the PF leads, one of the lead pairs was subject to a series of current pulses at 20 kA interspersed with periods without current. As the thermal inertia of the leads is rather high, it was expected that the mass flow rate should remain constant during the testing period. As seen in Figure 4, the temperature of the HTS part, as well as of the warm contact, stabilised after about 3 pulses, and increased only by a fraction of a degree thereafter. With this result, the coolant control will be simplified during operation of the JT-60SA magnet system.

By September 2016, the next 2 pairs of PF CLs will be tested, allowing the delivery all of 10 CLs for the second and third coil terminal boxes to Japan by the end of this year.

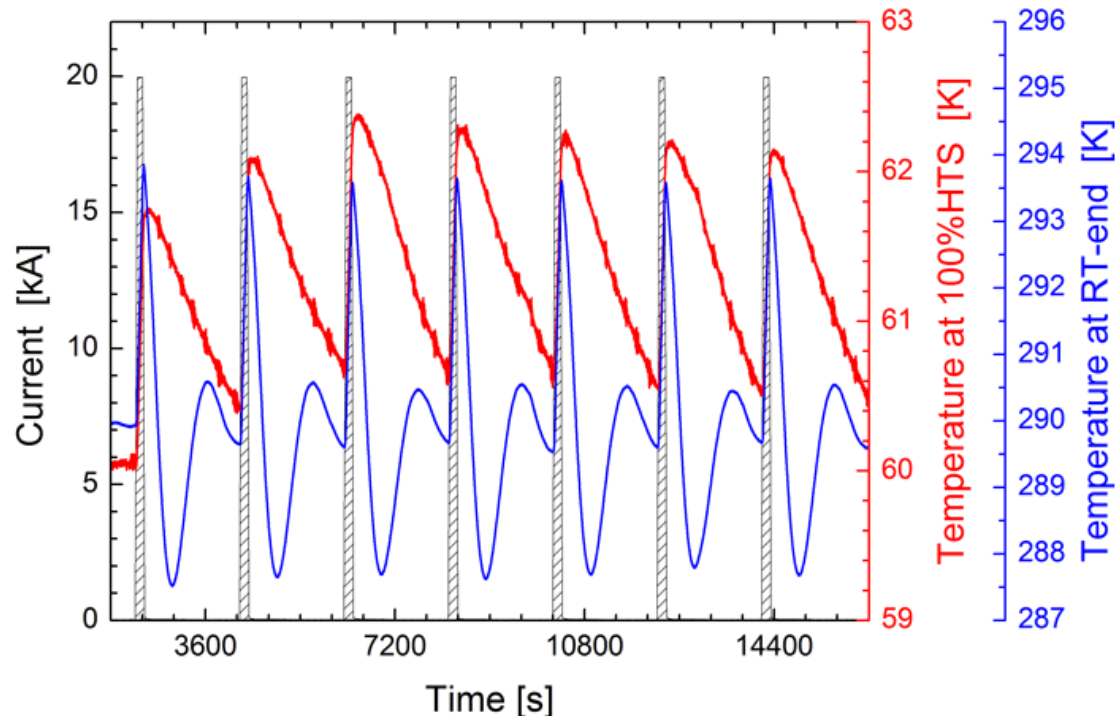


Figure 4: Simulation result of periodic operation of the PF CLs (current: black, temperature warm end: blue, temperature at HTS heat exchanger: red, RT: temperature at room temperature end)

News

PS manufacturing at JEMA

The Spanish supplier Jema Energy S.A. (JEMA) has been involved in the JT-60SA project since March 2013, when CEA awarded JEMA the contract for the procurement of the toroidal field (TF) coil power supply (PS) and the 4 equilibrium field (EF) coil PSs (see [Newsletter No.40](#)). Successively, in August 2013, ENEA awarded an industrial joint venture composed of Poseico S.p.A and JEMA the contract for the procurement of 4 central solenoid (CS) PSs, 2 fast plasma position control (FPPC) coil PSs, and 2 EF PSs (see [Newsletter No.44](#)). More recently in March 2016, the contract for the procurement of the PSs for 2 gyrotrons was awarded from F4E to JEMA.

Because of this large involvement of JEMA with many different PS systems of the JT-60SA project, on 7 April 2016, the JT-60SA Project Leader, H. Shirai, accompanied by representatives of CEA, ENEA and F4E, visited JEMA premises located in Lasarte-Oria, Spain (Figure 1).

Here the PL was welcomed by the JEMA team working on the JT-60SA PS systems, and he gave an overview of the progress of the JT-60SA project. Then, after an introduction from JEMA about the status of the different JT-60SA procurements in which the company is involved, the PL visited the JEMA workshops to verify the advancement in manufacturing and testing of the components: CS1 and CS4 PSs already completed, CS2 and CS3 PSs in an advanced stage of manufacturing, TF PS under preliminary test, and EF4 PS already tested and still installed in the testing room. In fact, the PL was able to appreciate, in real time, the good control performance of the EF4 PS, witnessing that the converter, with the output terminals connected to short circuit, correctly followed a triangular current reference of +20 kA and -20 kA at 1 Hz, operating in current circulation, single and dual mode (Figure 2).

The PL thanked JEMA for the good advancement of their activities, and remarked that he was looking forward to receiving the first JEMA converters at the QST Naka site, where the installation is expected to start in June 2016.



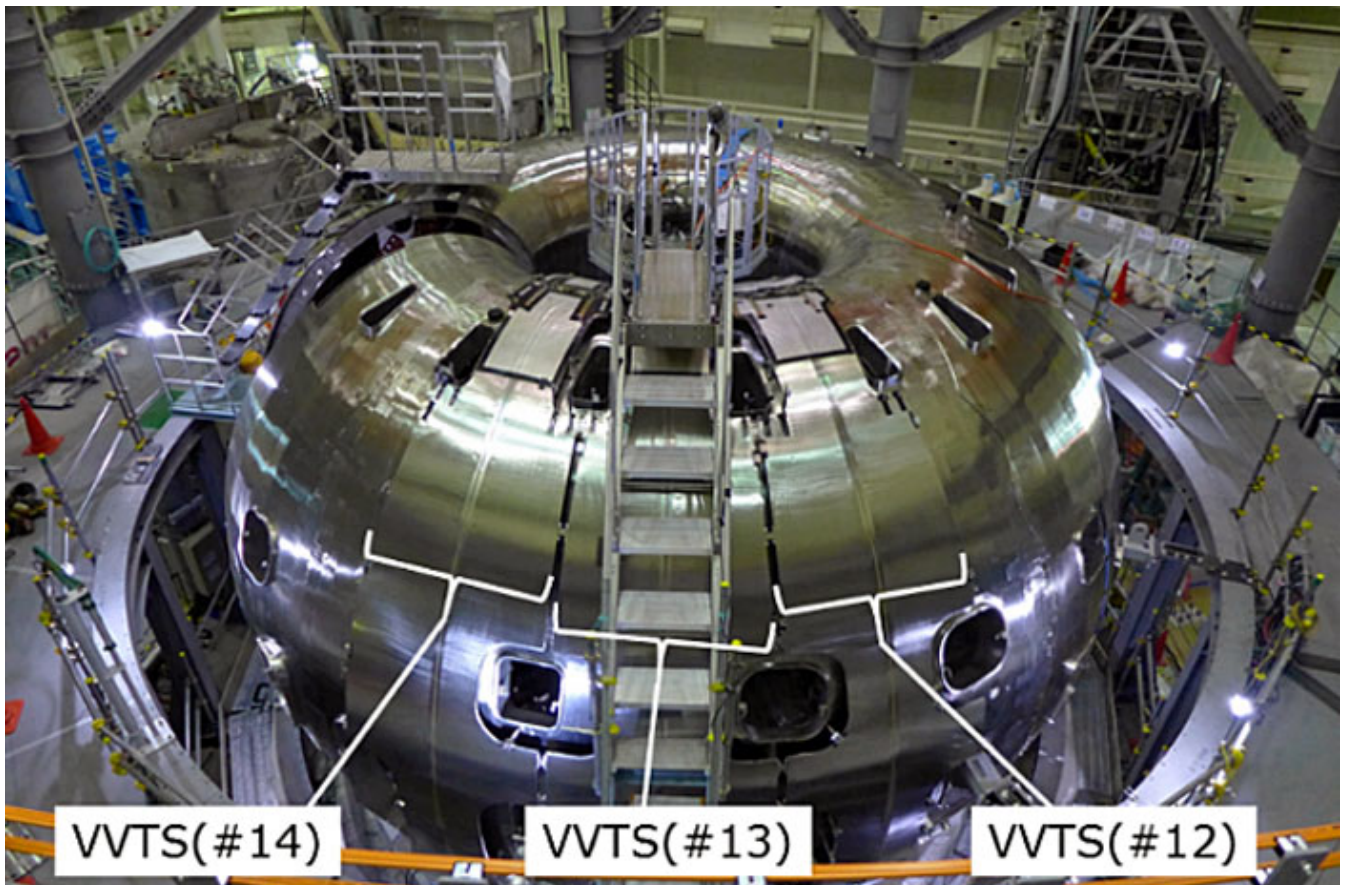
Figure 1: The PL with JEMA, CEA, ENEA and F4E representatives in front of the EF4 PS in the testing area



Figure 2: The PL witnessing the EF4 PS performance during a full current test

News

Assembly of 3 VVTSS finish



The assembly of the vacuum vessel thermal shields (VVTSS) for the JT-60SA device started in February 2016. So far, 3 sets of VVTSSs (#12, #13 and #14) have been mounted around the 340° vacuum vessel torus, and linked to each other with mechanical couplers (see figure). The welding of their helium cooling pipe joints has been completed, and the tests of vacuum seal tightness and the helium leak rate at weld zones produced good results as well.

News

VIPs visit QST Naka site



Mr. Massimo Garribba



Mr. Antobuys Johannes Helman Donné



Mses. Clissa, Devos and Kuypers (from left to right)

In April 2016,

- Mr. Massimo Garribba (Director of Nuclear Energy, Safety and ITER at the European Commission's DG Energy) on 20 April;
- Mr. Antobuys Johannes Helman Donné (EUROfusion Programme Manager) on 19 April;
- Ms. Antonella Clissa (Personal Assistant to F4E Director), Ms. Marie Nathalie Devos (F4E Budget Officer), and Ms. Maryse Kuypers (F4E Financial Officer) on 13 April (private visit),

visited the QST Naka site to see the progress of JT-60SA construction, which has been supported by European and Japanese collaboration.

Representatives of QST and F4E welcomed and guided them on a tour of the JT-60SA device, including the vacuum vessel in the torus hall, the equilibrium field coils in the superconducting coil winding building, the cryogenic system in the compressor building and cryogenic hall, and the magnet power supplies in the rectifier building.

News

F4E office opened at Naka site

The assembly of the JT-60SA device and the installation of its auxiliary plant and systems on the QST Naka site are entering their critical phase. This is particularly true for European contributions. The cryoplant is in an advanced commissioning phase, and is getting close to the acceptance tests. The Italian switching network units and the French contribution to the superconducting magnet power supplies (PSs) are going to arrive at the port of Yokohama before summer, and their installation on the site will start soon after. Last but not least, the toroidal field (TF) coils will arrive in Japan at a typical pace of one each month starting from the middle of July 2016, and their assembly will start immediately thereafter.

The presence of F4E on the site, which is necessary to function as the primary interface among QST, European Voluntary Contributors and F4E suppliers, is increasingly needed.

One member of F4E's technical staff has already been seconded to the QST Naka site with the objective of assisting in the final phase of cryoplant commissioning and the intensive phase of PSs installation. F4E is recruiting additional personnel to be seconded to the QST Naka site.

In the meantime, a constant coverage of the ongoing activities on the site is being ensured by the mission of several F4E personnel.

QST agreed that this F4E presence on the site required a fixed location, and has reserved Room 216 on the first floor of the QST JT60 Control Building for F4E staff.

The room is equipped with simple but practical furniture, and even includes useful videoconferencing equipment.

Now the F4E flag is there to mark this small but meaningful step of the project and continuous, strong involvement and commitment of F4E!



Meeting

18th BASC Meeting



On 22 April 2016, the 18th Broader Approach Steering Committee (BASC) meeting was held at QST Rokkasho Fusion Institute with attendance of representatives and experts from Europe and Japan. The Annual Report 2015 and the Project Plan for the 3 projects (IFMIF/EVEDA, IFERC and Satellite Tokamak Programme (STP)), which had been submitted to the BASC, were discussed and approved.

As for the STP Project, the Project Leader (PL), H. Shirai, mentioned that the project had been progressing quite well with procurement and assembly of the JT-60SA components and systems, such as fabrication of the poloidal field (PF) coils, high temperature superconducting current leads for the PF coils, power supply systems and cryostat vessel body cylindrical section, commissioning of the cryogenic system, start of vacuum vessel thermal shield assembly and so forth. In particular, the PL emphasised that the first toroidal field coil was ready for shipment to the QST Naka site after the successful cold test in Saclay, France. It was also reported that the JT-60SA Research Plan was updated as the result of a joint effort among European and Japanese fusion communities (46 institutes from 15 countries). The BASC expressed satisfaction with the progress of the STP Project.

The next BASC meeting will be held in Madrid on 14 December 2016.

Local

One year in Japan

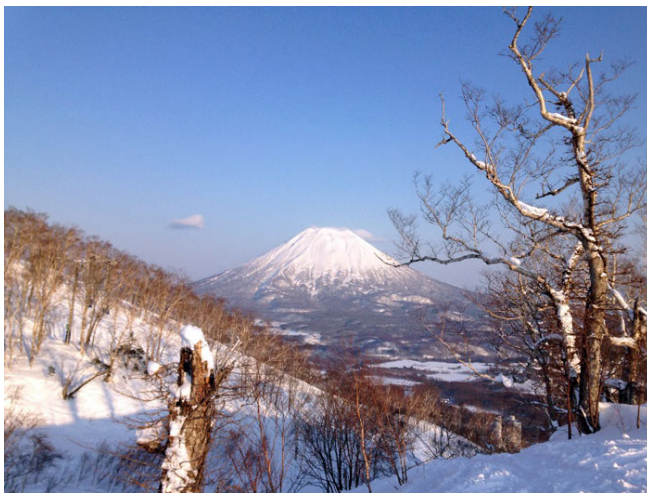
* This article was contributed by Dr. Christine Hoa of CEA



"Koyo (autumn leaves)" at Fukuroda Falls, Ibaraki



"Umi game (sea turtle)" in Zamami Islands



From Niseko ski resort, view of Mount Youtei, Hokkaido



Cherry blossoms, "Hanami (cherry blossom viewing)" at the Imperial Palace, Tokyo

I have been working on the JT-60SA project since 2008 in CEA Grenoble. I did not hesitate to volunteer to come to Japan to follow up the commissioning phase of the cryogenic system. It was a good continuity of my work and an opportunity to live a unique experience abroad, discovering Japanese culture and customs. I started to take some Japanese classes as soon as I knew I would come to Japan, and even though I can speak very little Japanese it gave me a bit of confidence when I arrived in Japan.

My husband agreed to follow me for one year in Japan. He took a sabbatical, and his company accepted he is working as a research engineer in Sanso-ken (National Institute of Advanced Industrial Science and Technology (AIST)), a well-known Japanese research centre in Tsukuba. He found a position in a robotics laboratory. We finally settled in Tsukuba, a very

pleasant “Science city” between Tokyo and Mito, about 1 hour’s drive from QST Naka Fusion Institute, newly renamed from JAEA Naka Institute on 1 April 2016 (QST: National Institutes for Quantum and Radiological Science and Technology).

Since August 2015, when we arrived in Japan, we have travelled and discovered many nice places during weekends and bank holidays. For the “Silver week” in September, we could climb the Fuji-san (Mount Fuji) and luckily admire the sunrise. In autumn, we could enjoy the “koyo (autumn leaves)” at Fukuroda Falls and Nikko. We also visited the Izu Peninsula and its beautiful coastline. In November, we had the chance to spend one week in Okinawa and swam with “umi game (sea turtles)”. These islands in the south of Japan benefit from tropical weather. In January and February, we could go skiing in Naeba (Niigata prefecture) and also in Niseko (Hokkaido Island) to taste the well-known snow powder. In March, our relatives in France came to visit us. We showed them Tokyo and we could enjoy with them Hanami (cherry blossom viewing) in the Imperial Palace gardens.

For sure, living in Japan is a wonderful experience for us, it has opened our minds and spirits to the Japanese culture. We are very grateful to our Japanese colleagues for kindly helping us during our stay.

Photos:

- 1) “Koyo” in Fukuroda Falls, Ibaraki
- 2) “Umi game” in Zamami Islands
- 3) Niseko and the snow powder, Hokkaido
- 4) Cherry blossoms in the Imperial Palace gardens

Calendar

4 – 8 July 2016

43rd European Physics Society Conference on Plasma Physics (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 STP Project Committee (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 newsletter@jt60sa.org.

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