

Headline

VIPs visit QST Naka site



Mr. Bernard Bigot



Mr. Masami Kinefuchi



Mr. Johannes Schwemmer



Mr. Richard Kamendje

In September and October 2016,

- Mr. Bernard Bigot, Director-General of the ITER Organisation (13 October);
- Mr. Masami Kinefuchi, Consul-General of Japan in Nashville, TN, USA (twinned with Naka) (23 September);
- Mr. Johannes Schwemmer, Director of F4E (13 October);
- Mr. Richard Kamendje, Department of Nuclear Sciences and Applications, IAEA (13 October),

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 (VV) and VV thermal shields in the torus hall, the equilibrium field coils in the superconducting coil winding building, the toroidal field coils in the engineering experiment building, the cryogenic system in the compressor building and cryogenic hall, and the magnet power supplies in the rectifier building.

News

Progress of ENEA SCMPS manufacturing

The JT-60SA superconducting magnet power supplies (SCMPSs) consist of the toroidal field coil PS, poloidal field (PF) coil PSs and fast plasma position control (FPPC) coil PSs. These systems drive desired currents in the conductors in order to produce a magnetic field to confine and control the plasma inside the vacuum vessel.

ENEA provides, among its procurement of various JT-60SA components, a total of 8 SCMPSs: 6 AC/DC converters for the PF coils (2 equilibrium field (EF) coils - EF1 and EF6 - and 4 central solenoid (CS) modules - CS1, CS2, CS3 and CS4) rated in the range of $\pm 20\text{kA}$, $\pm 1\text{kV}$, 2 AC/DC converters for the FPPC coils rated at $\pm 5\text{kA}$, $\pm 1\text{kV}$, and 6 converter transformers.

In August 2013, ENEA awarded POSEICO - JEMA, the temporary joint venture between Poseico S.p.A. (Italy) and Jema Energy S.A. (Spain), a contract for the procurement starting with design activities.

In April 2015, the First Design Report on the SCMPSs was completed by POSEICO - JEMA, and it was officially approved by ENEA, F4E and QST.

Both dry and oil transformers were manufactured and tested by November 2015. All of the tests gave a positive result. The CS2 & CS3 converter oil transformers are currently stored at the laboratory of the transformer manufacturer, Società Elettromeccanica Arzignanese S.p.A. (Italy). 2 transformers for the FPPC coil PSs were transferred by POSEICO to the JEMA laboratory (San Sebastian, Spain) in order to test the FPPC coil converters. The acceptance tests were performed there in February 2015. All of the tests gave a positive result.

In May 2015, seismic tests of the crowbar were performed in accordance with the IEC 60068-3-3 60068-2-47 at VIRLAB S.A. (Spain), confirming the very good quality of the manufacturing.

The construction of the CS1 and CS4 converters at the JEMA laboratory was completed and they were tested in July 2016 (Figure 1). Tests were split into routine and type tests in accordance with the test procedure previously agreed. All of the tests gave a positive result.

Furthermore, the crowbar system for the FPPC coil PSs was successfully tested at the JEMA laboratory in the same period. The current capability type test was performed at a current of ± 26 kA and a current-squared-time of $1.5 \text{ GA}^2\text{s}$. For this test, the CS1 PS was used to power the FPPC coil crowbar with the loads in series. Further, a test to verify that the diode properly conducts electrical current to decrease voltage to protect a circuit only after the "breakover" voltage has been reached momentarily, was performed applying 2kV with an external DC PS and a bank of capacitors at DC terminals of the crowbar.

The construction of the CS2 and CS3 converters at the JEMA laboratory was completed in September 2016, and they will be tested in November 2016 (Figure 2 and Figure 3).

The EF1 and EF6 coil converters will be completed in October 2016.

The transportation will be split into 2 batches: the first will include the FPPC coil 1 and 2 PSs, CS1 and CS4 PSs, and 6 converter transformers, in December 2016; the second will include the CS2 and CS3 PSs, and EF1 and EF6 coil PSs, in September 2017. All PSs will arrive in Yokohama (the Port of Entry in Japan) within 2017.

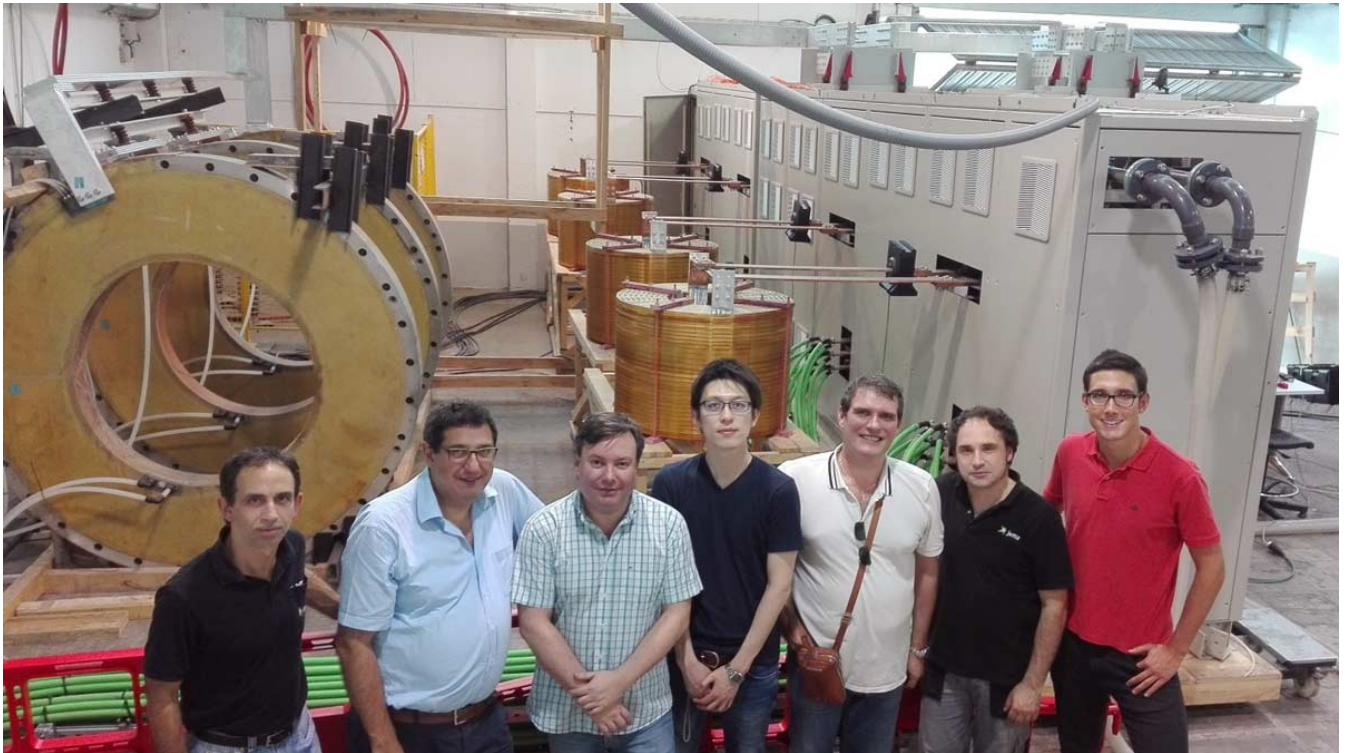


Figure 1: At the CS1 and CS4 PS tests in the testing hall of the JEMA laboratory



Figure 2: CS2 PS in the testing room of the JEMA laboratory



Figure 3: CS3 PS in the testing room of the JEMA laboratory

Progress of CEA SCMPS installation at Naka site



EF2 – 5 coil PSs installed in the rectifier room



EF2 – 5 coil PSs (side view)



TF coil PS installed in the TF PS room



TF coil PS (front view)

The CEA activities for the superconducting magnet power supplies (SCMPSs) of JT-60SA are rapidly progressing: 5 converters to supply the superconducting magnets have been installed almost completely and are now standing ready at the QST Naka site (see figures).

The installation and commissioning of the PSs feeding the equilibrium field (EF) coils 2 to 5 and the toroidal field (TF) coils are the activities included in the contract awarded by CEA to a Spanish supplier, Jema Energy S.A. (JEMA).

The EF3 and EF4 coil PSs are thyristor converters rated at ± 20 kA and ± 1 kV, while the EF2 and EF5 coil PSs are rated at $+10/-20$ kA and ± 1 kV. These 4 converters are designed to operate with a duty cycle of 220s/1800s. The TF coil PS is a thyristor converter rated at $+25.7$ kA and ± 80 V, and designed to operate continuously for 8 hours every day.

The installation was officially begun on 4 July 2016. By that time, a total of 39 boxes containing the PS components had been unpacked, and the different types of cubicles (20 in total) and dc reactors (16 in total) had been moved to their final positions and fixed to the floor with chemical anchors. Particular care was taken to anchor the crowbar cubicles, because they are earthquake-proof components designed to ensure a steady flow of current to the superconducting coils whatever the situation (in any cases of seismic event, shutdown of auxiliary PS or component failure).

The power cable connection between the adjacent cubicles was rapidly performed, followed by the signal cable connection among the different cubicles which constitute each unit of the PS.

The activities involved up to 21 workers in total. Most of them were from Nippon Advanced Technology Ltd., a local subcontractor of JEMA. They worked in the rectifier room in the rectifier building and in the TF PS room in the extended part of the JT-60 main building, supervised by CEA, F4E and QST representatives. The main installation phase was concluded on 15 September 2016, after about 46 working days. Additional work for a period of 2 weeks is scheduled in November 2016 in order to finalise all the PS installation.

The next step is the connection of auxiliaries (auxiliary PS, cooling water, and grounding) that will be performed under QST's responsibility. Then, the commissioning of the PSs is planned, starting in January 2017, followed by the power tests expected in April 2017.

News

15 vacuum vessel thermal shields assembled

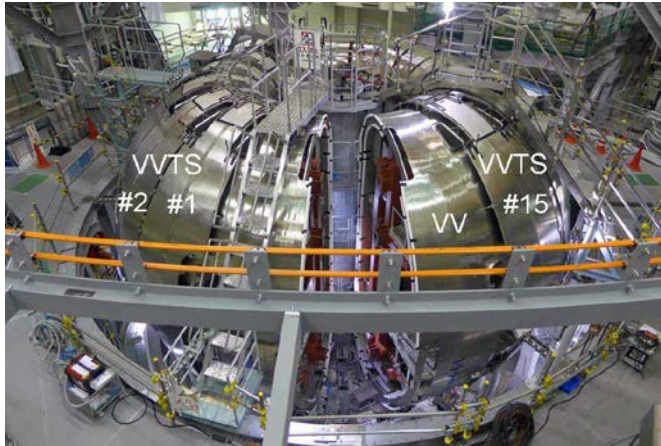


Figure 1: View from the 20° VV gap side



Figure 2: A total of 15 VVTS sectors has been mounted

The assembly of the vacuum vessel thermal shields (VVTSs) is underway with the use of 3 newly developed assembly jigs for the inboard sector. As of 24 October 2016, 15 sets of 20° VVTS sectors (#1 - #15) have already been mounted on the 340° VV torus (Figure 2).

As the assembly has gone on, deformation of the sectors has been more than expected. Such variation in the sector shapes has made it difficult to link the adjacent sectors with the original coupler connection with bolting. Therefore, the approach has been changed to plate connection with welding.

The VVTS assembly will be completed at the end of November 2016.

News

Central solenoid 1 module completed



Figure 1: Completed CS1 module

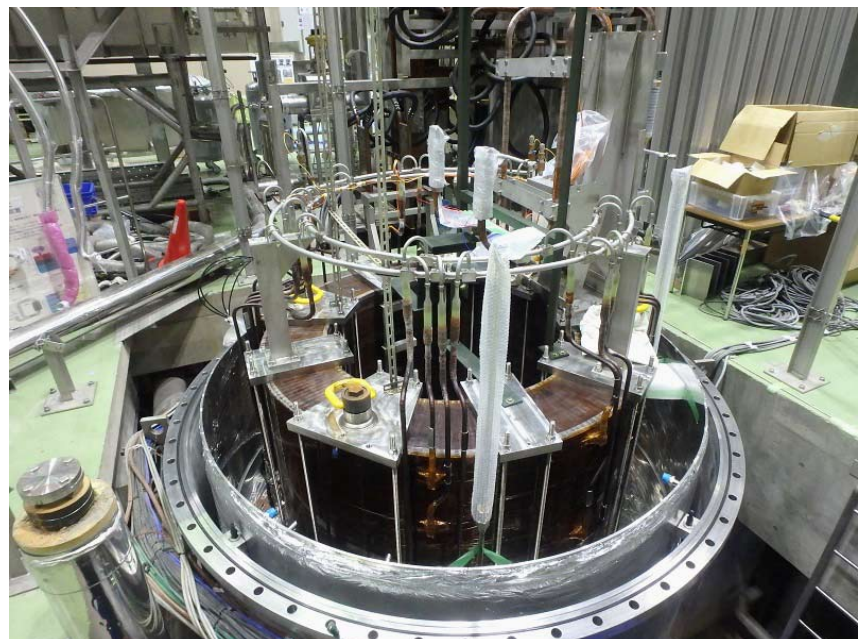


Figure 2: CS1 module installed in the cryostat for a cold test

The central solenoid (CS) of JT-60SA consists of 4 modules: CS1, CS2, CS3 and CS4. Each module is composed of a 4-layer pancake (quadra-pancake) and six 8-layer pancakes (OPs: octa-pancakes). The production status of each module is as follows:

- CS1 module:
Vacuum impregnation after turn insulation taping was completed at the end of August 2016. Following the ground insulation and terminal connection and so forth (Figure 1), the module was delivered to the National Institute for Fusion Science (NIFS) in Toki, Japan at the end of September. It has already been installed in the cryostat for the later cold test there (Figure 2).
- CS2 module:
Turn insulation taping has been completed. The next step is the vacuum impregnation.
- CS3 module (the fourth module in manufacturing):
Heat treatment of the OP1 was performed together with the CS4 OP5 below. OP1 was delivered to the workshop at the end of September.
- CS4 module (the third module in manufacturing):
Turn insulation taping of the OP1 has begun. Heat treatment of the OP5 is ongoing, and the winding of the OP6 has been completed.

Meeting

SOFT 2016



V. Tomarchio giving an invited presentation at SOFT 2016

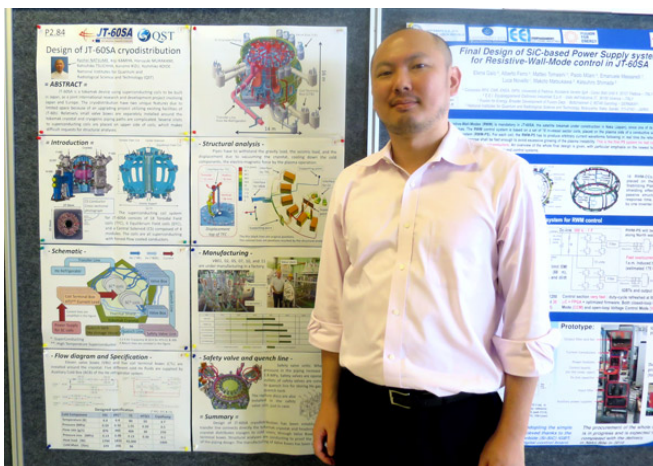
The 29th Symposium on Fusion Technology (SOFT 2016) was held in Prague, Czech Republic from 5 to 9 September 2016. The symposium focused on the latest development of running and planned fusion experiments. The programmes consisted of plenary sessions, oral and poster presentations. A total of 950 participants attended the conference.

V. Tomarchio from F4E presented an invited talk entitled "Status of the JT-60SA Project" giving an overview of the fabrication, assembly and future exploitation of the JT-60SA device. He remarked that the JT-60SA project is progressing steadily.

22 contributions from the JT-60SA EU and JA Home Teams were presented as follows (only presenters and titles are shown):

- Invited presentations (1)
 1. V. Tomarchio, Status of the JT-60SA Project.
- Oral presentations (3)
 1. J. Botija, Manufacturing of the JT-60SA cryostat vessel body cylindrical section;
 2. W. A. Maksoud, Results of the first JT-60SA TF coils tests in the Cold Test Facility;
 3. A. Kojima, Development of long-pulse high-power-density negative ion beams with a multi-aperture multi-grid accelerator.
- Poster presentations (18)
 1. A. Moro, Electron cyclotron stray radiation detection and machine protection system proposal for JT-60SA;
 2. H. Tojo, Conceptual design of laser transfer system of the JT-60SA Thomson scattering diagnostic;
 3. M. Takechi, Progress of the magnetic sensors development for JT-60SA;
 4. Ö. Asztalos, Feasibility study on the JT-60SA tokamak beam emission spectroscopy diagnostic systems;
 5. A. Cardella, Manufacturing and Installation of the JT-60SA Helium Storage Vessels for the Cryogenic Plant;
 6. M. Ejiri, Gravity support design, manufacturing and installation of the JT-60SA vacuum vessel;
 7. M. Medrano, Pre-assembly and dimensional inspection at factory of JT-60SA Cryostat Vessel Body Cylindrical Section;
 8. P. Lang, Conceptual design of the JT-60SA pellet launching system;
 9. Z. Pietro, Design and Testing of Crowbar Protection System for the JT-60SA Superconducting Magnet Power Supplies;
 10. M. Pretelli, Final tests of four switching network units procured by the European Union for JT-60SA;
 11. E. Gaio, Final Design of SiC-based Power Supply system for Resistive-Wall-Mode control in JT-60SA;
 12. K. Natsume, Design of JT-60SA cryodistribution;
 13. P. Rossi, Status of casing manufacturing for JT-60SA toroidal field coils;
 14. S. Nicollet, Thermohydraulic and Quench Behaviour of the JT-60SA Toroidal Field Coil in Cold Tests Facility;
 15. G. M. Polli, JT-60SA TF Coils procured by ENEA: an intermediate assessment;
 16. D. Ciazynsk, Performance of JT-60SA toroidal field coils in light of strand and conductor test results;
 17. Y. Huang, Quench tests analysis of the first JT-60SA Toroidal Field coils;
 18. P. Decool, Manufacturing and acceptance by CEA of the first JT-60SA TF coils.

The next SOFT will be held in Sicily, Italy from 17 to 21 September 2018.



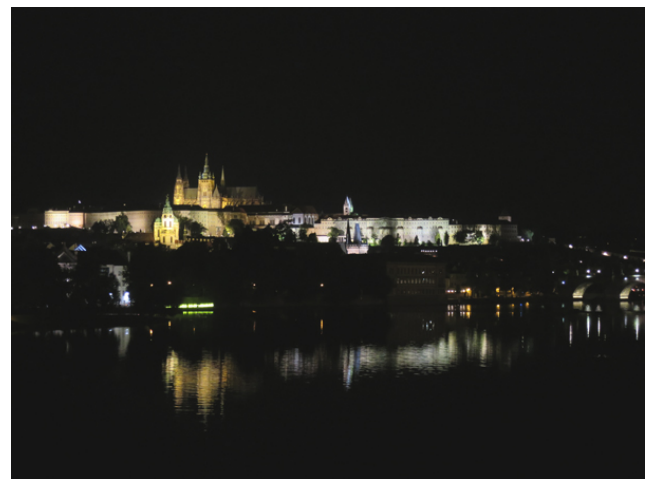
K. Natsume with his poster presentation



A. Cardella with his poster presentation



Ö. Asztalos in discussion over his poster presentation



Prague night view

Local

Welcome to Japan Jokinen family



Mr. A. Jokinen at the F4E Naka office

Hi, my name is Antti Jokinen and I am originally from Finland.

In the recent months F4E have geared up the EU presence in Japan and, thanks to this, I got a chance to relocate from our Garching office in Germany to the Naka site in Japan. The plan is to stay for 3 years in order to follow up the assembly of this fascinating fusion machine and its various subsystems (coils, power supplies, cooling system, etc.). Additionally I am working on the other BA project, IFMIF/EVEDA, whose Linear IFMIF Prototype Accelerator (LIPAc) is being assembled and tested in Rokkasho, where I am traveling frequently on business.

I have actually lived in Japan before about 8 years ago when I was doing superconducting magnet research in Kyushu University in Fukuoka. At that point, I fell in love with the Japanese way of life. Life in Hakata, Fukuoka was fantastic with all the "yatai culture" (people sit together and close in a small street stall to drink and have finger foods. You can easily make friends even with strangers.), the beautiful and sunny city and, of course, the delicious "Hakata tonkotsu ramen" (pork bone broth soup noodle). Currently I live in Tsukuba with my wife and 2 boys (6 years old and 2 years old). We are an international family and the discussion over the dinner is often carried out in Finnish, English and "bari-bari Hakata-ben" (native Hakata dialect Japanese). My Japanese skill has become a bit rusty during the last 6 years living in Europe, but I definitely want to learn more Japanese language and more about the local culture e.g. local food, "shochu" (Japanese spirit distilled from sweet potato, wheat, etc.), beer, "nattou" (fermented soybeans), etc. Please feel free to catch me in the corridors anytime for a chat in English or in Japanese.

I want to be around during the first plasma of JT-60SA and the first beam for LIPAc. Until then, I believe there is a mountain of work to do. Let us get through it together. It is nice to meet you all.



Jokinen family at "Onsen Aomori-ya" in Misawa, Aomori, Japan

Calendar

7 – 10 November 2016

1st Asian International Cryogenic Materials Conference (ICMC) and Cryogenics and Superconductivity Society of Japan (CSSJ) 50th Anniversary Conference

Kanazawa, Japan

9 – 10 November 2016

26th Technical Coordination Meeting (TCM-26)

Naka, Japan

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

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/>.