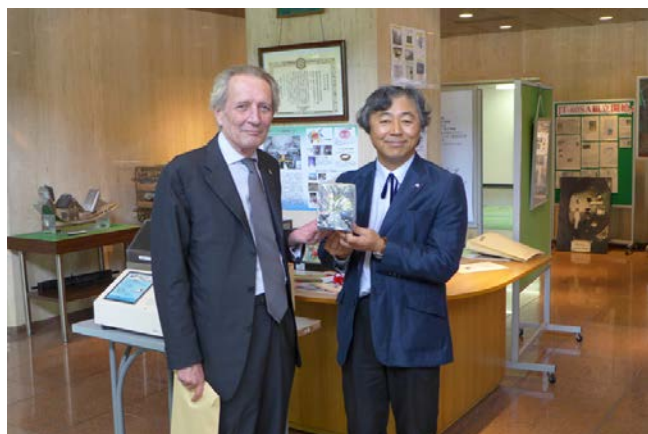


## Headline

### Italian Ambassador to Japan visits JAEA Naka site



On 23 June 2015, H.E. Mr. Domenico Giorgi, Ambassador of the Italian Republic to Japan, visited the JAEA Naka site welcomed by Y. Tajima, M. Mori, H. Shirai, Y. Kamada, Y. Ikeda of JAEA, and by Mr. A. Portone of F4E. The Ambassador was accompanied by Mr. Alberto Mengoni, Science and Technology Attaché at the Embassy of Italy in Tokyo.

Ambassador Giorgi toured the JT-60SA device under assembly in the torus hall and the quench protection circuit (QPC) in the rectifier building. The QPC for the superconducting magnets was designed by Consorzio RFX and manufactured by the Italian company NIDEC ASI S.p.A. The installation, commissioning and acceptance tests of these devices were successfully completed in June 2015. (Amongst the group photos taken in the occasion, the upper right one shown in the Figure was taken in front of a component manufactured in Piacenza, a northern Italian city and hometown of the Ambassador).

As pointed out during the visit, several Italian companies such as ASG, NIDEC, OCEM, POSEICO, and WTO, under the supervision of ENEA and Consorzio RFX, participate in the JT-60SA project jointly implemented by Europe and Japan within the Broader Approach framework. Ambassador Giorgi expressed satisfaction for the notable Italian contribution in the construction of JT-60SA and joined in celebrating the steady progress of the project.

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## News

### QPC successfully passes final acceptance tests

After the completion of installation and commissioning at the JAEA Naka site, the quench protection circuits (QPC) of JT-60SA have successfully passed the final acceptance tests (FAT) on 12 June 2015.

After delivery to the site at the end of September 2014, the installation of the 13 QPC units started on 1 December 2014 and ended on 18 February 2015. The installation, in the scope of work of the contract with NIDEC awarded by the Italian National

Research Council acting through Consorzio RFX, was performed by Nippon Advanced Technology Co., Ltd. under NIDEC's supervision. In parallel with the conclusion of the installation, the commissioning started, including voltage to ground tests, pressure tests of the cooling water circuit, and functional tests on all QPC units. It took more than 2 months. The QPC units were then ready for performing the FAT.

During the FAT, the main functional tests were formally repeated. The tests included a check of redundancies, tests of signal communication between the QPC control and the power supply supervising computer, and the performance of complete QPC activation sequences. Two specialized technicians from NIDEC were on site for more than 3 months to perform commissioning and the FAT, witnessed by Consorzio RFX, F4E and JAEA representatives. The FAT was successfully completed, and the good results obtained marked the completion of the QPC on-site activities, allowing the transfer of QPC ownership from Consorzio RFX to F4E and then from F4E to JAEA successively subject to final acceptance by the Project Leader and JAEA.

The last step before the completion of the QPC Procurement Arrangement (PA) was to complete the QPC Final Report, collecting all the documentation prepared during the QPC procurement, which started from December 2009 and ended in July 2015, in accordance with the original schedule.



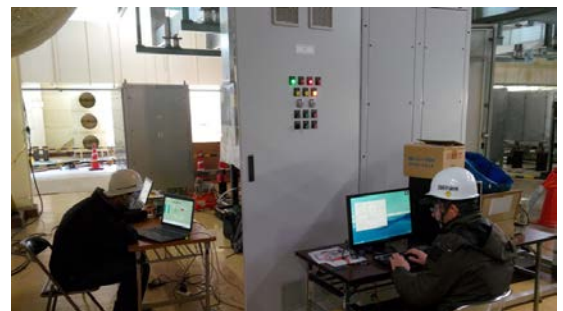
Panoramic view of the rectifier room after QPC installation



QPC installed in the rectifier room



Performing the voltage to ground test



QPC functional tests in progress



Explaining the QPC system to site tour visitors

## News

### First TF seal welding started at ALSTOM

18 toroidal field (TF) coils are being produced at 2 manufacturers: 9 at Alstom S.A. (ALSTOM) in France and the balance at ASG Superconductors S.p.A. in Italy. On 11 June 2015, K. Tsuchiya, K. Masaki (JAEA), S. Davis, E. Di Pietro (F4E), R. Gonde, P. Decool, J-L Marechal and J. C. Vallet (CEA) visited ALSTOM to review production progress.

The first winding pack had completed its ground insulation process, and was inserted in a coil casing. The welding of cover plates on the plasma facing side of the casing to cover the winding pack completely had just started at the time of their visit.

The work involves long welding zones along the coil turn, which is approximately 19 m long (Figure 2). The welding should be repeated step by step for 7 turns until completion. The D-shaped coil, with a weight of about 15.5 t, was set up with the straight-leg-side down. An automatic welding machine was running on rails mounted on the coil side and was welding the cover plates, while at the same time an operator was viewing the weld conditions by camera. The casing should be seal welded and will be sealed with resin to shut out air perfectly. Great care is needed to keep the current centre at the designated position.

Approximately two-thirds of the first turn was welded during the visit. The production was performed smoothly without any troubles.

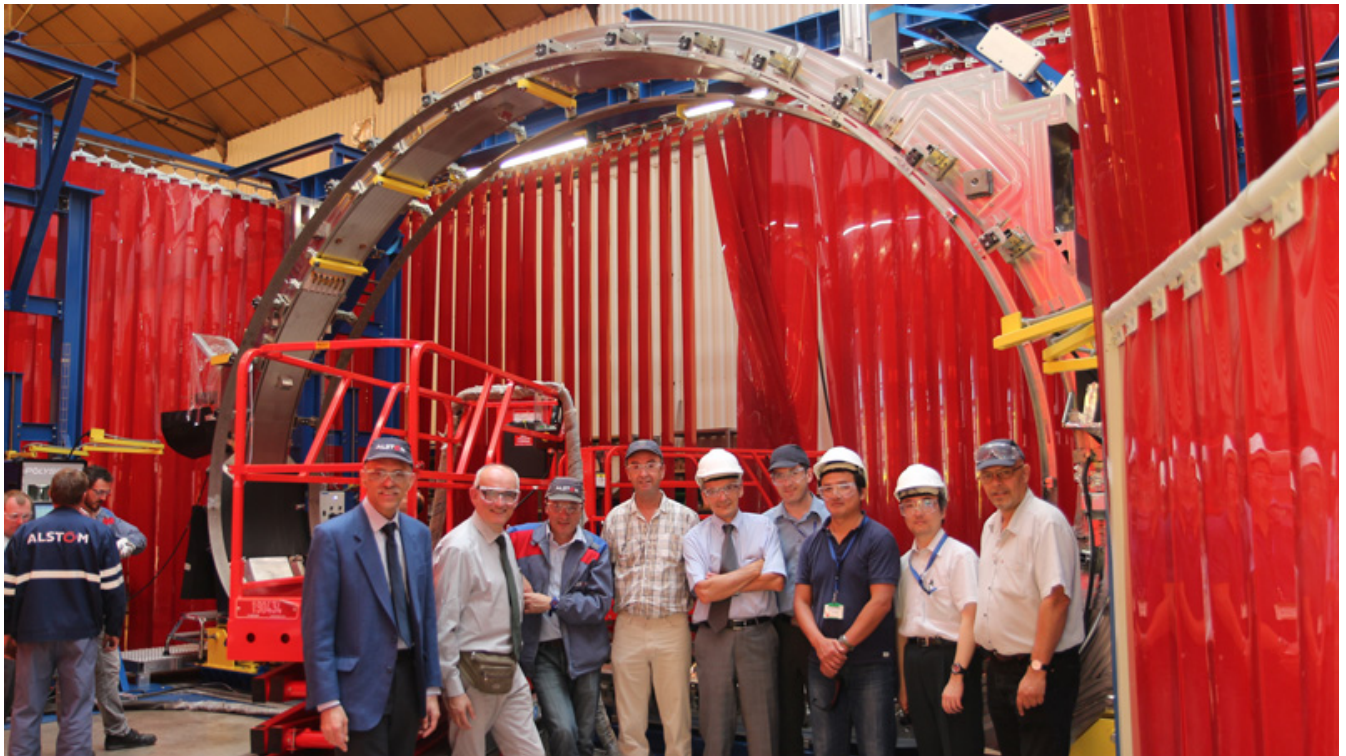


Figure 1: Group photo taken in front of a TF casing with the welding machine rails mounted

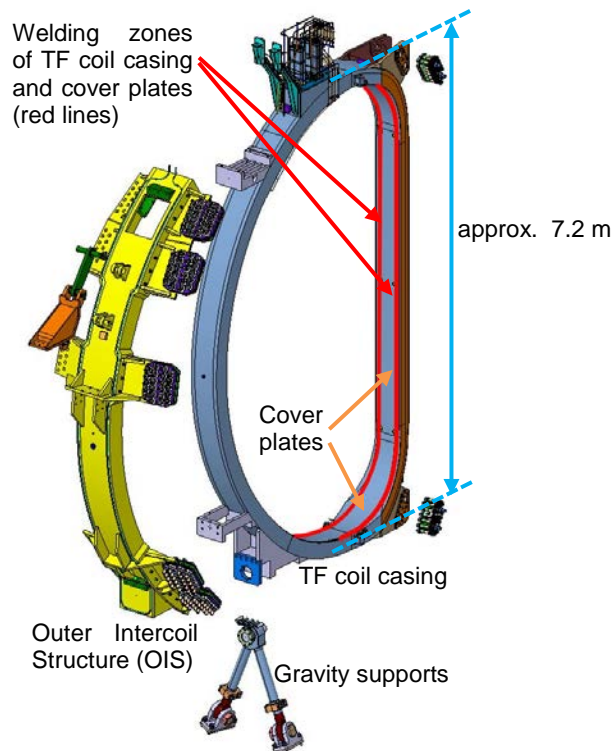


Figure 2: A single TF coil and cover plate welding zones

## CVBCS manufacturing status at ASTURFEITO



Figure 1: Inspecting the CVBCS (sector 2-3) production at the works

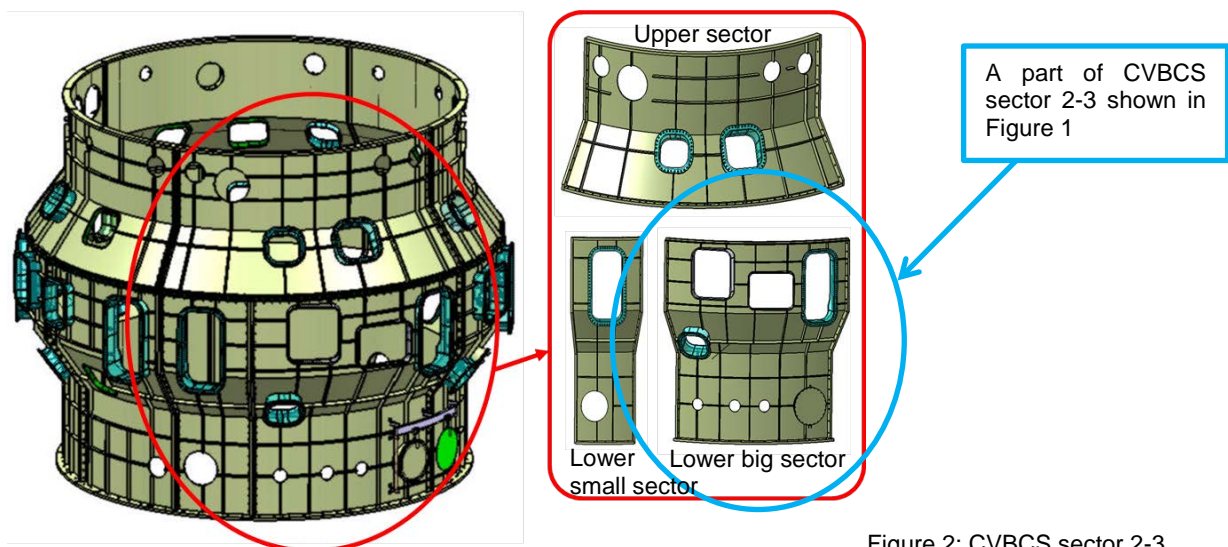


Figure 2: CVBCS sector 2-3

The *cryostat* vessel body cylindrical section (CVBCS), with a maximum diameter of about 14 m, and a height of about 11 m, consists of 4 sectors, designated 2-3, 4-5, 6-7 and 8-1. On 15 June 2015, Y. Shibama, K. Masaki (JAEA), A. Cardella (F4E) and J. Botija (CIEMAT) visited the workshop of Asturfeito S.A. (ASTURFEITO), the supplier of the CVBCS in Spain, to check manufacturing status.

A single sector consists of 3 sub-sectors (Figure 2). The parts of each sub-sector are cut out from steel sheets and get press-formed. They are then assembled and welded together on special welding frames. After mounting and welding, the ports, major port openings, flanges etc., are added. A final machining completes the single sector. Dimensional inspections are performed as needed in each production phase, maintaining the manufacturing tolerance within a few mm (on diameters, height, port positions, and so forth).

The production was seen to be progressing smoothly. Figure 1 shows the lower shell of sector 2-3 in preparation for final machining. Sector 4-5 parts, such as the body shell, shell joint flanges etc., had also been completed. As for the other sectors 6-7 and 8-1, preparation to cut out their parts from sheet steel was in progress.

## Meeting

### 1st DRM for ECRF PS of JT-60SA



The Electron Cyclotron Range of Frequency (ECRF) system of JT-60SA will be used for a variety of purposes, including generation and sustainment of high performance plasmas, reduction of the loop voltage for plasma start-up, and cleaning of the first wall in the vacuum vessel. It includes 2 sets of 110/138 GHz, 100 s gyrotrons and 2 sets of 110 GHz, 5 s gyrotrons (for the JT-60SA initial research phase), that will inject radio frequency waves up to the nominal value of 3 MW for 5 s and 1.5 MW for 100 s mainly used for current drive and heating.

Each of these 2 gyrotrons is operated by a set of high voltage power supplies (PS), and these 2 PS sets are to be procured by Europe. On 19 June 2015, the management and technical details of the related PA were discussed during a Design Review Meeting (DRM) in videoconference with the participation of involved people from F4E, JAEA and the Project Team.

The PSs include:

- a high voltage main power supply (HVMPS), supplying the 60kV voltage between the collector and the cathode of the gyrotron and providing a nominal current of 55 A;
- a body power supply (BPS), establishing the 35 kV voltage between the gyrotron body and the collector;
- an anode power supply (APS), regulating the 50 kV voltage between the anode and the cathode of the gyrotron.

After the agreement resulting from the DRM, the formal signature process of the related PA has started. The procurement of the PS system of the JT-60SA ECRF will begin shortly.

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## Meeting

### SOFE-26

The 26th IEEE Symposium on Fusion Engineering (SOFE-26) was held from 31 May to 4 June 2015, located jointly with the 20th IEEE Pulsed Power Conference in Austin, Texas.

Besides hearing the status of existing experiments or those under construction, it was possible to observe the different future visions being prepared around the world. For example, in Japan, a Joint Core Team has been established to integrate national research organisations with industry and universities. In China and the USA, where pre-DEMO devices are desired, researchers hope emerging new technologies, such as high-temperature superconductors or additive manufacturing, can significantly help with old design challenges. Many leaders are learning to think beyond their specialisms and apply systems engineering concepts to reactor designs.

The conference featured a relatively high proportion of invited presentations, ensuring a broad programme and representing many of the main projects in work around the world. Besides the USA, attendance was particularly strong from China and Korea. A number of presentations related to hybrid fusion concepts, in which magnetic plasma confinement is used to assist inertial fusion or fission for a variety of purposes, such as neutron production or spaceflight.

There were 5 presentations relating to JT-60SA as follows (only presenters are shown):

- Invited presentations (3)
  - S. Davis, from F4E Garching, on the status of the JT-60SA magnet system (Figure 1);
  - L. Novello, from F4E Garching, on the advancement on the procurement of power supply systems for JT-60SA;
  - E. Gaio, from RFX Padua, on the Si-SiC-based switching power amplifier for MHD modes control in fusion Experiments.
- Oral presentations (2)
  - A. Cucchiaro from ENEA Frascati, on the first Italian JT-60SA TF coil winding pack insertion into the casing;
  - G. M. Polli, from ENEA Frascati, on the manufacturing assessment of the first half of the Italian supply of the JT-60SA TF coil winding pack.

- Poster presentation (1)
  - A. Maistrello, from RFX Padua, on the installation, commissioning and acceptance tests of the JT-60SA Quench Protection Circuit.

Austin, the capital of Texas and the self-styled live music capital of the world, is a vibrant city with plenty of entertainment. The downtown Hilton hotel proved a first-class venue (Figure 2). The next SOFE will mark a turning point for the conference as it takes place in Shanghai, outside the USA for the first time in its history of over 40 years.



Figure 1: S. Davis making the invited presentation of the status of the JT-60SA magnet system



Figure 2: Austin - the capital of Texas in USA

## Local

### Welcome to Japan Michel family

\* This article was contributed by Dr. Frederic Michel of CEA.

For the installation and commissioning of the JT-60SA cryogenic system, CEA organized an on-site team at the JAEA Naka site. During the installation of the cryogenic system, which takes about 7 months (March - October 2015), I decided to join the

team and to stay in Japan with my family. My wife took 9 months off from her work in France. Our son (just 6 years old) stopped school, too.

Despite the 9 suitcases and 2 hour long procedures at the immigration office, our arrival and entry to Japan was very easy due to the innate helpfulness of Japanese people and due to our own preliminary preparation. In the shuttle bus from Narita airport to Mito city, we met a Japanese woman, by chance, who became our first Japanese friend and offered a wonderful way for our integration into the community in Mito by inviting us to diners and local events etc... In reality, as we are a French foreigner family (with a young child), a lot of Japanese people talked with us and helped us settle into our life in Japan.

Then, the administrative procedures were a little bit more complicated, but we always dealt with success with registering at the city hall, opening a bank account and enrolling our son in the Senba Kindergarten in Mito, which is a Japanese local preschool. This kindergarten life of our son was also a good occasion to discover the real way of Japanese education and life and to have some particular experiences of Japanese culture, such as putting on the same school uniform as others, preparation of the daily Bento Box (Japanese style lunch box), participation of our son in his first athletic sports festival, and also involvement of mothers in the events (such as weeding the school playground, cooking for a curry party, etc.). We think that, in spite of many communication difficulties, my son learned a lot of basic Japanese manners, and the famous “DAMÉ”, which means “forbidden” in Japanese.



The entrance ceremony of the kindergarten



With teacher and friends in the same uniform (a day trip of the kindergarten to the Aqua World Oarai)



Children are marching at kindergarten's athletic sports festival

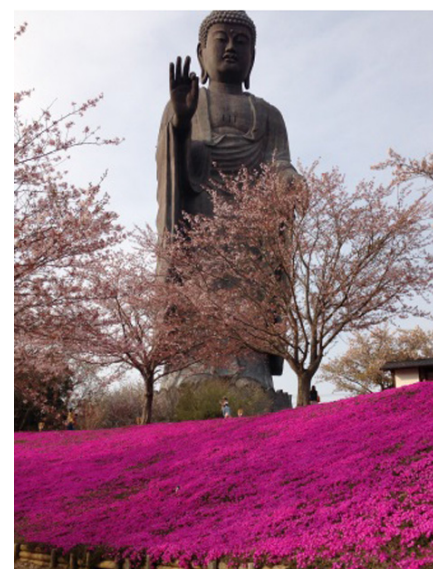
To continue getting familiar with Japanese culture and traditions even after returning to France, my son asked me to practice KARATE-DO (inspired by “The Karate kid” and “Miyagi sensei”). As he has some difficulties in communication to follow the actions, our wonderful sensei (Karate master) asked me to join the karate lesson together. The lesson once every 2 weeks is a pure happy moment for my son and me among other Japanese pupils learning movements, traditions, respect and also a little bit of religion (because the sensei is also the pastor at Mito protestant church). We hope to have the opportunity to continue to practice this sport when we are back in France with the same spirit ...



I am the Karate Kid



With Holly-kun (a dragon mascot of Mito Hollyhock Football Club)



At the Ushiku daibutsu (a colossal statue of Buddha)

During the weekends, we also spent some time visiting mainly around Ibaraki prefecture, such as shrines and temples of Nikko (UNESCO World Heritage site), Tsukuba science city and Tsukuba-san mountain, Ushiku Daibutsu (a colossal Buddha), Oarai beach, Nakaminato port, Fukuroda falls (one of the three outstanding falls in Japan), National Hitachi seaside

park, Mito Kairakuen parks (one of the three outstanding gardens in Japan), Rokkakudo hexagonal observatory (an ex-centre of Japanese traditional art), etc., and a little bit in Tokyo during the famous and pleasant golden week (Japanese long holidays week in May).

In conclusion, we are really happy about this experience in Japan, and we have a real and deep respectful admiration for Japanese. Thank you Japan for hosting us, and I hope that French people (and other Europeans) will offer the same hospitality for you when you visit our countries.

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## **Calendar**

9 – 11 Sep 2015

15th International Workshop on Plasma Edge Theory in Fusion Devices (PET-15)

Nara, Japan

14 – 18 Sep 2015

12th International Symposium on Fusion Nuclear Technology (ISFNT-12)

Jeju Island, Korea

29 – 20 Sep 2015

23rd Technical Coordination Meeting (TCM-23)

Genoa, Italy

26 Oct 2015

The 17th Meeting of STP Project Committee (PC-17)

Naka, Japan

3 – 6 Nov 2015

25th International Toki Conference (ITC-25)

Toki, Japan

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## **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](mailto:newsletter@jt60sa.org).

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