# JT-60SA Newsletter



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# **Headline**

# TF coil test facility procurement agreed



Cryostat and workgroup

The Procurement Arrangement between JAEA and F4E for the setup of a Toroidal Field Coil Test Facility (TF CTF) and the performance of the tests as well as the complementary Agreement of Collaboration between F4E, CEA (France), and SCK CEN (Belgium) was agreed at the beginning of October 2011. According to the agreement, CEA and SCK CEN will set-up a powerful test facility for the TF coils, which will also be provided by Europe. The facility will allow cool-down of a TF coil from ambient temperature to around 5 K, within 10 days, functional tests at the nominal current of 25.7 kA, and a check of the temperature margin of the superconductor against a quench.

L. Genini, the responsible CEA officer, and his team will benefit from their exhaustive experience gained during the tests of all seventy W7-X coils. CEA has prepared an area of about 1000 m<sup>2</sup> for the installation of the test cryostat, the helium refrigerator and the coil preparation zone. A 3D CAD sketch of the planned test assembly is shown in Fig. 1. CEA is also making existing equipment from previous experiments available to support the tests. This is currently undergoing some revisions, modifications and relocation to the new test area. The helium refrigerator has already been tested successfully under simulated test conditions. It is able to provide an equivalent power of 500 W at 4.5 K, which is fully sufficient for the JT-60SA coils.

Construction of the test cryostat in Belgium started already in 2010 (see Newsletter No.16). The cryostat is in its final stage of assembly (see photo above) and will be delivered to Saclay, together with its vacuum pumping system and a vessel for the helium distribution, in February 2012.

Installation of the test facility must be completed by January 2014 to be ready to receive the first TF coil for testing in mid-2014. Commissioning of the facility will be performed using the W7-X prototype coil.



Fig. 1 Cutaway CAD drawing

#### <u>News</u>

#### Pressure loss measurement implemented for EF and CS conductors



Sample conductors for the Central Solenoid (CS) and Equilibrium Field (EF) coils were delivered to CEA Cadarache in France from the Naka Fusion Institute in Japan, and the pressure loss measurement was made. The test results with the conductor for the CS and that for the EF were equivalent to or lower than the calculated values in the design. It was thus confirmed that the pressure loss of the entire coils would meet the specification and that the specification of the cryogenic system could therefore be retained.

#### **News**

# Ansaldo Sistemi Industriali S.p.A. BPS QPC Pyrobreaker U Static breaker (IGCT) DC Power Discharge Superconducting Supply Discharge Superconducting Magnet

## Successful type tests on ByPass Switch of Quench Protection Circuits

Fig.1 BPS prototype

After the conclusion of the detailed design phase of <u>the JT-60SA Quench Protection Circuits (QPC)</u> in July, the manufacturing and test of a full-scale prototype have been in progress and they are expected to be completed in September 2012. The planned campaigns of type tests are complex and wide-ranging: they include tests to check the performance of the single components, and tests on the whole protection circuit. An agreement has been made to perform the high power pulse tests at the Consorzio RFX facility, in Padua, Italy, during the shutdown periods of the RFX-mod experiment. The first campaign of special tests on the ByPass Switch (BPS) prototype has successfully been performed, in the presence of the company Ansaldo Sistemi Industriali, in charge of the contract, the BPS manufacturer (Siemens), and EU and JA experts.

The BPS prototype under test is shown on the left side of Fig. 1; it is rated to sustain the toroidal nominal current (25.7 kA) in steady state. Fig.2 shows the layout of the test circuit: on the right side there is a shunt resistor simulating the Static Circuit Breaker (SCB); the resistance value and the busbar inductance are such as to reproduce the real current commutation transient from the BPS to the SCB.



Fig. 2 Test circuit

According to the technical specifications, six pulses with a dc current of 51.4 kA applied for 100 ms were performed to check the electro-dynamic robustness of the BPS, and a full campaign of 200 interruptions of 26 kA dc was successfully completed, which confirmed the BPS capability to assure the specified number of nominal current interruptions without requiring any maintenance.

The BPS opening time was recorded: it is 0.35 ms, much faster than the maximum specified value, equal to one second. This allows a reduction in the amplitude of the discharge voltage applied to the superconducting coils, thus enhancing the protection in case of quench.

#### News

#### **P**rocurement Arrangement signed for divertor cassette remote handling tools

The Procurement Arrangement for the supply of <u>the divertor cassette remote handling tools</u> for the Satellite Tokamak Programme was concluded on 26 September 2011 following the discussion at the design review meeting (see <u>Newsletter</u> <u>No.17</u>).

Divertor cassette remote handling tools are utilized for the repair and exchange of <u>divertor cassette</u>s which consist of a cassette frame and main coolant pipes. The tools, a pipe cutting tool and a pipe welding tool, can be inserted from the plasma side into pipes, and these cut and weld them from inside the pipe, which has an external diameter of 59.7 mm and a thickness of 2.8 mm.

#### **Meetings**

#### **12th Technical Coordination Meeting**



From 26 to 27 September , the 12th Technical Coordination Meeting (TCM-12) was held at the JAEA Naka Fusion Institute, and 87 experts in total, 34 from the JA Home Team, 43 from the EU Home Team, 5 from the Project Team, and 5 invited attendees, participated in the meeting including some experts from Italy, Germany, and Spain by videoconference.

Progress on each component was reported at the meeting in detail, including the results of the design review meeting on remote handling, such as the manufacturing of the toroidal field (TF) coil and poloidal field (PF) coil, design progress of the gravity support for the TF coil, manufacturing of the cryostat base and progress of its body's design, interference avoidance of the thermal shield, quench protection circuit manufacturing, and detailed adjustment of the operational scenario. For future assembly, the results of the examinations of pre-assembly and assembly on the TF coil, workers safety on site, and transportation of the components were reported. At each session, action lists were updated, and the update of the Plant Integration Document (PID) was agreed at the end of the meeting.

On the second day of the meeting, the participants joined a technical tour, and looked around the site including disassembly of JT-60U, and viewed the 40° sector of the vacuum vessel and the PF conductor. After the TCM-12, several experts involved joined another tour to look over the Port of Hitachi, and the transportation route from the port for the components to be contributed by Europe.

#### **Meetings**

#### 9th Meeting of the STP Project Committee



On 28 September, the 9th Meeting of the Satellite Tokamak Programme Project Committee (PC-9) was held at the Naka Fusion Institute, and 27 participants in total joined the meeting, 6 members from the Project Committee (PC), the Project Leader, 5 experts from the Project Team, and 21 experts from the EU and JA Home Teams, including some experts who joined by videoconference.

Before the meeting, the Chair, J. Pamela, and the PC members made a technical tour to view the  $40^{\circ}$  sector of the vacuum vessel in the vacuum vessel sector assembly building, manufacturing of the PF conductor in the buildings for superconducting conductor jacketing and superconducting coil winding, and disassembly of JT-60 in the torus hall. They also visited facilities for ITER affected by the earthquake.

At the meeting, the Project Leader reported the Work Programme 2012 to be submitted to the Steering Committee, and the current status and progress of the project were also reported in detail by the PL and PMs from the EU and JA HTs. The Chair and the PC members took note of the status and steady progress.

On the occasion of this meeting, which was the last STP-PC J. Pamela would chair, he also thanked the project team for the efficient work and the impressive achievements over the past four years. He expressed his hope and encouragement for the project to continue on this good track and wished full success to JT-60SA during its construction phase as well as during its future operation as a key device in support to ITER and in preparation for DEMO.





The Chair and PC members on the technical tour: with the 40° sector of the Vacuum Vessel (left), the support structure for the EF coil with copper dummy conductors inside, and thermal shields in the background (right)

#### **Local**

# Saclay, France





The tower Saint-Germain

Church of Saclay

Saclay is a small French commune located in the IIe de France about nineteen kilometres south-west of Paris and close to the regional natural park of the high valley of Chevreuse. With its six thousand inhabitants the commune is marked by a long history and the progress of science and technology. Many visitors enjoy the historic church of Saclay from the 17th century, and the watch tower Saint-Germain which reaches back to the 15th century, which mark the old boundary of the village (see pictures).

In 1952 CEA (Commisariat à l'énergie atomique et aux énergies alternatives) established a research centre at Saclay. Nowadays the more than 6000 researchers working in CEA Saclay focus on nuclear technology, astrophysics, and life science, and cooperate with the other sites of CEA in France, with universities, and with industry.

In 2003 ten communes around Saclay joined to establish around CEA Saclay a centre of scientific excellence in the lle-de-France region, inviting universities, research institutions, and engineering and business schools, to establish facilities on the new campus. Five years later, twenty-three research centres had joined the Campus Paris-Saclay, sharing and developing further their know-how in research, training and development, offering students a broad selection of scientific education, and giving industry new opportunities for involvement. Meanwhile this campus attracts some 12500 researchers, students, post-docs and administrators, representing about ten percent of the French public research personnel.

### **Calendar**

November 1-4, 2011 <u>8th General Scientific Assembly of the Asia Plasma and Fusion Association (APFA2011)</u> Guilin, China

November 28 – December 1, 2011 21 International Toki Conference (ITC-21) Toki, Japan

December 6-7, 2011 13th Technical Coordination Meeting (TCM-13) Karlsruhe, Germany

March 28, 2012 10th Meeting of the STP Project Committee (PC-10)

April 18-19, 2012 14th Technical Coordination Meeting (TCM-14) Naka, Japan April 24, 2012 10th Meeting of <u>the BA Steering Committee</u> (SC-10) Naka, Japan

# Contact Us

The JT-60SA Newsletter is released monthly by the JT-60SA Project Team. Suggestions and comments are welcome and can be sent to <u>masayasu.sato@jt60sa.org</u>.

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