JT-60SA Newsletter
No.39, 29 March 2013

## Headline

# Celebration of first EU component delivery and start of tokamak assembly

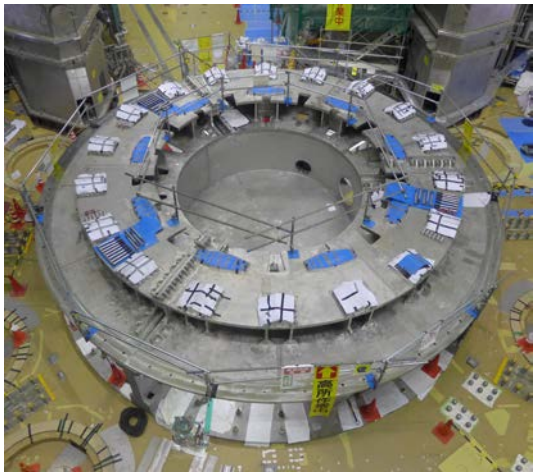


Figure 1: Cryostat base set in the torus hall

Figure 2: Bolt tightening ceremony

The cryostat base, the first major component to be made in Europe, and the base of the whole machine, was delivered to the JAEA Naka site on 26 January, and the JT-60SA assembly was started on 28 January (see Newsletter No. 37). The cryostat base, with a diameter of 12 m, had been divided into seven welded stainless steel sectors to allow it to be transported, so the three lower structure sectors, the cylindrical shell, and the three double rings were set in position and bolted together in the torus hall (Figure 1). Precision measurements using a laser tracker confirmed that the X and Y dimensional tolerances were within 0.2 mm (specified value: within ±1 mm) compared to the building base line, and that the flatness of the lower structure was within 0.3 mm across the diameter (specified value: within 1 mm across the diameter). After installation, the connecting surfaces of the double ring sectors were vacuum-sealed by welding, bringing the assembly of this first component successfully to a close in March as scheduled.

On 25 March, a “Celebration of the delivery of the first component from EU and start of assembly of the JT-60SA tokamak” was held at the conference hall in the Naka site. About 100 guests attended from the relevant organisations of the EU and Japan and from local government. It began with an opening address by M. Mori, Director General, JAEA Fusion Directorate. Following a welcome speech for the host by A. Suzuki, JAEA President, and addresses by guests such as T. Fukui, the senior Vice-Minister of MEXT, Japan, S. Ishida, the JT-60SA Project Leader (PL), presented an “Overview of the JT-60SA project” and J. Sanchez, CIEMAT Director presented the “Manufacture of the cryostat base”. After all speeches and presentations, the guests and attendees moved to the JT-60 torus hall, where the cryostat base is located, for the representatives to perform a bolt tightening ceremony (Figure 2 and 3). This ceremony event was reported by the media and appeared on the TV news that night.

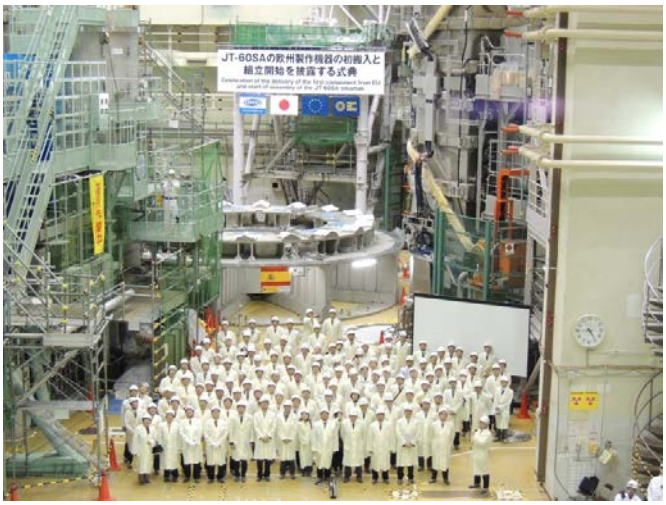


Figure 3: Group photo at bolt tightening ceremony

## News

# Completion of divertor cassette structures and monoblock targets

Figure 1: Divertor cassette structures

The divertor, which absorbs power from the plasma heat and particles, is one of the most important structures for JT-60SA operation. The JT-60SA divertor consists of 36 divertor cassette bodies (10 degree sectors) on which inner baffles, inner targets, domes, outer targets and outer baffles are mounted. Together these form the lower single null divertor for the initial research phase, as shown in Figure 2. The divertor targets consist of 36 bolted carbon fibre composite (CFC) tile plates for inner targets, and 32 CFC tile plates and 4 CFC monoblock target plates for outer targets. For the manufacture of these components, all the 36 divertor cassettes, including two delivered last year, have been completed and delivered to Naka by the end of February 2013.

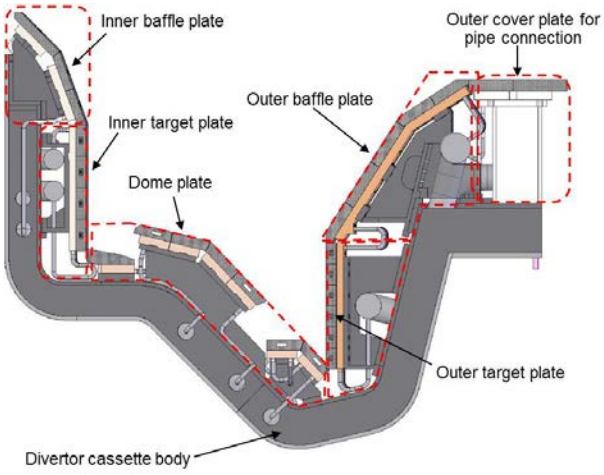



Figure 2: Divertor cassette components (10° sector)

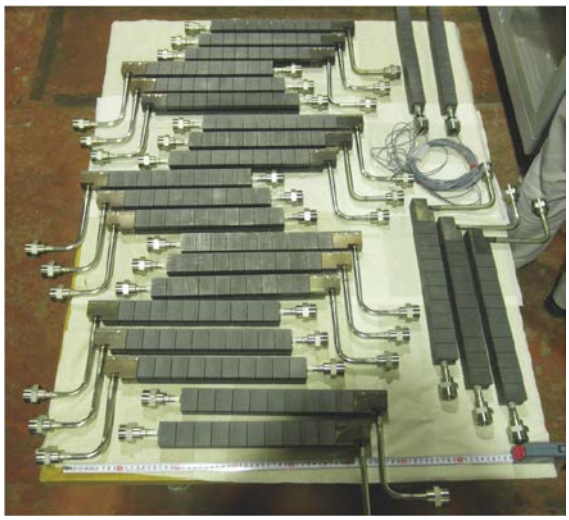
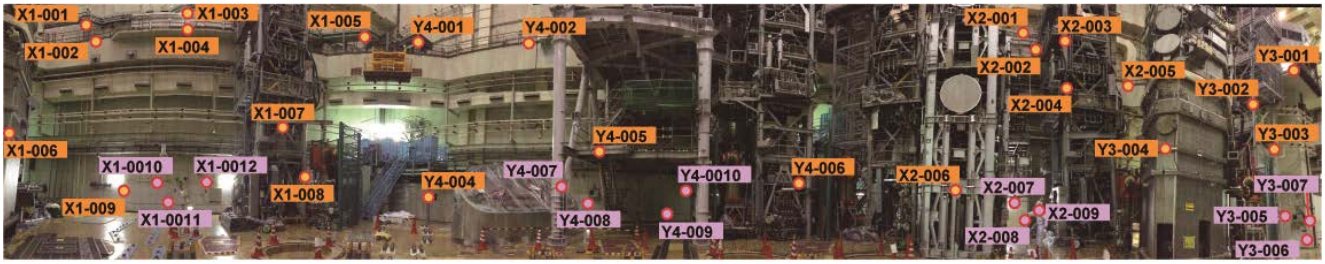


Figure 3: Monoblock target

Furthermore, 75 monoblock targets were delivered to Naka and confirmed to be able to remove a heat load of 10 MW/m$^2$ using FIND (Facility of Infrared Non-Destructive examination for Divertor) at the Naka site. Consequently, a total of 100 monoblock targets, including 25 monoblock targets delivered last year, have been completed and delivered. 333 bolted CFC tiles and 166 pieces of CFC material for monoblock targets, as well as all the CFC tiles (3,504) and CFC material for monoblock targets (1,020) have now been delivered to the Naka site.

## News

## Tokamak assembly prepared with high precision measurement




Coordinates measured in the torus hall

Accurate measurement of large objects in three-dimensions is necessary for many industries. The one method that can be relied upon is to use a laser tracker. This device was first introduced in the late 1980's and rapidly became popular in recent years. As its name suggests, a laser tracker measures three-dimensional coordinates by tracking a laser beam reflected from mirrors mounted on the object to be measured. In the JT-60SA project, this high technology has been introduced to establish reference points to use to assemble the tokamak with high precision.

After establishing reference points for the assembly in January 2013, 41 new reference points on components such as the catwalk, radio-frequency heating system frame or neutral beam injector tank have been established in the torus hall (see figure). Furthermore, the coordinates of the reference points have been measured from the future centre of JT-60SA (8 m above the floor) using the laser tracker. The tokamak will be assembled based on the measured coordinates from this point of origin.

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## News

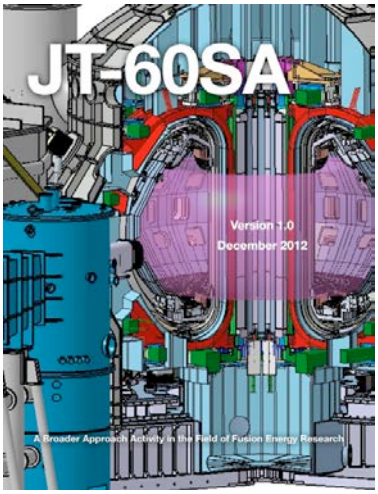
## Low-carbon stainless steel plate for thermal shield delivered

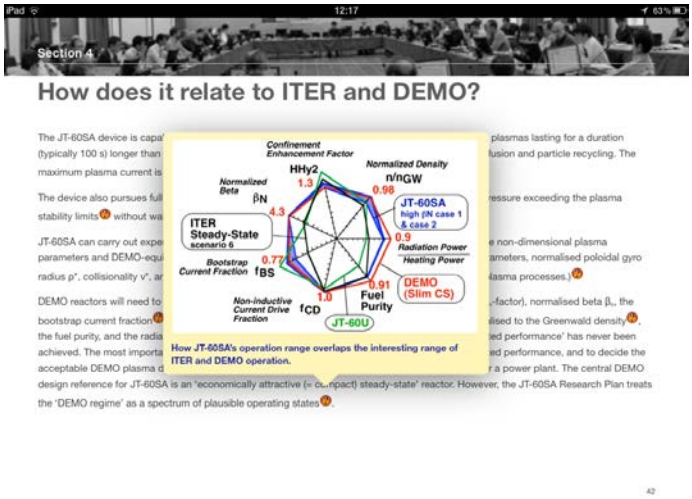
Thermal shields are necessary to limit the heating of the superconducting magnets, in particular due to radiation from the cryostat and the vacuum vessel（see Newsletter No.38）. Low-carbon stainless steel plates were delivered to Naka and stored in the superconducting magnet laboratory for the thermal shield manufacturing, which will be started later in 2013.

The basic specification of these steel plates is SUS316L, contains less than 0.05 % carbon, and one side is polished and has a mirror-finished surface. 445 steel plates (thickness: 3 mm, width: 1.2 m, height: 6.0 m), weighing 80.1 t in total, 150 steel plates (thickness: 1 mm, width: 1.2 m, height: 6.0 m), weighing 90 t in total, and 28 steel plates for ribs (thickness: 1 mm, width: 1 m, height: 6.96 m), weighing 13.8 t in total, were delivered.

## News

## JT-60SA iBook




The opportunity was taken recently to reach users of the popular iPad, by creating an interactive iBook with information about JT-60SA. Using Apple's iBooks Author 2 software, material from the public web site has been organised into five main chapters covering an introduction, project description, project organisation, device and progress description, and operation plan. Readers can touch the text to "pop-up" more detailed explanations about technical terms, and to view pictures of the project hardware in production. Also included are animations of the assembly process and a conceptual fly-through of the torus hall, as well as a time-lapse view of the JT-60U disassembly.

Version 1.0 of the book was published in December 2012, and a new version (1.1) has just been released in March, including the latest assembly progress. It is intended to revise the book on a regular basis adding new material as it becomes available.

The book can be directly downloaded in 51 iTunes Bookstores worldwide. So far it has been downloaded from those in Germany, Italy, France, Netherlands, Czech Republic, USA and Japan. For those countries currently without an iTunes Bookstore it can also be downloaded directly from the JT-60SA public web site.

## Meetings

### 12th Meeting of the STP Project Committee

Figure 1: 12th Meeting of the STP Project Committee

On 26 March, after the ceremony day, the 12th Meeting of the Satellite Tokamak Programme Project Committee (PC-12) was held in the morning at the JAEA Naka site (Figure 1). At the beginning of this meeting, the Project Leader (PL) expressed his deep appreciation to the Implementing Agencies and Voluntary Contributors for completion of the major milestone, the start of tokamak assembly. He went on to present the Annual Report 2012, the updated Project Plan, and the update of the Work Programme 2013, to be submitted to the Broader Approach Steering Committee. The current status and progress of the project were also reported in detail by the PL and Project Managers from the EU and JA Home Teams.

The project has achieved the major milestone on 28 January 2013 of the start of tokamak assembly, and has progressed well with 90% of PAs now being signed. The PC members expressed satisfaction with the accomplishment of the completion and transport of the cryostat base and its assembly, and the overall progress in both EU and JA procurement.

After the PC meeting, the PC members visited the superconducting coil winding building at the Naka site to see the winding workshop for equilibrium field coils No. 5 and No. 6 (EF5 and 6) (Figure 2) and the completed EF4 (Figure 3).

Figure 2: PC members and experts learn about EF6

Figure 3: Explanation in front of completed EF4

## Local

# Towns near Madrid, Spain

Don Quixote and Sancho Panza in front of the Miguel de Cervantes birthplace museum

Royal Palace in Aranjuez

There are many interesting things to do and see in the province of Madrid and in the nearby region. Below you can find information about the most popular places to visit near Madrid.

Alcala de Henares is a small village situated 30 km from Madrid, which in 1998 was named World Heritage City by UNESCO. In this village you can find the University of Alcala from the 16th century, the birthplace of the Spanish author Cervantes, which is a museum today, and the San Bernando convent from 1618.

Aranjuez is another interesting small village located 47 km from Madrid. In 2001 Aranjuez was named World Heritage City by UNESCO for its unique architectural heritage, which makes it one of the most popular tourist attractions of the region. This small village was used as the royal residence of Philip II of Spain and today people can still visit the palace. Aranjuez is also known for its beautiful gardens and natural surroundings and for the Casa del Labrador designed by Villanueva in a neoclassical style.

Royal Palace in San Lorenzo

Roman Aqueduct

San Lorenzo de El Escorial is located 50 km from Madrid. In this beautiful village Philip II of Spain decided to build the Royal residence in 1563. The palace designed by architect Juan Bautista is made up of 16 small gardens and a 92 m high chapel in the centre of the palace. El Escorial is also the palace where many of the kings and queens of Spain lie buried in the incredible Panteon de los Reyes (Royal burial place) all designed in gold.

Segovia is located 87 km from Madrid in the province of Castilla de Leon. This town is principally visited by tourist to see the 16 km long Roman Aqueduct, which is one of the longest and best kept Roman Aqueducts in the world. Apart from the Aqueduct visitors can find the Cathedral and the castle Alcazar both built in a Gothic style.

Town of Toledo

Toledo is located 85 km from Madrid in the Province of Castilla la Mancha. This town, which once aspired to be the capital of Spain, is another of the many towns in and around Madrid named World Heritage City by UNESCO. In Toledo you can find a great mixture of cultures and monuments made by the Romans, the Arabs, the Jews and the Spaniards. The town walls surrounding Toledo were originally built by the Romans and later rebuilt by the Arabs, and inside the walls the Jewish Synagogue of El Transito and the Cathedral are worth a visit.

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## Calendar

April 23, 2013
12th Meeting of the BA Steering Committee (SC-12)
Rokkasho, Japan

May 28-29, 2013
17th Technical Coordination Meeting (TCM-17)
Grenoble, France

June 10-14, 2013
25th Symposium on Fusion Engineering (SOFE-25)
San Francisco, USA

July 1-5, 2013
40th European Physical Society Conference on Plasma Physics (EPS-CPP-40)
Espoo, Finland

July 14-19, 2013
23th International Conference on Magnet Technology (MT-23)
Boston, USA

September 16-20, 2013
11th International Symposium on Fusion Nuclear Technology (ISFNT-11)
Barcelona, Spain

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## 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 hisato.kawashima@jt60sa.org.

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