JT-60SA Newsletter No. 89, 31 May 2017



Headline

King and Queen of Spain visit Japan and talk of fusion R&D



Group photo with H.M. King Felipe VI (centre, right) and H.M Queen Letizia (centre, left) in the front row, Mr. Sanchez (CIEMAT, at the second from the left of the rear row), and Mr. Mori (QST, at the left end of the rear row)

On 5 April 2017, H.M. King Felipe VI and H.M Queen Letizia of Spain visited the National Museum of Emerging Science and Innovation ("Miraikan") in Tokyo, Japan.

Masahiro Mori, Managing Director of QST, explained fusion energy research and development including the JT-60SA project, which Europe and Japan jointly promote. H.M. King Felipe VI graciously commented that he was especially impressed by the cooperation between Spain and Japan in fusion research and development.

<u>News</u>

Pre-assembly of cryostat vessel body cylindrical section begins

Following the <u>preparation meeting</u> in February 2017, the pre-assembly of the <u>cryostat vessel body cylindrical section</u> (CVBCS) began. On 27 March 2017, a ceremony to celebrate its start was held at the premises of Asturfeito S.A. (ASTURFEITO) in Spain (Figure 1 and 2).

The CVBCS is the large outer vessel structure surrounding the core JT-60SA components. It provides a high vacuum environment to avoid excessive thermal loads from ambient temperature on cryogenic components such as the <u>superconducting coils</u>. It is procured by Europe from the manufacturer, ASTURFEITO, through the Spanish Voluntary Contributor, CIEMAT.

The CVBCS is composed of 12 large sectors. ASTURFEITO has already completed 10 sectors, and the remaining 2 are in advanced stages of manufacturing.

All sectors will be delivered to Japan in parts. They will then be assembled into the entire CVBCS with a high precision and <u>capped by the cryostat top lid</u> (QST procurement) at the QST Naka site in the later tokamak assembly phase. In order for the sectors to be precisely finished at the factory and to be assembled together within the required tolerance at the site, they will be pre-assembled on trial and, if necessary, undergo a final adjustment machining at the ASTURFEITO factory.

The pre-assembly will be performed in 3 main phases. In the first and the second phases, the 8 lower sectors (with a height of \sim 7 m) and the 4 upper sectors (with a height of \sim 4 m) will be separately pre-assembled. In the third phase, the pre-assembled upper sectors will be positioned and adjusted on the lower sectors, completing the entire CVBCS (Figure 3).

The first pre-assembly phase is planned to be completed at the beginning of June 2017, and the integrated CVBCS is foreseen to be completed by September 2017. It will then be disassembled and delivered to the QST Naka site in January 2018.



Figure 1: Group photo taken inside the CVBCS lower sectors in pre-assembly with the ASTURFEITO management and technicians (welders, milling machine operators etc.) as well as the CIEMAT and F4E representatives



Figure 2: Group photo taken from the CVBCS outside with Mr. Alberto Gonzalez (ASTURFEITO project manager), A. Cardella (F4E), Mr. Belarmino Feito (ASTURFEITO owner), and J. Botija (CIEMAT) from left to right



Figure 3: CVBCS bird's eye view

5 TF coils and lower vertical ports mounted



Figure 1: 5 TF coils mounted around the 340° VVTS sector



A total of 5 toroidal field (TF) coils (see the <u>last article</u> for the details of each coil) had been mounted in place around the <u>340° vacuum vessel thermal shields</u> (VVTSs) as of 17 April 2017 (Figure 1).

Those coils were positioned and assembled with an extremely high accuracy, that is, within an assembly tolerance of ± 1 mm.

In parallel with the TF coil assembly, the lower vertical ports were connected to the bottom of even-numbered vacuum vessel sectors by welding (Figure 2).

Figure 2: Joining a lower vertical port at the bottom of the torus

First coil terminal box completed



Completed coil terminal box (CT-01)

The first unit of the <u>coil terminal boxes</u> (CT-01), the feeder for the <u>toroidal field coils</u>, has been manufactured and assembled by Mitsubishi Electric Corporation in the superconducting coil winding building at the QST Naka site.

The vacuum vessel and thermal shield assembly has been finished, and the 6 high temperature superconductor current leads, manufactured and <u>delivered</u> by Karlsruhe Institute of Technology in Germany, have been installed. Thus, the CT-01 manufacturing and assembly are now completed (see figure).

The CT-01 passed the subsequent tests as well. It was transferred to QST at the end of February 2017.

News

CS module production progressing steadily



Figure 1: Completed CS4 module (left front) and CS2 module (right back)



Figure 2: Octa-pancake 2 for the CS3 module during winding

The JT-60SA <u>central solenoid</u> (CS) consists of 4 modules: CS1, CS2, CS3, and CS4. Each module is composed of a fourlayer pancake (quadra-pancake) and 6 eight-layer pancakes (octa-pancakes (OPs)).

The CS1 module was completed in September 2016.

The modules of <u>CS2</u> and CS4 (the third module manufactured) passed the completion tests and were successfully completed in February and March 2017, respectively (Figure 1).

The contract for the CS3 module (the final module) was signed between Mitsubishi Electric Corporation and QST on 15 February 2017. Its production began in March. The winding of 3 OPs has already been completed (Figure 2).

News

Tsukuba International School visits QST Naka site



On 21 April 2017, about 40 students of Tsukuba International School (a.k.a. TIS) in Ibaraki, Japan visited the QST Naka site to explore cutting edge fusion research and development.

At the beginning, a representative of QST made a presentation entitled "Status of Fusion Research Development" in the exhibition hall. The young future scientists listened with interest and asked many questions regarding the history and roadmap of fusion research including the JT-60SA project.

As the next part of their mission, they stepped into the JT-60 main building, control room and the JT-60 storage building, where the JT-60SA device was being constructed and the former JT-60 components were peacefully sleeping. They investigated the information they had been given, and found it true.

One of the students (actually his father is a member of the JT-60SA Integrated Project Team) said, "It is exciting to see a project that is like a science fiction movie and knowing that my dad is part of it. I look forward to coming back in a few years and seeing the renewed control hall". His eyes were sparkling like gems.



<u>Local</u>

Cherry trees in full bloom in Naka



Cherry trees in full bloom at the QST Naka site

At the QST Naka site, the cherry trees reach full bloom around the beginning to the middle of April.

As you walk on the site avenue arching your back, you are immediately aware of the swelling flower buds. They change into thousands of pink and white petals all at once. Then, you may certainly mutter to yourself with a smile, "spring has come".

Once stepping outside the site, you can find rare weeping and double-flowering cherries, which welcome you with unique sweet fragrance.

Any and every cherry blossoms only for a week, as soon as the first spring storm blows on your cheek. Come on to the Naka site, and don't miss the spectacular flower show next spring.





Double weeping cherry in the setting sun

Double-flowering cherry around the QST Naka site

Calendar

4 – 8 June 2017 27th IEEE Symposium on Fusion Engineering (SOFE 2017) Shanghai, China

26 – 30 June 2017 <u>44th European Physical Society Conference on Plasma Physics</u> (EPS 2017) Belfast, UK

5 – 6 July 2017 28th Technical Coordination Meeting (TCM-28) Naka, Japan

25 - 29 September 2017 <u>13th International Symposium on Fusion Nuclear Technology</u> (ISFNT-13) Kyoto, Japan

27 – 29 September 2017 <u>16th International Workshop on Plasma Edge Theory in Fusion Device</u> (PET-16) Marseille, France

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/.