JT-60SA Newsletter
No. 57, 30 September 2014

Headline

Shipping of QPC – First components from Italy

QPC components protected by moisture-proof antistatic bags

QPC boxes ready for collection in the Nidec ASI storage area

The quench protection circuit (QPC) units successfully passed the factory routine tests carried out after the manufacturing of the different components, between the summer of 2013 until 23 July 2014, when the very last test was completed. The 13 QPCs, which protect the poloidal and toroidal field superconducting magnets of JT-60SA, were procured by the Italian National Research Council acting through Consorzio RFX by means of a contract awarded to Nidec ASI S.p.A. (previously Ansaldo Sistemi Industriali S.p.A.).

The components of the 13 QPC units were packed in moisture-proof antistatic bags, to prevent damage to electronic devices during the trans-oceanic shipment, and then enclosed in 72 wooden boxes, with a total weight of about 137 t. Before being stored in 17 containers, the wooden boxes have been provided with two shock detectors each, allowing the detection of possible mishandling of components during the transportation. Different types of standard containers with different dimensions have been employed, depending on the dimensions of the QPC boxes: flat rack, box, high cube and hard top. All the packing activities have been checked by representatives of Nidec ASI and Consorzio RFX. All the documents and information for loading and customs formalities were prepared in close collaboration between Nidec ASI, Consorzio RFX, F4E and JAEA, allowing a smooth start to the transportation procedure.

On 8 August, the 17 containers began to leave the storage area of Nidec ASI in Milan, reaching the port of Genoa where they remained in temporary storage before being uploaded into the ship, OOCL Rotterdam, with a length of 320 m and a net tonnage of 55,204 t.

After loading the QPC containers, the ship left the port of Genoa Voltri on 11 August. After passing through other European ports (Marseille, Barcelona, Valencia) the ship passed through the Suez Canal and reached Hong Kong. There the QPC containers were moved to another container ship that finally reached the Japanese port of Yokohama on 18 September 2014. Here the QPC containers were opened and the shock detectors checked. After that, the QPC boxes were transferred to Naka under JAEA responsibility.

QPC boxes loaded in a hard top container

QPC boxes leaving Nidec ASI storage area in a flat rack container

The container ship transporting the QPC (courtesy of OOCL)

News

Welding of VV 40° sector started

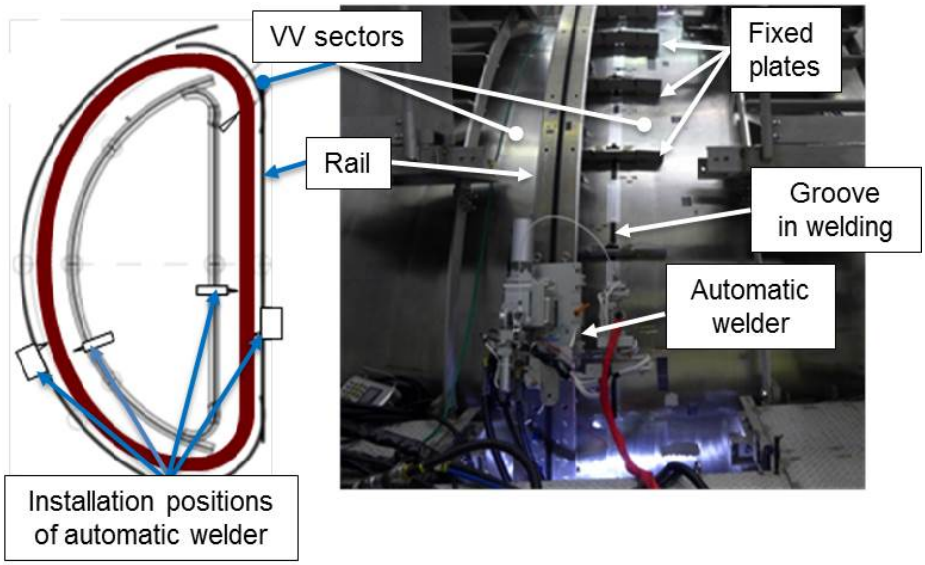


Figure 1: Details of VV 40° sector welding

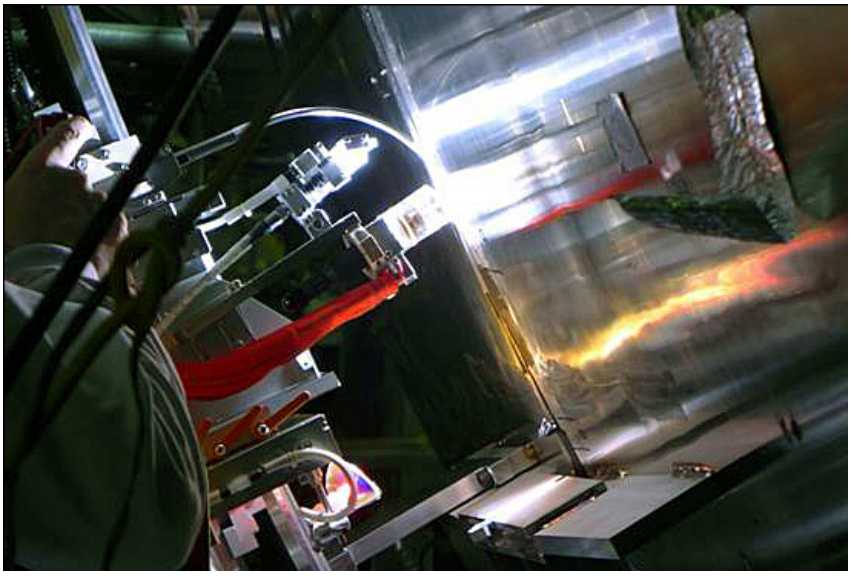


Figure 2: Actual welding using an automatic welder

The welding between the vacuum vessel (VV) 40° sectors (D03 and D04), which were installed on the cryostat base in June 2014, started at the end of July. Since the VV sector is a double walled structure, four automatic welders are used for the welding to reduce thermal deformation. The welders are installed on both inner and outer walls of the VV sectors (Figure 1).

For the advance preparation of the weld, the groove gap between the mating VV sectors was adjusted to be less than 1 mm using a hydraulic jack and heating torch, and fixed plates were temporarily welded between the sectors approximately every 500 mm to 600 mm so the sectors did not move during welding (Figure 1). Rails on which the welders were mounted were installed on the sectors in parallel with the groove. Weld line tracking and an operation check were also performed before the actual operation (Figure 2).

News

Refurbishment of JT-60 experimental building

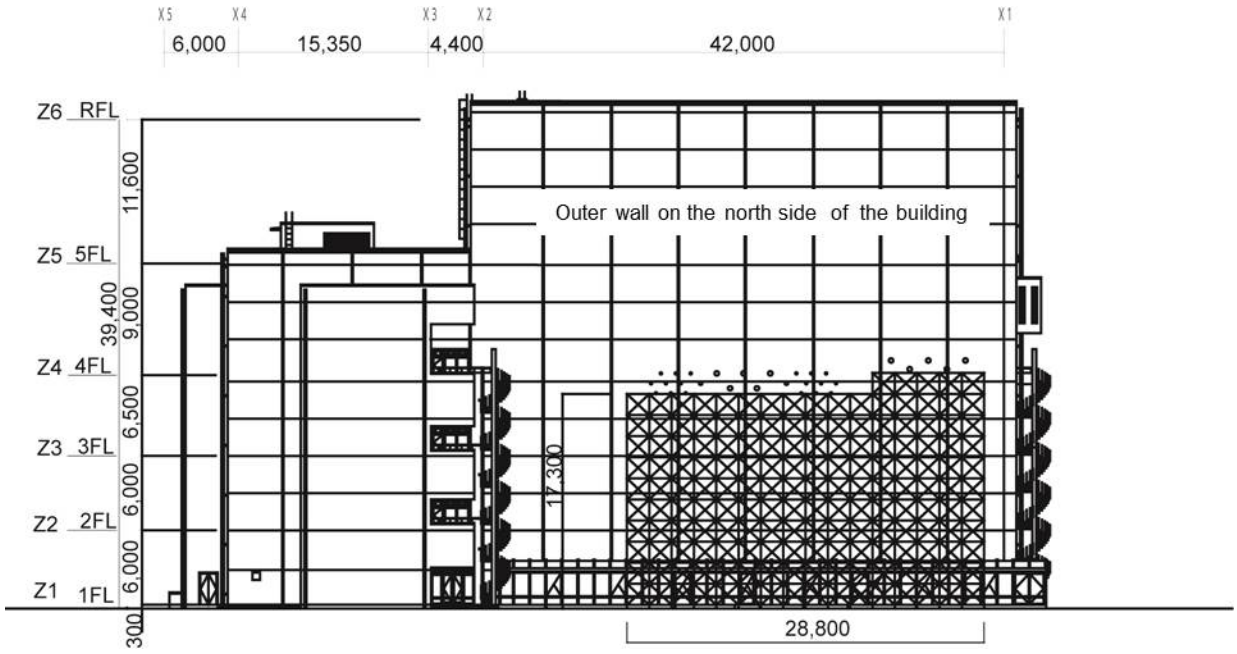


Figure 1: Schematic of open hole construction

Figure 2: Scaffolding assembled on the JT-60 experimental building

The JT-60 experimental building in which the JT-60SA tokamak is being installed is now being refurbished to allow the supply of electricity from the power supply building. The refurbishment work started with the opening of holes in the 2 m thick building wall for piping, wiring and cable laying (Figure 1).

Scaffolding was set up to drill the holes in the outer wall on the north side of the building, and at the beginning of August (Figure 2) a total of 30 holes (diameter: 200 to 350 mm) were drilled at a height of 16 to 19 m above the ground, using two different drilling methods: a wet core drilling method for the outer wall, and a dry core drilling method for the inner wall (Figure 3). The work was completed for now by inserting heat insulation and closure plates into the holes as a seal.

Figure 3: Open holes drilled by wet core drilling method

News

Factory witness of port and VV thermal shields

JAEA representatives with the prototype of the LPTS

The thermal shield for JT-60SA, which consists of the vacuum vessel thermal shield (VVTS), cryostat thermal shield (CTS) and port thermal shield (PTS), reduces the radiation heat and thermal conduction, coming from components at ambient temperature, to the superconducting coils.

JAEA representatives recently visited the manufacturer's factory to verify the progress of the lower PTS (LPTS) and VVTS manufacturing. The prototype of the LPTS was already completed (see figure). For the actual LPTS manufacturing, the leak and pressure tests are underway. Furthermore, for the VVTS manufacturing, the bending jig for cooling pipes has now been manufactured.

Meetings

Design Review Meetings for SCMPS


The four equilibrium field coil power supplies (EF2, EF3, EF4 and EF5 PS), included in the superconducting magnet power supply (SCMPS) procurement arrangement, are procured by CEA through a contract signed in March 2013 with the industrial supplier JEMA Energy SA.

The detailed design of the EF3 and EF4 PS was finalised in July 2014 with the release by JEMA of the related First Design Report (FDR). The detailed design phase of EF3&4 PS, started in the second half of 2013, lasted longer than expected, but starting from the preliminary report presented by JEMA at the end of 2013, a number of interactions and adjustments led to a good level of the PS design in detail.

A modular design has been adopted for the ±20 kA and ±1 kV thyristor converters supplying the EF3 and EF4 superconducting coils: each converter is composed of four bi-directional bridges connected in parallel, having a current rating of ±5 kA. Each bridge is composed of twelve thyristors connected in a back-to-back scheme (1 bridge = 3 stacks of 4 thyristors), allowing to be optimised space and minimising the number of auxiliary components such as fuses and snubbers. The thermal rating of the selected thyristors introduces a large margin in the converter design, assuring safe operation under all plasma scenarios. At the output of the converter, a bidirectional crowbar, composed of thyristors paralleled to a mechanical switch for redundancy, assures a reclosing path for the superconducting coil current under any fault condition.

The key aspects of the design, together with the detailed layout of components and cubicles, were presented by JEMA during the Design Review Meeting (DRM-MPS23) held on 28 July 2014, with the participation of 15 experts from Spain (JEMA), France (CEA), Germany (F4E Garching) and Japan (JAEA Naka). During the meetings some comments were discussed, and included in the final version of the FDR issued by JEMA and finally approved by stakeholders on 12 August 2014.

To reduce the delay related to the purchasing of components, JEMA has procured in advance some critical components, and so the approval of the FDR allowed immediate entry into the manufacturing phase of the EF3&4PS.

Meetings

Applied Superconductivity Conference 2014

The Applied Superconductivity Conference (ASC 2014) was held at the Charlotte Convention Centre in Charlotte, NC USA from 10 - 15 August. There were over 1,500 participants and 1,200 papers, of which 400 were presented orally and 800 were presented as posters. About 40 researchers from JT-60SA, ITER and other fusion devices presented in the sessions on fusion magnets, conductors and materials.

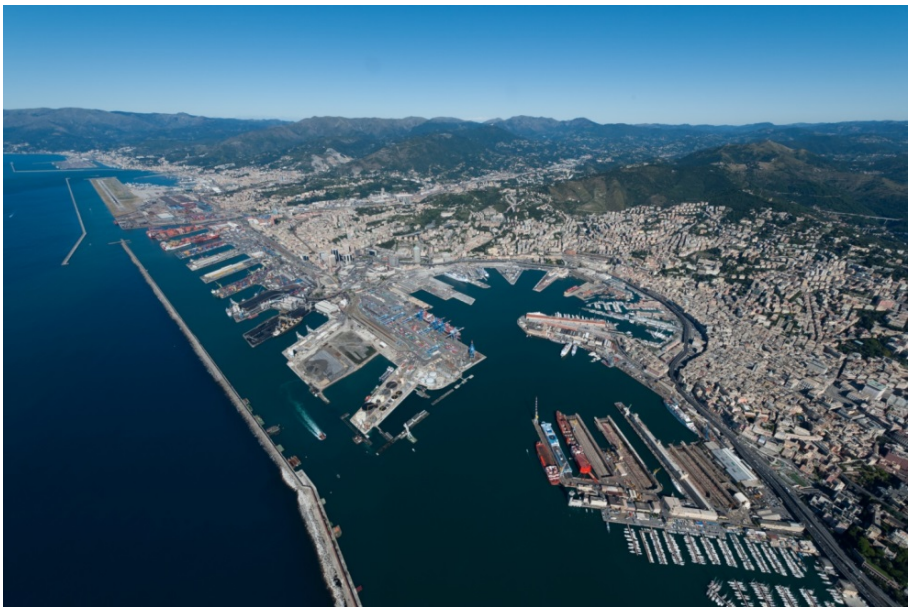
Four contributions on JT-60SA were presented as follows (only presenters shown):

- Poster presentations

- T. Yagai from Sophia University, Tokyo, on the tribological analysis of Inter-strand contact resistance for AC loss assessment in cable-in-conduit conductor for EF coil in JT-60SA;
- K. Nakamura from Sophia University, Tokyo, on the evaluation of temperature rise caused by AC loss in joint of JT-60SA poloidal field coil;
- L. Zani from CEA Cadarache, on the extended quality control process applied on TF strand and TF conductor production for JT-60SA project;
- H. Murakami from JAEA Naka, on the development of terminal joint and lead extension for JT-60SA central solenoid.

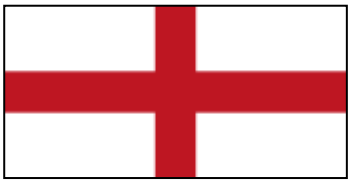
Local

The port of Genoa in Italy



Panoramic view of the port of Genoa

A golden “Genovino”, the currency of Genoa during the time of the Maritime Republic



The flag of the Genoa navy

The port of Genoa is the largest Italian port, covering about 500 hectares on water and about 700 hectares of land, with more than 30 km of operative quays. It is composed of 13 container and passenger terminals, moving over 50 million tonnes of goods every year, and with an annual throughput of 4 million ferry passengers.

Located in the centre of the Ligurian Gulf, representing the natural coastal outlet of the Italian north-west regions, the port of Genoa has an ancient history.

Traces of the Genoa harbour can be found since before the 5th century BC, and its importance as a commercial port started at the beginning of the 2nd century BC during the Roman period, being a trade centre for skins, wood and honey. During the Middle Ages the fortune of Genoa port increased considerably, and from the 10th century up to the 18th century, Genoa become one of the so called Maritime Republics, an independent republic having most of its economy based on commercial activity: the Bank of Saint George, founded in 1407 in Genoa, is one of the oldest chartered banks in the world and its currency, the “Genovino", was recognised throughout the Mediterranean Sea region.

The relation between Genoa and navigation is well symbolised by Cristoforo Colombo (Christopher Columbus), the famous explorer, navigator, and coloniser born in Genoa in 1450. Sailing westward to find the shortest path from Europe to Asia, instead of reaching Japan as he had intended, Colombo landed in the Bahamas archipelago, starting what is commonly defined as the European discovery of America.

The old port of Genoa, with the Bio-sphere (on the left) and the Bigo (on the right)

Colombo statue, in the port of Genoa

On the occasion of the celebration of the 500th anniversary of that event in 1992, the old port of Genoa has been completely renovated, based on a design by the Italian architect Renzo Piano. Close to ancient 17th century buildings, futuristic structures have been built: the Aquarium of Genoa, the second largest aquarium in Europe, welcoming more than 1.2 million visitors each year; the Bio-sphere, a 20 m diameter spherical structure hosting a tropical ecosystem; and the so called “Bigo”, a modern monument reproducing in bigger scale an old crane used on ships (named bigo), hosting a circular panoramic elevator giving a 360 degree view of the old port area from an height of 40 m.

Calendar

October 7, 2014
15th Meeting of the STP Project Committee (PC-15)
Naka, Japan

October 13-18, 2014
25th Fusion Energy Conference (FEC 2014)
Saint Petersburg, Russia

November 4, 2014
15th Meeting of the BA Steering Committee (SC-15)
Karlsruhe, Germany

November 12-13, 2014
21st Technical Coordination Meeting (TCM-21)
Saclay, France

March 17, 2015
16th Meeting of the STP Project Committee (PC-16)
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 newsletter@jt60sa.org.

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