JT-60SA本体組立て開始と今後のスケジュール
Start of Assembly of JT-60SA and its schedule

池田　佳隆[1], JT-60SAチーム[1, 2]
Yoshitaka IKEDA[1], JT-60SA Team[1, 2]

[1]日本原子力研究開発機構、[2]フュージョン・フォア・エナジー
[1]Japan Atomic Energy Agency, [2]Fusion for Energy

The JT-60SA project is one of the three projects of the Broader Approach activities being undertaken jointly by Japan and Europe. There are two Implementing Agencies (IAs) such as the Japan Atomic Energy Agency (JAEA) for Japan, and Fusion for Energy (F4E) for Europe. Whereas major Europe's contribution is covered by commitments undertaken at national government level such as "Designated Institutions" (CEA, ENEA, CNR(RFX), CIEMAT, SCK-ECN, KIT). Both JAEA and F4E(+DI) share the procurements and services to produce its first plasma in March 2019. Figure 1 shows the schedule of JT-60SA.

Thanks to good progress on both IA's contributions, the assembly of JT-60SA started at Naka site in January 2013, with the arrival of the cryostat base from Europe after disassembly of JT-60.

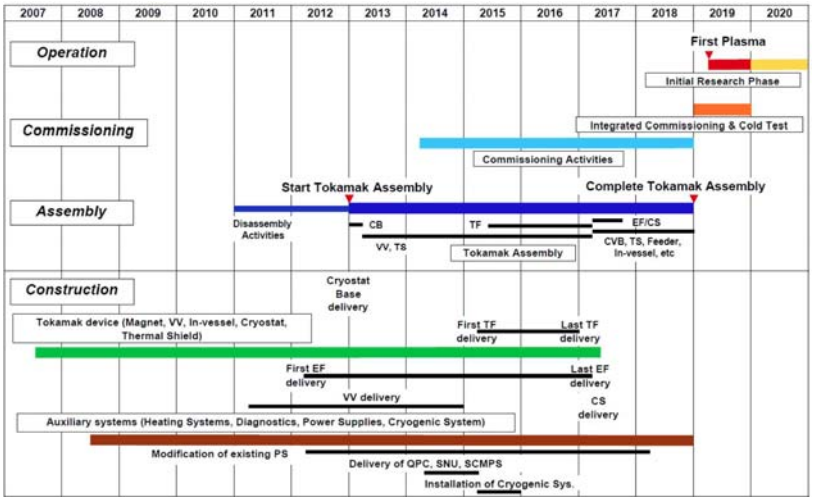

Fig.1　JT-60SA project schedule

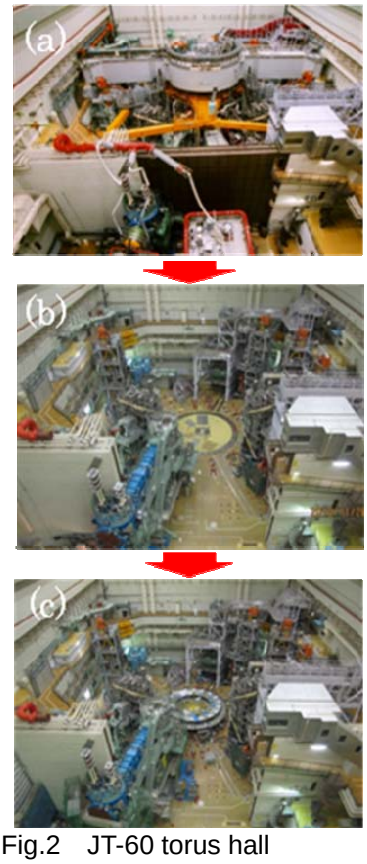

Fig.2　JT-60 torus hall
(a)before JT-60 disassembly,
(b)after JT-60 disassembly,
(c) start of JT-60SA assembly

Preparation for assembly of JT-60SA (Disassembly of JT-60)

The JT-60SA tokamak is to assemble at the same location of the JT-60 tokamak in the torus hall, so the disassembly of the JT-60 tokamak was required before the assembly of JT-60SA. Disassembly of the JT-60 tokamak was started in 2009 after 18-years D_2 operations, and was completed in October 2012. The JT-60 tokamak was featured by the complicated and welded structure against the strong electromagnetic force, and by the radioactivation due to D-D reactions. Since this work was the first experience of disassembling a large radioactivated fusion device in Japan, careful preparations of disassembly activities, including treatment of the radioactivated materials and safety work, were made. About 13,000 components cut into pieces with measuring the contact dose were removed from the torus hall and stored safely in storage facilities as shown in Fig 2(a) (b). The total weight of the disassembly components reached up to ~5,400 tons. Most of the disassembly components will be treated as non-radioactive ones after the clearance level inspection under the Japanese regulation in future.

After completion of the disassembly, the position and levelness of the sole plate of JT-60, which is

reutilized for JT-60SA, was measured with a 3D Laser Tracer. It was confirmed the flatness of the sole plate is less than ~1.3 mm and is good enough for utilization with shims for JT-60SA.

Assembly of JT-60SA

The assembly of the JT-60SA is featured by the integration process to combine the key components contributed by both IAs as shown Fig.3. There are four assembly stages. The first stage began in January 2013, with the arrival of the cryostat base contributed by CIEMAT (Spain) as shown in Fig. 2(c). The cryostat base is the base of the JT-60SA tokamak. The total weight and diameter are ~260 tons and ~12m. The cryostat base is composed of seven parts. Each of them was transported from the Hitch port to Naka site at every night based on the Japanese road regulation for large components. The assembly was carried out to mount the cryostat base on the sole plate with high accurate positioning by using a 3D Laser Tracer. Finally, the excellent installation accuracy (flatness < ~±0.5 mm, xy< ~1 mm) across its 12m diameter was obtained. The assembly of the cryostat base was completed in March 2013.

Second stage is now under going to assemble the 340º of the vacuum vessel and thermal shield with the lower EF coils (4, 5, 6) in a retracted position, which are contributed by JAEA. To transport the EF coils into the torus hall, a large inlet of 14 m x 2.6 m has already been made on the wall of the experimental building. An assembling flame will be constructed around the cryostat base to assemble the vacuum vessel sectors in accuracy position.

Third stage is to insert the TF coils over the vacuum vessel. TF coils are provided by Europe. The lower ports are to set to the vacuum vessel. Once the torus is closed by mounting the final TF coil with the final vessel sector, the lower EF coils is to be raised into their final position.

In the final stage, the upper EF coils and CS will be mounted. Then, cryostat vessel body and top lid are to be assembled, with connecting all current feeders and liquid He pipes. The assembly will be completed by the connection of peripheral equipments such as the vacuum pumping system, gas puffing system and the heating systems. After the cryogenic test of the superconducting coils, the first plasma will be obtained on March 2019.

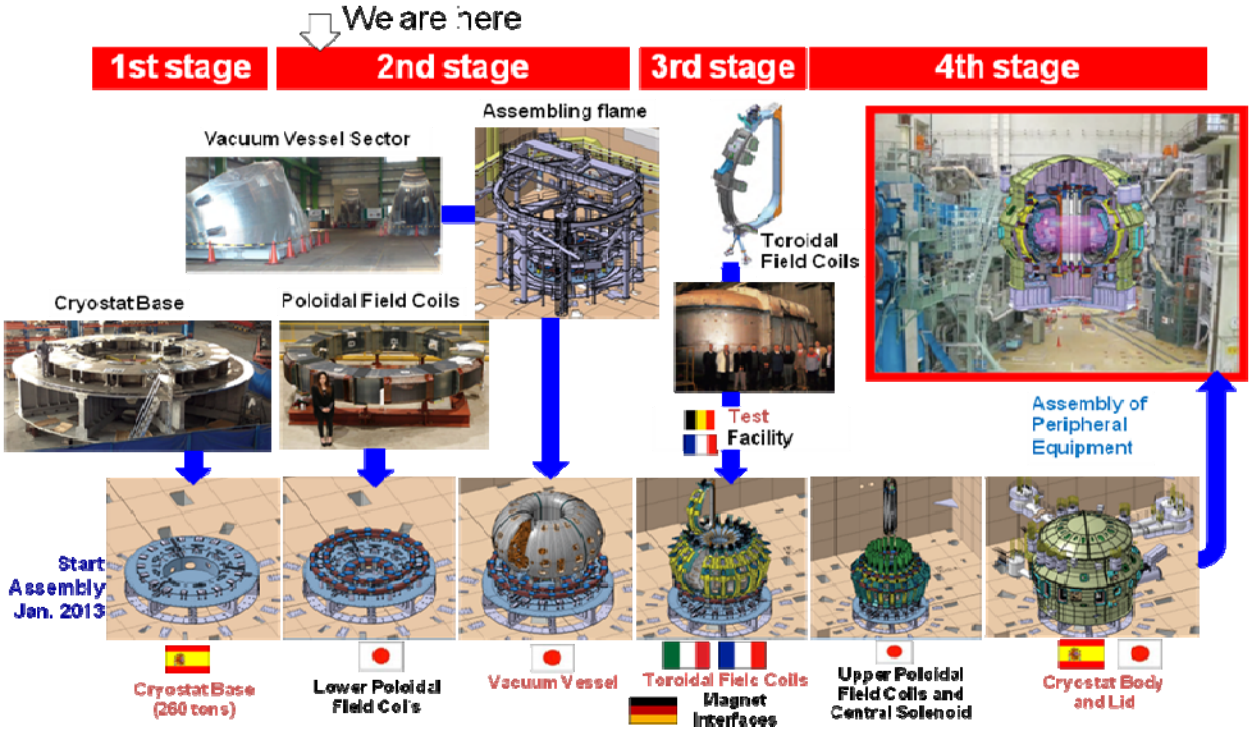

Fig. 3 JT-60SA assembly process