

Wendelstein 7-X progress report

First module moves on

After less than 6 months, the first of five modules for Wendelstein 7-X (W7-X) has been moved from assembly rig station II to station IIIa (Figs. 1 and 2). The assembly of W7-X is organized in six stages, making use of the five-fold symmetry of the magnetic field structure: In the first stage, the coils are threaded onto the vacuum vessel and joined to the central support ring; the mechanical support elements between the coils are also installed. This work is done separately for all half modules. For this stage, two assembly rigs (Ia and Ib) are available, allowing the simultaneous assembly of two half-modules. During stage 2, the half-modules are joined to create full magnet modules. Meanwhile the third and fourth half-modules have been moved to assembly station II, giving space for another two half-modules being prepared at stations Ia and Ib.

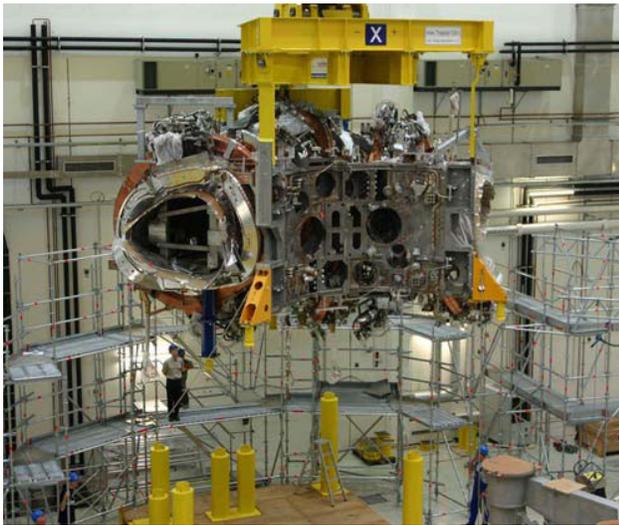


Fig. 1. The first magnet module moving from assembly station II to assembly station IIIa in the torus hall. (Photo: Beate Kernitz IPP)

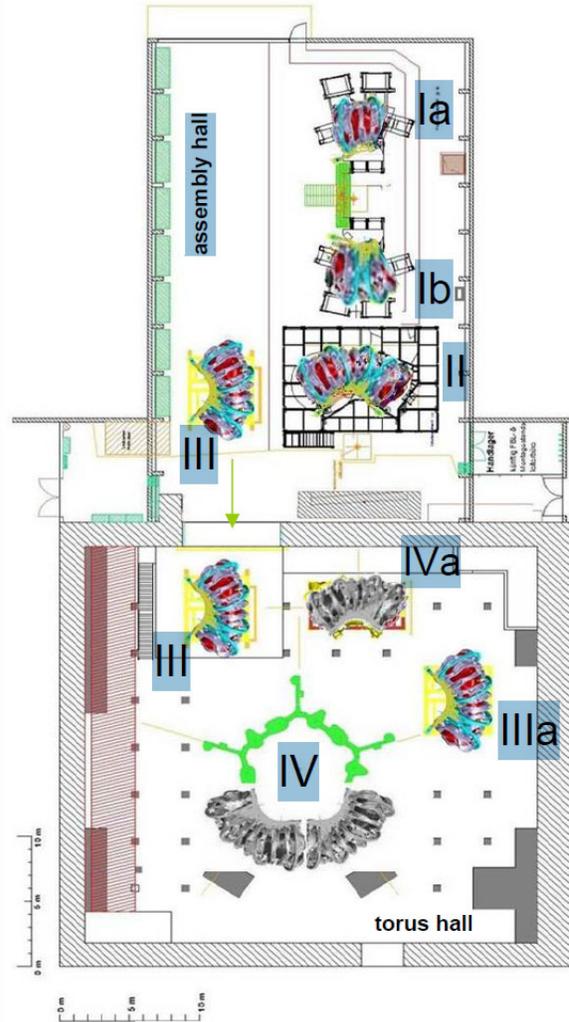


Fig. 2. Overview of the W7-X assembly process.

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The first of the five W7-X modules has been moved from the assembly hall to the torus hall. The cryostat and outer vessel shells are progressing. 1

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The other important step performed at assembly station II is to prepare for the installation of the superconducting bus and the cryo-pipes for the liquid helium supply. Moving the module from the assembly hall to assembly station III inside the torus hall, where superconducting bus and cryo-pipes will be installed, means that work can now progress on three magnet modules in parallel. Subsequent assembly stages are the completion of five single magnet modules (stage 3), the final alignment of these modules on the machine base (stage 4), the successive connection of the modules (stage 5), and the set-up of the periphery (stage 6), including electrical connections, cooling system, etc.

A major task involving the first magnet module during recent months was the manufacturing and installation of the support brackets and clamps of the superconducting bus, which is provided by Forschungszentrum Jülich, and the design and manufacturing of the cryo-pipes. Because of limited space inside the cryostat and the calculated movement of the coils and structures for different magnetic field load cases, a very complex collision analysis is required. Assembly trials for the holders of the superconducting bus, which need very careful adjustment, have turned out to be very time-consuming. Countermeasures, to avoid delays during these working steps, require increase in design, manufacturing, and assembly capacities.

In parallel to the advancing assembly in Greifswald, the first half-shells of the cryostat vessel have been delivered to Lubmin (Fig. 3), the site of the “Energiewerke Nord” about 20 km from Greifswald, where the IPP has rented additional space for the preparation and storage of these vessel parts.

The cryostat (Fig. 4) with its many holes for ports which connect the plasma vessel with the outside world, allowing for plasma heating and for stationary cooling of the plasma facing components, is manufactured by MAN DWE. In a first step to prepare the cryostat for final assembly, experts from this company apply thermal insulation to the cryostat vessel shells to limit thermal radiation to the cold structures to an acceptably low level. The magnet modules will be enclosed by the lower and upper half-shells of the cryostat vessel during the assembly stages 3 and 4, after which the port installation can start.

During the SOFT 2008 conference held 15–19 September at Rostock, about one hour driving distance from Greifswald, more than 450 participants visited the W7-X construction site.

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Fig. 3. Outer vessel shell in Lubim. (Photo: assemblyIPP)

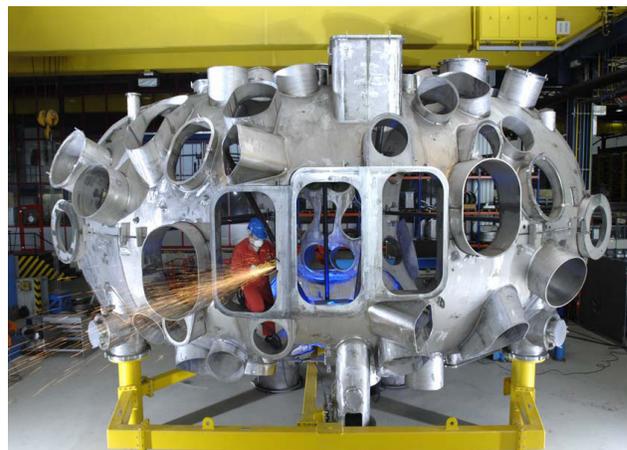


Fig. 4. Cryostat vessel at MAN DWE in Deggendorf giving an impression of the final size of Wendelstein 7-X. (Photo: Wolfgang Filser)