Wendelstein 7-X

NEWSLETTER

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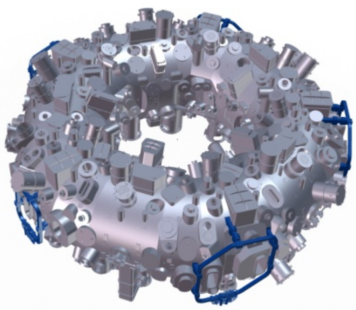
U.S.A. participates in Wendelstein 7-X.

One of the few projects for which American research funding has been invested into research facilities outside the U.S.A. successfully reached a decisive milestone on 26 June: the first so-called trim coil has arrived in Greifswald.

The three-year cooperation project with the Princeton Plasma Physics Laboratory (PPPL) and the national laboratories in Oak Ridge and Los Alamos amounts to 7.5 million dollars in total and was started in 2011. In return, the participating U.S. institutions will become partners in the research programme at the Max Planck Institute für Plasmaphysik.

Scientists and engineers from Princeton started the design of the coils in January 2011. The construction order was placed with Everson Tesla, Inc. (ETI) of Nazareth, Pennsylvania in October. ETI is one of the larger magnet manufacturers in the U.S. and has collaborated with PPPL for more than 20 years on different projects. Holding to schedule in spite of the large distance and six hours time difference separating the partners is a noteworthy achievement. The constructive cooperation between PPPL, ETI and IPP was ensured by numerous video conferences and also visits on site.

Together with U.S. researchers important experiments are planned to answer the question of whether the stellarator is suitable for operation as a power plant: Is it possible to generate a stable and at the same time spatially precise magnetic field in such a way that particles and energy can be dissipated from the plasma while maintaining acceptable loads on the divertor? The key to answer this question lies in the accuracy of the main magnetic field and the possibility to influence the particle and energy fluxes with the help of smaller correction fields. Beside these practical considerations the trim coils provide an additional experimental tool for investigating the complex interaction of plasmas and fields, studying for instance the influence of particle drifts and shielding effects.



One trim coil will be installed on each of the five Wendelstein 7-X modules. In contrast to the superconducting main coils the trim coils are normal conducting copper coils with integrated cooling channels. This is acceptable because the trim coils only generate a small correction field. Four out of five coils have identical size and shape. Due to limited space on the outer vessel the fifth trim coil is smaller. Each trim coil will be fed by an independent power supply unit designed for continuous operation. The power supplies provide each coil with almost 2000 A.

The first coil with its overall dimensions of 3,5 x 3,3 m will be prepared for assembly during the next weeks. First the coil will be measured precisely. Furthermore points must be marked where the supports have to be fixed to attach the coil to the outer vessel. With a budget of 4.3 million dollars the largest contribution of the German-American cooperation project will be finished with the delivery of the last coil in 2013.

photo: Everson Tesla, Tom Stenulis

photo: IPP, Anja Richter Ullmann

Members of staff standing at the first trim coil at EversonTesla (left) and at IPP Greifswald

The other contributions of the U.S. partners have also made good progress. With Oak Ridge National Lab in charge, the design for a special divertor target element is being developed which can absorb high heat fluxes from the plasma and thus protect more sensitive structures from overload.

Status Wendelstein 7-X: The five modules are in their final position on the machine's foundation. Three modules are already joined: the central rings have been screwed together and the plasma and outer vessel module planes have been welded. This process was again accompanied by laser measuring. The port assembly for the last module is coming to an end whereas the assembly of the in-vessel components has just started. In every module about 1200 bolts and supports for fixing the in-vessel components to the plasma vessel will have to be welded with the help of a positioning robot.

photo: FANUC Robotics Europe S.A.

Positioning robot in the plasma vessel

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