

## Metrology of WENDELSTEIN 7-X Results of first Component Adjustment

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One of the main aims of WENDELSTEIN 7-X is to prove the concept of an advanced magnetic field configuration for an optimised plasma confinement. Particularly for that reason but also to cope with the high requirements on mechanical stability of the magnet system there are high requirements on the geometrical adjustment accuracy of main components like coils, support structure, vacuum vessel (VV) and plasma facing components.

In relation to the dimension of the complete experiment of roughly 15 m in total diameter the required positioning accuracies of the main components per assembly step are in the range of  $0.5 \dots 1.5 \cdot 10^{-4}$ .

The paper presents the results of coil and VV adjustment for the first half module of W7-X (1 of 10). Here the required component positioning accuracies are 0.7...1.0 mm for coils and 2 mm for VV respectively. It is shown that the alignment requirements can be achieved by the present adjustment procedures. In particular the metrology procedure and metrology equipment used for adjustment and control measurements are described. For VV a deformation analysis of the welding of two VV-sectors is given.

For coil to coil assembly special kinds of shim elements have to be prepared and assembled. Therefore a coil has to be adjusted in its nominal position and the thickness of the shim element has to be measured. After that, the coil has to be removed, the shim element has to be manufactured and assembled and the coil has to be brought back to its original position. For this procedure a higher positioning accuracy of  $\approx 0.5$  mm is required. This procedure and its limitations are discussed.