

DESIGN OF NARROW SUPPORT ELEMENTS FOR NON PLANAR COILS OF WENDELSTEIN-7X

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The WENDELSTEIN 7-X (W7-X) is a new steady state stellarator presently under construction at IPP in Greifswald, Germany. The main parameters of W7-X are: average major radius 5.5 m, average minor radius 0.53 m, maximum magnetic field on the plasma axis 3.0 T.

The superconducting magnet system of the W7-X consists of 50 non planar coils and 20 planar coils which are arranged as 5 identical modules in a pentagonal shape. All coils are supported on their inner side via two radial extensions by a central support ring. The electromagnetic forces are withstood by backing of all coils against this central ring and by wedging among coil casings through “Narrow Support Elements (NSE)” between the inner legs of two adjacent coils and “Lateral Support Elements” between the outer legs.

Three to seven NSEs (depending on type of coil) are placed in a very limited space between adjacent coils and have to satisfy the following requirements:

- to take high normal forces up to 1,5 MN,
- to allow relative sliding of adjacent coils under load without stick slip to avoid coil quenching
- to allow relative tilting between coils up 1°
- to assure the assembly of the coils with high accuracy and without access after assembly

An intensive development program has been carried out on the narrow support elements to assure a safe operation of the stellarator. Beside detailed FE analysis different anti friction coatings have been considered and tested at room temperature and 77K. This paper describes the design, analysis and tests which have been carried on the NSEs so far.