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Wendelstein 7-X, currently under commissioning at the Max-Planck-Institut für Plasmaphysik in Greifswald, Germany, is a continuation of the helical advanced stellarator line, with the final goal to demonstrate the reactor capability of modular stellarators.

Most of the envisaged magnetic configurations of the machine are very sensitive to symmetry breaking perturbations which are the consequence of unavoidable construction displacements and manufacturing tolerances. The optimized placement of the modules (Fig. 1) on the machine base resulted in a significant reduction of the magnetic field perturbation. Next assembly steps, leading to new possible asymmetries of the magnet system, were analyzed with help of finite element methods. These studies resulted in individual filament displacements for all 70 coils. It allowed to estimate the corresponding level of the magnetic field perturbation and to finalize a comparison of all main sources of the magnetic field perturbation.

Even with a safety margin to cover calculation uncertainties and inaccuracy of FE models, the level of the magnetic field perturbation is below the compensation capacities of the installed trim coils, which demonstrates that the compromise between physical needs and engineering challenges can be successfully met.

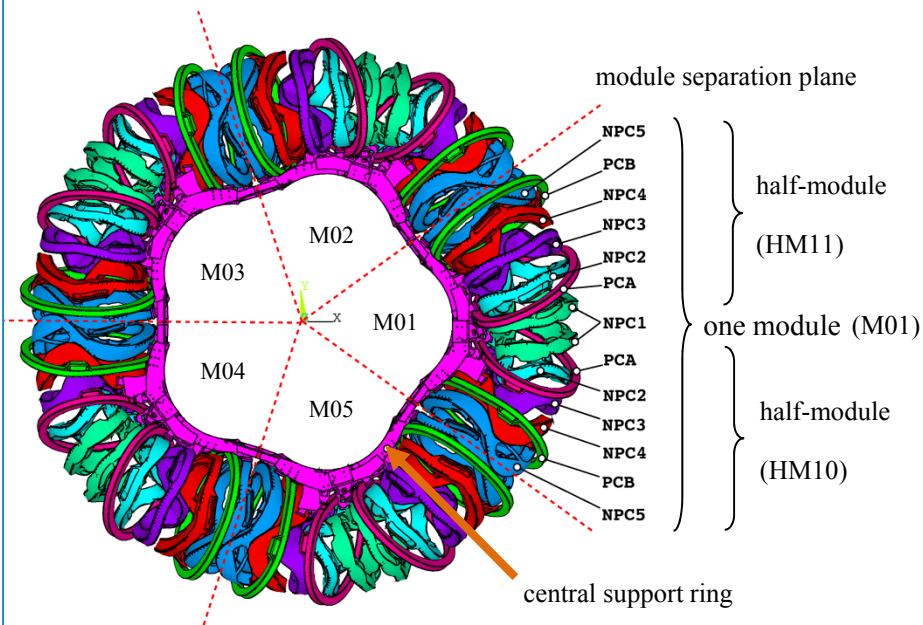


FIG 1. Wendelstein 7-X magnet system, top view.  
NPC – non-planar coil, PC – planar coil.