

COIL WINDING PACK FE-ANALYSIS FOR A HELIAS REACTOR

K. Egorov, V. Bykov and F. Schauer

*Max-Planck-Institut für Plasmaphysik (IPP), Euratom Association, Branch Institute Greifswald,
Wendelsteinstrasse 1, 17491 Greifswald, Germany*

Corresponding author: konstantin.egorov@ipp.mpg.de

An engineering study of a HELIAS type stellarator reactor, as proposed by the Max-Planck-Institut fuer Plasmaphysik (IPP), is currently focused on the conceptual design of the magnet system of a five-periodic 12 T version, the HSR50a. Preliminary simplified assessment shows that such a magnet system is feasible. The HSR50a modular coil size is very similar to that of the ITER TF coil, but also other mechanical and electromagnetic characteristics are quite similar. Therefore, this HELIAS magnet system could be built without drastic development leaps surpassing significantly the quasi existing ITER key technologies [1].

Further analyses are required in order to optimize the coils as well as the magnet system support structure. Two principal options for the stellarator conductor and winding pack could be considered: a circular conductor with radial plates similar to the ITER TF coil winding pack, or a conductor with square jacket without additional plates within the winding pack. Both solutions have advantages and disadvantages in different aspects. Comparative mechanical analyses of the HSR50a magnet system with both conductor types have been performed in order to investigate their influences on the magnet support structure including coil casings, and to highlight some structural pros and cons of both variants.

The paper is devoted to the current status of the HSR50a conceptual design with focus on recently performed comparative local analyses of the winding pack built up from circular and square conductors.

[1] F. Schauer, H. Wobig, K. Egorov, V. Bykov, and M. Köppen, Extrapolation of the W7-X magnet system to reactor size, Contributions to Plasma Physics, 2010, in print.