

First results from Wendelstein 7-X

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Abstract Text:

The world's most advanced stellarator, Wendelstein 7-X (W7-X) [1], located in Greifswald, Germany, started plasma operation on Dec.10, 2015. Its purpose is to demonstrate the fusion reactor relevance of the optimized stellarator. The experiment is built for steady-state operation, featuring 70 superconducting coils, up to 10 MW of steady-state ECRH heating, and actively cooled plasma facing components. The first operation phase, OP1.1, is being conducted with five inboard limiters instead of the island divertor configurations to be used for later operational phases, and features operation at $B=2.5$ T, and ECRH power up to 5 MW. Due to the lack of a divertor, the OP1.1 plasmas will be relatively short-lived. An interesting and relevant physics program can nonetheless be performed in this phase [2]. Several OP1.1 results were obtained before and during the first week of plasma operation. The full operational magnetic field strength of 2.5 T is routinely reached, and the required topology - nested magnetic flux surfaces - has been verified for limiter operation. The first weeks of plasma operation are being conducted with helium as the working gas. Core electron temperatures in the range of several keV have been achieved, as have ion temperatures of several hundred eV. Densities are in the 10^{19} range during the early parts of the discharge. These first helium discharges serve to condition the device and commission a number of diagnostics, as well as to optimize the ECRH startup. Results from flux surface measurements, helium plasma operation, and (if available at the time of the workshop), hydrogen plasmas, will be presented.

[1] H.-S. Bosch et al., Nucl. Fusion 53 (2013) 126001 [2] T. Sunn Pedersen et al., Nucl. Fusion 55 (2015) 126001

Comments: