

P2.1048 Reduction of intrinsic impurities by wall boronization in Wendelstein 7-X as observed by VUV spectroscopy

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see full abstract here

<http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1048.pdf>

The recent operation phase OP1.2b of the superconducting stellarator Wendelstein 7-X (W7-X) was the first experimental campaign with a boronized wall in this machine. Wall conditioning by means of boronization is a standard technique to reduce the influx of intrinsic impurities, typically carbon and oxygen, from plasma facing components into the plasma. Three boronizations were performed during OP1.2b, each leading to a significant reduction of C and O radiation. While the beneficial effect of the boronization in terms of reduced impurity radiation losses is observed by a number of diagnostics, the High Efficiency XUV/VUV Overview Spectrometer (HEXOS) is the only system capable of simultaneously observing the line emission of a wide range of ionization states of the most relevant impurities. This broad spectral coverage, combined with an absolute intensity calibration of HEXOS and impurity transport characteristics derived from impurity injection experiments by means of laser blow-off, allows to estimate impurity concentrations using the 1D impurity transport code STRAHL with given profiles for plasma density and temperature. In this contribution, the effect of the three boronization efforts is assessed based on HEXOS measurements, and the reduction of the C and O concentrations is estimated by comparing calibrated HEXOS measurements with forward-modelling results from STRAHL. The results are further compared with the change of impurity radiation registered by the pulse height analysis system, as well as the reduction of total radiation as measured by the bolometer systems on W7-X.

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