

The High Efficiency XUV/VUV Overview Spectrometer at Wendelstein 7-X

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The High Efficiency XUV/VUV Overview Spectrometer (HEXOS) at the stellarator Wendelstein 7-X (W7-X) in Greifswald is one of the main diagnostics for impurity studies in W7-X. Its broad wavelength coverage (2.5 ... 160 nm) and high time resolution with typically 1000 full spectra/s enable it to measure almost all charge states of light impurities, and low to medium charge states of heavy impurities simultaneously.

In the last three operation campaigns of W7-X, HEXOS data was mainly used to measure with good time resolution the intensity time traces of injected impurities, from which central properties of impurity transport can be deduced. This evaluation is based on the 1D impurity transport code STRAHL, and almost has become a routine process by now.

Beyond that, HEXOS also aims at estimating the concentration of intrinsic impurities, which are typically carbon, oxygen, and nitrogen, with admixtures of fluorine, chlorine and sulfur. Basis for the concentration evaluation is an absolute intensity calibration, which can be performed for a part of the covered wavelength range (approximately 20 ... 150 nm) by means of a secondary standard light source. From this calibrated region, some additional individual lines can then be calibrated via branching ratios. With the absolute intensity measurement, concentrations can then be estimated by running STRAHL in a forward-modelling way by providing plasma background profiles and impurity transport information, and adjusting the simulated impurity concentration until the measurements are matched.

On this poster, we present the technical basis for all data evaluation (e.g. the intensity calibration, line detection and fitting routines), some results of transport properties obtained from HEXOS data in combination with X-ray spectral data, and first results on the intrinsic impurity content obtained from the last operation phase of W7-X.