

First Results of Transport Studies of injected impurities in Wendelstein 7-X

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This contribution explains in detail the experimental setup of the new laser blow-off system on W7-X and presents initial results regarding transport properties of injected impurities which were introduced in plasmas with different conditions.

The understanding of impurity transport is a demanding task for stellarators which have a high potential for steady state operation. The accumulation of impurities in confined plasma in certain operation regimes can cause an early pulse termination due to a radiative collapse. The development of favorable operating scenarios that avoid these accumulations is therefore one of the main objectives of W7-X operation. Hence, the investigation of transport properties is inevitable and a new laser blow-off system was installed to inject non-intrinsic, non-recycling impurities in a controlled manner. The system was available from the beginning of the second operation phase OP1.2a and successfully performed more than 300 injections of different materials with varying material thicknesses, spot diameters and injections frequencies. The ablated amount was large enough to measure the emission of several ionization stages from the X-ray to XUV wavelength range with temporal and spatial resolution in different magnetic field configurations and plasma parameters. From the temporal decay of the emission one can estimate a confinement time of the injected impurities of about 100 ms. The detailed analysis of the emission by means of the radiation and transport code STRAHL enables the characterization of transport properties, e.g., diffusion and convection coefficient.