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12.45 A new laser blow-off system on Wendelstein 7-X

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For the use of impurity transport studies a new laser blow-off system was designed and installed on the Wendelstein 7-X (W7-X) stellarator. Basically, the system is able to inject impurity tracer ions in a controlled manner with a repetition frequency of 20 Hz. In particular, a Nd:YAG laser (1 J, 1064 nm) hits a glass plate inside the torus from behind which is coated on the plasma facing side. The optical path of the laser beam was previously determined and designed by means of ray tracing. The injected amount can be controlled by changing the spot diameter and the spot position on the glass target between laser pulses. The ablation process can be monitored with a monochromatic charge-coupled device (CCD) camera showing the reflection of a visible diode laser at 650 nm which is aligned with the high energy laser. The emission of excited particles in the plasma, measured by the EICAM system, reveals information about the beam quality and in parts the velocity of the ablated particle beam which consists of very fast atoms and slower clusters for the used laser energy density. During the second operation phase of W7-X this system was able to inject a sufficient amount of tracer ions which was successfully observed by spectrometers measuring from the X-ray to the XUV spectral range.

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