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11.1 Helium line ratio spectroscopy for high time/spatial resolution plasma edge profile measurements at ASDEX Upgrade

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To investigate steady-state as well as fast transport processes in the plasma edge region of magnetically confined fusion plasmas, a thermal helium beam diagnostic has been implemented at ASDEX Upgrade. Neutral helium is injected into the plasma by a piezo valve to perform line ratio spectroscopy for electron density and temperature determination. An optical head with 53 lines of sight aligned with the magnetic field lines provides a radial resolution of 4 mm, covering 8 cm of the plasma edge region. The line resolved emission intensities of four He I lines are measured simultaneously with a newly developed 32 channel polychromator system, based on dichroic mirrors, small band interference filters and linear array photomultiplier tubes. The data acquisition rate is 900 kHz, which will also enable to study relaxation effects for the emission lines used. Beside the hardware setup, first measurement results of the He-beam diagnostic are shown during regime transitions. Electron temperature and density profiles are compared in L-mode, I-phase and H-mode as well as I-mode. The high spatial and temporal resolution allows the determination of the propagation velocity of fast transient events such as bursts and blobs.

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