Studying ELM filaments with Doppler reflectometry in ASDEX upgrade

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During edge localized modes (ELMs), filament structures are expelled from the edge of H-mode plasmas [1]. In the non-linear development of the underlying instabilities leading to the formation and expulsion of filaments, shear flows have been shown to be an important ingredient, and are now included in the modeling tools. It is therefore essential to investigate experimentally the dynamics of the filaments during an ELM crash, and to compare them to simulations. In this respect, the Doppler reflectometers installed in ASDEX Upgrade probe the density fluctuations in the pedestal region and can detect filaments and their movement during an ELM.

In this contribution, we report observations of an acceleration, followed by a reversal of the filaments velocity during type-I ELMs. Assuming it is due to a poloidal motion, this would correspond to an initial velocity increase in the electron diamagnetic direction, before a reversal in the ion direction; but a possible influence coming from radially propagating structures is a priori not excluded and needs to be considered. By changing the probing beam angle, and hence the direction of the probed wavevector, it is possible to distinguish whether these velocity changes are due to radial or poloidal motions. Possible changes in the measurement localization due to filament-induced modifications of the density profile are also discussed. These measurements are compared with the modelling of an ELM done with the non-linear MHD code JOREK [2, 3], using full wave simulations [4] to simulate the Doppler reflectometry diagnostic.

References

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