High-frequency edge coherent modes observation in ASDEX Upgrade

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The modes which can be observed in a confined magnetized plasma are related to instabilities caused by different drives. The goal is to describe the mechanisms and to identify the basic properties of such instabilities, which can be measured in the experiment. During the I-phase of L-H confinement transitions the turbulence level, background and turbulent flows oscillate in the kilohertz range creating limit-cycle oscillations, while the turbulence frequency spectra significantly modify in the plasma edge. High-frequency edge coherent modes (ECMs) have been detected in the reflectometer signals during the experiments dedicated to the L-H transition studies on ASDEX Upgrade [1]. The role of the ECMs in the clamping of the pedestal pressure has been examined.

The modes have been observed in the ultra-fast swept reflectometer (UFSR) signal [2] continuously during the I-phase, after the transition to the ELM-free phase of the H-mode and in between ELMs [3]. The mode frequency is in the range of 40–200 kHz and often several branches are observed simultaneously. The UFSR data allow to locate the modes in the plasma pedestal region. Through a detailed analysis it is shown that the ECM frequency increases with plasma edge electron pressure. ECMs have low toroidal mode numbers between $n = -2$ and -11. From the UFSR and poloidal correlation reflectometer data it follows that the ECMs have a small radial wavenumber $k_r < 2$ cm^{-1} and a poloidal wavenumber $k_\perp = 0.2 - 0.4$ cm^{-1}. The absence of the ballooning character, the propagation in the electron diamagnetic direction and the localisation close to the pedestal top indicate that the ECMs might be microtearing modes.

References

[1] A. Medvedeva et al., Plasma Physics and Controlled Fusion **59.12**, 125014 (2017)

[2] F. Clairet et al., Review of Scientific Instruments **88.11**, 113506 (2017)

[3] A. F. Mink et al., Nuclear Fusion **58.2**, 026011 (2017)