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The Rotation of Quasi coherent Modes in W7-X

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For the first time quasi coherent modes (QC-modes) are detected at the isodynamic stellarator W7-X. QC-modes are known from many tokamak experiments. They appear mostly in the plasma core at low collisionallity and some times in the plasma edge. They show up as density fluctuations in the power spectra, as structures with centre frequency ranging from $40\,\mathrm{kHz} \leq f_c \leq 120\,\mathrm{kHz}$. Whereas in the plasma core trapped electron modes (TEM) are the cause of the QC-modes, density gradient driven TEMs are supposed to be the drive for the QC-modes in the edge.
At W7-X QC-modes are observed in plasma core of programs with $T_e > T_i$ and low collisionallity. The centre frequency ranges from 100 kHz-250 kHz, depending on applied ECRH heating and the magnetic configuration. For certain conditions in the plasma edge such structures at higher frequency ($f_c \approx 800\,\mathrm{kHz}$) are observed, too. The modes are detected by Poloidal Correlation Reflectometry (PCR), a set of 5 antenna looking from below the plasma mid-plane at the bean shape plasma cross section into the plasma and measuring density fluctuations allowing for the estimation of the mode-rotation and its properties, simultaneously. The measurement of the coherence spectra allows to discriminate all kind of uncorrelated fluctuations and allows to decompose the coherence spectra in two components (i) the central low frequency turbulence e.g. MHD at the $E \times B$-speed and (ii) the QC-mode rotation. A difference in the rotation speed is observed for the time intervals where the QC-modes are observed. To validate the PCR measurements they are compared with the rotation observed from Doppler Reflectometry and with neoclassical calculations.
The presentation will discuss the results from this analysis.

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