Subject: 2), 3b)

"Impact of the DED on ion transport and poloidal rotation in TEXTOR"

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The recently installed Dynamic Ergodic Divertor (DED) in the TEXTOR tokamak allows for a distinct ergodisation of the plasma edge. In this contribution the influence of the DED on poloidal rotation and transport of carbon impurities are presented. The underlying data stems from passive line emission and active charge exchange spectroscopy with a diagnostic hydrogen beam. The system consists of an edge and a central system providing impurity and temperature profiles both. At that time the edge system consisted of 20 channels (r/a=1.0–0.5) transferring the light to a high resolution spectrometer (littrow geometry, n=46) where it is then recorded by a 1024x1024 pixel CCD camera, giving a dispersion of 0.7 Å/mm. In addition there are reference channels looking from the opposite direction which are projected onto the same detector. This enables a differential measurement of the poloidal rotation with a theoretical resolution of approximately 0.5 km/s. The central observation is equipped with 22 fibre channels (r/a=0.5–0.0) projected onto another littrow-spectrometer and recorded by a 256x256 pixel camera. The hydrogen beam is pulsed at 10 Hz for separation of the passive background signal, however the time resolution so far is 1s due to the limited level of the active signal.
The DED 3/1 configuration is characterized by a deep penetration of the perturbing field up to the q=2 surface. Here the analysis is based on passive CIII emission originating from a thin radial emission shell just inside the last closed flux surface to be evaluated. A 2/1 and then a 3/1 tearing mode develop successively with rising perturbation field, which in turn has influence on the degree of ergodisation. Under these conditions a reversal of the rotation with increasing ergodisation at this edge position has been found: The initial rotation in the unperturbed case compares with earlier measurements where the rotation had been found to be dominated by the ExB drift. Therefore, we conclude a reversal of the radial electric field. This has indeed been confirmed by independent probe measurements.
In the DED 12/4 configuration, which is characterized by a much more shallow penetration of the perturbation, the results are deduced from active CVI spectra and therefore complete profiles are at hand. Usually, the poloidal rotation profile has a zero-crossing at the last closed flux surface, where radial electric field changes its direction from inward within the confined plasma to outward in the scrape off layer. The analysis of the 12/4 perturbed scenario shows an inward shift of this zero-point. It moves from the last closed flux surface up to the innermost edge of the ergodised region.
For the new experimental campaign the edge observation system had been changed being now two separate systems. The first one uses the initial fibre setup with a doubled radial resolution and is intended for the rotation measurements only. The second one is a direct observation of the previously covered edge range edge with approximately up to 64 radial channels providing a spatial resolution in the mm range. First results will be presented.