Impact of the Dynamic Ergodic Divertor on the Structure of the Plasma Edge at TEXTOR.

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The Dynamic Ergodic Divertor *(DED)* installed at TEXTOR consists of 16+2 coils wound helically on the inboard side of the torus. They produce a perturbation field resonant at the q=3 surface with different mode numbers.
The magnetical topology induced by the DED was prescribed by field line tracing and mapping methods collected in the *ATLAS-Code*. This magnetic field topology consists of three regions: A region with *island chains*, a region where these islands overlap, called the *ergodic region* and a *laminar region*, where the field lines, before they get decorrelated, are deflected towards the DED target tiles. The calculated connection lengthes of the field lines hitting this target show a splitting of the broad ergodic pattern in the moment of the creation of the laminar region: The field lines of the laminar zone form an helical divertor.
The evolution of the plasma parameters in this DED induced magnetical topology is modelled by the EMC3-Eirene code package. This Monte-Carlo/Fluid-Code prescribes n_i (n_e), T_e, T_i, the density of molecules and atoms, the particle and energy deposition on the DED target tiles and the particle flow from the target tiles.

In this contribution the measured plasma edge parameters n_e and T_e and the experimentally determined particle flux distribution will be compared with the calculated magnetic topology and results of the modelling of these plasma parameters.
We use *Beam Emission Spectroscopy (BES)* on thermal He- and Li-Beams to determine the electron density n_e and the electron temperature T_e and spectroscopic filtered cameras to investigate the particle fluxes. The atomic beams measure n_e in a range of $1 * 10^{18} m^{-3} - 2 * 10^{19} m^{-3}$ and T_e in a range of $20eV - 200eV$ in the plasma edge. They are located at the *Low Field Side (LFS)* ($\theta = 0°$, midplane) at $\varphi = 282.5°$, the *High Field Side (HFS)*($\theta = 180°$, midplane) at $\varphi = 192.5°$ and at the top of TEXTOR ($\theta = 270°$) at $\varphi = 82.5°$.
With increasing DED current the formation of the helical divertor is detected by an decrease of n_e and the pressure p in the edge on the *LFS* caused by the formation of a flux tube of laminar field lines. At this stage a correlated spreading of the strike points on the DED target tiles shows up. The poloidal structure of the laminar zone and the divertor structure imposed by the DED was investigated with a sweeping of the DED field. The movement of the whole divertor structure leads to an alternating appearance of laminar regions and parts of ergodic regions in front of the atomic beams and with this to the same variations in n_e as described above.
When changing the plasma *safety factor q* and the plasma position relative to the DED coils the perturbation level is changed and the development of the ergodic structure can be investigated. The nearer the plasma respectively the resonant q-surface is positioned to the DED coils the lower is I_{DED} to accomplish a specific perturbation. For a scan of q by ramping down the plasma current I_P this show up in a sudden decrease of n_e when q reaches values above $q = m/n = 10/4$. From this point on the strongest fourier components of the DED field have resonances in the plasma. The laminar region with the helical divertor builds up immediately which causes the characteristic drop in n_e and the edge pressure p.
This DED induced variations of the edge parameters n_e, T_e and from this the pressure p correlates strongly to the calculations of the magnetical topology and to the modelling of these parameters and enables us to specify the created complex divertor structure experimentally.