Subject: 6)Dynamic stabilisation and parametric resonances in dynamic magnetic fields

Influence of the Dynamic Ergodic Divertor on the Density Limit in TEXTOR

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Recently, the Dynamic Ergodic Divertor (DED) has been installed at the high field side of the tokamak TEXTOR, (major radius 1.75 m, minor radius of the circular plasma cross-section 0.47 m). DED consists of 16 coils oriented parallel to the field lines on the magnetic surface with the safety factor equal 3. They extend symmetrically from the midplane in both directions till the poloidal angle of 36 degree; two additional coils compensate the end effects [Finken(1997)]. The resonant magnetic field perturbations caused by DED introduces a complex three dimensional magnetic field structure in the edge region, consisting of an ergodic zone formed by overlapping island chains and a laminar zone with short connection lengths of field lines to the wall. The DED is working in $m/n = 3/1$ and 12/4 configurations, where m, n are the mode numbers of magnetic perturbations in poloidal and toroidal directions. DED can be operated with static (dc) and rotating perturbation field with frequencies up to 10 kHz in co or counter current direction (ac).

A significant influence of Dynamic Ergodic Divertor (DED) on the density limit in TEXTOR, depending on the DED operation mode and on the heating scenario, has been found. In Ohmic discharges, where without DED detachment normally arises at the density limit, multifaceted asymmetric radiation from the edge (MARFE) develops when the DED is operated in dc mode and the maximal achieved density decreases with increasing DED current. With 1 kHz ac DED the density limit is due to detachment and its value, being lower than under normal conditions, exceeds the level achieved with dc DED at the same current. By additional heating with the neutral beam injection, the density limit is always due to MARFE development. The limit is reduced by dc DED, but is increased above the standard value when DED is operated in ac regime. There is a good agreement between experimental observations and the theoretical predictions.

References

[Finken(1997)] K. H. Finken, Fusion Engineering and Design **37**, 335 (1997).

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