

Behavior of intrinsic carbon under the action of the Dynamic Ergodic Divertor on TEXTOR

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The submitted paper deals with measurements of carbon spectral lines performed in the UV range on TEXTOR during operation with the Dynamic Ergodic Divertor, DED. The spectroscopic data are taken along 9 viewing chords, which cover a significant fraction of the total poloidal cross-section of TEXTOR. Considering the two dimensional nature of the DED interaction on each poloidal plane, the geometry and the number of the viewing chords allows to detect local effects and to distinguish them from global ones. The change of carbon line intensities under the action of DED is seen to depend on the operational mode of DED and on the edge safety factor of the unperturbed magnetic field. In particular, the intensity ratio of CIII to CV – which may be taken as a figure of merit for carbon screening efficiency - changes only moderately for 12/4 mode while might increase significantly for 6/2 mode, with a strong dependence on $q(a)$. In 3/1 mode a dramatic increase of CIII/CV is seen at the onset of the 2/1 tearing mode but only locally, while, on the average, the ratio shows a modest increase. The behavior of CIII/CV ratio can be related to the structure both of the laminar and of the ergodic zone in the three operational modes of DED. Data analysis suggests that the action of frictional forces (charge dependent) in the stochastic volume as well as prompt re-deposition of carbon in the laminar zone (dependent on the ratio of downstream to total carbon flux) can be considered as complementary physical mechanisms responsible for the improved carbon screening efficiency with DED. The carbon data analyzed so far are taken at a repetition time of 100 ms, thus are suitable for analysis of stationary situations. Recently, the time resolution of the carbon diagnostic has been improved up to 20 kHz, so we expect that also time dependent phenomena can be analyzed in the near future and presented at the Workshop.