# The DED divertor scenario

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The DED is a tool which by means of resonant perturbation fields controls edge transport as well as plasma core properties. With its different operating modes – the mode numbers of the perturbation field are variable (m/n = 3/1, 6/2, 12/4) – the DED focuses on different physics tasks which range from MHD effects to plasma wall interaction. One of these tasks is to investigate edge ergodisation as an alternative divertor concept. The DED operated as a divertor has to fulfil the common demands on divertors: decoupling of the recycling region from the core plasma, impurity screening, controlled plasma wall interaction.
The 12/4 mode of operation is the most suitable one for such a divertor scenario since the perturbation field is restricted to a plasma edge region covering about 10% of the plasma minor radius. This perturbed plasma edge splits into an ergodic and a laminar region. The radial transport is enhanced in the ergodic region, leading to a decrease of the plasma edge temperature. The laminar region and especially the near field of the divertor defines the spatial structure of the edge plasma and the structure on the divertor tiles.

The aim to establish a divertor scenario is to maximise the width of the laminar region in order to restrict the recycling processes to this area. The degree of ergodisation and the width of the laminar region can be controlled by the amplitude of the perturbation field and the edge safety factor $q_a$. A variation of $q_a$ by means of a plasma current ramp leads to a drop in the edge temperature when $q_a$ is about 3.0 and lower indicating a change in edge ergodisation. At these $q_a$ values also the structure on the target plates changes and the 4 strike zones split into 8. ATLAS code calculations give a Chirikov parameter larger than one for these $q_a$ values. Gas puff experiments with $C_3H_4$ show a reduced core contamination of carbon when this regime is established. The influence of the plasma beta on the edge structure is discussed and the density and temperature at the target plates is set in correlation with the core plasma parameters.