Characterization of the Power Deposition Profiles in the Divertor of ASDEX Upgrade

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Handling the high energy flux passing through the plasma boundary is an important problem for the realization of reactor-size fusion devices. Especially, the maximum heat flux onto the target plates in divertor tokamaks has to be kept below a material dependent critical value. That's why, different scenarios for the controlled dissipation of the energy flowing into the boundary layer are investigated at ASDEX Upgrade

The heat flux onto the divertor plates in the ASDEX Upgrade tokamak is routinely measured by a thermography diagnostic. The high time resolution makes it possible to investigate the power deposition not only during quiescent periods of a discharge but also during highly dynamic events as type-I ELMs and disruptions. The spatial resolution is well below measured heat flux e-folding lengths.

The measured heat flux profiles across the divertor plates are characterized by e-folding lengths into the private flux region and into the scrape off layer, respectively. Additionally, the peak height and width at half maximum, and the total deposited power are calculated. In this paper we will present these characteristics for a wide range of ASDEX Upgrade discharges including ohmic, H- and L-mode, as well as CDH- and CDL-mode shots. The measured e-folding lengths varies at the outer plate between 20 mm in low density H-mode discharges and more than 100 mm in CDH-phases. A significant drop of the maximum heat load is found in the CDH-mode with strong edge radiation.

The dependence of peak characteristics on different discharge parameters is investigated and a scaling of e-folding lengths and maximum heat fluxes with this parameters will be given. The results will be discussed applying a simple theoretical model of the boundary layer.