The Correlation of ELM frequency on Pedestal Plasma Properties

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JET data for the correlations between pedestal plasma temperature and density with the frequency of type I ELMs are analyzed in the framework of a classical Focker-Planck approach. In first approximation we derive a functional dependence in steady state of ELMs assuming equality between the outward flux of plasma from the core and the loss of plasma from the pedestal into the SOL. In this assumption one expects equality between ELM frequency and Coulomb collisionality in the pedestal plasma. Our analysis of JET data shows that the derived formula for density dependence on temperature is obeyed in wide range of ELM size (including ELM III) but with varying coefficient that corresponds to the configurations of the engineering parameters. The values of this constant differ from that in the Focker-Planck solution for diffusion transport. Clear correlation of the constant with the input power is observed that indicates larger frequency of ELMs in comparison with the diffusion collisionality. It could be related to the impact of non-diffusion transport.

Preliminary estimations for the impact of plasma recycling and impurities on the quasi equilibrium state of pedestal plasma during ELM discharges are made. They will be verified with PIC simulation of the transport of plasma in the SOL and its interactions with the plates of the divertor .