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Inter-ELM filamentary studies during density "shoulder" formation in ASDEX Upgrade

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Particles and energy frequently escape the confined region of tokamaks in the form of filaments elongated along the magnetic field lines propagating radially towards the wall. The filaments contribute to the plasma-wall interaction in form of heat-load and wall sputtering, thus affecting the lifetime of plasma facing components. Recent studies[1-4] showed that during high density operation the scrape-off-layer (SOL) plasma exhibits a broadening of the density profile (named "shoulder") assumed to be associated with the transition from the sheath-connected to the inertial regime of filamentary transport, i.e. when perpendicular transport dominates over the parallel one. Results from AUG and JET indicate a link between "shoulder" formation, divertor detachment and increased collisionality in the divertor region[4]. Analyses in these two devices in L-mode scenarios suggested that the normalized collisionality is the parameter determining the transition, in good agreement with the analytic filamentary model[5]. Presently, in the framework of EUROfusion experiments, an investigation of the extension of this model to H-mode plasma is under way. Floating potential and ion-saturation current signals (as good estimate for the local plasma density) from the midplane SOL plasma in ASDEX Upgrade tokamak have been analysed during L-mode and H-mode inter-ELM intervals with and without nitrogen seeding in the divertor region. A detailed characterisation of filamentary transport is presented with attention to the normalized collisionality in the divertor. The ongoing analysis of experimental data will address previous and newer evaluation techniques in relation to the latest experiments from 2015 and 2016 which focus on H-Mode conditions at high density extending our work to more reactor relevant scenarios.

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