

### **Scrape-off layer transport and filament characteristics in high-density tokamak regimes**

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Abstract:

A detailed cross-device investigation on the role of filamentary dynamics in high-density regimes has been performed within the EUROfusion framework, comparing the ASDEX Upgrade (AUG) and TCV tokamaks. Both devices run density ramp experiments at different levels of plasma current, keeping the toroidal field or  $q_{95}$  constant in order to disentangle the role of the parallel connection length and the current. During the scan at a constant toroidal field, in both devices the scrape-off layer (SOL) profiles tend to develop a clear SOL density shoulder at a lower edge density whenever the current is reduced. Different current behaviour is substantially reconciled in terms of the edge density normalized to the Greenwald fraction. During the scan at constant  $q_{95}$  AUG exhibits similar behaviour, whereas in TCV no upstream profile modification signature has been observed at lower current levels. The latter behaviour has been ascribed to the lack of target density rollover. The relation between the upstream density profile modification and detachment condition has been investigated. For both devices the relation between blob size and the SOL density e-folding length is found independent of the plasma current, with the observation of a clear increase in blob size and the edge density normalized to a Greenwald fraction. ASDEX Upgrade has also explored filamentary behaviour in the H-mode. The experiments in AUG have focused on the role of neutrals, performing discharges with and without cryogenic pumps, highlighting how high neutral pressure, not only in the divertor but also at the midplane, is needed in order to develop an H-mode SOL profile shoulder in AUG.