SOL transport and filamentary dynamics in tokamaks: from L to inter-ELM filaments in high density regimes

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Addressing the role of Scrape Off Layer filamentary transport is presently a subject of intense studies in fusion science. Indeed intermittent coherent structures are found to dominate transport in the L-Mode scenarios as well as in the inter-ELM phases. The role of convective radial losses towards the first wall has become even more important when it was recognized its contribution to the so called process of *shoulder formation* in L-Mode, which describe the progressive flattening of the density scrape off layer profile, experimentally observed at high density in a variety of devices[1–4]. Investigation on this process revealed the strong inter-relationship existing between the divertor conditions, including collisionality, neutral density, detachment degree, pumping efficiency and the upstream profiles, relationship mediated by the dynamics of filaments which varies accordingly to the modification of the downstream condition. Given the relevancy of the topic a strong effort is on-going on European level to coordinate the study of filaments and in particular of their modification in high density regimes both in L and H-Mode. The present contribution will provide a detailed investigation of the role of filamentary transport in high density regimes both in L and in H-mode as obtained in the ASDEX-Upgrade and TCV tokamaks. The combined results from different machines allow to increase the operational space explored moving from a device with closed divertor, metallic first wall and highly efficient cryogenic pumping system to a carbon machine with a complete open divertor. We will provide evidences concerning the relationship between shoulder formation and increase filamentary transport in both L and H mode focusing on the role of neutrals pressure,

[1]B LaBombard et al., Physics of Plasmas **8**, 2107 (2001).

[2]D Carralero et al., Physical Review Letters **115**, 215002 (2015).

[3]F Militello et al., Nuclear Fusion **56**, 016006 (2016).

[4]N. Vianello et al., Nuclear Fusion **57**, 116014 (2017).