

# The simulations of SOL width with helical current filaments in ELMy H-mode

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## Abstract

The EAST ELMy H-mode discharges with different plasma current  $I_p$  and geometries are applied to study the scaling law of SOL width. The similar trend of the SOL width  $\lambda_q$  with  $I_p$  is reproduced by the simulations. The simulated SOL width is only half of the EAST measurements, but agrees well with the multi-machine scaling law. Because there is no RF heating scheme in the simulations, which is effective to change the boundary topology and increases the flux expansion (Liang et al., PRL, 2013). In order to prove the topology change effects of LHW in SOL region, a modeled helical current filament (HCF) in SOL is added as the force-free form into the 6-field 2-fluid module of BOUT++. In order to save the computational resources, only the toroidal mode number  $n=5$  HCF is modeled. The amplitude of HCF is chosen to be the same as that observed in the EAST experiments. The radial magnetic field induced by this HCF could be much smaller than the perturbed field, but it is able to force the perturbations with the same toroidal mode number to grow up at the start of the linear phase. This forced mode is effective to compete with the spontaneous fluctuations and change the linear properties, which leads to the obvious suppression of diverotr heat flux and the broadening of SOL width. The preliminary results shows that the  $n=5$  HCF is able to increase the SOL width by  $\sim 25\%$ . More details will be reported in this talk.