EUROfusion

Topic 21 Experiment and analysis

presented by N. Vianello on behalf of MST1-Topic 21 scientific team

17 May 2018

This work has been carried out within the framework of the EUROfusion Consortium and has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 633053. The views and opinions expressed herein do not necessarily reflect those of the European Commission.

Scientific team

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Motivation and deliverables

- ✓ Relation between downstream divertor conditions and up-stream SOL profiles is not well understood. Influence of SOL blob structures on shoulder formation and divertor conditions is key element towards predictive capabilities. Joint effort within the EUROfusion framework to address this issue on all the MST1 devices (AUG, TCV and MAST-U)

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A series of deliverables were foreseen by 2017 program

1. Cross-machine L-Mode shoulder dependence on current both at constant B_t and at constant q_{95}. Rationale: disentangle the effect of current and parallel connection length
2. Establish robust scenario for density shoulder profile in H-Mode and establish dependence on fuelling/neutral profiles/divertor condition
3. Fluctuations mesurement on AUG to study filamentary transport under high-power H-Mode conditions and under different plasma configurations (SN, DN)
4. Study the role of ELM regimes, neutral compression and particle density in filamentary transport and related shoulder formation
5. Identify the contribution of collisionality and seeding on filamentary transport and related shoulder formation
6. Determine the effect of filaments and shoulder formation on target heat loads in different H-mode plasmas

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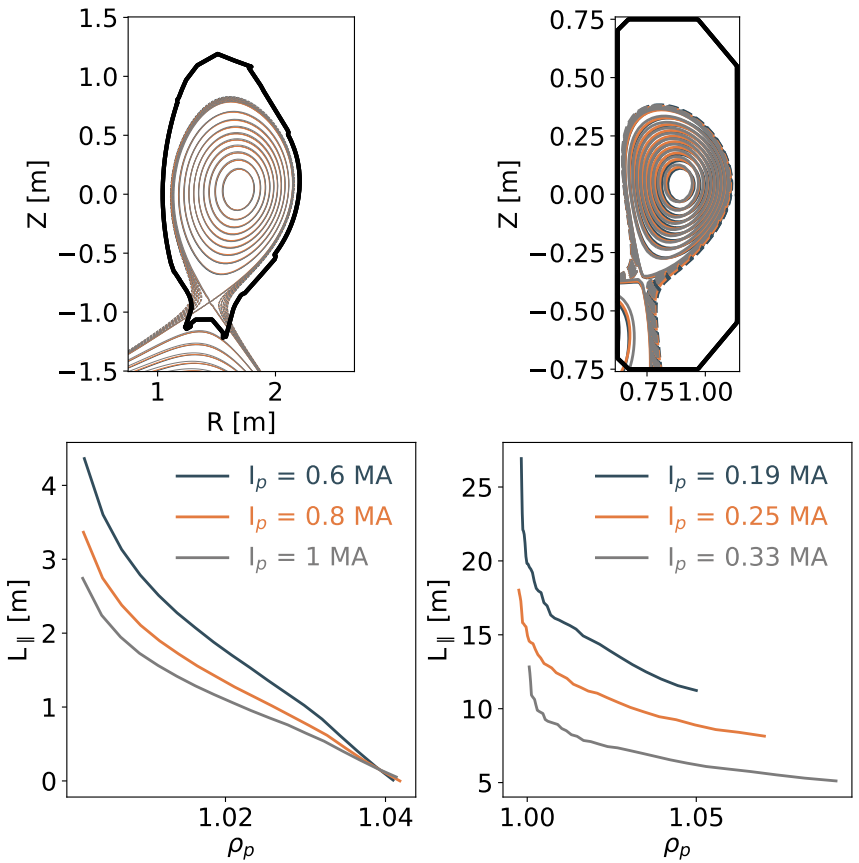
Remember this is still a work in progress

Current scan at constant B_t in L-Mode plasma



- ✓ Shape matched in within the single scan done for each of the machine
- ✓ The scan implies a modification of the $L_{||}$. There is a factor of 5 difference between the two machines due to the very long outer divertor leg of TCV

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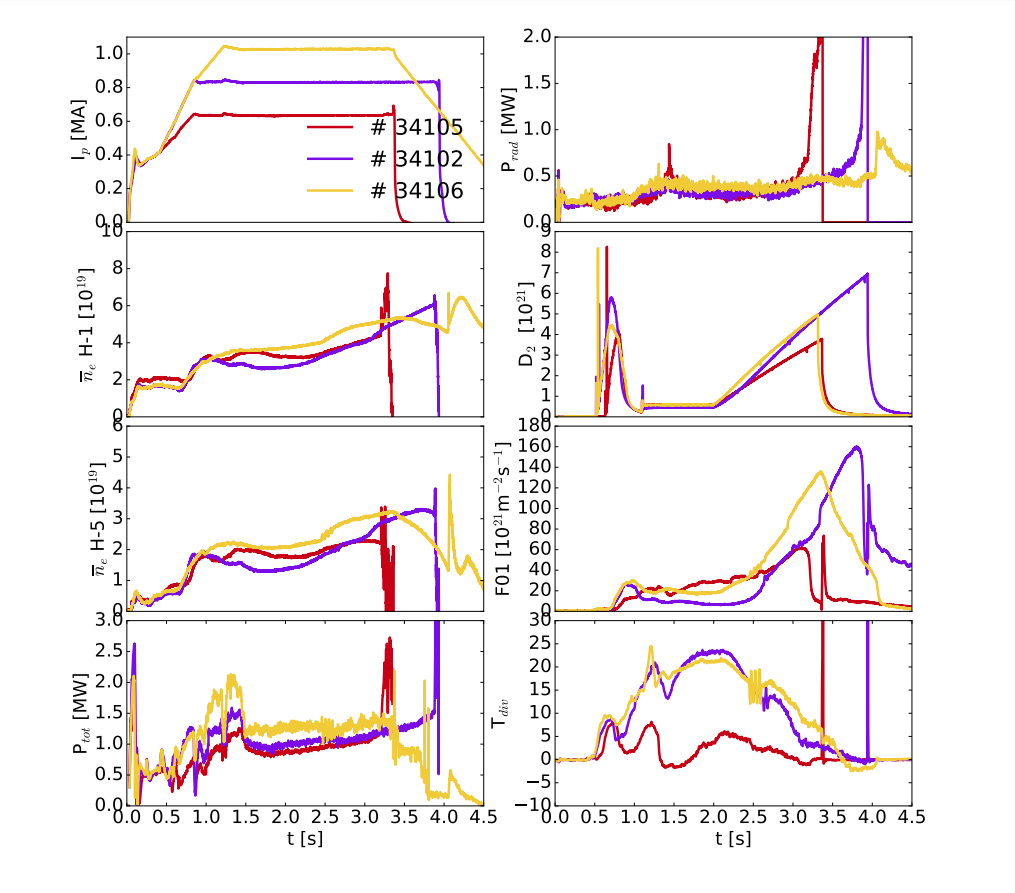
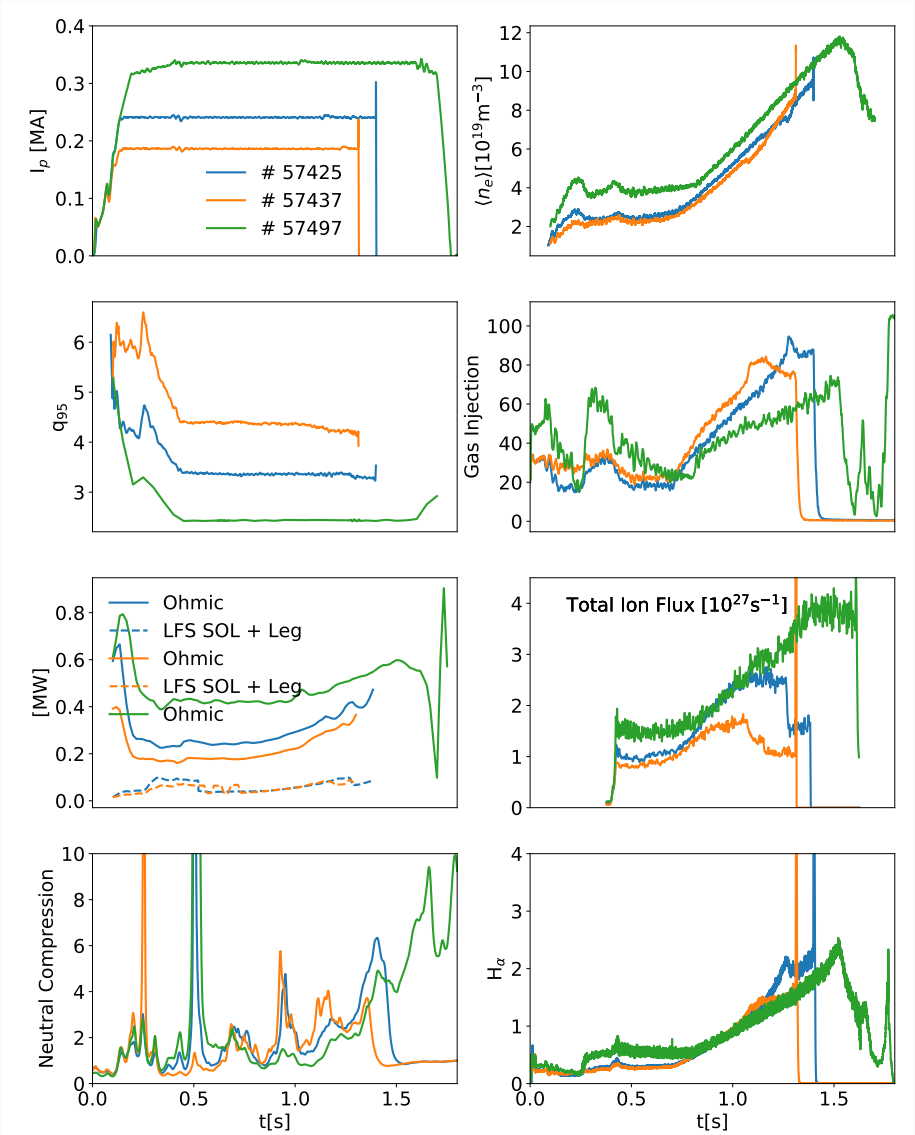


- ✓ AUG: Fueling reduced only at lower I_p to avoid earlier disruption. Similar neutral pressure in the subdivertor region reached. NBI additional power added to keep power in the SOL approximately constant

Current scan at constant B_t in L-Mode plasma



- ✓ TCV: Ohmic heating only. Similar neutral compression reached and D_α radiation from the floor. Ion flux rollover reached in all the three current, although marginally at 330 kA

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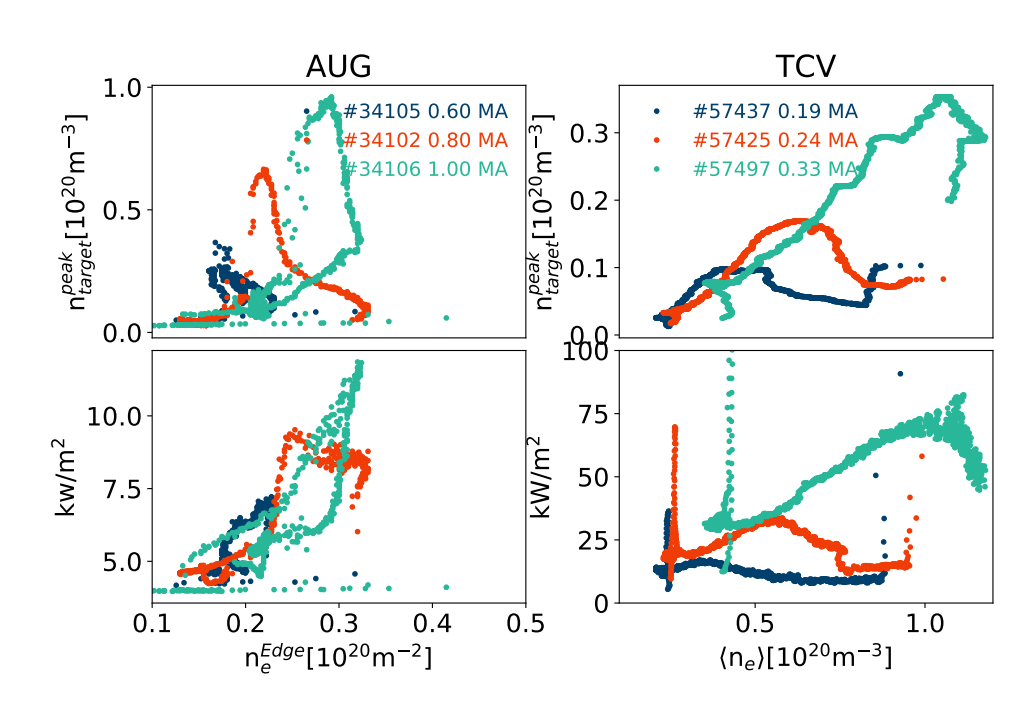

- ✓ In both the machines both the peak target density and the radiation close to divertor target exhibit rollover at increasing density with increasing current

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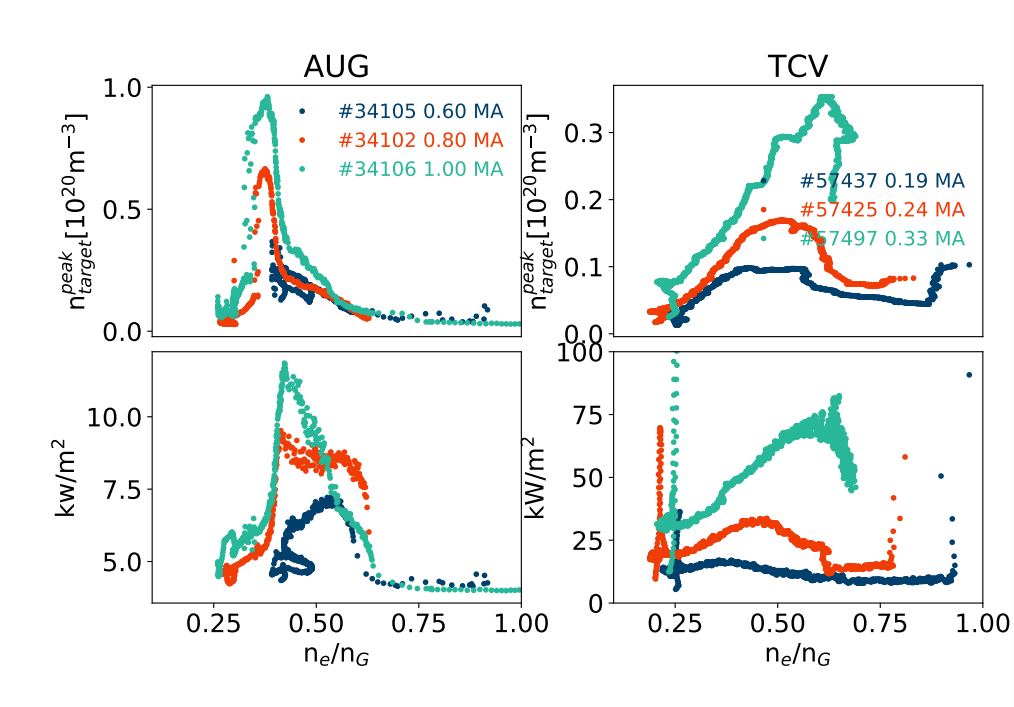
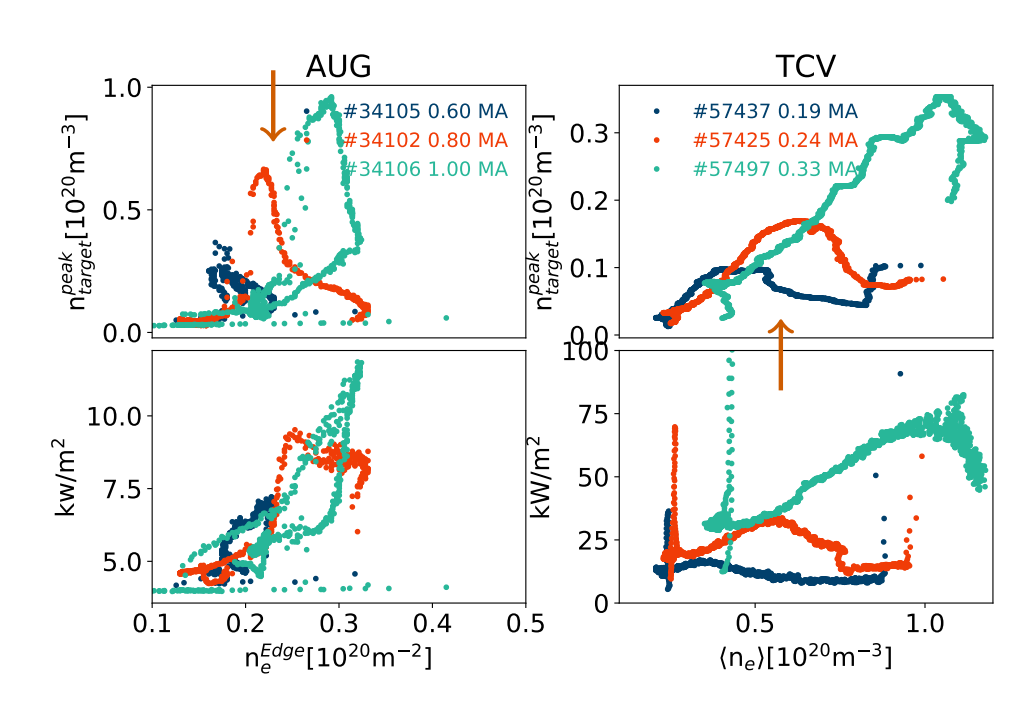


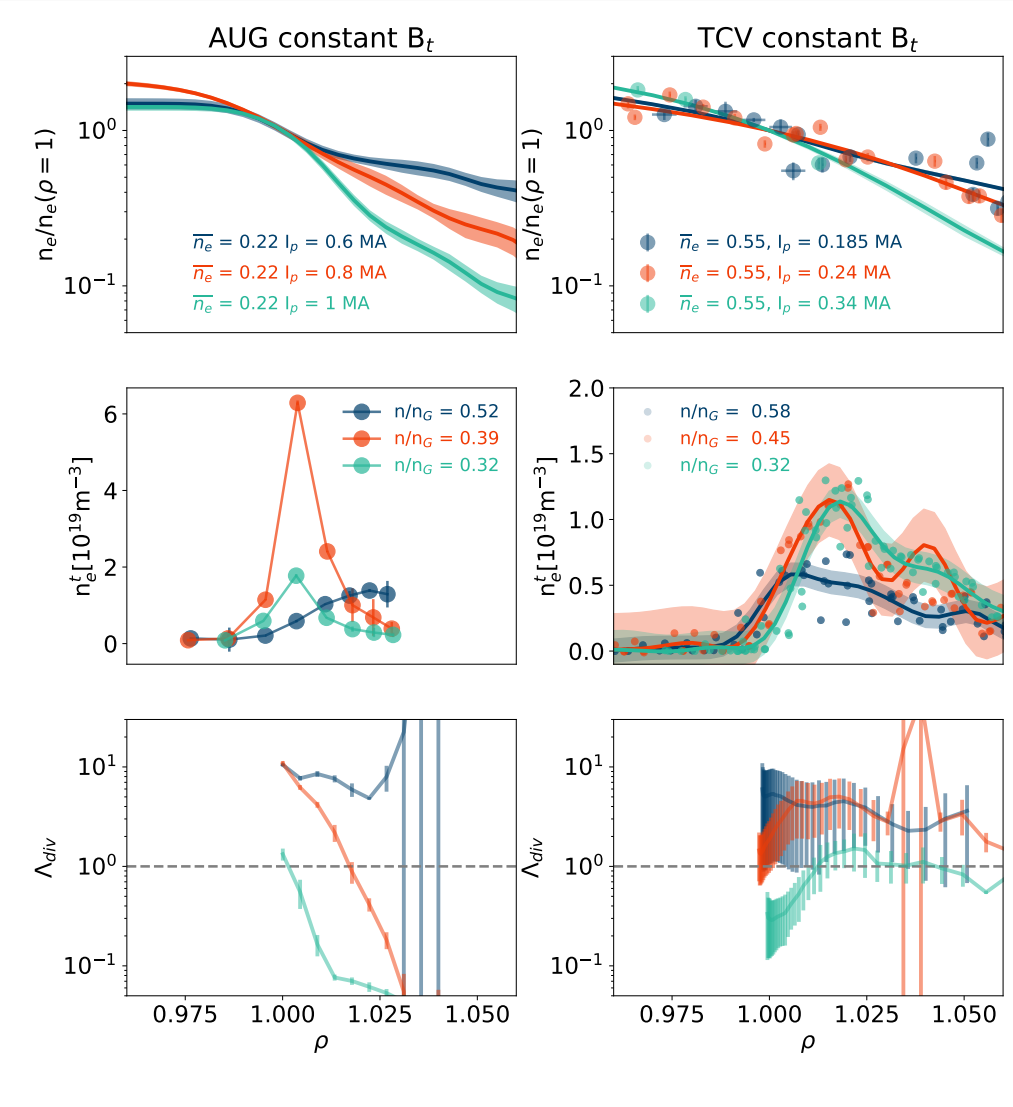
- ✓ Whenever considered as a a function of Greenwald fraction the behaviors at different currents almost reconciled for AUG but not for TCV

Current scan at constant B_t in L-Mode plasma



✓ We now consider the Target and upstream profiles at the same level of densities

Current scan at constant B_t in L-Mode plasma



- ✓ For both AUG and TCV flattening of normalized upstream profile reached earlier in density at lower current. For both the machine the increase of λ_n reached for larger values of Λ_{div}