SOL Filamentary transport: update from joint AUG-TCV MST1 experiment

presented by N. Vianello

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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 are foreseen for 2017-2018 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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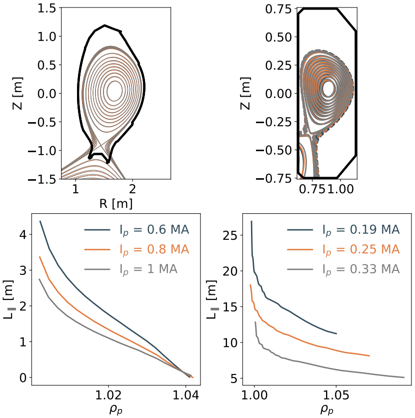
I will report only on few of the deliverables since part of them will be studied in forthcoming campaigns

Current scan at constant B_t



- ✓ Shape matched in within the single scan done for each of the machine
- ✓ The scan implies a modification of the $L_\parallel$. AUG exhibit a parallel connection length which is 5 times smaller then TCV

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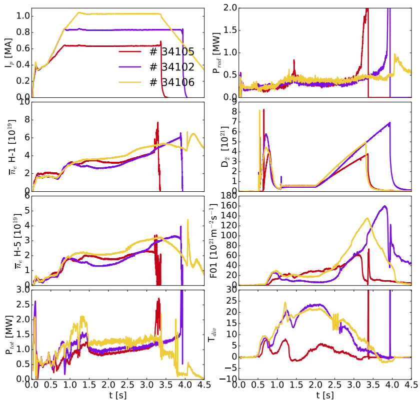
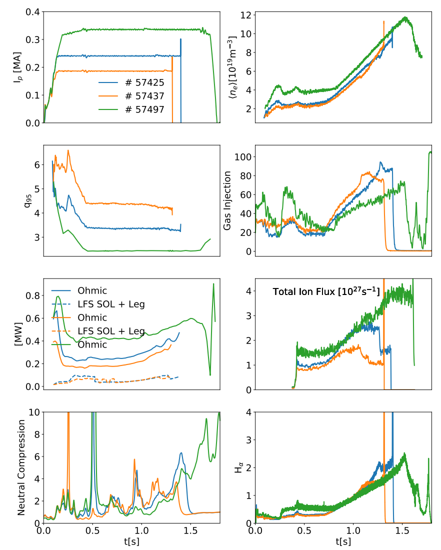


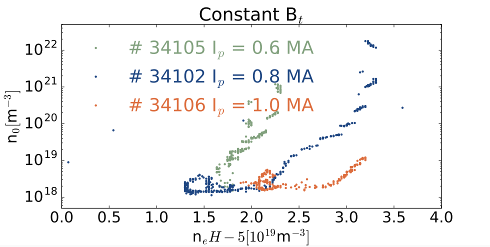
✓ AUG: Fueling reduced only at smaller current to avoid earlier disruption. Similar neutral pressure in the subdivertor region reached. NBI additional power added to keep power in the SOL approximately constant

Current scan at constant B_t



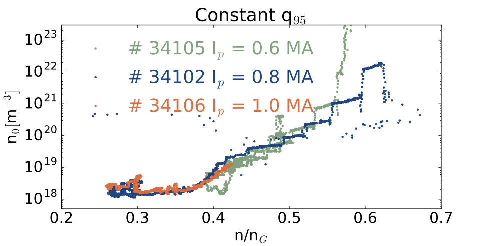
✓ TCV: Ohmic heating only. Similar neutral compression reached and D_α radiation from the floor.

Current scan at constant B_t



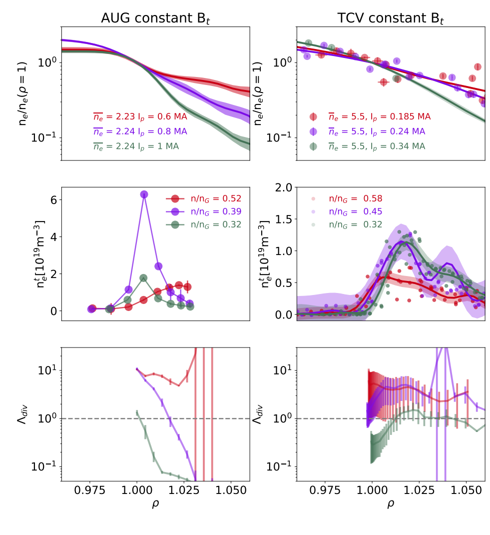
✓ Divertor neutral density estimated starting from D_α calibrated camera and using electron density and temperature from LP data. Neutral density increases earlier in edge density at lower current

Current scan at constant B_t



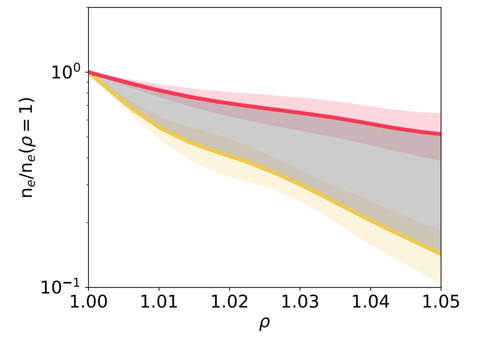
✓ Neutrals behavior reconciled whenever comparison considered as a function of Greenwald fraction

Current scan at constant B_t



- ✓ 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}

Current scan at constant B_t



- ✓ Quantifying profile evolution using the shoulder amplitude metric introduce by Wynn and Lipschultz for JET. Amplitude is the difference between normalized upstream density profiles