EUROfusion

# Filamentary transport in high-power H-mode conditions and in no/small-ELM regimes to predict heat and particle loads on PFCs for future devices

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**Include scientific team and logos**

# 2017 Top Objectives 12.12.2016

Deliverables listed during the call for manning of last December

1. Provide cross-machine L-Mode shoulder dependence on current both at constant $B_t$ and at constant $q_{95}$
2. Establish robust scenario for density shoulder profile in H-Mode and establish dependence on fuelling/neutral profiles/divertor conditioon
3. Use the new HHF probe 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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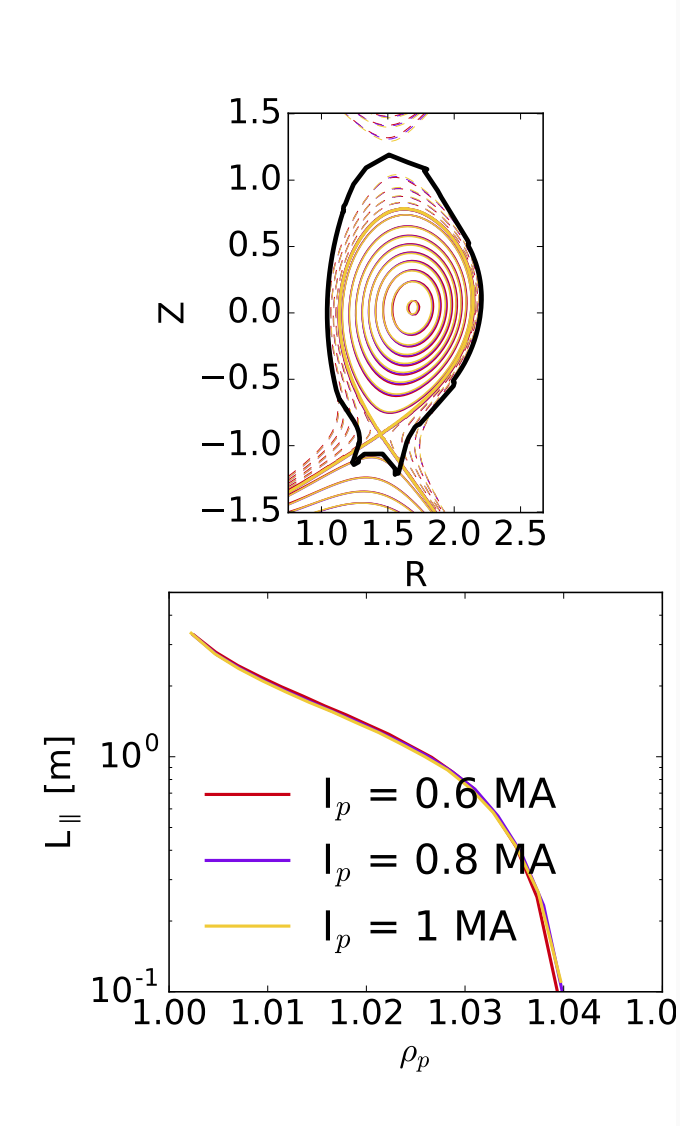
So far H-Mode operation has been limited to AUG since no operational scenarion in high-density NBH heated plasma on TCV has been established

# L-Mode analysis: $I_p$ scan at constant $q_{95}$




- ✓ AUG: All the shots were performed in the so-called Edge Optmized Configuration (EOC) shape
- ✓ AUG: We matched correctly the shape and the $L_{||}$ here shown from outer divertor plate up to X-point

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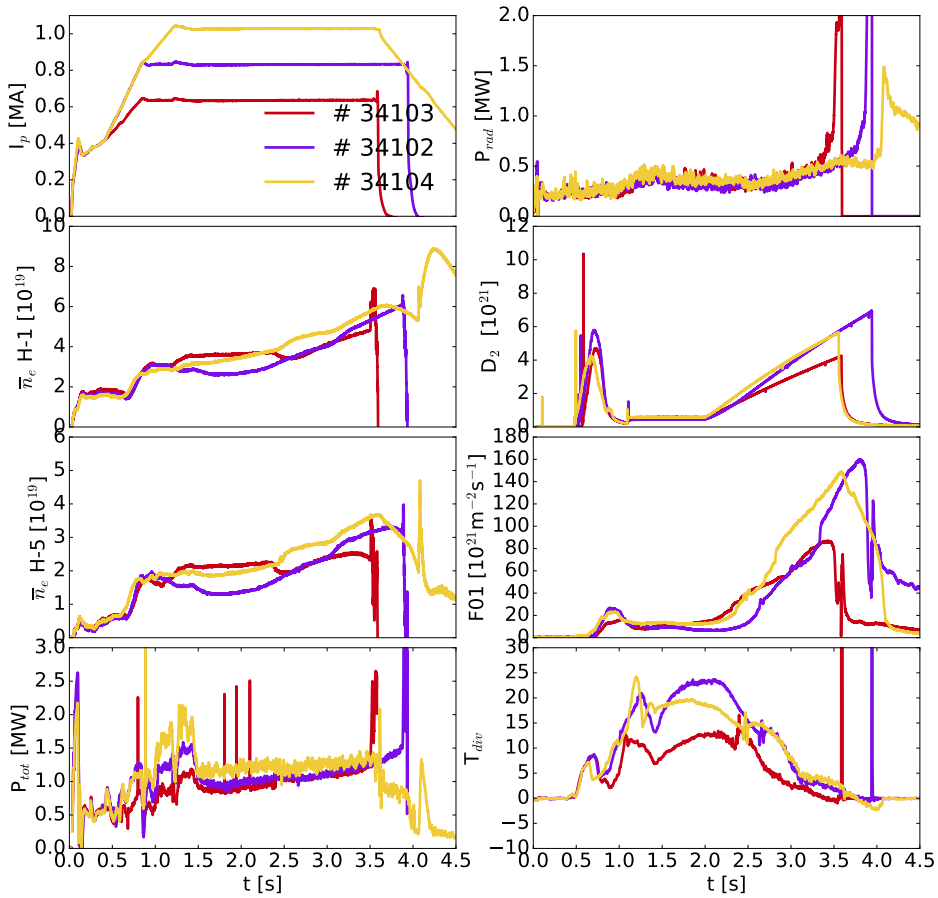


- ✓ AUG: The scan was performed with similar puffing rate (0.8-1 MA) whereas we reduced it at lower current to avoid early disruption
- ✓ AUG: The total power (Ohmic plus NBI) was kept constant throughout the scan
- ✓ AUG: We have comparable edge density, divertor neutral pressure and divertor temperature

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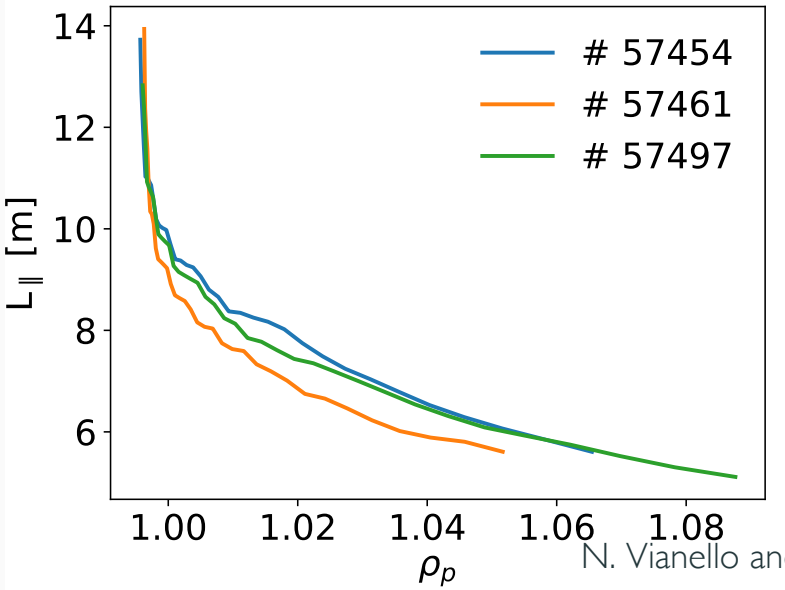


- ✓ TCV: We repeat the same excercise at TCV with a slight difference in the profile of parallel connection length. This required operation at unusual low toroidal field (up to 0.8T)

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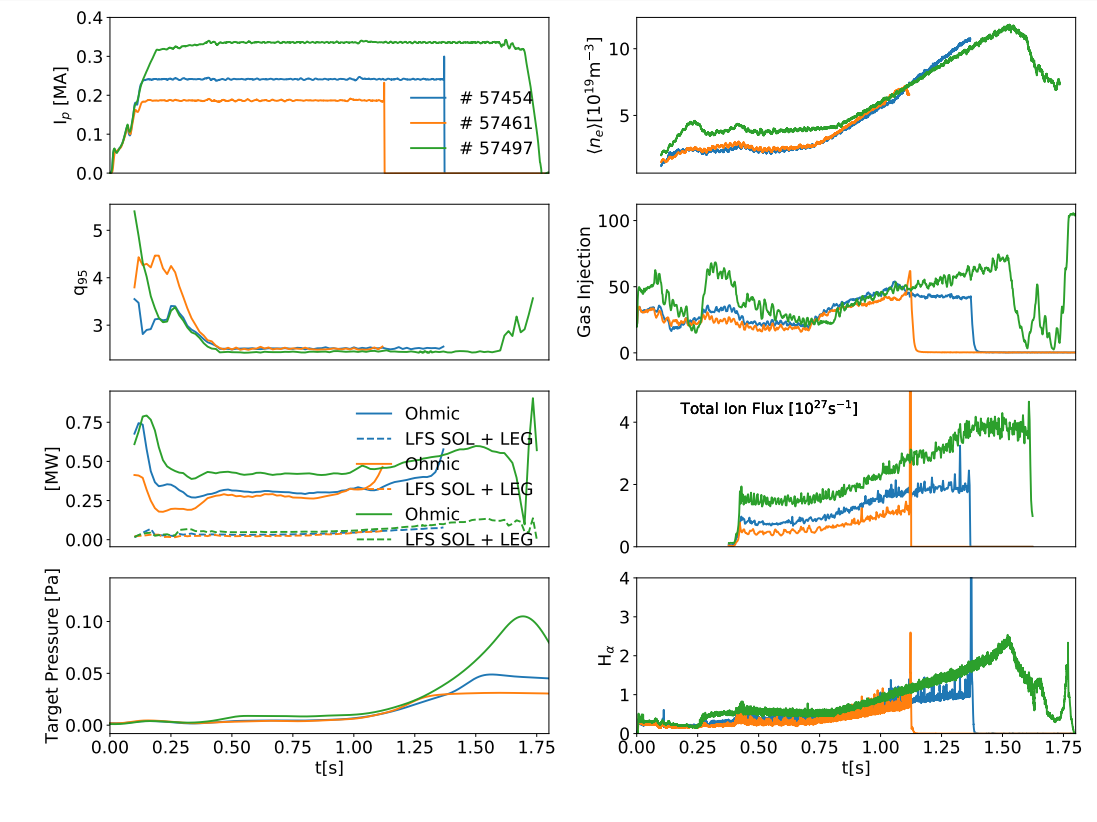


- ✓ TCV: no additional heating used. Nevertheless the difference in power crossing the separatrix is small
- ✓ TCV: The difference in target pressure similar to AUG behavior

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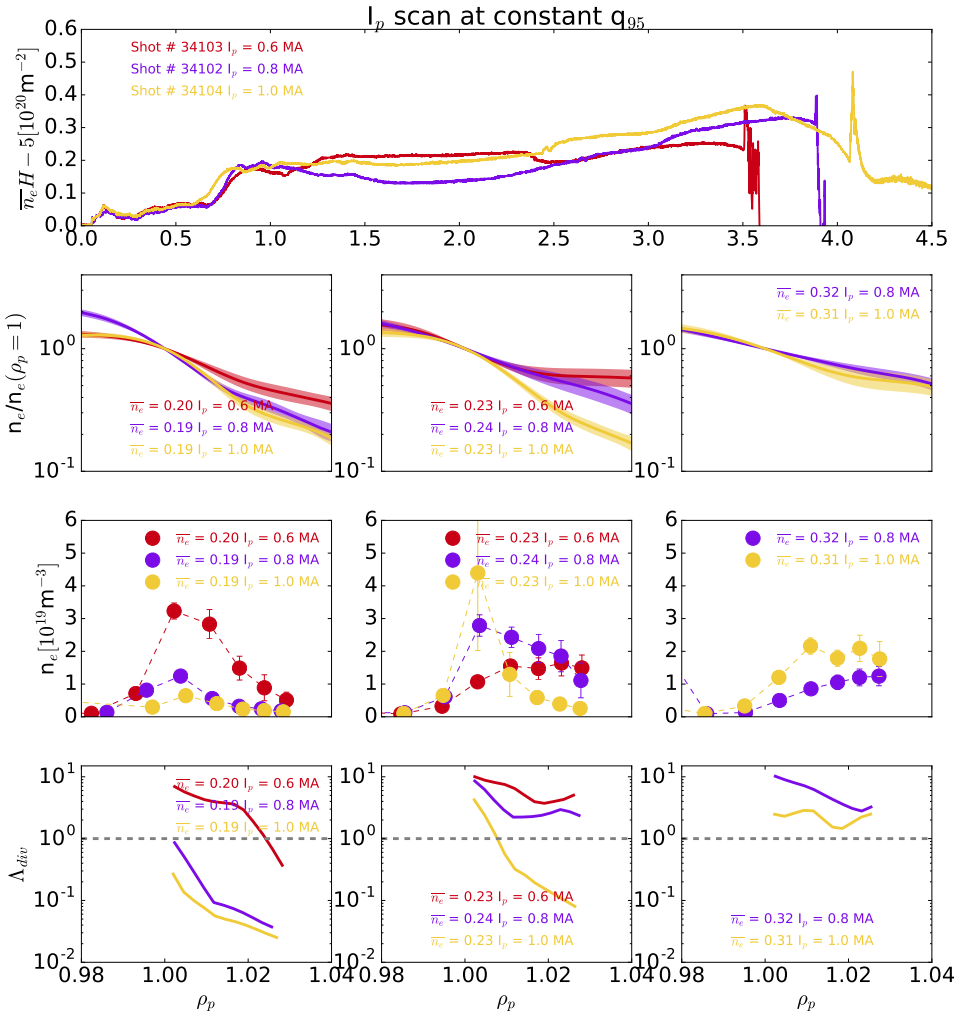


- ✓ AUG: At comparable edge density Upstream profiles are different with the tendency to develop shoulder easier at lower current

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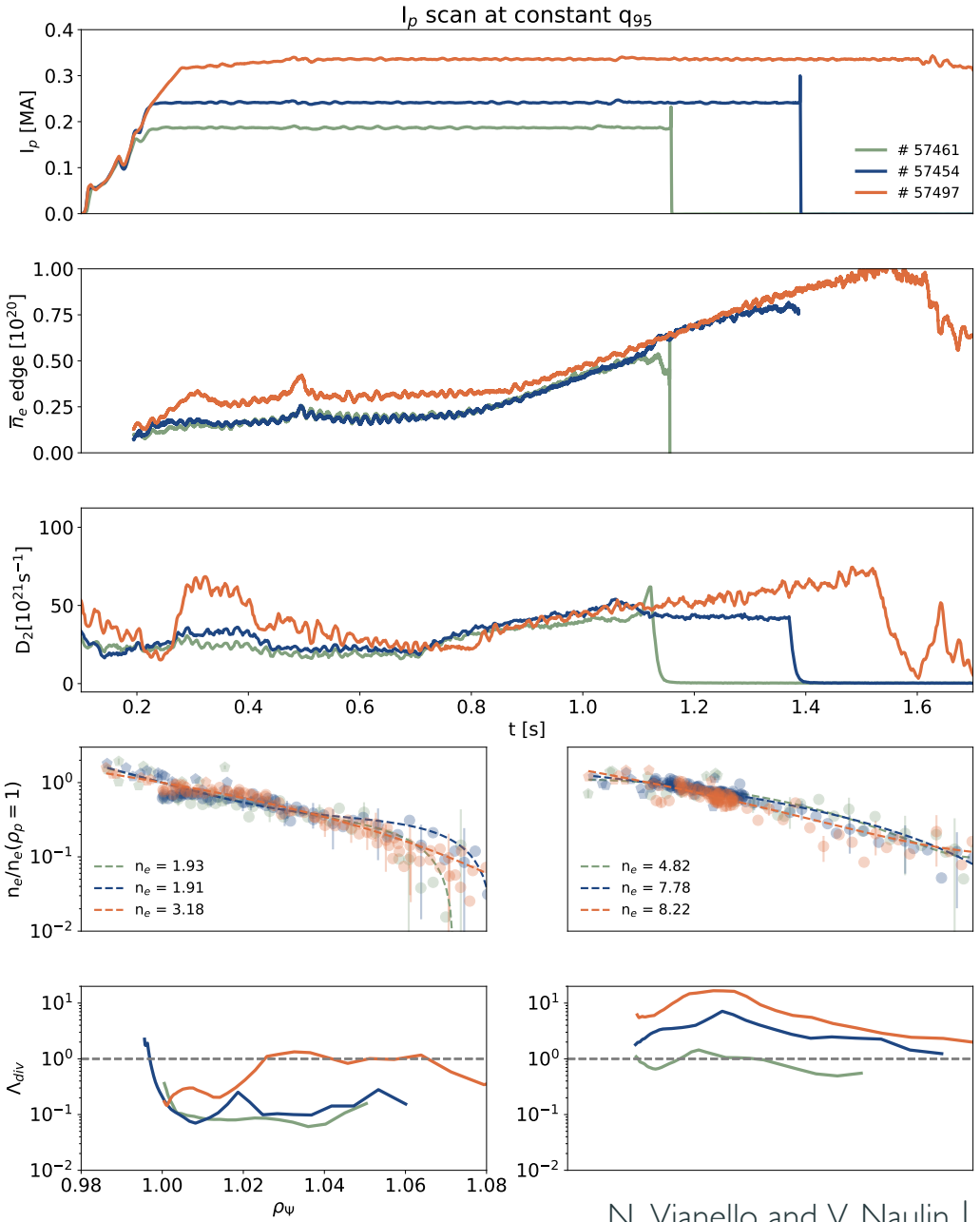


✓ TCV: This tendency is not observed for TCV where profiles seem resilient to modification of Bt.

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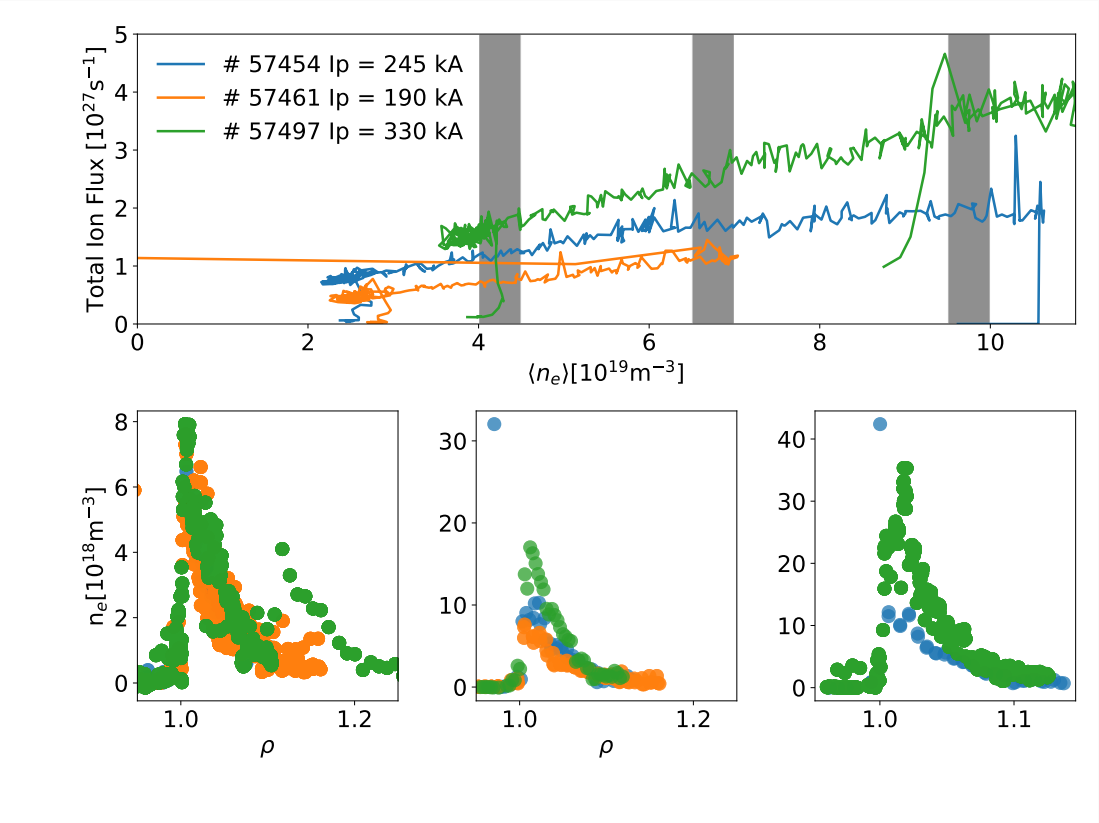


- ✓ TCV: This is due to the fact that we can't observed during the density ramp any signature of rollover or detachment, whereas upstream profile modification at TCV are only observed well after rollover