



Topic 21: 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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N. Vianello for the Topic 21 Scientific Team

08 May 2017



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# Scientific team



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# Objective of Week 17 campaign



- ✓ Check shoulder formation and filamentary transport behavior at different current keeping  $q_{95}$  constant in L-Mode

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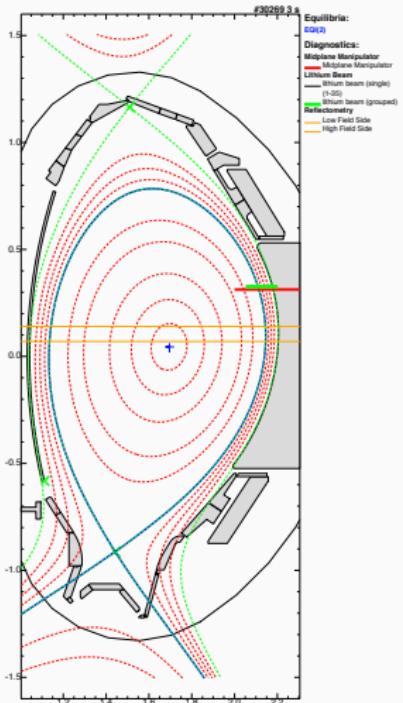
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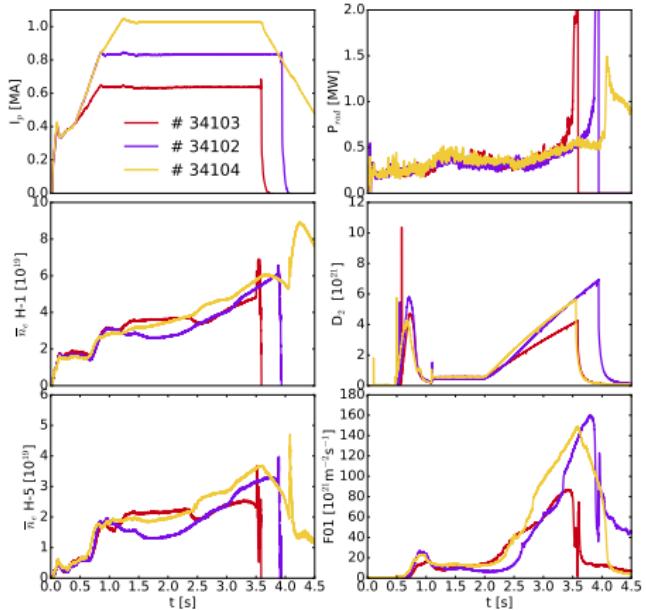
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- ✓ Check shoulder formation and filamentary transport behavior at different current keeping  $B_t$  constant in L-Mode
- ✓ Find suitable H-Mode scenario at *high power* (compatible with probe operation) for shoulder behavior and filamentary transport studies in H-Mode

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



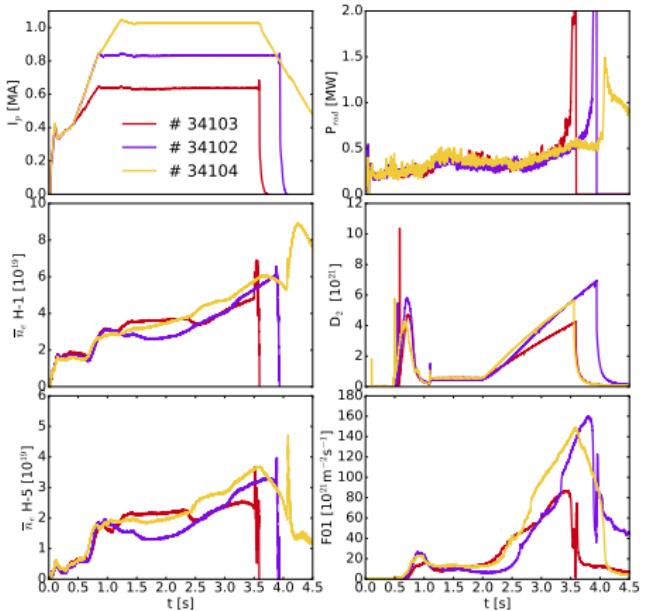
- ✓ Reference shot with **EOC** Shape, 0.8MA,  $B_\phi = -2.5$  T, 0.5MW NBI heating, fueling in order to keep heating approximately constant during the current scan

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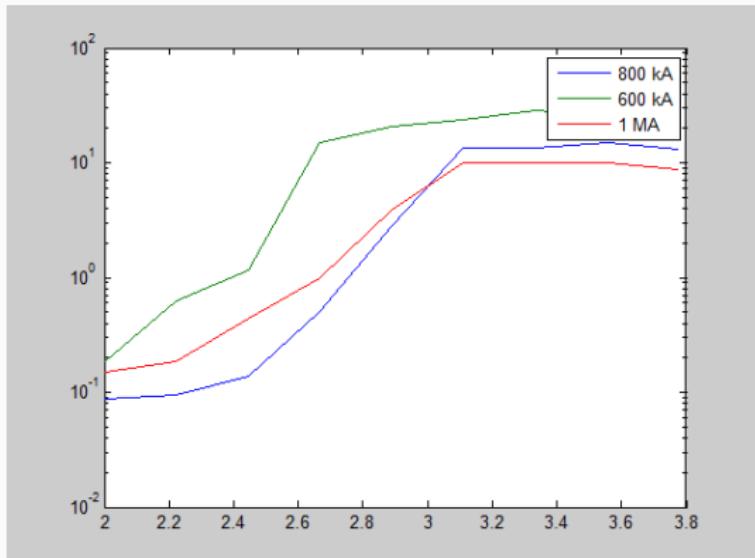
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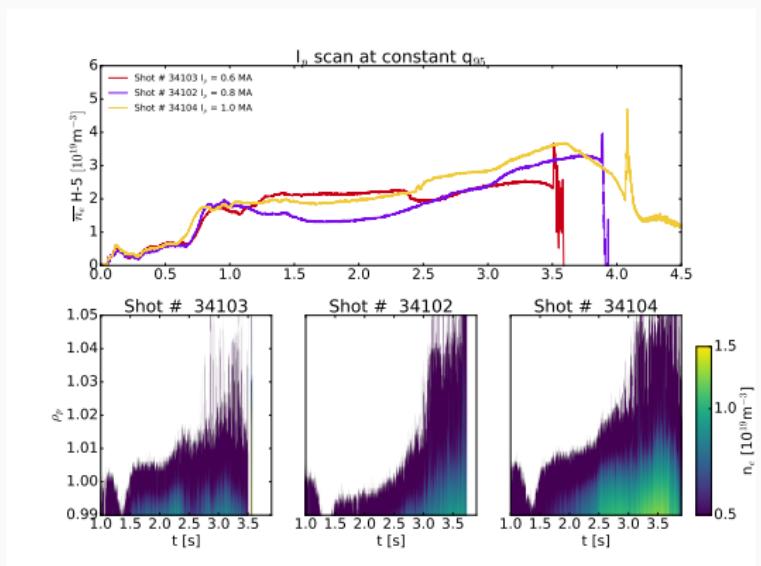
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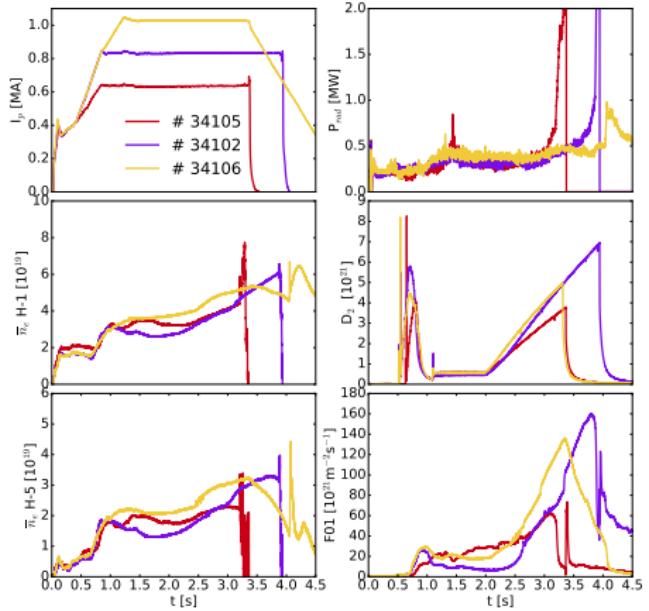
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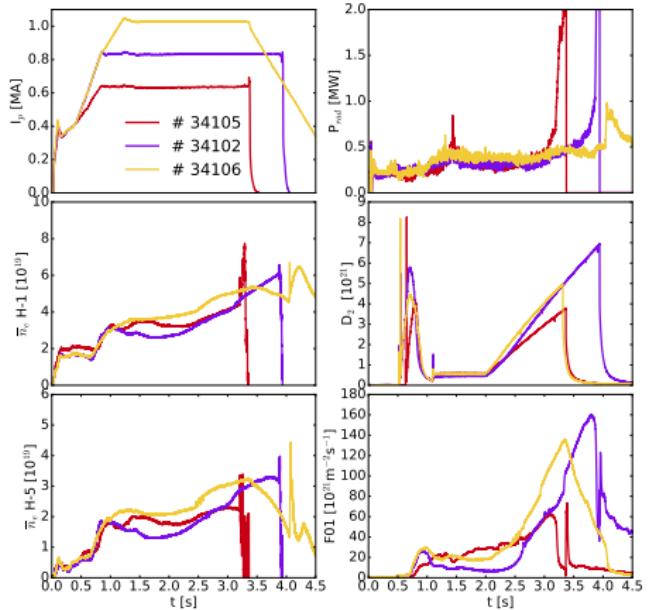
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- ✓ During the discharge complete scan of  $\Lambda_{div}$  from well below to well above I.
- ✓ In all the cases the profiles evolve and tends to become flatter. Preliminary indication suggest this occurs at similar  $\Lambda_{div}$

# L-Mode: Current scan at constant $B_t$



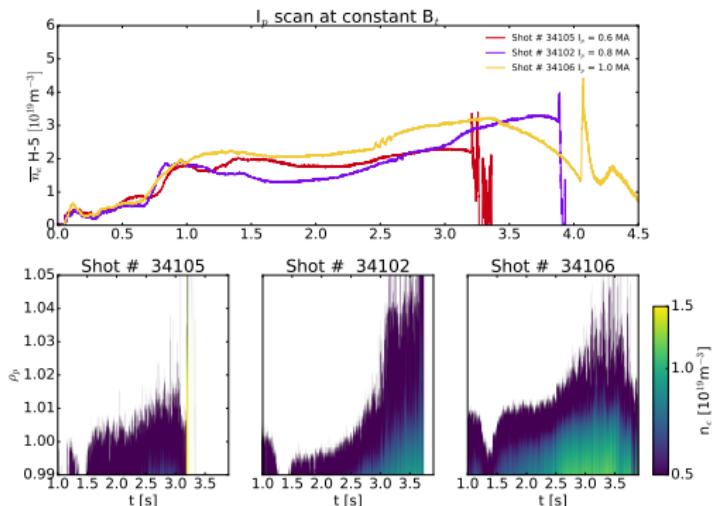
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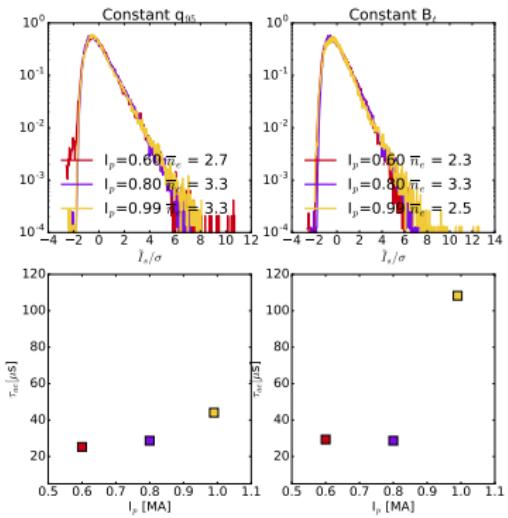
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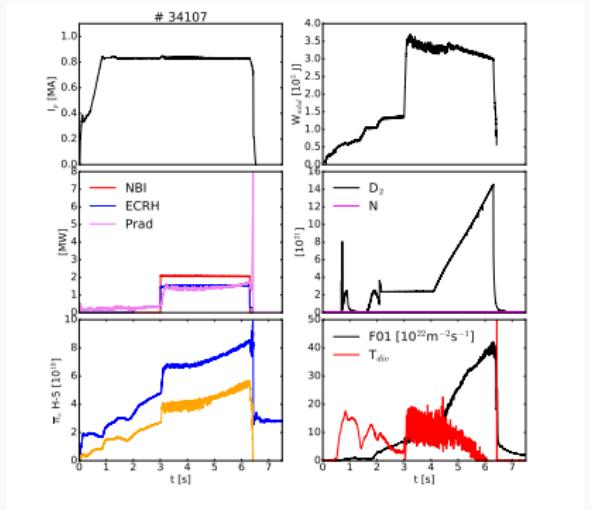


- ✓ The fueling has been reduced at lower current for not encountering disruption too early
- ✓ Up to 3 seconds 0.6 and 0.8 MA discharges exhibits close edge and core density as well as neutral pressure from gauges under the dome
- ✓ In all the cases the profiles evolve and tends to become flatter. Work in progress to evaluate development as a function of divertor collisionality  $\Lambda_{div}$

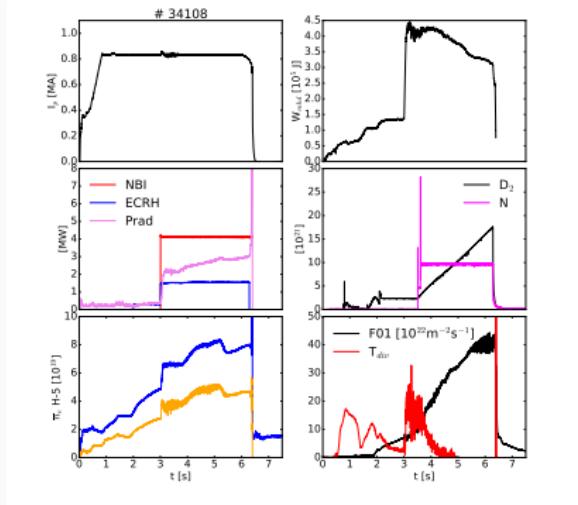
# Fluctuations



# H-Mode

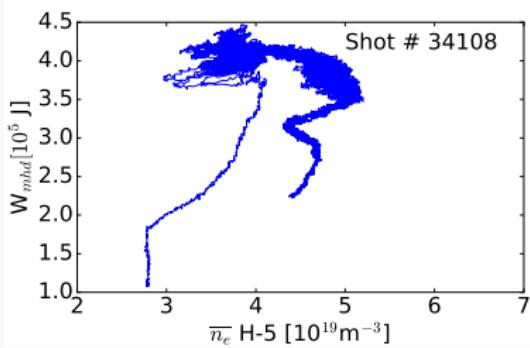


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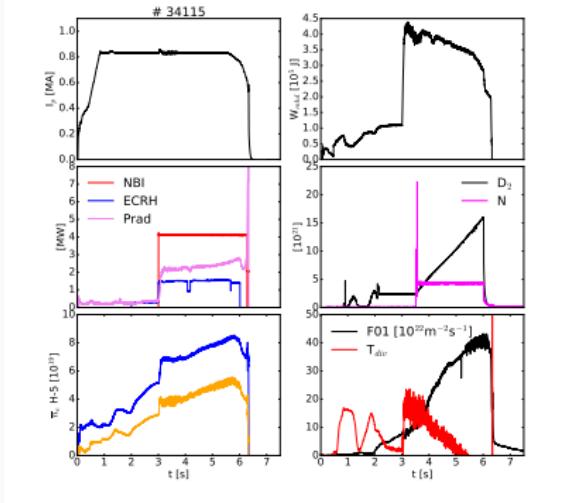
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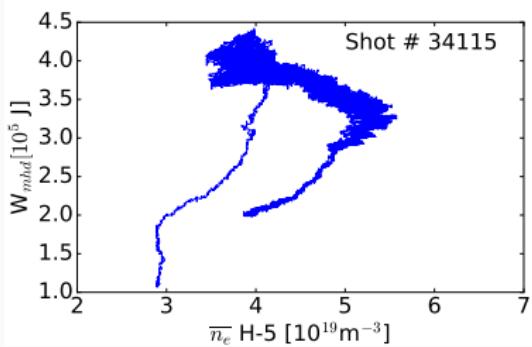


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- ✓ We end up in a degraded H-Mode with all the 4 phases. Fluctuations from MEM available in all the phases

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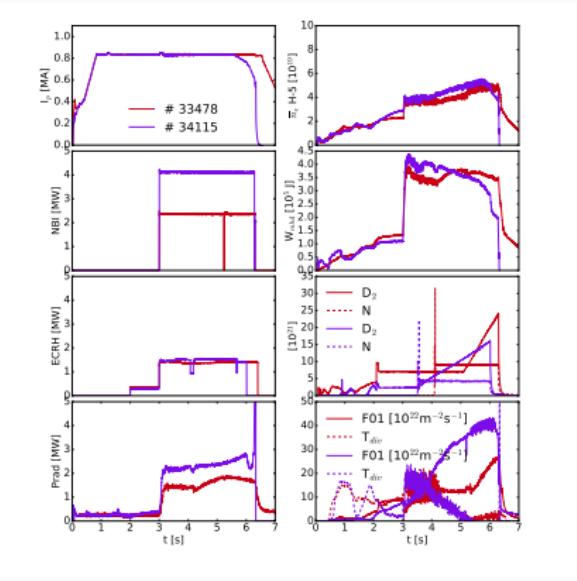


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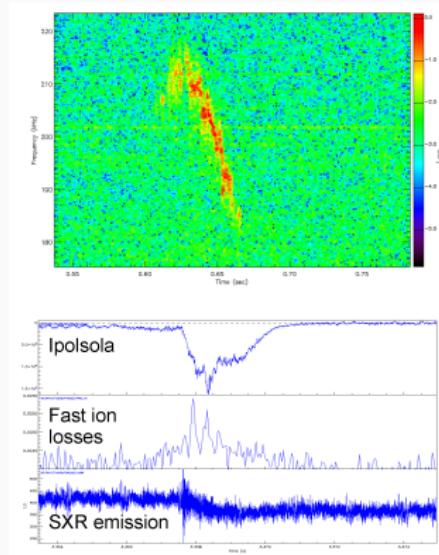
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- ✓ In this cases we still encounters a degraded H-Mode but without all the phases
- ✓ With respect to the reference we achieve higher power and higher neutral pressure in the divertor. We will need to adjust once the cryopump will operate in the next session

# Fast particle acceleration



- ✓ L-mode shots: no evidence of electron or ion acceleration during flat-top, but TAE excitation (top) & neutron time traces during current ramp-up in three shots suggest bulk ion acceleration
- ✓ H-mode shots: many examples found of SXR spikes from plasma edge at start of ELMs → electron acceleration), although enhancements are less dramatic than in earlier H-mode pulses with lower pedestal  $\nu^*$  (lower plot)
- ✓ ELMs also linked to enhanced fast ion losses, as in previous H-mode pulses – not yet clear whether beam ions are accelerated during ELMs, but fast ion loss detector settings will be optimised in remaining pulses of this experiment

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