



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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20 September 2017



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.

Summary of the campaigns



- ✓ L-Mode experiment, Calendar week 17. It will constitute baseline scenarios to be replicated on the other MSTI devices. **Operation without cryopumps**
 - 1. Performed similar density ramps in an I_p scan at constant q_{95}
 - 2. Performed similar density ramps in an I_p scan at constant B_t
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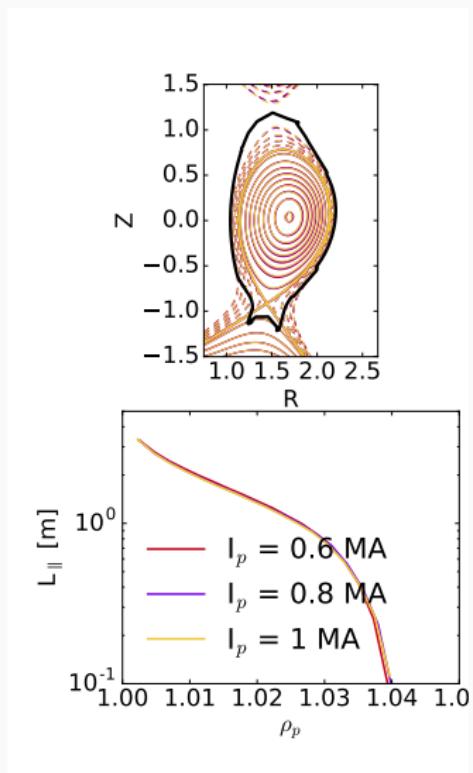
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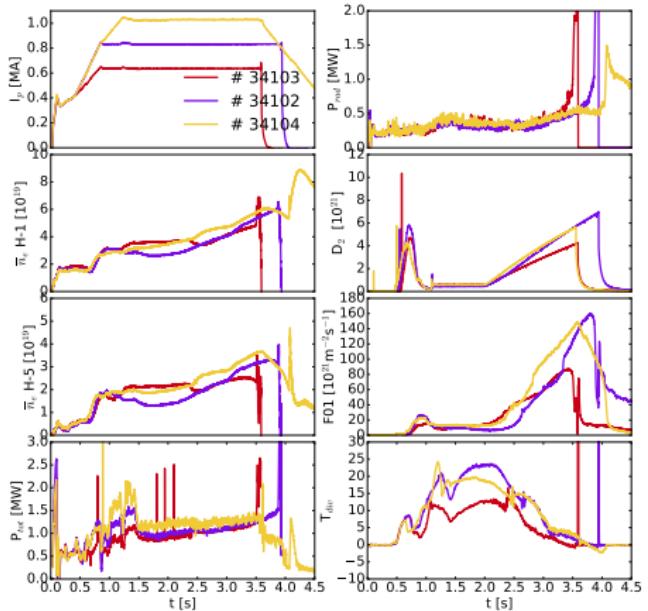
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L-Mode analysis: I_p scan at constant q_{95}



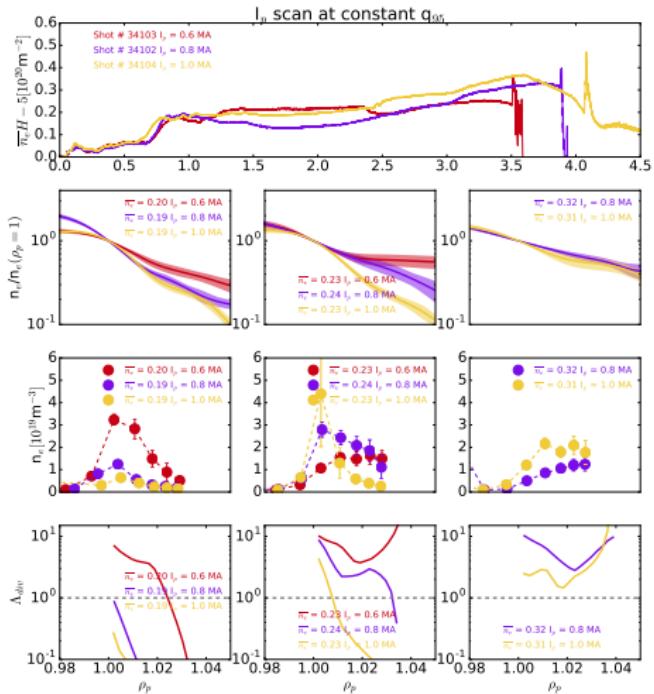
- ✓ All the shots were performed in the so-called Edge Optimized Configuration (EOC) shape
- ✓ We matched correctly the shape and the L_{\parallel} here shown from outer divertor plate up to X-point

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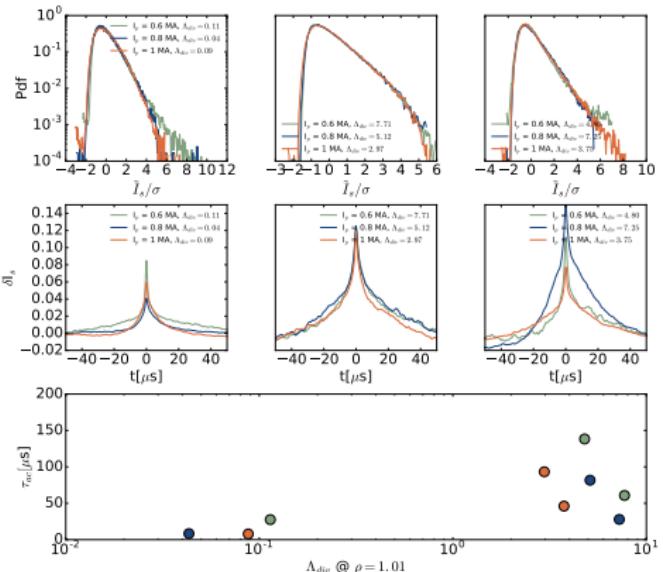
- ✓ The scan was performed with similar puffing rate (0.8-1 MA) whereas we reduced it at lower current to avoid early disruption
- ✓ The total power (Ohmic plus NBI) was kept constant throughout the scan
- ✓ We have comparable edge density, divertor neutral pressure and divertor temperature

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



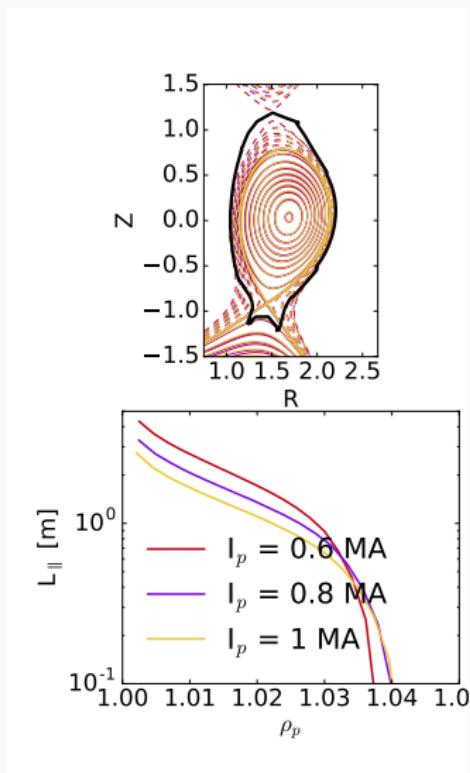
- ✓ At comparable edge density Upstream profiles are different with the tendency to develop shoulder easier at lower current
- ✓ Still need to provide detail evolution of edge profiles as a function of Λ_{div} which are different at different current although same $L_{||}$

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



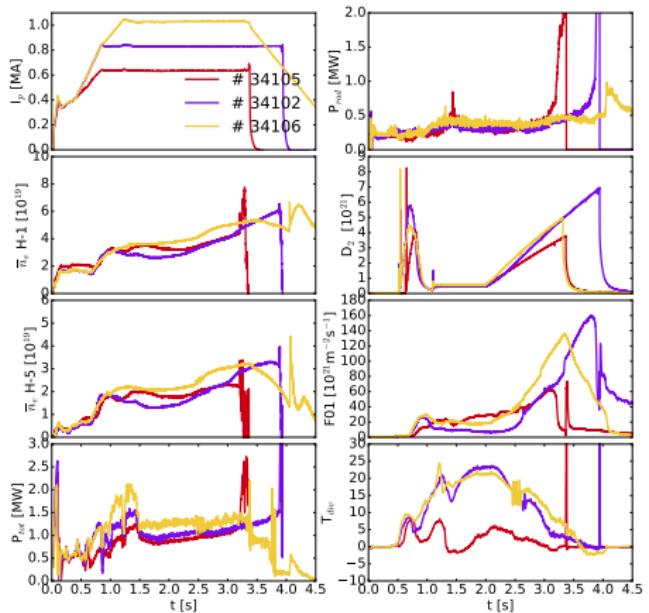
- ✓ No sensible difference of PDFs of J_{sat} at different current even though obtained at different values of Λ_{div} .
- ✓ Autocorrelation time τ_{ac} increases with Λ_{div} without sensible difference among the current

L-Mode analysis: I_p scan at constant B_t



- ✓ We matched correctly the shape the parallel connection length L_{\parallel} is modified consistently

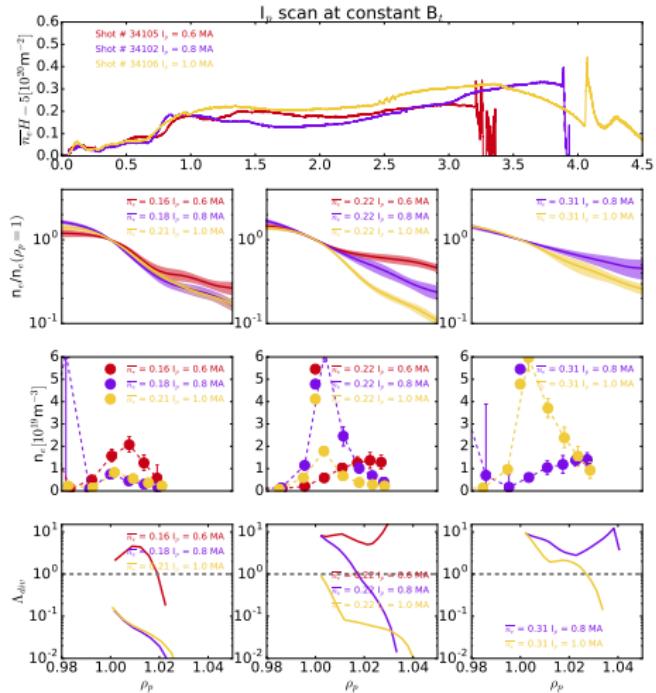
L-Mode analysis: I_p scan at constant B_t



- ✓ The scan was performed with similar puffing rate (0.8-1 MA) whereas we reduced it at lower current to avoid early disruption
- ✓ We have comparable edge density and divertor neutral pressure even though pressure increase earlier at higher current

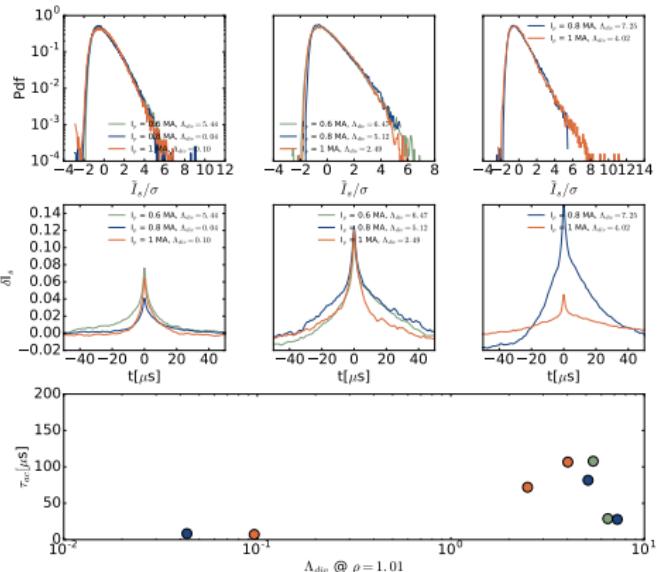


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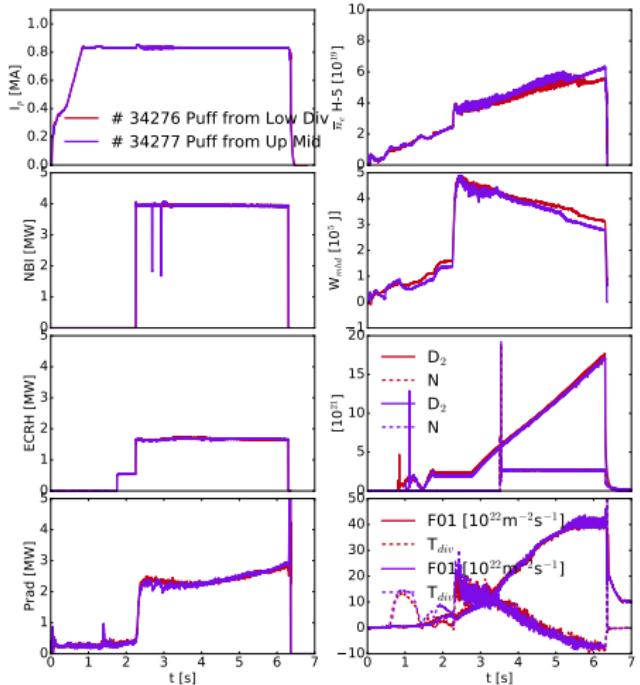
L-Mode analysis: I_p scan at constant B_t



- ✓ No sensible difference of PDFs of J_{sat} at different current even though obtained at different values of Λ_{div} .
- ✓ Remarkable difference in the shape of typical structure, even though τ_{ac} follow usual trend apart from very last points. **To be double-checked**

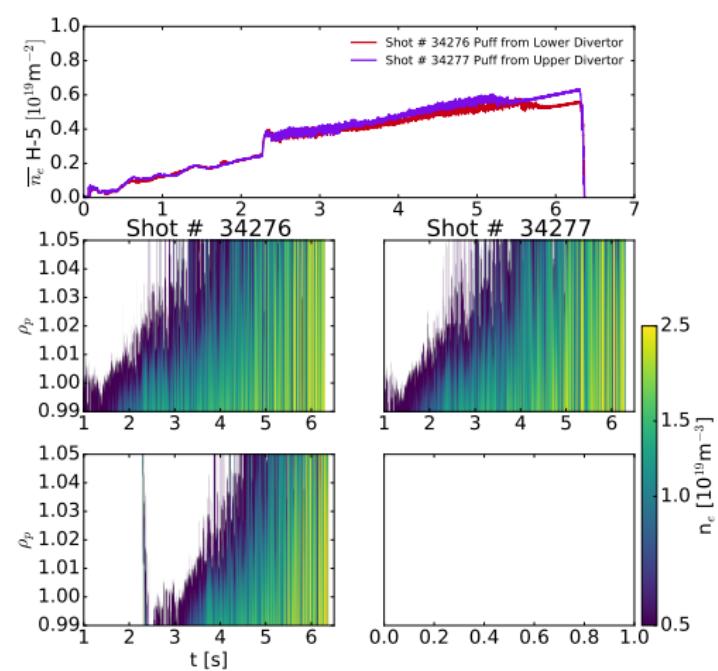


H-Mode investigation: puffing location



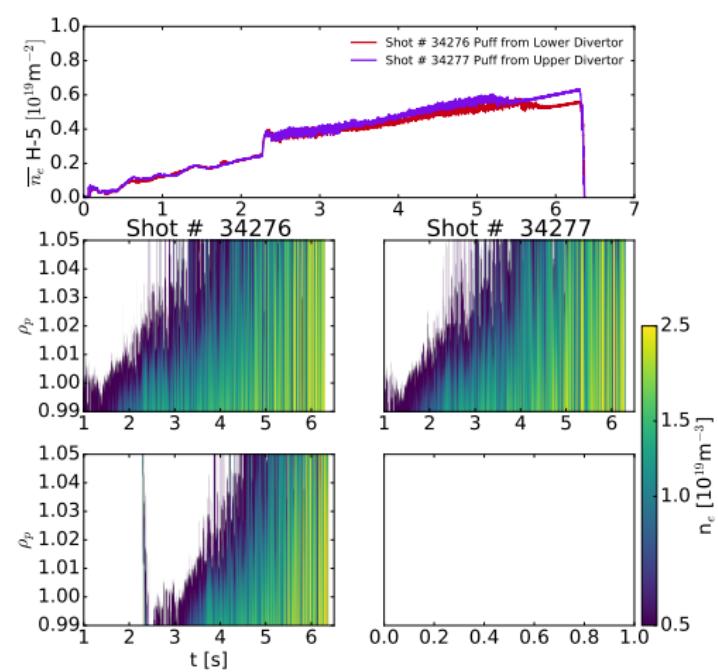
- ✓ Similar puff from Lower and Upper divertor valves (we asked for divertor/midplane valves)

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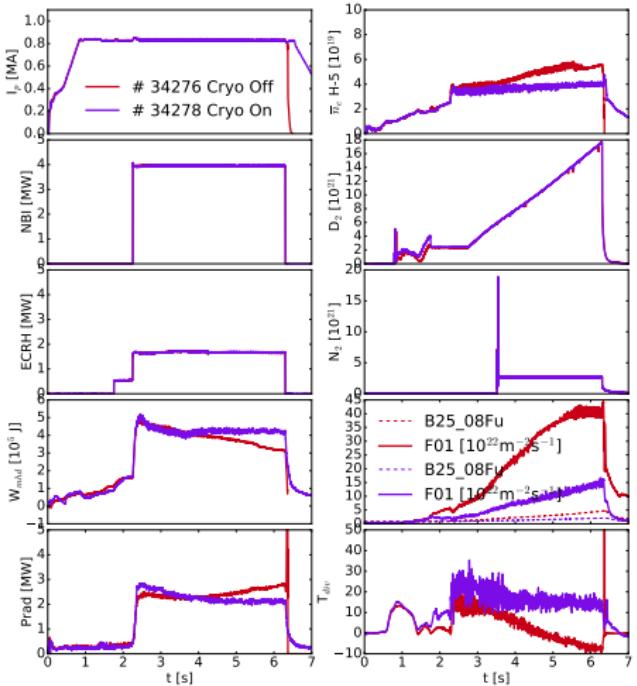
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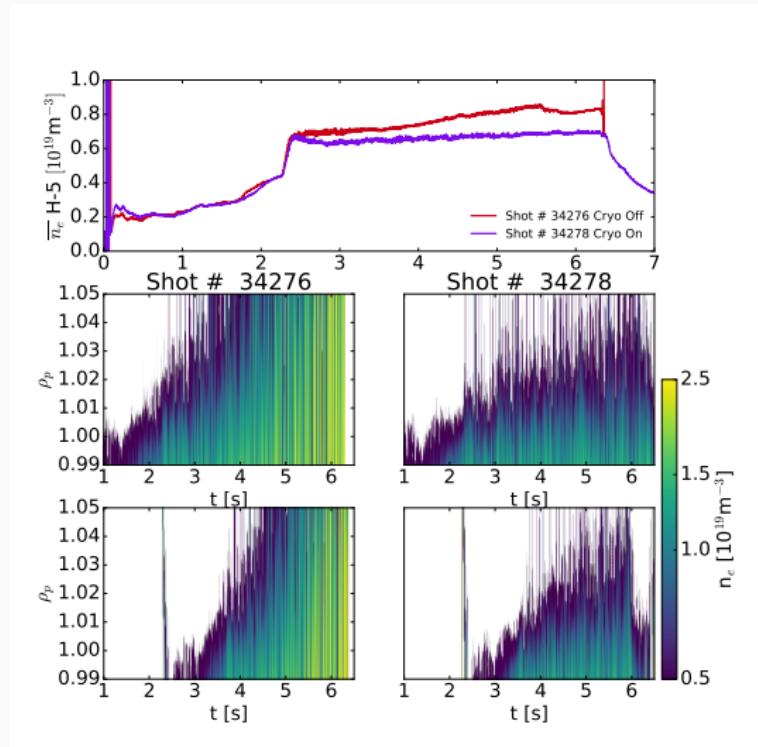
- ✓ Similar puff from Lower and Upper divertor valves (we asked for divertor/midplane valves)
- ✓ Edge density profiles from Li-Beam evolution are pretty similar
- ✓ Similar behavior observed from RIC Antenna 4 for the available shot

Compare Similar fueling with/without cryopumps



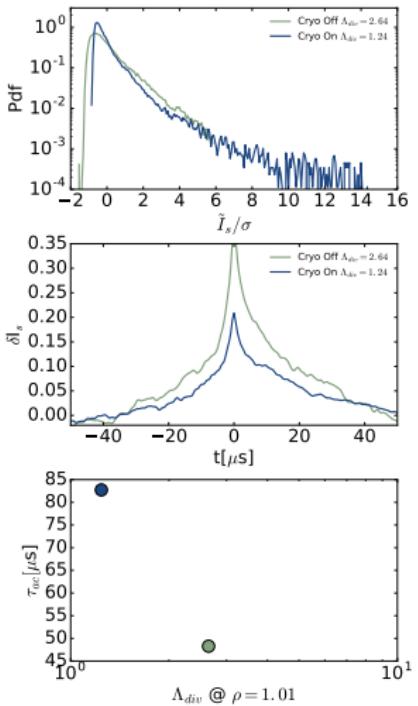
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- ✓ Also with this amount of fueling no instance of SOL saturation observed as confirmed by Li-Beam and by RIC (Antenna 4)

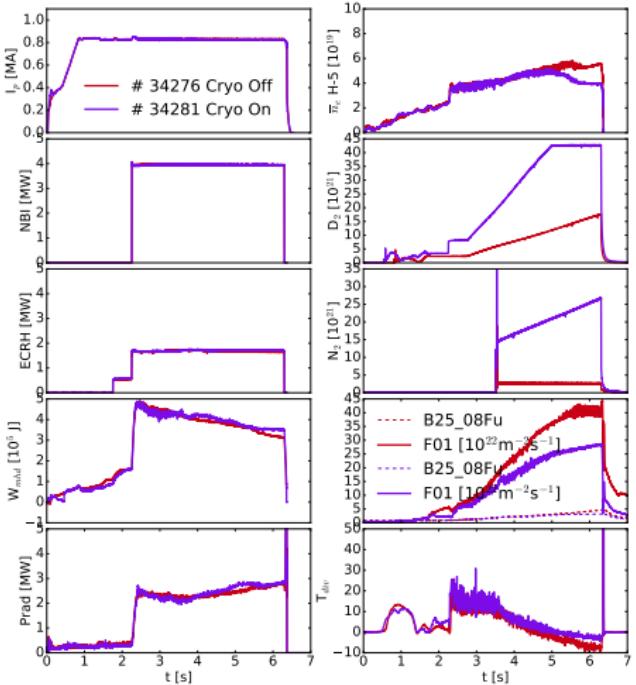
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- ✓ Comparison of fluctuations during the plunge at higher density (**ELM included**) reveal differences in fluctuations. **ELM resolved measurement to be properly done**

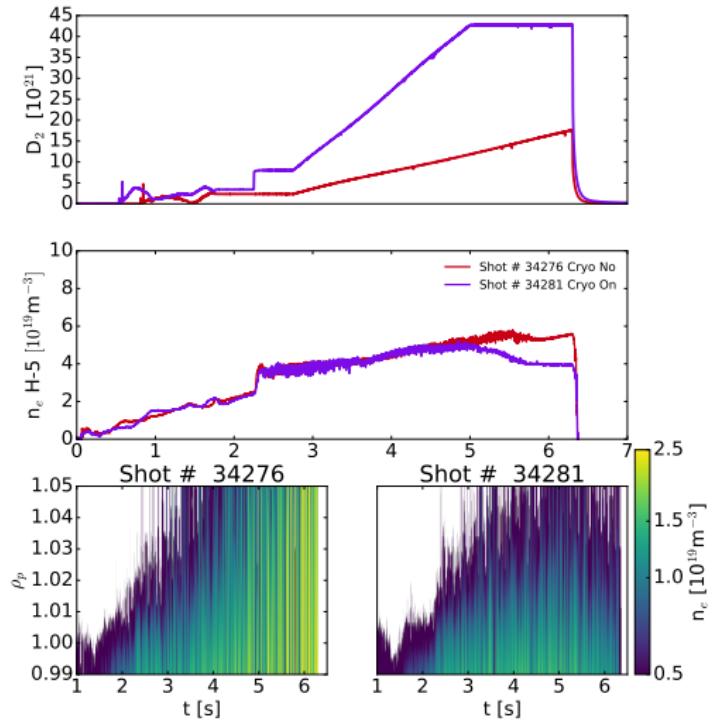


Matching scenarios with cryo-pumps



- ✓ To match similar edge density and divertor pressure and to reach the same level of detachment we increase the fueling by almost a factor of 3, increasing also the rate. In addition to that we also increase substantially the N puffing

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- ✓ Without cryopumps evidence of stronger SOL profile flattening from Li-Be. **To be compared with appropriate variation of Λ_{div}**

What is missing



1. RIC profiles with possible poloidal variation among the antennas in particular in H-Mode. **To be done**
2. Li-Be ELM resolved profile variation with Λ_{div} **To be done**
3. Li-Be fluctuations **To be done**
4. Structures size and velocities in L-Mode **In progress**
5. Radiation front movement **In progress**
6. Can we have from stark-broadening the movement of density front towards the X-Point **To be done, maybe not feasible**
7. Neutrals analysis from D_α camera **In progress**
8. Fast-camera **To be done**
9. Other?



Just a brainstorming exercise so far

- ✓ X-point probe. Realistically there should be man-power for proper operation and we need information below the midplane before entering the divertor region
- ✓ NPH evaluation of Ti
- ✓ Parallel and perpendicular momentum variation at high density. We already know there is a change in the perpendicular flow to be complemented with parallel flow as well
- ✓ Divertor modification? I guess SP movement is not feasible in AUG but keeping the SP at the same position and moving the X-point (vertically/radially) can induce some modification?
- ✓ Increasing the density through pellet is feasible?
- ✓ Isotope effect? In case campaign is foreseen we could change parallel flow and recycling (?)