EUROfusion

Topic 21: AUG experiment analsysis meeting

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Summary of the campaigns

- ✓ L-Mode experiment, CW 17.
  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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- ✓ L-Mode experiment, CW 17.
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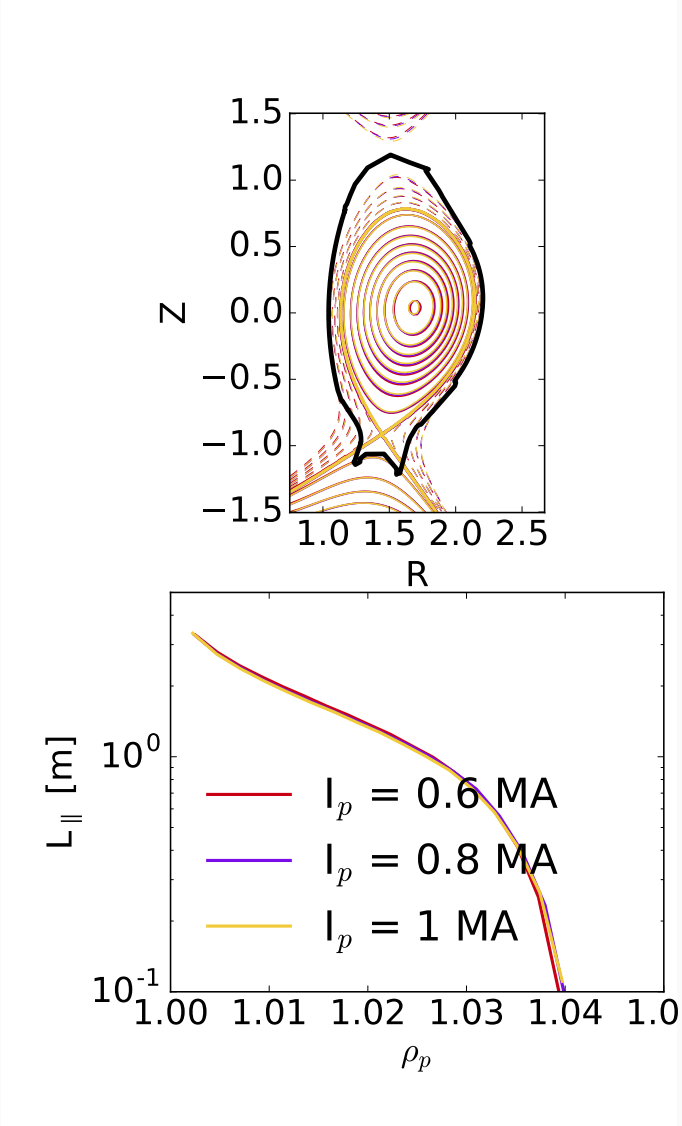
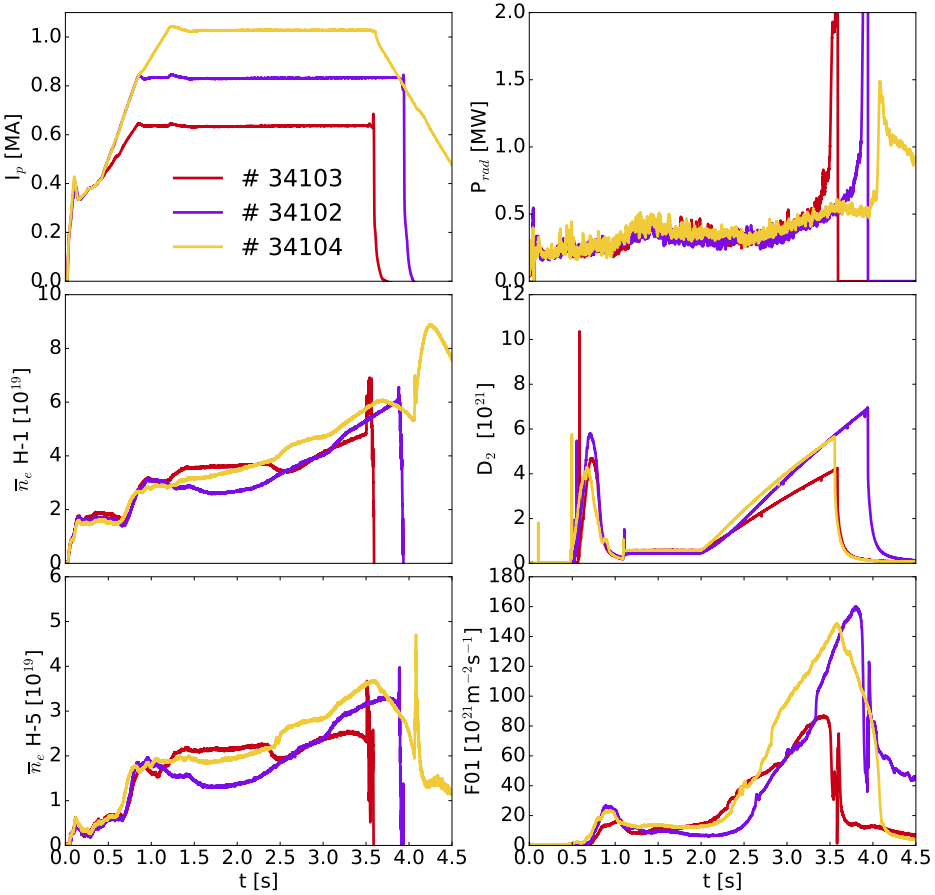
  2. Performed similar density ramps in an I_p scan at constant B_t
- ✓ H-Mode experiment, CW 21.
  1. Compare divertor/midplane fueling effect on filamentary transport and profiles without cryo-pumps
  2. Compare profiles with the same fueling with/without cryopums
  3. Determine an H-Mode with the cryopumps matching similar divertor pressure and SOL profiles

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



✓ We matched correctly the shape and the $L_{||}$ here shown from outer divertor plate up to X-point

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



- ✓ 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

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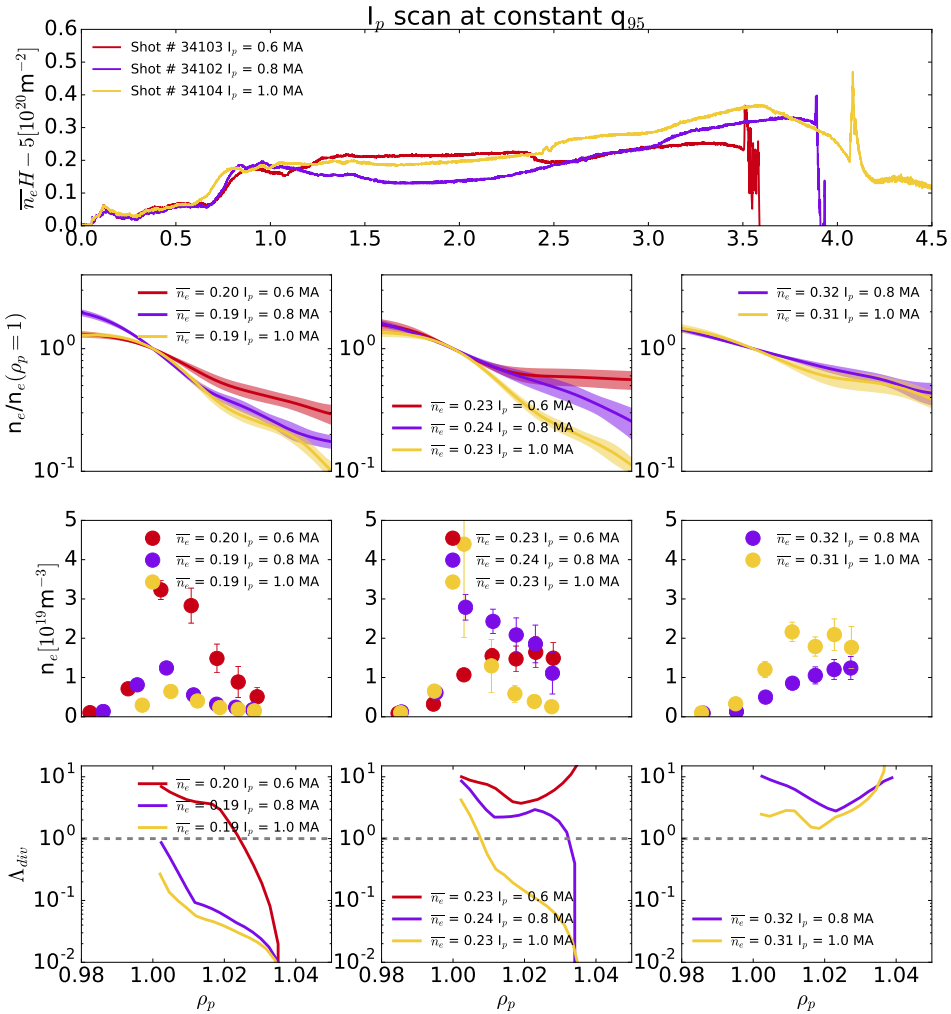
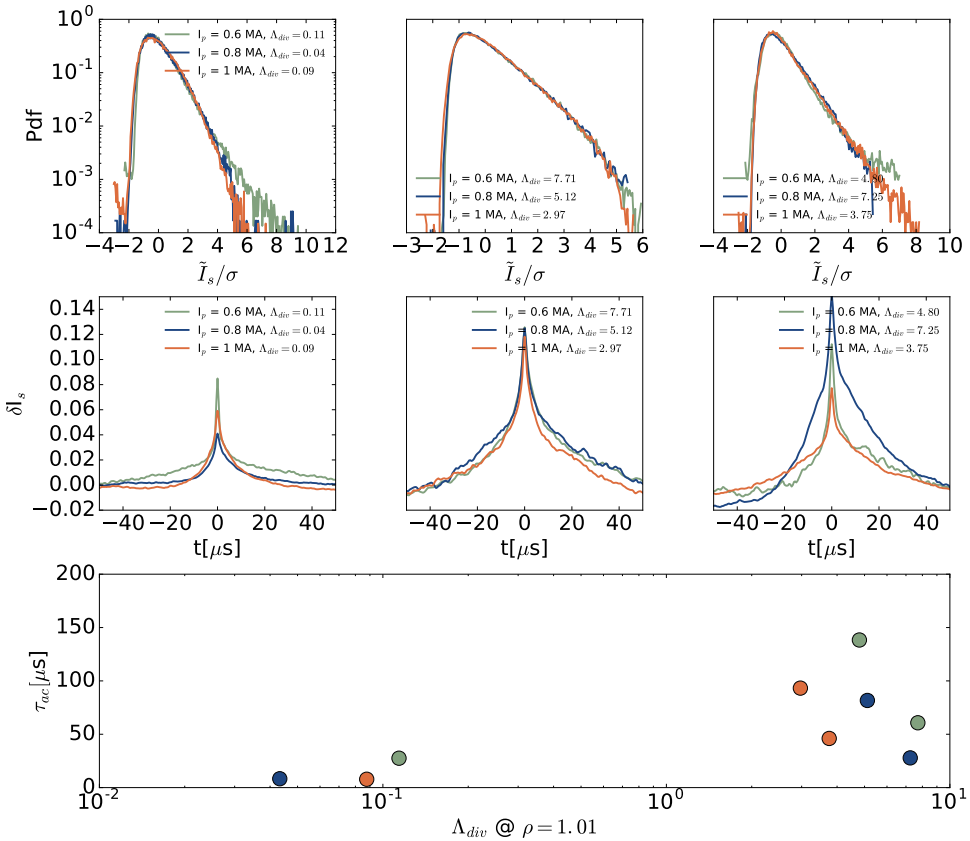


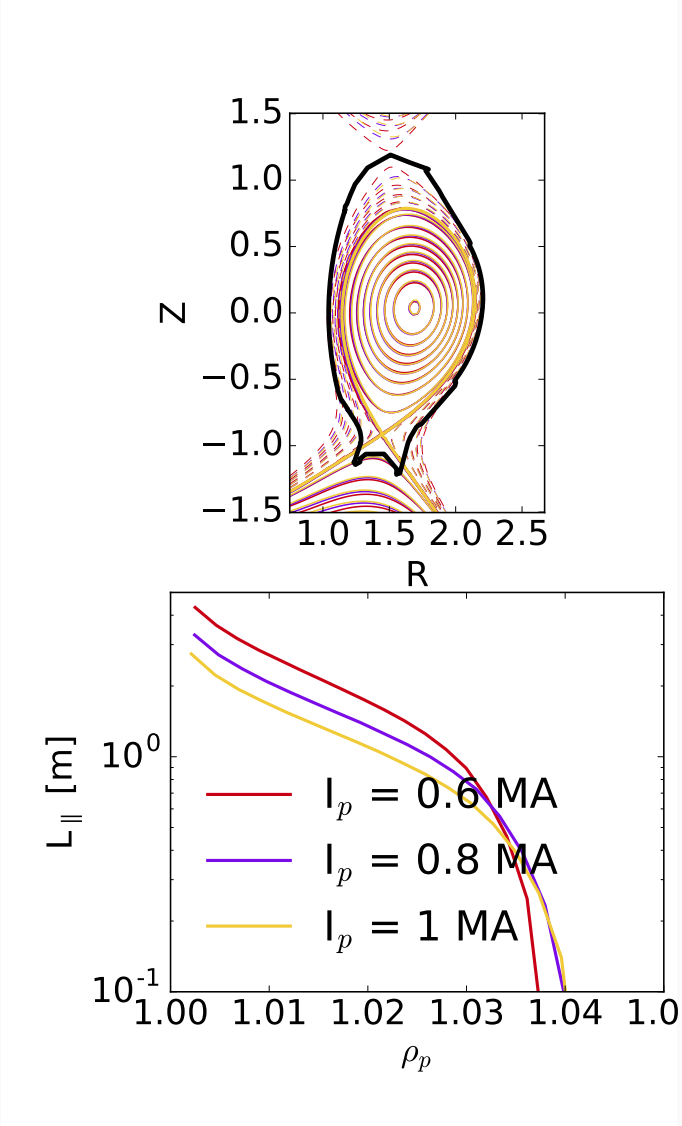
- ✓ At comparable edge density Upstream profiles are different with the tendency to develop shoulder easier at lower current
- ✓ Still need to provide detail evolution of edge profiles as a function of Λ_{div} which are different at different current although same $L_{||}$

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



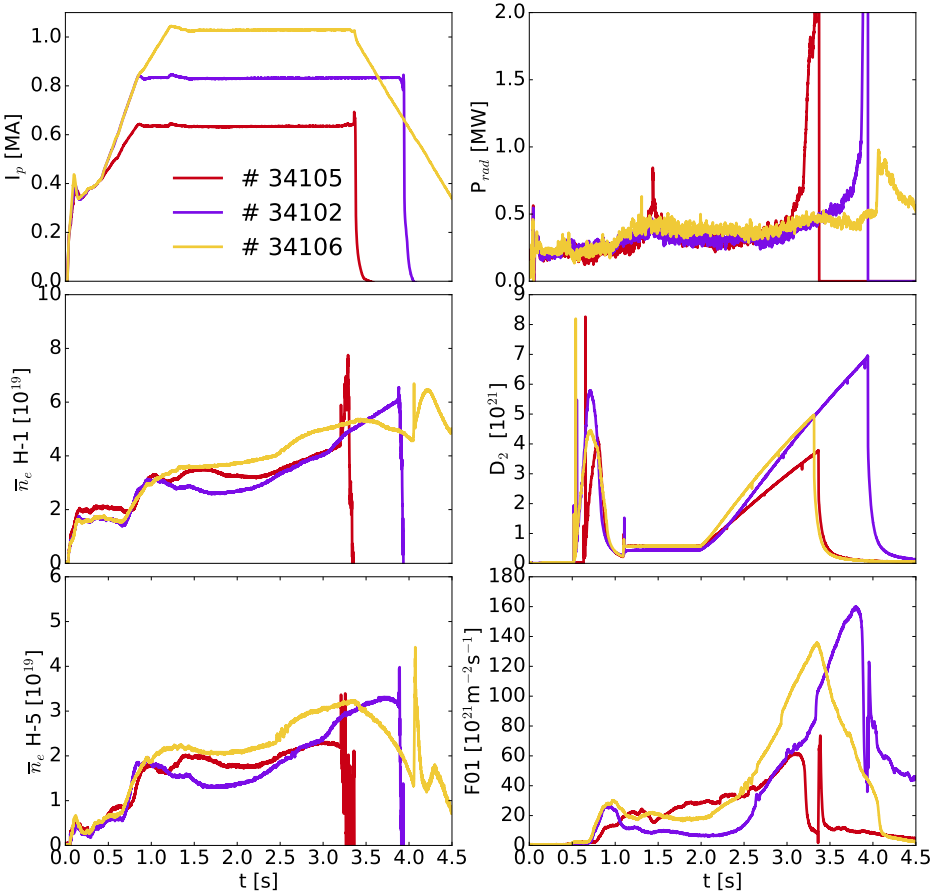
- ✓ No sensible difference of PDFs of J_{sat} at different current even though obtained at different values of Λ_{div}.
- ✓ Autocorrelation time τ_{ac} increases with Λ_{div} without sensible difference among the current

L-Mode analysis: I_p scan at constant B_t



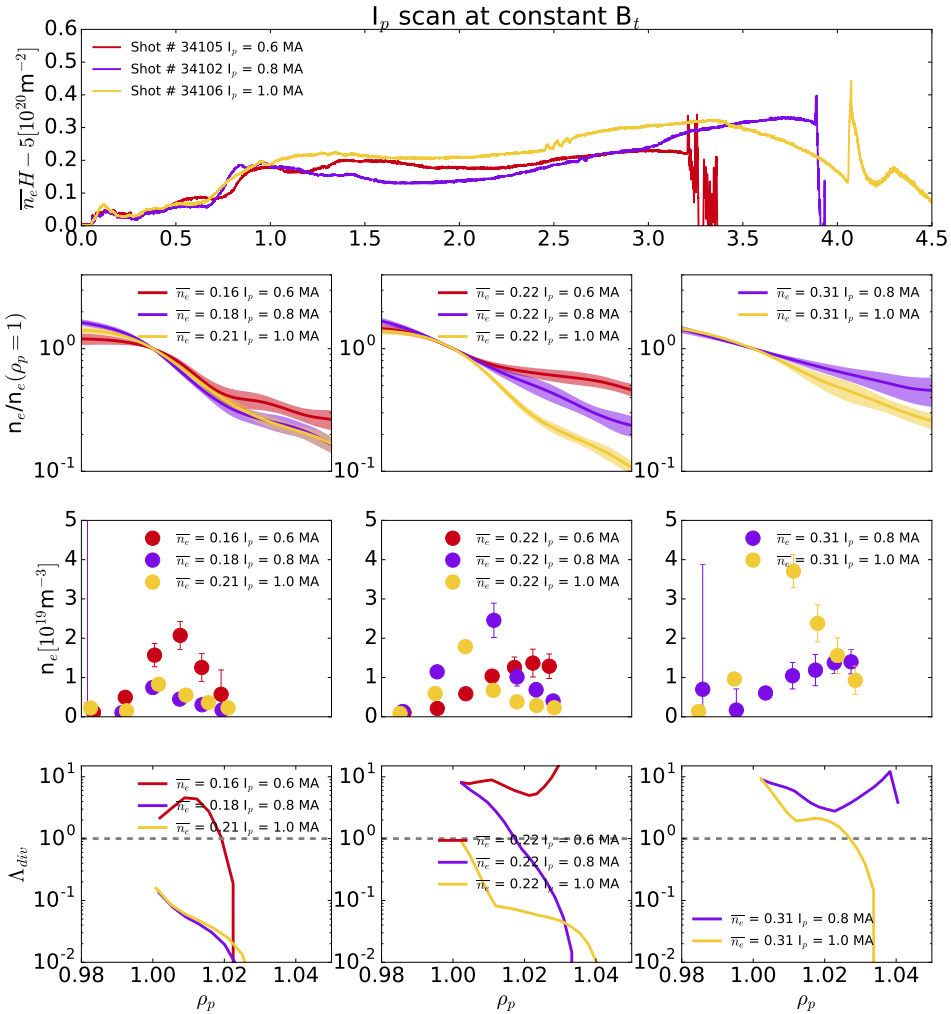
✓ We matched correctly the shape the parallel connection length $L_{||}$ is modified consistently

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

L-Mode analysis: I_p scan at constant B_t



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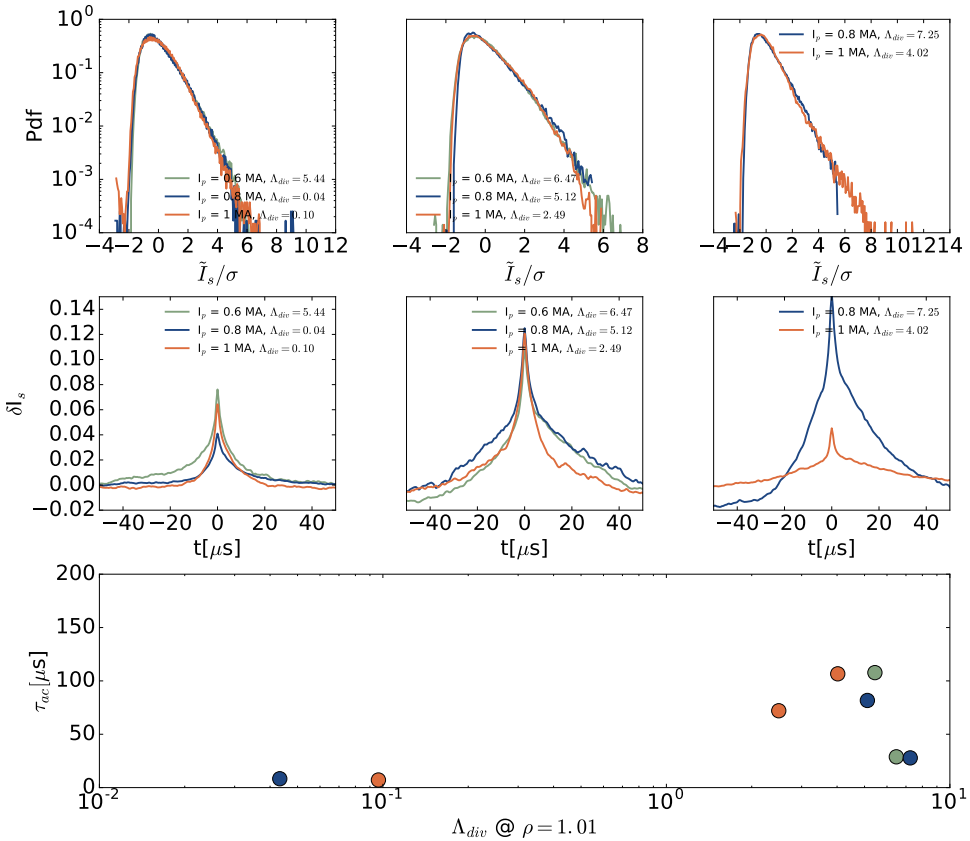
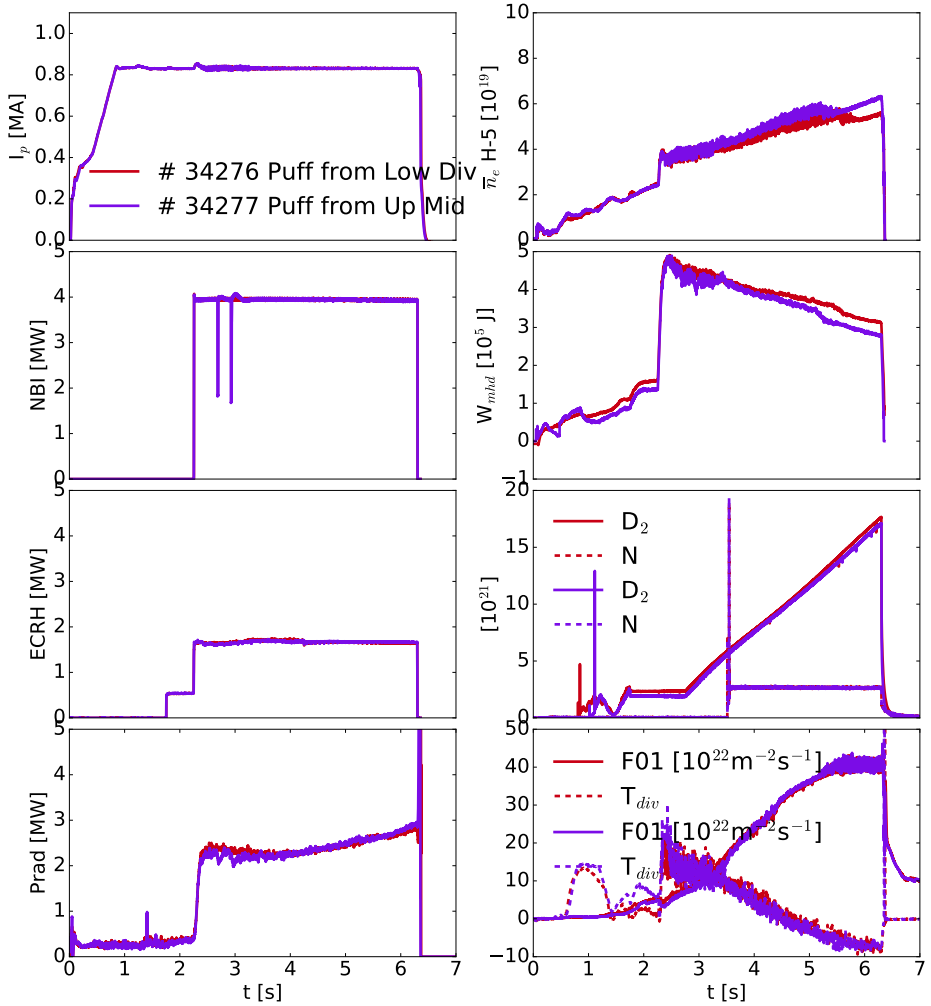


- ✓ No sensible difference of PDFs of J_{sat} at different current even though obtained at different values of Λ_{div}.
- ✓ Remarkable difference in the shape of typical structure, even though τ_{ac} follow usual trend apart from very last points. To be double-checked

H-Mode investigation: puffing location



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

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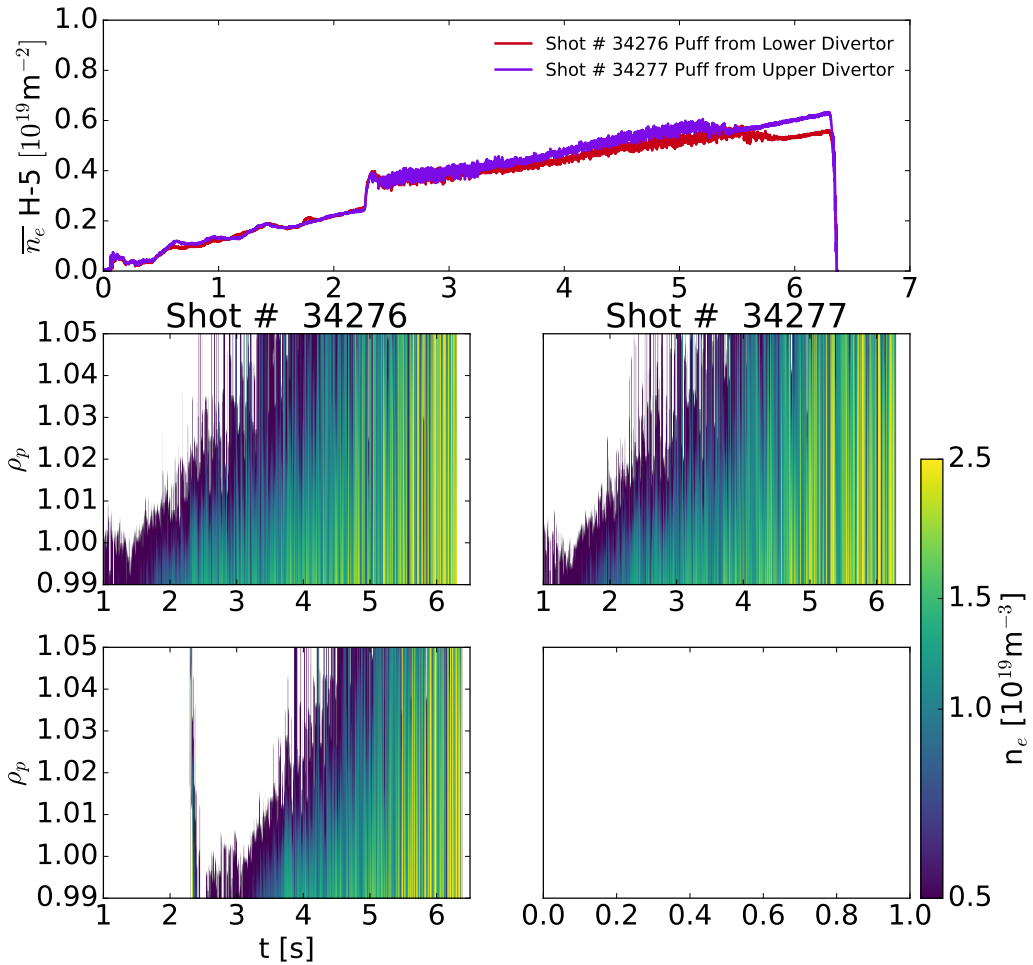

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- ✓ Edge density profiles from Li-Beam evolution are pretty similar

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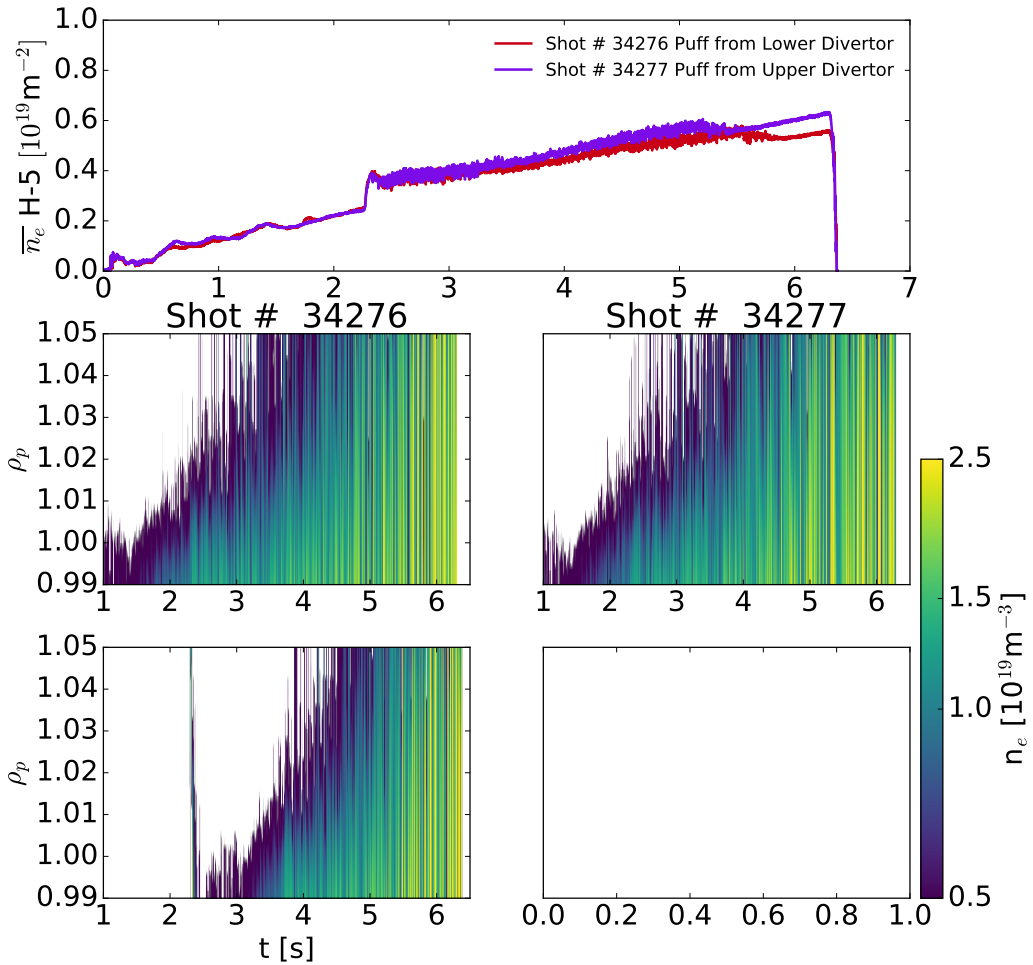
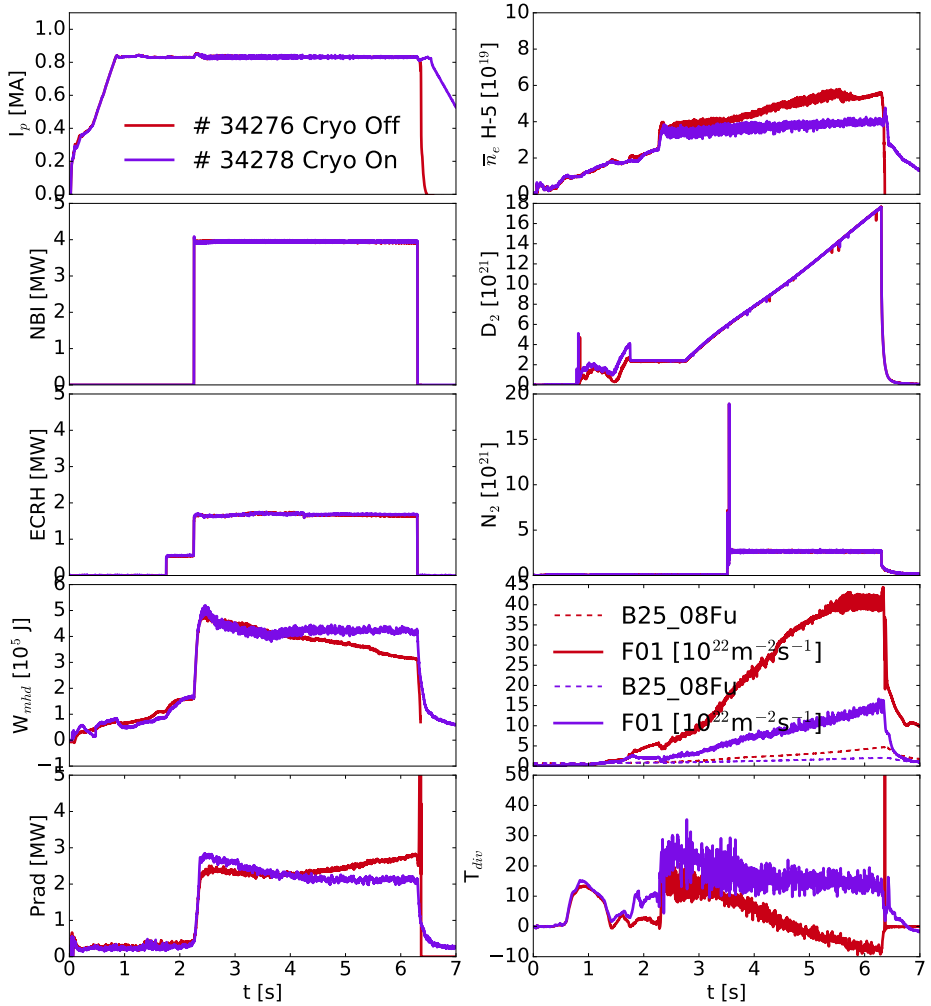


- ✓ Similar puff from Lower and Upper divertor valves (we asked for divertor/midplane valves)
- ✓ Edge density profiles from Li-Beam evolution are pretty similar
- ✓ Similar behavior observed from RIC Antenna 4 for the available shot

Compare Similar fueling with/without cryopumps



- ✓ Same fueling but with cryo-pumps. Clearly different in terms of Edge density and Divertor pressure

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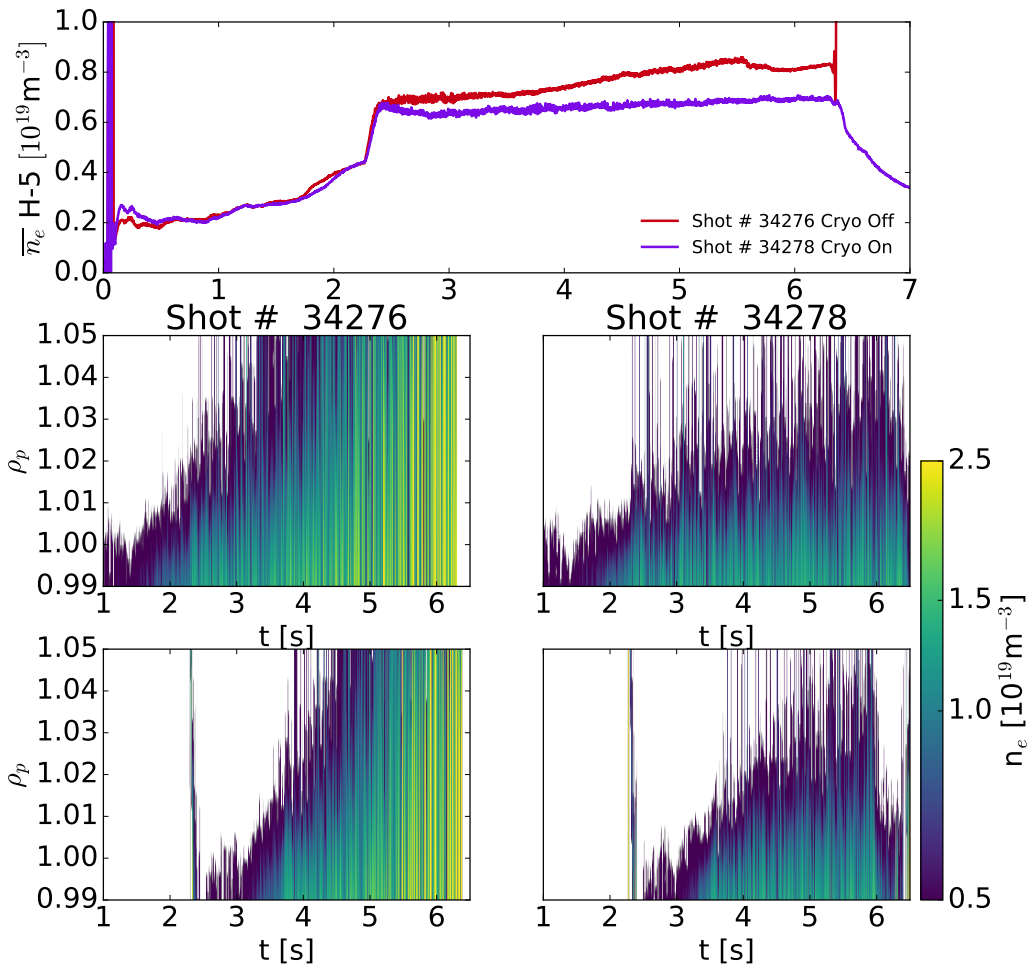

- ✓ Same fueling but with cryo-pumps. Clearly different in terms of Edge density and Divertor pressure
- ✓ Also with this amount of fueling no instance of SOL saturation observed as confirmed by Li-Beam and by RIC (Antenna 4)

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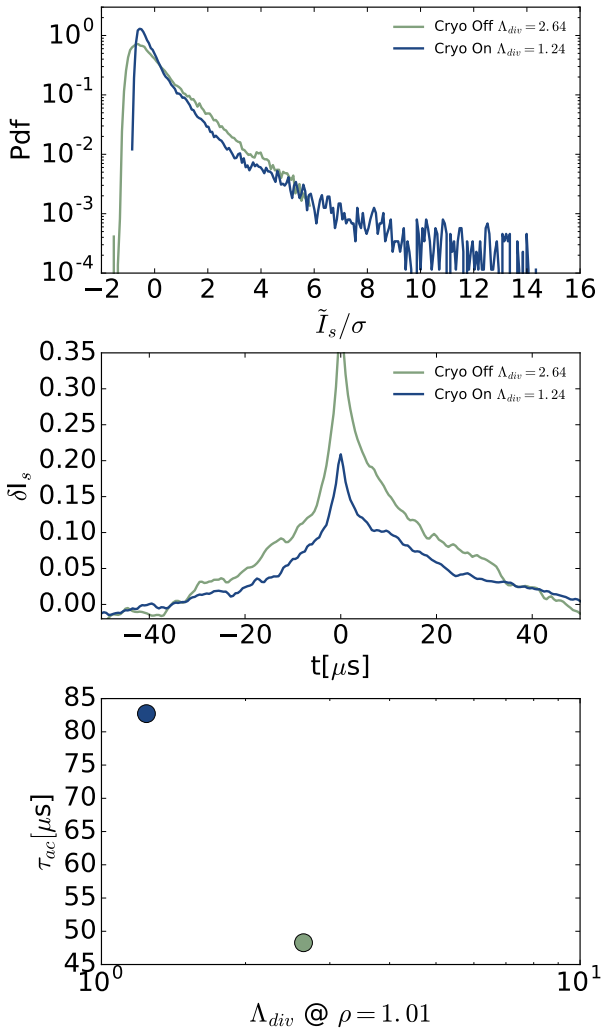
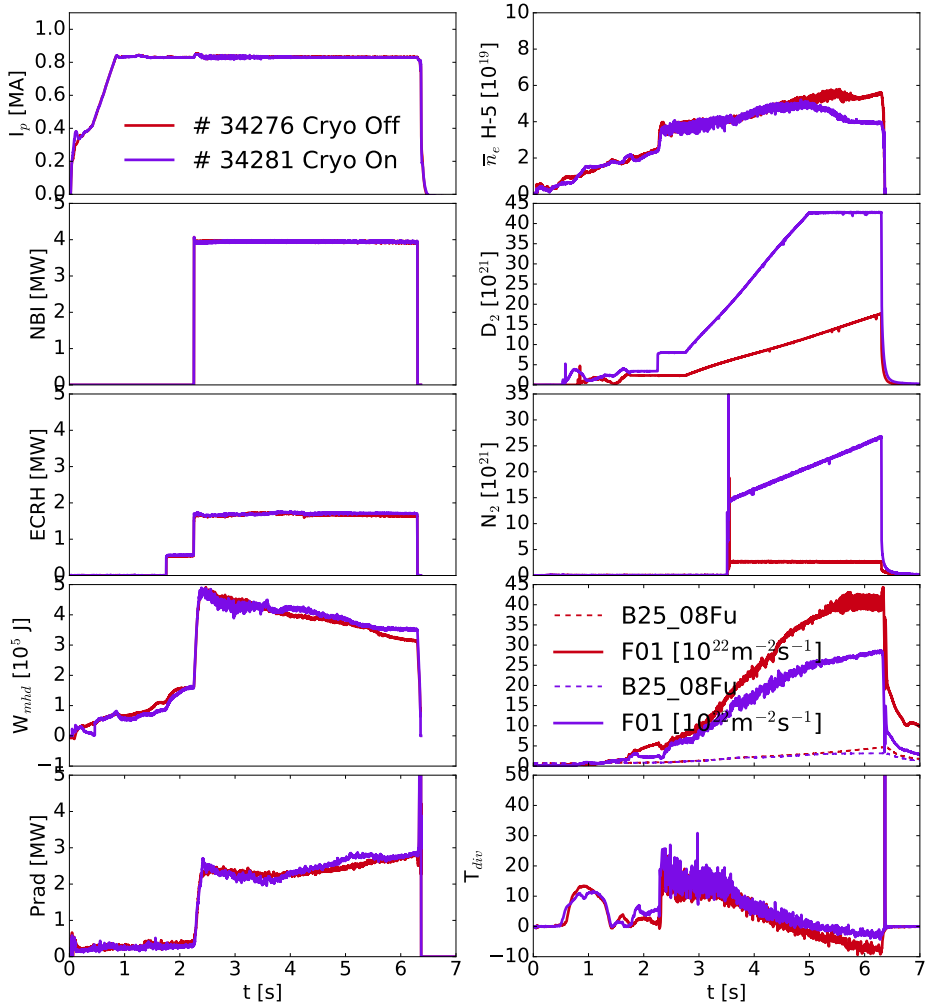


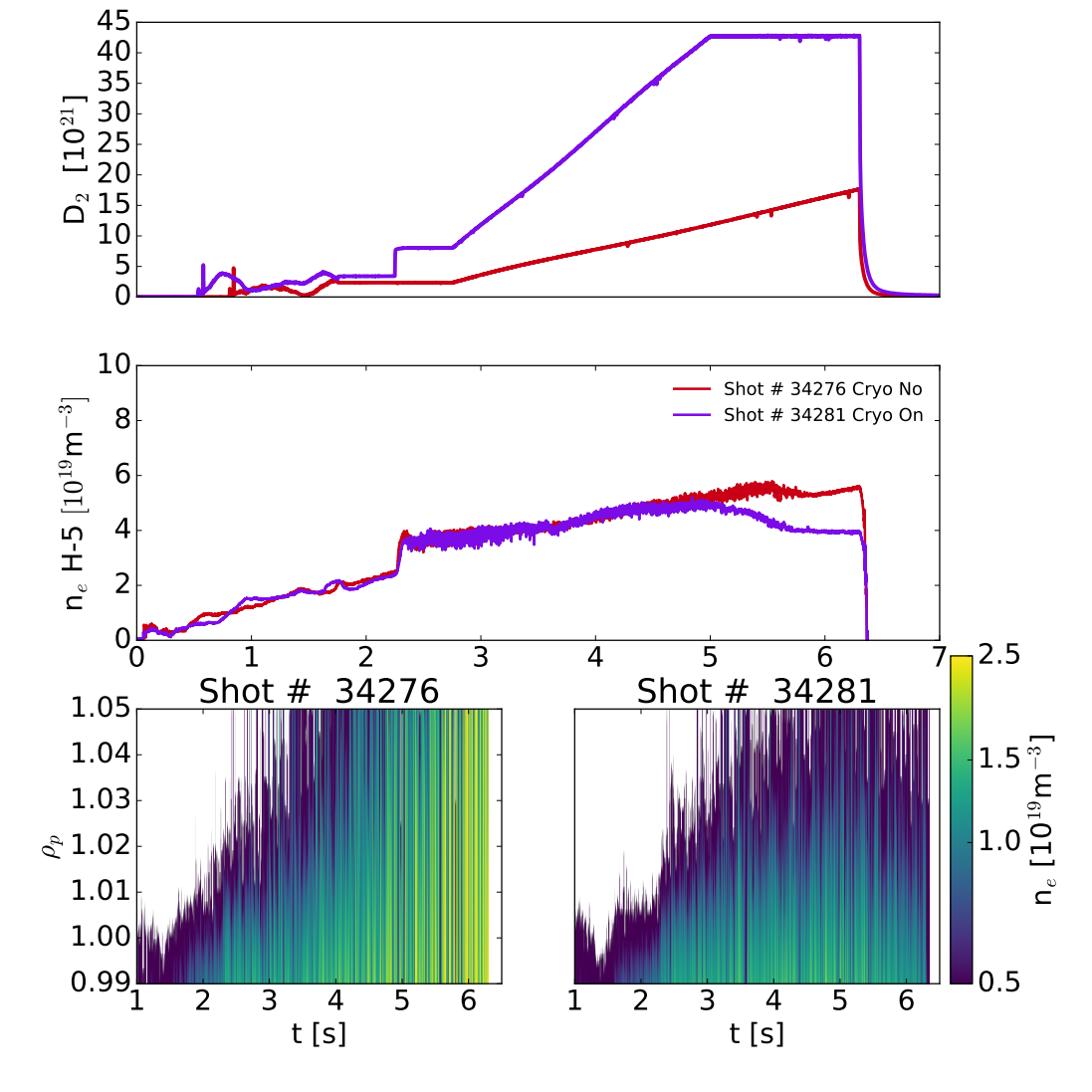
- ✓ Same fueling but with cryo-pumps. Clearly different in terms of Edge density and Divertor pressure
- ✓ Also with this amount of fueling no instance of SOL saturation observed as confirmed by Li-Beam and by RIC (Antenna 4)
- ✓ Comparison of fluctuations during the plunge at higher density (ELM included) 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

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
- ✓ 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 (?)