EUROfusion

Topic 21 experiment Week 24

N . Vianello and V. Naulin for the Topic 21 SC team

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Scientific Team

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TCV experiments: boundary condition

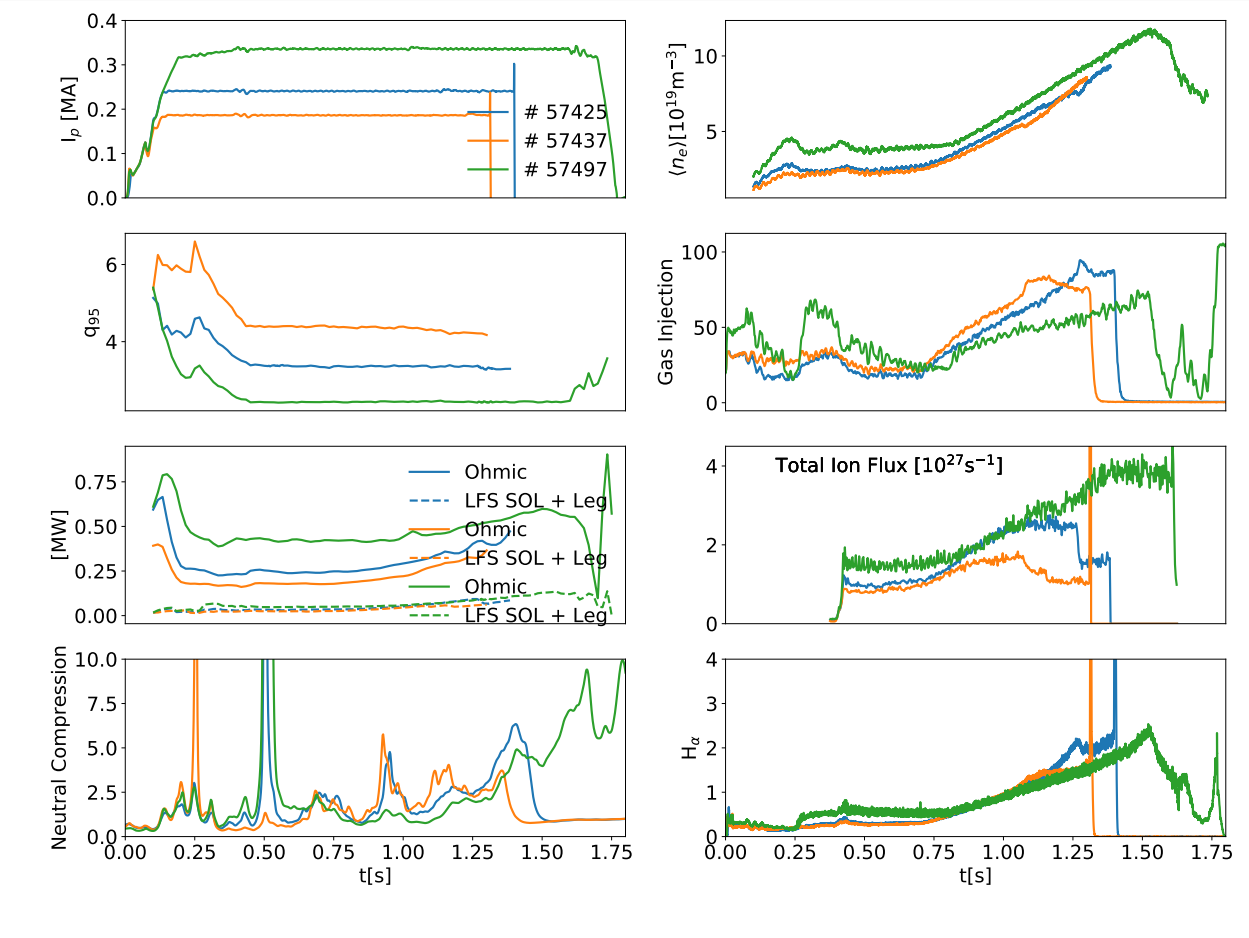
- ✓ 2017 **objectives** listed after the General Planning Meeting
  1. Provide cross-machine L-Mode shoulder dependence on current both at constant Bt and at constant q_{95}
  2. Establish robust scenario for density shoulder profile in H-mode and establish dependence on fuelling/neutral profiles/divertor condition
  3. Study the role of ELM regimes, neutral compression, and particle density in filamentary transport and related shoulder formation.
  4. Identify the contribution of collisionality and seeding on filamentary transport and related shoulder formation.
  5. Determine the effect of filaments and shoulder formation on target heat loads in different Hmode plasmas.
- ✓ We have a total number of **# 23 Shots** originally split into two operational window. Calendar week 24 (12.06-16.06) and Calendar week 43 (23.10-27.10)

Experimental plan

For the first week of operation we originally planned L-mode shots only. Shots 1-3 I_p scan at constant toroidal field. Shots 1, 4 and 5 I_p scan at constant q_{95} to be compared with analogous experiments in AUG and MAST-U. Shots 6-7 Low collisionality scan. Shots 8-9 DN current scan: this will be compared directly with Mast-U which will run predominantly in DN configuration. Shot 10-11 Current scan in forward field to check the role of $\nabla \times B$ direction.

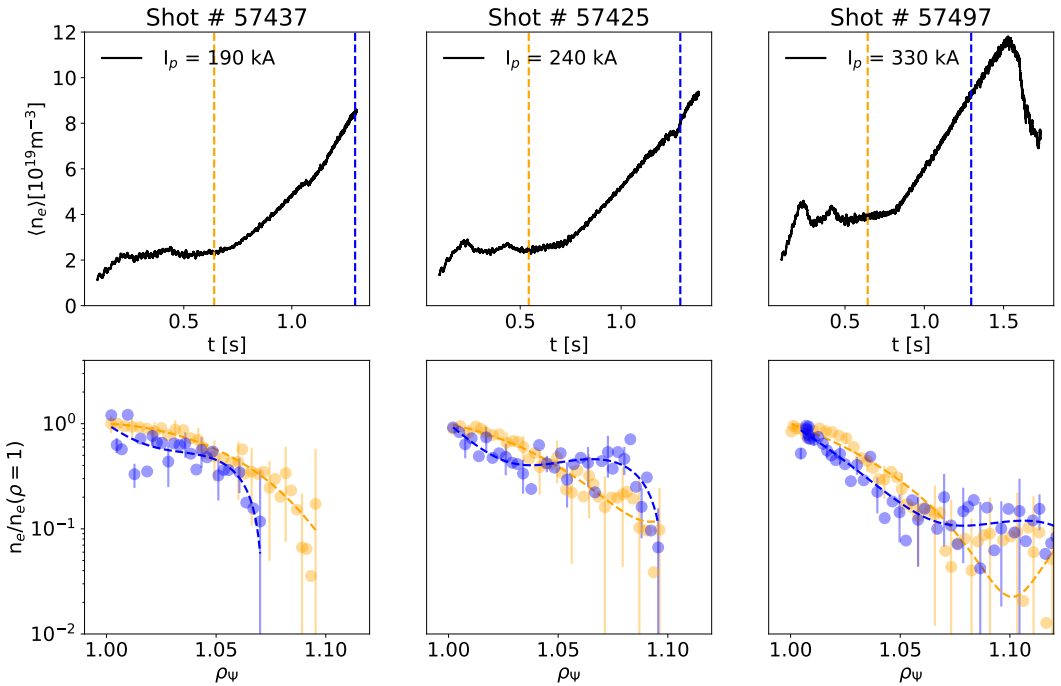
1. Shape from 57088, I_p = 245 kA, Reverse B_t, density ramp from Line Average Density = 3.8e19 @ 0.5 s to 11e19 @ 1.6s, Bt = 1.4T. Plunge @ 0.65, 1.52
2. Repeat # 1 with I_p=330 kA Bt=1.4T, same density ramp, same timing for plunges
3. Repeat # 1 with I_p=180 kA, Bt=1.4T, same density ramp, same timing for plunges
4. Repeat # 1 with q95=2.44 as # 2, adjust Bt consequently (Bt = 1.02T)
5. Repeat # 3 with q95=2.44 as # 2, adjust Bt consequently (Bt=0.8T)
6. Shape and current from # 1. Stop puffing once the divertor is formed to get low collisionality case. ECRH ramp from 0.9s (150 kW–500 kW)
7. Repeat # 6 with intermediate density value between # 6 and #1 density at 0.65s.
8. Repeat density ramp of Shot # 2 in DN configuration
9. Repeat density ramp of Shot # 3 in DN configuration
10. Repeat # 1 in forward field
11. Repeat # 3 in forward field

Current scan at constant B_ϕ



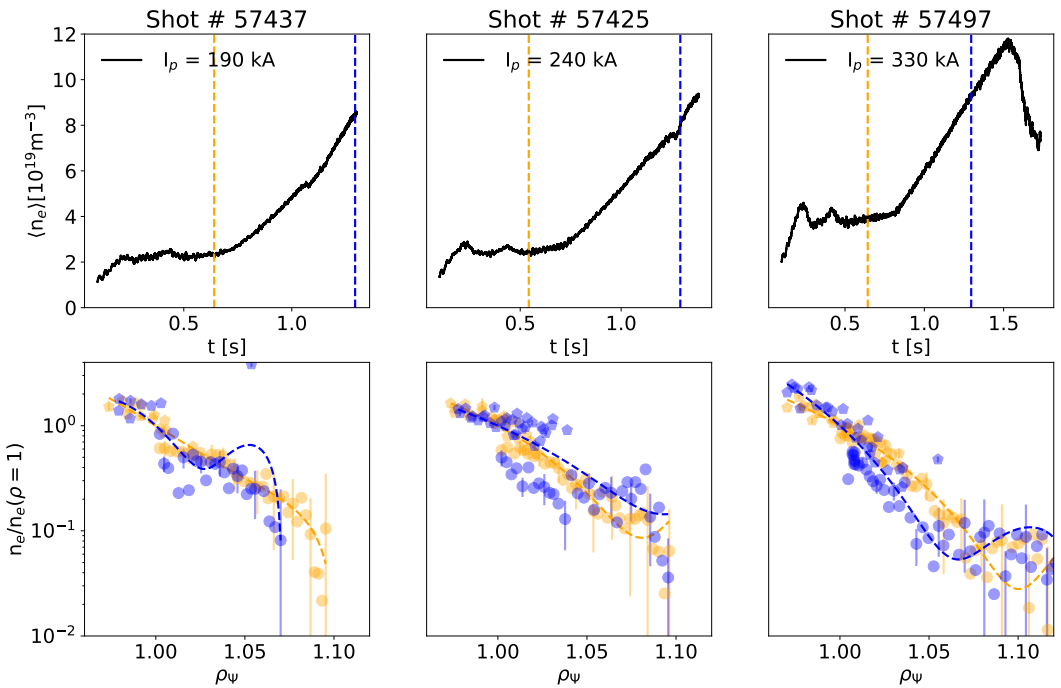
- ✓ Confirming results from Topic-25 increasing the current reduces the ion flux rollover density threshold
- ✓ Neutral compression seems slightly reduced at higher current

Current scan at constant B_ϕ



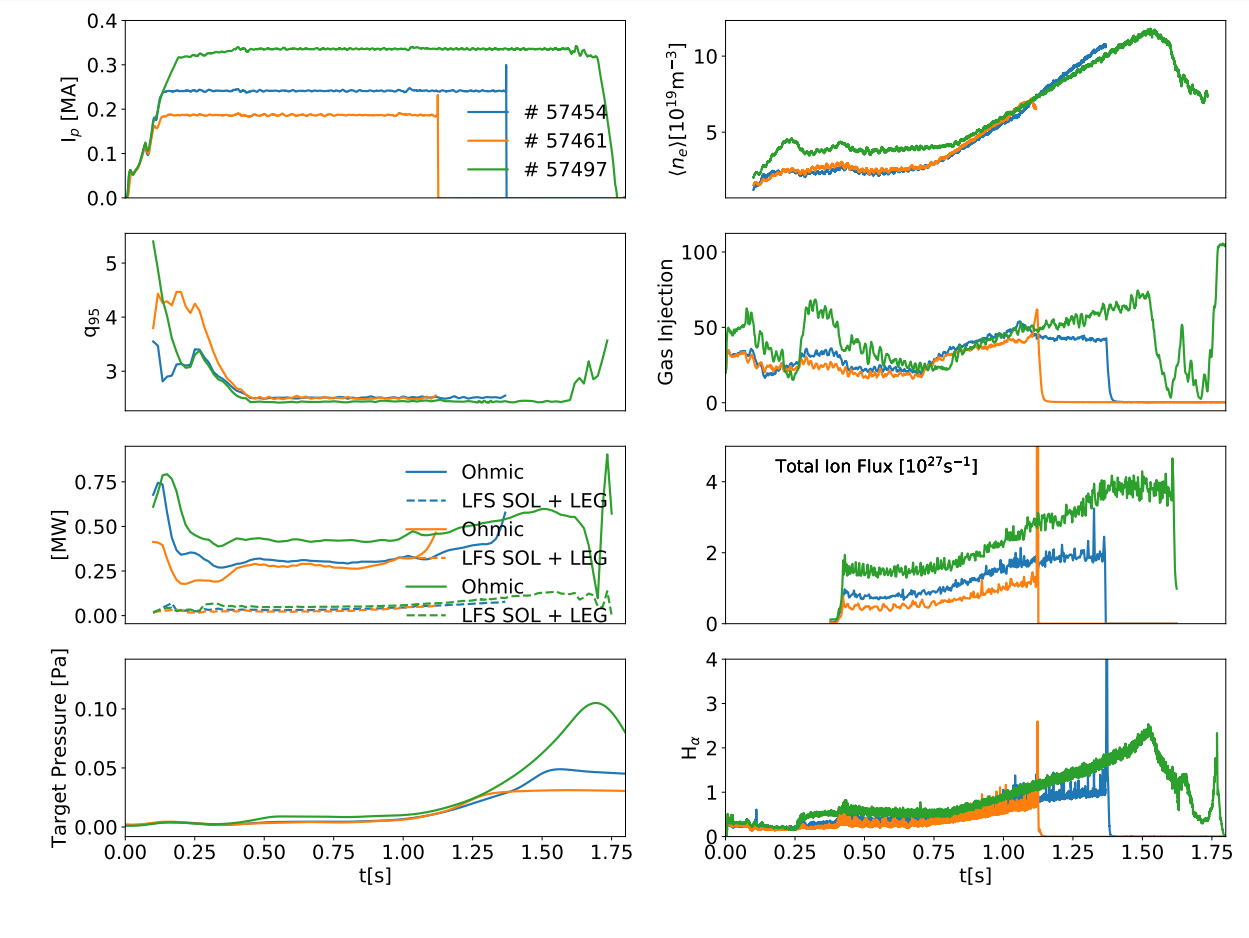
- ✓ Confirming results from Topic-25 increasing the current reduces the ion flux rollover density threshold
- ✓ Neutral compression seems slightly reduced at higher current
- ✓ Profiles from RCP are not yet clear, with the only robust variation between 245 and 330 kA

Current scan at constant B_ϕ



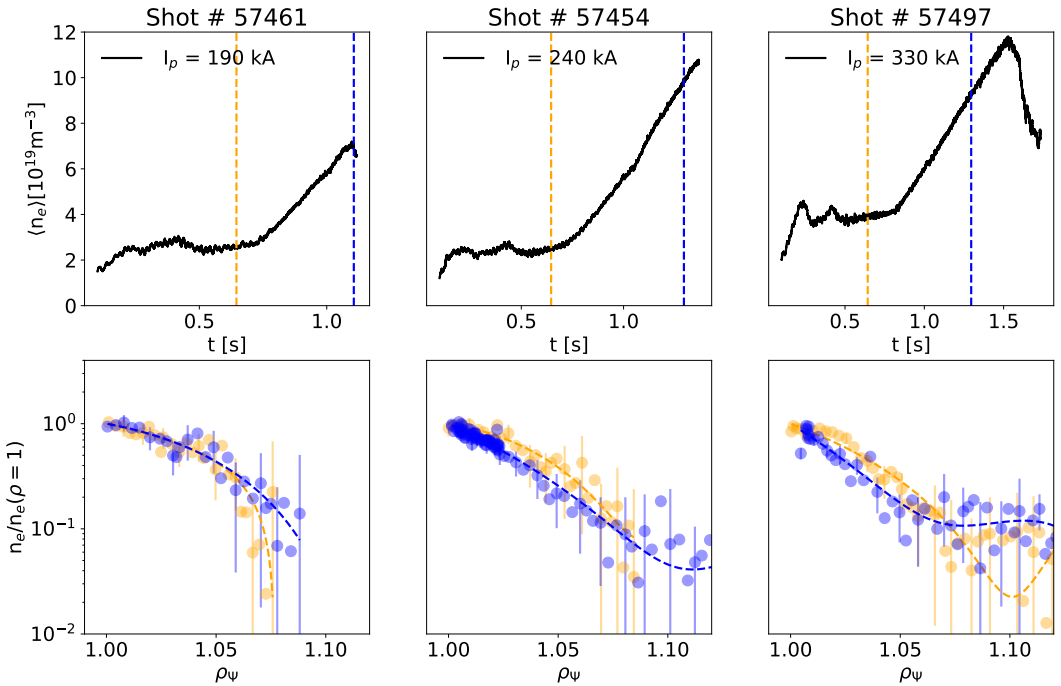
- ✓ Confirming results from Topic-25 increasing the current reduces the ion flux rollover density threshold
- ✓ Neutral compression seems slightly reduced at higher current
- ✓ Profiles from RCP are not yet clear, with the only robust variation between 245 and 330 kA
- ✓ If we combine with Thomson scattering there are still unresolved issue

Current scan at constant q_{95}



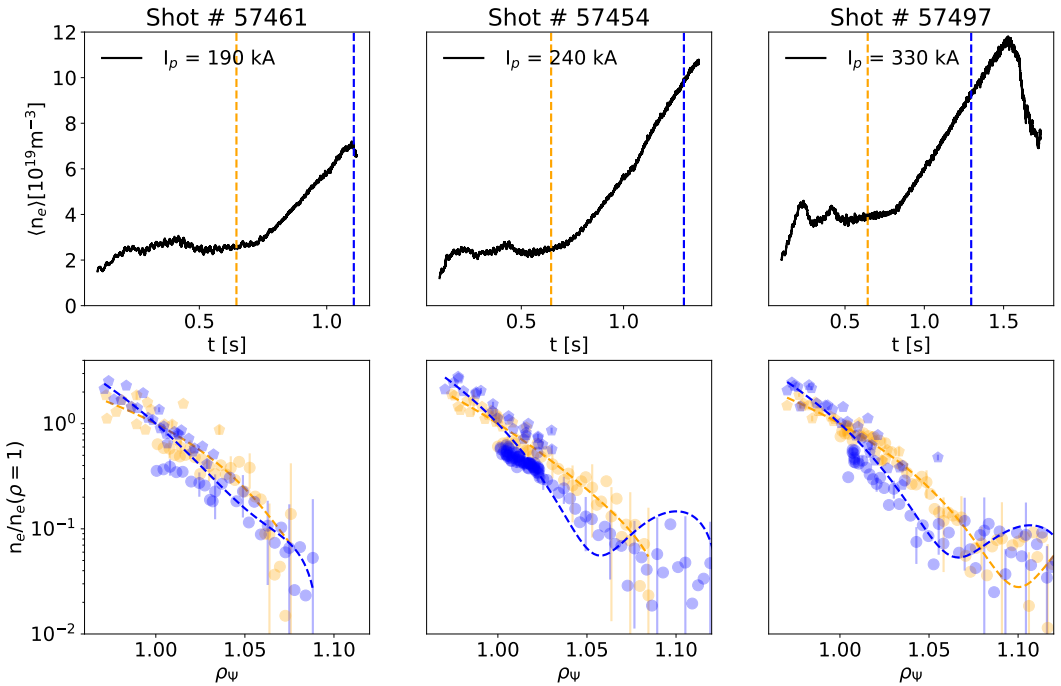
- ✓ Unusual scenarios with B_{phi} up to 0.8T. No rollover on at any of the current
- ✓ Expected higher target neutral pressure increase at higher current

Current scan at constant q_{95}



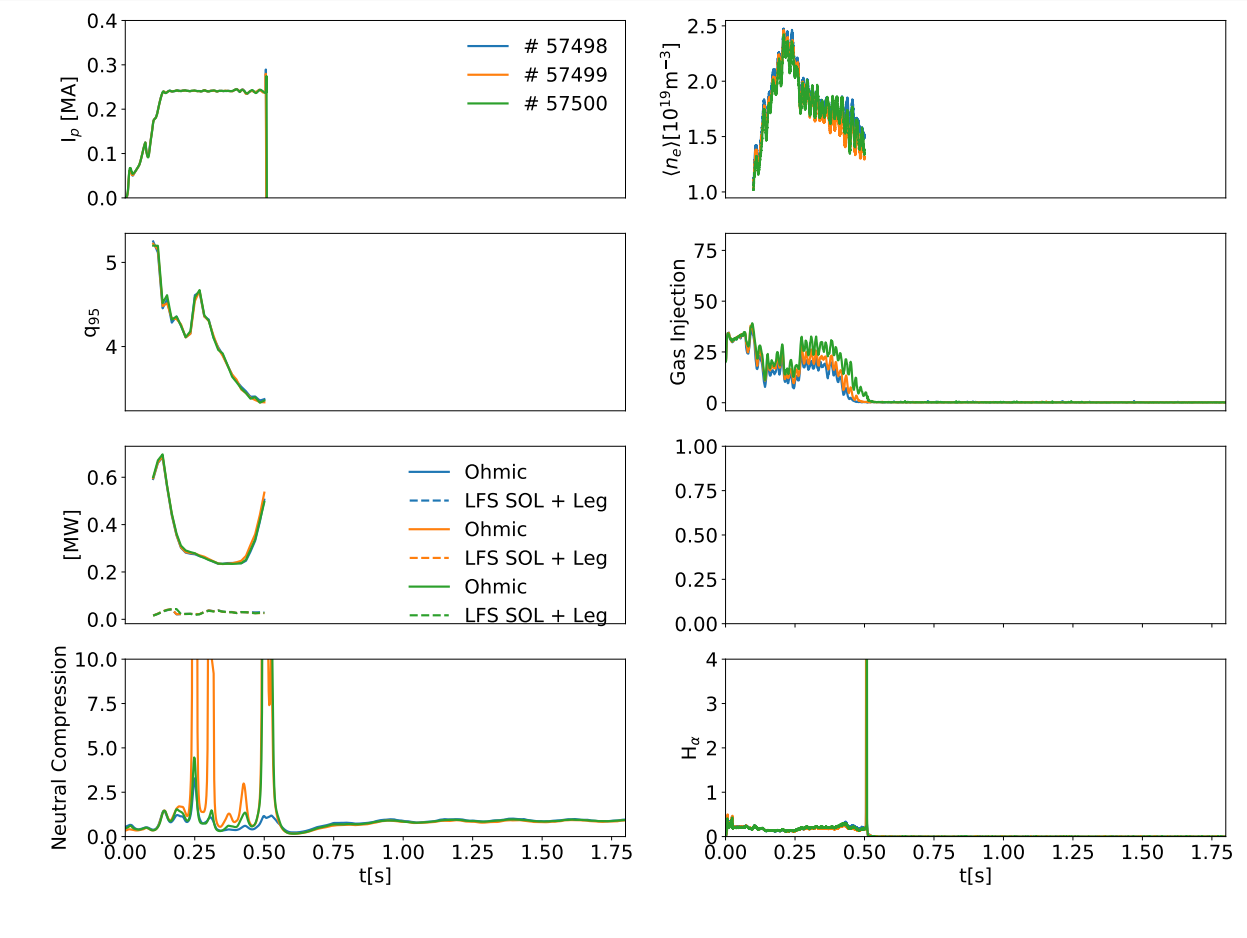
- ✓ Unusual scenarios with B_{phi} up to 0.8T. No rollover on at any of the current
- ✓ Expected higher target neutral pressure increase at higher current
- ✓ Profiles from RCP suggest slight flattening in the far SOL at higher current

Current scan at constant q_{95}



- ✓ Unusual scenarios with B_{phi} up to 0.8T. No rollover on at any of the current
- ✓ Expected higher target neutral pressure increase at higher current
- ✓ Profiles from RCP suggest slight flattening in the far SOL at higher current
- ✓ Confirmed even combining with Thomson data

Attempt for low collisionality



All the attempt to perform a low collisionality case disrupted whenever density decreases below a certain threshold

Conclusion

1. Shape from 57088, I_p = 245 kA, Reverse B_t, density ramp from Line Average Density = 3.8e19 @ 0.5 s to 11e19 @ 1.6s, Bt = 1.4T. Plunge @ 0.65, 1.52
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