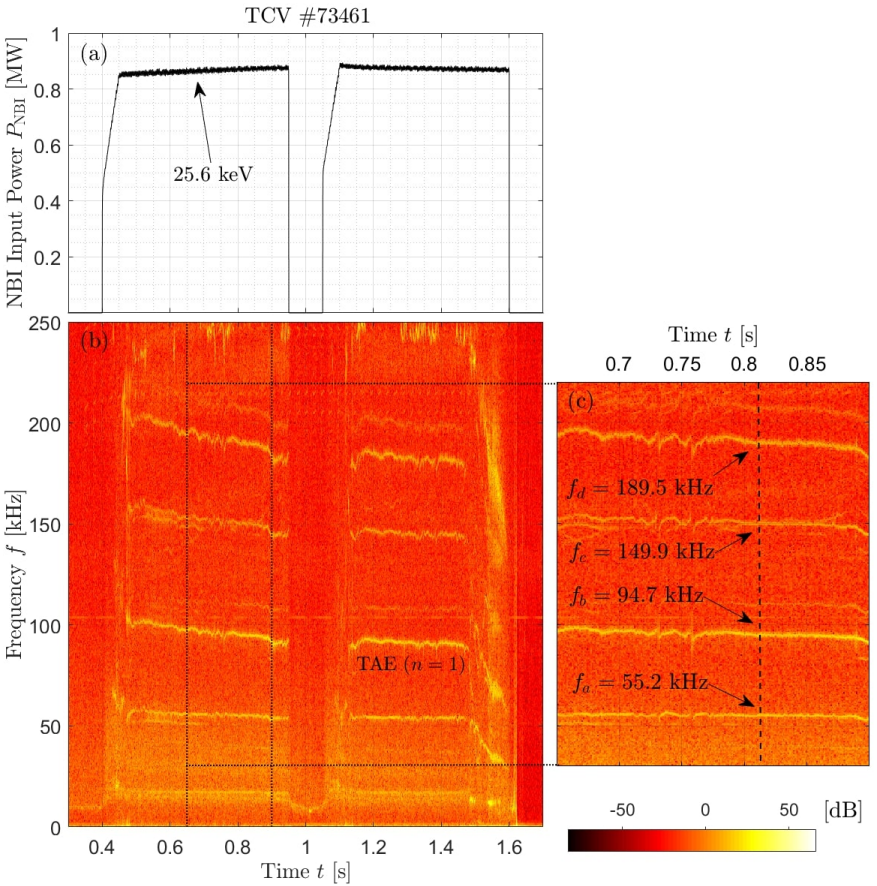
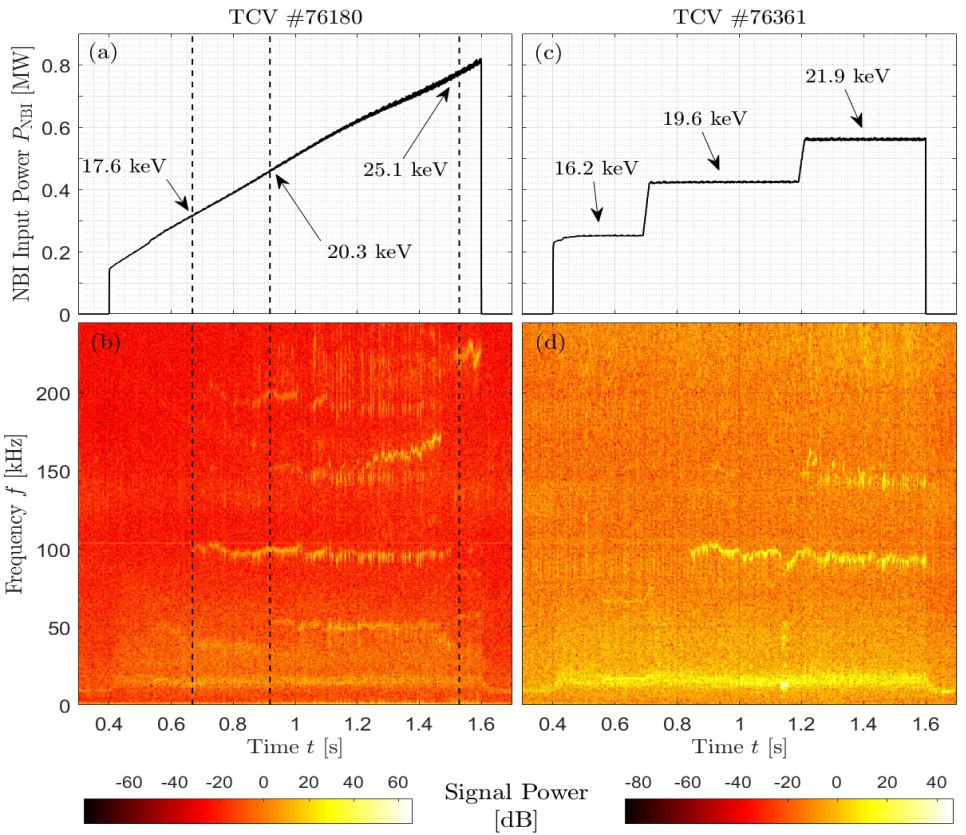
EP driven modes on TCV

20/09/23
Baruch Rofman

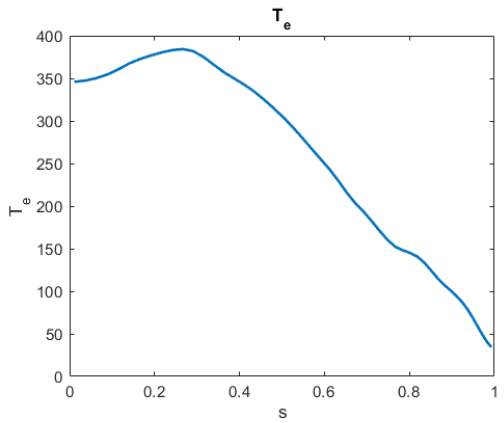
Motivation – Experimental Results

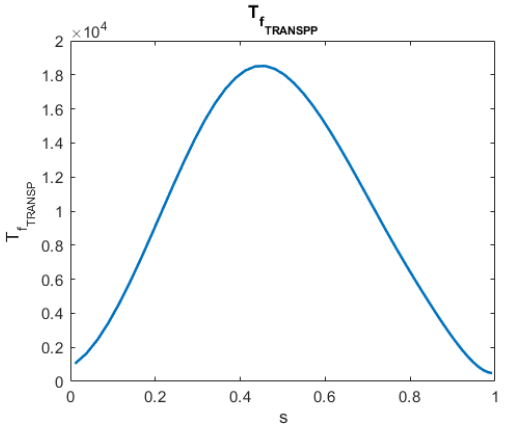


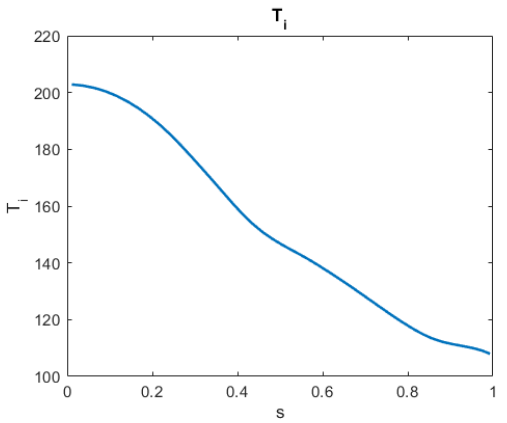


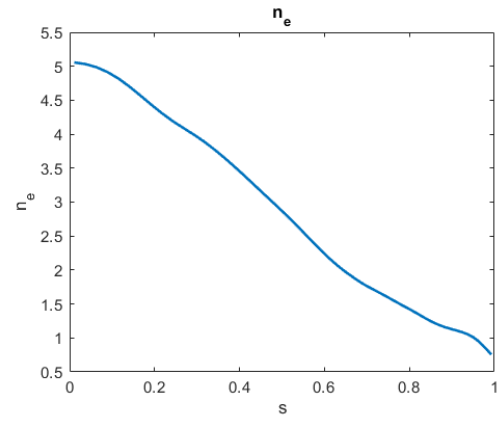
Mazzi, Samuele, et al. "Study of fast-ion-driven toroidal Alfvén eigenmodes impacting on the global confinement in TCV L-mode plasmas." Frontiers in Physics 11: 1225787.

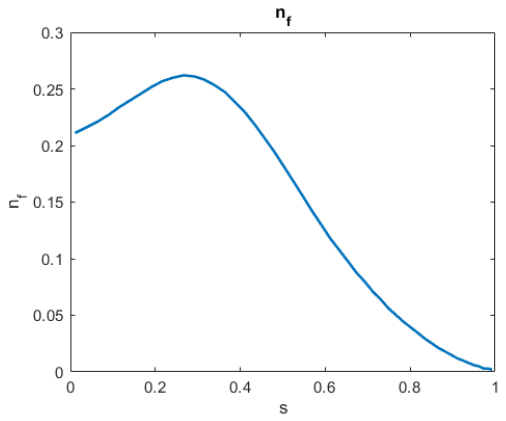
Reconstructed Profiles TCV #73461

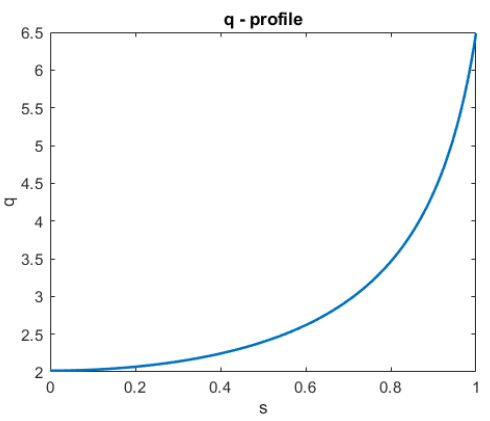




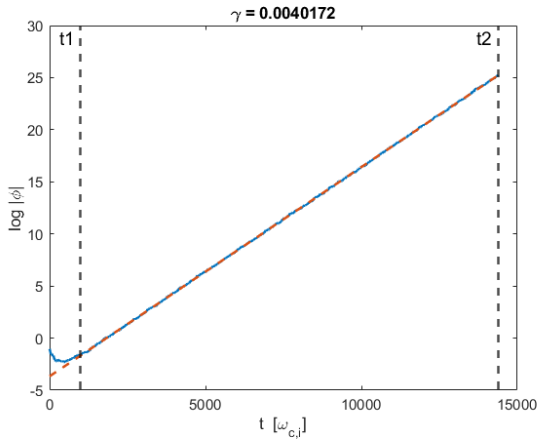


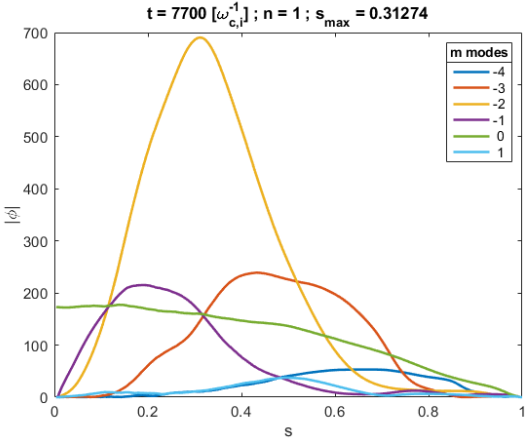


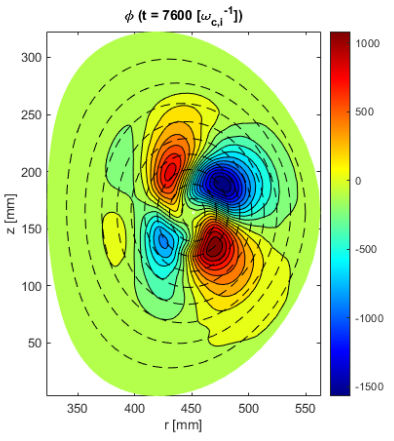


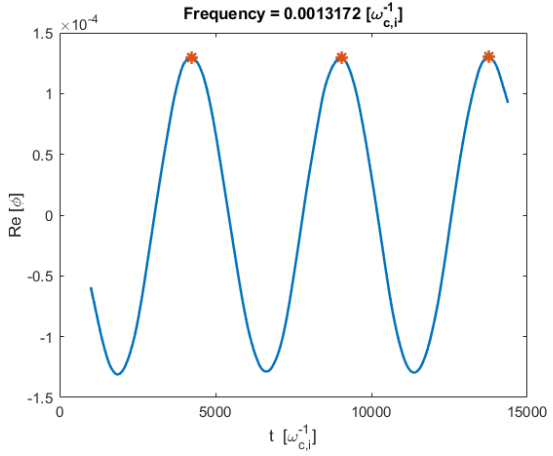


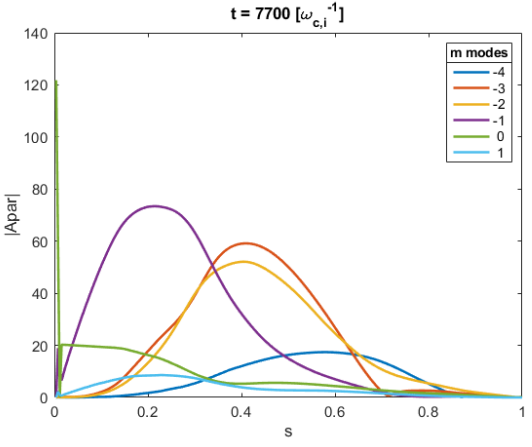
Background (no EPs)

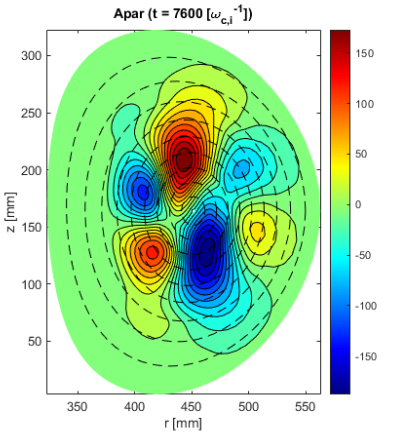




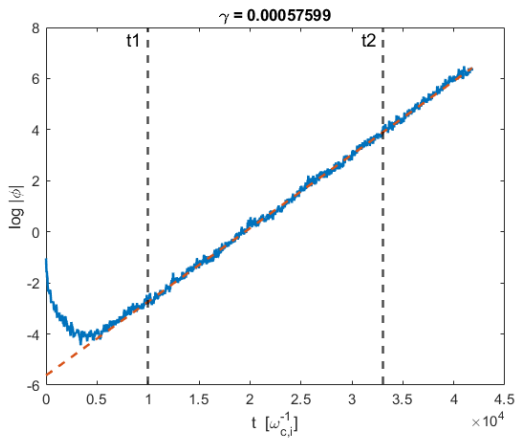


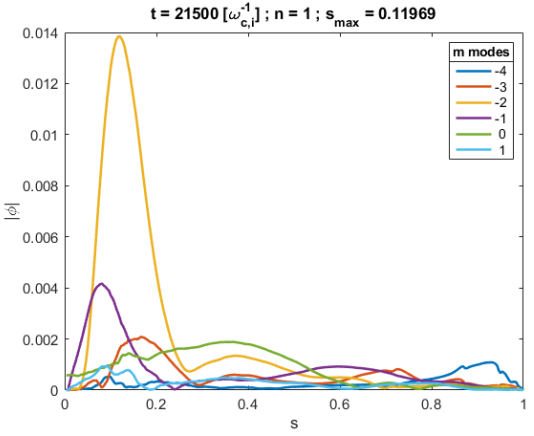


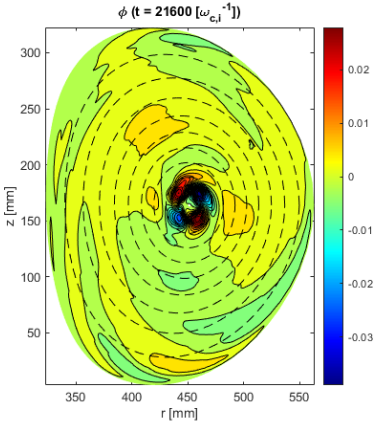


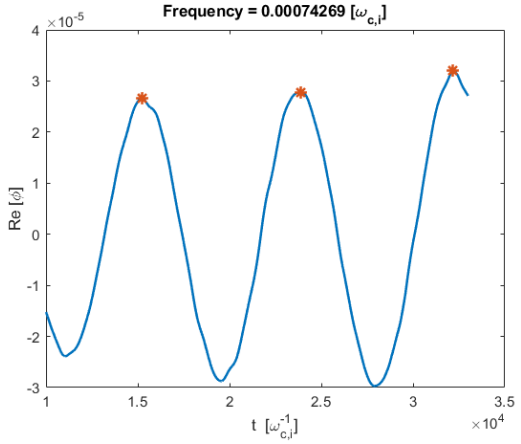


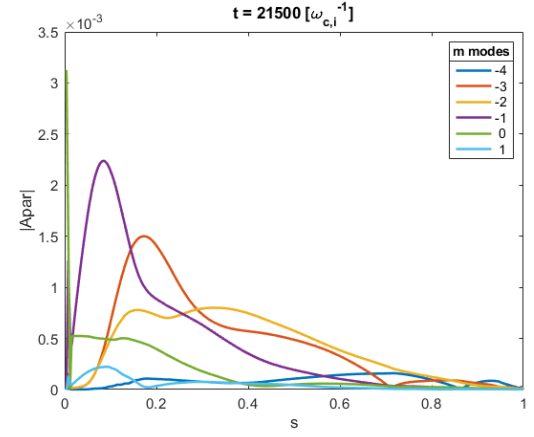
Background with flat temperature

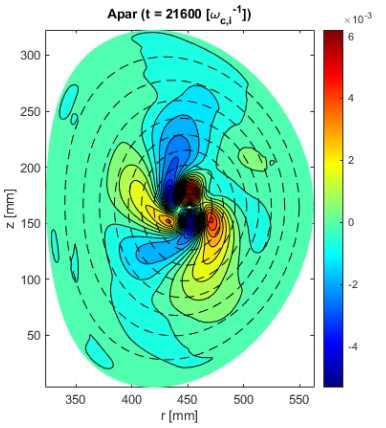




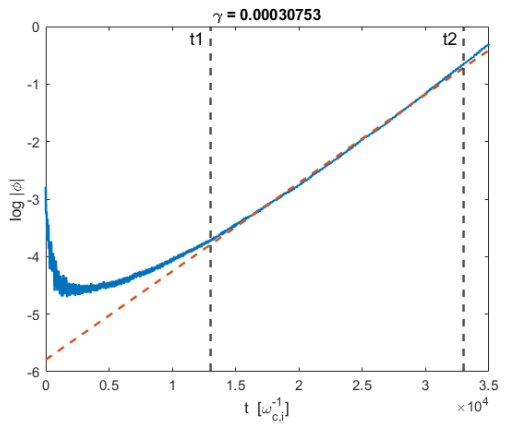


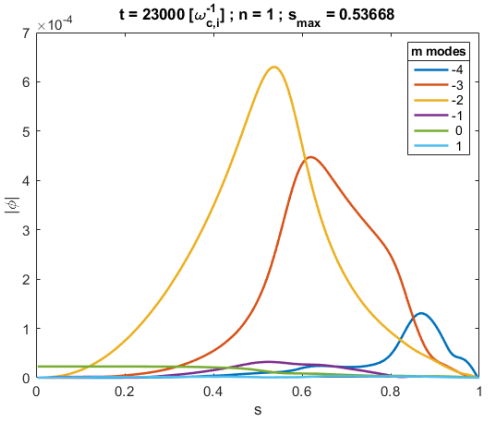


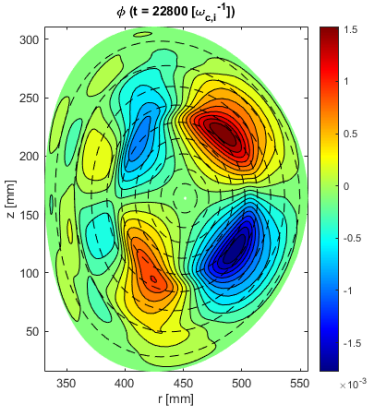


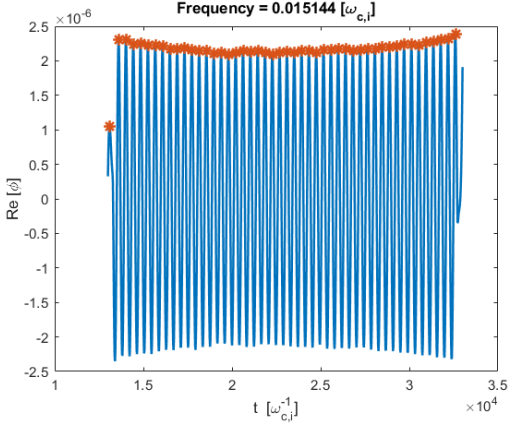


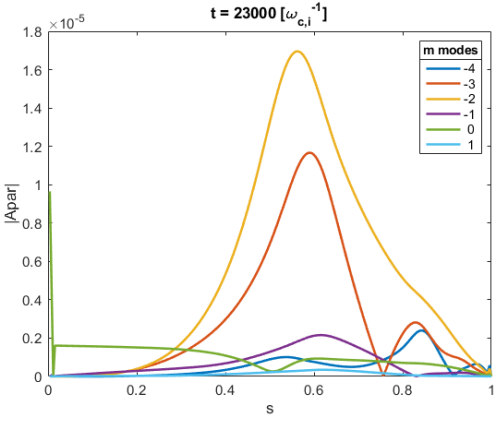
EPs (no background profiles)

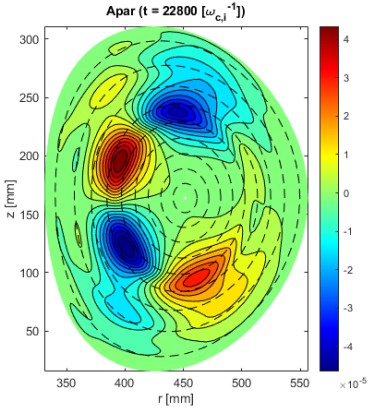




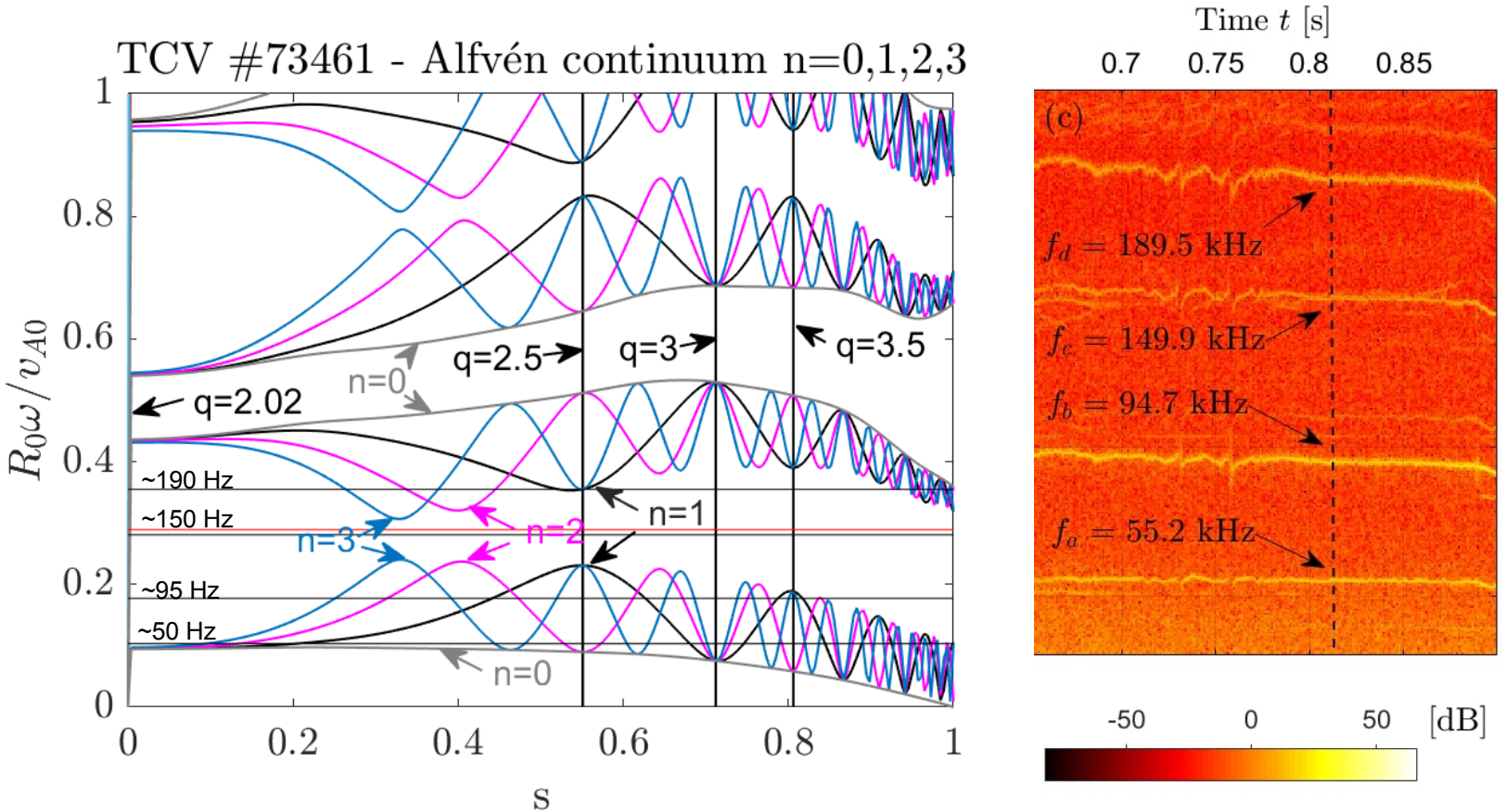








Alfven Continuum



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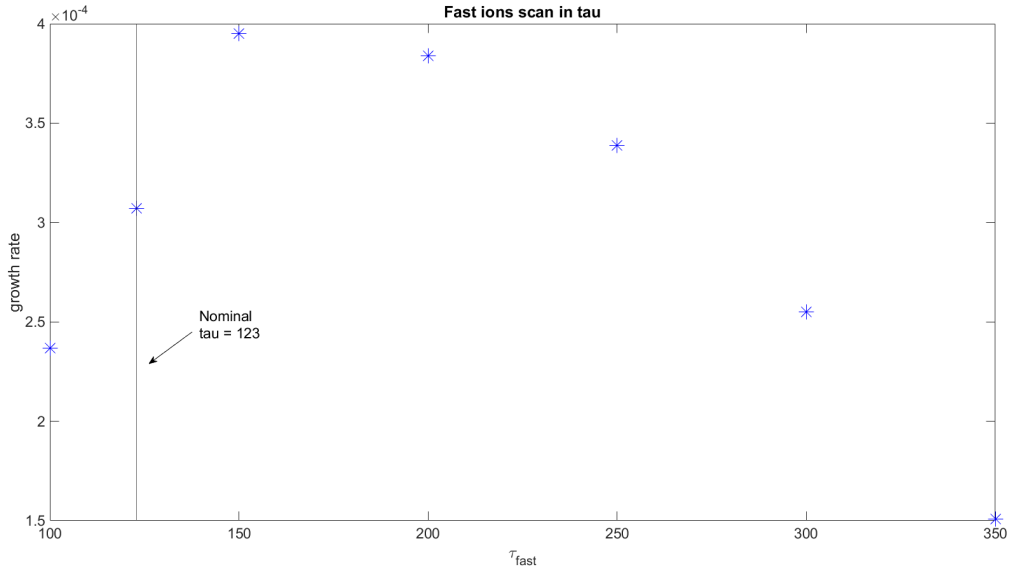
Short summery

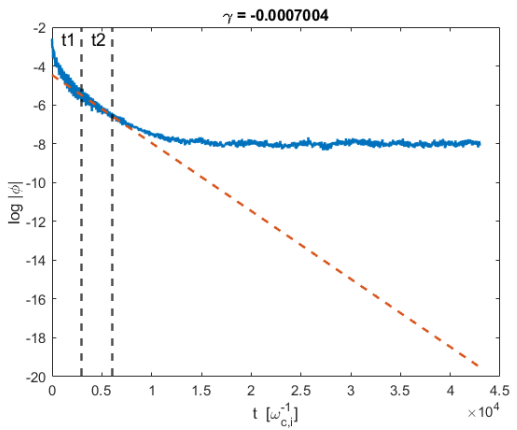
	Growth rate	Frequency [ω_ci]	s_max	n	m
Background	0.004	0.001317	0.31	1	-2
Background with flat temperature	0.0005766	0.0007436	0.12	1	-2
Fast ions	0.000307	0.0152	0.537	1	-2 ; -3

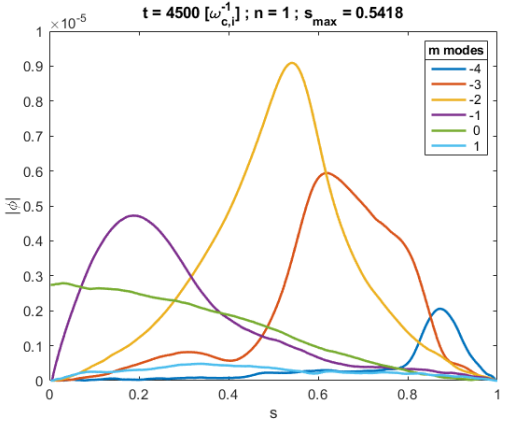


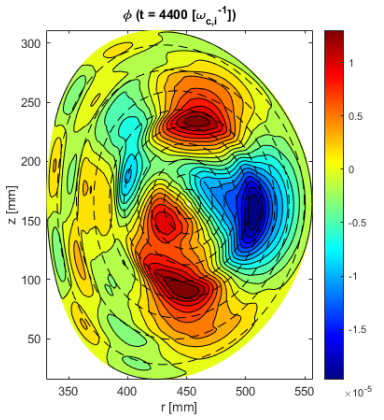
EM Antenna in ORB5

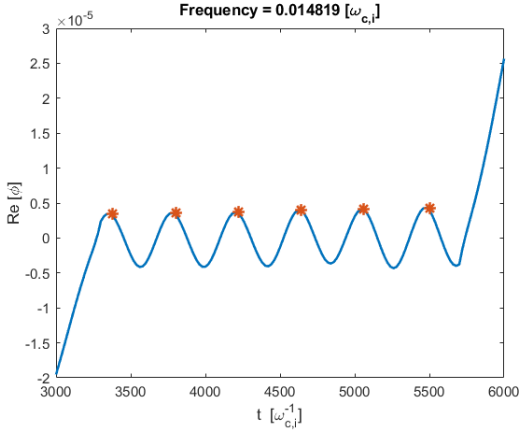
- **Current status** – used in the past, but not part of the main branch.
- Testing the after merging with the current master
  - Past simulations that used the EM Antenna (M.Sadar *et al* 2022) ✓
  - Past simulation that used the master (current work) ✓
- Using the EM Antenna to induce TAE (in progress)
  - So far resulting in decaying turbulence
- Merging the EM Antenna to the master branch (in progress)

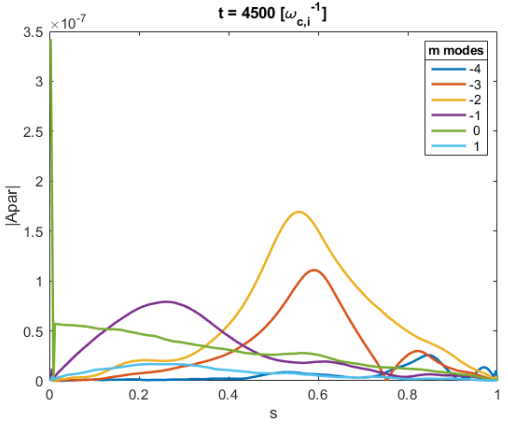
EM antenna mimics the EP mode

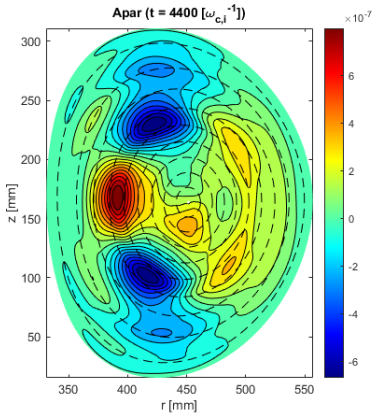












Next steps

- Use the “EM Antenna” for frequency scans
- Adjusting the density profile to keep the flat temperature background stable
- Switching to a more realistic distribution like a slowing-down Maxwellian (for the EPs)
- Nonlinear simulations (chirping down?)

Simulation parameters (ORB5)

- Linear
- MHD equilibrum obtained by CHEASE
- Profiles found using TRANSP and NUBEAM
- Single toroidal mode
- Electromagnetic with low beta (0.0008)
- Lx = 243
- Unicity B.C. on axis
- Kinetic electrons
- Mass ratio (mi/me) = 200
- EP fraction = 5.6%