EUROfusion

AE stability of Initial scenarios

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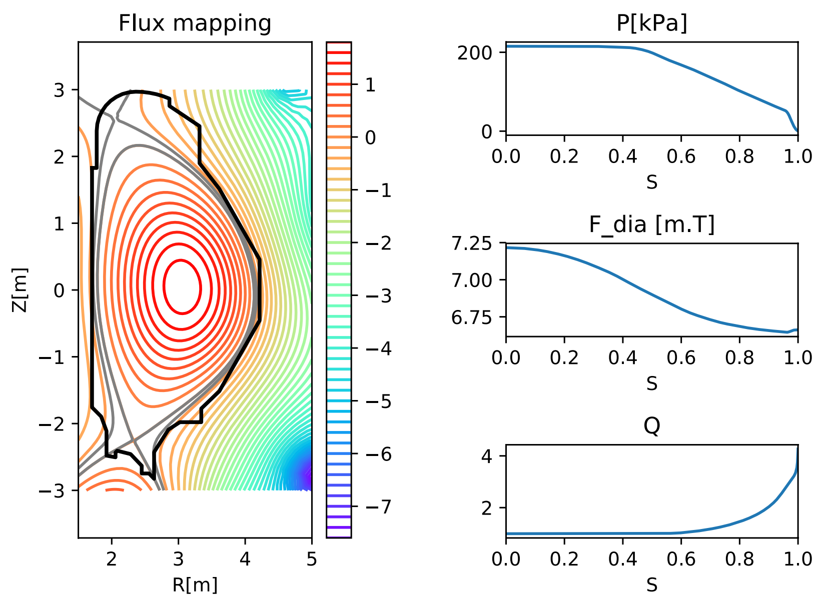
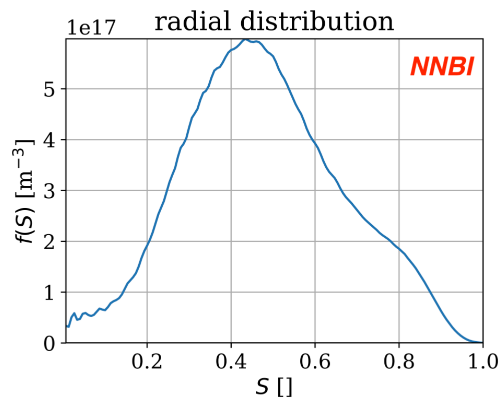
Motivation and goals

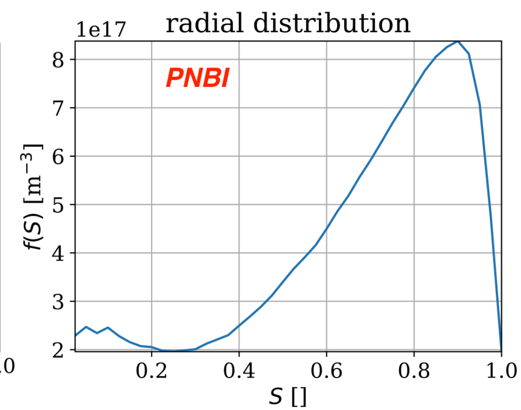
- Investigate Alfven mode MHD stability of Initial research phase scenarios of JT-60SA
  - JT-60SA initial research phase I and II, in H and D, with reduced power and C-PFC are "approaching"
  - Despite the "reduced power", it entails already 33 MW (***N-NB of 10 MW***, ***P-NB of 20 MW***, ECRF of 3 MW). The high heating power and high plasma current will enable access to the ITER and DEMO regimes of βN, f_{BS}, ρ* ν* and electron heating ratio !
- Can Alfven Eigenmodes be driven unstable in such scenarios ?
  - ***N-NB*** at 500keV is always relevant and grants access to most relevant Alfvén resonances → drive may be possible
  - Isotope differences H *vs* D
    - On JET H-beams on H-plasma could not drive AEs (*NBI inj.energy <160keV was clearly too low…*)
- Toolset: HELENA+MIHSKA+CASTOR-K suite with kinetic profiles from experimental/modelling data + energetic particles (parametrized or tabulated)

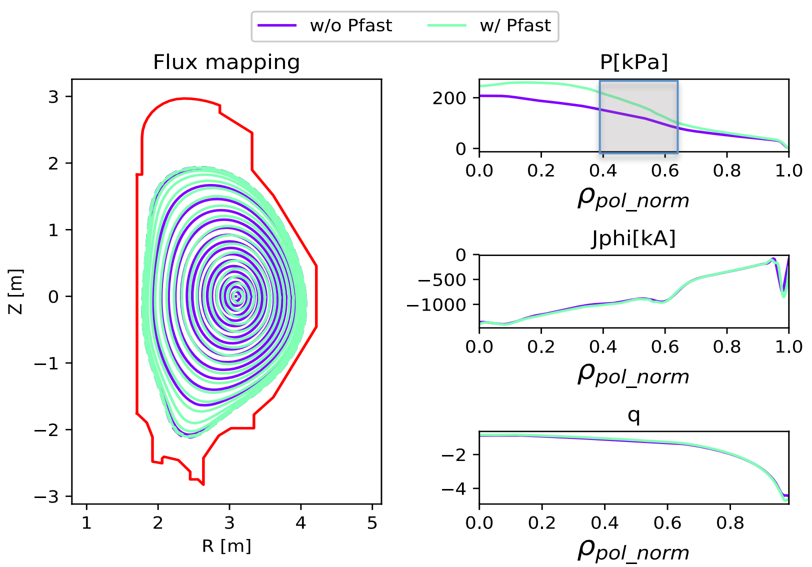
Previous highlights on AE stability



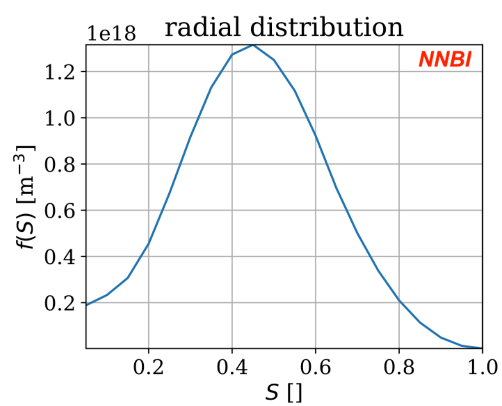
Scenario 3 (high density)

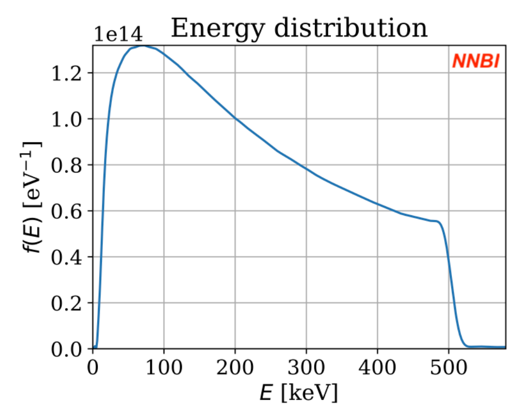




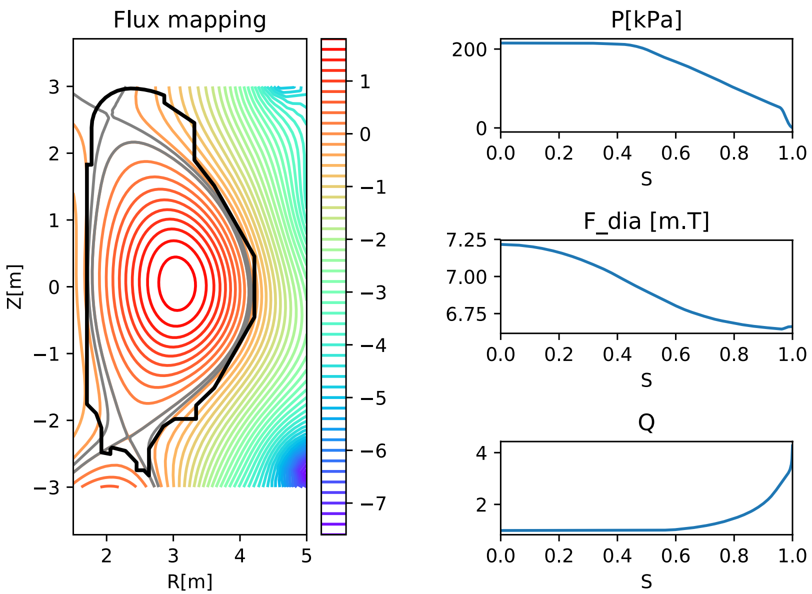


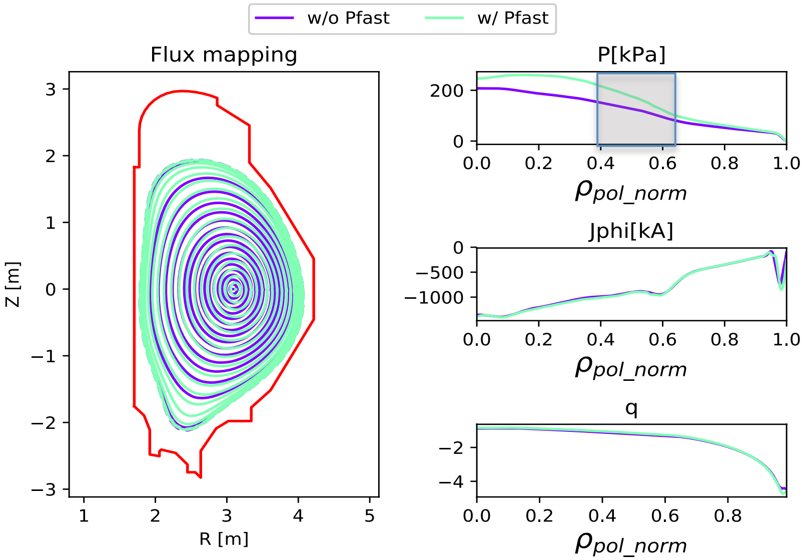
Scenario 4 (CDBM)





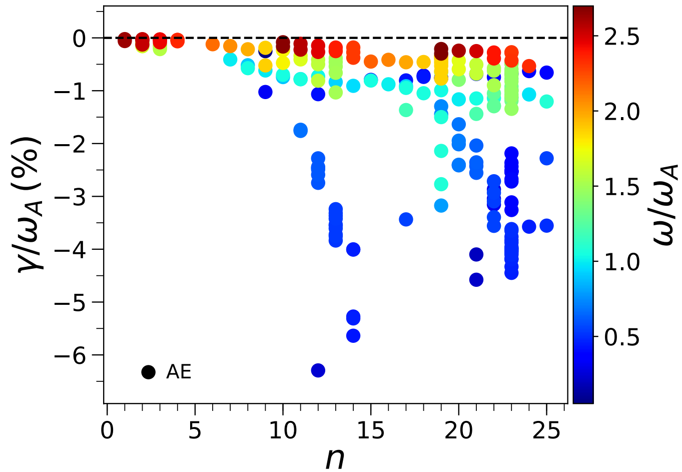
Previous highlights on AE stability



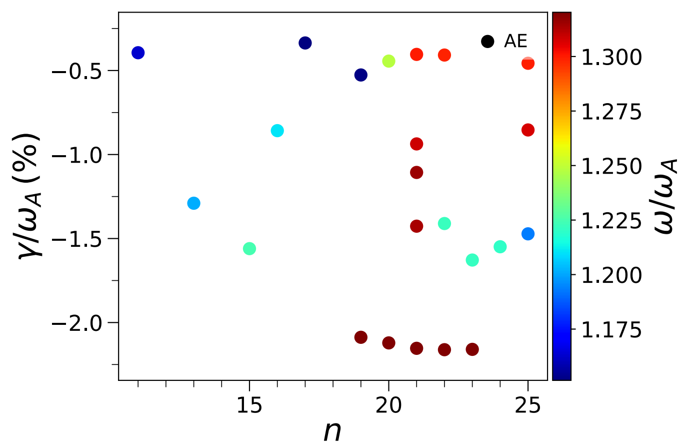


N-NB<0.3% ; P-NB<0.02%; thermal ~[0-6]%

Thermal+P-NB+N-NB contibutions



Thermal+P-NB+N-NB contibutions (ITB located modes only)



Modelling plans

- Obtain the plasma scenarios from JETTO/ETS (preferably in IDSs)
- Obtain/calculate (*collaboration with ETS / JINTRAC teams*) the NBI energetic particle deposition profiles and distributions using ASCOT
  - Use separately P-NBI and N-NBI
  - Convert to COM space
  - ACHTUNG: outcome is highly sensitive to “kinetic”/q plasma profiles → *solid agreement is envisaged*.
- Estimate drive/damping contribution from NBI ions using CASTOR-K hybrid MHD drift kinetic code. Estimate also thermal ion damping.