Investigation of the nonlinear dynamics of energetic particles, turbulence and zonal structures in AUG and JET with ORB5

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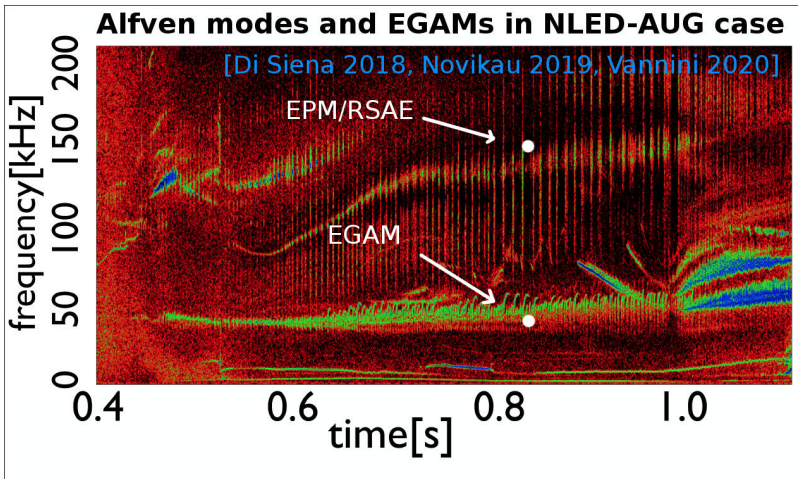
TSVV#10 meeting
July 9th, 2021

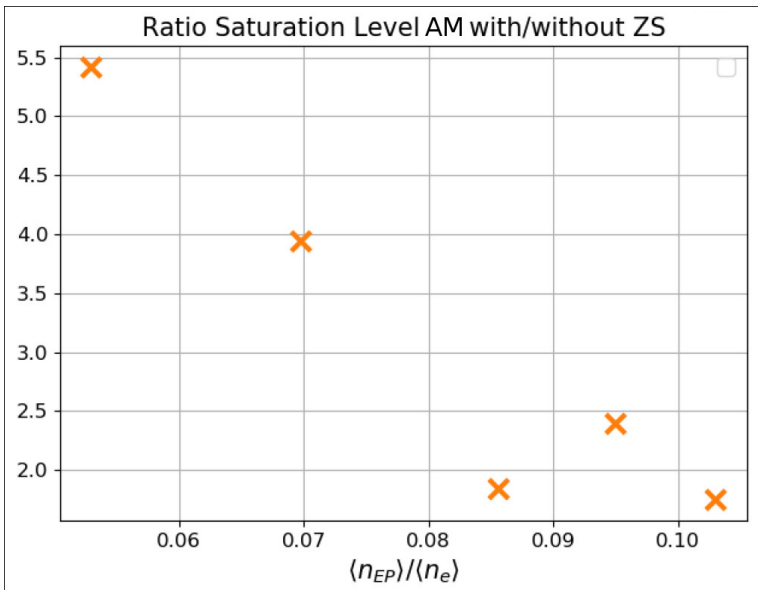
EUROfusion

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.

EGAMs and AMs in AUG

- Energetic particles (EP) excite EP-driven geodesic acoustic modes (EGAM) and Alfvén modes (AM) in ASDEX Upgrade [Lauber-14]
- Despite approximation on EP distrib. function, good match of theoretical (white dots) and exp. frequencies (spectrogram) found
- Electron Landau damping is the dominant lin. damping mechanism
- NL relative frequency chirping recovered for EGAMs [Novikau-20], in progress for AMs
- Zonal structures (EGAM/ZF) can modify the nonlinear saturation level of AMs [Vannini-21]
- Effect of exp. EP distr. functions under investigation [Rettino]





AMs in JET

- JET discharge # 73224 under investigation with ORB5 and GENE (profiles from [DiSiena-19], studying the interaction of AMs, turbulence and EPs in this case)
- Preliminary study of AM dynamics started with ORB5 in circular magnetic geometry
- Toroidicity-induced Alfvén Eigenmode (TAE) observed with $n = 1$, dominant $m = 1, 2$
- Interaction with the continuum branch at $m = 3$ observed.
- Nonlinear EP radial redistribution observed
- ZS excitation under investigation
- Next step: shaped magnetic geometry