

NSTX contributions to ITPA: Energetic Particles

1. Measure damping rates of Alfvén waves (together with reliable mode identification: eigenfunction, frequency etc) and compare with theory.
Difficult: would require allocation of time with reduced HHFW capability.
Well covered by JET, MAST, C-MOD, but complements studies in Task 2.
2. **Define benchmark test cases for fast particle stability codes.**
Perfect task for NSTX, NOVA/ORBIT/M3D-k benchmark case already defined:
2004-2008, Experiments used refl., Mirnov arrays, MSE, NPAs, sFLIP and FIDA to document TAE avalanches.
Additional run time required to supplement existing experimental data:
 - New FIDA, neut. Coll., more complete measurement of fast ion redistribution.
 - BES to extend avalanche studies to H-modes
3. Compare theoretical predictions with measurements of fast ion losses caused by magnetic field ripple and error fields in present day devices.
Ripple is small, but study of error fields is a possibility.
 - HHFW experiments on NSTX important for benchmarking codes for ITER
Experiments on antenna coupling, fast ion coupling, start-up and current ramp

Joint Experiments in Energetic Particle Physics

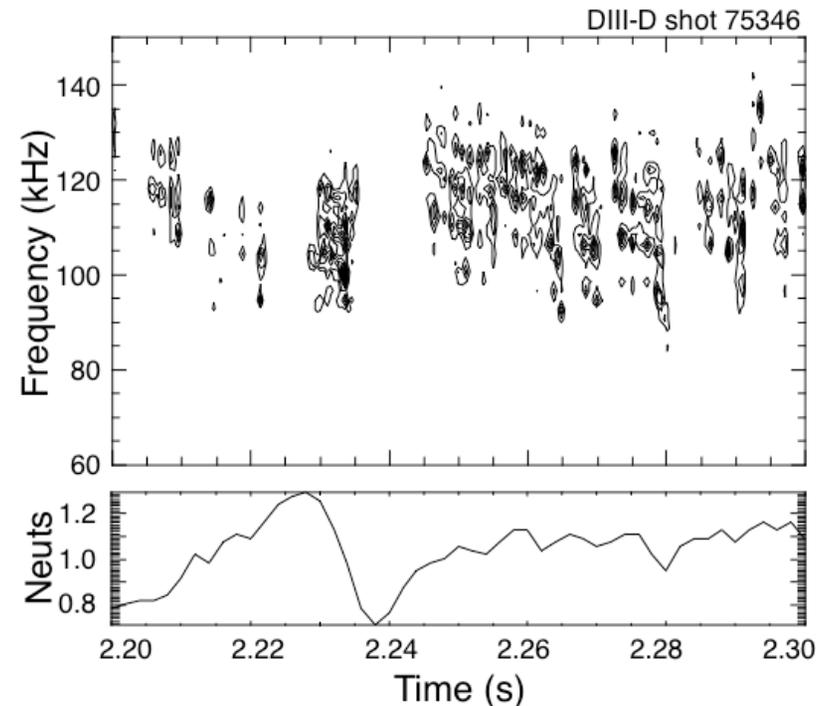
- **MDC-10** Measurement of damping rate of intermediate toroidal mode number Alfvén Eigenmodes

How important is rotational shear for GAP structure, continuum damping?
Damping measurements in quiescent regime could answer this question.

- **MDC-11** Fast ion losses and Redistribution from Localized AEs

Similarity experiment with DIII-D; fast ion transport from (bursting) TAE or TAE avalanches. For example DIII-D 75346.

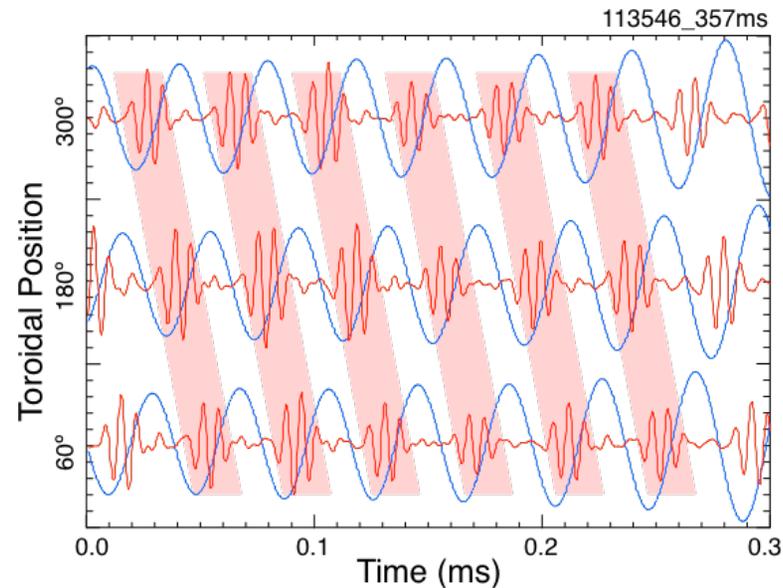
Can NOVA/ORBIT predict fast ion transport on DIII-D for TAE?



Proposed modifications or additions to High Priority Tasks

Energetic Particle Physics

- Identify/document strongly non-linear energetic particle driven instability cases to be benchmarked with non-linear codes. Examples could be:
 - EPM/TAE/GAE avalanches.
 - 3-wave coupling of TAE/EPM, GAE/TAE or GAE/EPM
- Importance of high frequency modes, CAE/GAE,
 - Electron heat transport
 - Stochastic ion heating



Integrated Operation Scenarios

- Develop benchmarked modeling tools for ICRF coupling.
- Investigate ICRF interaction with beam ions, fusion alpha's
- Investigate ICRF for ITER start-up and current ramp.

Other High Priority Research Tasks

3. Develop relevant diagnostics and make recommendations for ITER diagnostics.

Not a clear Research task.

4. Predict the power loads to the ITER first wall caused by error fields, ferritic inserts, test blanket modules and perturbation fields (ELM mitigation coils).

We don't/can't do ITER similarity experiments.