NSTX contributions to ITPA-EPTG

E Fredrickson

Draft High Priority Research Tasks

1. Measure damping rates of Alfvén waves (together with reliable mode identification: eigenfunction, frequency etc) and compare with theory.

   Difficult with existing and proposed NSTX hardware for 5-year horizon. HHFW antenna straps might be used for these measurements, but would require substantial allocation of run-periods with no or limited HHFW.

2. Define benchmark test cases for fast particle stability codes.

   Perfect task for NSTX:

   NSTX has well developed fast-ion diagnostic set (NPAs, FIDAs, FLIPs, neutron monitors, neutron collimator, etc.

   NSTX has good equilibrium diagnostic set, incl. MSE

   NSTX has pretty good internal diagnostics of mode structure/amplitude (Refl., BES, Firetip, SXI, lfMSE?)

   Strong theory and modeling support.

Draft High Priority Research Tasks

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

   ?

4. 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.

5. 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?

Joint Experiments in Energetic Particle Physics

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

  Difficult in any circumstance. Plasmas would have to be very low beam power or

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

  Probably not relevant to NSTX, most modes are fairly global. Implied is multi-mode transport which we can address.

Proposed High Priority Task

- 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