XP1171: 2012 JRT

S.M. Kaye for the T&T TSG

T&T TSG Meeting

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2012 JRT Description

Conduct experiments on major fusion facilities leading toward improved understanding of core transport and enhanced capability to predict core temperature and density profiles. In FY 2012, FES will assess the level of agreement between predictions from theoretical and computational transport models and the available experimental measurements of core profiles, fluxes and fluctuations. The research is expected to exploit the diagnostic capabilities of the facilities (Alcator C-Mod, DIII-D, NSTX) along with their abilities to run in both unique and overlapping regimes. The work will emphasize **simultaneous comparison of model predictions with experimental energy, particle and impurity transport levels and fluctuations** in various regimes, including those **regimes with significant excitation of electron modes**. The results achieved will be used to improve confidence in transport models used for extrapolations to planned ITER operation.

2012 JRT Milestones

- **Quarter 1 Milestone:**
  - Develop an initial, coordinated research plan among the three facilities including specific experiments to be conducted and approaches to analysis and modeling. Outline methods for data and document sharing. Begin preliminary experiments on two of the three facilities.

- **Quarter 2 Milestone:**
  - Begin preliminary modeling work, especially for run planning. Begin data analysis. Continue experiments on two of the three facilities with plans adjusted based on evaluation of preliminary research.

- **Quarter 3 Milestone:**
  - Experiments underway at 3rd facility. Experiments at other two facilities have completed all or most of their experimental work. Data analysis continues. Modeling of discharges from all three facilities is underway.

- **Quarter 4 Milestone:**
  - All experiments and analysis completed. Final report prepared and submitted, outlining experimental observations, initial comparisons with code predictions and recommendations for further work.

Specific shot list for XP cannot be developed until SGI/reflectometer scoping XP complete

- Can discuss several branch points for XP, however
- Would like to at least identify the highest leverage studies (changes) that can be made
- Will outline some steps in XP in next few vgs
- Will give overview first, then let's have detailed discussion of the specific approaches

I. SGI Scoping (XP1161) – outer view for high-k (BES covers most r)

1. L-mode – establish low TAE discharge, vary SGI plenum pressure, then frequency. Couple with Ne injection
2. Repeat in H-mode

II. XP1171: L-mode (if SGI successful)

1. Inner view for high-k
2. Intersperse SGI pulses with none (depending on how far in reflectometer can probe)
3. Impurity seeding

Options:

- Change I_p (core or edge effect?)
- Change rotation (vary amount of low-k stabilization)
- Change collisionality (ETG->microtearing, change I_p, B_T at fixed I_p/B_T)
  (done in Guttenfelder's XP, but not with SGI?)

III. XP1171: L-mode (if SGI successful)

1. Repeat II. with inner view for high-k
2. Intersperse SGI pulses with none (depending on extent of reflectometer)
3. Impurity seeding
4. Change to outer view for high-k and repeat II.

XP1171: cont'd

IV. H-mode

1. Continue in outer view, repeat II.
   a. SGI only if proven it can work in H-mode
2. Repeat IV.1 in inner view (probably only with impurity seeding)
3. Repeat IV.2 with 400 A n=3 to change rotation, rotation shear (ions more anomalous)
4. Repeat IV.2 with 800 A n=3
5. Repeat IV.2-3 with outer view high-k and SGI

Change collisionality and repeat?

Discuss XP

- Approach
  - L vs H, inner vs outer, SGI vs none
- Options in L-mode
  - Change I_p (core or edge effect?)
  - Change rotation (vary amount of low-k stabilization)
  - Change collisionality (ETG->microtearing, change I_p, B_T at fixed I_p/B_T)
- Options in H-mode
  - Change rotation (vary amount of low-k stabilization
  - Change collisionality (ETG->microtearing, change I_p, B_T at fixed I_p/B_T)