

Wave-Particle Interactions Research Strategy for the 2010 Run

G. Taylor

Leader

M. Podestà

Deputy leader

N. Gorelenkov

Theory and modeling

**FY2010 NSTX Research Forum
December 3, 2009**

Run Time Allocation, Milestones & ITER/ITPA Issues for NSTX WPI TSG Experiments in 2010

- WPI-TSG allocated run time: 7 days for 1st priority, 10 days 1st & 2nd priority
 - 27 days requested (15.35 days minimum useful)
- 2010 Research milestones:
 - R10-2 : Characterize HHFW heating, current drive, and current ramp-up in deuterium H-mode plasmas
- Related ITPA/ITER issues:
 - EP-1: Measure damping rate of intermediate mode number AEs
 - EP-2: Fast ion losses and redistribution from localized AEs
 - TC-12: H-mode transport and confinement at low aspect ratio (with T&T-TSG)
 - [TC-9: Scaling of intrinsic plasma rotation with no external momentum input (with T&T-TSG)]
 - IOS-5.2: Maintaining ICRH coupling in expected ITER regimes

28 experiment ideas considered during 21 presentations

- 3 hours for presentations, 1 hour discussion & planning
- Presentations included 2 talks on RF modeling
- Proposed ideas combined/prioritized:
 - 2(+1) XMP:
 - HHFW plasma conditioning to high RF power
 - Power limiting mechanisms on HHFW
 - [Plasma jogs to measure *AE mode structure w/ interferometer]
 - 17 XPs:
 - 8 First-Priority XPs, addressing FY10 Milestones and/or ITPA/ITER issues
 - 5 Second-Priority XPs
 - 4 Third-Priority XPs (include reversed I_p/B_{tor} XPs)
 - 5 Piggyback experiments
 - 2 possible “cross cutting” XPs
 - Plasma jogs to measure *AE mode structure w/ interferometer
 - Clamping of edge rotation by HHFW (with T&T-TSG)
- More details at Research Forum / WPI web page

HHFW experiments - 4 (5.5) days

- HHFW heating at low T_e , I_p 1 day [1] R10-2, IOS-5.2
- HHFW power coupling vs ELMs 1 day [1] R10-2
- RF heating at divertor/SOL regions 1 day [1] R10-2, IOS-5.2
- HHFW heating in NB heated plasmas 1 day [1] R10-2, IOS-5.2
- Sustainment of 100% non-inductive H-mode 0.5 days [2] R10-2, IOS-5.2
- MSE measurements of HHFW-CD 0.5 days [2] R10.2
- Clamping of edge rotation by HHFW 0.5 days [2] R10.2, TC-9

- Interaction of HHFW SOL heating with LLD piggyback
- Measure internal RF wave amplitude with reflectometer piggyback
- Measure RF induced density fluctuations with FIRE TIP piggyback
- Study of HHFW generated PDI piggyback

- HHFW plasma conditioning XMP
- HHFW power limiting mechanisms XMP

[1] priority

1st (1st & 2nd) priority days assigned

Milestone/ITER/ITPA

Energetic Particles experiments - 3 (4.5) days

- H-mode TAE avalanches 1 day [1] EP-2
- Validation of M3D-k code 1 day [1] EP-2
- Study of Angelfish instability 0.5 day [1] EP-2
- *AE induced electron transport 0.5 (1) days [1] EP-2, TC-12
- EPM effects on fast ion transport and current profile 1 day [2] EP-2
- Conversion of AEs to Kinetic Alfvén waves -- day [2] EP-1
- Error field modulation of TAEs -- day [3] EP-2
- Study of co-propagating CAEs piggyback, but BES limited to 1MHz
- Study of High Energy Feature with NPA/NBI scans [3] EP-2
 - Requires no-Lithium scenario
- Energetic particle driven GAM [3]
 - Needs reversed I_p
- Red/blue Doppler shift in FIDA spectra [3]
 - Needs reversed B_{tor} or I_p
- [Plasma jogs to measure *AE mode structure w/ interferometer XMP]

Special conditions required

[1] priority

1st (1st & 2nd) priority days assigned

Milestone/ITER/ITPA