Wave-Particle Interactions Research Strategy for the 2010 Run

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Agenda:

- Run time allocation for XPs

- ITER high priority XPs

- XMPs & run time for HHFW conditioning

- Priority 1 XP review schedule

NSTX Wave-Particle Topical Science Group Meeting
December 10, 2009

Run Time & Priorities Revised to Match Guidance & to Better Address HHFW Research Milestone

- Total WPI-TSG XP allocated run time now matches guidance of 6 days for 1st priority XPs, 8 days 1st & 2nd priority XPs

- Highest priority given to XPs supporting 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

HHFW Experiments - 4 (5) days

- **WPI-1:** 100% non-inductive RF H-mode [1] 1(1.5) days R10-2, IOS-5.2
- **WPI-2:** HHFW heating at low T_e, I_p [1] 0.5 days [+1 in SFSU] R10-2, IOS-5.2
- **WPI-3:** HHFW power coupling vs ELMs [1] 1* day R10-2
- **WPI-6/15:** HHFW heating in NB heated plasmas [1] 1 day R10-2, IOS-5.2
- **WPI-4:** RF heating at divertor/SOL regions [1] 0.5 days R10-2, IOS-5.2
- **WPI-17:** Clamping of edge rotation by HHFW [2] (0.5) days R10.2, TC-9
- **WPI-26:** MSE measurements of HHFW-CD [2] 0 days R10.2
- **WPI-5:** Interaction of HHFW heating with LLD piggyback R10-2, IOS-5.2
- **WPI-20:** Measure RF wave amplitude with reflectometer piggyback R10.2
- **WPI-24:** Measure RF density fluctuations with FIReTIP piggyback R10.2
- **WPI-27:** Study of HHFW generated PDI piggyback R10.2

- **XMP:** HHFW plasma conditioning (XMP-26)
- **XMP:** RF power limiting mechanisms in HHFW antenna

* = Possible 0.5 day ITER XP – allowing additional 0.5 days for **WPI-4**

[1] = priority   1st (1st & 2nd) = priority days assigned   = Milestone/ITER/ITPA

Energetic Particles experiments - 2 (3) days

- **WPI-8/9:** H-mode TAE/GAE avalanches [1] 0.5 days EP-2
- **WPI-11/16/19:** M3D-K validation for beam-driven TAE [1] 0.5* (1) day EP-2
- **WPI-14/21:** Study of Angelfish instability & effect of HHFW [1] 0.5 days EP-2
- **WPI-18:** *AE induced electron transport [1] 0.5 days EP-2, TC-12
- **WPI-7:** EPM effects on fast ion transport & current profile [2] (0.5) days EP-2
- **WPI-12:** Conversion of AEs to Kinetic Alfvén waves [2] 0** days EP-1
- **WPI-25:** Error field modulation of TAEs [3] 0 days EP-2
- **WPI-22:** Study of co-propagating CAEs piggyback [BES limited to 1MHz]

- **WPI-28:** Study of High Energy Feature with NPA [3] 0 days EP-2
  - Requires no-Lithium scenario
- **WPI-10:** Energetic particle driven GAM [3] 0 days
  - Needs reversed I_p
- **WPI-13:** Red/blue Doppler shift in FIDA spectra [3] 0 days
  - Needs reversed B_{tor} or I_p

} *Special conditions required*

- **XMP?:** Plasma jogs to measure *AE mode structure with interferometer

* = Possible 0.5 day ITER XP – allowing additional 0.5 days for **WPI-8/9**

** = Possible 0.5 day ITER XP – allowing 0.5 days for **WPI-12**

[1] = priority   1st (1st & 2nd) = priority days assigned   = Milestone/ITER/ITPA

HHFW Conditioning

- ~ 2 days of HHFW plasma conditioning at start of run campaign:

  - Achieve reliable operation at P_{rf} ~ 5 MW (XMP-26) [Hosea]

  - Interleave XMP to study power limiting mechanisms in the HHFW antenna [Ryan] with XMP-26

- ~ 0.5 days of HHFW plasma conditioning at start of each RF-related XP campaign:

  - Establish P_{rf} ~ 5 MW (XMP-26) before running RF-related XP's

  - May need total of 4-5 run days of RF plasma conditioning

  - Propose we group several RF-related XP's together to form 3-4 day RF campaigns

Proposed Schedule for WPI TSG Priority 1 XP Reviews

- Run campaign begins ~ March 1

- Priority 1 XP's need to be reviewed in WPI TSG by Feb 18

- Propose we meet Thursday's at 1 PM to review XP's:

  - Jan 7: **WPI-1** [Taylor] & **WPI-2** [Taylor]

  - Jan 14: **WPI-3** [Hosea] & **WPI-4** [Hosea]

  - Jan 21: **WPI-6/15** [LeBlanc/Podesta/Heidbrink]

  - Jan 28: **WPI-8/9** [Fredrickson]

  - Feb 4: **NSTX PAC Meeting**

  - Feb 11: **WPI-18** [Tritz] & **WPI-14/21** [Heidbrink/Fredrickson]

  - Feb 18: **WPI-11/16/19** [Fu/Podesta/Crocker/Smith]