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PPPL LSB-252

December 15th, 2010

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NSTX Milestones 2011/2012

Reminder: no or very limited break between FY11–FY12 NSTX Runs

All in-vessel jobs must be completed by early 2011 !

Strategy for early HHFW experiments under discussion

Avoid running after heavy Lithium deposition

- ***R(12-2): Assess confinement, heating, and ramp-up of CHI start-up plasmas - SFSU + WPI/HHFW + ASC***
- ***IR(12-2?): Assess predictive capability of mode-induced fast-ion transport - WPI***

ITPA tasks 2011, HHFW

- **Participate in:**

- ***TC-9 Scaling of intrinsic plasma rotation with no external momentum input***
- ***TC-14 RF rotation drive***
- ***IOS-5.2 Maintaining ICRH coupling in expected ITER regime***

ITPA tasks 2011, Energetic Particles

- **Participate in:**

- ***EP-2 Fast ion Loss and Redistribution from Localised AEs***
- ***EP-4 Effect of dynamical friction (drag) at resonance on nonlinear AE evolution***

- **Also considering participation in:**

- ***EP-3 Fast ion transport by small scale turbulence***
- ***EP-6 Fast-Ion Losses and Associated Heat Load from Edge Perturbations (ELMs and RMPs)***

Recommendations from NSTX PAC 2010 HHFW

*[...] it is recommended that the NSTX Team start developing plasma scenarios ...that can be used for **HHFW heating in current ramp-up and start-up plasmas.***

*[...] revisit the **absorption and propagation physics of HHFW in NSTX-U** in light of the fact that the magnetic field for the upgrade will be 1 T. This can be done with combined full-wave and Fokker Planck solvers such as AORSA/TORIC and CQL3D.*

*[...] continue to assess the level of **parasitic losses in combined HHFW-NBI experiments**, especially given the need to understand the interaction of RF waves with energetic particles in future burning plasma devices.*

*[...] consider **increased emphasis on determining compatibility of HHFW (in particular plasma-antenna gap) and long-pulse, high-power NBI***

*[...] agree with the need to **develop increased protection against ELM-induced transients** in the antenna loading, and **ELM-resistant antenna matching techniques**, over the next 2-3 years.*

Recommendations from NSTX PAC 2010

Energetic Particles

[...] The PAC encourages NSTX to push forward important cross-cutting research in the topics of

- (i) fast ion effects on RWM stability (with MHD TSG),*
- (ii) simulation of multi-mode avalanches, also with rotation shear, and*
- (iii) consideration of simulating alpha heating with on-axis 2nd harmonic HHFW on protons (with HHFW TSG).*

In addition to existing energetic particle research plans, the PAC recommends increased emphasis on resolving the discrepancy (NSTX, DIII-D) between measured and simulation mode amplitudes to reproduce fast ion losses.

HHFW Research Priorities for 2011-12

- ***Characterize and optimize high-harmonic fast wave coupling in deuterium H-mode plasmas***
- ***Utilize HHFW heating and current drive to assist non-inductive plasma current ramp-up and sustainment (R12-2)***

EP Research Priorities for 2011-12

- ***Assess predictive capability of TAE-induced fast ion transport***
- ***Extend TAE/EPM studies to H-mode plasmas***