HHFW Conditioning Discussion

WEP TSG Meeting
April 26, 2011
B318

Objectives for HHFW Conditioning

- First priority is to establish maximum power levels attainable with and without NBI:
  - If possible, identify power limiting mechanism
- Develop methods of maintaining conditioned antennas
- Document the antenna performance history during rf operation and lithium deposition
- Condition antennas to power levels needed for subsequent HHFW experiments → goal of this meeting is to identify XP needs
- Obtain information needed for improved HHFW operation on NSTX-U

Condition Antennas To Power Levels Needed For HHFW Experiments

- Vacuum conditioning:
  - Assess HHFW antenna voltage limits in vacuum with "clean" antenna before run campaign starts to get baseline without plasma operation or lithium deposition
  - Periodically re-condition to assess affect of routine plasma operation and LiTER usage on antenna voltage holding
  - Develop between shot vacuum conditioning techniques?
- Plasma conditioning:
  - Day 1: He without NBI (highest priority is to push RF power in He)
  - First ½ Day 2: D without NBI
  - Second ½ Day 2: D with NBI
  - May need third day
- One or two RF plasma fiducial shots per week thereafter to assess antenna condition
  - Can we use usual "morning" fiducial with 50 ms RF pulse?

Some General Thoughts on High Power HHFW Operation

- Doubtful that 2 days of conditioning will achieve >3 MW of arc-free HHFW power, particularly with NBI
- Should give a general idea of how easy or difficult it will be to support the higher power experiments
- In most campaigns, power limits increased with time. Last year power limits degraded with time. Weekly RF fiducial shots may help us determine the sign of the derivative
- Experiments needing >4 MW should prepare to spend early part of XP time for RF conditioning/increasing power
- Low current/CHI XPs may need a half day of devoted shot development/conditioning

Summary of Priority 1 & 2 Experiments Requesting HHFW Power

XP#	Lead Author(s)	Title	H-Mode or L-Mode	HHFW Power Requirements (MW)	HHFW Phasing & Modulation	NBI Power Requirements (MW)	FY11 Priority 1 Days	FY12 Priority 1 Days	FY11 Priority 2 Days	FY12 Priority 2 Days
WEP-18	**D. Smith**	Measure HHFW Wavefield	L	1	10 kHz mod.	2			0.5	
1012	**B. LeBlanc M. Podesta**	HHFW Absorption in NBI-Heated Plasmas	L & H	3-4		2	1.0	0.5		
	M. Podesta	Clamping of Edge Rotation by HHFW	L	2	60 deg. for max. clamping	2				
1062	**S. Sabbagh**	NTV steady-state offset vel. at red. torque with HHFW	H (but not required)	2-3	Any phasing	2		0.5		
1105	**M. Bell**	HHFW Heating to Increase Non-Inductive Current Fraction in NBI H-modes	H	3		2-4		0.5		0.5
	J. Menard	HHFW for q-profile control	H	2-4	Heating and co & cntr CD	2-3				
1155	**G. Taylor**	HHFW Ramp Up of Inductively Initiated Plasma from 250 to 400 kA	H	4-5	CD phasing	2	0.5	0.5		
1158	**G. Taylor**	HHFW Heating of CHI-initiated Plasma	L & H	2-3	CD phasing	0	0.5	0.75		0.25
1160	**G. Taylor**	Low Plasma Current Fully Non-Inductive HHFW H-Mode	H	2.5-3	CD phasing	0	0.5	0.5		0.5
1168	**J. Hosea**	Study HHFW Power Coupling Versus ELM Activity	H	2-3		2	0.5	1.0		
	J. Hosea	RF Heating at Divertor/SOL Regions	H	2-3		2				
	R. Maingi	Comparison of H-mode Pedestal Characteristics with RF and NBI	H	3		0				
	A. Diallo	Plasma Current Scaling of the Pedestal Structure in RF Heated ELMy H-mode	H	3		0				
	J. Hosea	Turbulence Characteristics for HHFW Saturated Stored Energy versus RF Power	H	3.5-4		0				
						TOTAL	**3**	**4.25**	**0.5**	**1.25**