Princeton Plasma Physics Laboratory

Machine Proposal Procedure

Procedure Title: Bring HHFW system online and raise power to 6 MW

OP-XMP-	**Revision:** 0	Effective Date: 01/13/03 *(Ref. OP-AD-97)* Expiration Date: 01/13/05 *(2 yrs. unless otherwise stipulated)*

Procedure Approvals

Author JR Wilson	Date
ATI G Taylor	Date
RLM Michael Bell	Date

Responsible Division: Experimental Research Operations

Procedure Requirements
designated by RLM

	NSTX Work Permit (TBD)		Lockout/Tagout (OP-AD-61)
	TFTR Work Permit (OP-AD-09)		Door Permit (OP-G-93)
	Tritium Work Permit (OP-AD-49)		T-MOD (OP-AD-03)
	RWP (HP-OP-20)		Lift Procedure (ENG-021)
	Confined Space Permit		DCA/DCN (OP-AD-104)
	Pre-job brief (OP-AD-79)		ATI Walkdown
	USQD (OP-AD-63)		Independant Review
	Master Equip. List Mod (OP-AD-112)		ES&H Review (NEPA, IH, etc)

MINOR MODIFICATIONS

REVIEWERS (designated by RLM)
ATI
Test Director
Independent Reviewer
D-Site Shift Supervisor
NSTX
TFTR Caretaking
Vacuum
Computer
Tritium
QA/QC
AC Power
FED
ECS/MG
FED
ERWM
Water
NB
RF
Diagnostics

TRAINING (designated by RLM)

No training required _____ Instructor _____

Personnel (group, job title or individual name)	Read Only	Instruction	Hands-On

Training Rep. _____

RLM _____

NSTX MACHINE PROPOSAL

TITLE: **Bring HHFW system online and raise power to 6 MW XMP#**

AUTHORS: J. R. Wilson **DATE:** 01/02/03

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1. **Overview of planned experiment:** Operate HHFW into plasma to check out system performance, condition antenna to maximum voltage and evaluate performance in standard discharges. Power will be applied starting at a low level (~0.6 MW). Phase and amplitude control will be verified. Arc control and plasma current inhibit will be verified. Power will be raised until either a hard voltage limit or 6 MW level is reached. Some arcing during the conditioning process is expected. Evaluate plasma heating utilizing magnetics and Thomson scattering. Compare voltage limits and performance in multiple plasma configurations

2. **Justification:**
After a major vacuum opening the HHFW system needs to be re-conditioned up to maximum power into plasma. Any significant changes in the systems behavior either due to changes in HHFW system itself or in the machine need to be documented. In addition the performance of the system in terms of plasma heating needs to be verified in standard discharge conditions. The many scans allow the antenna to be power conditioned in a variety of discharge conditions, promoting reliability in future experimental operations.

3. **Plan:**
Establish standard HHFW plasma like shot 107965. Plasma may be either D or He4 (use D for prefill in either case). Inject HHFW power from 0.2- 0.4 s beginning at 100 kW per transmitter. Look for arcing, density rise, D_{alpha} signal and electron temperature response. Verify phase and amplitude control at this power level. Increase power on succeeding shots by increments of ~100 kW per transmitter while observing plasma behavior, repeat shots at a given power if arcing occurs or a large increase in density or D_{alpha} is observed. Continue until an arcing limit is found. Vary outer gap and plasma density to see if limit is a true voltage limit or a power limit. Vary plasma current to observe dependence of voltage limit. Vary antenna phasing to observe voltage dependence Repeat power scan in double null configuration.

4. **Required machine, beam, ICRF and diagnostic capabilities:**
Requires HHFW system, magnetics, Thomson scattering.

5. **Provide sign-off to proceed from Physics Operations.**
Provide spaces to enter data as may be appropriate.

5.1 Permission to Proceed: _____
Physics Operations

5.2 Documentation of results:

Record voltage limit and accompanying plasma parameters.

_____

Cognizant Physicist

PHYSICS OPERATIONS REQUEST

Title: **Bring HHFW system online and raise power to 6 MW** **Proposal:**

Machine conditions (indicate range where appropriate):

I_p (MA)_0.5-1.0 MA__ R(m)_____ z(m)_____

Inner Wall / Single Null / Double Null_all

Flattop start/stop__, I_{TF}(kA)__0.35-0.5 T_, Gas Species_D and He4

Beams: Power_0 MW, duration_____, voltage___,

RF: Power_6MW, duration_1 s,

CHI on/**off** Start-up/Current ramp/Current Sustainment

If this is a continuation of a previous run or if shots from a previous run are similar to those needed, please provide that information.

List of previous shot numbers for setup
_____
_107965_

_____
_____

If this is a series of shots that are new and unique, sketch the desired time profiles and shapes. It is important that you accurately label the sketch so there is no confusion about times or values.

(Attach additional sheets as required)

Diagnostic Checklist

XP Title: XP No.

		Need	Desire	Comments
Magnetics:	Magnetics	x		
n_e and T_e:	Interferometer	_		
	Thomson Scattering	x		
T_i:	CHERS			
	NPA			
Spectroscopy:	H□	x		
	SPRED (UV)			
	VIPS (H/D ratio			
	X-ray PHA			
	Visible Bremsstrahlung			
Particles:	NPA		x	
Waves:	Mirnov Coils		x	
	X-ray Array		x	
	Reflectometer			
Edge:	Bolometer	_		
	Plasma TV	x		
	IRTV			