Princeton Plasma Physics Laboratory
Machine Proposal Procedure

Procedure Title: Start-up with large plasma for HHFW

OP-XMP-	**Revision:** 0	Effective Date: 02/01/1999 *(Ref. OP-AD-97)* Expiration Date: 02/01/2001 *(2 yrs. unless otherwise stipulated)*

Procedure Approvals

Author J R Wilson	Date
ATI G Taylor	Date
RLM M. 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	J R Wilson
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: Start-up with large plasma for HHFW **XMP#**

AUTHORS: J. R. Wilson **DATE:** 1/03/02

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1. **Overview of planned experiment:**

The experiment is designed to find an appropriate start-up scenario that allows: the application of HHFW power to the NSTX plasma as early in the discharge evolution as possible, that facilitates the achievement of a flat-top discharge with low li, high q(0) and good MHD stability, and one that extrapolates towards using HHFW in current ramp-up mode after non-ohmic plasma initiation

2. **Justification:**

In order to perform HHFW current drive experiments more definitively a low li high q(0) target plasma is desired since in previous experiments the observed current drive effects are strongly reduced after q(0) nears unity. Previous plasma start-up techniques encouraged this discharge evolution by starting up with smaller plasmas and growing by adding to the outside of the discharge. In addition the production of a lower li plasma should provide a better target for high beta achievement. Finally, eventual non-inductive operation on NSTX will require heating and/or current drive during the current ramp phase., presently the application of HHFW is restricted to times > 0.05 – 0.1 s by the presence of too large an outer gap at earlier times.

3. **Plan:**

Begin by trying to establish an ohmic target plasma with an outer gap < 0.1 m at as early a time as possible in the discharge (goal < 0.05 s). Use B_{TF} = 4.5 kG, Ip ~0.5 MA. Vary current ramp-rate and gas fueling to obtain target plasma. Apply HHFW power and observe changes in evolution. Increase rf power level and make adjustments in discharge programming to maintain acceptable discharge conditions. Try various antenna phasings: Balanced, Co- and Ctr- CD to obtain lowest li and q(0) discharge with good MHD stability. Process can be repeated at Ip ~ 1MA.

4. **Required machine, beam, ICRF and diagnostic capabilities:**
HHFW power, 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:

Identify successful target plasmas by shot number

_____
Cognizant Physicist

PHYSICS OPERATIONS REQUEST

Title: **Proposal:**

Machine conditions (indicate range where appropriate):

I_p (MA) 0.5 – 1 MA R(m)_____ z(m)_____

Inner Wall / Single Null / Double Null

Flattop start/stop__, I_{TF}(kA) 0.45 T, Gas Species D

Beams: Power__, duration_____, voltage___,

RF: Power max, duration 0.5 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

_____
__

_____
_____

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		x	
Spectroscopy:	H□	_		
	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	_		
	IRTV			