

Experimental Task Force 1 (ET1)

XP 1: Basic plasma startup with feedback control

PURPOSE: The purpose of this XP is to initiate feedback control of the NSTX plasma.

SCOPE: Commission the plasma control system to accommodate routine plasma startup and control. Plasma control will be addressed in three phases.

- 1) Current control in the coils
- 2) Plasma current control
- 3) Position control
 - a. Radial position
 - b. Vertical position

Since this will be the first operation of the control system, an initial phase dealing with gain optimization, magnetics calibrations will be performed followed by an iterative process of control algorithm development for each of the phases outlined above.

REQUIREMENTS:

Before beginning this XP the following systems should be readied:

- 1) TF and PF Coil systems
- 2) Magnetics diagnostics
- 3) Gas injection system
- 4) Plasma control hardware
- 5) Plasma control software
- 6) Preionization system(EC and/or filament)
- 7) EFIT reconstruction
- 8) MDSplus storage and retrieval

For plasma current and shape control a signal proportional to plasma current needs to be developed. To accomplish this, calibrations shots to deduce the eddy currents produced by individual coils should be done prior to this XP.

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XP 2: Optimization of volt-second consumption

PURPOSE: The purpose of this XP is to measure the volt-second consumption during ohmic startup, and to test scenarios to optimize startup.

SCOPE: This XP will test various startup scenarios to conserve volt-second consumption during startup. Scenarios to examine will include

- 1) Plasma position during startup (inside, central, outside startup)
- 2) Changing preionization (EC, filament, none)
- 3) Adjusting Ip ramp rates
- 4) Changing gas prefill levels

REQUIREMENTS:

This XP assumes that plasma control system has been commissioned.

Before beginning this XP the following systems should be ready:

- 1) TF and PF Coil systems
- 2) Magnetics diagnostics
- 3) Gas injection system
- 4) Plasma control system
- 6) Preionization system(EC and/or filament)
- 7) EFIT reconstruction