

## NCSX Diagnostic Plan

<b>Research program phase/Measurement</b>	<b>Diagnostic technique</b>
<b><i>1. Initial Operation (B=0.5 T, room temperature)</i></b>	
I <sub>p</sub>	Rowgowski coil
Wide-angle image of plasma/wall	Visible camera (1)
<b><i>2. Initial Field Line Mapping (no plasma)</i></b>	
Vacuum flux surfaces	E-beam, fluorescent probe & CCD camera
<b><i>3. 1.5 MW Initial Experiments (1.5 MW NBI, B=1.2 T, cryogenics, minimal PFCs)</i></b>	
Boundary position and shape	Saddle loops, flux loops, B probes, V3FIT
Total stored energy	Diamagnetic loop
Wide-angle image of plasma/wall	Visible cameras with filters (2)
Core T <sub>e</sub>	Basic Thomson scattering or filtered SXR diodes, & x-ray crystal spectrometer
n <sub>e</sub> profile	FIR interferometer/polarimeter
Core T <sub>i</sub>	X-ray crystal spectrometer
Total P <sub>rad</sub>	Wide angle bolometer
Low m,n MHD modes (<100 kHz)	Compact soft x-ray arrays (8 20-channel arrays)
Magnetic axis position	Compact soft x-ray arrays & 3-D EFIT
Impurity identification	Visible spectrometer
VB, H <sub>α</sub> & carbon line emission	Visible filterscopes
PFC temperature	Compact IR camera
<b><i>4. 3 MW Heating (3 MW NBI, full PFCs, B=2.0 T, 350 C bake)</i></b>	
T <sub>e</sub> profile	Full Thomson scattering system
T <sub>i</sub> , v <sub>θ</sub> profiles	DNB & CHERS
Rotational transform profile	DNB & MSE, FIR inter./polar., V3FIT
Higher m,n MHD modes	Additional soft x-ray arrays (8 20-channel arrays)
High-frequency MHD (<5 MHz)	High-frequency Mirnov coils
Flux surface topology	Tangential SXR camera
Impurity concentrations	Absolute VUV spectroscopy
Z <sub>eff</sub> profile	Thomson scattering detector system
P <sub>rad</sub> profile	Core bolometer array
Fast ion loss	Fast ion loss probe, IR camera
Ion energy distribution	Neutral particle analyzer
Neutron flux	Epithermal neutron detector
SOL n <sub>e</sub> and T <sub>e</sub>	Movable Langmuir probe
Edge neutral pressure	Fast pressure gauges
<b><i>5. Confinement &amp; β push (3 MW NBI &amp; 6 MW NBI or RF, divertor)</i></b>	
Core n <sub>e</sub> fluctuations	Fluctuation diagnostic (HIBP and/or BES)
Core helium density profile	DNB & He CHERS
Divertor P <sub>rad</sub> profile	Divertor bolometer arrays
Divertor plate temperature	Fast IR camera & thermocouples
Target T <sub>e</sub> & n <sub>e</sub>	Plate-mounted Langmuir probes
Divertor recycling	Divertor filtered 1-D CCD camera
Divertor Impurity concentrations & flows	Divertor VUV spectroscopy
<b><i>6. Long pulse (Existing heating &amp; 3 MW long pulse NBI or RF)</i></b>	
Divertor T <sub>e</sub> & n <sub>e</sub> profiles	Divertor Thomson scattering