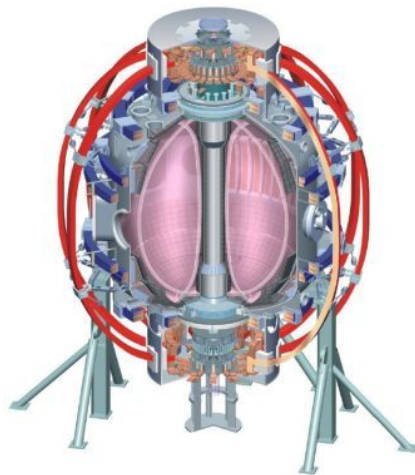


Effects of NSTX Upgrades on Diagnostics

College W&M
 Colorado Sch Mines
 Columbia U
 CompX
 General Atomics
 INEL
 Johns Hopkins U
 LANL
 LLNL
 Lodestar
 MIT
 Nova Photonics
 New York U
 Old Dominion U
 ORNL
 PPPL
 PSI
 Princeton U
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B. Stratton and R. Kaita

**NSTX Physics Meeting
February 8, 2010**



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 RRC Kurchatov Inst
 TRINITY
 KBSI
 KAIST
 POSTECH
 ASIPP
 ENEA, Frascati
 CEA, Cadarache
 IPP, Jülich
 IPP, Garching
 ASCR, Czech Rep
 U Quebec

Overview

- Have compiled a spreadsheet listing all diagnostics, effect of upgrades on them, and current plan for affected systems
- Most diagnostics not affected by center stack and 2nd NB upgrades
- Timeline: Upgrades to occur in FY13 and FY14 so affected systems are not changed until then
- Will review plans for systems affected by:
 - New center stack
 - Larger diameter at midplane
 - 2nd neutral beam:
 - Loss of bay K port
 - Modification of vacuum vessel around bays J and K
 - Elimination of pumping duct at bay L (replace with standard port cover)
 - Extension of NB armor toward bay G

Diagnostics affected by new center stack

- Diagnostics that are integral to center stack will be included in new CS to provide same or improved capability:
 - Magnetics
 - Langmuir probes
 - Thermocouple array
- MPTS: Larger diameter of new CS means that laser beam would hit new CS if left in current location.
 - MPTS modifications required:
 - Re-aim laser
 - Provide new beam dump
 - Re-aim viewing optics (modification required?)
 - Have started engineering job to do conceptual design
 - Plan to have MPTS available for day 1 following upgrades

Diagnostics affected by 2nd neutral beam-1

- Toroidal-CHERS
 - 2nd NBI makes existing background view unusable
 - No good location for new background view since it should be near midplane and not see beams or RF antennas. Alternative solutions being sought.
 - Current plan is to leave Toroidal-CHERS as is with background view re-installed on new bay L port cover.
 - Will likely require NBI notches for accurate profile measurements
 - Requires all 3 2nd NBI sources to be off – this may be acceptable if only 1 or maybe 2 2nd NBI sources are being used – need to analyze this further
- Tangential high-k microwave scattering
 - Will be eliminated in present form since receiving optics are at bay K. Can not be easily relocated.
 - High-k fluctuation data very important for post-upgrade transport research
 - Will initiate design of new high- k_{θ} system to replace existing high- k_r system

Diagnostics affected by 2nd neutral beam-2

- Far IR Tangential Interferometer/Polarimeter (FIReTIP)
 - Receiving optics at bay K. Can not be easily relocated.
 - Would lose density normalization for Thomson scattering system, also lose real-time density measurement for n_e feedback control
 - Plan to implement dedicated interferometer(s) for density measurement
- Scanning Neutral Particle Analyzer (NPA)
 - Located at bay K. Scanning capability would interfere with 2nd NB so will be removed
 - Have perpendicular FIDA, implementing tangential FIDA for FY11
 - Consider targeted NPA capability to complement FIDA and other energetic particle diagnostics
- Diagnostics to be removed due to limited utilization
 - Horizontal x-ray crystal spectrometer (bay L pumping duct)
 - Fast tangential x-ray camera (bay K)

Diagnostics affected by 2nd neutral beam-3

- Diagnostics at bay J requiring some modification:
 - Microwave reflectometers
 - SFLIP
 - Divertor bolometer
- Diagnostics at bay L that will be re-installed on new port cover
 - SPRED VUV spectrometer
 - XEUS EUV spectrometer
 - Fast camera view of RF antennas
 - Toroidal-CHERS background view
- Change to design of extended NB armor should eliminate interference with MSE-LIF edge sightlines (bay G)
- EUV transmission grating spectrometer can be re-installed on port on side of new NB port structure at bay K