



U.S. DEPARTMENT OF
ENERGY

Office of
Science

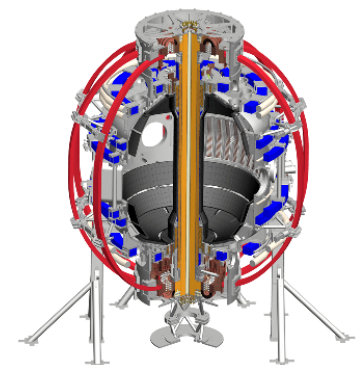


Research Operations Update

S.P. Gerhardt

Thanks to Bob Ellis, Bob Kaita, Brent Stratton, Vlad Soukhanovskii, Dennis Mueller, Joel Hosea

NSTX-U Team Meeting
B-318, PPPL
2/5/2016



Outline

- Diagnostics
- RF Operations
- Boundary Operations
- Physics Operations

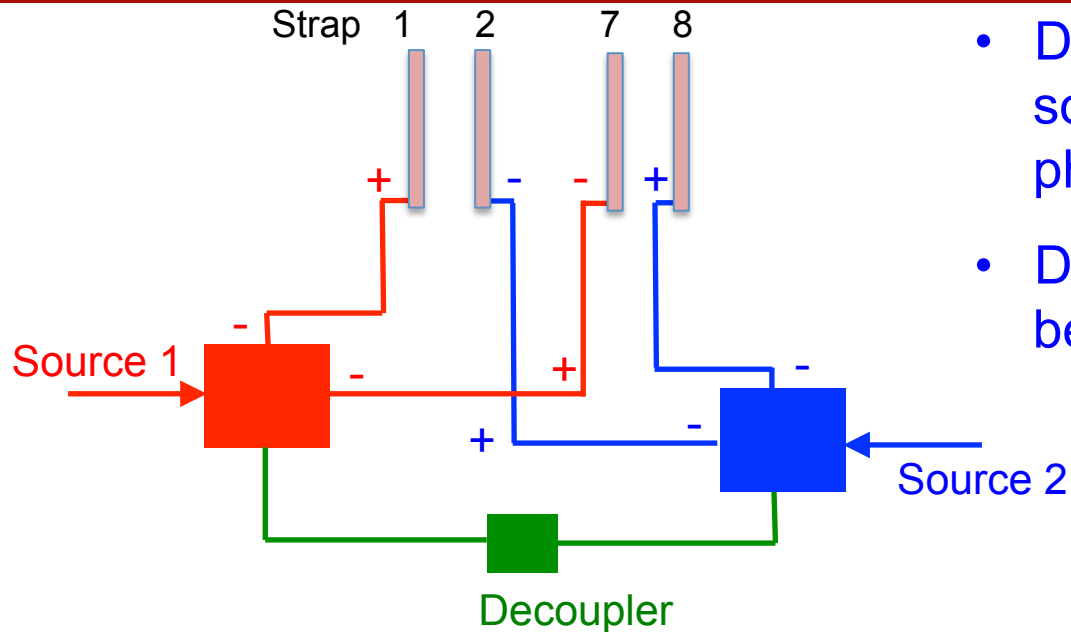
Diagnostics Update

- Magnetics & MTPS routinely taking data
 - Debugging realtime processing of RWM sensors
- CHERS has written data to the tree as well.
 - Real Time Velocity diagnostic has obtained initial plasma data
- MSE-CIF ready and waiting for NB to come up in energy
- Installations in progress:
 - LLNL EUV spectrometers (Xeus, Loweus, and Mona Lisa)
 - IR cameras at Bay H Top and Bay G Bottom
 - Gas Puff Imaging (but related GIS things remain outstanding)
 - AXUV diode and ME-SXR noise problems being resolved
- Hoping to finish remaining diagnostic installations for the current run in March
- Design work on Divertor SPRED, FIRE TIP, Laser Blowoff system, Fusion Products diagnostic, IR Video Bolometer, Pulse Burst Laser System, and Resistive Bolometers is ongoing.
 - Thermionics probe drive for Fusion Products diagnostic is ready to ship.
- Computer connection between SAMI diagnostic and England has been tested successfully. Updating SAMI firmware. SAMI shutter is connected and has been cycled.
- LLNL spectroscopy making good progress
 - EIES, VIPS2, filtered divertor cameras, LADA all operational (LADA also suffering SPA noise problems)
 - Getting close on Xeus, Loweus, Mona Lisa, 1D CCD arrays, DIMS
- If there are required shutters not yet in the control cycle please let me know.

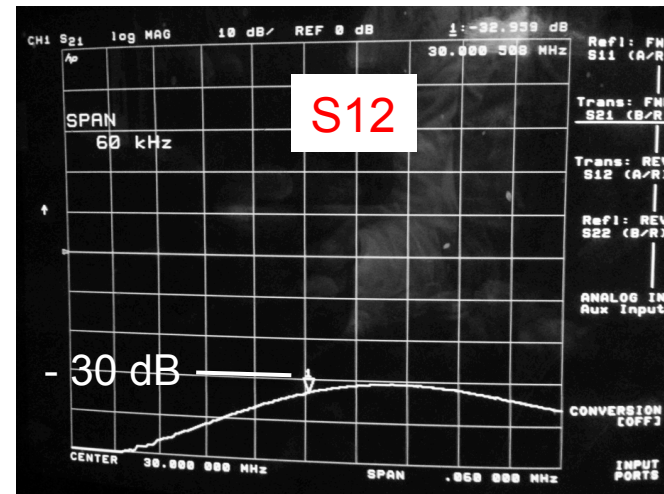
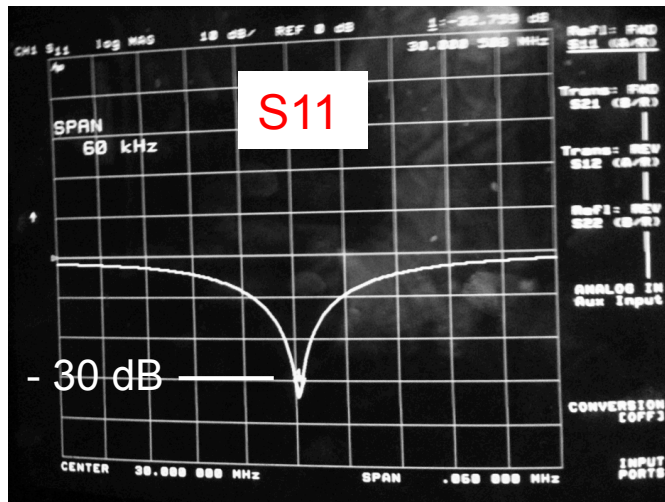
RF Operations Status

- ECH-Pre Ionization system commissioned and is supporting NSTX-U operations
- 6 HHFW sources commissioned in December 2015
- Source #5 breaker failure was encountered in Jan 2016
 - Repair under recovery action plan is underway
 - Expect to begin vacuum cond. with 2-4 sources at end of February, sources 5 & 6 may take a bit longer
- Will begin conditioning with 2 sources at a time
 - Decoupling between 2 sources for vacuum operation adjusted to better than -30 dB down (next slide)
- Lots of progress on related diagnostics
 - ORNL reflectometer installed and being instrumented for measuring density fluctuations and PDI effects through the HHFW antenna
 - ORNL Langmuir probe being modified to fit through a gate valve to make measurements in front of the antenna
 - 6 coaxial Langmuir probe arrays at J Top and J Bottom being instrumented for measuring RF deposition properties associated with the RF power lost to the SOL
 - RF probes are being prepared for Bay J installation
 - Several IR cameras are installed (or being installed) and will provide wide angle RF coverage for viewing the RF deposition in the divertor regions bottom and top
 - Mounting equipment and DAQ are being built for the antenna-dedicated fast visible camera and IR camera

Feed configuration for two adjacent source vacuum conditioning



- Decoupler between adjacent source cubes gives excitation phase flexibility
- Decoupling between sources is better than -30 dB for vacuum



Boundary Physics Operations

- Electrical installations for LITERs complete with attachment of cables between electronics rack and probe drives in NTC
- Procedures complete for filling and installing LITERs on NSTX-U
- Radiation levels in South High Bay prevent access for LITER loading during plasma operations
 - May limit lithium deposition rates due to less frequent LITER loading
 - Impact being compared with additional complexity of using TFTR Test Cell
- Initial data obtained with Materials Analysis Particle Probe – MAPP
 - Surface analysis of ATJ graphite and Titanium-Zirconium-Molybdenum (TZM) samples performed before and after exposure to boronization of NSTX-U PFCs with X-ray photoelectron spectroscopy - XPS
 - Preliminary results indicate change in surface oxygen after boronization
 - New electrostatic analyzer for XPS being installed for better energy resolution
- Support stand built and remote control system development for granule injector complete
 - Installation planned for next maintenance period with completion of electrical installation package
- Successful Preliminary Design Review held for initial high-Z tile set
 - Test machining indicated no issues with fabricating pockets for diagnostics
 - Bulk of TZM plate for manufacturing new tiles received
 - Aspiring for FDR in later February
 - Installation in outboard divertor planned for upcoming outage

Physics Operations

- Now (semi)routinely operations produce ~20-25 plasma shots per day.
 - Shot cycle 15-20 min cycle is set by the time to cool the OH coil, not GDC+pumpout
- Coming improvements in next 4 weeks:
 - New gas valve controller
 - Correct mapping of all 4 centerstack puff valves
 - 2 - 1/8" and 2 - 1/4" diameter, one each at midplane and shoulder
 - Multiple sensors for vertical control, improved filtering on sensors
 - rtEFIT & isoflux: first control of outer gaps, DRSEP
 - X-point control will come latter
 - Automatic limit on OH heating to keep rep. rate uniform
 - Ability to program n=1,2,3 fields directly proportional to PF/OH/TF coil currents
- Machine start-up XMPs underway
 - Two immediate priorities
 - Still tuning shape/position control...this is the focus of first week back.
 - Continued development of the H-mode scenario at lower I_p , higher κ , reduced PF-1a currents
 - A few diagnostic XMPs will then follow as a priority
 - Ready for some XPs
- Latency of PCS reduced by 200 μs to ~ 515 μs
- New operators being phased in

Schedule Note

- Maintenance periods presently scheduled for weeks of
 - March 7th
 - April 11th
- See: <http://www-local.pppl.gov/dss/CurrentRollover.pdf>
- Remember:
 - Permanent change to the NSTX-U device requires a work package.
 - Typically includes drawings, design reviews (peer reviews)
 - Can take a few weeks (or more) to assemble, so plan early.
 - Minor tasks not falling under this description can be done under work permits.
 - If in doubt, ask me, Tim, Al, Brent, Bob Kaita, Bob Ellis.