Plans for NSTX-U

- Existing MSE-CIF system will remain the same, 18 channels, ~5 ms time resolution, using source NB1A and analysis with LRDFIT.

- System ready for filter tuning and then XMP for calibration.

- Data acquisition and control completed transition to Windows 7 from XP.

  - Involved LabView upgrade and re-write of data acquisition and control system.

rtMSE

- Real-time MSE (rtMSE).
  - NSTX-U will be able to use rtMSE for feedback control of the off-axis beam.
  - High performance real-time computer operating system.
  - High throughput digitizer and real-time driver.
  - Digital lock-in software.
  - Low latency propagation of MSE calibrated pitch angles to NSTX-U PCS computer (goal is <10 ms).

- Status: All hardware is installed and tested. Latency testing, optimization of algorithms in process. Delayed due to Windows 7 conversion. Available next year with limited number of channels.

Hardware Modifications

- With higher magnetic field we plan to re-optimize the optical aperture to increase the throughput. This will result in more light and better time resolution for MSE-CIF and CHERS. We plan to do this during the outage this summer/fall.

- New filter switching circuit for different sources/beam energy has been prototyped. Probably not available until FY 17 at the earliest.

- Concern: With additional heating beam the neutron/ gamma radiation increase to our detectors will degrade system performance. Additional shielding may be required.

Internal Magnetic Fluctuation Profile

- Utilizes MSE-CIF system. Coherent magnetic pitch angle fluctuation measurement has 5–10 ms time interval with ~100 kHz frequency bandwidth.

- Simultaneously measure density fluctuation profile, and phase angle between density and magnetic field fluctuations.

- We plan to cross calibrate with Mirnov and BES.

MSE Ch 15
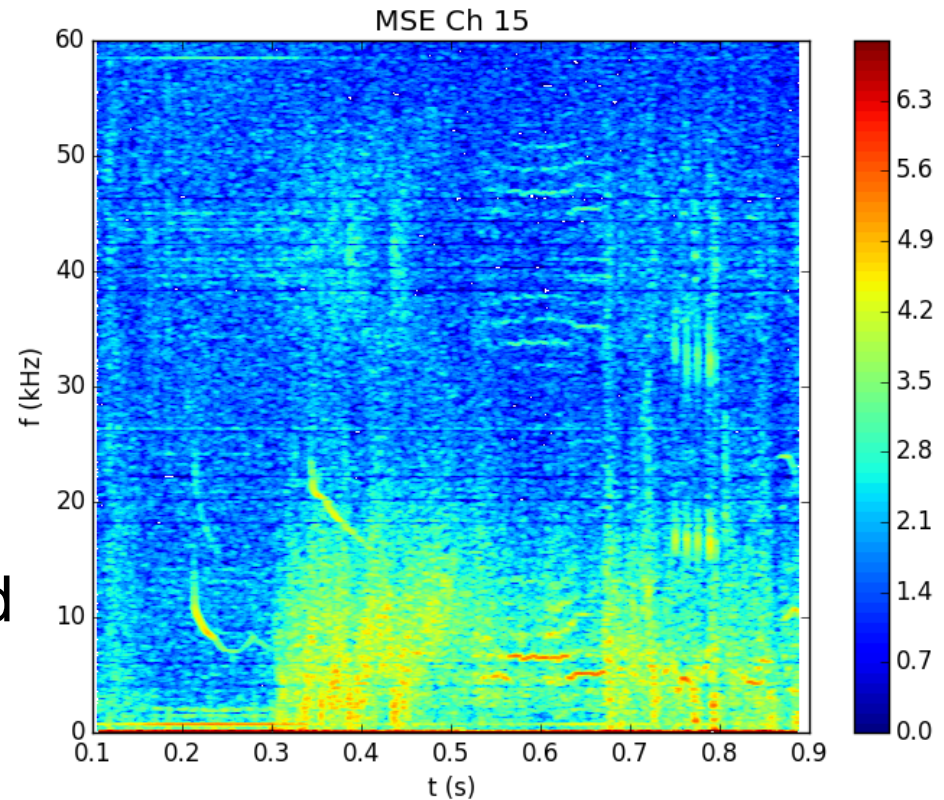
MSE with Laser-Induced Fluorescence
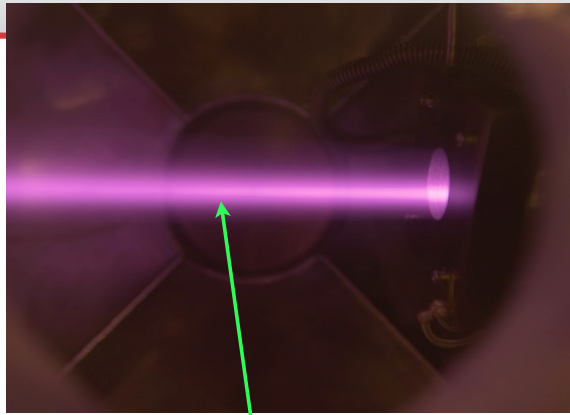
Neutral Beam through low density gas
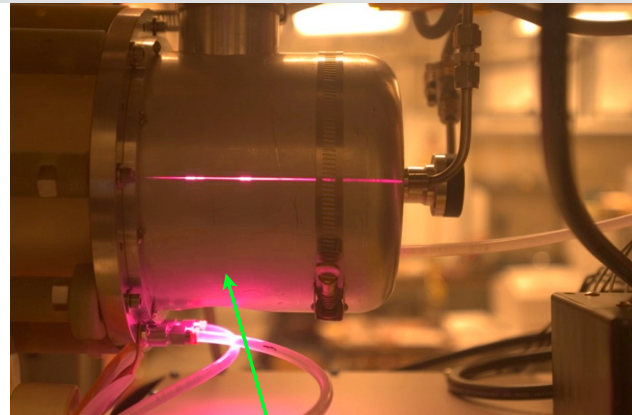
RF source for beam

Measurements of magnetic field magnitude and pitch angle.
Can operate during startup and for RF studies without heating beams.

|B| can be used to reconstruct the total plasma pressure,- use for MHD studies, and for fast ion pressure.

With MSE-CIF system, determine radial electric field.

Time resolution ~5-10 ms, spatial resolution 1–3 cm, 32 channels installed (fiber only). Ten photo-detector channels this summer.

MSE-LIF important for ITER MSE decision regarding line-splitting (LS) and/or polarization (LP) approach.

MSE-LIF Status

- DNB control software is in good shape. DNB has been operated in sync with NSTX-U. We have injected into a beam heated plasma.

- Partially completed XMP-149 for DNB commissioning into NSTX-U.

- Plan to obtain spectrometer data of DNB into plasma or neutral gas in near future. Then obtain photo-detector data of beam into plasma.

- Ready to begin laser commissioning next week?

- Begin operation of DNB with laser in July.

- Data acquisition is nearly complete. Some installation work remaining.