NSTX

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SFPS 2009 mid-run Assessment

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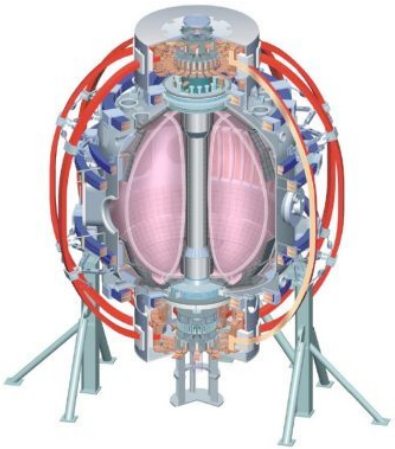
D. Mueller, R. Raman

and the NSTX Research Team

2009 Mid-Run Assessment
Control Romm Annex, PPPL
June 17, 2009



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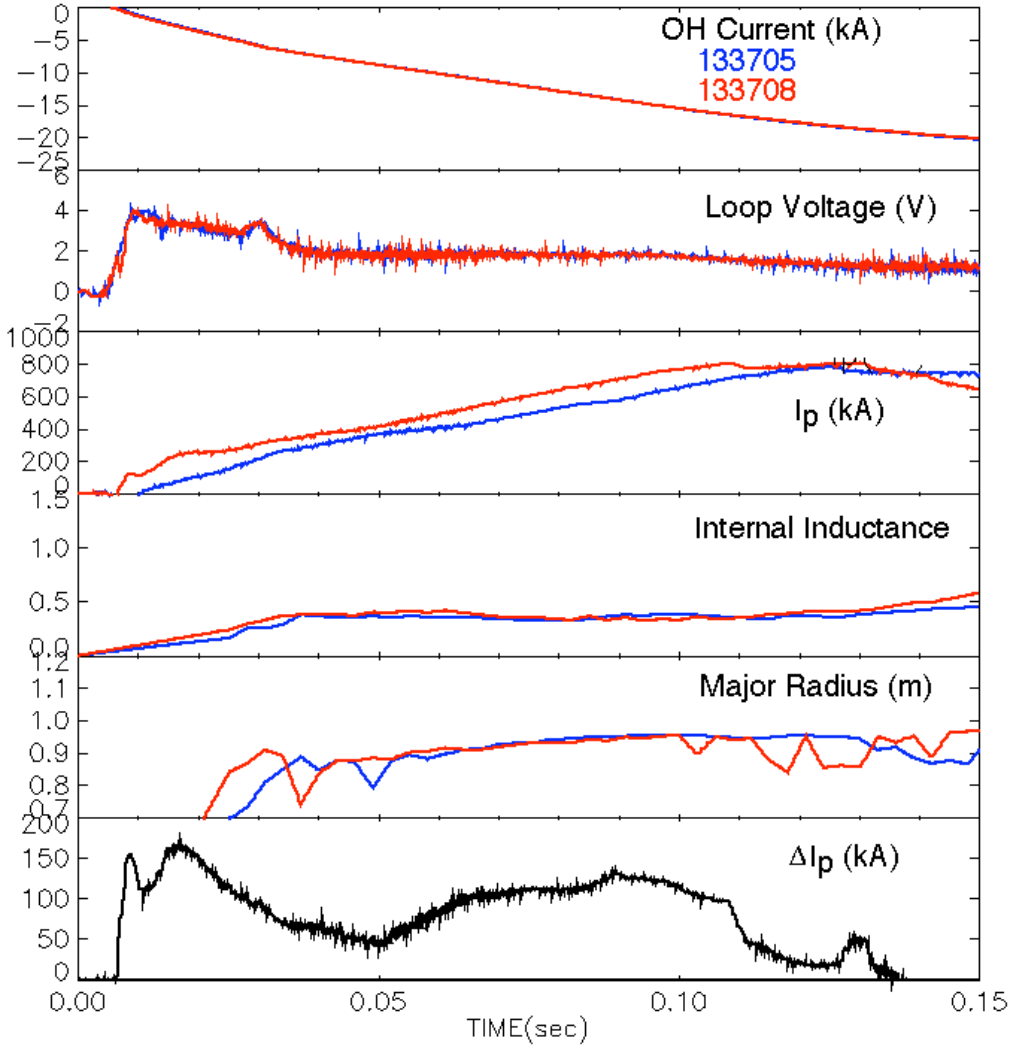
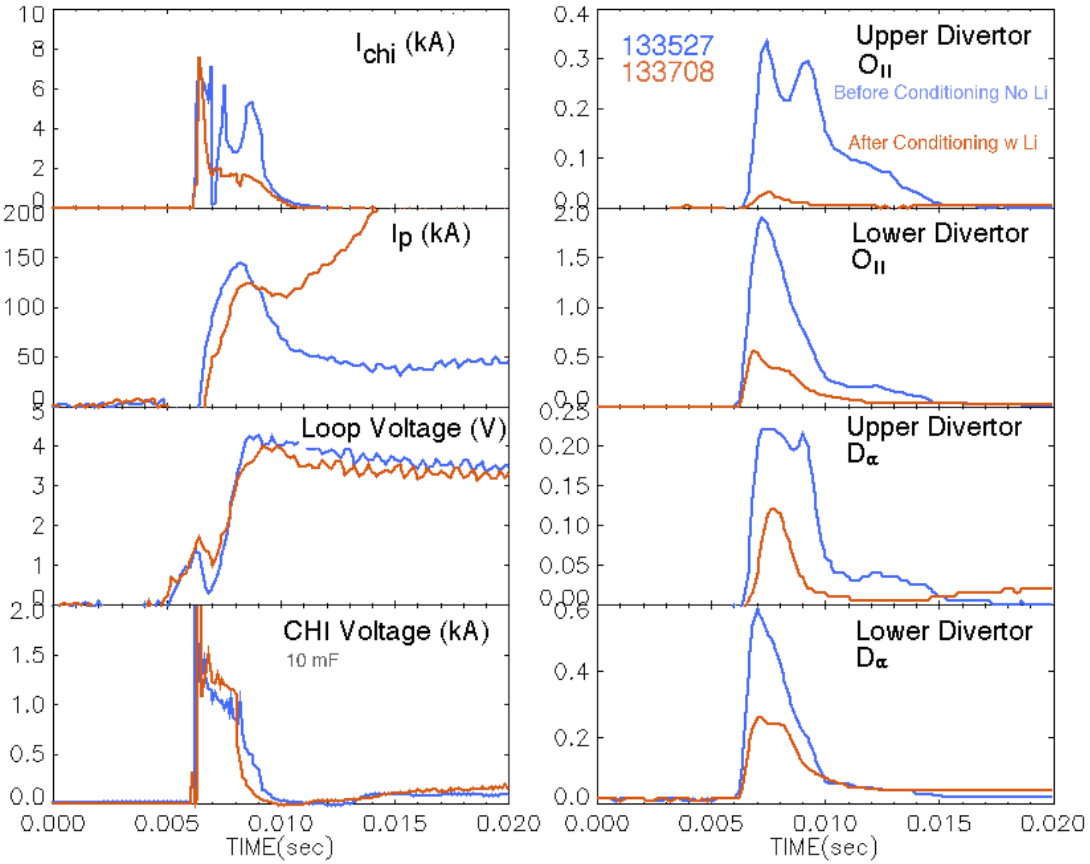
For first on NSTX time flux savings from CHI was unambiguously demonstrated



- Discharge in red is initiated with CHI using 10 of 50 mF bank at 1.7 kV
- Blue indicates an inductive-only comparison shot with the same OH programming
- The last frame shows an increase in I_p of ~ 100 kA for the shot with CHI until a reconnection event

Scaling indicates ΔI_p ~500 kA is possible with full NSTX CHI Cap. Bank

Conditioning is essential for flux savings with CHI start-up



Low Z impurities at low T_e (10-30 eV) radiate efficiently, the low input from ohmic heating after CHI is off cannot sustain the discharge.

O-II emission form either divertor is reliable predictor of flux savings.

CONDITIONING TECHNIQUES

Long (400 ms) CHI discharges were produced to condition the lower divertor

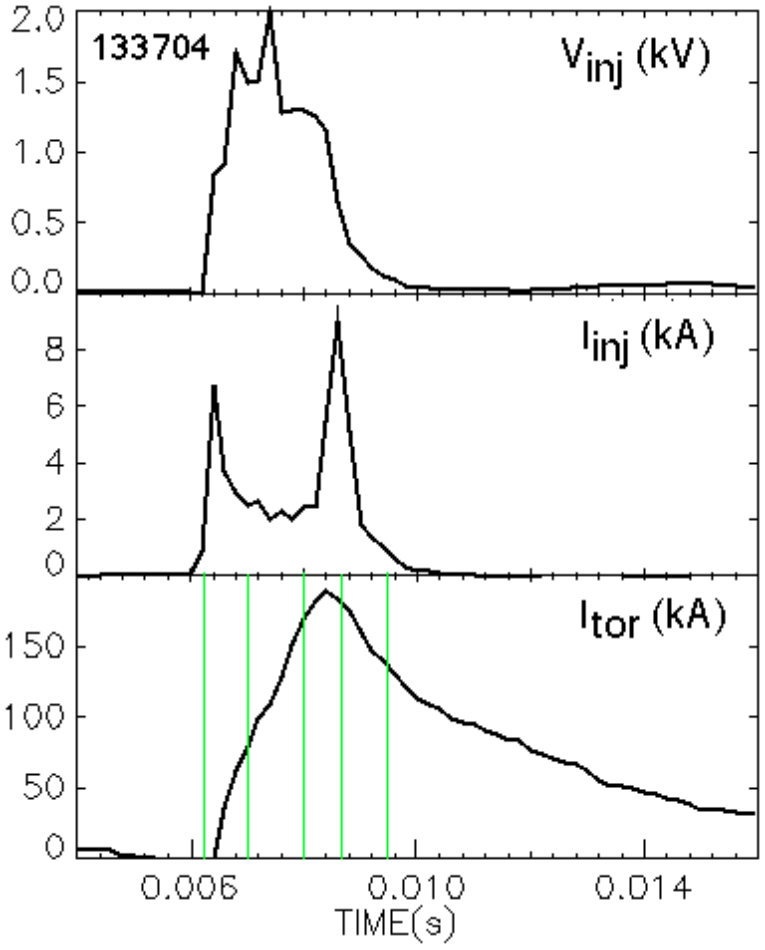
Normal USN (or at least more close to USN than is usual) discharges with NBI to condition the upper divertor

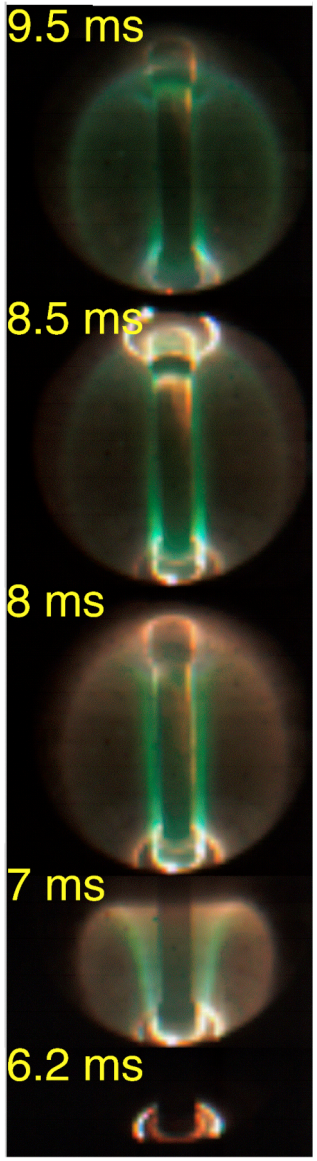
LITER evaporation between shots

Comparison of shots with the same cap bank energy (10 mF at 1.7 kV) before and after applying conditioning techniques.

Typically O-II emission increases with CHI cap bank energy

TV images indicate absorber arcs even in successful shots





- Cap bank fired at 6.0 ms.
- Cap bank crowbar fired at 8.0 ms
- Note increase in I_{inj} even as V_{inj} starts to fall
- This raises O-II emission
- Need to decrease the poloidal field connecting the inner and outer vessel at the absorber region
- Use absorber coils

Remaining work

Before TF reversal (4-5 days)

1. One day for more DC PS conditioning + improve the USN plasmas.
2. Two days for combined XP927 and 928, improving transient CHI discharges and developing absorber PF capability.
3. We would like to spend up to 2 hours getting more data on the biasing experiment, to develop its capability for FY10
4. One day for applying RF to a low current inductive discharge (after it has been developed by the RF group)

After TF reversal (1-2 days)

1. One day for running reference discharges with the outer electrode as the anode for a direct comparison with LLD.
2. If an additional day is available, we would do some conditioning as well

Misc. As a prelude to TF reversal, produce some USN plasmas to compare with LSN after reversal