

Summary of the CHI ET session

R. Raman¹ and D. Mueller²

¹University of Washington, Seattle

²Princeton Plasma Physics Laboratory

NSTX Research Forum
November 28 - 30, 2001

* Work supported by U.S. DOE contract numbers. DE-AC02-76CH03073, DE-AC05-00R22725, DE-AC03-99ER54463, DE-FG02-99ER54524, DE-FG03-99ER54519, W-7405-ENG-36



Non inductive current initiation needed for STs



Main goals for Fy 02

- § Produce higher current discharges suitable for characterization with auxiliary heating
- § Initiate test on feedback control
- § Improve tests on edge current drive

XP Presentations



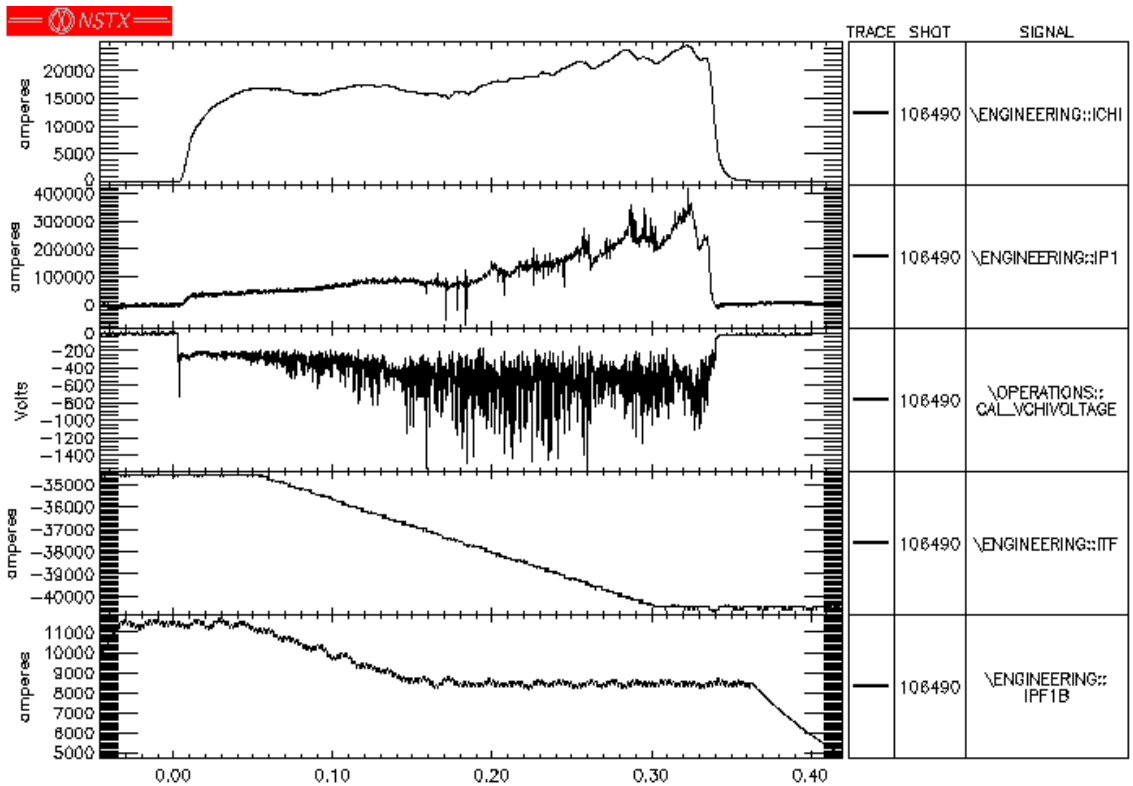
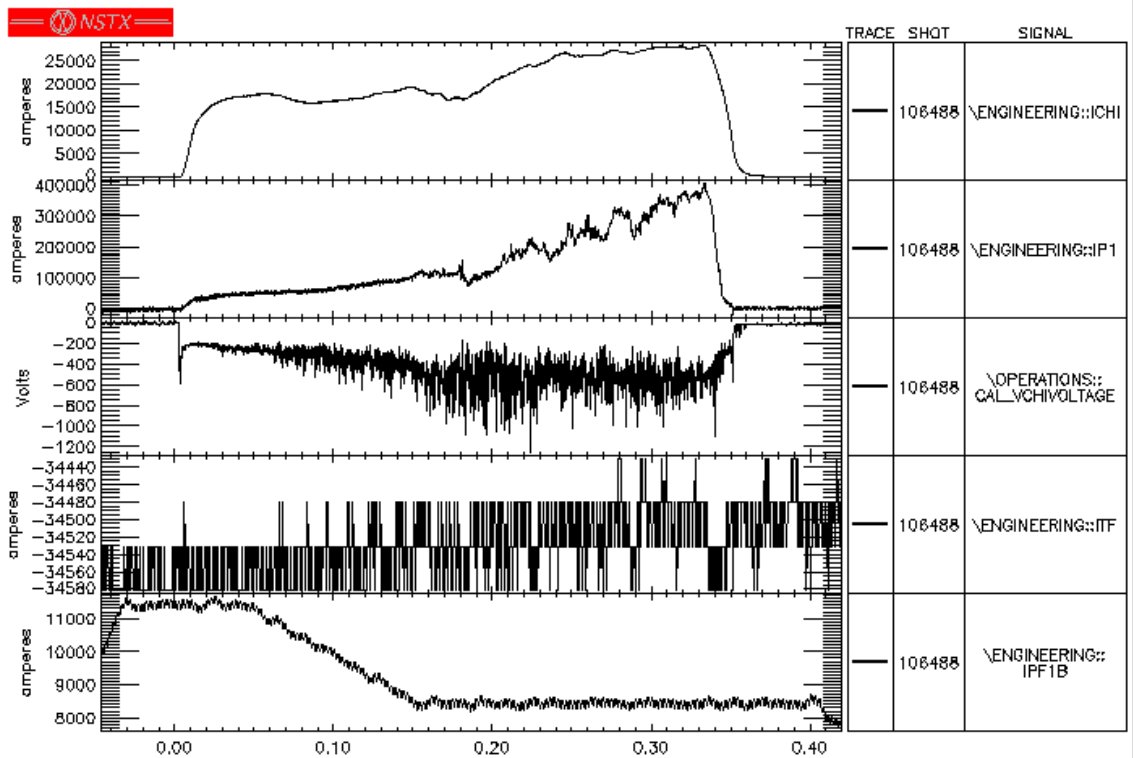
R. Raman, D. Mueller	500 kA goal, TF scan, Absorber feedback control, New Absorber
B.A. Nelson (U-Wash.)	Boundary feedback control
D.A. Gates (PPPL)	Boundary feedback control
M. Nagata (HIT, Japan)	IDS measurements
H. Ji (PPPL)	Update on dynamo probe

Supporting Presentations

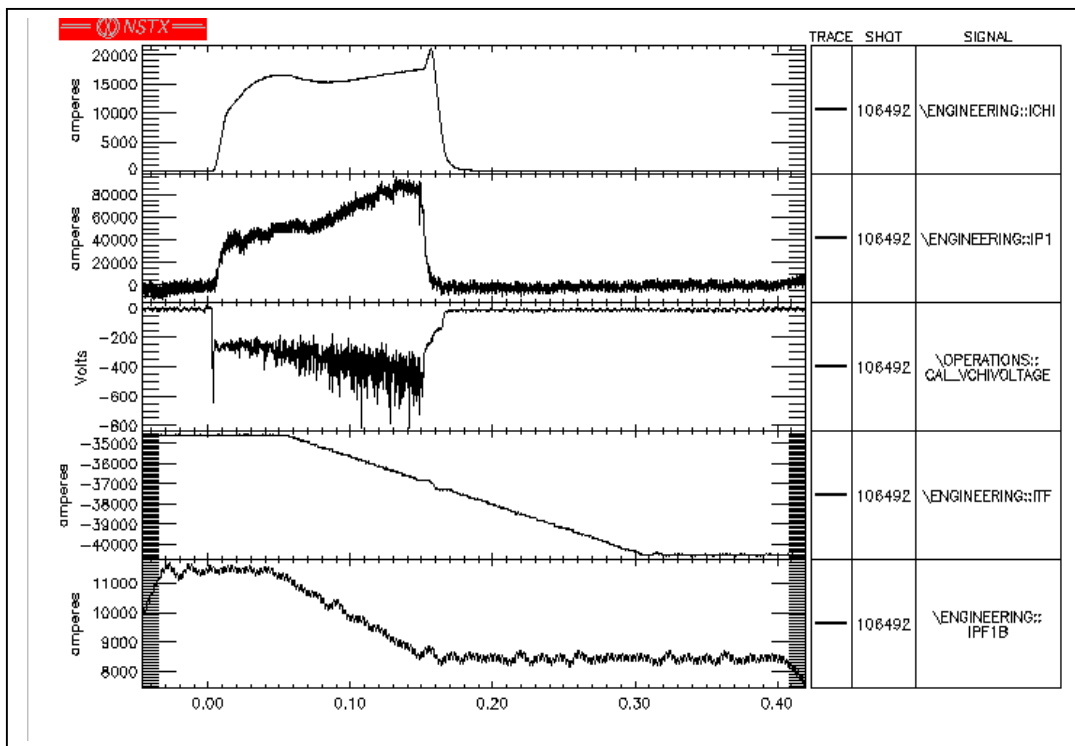
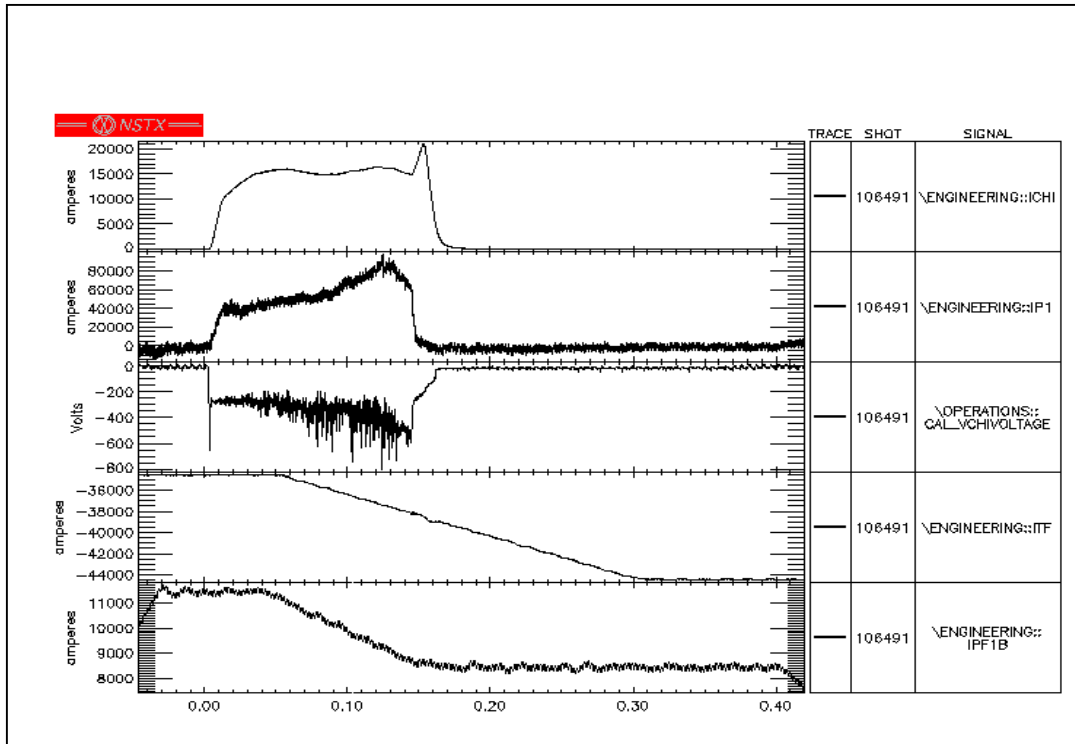


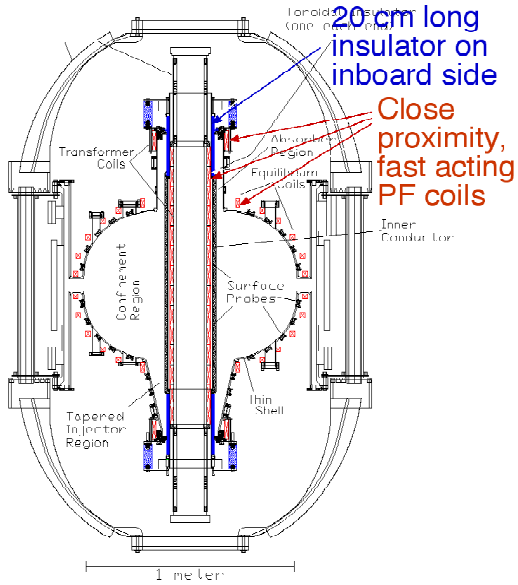
M. Schaffer (GA)	EFIT improvements
X.Tang (LANL)	3-D MHD simulations
L. Zakharov (PPPL)	2-D EFIT-like real time simulations

Initial discharges with TF ramps: 106488 (LDGIS @ 1330 Torr, 15 min HeGDC, 0.29T) Shot: 106490: Ramp TF from 0.29 T to 0.34 T (no arcs, but ICHI drops by approximately the ratio: 0.29T/0.34T, current multiplication stays about 14 - need to increase V-CHI).

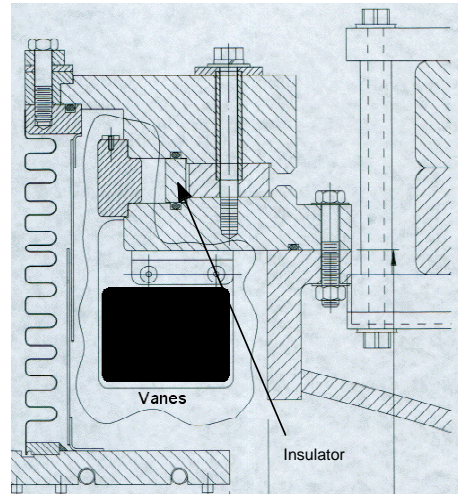


Shot 106491: (ramp TF from 0.29 T to 0.375 T & Increase VCHI from 800 to 825 @ 200ms and from 840 to 850 at 330ms. Shot 106492: Restore 106490, 15 min HeGDC, LDGIS at 1300 Torr & increase VCHI from 840 to 875V at 330ms. Would reducing ITF from 200 to 330ms avoided absorber arc?

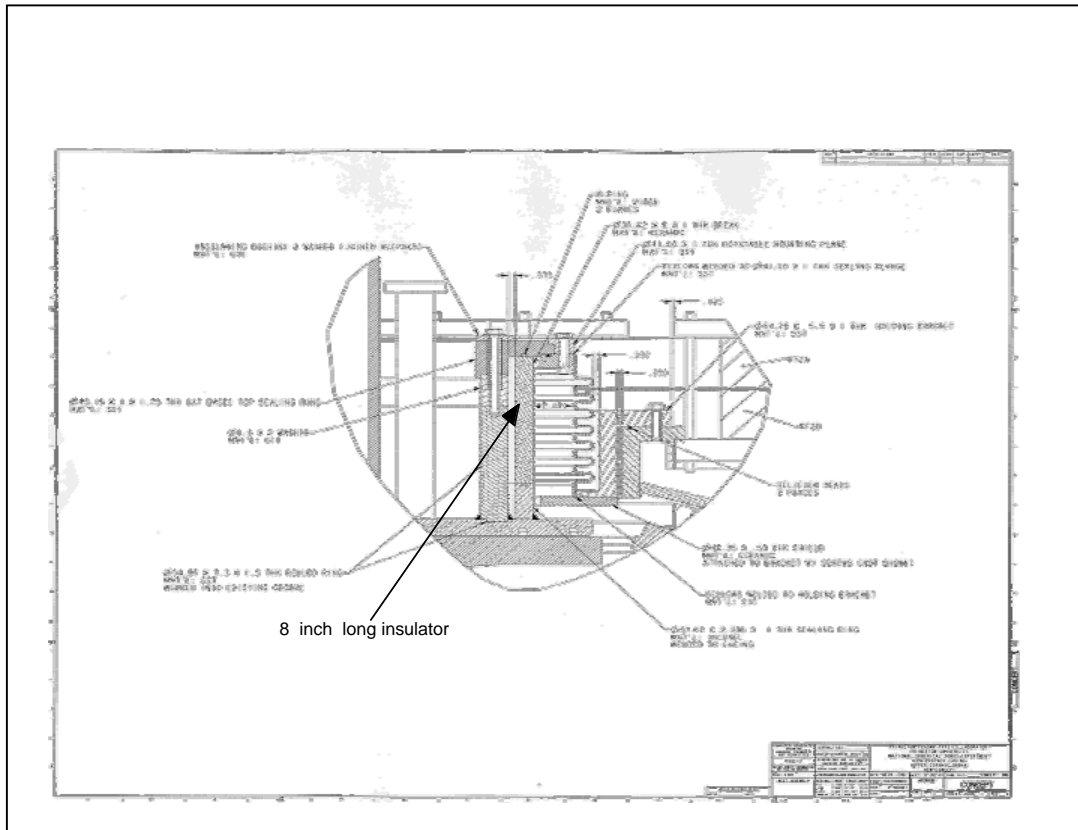




The HIT-II absorber region showing the long insulator and close fitting PF coils.



The present NSTX absorber region. The length of the 1.5 inch long insulator needs to be increased and the insulator needs to be positioned on the high field side as on HIT-II. New fast acting PF coils are needed.



Drawing of the preliminary design for the new NSTX absorber. The primary features are the 8-inch long insulator on the inboard (high field side) as on HIT-II. A study by the NSTX engineering team shows that there are no significant issues with this design.

Research Plan (part 1) - 6 run days for CHI



- 500kA goal, TF Scan, high current flattop
- 3 days (Raman, Mueller)

CHI induced MHD activity (Nelson)

Absorber arc sensitivity as TF is changed

EFIT results for flux closure assessment (Schaffer, Lao)

TSC simulations (Raman, Jardin)

- Initiate feedback control tests for vertical position control
- 2 days (Gates, Nelson)

To be improved after absorber modification to include

Absorber field feed back control

Boundary feedback control

Research Plan (part 2)



- Improve experiments on edge current drive
 - 1 day (Mueller)Determine if noise on magnetics has reduced

- Characterize CHI plasmas, including electron pressure profile measurements, with and without auxiliary heating (2 to 3 days - TBD)

Hardware Priorities



- Improved absorber needed
- Work on incorporating new PF coils in absorber (avoid second CS removal).
- Dynamo probe (~\$50k) - Consider low cost options

PF3L coil current controls flux foot print width

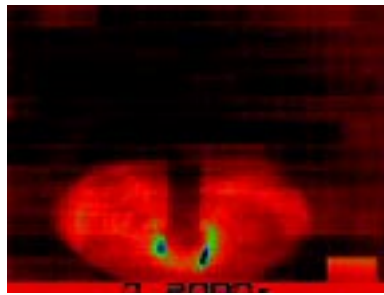


$t = 200 \text{ ms}$

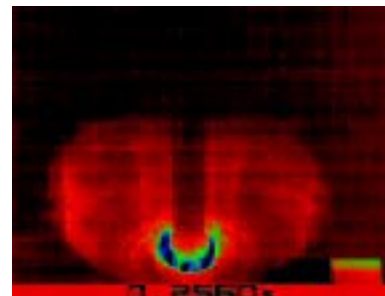
$t = 256 \text{ ms}$

SN 106488

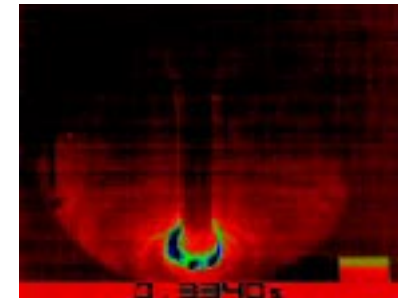
$t = 334 \text{ ms}$



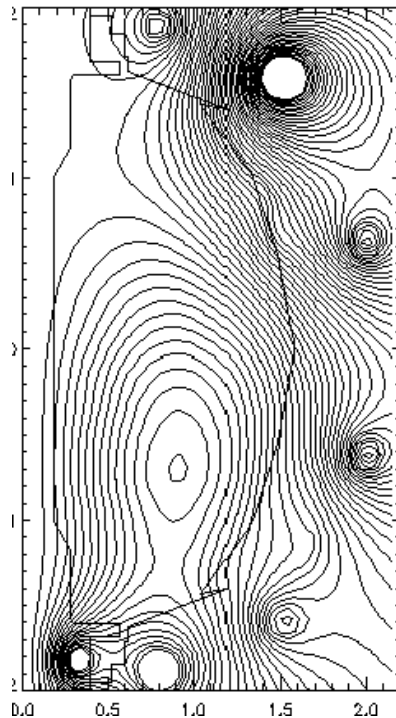
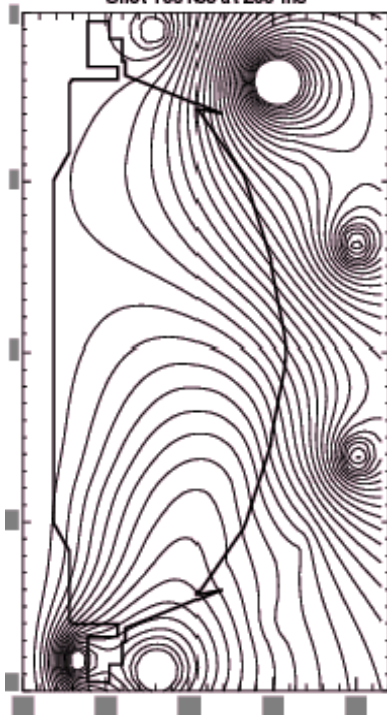
Shot 106488 at 200 ms



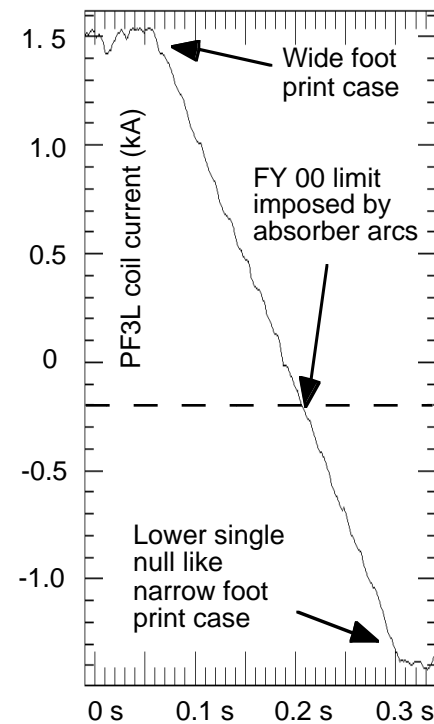
Shot 106488 at 256 ms



Shot 106488 at 334 ms



Fast camera fish eye images:
R. Maqueda (LANL)

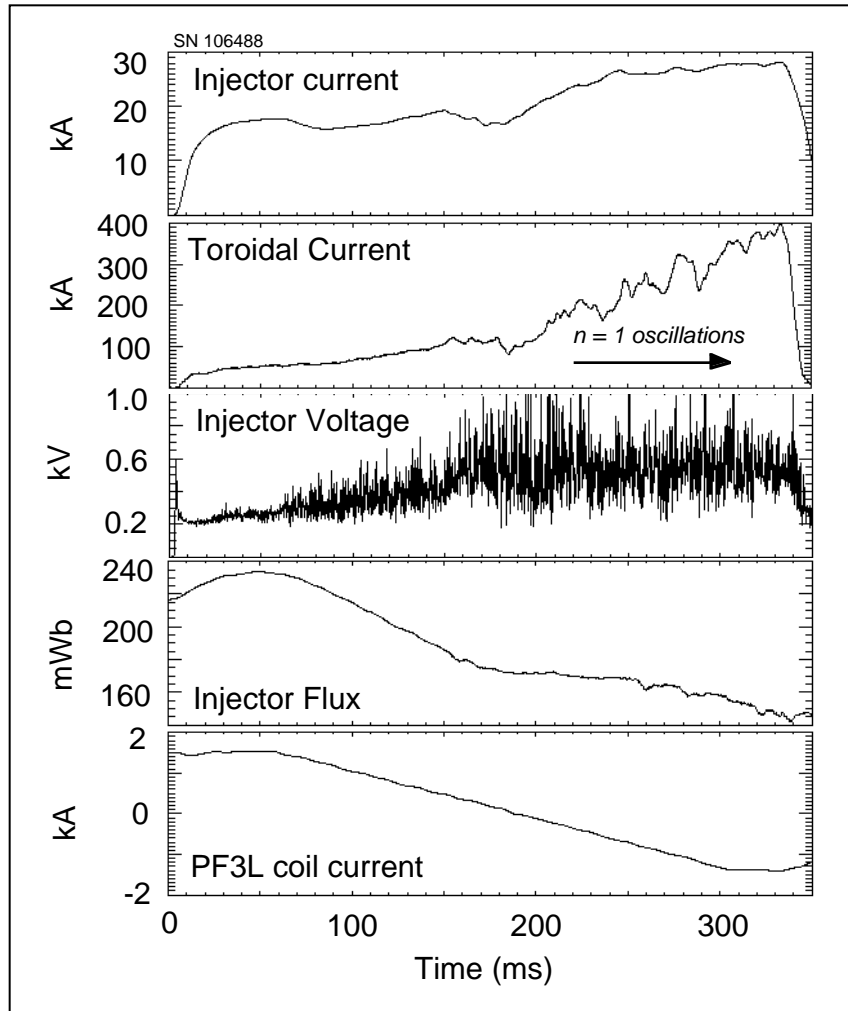


MFIT: M.J. Schaffer (GA)

CHI Plans for Fy 02

Improved MFIT reconstructions consistent with but do not prove flux closure

Obtained 390kA with a current multiplication of 14



Accompanying observations

- Evidence for good $n=1$ oscillations deemed necessary for flux closure.
- Consistently encouraging MFIT reconstructions.
- Evidence for higher temperature from SXR's. Ion temperature and plasma rotation measurements.