Confinement/Power Balance/XP Status

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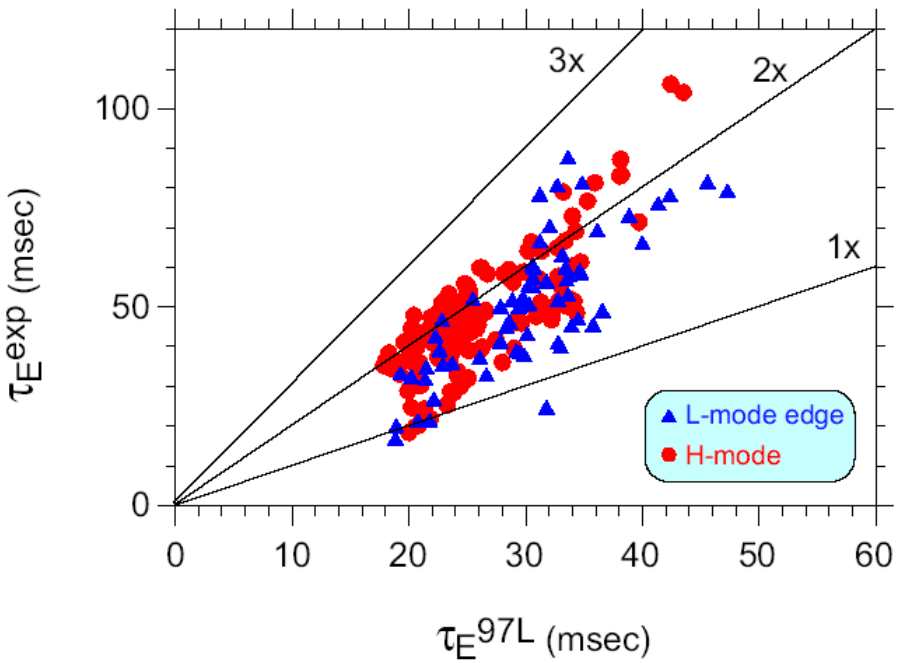
NSTX Results Review

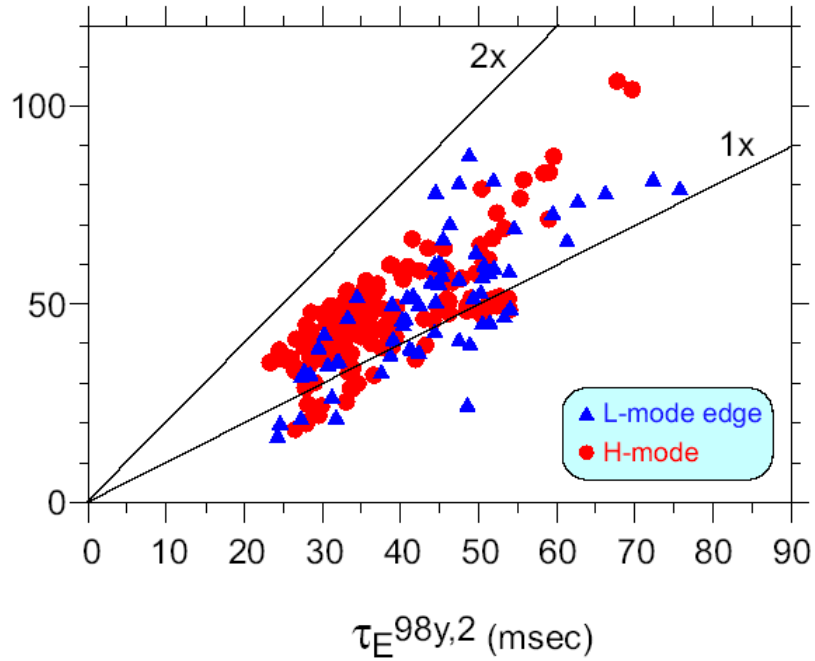
9-11 Sept. 2002

Global Confinement

- Based on magnetics (EFIT01)
- Use M. Bell's τ_E determination ("time-backwards" filtering)
- To date, just compared τ_E's to scaling estimates
  - More detailed analysis of parametric dependence of entire dataset needs to be done

Enhanced Confinement With Both L- and H-mode Edge Plasmas



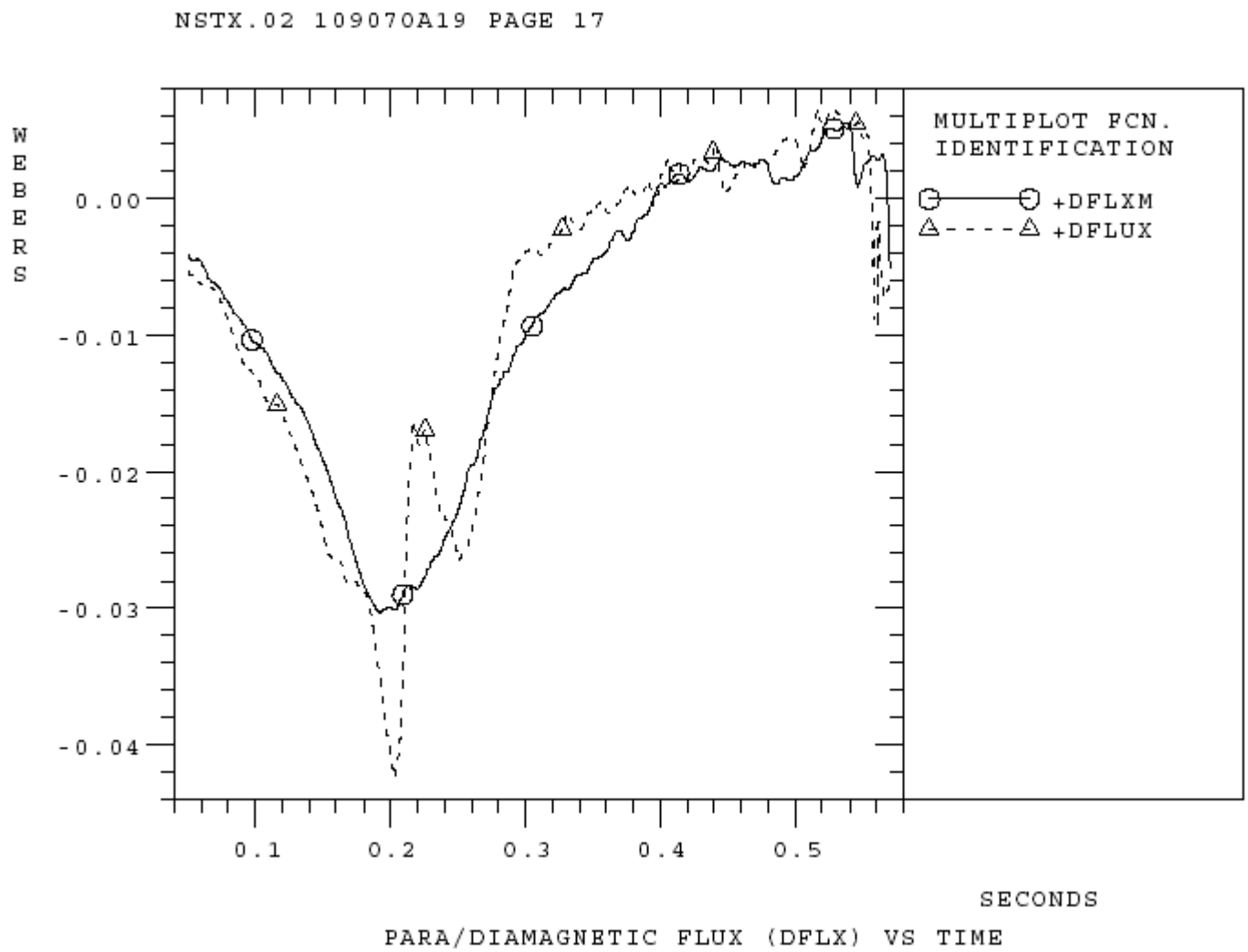


Power Balance Update – Is Ion Thermal Transport (or Heating) Still Anomalous?

- Recalibrated CHERS, MPTS
- 20 point MPTS

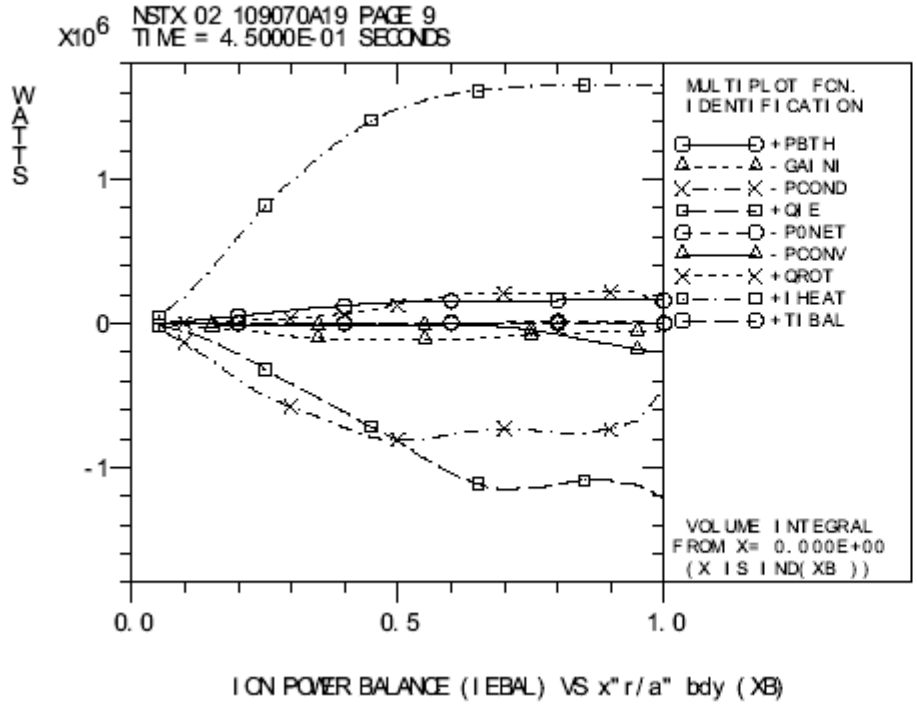
- Focus on 109070 – CHERS profiles released for use
  - TRANSP/EFIT stored energies within a few percent of each other
  - χ_i positive during most of discharge
    - Near neoclassical
    - Negative χ_i near end of discharge
    - May be related to “noisy” equilibrium solution (VMEC, ESC)

Calculated Diamagnetic Flux in Good Agreement with Measured Value

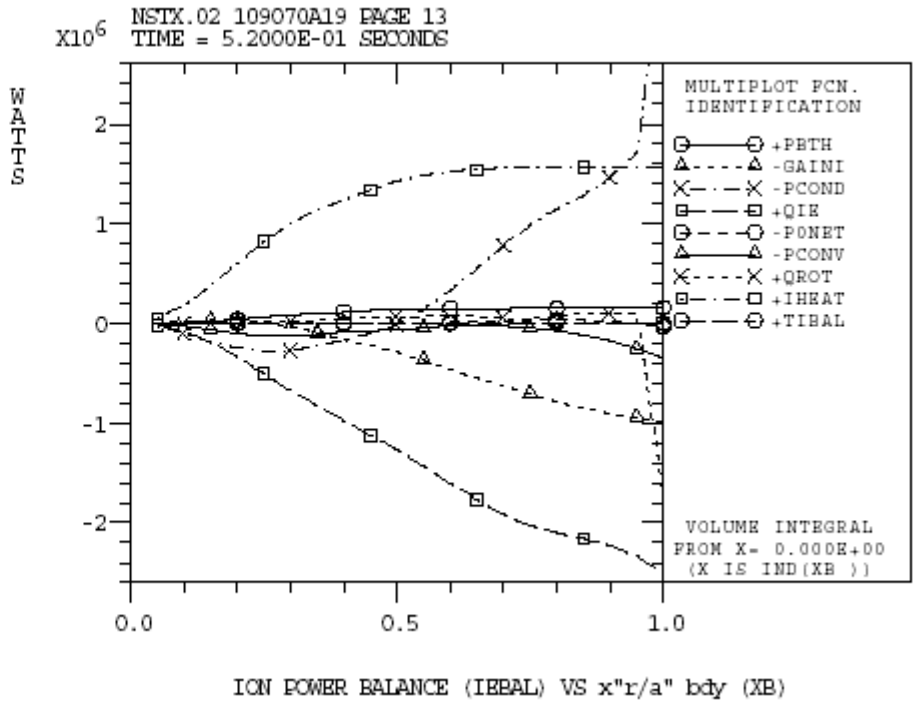


Ion Power Balance

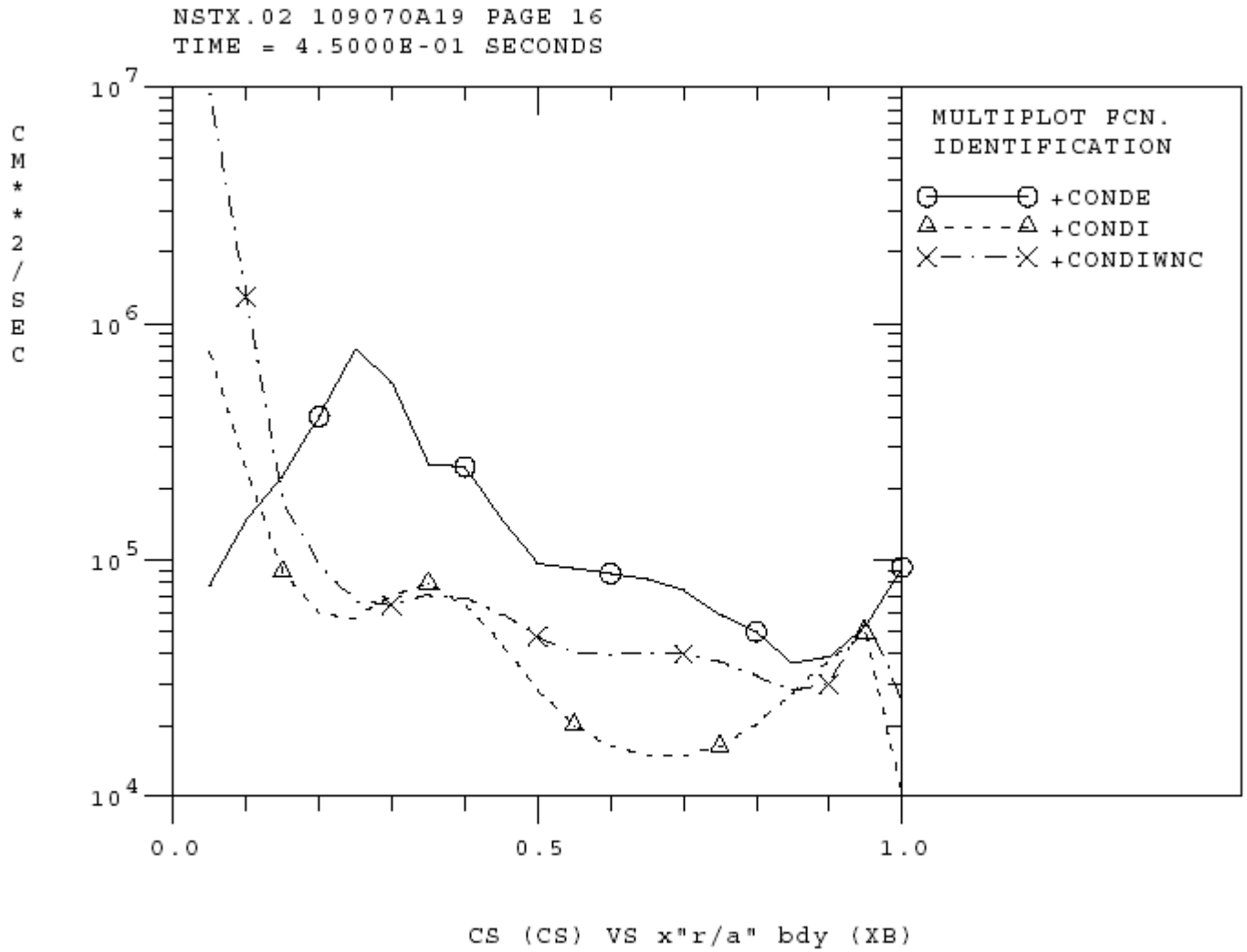
“Well-Behaved”



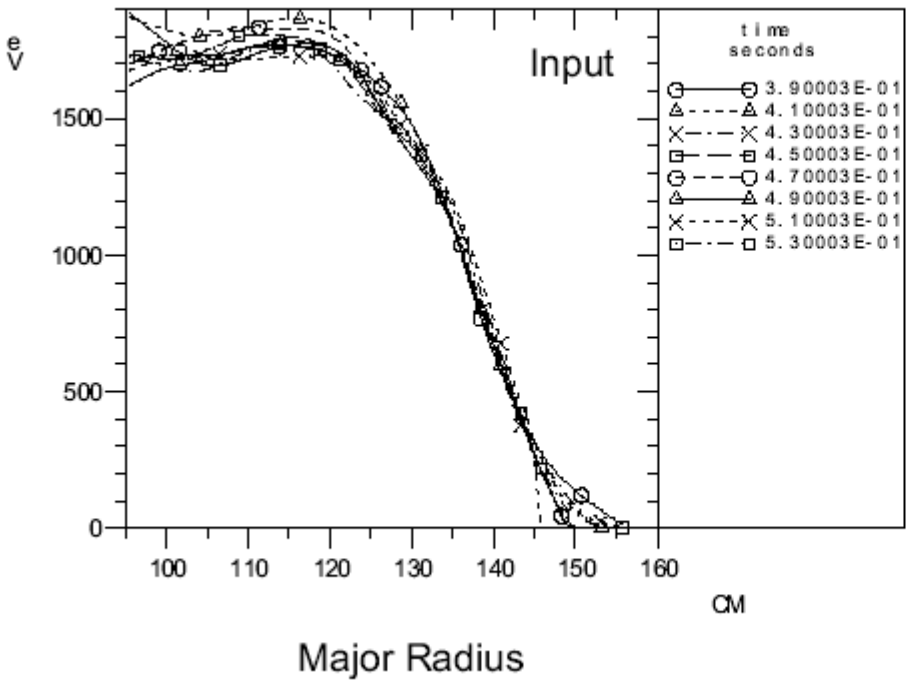
“Anomalous”

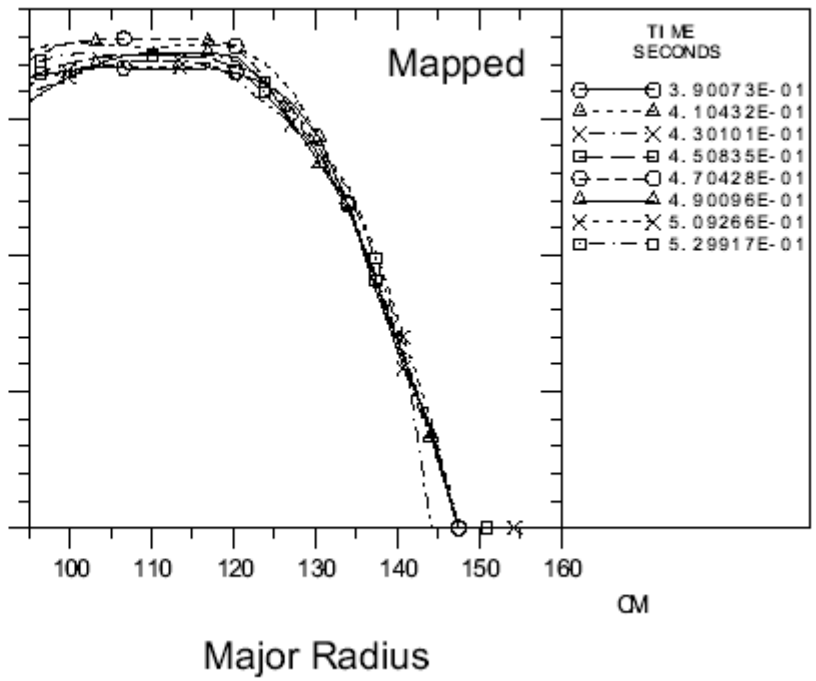


χ_i Near Neoclassical When Ion Power Balance "Well-Behaved"

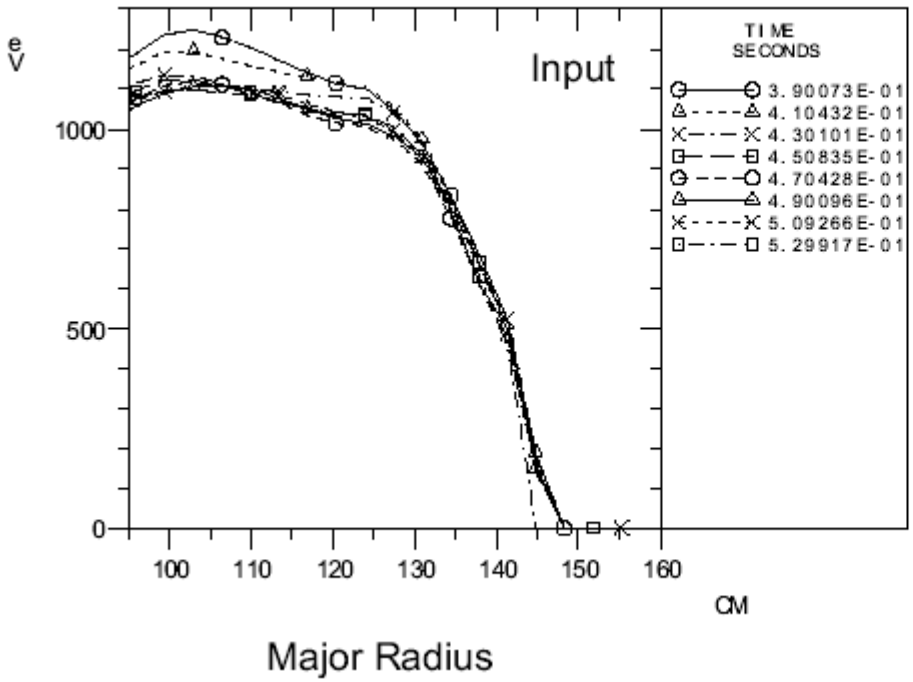


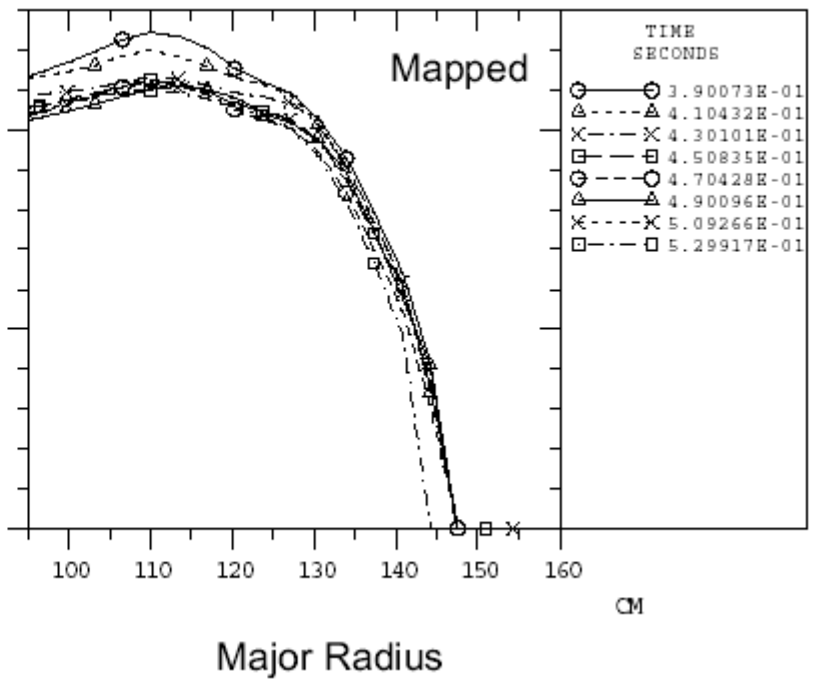
Ion Temperature Mapping Appears to be Good





Electron Temperature Mapping Good, BUT Mapped T_e Appears to be Low Towards End of Discharge (Larger Q_{ie})





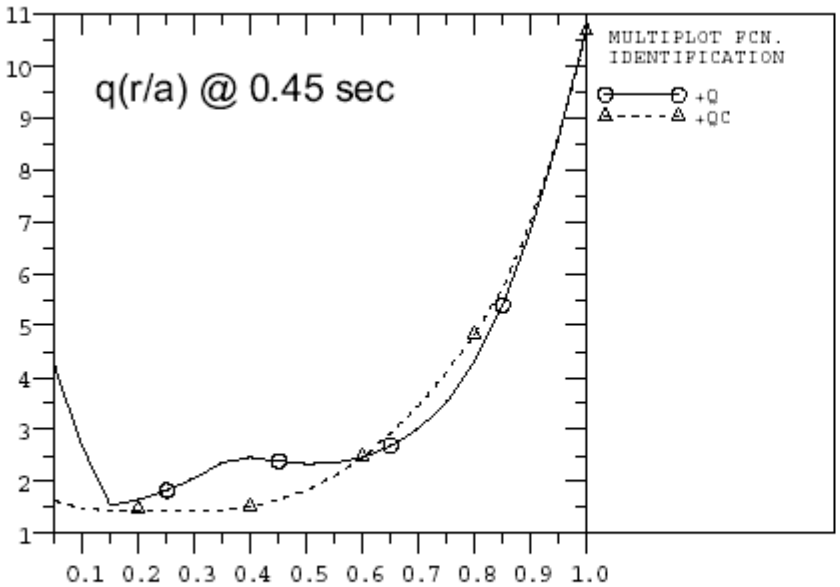
Treatment of double sided T_e profile important

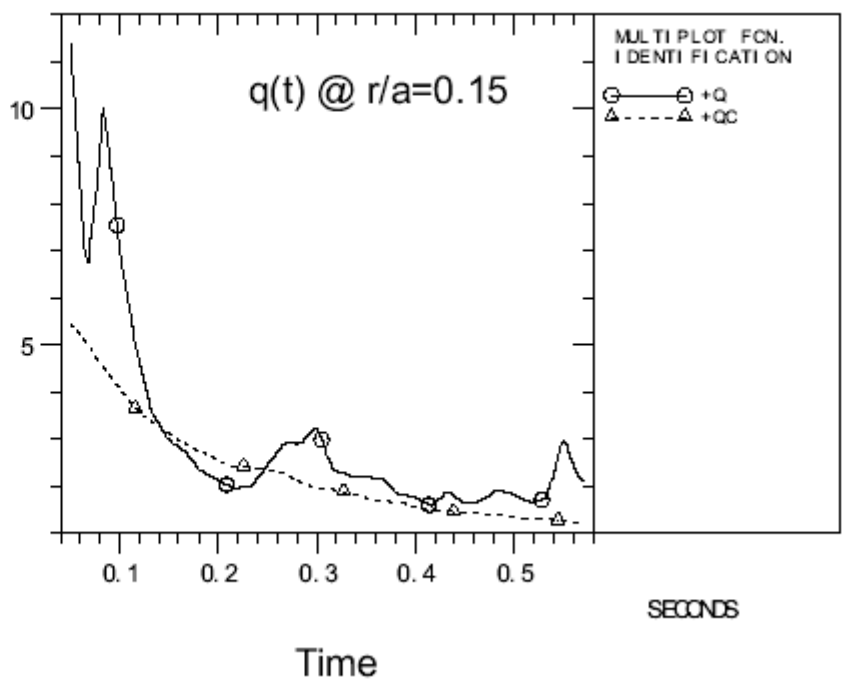
Possible issues with equilibrium solution (VMEC, ESC)

Testing version of TRANSP that uses full equilibrium from EFIT

Magnetic Diffusion Calculation in TRANSP Generally Reproduces EFIT q-profile Evolution

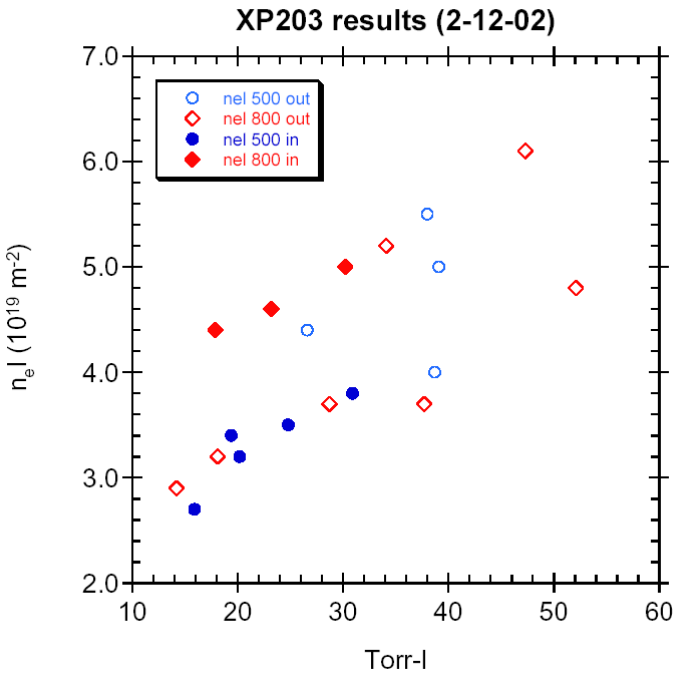
Slightly more peaked current profile





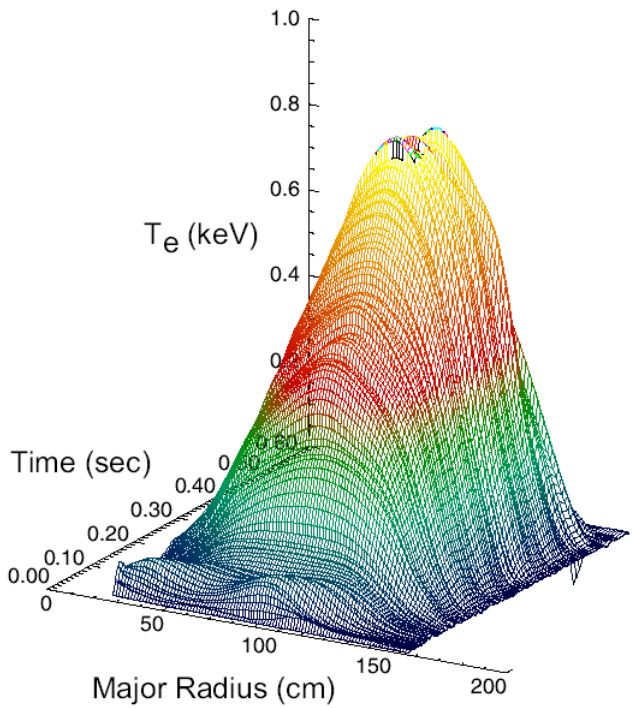
XP Status

- XP203 – Ohmic Density Limits (2/12, 4/2)
  - Compare inner/outer gas fueling, 500 and 800 kA
  - Greenwald limit surpassed at lower current
  - Different fueling efficiencies for inner/outer, 500/800 kA (2/12)
    - Need to fold in 4/2, new gas valve calibration

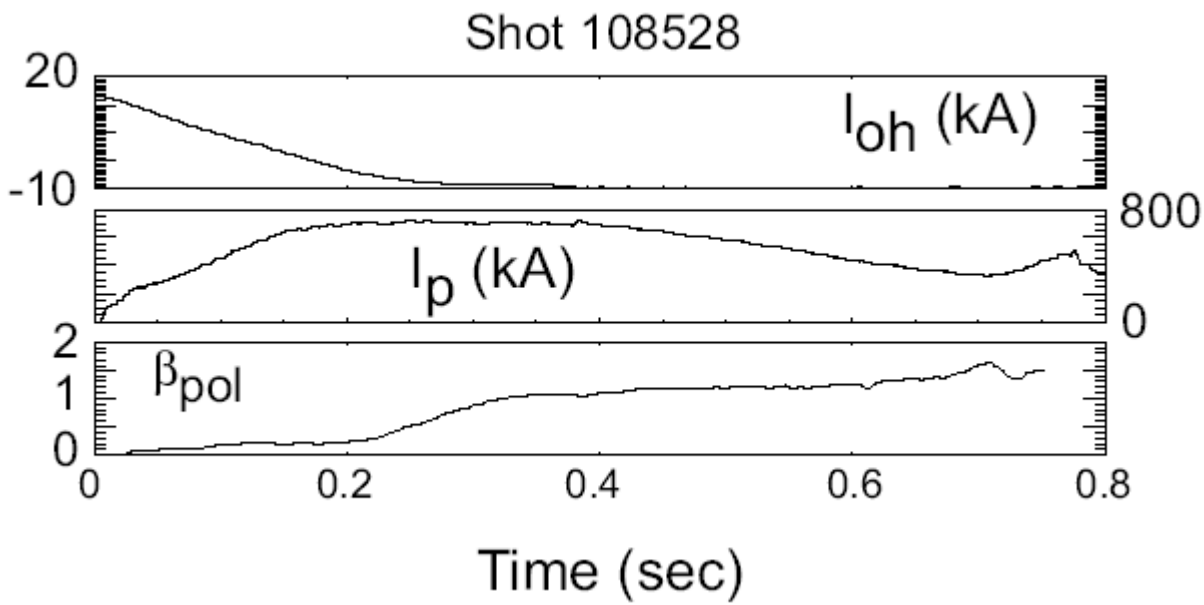


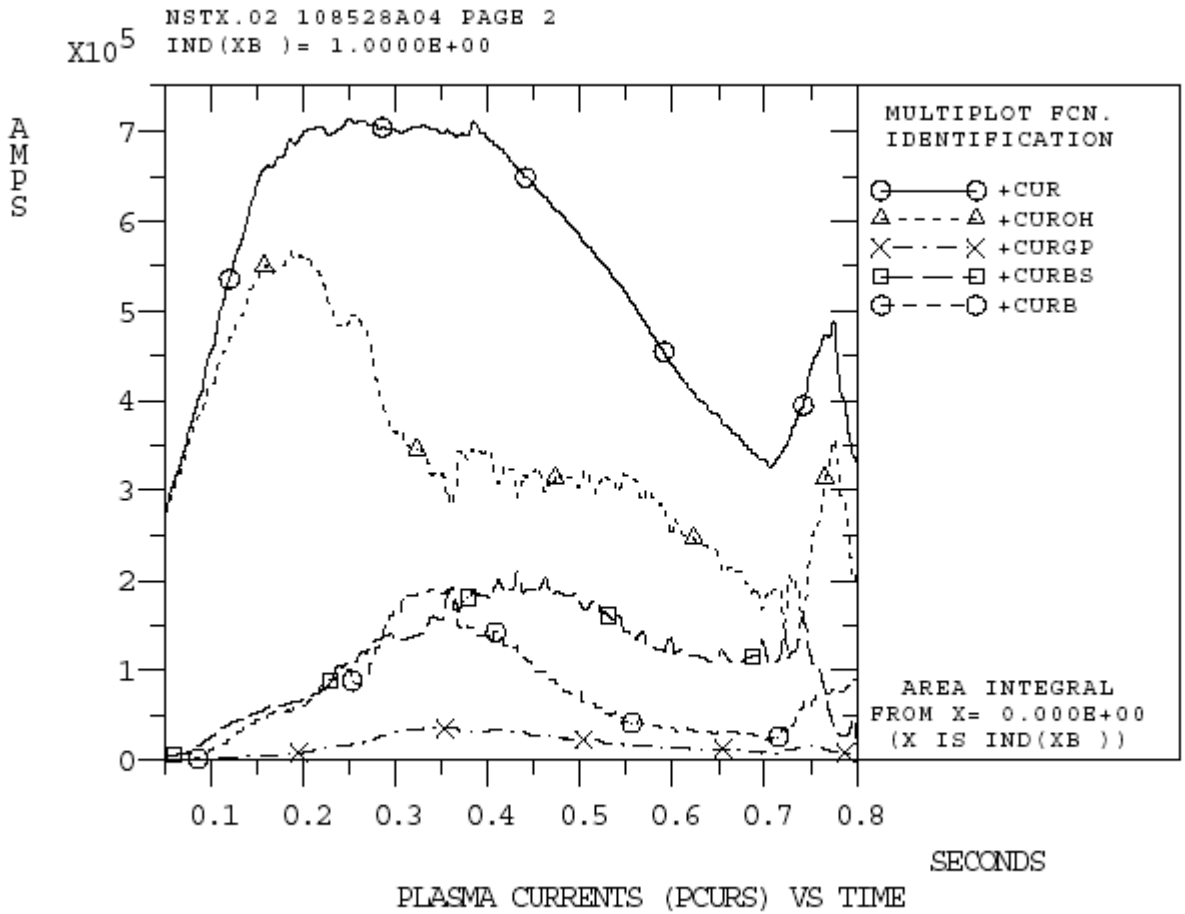
  - GPI analysis to be done on determining nature of density limit

- XP204 – RF+NBI for power balance studies
  - Vary RF power, duration to vary target T_e for NBI
    - 300 to 1400 eV by end of RF (not reproducible)
    - T_e drops to 500 eV level shortly after RF turn-off
  - Density scan for varying target T_e
    - 2 to 4 x 10^{19} m^{-3}
  - Closely spaced MPTS (5 msec separation) to monitor initial rise of T_e, determine consistency with collisional heating



- XP226 – High β_{pol}/high bootstrap
  - I_p = 650 to 750 kA, I_{oh} clamp
  - H-modes obtained (broad density profiles)
  - β_{pol} of 1.5 achieved after I_{oh} clamp
  - Pulse duration up to 800 msec (I_p>300 kA), often slow decay in I_p after I_{oh} clamp
  - Preliminary TRANSP analysis (T_i=3/2T_e) shows bootstrap fractions of ~40-50%

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X10^5
AMPS
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6
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4
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0
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SECONDS
MULTIPLOT FCN.
IDENTIFICATION
+CUR
+CUROH
+CURGP
+CURBS
+CURB
AREA INTEGRAL
FROM X= 0.000E+00
(X IS IND(XB))
PLASMA CURRENTS (PCURS) VS TIME