CHI EQUILIBRIUM MODELING WITH EFIT

M.J. Schaffer and L.L. Lao

General Atomics, San Diego, CA, USA

NSTX Results Review
PPPL
2003 November 10 - 12

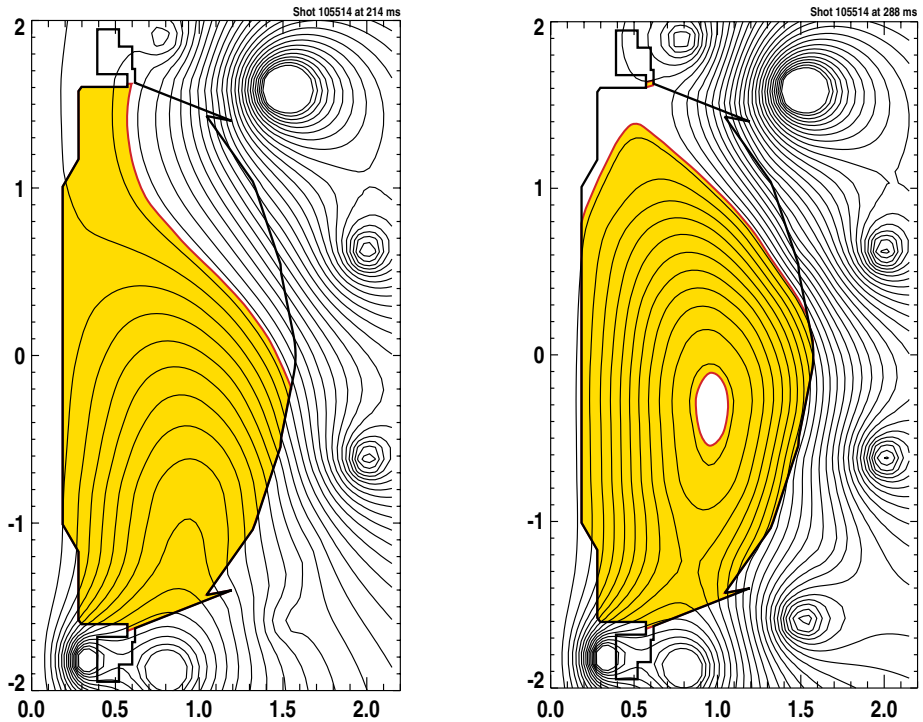
CHI Experiments Need Easy-to-Use Equilibrium Reconstruction Tools

NSTX

- Is there a sizeable central region of CLOSED magnetic surfaces by the end of a CHI non inductive startup pulse?
  - Needed to confine energetic HHFW electrons and/or NB injected ions during handoff from CHI startup to another non inductive current driver.
- Need Reconstruction for Control Room analysis and guidance.
- Need Reconstruction for data analysis.

GENERAL ATOMICS

EFIT was Coded to Fit Current on the Correct Open Magnetic Lines



- Uses the insulated gaps to defin e the minimum and maximum flu x values that bound current-carrying flux (yellow).
  - This works for some common topologies and geom etries.

EFIT Has Been Modified to Allow Reconstruction with Open Flux Surfaces

NSTX

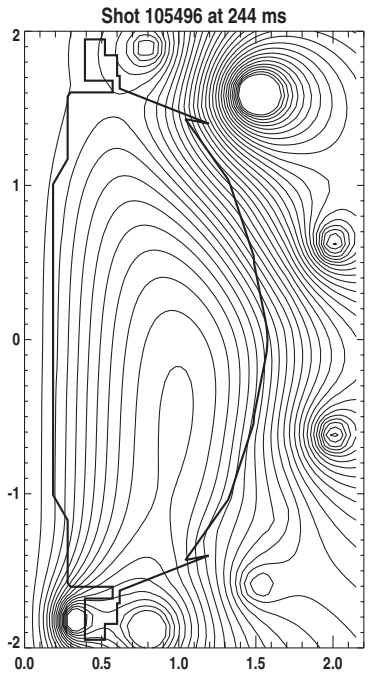
- Open-flux EFIT coded
  - Runs with or without any closed magnetic surfaces
- Limited testing done using CHI shot 105496.00244, which has open surfaces
  - New EFIT converged well, to to error ~ 10^{-5} after 26 iterations
  - Standard EFIT with "halo" converged poorly, error ~ 10^{-2}
- Initial results are good, but code needs more testing
- Will have it operational for 2004 CHI experiments

GENERAL ATOMICS

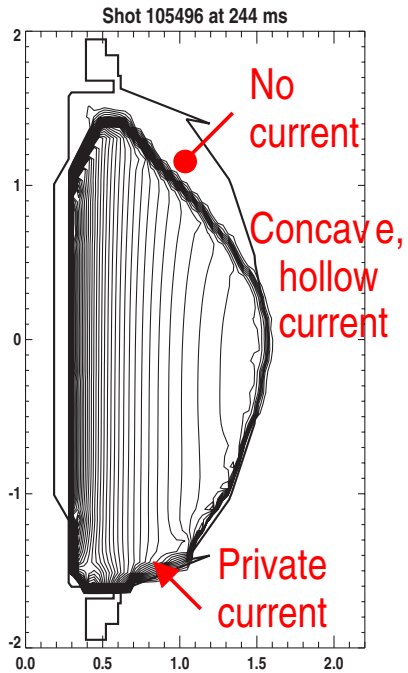
EFIT Test Reconstructio ns: New Method Con verges Much Better and to a Different Solution

NSTX

New EFIT with "Gap Algorithm" and no closed surface requirement

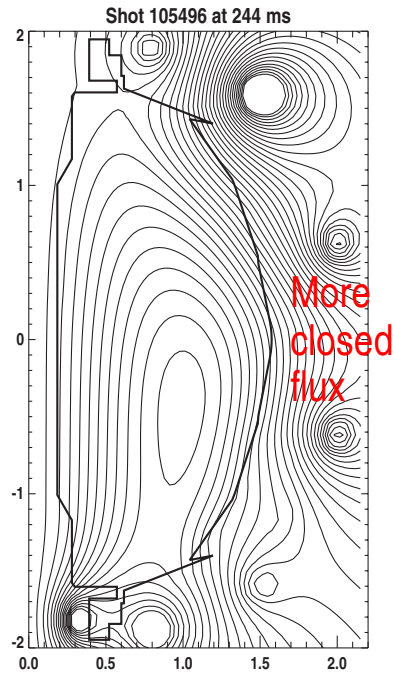


Poloidal Flux

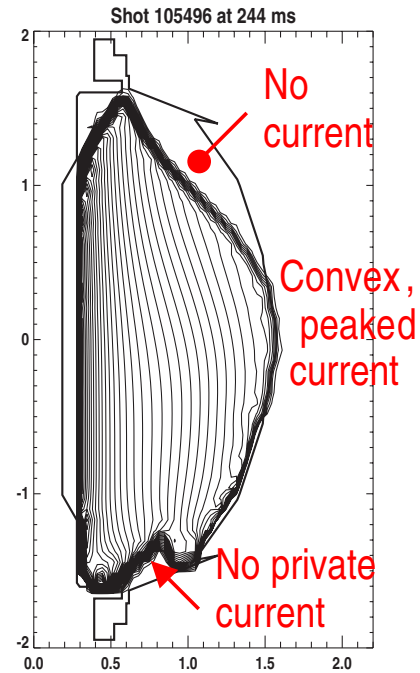


$|J_{Tor}|$ contours

Old Manual Halo Method that requires some closed surfaces



Poloidal Flux



$|J_{Tor}|$ contours

GENERAL ATOMICS

In Conclusion. ..

We expect to have a pu blic version of EFI T

with open-surface cu rrent fitting

available in time for CY 2004 CHI experiments