

MAGNETIC FITTING WITH EFIT OF HELICITY-INJECTED PLASMAS IN NSTX



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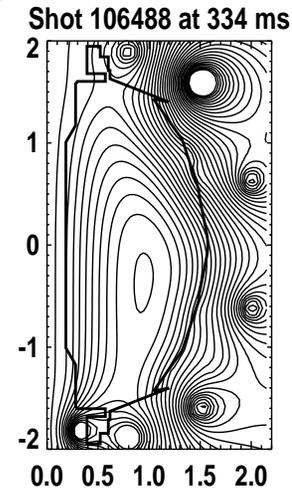
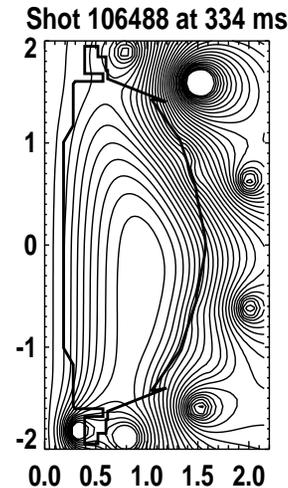
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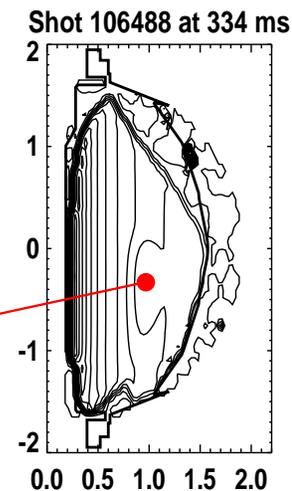
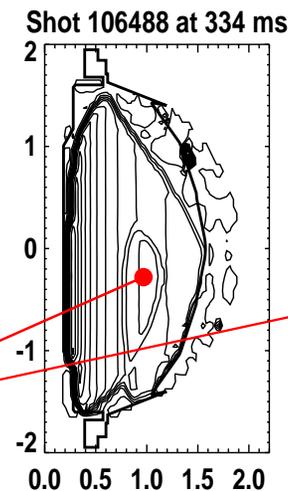
EFIT Returns Fits Showing Small Closed Flux When CHI Current is Large



- Two example EFITs are shown here for sh 106488 at 334 ms, $I_p \approx 390$ kA.
- EFIT was fitting parallel current throughout the thick SOL.
 - EFIT still puts no current in private flux.
- **These are poor fits** ($\chi^2 \approx 750$ and convergence error ~ 0.05).
- These EFITs are much like MFITs:
 - Modest closed flux.
 - J hollow in closed flux region.
 - MFIT $\chi^2 \approx 650$ is also poor.



EFIT
Flux
contours



J_ϕ
contours

EFIT current is hollow here

What Does **EFIT** Tell Us About Existence of Closed Surfaces in CHI?



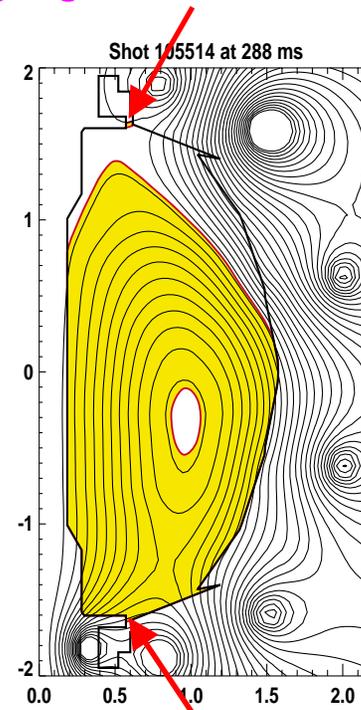
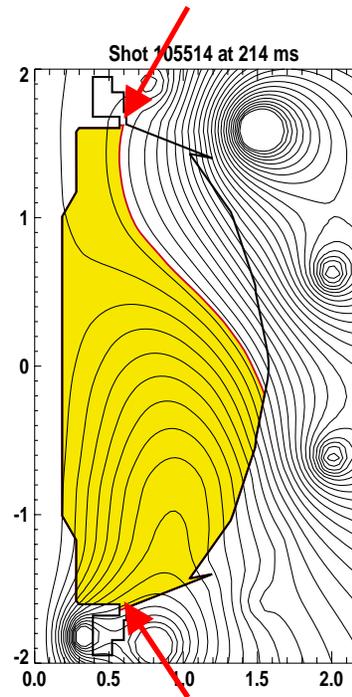
- EFIT has been run with large, force-free current in a thick SOL.
 - With SOL current extended out to 2nd (upper) X-point.
- EFIT is constrained by Grad-Shafranov equation.
- However, these fits during CHI are of very poor quality compared with the usual EFITs.
- As with MFIT, the evidence is weak, and we can only draw a tentative conclusion that mean-flux closed surfaces have been produced by CHI in NSTX.

We Need an EFIT That Works for ALL Open Surfaces, Where: Open Lines \rightarrow Low β Plasma \rightarrow $J \parallel B$



- Method being developed uses the insulated gaps to define the minimum and maximum flux values that bound the current-carrying flux.

Examples:



- This works for some common topologies and geometries.
- It does not work once the closed flux is large; but then regular EFIT works.

Conclusions



- EFIT shows closed mean-field flux similar to MFIT at the highest attained toroidal plasma currents.
- EFIT presently does not work well at lower currents, i.e. with less apparent closed magnetic flux .
- EFIT is presently being modified to fit current in fully open configurations and in private flux and large SOLs.

Thoughts on how to hand off from CHI to Ohmic discharges in NSTX

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HAND OFF

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RESEARCH FORUM
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Preserve as
much pol. flux
as possible.

- Do in $\Delta t \ll \frac{L}{R}$
- $\sim 20 \text{ kA} \lesssim 100 \text{ V}$.

Shift flux
thru X-point
- "Reconnection"

- Moves current-carrying flux to interior.

