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# Update on EFIT Reconstruction of Day 0 Plasmas

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# Reconstructions with a sparse data set

## Vacuum vessel current

### Pre-Day 0 modeling

- Day 0 diagnostics adequate for field null determination
- Day 0 diagnostics marginally adequate for vessel current distribution

### Day 0 modeling

- 6 less measurements than expected
- Need a lower resolution vessel model for vessel current fitting

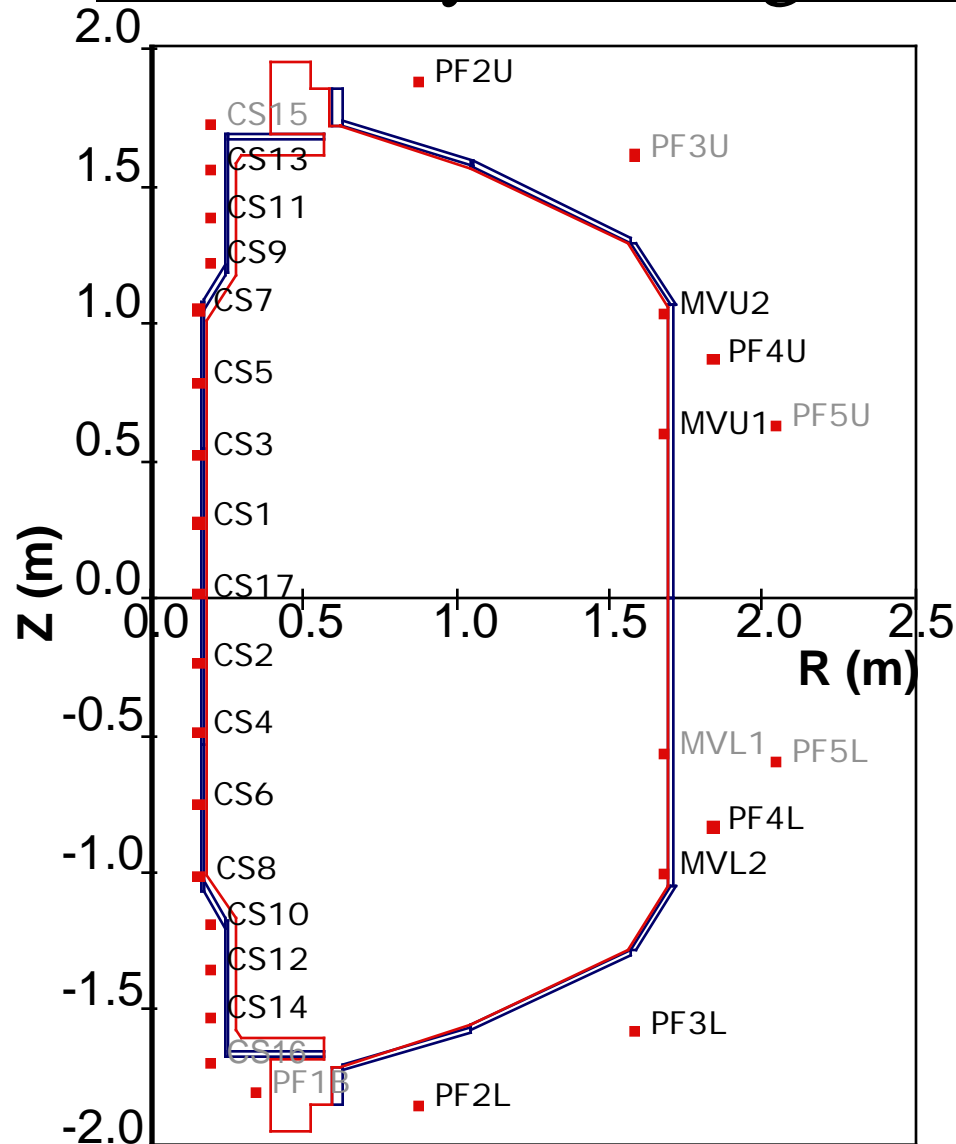
## Plasma equilibria

Code will reconstruct plasma, and plasma + vessel current

Plasma reconstructions not yet robust

- dependent on vessel current model used
- fitting plasma + vessel current accurately might require probes in vessel

# NSTX Day 0 Configuration for Reconstructions



## Measurements for EFIT

### Magnetics Diagnostics

- 23 flux loops
- Rogowski coil

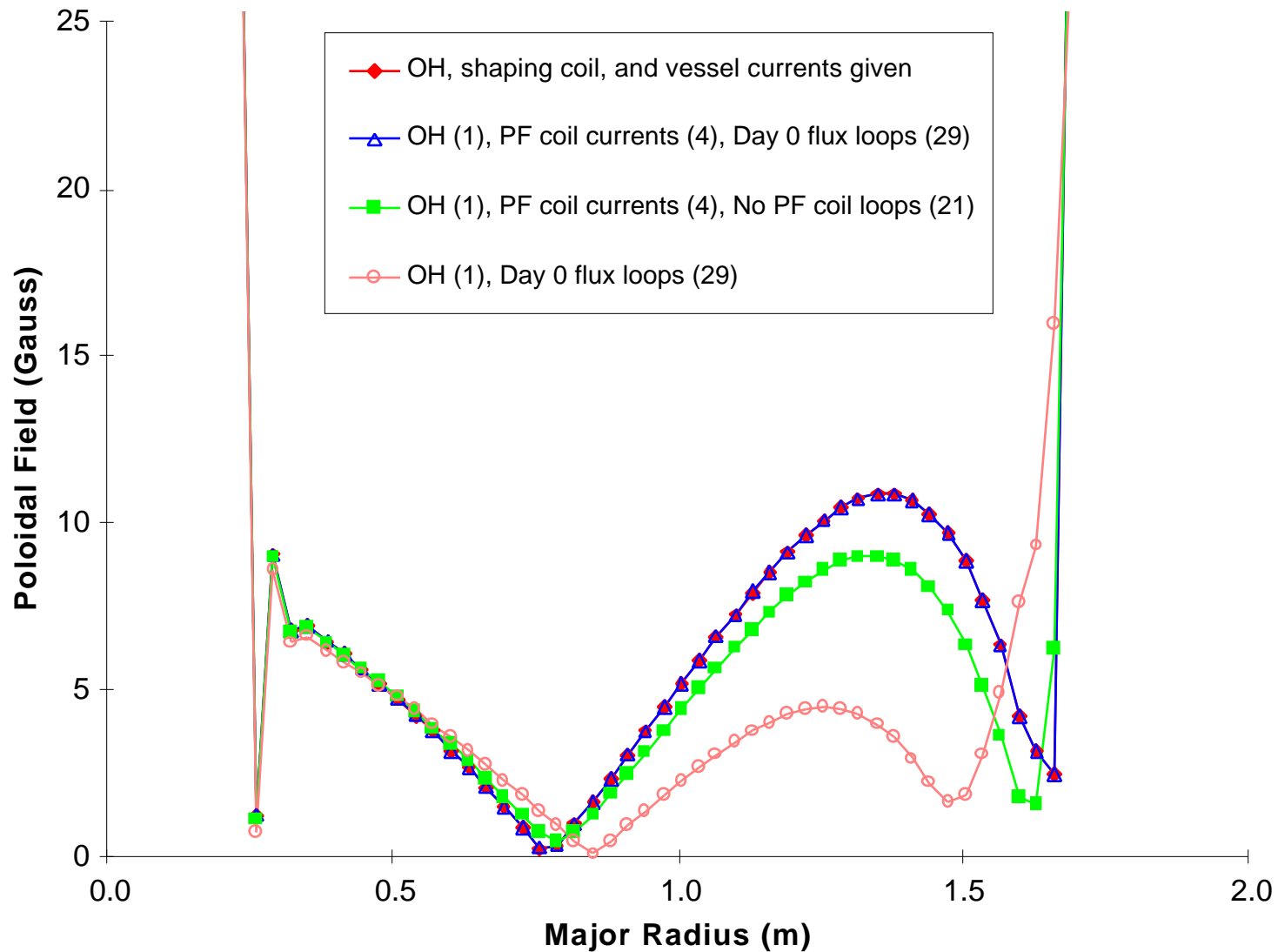
### Coil currents

- 4 PF coil currents
- 1 Ohmic coil current

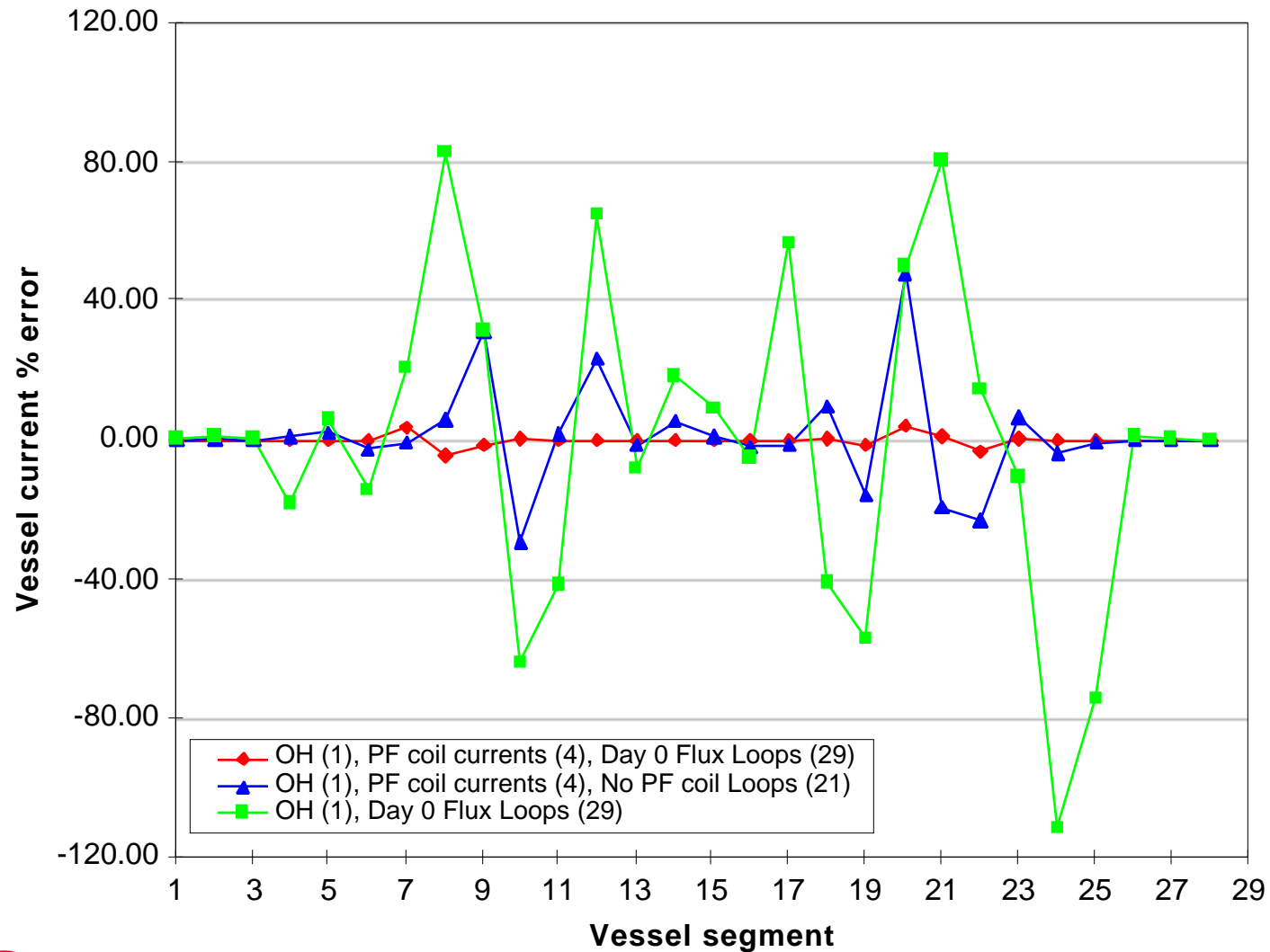
### Vacuum vessel model

- Attempted 28 vessel segments
- Presently testing 20 vessel segments

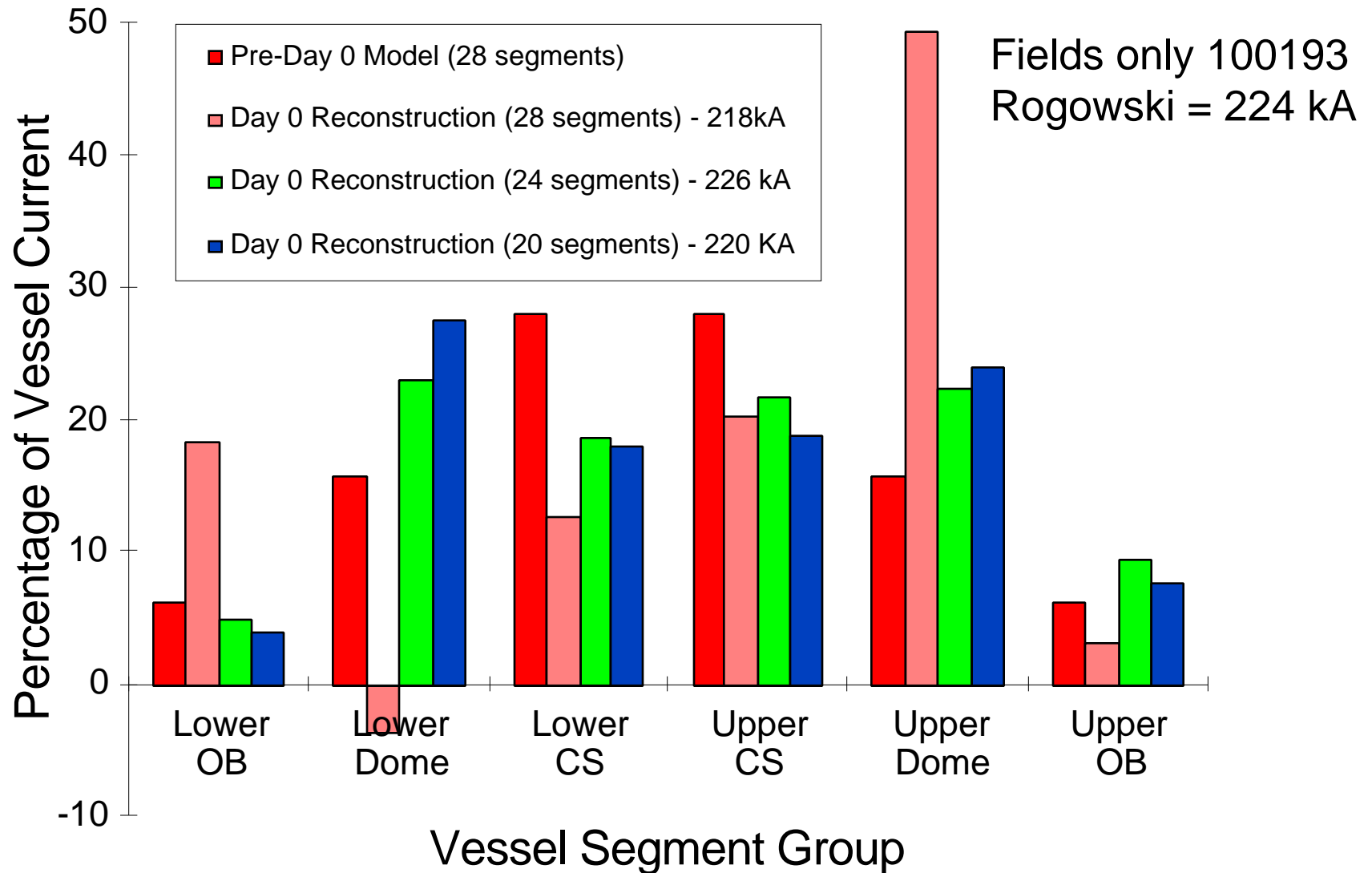
# Day 0 diagnostics OK for field null determination



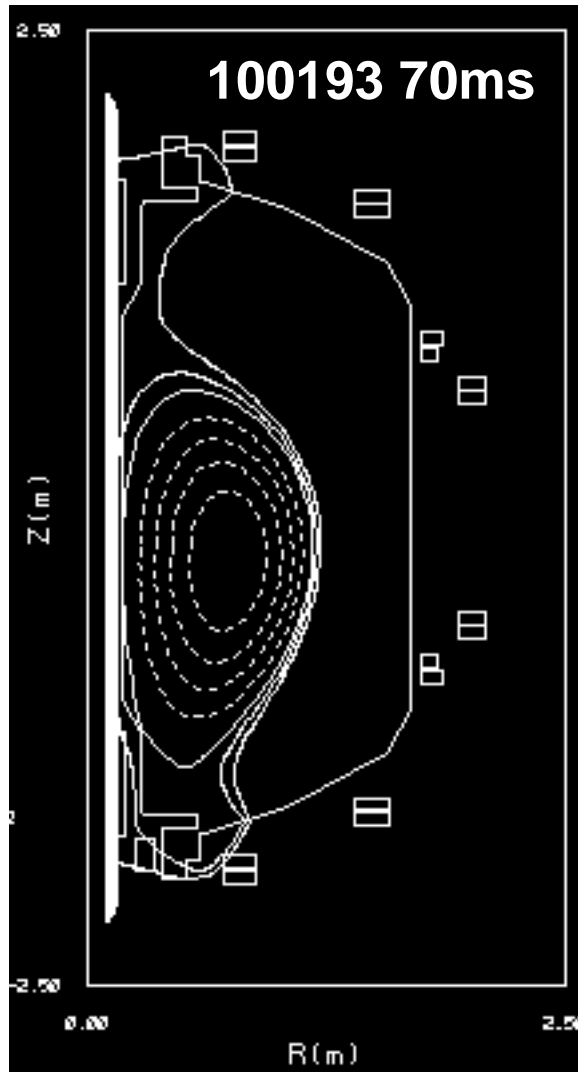
# Day 0 diagnostics marginally adequate for vessel current distribution



# Reduce number of segments to fit current distribution



# Present samples of initial Day 0 reconstructions



Vessel currents from fields-only

$$I_{\text{Rog}} = 485 \text{ kA}$$

$$I_{\text{vessel}} = 210 \text{ kA}$$

$$I_{\text{plasma}} = 218 \text{ kA}$$

$$= 1.98; \quad \sim 0.3$$

consistent with fast camera?

Vessel + plasma fitted

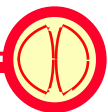
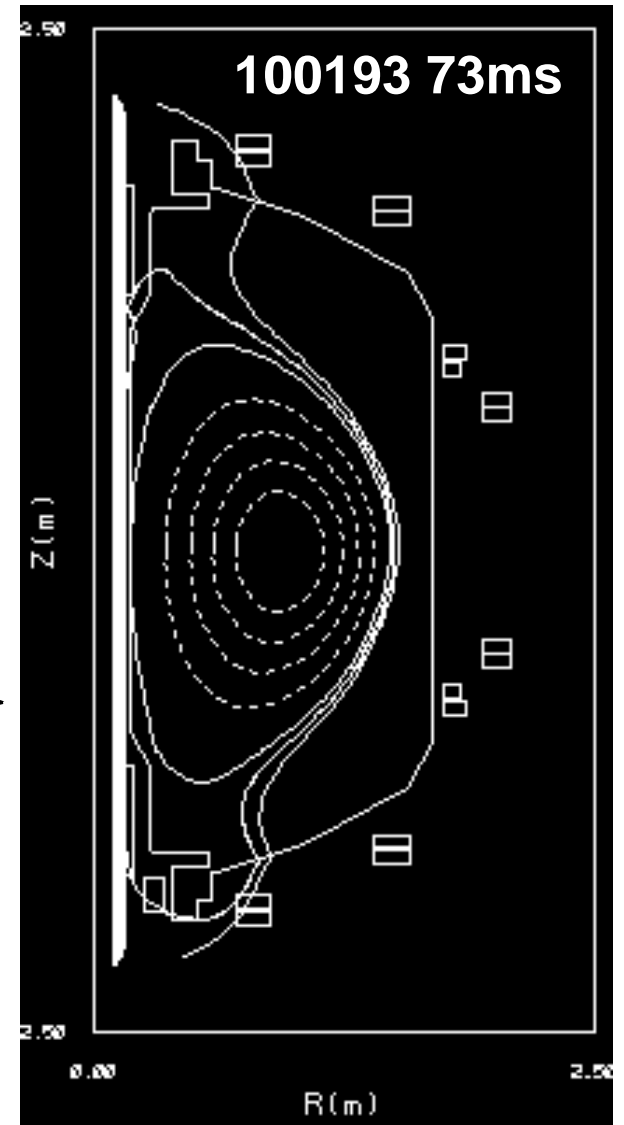
$$I_{\text{Rog}} = 498 \text{ kA}$$

$$I_{\text{vessel}} = 150 \text{ kA}$$

$$I_{\text{plasma}} = 303 \text{ kA}$$

$$= 1.68; \quad \sim 0.39$$

questionable vessel current distribution



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## This is Work in Progress...

### Compare vessel current reconstruction models

- specify vessel segment resistance, use loop voltage (to do)
- use fitting vessel currents from fields-only shots
- fit plasma + vessel (possible for Day 0 data?)

### Determine sensitivity of results

- consider variations of plasma profile model, etc.

### Reconstruct plasma parameters

- requires reconstruction of plasma evolution

### With $I_p \sim I_{\text{vessel}}$ , magnetic probe distribution important

- distribute coils to accurately resolve vessel current distribution
  - optimally have a probe inside & outside segment of interest
- passive plate current distribution should have similar coverage