NSTX

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XP1030: ELM suppression using 3D fields from a single row off-midplane coils on NSTX

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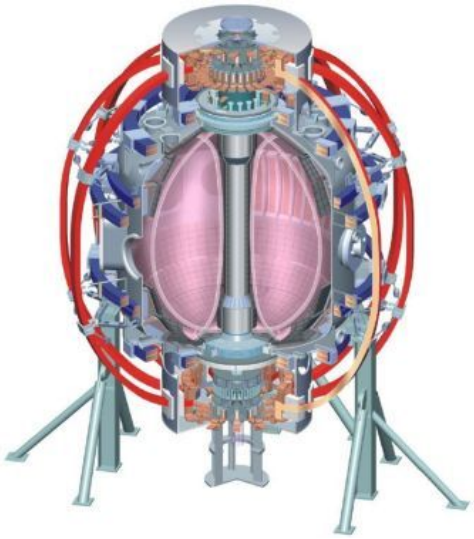
** Participant in the U.S. DOE Fusion Energy Postdoctoral Research Program administered by ORISE & ORAU*

2010 NSTX Results and Theory Review
December 1, 2010



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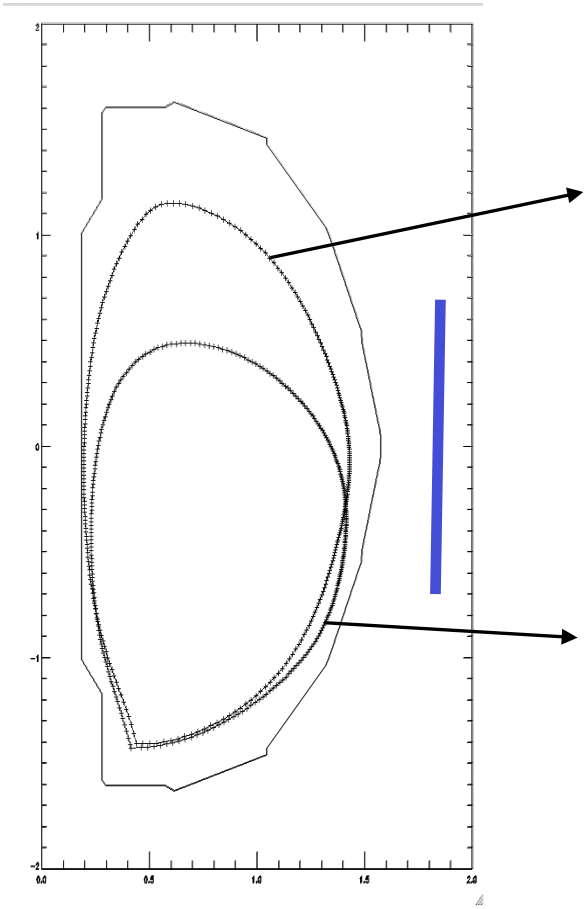
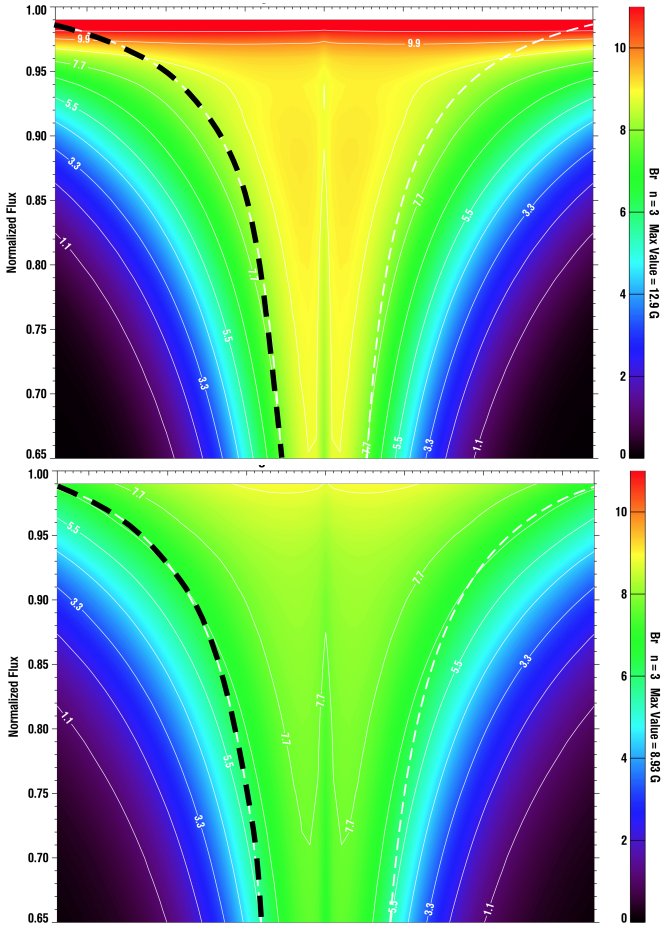
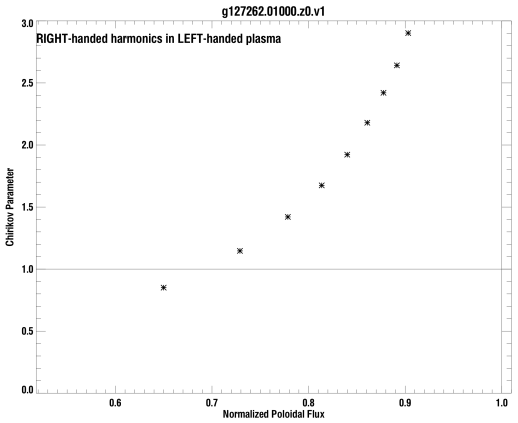
Shifted shape leads to reduced non-resonant fields compared to standard NSTX shape

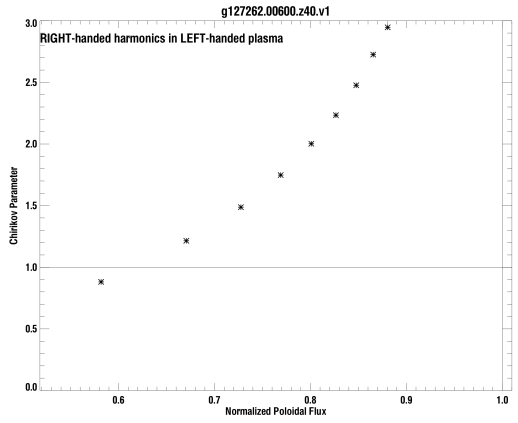


1 MA fiducial shape and 600kA shifted shape with matched q profiles

n = 3 field

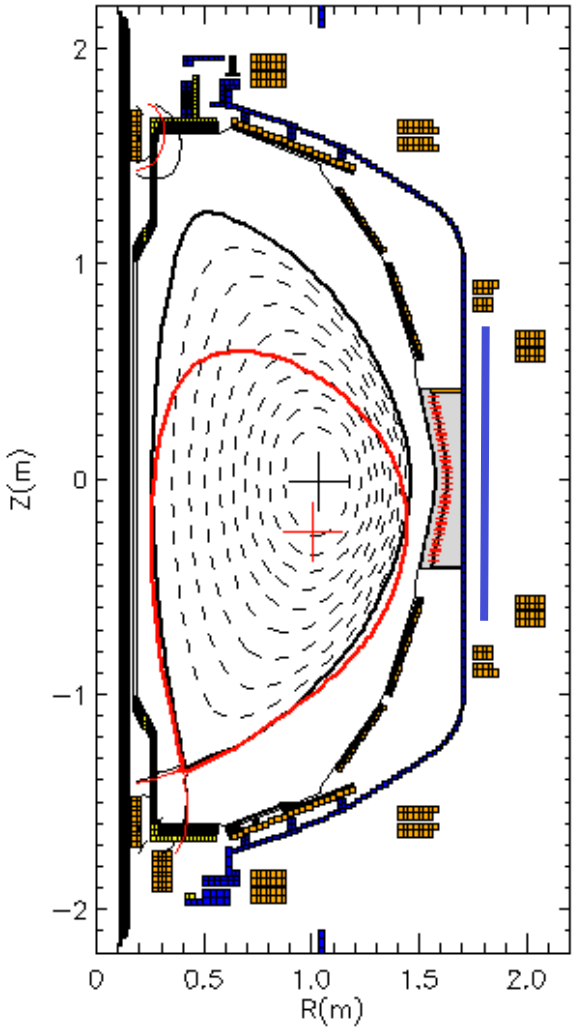




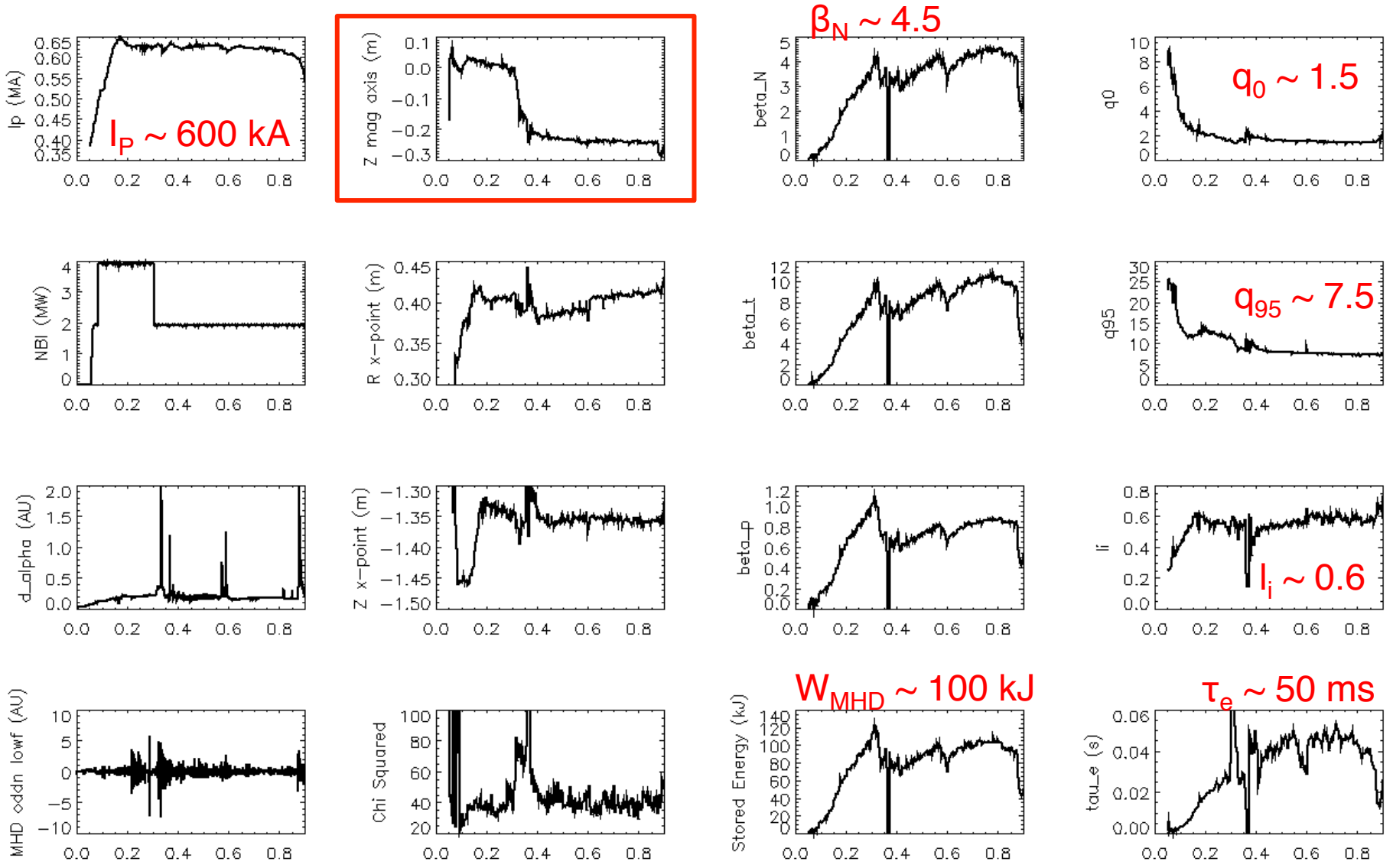


XP1030: Investigate response to 3D fields from off-midplane coil

- Δz ~ -25 cm achieved
  - 600 kA, 4.5 kG
  - Limited by length of PF3U segment
  - Limited by PF1A multiplier
- Administratively limited to 2MW NBI
  - Not many type-I ELMs
  - Tried different fueling schemes
  - Non-shifted plasma at 4MW was sufficiently ELMy
- Did not apply n=3 fields above EFC level



Shifted shape is stable and global parameters are typical for a 2MW NBI discharge



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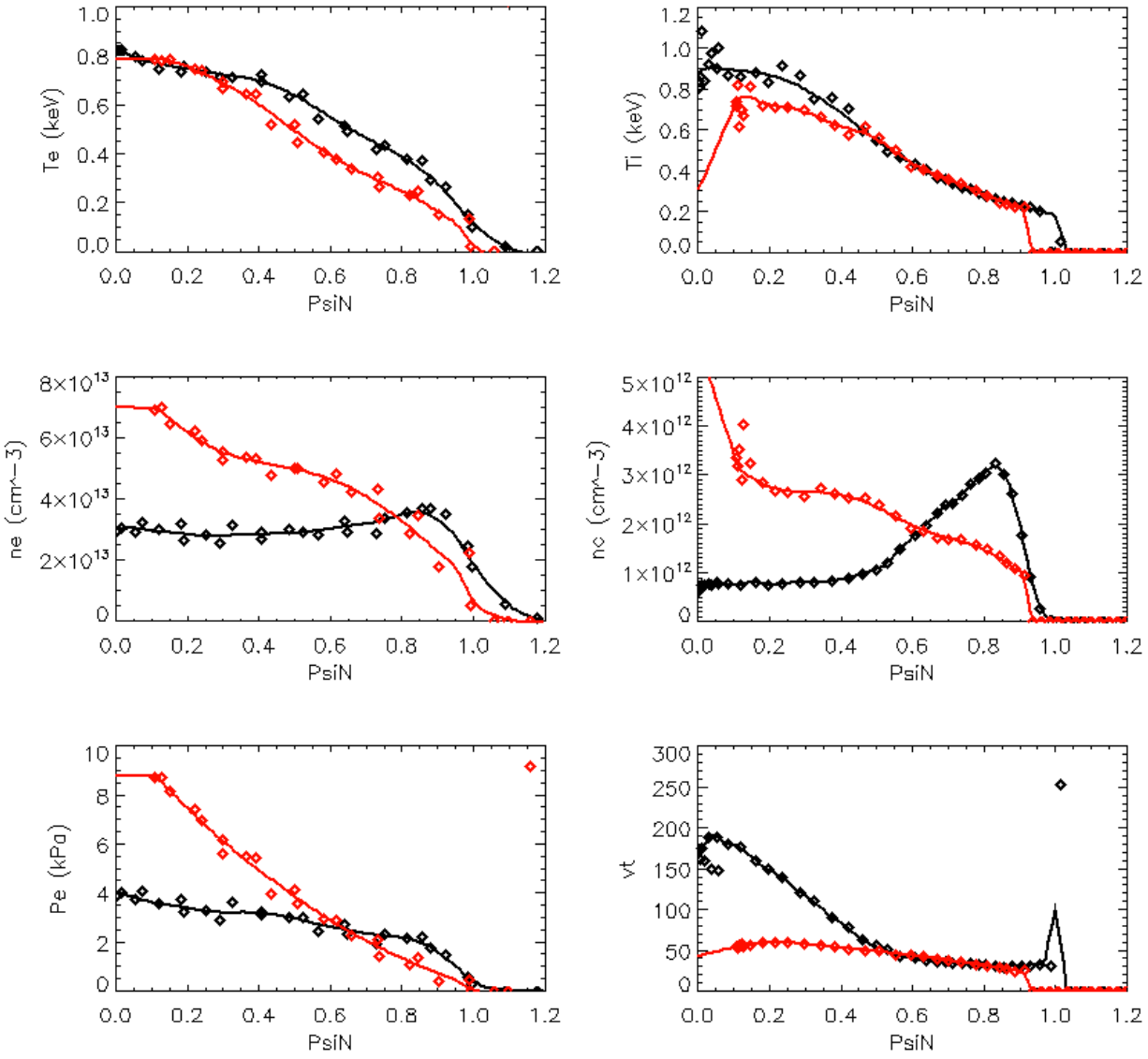
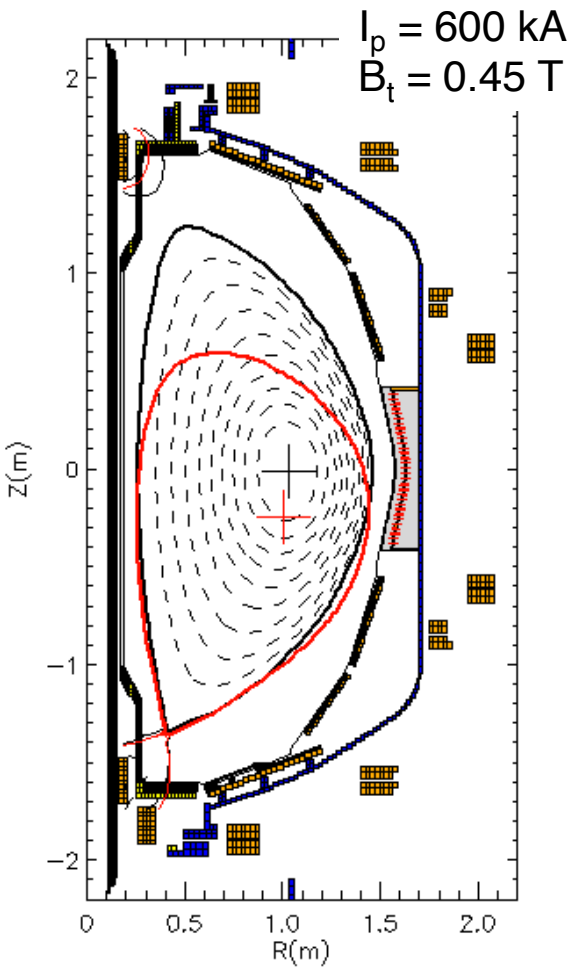
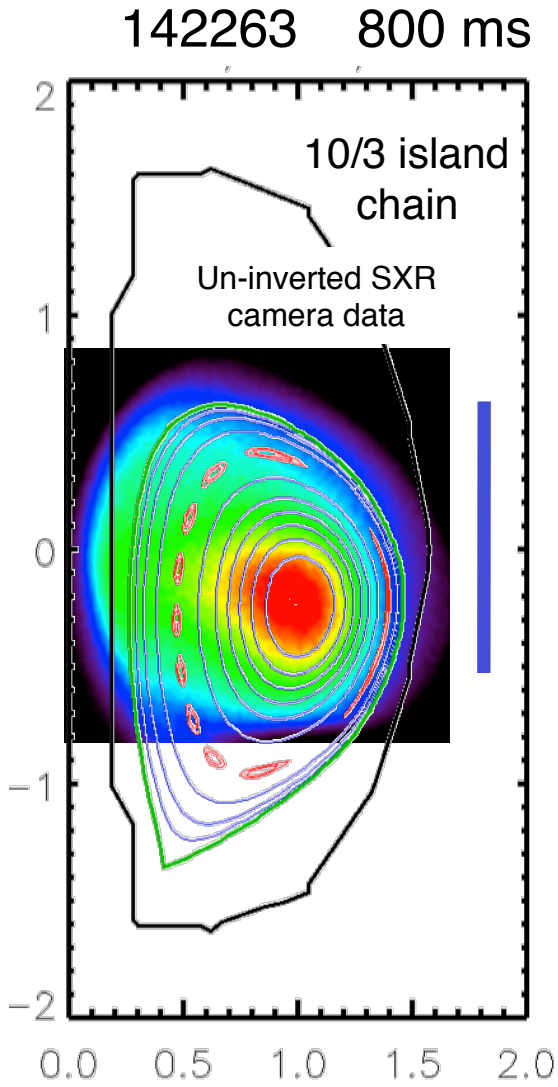




LRDFIT04 142263 0.299000 s
LRDFIT04 142263 0.701000 s

Potential to image induced edge resonant islands with SXR camera

- Resonant perturbation → may open up edge island chains
  - Island widths depend on plasma shielding (or amplification)
- SXR imaging of induced island structure pursued on DIII-D and NSTX
  - Image X-points where islands are largest
  - Validate models of plasma response to 3D fields
- NSTX is well-suited to make this measurement
  - ST has great tangential viewing access
  - Ample SXR signal in edge
  - High-β and rotation → expect significant shielding
  - SXR diagnostic is in place and running



XP1030: Summary

- XP1030: First goal successfully completed
  - Developed stable plasma with $\Delta z < -20$ cm
  - Further shape development is possible with controller modifications
- Next goal: run TRANSP to investigate NBI orbit losses
  - Can we run this shape with more beam power?
  - What is the impact of off-axis beams?
  - 4MW should lead to an ELMy discharge
- NSTX is poised to make first detection of RMP islands
  - Minor modifications to SXR camera planned to improve spatial resolution and optimize filter
  - ELM suppression goal could be attempted during FY11 run

Acknowledgement

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