Control of MHD Activity through Active Manipulation of Scrape-Off-Layer Current (SOLC) on NSTX
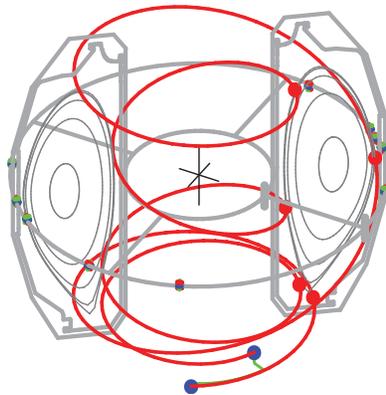
H. Takahashi and **E. Fredrickson**

NSTX 5 Year Plan Mini-Wks - MHD Group

Princeton Plasma Physics Laboratory
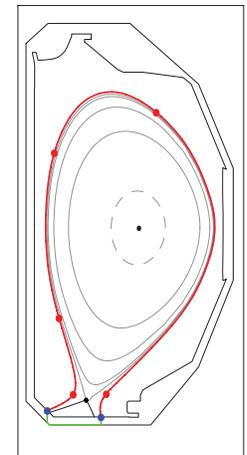
Princeton, NJ

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H. Takahashi, et al.
APS '06 (GP1.31) '05(CP1.23) '04(NP1.016) '03(KP1.026)
EPS '05(P4018) '03(P399)
NF 44(2004)1075 (DIII-D)
NF 42(2002)448 (TFTR)

Proposed Project

GOALS:

Develop method of controlling MHD (suppress or induce) by actively manipulating Scrape-Off-Layer Current (SOLC).

DEVELOPMENT:

Stage-I: Measure intrinsic SOLC and assess its links to MHD (parallel effort on DIII-D) - 2 years.

**Stage-II: Eliminate/reduce intrinsic SOLC and assess effect of its absence on MHD and discharge - 1 year.**

Stage-III: Actively drive SOLC to suppress or induce MHD (ELM, RWM, NTM, LM) - 2 years.

- **SOLC generates field at close range from plasma surface**
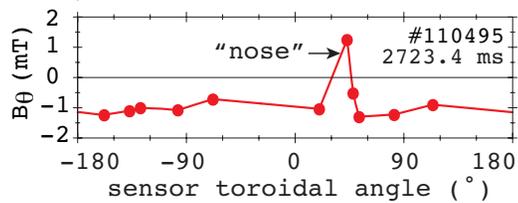- **SOLC is a virtual coil, called into existence as needed**

SOLC Field Comparable to Error and Control Coil Field

B_θ Measured by Mirnov
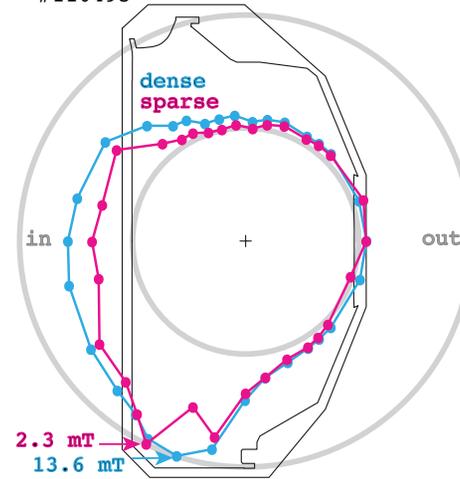
(a) B_θ pol var (mod polar plot)
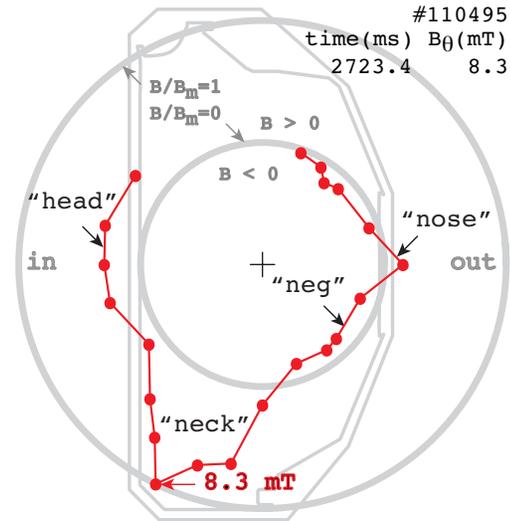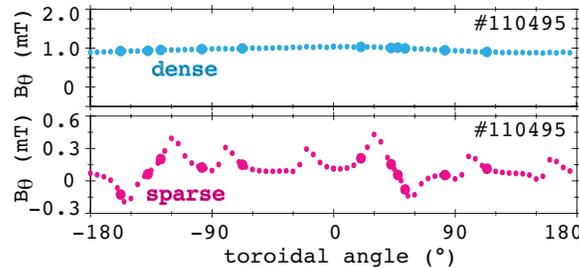

(b) B_θ tor variation

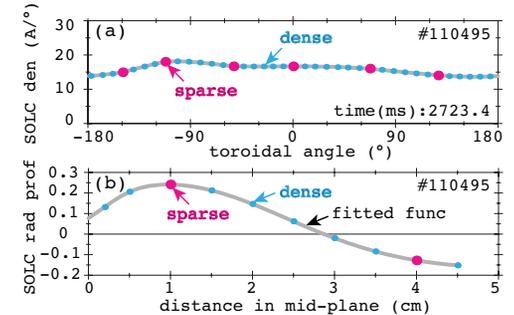**B_θ Calculated from SOLC**

(a) B_θ poloidal variation (modified polar plot)
#110495

(b) B_θ toroidal variation

Measured SOLC profiles

SOLC field can be predicted from measured tile current - here reproducing prominent idiosyncratic features in measured B_θ poloidal-profile during ELMs.

Hardware Requirement

Stage-I: Install a toroidal array of tile current sensors on at least two tile rings and a radial array of closely spaced Langmuir probes in at least one toroidal location, both with associated instrumentation/data acquisition.

Stage-II: Provide for SOLC paths with higher resistance (higher resistivity material or insulated tiles) for all tiles in at least two rings.

Stage-III: Bring out electrical conduits from a small number of tiles or electrodes for external power supply connection.