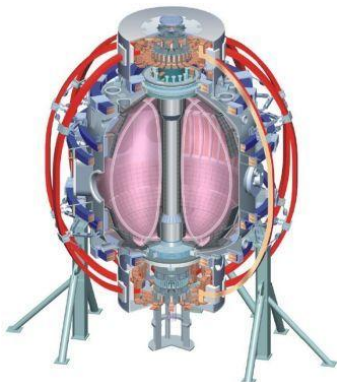


Solenoid-Free Plasma Startup

College W&M
Colorado Sch Mines
Columbia U
Comp-X
General Atomics
INEL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
Old Dominion U
ORNL
PPPL
PSI
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Maryland
U Rochester
U Washington
U Wisconsin

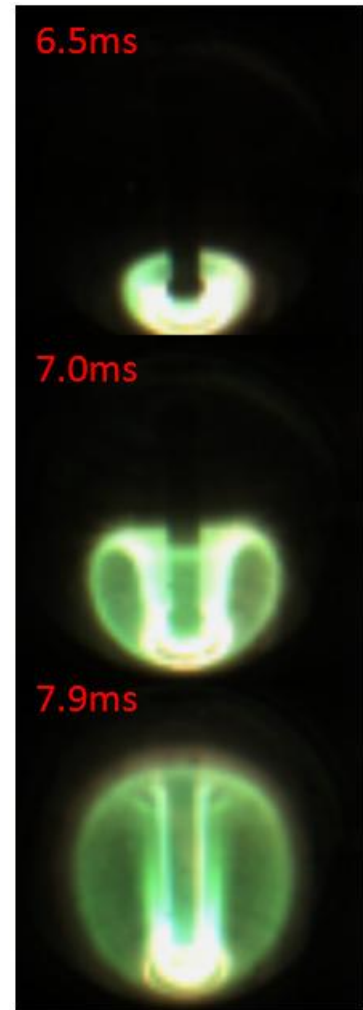
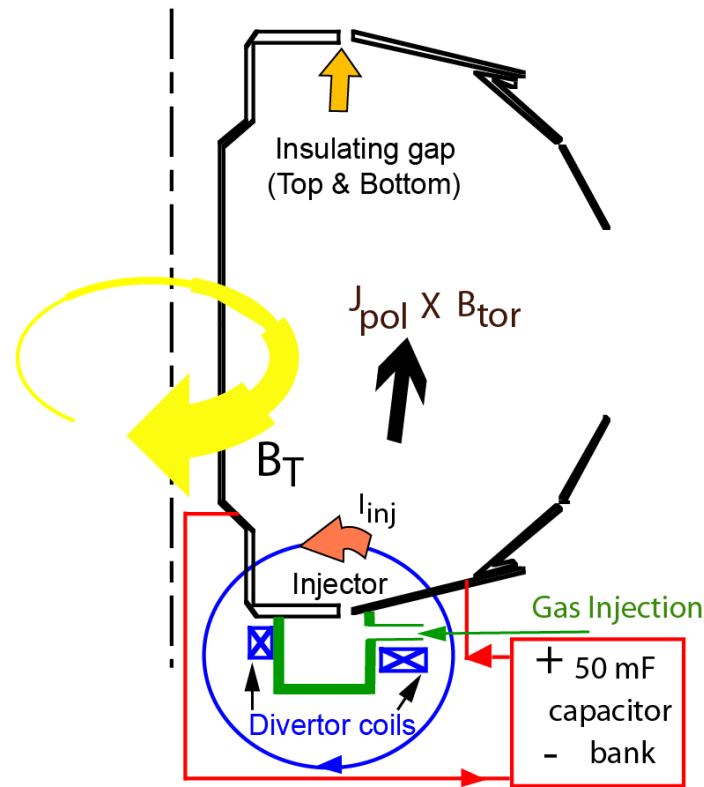
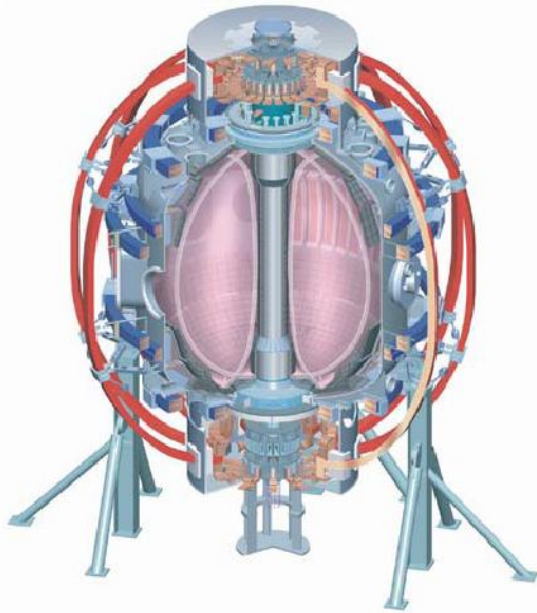


R. Raman, D. Mueller
University of Washington / PPPL

**NSTX Research Forum for
FY2010 Research
1-3 December 2009**

Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITY
KBSI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec

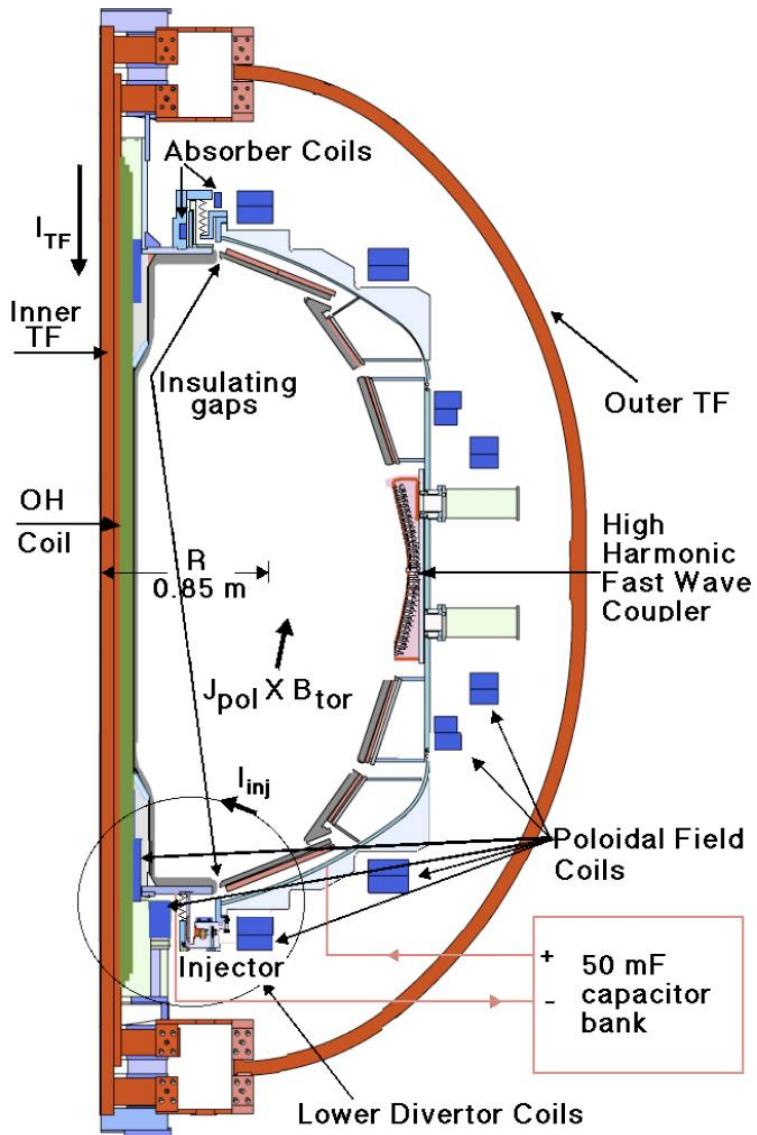
Transient CHI: Axisymmetric Reconnection Leads to Formation of Closed Flux Surfaces



- Demonstration of closed flux current generation
 - Aided by gas injection from below divertor plate region
- Demonstration of coupling to induction (2008)
 - Aided by staged capacitor bank capability

CHI for an ST: T.R. Jarboe, Fusion Technology, 15 (1989) 7
 Transient CHI: R. Raman, T.R. Jarboe, B.A. Nelson, et al.,
 PRL 90, (2003) 075005-1

“If the coupling current could be doubled, pronounced flux savings should happen naturally” – FY2009 SFPS Research Forum Conclusion
Flux Savings on NSTX Now Realized (FY09 Results)



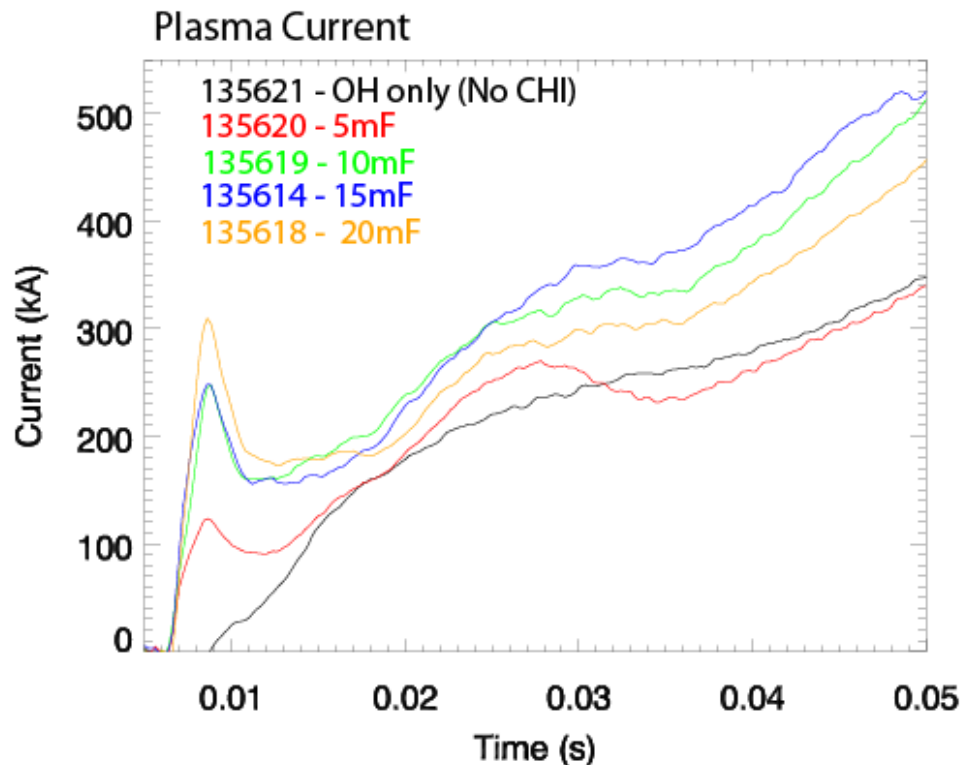
Long-pulse (400ms) CHI discharges in a ‘stuffed-injector’ current mode used to ablate Low-Z impurities from lower divertor [Helped FY09 CHI]

Deuterium Glow Discharge cleaning employed to chemically sputter and reduce oxygen levels [Helped FY09 CHI]

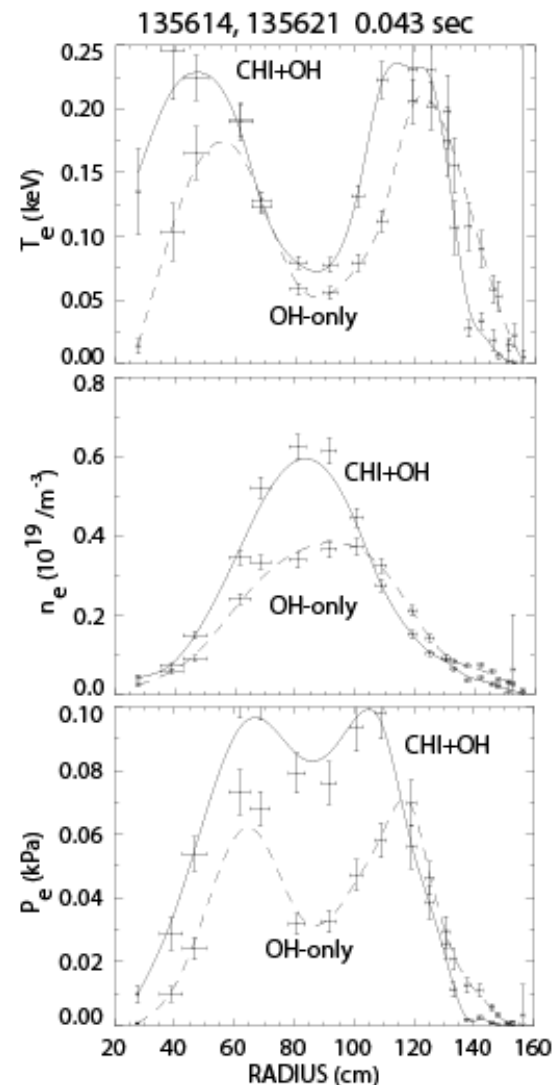
A buffer field was provided using new PF coils located in the upper divertor region (Absorber region) to reduce interaction of CHI discharge with un-conditioned upper divertor plates [Helped FY09 CHI]

Lithium evaporation on lower divertor plates improved discharge performance [Helped FY08 and 09 CHI]

Using Only 27kJ of Capacitor Bank Energy 300kA of CHI Started Discharge Generated and Coupled to Induction



Additional effort required to reduce absorber arcs to allow operation above 300kA



NSTX is Unique in the World Program Investigating CHI Plasma Startup & Fast-Wave Assisted Ramp-up

*Priorities for FY2010 aimed at improving CHI discharges from
FY2009*

- *Develop operating conditions aimed at improving the control of CHI*
- *Increasing the current and closed poloidal flux production of CHI*
- *Increase ohmic flux savings using CHI by reducing impurity influx*
- *Increase high-performance plasma pulse lengths using CHI startup*

FY2010 Research Milestone (R10-2): Characterize HHFW heating, current drive, and current ramp-up in deuterium H-mode plasmas.

CHI group discussion to occur in B233 from 1-5:30PM (Today)

&

**RF coupling to CHI group discussion to occur tomorrow,
B233 from 10AM to 12:30PM**