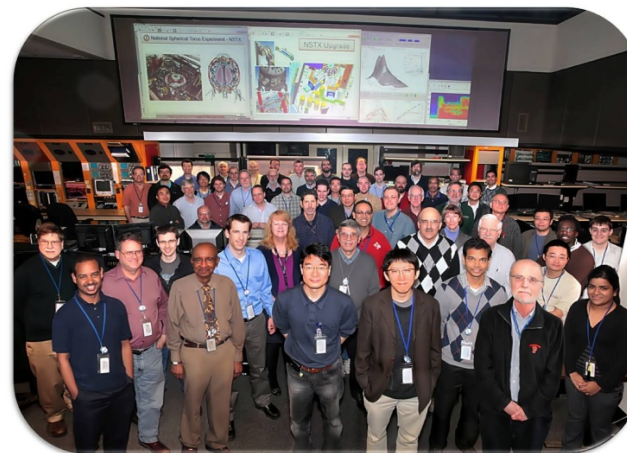
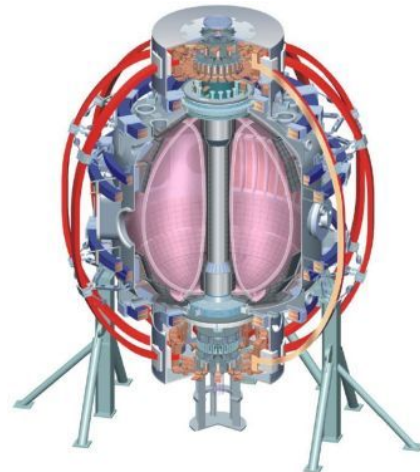


Long pulse divertor biasing on NSTX-U

Devon Battaglia

Columbia U
CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
ORNL
PPPL
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Illinois
U Maryland
U Rochester
U Washington
U Wisconsin

**NSTX-U Facility Enhancement Brainstorming
PPPL
February 7 and 8, 2012**



Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
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Hebrew U
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RRC Kurchatov Inst
TRINITI
NFRI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep

NSTX-U has unique opportunity to test long pulse divertor biasing as a tool for addressing ST physics/concerns

- Hard part is done: inner/outer VV is electrically isolated
 - Need new or repurposed long pulse power supply
 - 100s of volts, 10s of amps, ~0.5s (~ kJ stored energy)
- Follows rich history of experiments on large-A tokamaks
 - Positive effects, but not game changing
 - But ST has unique physics/challenges
- Various biasing schemes possible
 - LSN, low- δ : differential SOL bias
 - LSN, high- δ : unipolar bias of plasma
 - DN, low- δ : differential in-out SOL bias

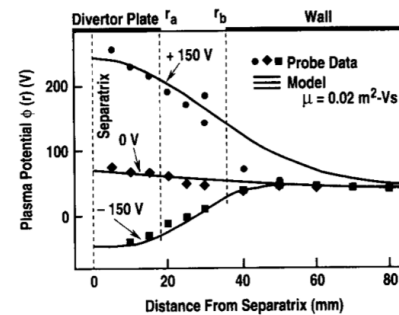
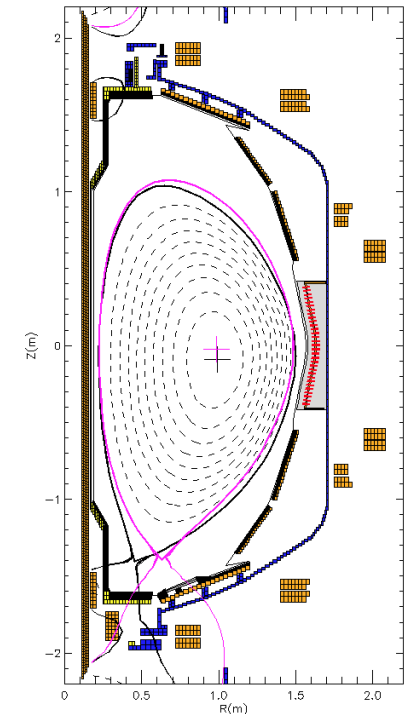


Fig. 11. Plasma potential measured at the outboard midplane by Langmuir probes on TdeV showing profiles obtained when the outboard divertor target plates are biased for three voltages, +150, 0, -150. From Ref. [9].

J.L. Lachambre et al. CFPP 1993 v.2, p.639



Potential applications of a biased divertor

- Increase divertor pressure independent of core fueling
 - Divertor detachment control
 - Impurity mitigation
- Heat and particle flux profile control
- Contribute to SOL physics
 - In/out asymmetries – especially interesting in ST
 - SOL current and sheath properties (I-V characteristic)
- Modify edge E_r
 - Edge rotation control
 - L-H transition: either help or hinder (for I-mode access)
 - ELM control: mitigate or trigger
- Helicity injection
 - Non-inductive current drive