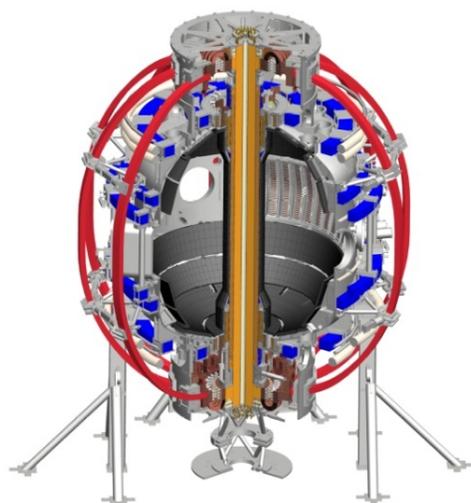


Outline for IAEA FEC Talk

Stefan Gerhardt
and the NSTX Research Team

NSTX Monday Meeting
B318
8/27/2012

Coll of Wm & Mary
Columbia U
CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Lehigh U
Nova Photonics
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 Tennessee
U Tulsa
U Washington
U Wisconsin
X Science LLC



Culham Sci Ctr
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Inst for Nucl Res, Kiev
Ioffe Inst
TRINITI
Chonbuk Natl U
NFRI
KAIST
POSTECH
Seoul Natl U
ASIPP
CIEMAT
FOM Inst DIFFER
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep

Synopsis Promised Approximately Equal Levels of Results in Three Areas

- Disruptivity analysis and safe operating windows
- Detectability, and detection, of disruptions
- Halo currents dynamics
- Proposed flow of talk:
 - What conditions minimize disruptions.
 - When they do occur, are then detectable?
 - When they do occur, what are the consequences in terms of halo currents?

Disruptivity And Safe Operating Windows

- Nuclear Fusion manuscript on subject ~95% complete.
- For IAEA talk:
 - 2D plots of disruptivity vs β_N and q^* , S , F_p , and I_i .
 - Disruptivity vs. rotation.
 - Importance of maintaining elevated q_{\min} .
 - Summarize characteristics of scenarios with minimal disruptivity, and that next step in research is to maintain these characteristics against the equilibrium evolution of the plasma.

Detectability of ST Disruptions

- Have not worked on it much since USBPO disruption mitigation workshop talk.
- For IAEA talk:
 - Describe simple “1D” tests of disruptions imminence.
 - Emphasize “physics based” tests (neutron rate).
 - Show how tests can be combined.
 - With fairly good level of success.
 - Describe types of scenarios/events that lead to:
 - false positives
 - failure to detect

Dynamics of the Halo Current Asymmetry

- January 2012 Nuclear Fusion paper covered basic characteristics of halo currents in NSTX.
- New draft manuscript for Nuclear Fusion covers details of the halo current asymmetry at locations where current enters the divertor floor.
 - Focus on this for talk
- For IAEA talk:
 - Example of halo current rotation and toroidal peaking.
 - Emphasize the variability.
 - Statistics of the rotation...vs. halo current magnitude, halo current fraction, maybe $n=1$ current level.
 - Observation and explanation of symmeterization of the halo current pulse late in the discharge.