

NSTX-U Collaboration Status and Plans for: Lodestar

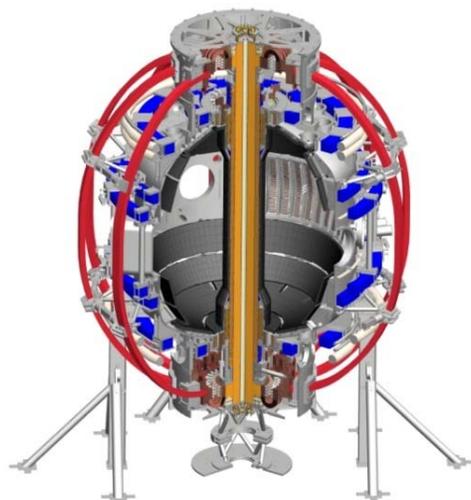
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Lodestar Research Corporation

NSTX-U Collaborator Research Plan Meetings
PPPL – LSB B318
April / May 2014

*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
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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
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JAEA
Inst for Nucl Res, Kiev
Ioffe Inst
TRINITI
Chonbuk Natl U
NFRI
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Seoul Natl U
ASIPP
CIEMAT
FOM Inst DIFFER
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep*

Research plans and needs for this year (FY2014) in preparation for NSTX-U operations in FY2015

- SOL turbulence simulations & comparisons w/ data
 - SOLT (scrape-off layer turbulence) code
 - Main diagnostics
 - GPI (Zweben, Maqueda); BES (Smith, Munsat, Sechrest); IRTV for SOL width (Gray, Maingi); probes (Boedo)
 - database of 2010 GPI shots in progress (Zweben, Davis) : look for empirical connections with SOLT
 - Effect of Li on the SOL width
 - simulating well-analyzed discharges (Canik)
 - prepare for IAEA and publish
 - pedestal width and SOL width related by non-local turbulent convection?
 - leveraging with theory work on turbulence vs. heuristic-drift / neoclassical
 - Key unresolved physics issue: turbulent V_{pol} in H-mode plasmas
 - < 4 km/s in GPI; several 10's of km/s in SOLT (depends on T_i , n_0 friction)
 - working with Zweben, Munsat, Sechrest, Davis to address this
 - large differences between: turbulent structure velocity, ExB, fluid flow

Research Plans for FY2015 - FY2018

- Proposed physics studies
 - SOL width
 - changes in NSTX-U: effect of Li; low collisionality edge/SOL
 - Effects of neutral-induced friction and impurity radiation on:
 - SOL width, blobs, flows
 - Effects of plasma shaping and SOL topology on SOL stability
 - κ , $L_{||}$, magnetic shear in ST configurations
 - linear eigenvalue code (2DX and/or ArbiTER)
- SOL turbulence modeling is difficult
 - $\delta n/n \sim 1$, $kL_n \sim 1$, many drives, neutrals, sonic flow, ...
 - limited by modeling manpower, not data availability (except maybe n_0)
 - need GPI, BES, IRTV + standard diagnostics
 - C.S. Chang et al. XGC-1
 - simulation interpretation (blob), SOLT model improvement
 - simulation : experiment : reduced models [3rd leg of validation]

Ideas to enhance participation in NSTX-U research/program by U.S. Universities, early-career researchers, and students

- Active engagement by NSTX-U team
 - Lodestar – U. Colorado collaboration facilitated by Stewart Zweben
 - Tobin Munsat and Yancey Sechrest: GPI analysis, velocimetry code
 - SOLT validation of synthetic GPI using identical analysis stream
 - model a coherent 3 kHz oscillation (quiet period before an L-H transition)