NSTX-U

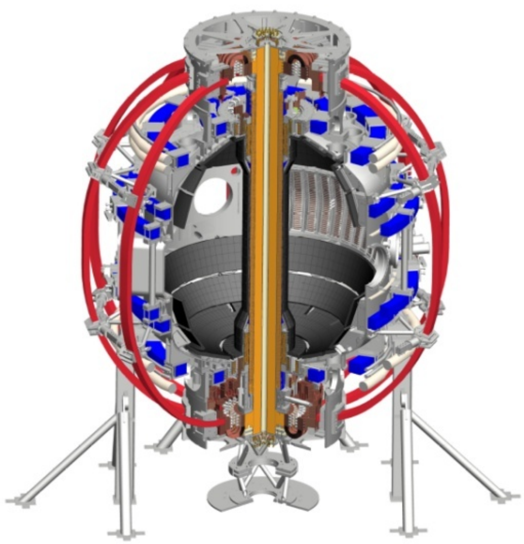
Supported by U.S. DEPARTMENT OF ENERGY | Office of Science

Summary of remaining XP ideas

Coll of Wm & Mary
Columbia U
CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Lehigh U
Nova Photonics
Old Dominion
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

M. Podestà

NSTX-U Research Forum 2015
EP-TSG session
PPPL, Room B252
02/24/2015



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

NB characterization, establish baseline for JRT-15 & R15-2

ID	Title of proposal	Proposer	Contributions to milestones or ITPA	Run time (run days)	Pre-li time (run days)	Min time (run days)	Goal, importance, and plan	Special requirements
2	Characterize 2nd NBI line	Podesta	JRT-15, R15-2, ITPA Joint Exp't	2	0	2	Cross-TSG XP to provide an initial set of data for JRT-15 and Milestone R15-2. Explore operational space achievable with the 2nd NBI line. H-mode, fiducial-like scenarios with Pnb=4-6MW. Two sets of data to explore the dependence of (i) NB-driven current profile and efficiency and (ii) pressure profiles vs. NB mix. Complements data from dedicated Ip/Bt scans obtained from other XPs.	All 6 NB sources required. Main profile & fast ion diagnostics (MPTS, CHERS, MSE, FIDA, ssNPAs, sFLIP, neutrons) needed. Requires reliable H-mode access and operation (fiducial-like scenario) with flat-top duration ~1sec or longer at Bt~0.65T, Ip~0.7MA.

- *Involves multiple TSGs*
- *To be coordinated at SG level (similar to Ip/Bt scan XP)*

Parametric studies of *AEs and associated fast ion transport

ID	Title of proposal	Proposer	Contributions to milestones or ITPA	Run time (run days)	Pre-li time (run days)	Min time (run days)	Goal, importance, and plan	Special requirements
4	Why do some fast-ion driven modes chirp?	Heidbrink	15-2	1	0	1	Some fast-ion instabilities "saturate" in steady burbling & but others have impulsive bursts that could deposit concentrated heat loads. Nobody knows why. A similarity experiment with DIII-D will test if this difference persists in NSTX-U. If it does not, we will scan parameters down to NSTX levels to recover chirping.	None
5	AE Critical Gradient	Heidbrink	15-2	1	0	1	Critical gradient models hold promise as a predictive tool for fast-ion transport. The experiment will compare DIII-D experiments with NSTX data to test whether the same physics is operative in STs. A modulated source is used to measure the incremental fast-ion flux. A power scan of other sources varies the severity of Alfven eigenmode activity.	None
8	Light ion beam probe of Alfven eigenmode transport	Heidbrink	none	1	0	1	Obtain accurate measurement of the transport caused by individual Alfven eigenmodes. A prompt loss orbit is arranged to pass close to the SLIP. AEs perturb the orbit. Calculations yield the radial kick through the mode.	The SLIP detector needs to have a high enough bandwidth to detect oscillations at the mode frequency.
6	TAE stability vs. NBI injection parameters	Podesta	none	1	0	0.5	Detailed scan of TAE stability vs. NBI injection parameters. H-mode scenario. Vary NBI mix/ Einj, identify the portion(s) of fast ion phase space which is more strongly driving the modes.	All six NBI sources with voltage scan capability in the range 65-90keV. All fast ion and mode structure diagnostics needed.

Rotation effects on *AE stability

ID	Title of proposal	Proposer	Contributions to milestones or ITPA	Run time (run days)	Pre-li time (run days)	Min time (run days)	Goal, importance, and plan	Special requirements
15	Modification of TAE gap structure via rotation	Podesta	none	0.5	0	0.5	Explore modification of TAE gap structure caused by induced variations of the rotation profile. Varying rotation in a controlled way, e.g. through magnetic braking, may provide a means to affect the TAE stability without directly affecting the fast ion population. The two main goals: (i) explore a potential control tool for TAEs, and (ii) provide a set of data to challenge theories on TAE damping mechanisms.	Requires well reproducible H-mode scenario with substantial TAE activity. Requires magnetic braking.

3D fields effects on fast ion confinement and *AE stability

ID	Title of proposal	Proposer	Contributions to milestones or ITPA	Run time (run days)	Pre-li time (run days)	Min time (run days)	Goal, importance, and plan	Special requirements
18	AE damping rates in 3D perturbed equilibria	Bortolon	none	1	0	0.5	Evidence from NSTX suggests that static n=3 3D fields could be actively used to mitigate or suppress AE, through enhancement of continuum damping. Goal: explore the physic basis of this mitigation mechanism, utilizing the new TAE antenna, in a simple Ohmic, L-mode scenario. 1) minimize the TAE drive and help to pin-down damping effects, 2) allow measurement of the density fluctuations by reflectometer; 2) permit accurate modeling, minimizing rotation. Two parts. Part 1, physics basis: measurement of TAE damping rates, with and without 3D perturbations. Part 2: use the antenna to drive TAE in a controlled fashion, and apply 3D perturbations to modulate the mode amplitude.	- This proposal depends completely on the successful operation of the TAE antenna. - Standard background plasma diagnostics are required to allow modeling. - Reflectometer, to determine mode structure

Fast ion studies with combined NBI & RF

ID	Title of proposal	Proposer	Contributions to milestones or ITPA	Run time (run days)	Pre-li time (run days)	Min time (run days)	Goal, importance, and plan	Special requirements
13	RF-NB interaction at low current	Poli	non-inductive rampup	1	0	0.5	Scan phasing of HHFW antenna and combine to NBI. Aim: broaden IC current profiles and reduce absorption to Fast Ions. Model validation of RF codes.	CHERS if use 2nd beamline, MSE, spectroscopy
12	Modification of fast ion distribution by RF	Podesta	Milestone R16-3	1	0	1	Goal of this experiment is to investigate how RF modifies the NB ion distribution as a function of RF injection parameters. Scans of RF phasing and NBI parameters (injection energy, NB mix) are planned.	HHFW system up & running. Minimum useful RF power is 2MW. All fast ion diagnostics needed to monitor the fast ion distribution function.

- *To be discussed with WH&CD TSG*