DivSOL TSG discussion

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NSTX-U Research Forum FY2015
Princeton, NJ
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Coll of Wm & Mary
Columbia U
CompX
General Atomics
FIU
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Lehigh U
Nova Photonics
ORNL
PPPL
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U Colorado
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U Tulsa
U Washington
U Wisconsin
X Science LLC
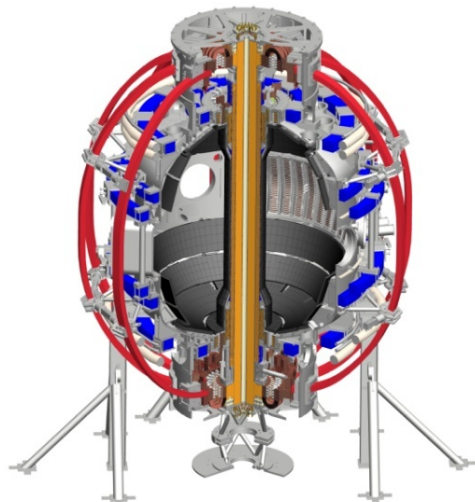
Culham Sci Ctr
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
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Inst for Nucl Res, Kiev
Ioffe Inst
TRINITI
Chonbuk Natl U
NFRI
KAIST
POSTECH
Seoul Natl U
ASIPP
CIEMAT
FOM Inst DIFFER
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep

DivSOL TSG leads and/or contributes to several milestones in 2015 and 2015

- **FY 2015**
  - **R(15-1)**: Assess H-mode energy confinement, pedestal, and scrape off layer characteristics with higher B_T, I_P and NBI heating power
  - **R(15-3)**: Develop the physics and operational tools for obtaining high-performance discharges
  - **IR(15-1)**: Develop and assess the snowflake divertor configuration and edge properties
- **FY 2016**
  - **R(16-1)**: Assess scaling and mitigation of steady-state and transient heat-fluxes with advanced divertor operation at high power density
  - **R(16-2)**: Assess high-Z divertor PFC performance and impact on operating scenarios

Run schedule assumptions

	FY15		Early FY16	
Run Weeks 1-4	**Run Weeks 5-8**	**Run Weeks 9-12**	**Run Weeks 13-16**	**17-18**
Commissioning	**Science**	**Science**	**Science**	

Mid-run assessment

Scope of pre-forum meeting #2 - see next page for additional details

Scope of Research Forum

- Pre-forum meeting #2 should emphasize XMP/XP title, goal, author identification to cover first 2 run months (Weeks 1-8)
- Forum should emphasize prioritization of XPs for weeks 3-18, but also document commissioning XMP/XP goals + run-time
- Mid-run (re-)assessment after first 6-8 Science run-weeks

Assumptions for first 2 run-months to use in identifying XMP/XP titles/goals/authors for Jan 29th pre-forum meeting #2

- Machine Commissioning…assume 1 month (run weeks 1-4)
  - Develop basic breakdown, current ramp, shape/position control, diverted plasmas, H-mode access, basic fuelling optimizations.
  - Goal: 1 MA, 0.5 T, NBI-heated H-mode (i.e. ~NSTX fiducial levels)
  - Diagnostic commissioning
  - Boronized PFCs
  - Mostly XMPs
  - **What science (aka XPs) can be done during this phase?**

- 1st Month of Science Campaign (run weeks 5-8)
  - Boronized PFCs, possibly begin lithium coatings
  - Operations and basic profile diagnostics, neutron rate,…
  - Operation up to 1.4 MA and 0.65 T, 2 seconds
  - 6 beam sources up to 90 kV
  - HHFW available for commissioning
  - **What critical XPs can/should be done during this phase?**

Proposed XPs

- ## SOL transport and turbulence

  - Heat flux and SOL width Scaling in NSTX-U, Travis Gray

  - Relaxation of the interchange instability and effect on SOL width with Li wall conditioning, Travis Gray

  - Relationship between lambda_q, S and Connection Length, Travis Gray

  - Initial NSTX-U edge characterization, Vlad Soukhanovskii

  - Relation between the midplane SOL pressure width and the divertor heat flux width, Robert Hager

  - SOL Width Scaling: Goldston's Heuristic Drift Model vs Critical Pressure Gradient Model, Egemen Kolemen

  - Investigation of ELM heat flux footprints with the variation of ELM regime, Kaifu Gan

  - Parallel Correlation of SOL Turbulence, Stewart Zweben

- # Radiative divertor

  – Radiative divertor experiments, Vlad Soukhanovskii

  – Toroidal divertor flux deposition asymmetries due to localized gas injection, Jeremy Lore

- # Impact of 3D fields on divertor

  – Interaction of applied 3D fields with detachment, Joon-Wook Ahn

  – Role of plasma response in the formation of lobe structures by 3D fields, Joon-Wook Ahn

  – Distinguishing between 3d magnetic field structures and transport, John Canik

  – S parameter under 3D perturbations, Egemen Kolemen

  – Divertor conditions and detachment characteristics in plasmas with 3-D fields, Alberto Loarte

Proposed XPs

- # Snowflake divertor

  – Clarifying Snowflake divertor configuration physics, Vlad Soukhanovskii

  – Assessment of 3D field effects on the properties of the snowflake divertor, Gustavo Canal

  – Compare alternative advanced divertor configurations: X-divertor, Snowflake, Egemen Kolemen

  – Detachment comparison study for Snowflake, X-divertor, Standard Divertor and long/short divertor leg, David Eldon

  – Performance optimization of divertor detachment, Joon-Wook Ahn

Proposed XPs

- ## Miscellaneous
  - Boundary diagnostic-optimized configuration (BDOC) for model comparisons, Vlad Soukhanovskii
  - ENDD Midplane Neutral Density Profiles in NSTX-U, Daren Stotler
  - Obtain 2D divertor density image using lithium emission, Oliver Schmitz
  - Effect of Lithium on SOL Power Balance, Travis Gray
  - Transport and radiation in the high flux expansion divertor configuration with cusp-like fields, Vlad Soukhanovskii
  - Studies of low- and high-Z dust transport in NSTX-U, Roman Smirnov
  - Testing advanced divertors on NSTX, Mike Kotschenreuther

Proposed run-time allocation

- Guidance: 5 Tier I run days and 2-3 Tier II run days
- DivSOL TSG Leaders propose Tier I run time
  - SOL transport and turbulence – 1.5 days (R15-1), T. Gray and S. Zweben
  - Radiative divertor – 1 day (R16-1), J. Lore and V. A. Soukhanovskii
  - 3D fields – 1 day (ITER/ITPA), J.-W. Ahn and E. Kolemen
  - Snowflake divertor physics – 1 day (R16-1), G. Canal and V. A. Soukhanovskii
  - B2Li transition studies – 0.5 day, TBD
- Tier II run time and Piggyback
  - Boundary diagnostic-optimized configuration (BDOC) for model comparisons, Vlad Soukhanovskii
  - Effect of Lithium on SOL Power Balance, Travis Gray
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