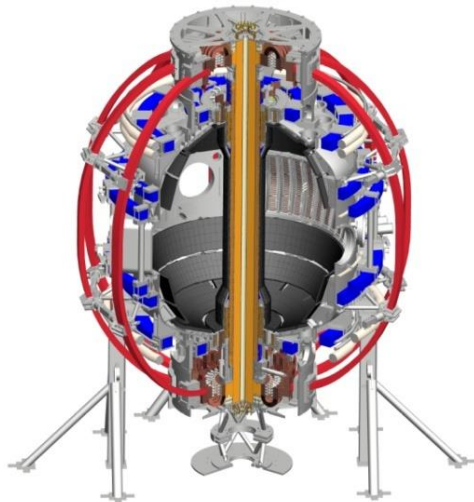


# M&P TSG Prioritization for FY2015 and campaign startup

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R. Kaita

*Coll of Wm & Mary*  
*Columbia U*  
*CompX*  
*General Atomics*  
*FIU*  
*INL*  
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*LLNL*  
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*MIT*  
*Lehigh U*  
*Nova Photonics*  
*Old Dominion*  
*ORNL*  
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*Princeton U*  
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*Think Tank, Inc.*  
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*U Maryland*  
*U Rochester*  
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*U Tulsa*  
*U Washington*  
*U Wisconsin*  
*X Science LLC*

**NSTX-U Science and Topical Science Group organizational meeting #1**



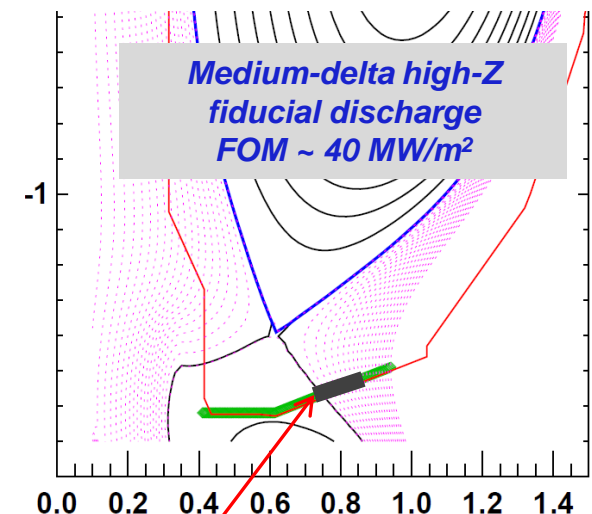
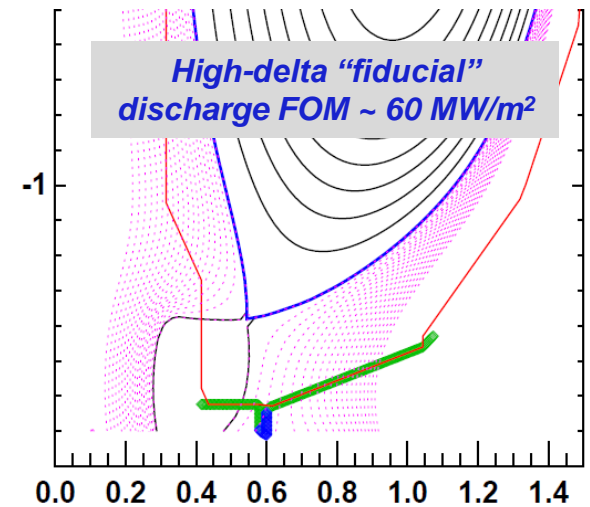
*Culham Sci Ctr*  
*York U*  
*Chubu U*  
*Fukui U*  
*Hiroshima U*  
*Hyogo U*  
*Kyoto U*  
*Kyushu U*  
*Kyushu Tokai U*  
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*Inst for Nucl Res, Kiev*  
*Ioffe Inst*  
*TRINITY*  
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*CIEMAT*  
*FOM Inst DIFFER*  
*ENEA, Frascati*  
*CEA, Cadarache*  
*IPP, Jülich*  
*IPP, Garching*  
*ASCR, Czech Rep*

# FY 2016 research milestone will drive XP/XMP development (ITPA-DSOL experiments relevant to high-Z upgrade)

- R(16-2): Assess high-Z divertor PFC performance and impact on operating scenarios (joint with divertor-SOL TSG)
  - **Carbon-only baseline needed in FY2015 for comparison**
  - Validate high-Z PFC design in actual operation
  - Establish additional heat-flux mitigation schemes needed for whole-machine high-Z conversion
  - Determine high-Z impurity production/influx and impact on operations and mitigate if necessary
- DSOL-31: Leading edge power loading and monoblock shaping
  - High-spatial resolution IR measurements of existing carbon tile gaps to determine whether heat flux is “missing” in NSTX-U as in JET-ILW
- DSOL-34: Far-SOL fluxes and link to detachment
  - Diagnose whether conditions at strike-point enhance cross-field transport into far-SOL to better predict first-wall power loading (e.g. LPs + GPI)
- DSOL-35: In/out divertor ELM-energy density asymmetries
  - Determine power splitting during ELMs and impact on design margins for PFCs during ELMy discharges

# Develop high-Z relevant baseline discharge in FY2015

- Incremental upgrade to high-Z proposed for outboard row 2 tiles
- Proposed figure-of-merit (FOM) for divertor PFC is unmitigated heat-flux to divertor surfaces
  - High-delta NSTX-U reference discharge:  $P_{inj} \sim 12\text{MW}$  FOM up to  $60\text{MW/m}^2$
  - Medium-delta, high-Z discharge:  $P_{inj} \sim 9\text{MW}$  FOM up to  $40\text{MW/m}^2$
- FY2015 development of medium-delta shape and create “standardized” parameter scans
  - $P_{inj}$ ,  $q_{95}$ , divertor gas puffing, B-field and angle-of-incidence, other mitigation
  - Duplicate scans in FY2016 (single variable experiment!)



Row 2 Tile location

# Critical diagnostics for milestone and DSOL activities

- ASC-support with wall conditioning experiments
  - MAPP characterization of boronization and lithiumization
- Critical diagnostics/capabilities for milestone R16-2:
  - IR thermography for heat flux, including high-spatial resolution view (DSOL-31)
  - Langmuir probe for particle fluxes to divertor under different operating conditions (low-high density, detached, etc.) (also DSOL-34)
  - Visible and X-ray emission spectroscopy to characterize impurity production, SOL and core conditions
  - Managing plasma-surface interactions of boronized and lithiumized high-Z PFCs with MAPP and standard plasma diagnostics
- Additional diagnostics/capabilities would be beneficial:
  - IR view on vertical target for DSOL-35 (or new plasma shape)
  - GPI to support far-SOL effects (DSOL-34)
  - Divertor bolometry for power-balance evaluation
  - MAPP measurements and post-run coupon analysis for material transport studies (support new model capabilities with WalIDYN)
  - Surface science studies, e.g. mixed-material sputtering and detailed plasma-exposed sample characterization