

# EP-TSG meeting

## 05/16/2017

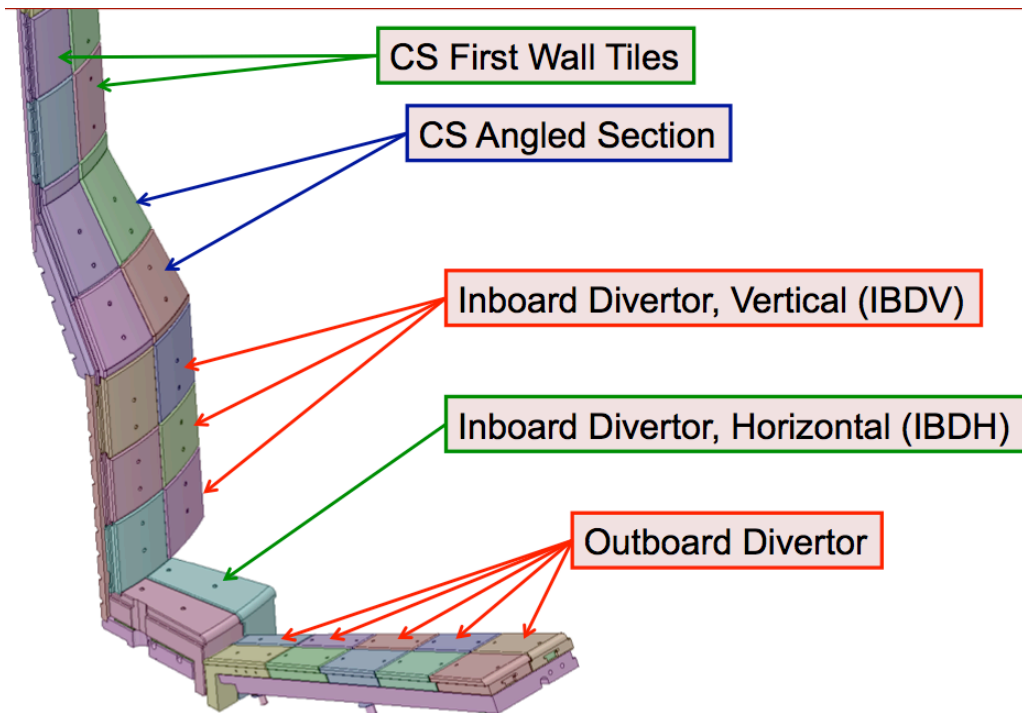
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### **Agenda:**

- Physics needs/desires based on considered changes to NSTX-U “polar regions”
- Adapt FY18-19 Research Milestones

# Changes to “polar regions” being considered to address heat flux issues et al.

*From NSTX-U Team meeting 04/28:*



- Tile fish-scaling required in several regions to manage high heat fluxes → Eliminates reversed  $B_T$ 
  - Bi-directional tiles may be an option for lower  $q_{\perp}$  divertor regions
- Need additional specs of requested range of  $\Delta R_{SEP}$ , duration,  $\kappa$ ,  $\delta$ ,  $R_{strike}$ 
  - Up/down asymmetric boundary increases  $q_{peak}$ , reduces  $\Delta t_{flat}$

# We need to assess impact of changes on EP-TSG Physics needs/desires

- Main knobs for EP-TSG experiments seem not directly affected by choice of PFCs, considered changes:
  - q-profile
  - Injected NB power 1-8MW
  - NB configuration (vary source mix)
  - L- vs H-mode (vary thermal plasma profiles)
  - RMPs with variable spectrum
  - About 2 sec flat-top for current equilibration, stationary profiles
- Would-be-nice-to-have items:
  - RF with ~4MW of HHFW power
    - Impact of proposed changes unclear
  - USN (in addition to LSN and inner wall limited)
    - May require “symmetric” top/bottom polar regions

# Additional considerations

- Expect “center-stack limited” plasmas with  $P_{NB} < 3-4\text{MW}$  during 0.5 sec to be OK
  - We pushed harder than this on NSTX
- Likely: reversed  $B_t$  operations NOT possible
  - Most likely affects “diagnostics” XMPs, e.g. for FIDA
  - What physics would we miss?
- EP-related XPs relatively insensitive to X-point radius, exact equilibrium
  - Reliability (e.g. of NB sources) & reproducibility more relevant
  - Exception: TAE stability *does* depend on  $\kappa$ ,  $\delta$
  - But: stability studies w/ AE antenna arguably run at low  $P_{NB}$

# Summary of EP-TSG Physics needs/desires

*What range of parameters we expect for EP-related XP/XMP?*

**Machine conditions** (*specify ranges as appropriate, strike out inapplicable cases*)

**B<sub>T</sub> Range (T): 0.5-1.0**

Flattop Duration (s):

**I<sub>p</sub> Range (MA): 0.6-1.5**

Flattop Duration (s): **2.0**

**Configuration: Inner Wall Limited / DN / LSN / USN**

**Outer gap (m): 0.05-0.15**

**Inner gap (m): 0-0.05**

**Z position (m): +/-0.05**

**Elongation:**

**Triangularity (U/L):**

**OSP radius (m):**

**Gas Species:**

**Injector(s):**

**NBI Species: D**

**Heating Duration (s): 2**

**NB Power (MW): 1-8**

**Voltage (kV) 50 cm (1C): 60-90**

**60 cm (1B):**

**70 cm (1A):**

**Voltage (kV) 110 cm (2C):**

**120 cm (2B):**

**130 cm (2A):**

**ICRF Power (MW): 4**

**Phase between straps (°):**

**Duration (s): 0.5**

# Update on FY18-19 EP Milestones

- JRT-18: Test predictive models of fast ion transport by multiple AEs (led by NSTX-U)
  - OK, no changes required
- R18-4: Optimization of the EP distribution function for improved plasma performance
  - Will incorporate collaboration with MAST-U
  - Contribute to DIII-D work with variable NBI parameters? (To be discussed with DIII-D EP group)
- R19-2: Assess the effects of neutral beam injection parameters on the fast ion distribution function and neutral beam driven current profile
  - Will include stronger collaboration with DIII-D, MAST-U