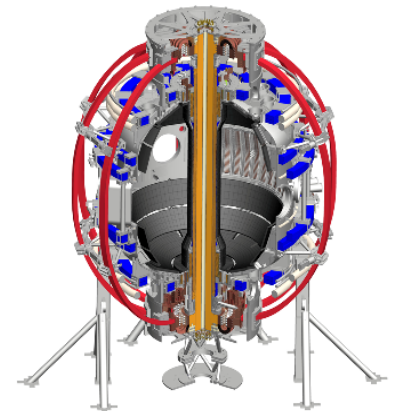


# EP-TSG: impact of potential “polar region” modifications on research and scenarios

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# Magnetic equilibrium, pulse duration, injected NB power

- Required scenarios include LSN, IWL, USN

<i>Configuration</i>	<i>Flat-top [s]</i>	<i>Max NB power</i>	<i>Notes</i>
LSN	2	8	Default option for H-mode discharges. Need 2sec for current equilibration, average data over NB modulation pulses or RMPs in stationary conditions.
IWL	1	4	Excellent scenario for theory/experiment comparison. Good for diagnostics (reduced background from divertor). Well reproducible. Need 1sec for CHERS, MSE data with NB modulation.
USN	2	8	High-performance alternative to IWL plasmas. Good for diagnostics (reduced background from lower divertor, e.g. vert. FIDA)

- EP-related experiments mostly insensitive to details of in/out gap, X-point radius
- Reproducibility and reliability (e.g. of NB sources) more important
- Possible exception: AE damping rate measurements vs  $\kappa$ ,  $\delta$ 
  - But: will start with ohmic discharges (no AE drive), then add  $<4\text{MW } P_{\text{nb}}$
- *Scenarios with rev- $B_t$  and rev- $I_p$  are highly desirable*
  - Characterize NB ion confinement for counter-NB injection
  - Validate diagnostics/theory/models, e.g. FIDA, AE destabilization by cntr NB ions

# Toroidal field, current and heating systems

- Required  $B_t$  is 0.5-1T
  - Highly desirable: decrease  $B_t$  to 0.35T to connect with NSTX
  - Rev- $B_t$  desirable if rev- $I_p$  is also possible
- Required  $I_p=0.6-1.5\text{MA}$ 
  - Lower limit: high/fully non-inductive scenarios at moderate  $P_{nb}<6\text{MW}$
  - Rev- $I_p$  operations desirable
- Require reliable NBI, need all 6 source
  - Include NB modulation capability, min. on/off 10ms
  - Include adjustable injection voltage 60-90kV
- Highly desirable: up to 4MW of HHFW power for 0.5sec
  - Study interaction of NB ions with RF
  - Validate codes, e.g. “RF kick operator” in TRANSP
  - *NSTX-U is the only US device with RF*

# Summary of required parameters

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

$B_T$  Range (T): **0.5-1.0**      Flattop Duration (s):

$I_P$  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**