

Meeting Agenda

1. S. Cowley
2. R. Hawryluk
3. J. Galayda - Introduction and Project Update
4. L. Hill - Project Management Update
5. S. Gerhardt - Recent Recovery Project Technical Achievements
6. T. Stevenson - M&RP Update
7. S. Kaye - Program Update

National Spherical Torus eXperiment Upgrade

Recent Technical Events

NSTX-U Team Meeting – September 20, 2019

[S. P. Gerhardt](#)

Recovery Project Deputy Director

Outline - 5 reviews & 5 slides

- PSS PDR
- Machine Core Structures FDR
- Inner-TF Bundle Resolution
- PF-4/5 Alignment FDR
- Passive Plate and Helium Tube Support FDR

Safety System Update Envisioned to Include Three Complementary Systems - Validated at PDR

1: Configuration

Managed Safeguards - mitigate contact thermal and electrical hazards

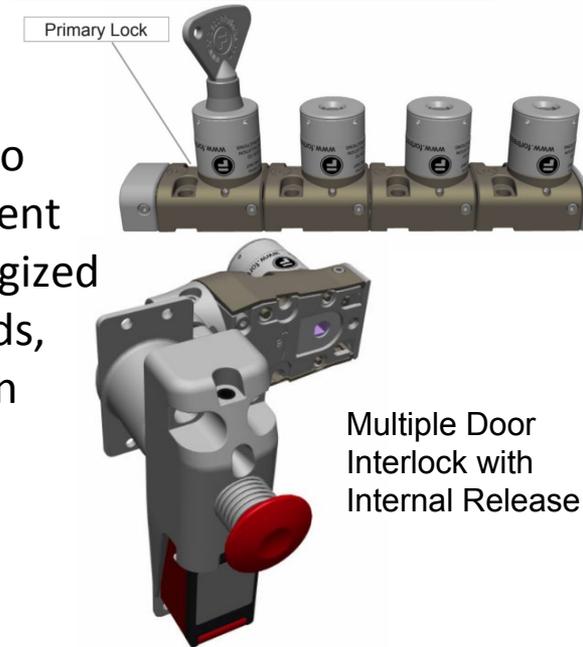


3: Safety Instrumented System - Dual PLC system used to turn off NB, FCPC power to test cell in the event of door violation, emergency stop, etc.

Also includes engineered search and secure (test cell station pictured)

2: Trapped key system

- used to ensure equipment cannot be energized when safeguards, doors, etc are in unsafe state.



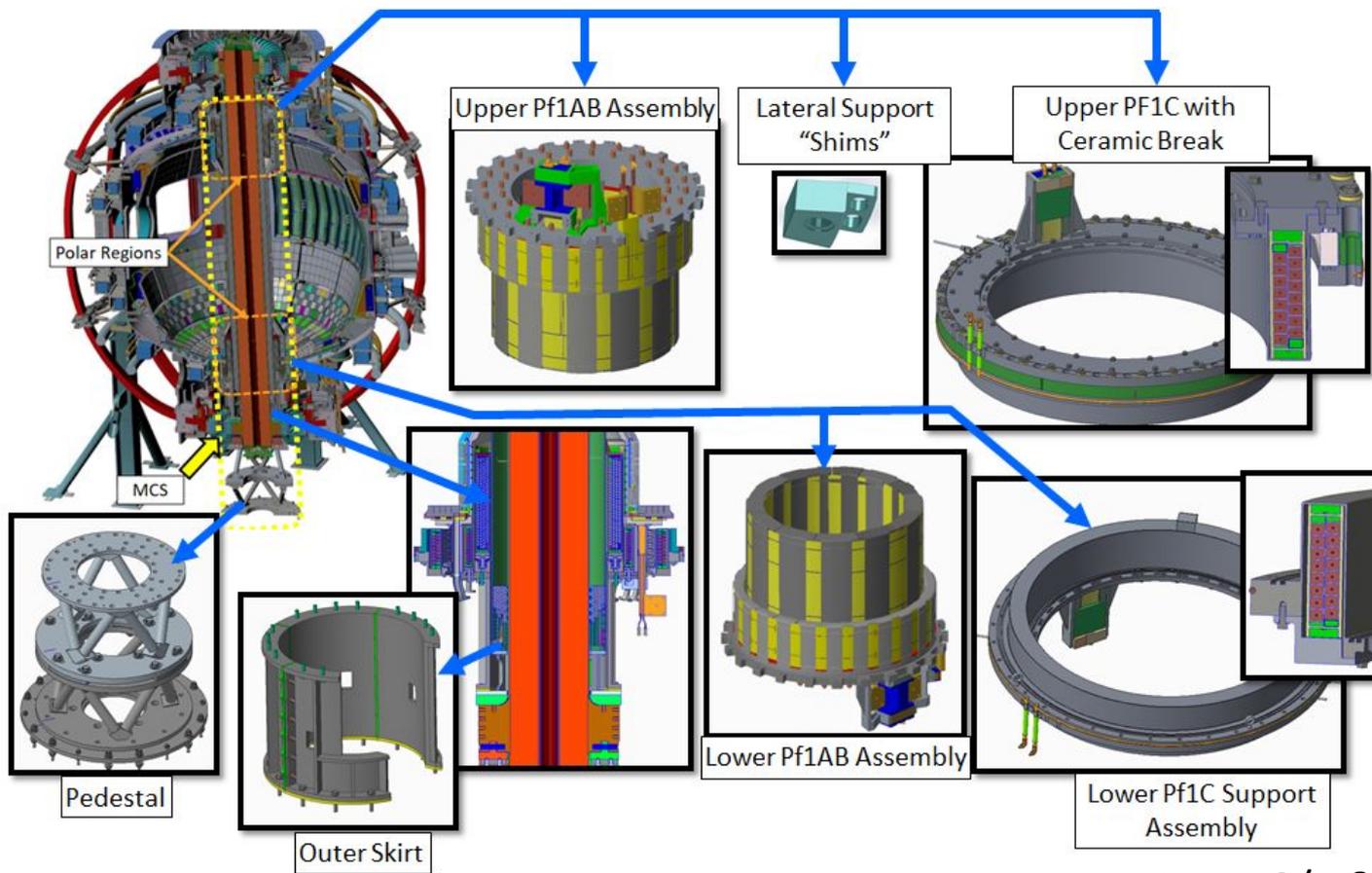
PDR on June 26th - Successful - [link](#)

FDR also held for breaker upgrade/ refurbishment - Successful - [link](#)

Will add a fail-safe trip mechanism to 13.8 kV breakers as means of isolating test cell after PSS trip



Machine Core Structures Design Validated in Final Design Review



Scope:

- PF-1a & -1b Sling assembly
- Lateral Support Shims
- Upper and lower PF-1c assemblies, including double O-ring seals and ceramic breaks
- New outer skirt
- Validation of existing pedestal.

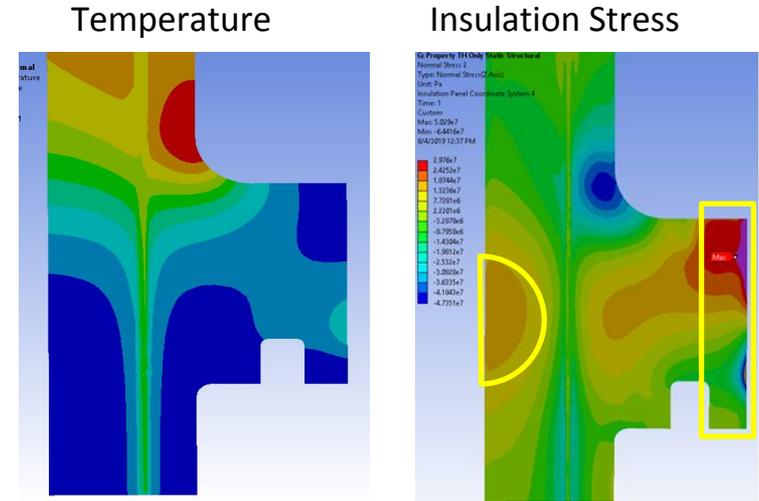
Loads:

- Thermal during bakeout or operations
- Operations static and transient loads
 - vertical loads
 - side loads

FDR on 8/5 & 8/6 - Successful - [link](#)

Inner-TF Bundle Concerns Resolved at Bundle Review #2

- Concern - temperature gradients in the Cu of the bundle result in insulation stresses
- Extensive sample testing done
 - PPPL coil shop fabricate samples
 - Tested at PPPL and Element
- Extensive analysis done



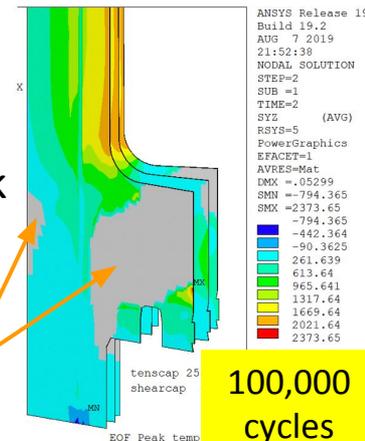
Conclusion:

Delamination will occur, but the GRD shot spectrum can be achieved

- The delamination will be limited in extent
- The delamination will not create electrical concerns in the flags and bus work
- The delamination will not result in over-stress conditions for other components

Review on 8/7 & 8/8 - Successful - [link](#)

Predicted Region of Delamination

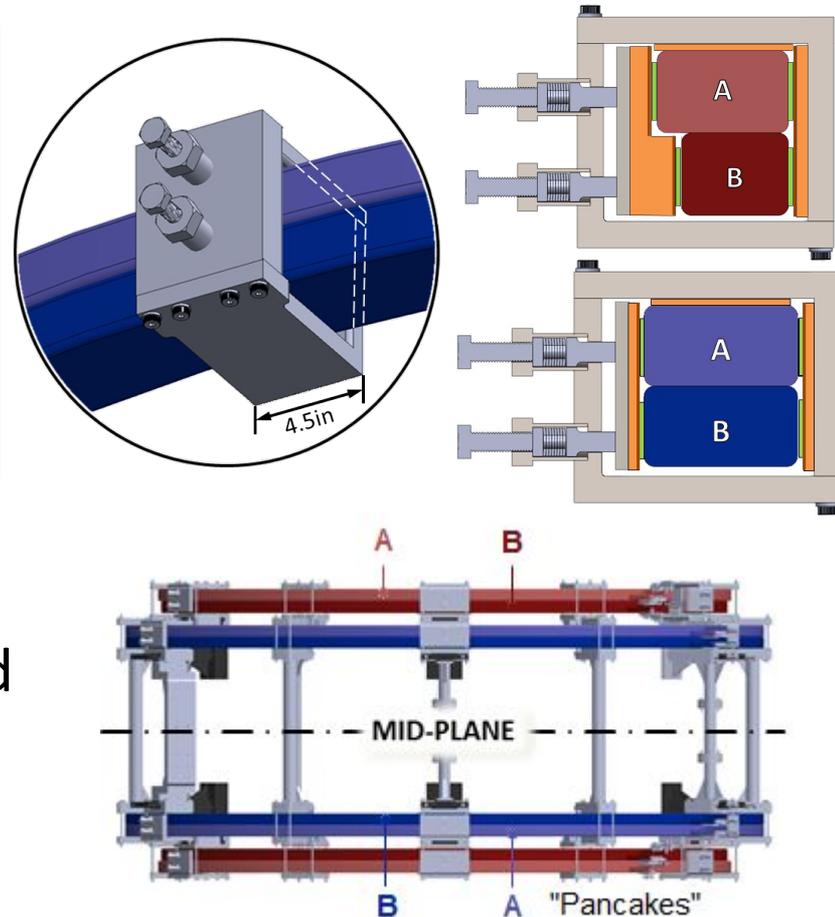


100,000 cycles

New Clamps on PF-4 and -5 Will Ensure Alignment is Maintained

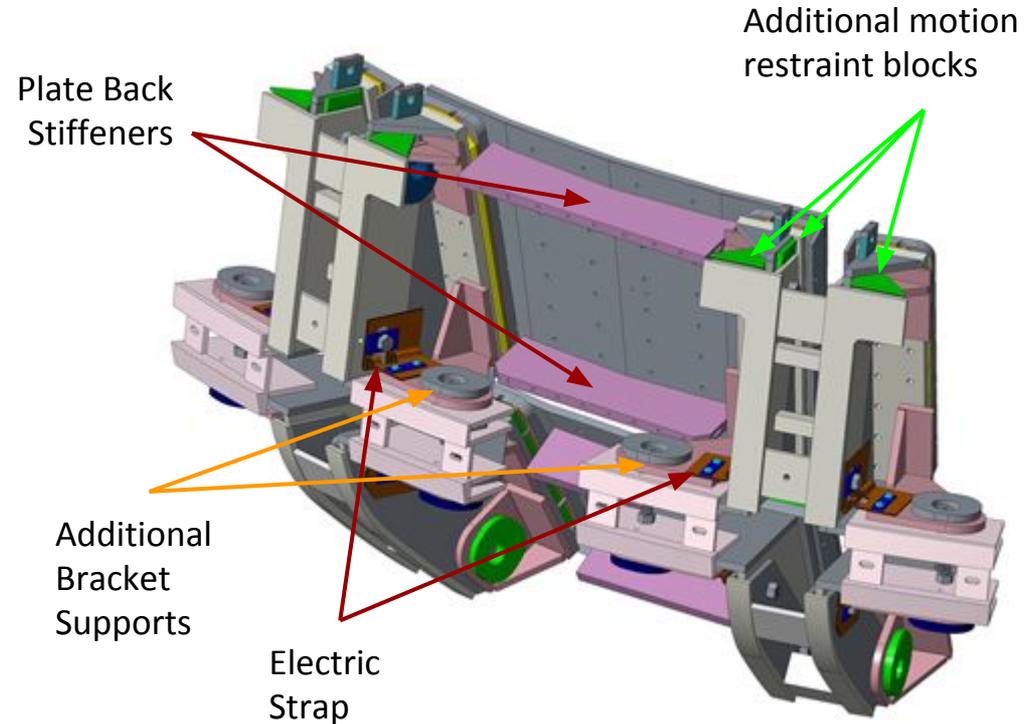
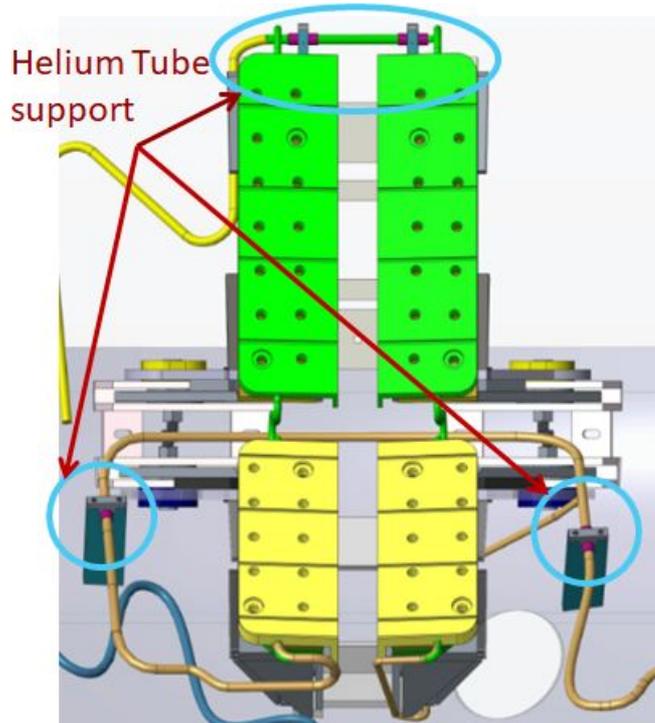
- Recent metrology shows that the individual “pancakes” of PF-4 and PF-5 are acceptably aligned to each other, but the pairs need to be shifted/tilted.
- Clamp design will ensure that pancakes maintain required alignment
- Coils pairs will then be shifted/tilted into alignment with global coordinate system

FDR on 8/9 - Successful - [link](#)



Passive Plate Review Showed Targeted Modifications Can Fix Brackets Against Disruption Loads

Solutions can be implemented w/o in-vessel grinding, or modifications to He tubing



FDR on 8/21 - Successful - [link](#)

Thanks to the Recovery Project technical team, including ORNL members, for the enormous amount of work in the past months.