

Welcome and Overview of NCSX

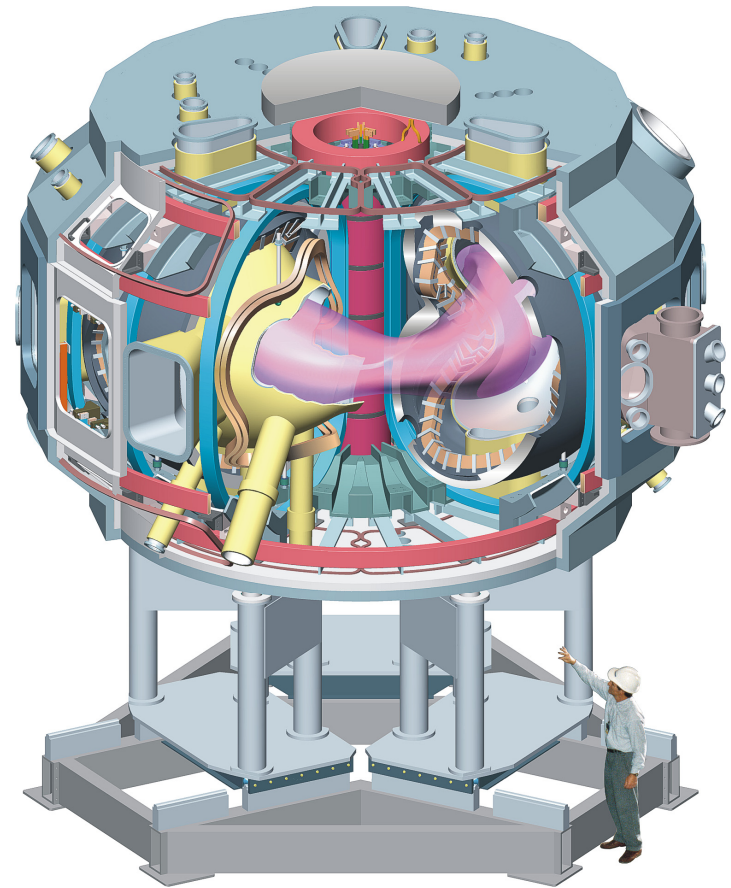
P. Heitzenroeder, NCSX Engineering Manager
for the NCSX Project

We welcome you to NCSX and sincerely thank you
for your participation!

NCSX Overview



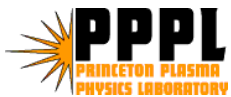
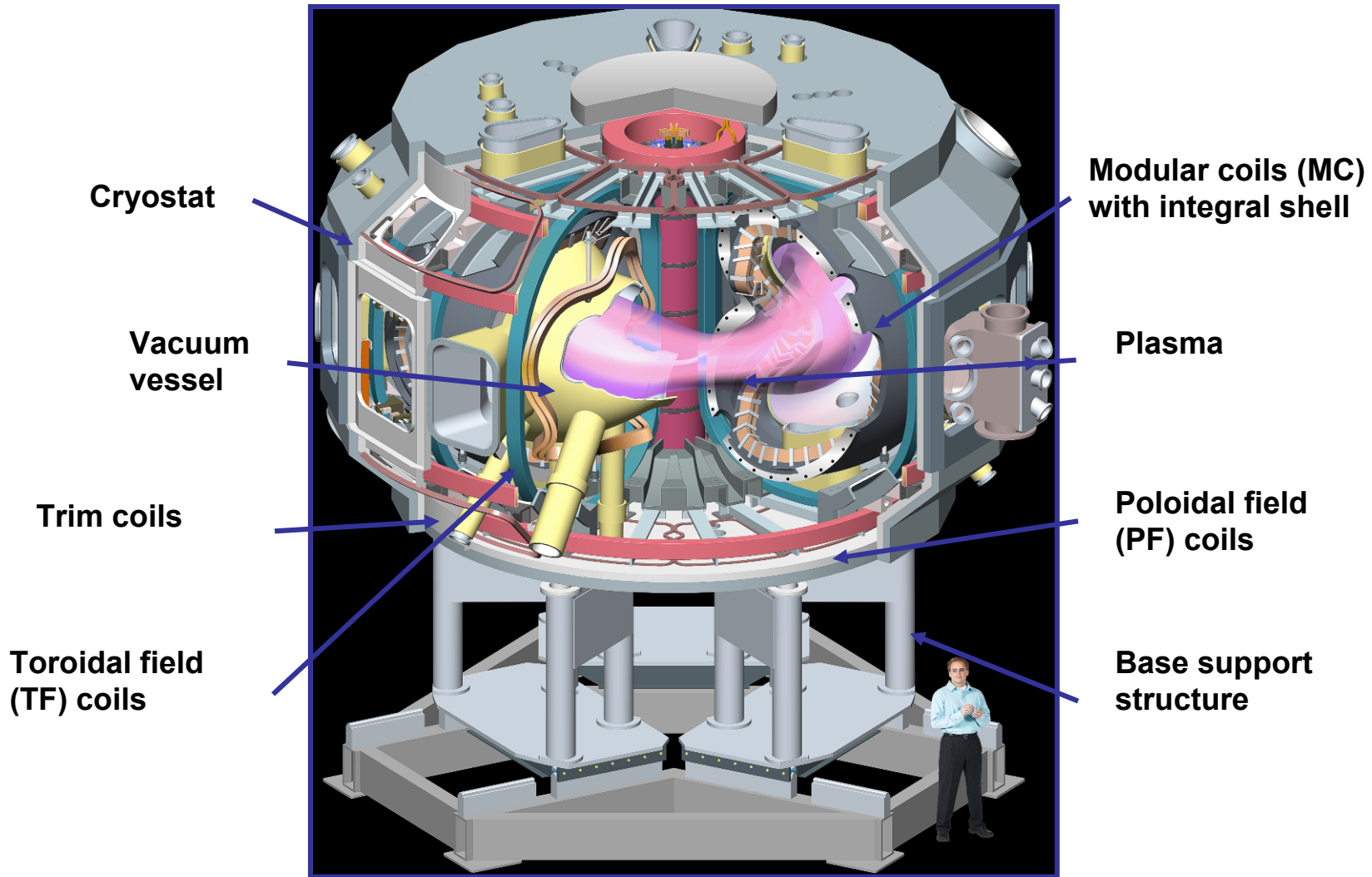
- Compact Stellarators are important because they may lead to the solution of one of the most important challenges of Magnetic Fusion Energy: steady state operation.
- The mission of the National Compact Stellarator Experiment (NCSX):
 - To acquire physics knowledge needed to evaluate compact stellarators as a fusion concept
 - To advance understanding of 3D plasma physics for fusion and basic science
- NCSX is funded by the US Department of Energy, and is jointly managed by PPPL and ORNL.
- Assembly is presently underway at PPPL; the early finish date is January, 2012.



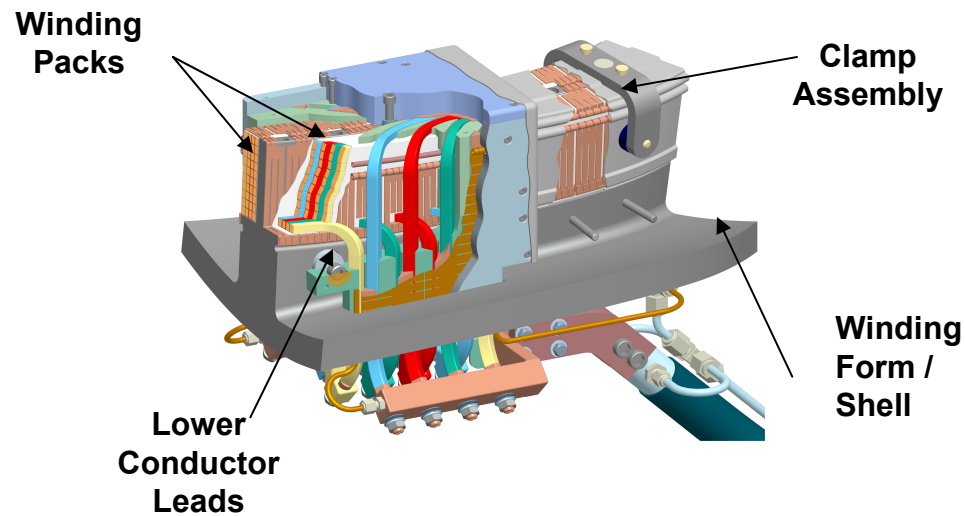
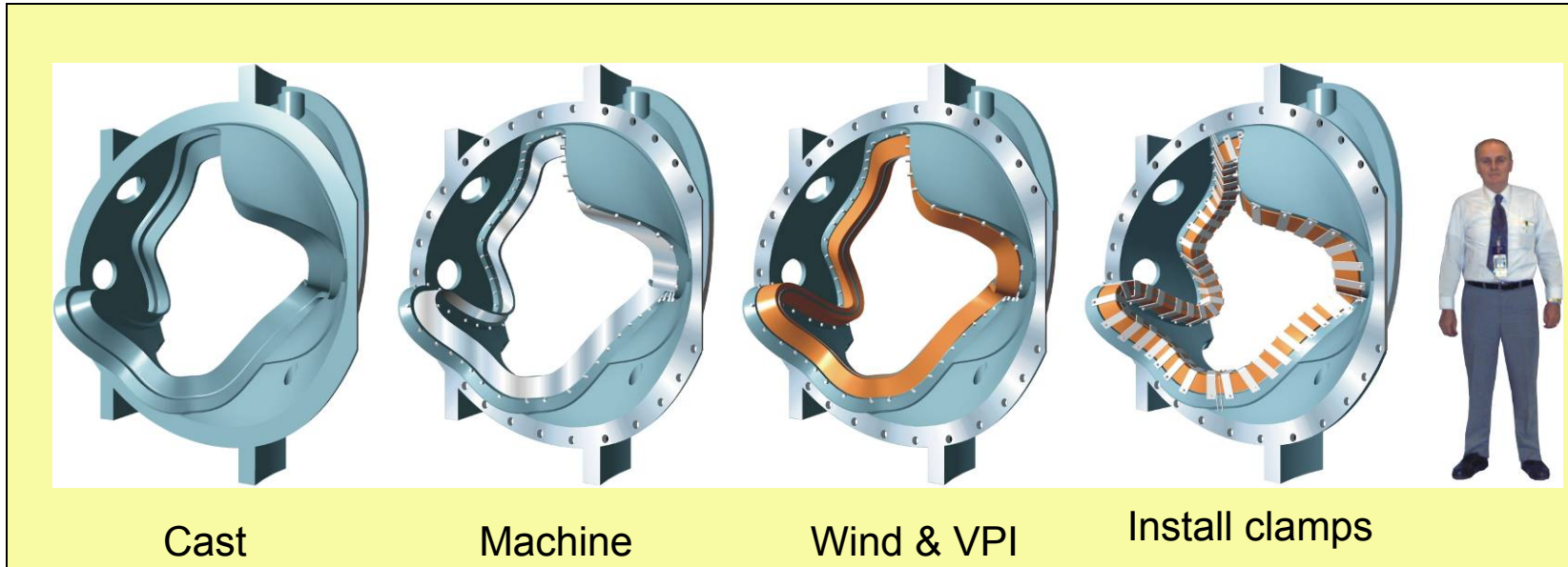
A few relevant facts

- Weight of machine core: ~250,000 lbs.
 - Predominant materials: stainless steel and copper.
- Magnetic systems: modular coil (MC) system; toroidal field (TF) coil system; poloidal field (PF) coil system; trim coil (TC) system.
 - All are copper windings, cooled by LN₂ to 80K.
 - Modest temperature rises, max. 40K; 15 min. rep. rate.
 - “once through” cooling; LN₂ consumption during full operation ~18,000 gal./ week.
- Core is enclosed in a fiberglass-skinned foam panel cryostat with ~60 ?? penetrations.
 - This number of penetrations is for first plasma only; ultimately, ~125 ports are required and must be provided for in the design.

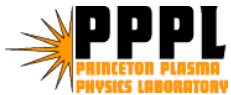
NCSX



The modular coil windings are wound directly on cast stainless steel winding forms



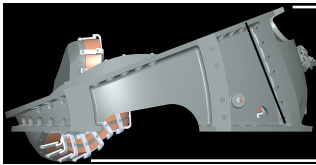
SC Project Review of NCSX, April 8-10, 2008
G. H. Neilson - page 6



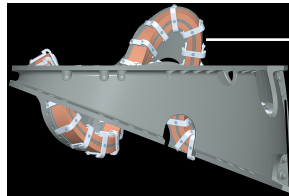
The 3 modular coil types

Wings. Inflatable epoxy-glass shims are installed at assembly for support.

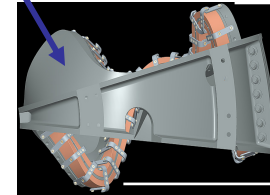
~6100lbs



~5600 lbs

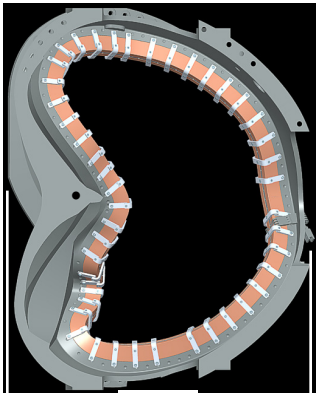


~6100 lbs



45.7"

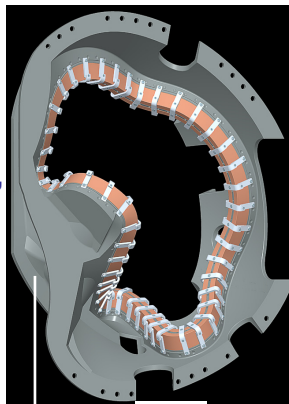
43.7"



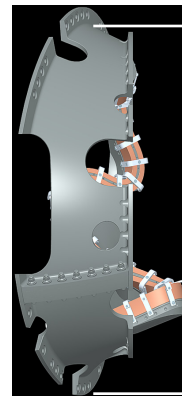
86.9"



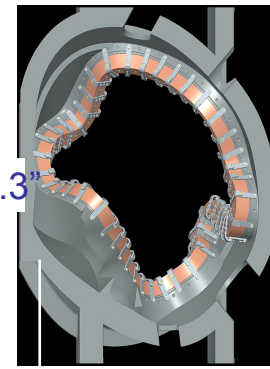
108"



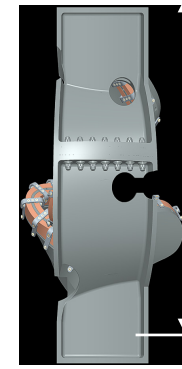
84"



107.3"



77.6"



94.4"

Type A

Type B

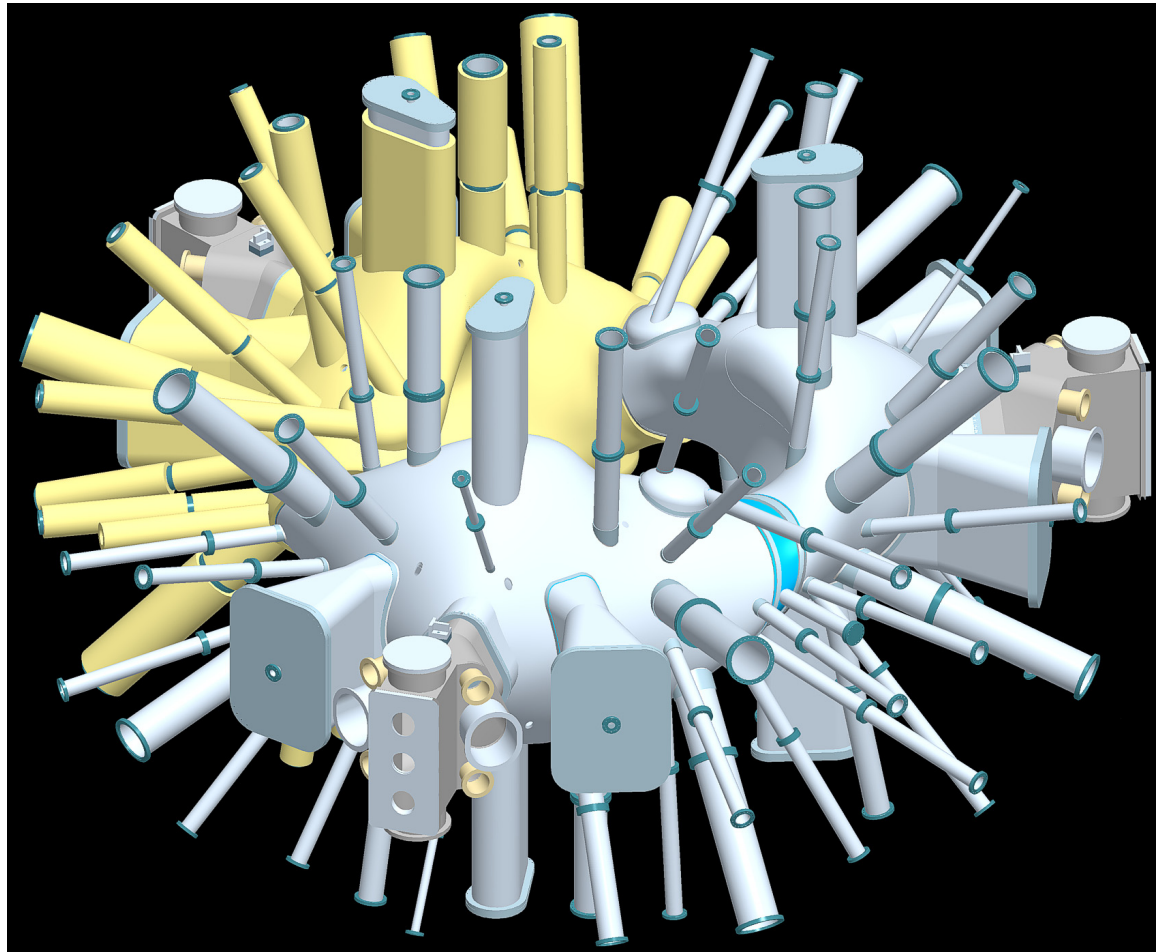
Type C

- 6 of each type; 18 in total.
- Castings made of "Stellalloy" which was specifically developed for NCSX.
 - Magnetic permeability <1.02 and good welding characteristics.

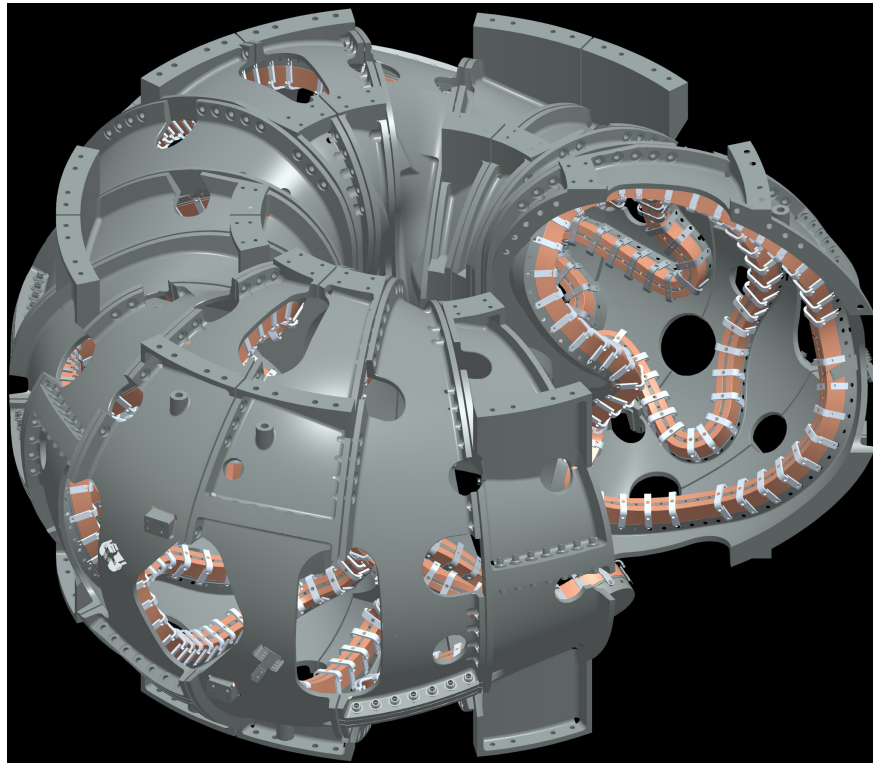
Vacuum Vessel



Shell material : Inconel 625
Thickness : 0.375 inch
Time constant: 5.3 ms
Total wt w/ports ~ 20,000 lbs
Welded joints connect field periods
Traced with He gas lines for heating (to 350C) and cooling

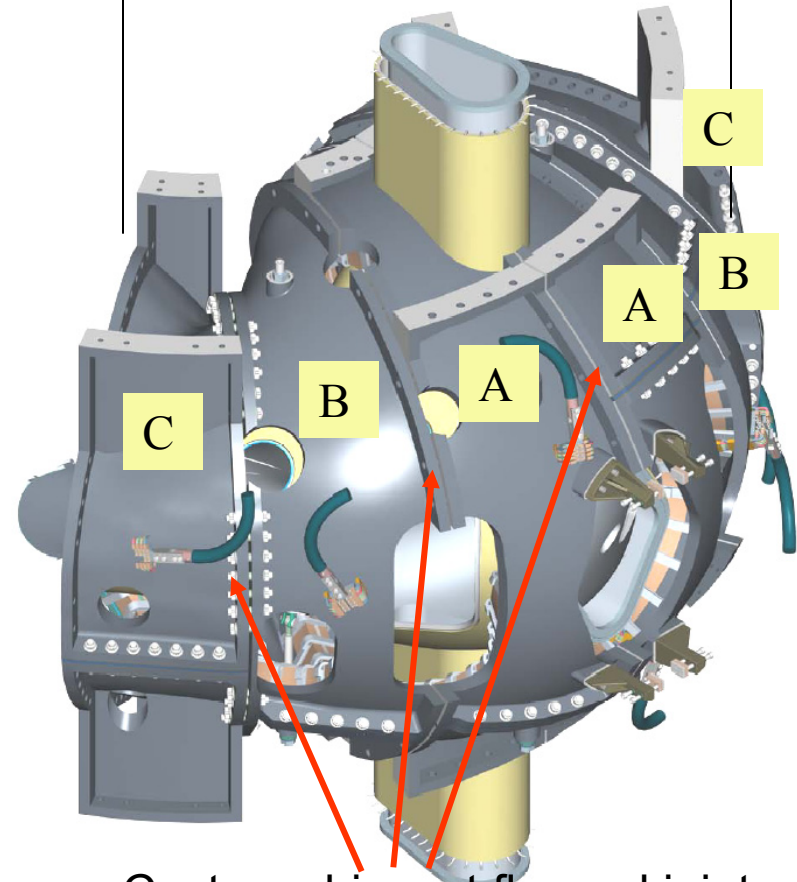


Modular Coil Assembly

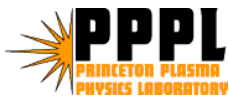


Modular coil assembly consists of 3 field periods. It serves as the structural backbone of the machine – the VV, PF, TF, and trim coils are all supported from it.

Field period: 2A's, 2B's, 2C's + VV



Custom shims at flanged joints between adjacent coil winding forms



A look at the NCSX Hardware...



A modular coil

An assembly of 2 modular coils

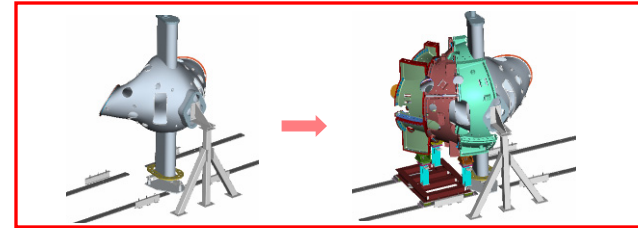


A TF coil

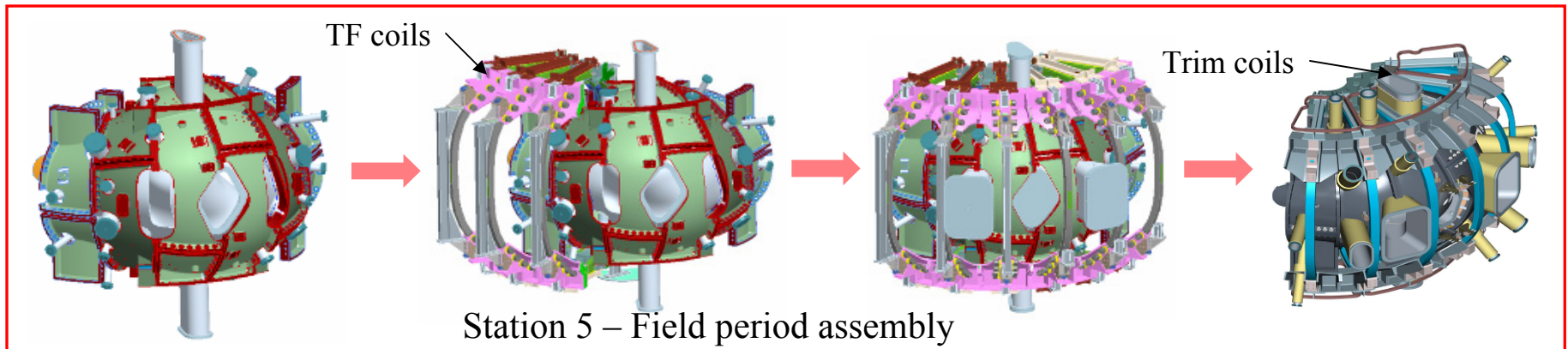


A vacuum vessel segment

Assembly



Station 3 – Modular coils installed around VV



Station 5 – Field period assembly

Station 6 –
Machine assembly

