FinalTerm Review

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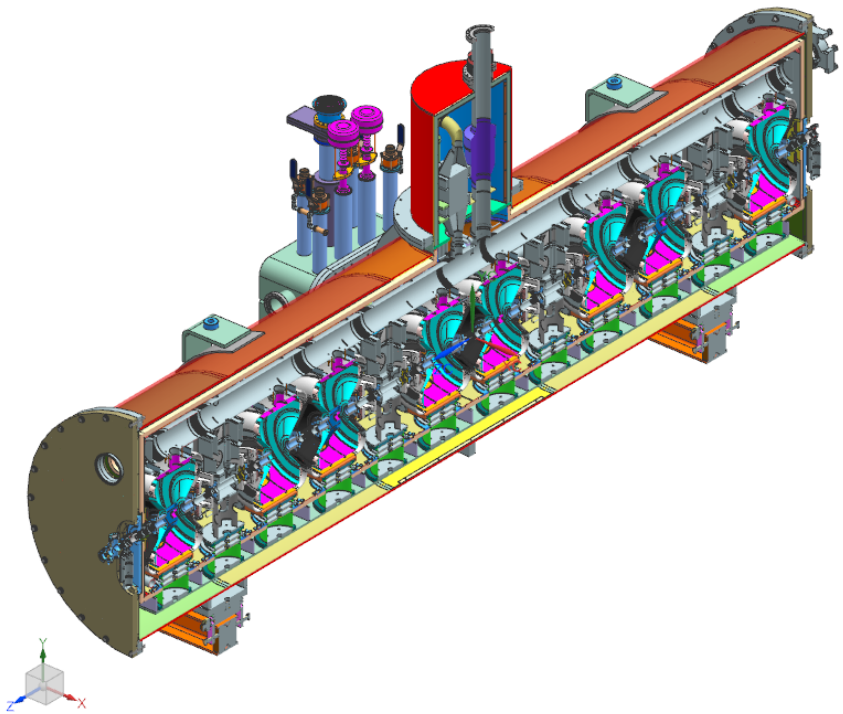
Fermilab Summer Student Program 2015
University of Pisa

23 September, 2015

CoolDown Analysis of SSR1 Cryomodule

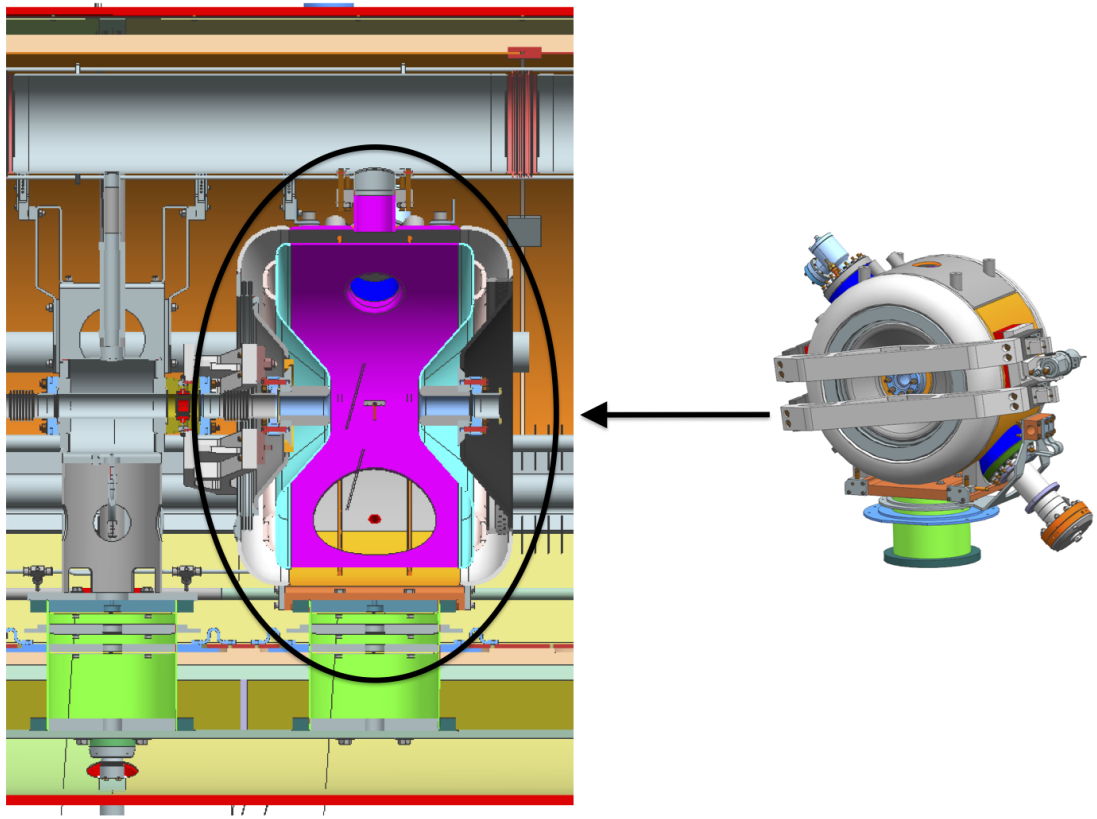


Summer Student Goal:

Simplify the **assembly** in order to evaluate the **shifts of target points** of the structure due to **Cooldown procedure**.

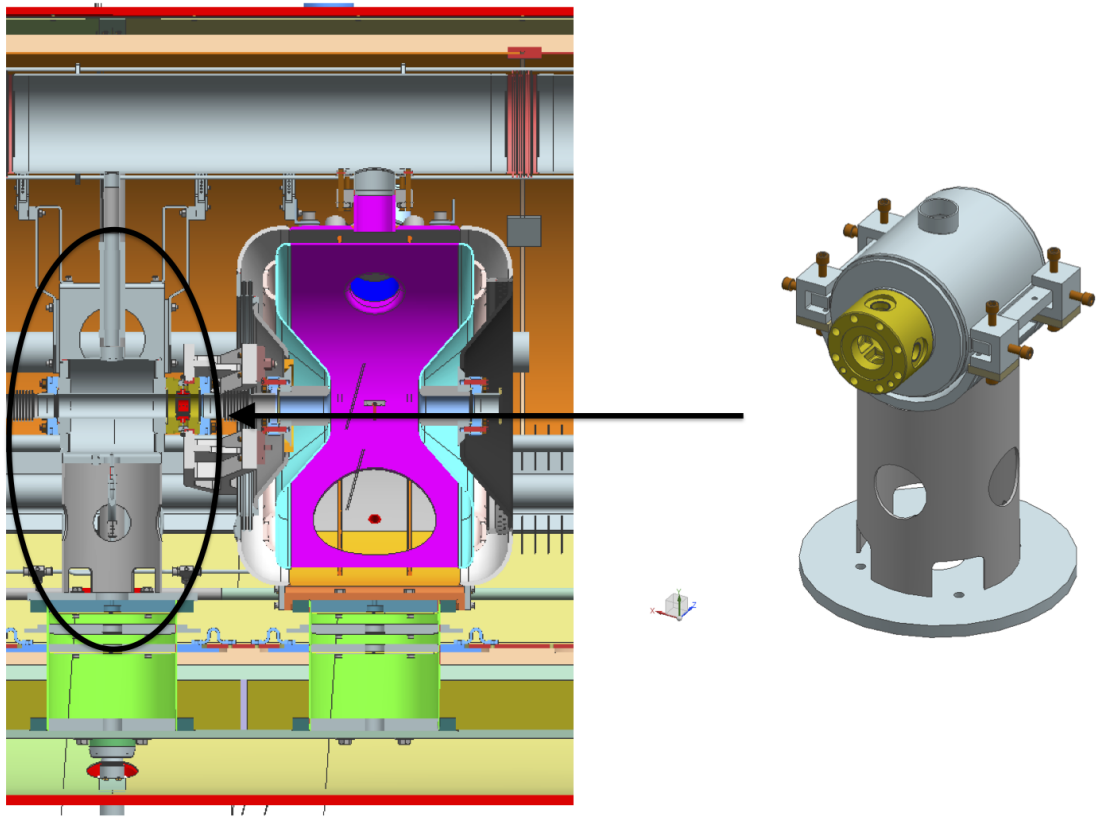
SSR1 Cryomodule Main Components

- Cavity



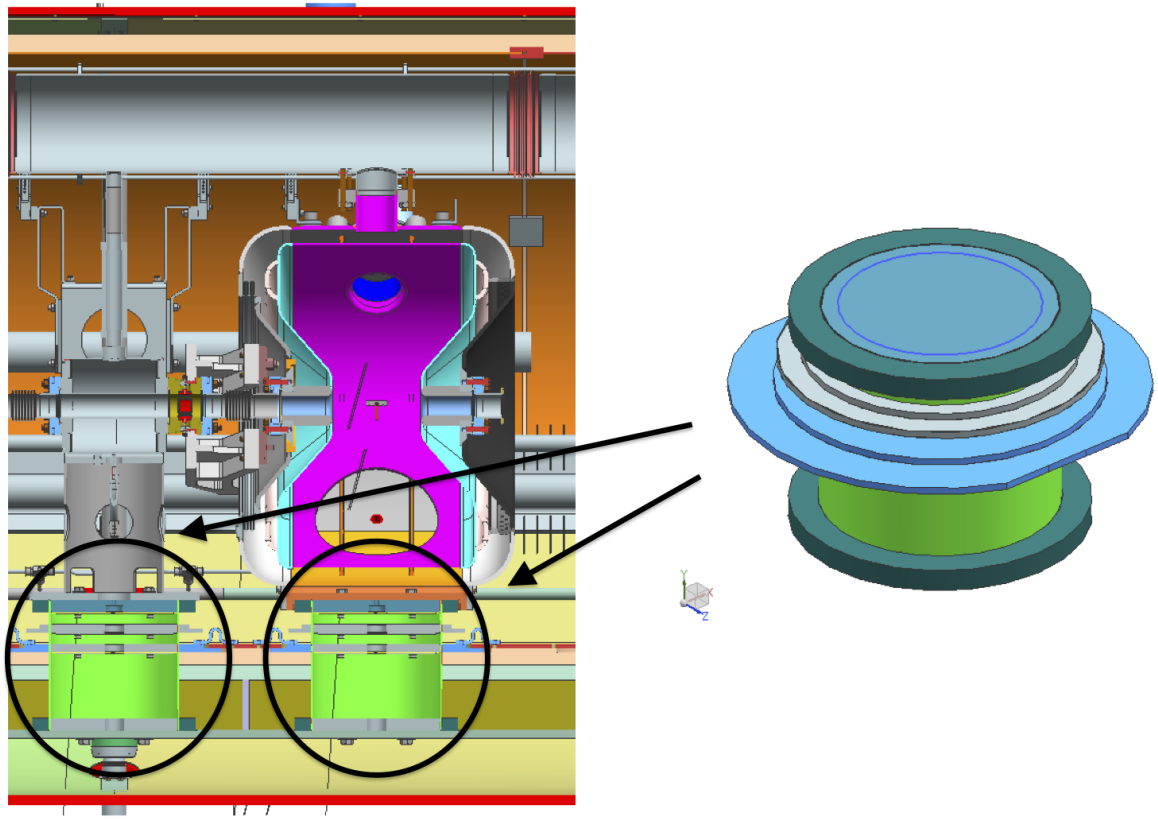
SSR1 Cryomodule Main Components

- Cavity
- Solenoids



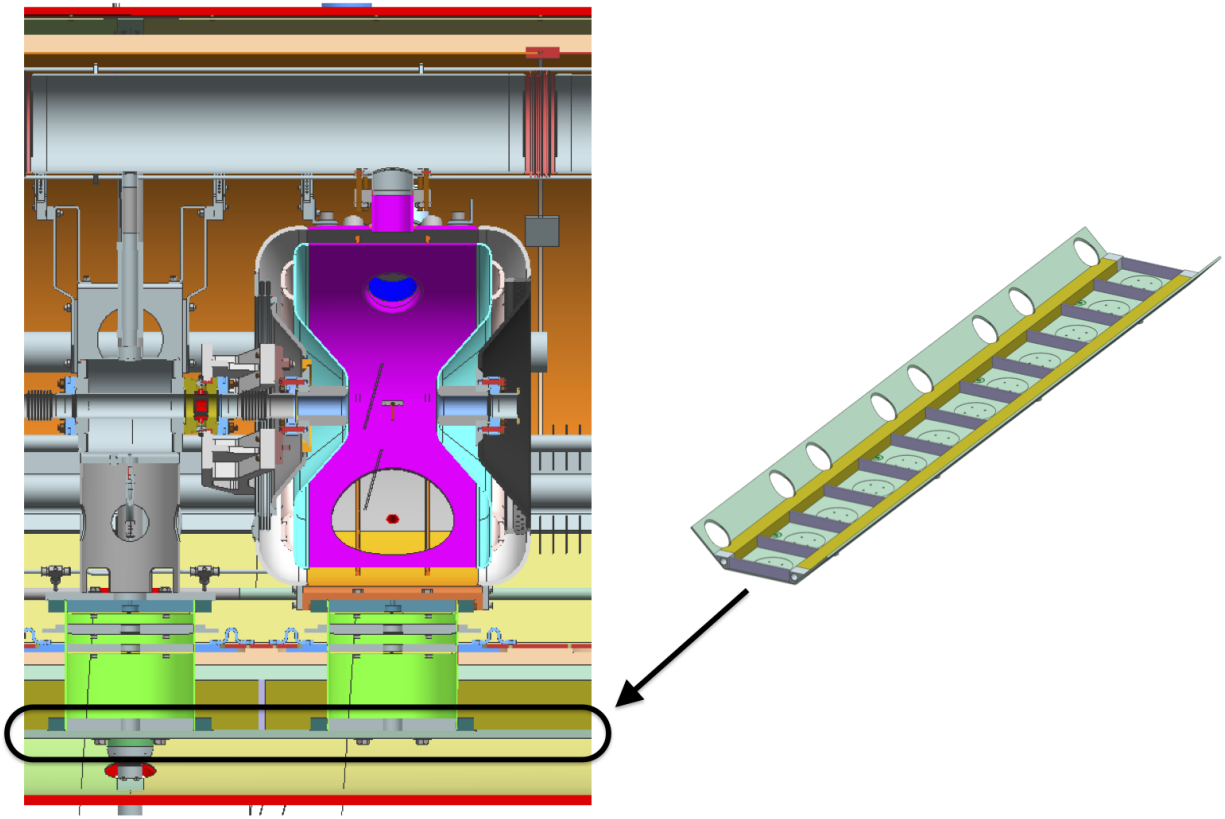
SSR1 Cryomodule Main Components

- Cavity
- Solenoids
- Support Post



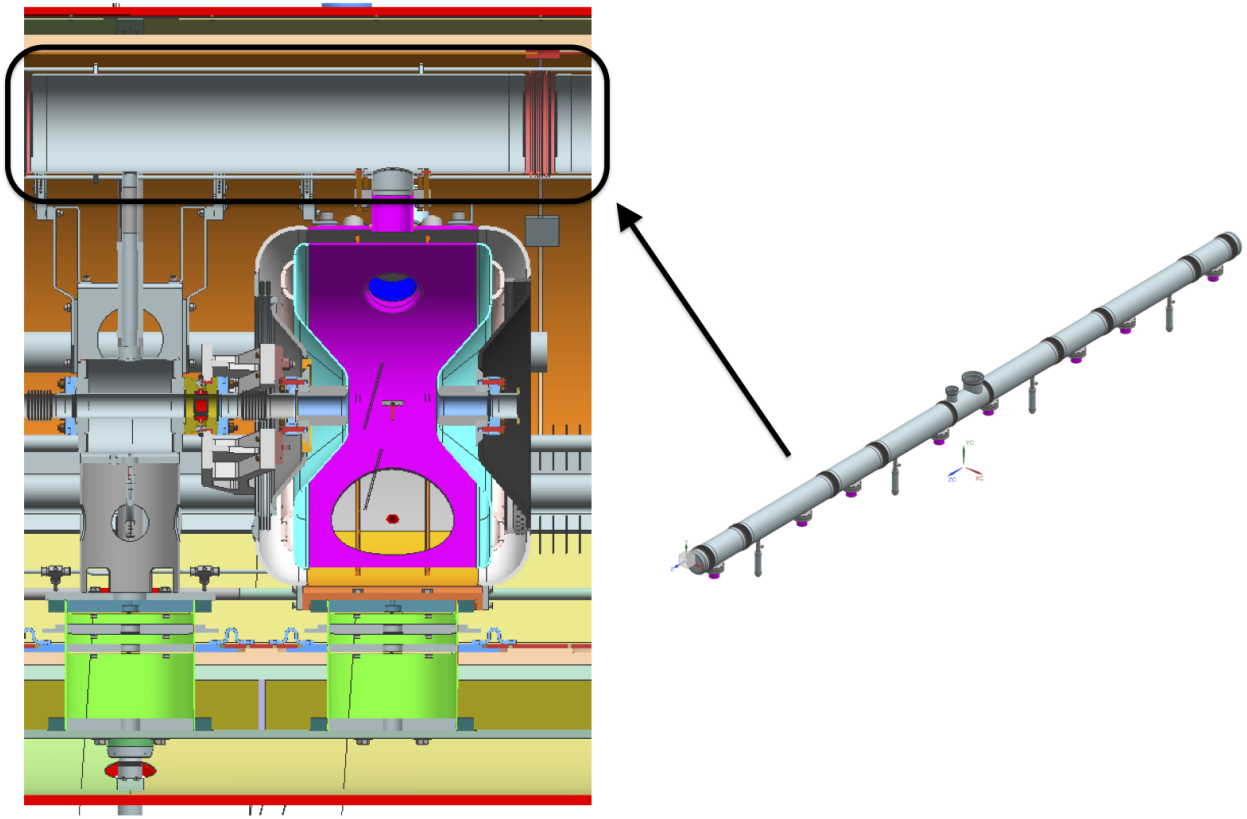
SSR1 Cryomodule Main Components

- Cavity
- Solenoids
- Support Post
- Strongback



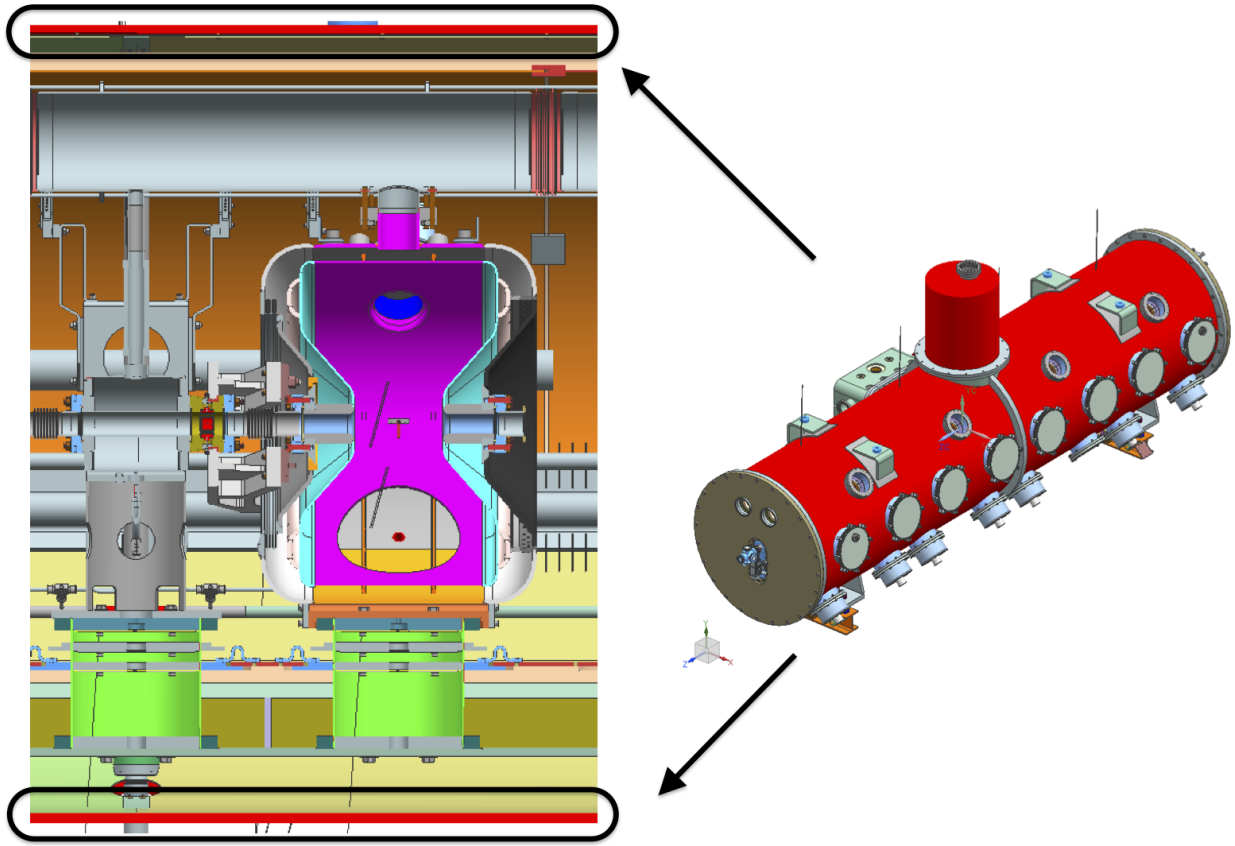
SSR1 Cryomodule Main Components

- Cavity
- Solenoids
- Support Post
- Strongback
- Pipelines



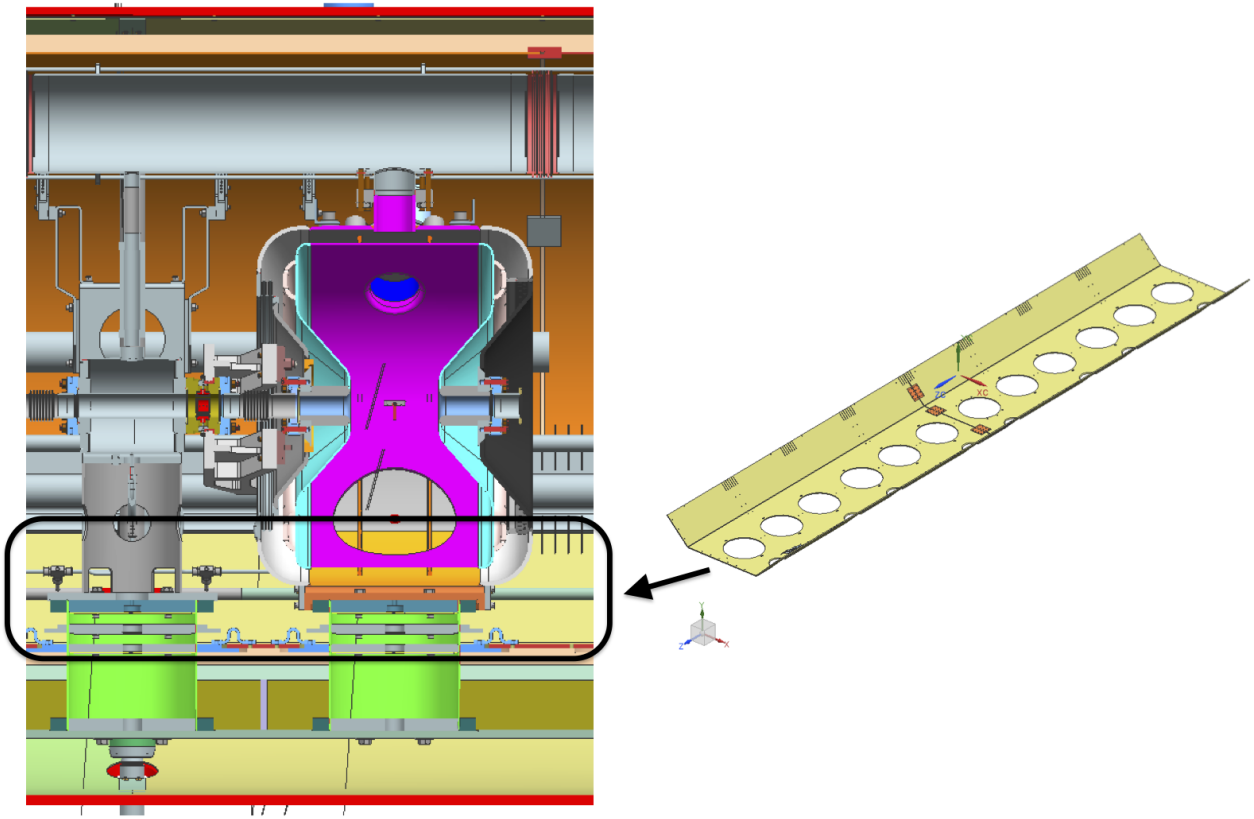
SSR1 Cryomodule Main Components

- Cavity
- Solenoids
- Support Post
- Strongback
- Pipelines
- Vacuum Vessel



SSR1 Cryomodule Main Components

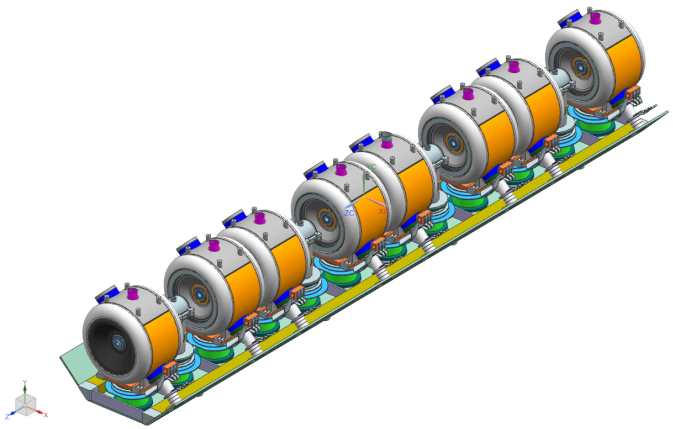
- Cavity
- Solenoids
- Support Post
- Strongback
- Pipelines
- Vacuum Vessel
- Thermal Shield



Conditions

- no gravity
- no vacuum force acting

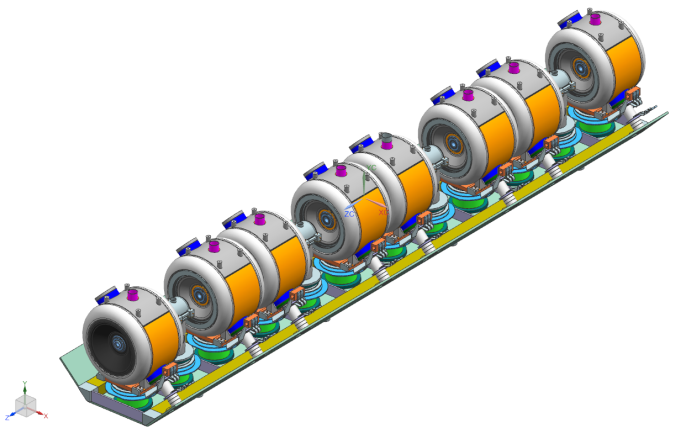
Simplified Cryomodule



The semplified geometry has no:

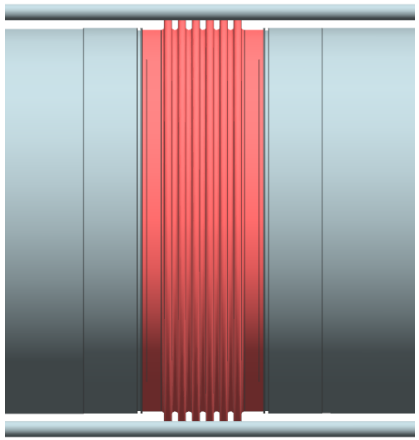
- Vacuum Vessel

Simplified Cryomodule

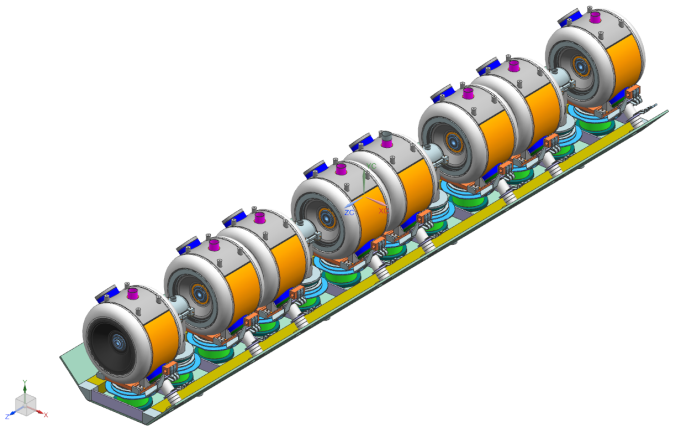


The semplified geometry has no:

- Vacuum Vessel
- Pipelines

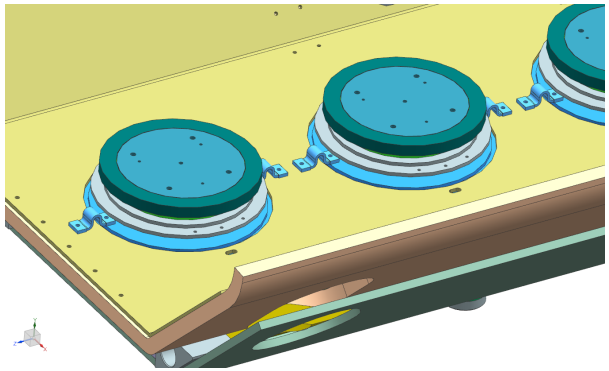


Simplified Cryomodule



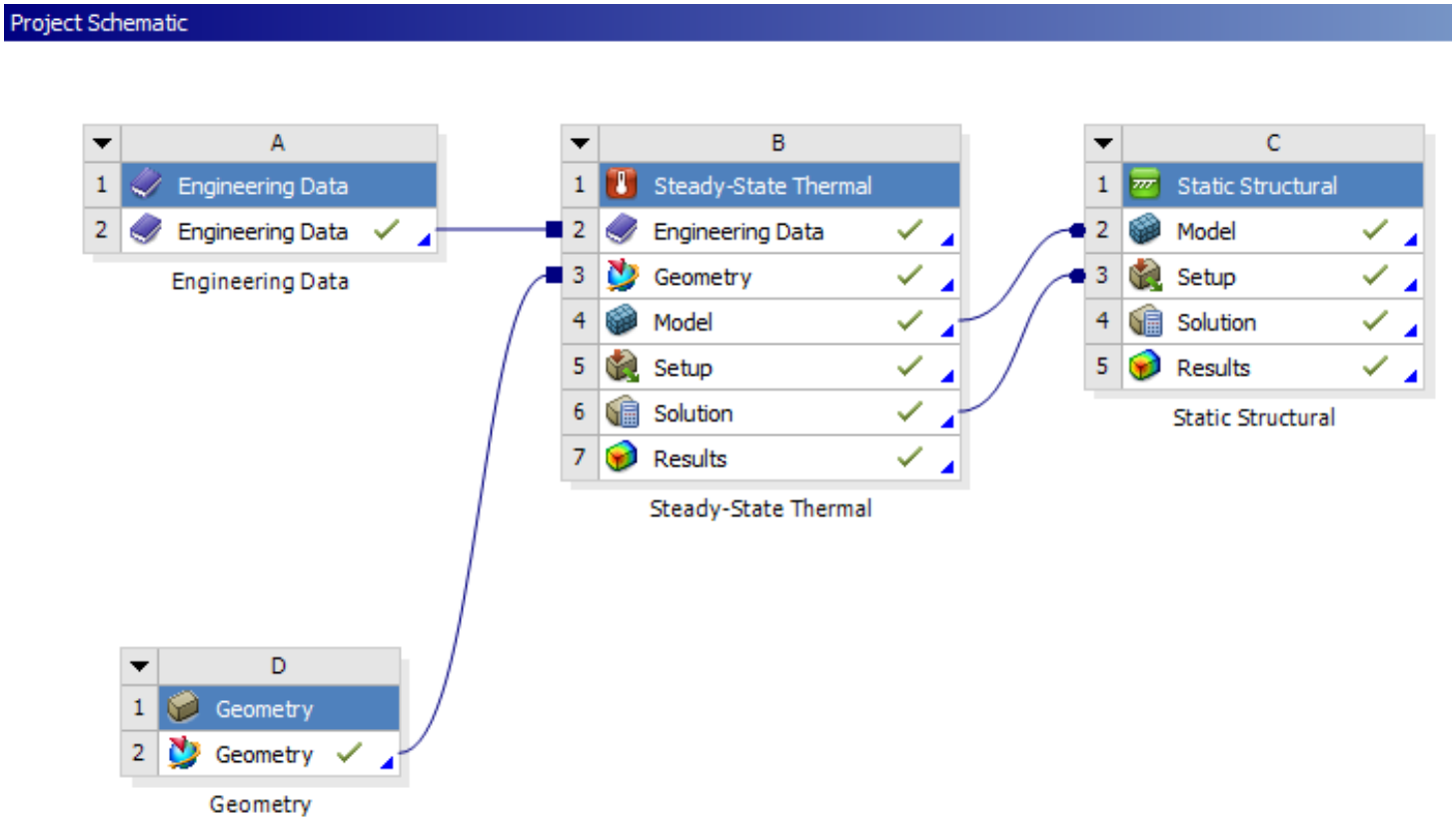
The semplified geometry has no:

- Vacuum Vessel
- Pipelines
- Thermal Shield



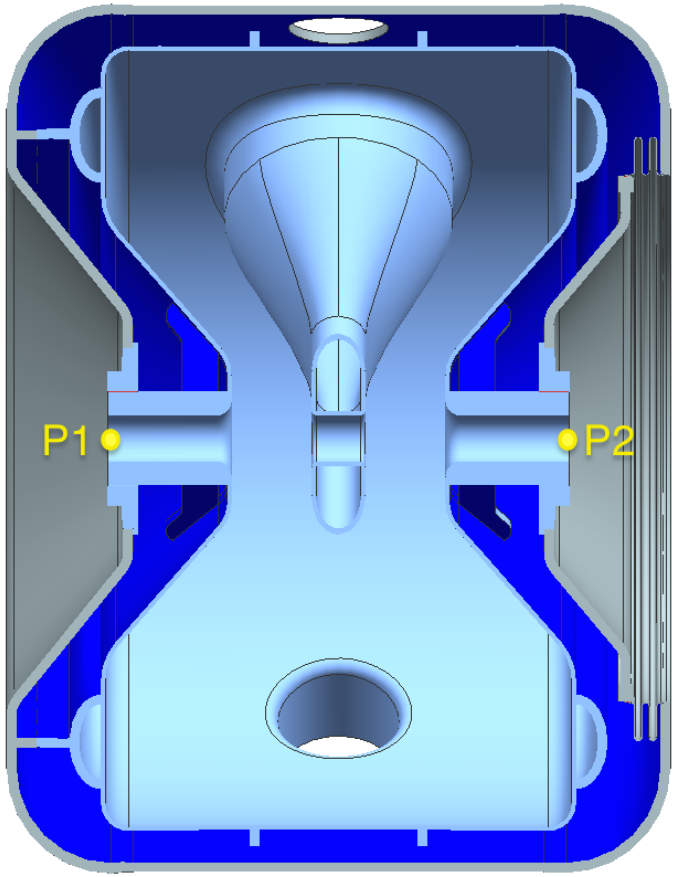
Project Scheme

ANSYS® Workbench 16.1



Temperature map → Displacement

Target Points

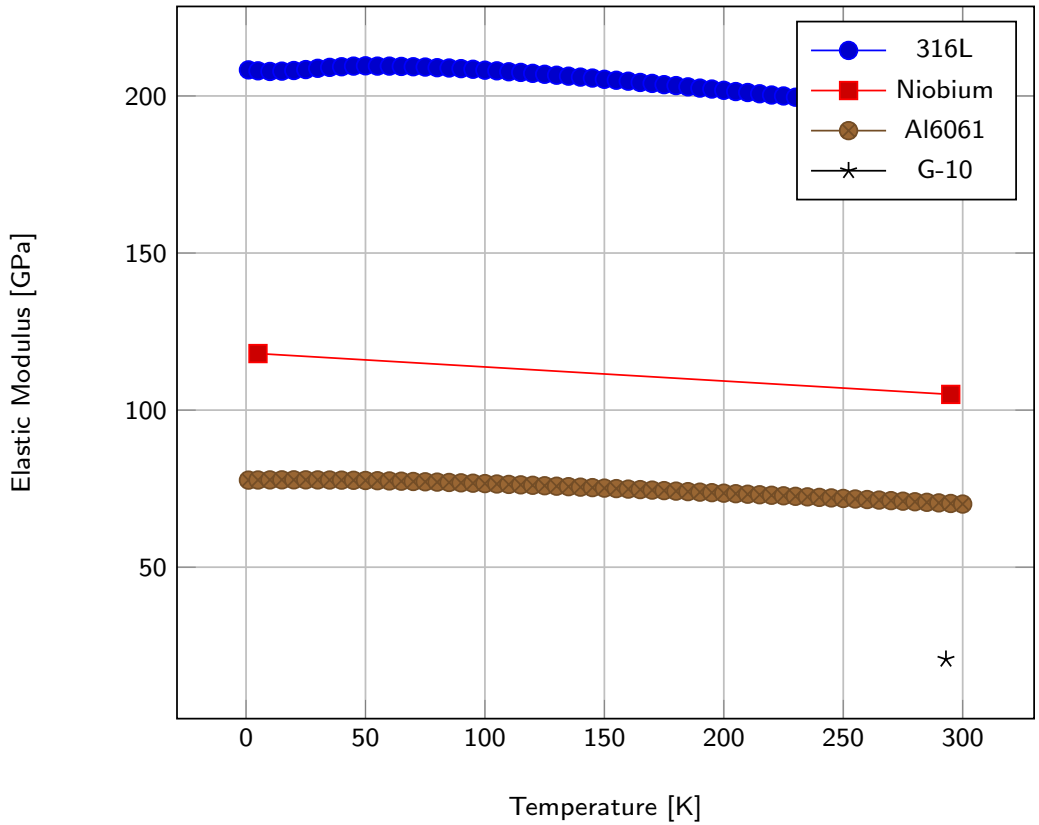


Cavity

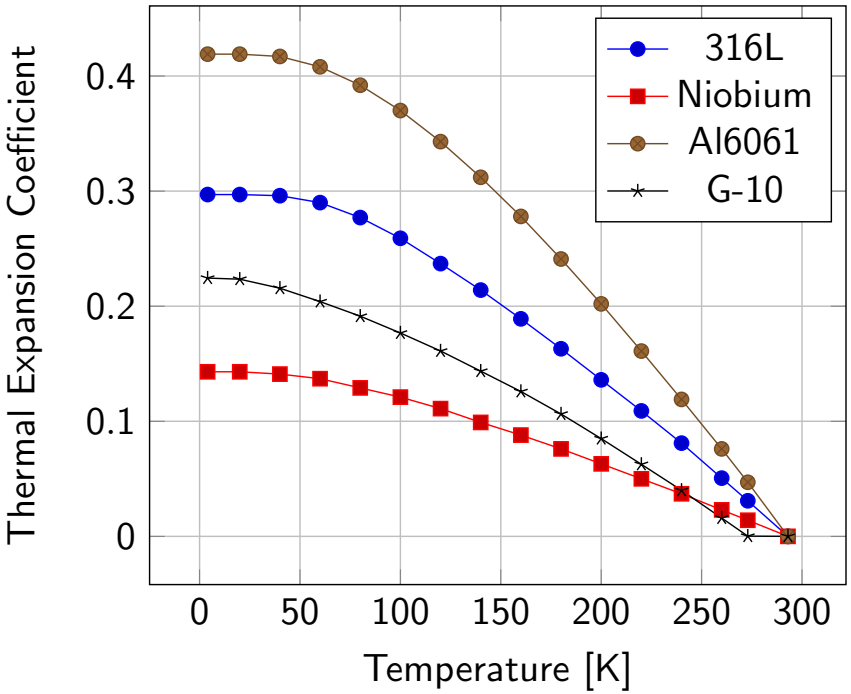
Magnet

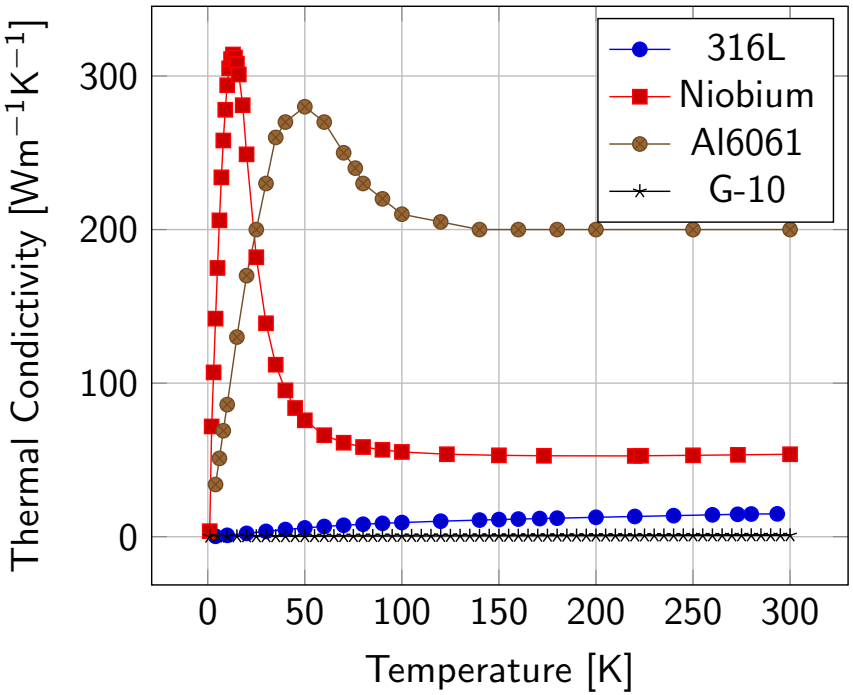
Elastic Properties

Material	Poisson's Ratio
Al 6061	0.30
Stainless Steel	0.29
G-10	0.30
Niobium	0.38

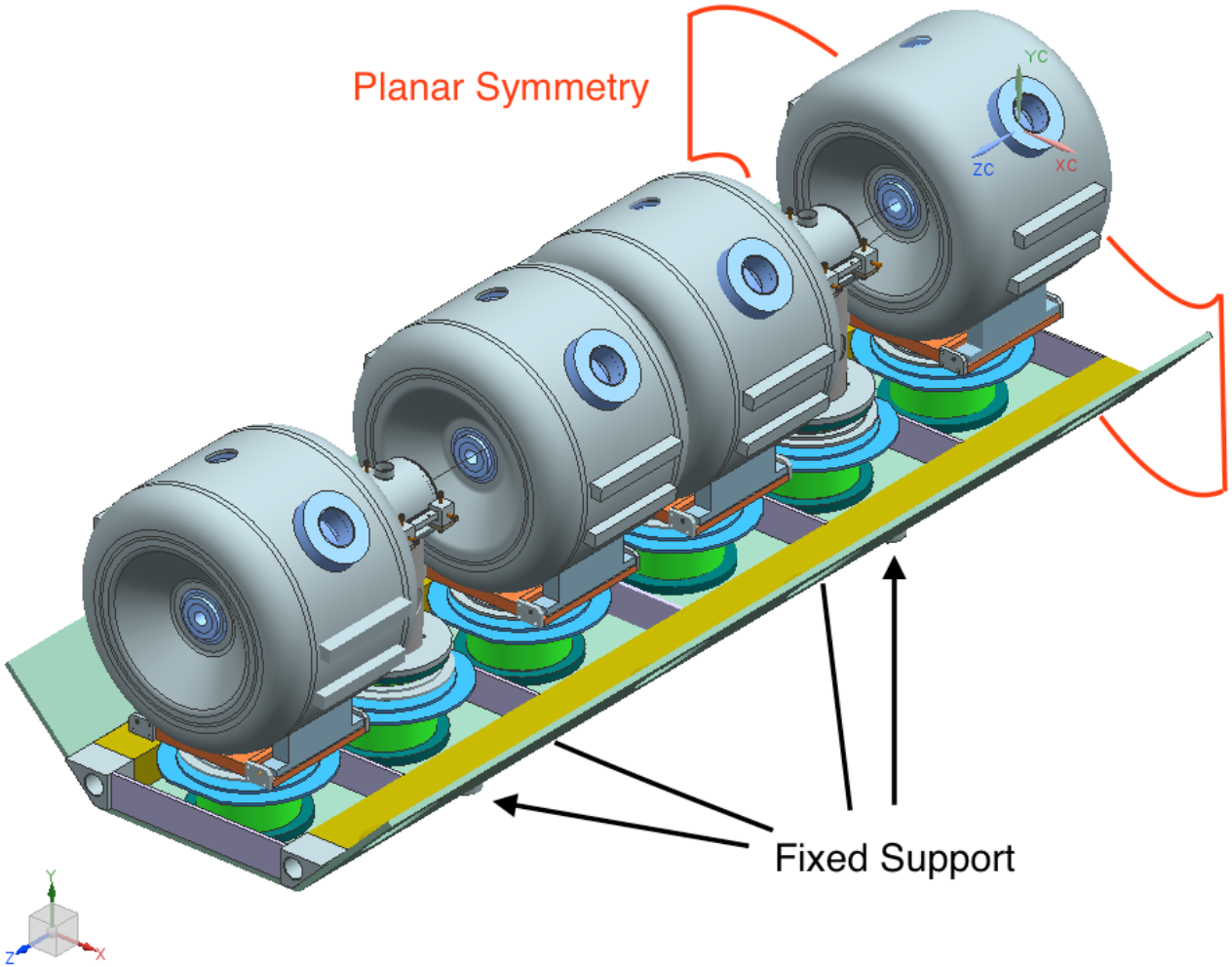


Thermal Properties

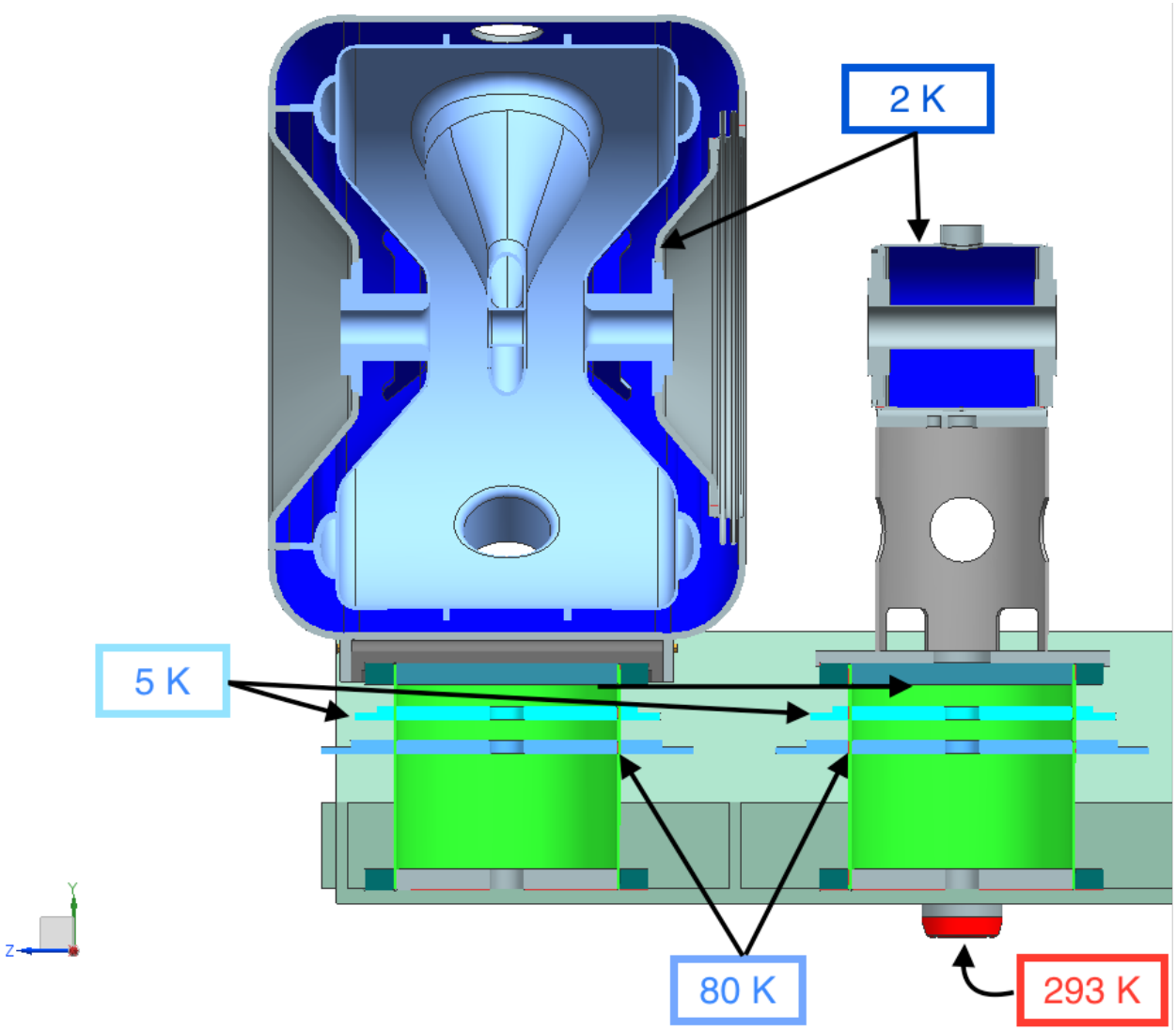




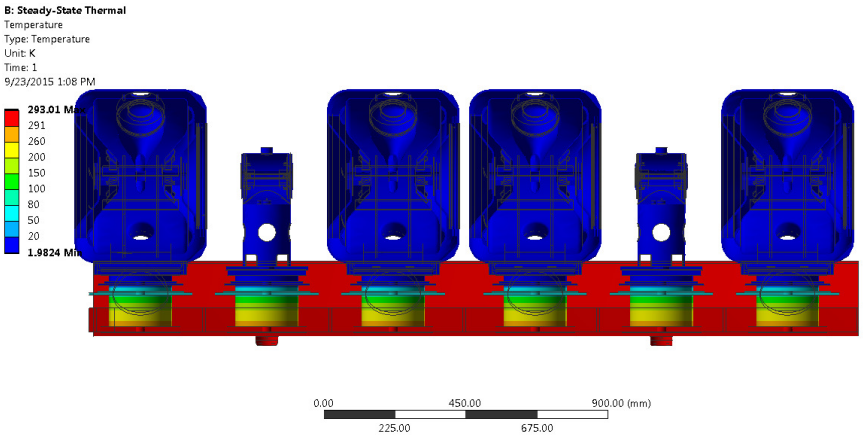
Analysis

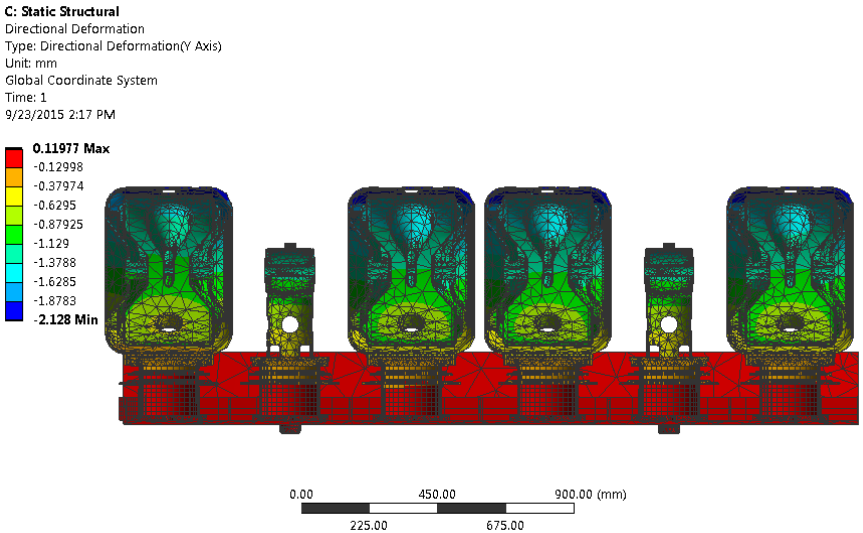


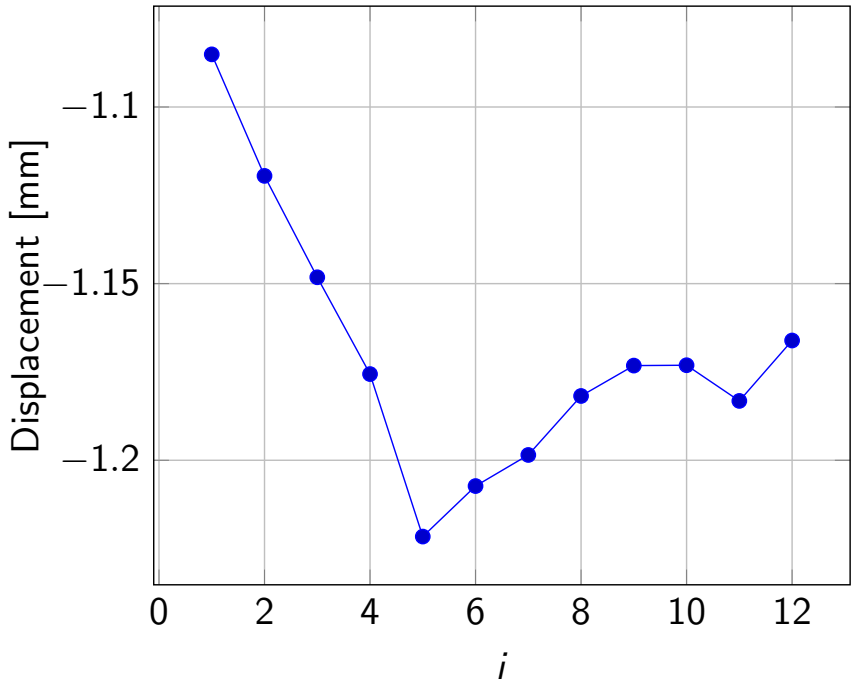
Temperature Condition



Results

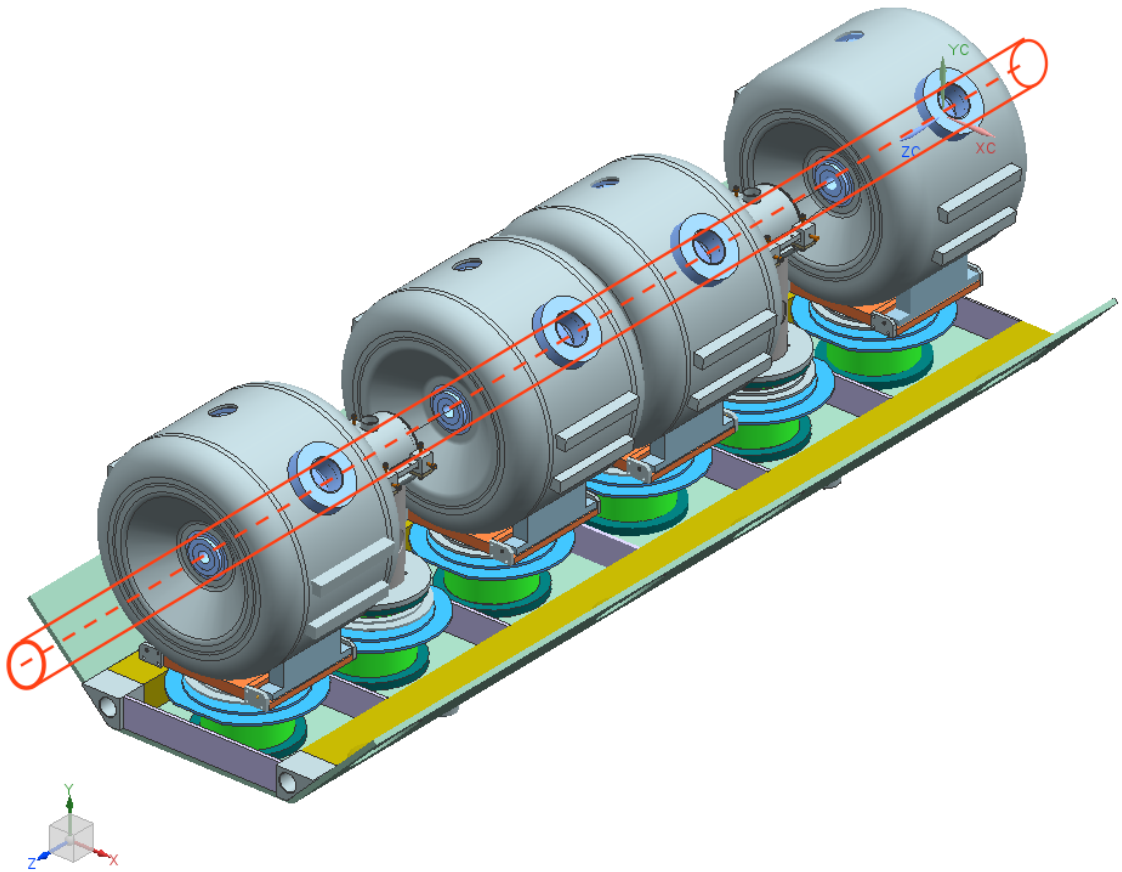

B: Steady-State Thermal
Temperature
Type: Temperature
Unit: K
Time: 1
9/23/2015 1:08 PM
293.01 Max
291
260
200
150
100
80
50
20
1.9824 Min
0.00
450.00
900.00 (mm)
225.00
675.00


C: Static Structural
Directional Deformation
Type: Directional Deformation(Y Axis)
Unit: mm
Global Coordinate System
Time: 1
9/23/2015 2:17 PM
0.11977 Max
-0.12998
-0.37974
-0.6295
-0.87925
-1.129
-1.3788
-1.6285
-1.8783
-2.128 Min
0.00
450.00
900.00 (mm)
225.00
675.00


Displacement [mm]
−1.1
−1.15
−1.2
0
2
4
6
8
10
12
i

Alignment

- Requirements of 0.25 mm on the beam alignment.



Future Developments

- More Realistic Temperature Condition
- Radiation effects