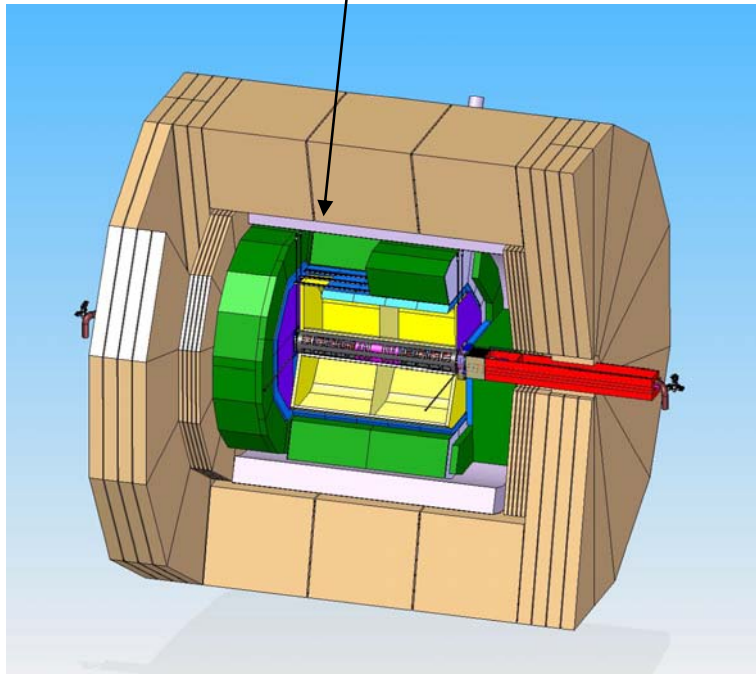


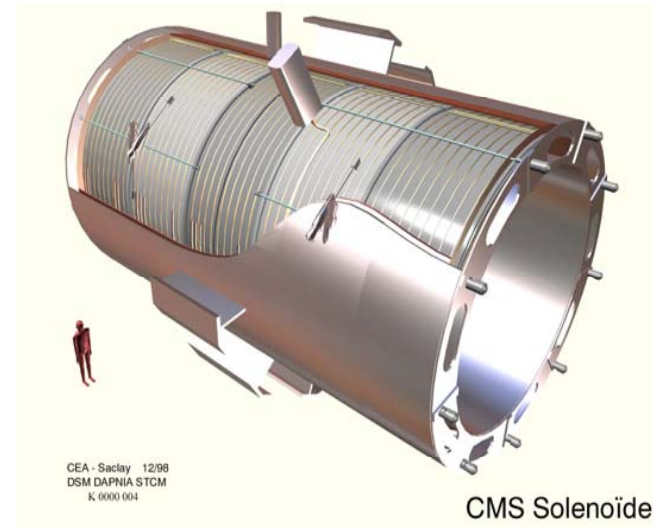
Short report on the rigidity of the cryostat

Feb. 10, '09
KEK H. Yamaoka

Mechanical strength of the cryostat and the support system have been studied.



The support system of the CMS solenoid was referred in this calculation.

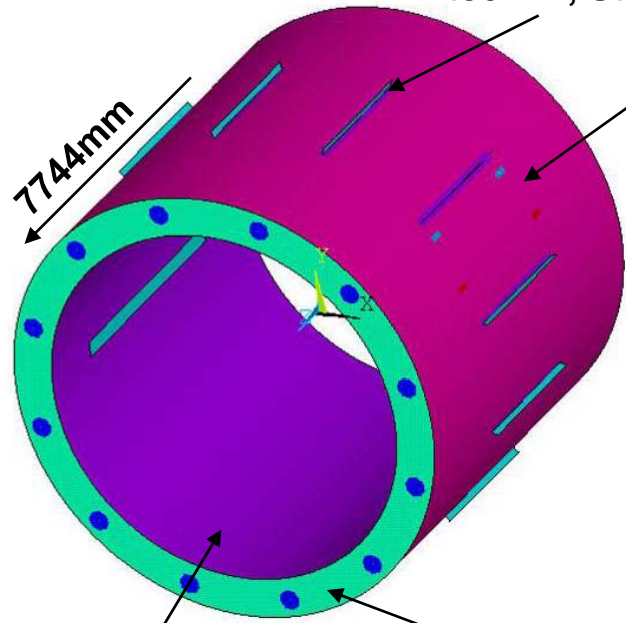


Referred parameters

2		ILD0	ILD
3	magnet	4T, 1,7 GJ	
4	Barrel Y Rin		4270
5	Barrel Y Rout	6420??	
6	Barrel 1/2 length		4647
7	thick	2150??	
8	Yoke plug front		3922
9	Yoke plug back		4022
10	Yoke plug Rin		350
11	Yoke plug Rout		3190
12	thick	100	
13	Yoke nose front	4022	
14	Yoke nose back	4672	
15	Yoke nose Rin	350	
16	Yoke nose Rout	4070	
17	thick	650	
18	Yoke endcap front	4672	
19	Yoke endcap back	6362	
20	Yoke endcap Rin	350	
21	Yoke endcap Rout	6420??	
22			
23	Coil cryostat		
24	Rin		3440
25	Rout		4190
26	cryo 1/2 length		3872
27	thick	750	
28	Coil Rin		3590
29	Coil Rout		3940
30	coil 1/2 length		3672
		SS/Scinti, 5.3 λ, max 48 layers barrel, 48	

FEM model

Cryostat



Solenoid support:
t50mm, Stainless

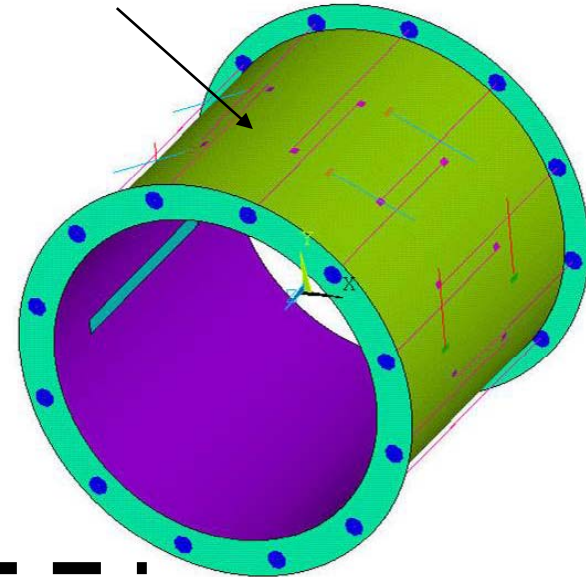
Outer vac. Wall:
t50mm, Stainless
→ R4190mm

Inner vac. wall:
t60mm, Stainless
→ R3440mm

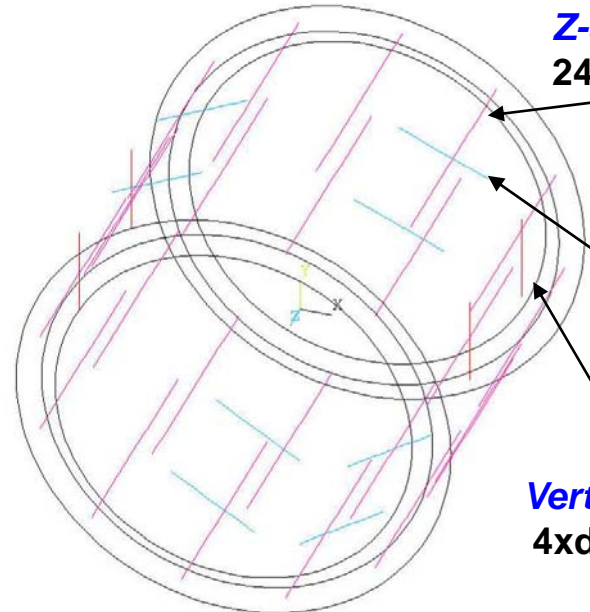
Bulk head: 50mm
(Stainless steel)

Coil:

t350mm, Al-alloy
→ R3765mm, L= 7344mm



Support rods



Z-support rods:
24xdia.45mm, Titanium alloy

Radial support rods:
8xdia.35mm, Ti-alloy

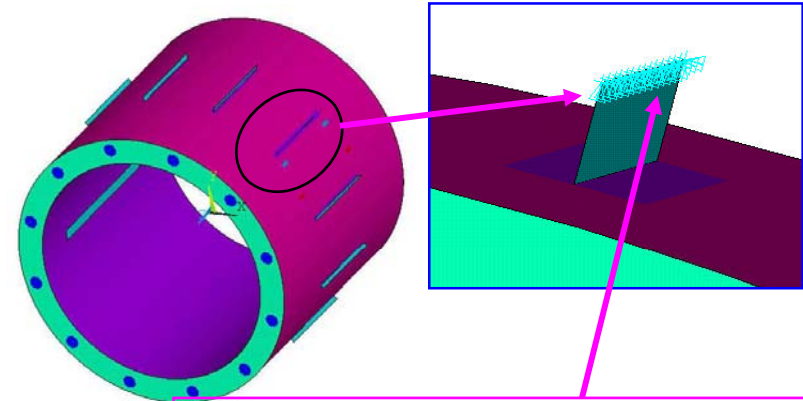
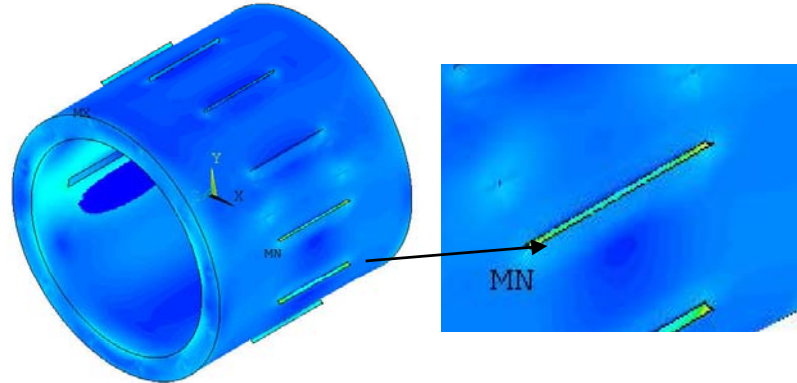
Vertical support rods:
4xdia.60mm, Ti-alloy

Calculation results

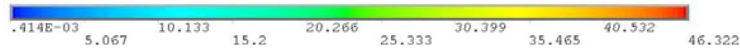
Load condition: *Combined with all forces.*

Von. M Stress : 463MPa

(AVG)
31.586
.414E-03
46.322



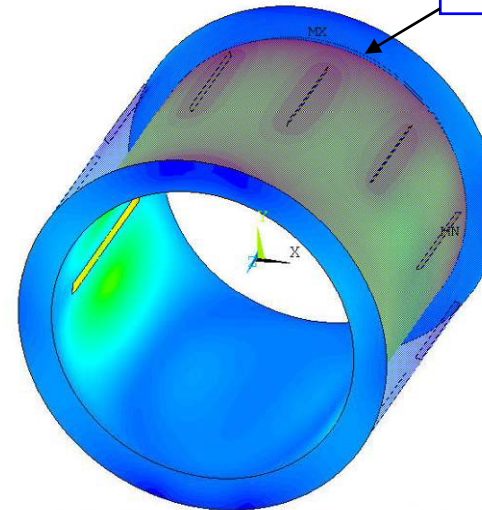
1. End of the solenoid support is fixed.



- 1. Thermal shrinkage: $\Delta t=300K$
- 2. Cold mass: 180tonnes
- 3. Vacuum pressure: 1atm
- 4. H-Cal. Weight: 2000tonnes
- 5. Unbalanced force: 840kN in Z-dir.
→ Not calculated. Referred from the CMS.
- 6. Magnet excitation: Not calculated

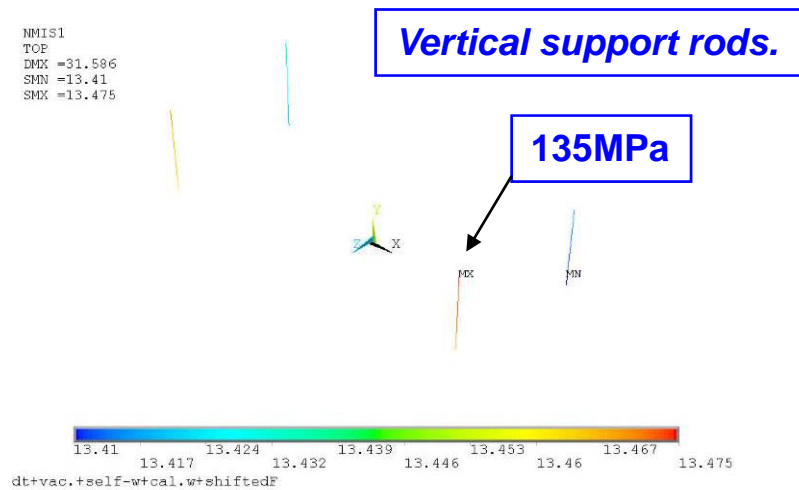
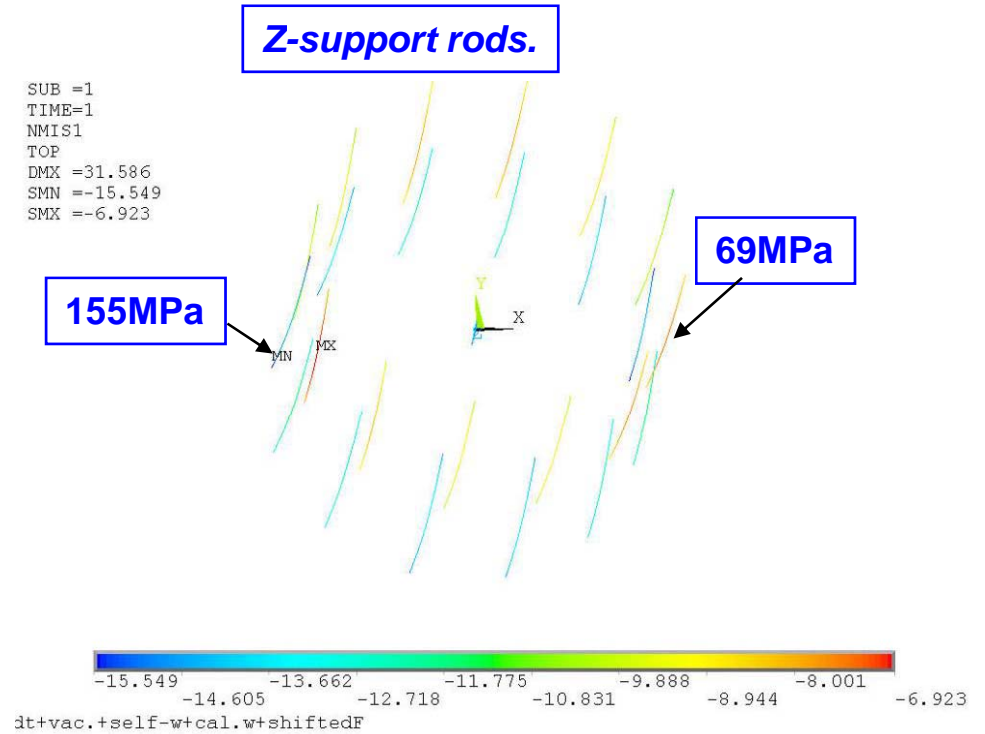
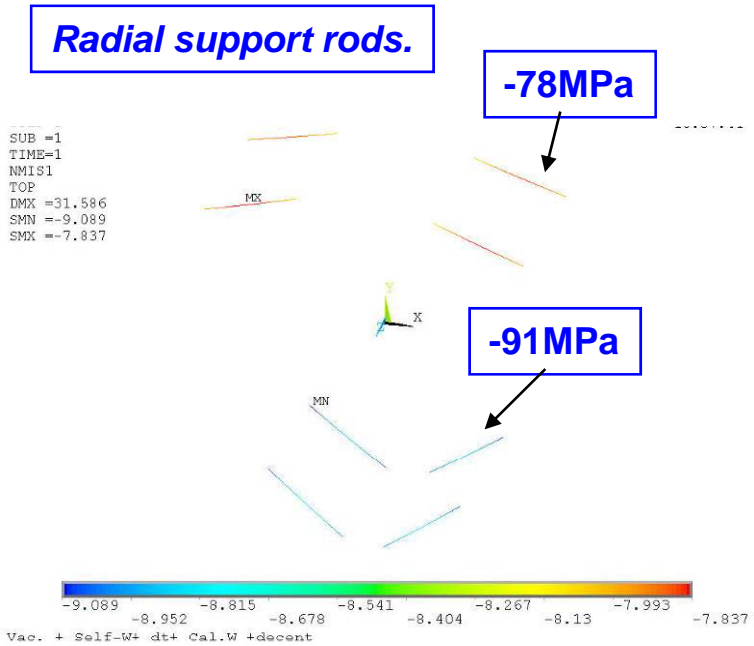
SUB =1
TIME=1
USUM (AVG)
RSYS=0
DMX =24.067
SMX =24.067

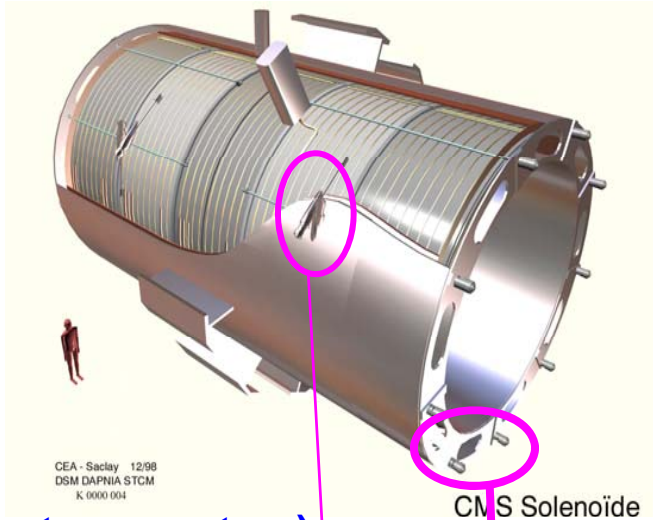
24mm



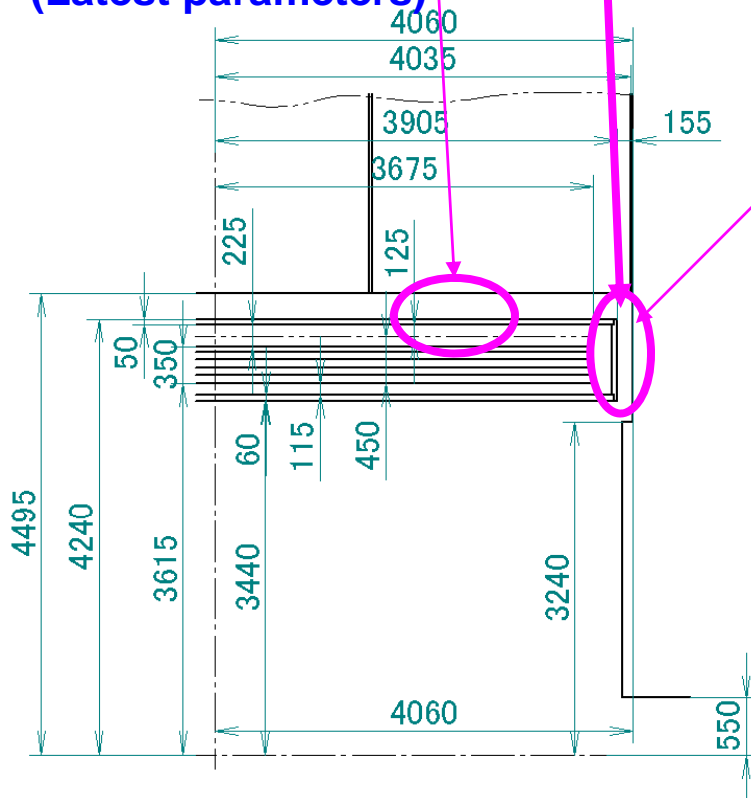
Condition: Combined with all forces
 → dt + Self-W + Vac. + Cal.W + shifted F.

Stress of the support rods.





(Latest parameters)



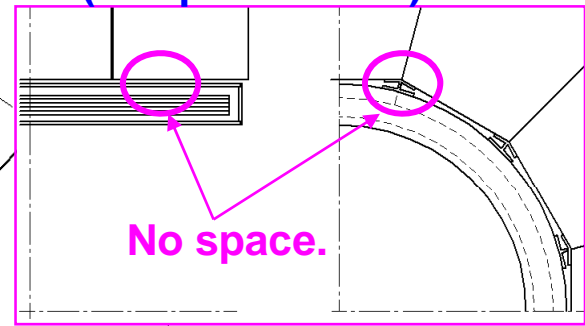
Enough space?

Alain Hervé, ILD Workshop, ILD-T-Coil&Yoke-Parametric-Model-4360, CERN-20 January 2009

Radial gaps in Coil System

Thus radial thickness of cryostat is taken as 500mm + thCoil

(Old parameters)



END