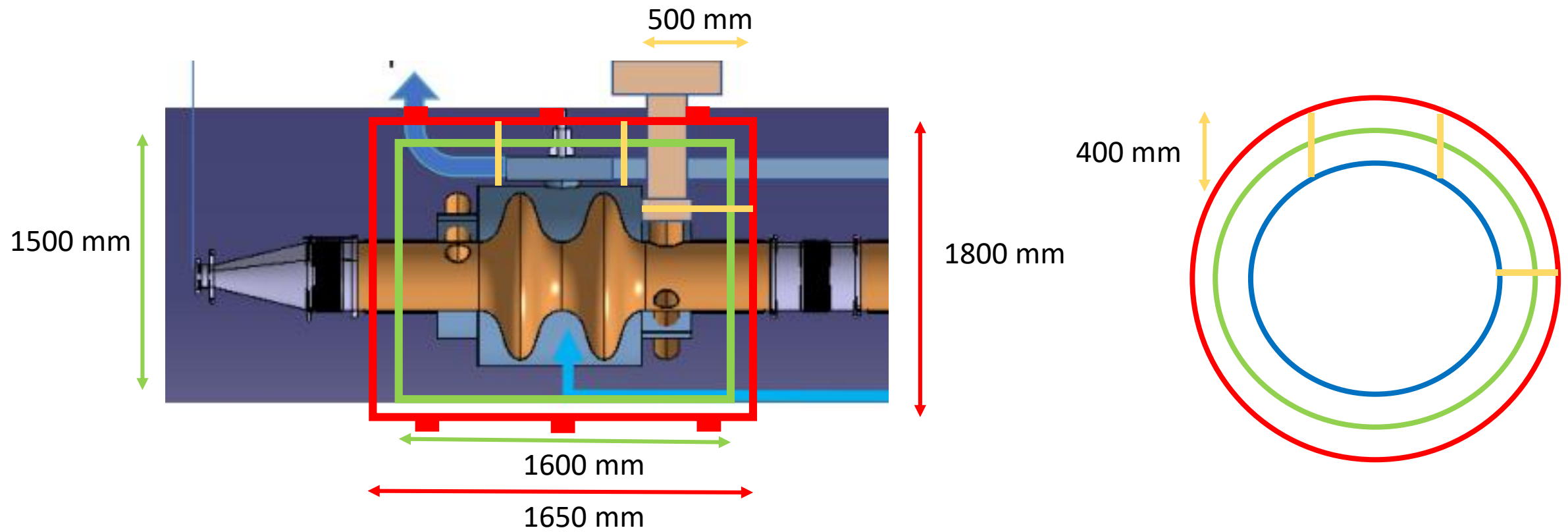
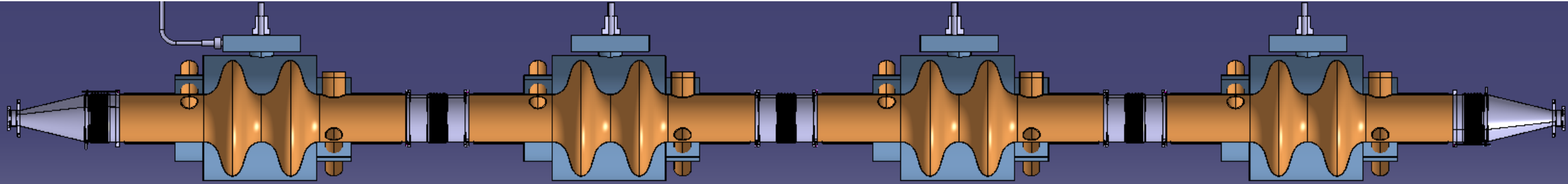


FCCee cryostat design

Team SIII

Design



Task 1.1. Table of design parameters

Item	Description	Value	Comments
1 a.	Tank thickness	1.4306 (304L) specification: RP0.2 200MPa 4 bar: thickness > 1.2 mm → 1.5 mm Cern SCEM 44.59.32.016.2	In operation, the cryomodule insulation vacuum must be pumped down before any pumping is done on the helium tank volume (otherwise, thickness must be 16 mm, incompatible with fabrication and thermal performance) Or advanced study for stiffeners
1 b.	Vacuum vessel	D=900 mm, thickness=12 mm Stainless steel with Cobalt content < 0.3%	Based on the buckling formula (SF=3): 36 mm, but with stiffeners, 12 mm (calculation according to standards to be done).
1 c.	Thermal shielding	OFE Copper/Al 6061, 2 mm, ϕ 1500	
1 d.	Supporting system	L= 400 mm V: 3 tie rods, r=5 mm, L=400 mm, H: 2 tie rods, r=5 mm, L=400 mm L: 1 tie rod, r= 5, L= 500 mm	Buckling, Tensile stress
1 e.	Assembly method	See next slide	

Assembly procedure

- Supporting frame assembled around Dressed cavity (cavity + helium tank + RF couplers) in cleanroom
- Connection of the string (4 cavities) : cleanroom rail system
- Connection of 4 cells of vacuum tank : clean room rail system
- Insertion of the cavities string onto the vacuum tank : clean room rail system
- Assembly of cryogenics lines (outside cleanroom)
- Assembly of MLI on cold mass (1 blanket = 10 layers)
- Assembly of thermal shield (and magnetic shield?)
- Assembly of MLI on thermal shield (2 blanket = 25-30 layers)
- *+ tuning systems, RF auxiliaries, cryogenics instrumentation, ...*

Task 1.2. Table of Static Heat Loads and mass flows

Source of HL	HL (W) @ 4.2 K		HL (W) @ 50 K	4.2 K liquid boil-off (g/s)	Liquefaction load (g/s)	Thermal shield mass flow (g/s) (with $T_{in}=50K$, $T_{out}=55 K$)
Supports conduction	$(0.6*5+0.48)*4=13.9$		-		-	-
Beam tube cones conduction	$5.77*2+$ (interconnections)=11.5		-		-	-
<u>RF Couplers conduction (uncooled)</u>	7.64 *4=30.5	-	-		-	-
RF Couplers conduction (ideal vapor cooling)	-	1.01 (divided by 30 form slide 75)	-		-	-
<u>Radiation, with thermal shield @ 50 K</u>	6.5W per cell + 2W per side 30W total				-	
Radiation, without thermal shield	91W per cell + 24W per side 412W total		-		-	-
Radiation from beam tube cones	0.63+radiation RF coupler		-		-	-
Totals	86.53 W (56 W with vapour cooling)					

