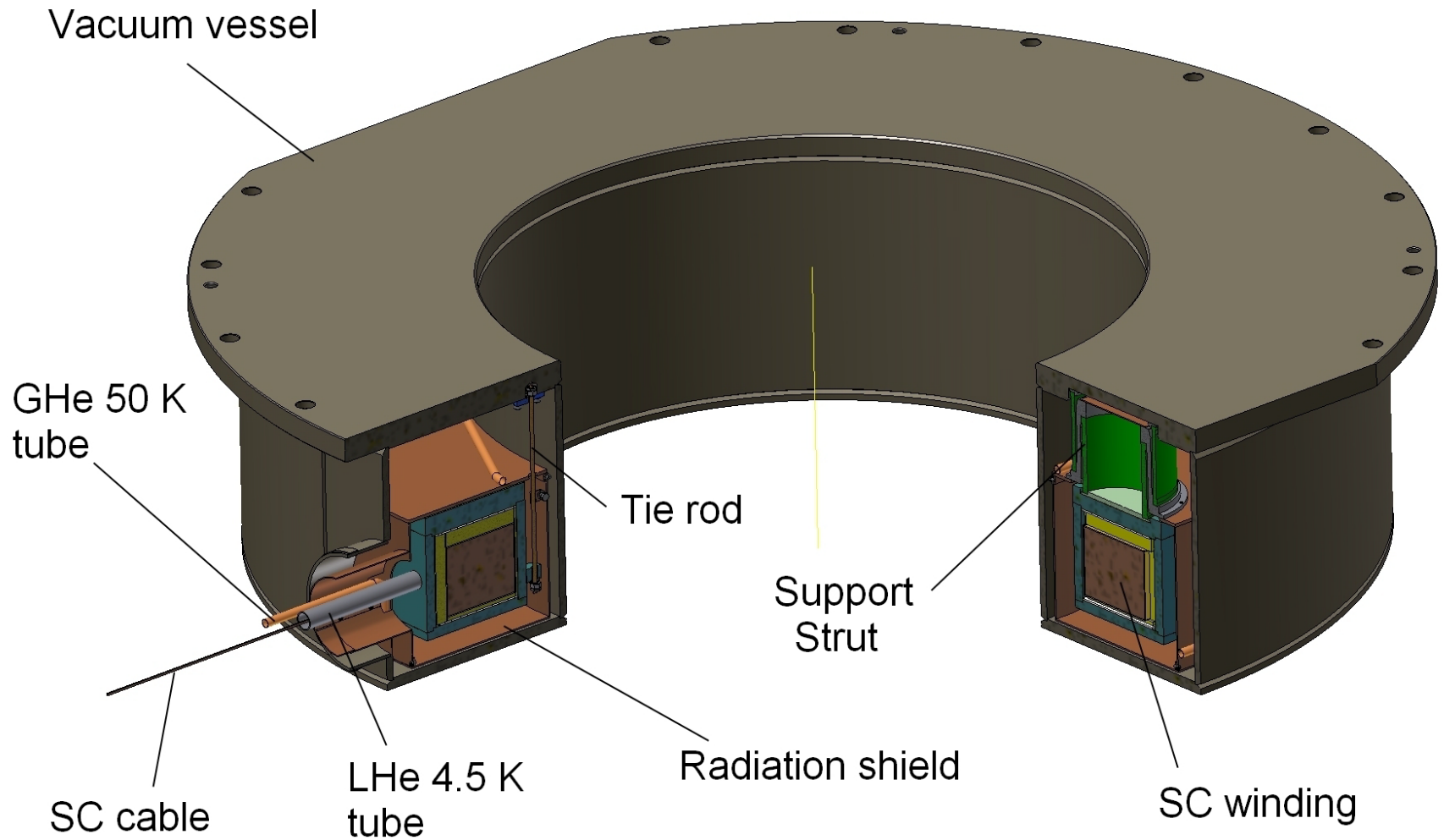


Coil design the CBM magnet

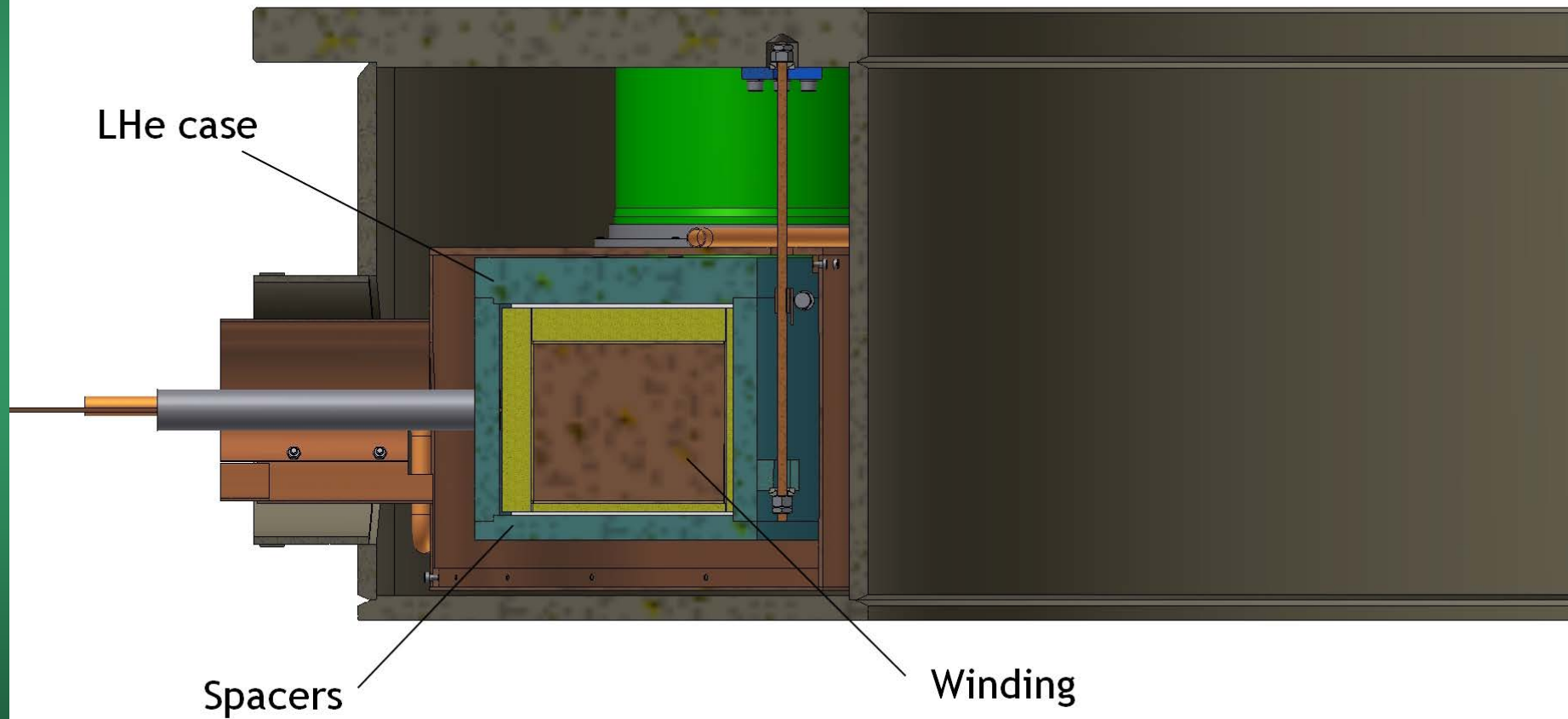
Alexey Bragin, Sergey Pivovarov
Budker Institute of Nuclear Physics, Novosibirsk,
Russia

CDR meeting, May 2017

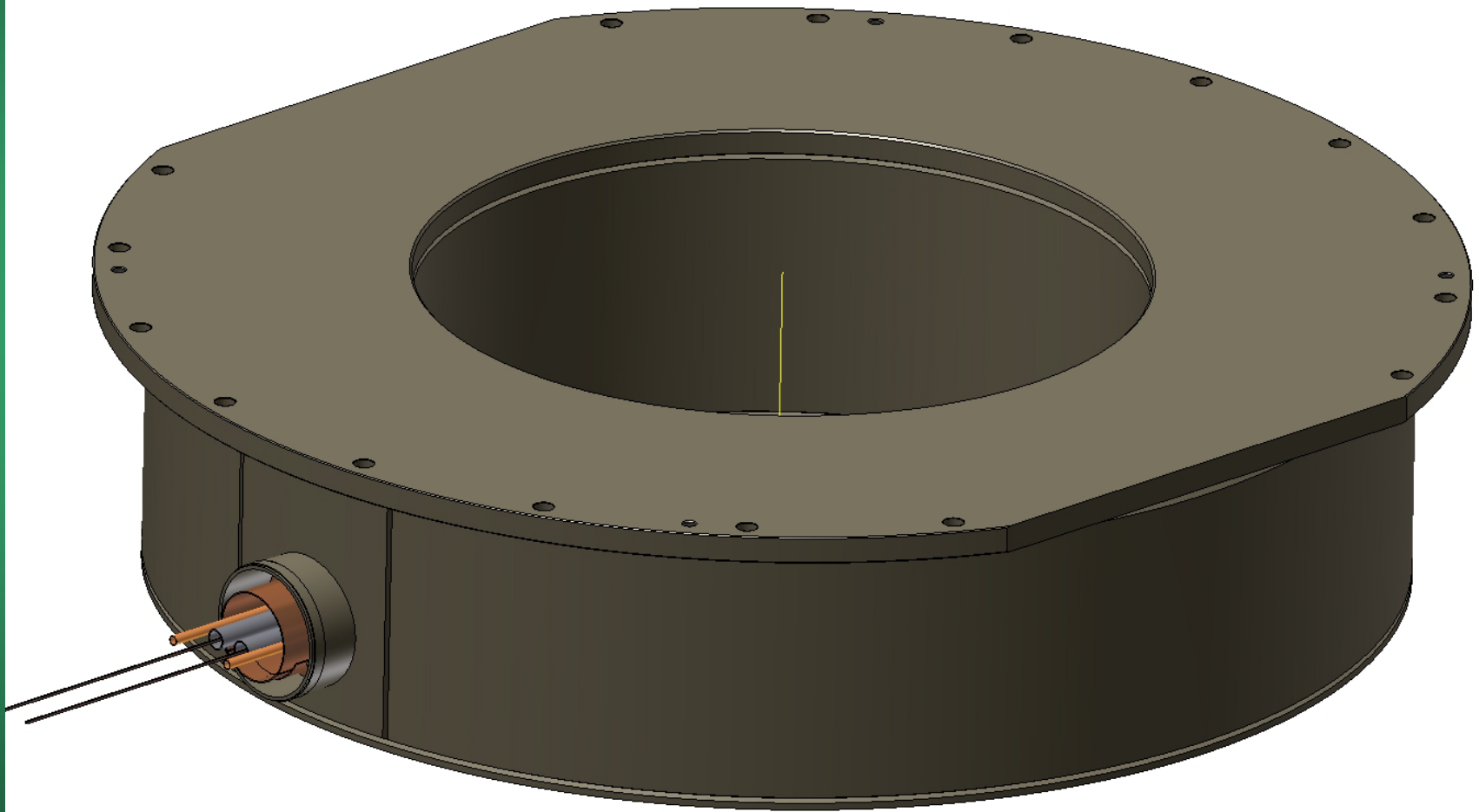
Coil design



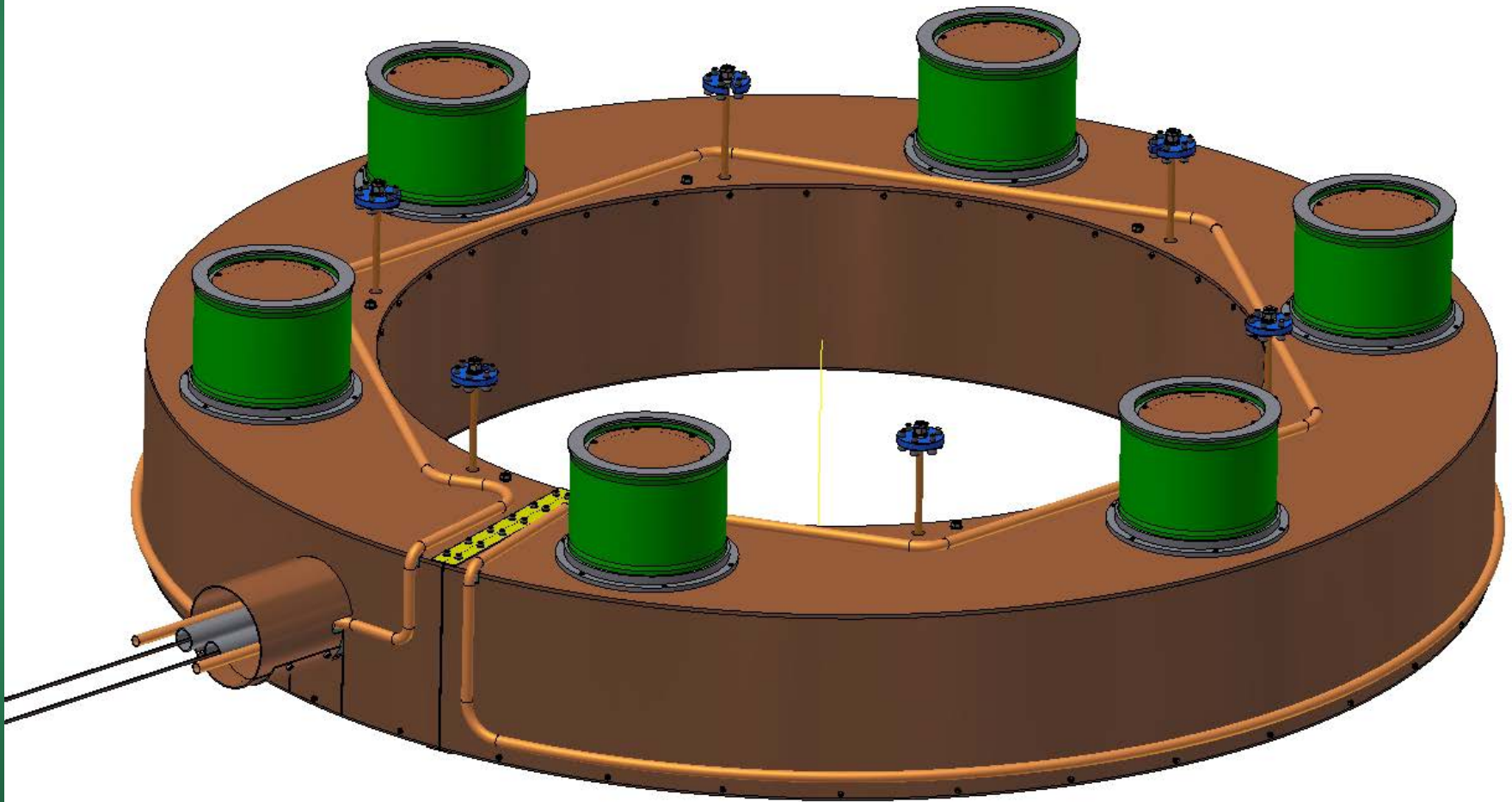
Coil design – close cut



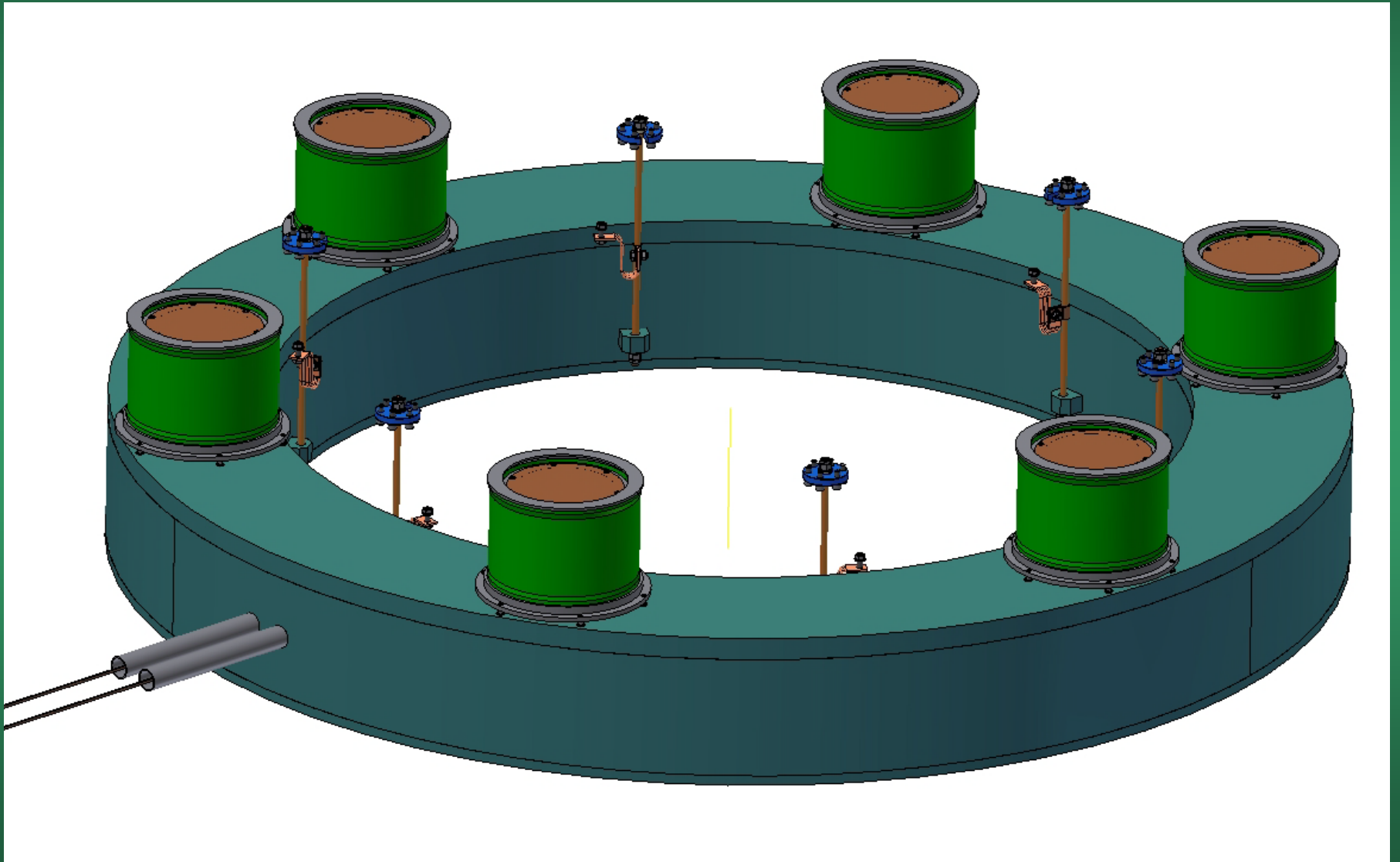
Coil total view



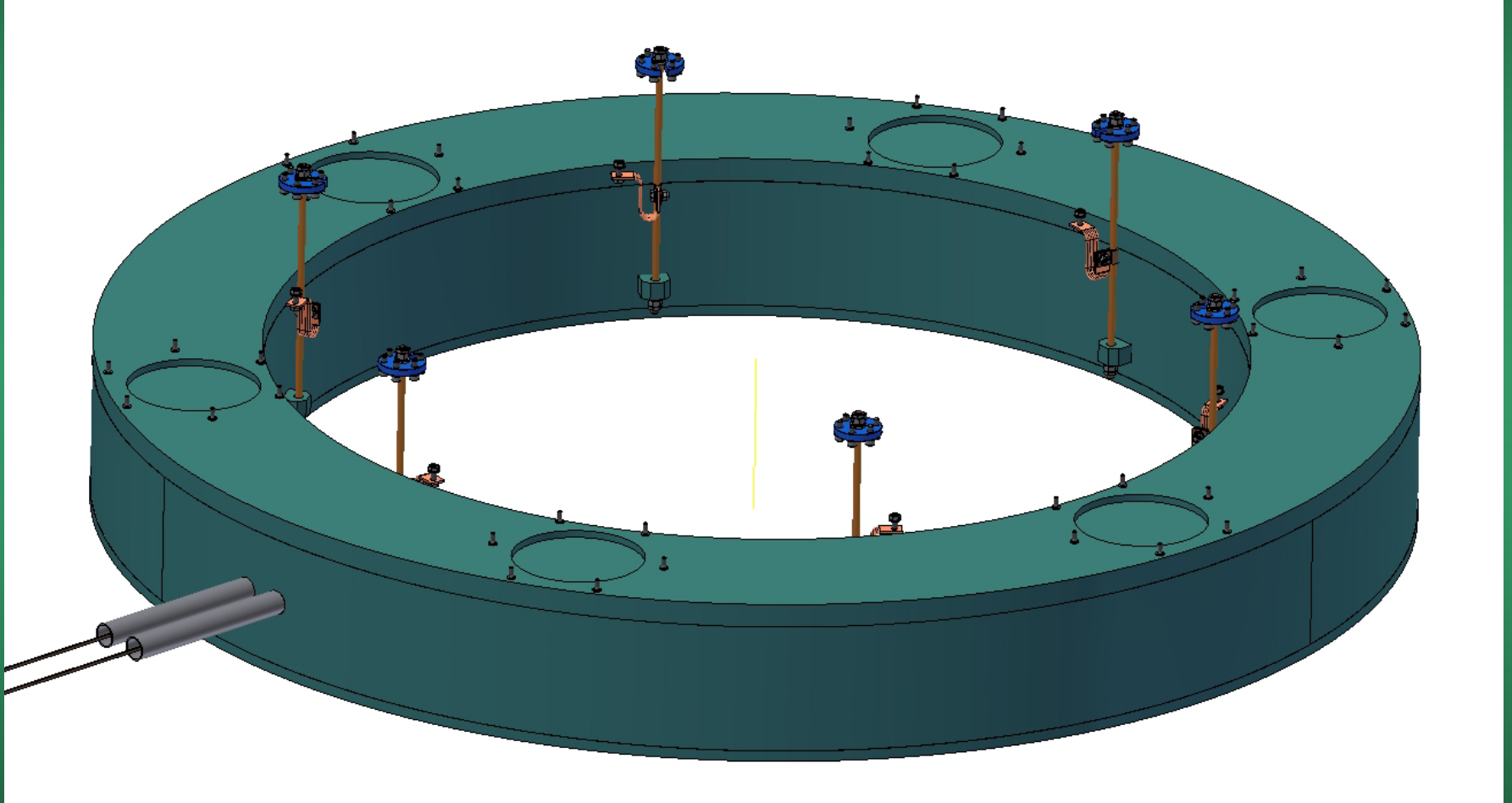
Radiation shield



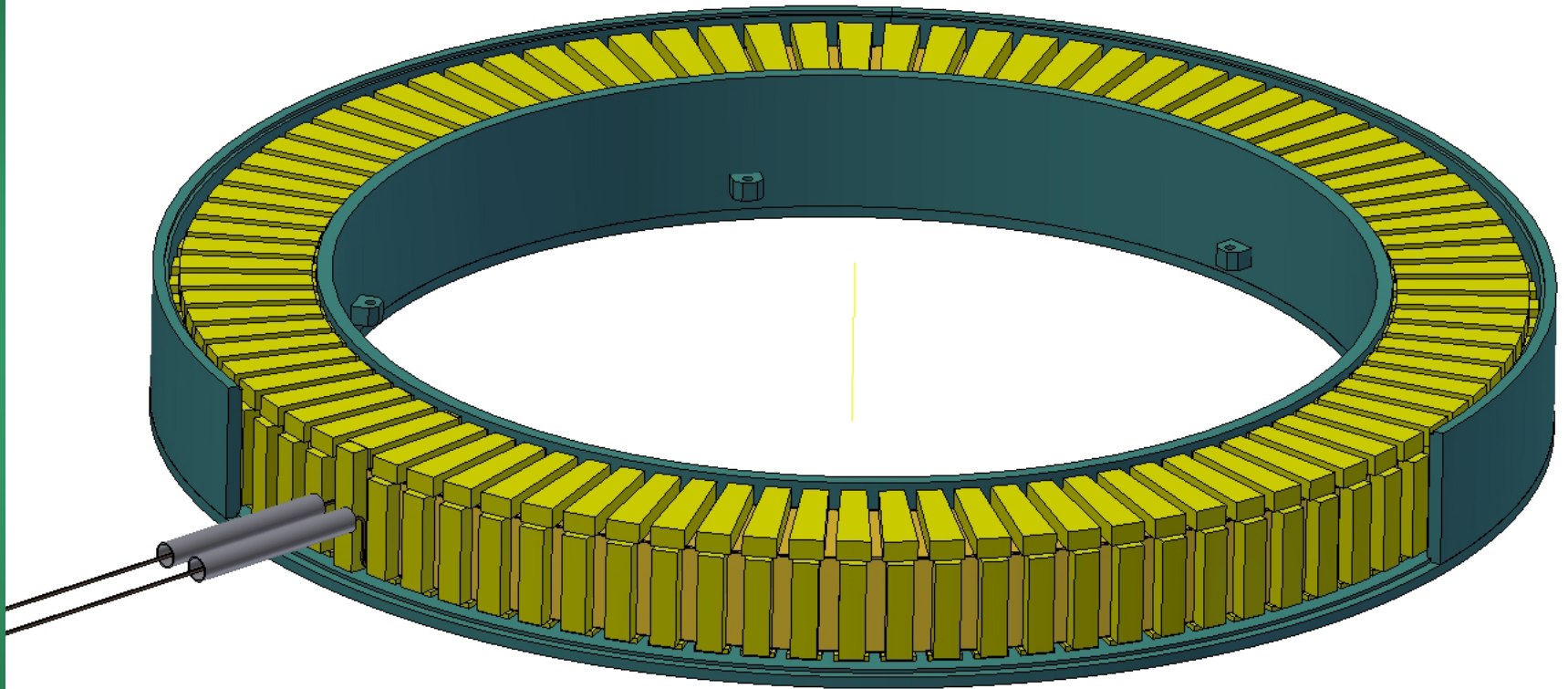
Supports



Cold mass suspended on the tie rods

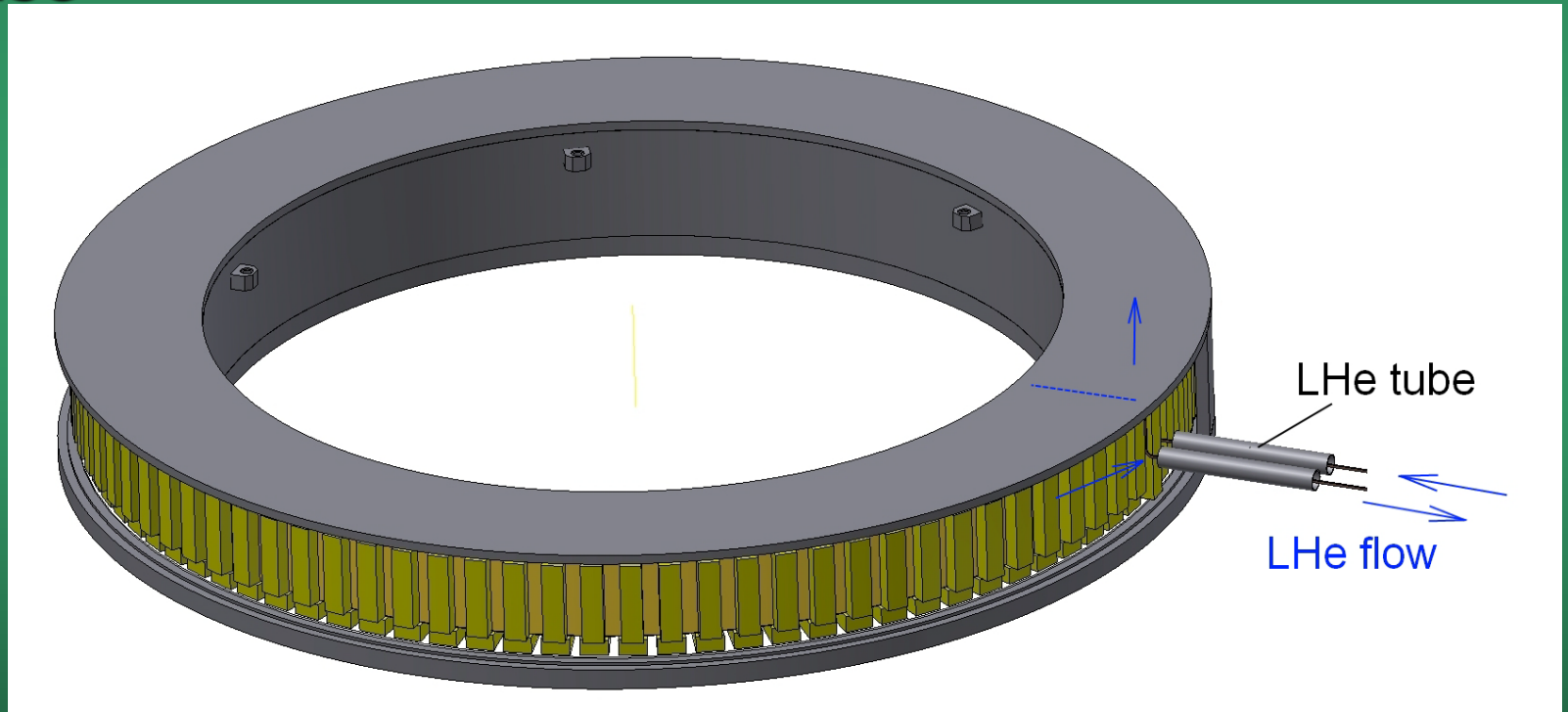


Cold mass

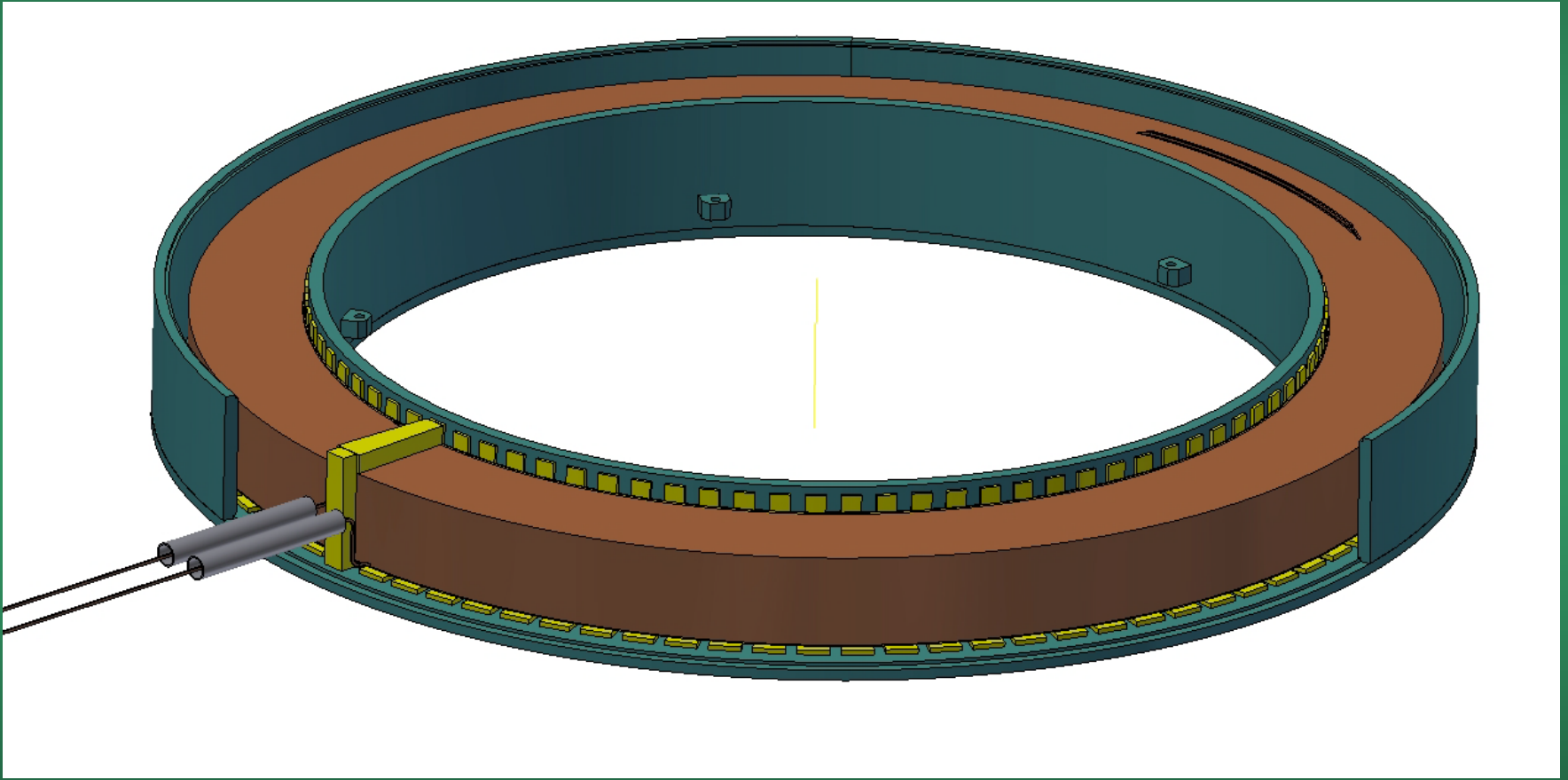


Helium flow inside the coil

Liquid helium flows around the coil inside the LHe case



LHe flow – detail view



Main parameters of the coil

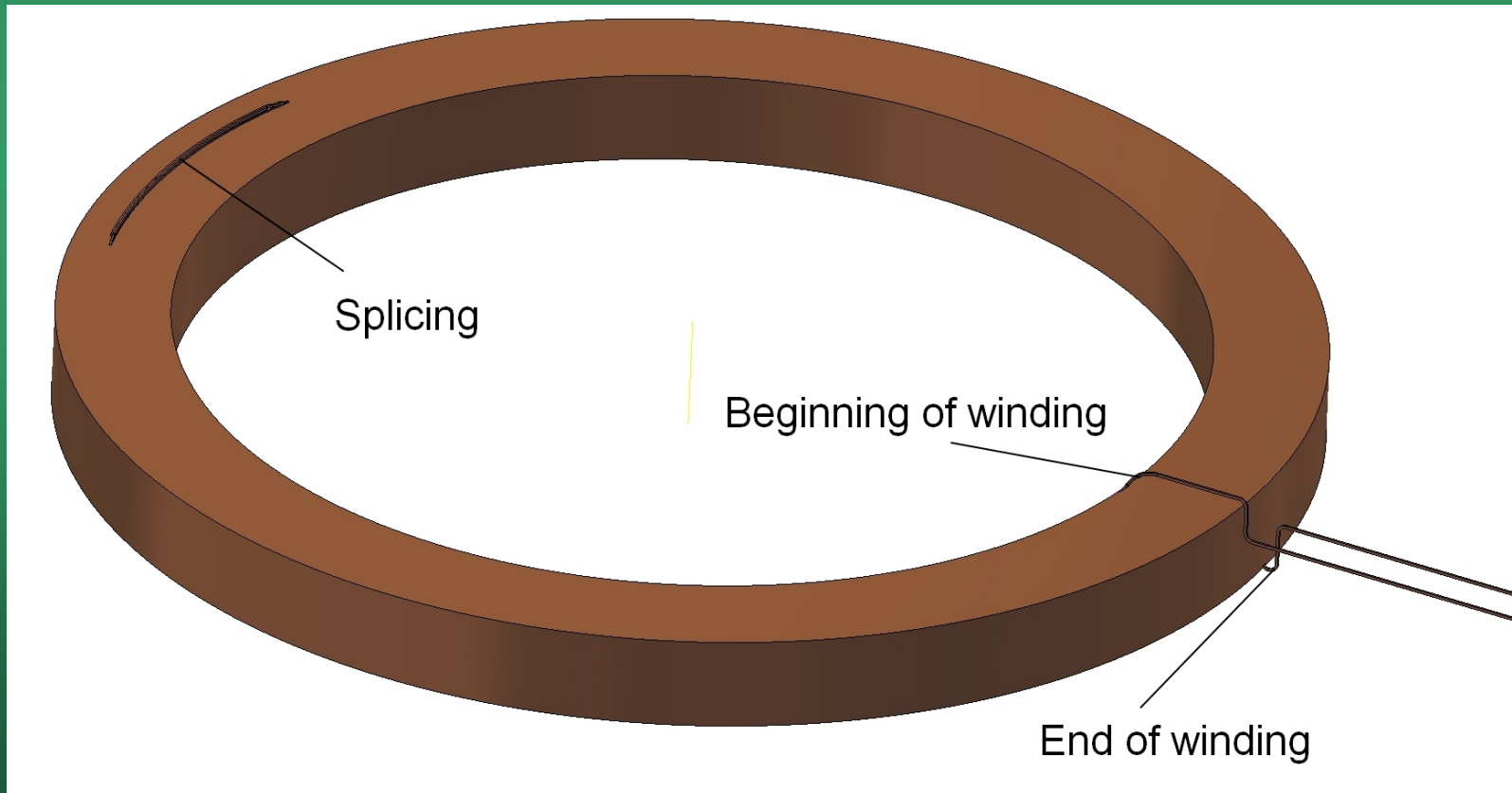
Coils parameters	Values
Inner radius of the winding, mm	1390
Cross section sizes of the winding:	
height, mm	131
radial length, mm	158
Number of turns in one coil	1754
Number of layers in one coil	53
Interlayer insulation, mm	0.3
Operating current I_o , A	686
Test current, $I_o \cdot 1.2$, A	823
Magnetic field on the coil B_{max} , T	3.25
I_o/I_c ratio along the load line, %	52
I_o/I_c at fixed B, %	25
Operating temperature, K	4.5
Temperature of current sharing, K	6.84
Stored energy of the magnet, MJ	5.1
Stored energy of the magnet at the test current, MJ	6.4
Cold mass of one coil at 4.5 K, kg	1800
Cold mass of one winding, kg	790
Inductance of the magnet at full current, H	21.2
E/M ratio for two windings, kJ/kg	3.2
Mutual inductance between the coils, H	0.21
Vertical force on one coil toward the yoke, MN	2.6 (2.8 if only one coil charged)
Vertical force on one coil toward the yoke at the test current, MN	3.3 (3.5 if only one coil charged)

Superconducting winding

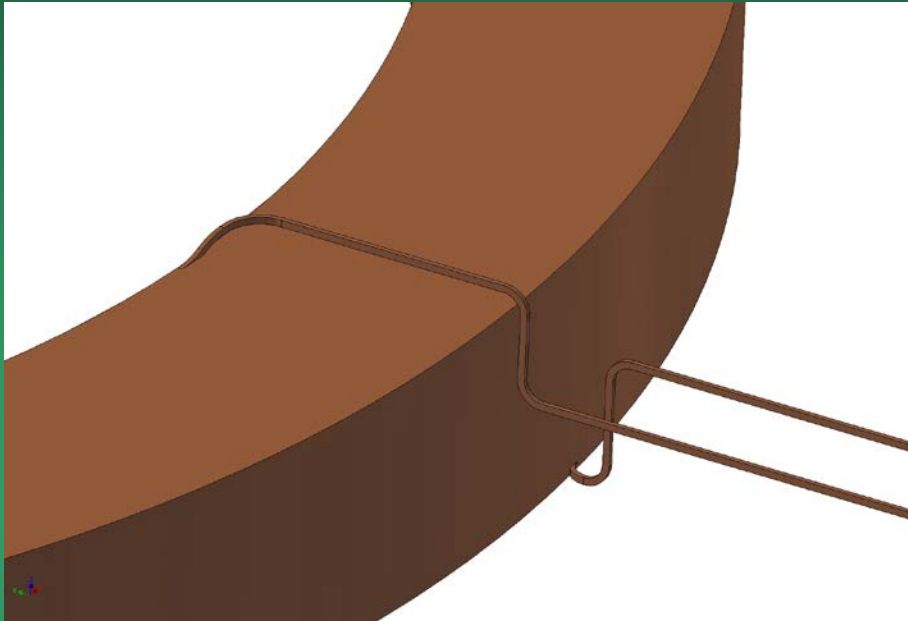
The winding will be wound of two pieces of SC cable. The length of one half is ~ 4.6 km.

Dry process of winding.

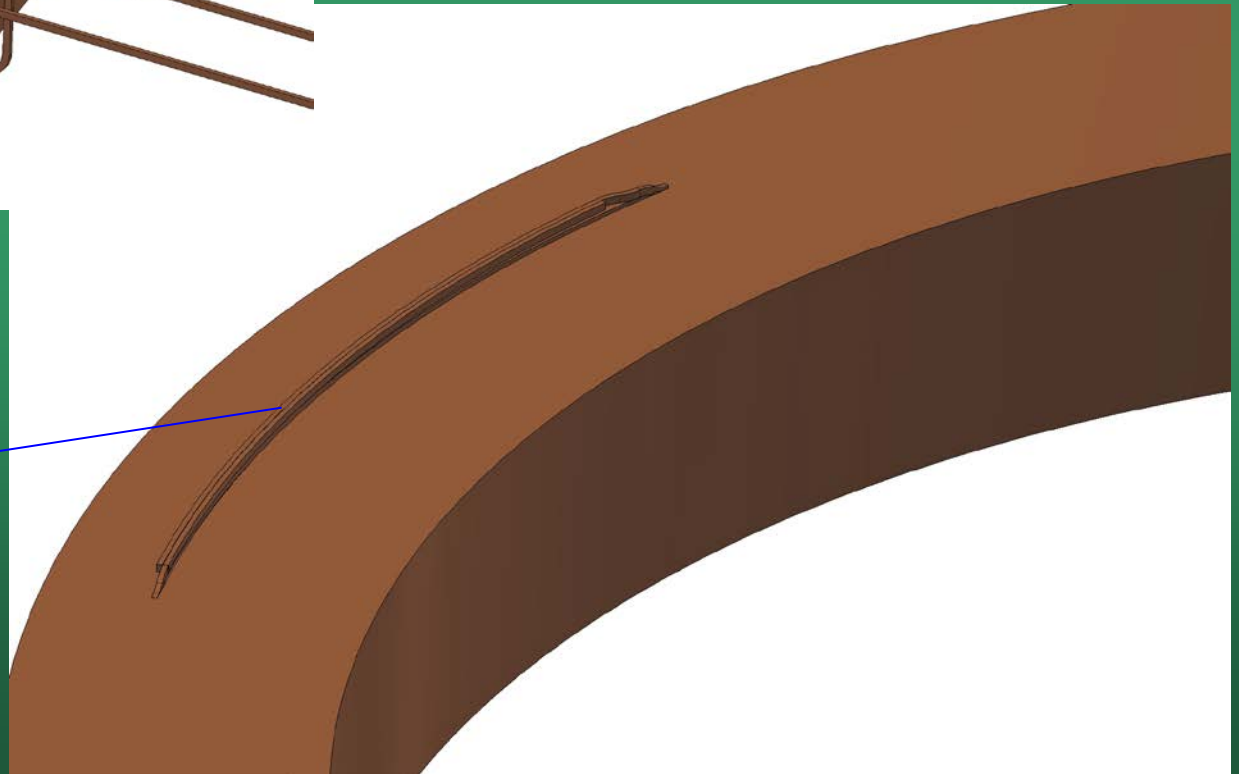
Impregnation by epoxy compound.



Close view of the terminals

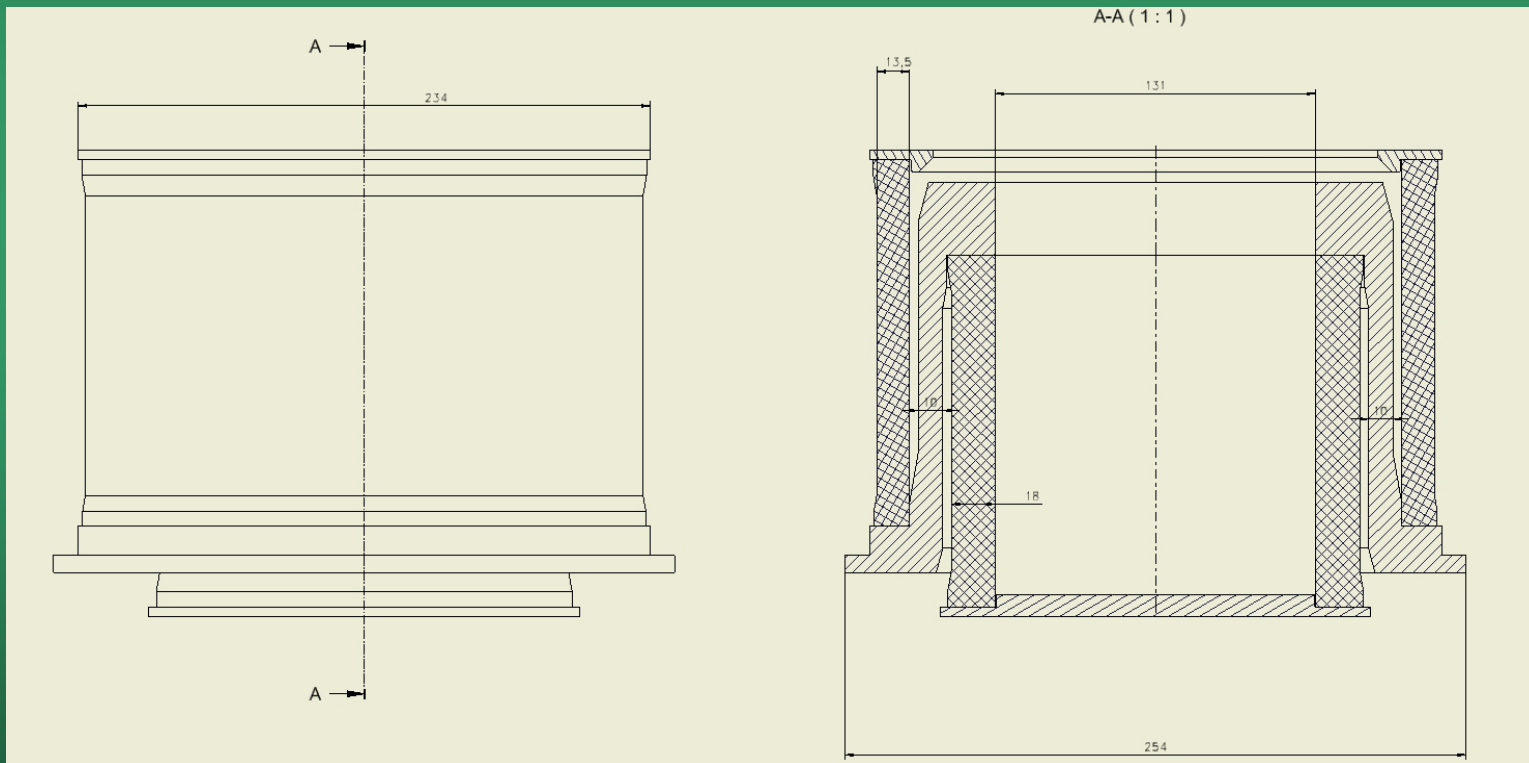


Soldering

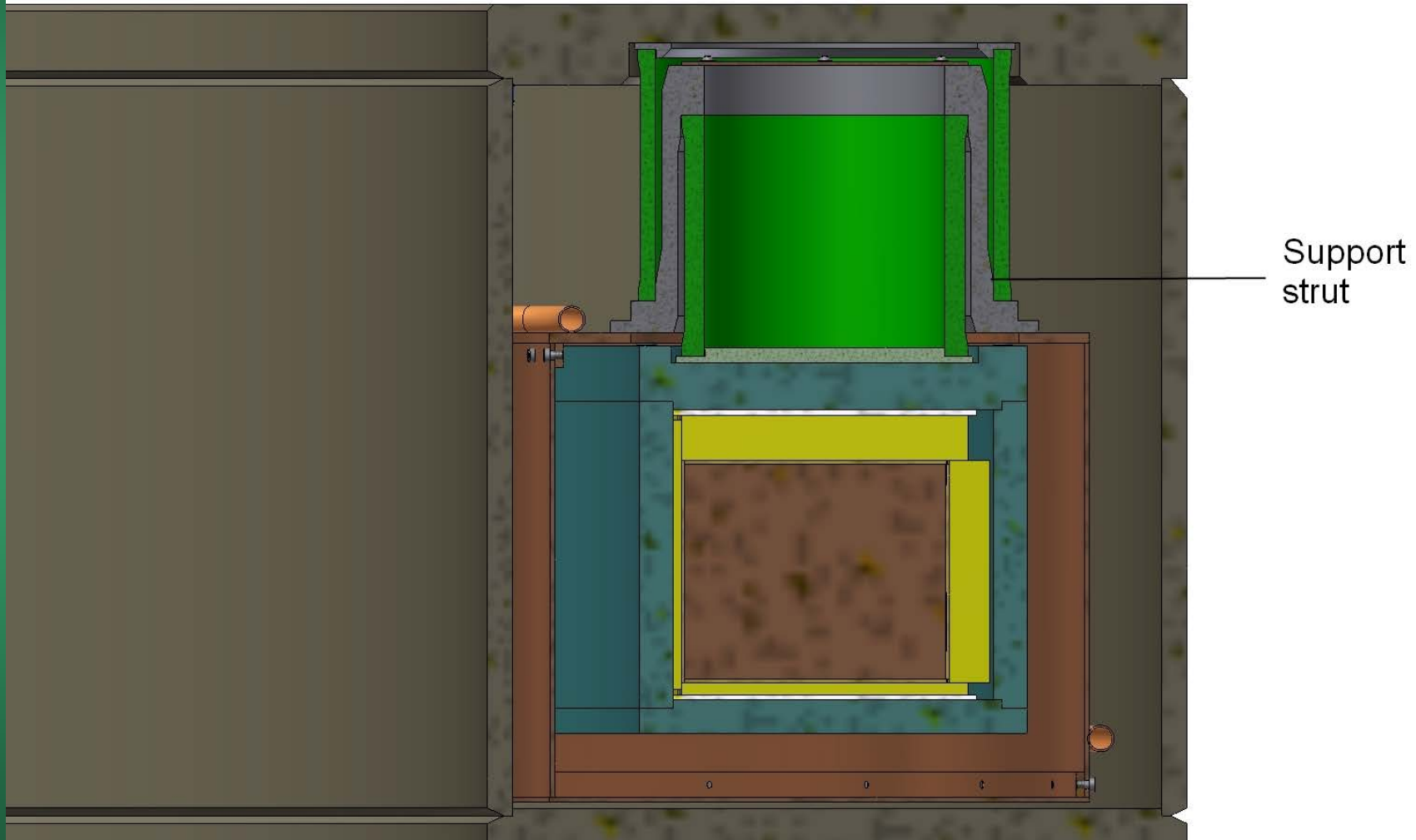


Support struts

The design of the support struts consists of three coaxial cylinders: two of G-10 composite, one of stainless steel.



Support strut – close cut



Results

The conceptual design of the CBM magnet coils is presented.

Most TDR parameters are the same for the present.

The main differences from the TDR are

- the winding will be made of two pieces of SC cable
- the support struts cylinders will be thicker
- LHe case has two tube for LHe supply. LHe goes around the winding
- the design of the spacers will be changed to exclude helium gas pockets