Cryostat design and heat loads

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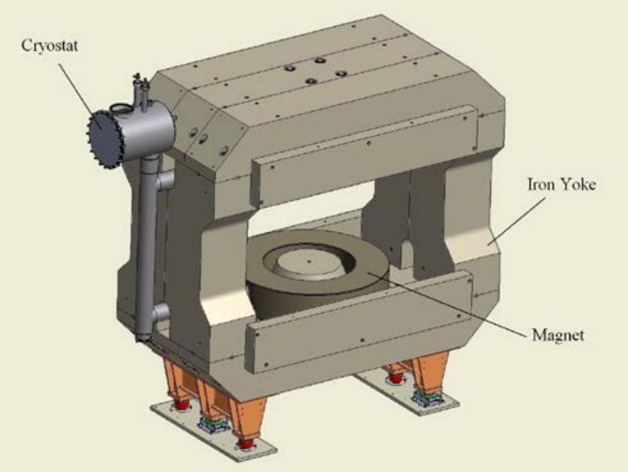
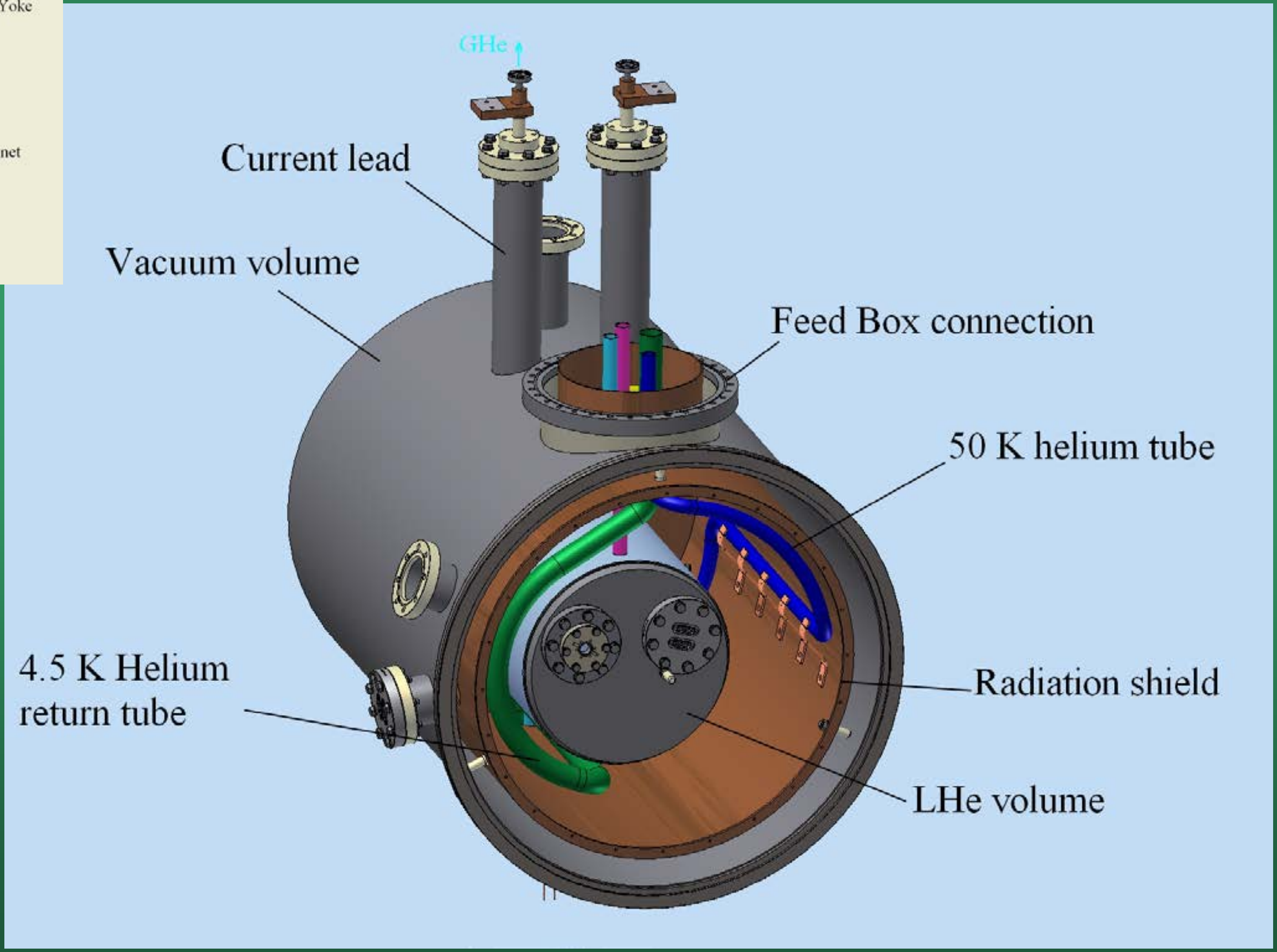
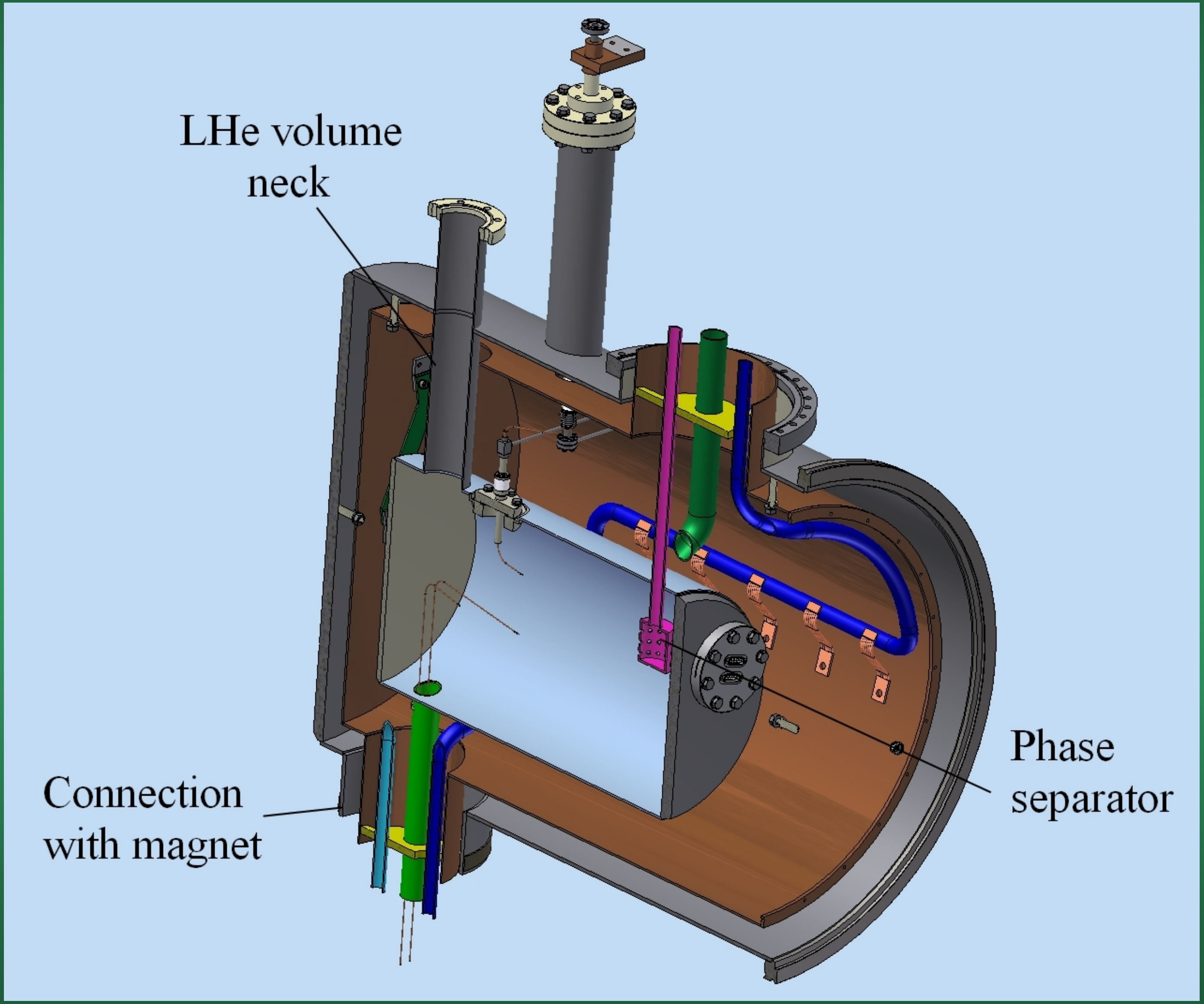
View of the cryostat



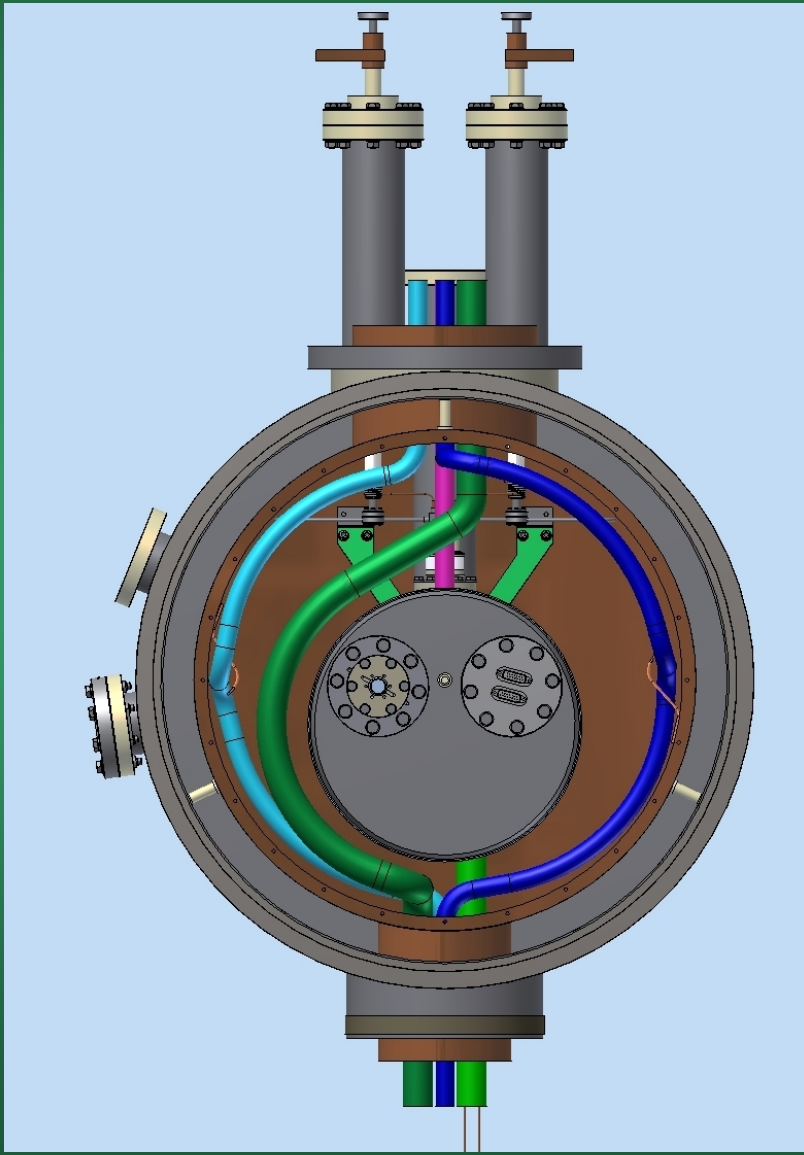
The cryostat is placed by the top side of the detector.

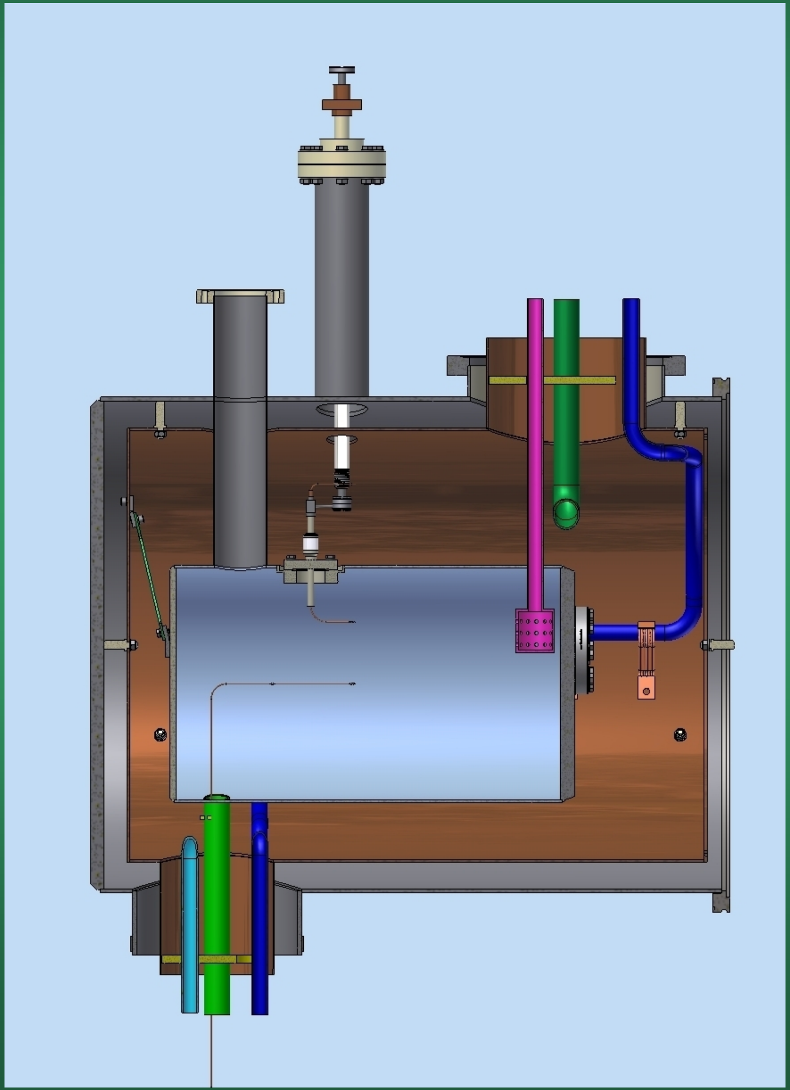


Cryostat view 2



Cryostat view 3





Heat loads on the cryostat

Table 3 Heat loads on 4.5 K helium from both coils and the cryostat

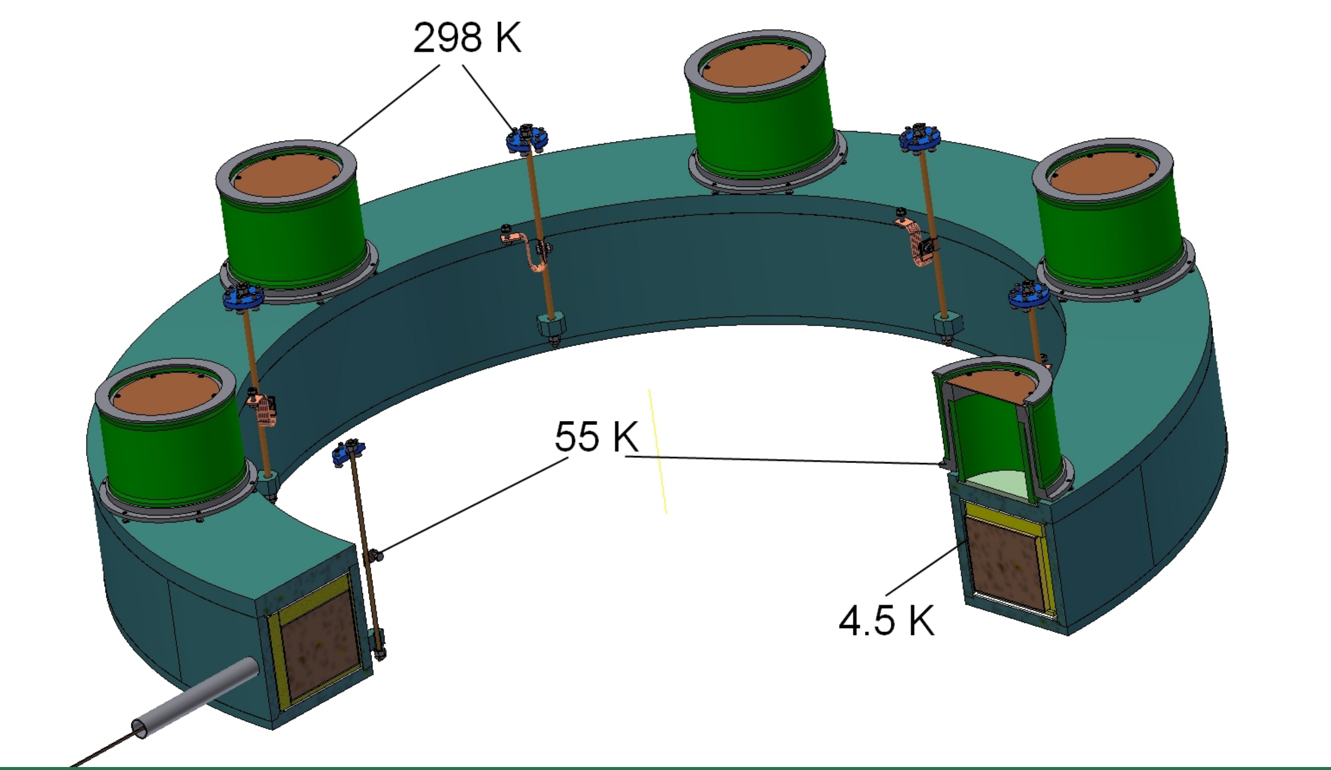
Heat load from	**Values**
Thermal radiation on the LHe case, W	0.12
Support struts, W	13
Tie rods, W	0.05
Soldering connection of the cable (at least 6 short splices), W	0.12
Thermal radiation on the cryostat, W	0.015
Cryostat suspension, W	<0.1
Current leads, W	0.5
Measurements wires, W	<0.1
Heat bridges of the cryostat neck and others connections, W	<0.1
Total, W	***~ 14.1***

Table 4 Heat loads on 50 K helium from both coils and the cryostat

Heat load from	**Values**
Thermal radiation on the shields from the vacuum vessel, W	10
Support struts, W	38
Tie rods, W	0.5
Thermal radiation on the cryostat shield, W	1.5
Cryostat suspension, W	2
Current leads, W	50*
Measurements wires, W	0.5
Heat bridges of the cryostat neck and others connections, W	1
Total, W	~ 104

*) It will be corrected after detailed design of the current leads

Heat loads from supports



Hot spot by the support struts

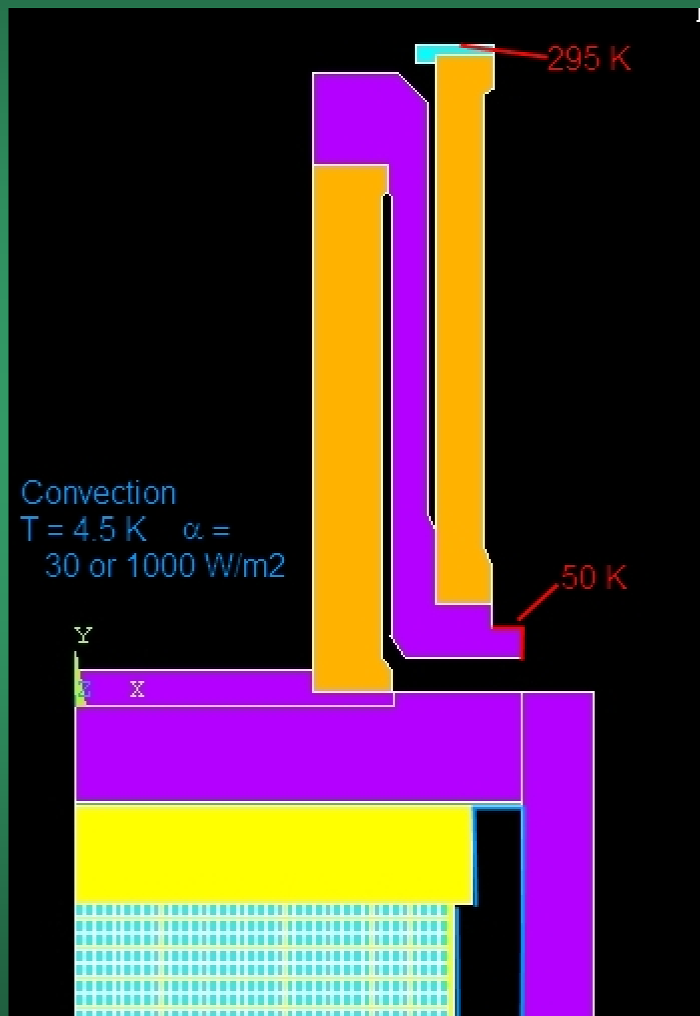
Materials:

St steel 304

Copper

G-10

Insulation



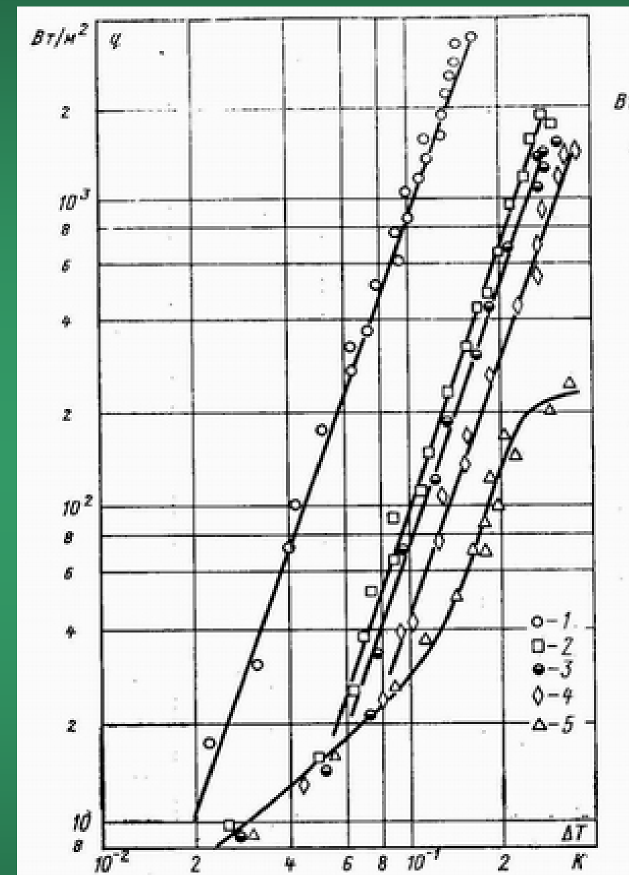
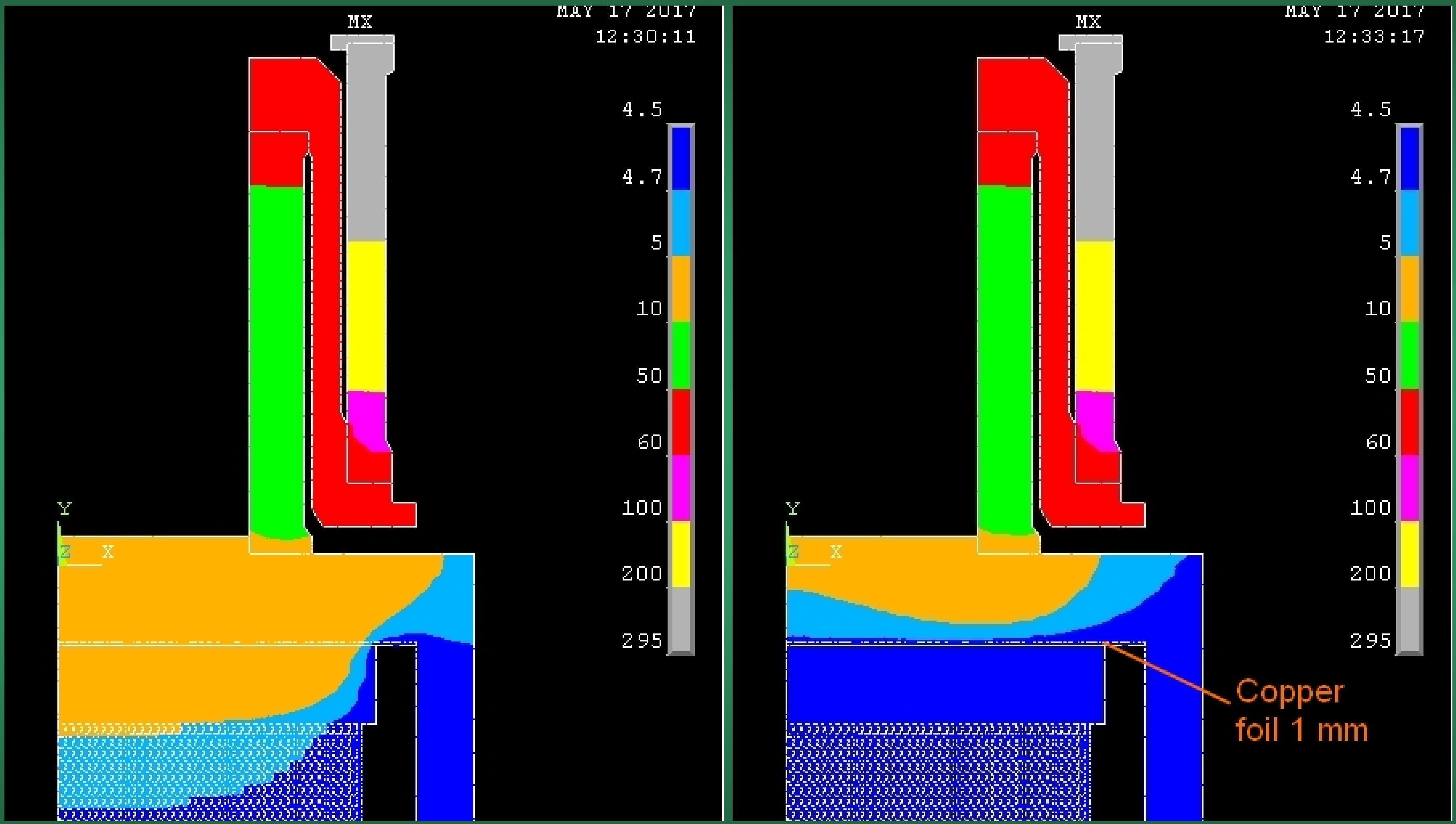


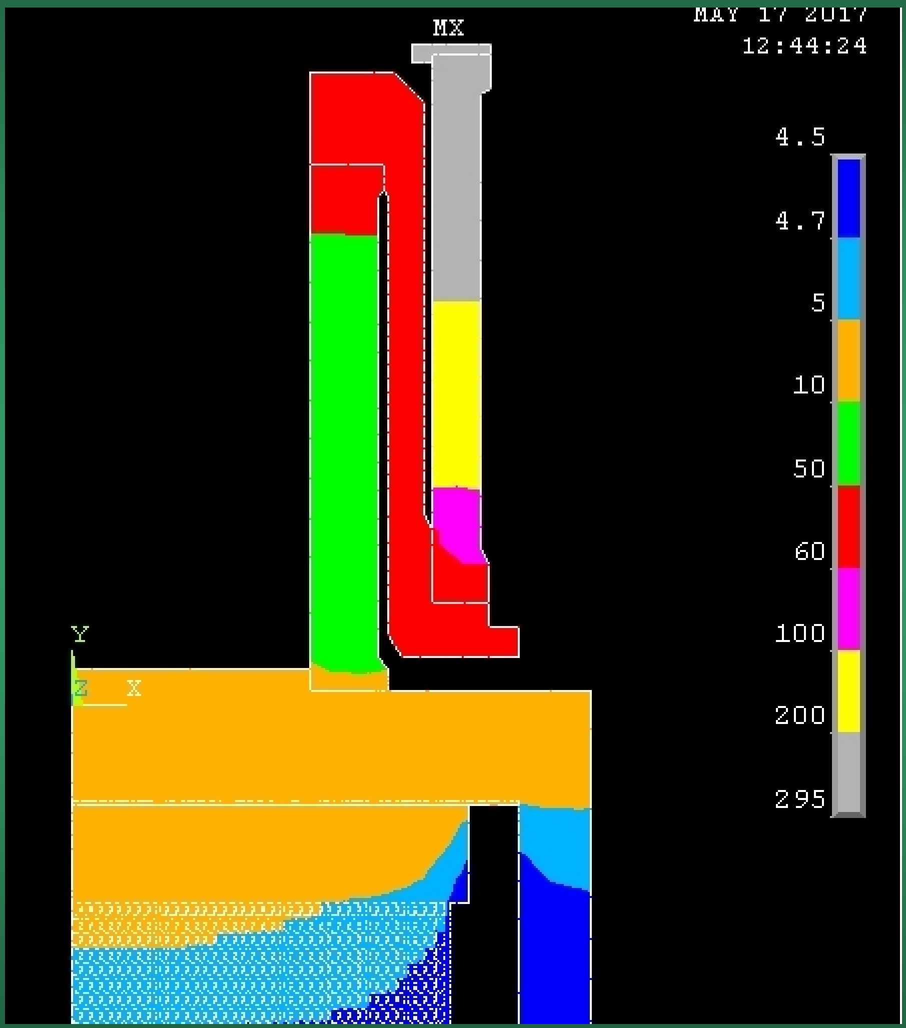
Рис. 1-26. Влияние теплофизических свойств материала поверхности нагрева на интенсивность теплоотдачи при пузырьковом кипении гелия в большом объеме (торец стержня $d=8$ мм, $R_z=5\div10$ мкм, горизонтальная ориентация, $p=1\cdot10^5$ Па, теплофизические свойства металлов см. в табл. 1-4).

Данные авторов: 1 — медь; 2 — бронза; 3 — никель; 4 — латунь; 5 — нержавеющая сталь.

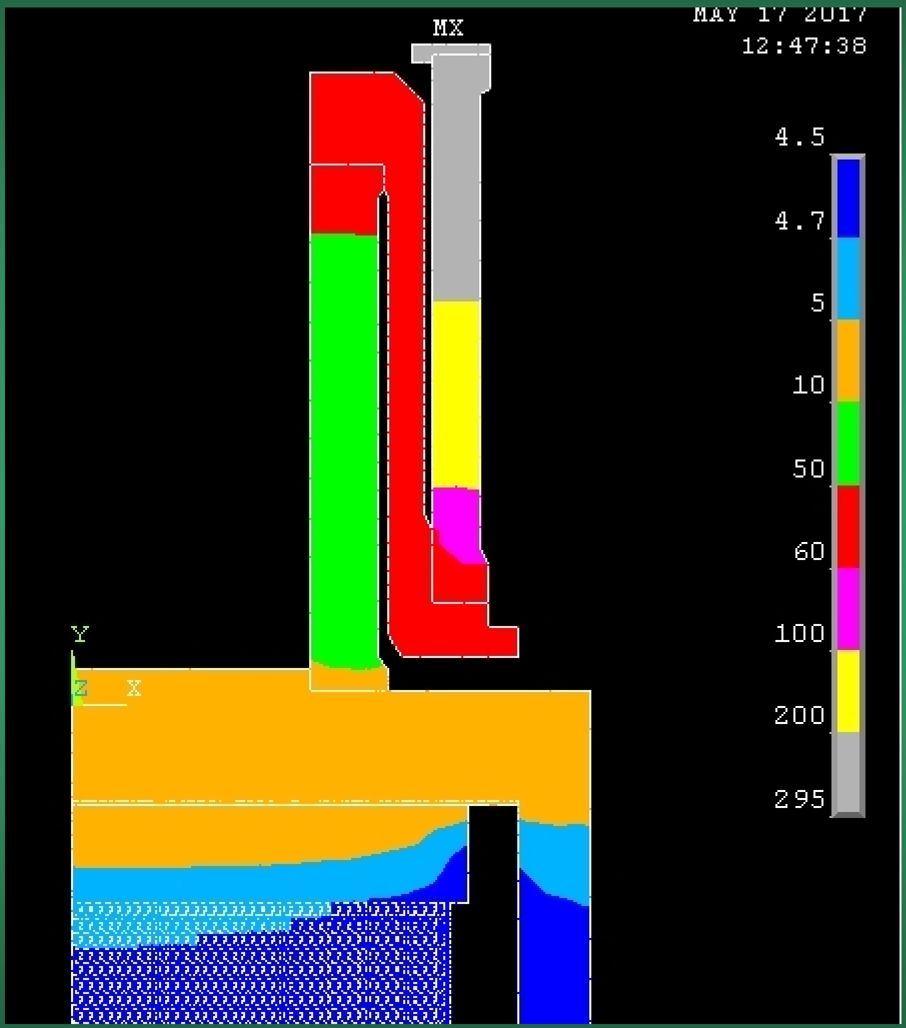
Temperature distribution at 1000 W/m^2



Temperature distribution at 30 W/m^2



Without copper foil



With copper foil, 1 mm thickness

Conclusions

- The design of the cryostat is presented
- The heat loads satisfy the specifications
- Copper foils are important in the coils for heat transfer
- The design of the G-10 spacers in the coils will be changed to exclude gas pockets