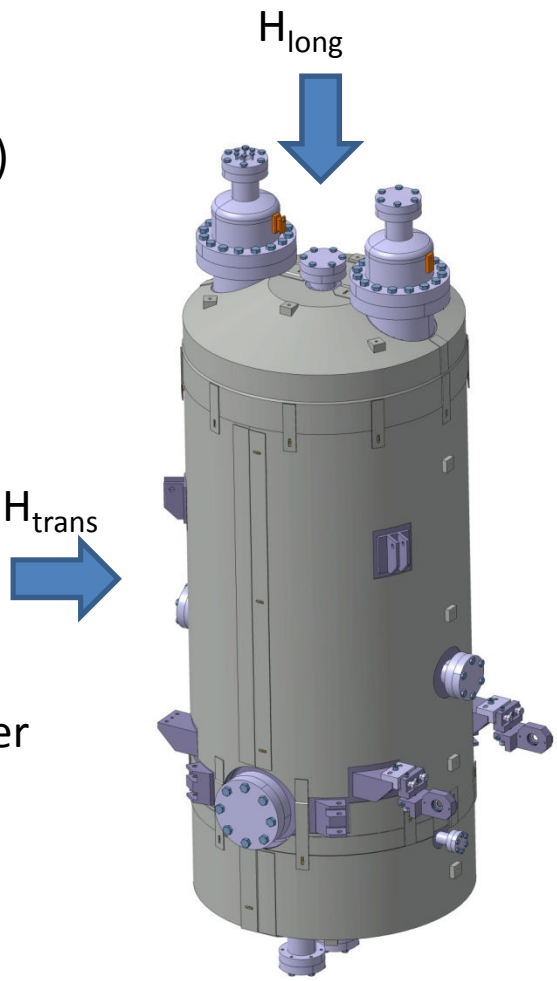
Magnetic shield for SPIRAL2

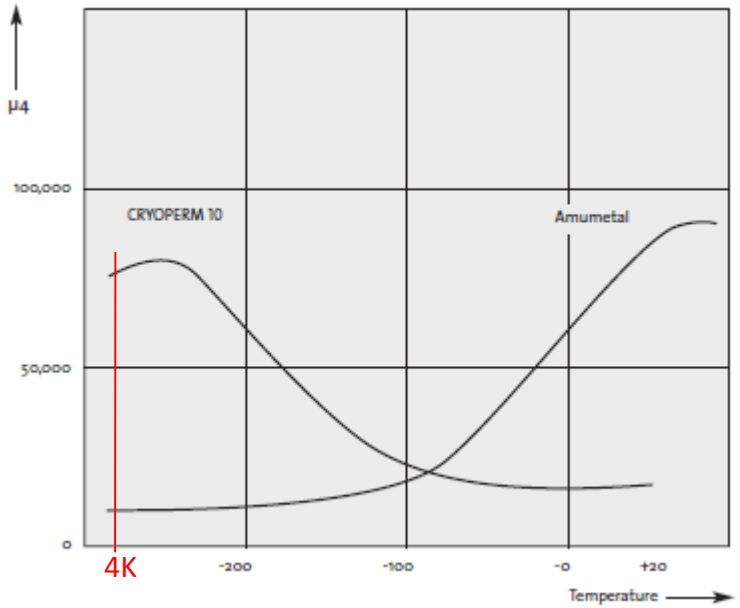
- Sensitivity: 0.1-0.2 nOhm/mG
- Goal: Hresidual<20 mG (Rbcs~2.5 nOhm @4K and 88MHz)
- Typical values for Earth's magnetic fields
  - H_{long}= 430 mG
  - H_{trans}= 200 mG
- Formula (single-layer)
  - S_{trans}= 1+μ.e/2R; e=thickness, R=shield radius
  - S_{long} proportionnal but < to S_{trans}

  ⇒Easier to shield horizontal cavities like elliptical rather than vertical ones



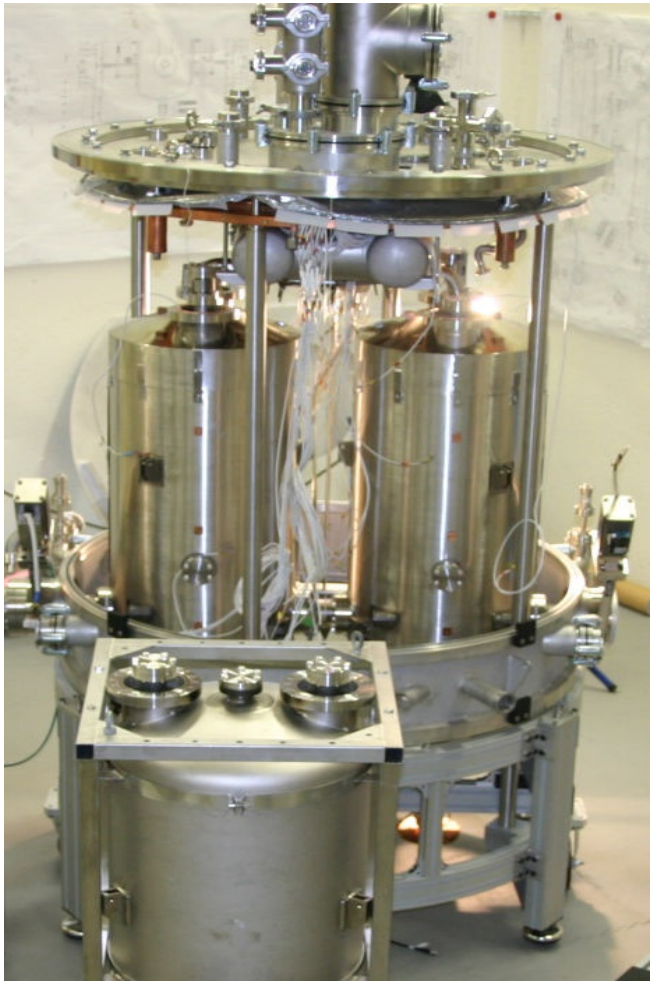
- Magnetic shield for 4K application ⇒ Cryoperm

- Guarantied values from suppliers
  - μ=12000 (SEKELS)
  - μ=16250 (AMUNEAL)

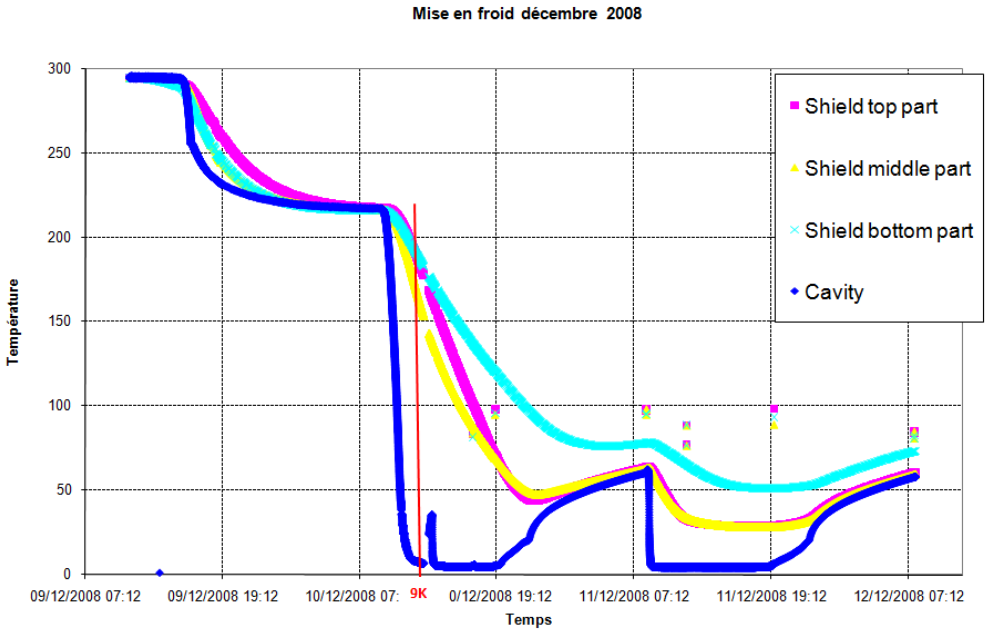


	Single layer	Dual layer
e (mm)	1.5	1
S_{trans}	58 (58)	145 (143)
S_{long}	22.5 (28)	42 (60)
Hresidual (mG)	19.5 (15.8)	10.4 (7.3)

Cool down

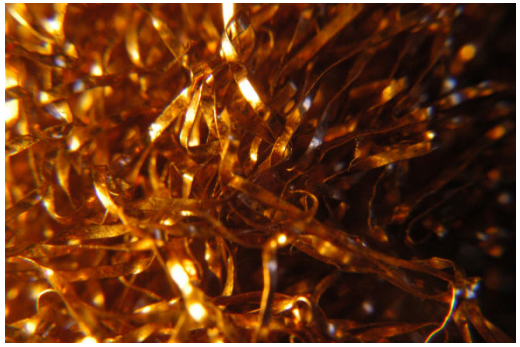


- 1.5 mm thick Cryoperm, single layer
- In contact with He vessel: cool down by conduction + copper braids

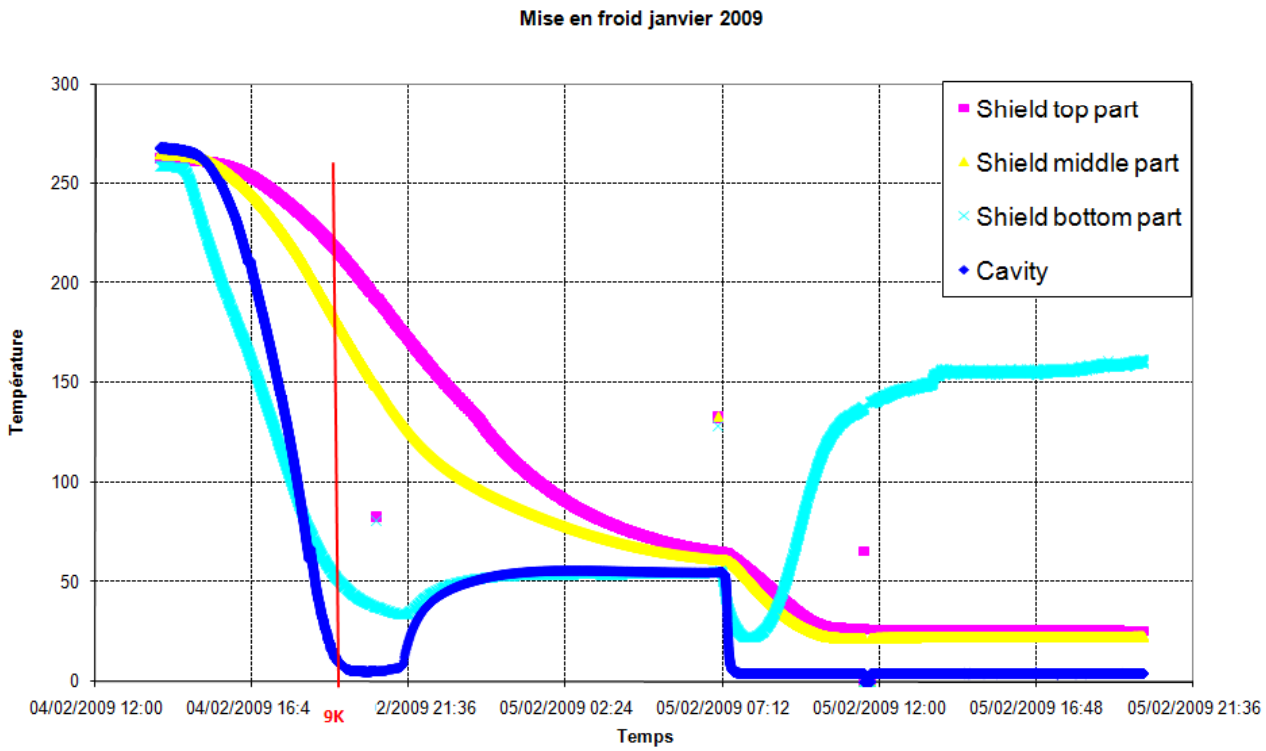


- Bad thermalization: magnetic shield temperature still > 150K when Tcavity is < 9K

Cool down



- New cool down with copper wool between the magnetic shield and the He vessel on the bottom of the shield only → better thermalization
- Bottom part @50K but top and middle parts are still > 150K



New design

• Dual-layer in Cryoperm (1mm)

• Pre-cooling: SS tubing between the two layers (welded on the inner shield)
• Outer shield screwed on copper spacers

• Expected Hresidual divided by 2 as compared to single-layer option

• Main concern: cavity could stays for hours (how many?) between 150K and 50K while the shield temperature is getting down to 4K