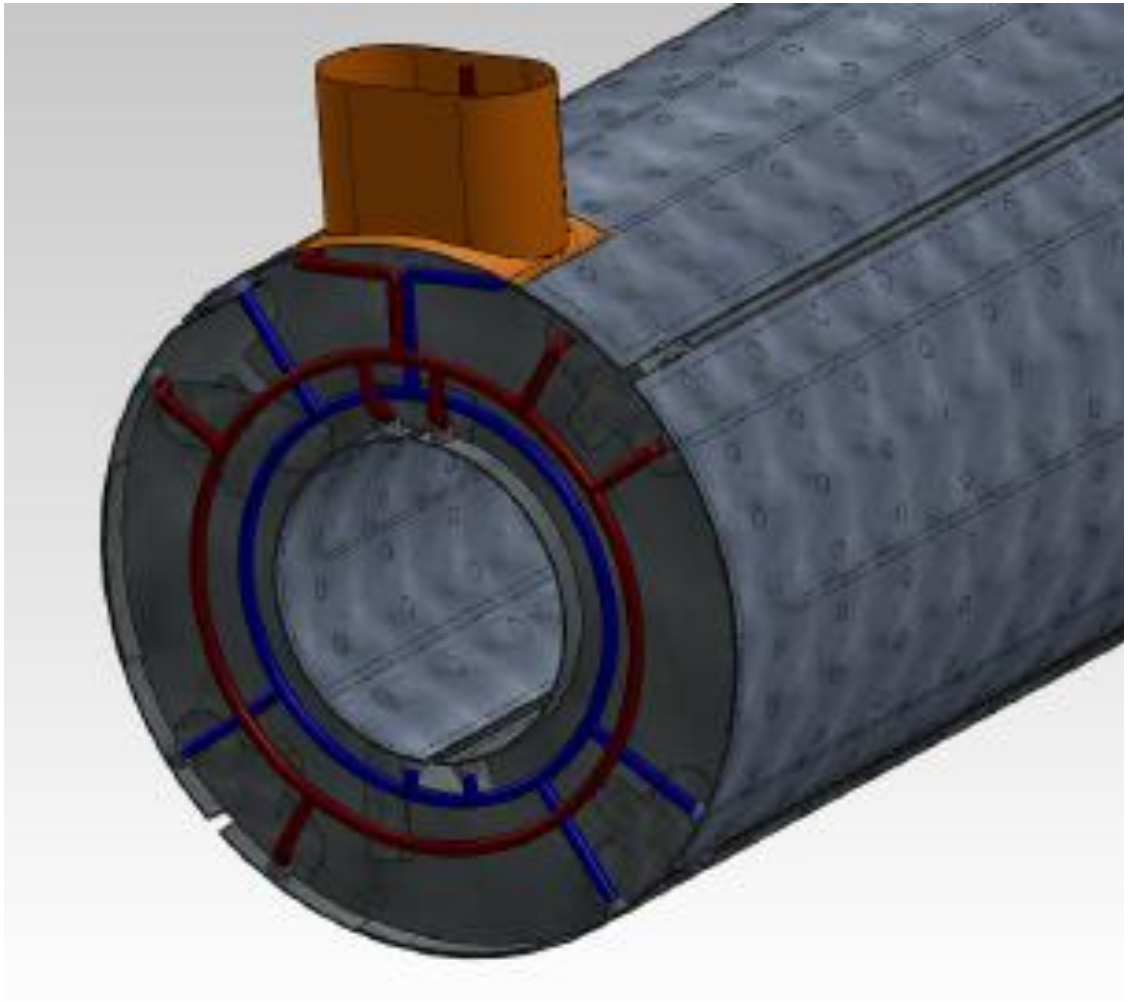
Intermediate Design Review
8 - 9 November 2011
Sigmaphi, Vannes

Radiation Screen

Radiation Screen



Blue Helium feed

Red Helium return

2 panels on the inner screen

4 panels for the outer screen

End pieces - conduction cooled

Rotate the panels:

- Entry at the low point
- Exit at the high point

Uniform Heat Flux Conduction Cooled End Pieces

$$\Delta T = \frac{q \cdot L^2}{8 \cdot t \cdot k}$$

ΔT	Temperature rise
q	Heat flux
L	Length between cooled edges
t	Material thickness
k	Material thermal conductivity

$$\Delta T = \frac{q \times 0.3975^2\ m^2}{8 \times 0.005\,m \times 8.12\ W/m.K}$$

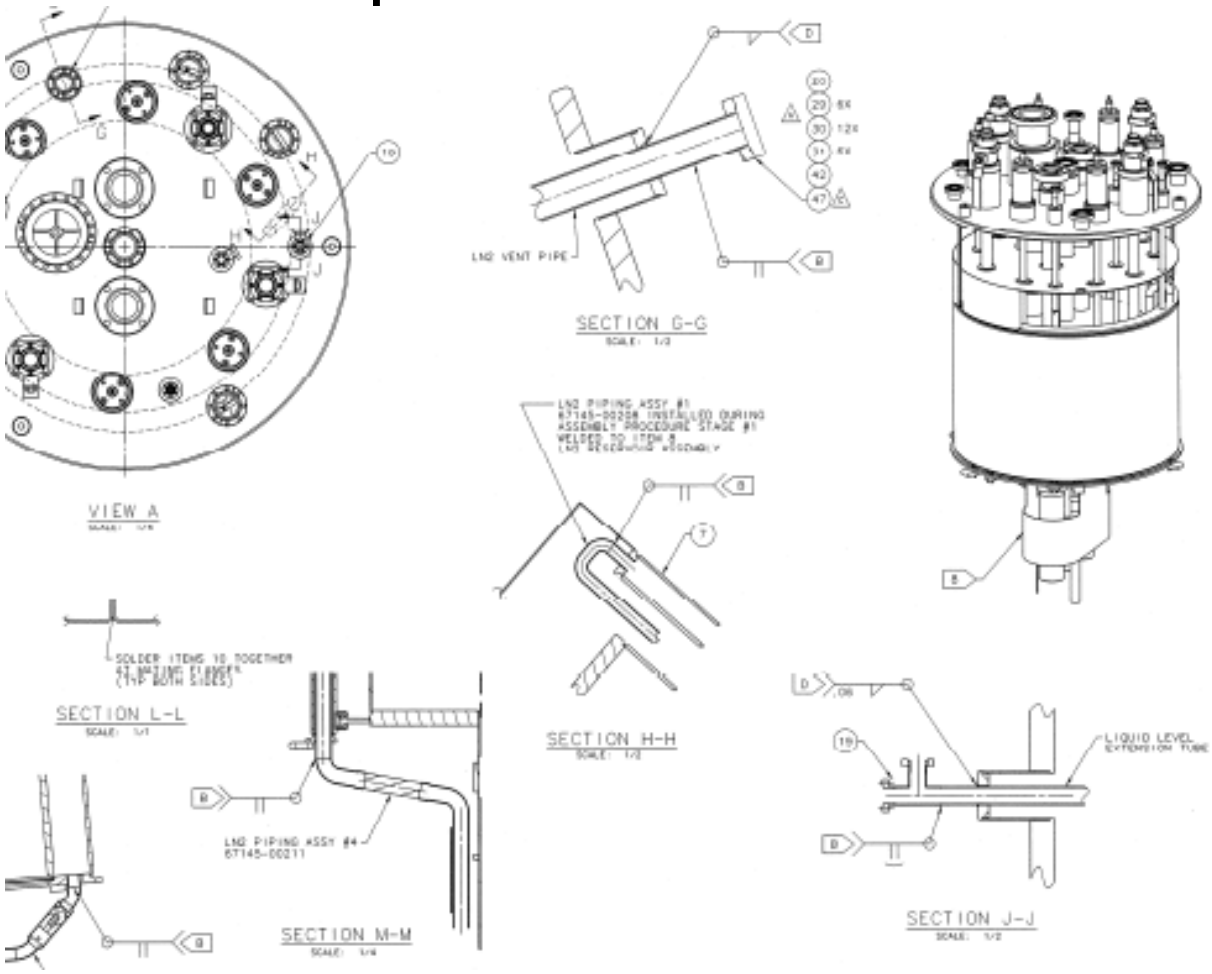
q = 3.0 W / m²	ΔT = 1.5 K
q = 1.2 W / m²	ΔT = 0.6 K
q = 0.8 W / m²	ΔT = 0.4 K

Edge connections

Point heat loads

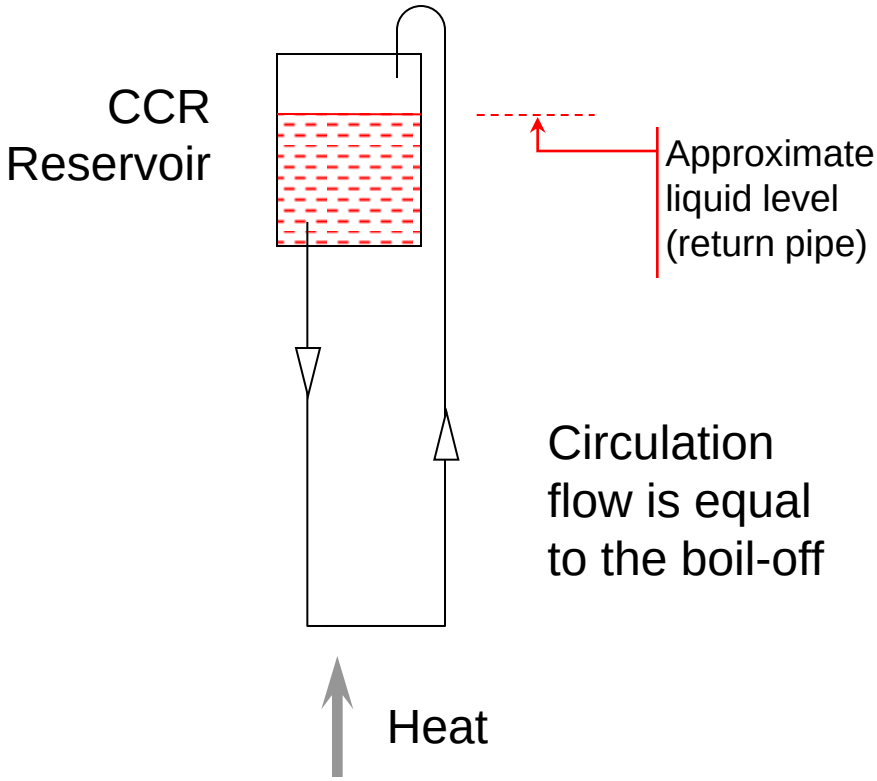
Radiation Screen

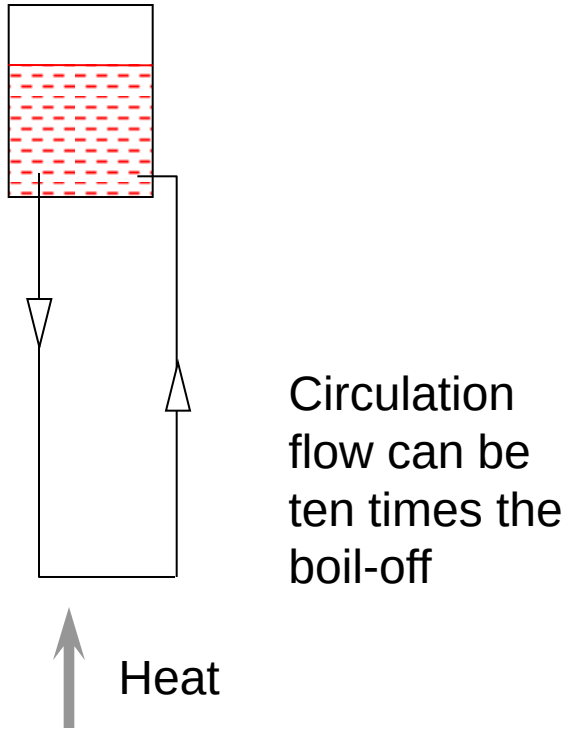
Flow and Return Pipes in the CCR



Radiation Screen

Thermosyphon



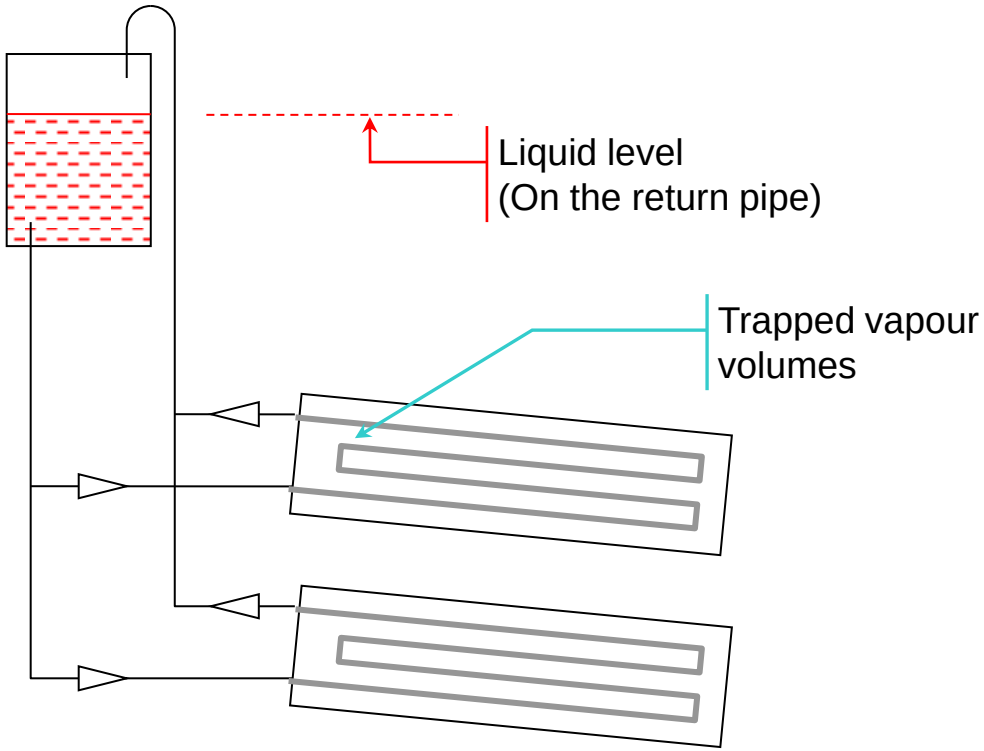


Radiation Screen

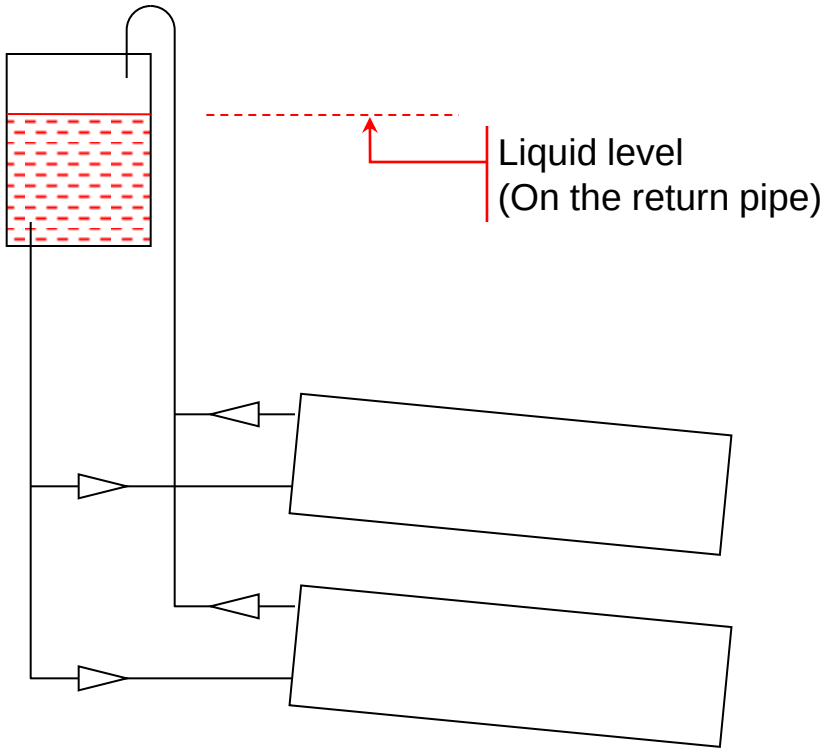
Mueller panels - Provisional specification

- 16 gauge / 16 gauge
- Inflated to give a 2 mm gap
- Material 316 L
- Material finish 2B
- Design pressure 200 psi G
- 6 passes

Flow Configuration



Flow Configuration



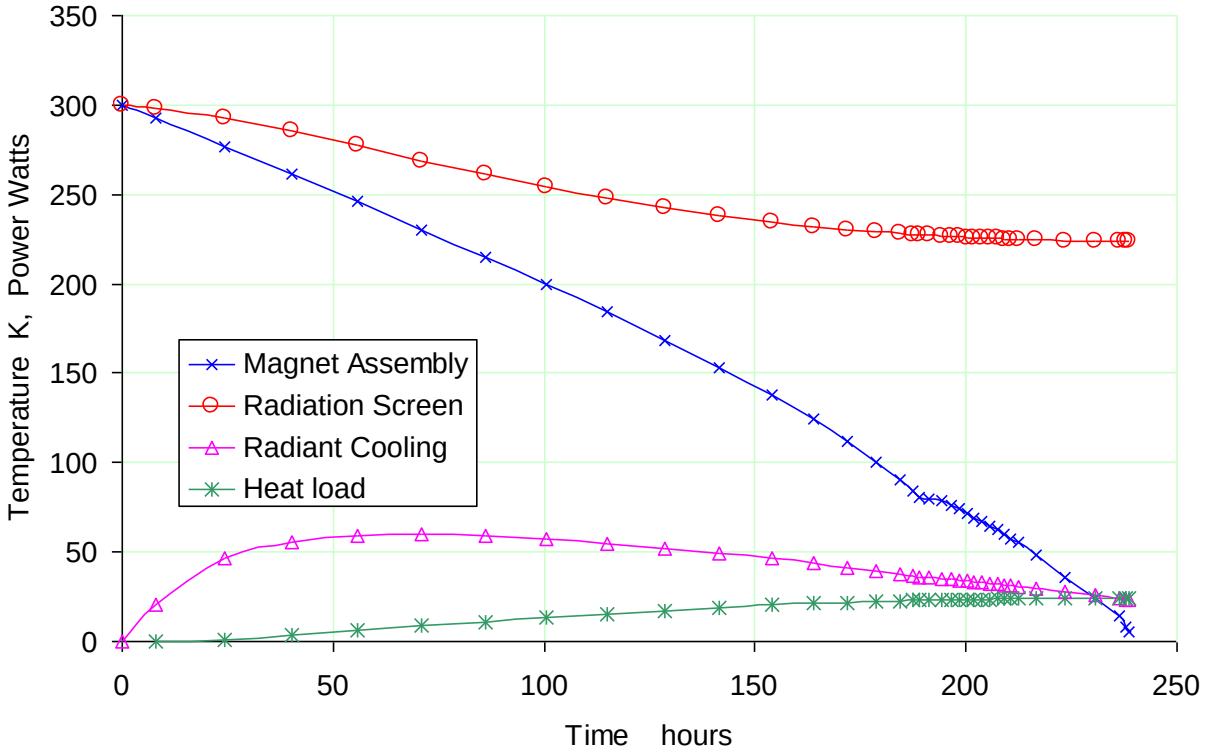
Radiation Screen

Cooldown

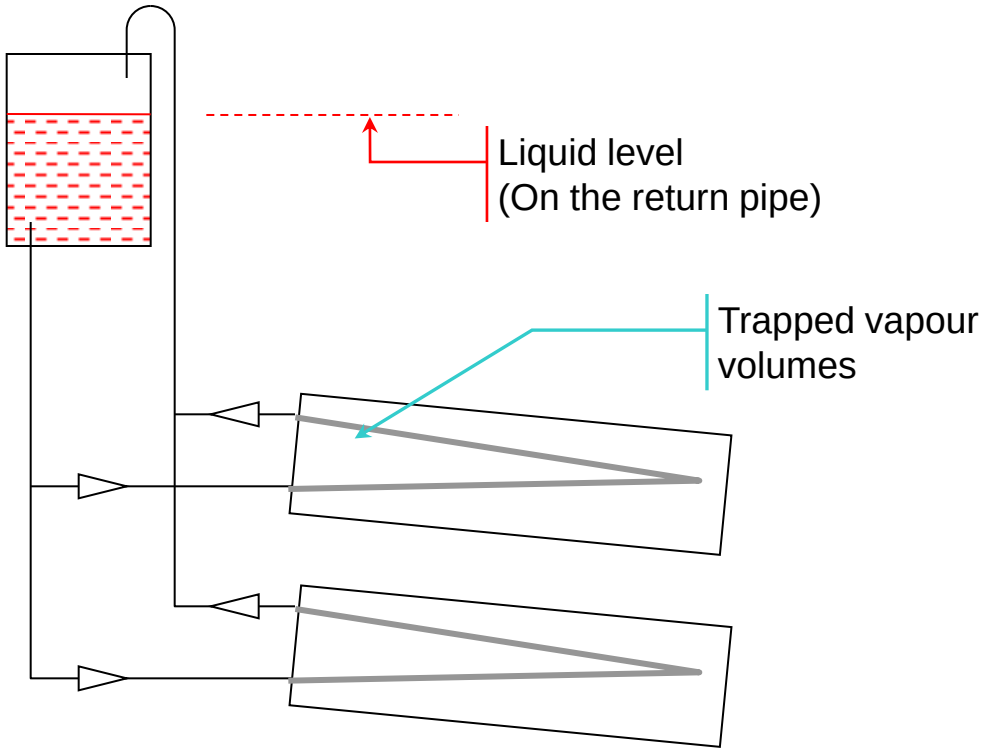
- Cooldown power
  Approximately 90W cooling for 200 hours

- Conduction cooling is not effective
  - Worst case: liquid nitrogen cooling at inlet edge
  - Temperature gradient 50 K
  - Conduction cooling of 3 W

Radiation Cooling

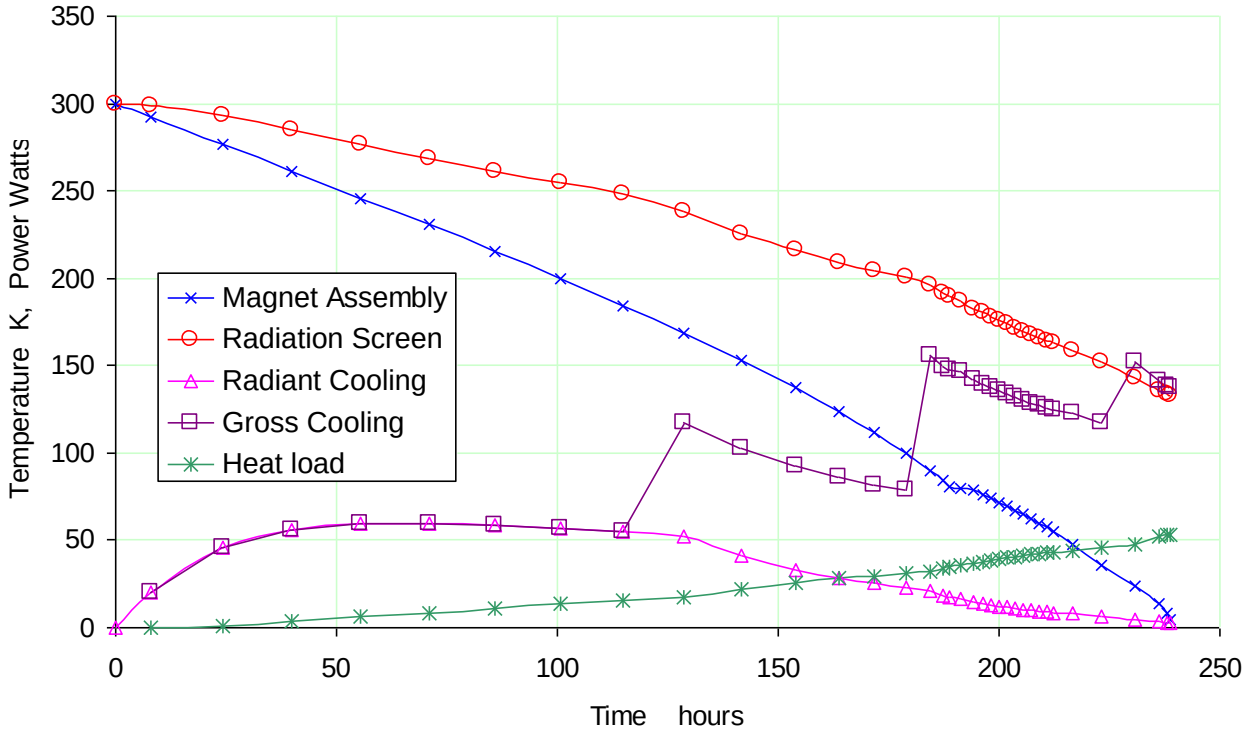


Flow Configuration



Radiation Screen

Combined Radiation and LN_2 Cooldown



Radiation Screen

- Provisional design with Mueller panels
- Liquid entry at the low point
  Gas exit at the high point
- Simple inclined flow path
- Thermal isolation on the feed pipe
  Chimney cooled on the return pipe
- Cooldown: Radiation cooling with LN2 cooling
- Temperature sensors on every panel