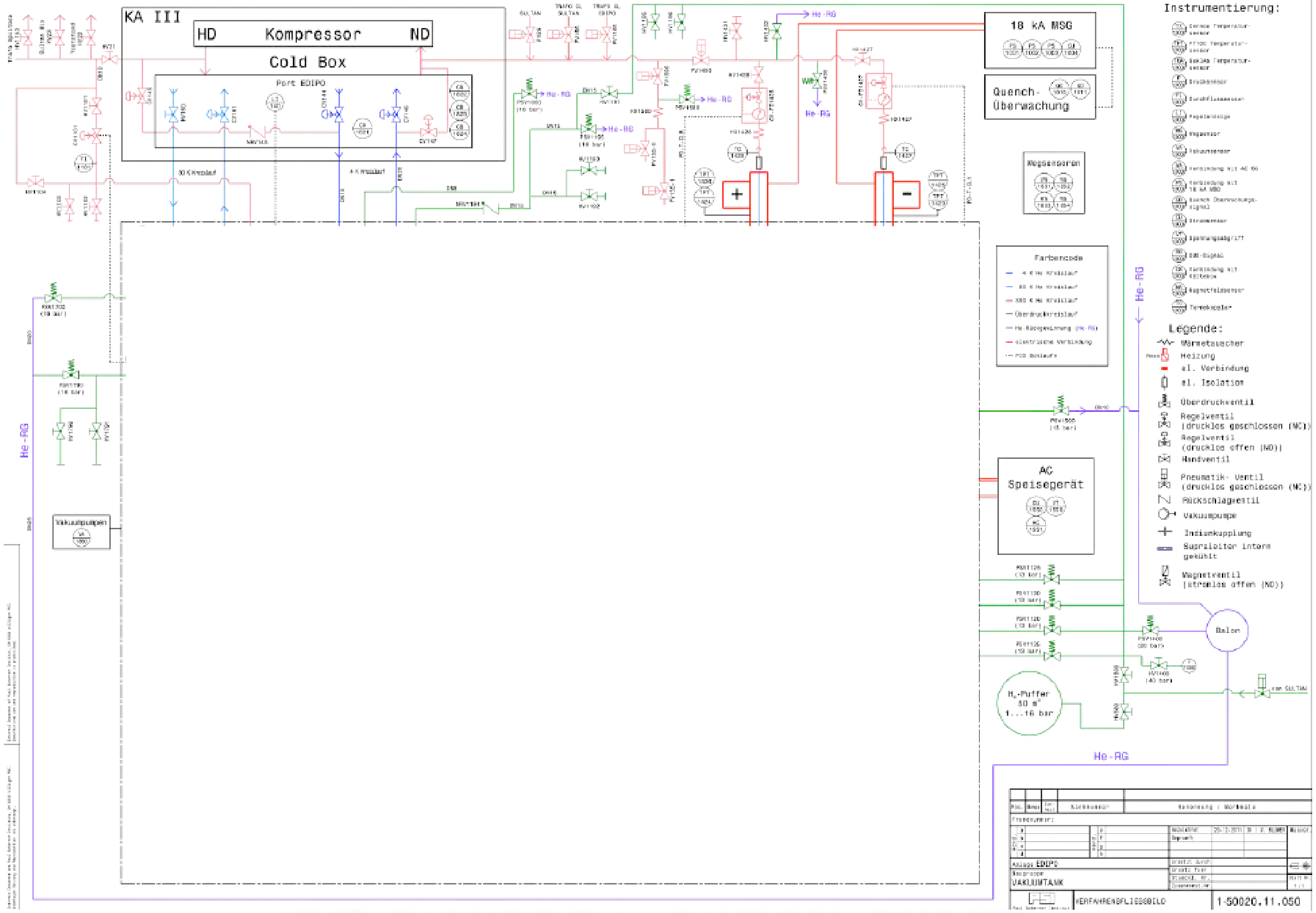
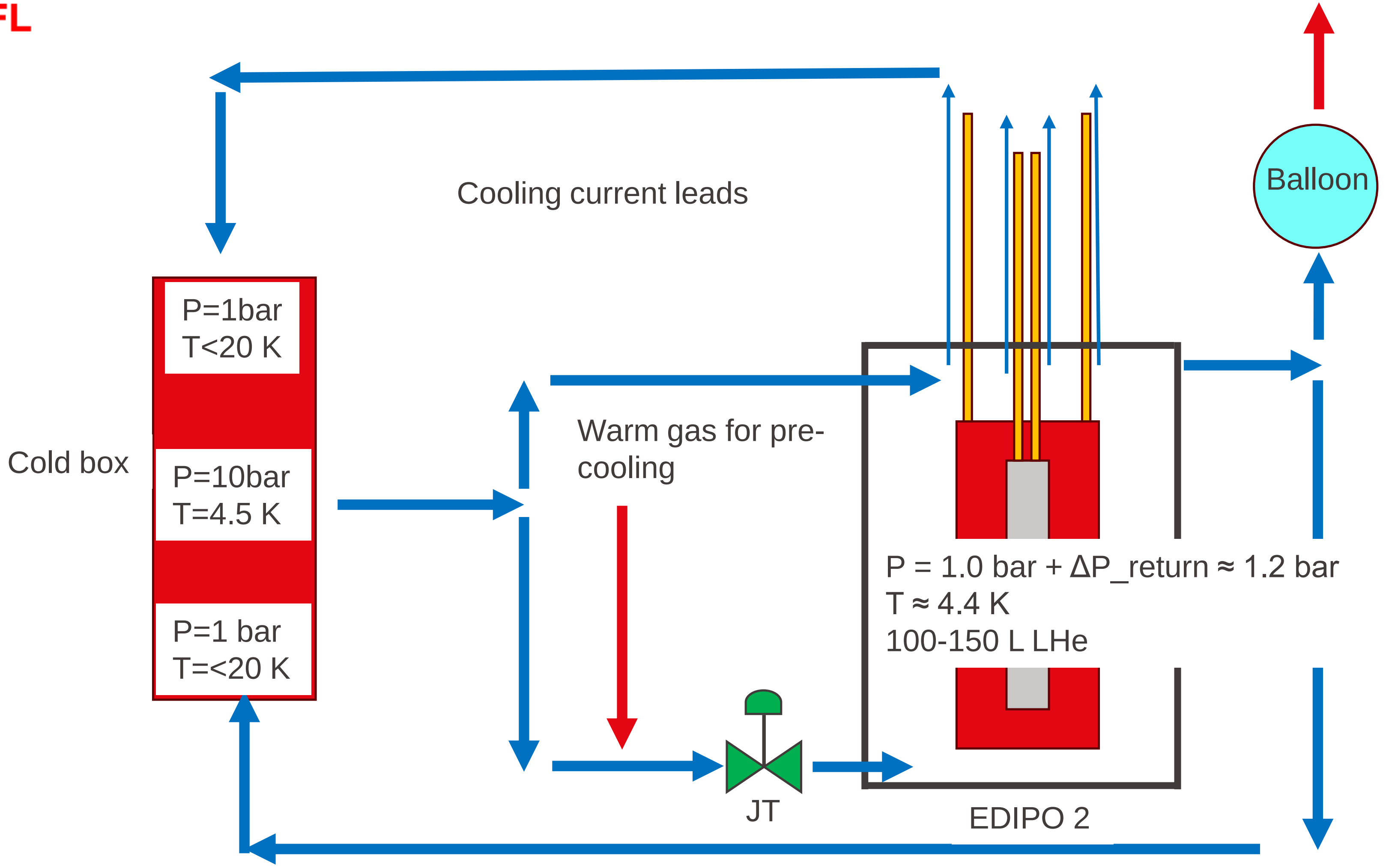
Cryoscheme



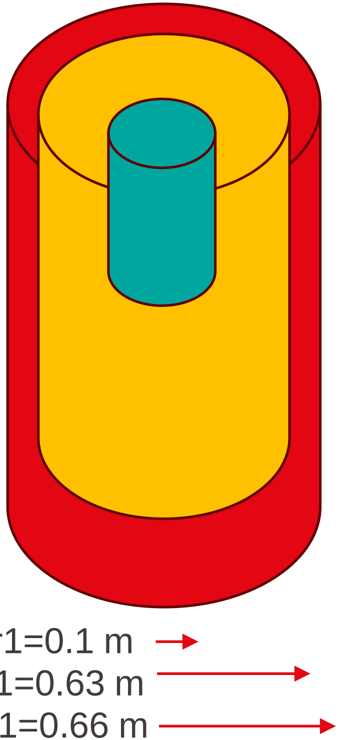
Speaker


Cooling current leads
Balloon
P=1bar
T<20 K
Cold box
P=10bar
T=4.5 K
P=1 bar
T=<20 K
Warm gas for pre-
cooling
P = 1.0 bar + ΔP_return ≈ 1.2 bar
T ≈ 4.4 K
100-150 L LHe
JT
EDIPO 2

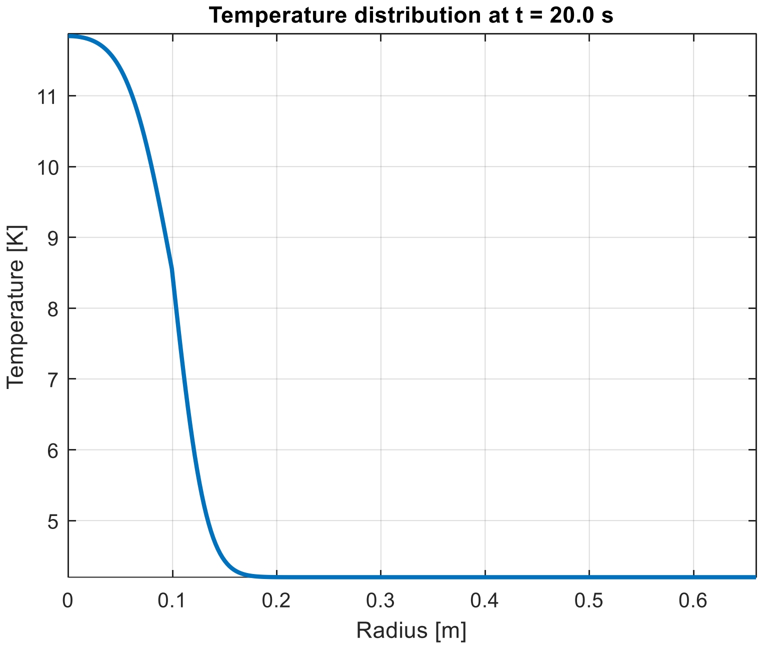
Little simulation for fun

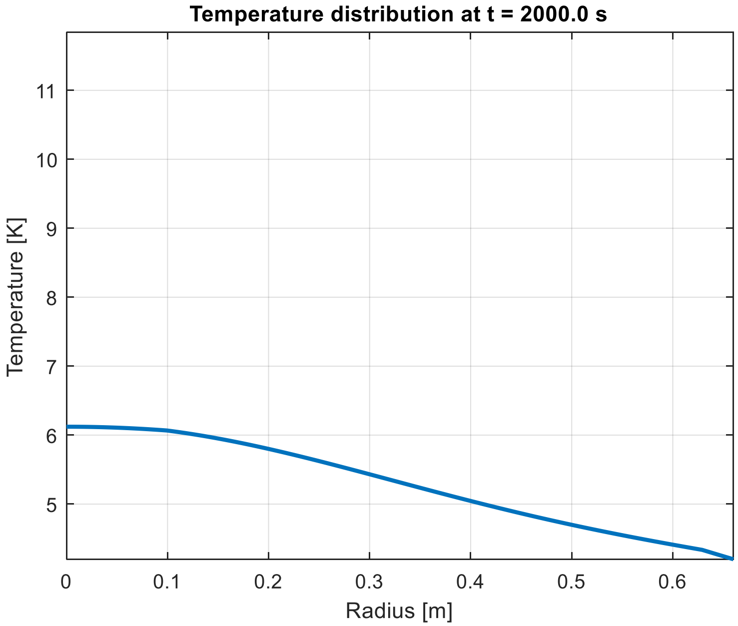
- Heat conduction in cylindrical geometry
- Three concentric cylinders, first Nb3Sn, Iron, Stainless steel
- 10% stored energy goes into Nb3Sn cylinder
  - E=22e5 J
- t=0 heating of Nb3Sn cylinder for 10 s
- Outside Boundary condition T=4.2 K
  - Heat can only escape through outside
  - (Infinitely good heat transfer to outside)
- PDE solved:

$$\rho(r)c_p(r)\frac{\partial T}{\partial t} = \frac{1}{r}\frac{\partial}{\partial r}\left(rk(r)\frac{\partial T}{\partial r}\right) + q(r,t)$$



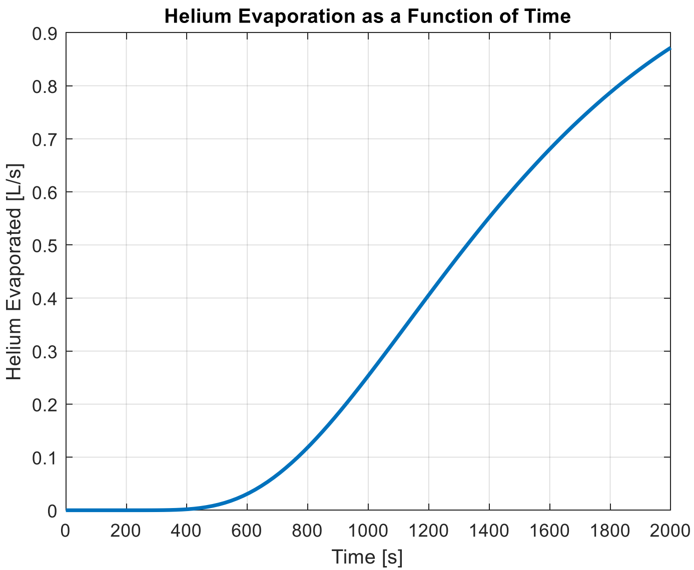
Time dependence

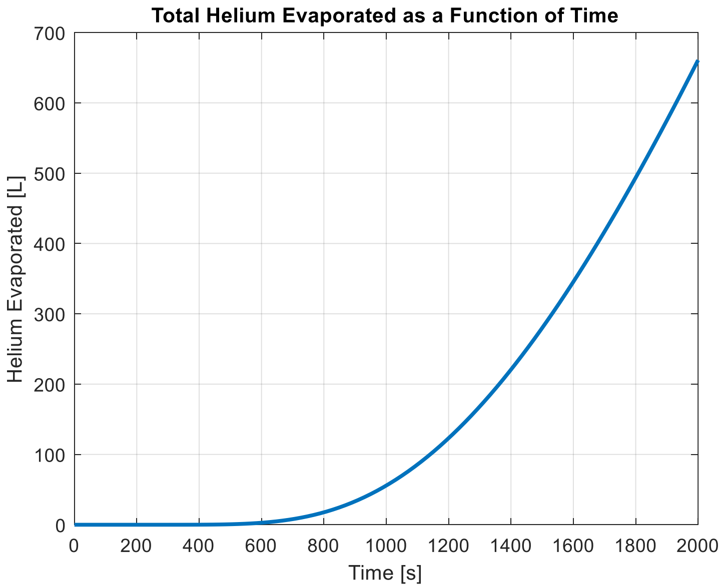




Helium evaporation

- Helium evaporation
- All helium will evaporate during quench





Using balloon for quench?

- During quench of magnet all liquid will evaporate
- 150 L LHe -> 113,550 L of GHe
- Example: NHMFL in Tallahassee uses multiple balloons of 80,000 L, so possible to store this volume
- Instead of one big balloon we can think of multiple smaller ones