

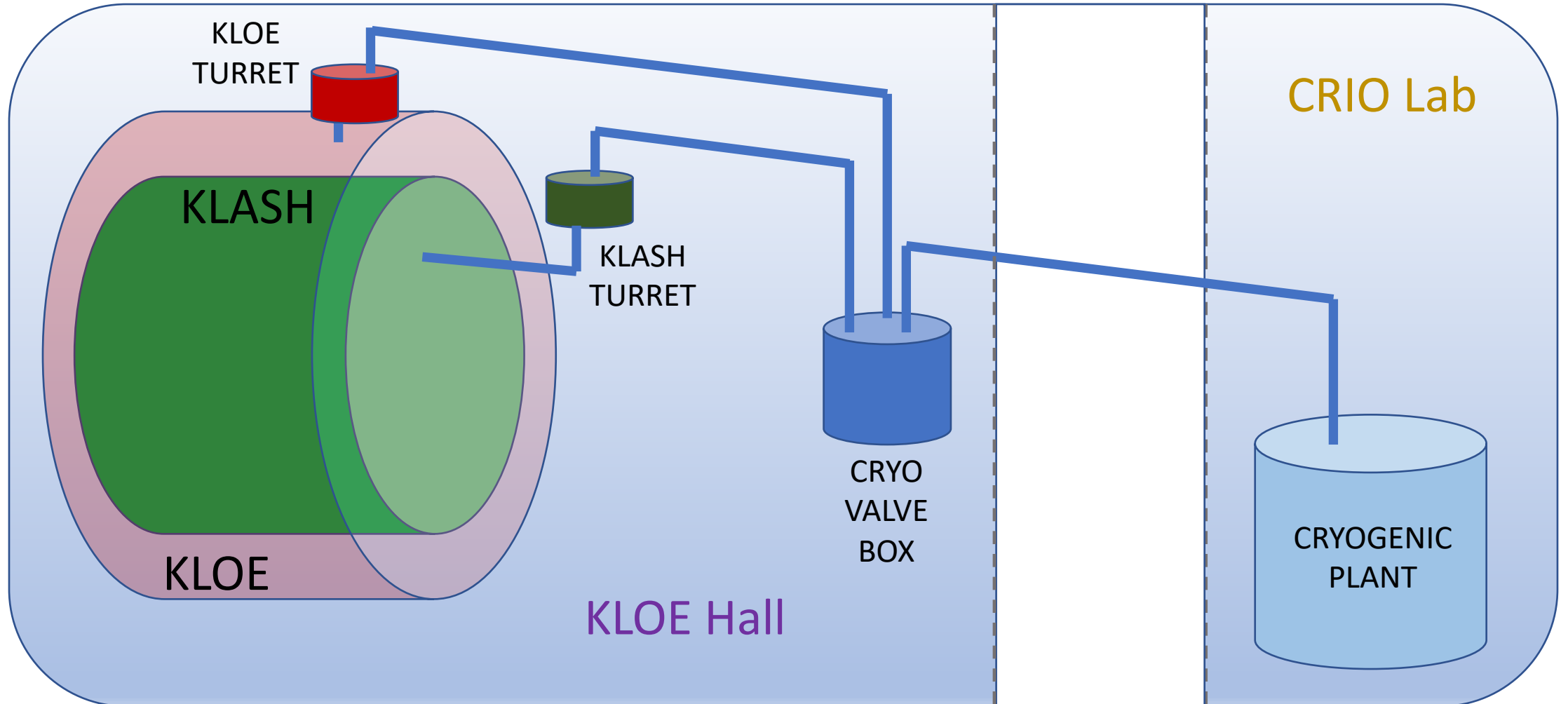
# KLASH

cryogenics

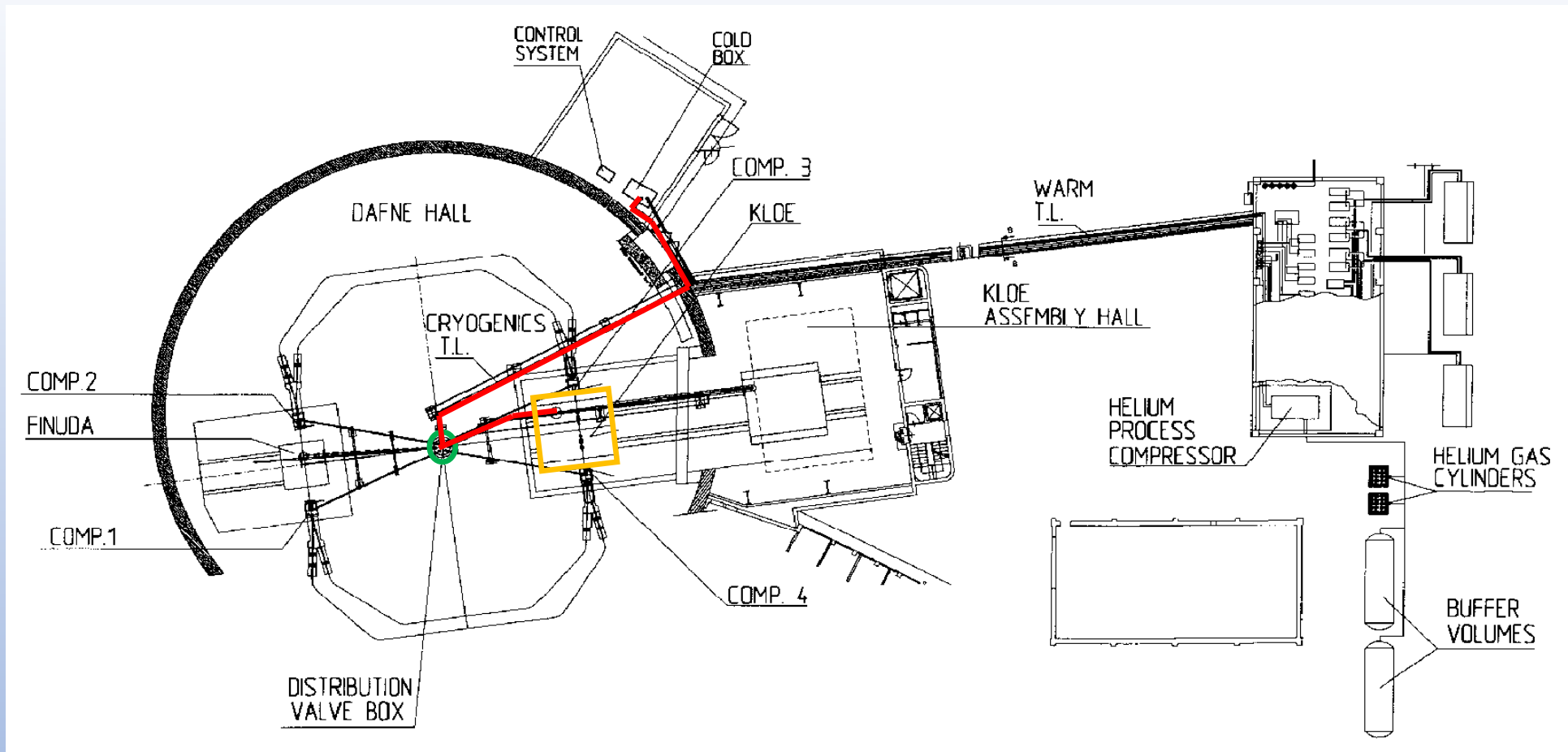
Carlo Ligi

INFN – 30/11/2018

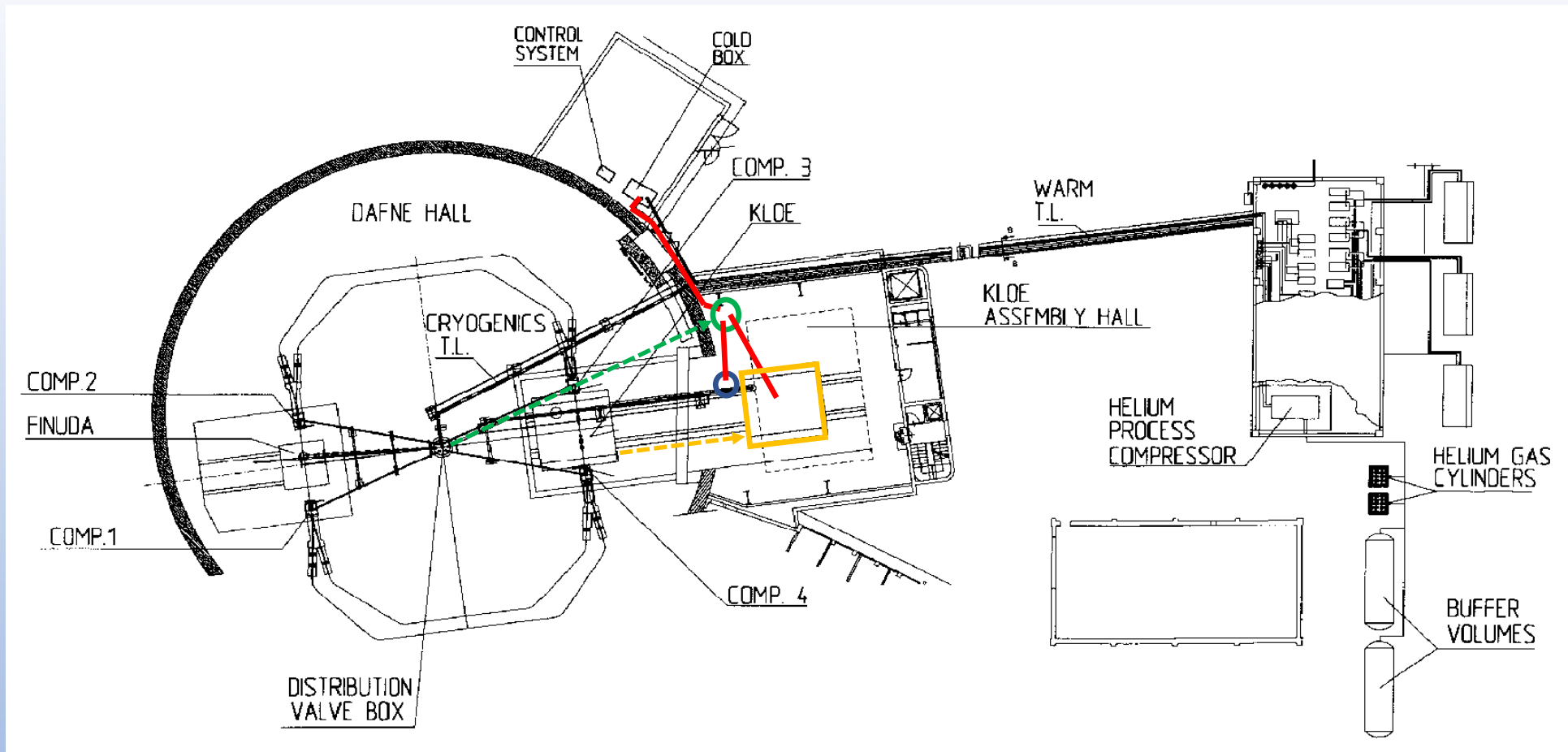
# KLASH cryogenics layout



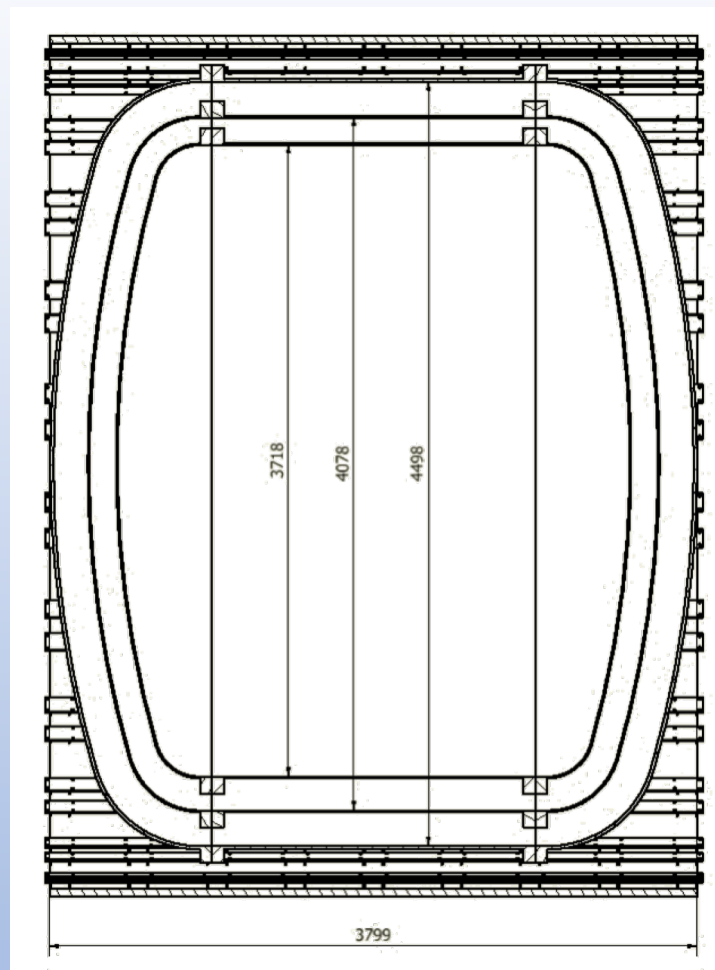
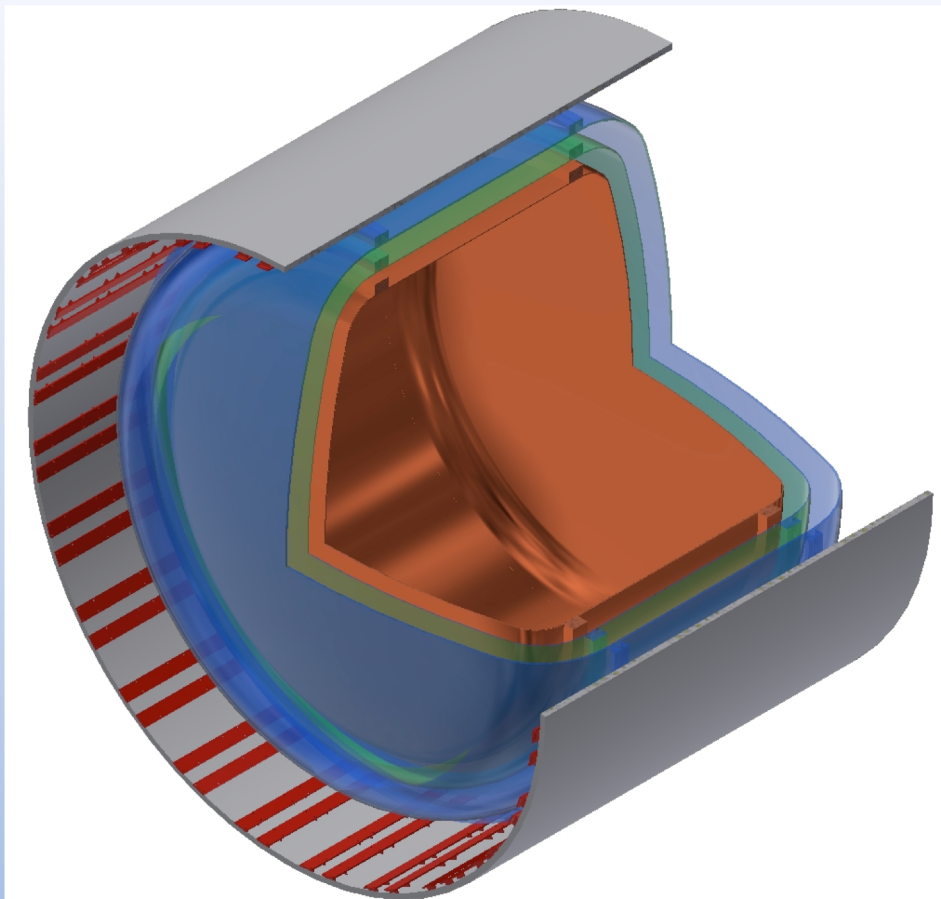
# KLASH cryogenics layout



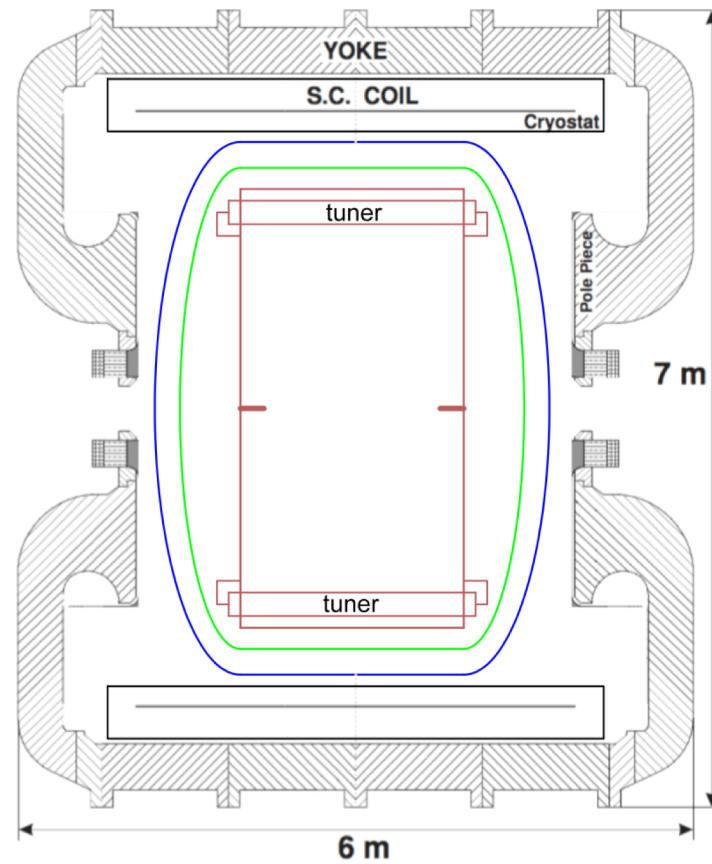
# KLASH cryogenics layout



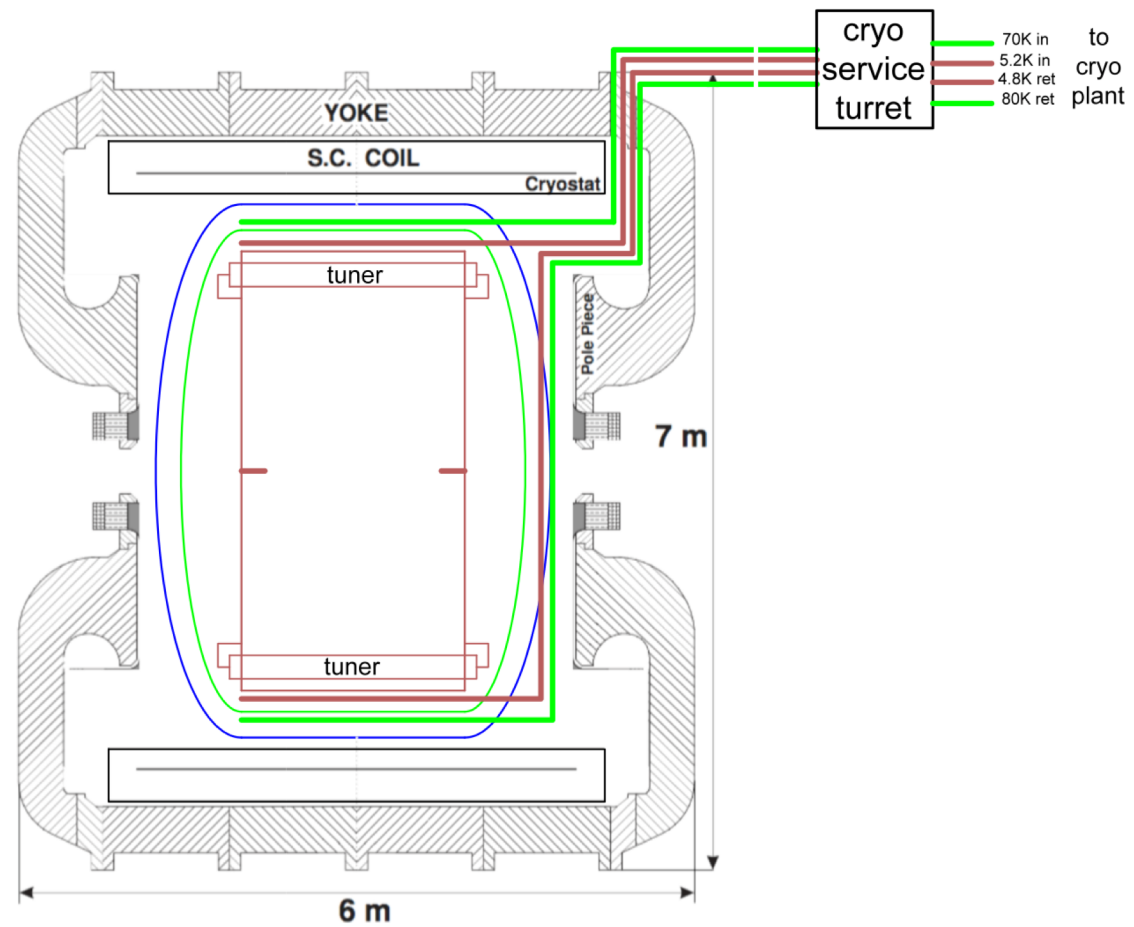
# KLASH cryostat



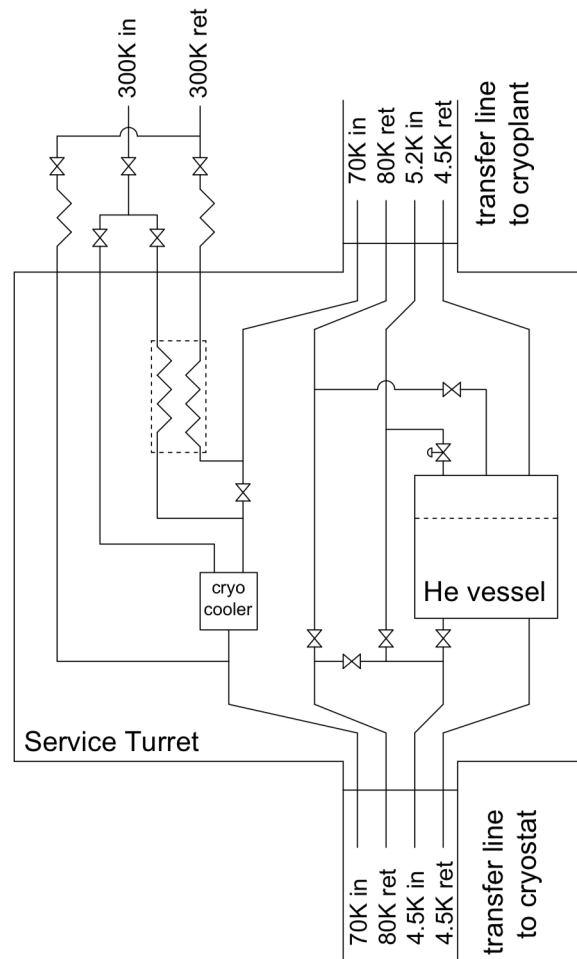
# KLASH cryostat



# KLASH cryostat

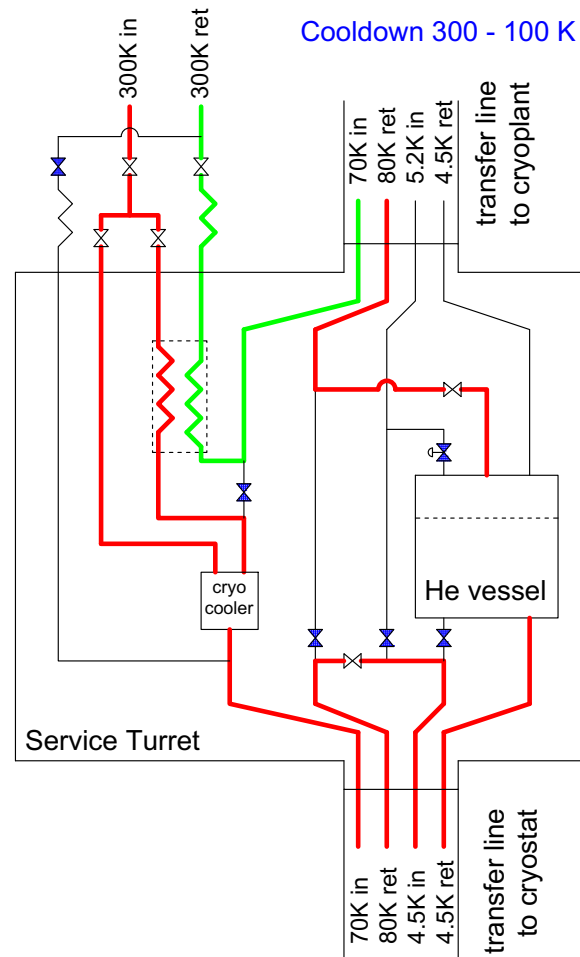


# KLASH service turret

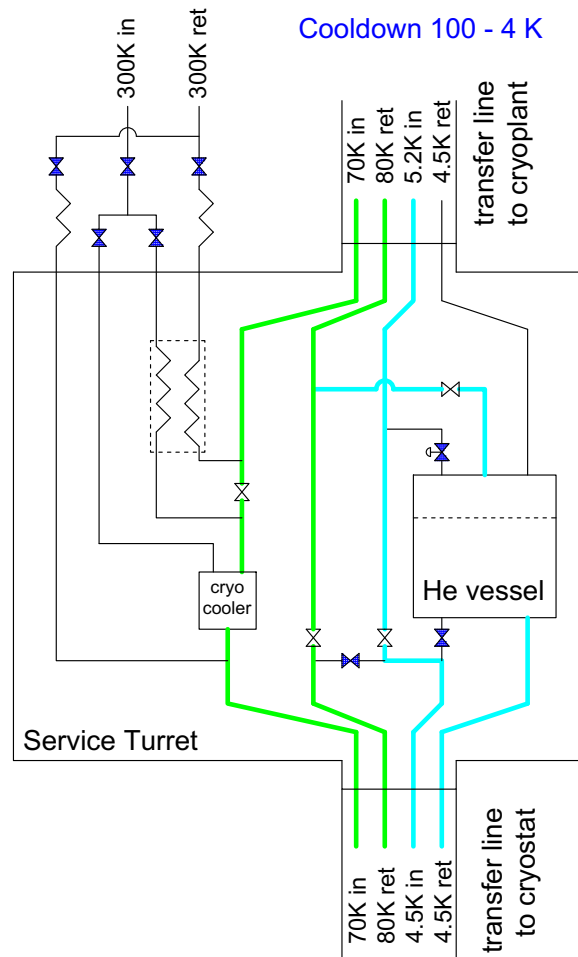




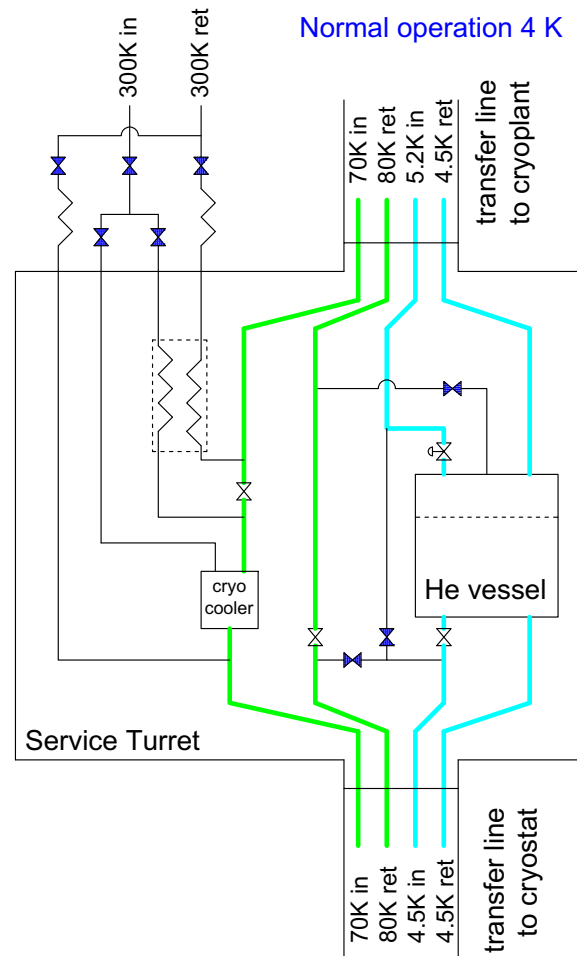
# KLASH service turret



# KLASH service turret



# KLASH service turret



# DAΦNE cryogenic plant

## LINDE TCF 50 liquid He liquefaction/refrigeration plant



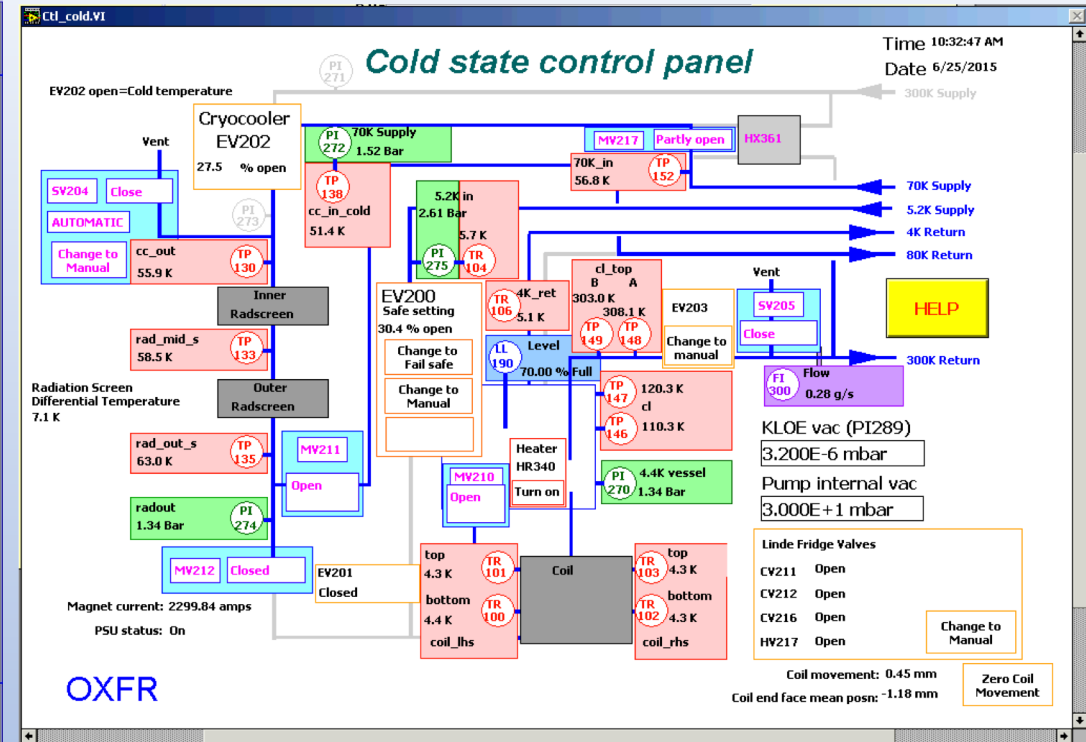
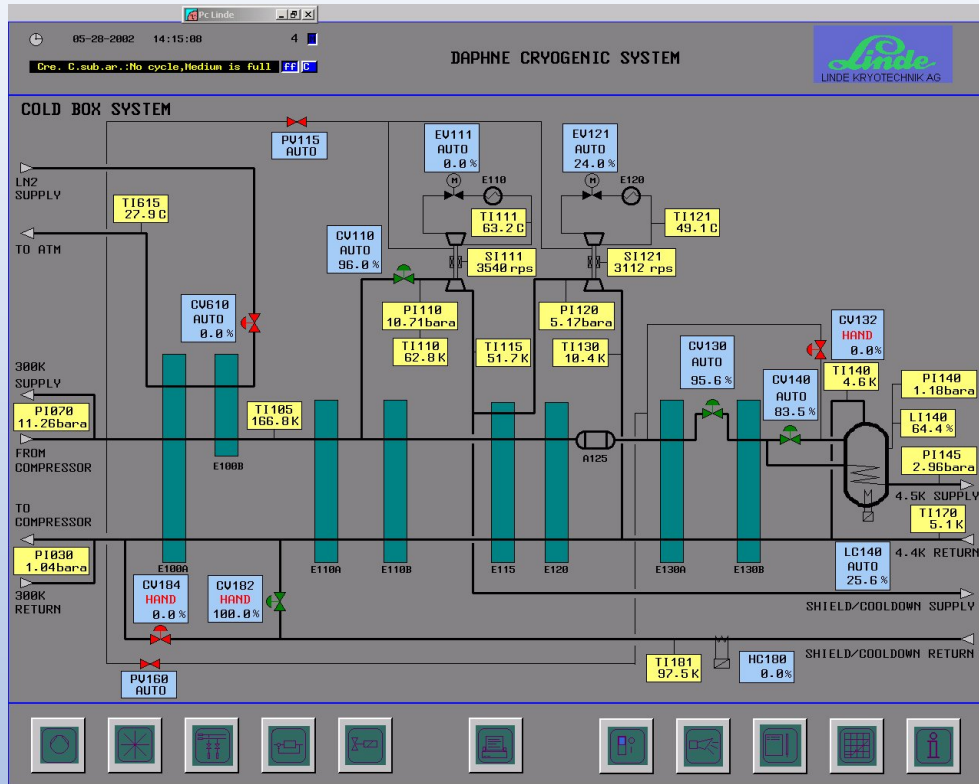
Worked at DAΦNE 1996-2018.  
Located outside the acc. main ring.  
New compressor installed in 2015.

4.5K refrigeration capacity: 99 W  
4.5K liquefaction capacity: 1.14 g/s  
70K refrigeration capacity: 800 W

KLOE 4.5K refig. load: 55 W  
KLOE 4.5K liquef. load: 0.6 g/s  
KLOE 70K refig. load: 530 W

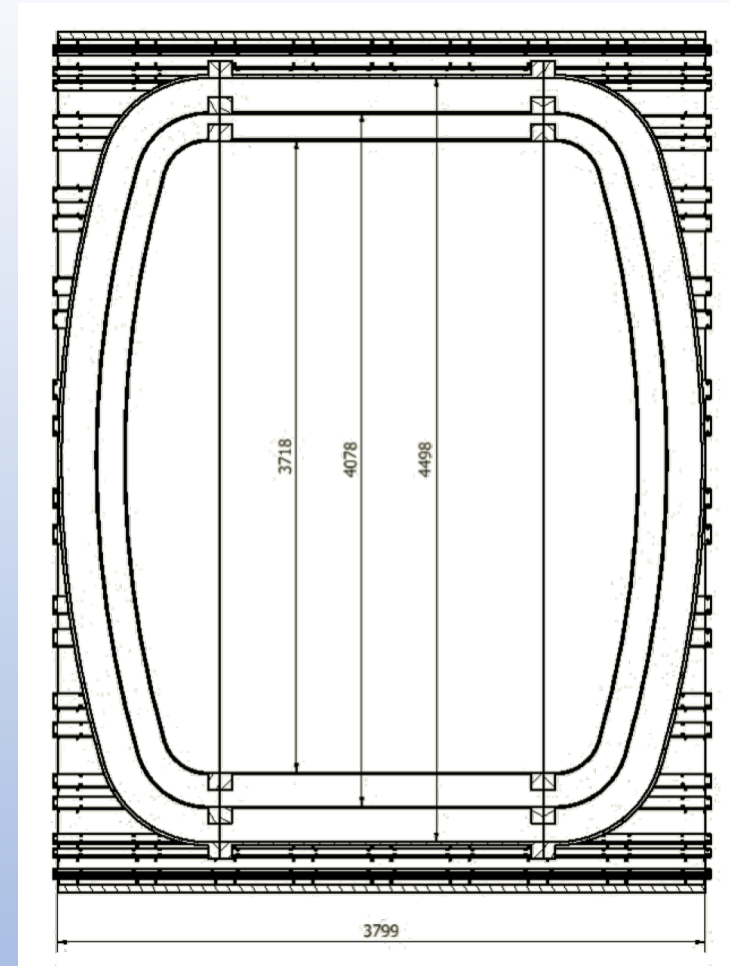
KLASH 4.5K refig. availability: 44 W  
KLASH 70K refig. availability: 270 W

# DAΦNE/KLOE control systems



# KLASH cryostat thermal requirements

- Radiation to 70K: 118 W
- Residual gas cond. to 70K ( $10^{-5}$  bar): 26.3 W
- Conduction to 70K: 98 W
- Total heat to 70K: 242 W
- Cryoplant 70K refrigeration: 270 W
  
- Radiation to 4K: 0.16 W
- Residual gas cond. to 4K ( $10^{-5}$  bar): 6.6 W
- Conduction to 4K: 14.9 W
- Total heat to 4K: 21.7 W
- Cryoplant 4K refrigeration: 44 W
  
- Service turret?
- Piping? Wiring?
- ...?



# SQUID $^3\text{He}$ refrigerator

- SQUID can be cooled at about 0.3 K using a  $^3\text{He}$  fridge
- The simplest solution foresees a coupled  $^4\text{He}/^3\text{He}$  fridges
- $T_{\text{base}} \approx 300$  mK, cooling power  $\approx$  few tens of  $\mu\text{W}$
- Single shot condensation allows a 80÷90% duty cycle operation
- Two  $^3\text{He}$  fridges and a thermal switch allow continuous operation but requires development



# Cryogenics to do list

- Cryostat + turret design and fabrication
- Linde Transfer Lines modification/procurement
- SQUID 3He refrigerator design, fabrication and test
- Control system (HW & SW) design and procurement
- KLOE synoptic update (?)
- Temperature, Pressure, Flow, Position Sensors definition and procurement
- Cryostat and turret pumping systems design and procurement
- KLOE sensores electronics update/procurement
- **KLOE new power supply procurement**