Test progress INFN

Alternative solution for the switch

~~**Solution 1**~~
~~**Opening time ≤ 1 ms seems feasible,** with replacement of the MOSFET's, introduction of a series resistance, new protections against extra-voltage, re-calibration and test is feasible in a few months.~~

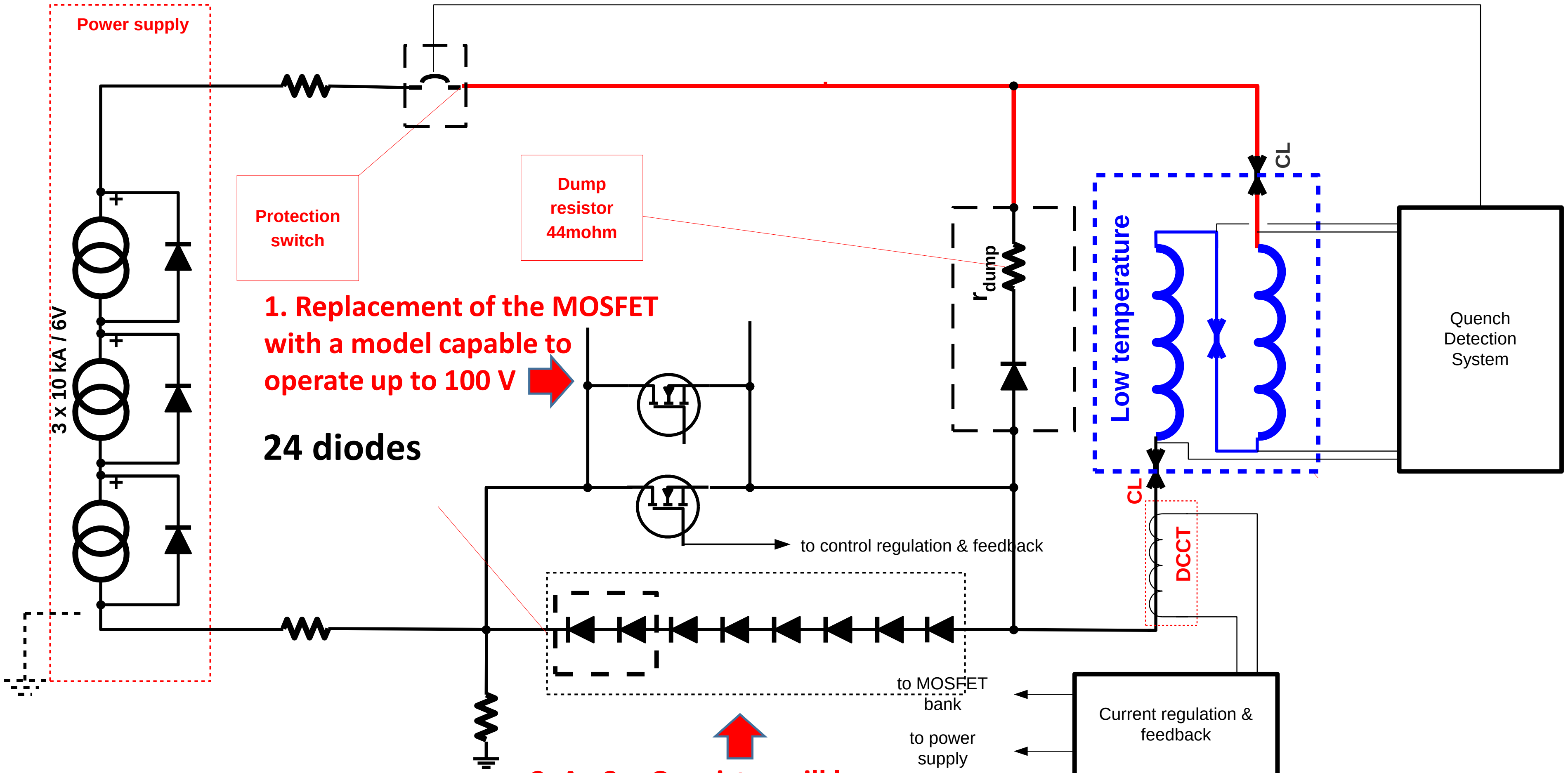
Is the discharge through 24 diodes + 8 mΩ is acceptable for the protection point of view (max 100 V)?

Let's say larger than 100 V…

Solution 2
Replacement of the MOSFET's with modules based on IGBT, which can sustain higher voltages. In this case there is a max voltage drop about 400 V (limited by the test station)
This requires an extensive redesign of the discharge unit, with new heat exchanger, current connection, control electronics… etc., so unlikely in time for the end of the next year.

Solution 3
Another Fast / Solid State Switch?

Magnet protection scheme: updated design



1. Replacement of the MOSFET with a model capable to operate up to 100 V

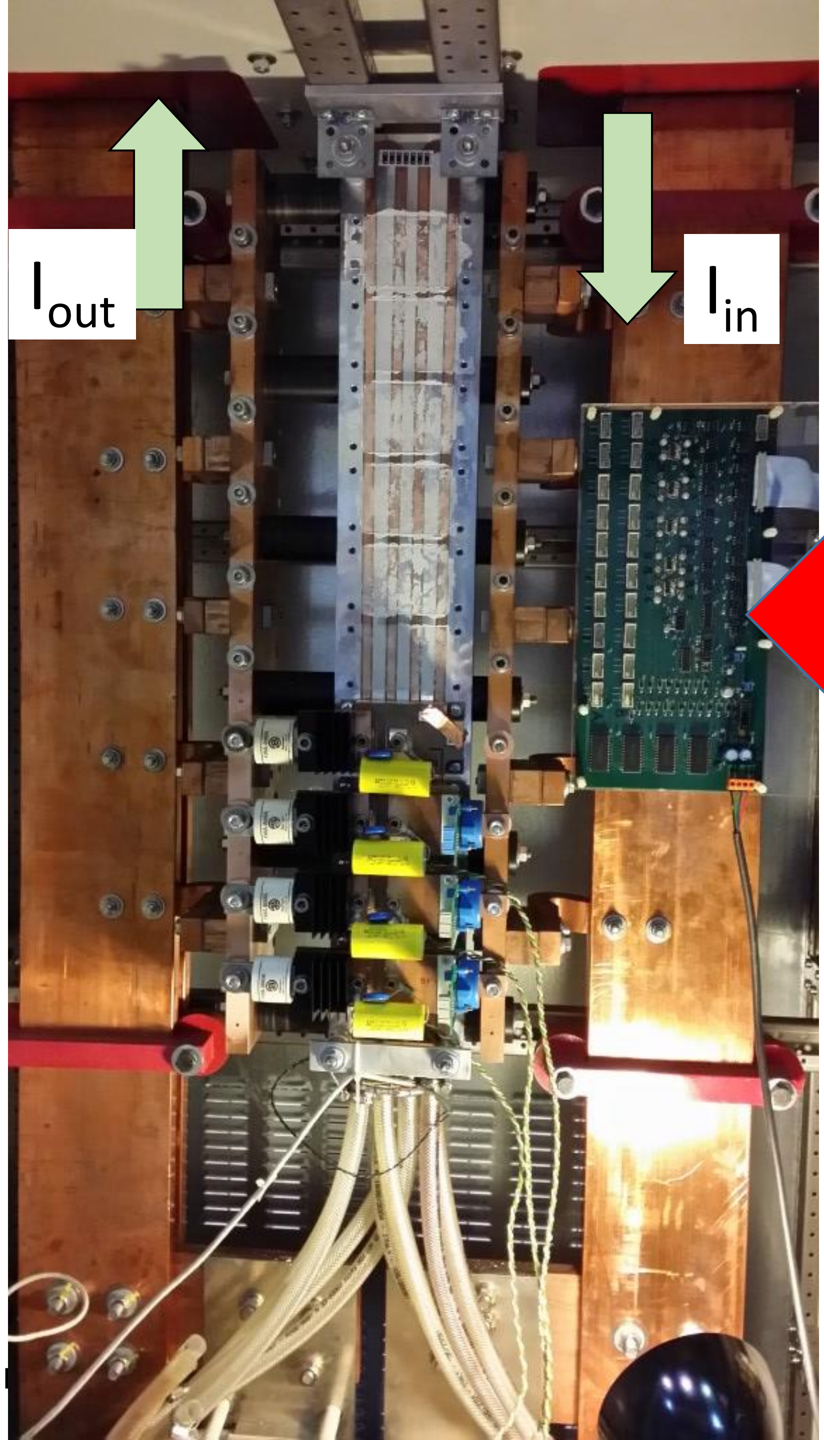
24 diodes

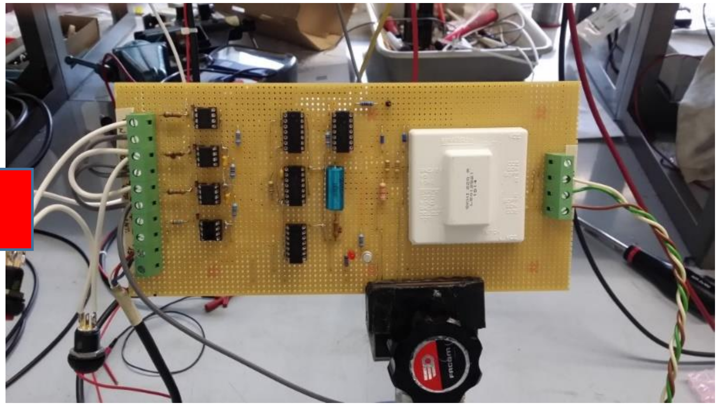
2. A ~8 mΩ resistor will be added in series to the diodes, providing a maximum total discharge voltage of 100 V

MOSFET’s replaced by IGBT ‘s which are more suitable thanks to their higher VCEmax

Their Von is however larger, and the extra dissipation will be disposed of through a larger water flow within the heat exchanger.

Test in progress with four IGBT’s in parallel, if OK more elements, up to 20, will be installed





New control board based on a hybrid IGBT driver circuit

EuCARD²

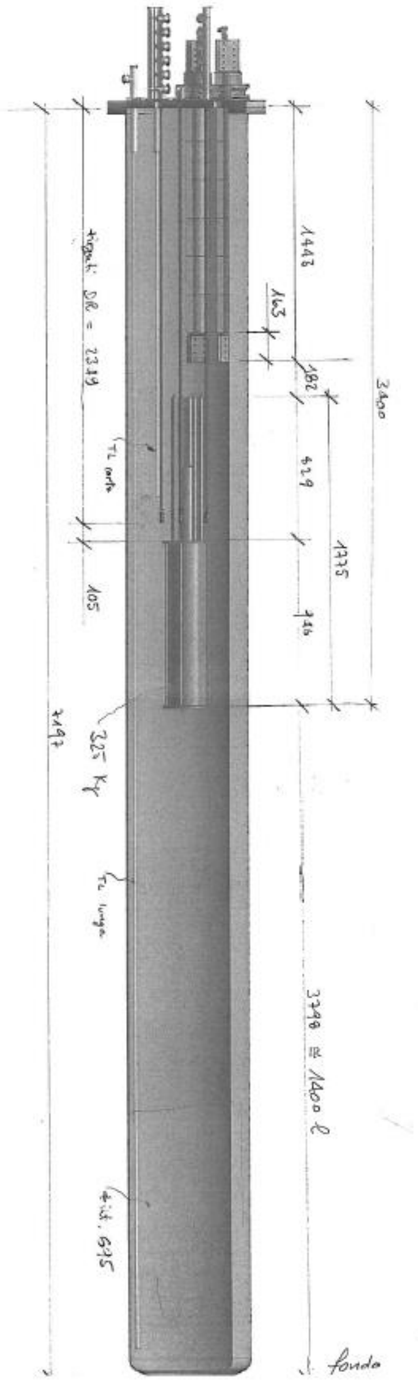
INFN

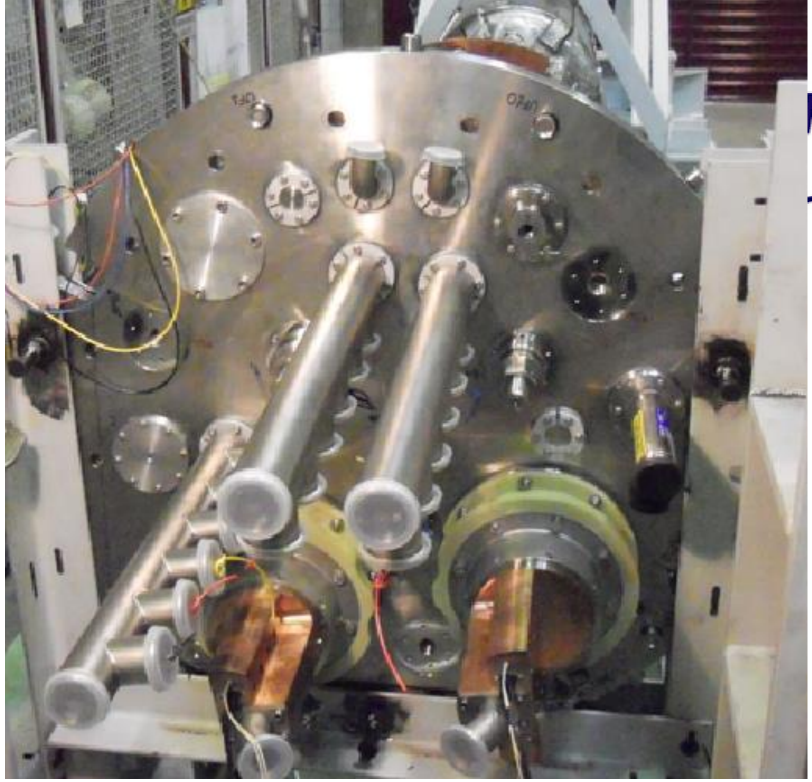
MAGIX cryostat is not the best choice:
- Too short
- Less room in the top flange

So we switched to the larger DISCORAP cryostat
- All equipement (top flange, radiation shield, tie rods) available

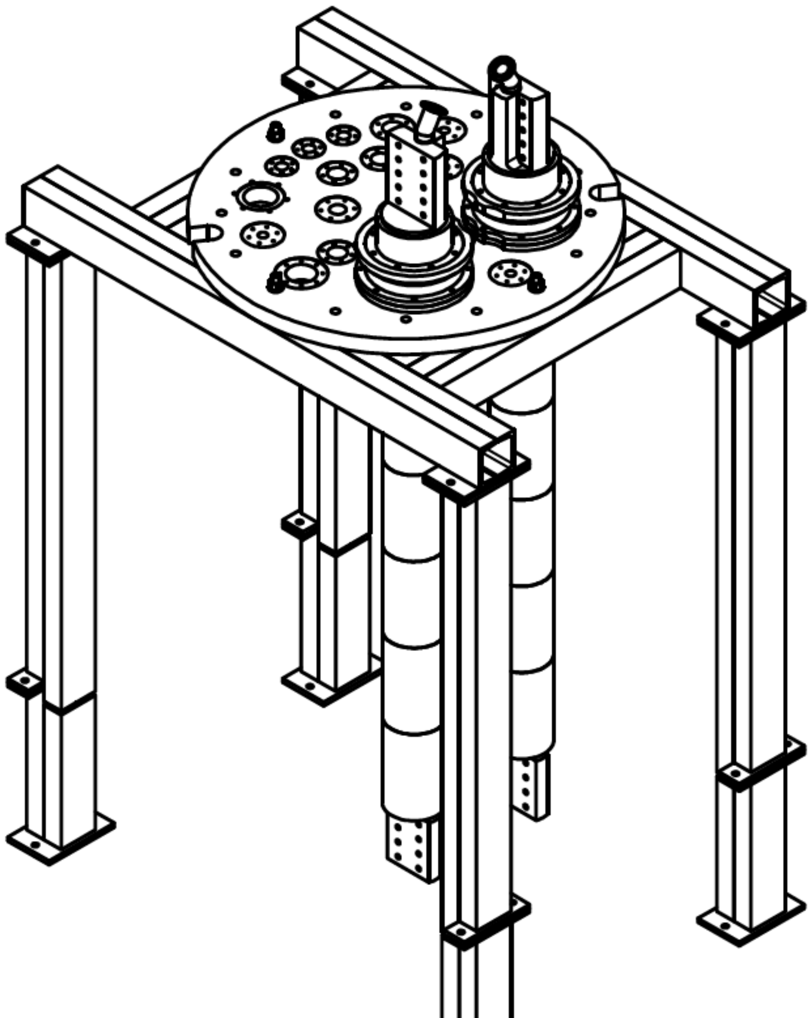
Lower cryostat ($1.4\ m^3$) filled with PlastazoteTM, whose density is close to LHe.

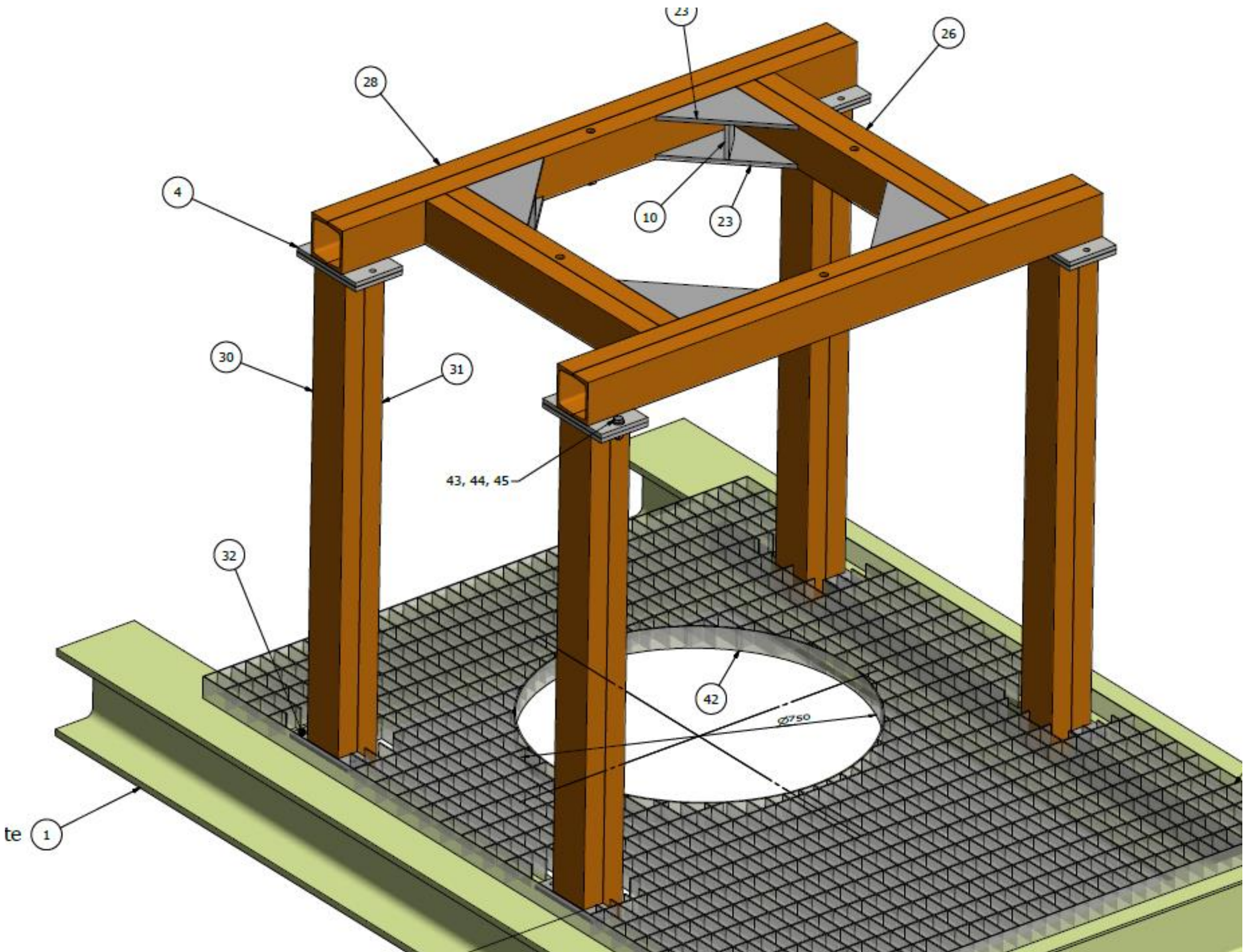
Not suitable for LN test



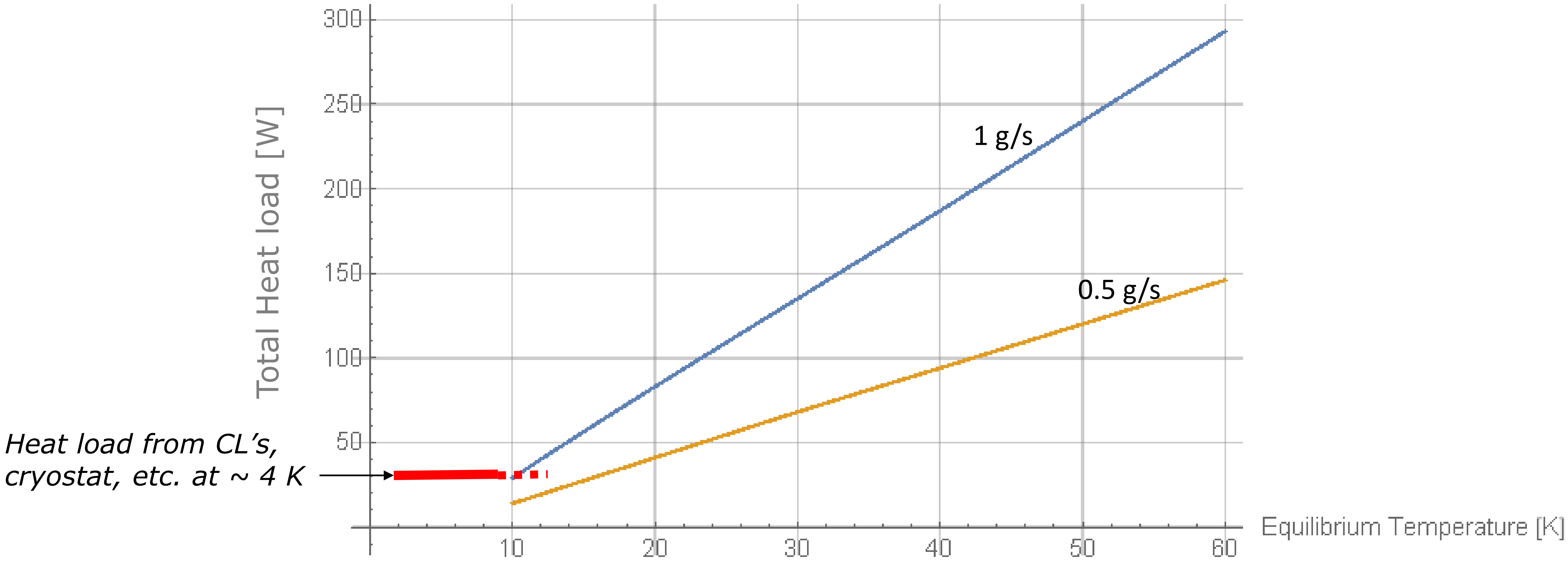


Assembly station: may be accessed from ground floor and lower floor



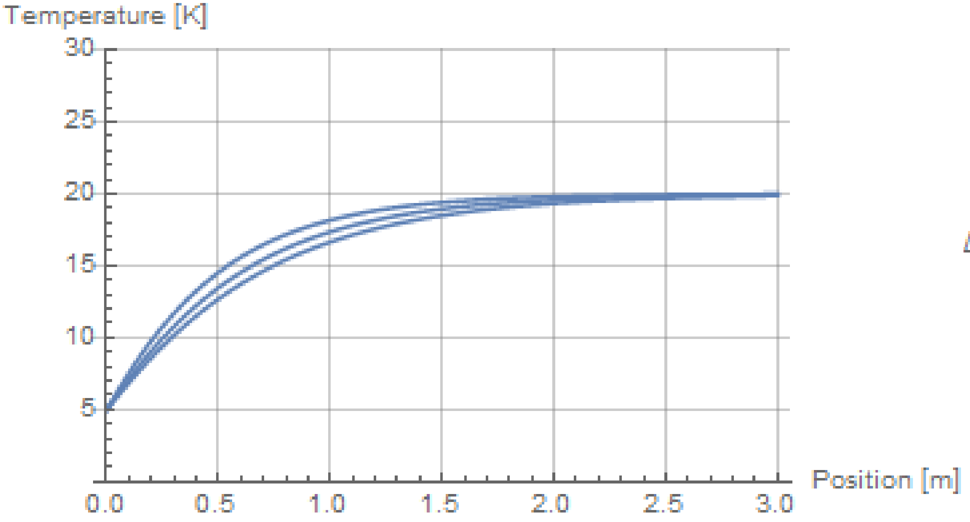


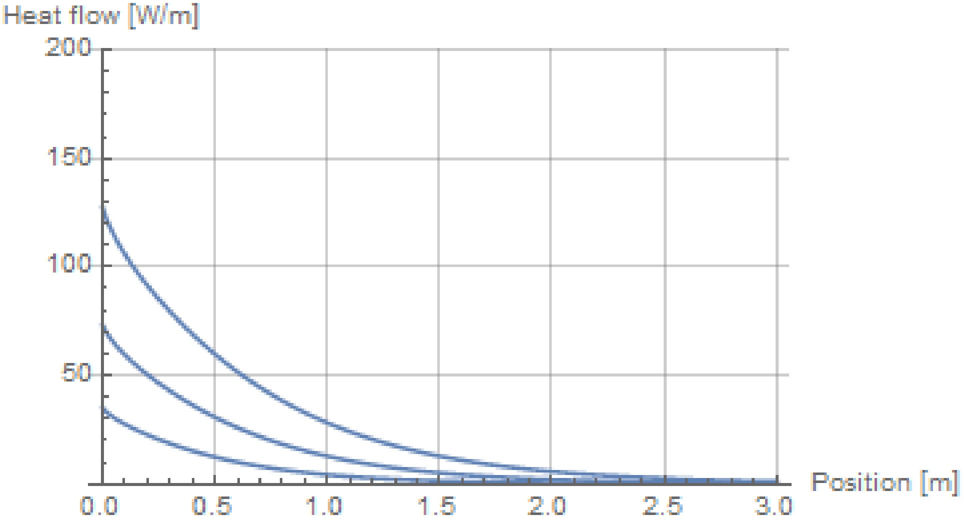
Heat load vs. equilibrium temperature

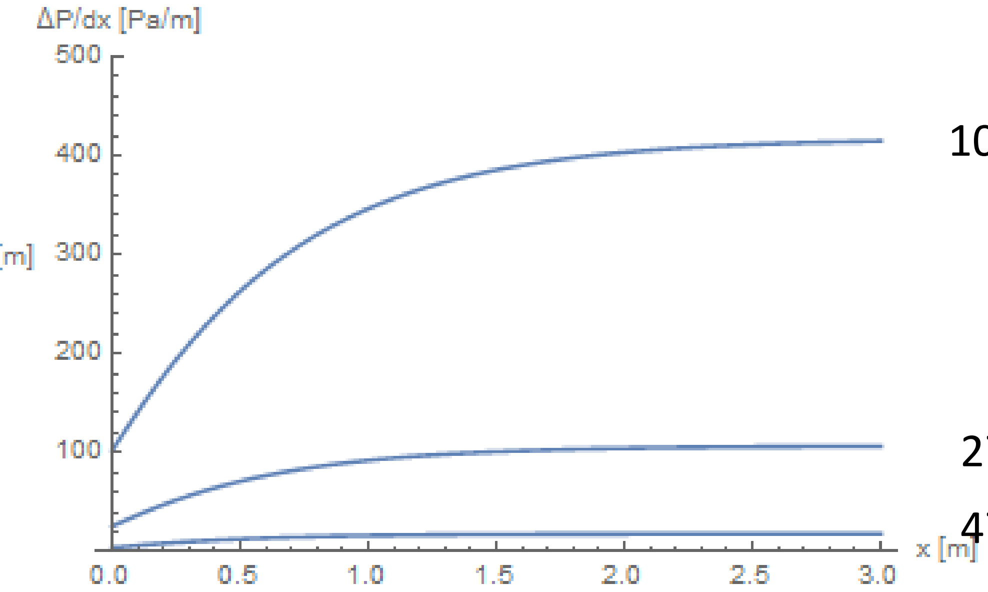


T = 20 K

0.2, 0.5, 1.0 g/s





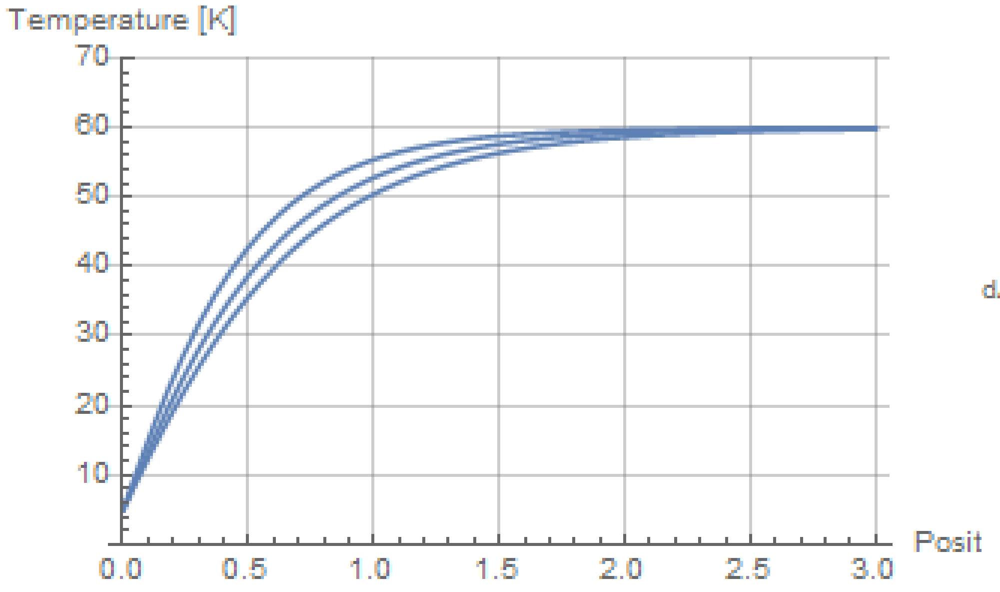


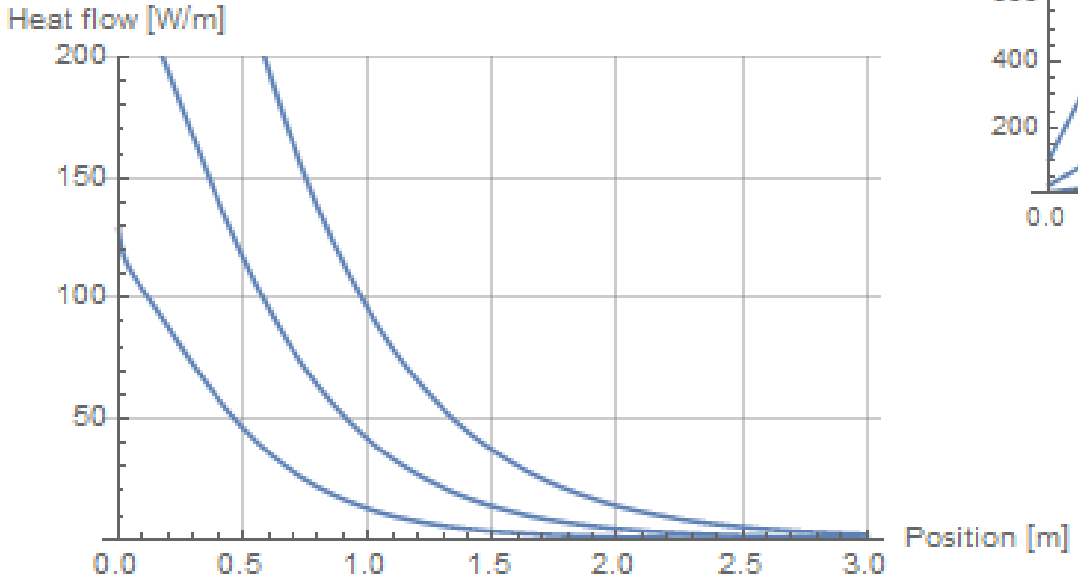
1040 Pa

275 Pa

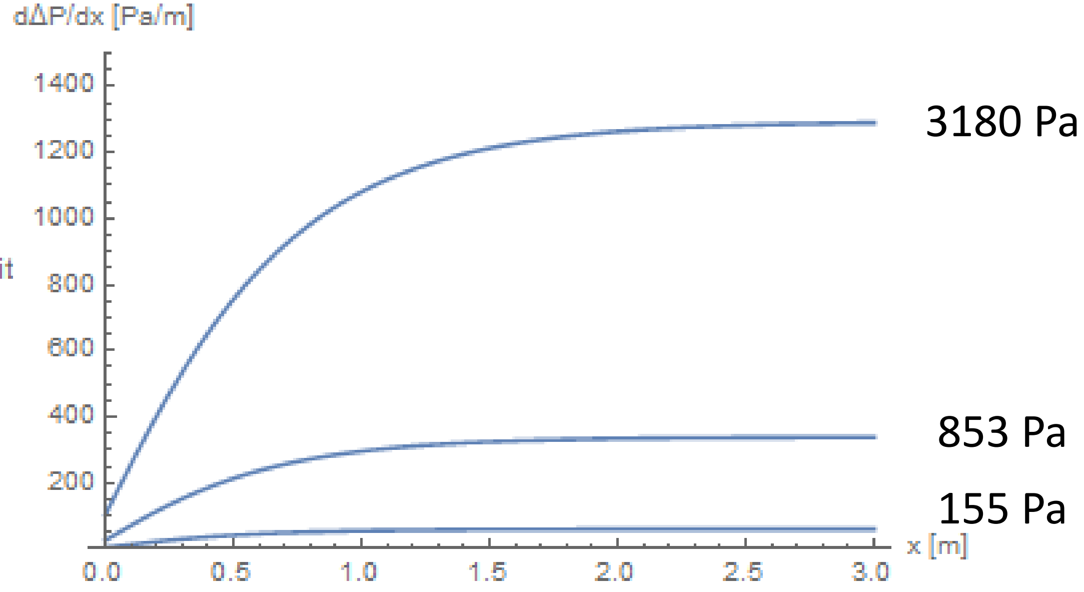
47 Pa

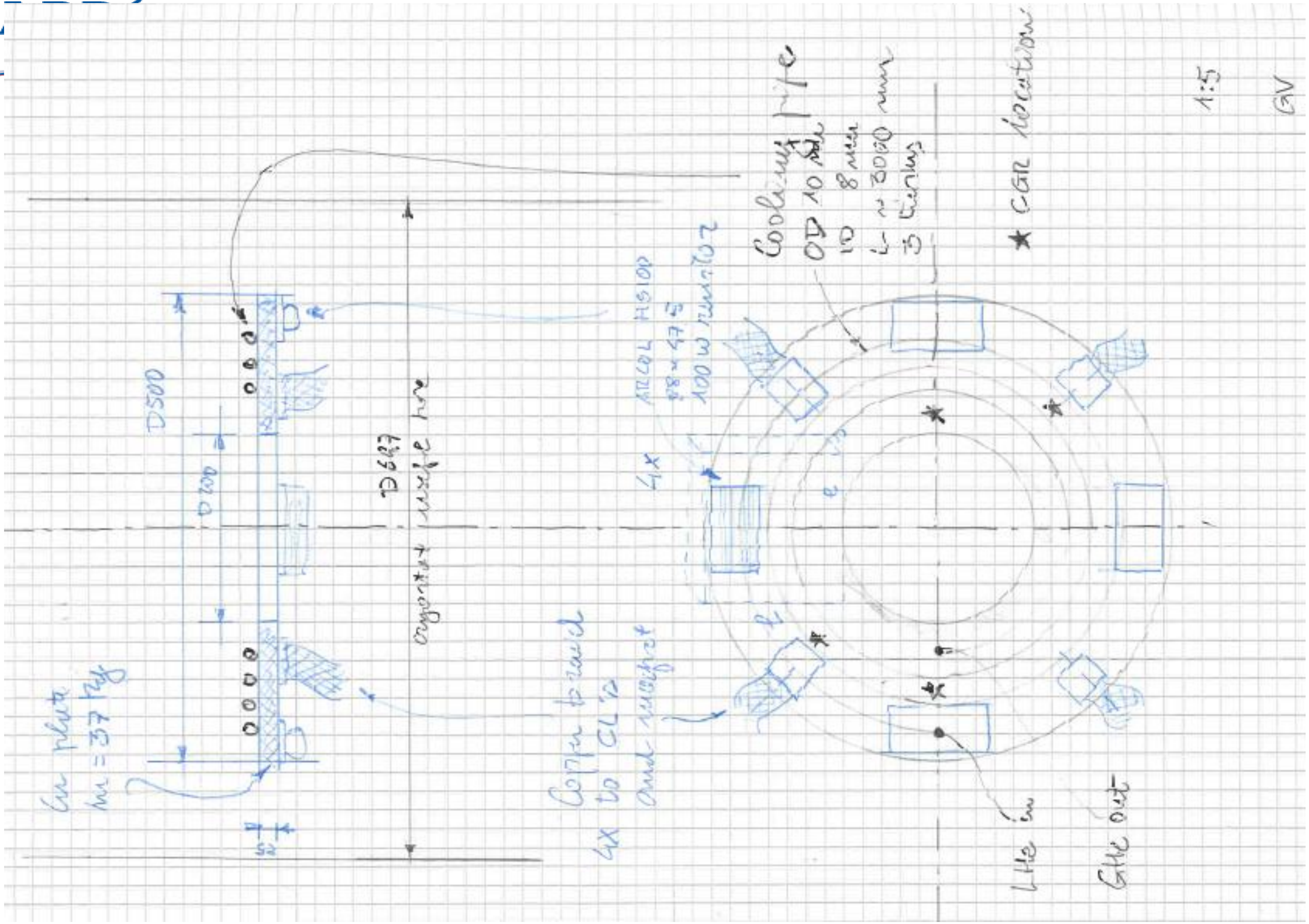
T = 60 K





0.2, 0.5, 1.0 g/s




Cooling pipe
OD 10 mm
ID 8 mm
3 turns
CGR location
1:5
GV
LHe in
GHe out
Copper braid
4x
D500
D200
D667
100 W resistor
Cu plate
m = 37 kg