



Cubism - Braque's Bottle and Fishes, Paris c.1910-12



## LAr progress in Bern



ND fortnightly meeting  
Jan 22<sup>nd</sup> 2020  
James Sinclair, LHEP<sub>1</sub>

# Current activity - Working towards the full system

External filter construction.

Filter test stand.

Gas analyser.

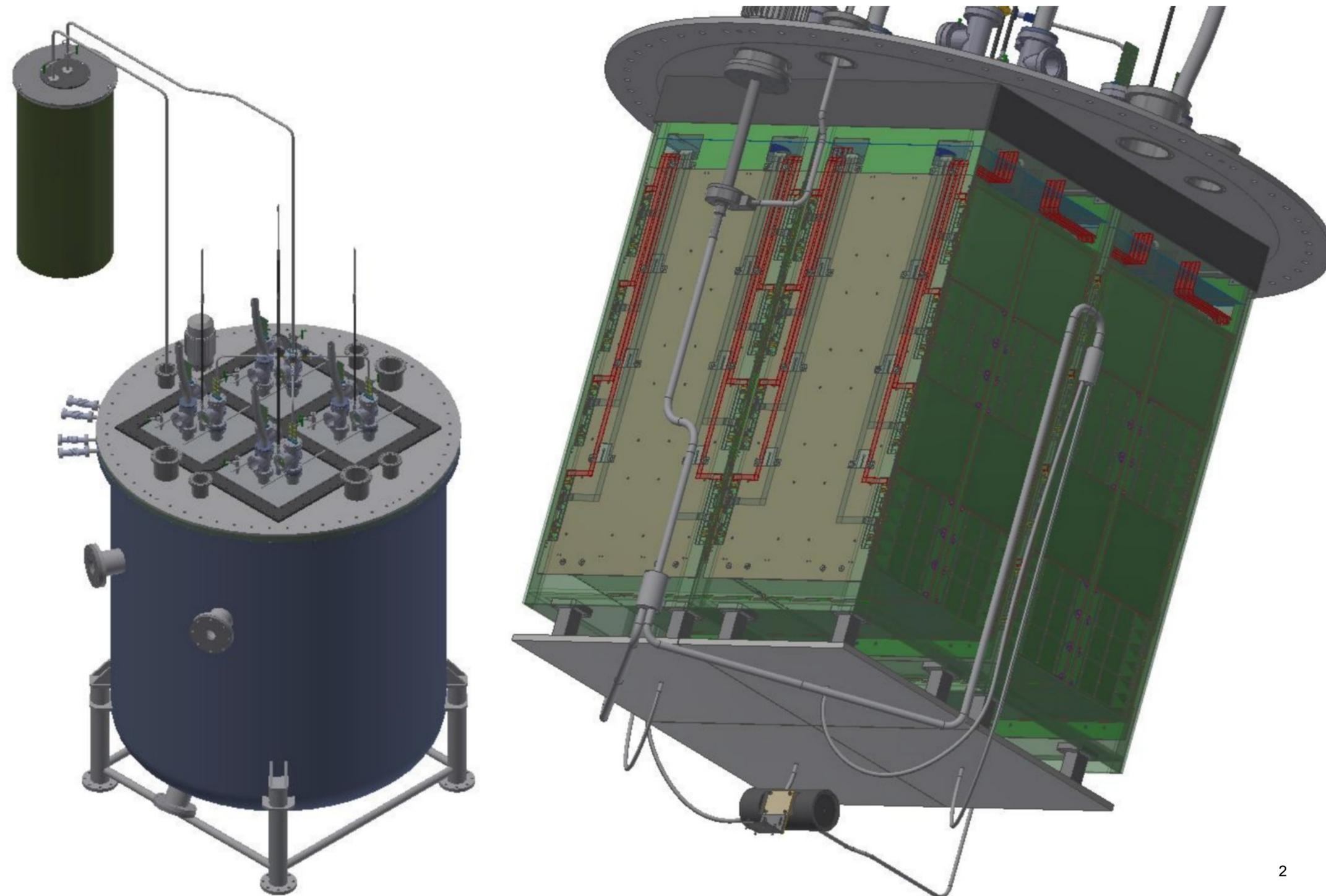
Detector electrical isolation.

Module construction lab space.

Single module cryostat.

Feedthrough mock up.

...and waiting for parts to arrive



# External filter

Active cooling of the external filter is necessary (in Bern).

LN2 at 2.25 bar will provide 85 K.

We have a cryostat, we have filter material.

We are manufacturing internal components and top flange.

We are waiting for the sintered diffusers and particulate filter.



# External filter

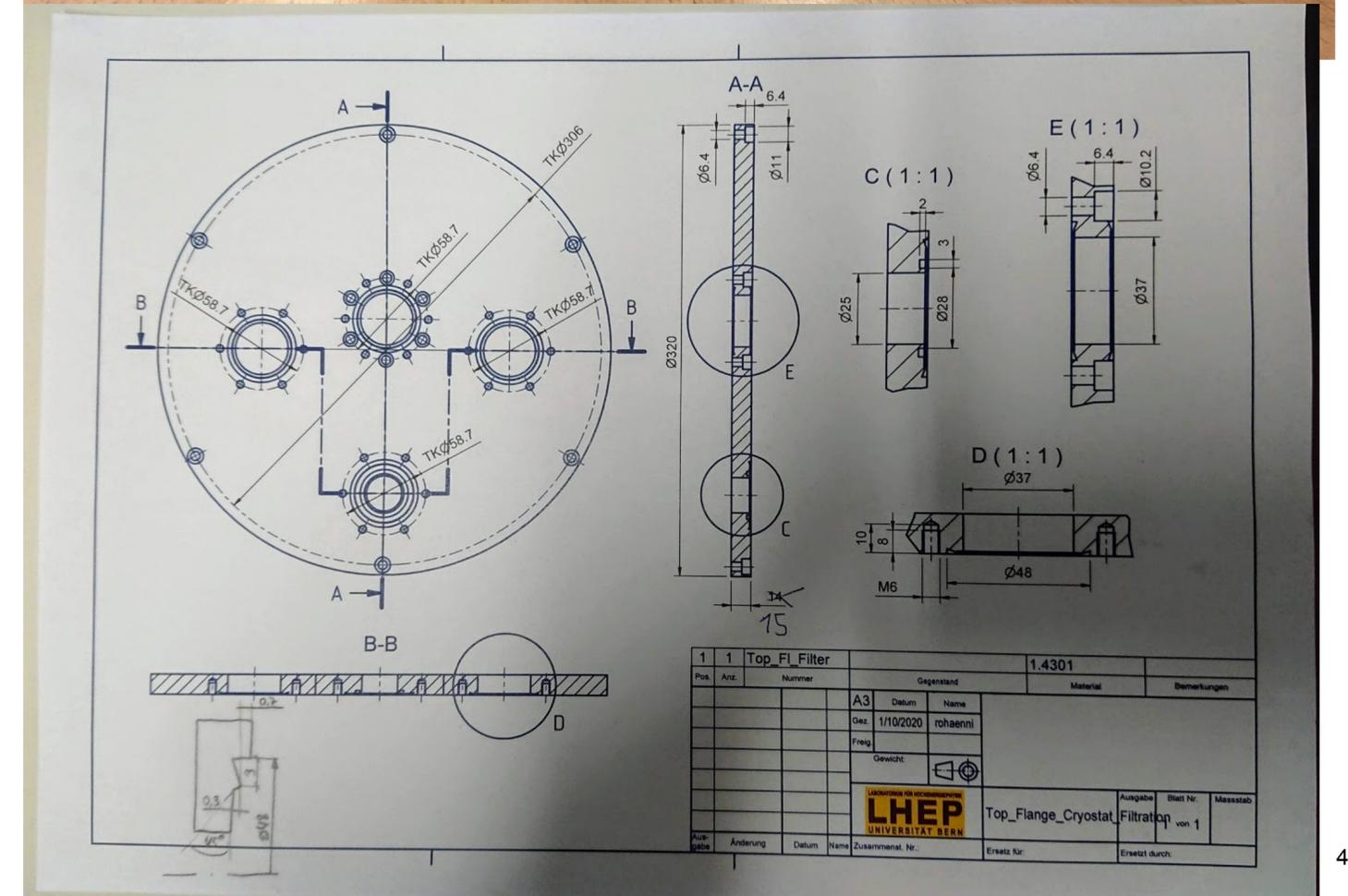
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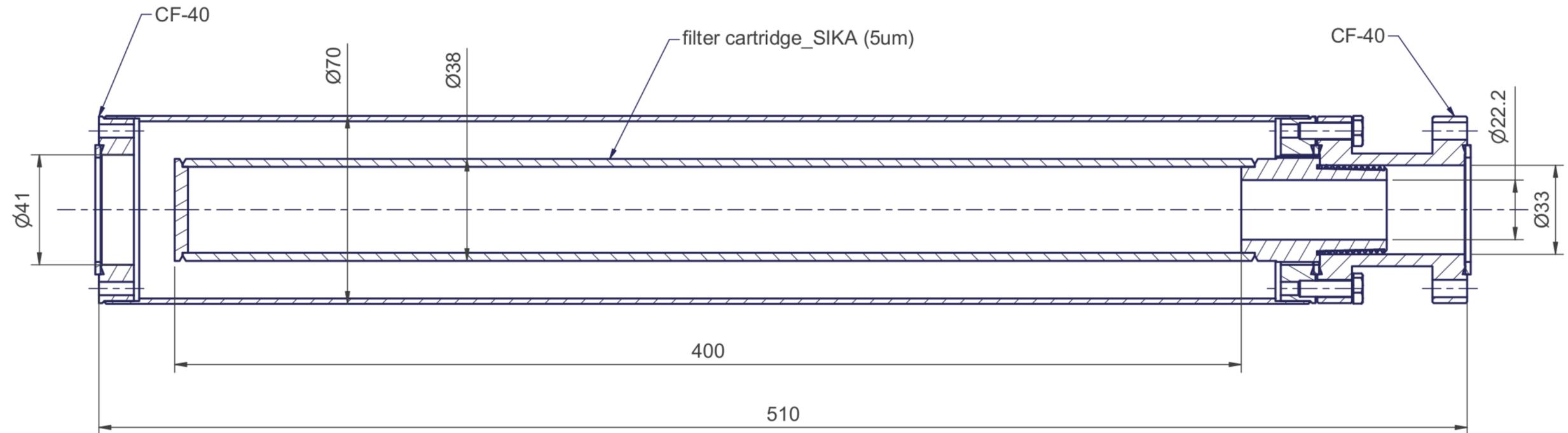
We are manufacturing internal components and top flange.

We are waiting for the sintered diffusers and particulate filter.





# Particulate filter



400 mm cartridge 1" internal diameter 5  $\mu\text{m}$  sintered stainless cartridge from GKN.

Sintered metal components should arrive this week.

70 mm diameter does not require pressure testing, relief valves are ok.

# Filter test stand

At 30 cm drift and 1 kV/cm we need a charge lifetime of 1.4 ms to not effect energy resolution (below this is possible bit needs good calibration).

Purity measurements with the 2x2 cryostat are not feasible (cost and time) so we are constructing a purity test stand in our 500 l cryostat.

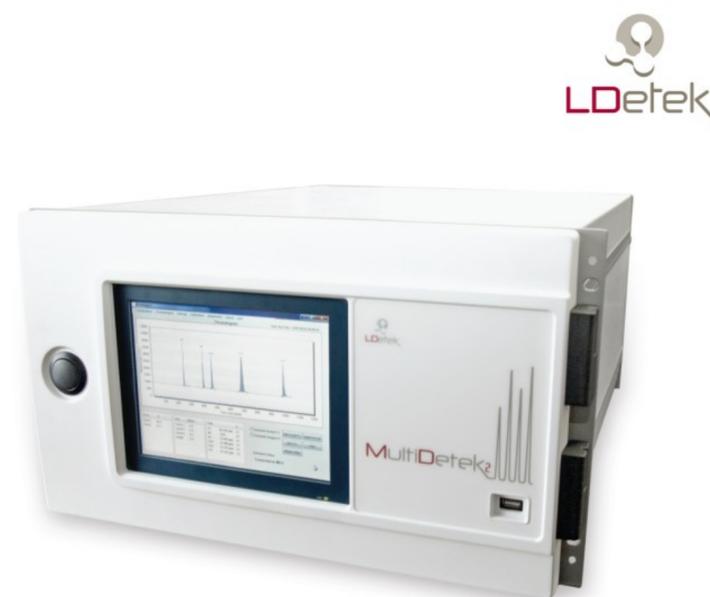
The external filter will be tested here first.



# Gas analyser

To better understand contamination we are setting up a gas analyser system based around a LDetek MultiDetek2 chromatograph.

We are waiting on calibration gas.



MULTI DETEK<sub>2</sub>

**USER'S MANUAL**

GAS CHROMATOGRAPH FOR MULTIPLE IMPURITIES

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method#1 :

Ar

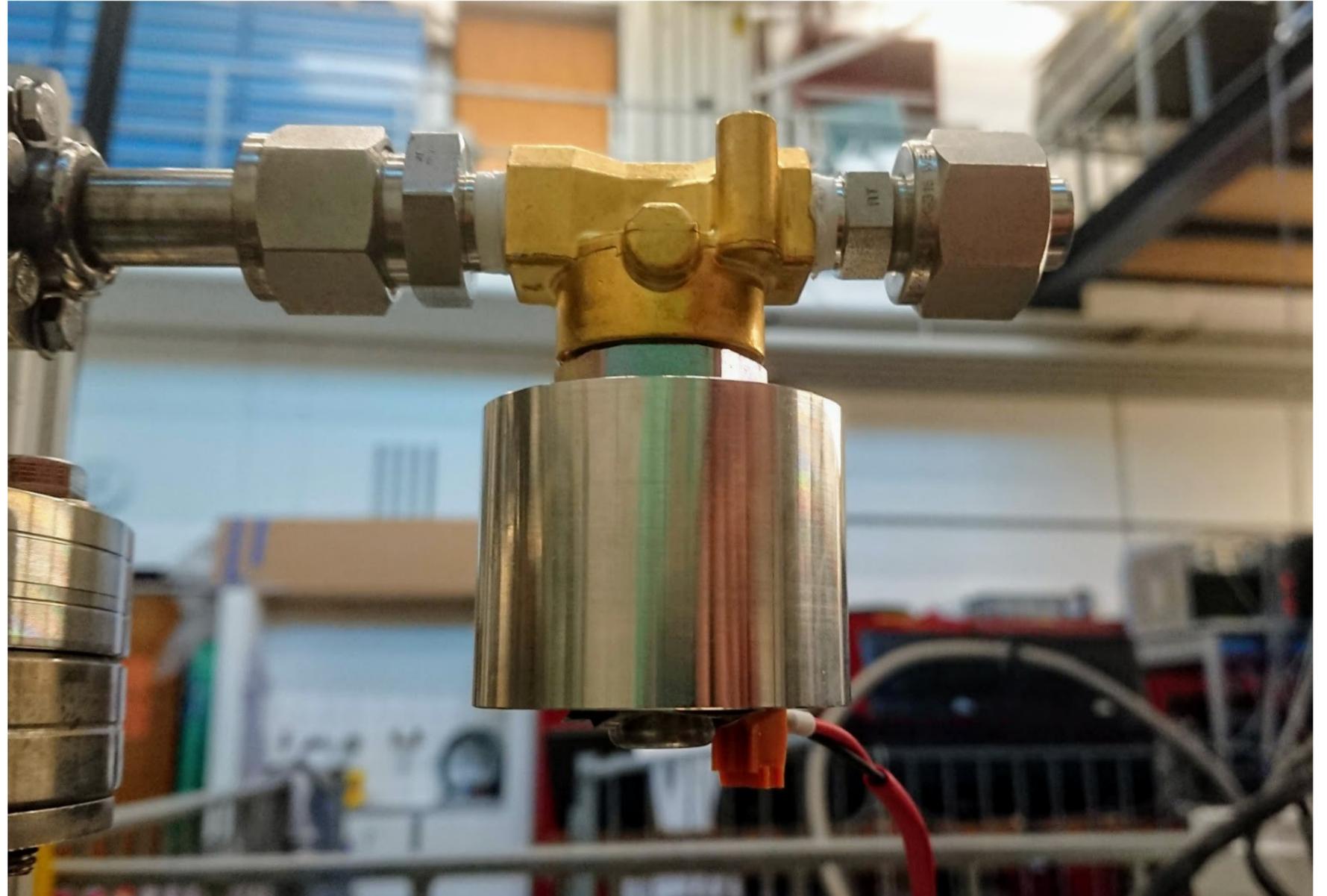
Impurities→	H2	O2	N2	CH4	CO	H2O
Ranges	0-10 ppm	0-50 ppm				
LDL	50 ppb	0.5 ppm				



# Control valve failure identified

The solenoid resistance was found to drop in the LAr, this caused intermittent failure states (non response).

A resistance measurement is now performed during operation, and control current adjusted to compensate.

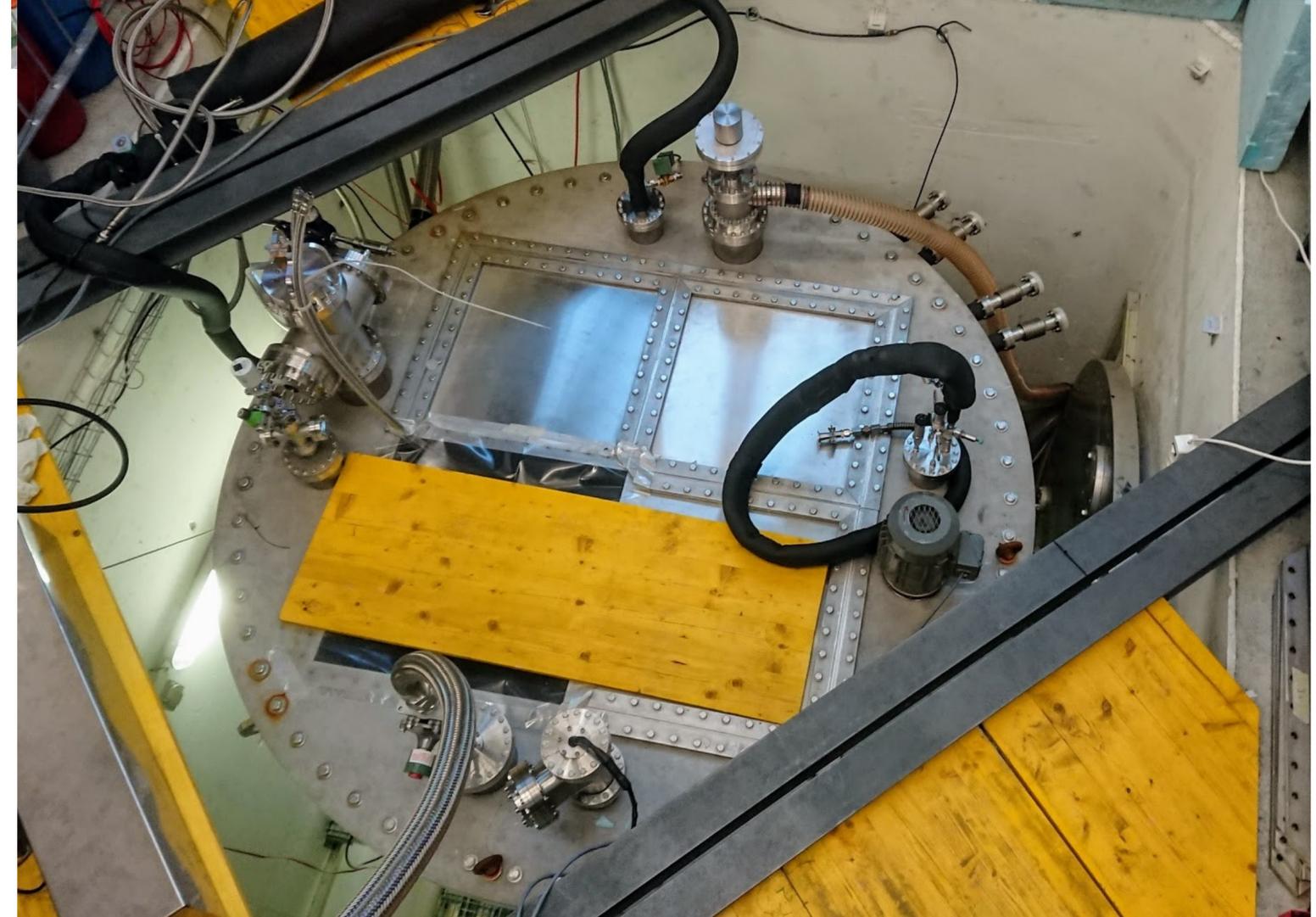


# Electrical isolation

Based on the advice of Linda Bagby, we have begun isolating the 2x2 cryostat.

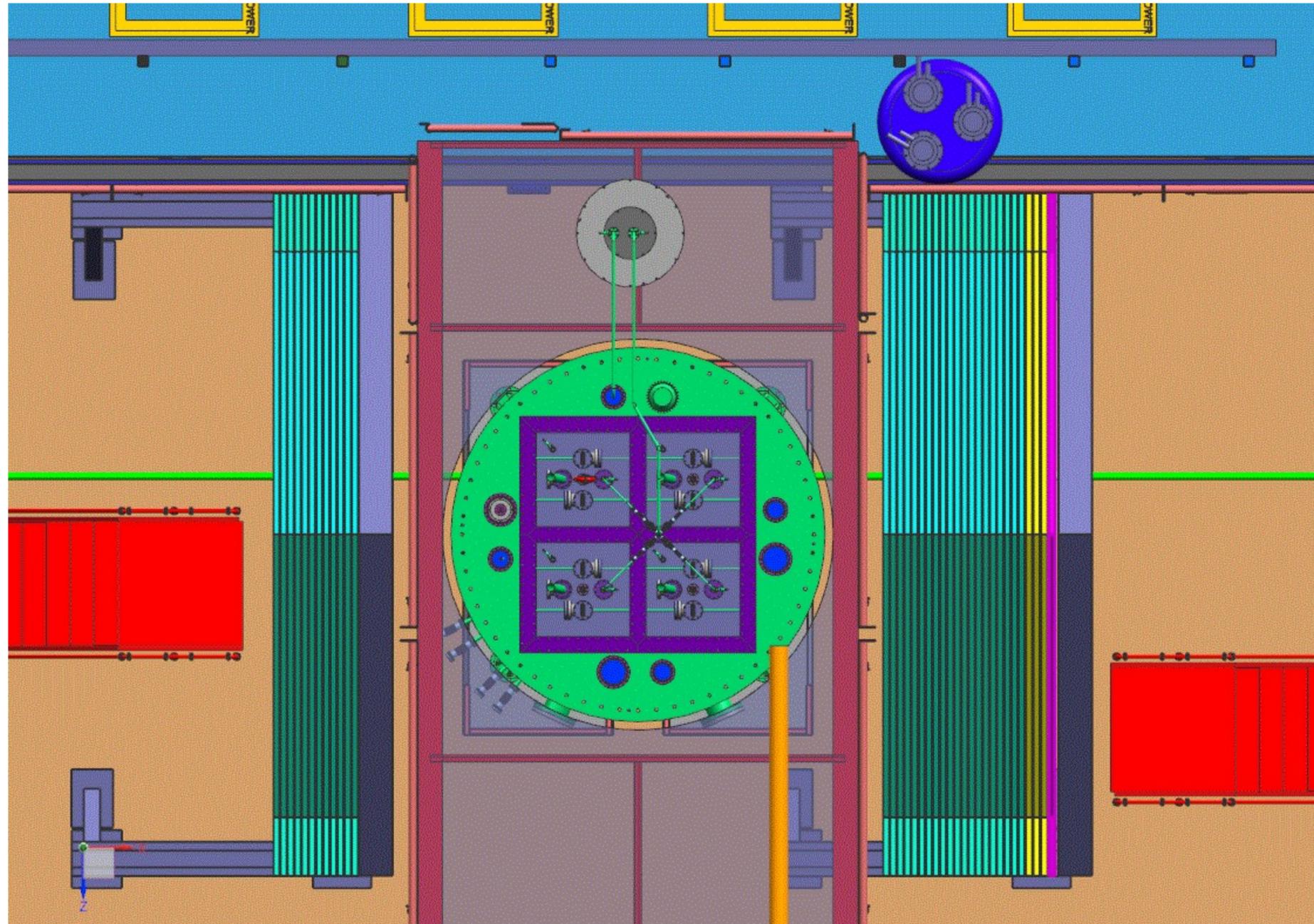
This includes POM spacers at all connections, and raising the detector on POM slabs.

Entailing complete disassembly, again.



# Top flange orientation

We will also change the orientation of the top flange to improve clearance for the MINERvA planes at FNAL.



# Module construction lab

We now have a dedicated lab for module construction.

Bucket and inner detector production will take place here.

But, final assembly has to happen in the Grosslabor (2x2 lab) due to ceiling height constraints.

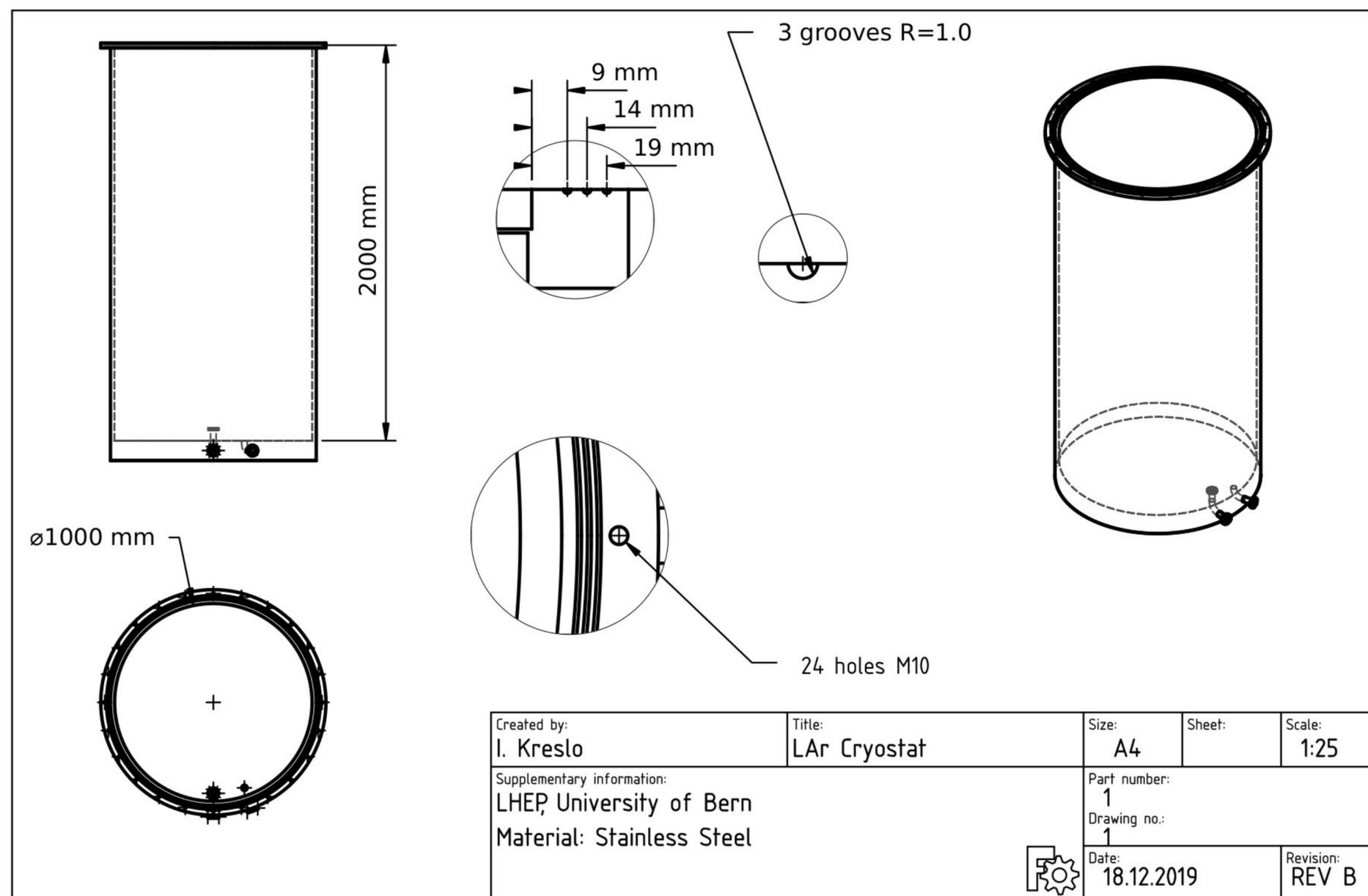


# Single module cryostat

To speed up the module testing process and reduce the cost of LAr, we have ordered a cryostat to house a single module from CRYOFAB.

This will be positioned next to the 2x2 pit, and share the same infrastructure.

Delivery is due in May.

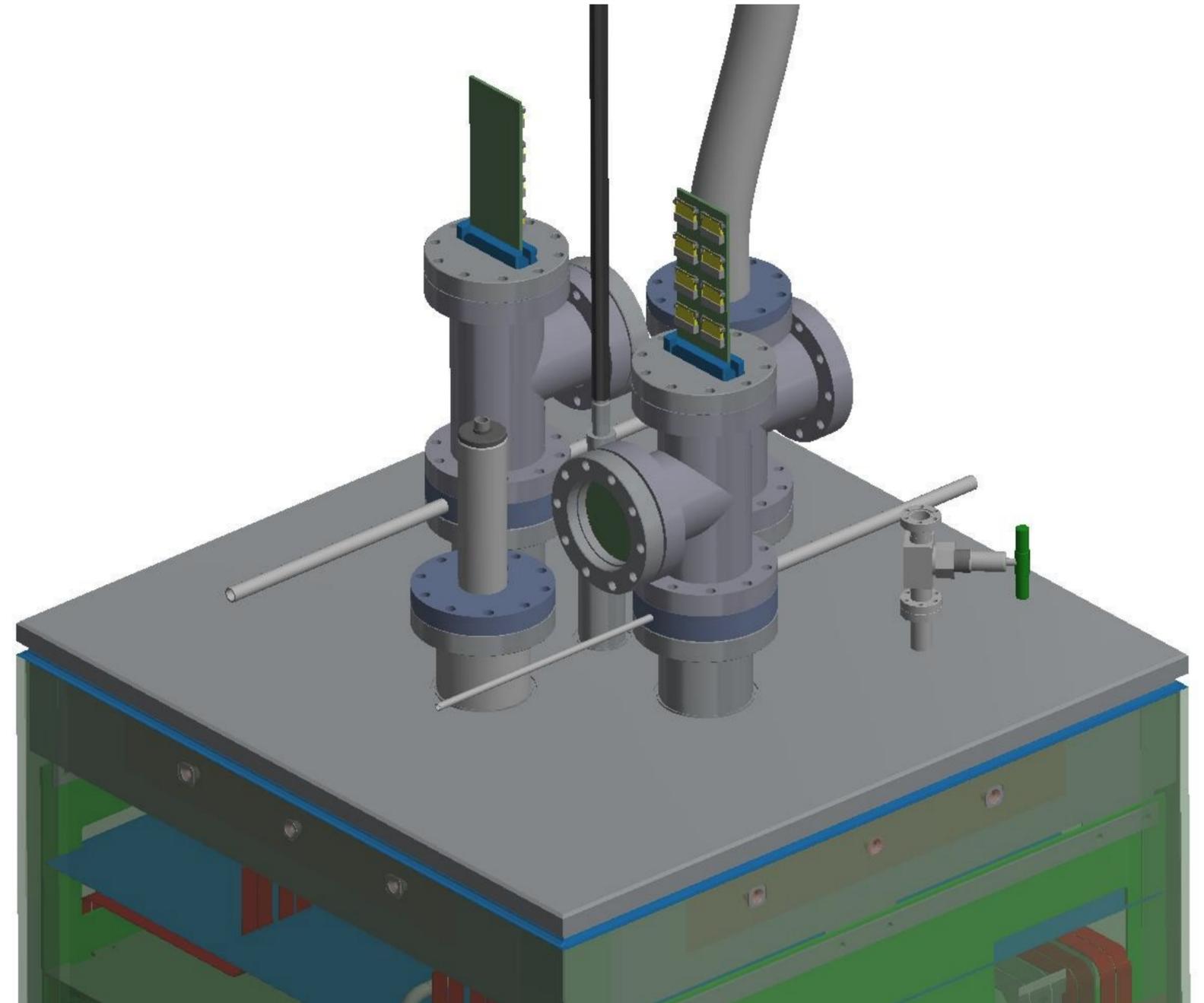


# Feedthrough mock up

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There is a concern that the cables and connectors may not fit the feedthrough, and may inhibit the gas system.

Before changing the top flange design, we're building a mock up of the feedthrough to test.



## In other news

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The first HV feed through arrived from SLAC (Thank you!). We will be installing this in the purity test stand, and using it to prepare the HV filter and supply for the 2x2.

The light R/O electronics and DAQ will be arriving in Bern next Monday. This will also see first deployment in the purity test stand.

