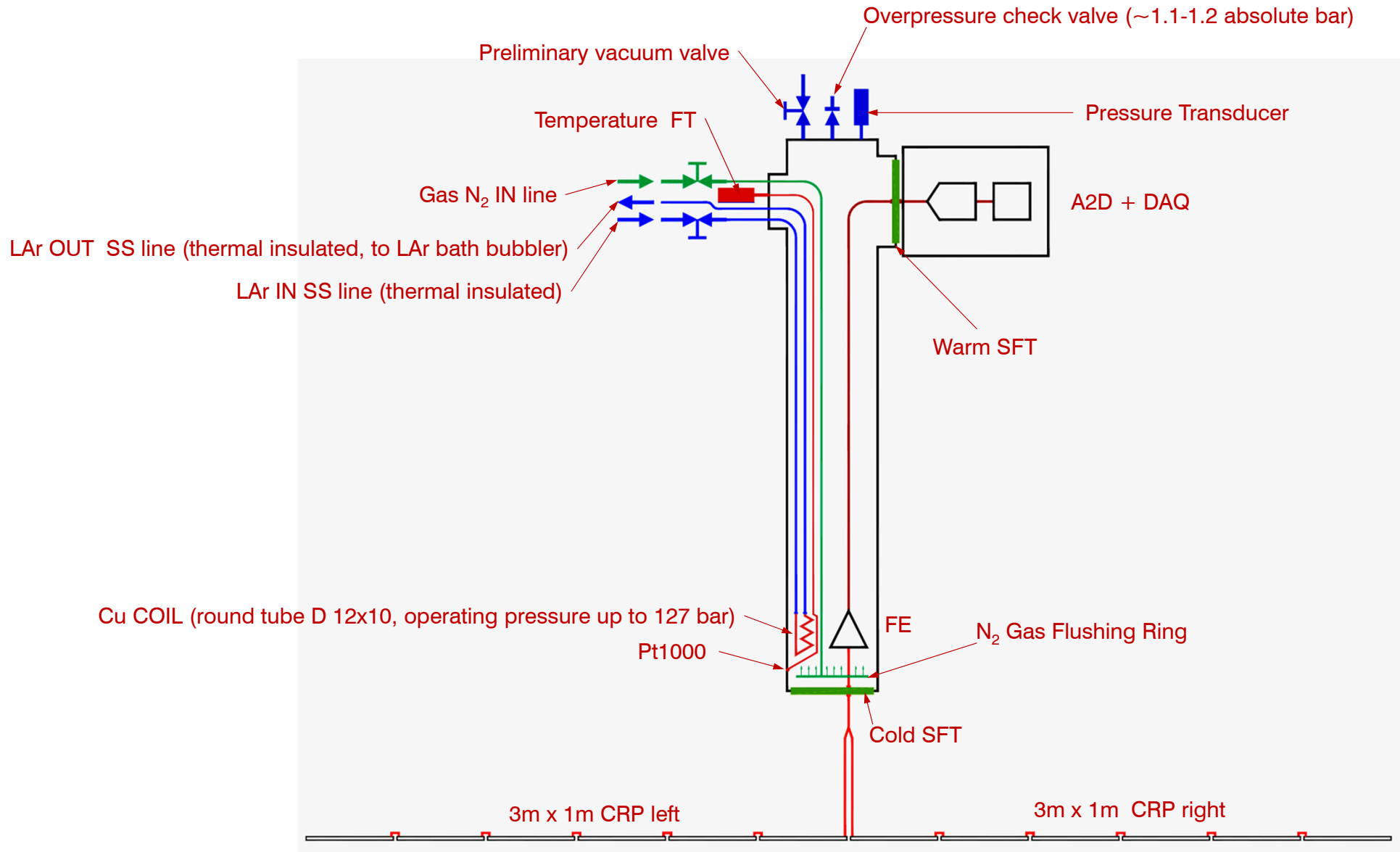


# ProtoDUNE-DP WA105 - 640 channels Signal Feedthrough Chimney configuration



## Signal chimney cooling

If we want keep 2 valves (IN and OUT) for each LAr coil, a solution could be, after purging and connecting the “LAr” lines, to keep open the OUT valve and secure it with special enclosures.

We could test this on the 4 output valves of the SFTCs of the 311, to safely inject LAr in the coils.

(thanks to Francesco)

This solution, with the approval of the Neutrino Platform and the CERN safety, can be adopted for the 666.



Franco

# WA105 DP. Signal Feedthrough Chimneys Heat Input Compensation

## Evaluation of the heat input via the 12 signal chimneys and the 12 top-cap crossing tubes

1. Heat input through twisted pair cable copper	$W_{Cu} =$	71.2 W
2. Heat input through Signal chimney outer tube	$W_{SCtube} =$	34.8 W
3. Heat dissipated by cold front-end electronics (?)	$W_{cE} =$	144 W (assuming <20mW/channel)
4. <b>Total heat input through the 12 SFTCs</b>	<b><math>W_{SC} =</math></b>	<b>250 W</b>
5. Estimated equivalent LAr evaporation rate	$EV_{rate} =$	4.0 L/h $\equiv$ 95.2 L/day
6. Heat input through the 12 top cap crossing tubes	$W_{TCxTube} =$	264.2 W
7. Total LAr evaporation rate	$TEV_{rate} =$	8.2 L/h $\equiv$ 195.7 L/day

The heat input via SFTC (Point 4: 250W) must be compensated by LAr flow (Point 5) in order **to keep the front-end electronics at its optimal temperature ( $\sim 110K$ ) and minimize the N/S ratio**. This point justify the use of the Cu coil (with LAr flow) around the FE electronics cards and in the inner atmosphere of gas  $N_2$ . This heat exchanger is also useful for minimizing the heat input from the cold SFTCs to the Anode planes via the r/o cables.

Remark: In the 311 SFTCs the temperatures around the FE electronics, without LAr flushing in the coils, are in the range 146 K - 150 K.

The heat input via the 10mm thick (!) top-cap crossing tubes (Point 6.: 264W) must be compensated by the general cryogenics.

Spare slides

# 311 Signal chimney cooling

## Heat exchanger and flushing connections

This is an old configuration for the 311 pre-prototype detector with 6 chimneys.  
The present configuration has only 4 chimneys to test the 3m long anode channels

