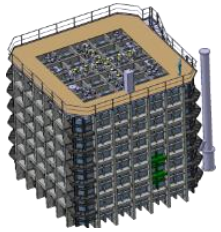
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



01/09/2017

WA105

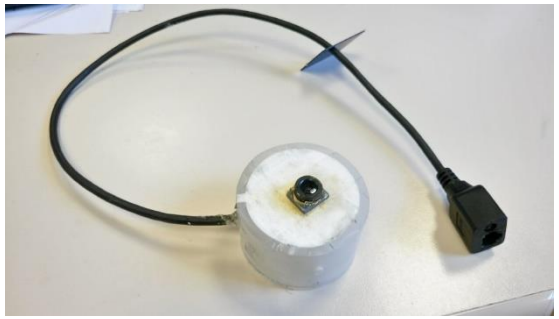
Cryocamera update

ProtoDUNE-DP

Thierry VIANT

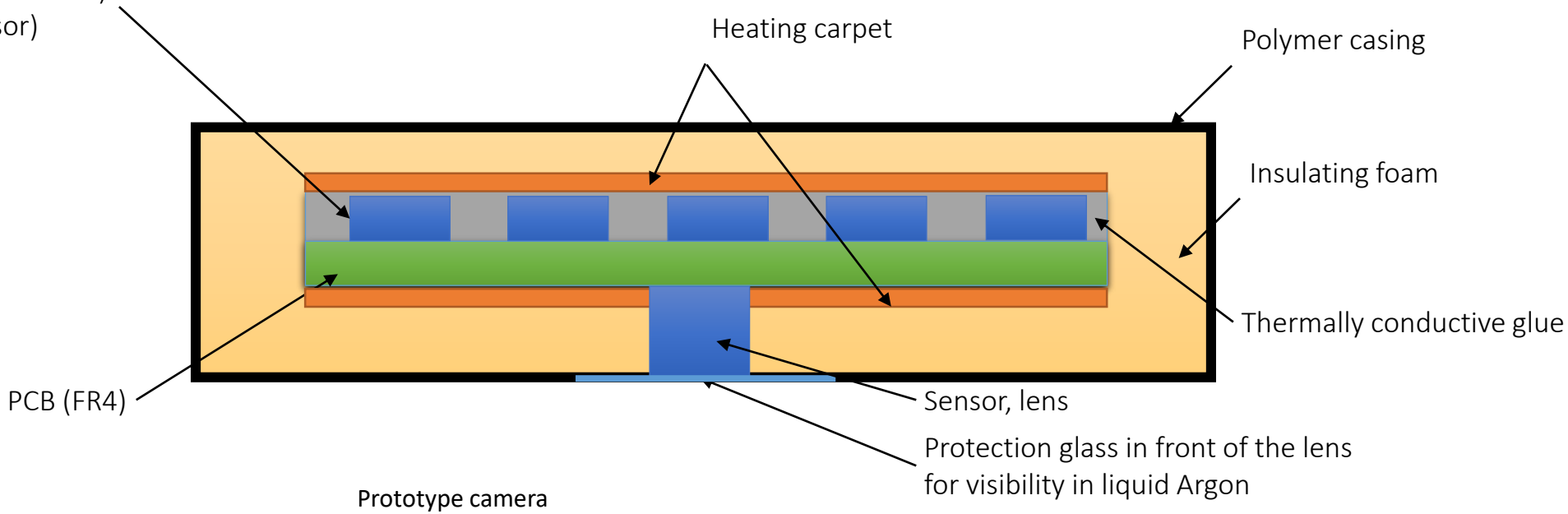
Camera scheme

Revotech camera



Prototype Revotech camera for the 6x6x6
(without polymer casing)

- Electronics components (Revotech)
- Pt 1000 (temperature sensor)

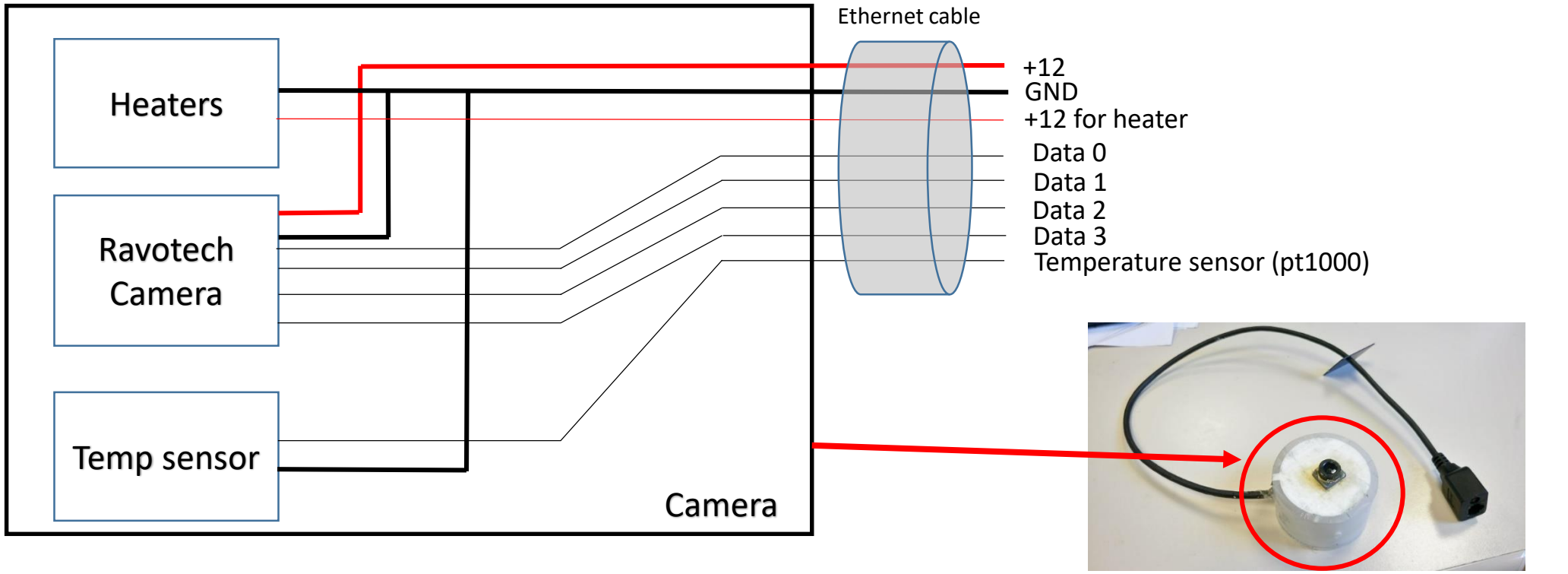


Prototype camera

Camera connection scheme : temperature regulation components

Ravotech camera needs 6 wires:

- 4 wires for data
- 2 wires for power (+12V, GND)
- still 2 other wires with a usual ethernet cable



Components inside :

- Heaters : 2 x heating carpet 12V/2W
- Ravotech camera : ethernet camera 12V 0.2 W
- temperature sensor : PT1000 glued against the camera

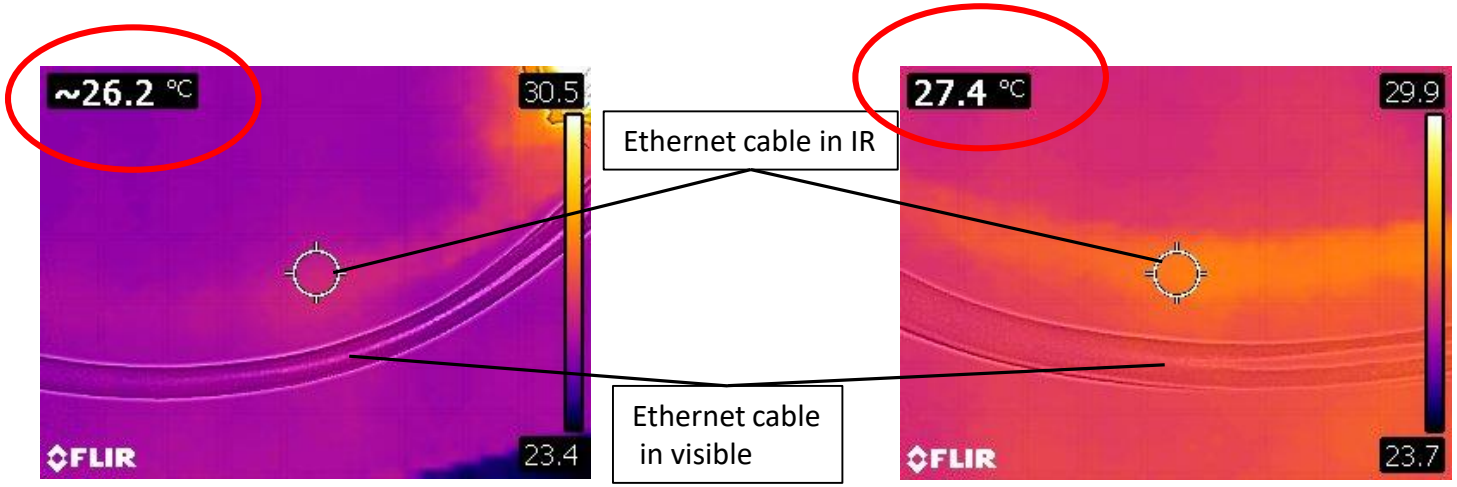
Intensity at 12 V :

Camera : 150 mA
Heaters : 350 mA
Camera ON + Heaters ON **: 500 mA/camera**

For 12 cameras, we need power supplied : 12v / 6 A

Heat dispersion of the ethernet cable:

- Pictures taken with a IR camera , with and witout heaters on (atm temp : 26°C)
- Infra red pictures show :
  - no heat elevation without the heater
  - ~1°C elevation temp after 20 min

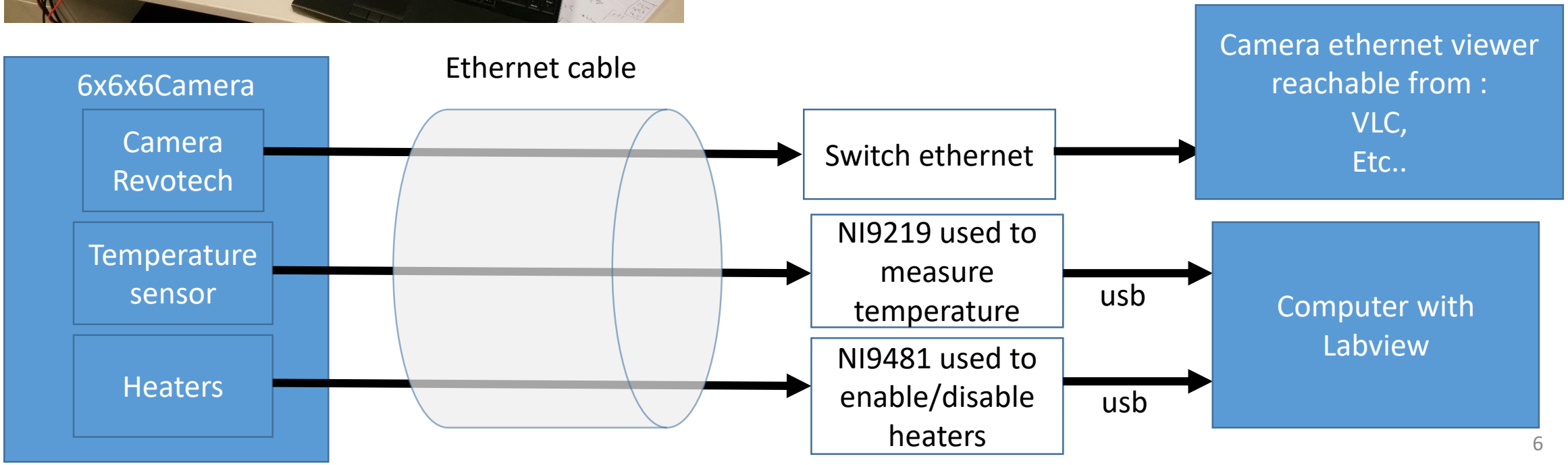


Camera ON / Heaters OFF (150mA)

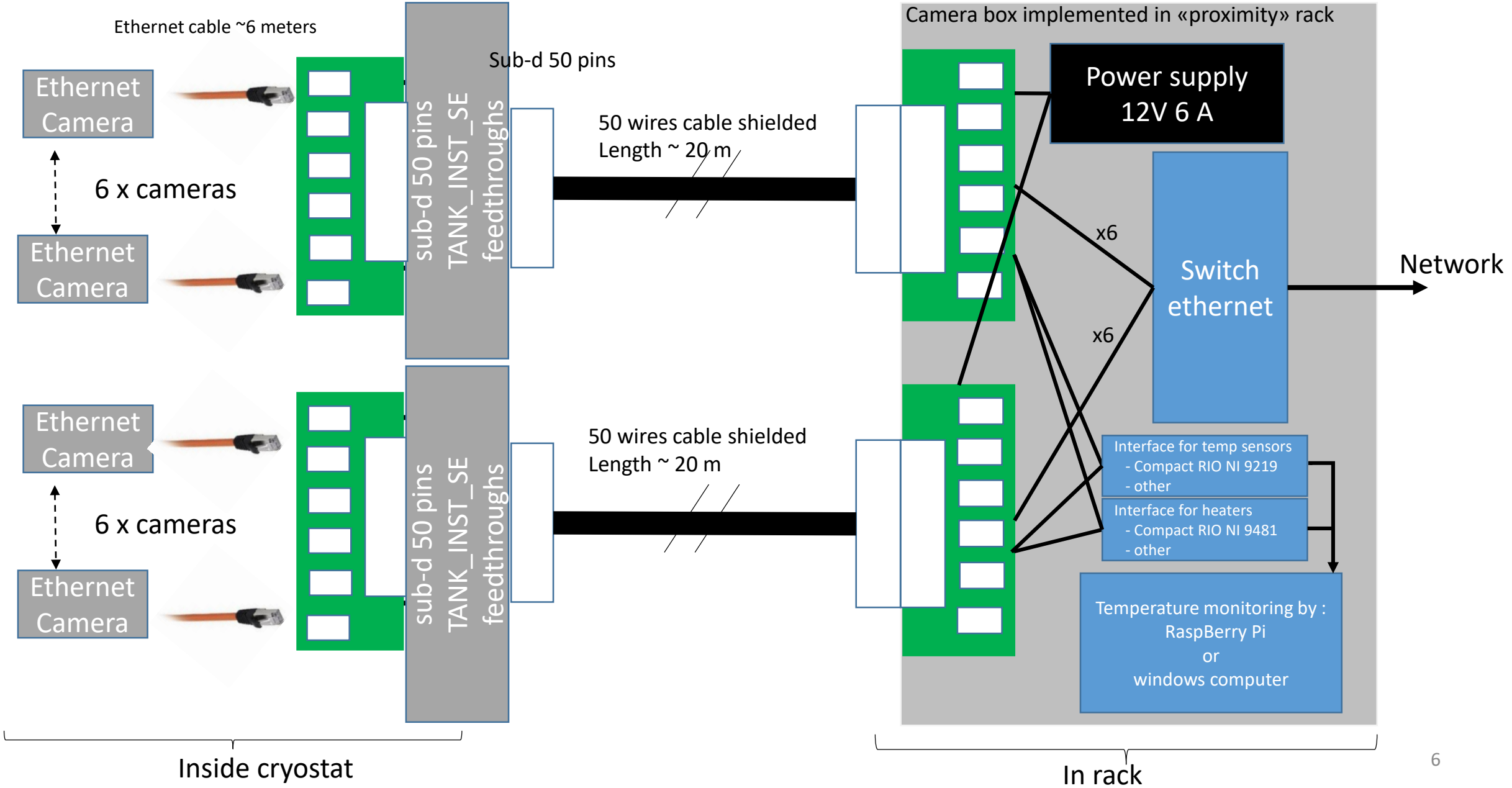
Camera and Heaters ON (500mA)

- Computer with Labview
- 2 x compactRIO of National Instrument (Labview)
  - NI9219 (4 ports)
  - NI9481 (5 ports)
- Labview software measure camera temp (via the NI9219) and switch on/off the heater (via the NI9481)

Ravotech camera needs to have a t° more than -80°C
(see backup , with Revotech camera restarting test slide)



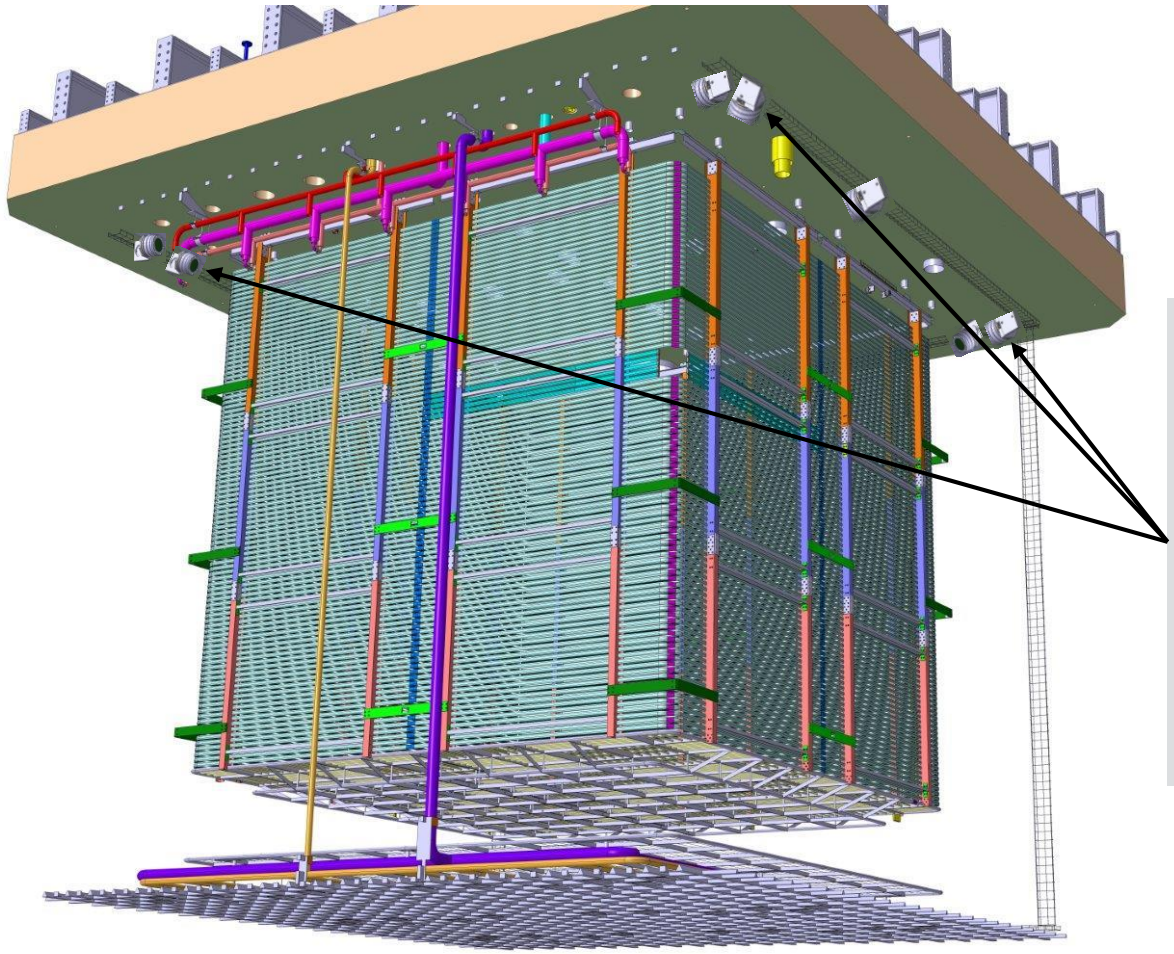
Main cameras scheme for the 6x6x6



Steps	Week
Finalize the camera prototype with polymer (CERN polymer team)	36 (next week)
Test the prototype in gas argon during few weeks	36 – 37 – 38 - 39
Build PCBs for the flanges connection → production (with Cosimo)	37
Labview with RaspBerry Pi (temperature regulation software)	37
Software (in PVSS ?) : - viewer - streaming recording	37 →….
Camera box building for rack (need PCBs)	38 - 39
Build 6 prototypes connected throught the flange (final config) - Tested in argon gas	40 → 43
Camera installation in the 6x6x6 cryostat	2 (2018)

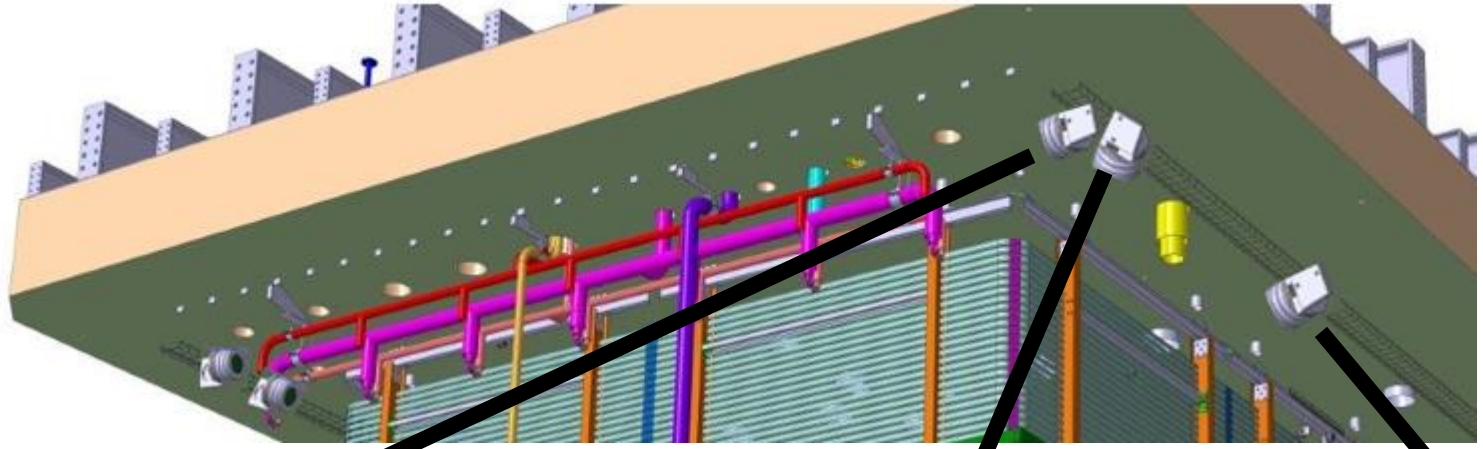
Backup

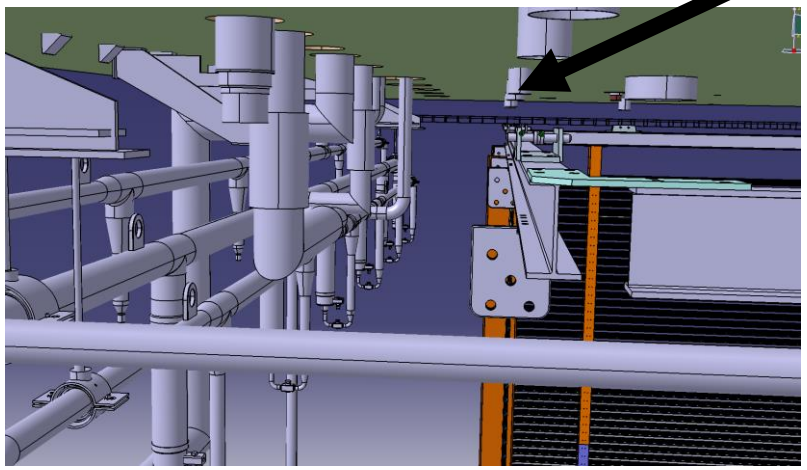
Camera inside cryostat



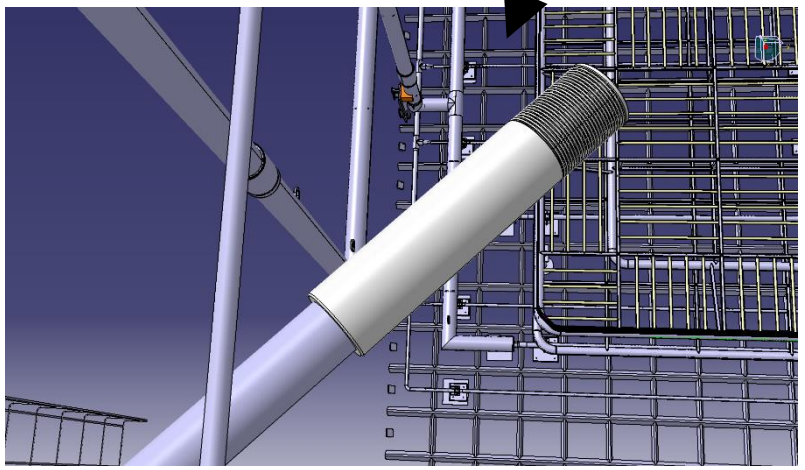
- 12 cameras fixed on the top cable trays:
  - 2 x VHV feedthroughts
  - 2 x cooling down nozzles
  - 1 x beam plug
  - 7 x liquid argon level + CRP
- No cameras in the liquid
- Safe distance from HV

Camera inside cryostat

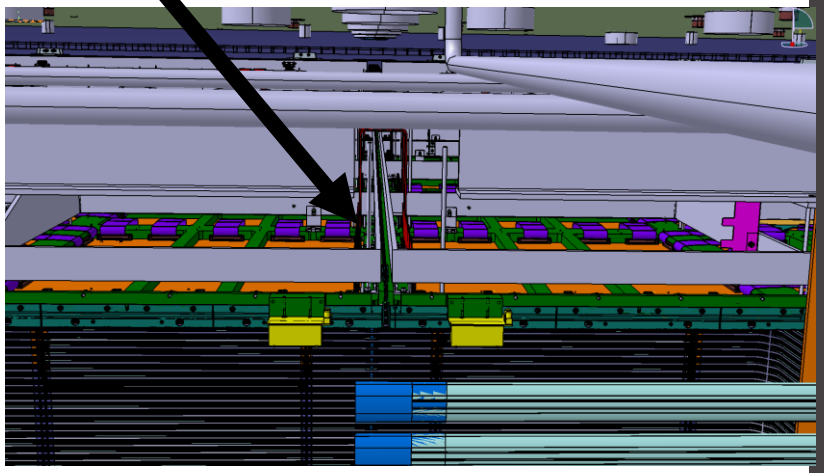




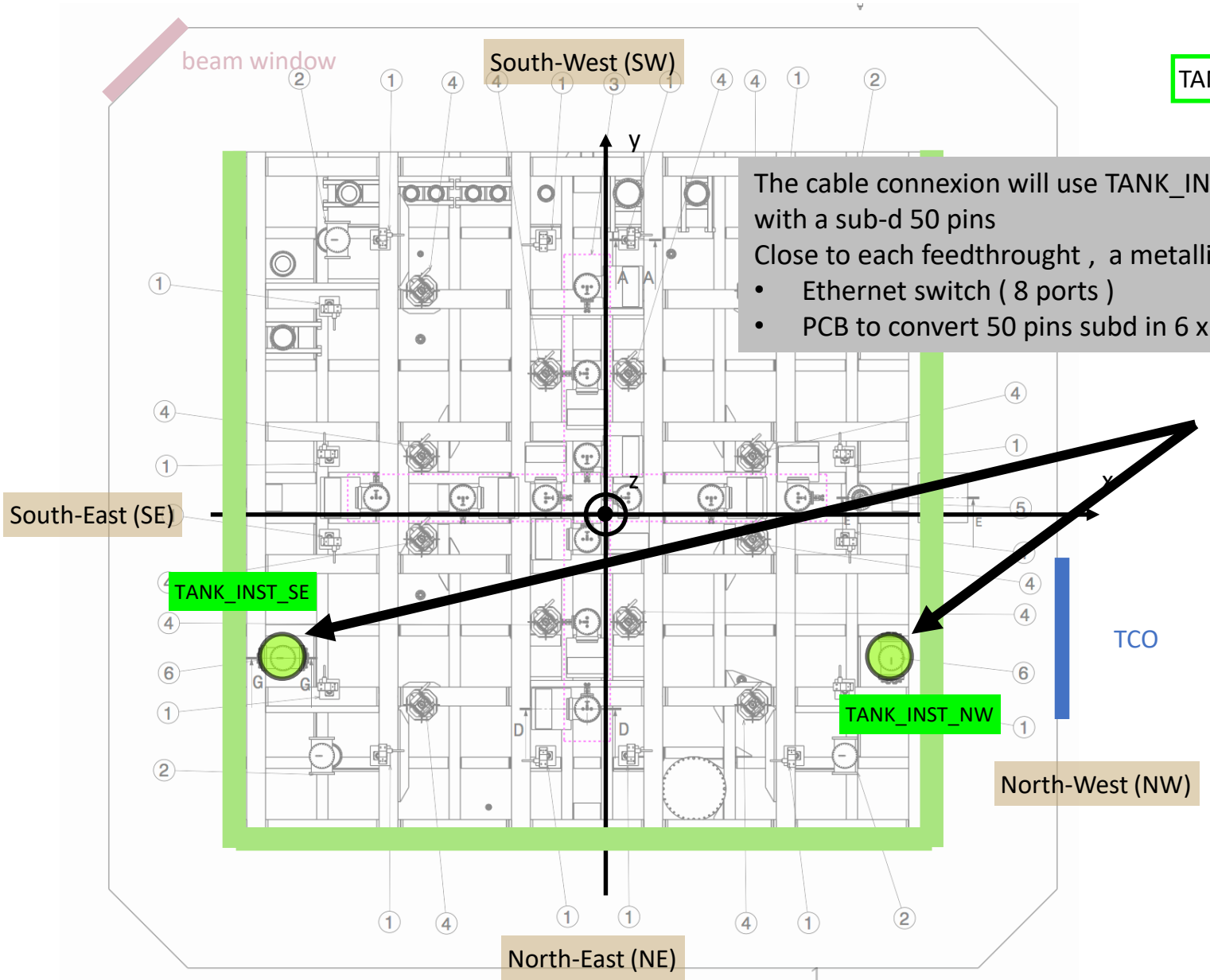
Cooling down nozzles



Beam plug



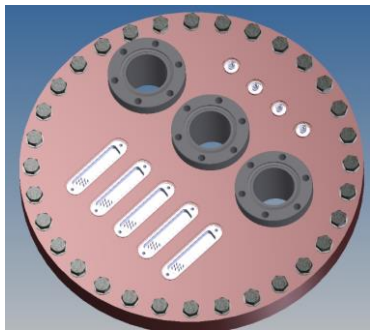
Levelmeters



TANK_INST_*SE,NW*

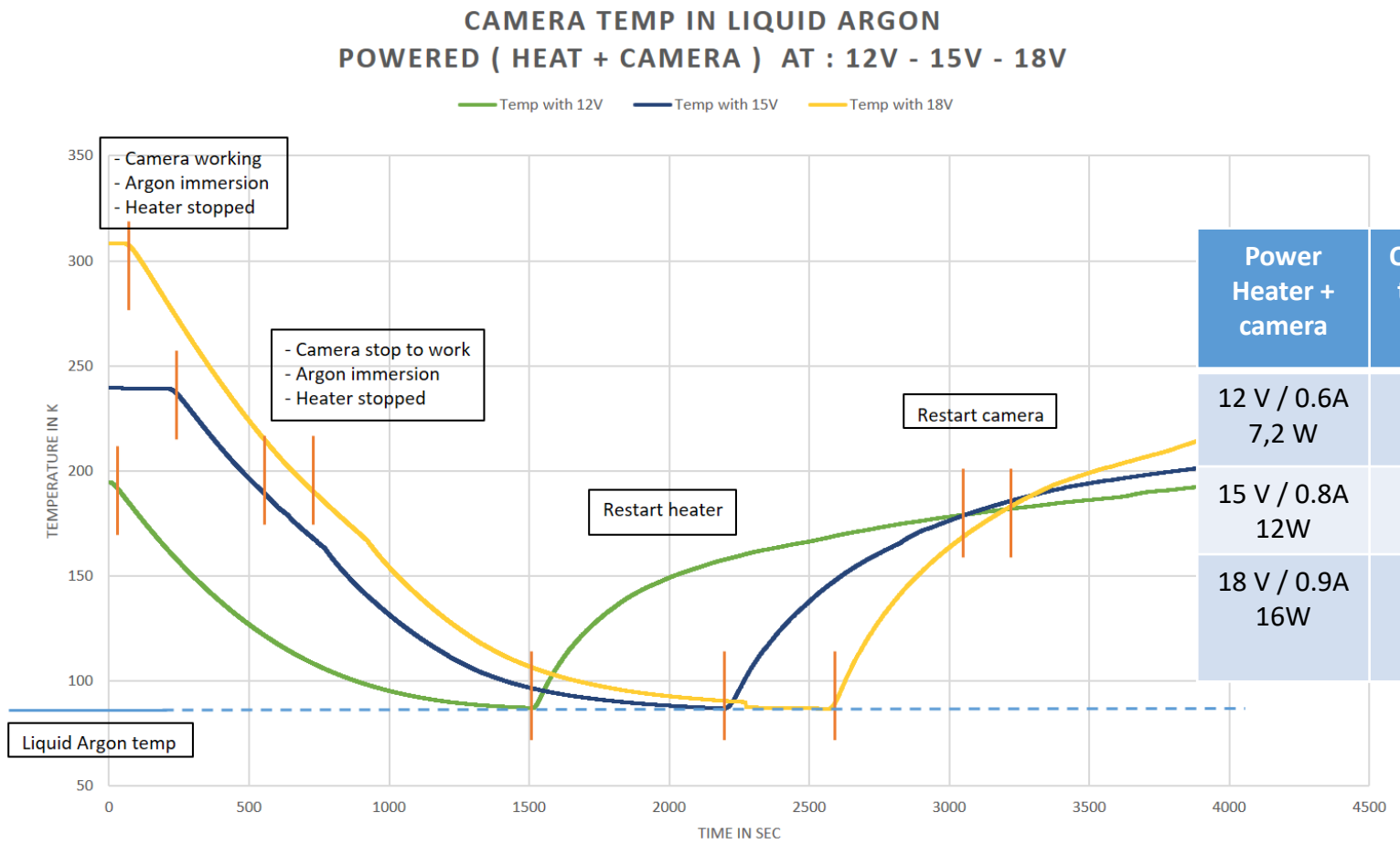
The cable connexion will use TANK_INST_SE and TANK_INST_NW feedthroughs with a sub-d 50 pins
Close to each feedthrought , a metallic box will contain:

- Ethernet switch (8 ports)
- PCB to convert 50 pins subd in 6 x RJ45 ethernet connexion



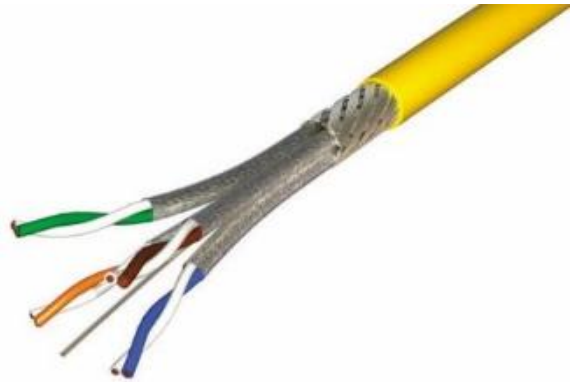
Feedthroughts with subd 50 pins

Goal : test stability and restarting of the camera once immersed in liquid Argon



Power Heater + camera	Operation/stable temperature on camera (°C)	Duration form camera at Lar temperature until restart	Camera temperature restart
12 V / 0.6A 7,2 W	-78	30 min	-90 … -85
15 V / 0.8A 12W	-30	15 min	-90 … -85
18 V / 0.9A 16W	+35	10 min	-90 … -85

Ethernet cable



The ethernet cable connected to each camera in the cryostat will be :

- Cable 100 ohm S/FTP 4P1200MHz CAT7A SH
- Double shielded
- Categorie 7A
- Zero halogen
- Low outgassing
- 10 Gb
- POE