

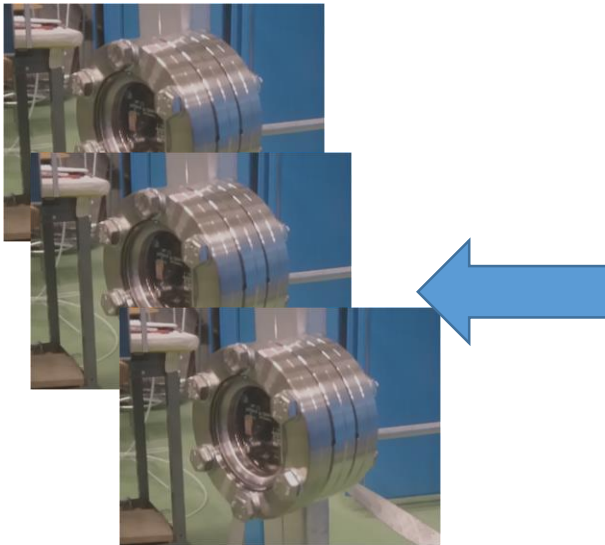
Cryo-Camera update

CERN, General Meeting
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RaspBerry Pi and camera module
- 15 pins cable connection



2 x 3 camera modules connected to the camera box



Camera box build for the Fermilab

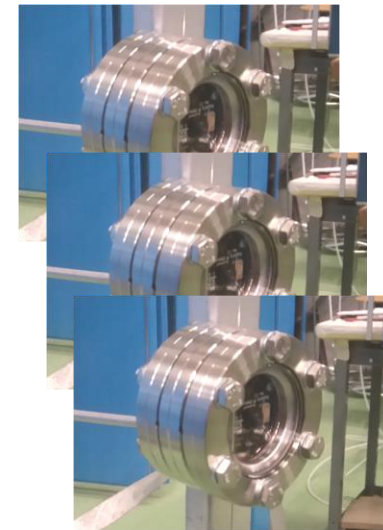


Box with :

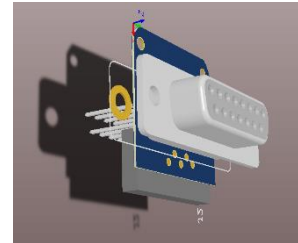
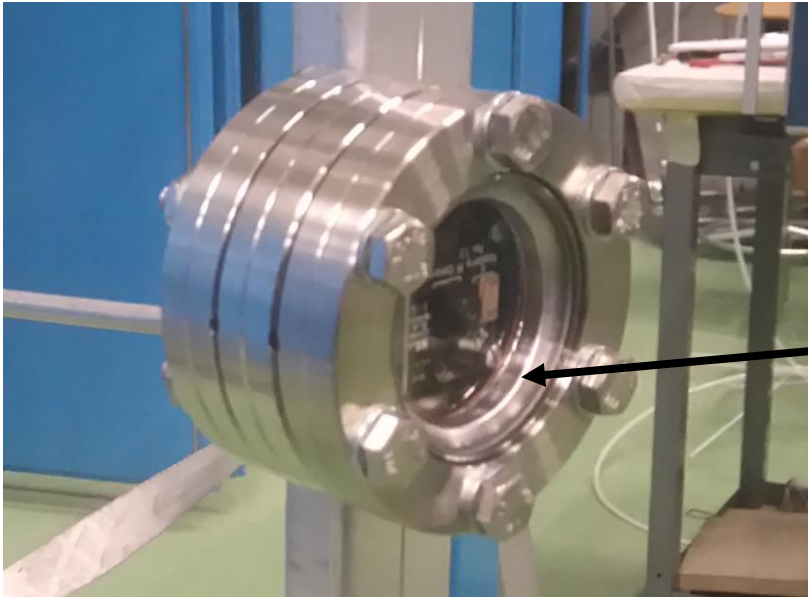
- Fan
- Ground electrical link
- 5V power supply
- Ethernet switch
- 6 x RaspBerry module V3
- Max length tested in between camera and RaspBerry : 8 m

Each RaspBerry module :

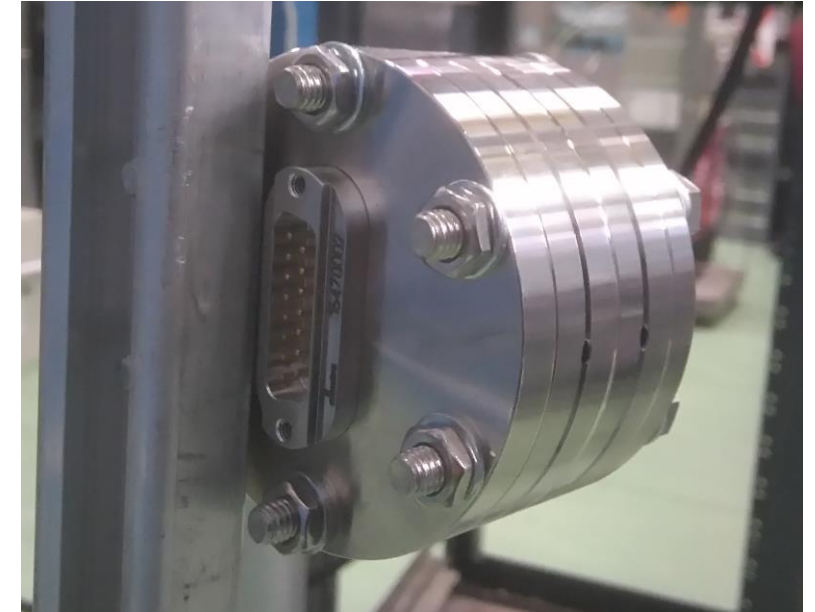
- HDMI output
- 2x USB output
- Ethernet output
- 16 Gb SD Card with Raspian Linux OS



- D x l : 70 mm x 40 mm
- Composed by 3 elements:
 - Viewport in Quartz (Fused Silica)
 - Spacer flange
 - Flange subd 15 pins



- Inside :
 - Camera module
 - Pcb module <-> 15pins d-sub



RaspBerry Camera in Liquid Argon during the CRP test



Condition of the test :

- RaspBerry Pi close to screen
- Camera module immersed in the liquid Argon
- Camera checking below the CRP

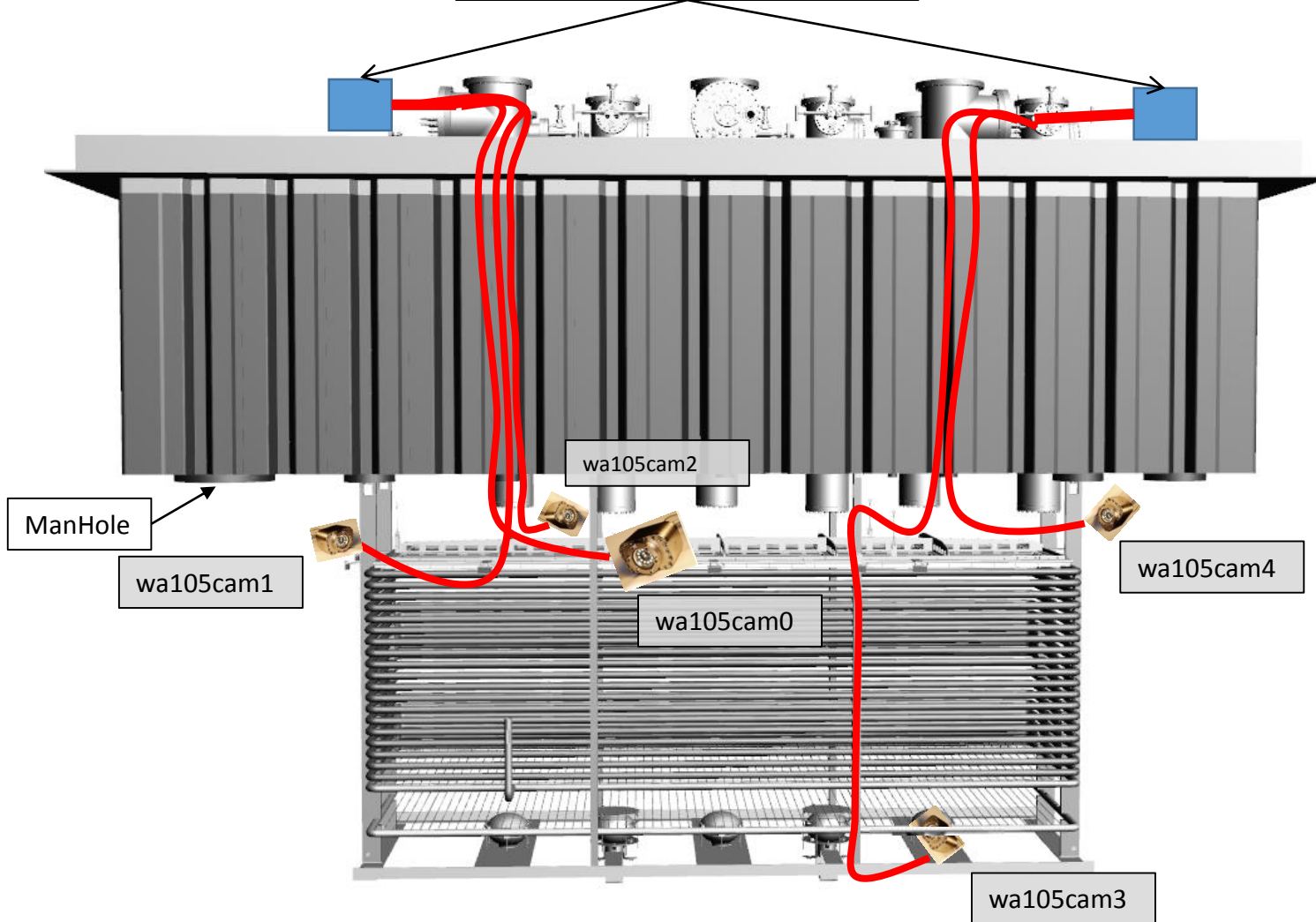


View from camera :

- Few ice block swimming in the Ar
- Distance in between 10cm to 2 m

2 x RaspBerrys box connected with :

- ethernet cable
- 220V cable



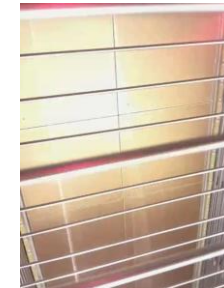
wa105cam0



wa105cam1



wa105cam2



wa105cam3



wa105cam4

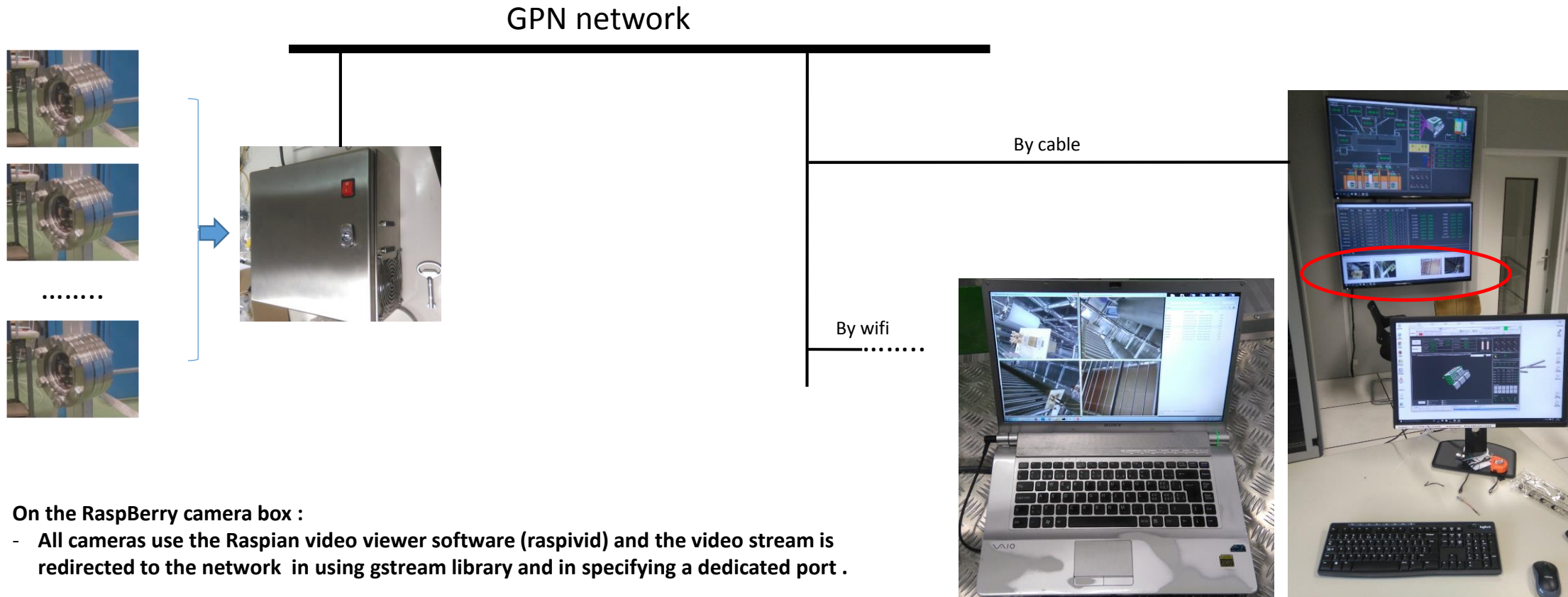
4 cameras for the top in gaz Argon:

- one for each side
- one watching also the HV feedthrough
- (4 meters length cable)

1 camera for the bottom in liqAr:

- watching LEMs (6 meters length cable)

Cryo - Cameras software streaming video



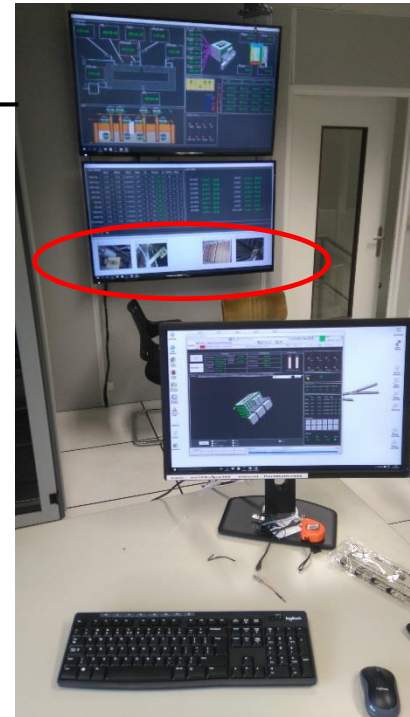
On the RaspBerry camera box :

- All cameras use the Raspian video viewer software (raspivid) and the video stream is redirected to the network in using gstream library and in specifying a dedicated port .

On computers :





- In installing gstream library , any computers (windows or linux) can be able to show all cameras with a correct fluidity . (10 to 25 frames/sec)

<https://gstreamer.freedesktop.org/>



3x1x1 Control room

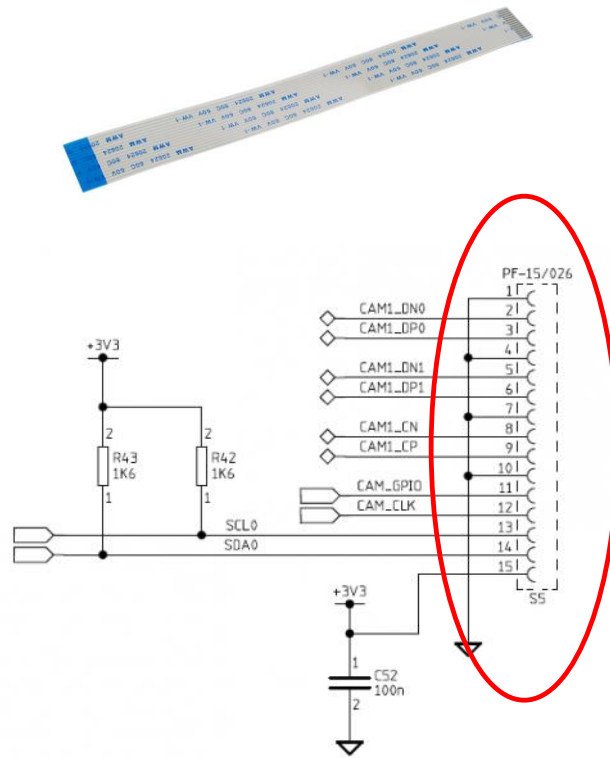
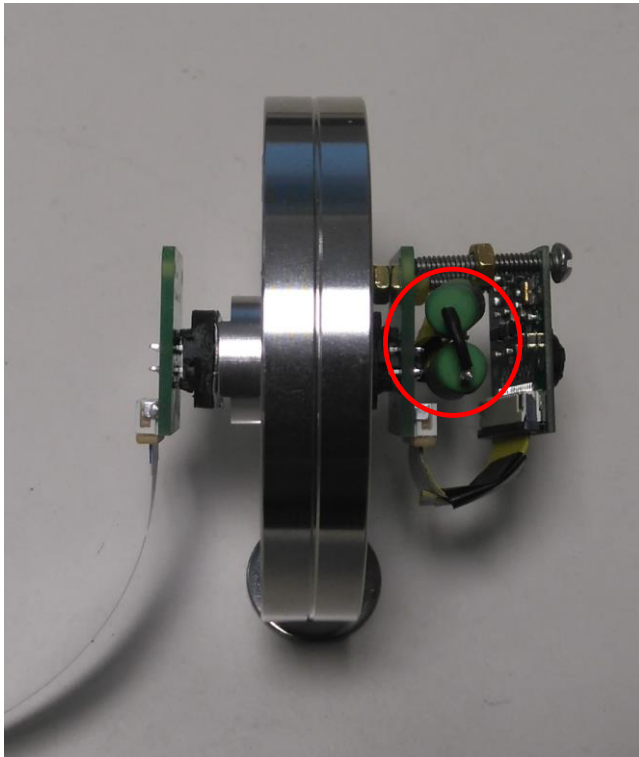
- RaspBerry created new camera module V2.1 with 8 MPixels instead 5 MPixels.
- Major problem with this new generation module , it doesn't restart after to be imerge in the liqAr

	Module name	Status
	Infra Red Camera V 1.3 <ul style="list-style-type: none"> - Omnivision 5647 - 2592×1944 	<ul style="list-style-type: none"> - Able to restart in the liqAr - Equipped the 3x1x1 - Discontinued - clone module doesn't restart in the liqAr
	Visible Camera V 1.3 <ul style="list-style-type: none"> - Omnivision 5647 - 2592×1944 	<ul style="list-style-type: none"> - Don't restart in the liqAr - Discontinued
	Infra Red Camera V 2.1 <ul style="list-style-type: none"> - Sony IMX219 - 3280 x 2464 (8 MP) 	<ul style="list-style-type: none"> - Don't restart in the liqAr
	Visible Camera V 2.1 <ul style="list-style-type: none"> - Sony IMX219 - 3280 x 2464 (8 MP) 	<ul style="list-style-type: none"> - Don't restart in the liqAr

**Only the IR v1.3 version of the camera module is able to restart after to be switch in the liqAr.
But the sale is stopped!! → Find a solution**

Camera module solution

Solution : Install a heater inside the camera module in adding a resistor, in between the camera module pcb and the d-sub 15 pin pcb , and in added glue to do a correct heat transmission.



Cable connection

This resistor will be supplied by the RaspBerry cable. The idea is to take 2 lines of the 4 common ground lines and supplied resistor to keep a correct temperature inside the module .

We are thinking for a regulation inside the camera module.

Actually Fermilab did this modification without regulation , but with success.

Fermilab modification (12V / 460 Ohm / 260 mA)

Work in progress...

3x1x1 :

- 5 x IR V1.3 cameras has been already installed → no heater modification

6x6x6 :

- Finalize and test the heater / regulation of the camera module
- Build the box
- Test in LiqAr conditions
- 4 x V2 cameras will be install in Argon gaz

Thank you