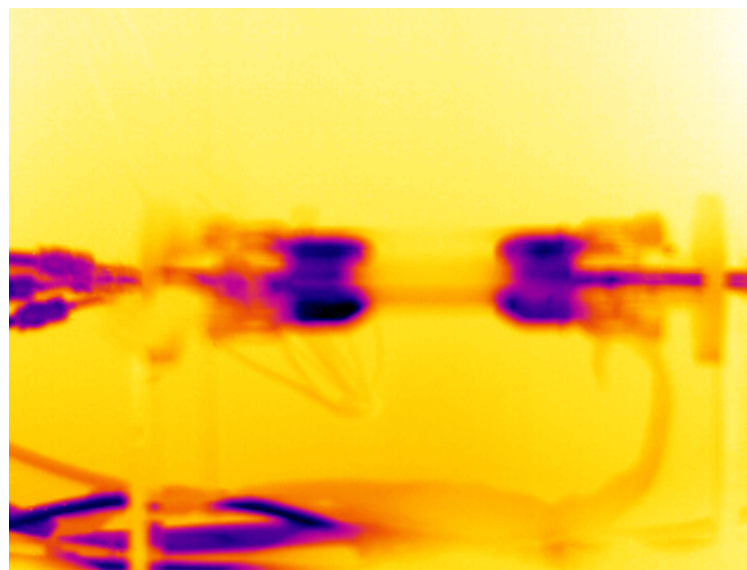


# Thermo-mechanical activities at Valencia

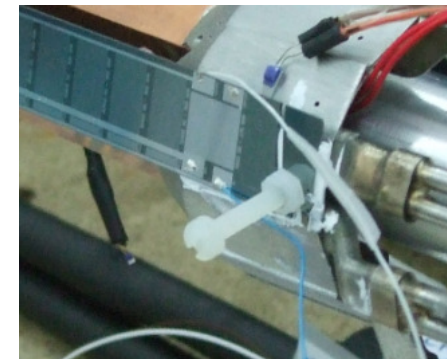
V. Castillo, C. Lacasta, A. Oyanguren, P. Ruiz

(IFIC - Valencia)



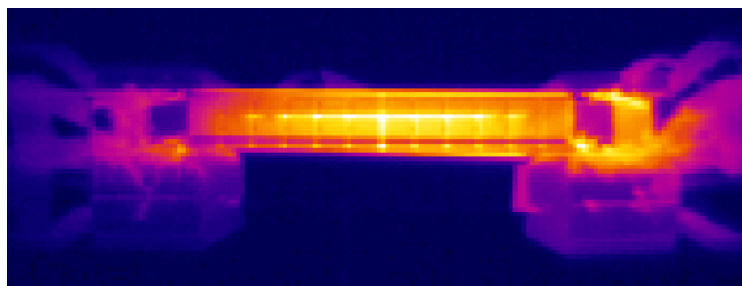
Mock-up status:

- Found a way to temporarily fix a dummy in the CrCo sample: plastic nut + screw ended with a wire embedded in the hole
- Thermal grease for the thermal contact
- One resistor sample in the outer layer
- Problems with the wire connections (easily loosen when installing the dummy, re-glued *in situ*)

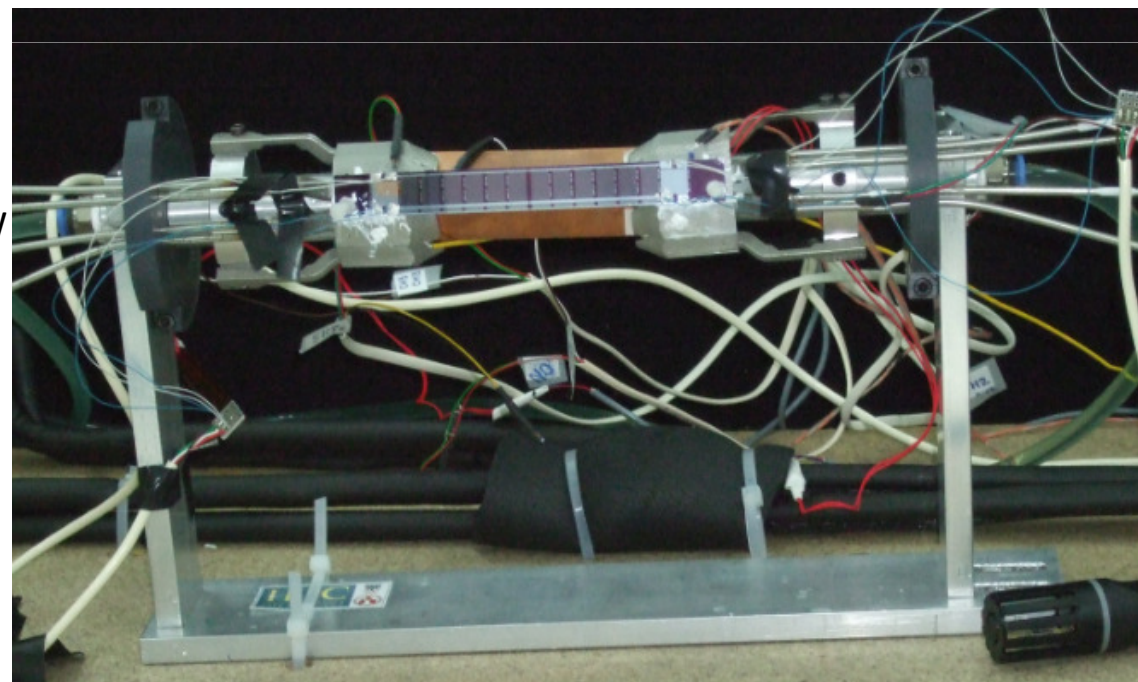


- Set voltages:

- Sensor: 12 V  $\rightarrow$  P  $\sim$  1W
- Switchers: 3V  $\rightarrow$  P  $\sim$  0.25 W
- DCDs/DHPs: 20V  $\rightarrow$  P  $\sim$  2.5 W

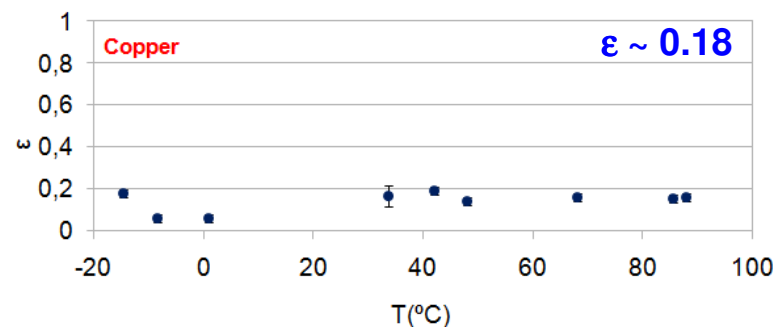
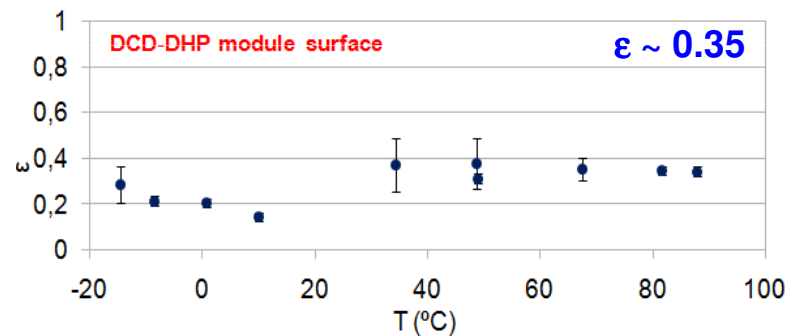
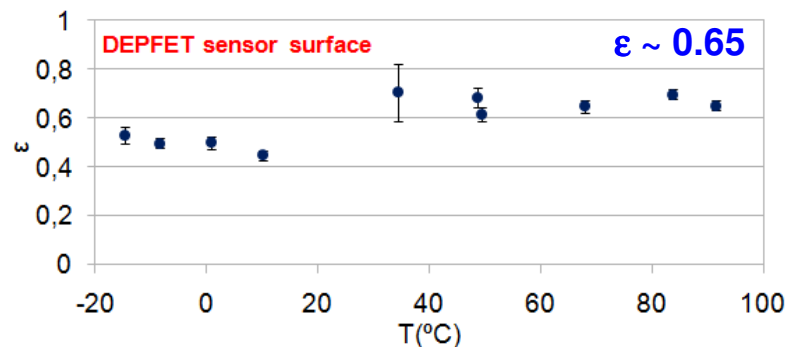
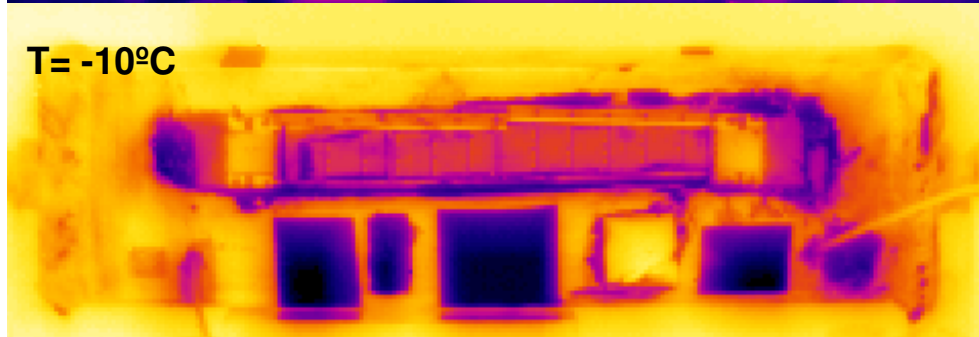
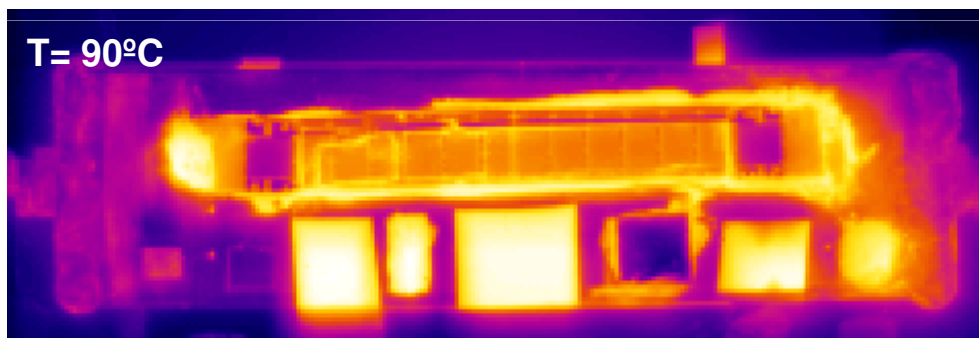
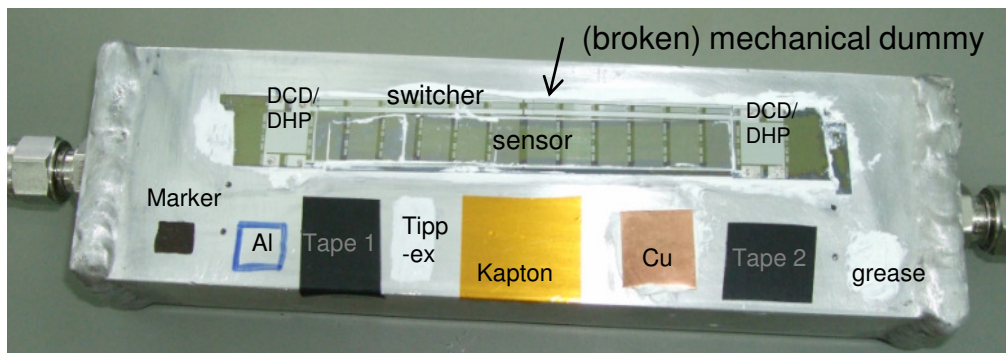


It works!  
(apart from the left switchers)



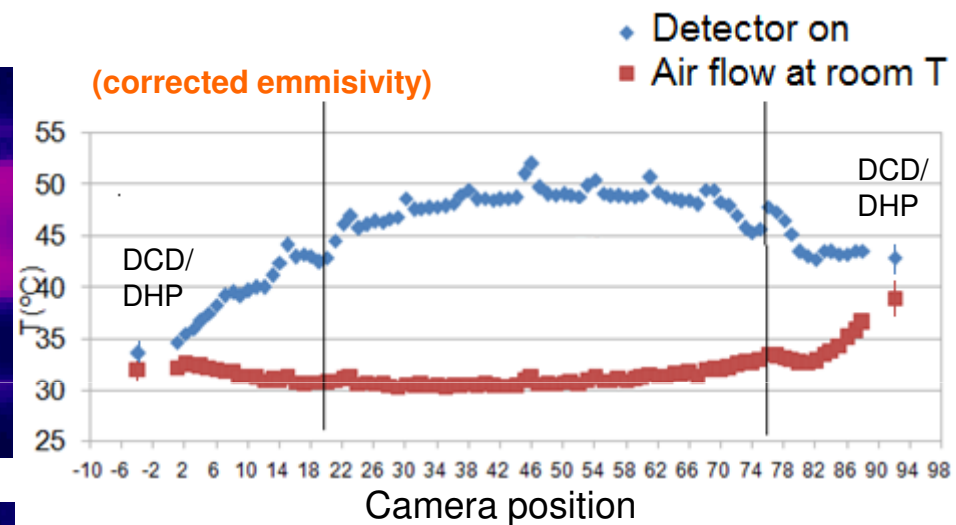
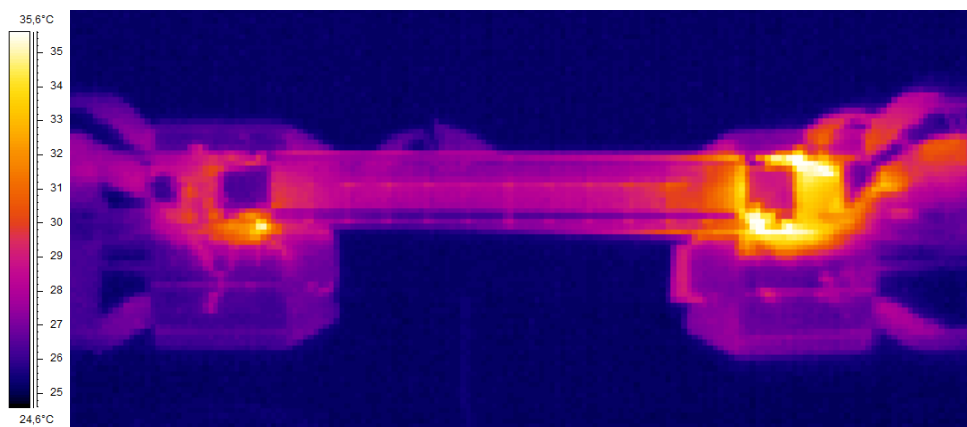
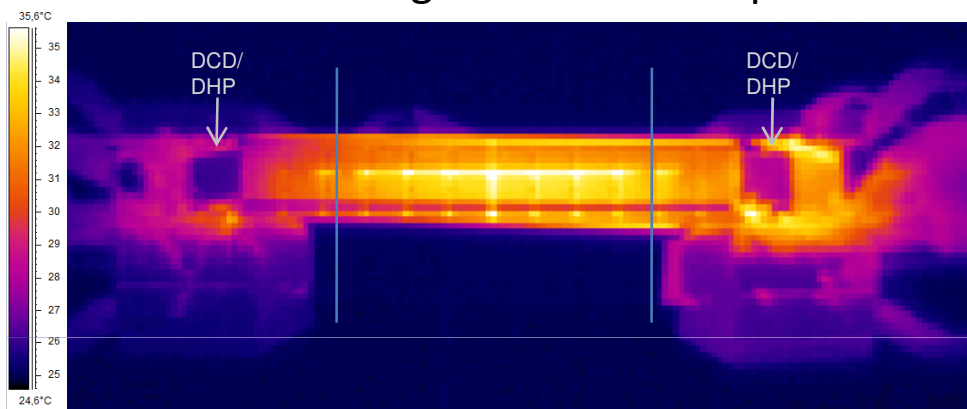
**Calibration tool for the IR camera: ( $\epsilon$  depends on the material)**

Al box filled with coolant: cooled down with chiller, heated with heaters. Study material  $\epsilon$



Air flow studies:

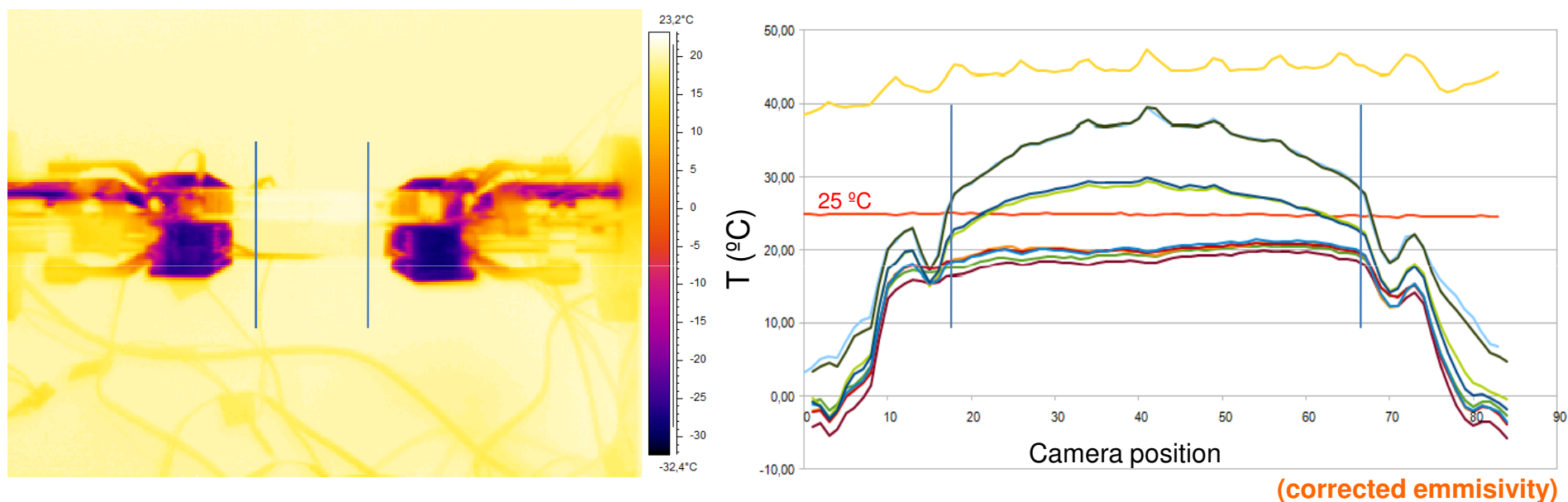
- Effect of blowing air at room temperature



-The air flow (at room T) decreases and homogenizes the temperature along the detector.  
 → Decreases  $T \sim 15^\circ \text{C}$   
 → Max  $\Delta T$  along the ladder  $18^\circ \text{C} \rightarrow 8^\circ \text{C}$

## Air flow studies:

- Cooling down the end flanges with CO2
- Blowing air/N2 at different temperatures (cooled down with N2 liquid atmosphere)



Looking at the central region of the sensor:

- Detector on:  $T \sim 45^\circ\text{C}$
- Effect of CO2 + air flow :  $T \sim 20^\circ\text{C}$  (or below)

Looking at the edges:

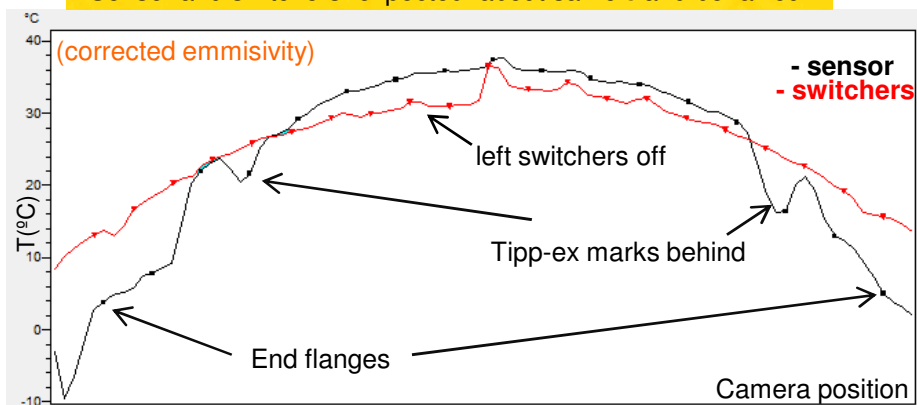
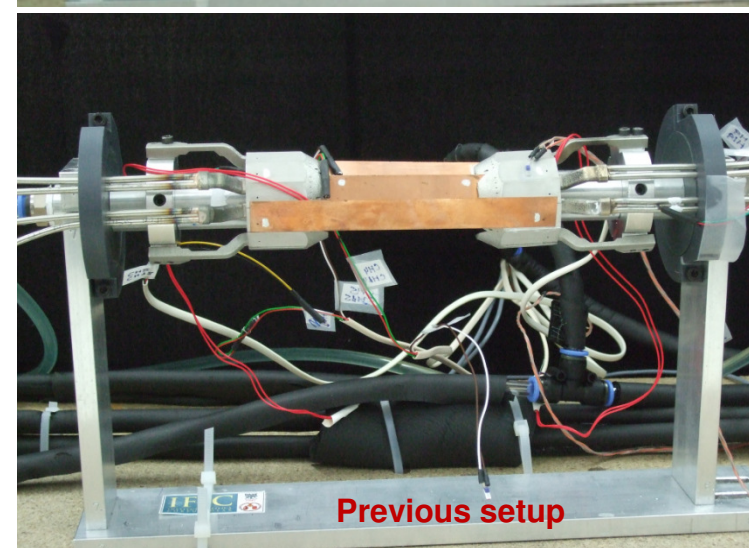
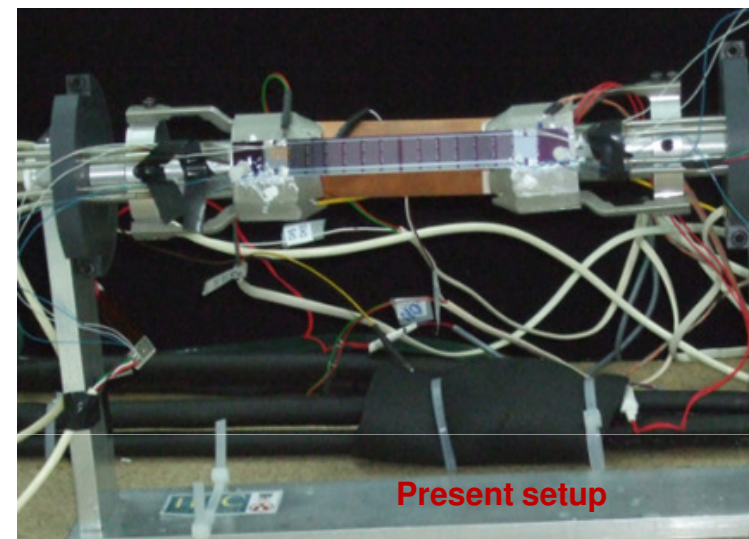
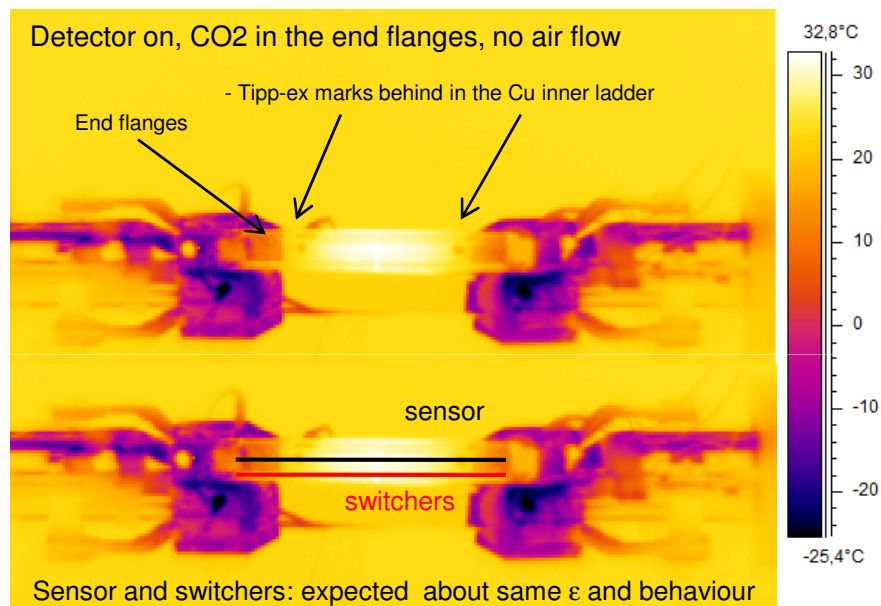
- Bumps ?? (crab legs)
- With CO2 + air flow  $\Delta T$  along the ladder  $\sim 20^\circ\text{C}$  (!?)

- Detector on
- End flanges cooled down with CO2
- Air/N2 flow at room T
- Background (room T)
- Air/N2 cooled [-3,-15]°C

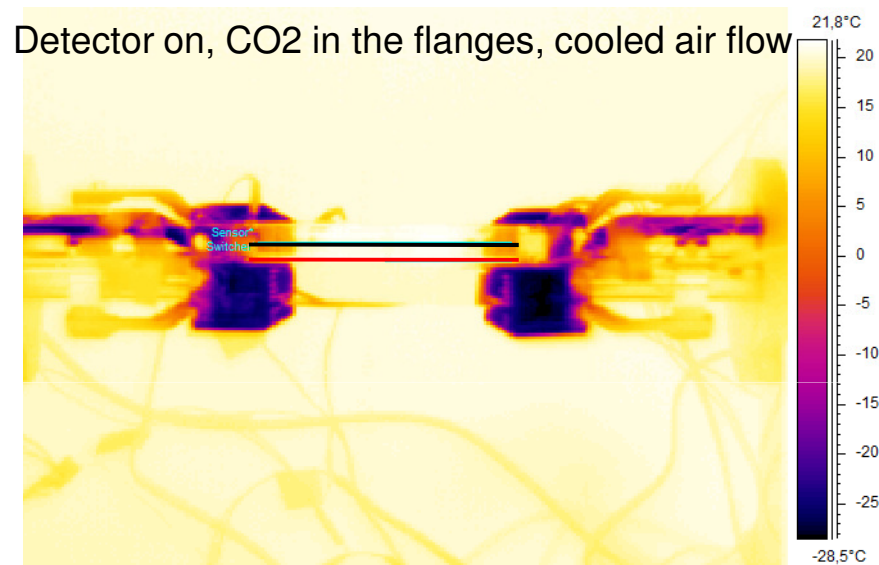


### Air studies:

- Problems of IR transparency due to the thickness of the detector:

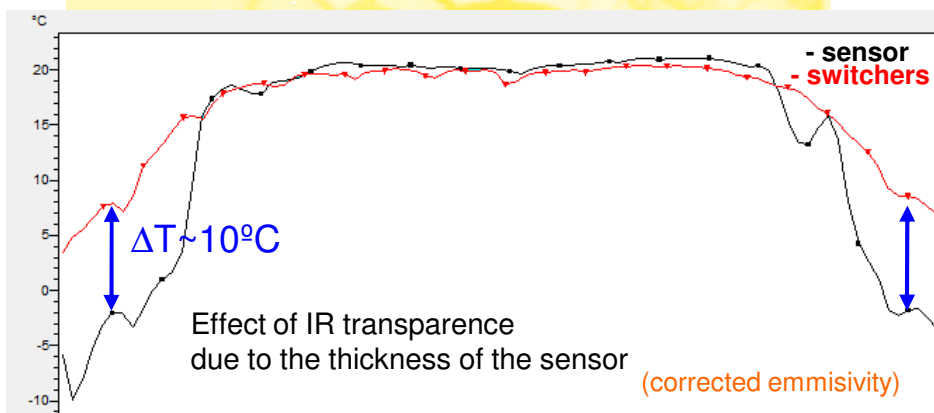


Air studies:



- Need to better study and calibrate this effect to obtain reliable results.

But if the thermal effect in the switchers is representative, the  $\Delta T$  in the ladder is about 15 °C under these conditions (in practice we expect larger power dissipation in the cooling blocks, so the  $\Delta T$  will decrease)



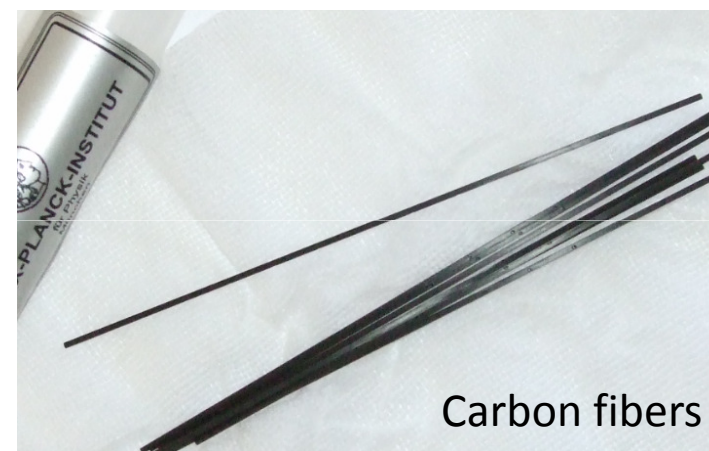
- Conclusions :

Still performing air flow cooling studies:

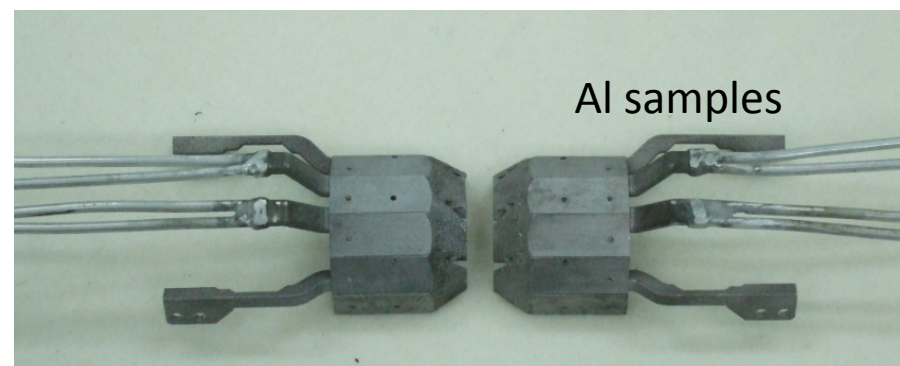
- First tests with a resistor sample
- Performed an IR camera calibration tool
- Need to study and calibrate IR transparence of the detector

- Foreseen studies (September):

- Test air flow effect through carbon fibers
- Air flow cooling with the CO2 return (CO2 system modification during August)
- New end flanges of aluminum or stainless steel (ladders better screwed, better fix and thermal contact)



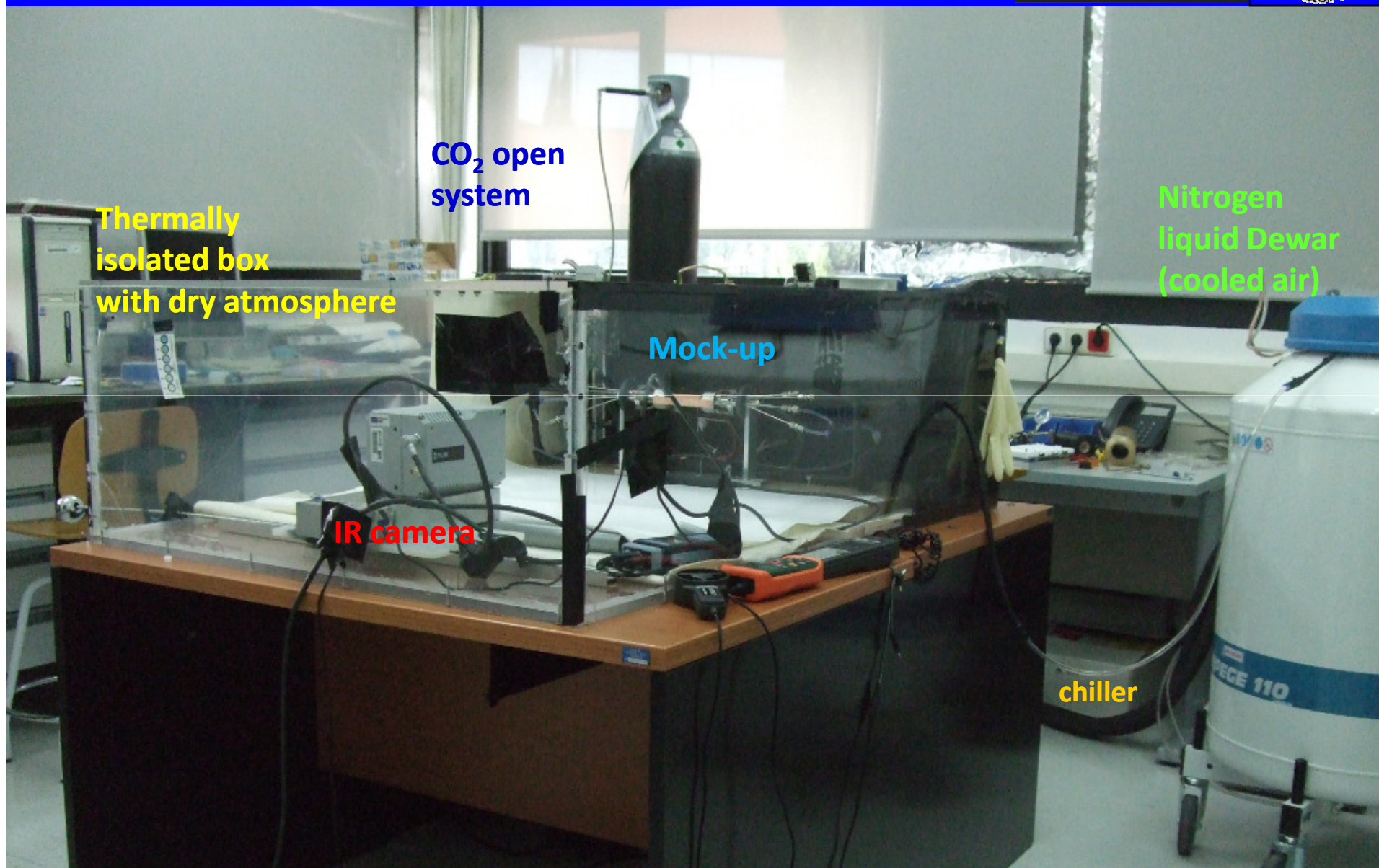
Carbon fibers



Al samples

Thanks and good summer holiday!





Thermally  
isolated box  
with dry atmosphere

CO<sub>2</sub> open  
system

Nitrogen  
liquid Dewar  
(cooled air)

Mock-up

IR camera

chiller

- Dummy ladders:

