NPS Mounting procedure
01/26/2021

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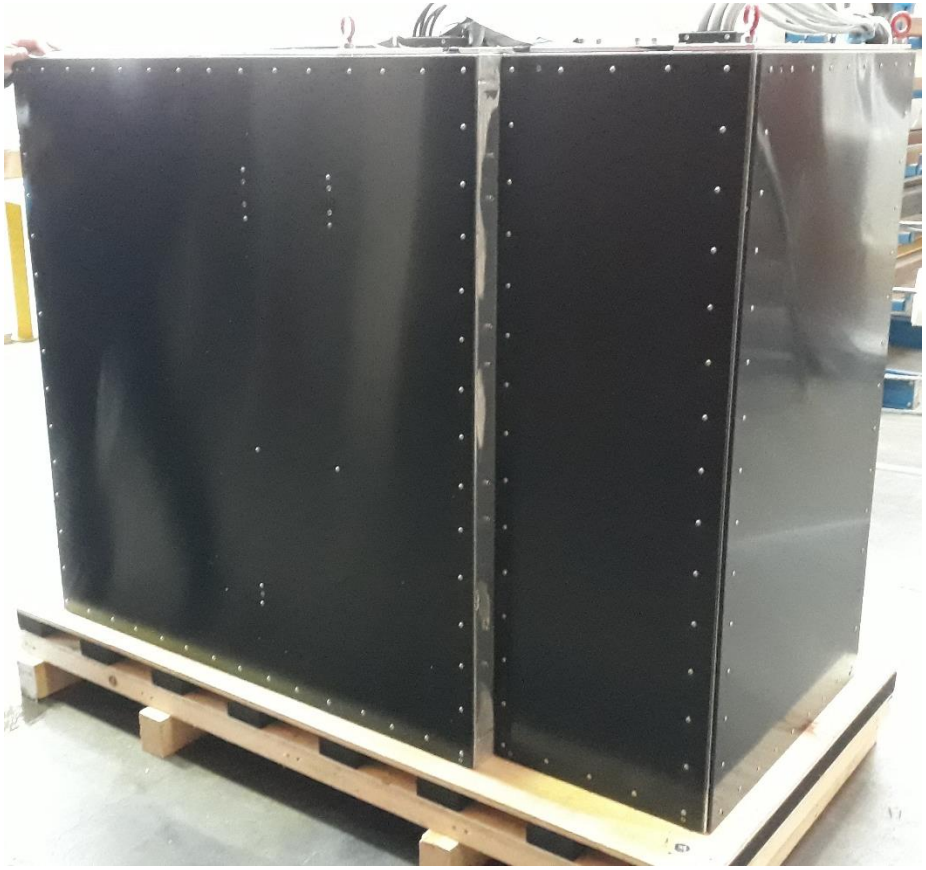
Task 1 :Open the wood box

Open first the rear plate noted on the wood box



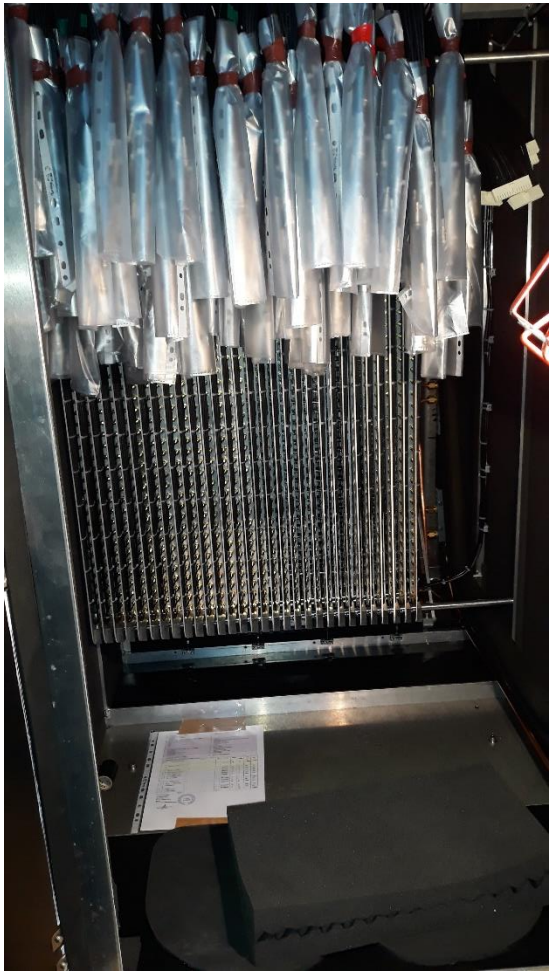
Then the other wood plates

Task 2 :Open the wood box

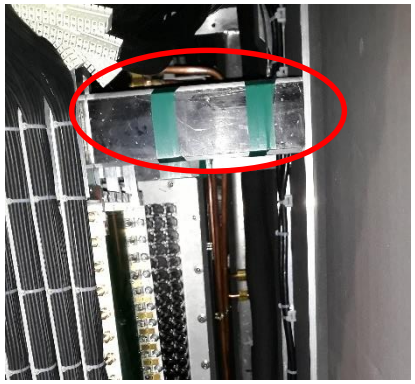
2: Remove all the black plates

Task 3 :Remove the 30 PCB

Remove the protection of anode cables

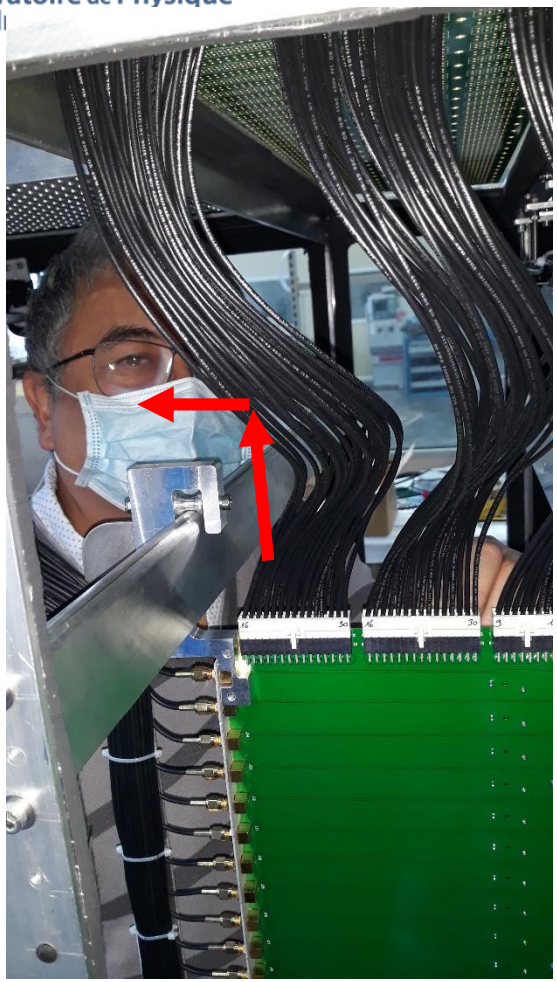


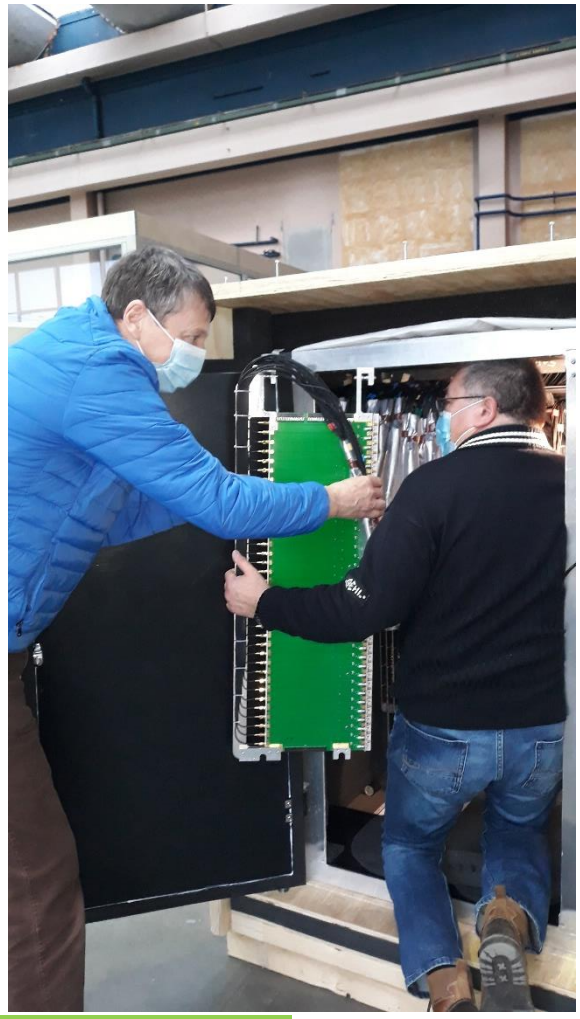
Don’t remove the individual bags for cables in order to avoid to loose the connectors nuts



Remove The Plastic parts which maintain blocked the PCB (Top x 2 + bottom x1)

Task 4 :Remove the 30 PCB





4:Remove all the PCB (take care the anode wires) The HV cables are not connected

Task 5 :Remove the bottom wood part

Remove the metal plate which is screwed on the bottom wood support (2 screws)

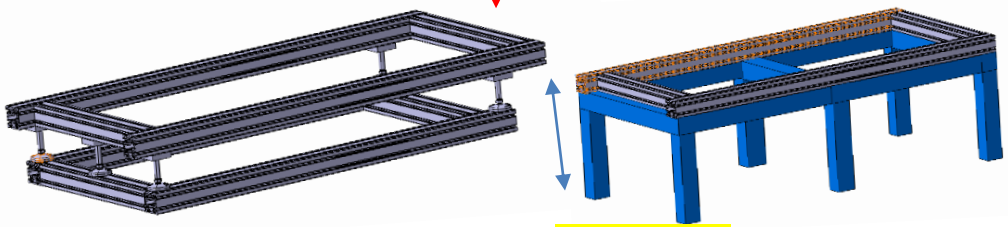
Backward corner

Remove the screws which maintain the Aluminum frame on the bottom wood support (6 screws)

Task 6:Lift the box and pull down on the Jlab support frame

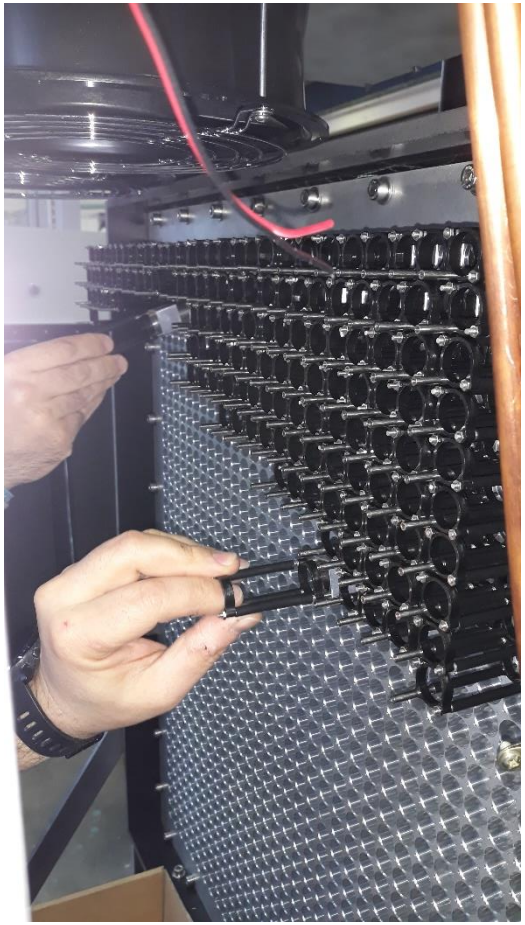
Use the 4 lifting rings

Fixing the box on the frame (6 screws)



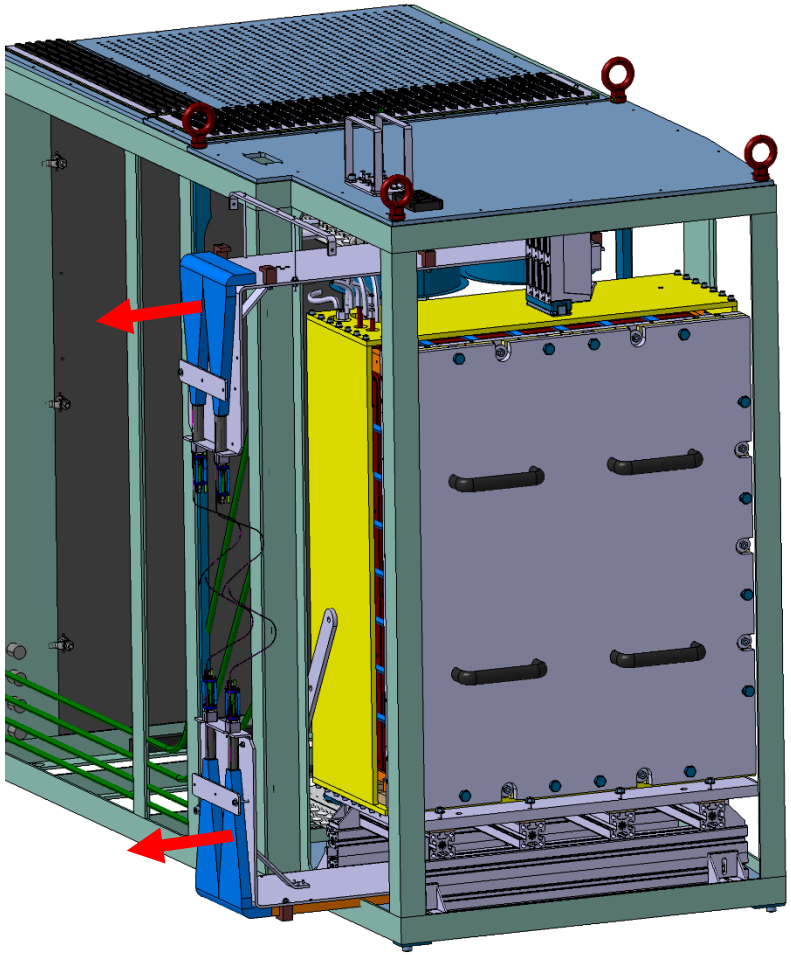
Jlab frame ? 52 cm

Task 7:Removing all the 1080 PMt supports



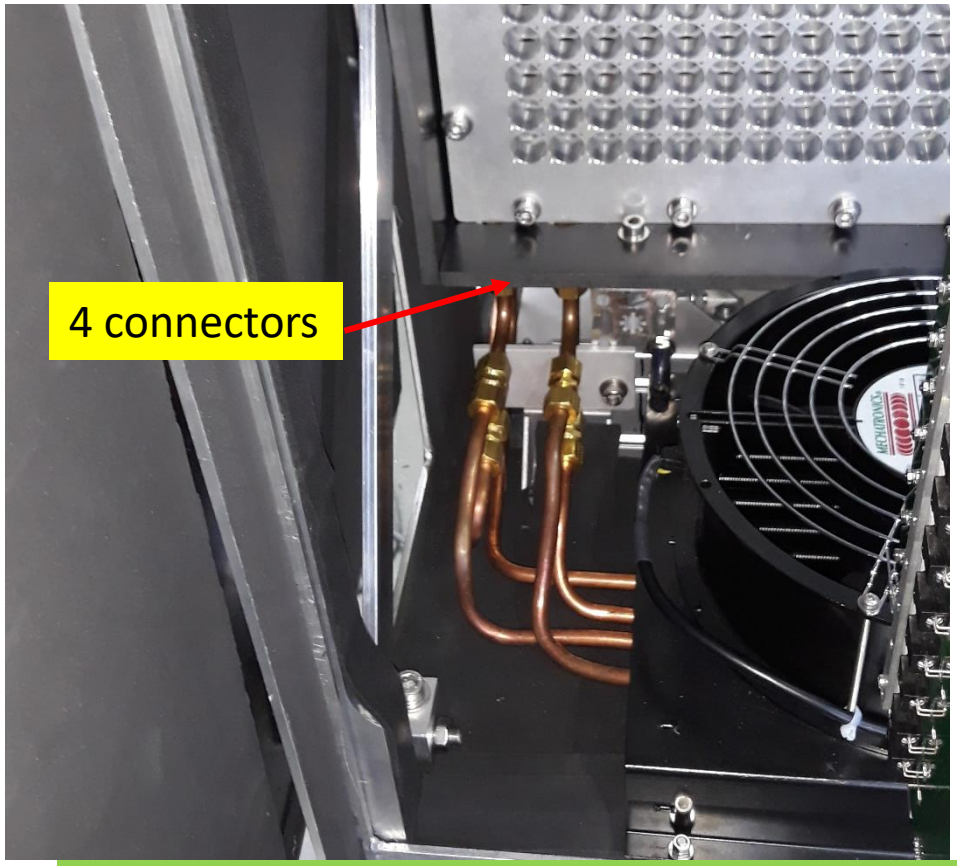
7 :Unscrew each fixation screw (1/PMt support) and pull the PMT support . Take care the fragile Mu metal tubes

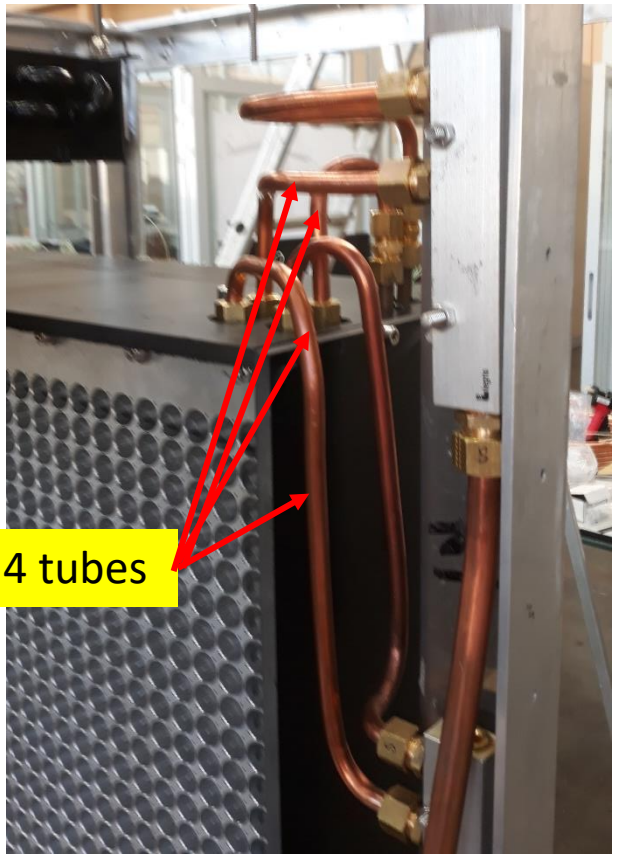
Preparation before mounting :Task 8



8 : Remove the 2 scintillators

Preparation before mounting :Task 9

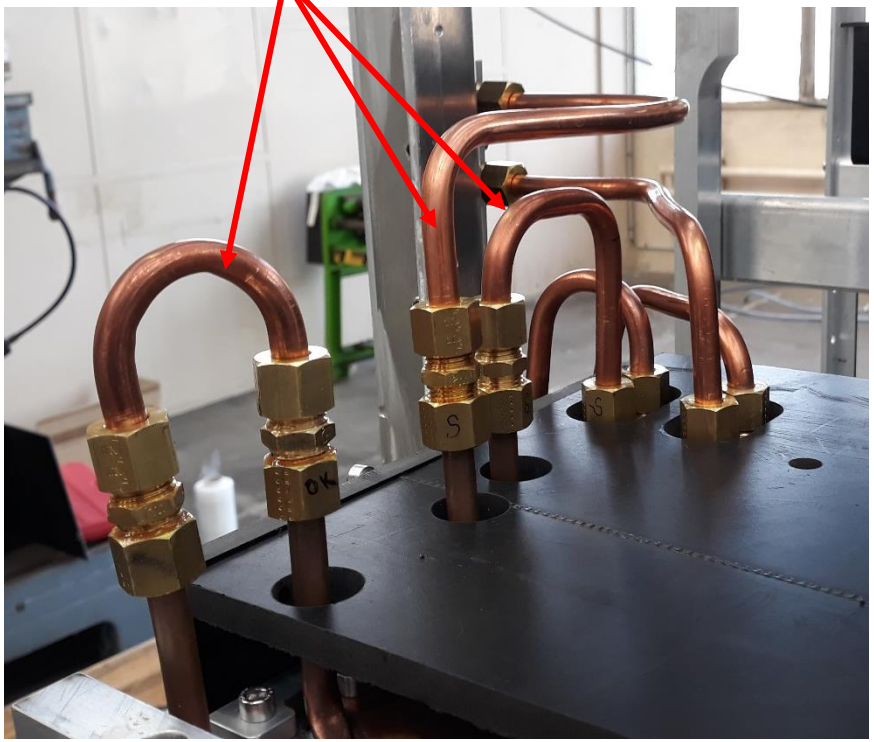




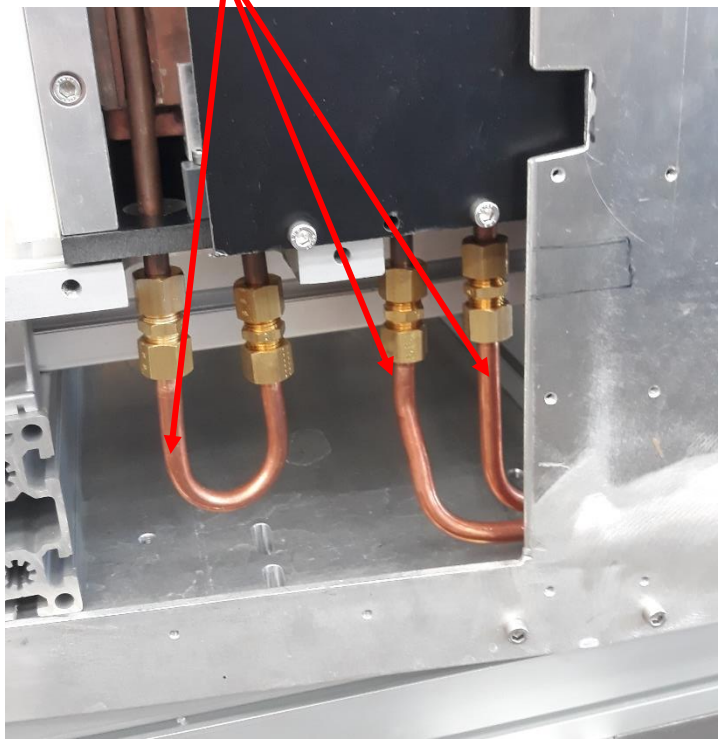
9 : disconnect all the copper tubes connected on the Reference and the support PMt aluminum plates

Preparation before mounting :Task 10

3 Top tubes



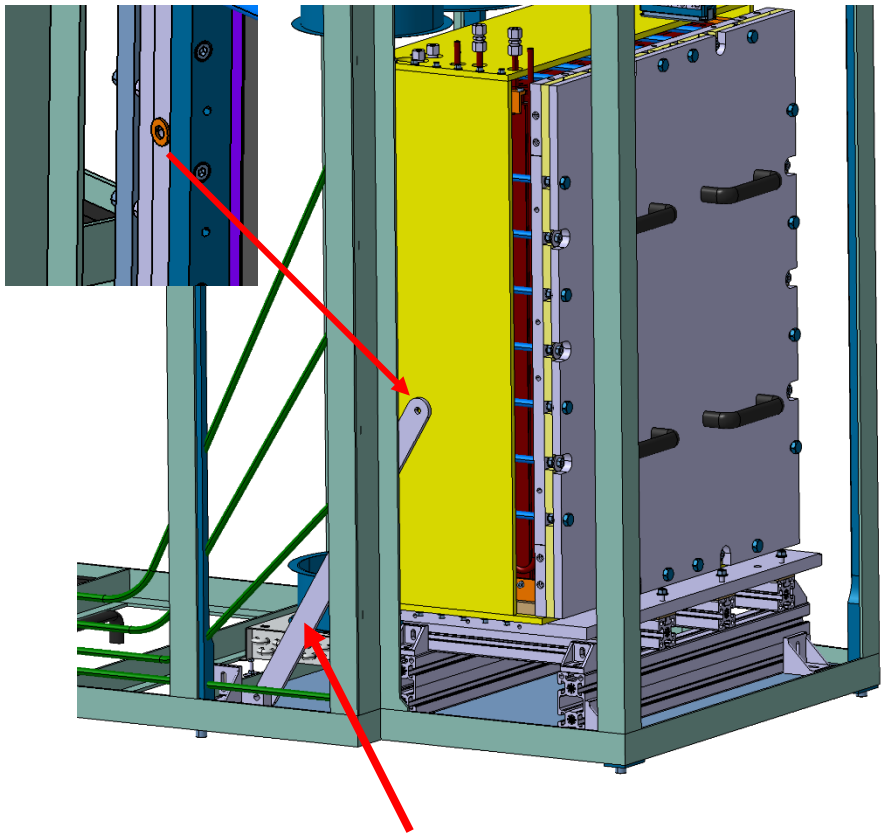
3 bottom tubes



10 : disconnect the 6 copper tubes connected on the 4 cooling plates

Preparation before mounting: Tasks 11 and 12

Caution: 2 mm spacer between false shielding plate and vertical frame

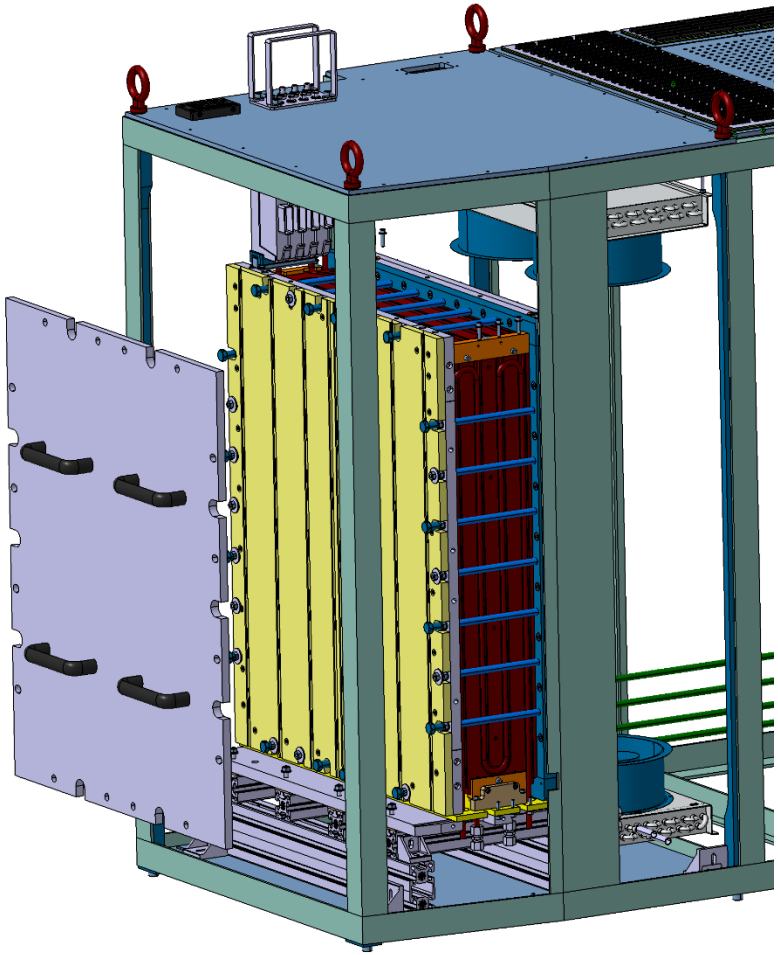


11 : remove the 2 reinforcement arms

False shielding

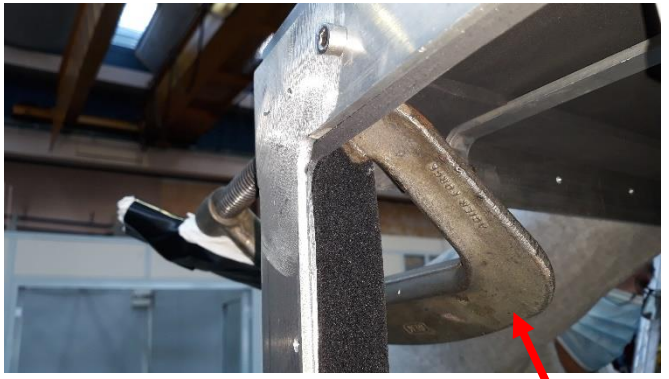
12: remove the plastic plates (false shielding)

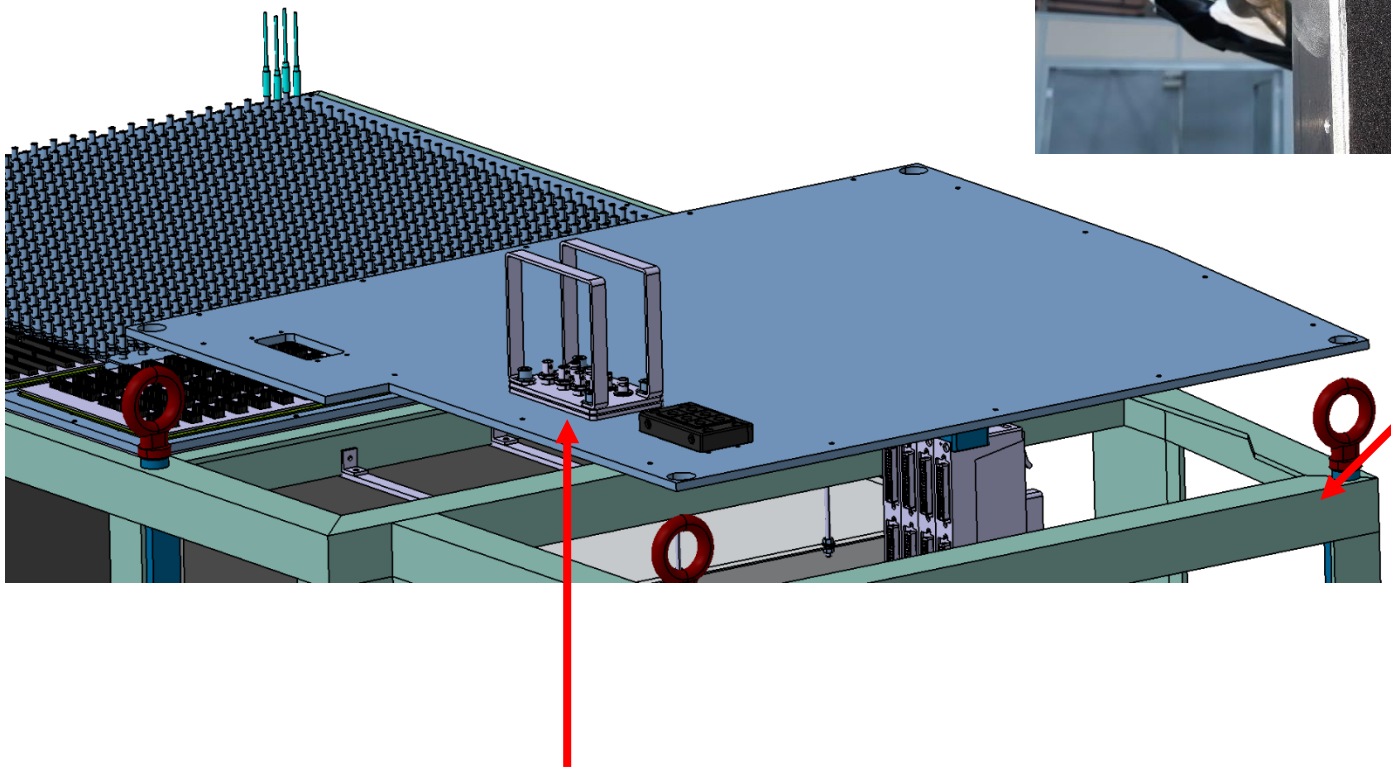
Preparation before mounting :Task 13



13 : remove the front reinforcement aluminum plate

Preparation before mounting :Task 14

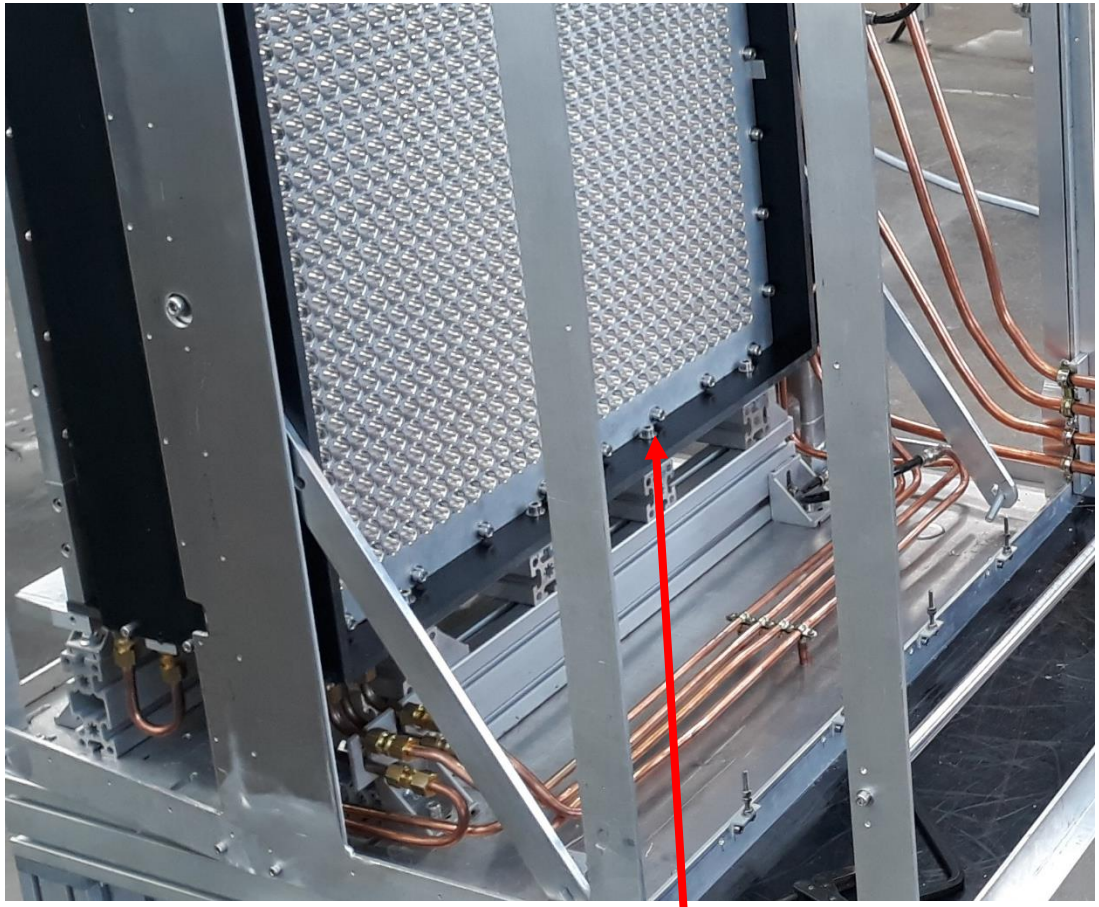




Need a tool to help the dismounting

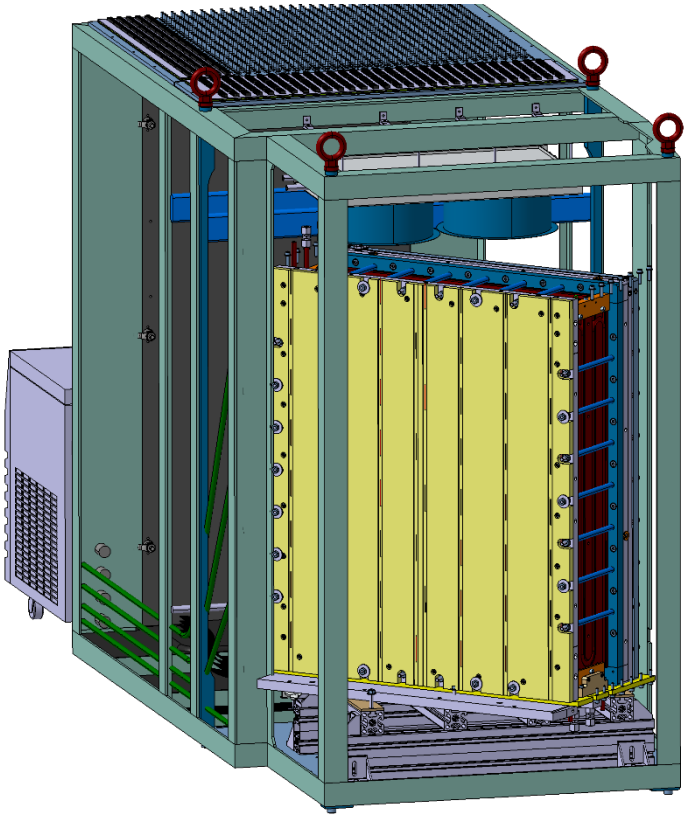
14 : remove Top Aluminum plate with its connectors and cables

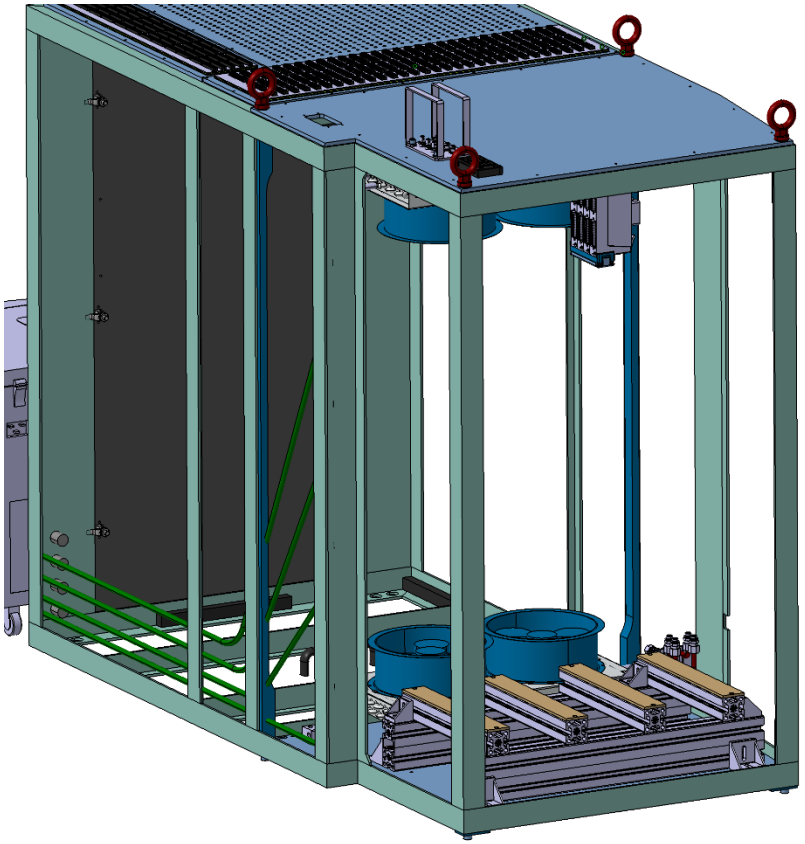
Preparation before mounting :Task 15



15: remove the 2 threaded rods and the fixing base plate screws T nuts (4 @ the front and 3 @ the back)

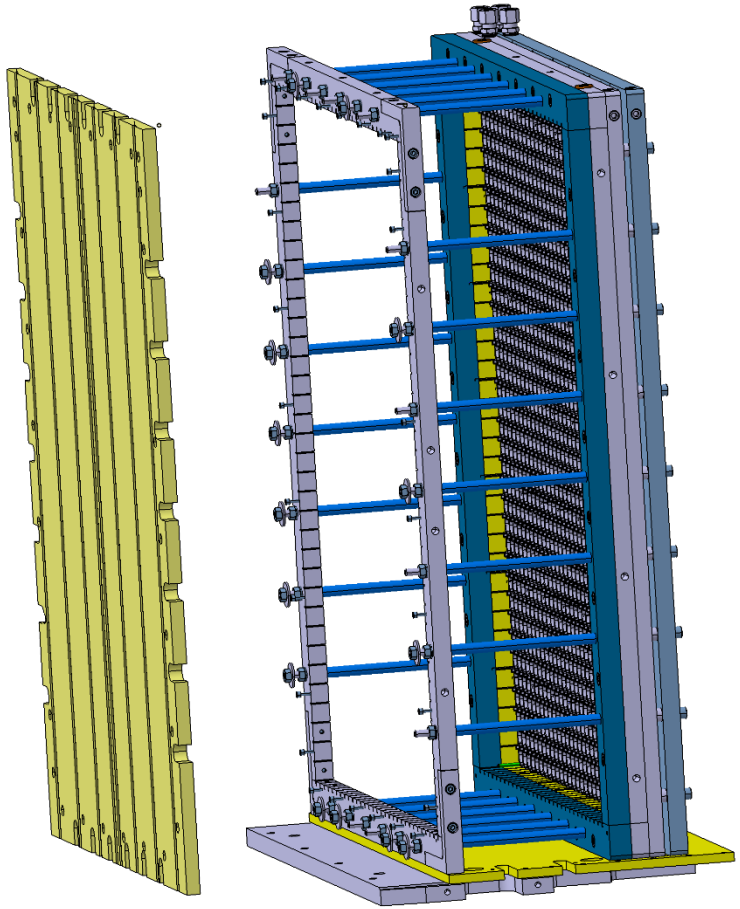
Preparation before mounting :Task 16





16 : remove the calorimeter support (without the support frame)

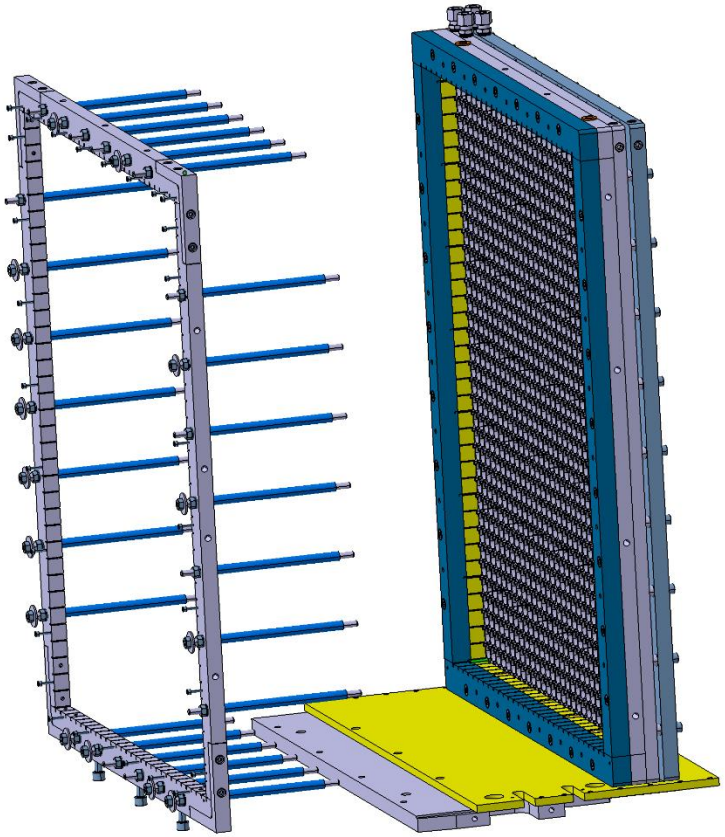
Preparation before mounting :Tasks 17 , 18

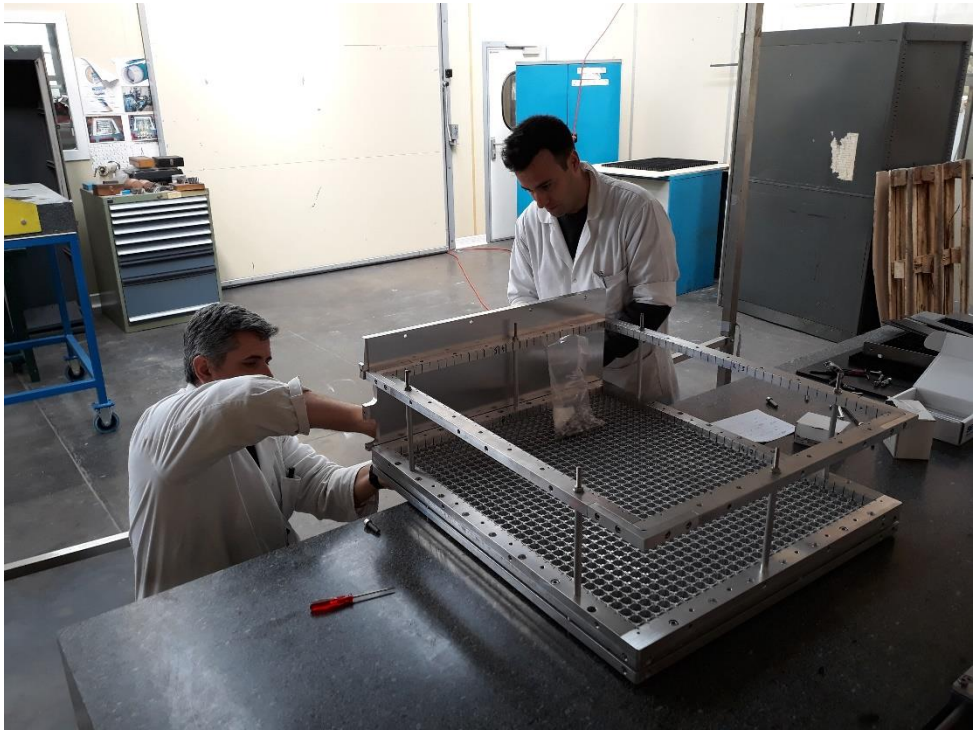


17 : remove the 4 Copper cooling plates

18 : remove the front PE plate with its T° sensors

Preparation before mounting :Task 19

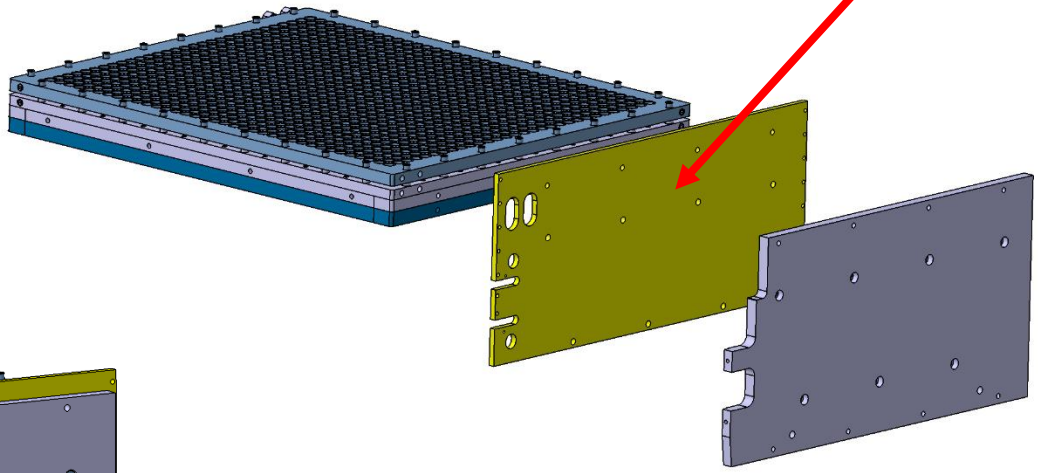


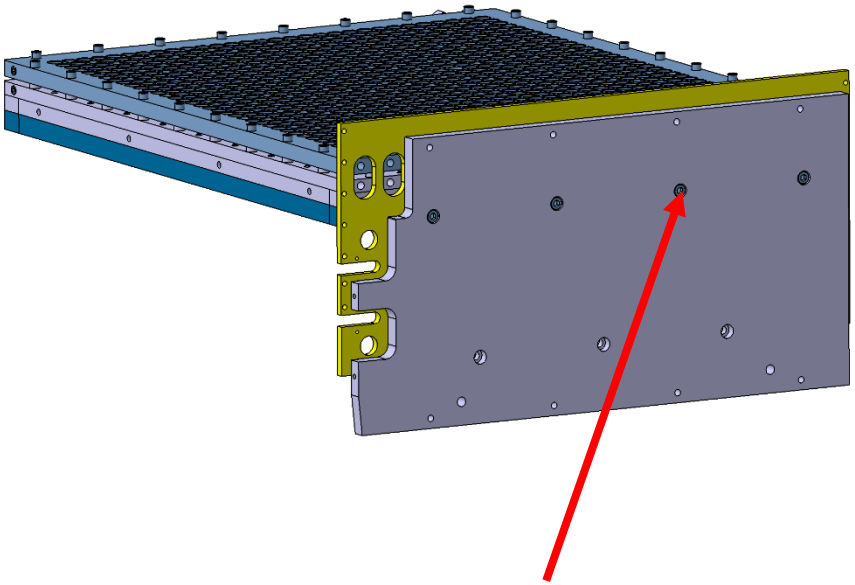


19 : remove the front frame

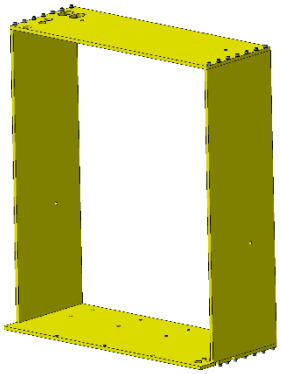
Preparation before mounting :Task 20

Iron bottom shielding plate





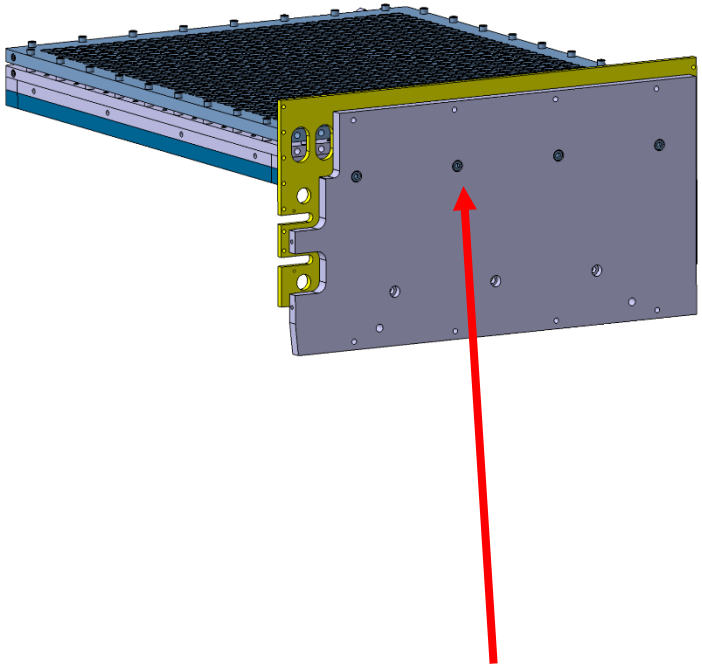
!Before: Test the complete mounting and check dimensions of Shielding (Jlab)

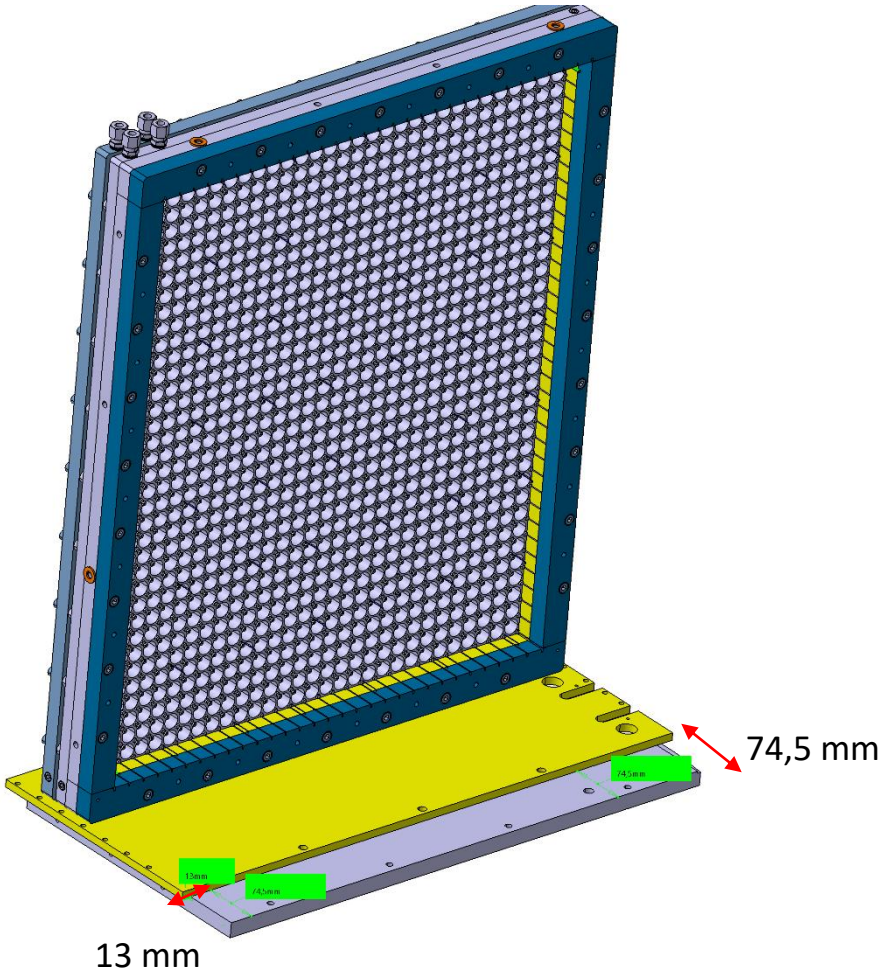


20 : remove the 4 screws under the base plate

Replace the false shieding with the iron bottom shielding plate

Mounting :Task 21

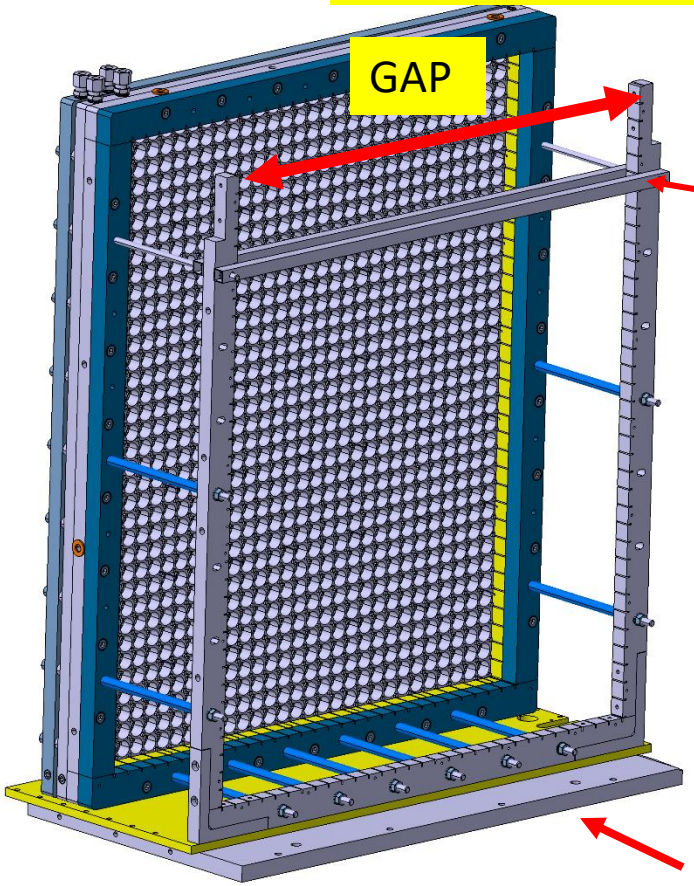




21 : Mounting of the 4 screws under the base plate and adjustment of the position both base plate and bottom iron shielding plate

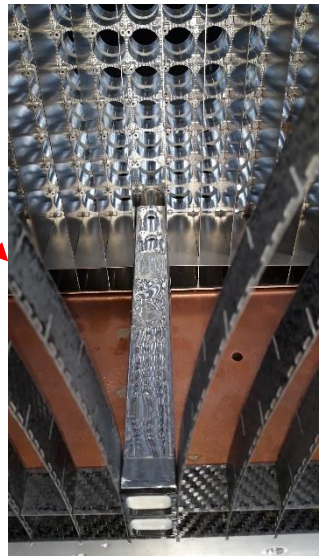
Mounting :Task 22

Check regularly during the stacking (each raw) of crystal to keep the good gap in order to permit the mounting of the top horizontal frame @ the end!!! (given by the tool)



2 temporary tools (Top position) to maintain the good position of the 2 vertical Aluminum frame

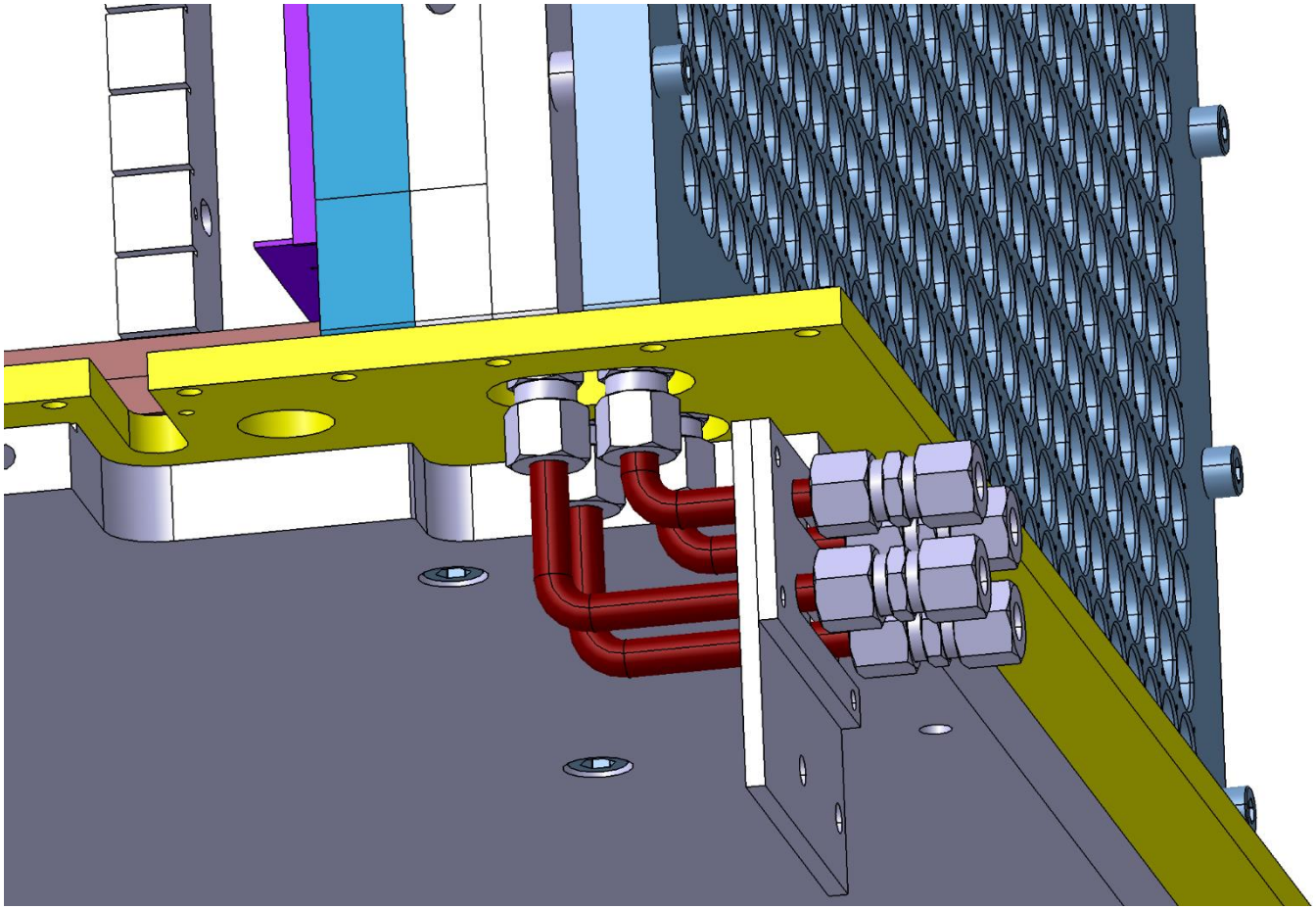
The Top frame is not monted to permit the free movement of vertical carbones, help for sliding the crystals and put hands through the vertical carbon plates



6 threaded rods @ bottom
3 only on the sides to keep a good access with hands during crystals stacking

22 : Mounting of the front frame

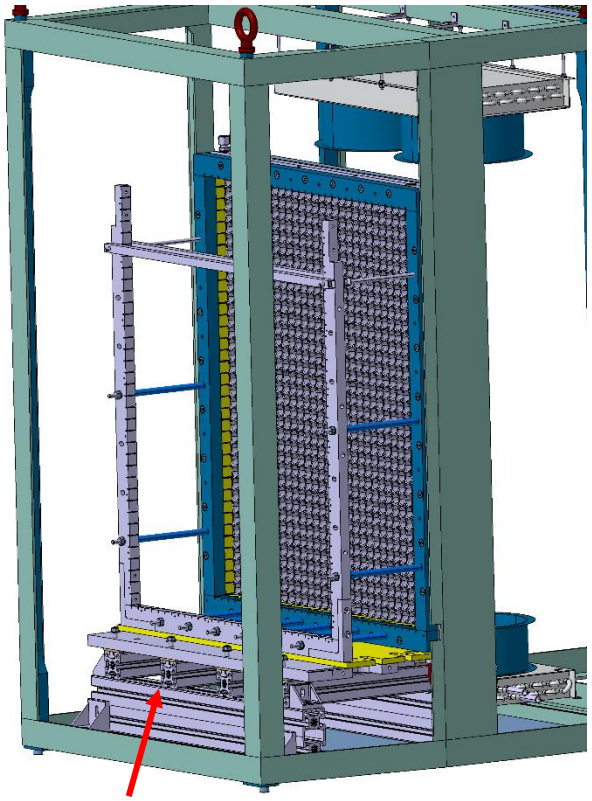
Mounting :Task 23



! Difficult access for tight in the box

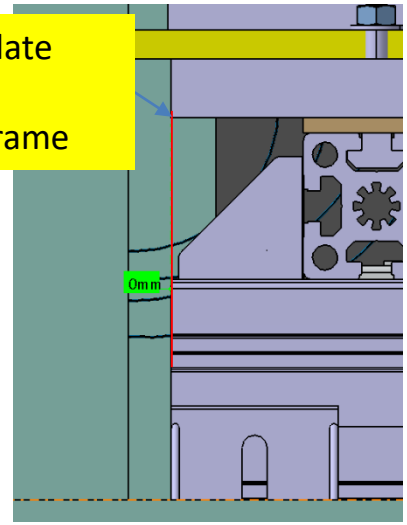
23: Mounting of the tubes bottom right (tight them and check no leak)

Mounting :Task 24

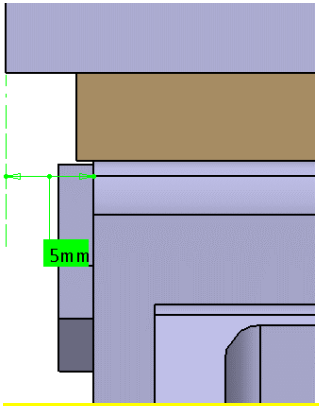


Put the 2 threaded rods and the fixing base plate screws T nuts (4 @ the front and 3 @ the back)

Side base plate aligned on extremity frame



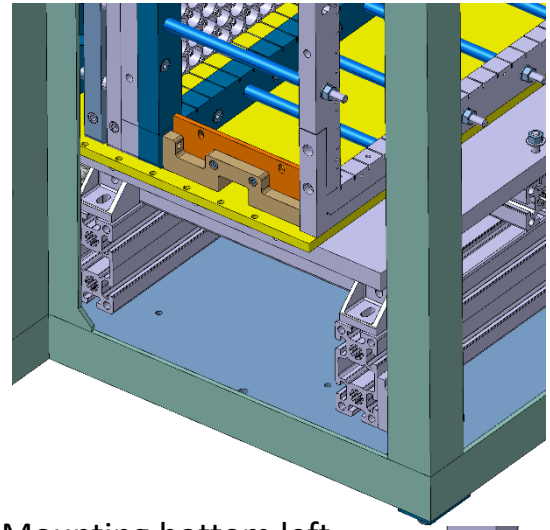
Take care the bottom tubes !

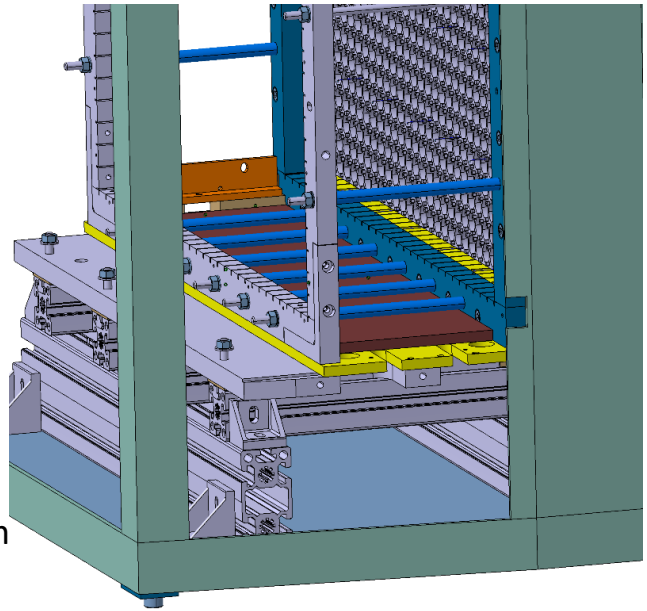


5 mm / front side

24 : Mounting of Calorimeter support in the box

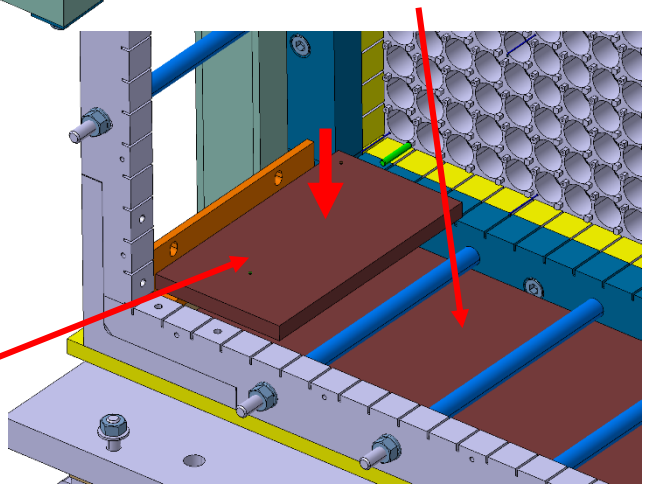
Mounting :Task 25



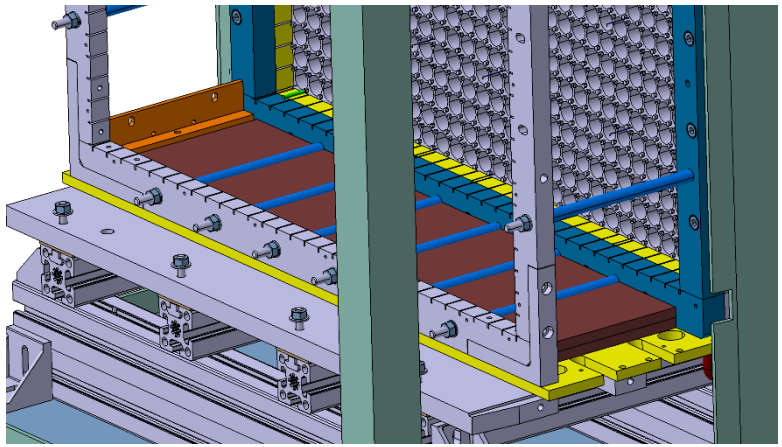


Mounting 1st layer bottom insulating foam (1 part)

Mounting bottom left cooling support

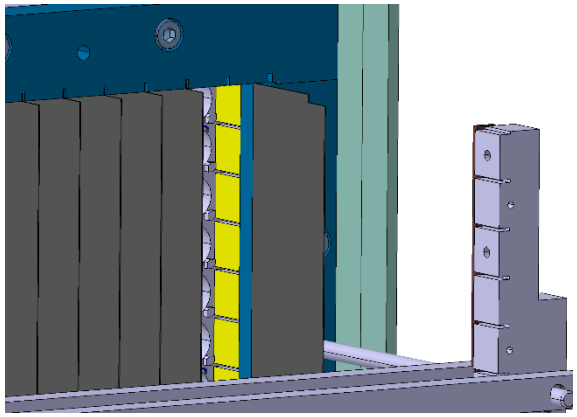


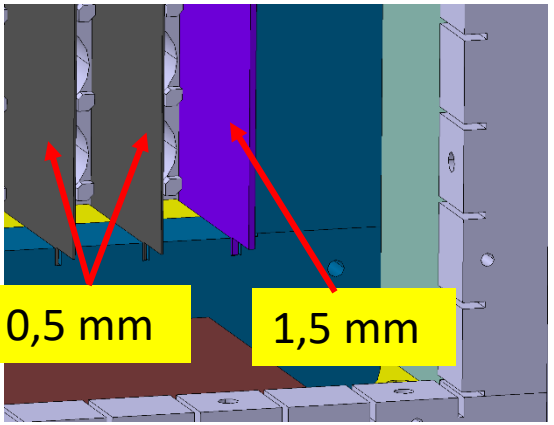
Mounting 2nd layer bottom insulating foam (7 parts)

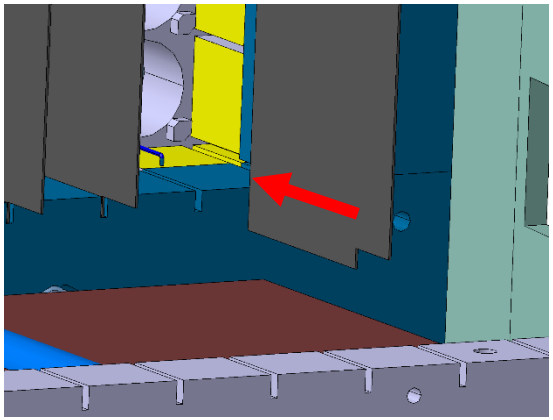


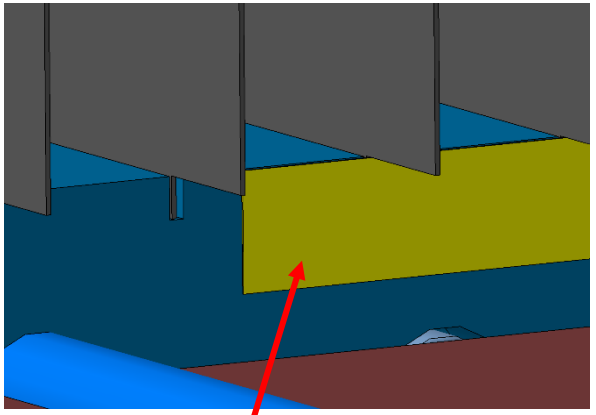
25 : Mounting of the bottom insulating foam

Mounting :Task 26









! Take care T° sensor wires

! Mu metal fragile

Put tape 12 mm Top and Bottom frames to maintain the plates

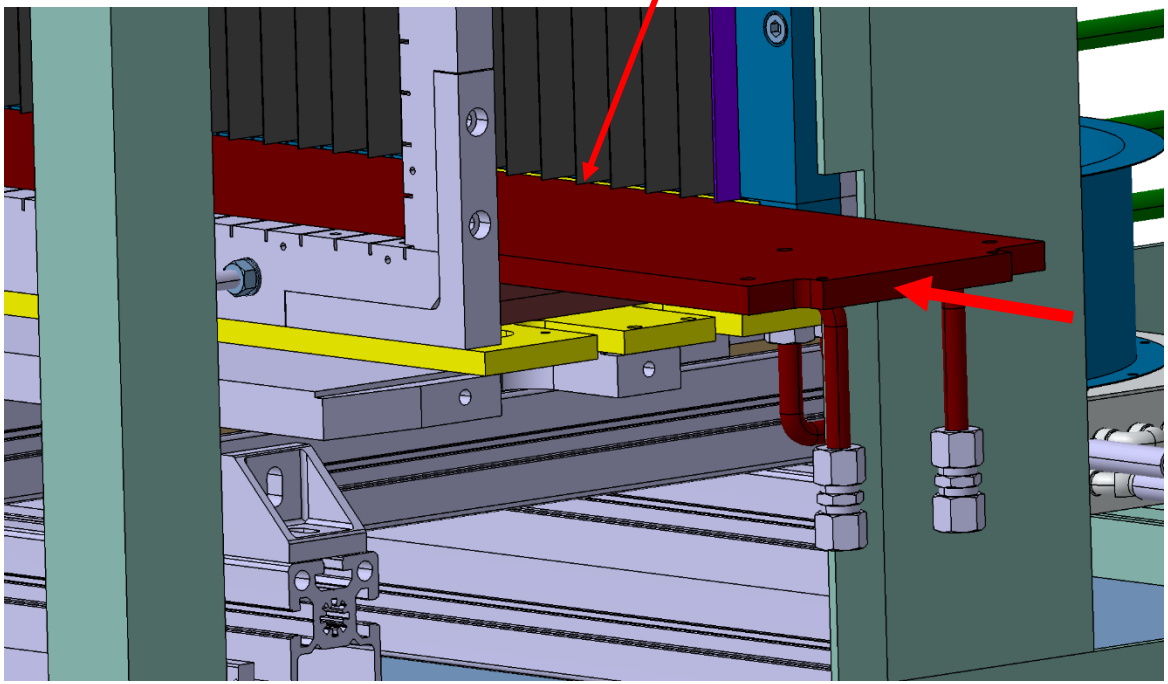
Slide the vertical mu metal plates (caution don't bend them ,very fragile)

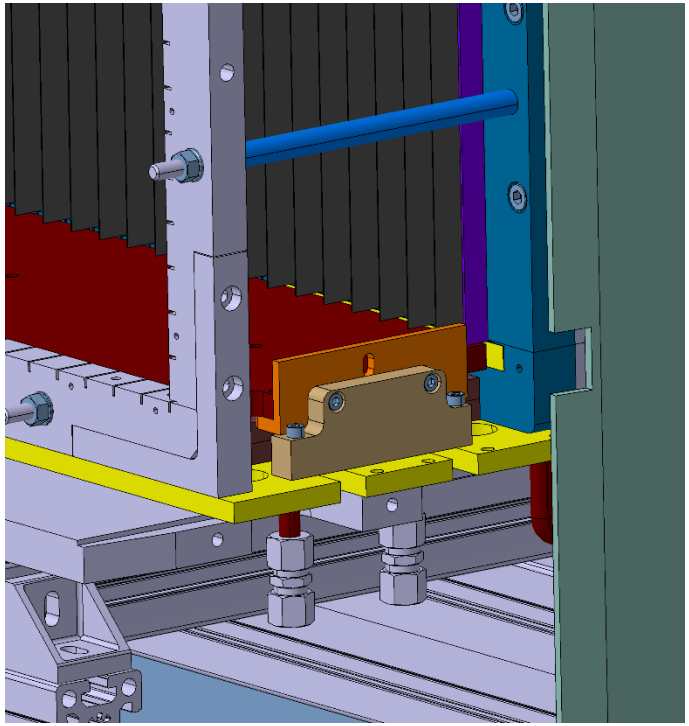
26 : Mounting of the vertical Mu metal plates

Put gloves to manipulate the mu metal

Mounting :Task 27

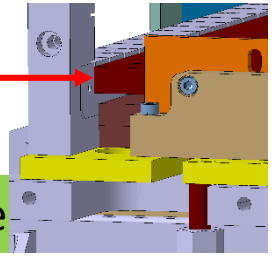
! Take care Mu metal edge





Slide the bottom plate between aluminum spacers and Mu metal

Contact with front frame in order to block carbon plates

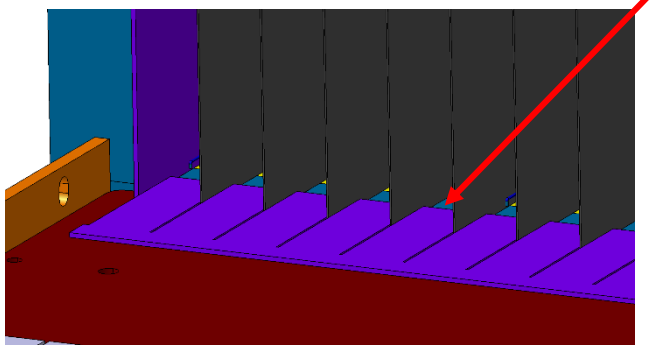


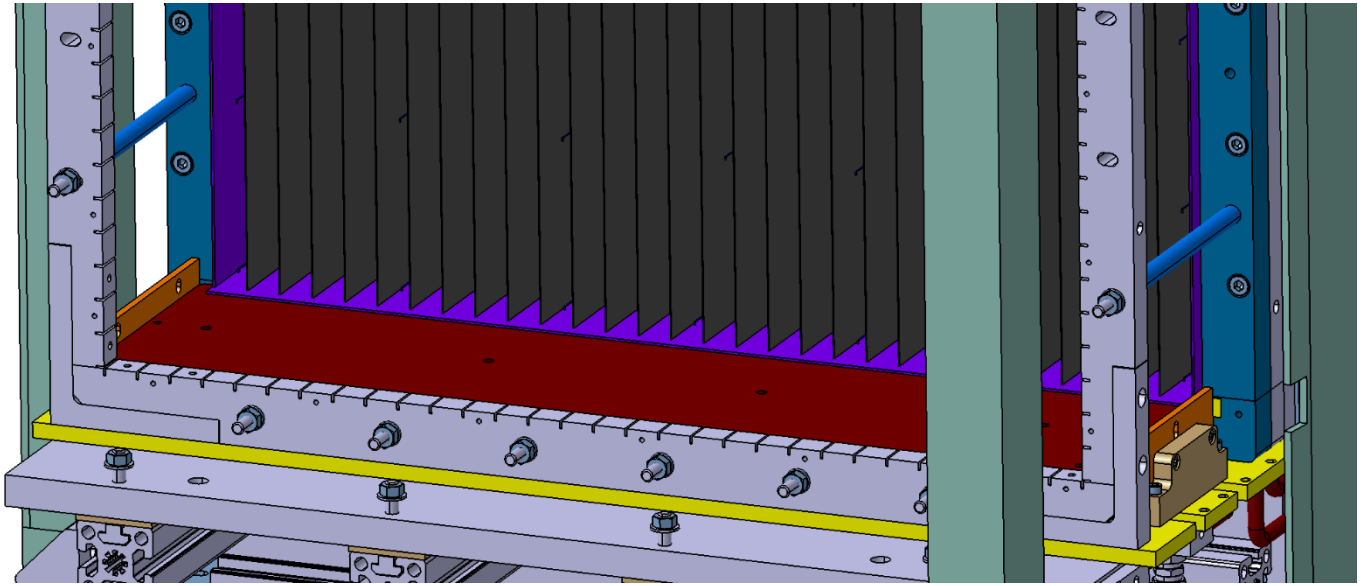
27 : Mounting of the bottom cooling plate

Mounting support parts screwed on the bottom iron plate (check the contact both front aluminum frame and side of copper plate : maintain of the vertical carbon plate)

Mounting :Task 28

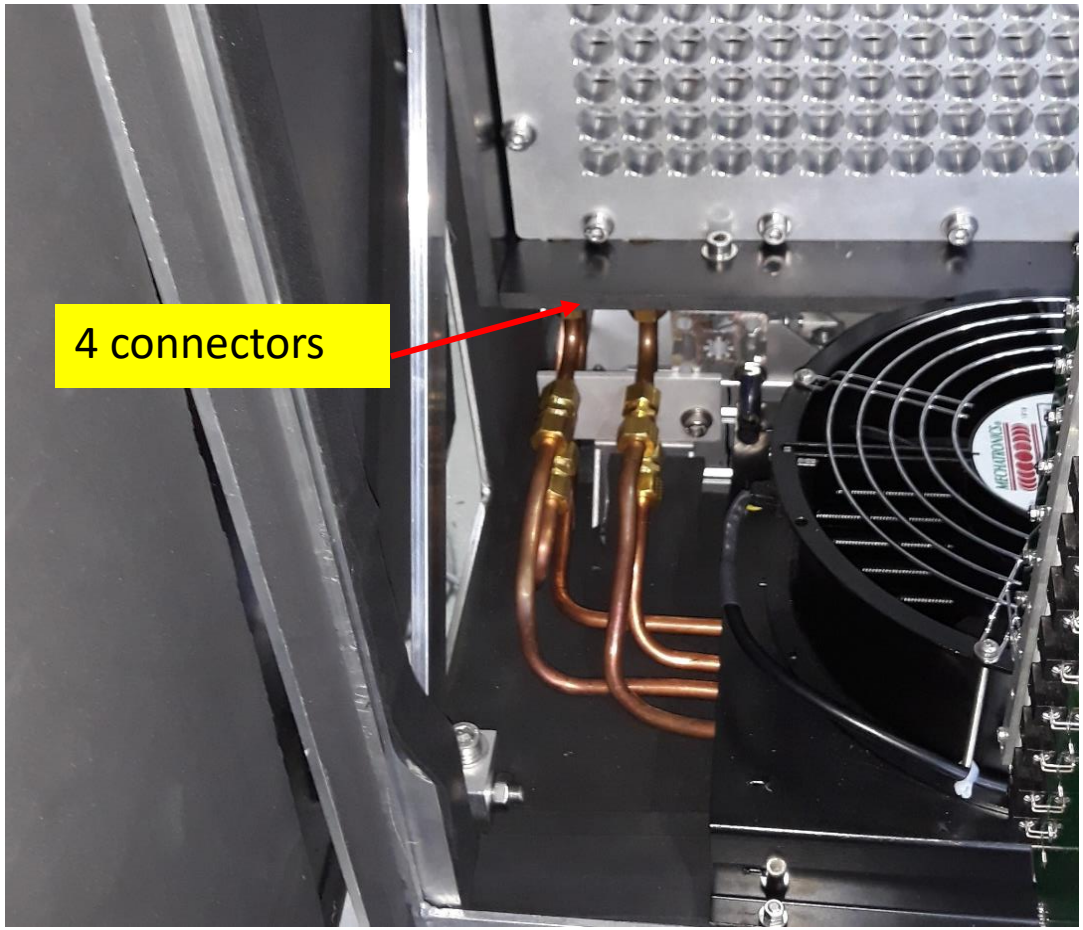
! Take care T° sensor wires





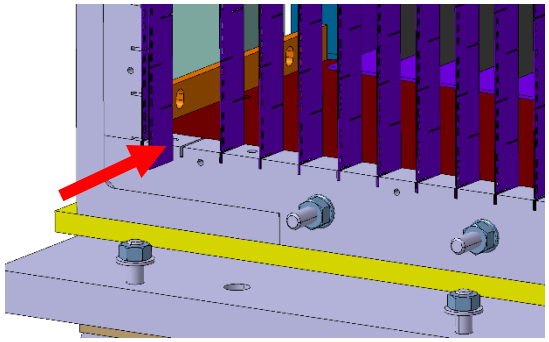
28 : Slide the bottom horizontal 1,5 mm mu metal

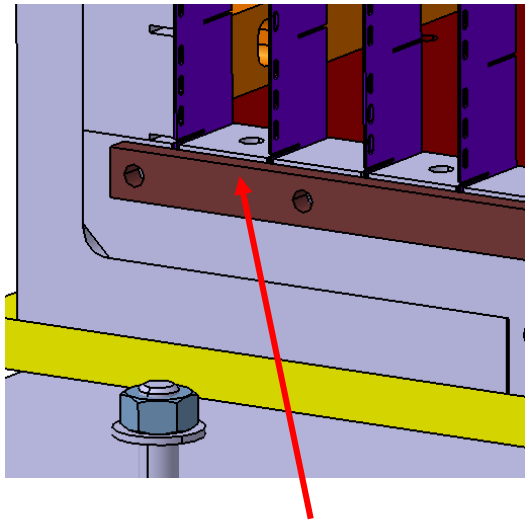
Mounting :Task 29



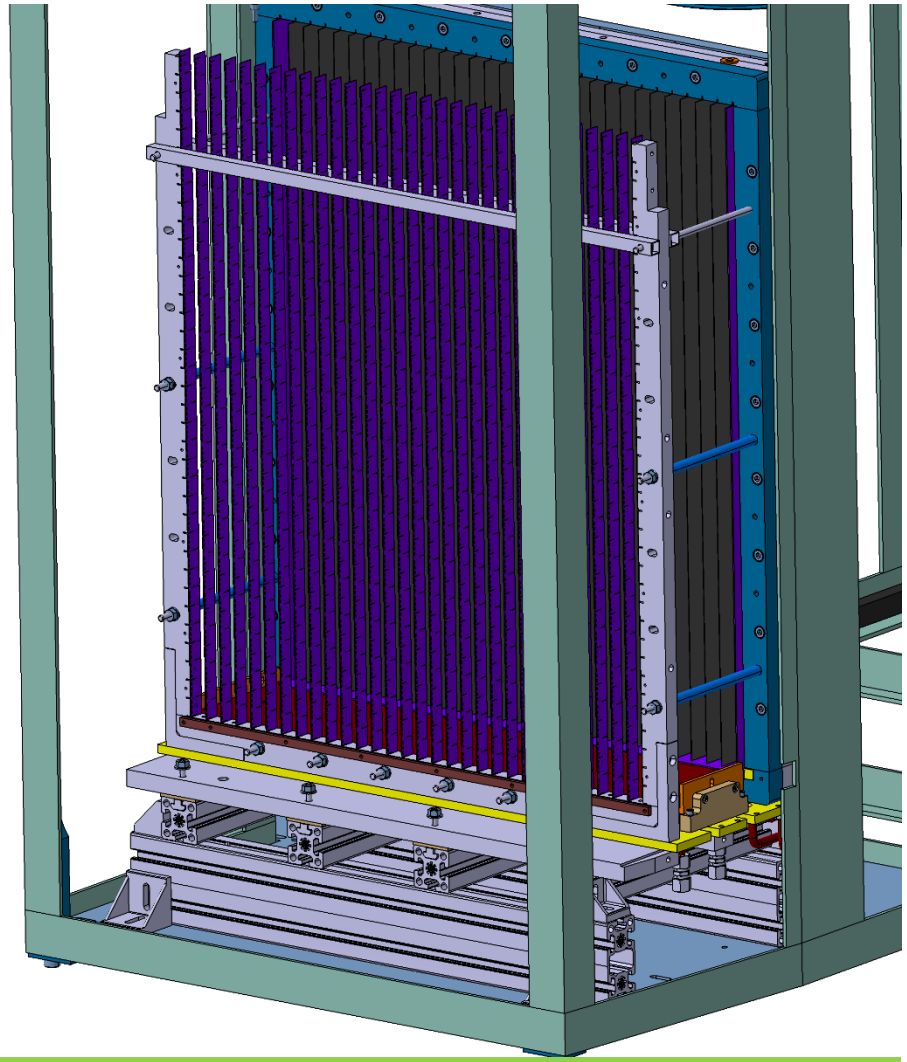
29 : Re-connect the bottom right tubes

Mounting :Task 30

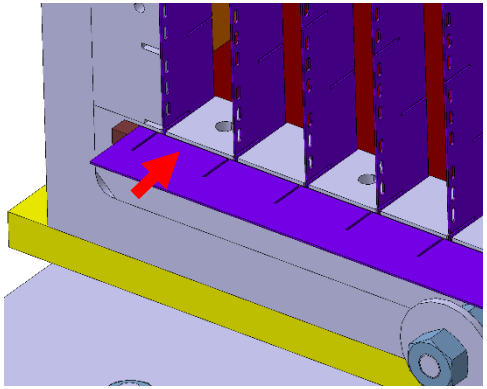


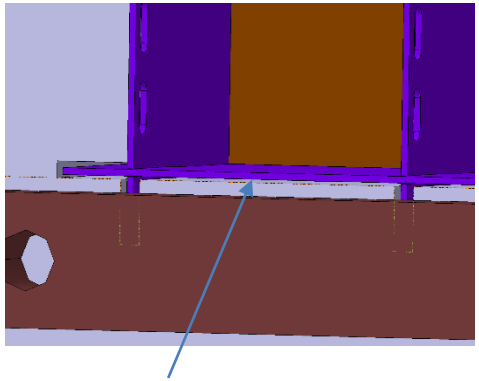


Put the front alu plate

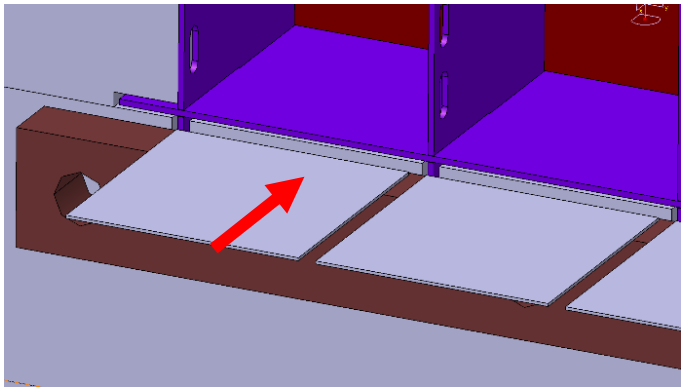


30 : Slide the vertical carbon plates



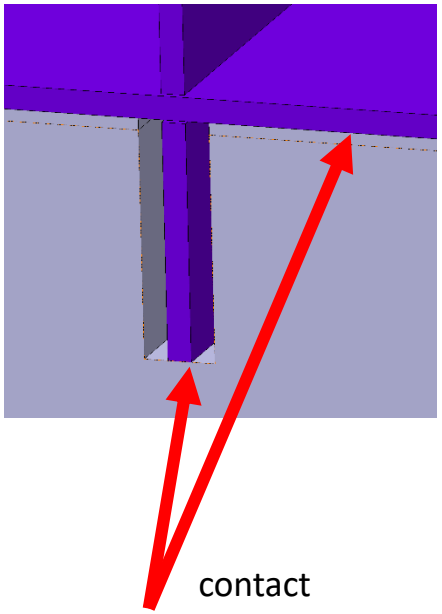


Gap 0,25 mm between the aluminum frame and the 1st raw carbon



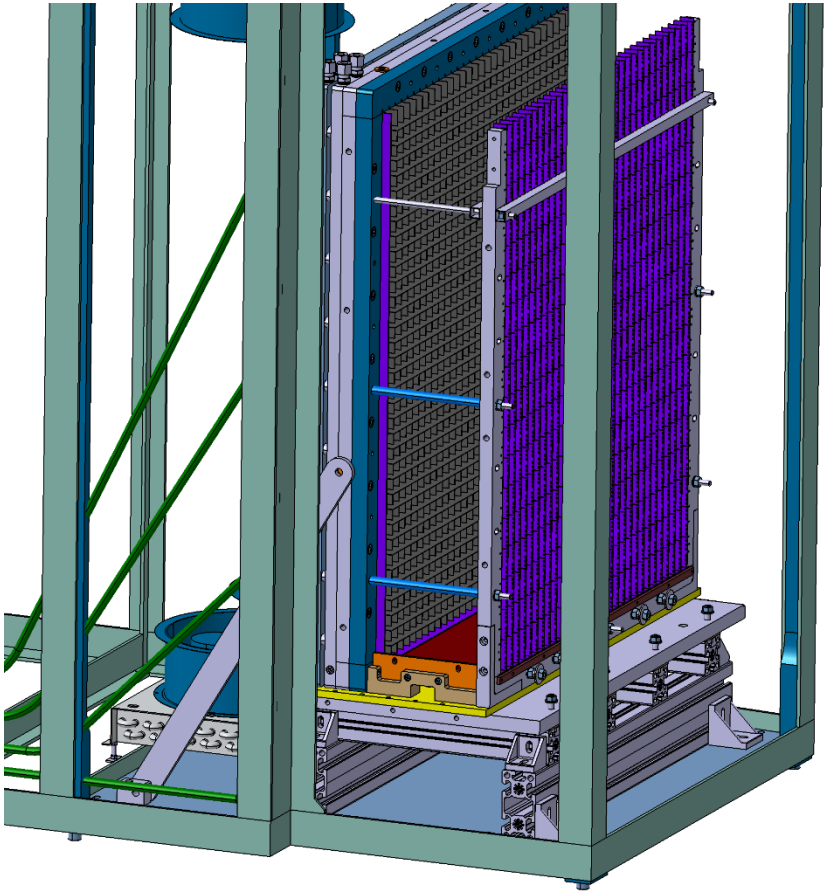
Insert 30 adjustment shims

Necessity to put 0,25mm adjustment shims



contact

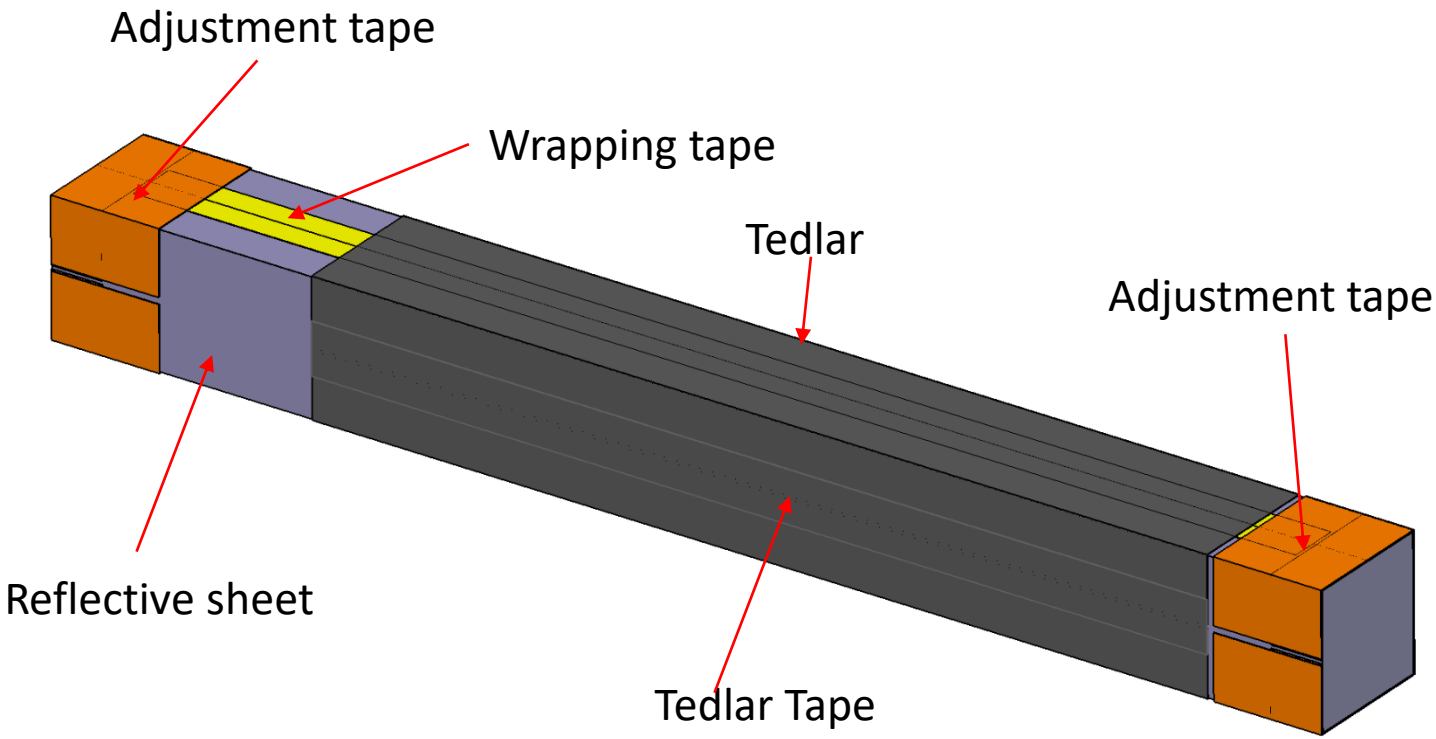
31 : Slide the 1st horizontal carbon plate and 36 adjustment shims



The frame is ready to insert the crystals

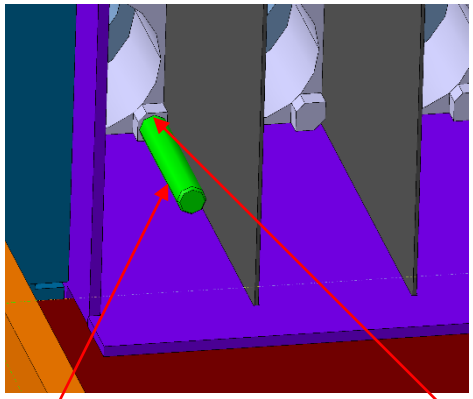
32 : preliminary mounting of the 2 reinforcement 2 arms

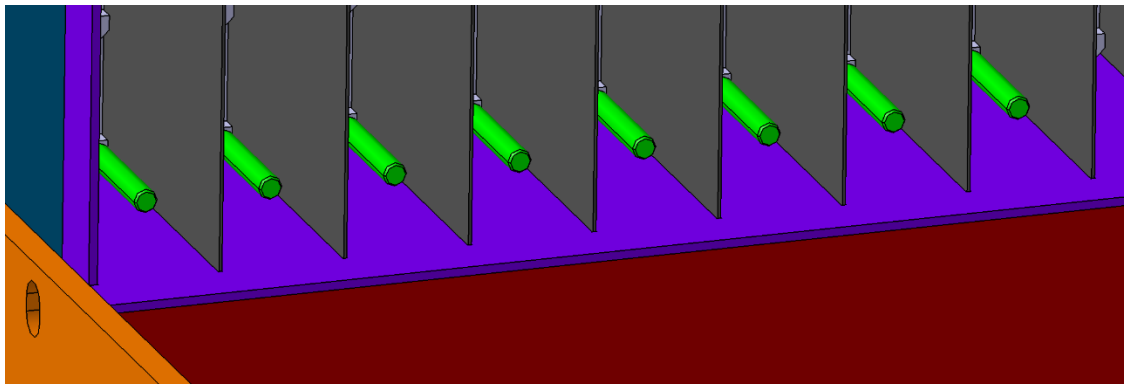
Mounting :Task 33



33 : Wrapping Crystal : see note about wrapping

Mounting :Task 34





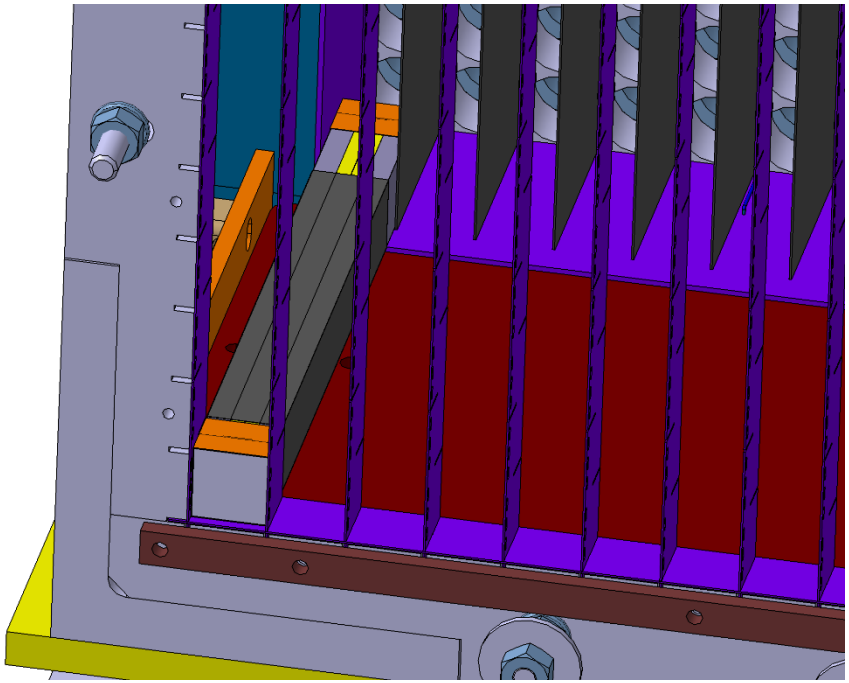
Can be glued in order to be fixed if PMt removed

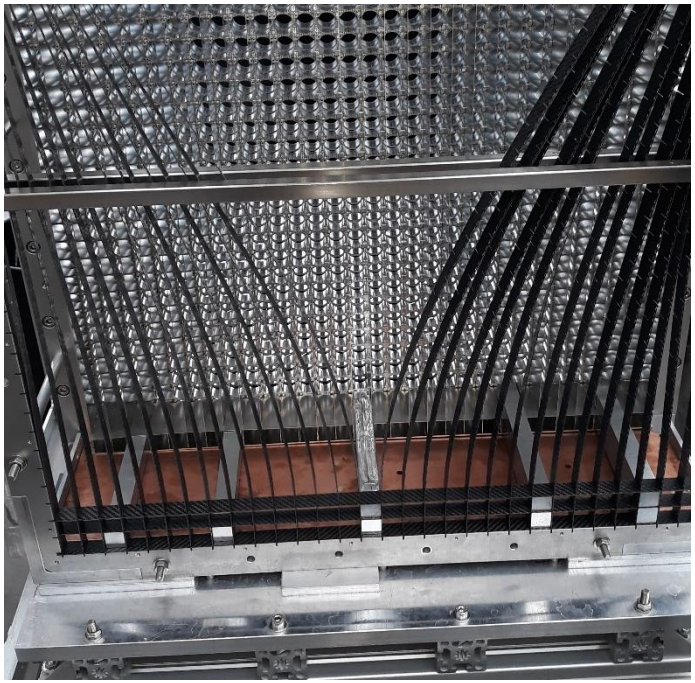
Contact with Aluminum part

Insert all the raw

34: inserting the stop plastic part which maintain axialy the crystal

Mounting :Task 35

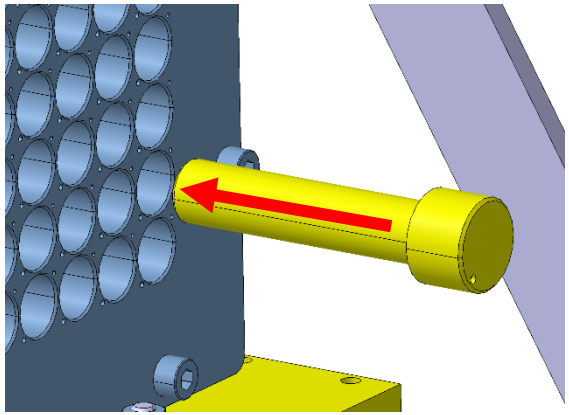




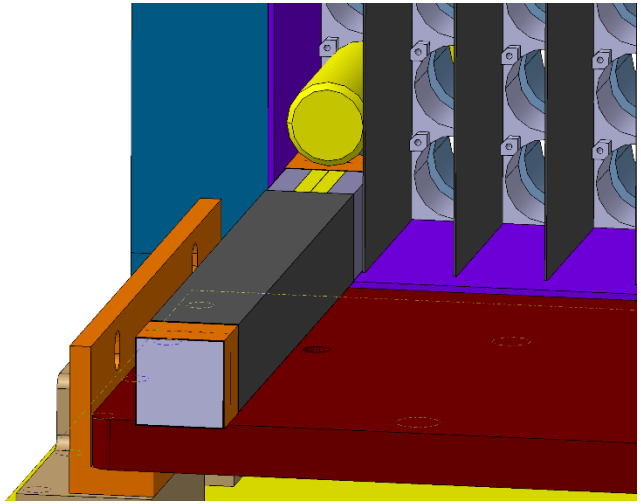
35: insert the 1st crystal with its wrapping

For a better access you can bend the vertical carbon plate

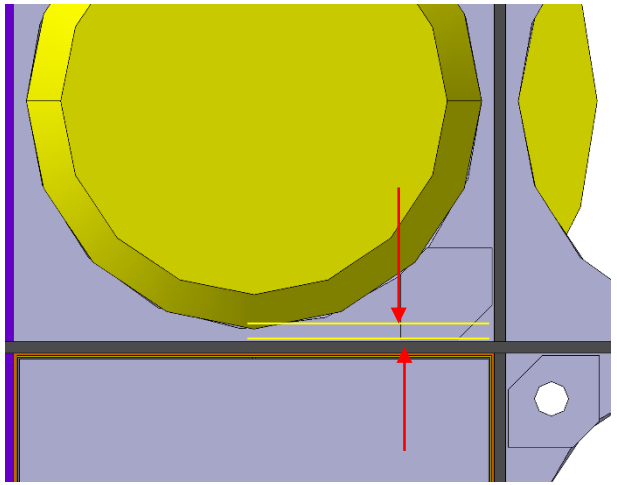
Mounting :Task 36



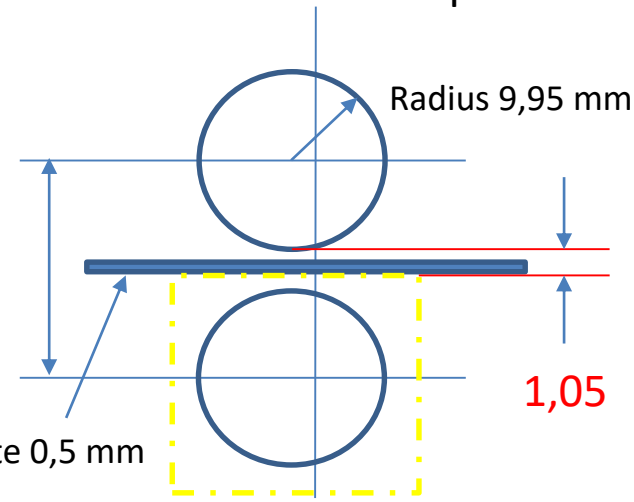
Insert Brass tool for adjustment in the upper holes raw of the support PMt plate



Measurement of the gap



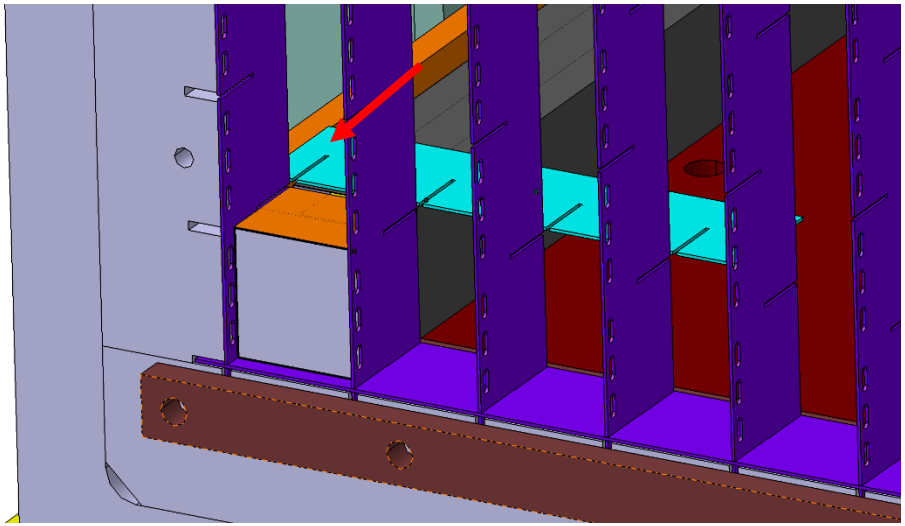
Gap



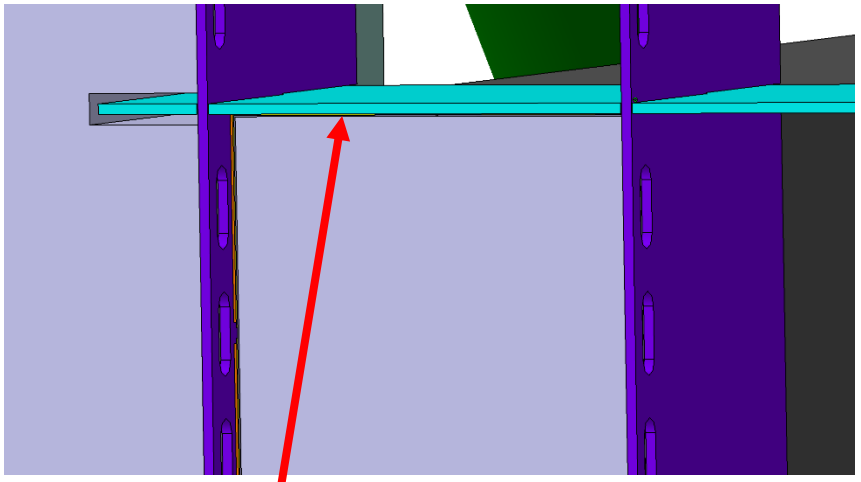
Check the good gap = 1,05 mm with a tool (slide the tool between the Top face of crystal and cylinder)

36 : Adjust the backward height of the crystal

Mounting :Task 37



Insert carbon tool and slide it

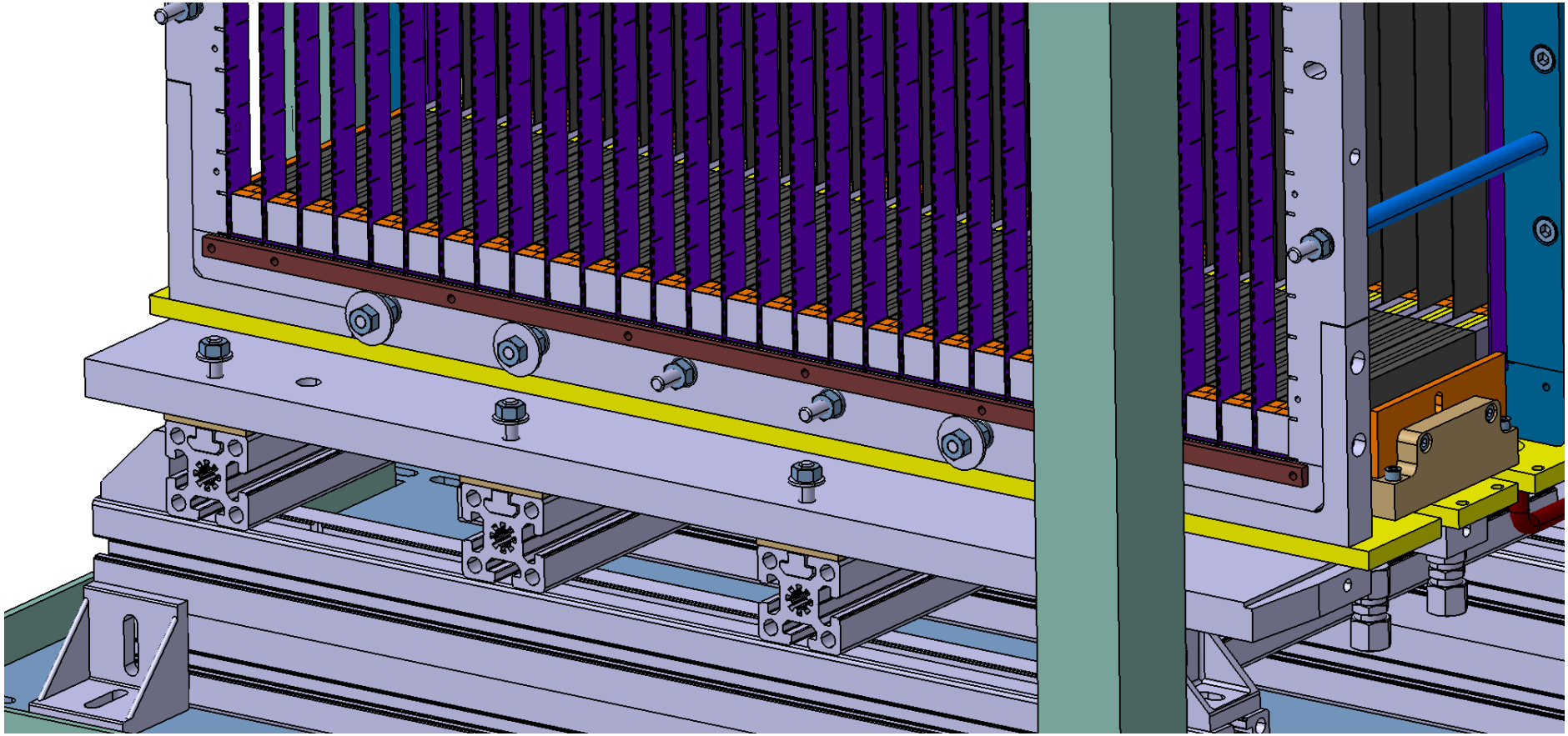


Check gap = 0 with a tool

37 : Adjust the Front height of the crystal

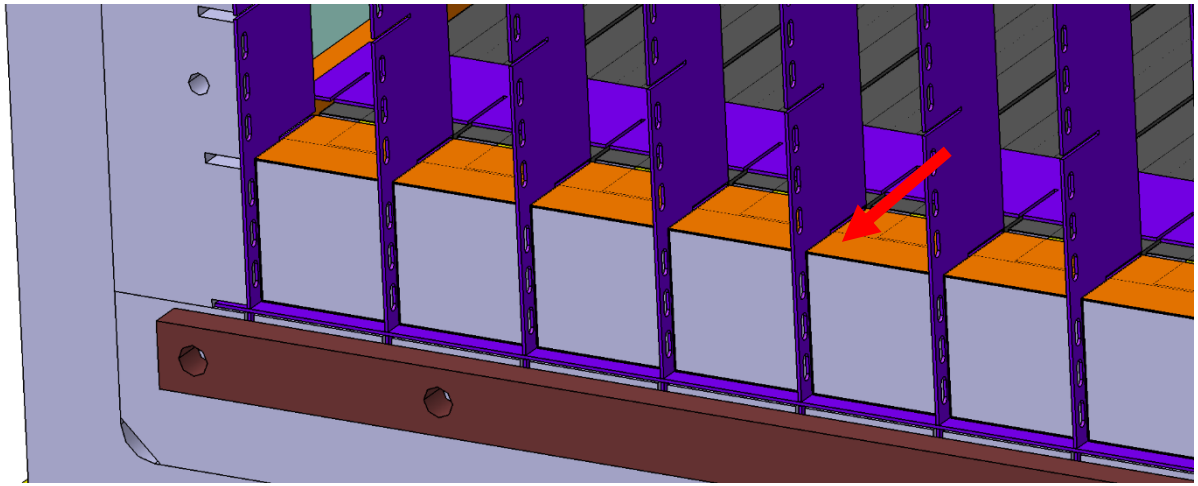
After measurement adjust the tape thickness and check

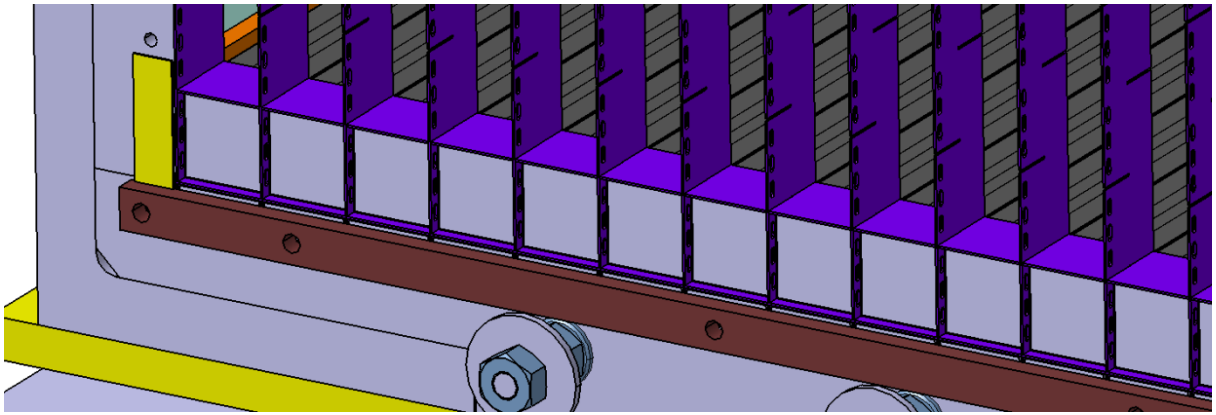
Mounting :Task 38

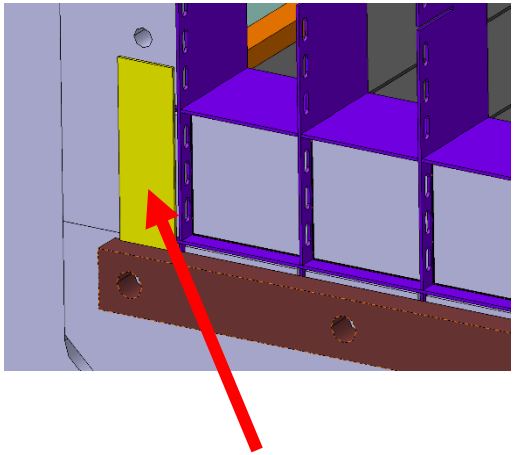


38 : insert the first raw of crystals with this method

Mounting :Task 39







Then put tape in order to block the horizontal carbone

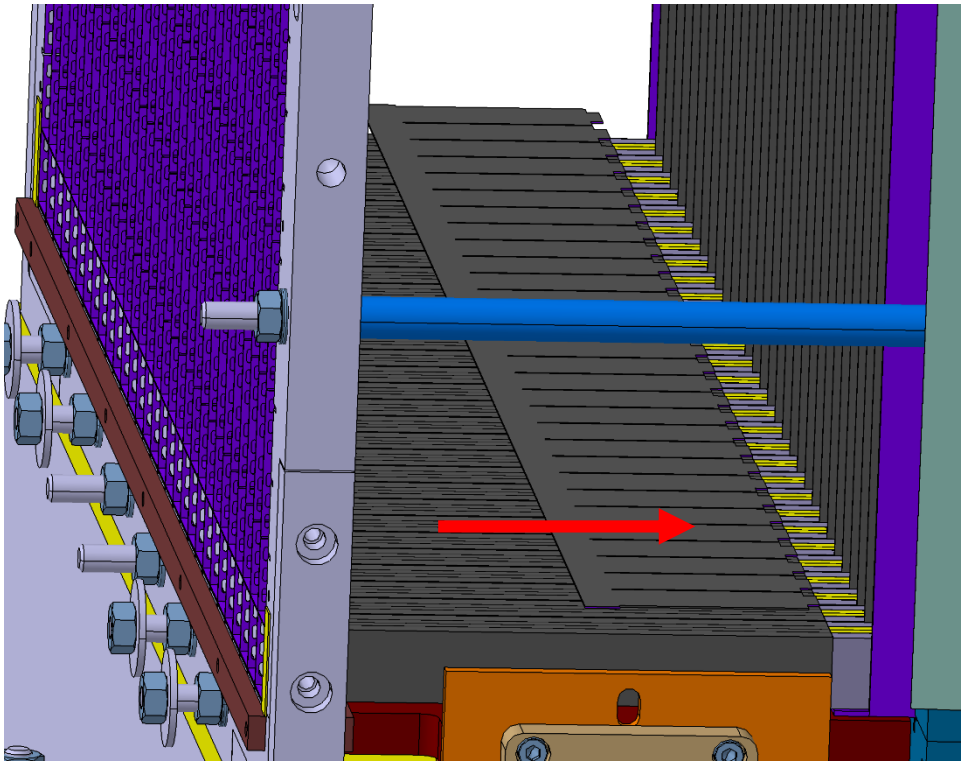
4 parts : 2 @ the front and 2 @ the other side of the frame

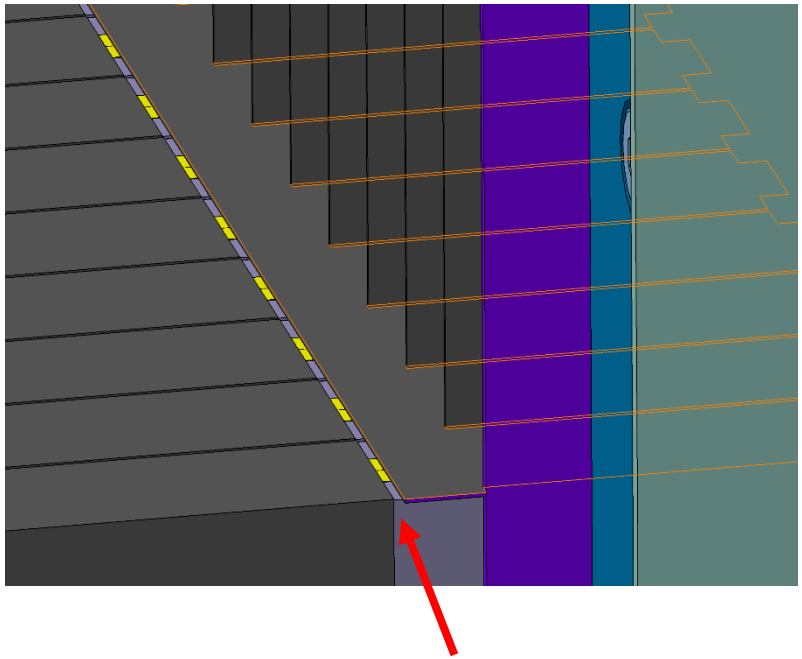
39 : slide the carbon horizontal plate

Mounting :Task 40

Caution !!! This plate is very fragile (soft) , don't bend it because it would loose its shielding properties

Use a rigid plate below to move it





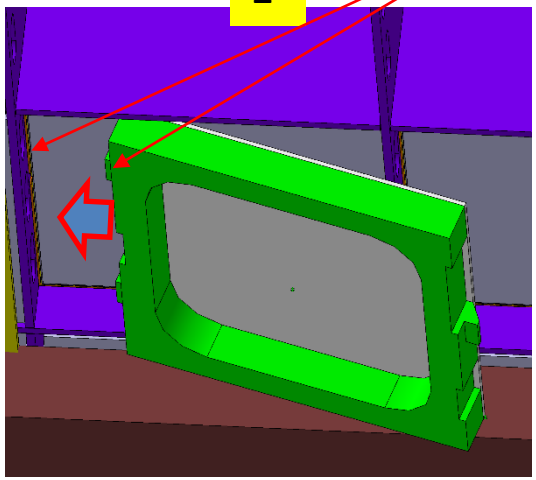
Check the gap : you never must not superpose the mumetal on the Tedlar

40 : insert the first 0,5 mm thick horizontal Mu-metal

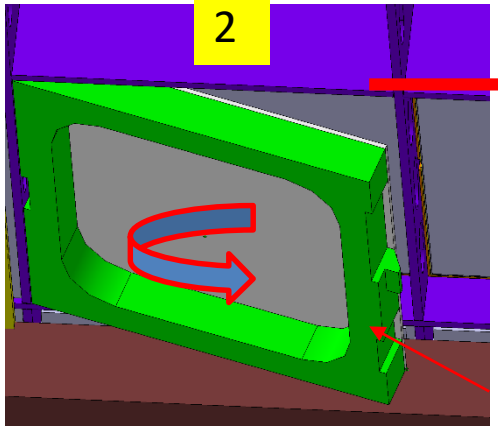
Mounting :Task 41

Insert the 2 pins in the holes

1

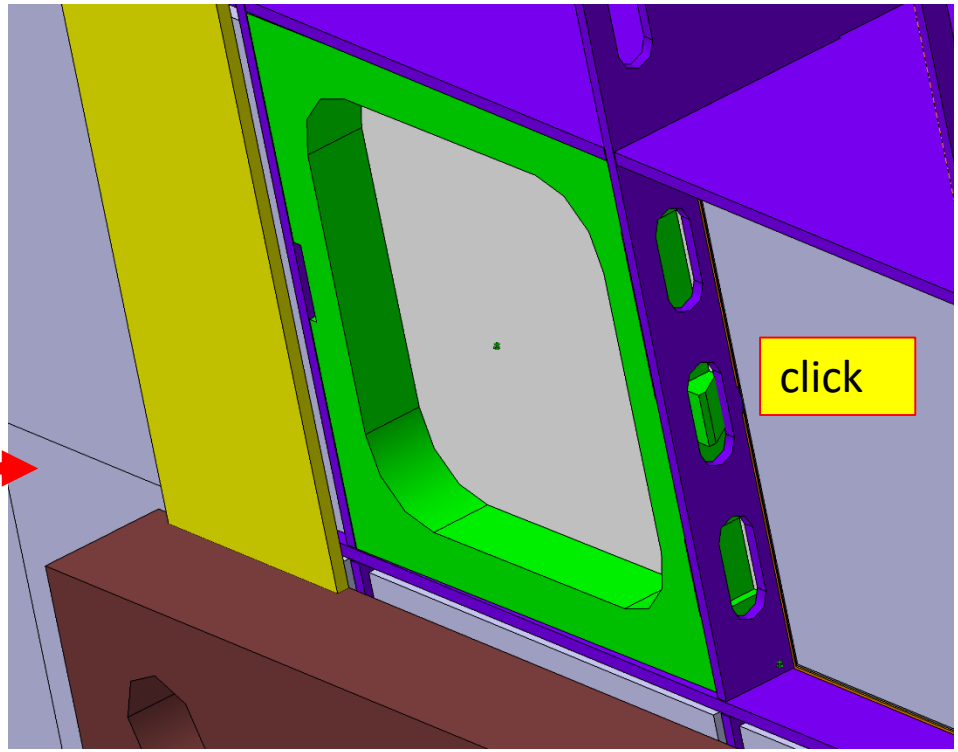


2



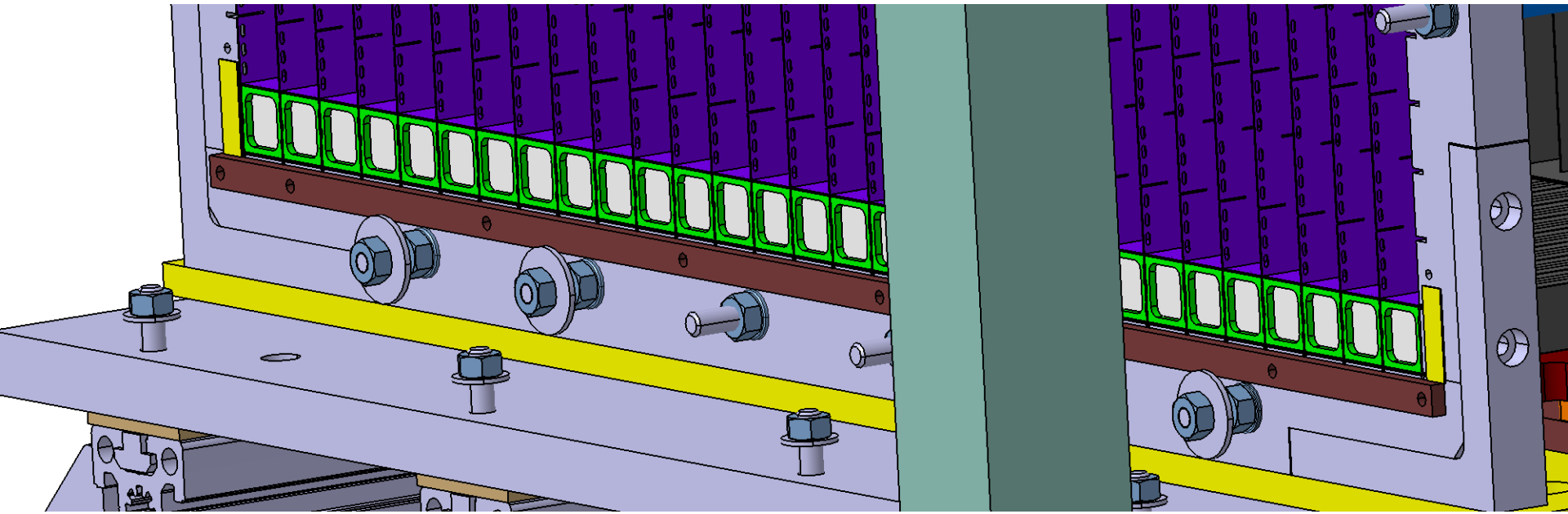
Rotate the plastic part

3



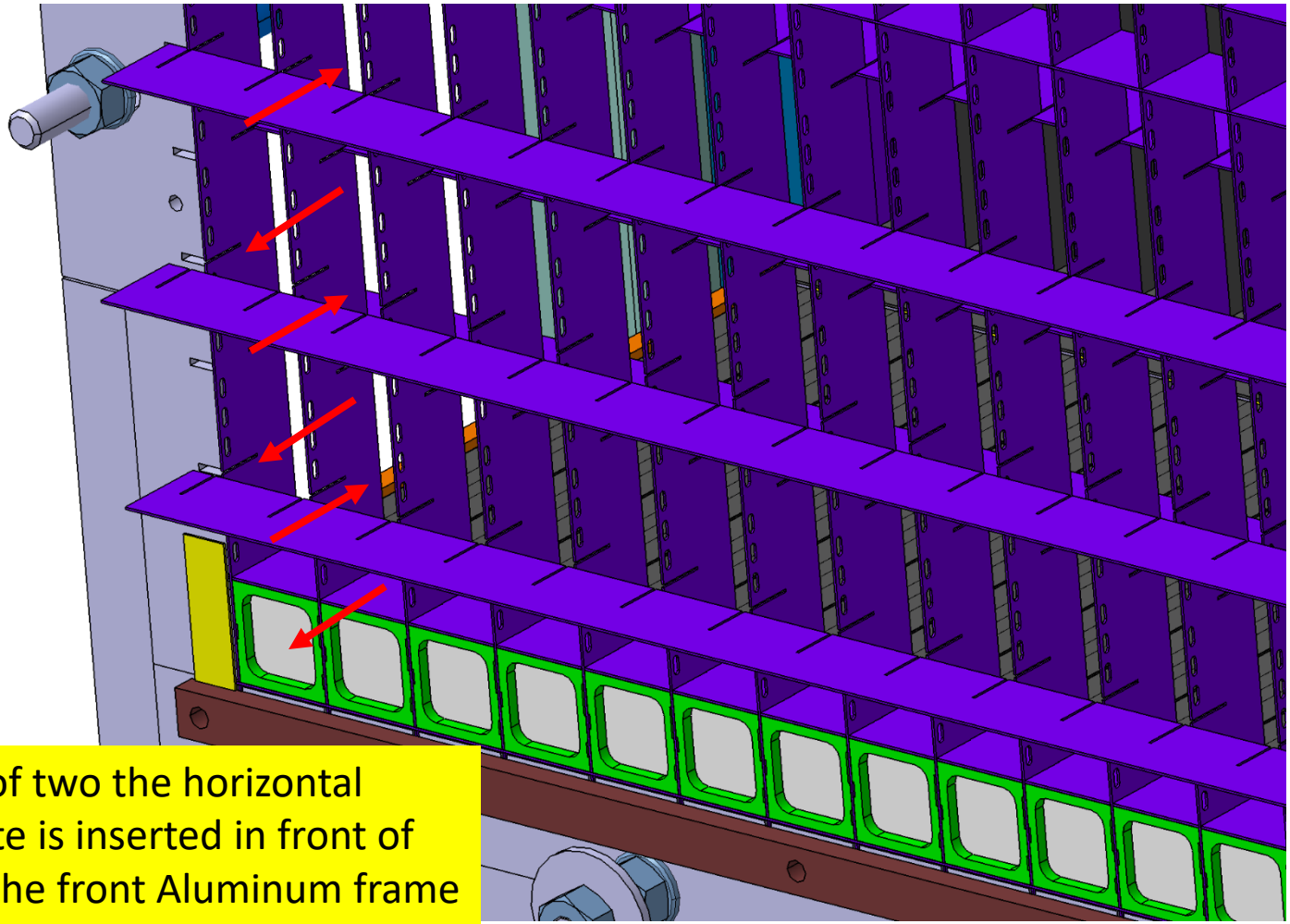
41 : insert the front plastic parts with reflective sheet

Mounting :Task 42



42 : insert the Layer of front plastic parts with reflective sheet

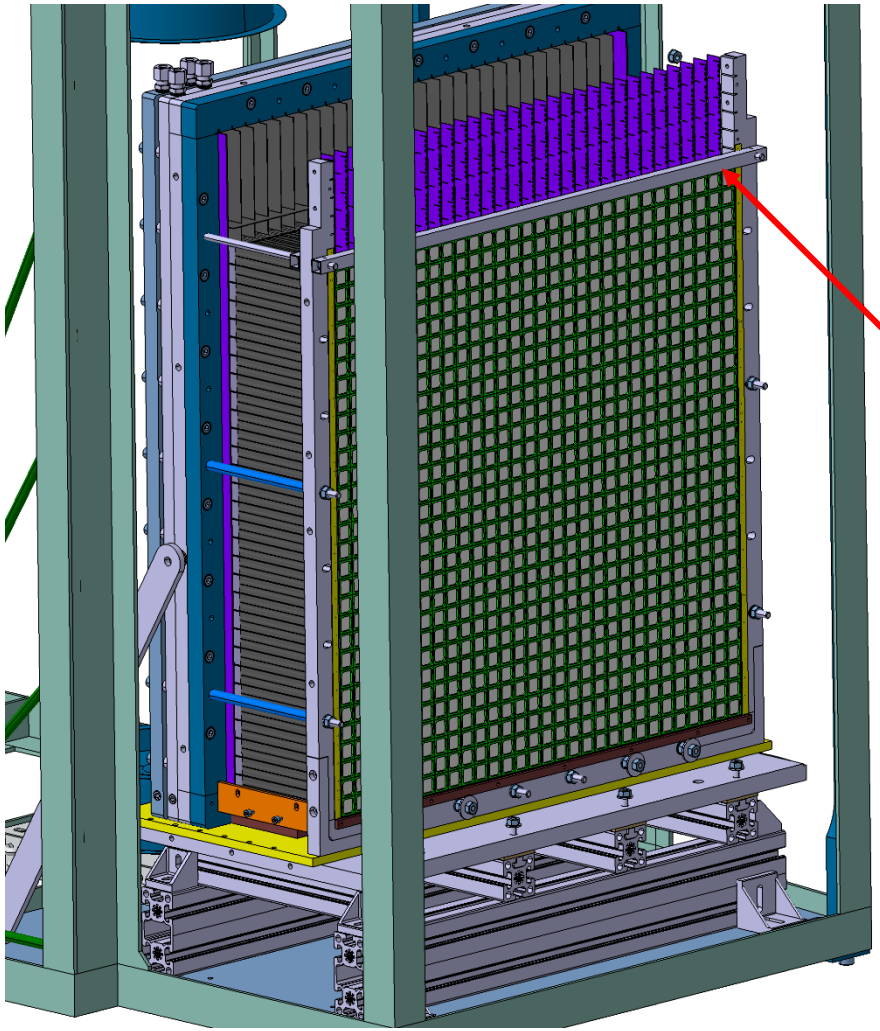
Mounting :Task 43



1 row out of two the horizontal carbon plate is inserted in front of or behind the front Aluminum frame

43 : Repeat the tasks 34 to 42 for each row

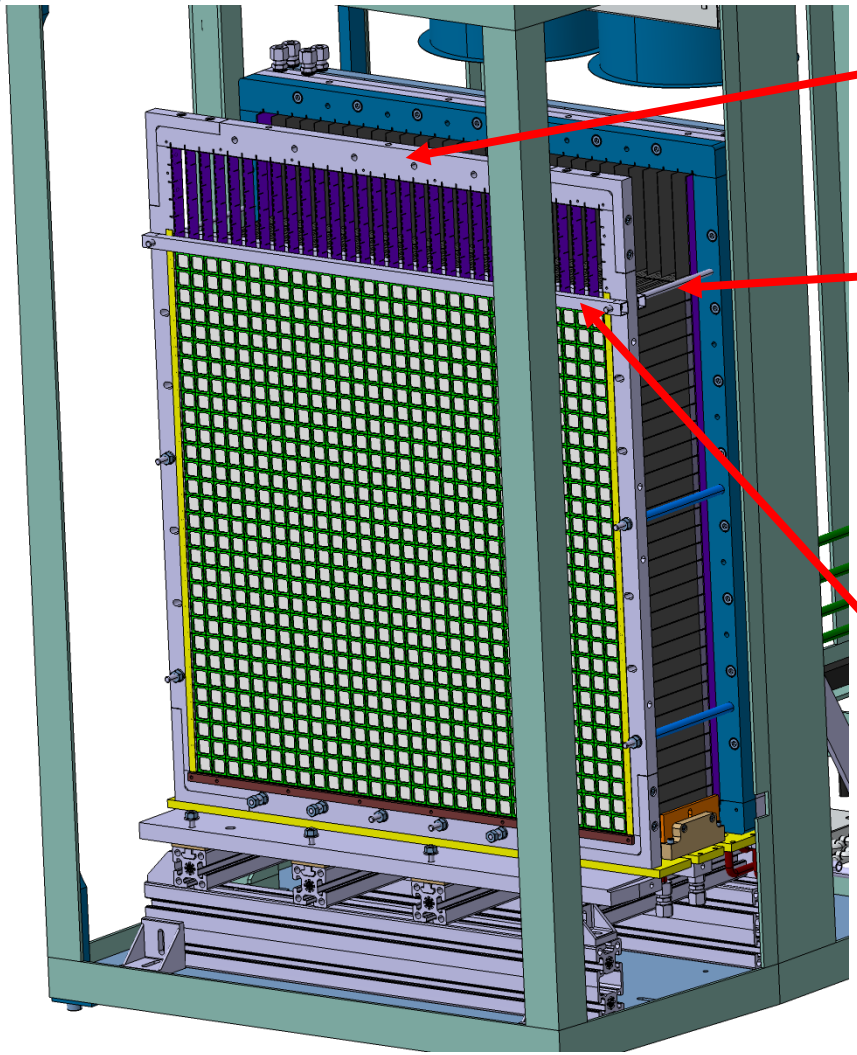
Mounting :Task 44



Until the row 29 we keep the tool which replace the horizontal Top Aluminum frame which let free the vertical carbon plates

44 : stacking until the raw 29

Mounting :Task 45



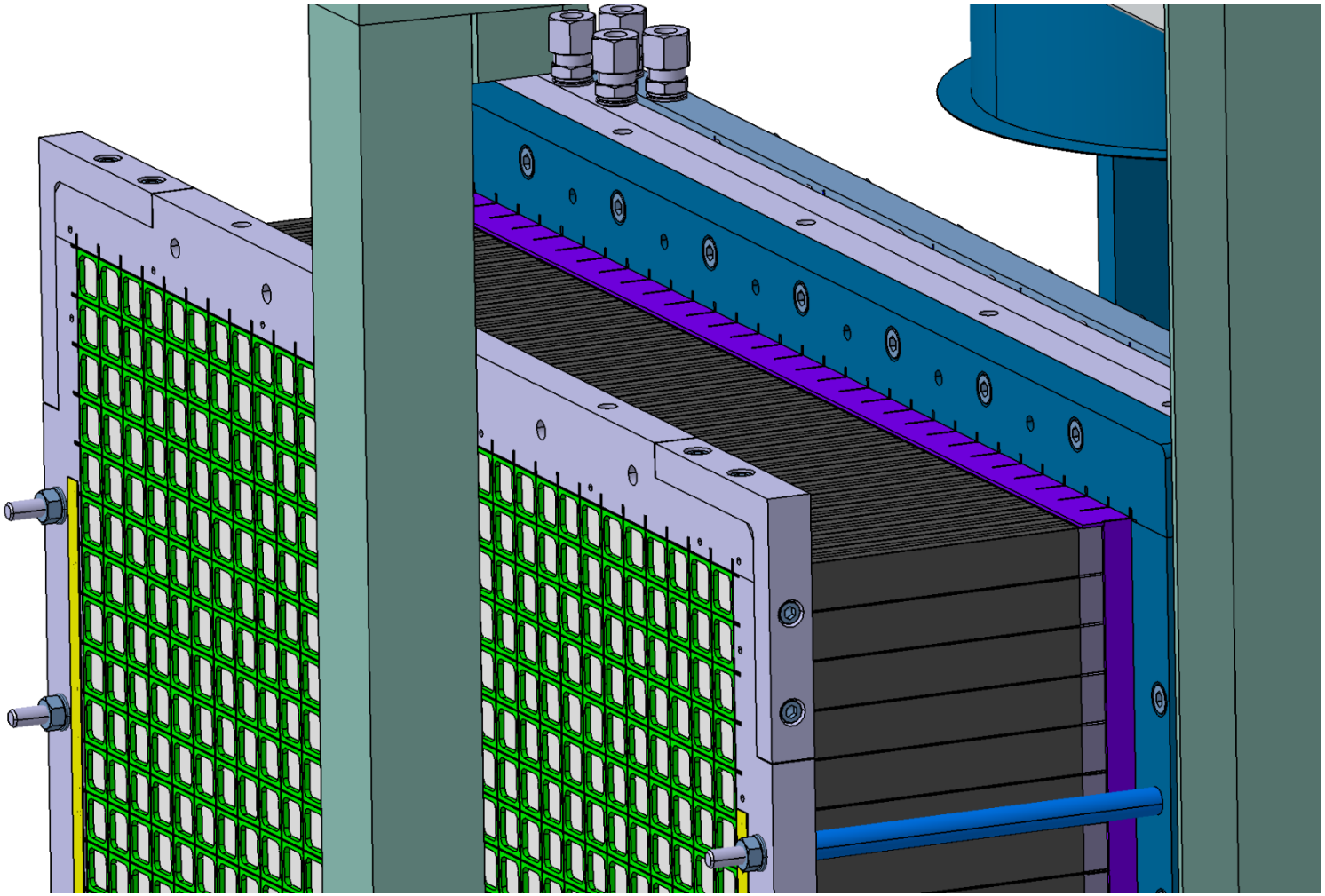
Mounting of the top Aluminum frame

Remove the 2 rods in order to remove the tools , then put it on with the spacer

Remove the tool **only after the mounting of the top frame and the threaded rods !!!**

45 : mounting of the Top Aluminum frame

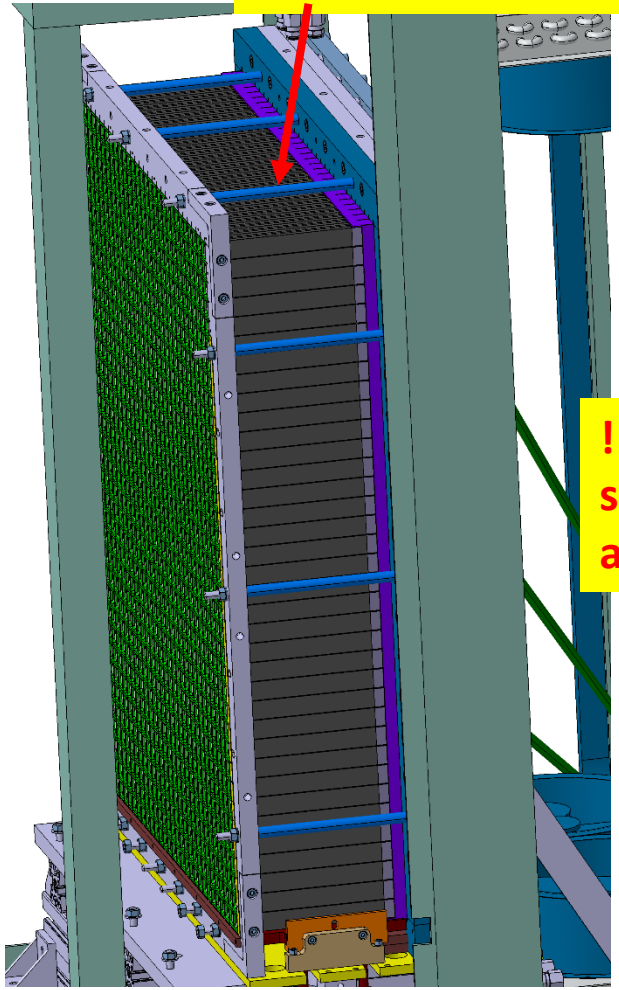
Mounting :Task 46



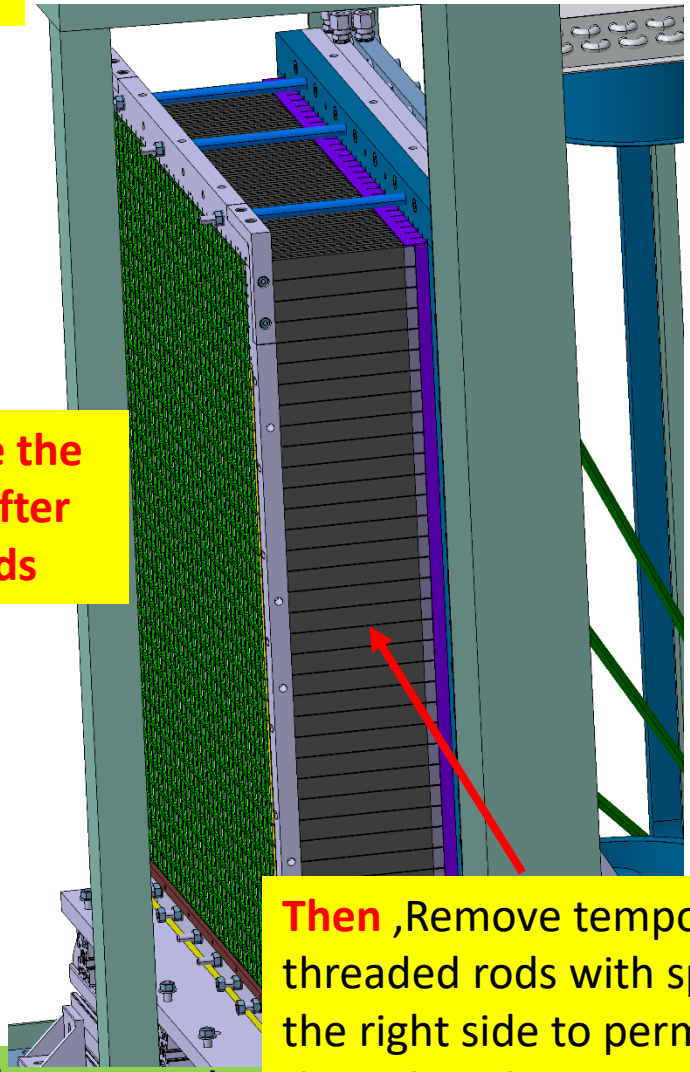
46 : Stacking the 6 last raws

Mounting :Task 47

Add temporary 3 threaded rods with spacers at the top



!!! Remove the side rods after add top rods

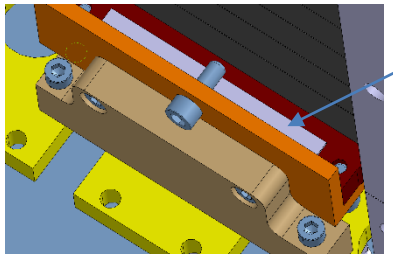


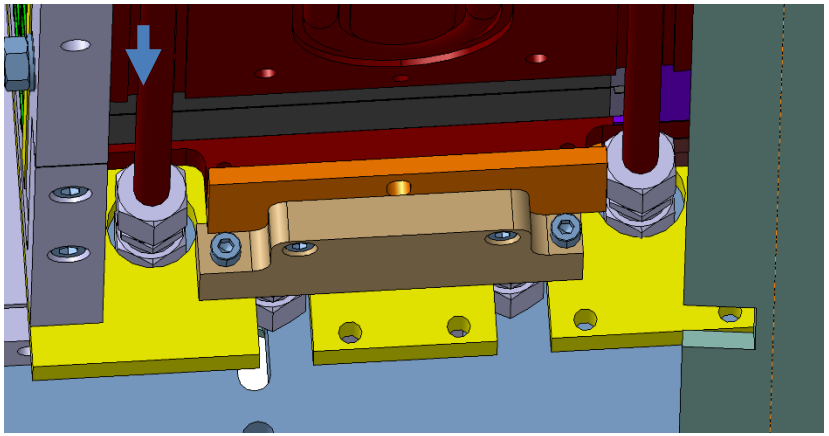
Then ,Remove temporary all the threaded rods with spacers at the right side to permit to insert the right side coper plate

47 : remove right side threaded rods for copper plate mounting

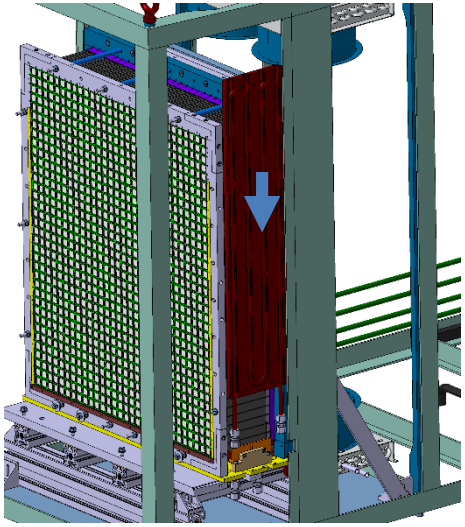
Mounting :Task 48

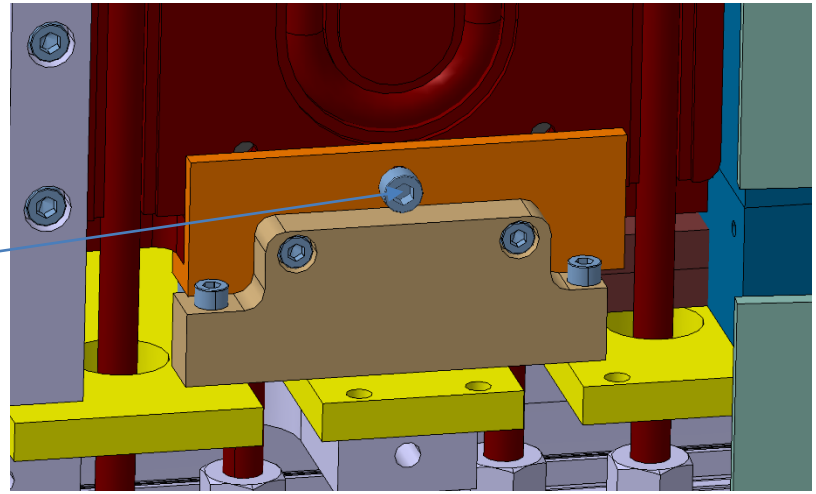
1: insert aluminum spacer 1mm on the bottom plate





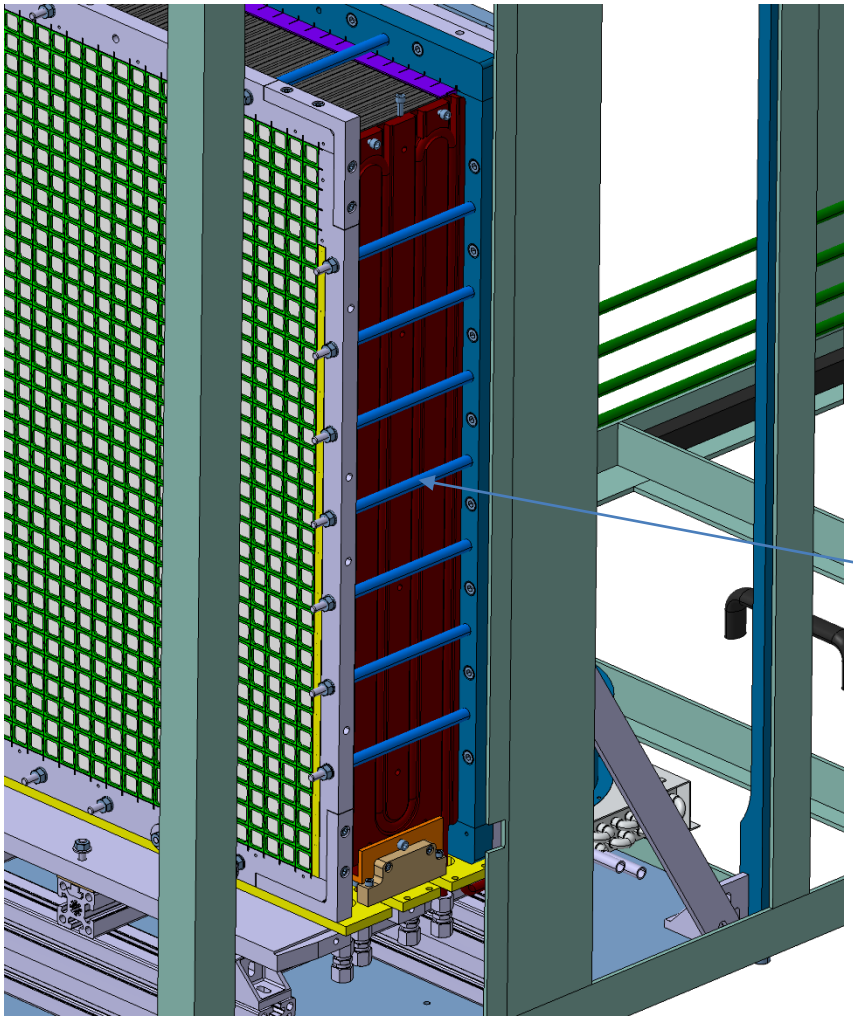
2: insert vertical copper plate





48 : mounting of the vertical right side copper plate

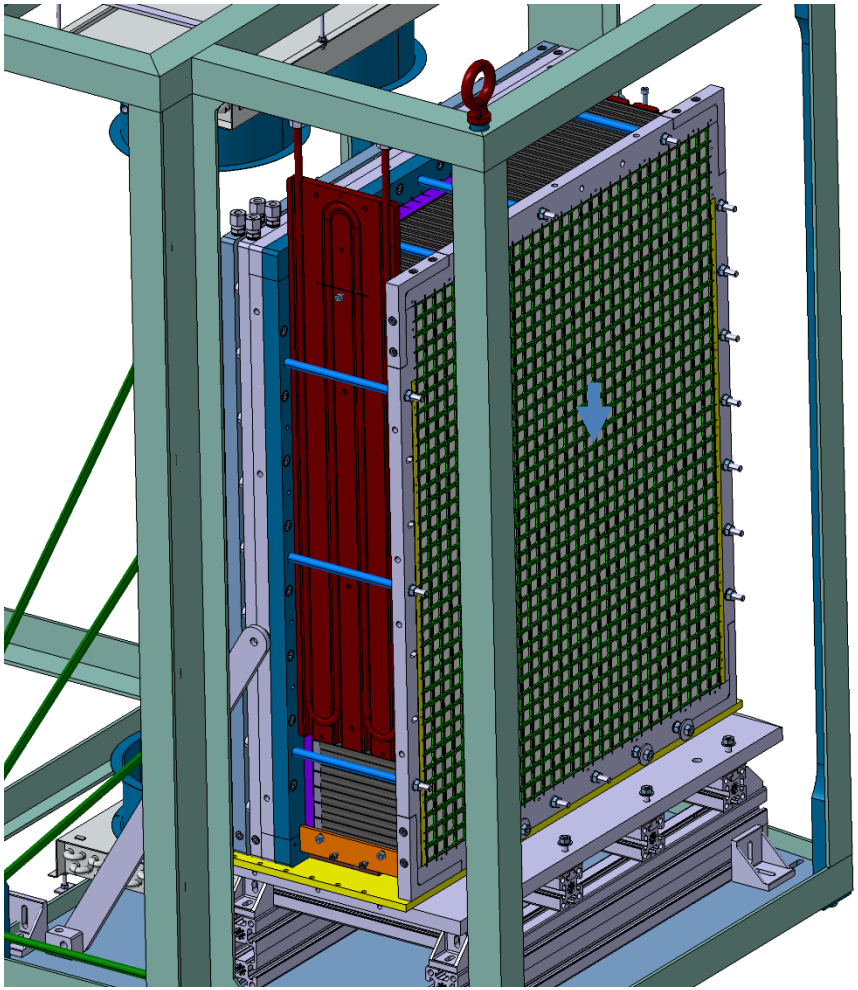
Mounting :Task 49

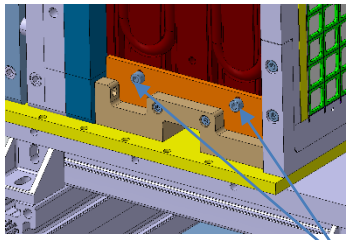


Rods with spacer

49 : mounting of the right side rods with spacers

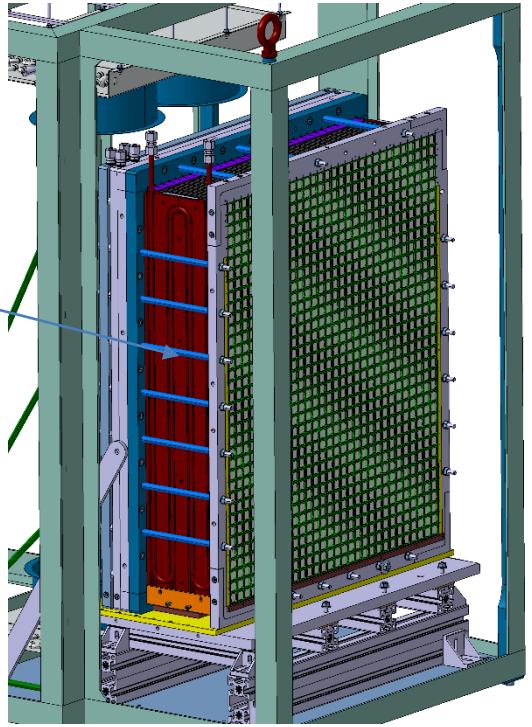
Mounting :Task 50





Put 2 screws

Put all Rods with spacer on left side

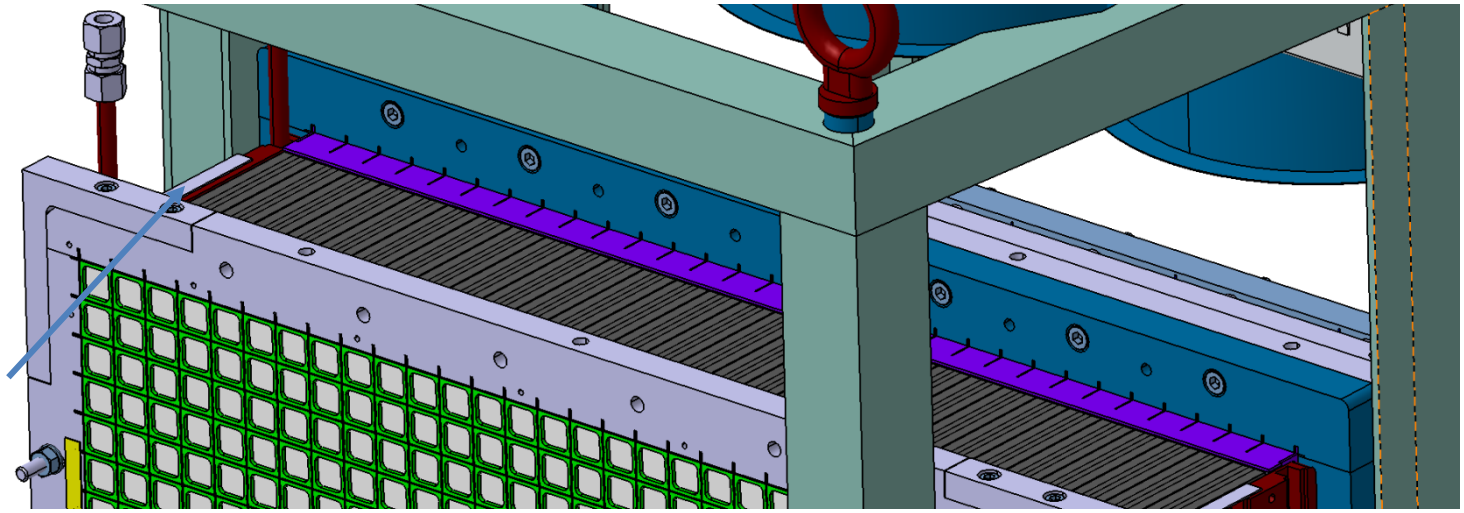


50 : mounting of the left side copper plate

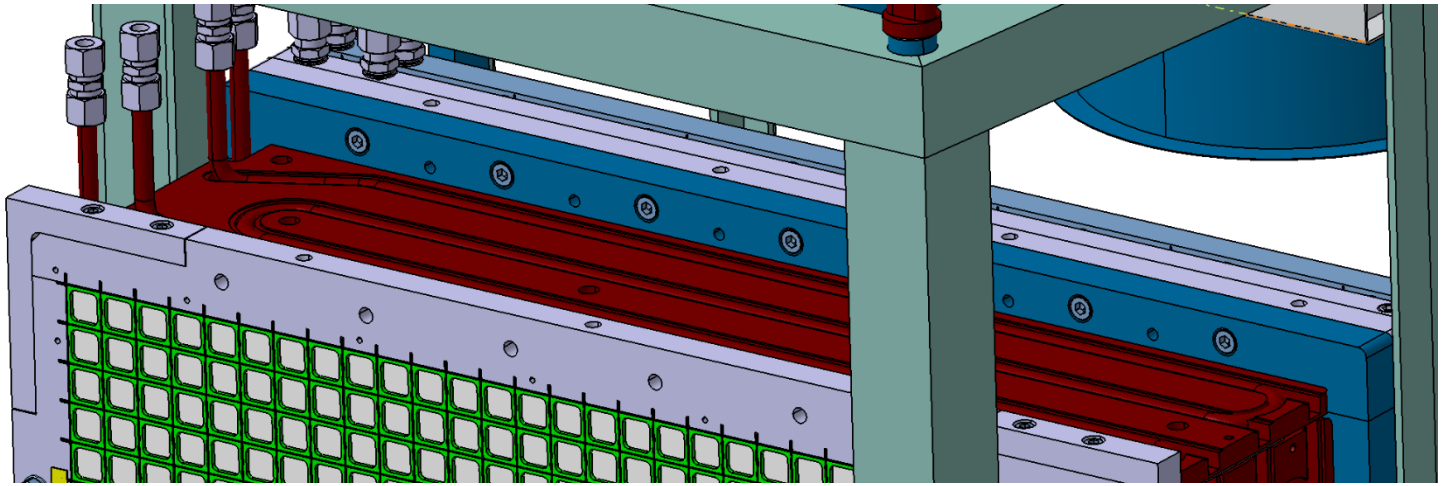
Mounting :Task 51

1 : remove all the top threaded rods

2 : put the spacers (adjustment in order to be above the mu metal plate)

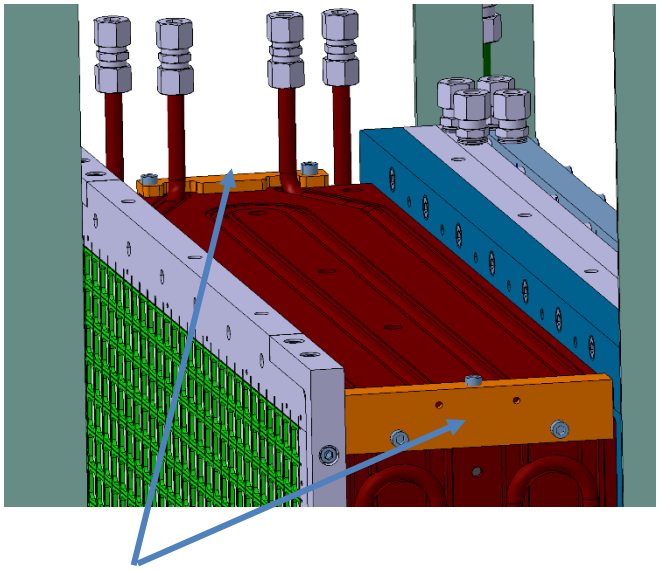


3 : insert the top copper plate)

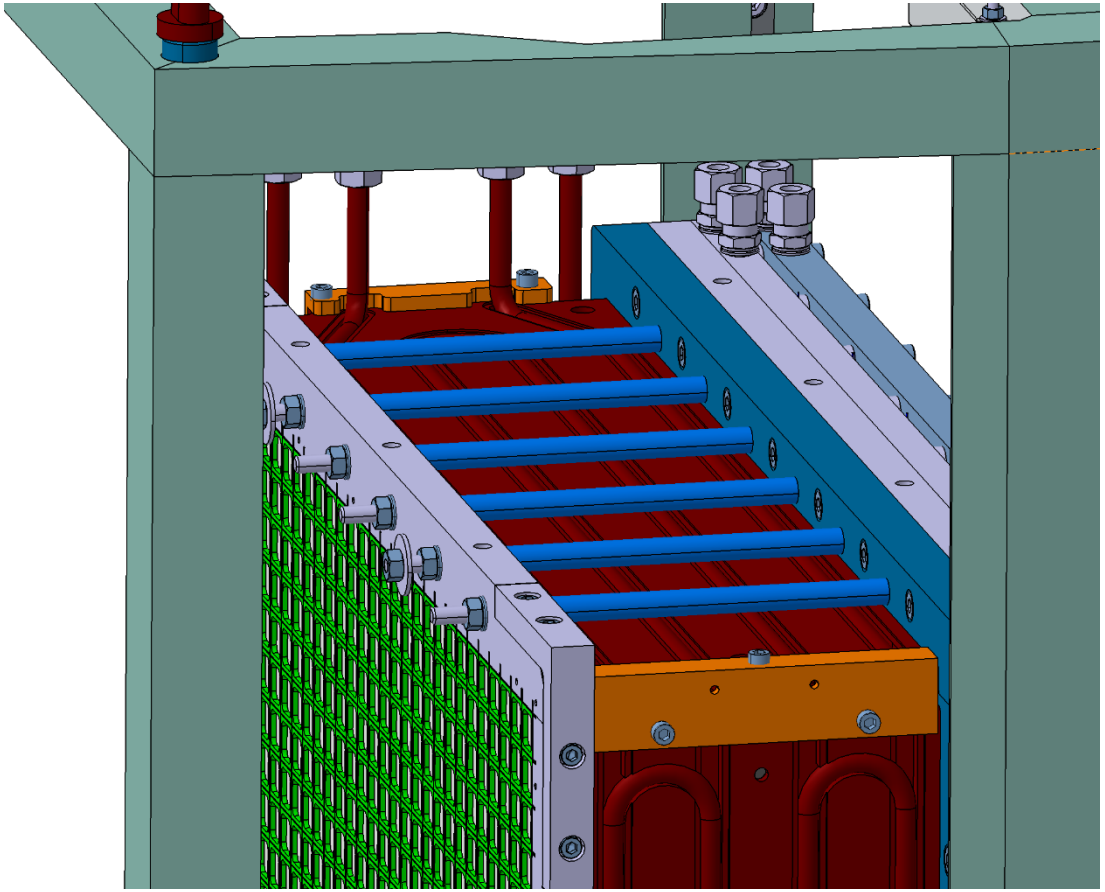


51 : mounting of the corners to fix the Top copper plate

Mounting :Task 52



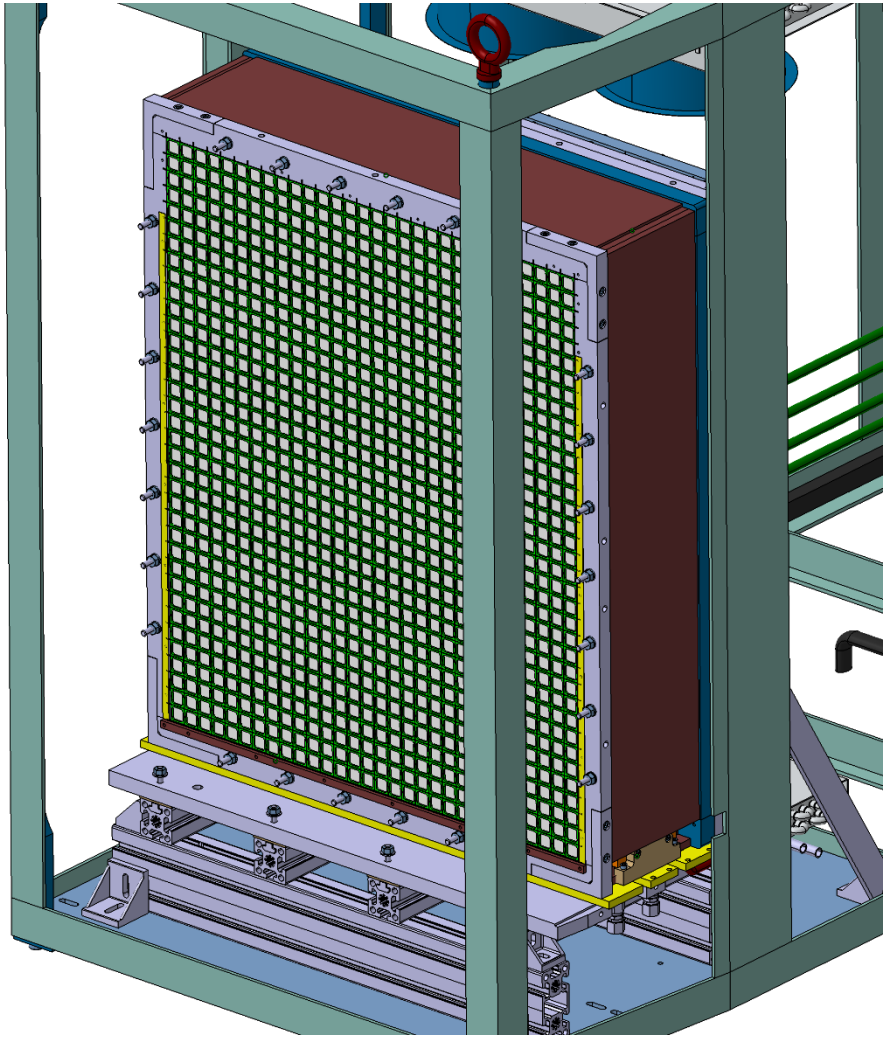
Put the brackets
and screws



Finaly put all the tops threaded
rods with their spacers

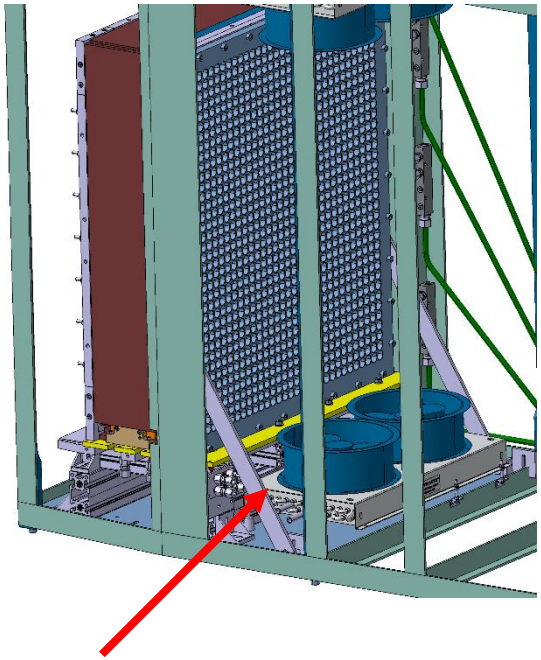
52: mounting of the Top side copper plate

Mounting :Task 53

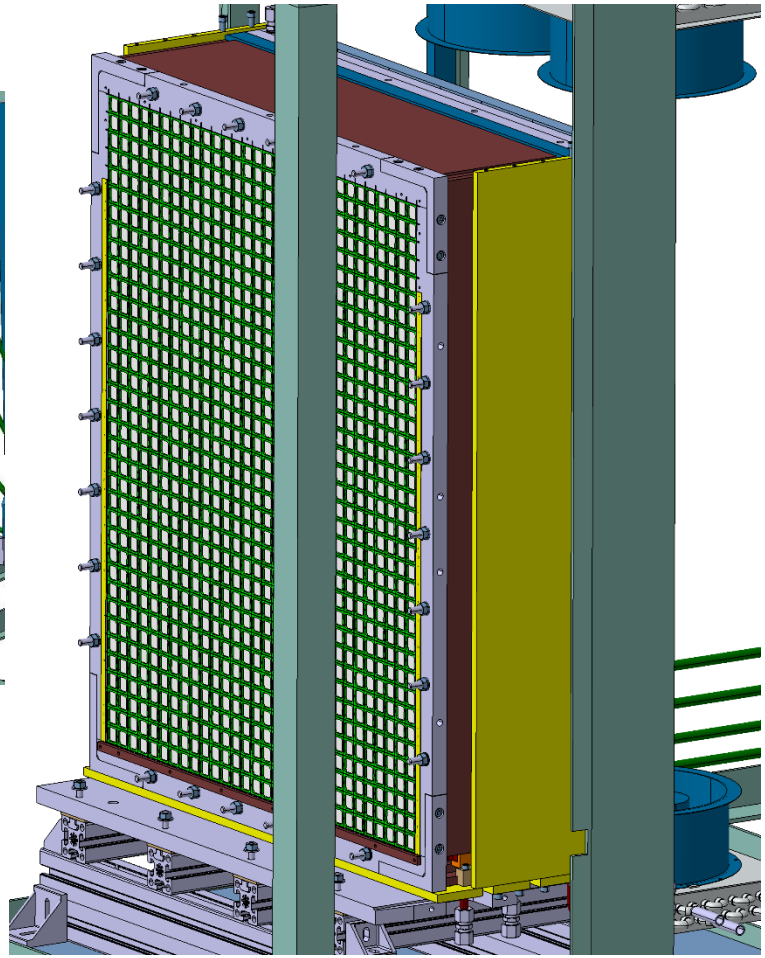


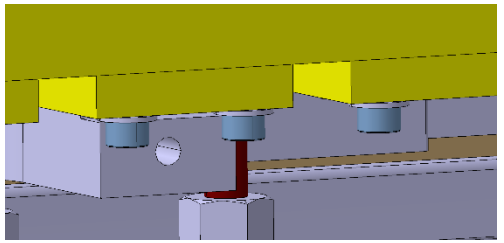
53 : mounting of foam around the copper plates

Mounting :Task 54



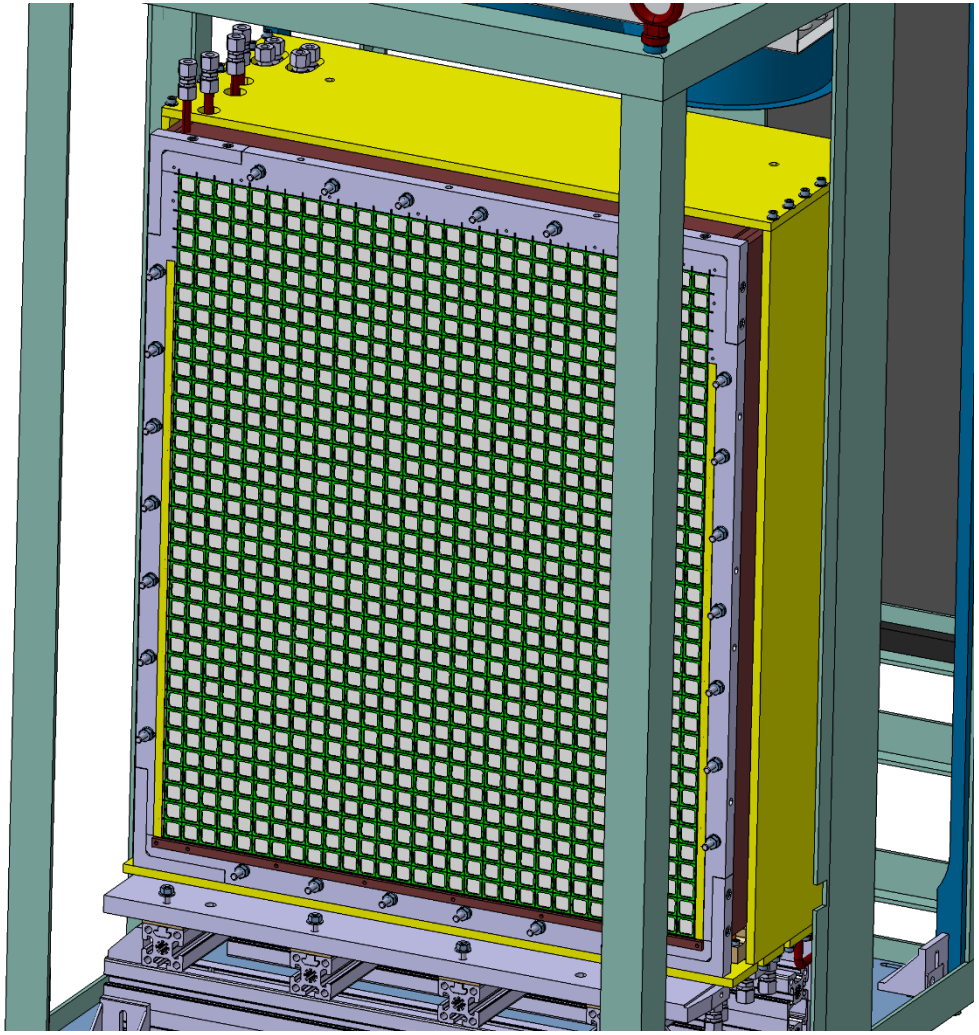
Before ,remove the 2 reinforcement arms





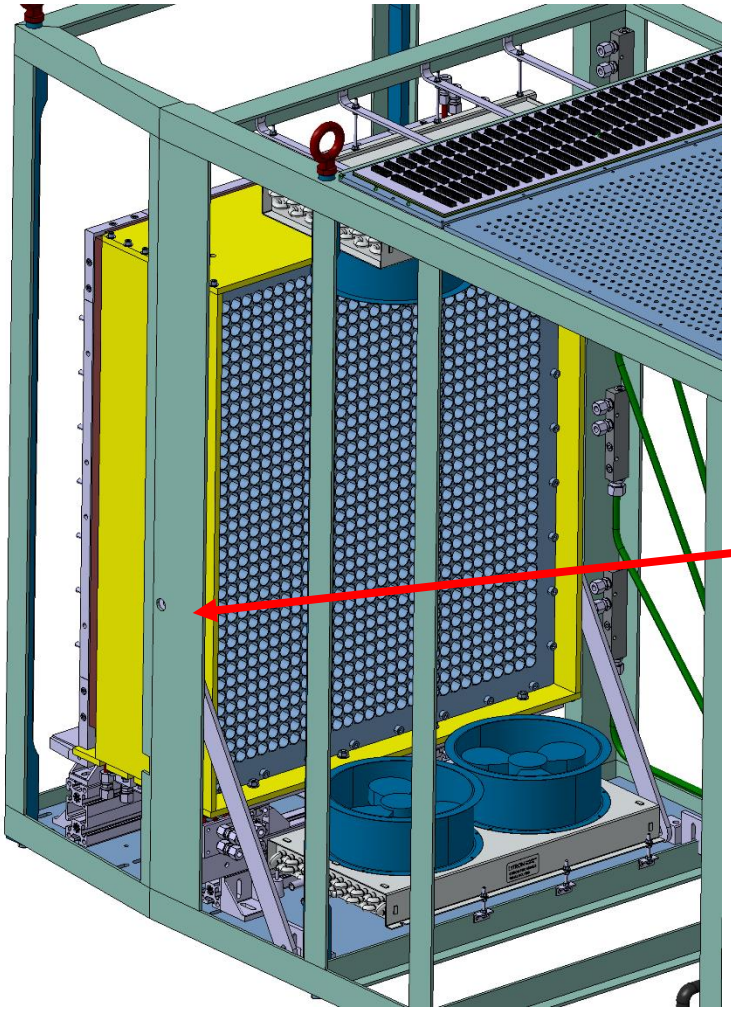
54: mounting of vertical Shielding plates

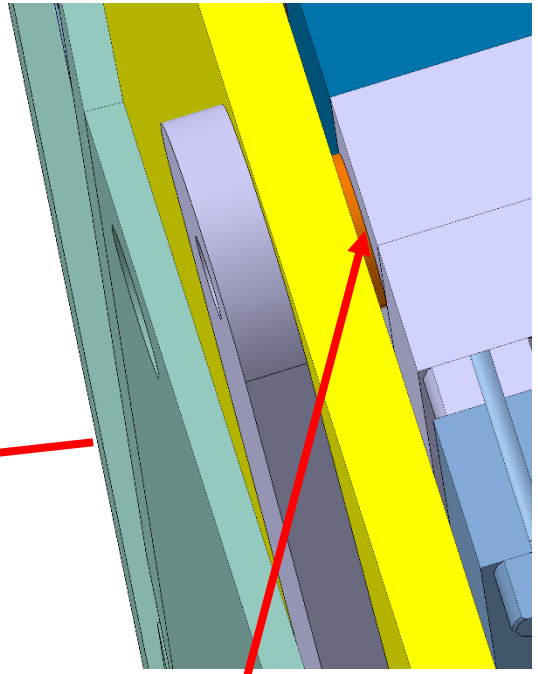
Mounting :Task 55



55 : mounting of Top Shielding plate

Mounting :Task 56



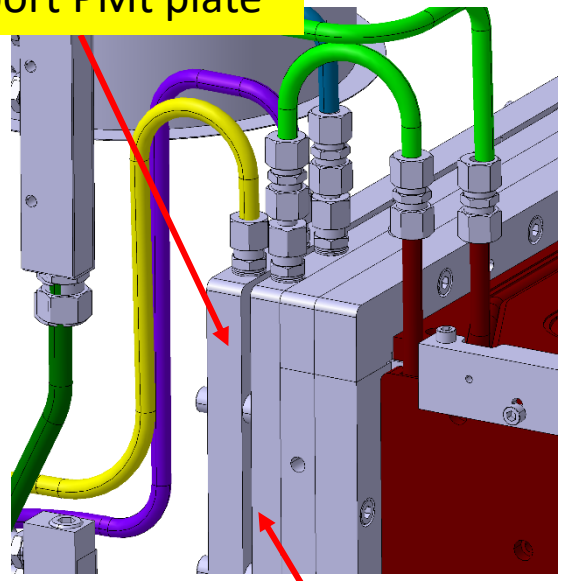


!!! Spacer 2 mm between Aluminum frame and vertical shielding plates

56 : mounting of the arms and spacers 2mm

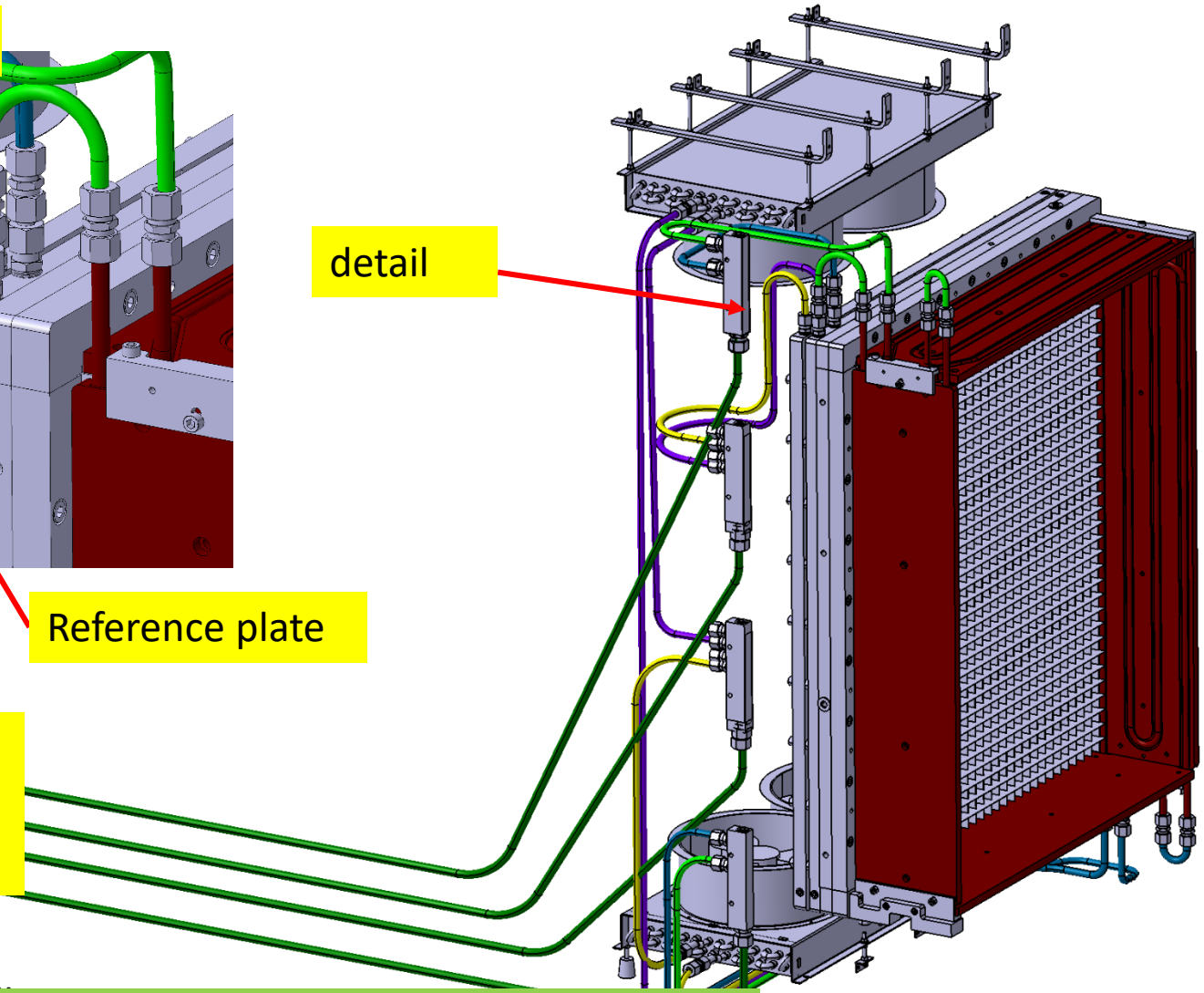
Connecting cooling and test :Task 57

Support PMt plate



detail

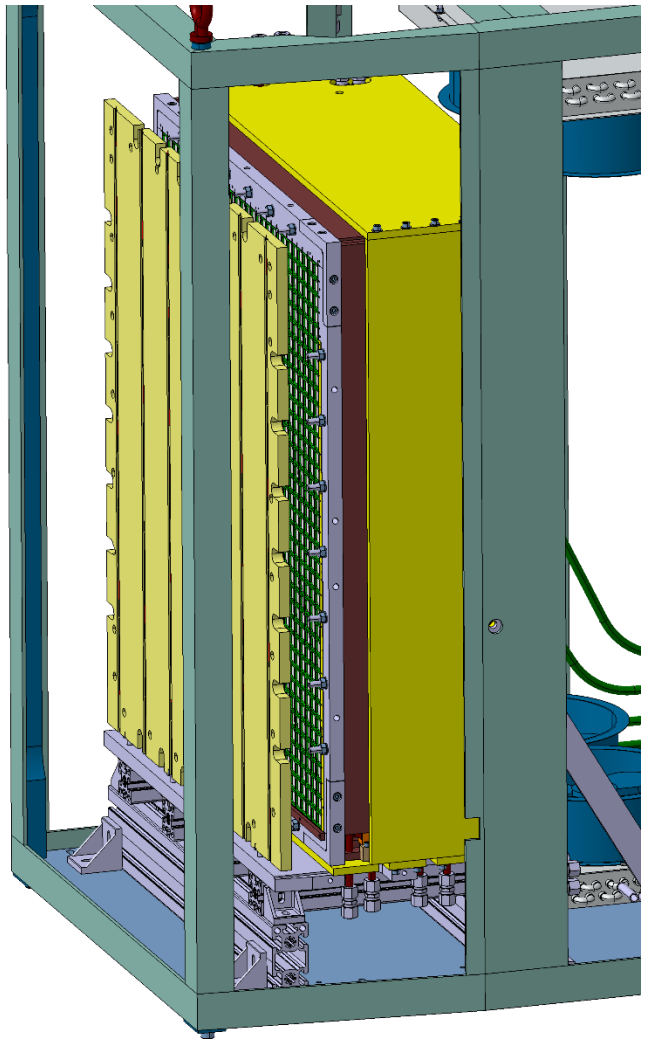
Reference plate

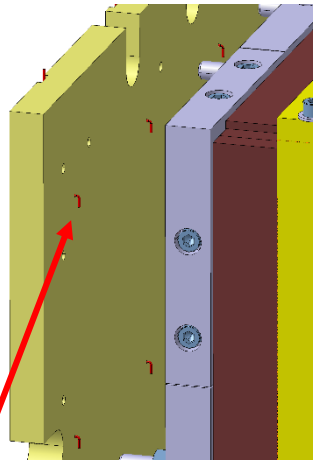


See cooling system note

57 : Connection of all the copper tubes and tightness test

Mounting :Task 58



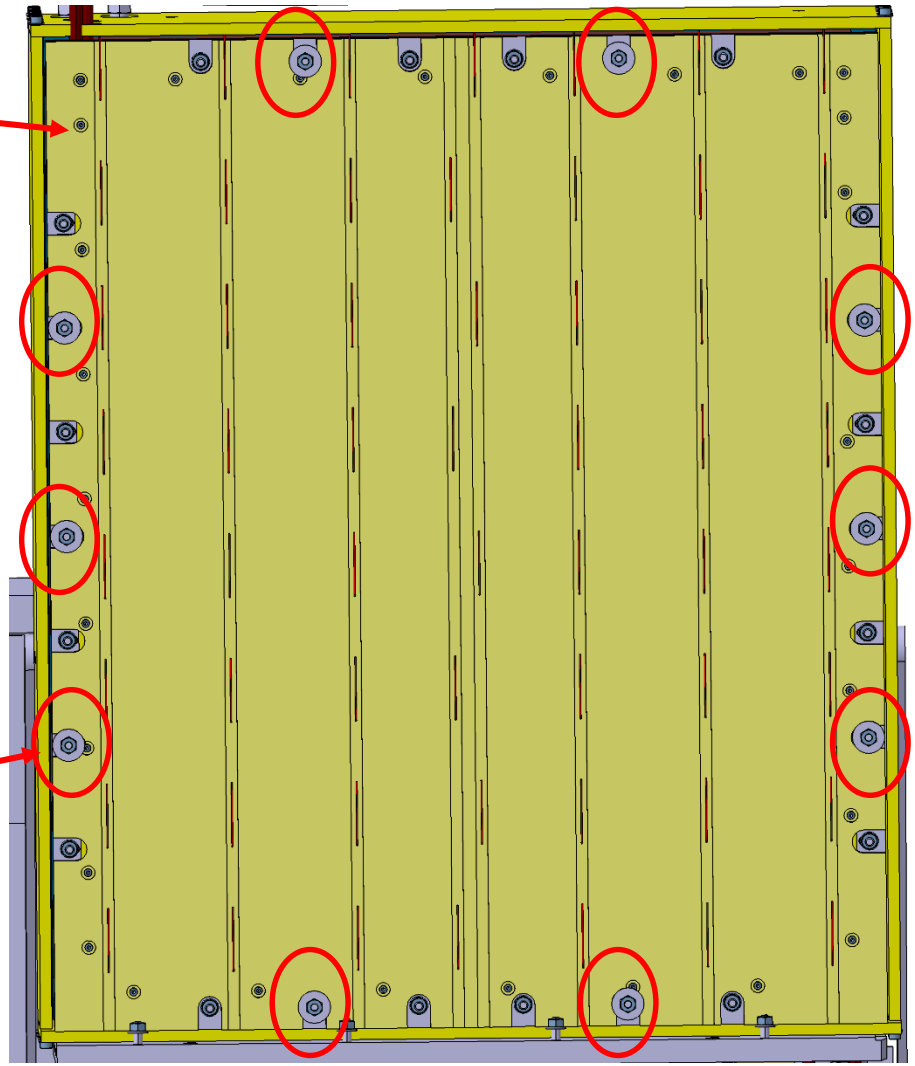


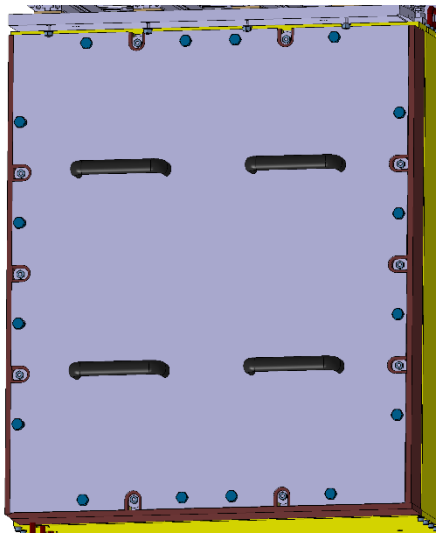
T° sensors

58 : mounting of the PE front plate and its sensors

Mounting :Task 59

29 screws M4 x 20



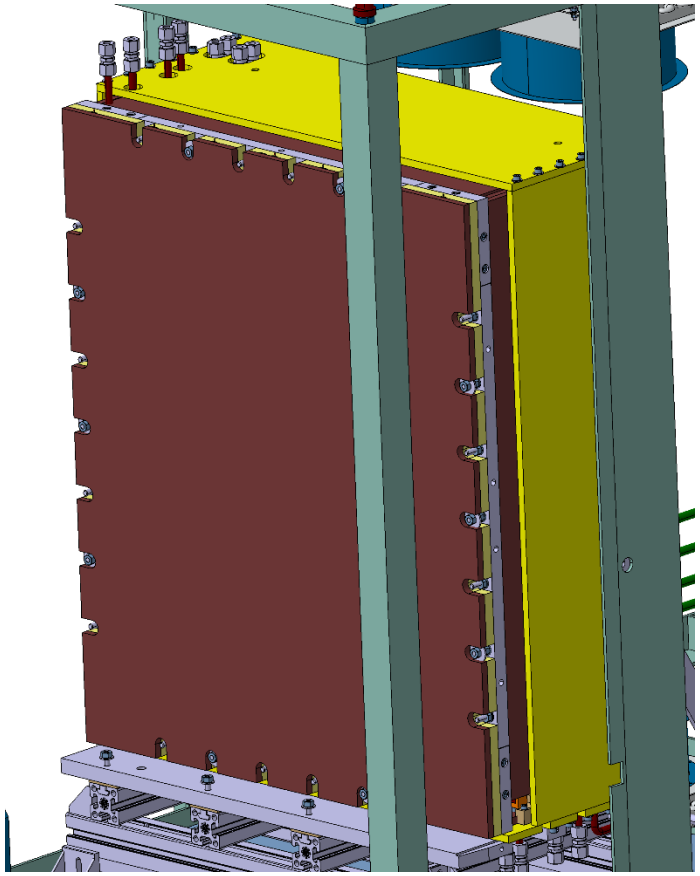


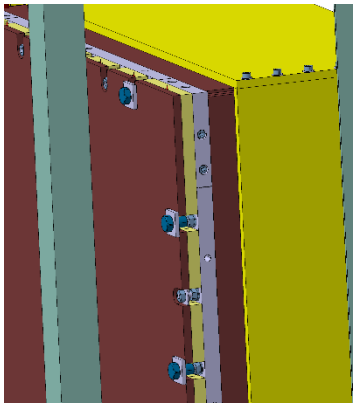
10 large washers and Nuts M8

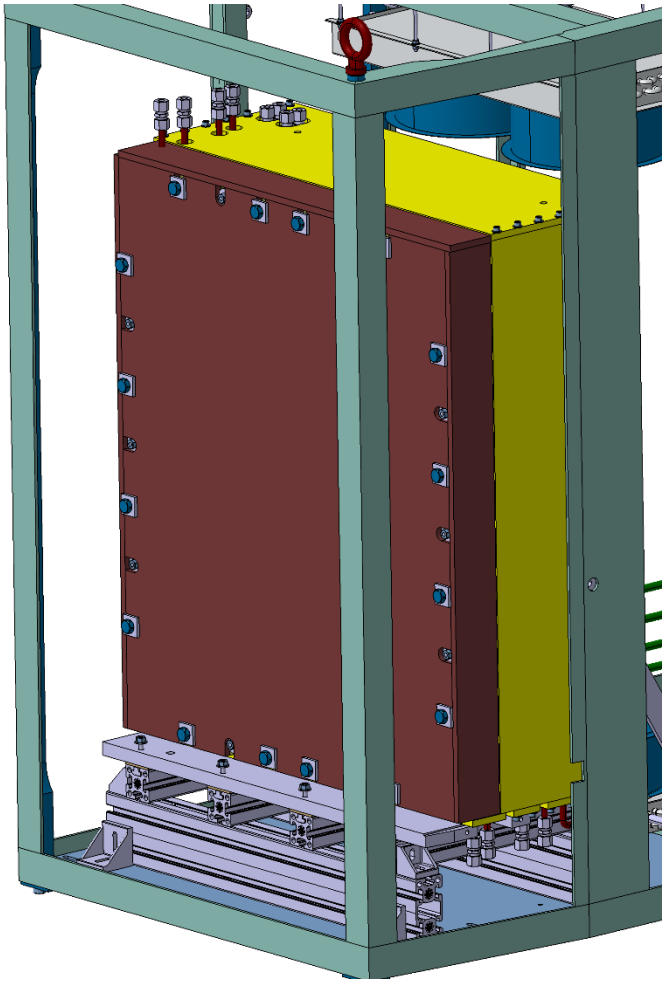
The other threaded rods are temporary without large washers and nuts in order to permit the mounting of the Aluminum reinforcement plate for moving the calorimeter

59 : mounting of the PE front plate and its sensors

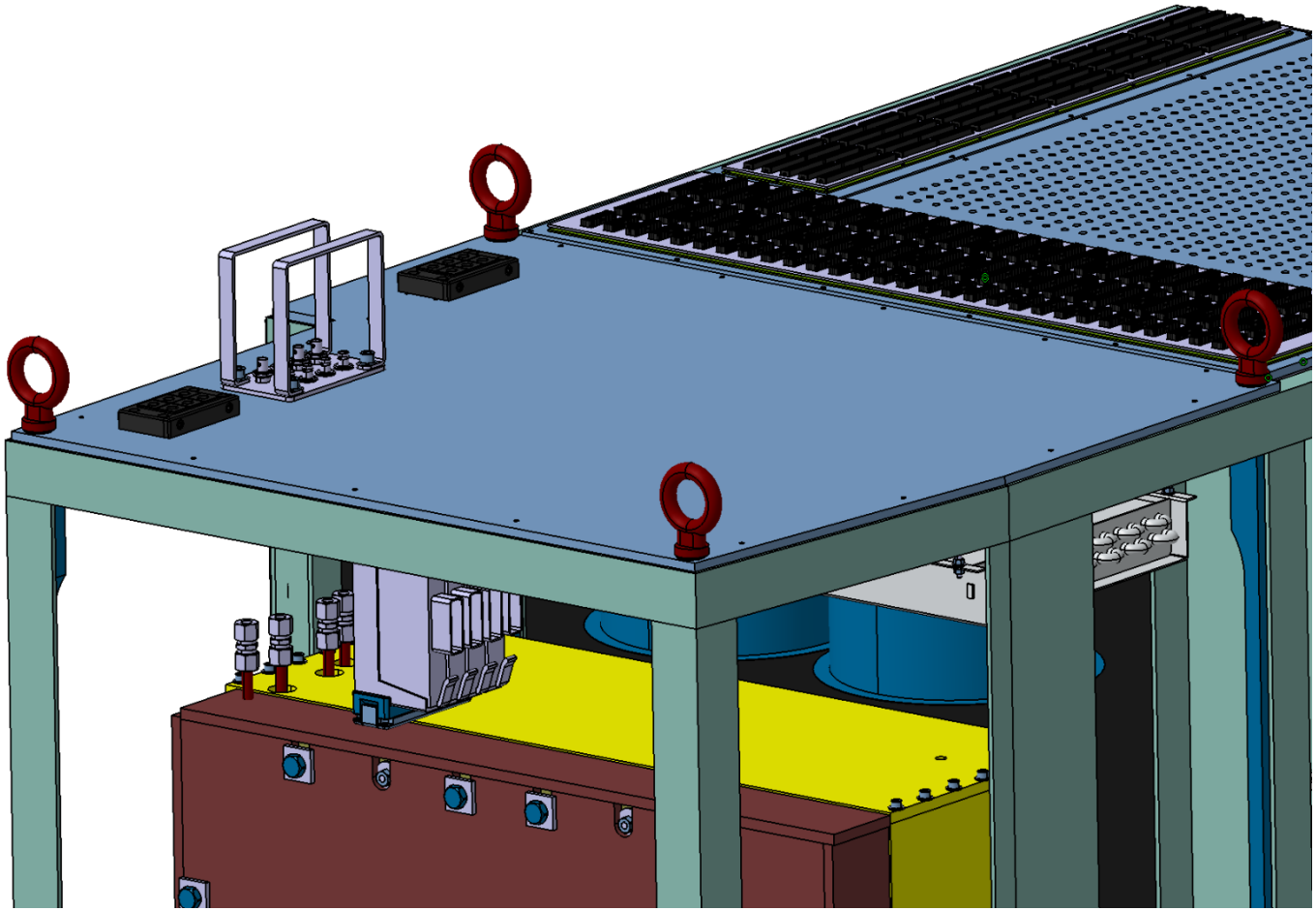
Mounting :Task 60





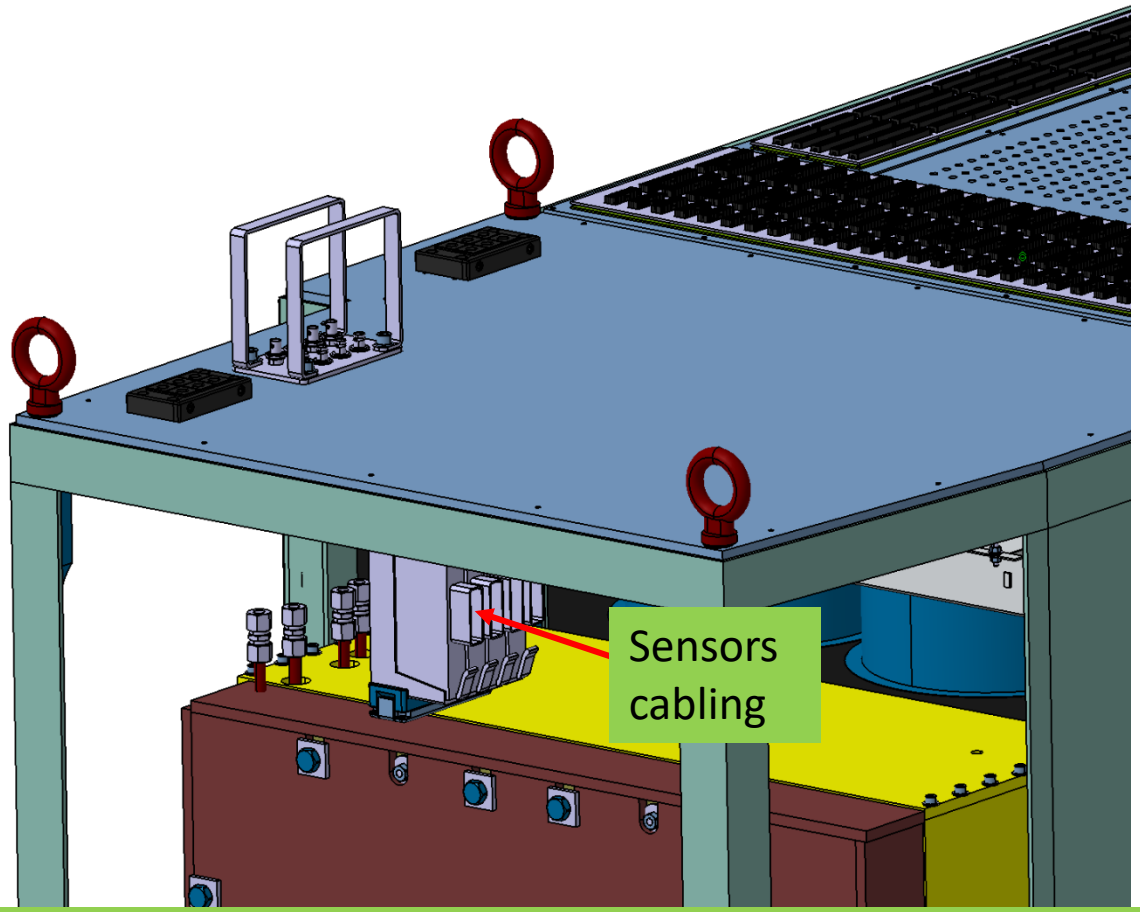


60 : mounting of the front foam



61 : mounting of the Top plate with its connectors and cables

Mounting :Task 62

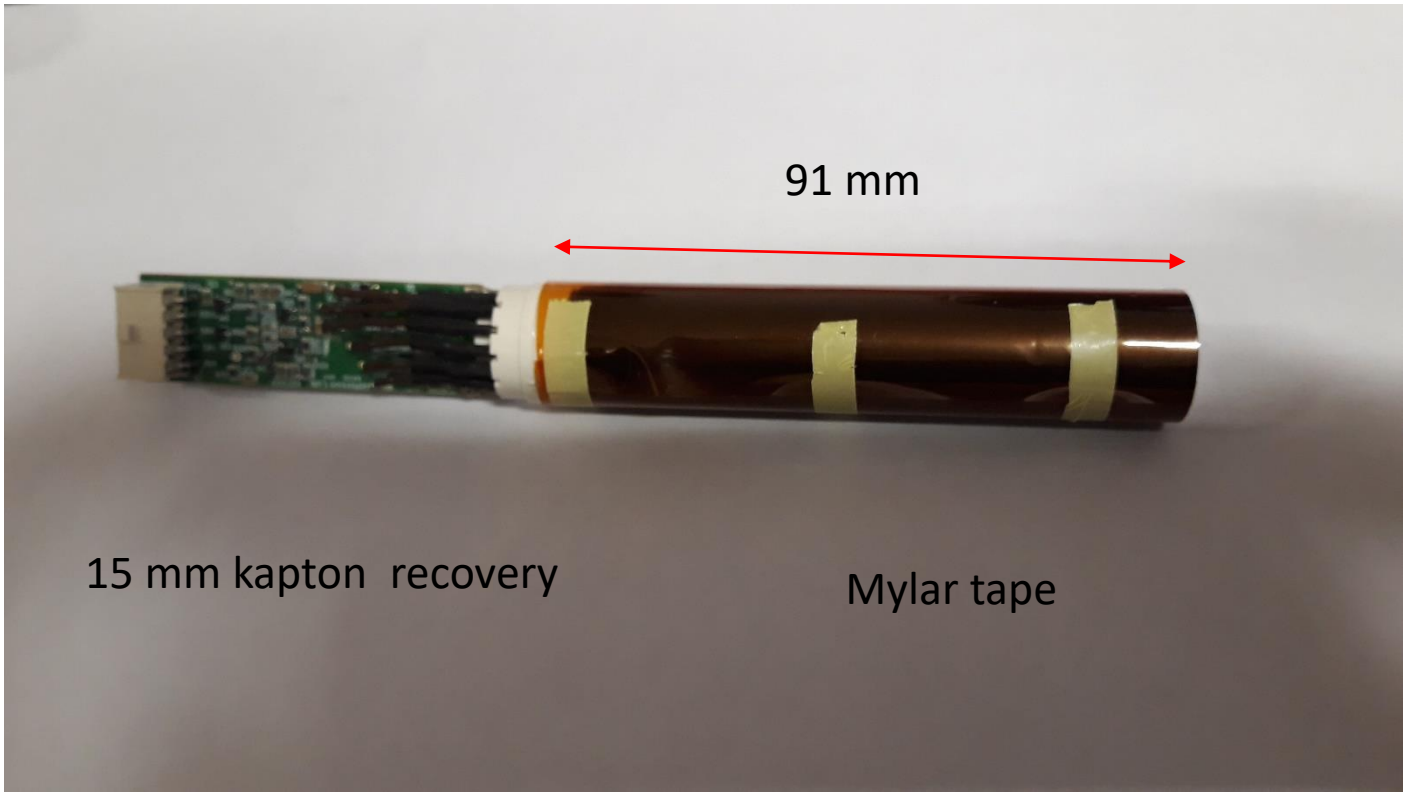


62 : sensors cabling

Mounting :Task 63

63 : assembling 1080 PMt and their base

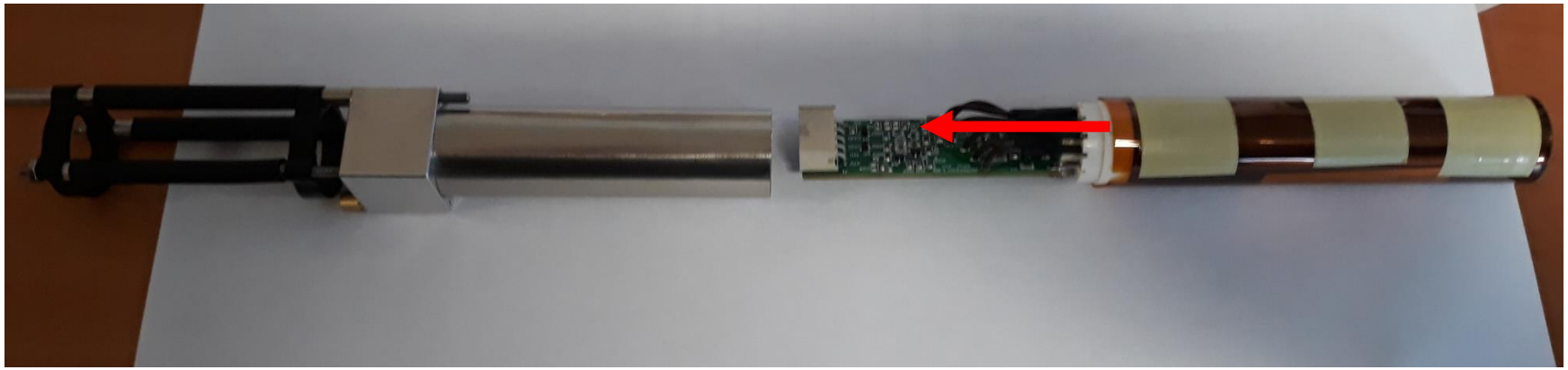
Mounting :Task 64



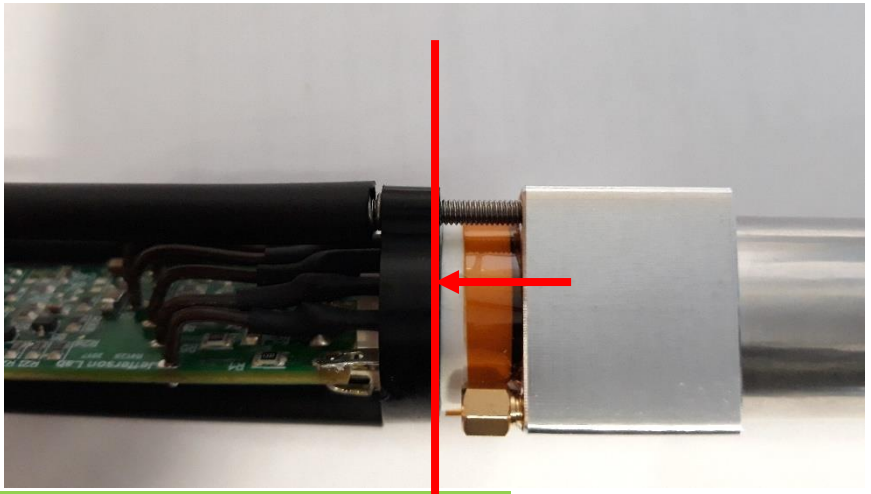
1080 + 20 = 1100 spares sheets 50µ 91mmx75 mm

64 : assembling 1080 Kapton sheet 50µ and tape for HV protection

Mounting :Task 65



Slide the PMt until the plastic washer of the support



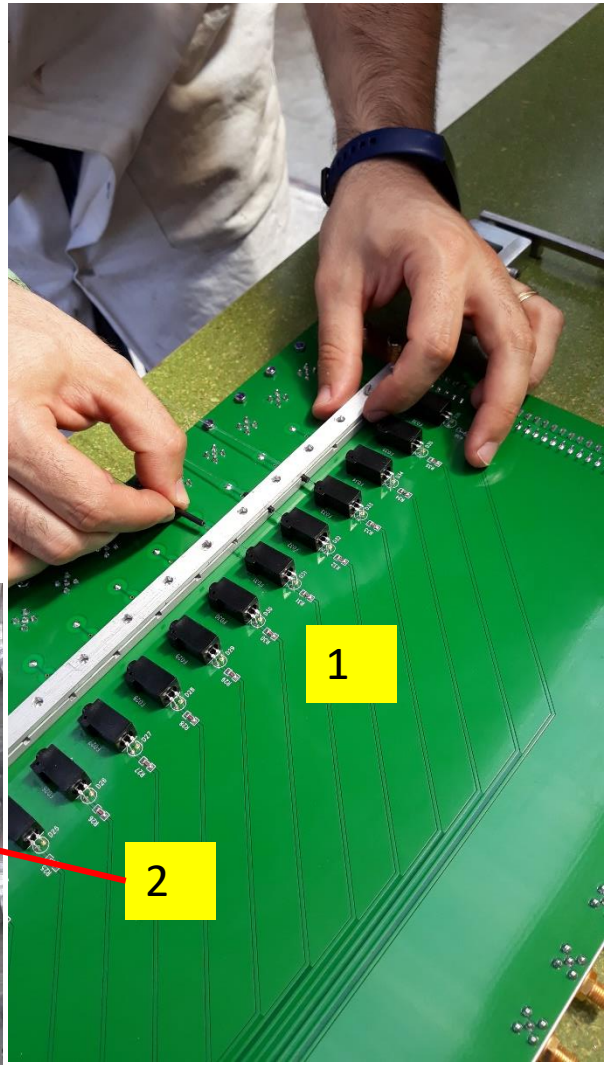
65 : assembling of 1080 Pmt +base + kapton into the PMt support

Mounting :Task 66

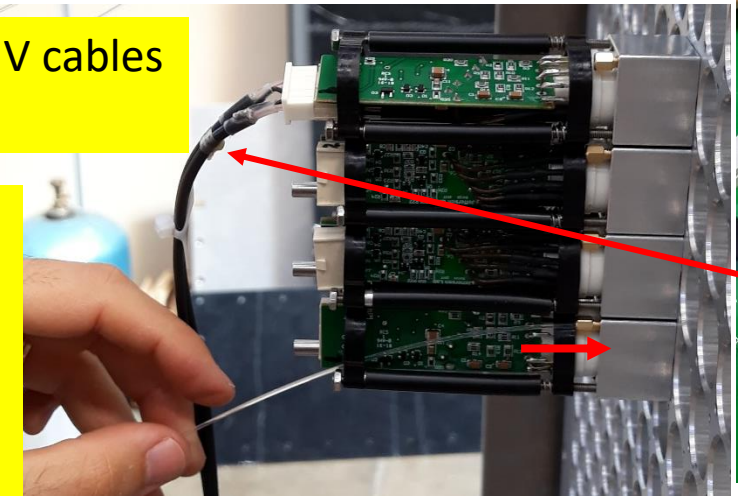
1 : insert the fiber first in the PCB plastic ferule on a table

Put the sheath around the fiber to press the fiber with the aluminum bars

Put all the 36 fibers and block them with screws



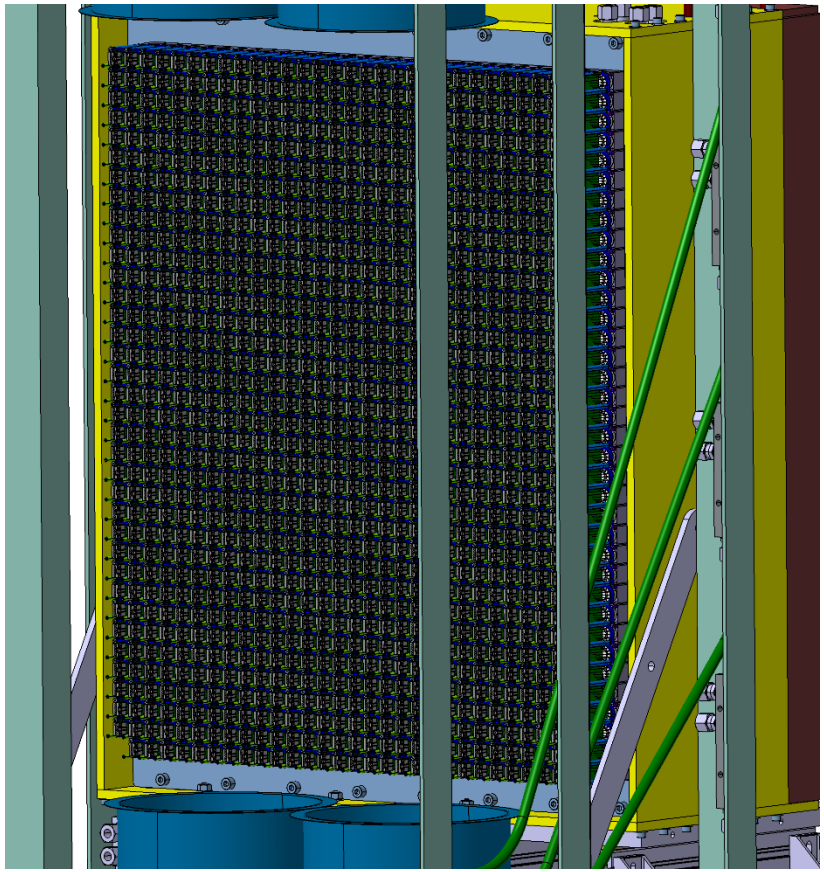
+ Connect Anode and HV cables in front of PCB



Then each other extremity of fiber will be inserted in the PMt support ferule when PCB installed (column)

66 : mounting of fibers and front cables (anode + HV) on PCB

Mounting :Task 67



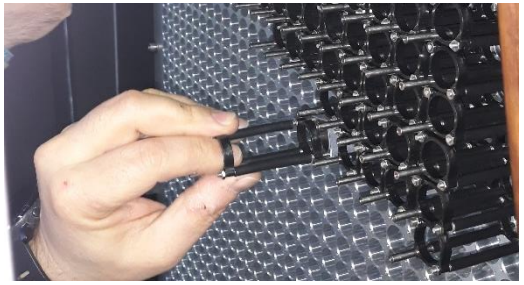
67 : mounting of 1080 PMt assembly on the PMt support plate

Method : see next pages

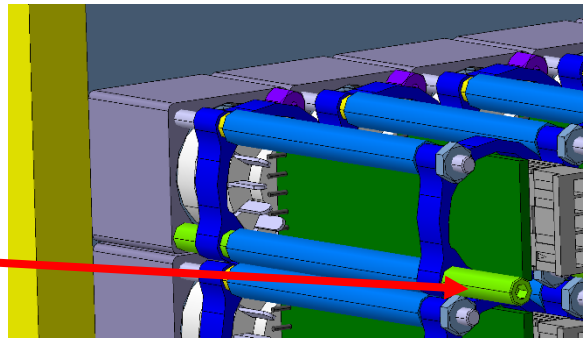
Mounting :Task 68

1 : put optical grease on the front glass face

Necessity to optimise the grease quantity



2 : insert the PMt with its support throw the Aluminum plate hole

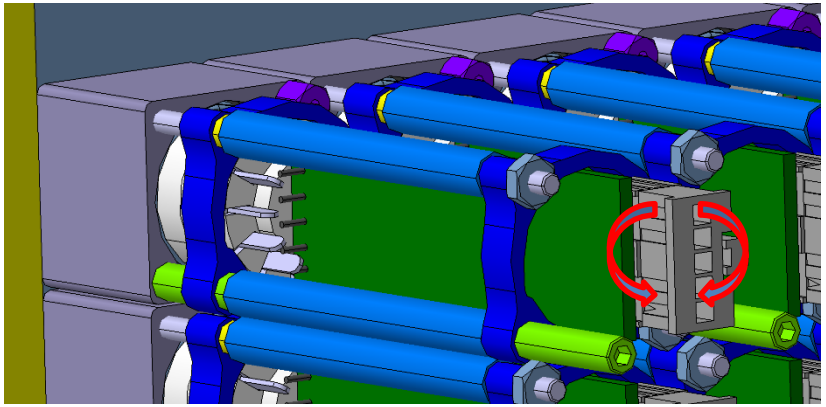


3 : Tighten the screw with a screw driver

68 : mounting of 1080 PMt assembly on the PMt support plate

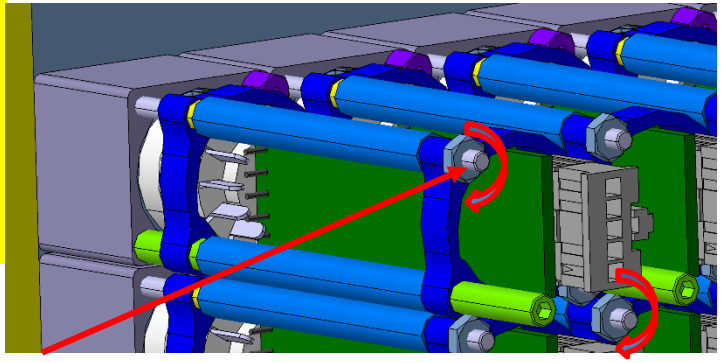
Mounting :Task 69

4 : Make a rotation of the PMt by hand with the help of base in order to spread the grease between the crystal and the PMt



5 : use a nut driver in order to press the 2 nuts on the plastic washer and press the springs

VERY IMPORTANT !!!
When contact (use fingers to screw) between nuts and washer, rotate ¼ turn Maxi with nut driver (not more in order to limit the force on the crystal and limit the force on the plastic front part , **we need just a contact between PMt and crystal**)



6 : Then ,Put vernish on the threaded rods to avoid loose them

69 : mounting of 1080 PMt assembly on the PMt support plate

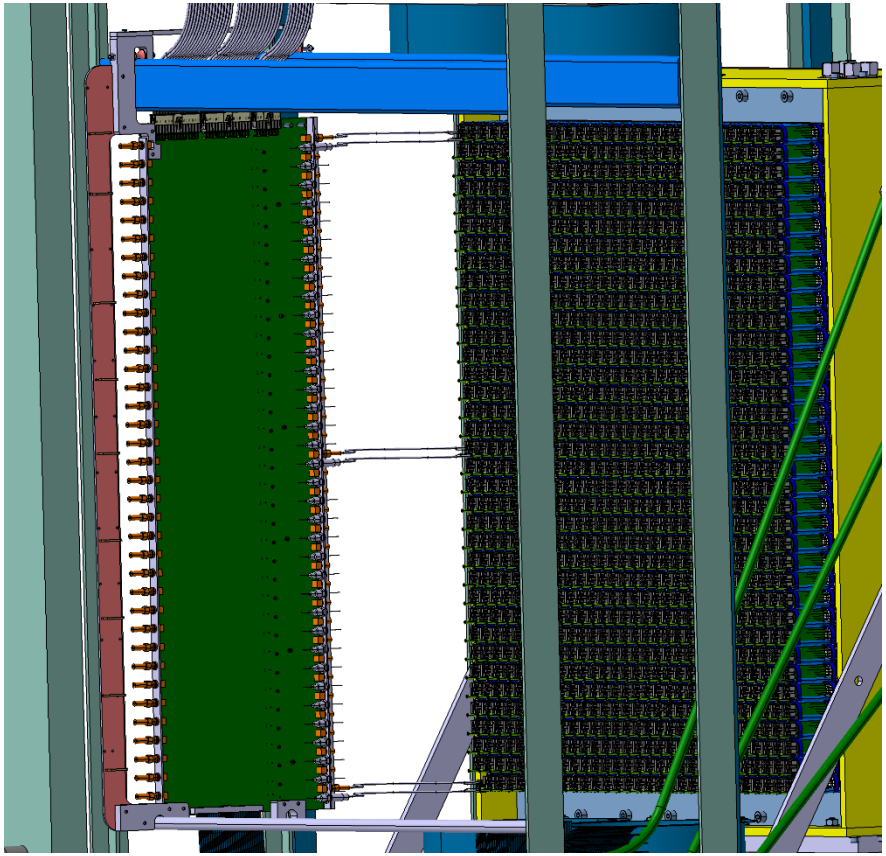
Mounting :Task 70

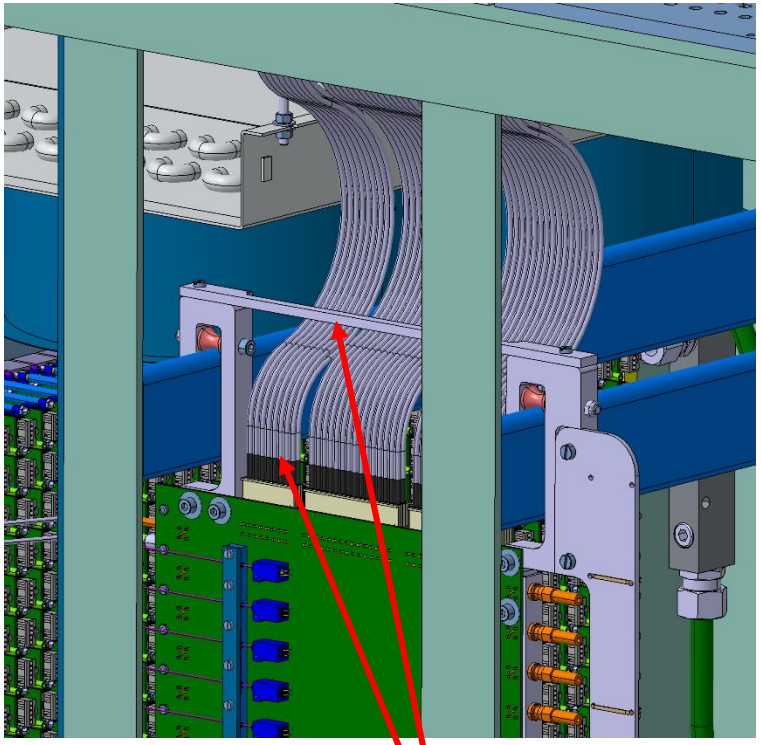
70 : mounting of the additionnal T) sensors @ the back (electronics)

Mounting :Task 71

71 : mounting of Gas connections

Mounting :Task 72

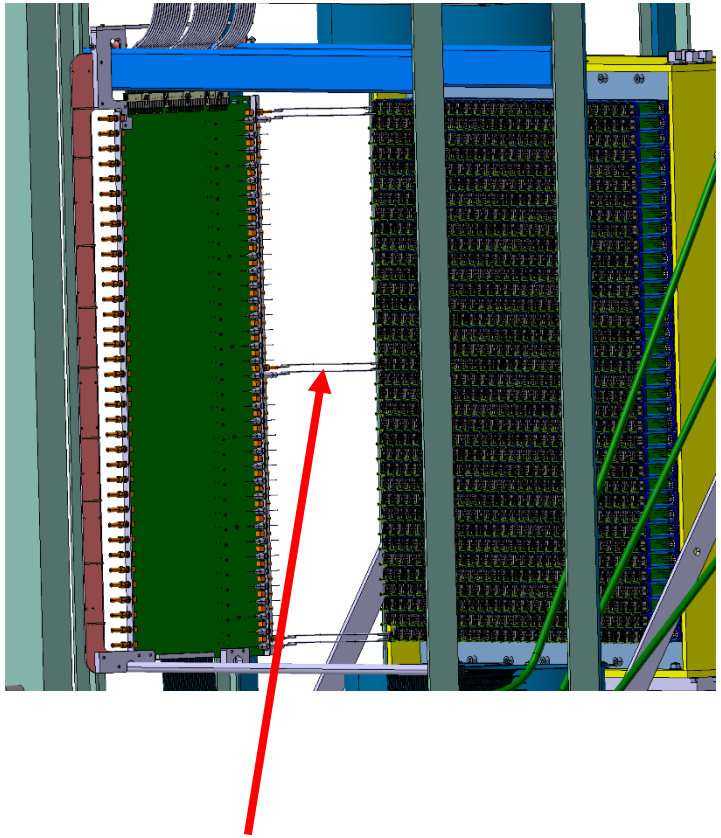


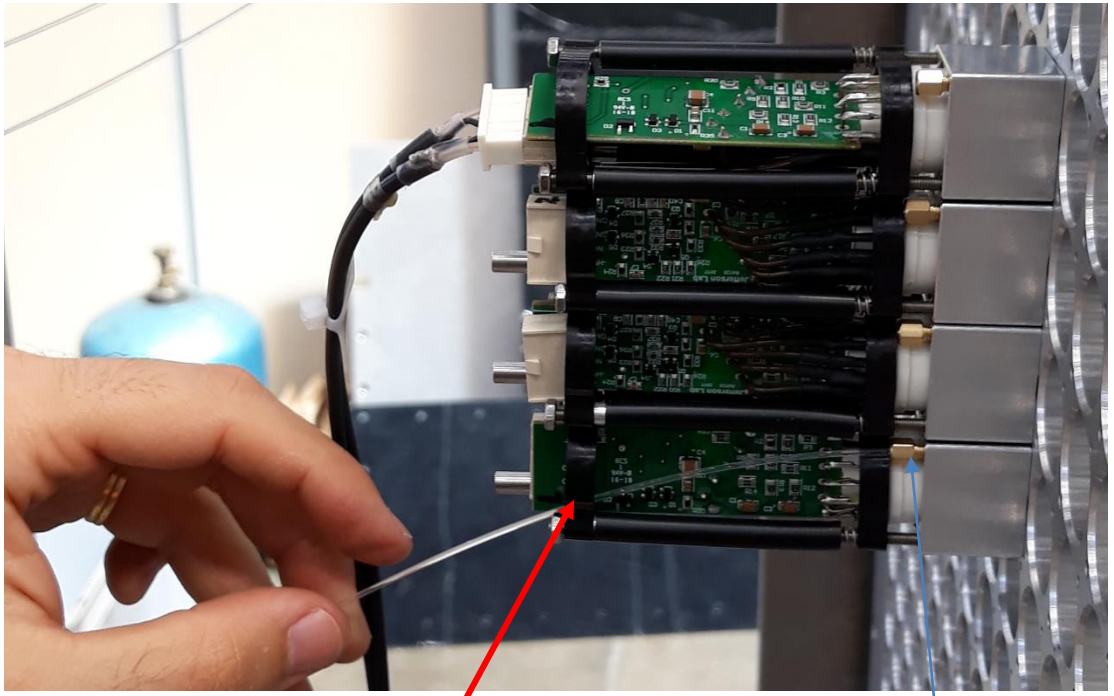


Connect HV connectors and put the Top aluminum bar

72 : mounting of the first left PCB

Mounting :Task 73



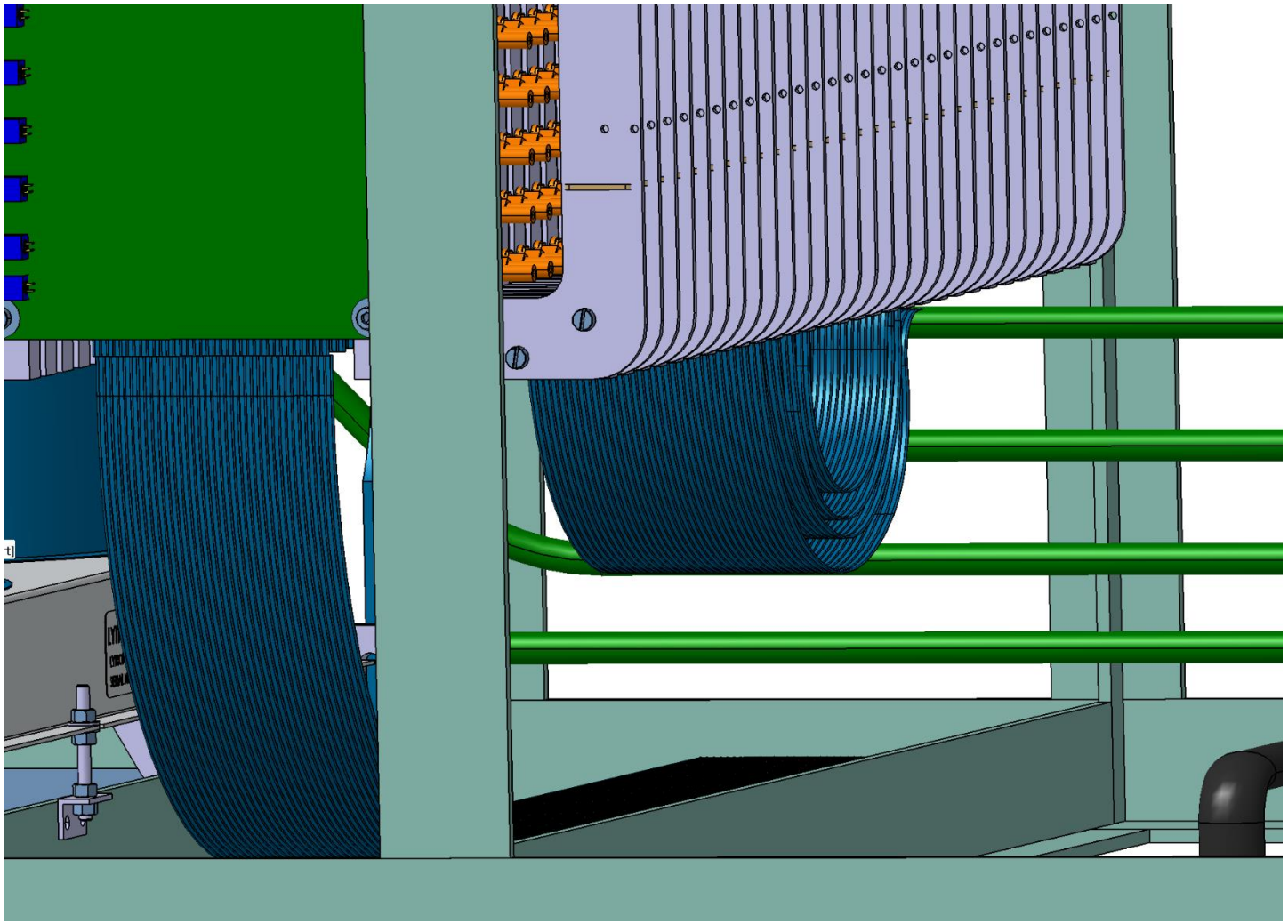


Slide the fiber until the crystal throw the plastic washer, then Tighten the metal ferule to block it

Metal ferule

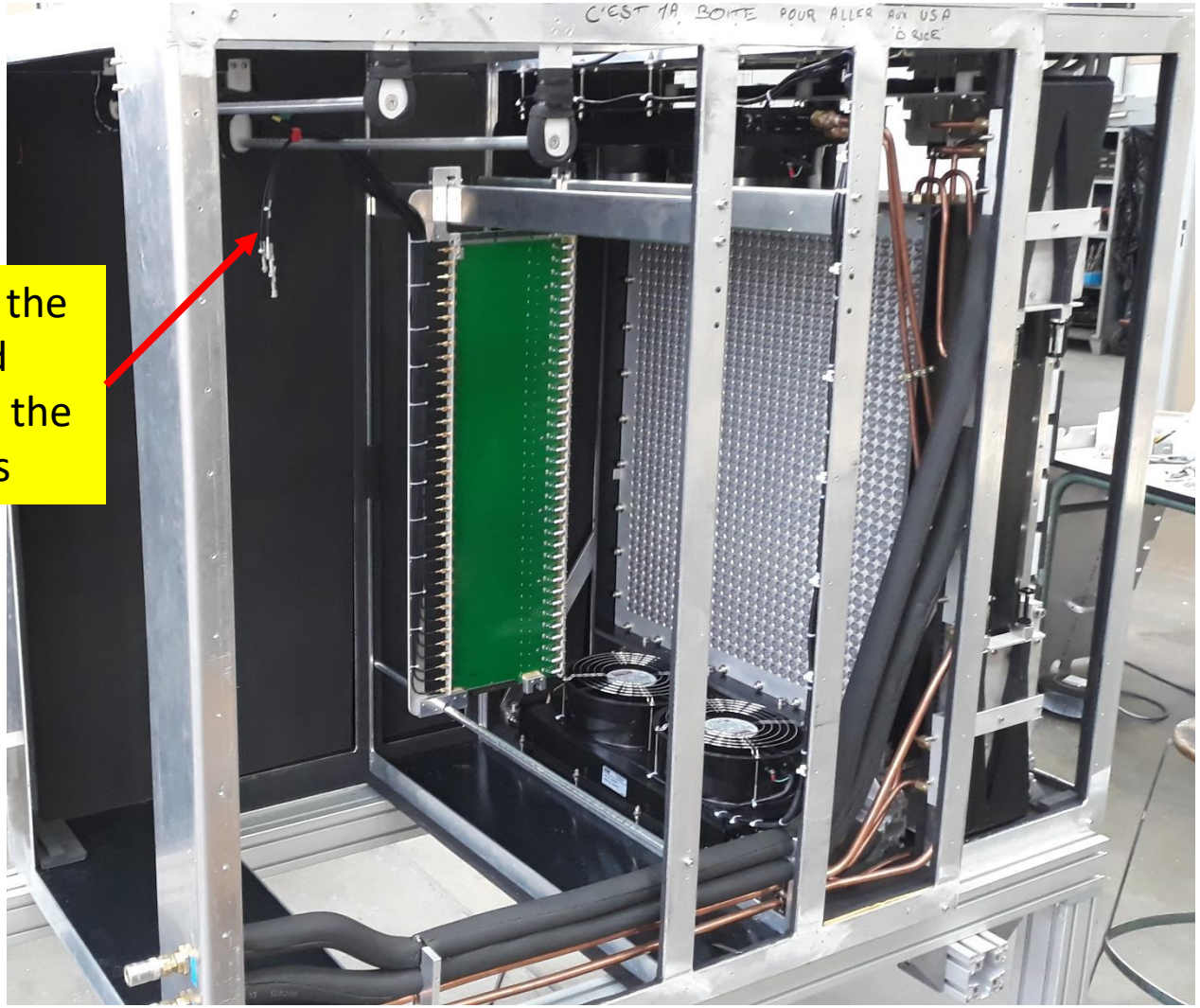
73 : connect the fiber and front cables on PMt support

Mounting :Task 74



74 : connect the LED flat cables to the LED PCB

Mounting :Task 75

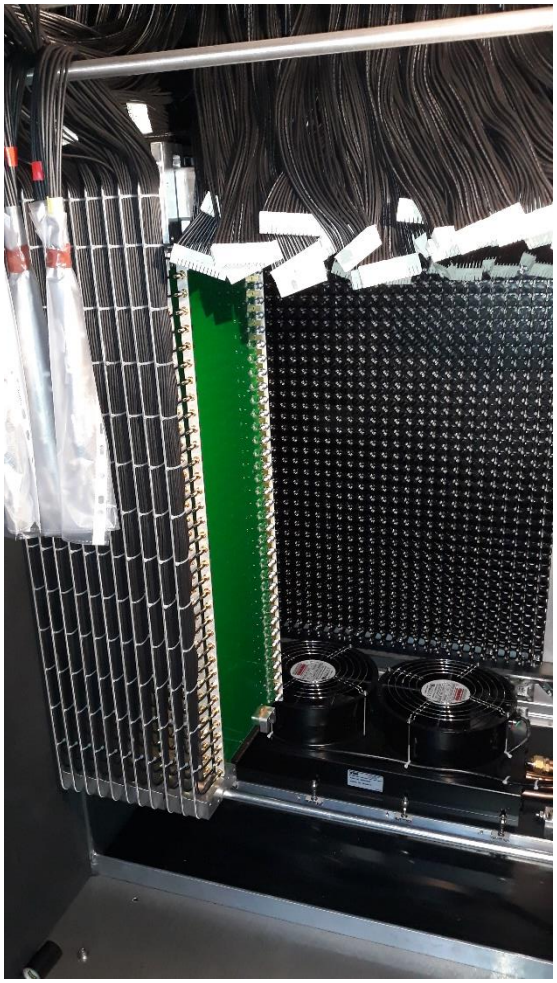


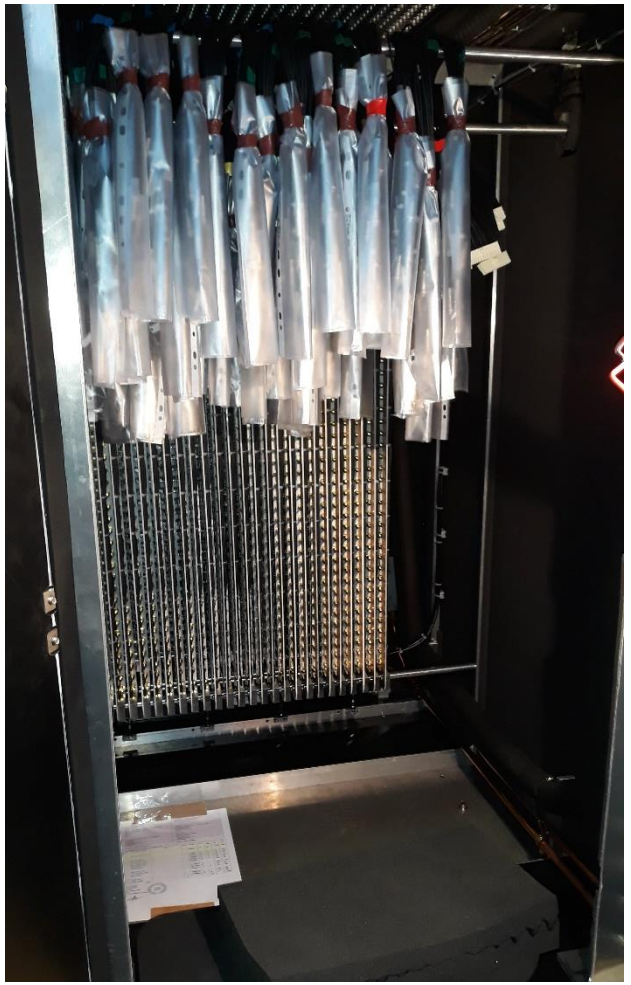
Put the cable on the support bars and connect them to the Lemo connectors

+ test LED

75 : connect the anode cables to the Top plate

Mounting :Task 76

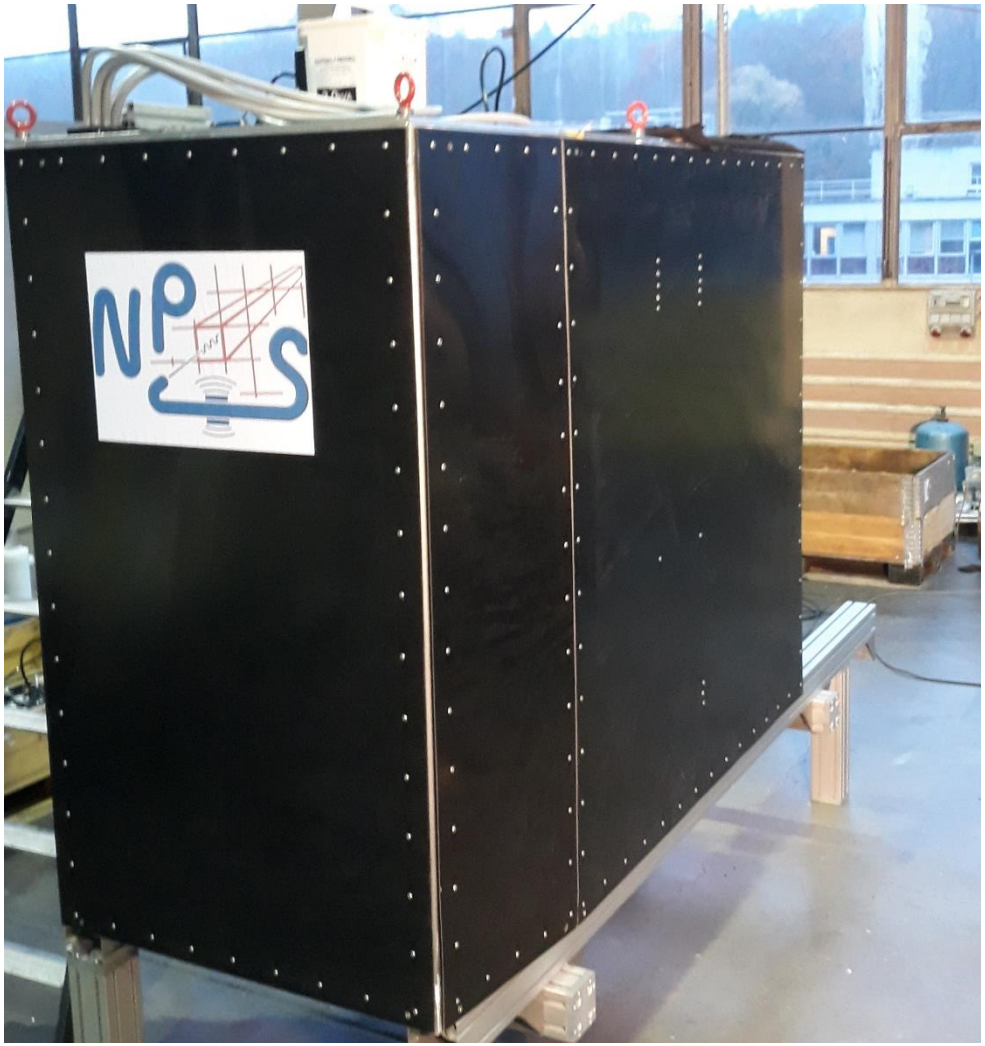




76 : mounting of the others PCB

Repeat the steps 72 to 75 for each PCB

Mounting :Task 77



77 : Close the box