DEEP UNDERGROUND NEUTRINO EXPERIMENT

CALCI CI WG meeting
12/03/2020

temperature sensors on APAs

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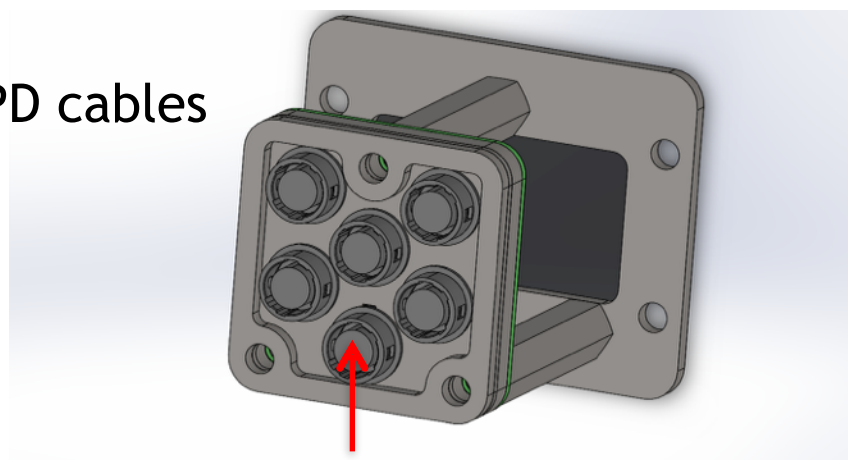
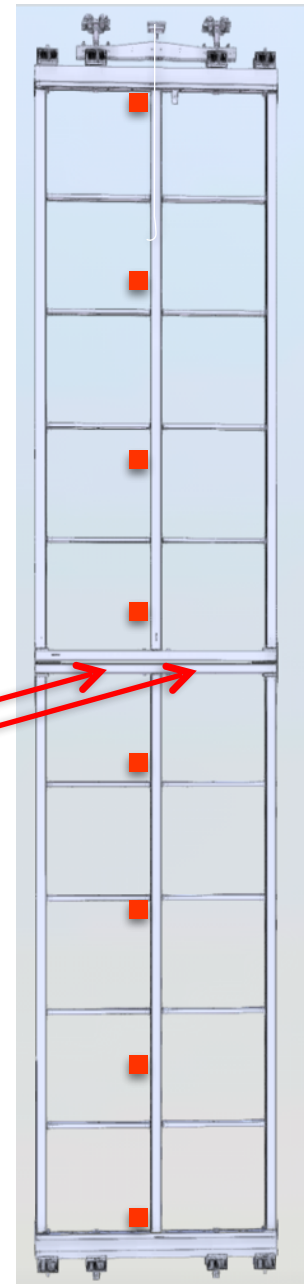
(IFIC-Valencia)

Number of vertical sensors

- The constraint on the number of sensors is given by the connector between the top and bottom APAs
- The SP-PD consortium has added an extra connector for CALCI
- The connector for CALCI has 12 pins. There are two of those connectors, so 24 pins in total, suitable for 6 RTDs (4 cables per RTD)
- But two pins in each connectors are needed to pass the ground, so at the end we can have only 4 sensors per APA

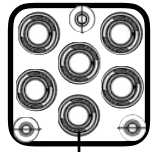




Option 1

T cables

2 cables with two twisted
pairs each ending in a 12-pin connector.
Two conductors for the ground lines, connected
to the shield of the temperature cables.



12 pin feedthrough

T cables

2 cables with two twisted
pairs each ending in a 12-pin connector.
Two conductors for the ground lines, connected
to the shield of the temperature cables.

flange

ground lines

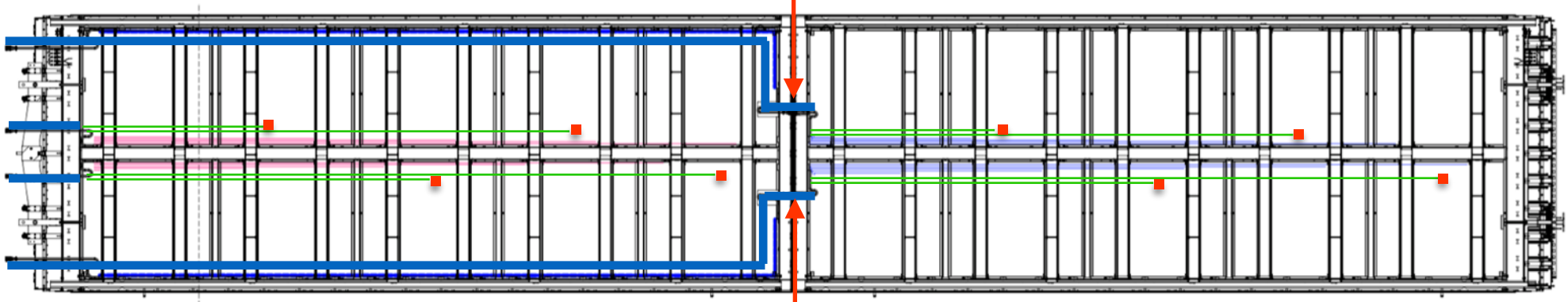
ground lines

floating shields

RTD

RTD

shields connected to flange



shields connected to flange

RTD

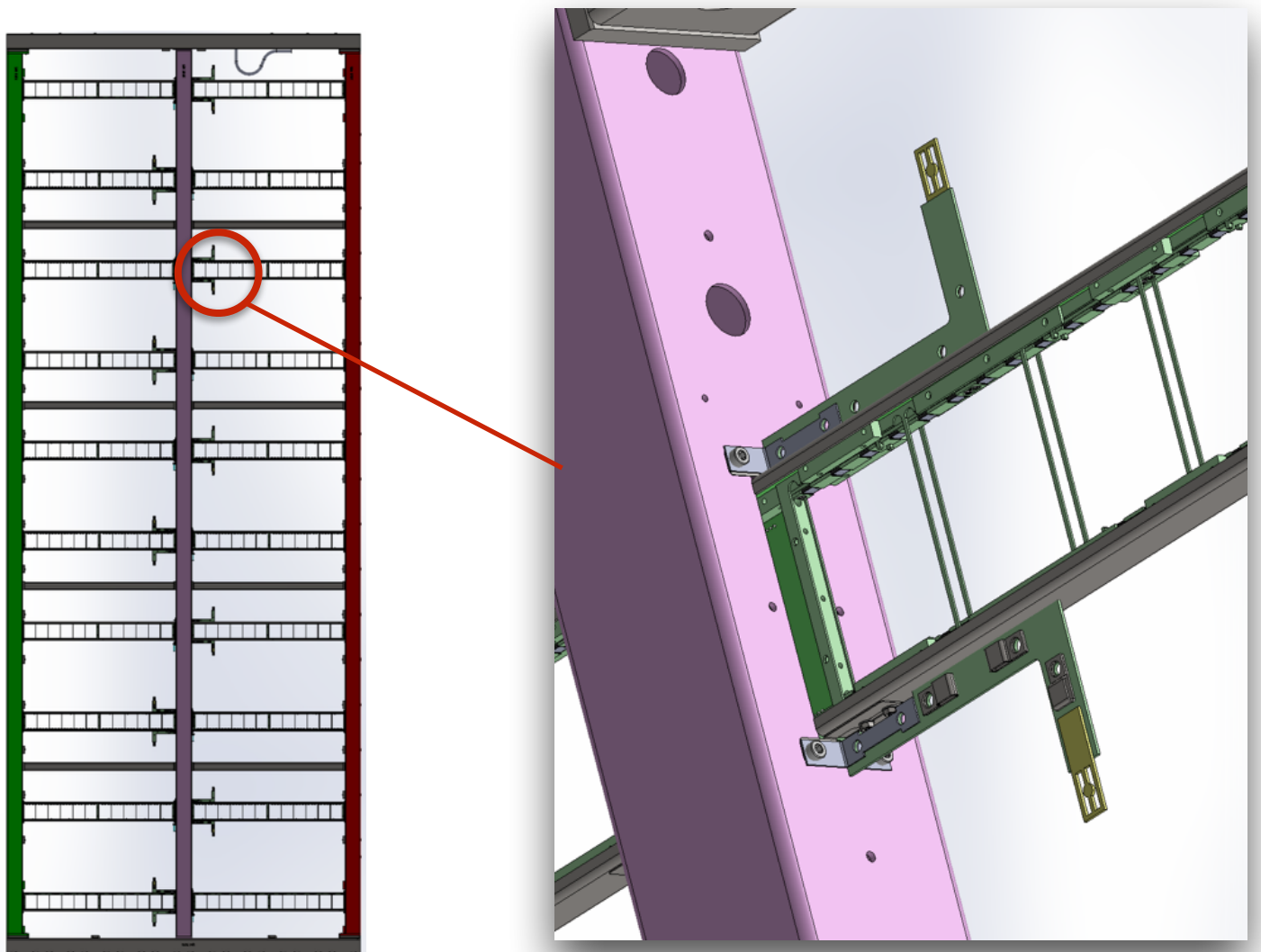
RTD

ground lines

ground lines

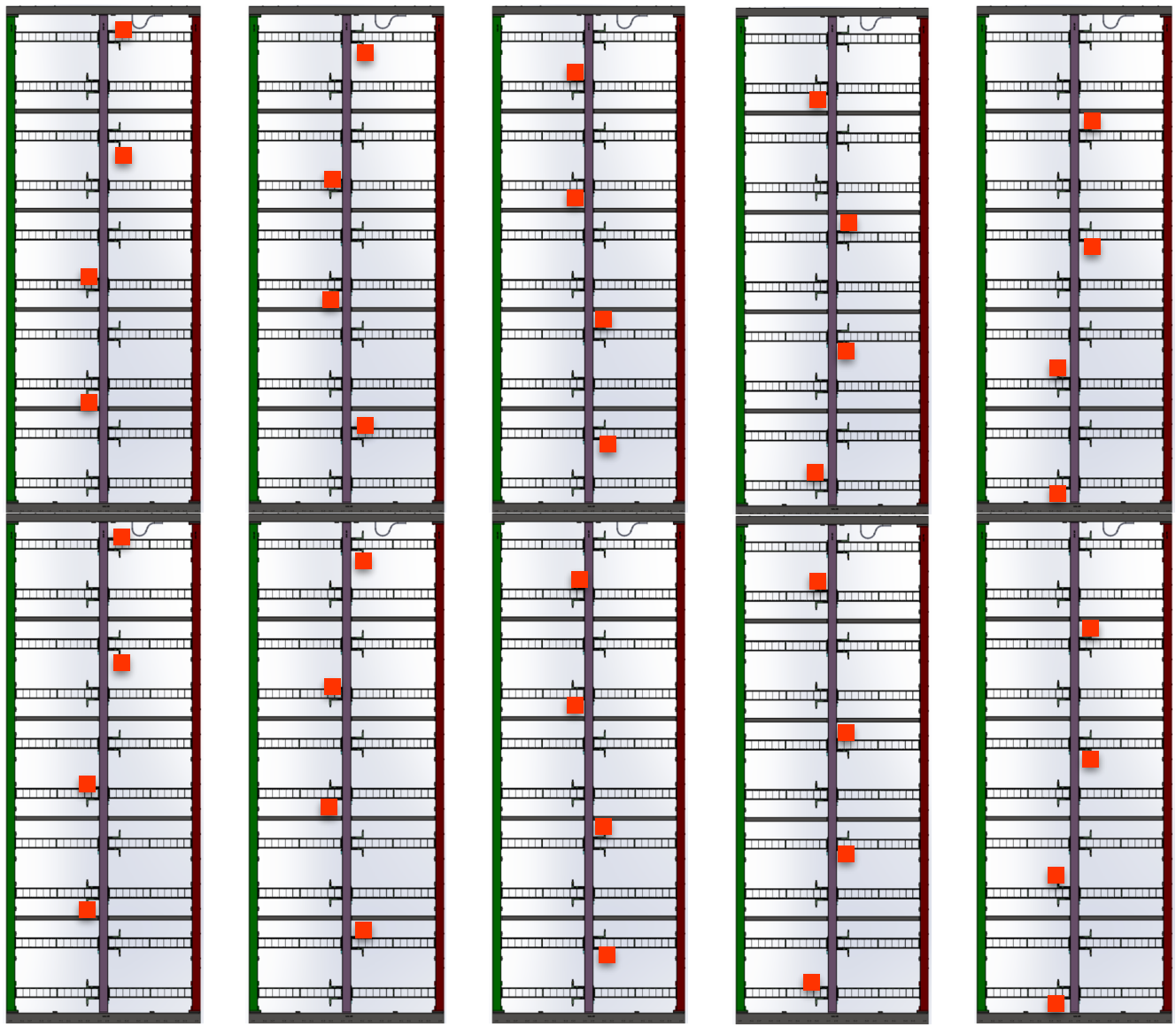
floating shields

- Each APA will have only 4 of those sensor supports, uniformly spaced, but there are 20 possible anchoring points



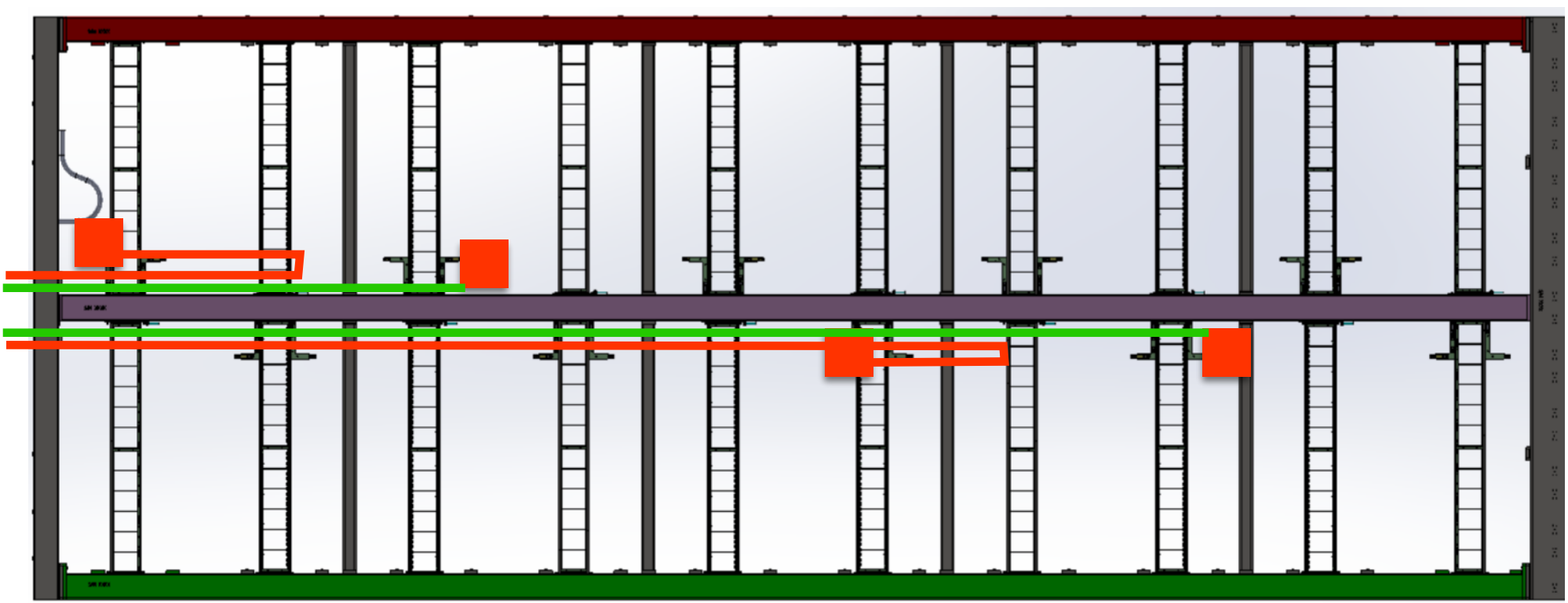
APA configurations

- 5 posible APA configurations (to be agreed with APA consortium)



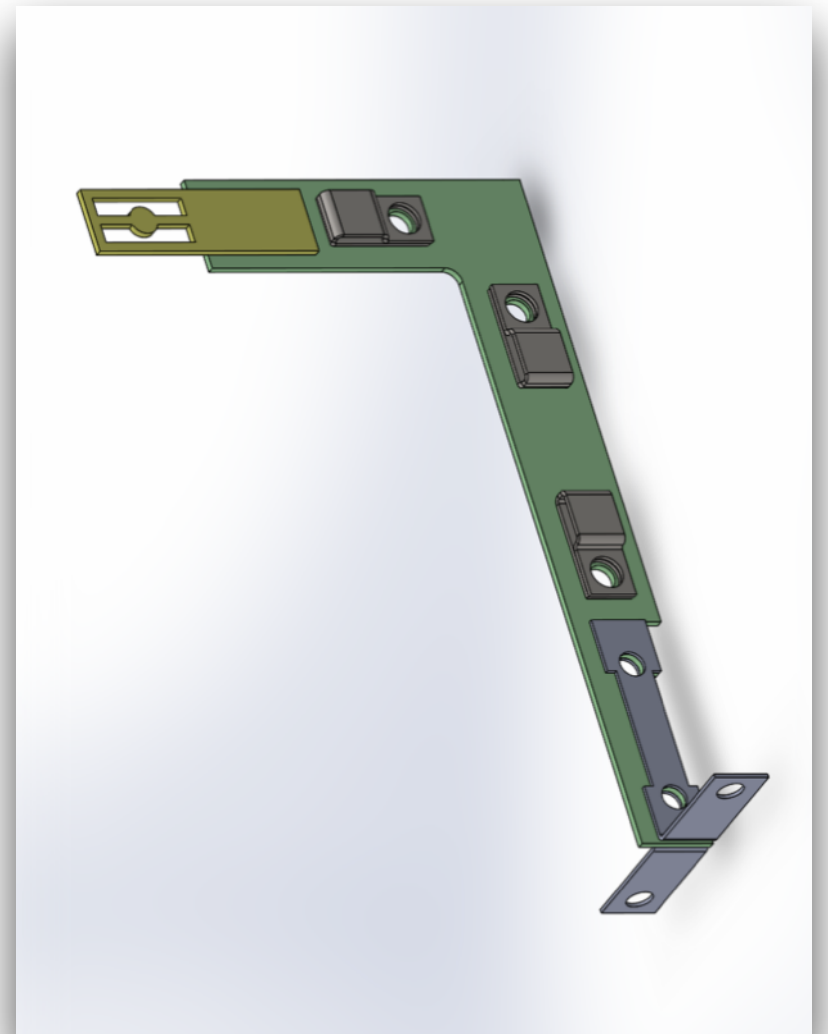
Cable slack

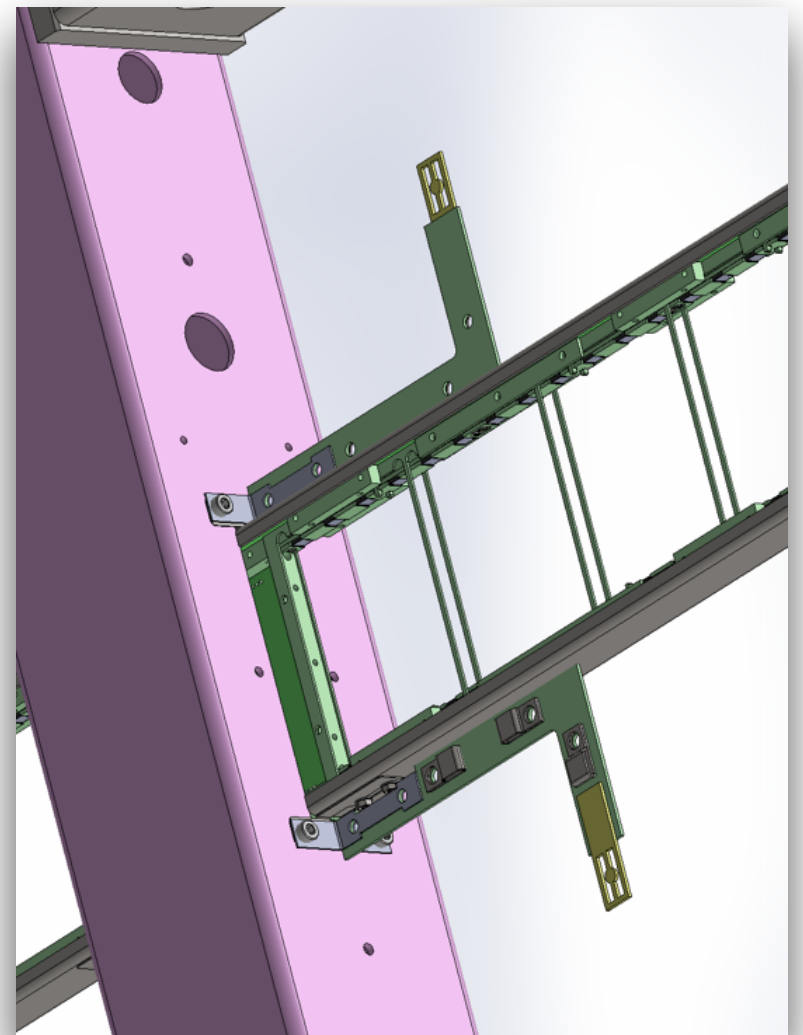
- Each APA frame will have two cables in each side.
- To simplify the installation process there will be only two cables sizes: one short and one long. Extra cable slack will be handled with a U-turn at the appropriate point. THIS NEEDS CAREFUL DESIGN



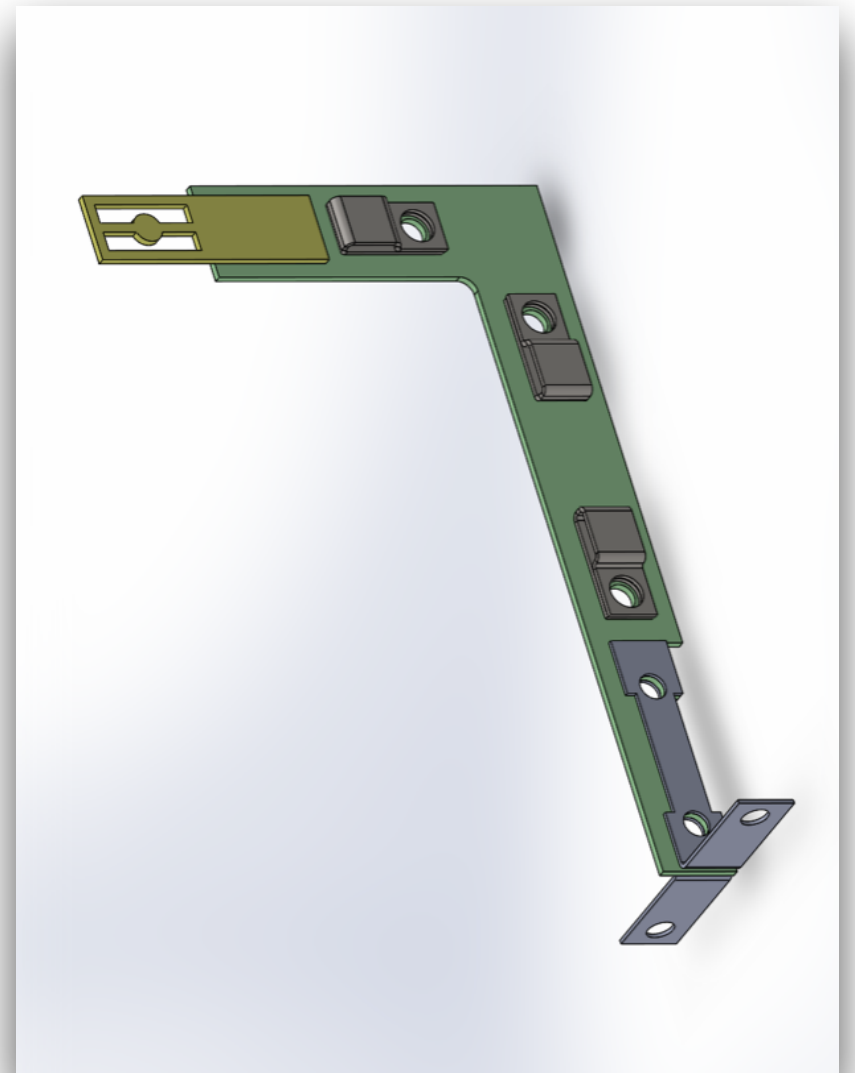
Sensor anchoring mechanism

- Initially developed by Dave Warner

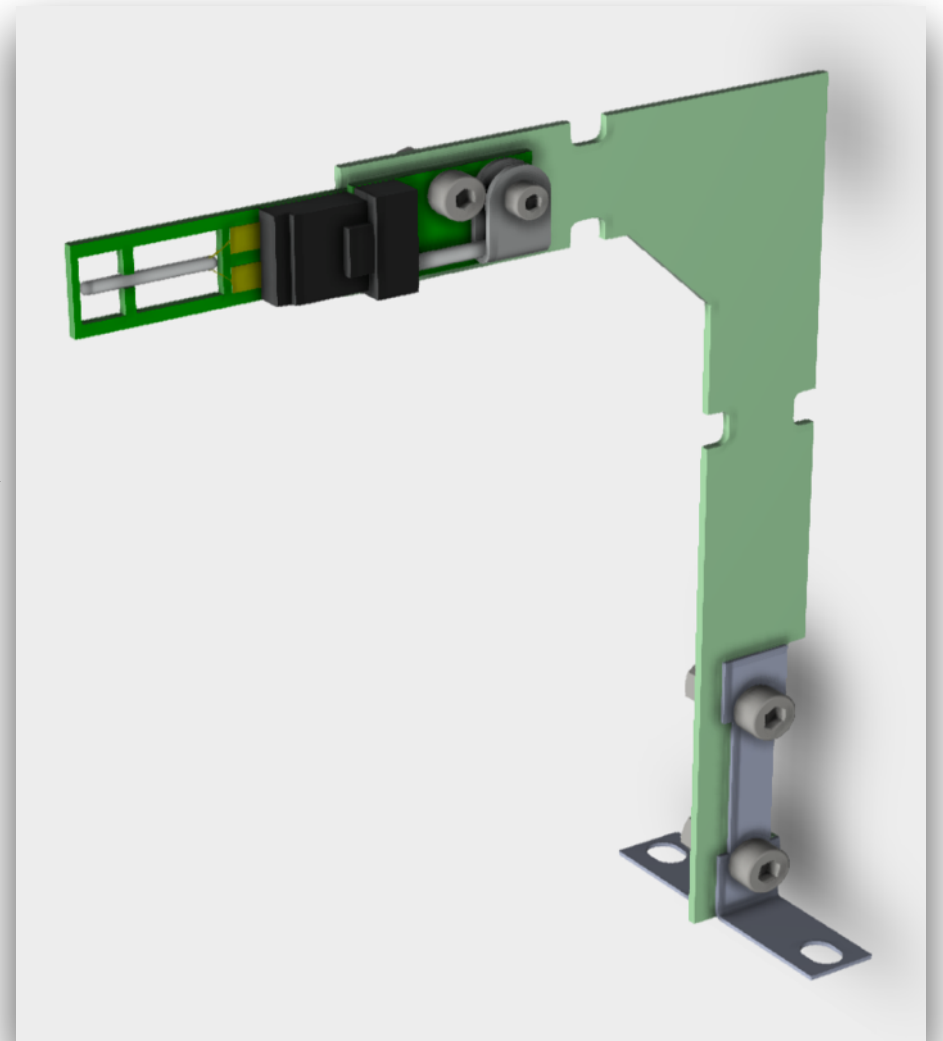




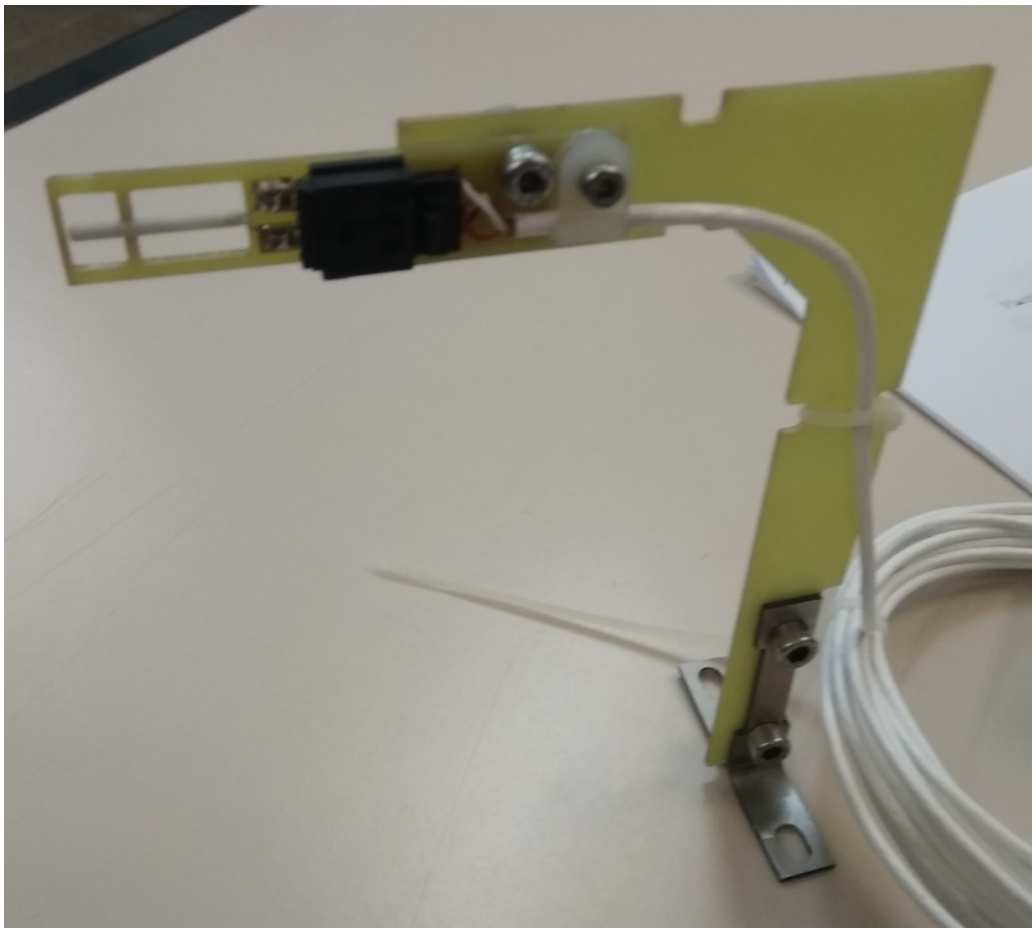
Dave's design

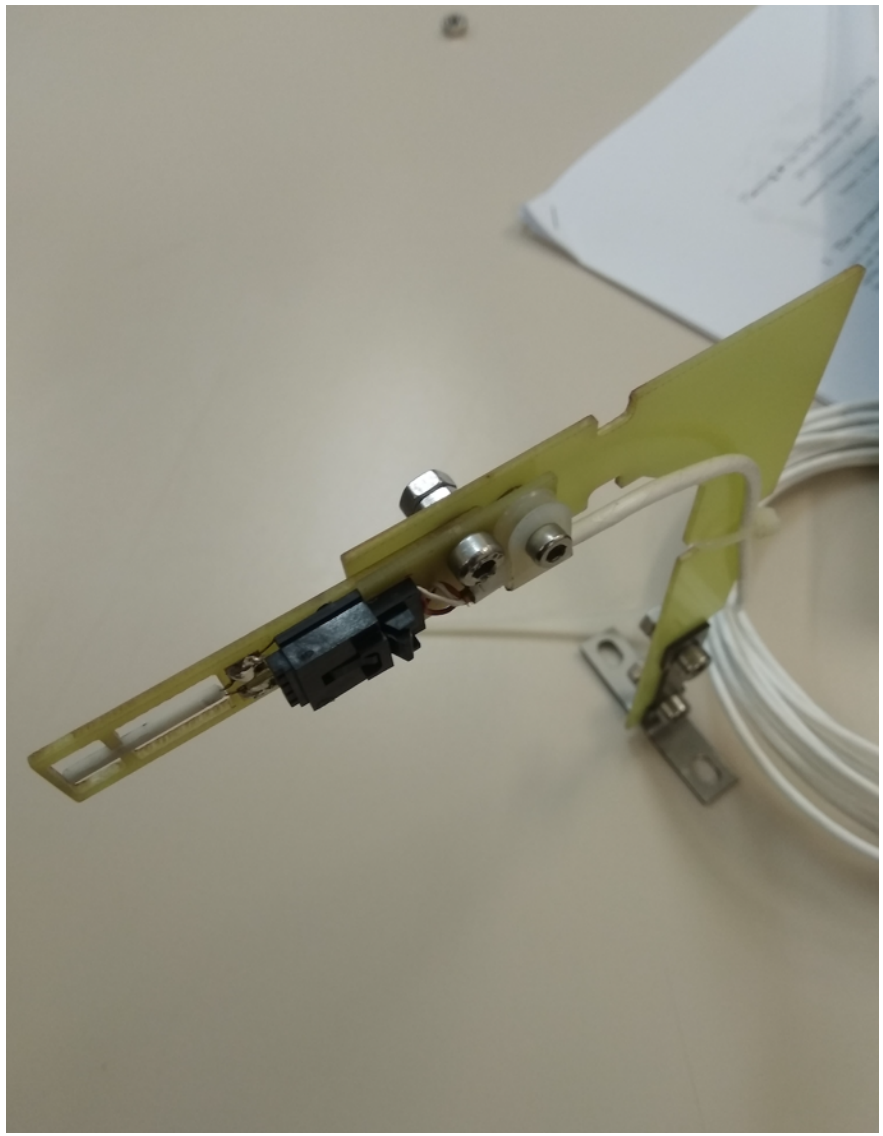


Final IFIC's design (J.V Civera)



Prototypes at IFIC

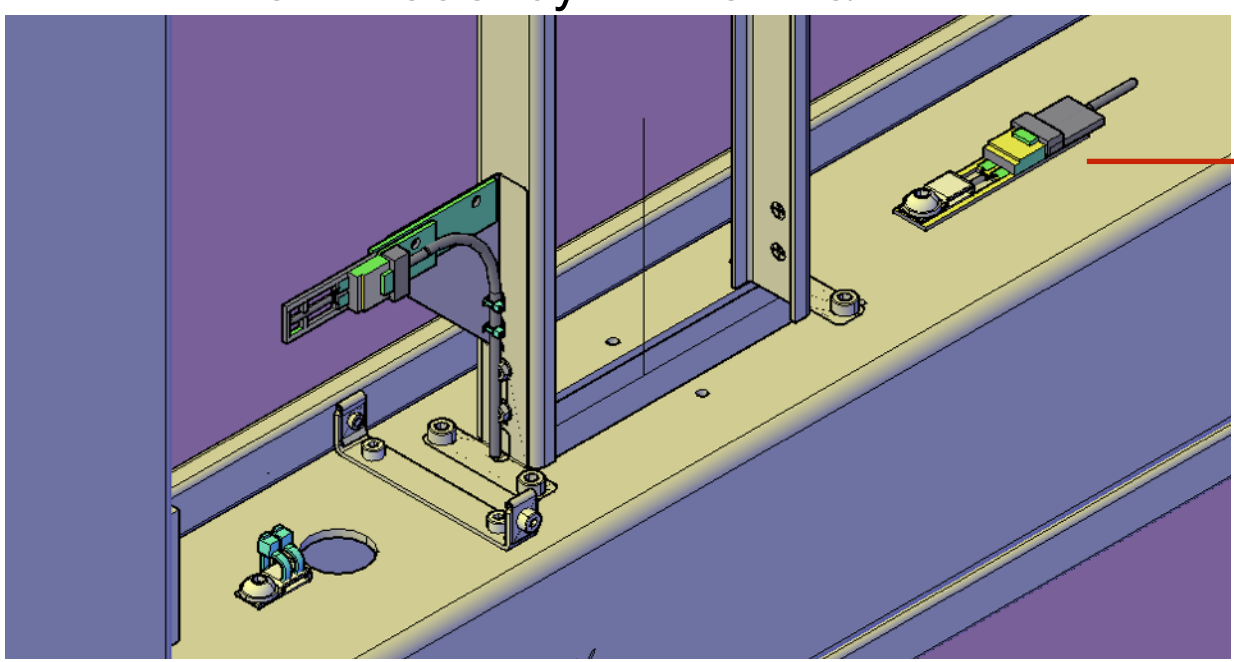




Sensors for frame temperature

- Some sensors will be in contact with the APA frame to measure its temperature during cool-down
- This is Dan's proposal, and the prototype made in Valencia
- Cable routing will be similar to the one used for LAr temperature sensors

3D model by D. Wenman



Prototype at IFIC

Material for cold tests at PSL

- Material sent to Dave Warner (Colorado)
  - Anchoring mechanism and cables for two LAr sensors and two frame sensors
- Dave will preassemble some pieces and send everything to PSL for integration into the APAs and cold tests

Cold box tests at PSL

- Mount sensors and cables on March 25th and the cold test will happen on March 27th.
- Purpose of the test as follows:
  - APA frame dimensional stability
  - Test frame temp sensor bond
  - Test continuity is maintained in PD connections
  - Test that slack is maintained in temperature sensor cables
  - Test that slack is maintained in PD cables
  - Mesh frame dimensional stability and mesh weld
- A full complement of PD rails, PD cables and temperature sensor cables will be installed. One dummy PD will be installed. Also installed will be four temperature sensors. PSL has the ability to readout 4 RTD's, so unless there is a compatibility issue with the PSL readout, I would like to read out all 4 temperature sensors. PSL can "connectorize" the temperature sensor cables. Continuity with of the PD connections will be monitored.

Lessons to be learned

- From the PSL tests we will lear few things:
  - Suitability of current design for sensor supports and improvements to be done
  - How to handle cable slack
  - How long does it take to mount one temperature sensor
  - How complicated is the integration with PD cables
  - ….

Next steps

- The impact of temperature readout on cold electronics will be most likely tested in ICEBERG in June or so.
- For those tests the full chain should be available:
  - PD connectors, flange and readout.