DEEP UNDERGROUND NEUTRINO EXPERIMENT

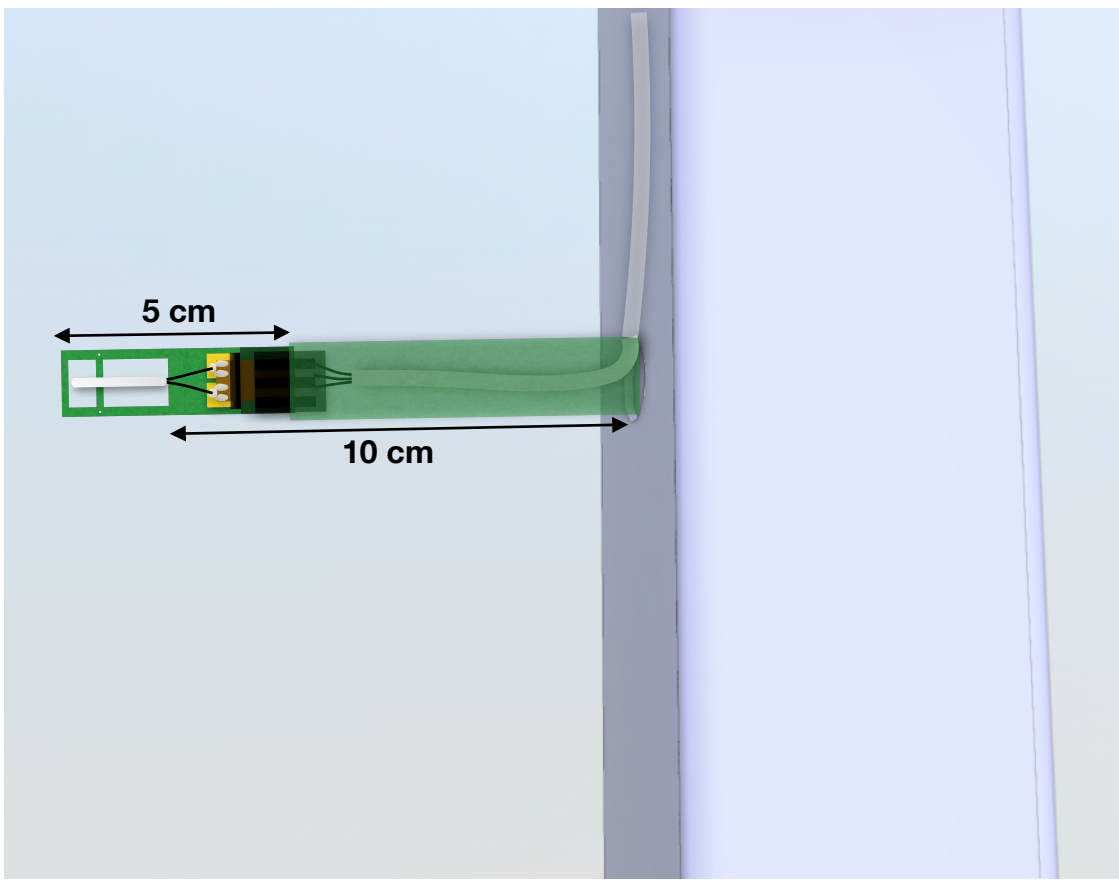
CISC meeting
21/11/19

temperature sensors on APAs

A. Cervera
(IFIC-Valencia)

Sensor positioning

- Sensor should be kept at some distance from the APA frame to minimize the effect of the frame in the LAr flow and temperature

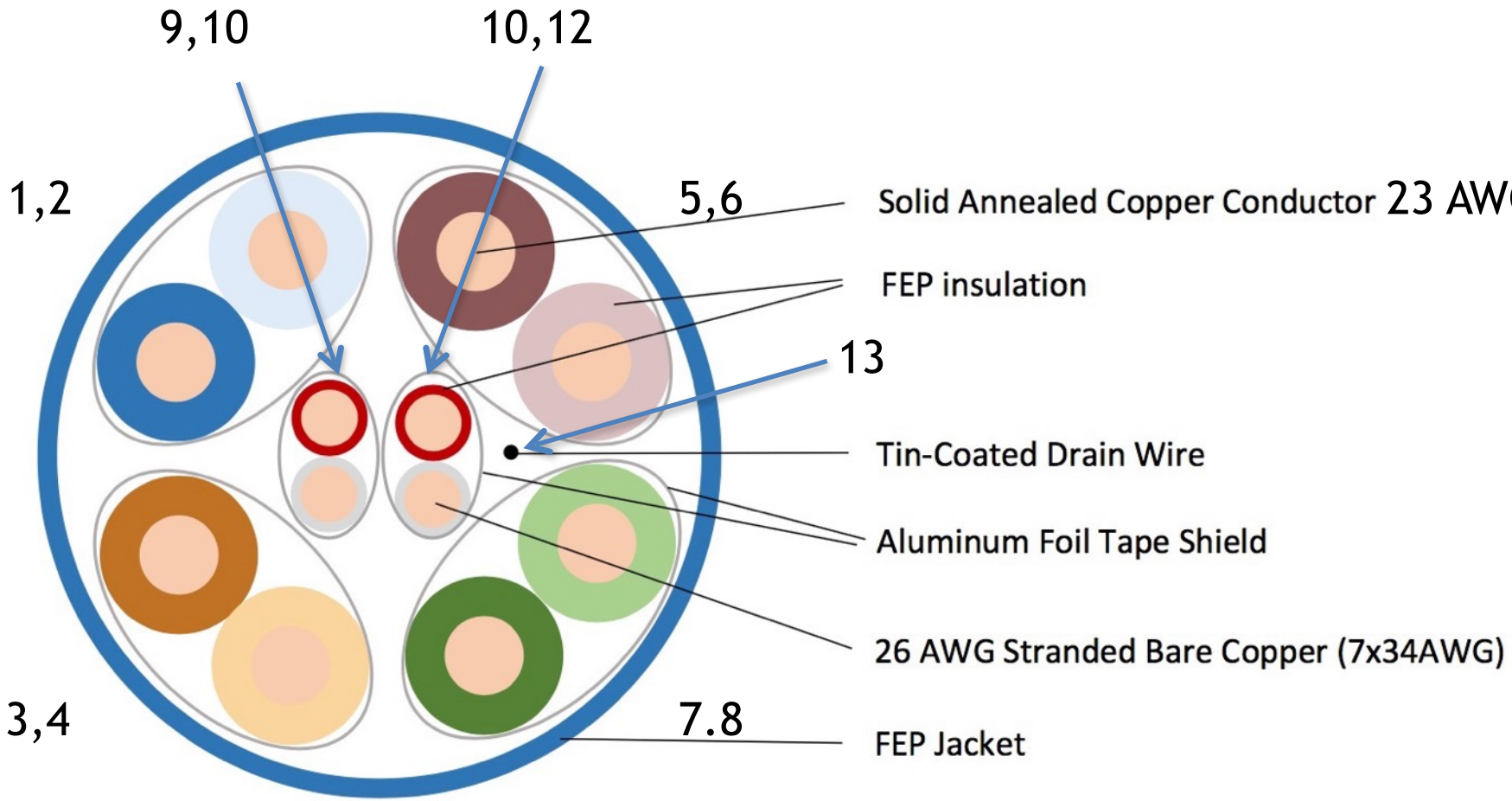


Cable routing

- Cable routing is one of the main issues
- The baseline is to use PD cables and connectors for RTDs
  - Each cable has 6 individually shielded twisted pairs.

~8 mm diameter

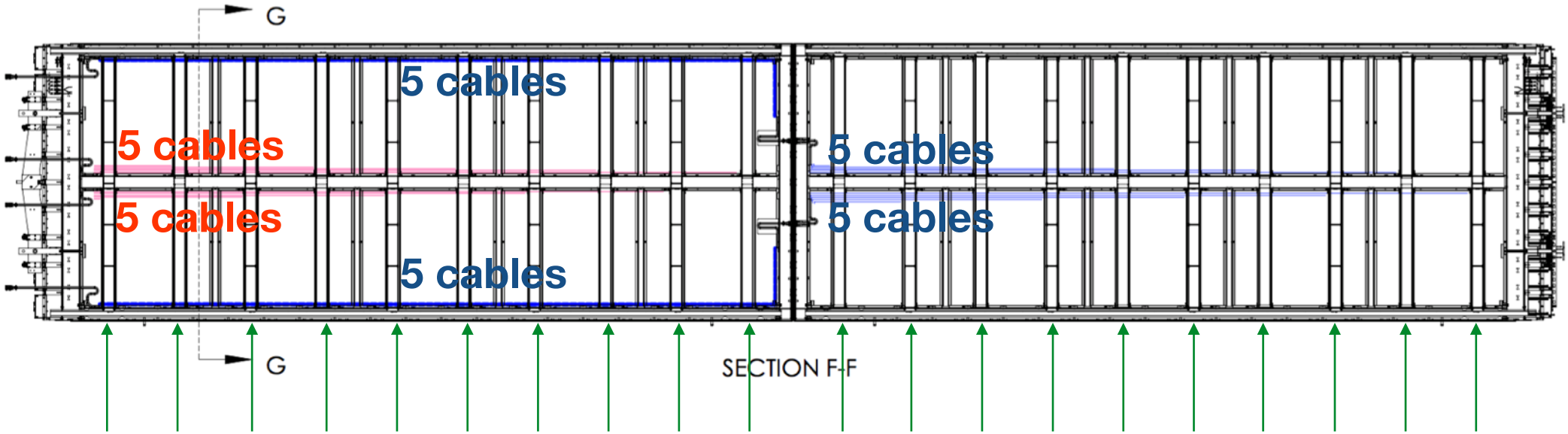
New Cable Layout
(Cable not received yet)



OD Approximately 10mm (To be confirmed)
CISC Cable may not contain central pairs

Slide from Dave Warner at last integration meeting

Cable routing

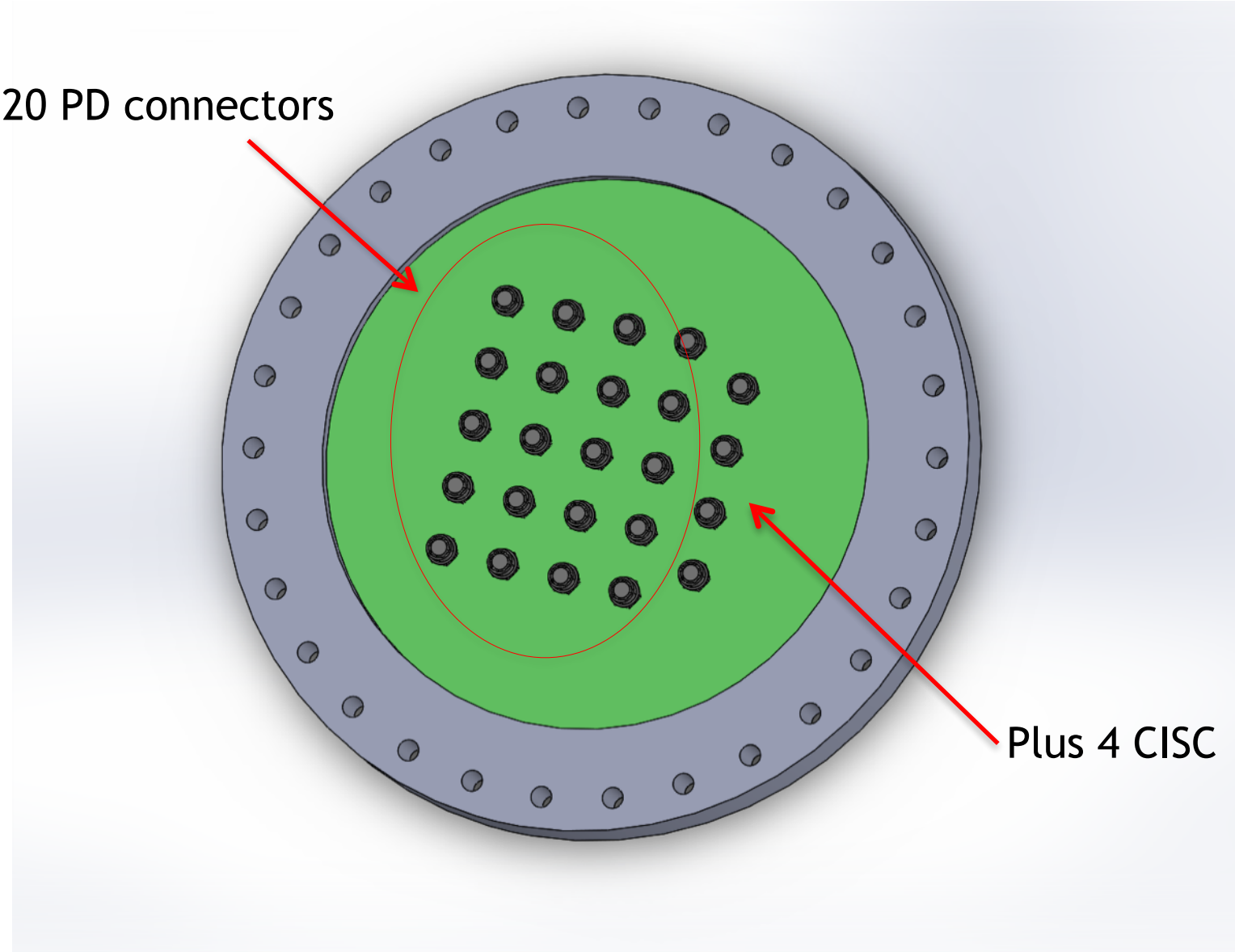


10 PDs per APA, 20 in a doublet

- In blue, 10 cables from bottom PDs
- In red, 10 cables from top PDs

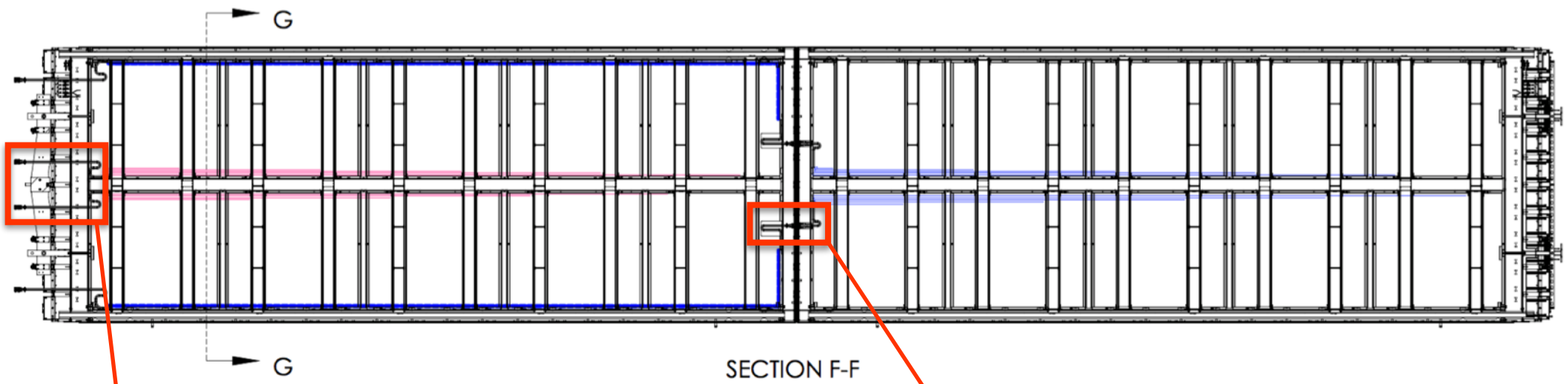
The idea is to add a sixth cable to each group

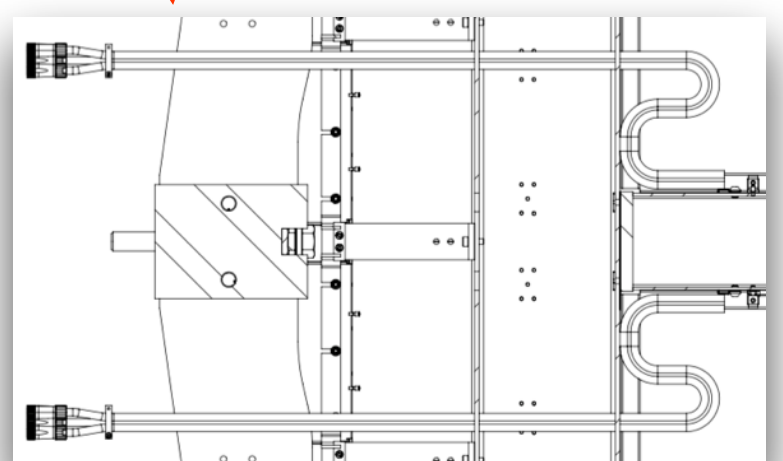
PD Flange Assembly



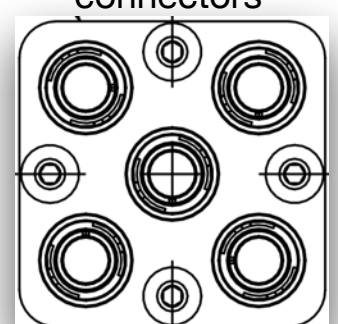
Slide from Dave Warner at last integration meeting

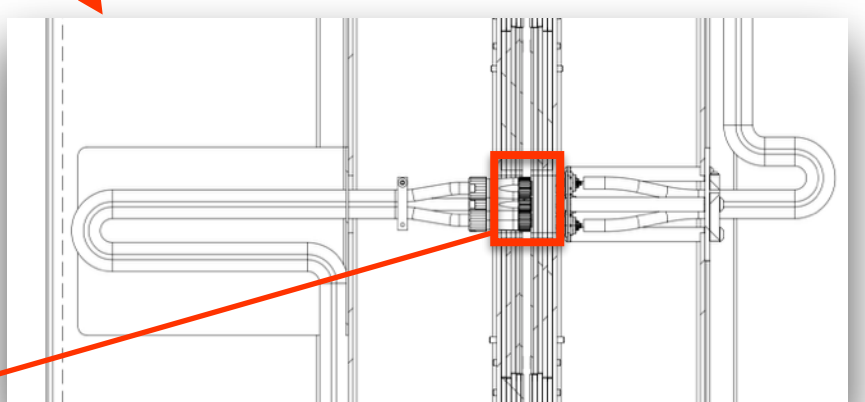
Problem: APA connection





five 12-pins connectors

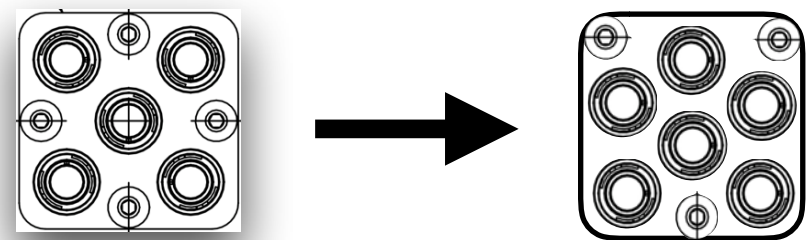




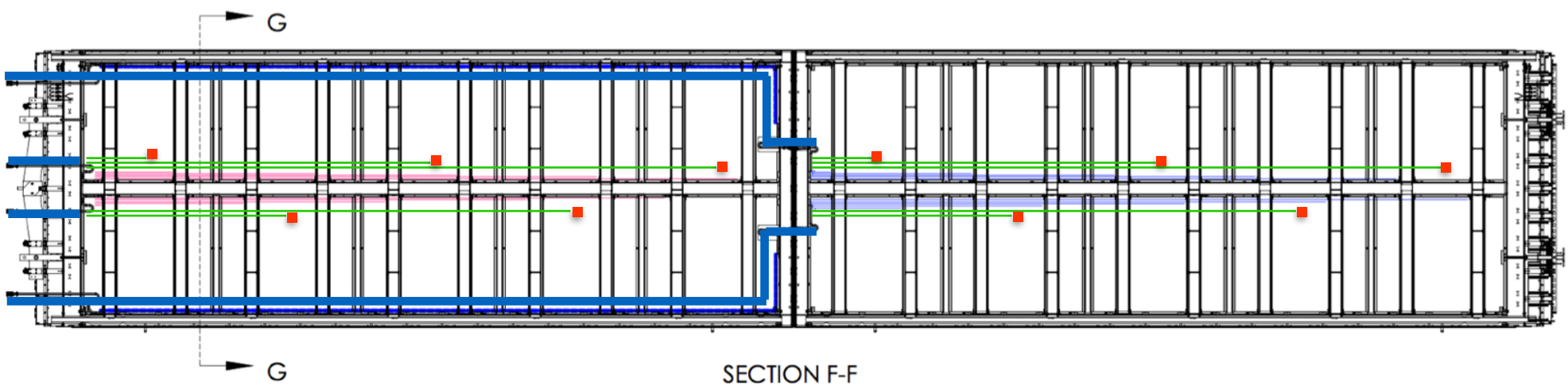
Add a new connector

Baseline option

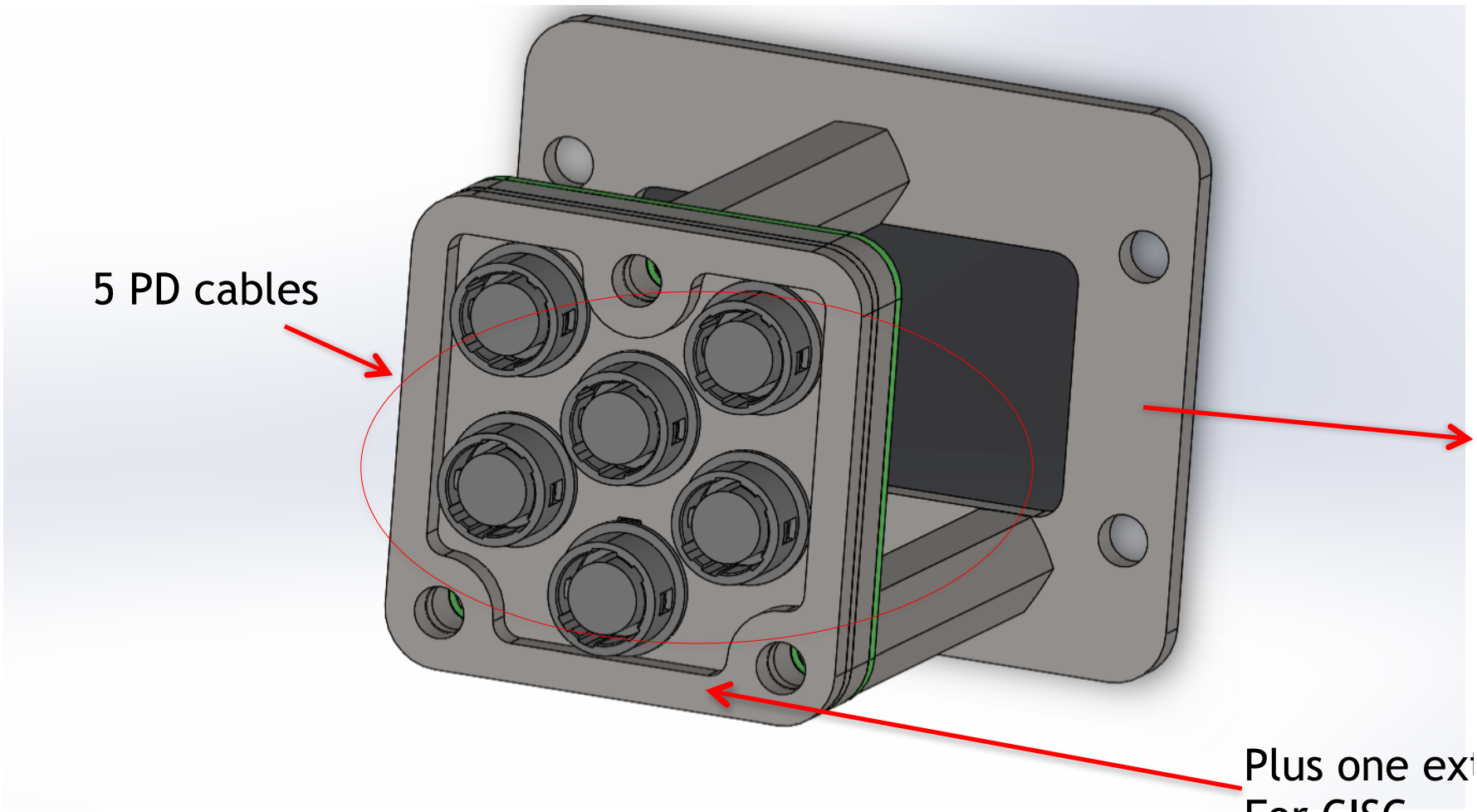
- Add a new PD cable to each group of 5 cables
- Add a new connector to the feedthrough

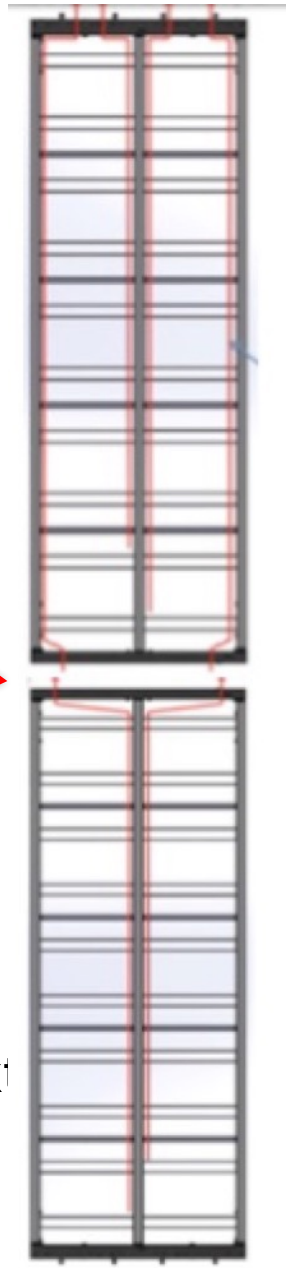


- Bring additional PD cable (blue) to top of APA, and from there use dedicated cables (green)



Upper/Lower APA Junction Block

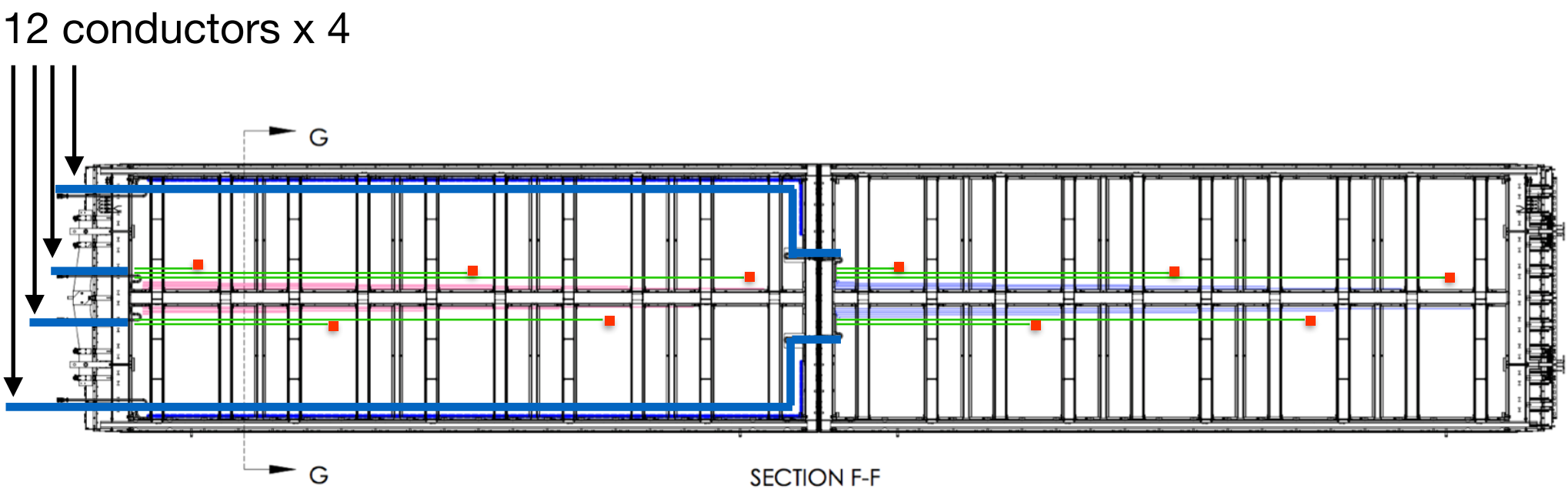




Slide from Dave Warner at last integration meeting

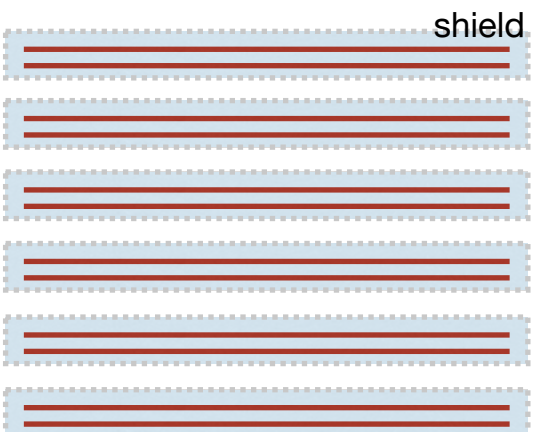
Number of sensors per cable

- Each PD cable has 12 conductors
- In principle we could read 3 sensors per cable
- Since we have 4 of those cables we could read up to 12 sensors per APA doublet

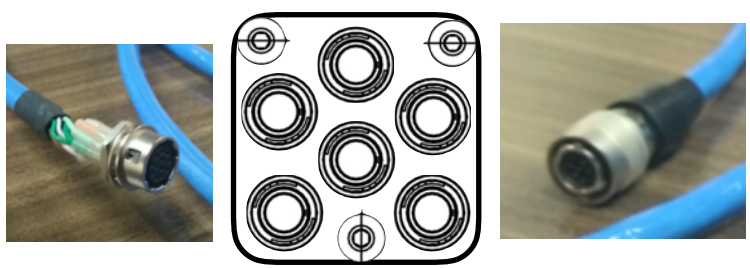


Grounding

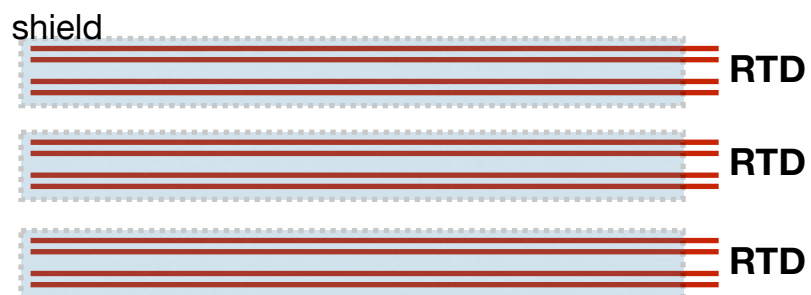
- The main problem is grounding
- We need to pass the ground from top to bottom through the feedthrough



6 twisted pairs with individual shield ending in a 12-pin connector

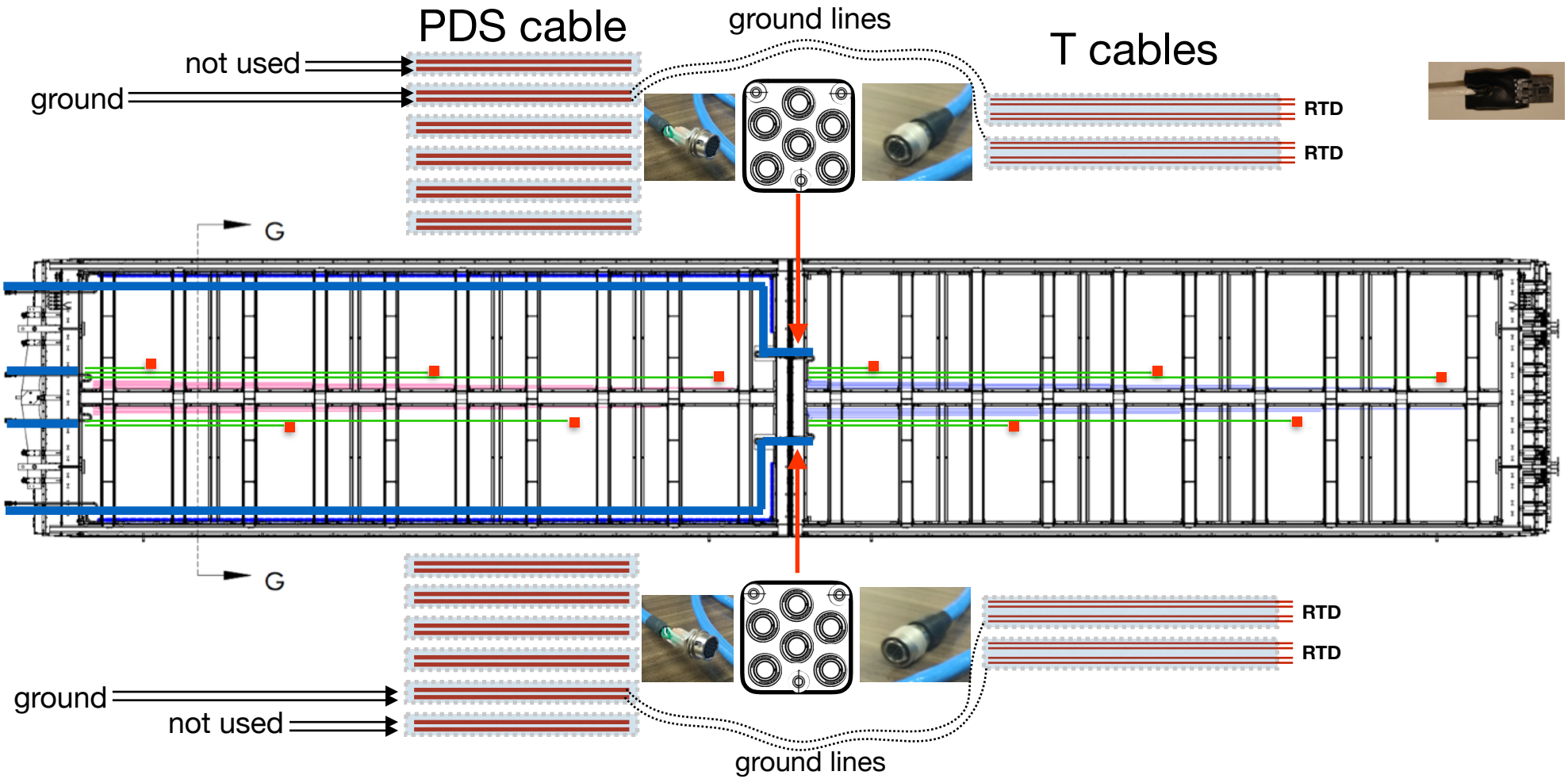


feedthrough with 6 connectors. One of them for RTDs



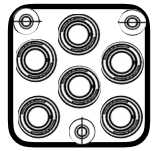
3 cables with two twisted pairs each ending in a 12-pin connector

Option I



- D. Warner suggested to use two of the conductors in each PDS cable to pass the ground individually to the shield of each RTD cable. But then we loose one sensor in each PDS cable. Maximum would be 4 sensors in the bottom APA

PDS cable



T cables

6 twisted pairs with individual shield ending in a 12-pin connector. One conductor use for the ground line, and three spare conductors

2 cables with two twisted pairs each ending in a 12-pin connector. One conductor for the ground line, connected to the shield of all temperature cables.

flange

floating shields

12 pin feedthrough

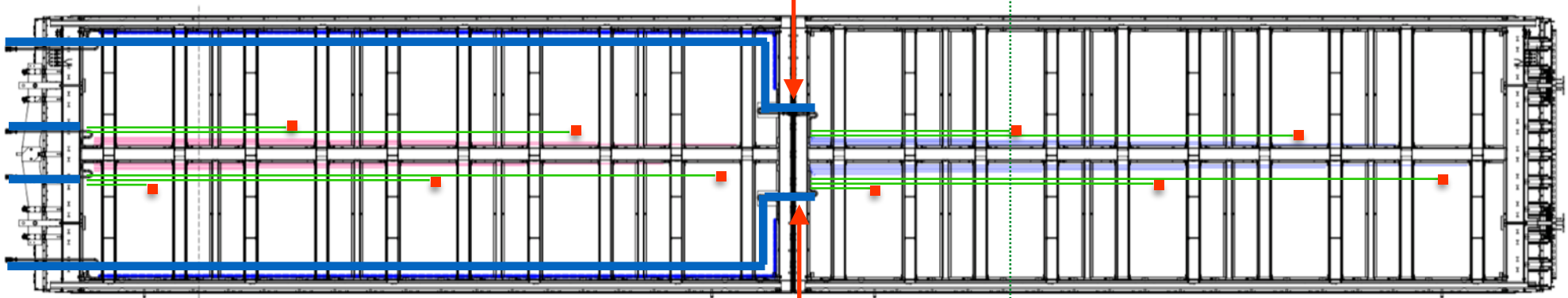
ground line

floating shields

RTD

RTD

shields & ground line connected to flange



shields connected to flange

RTD

RTD

RTD

6 twisted pairs with individual shield ending in a 12-pin connector

floating shields

feedthrough with 6 connectors. One of them for RTDs

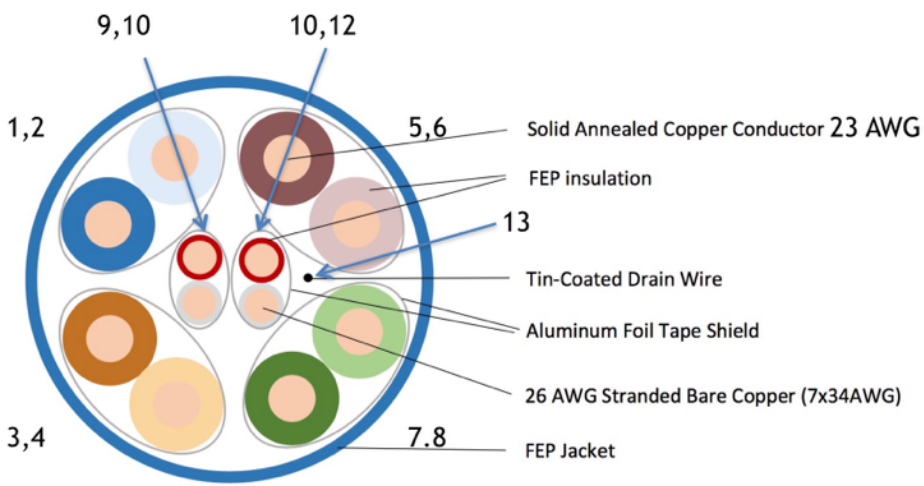
floating shields

3 cables with two twisted pairs each ending in a 12-pin connector

Cable shields

- PD's cable has 6 individually shielded twisted pairs, but the shields are touching each other
- RTD cables use for ProtoDUNE-SP have two twisted pairs inside a shield, but each sensor has its independent shield
- PD cable will be ordered in about a week. We need to decide ASAP

PD cable



RTD cable