



SBND/ProtoDUNE Single Phase System Interfaces

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ProtoDUNE/SBND CE Electronics Review

13 October 2016

In collaboration with:



Purpose

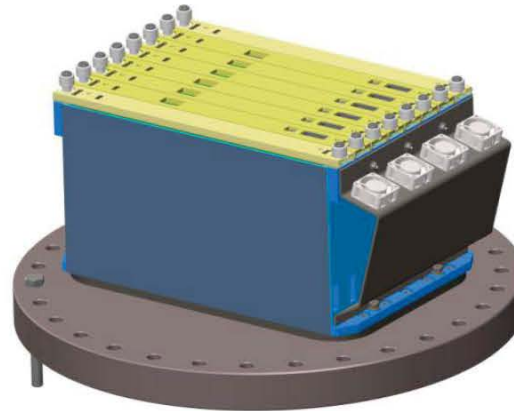
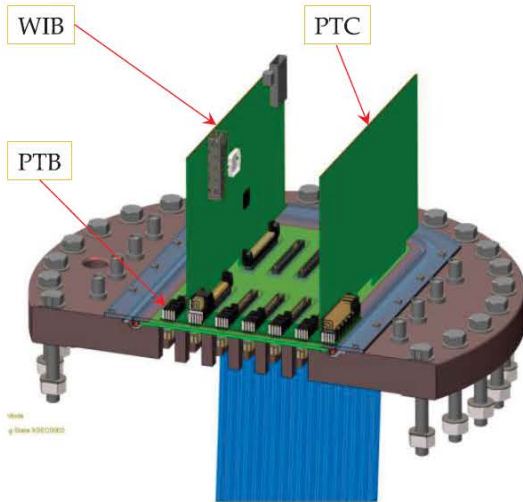
This talk addresses Charge Question 5.

Are the CE interfaces to other detector subsystems including TPC, DAQ, and cryostat well defined and documented?

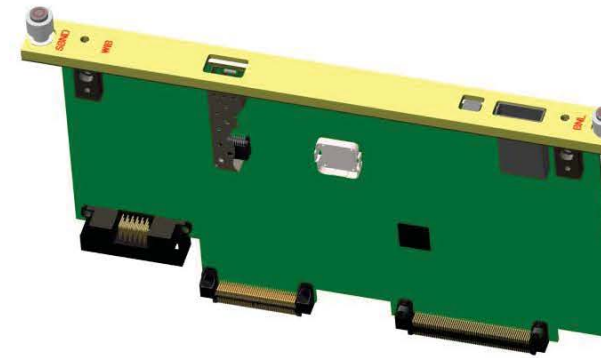
SBND/ ProtoDUNE SP System Interfaces

- Cryostat
 - Warm Interface crate
- DAQ
 - SBND: Nevis Electronics
 - ProtoDUNE: RCE (Reconfigurable Cluster Element)/Felix
- TPC – APA wires and Frame
 - How FE card attaches to APA frame
 - Wire Bias supply to APA
- Racks and Power Supplies

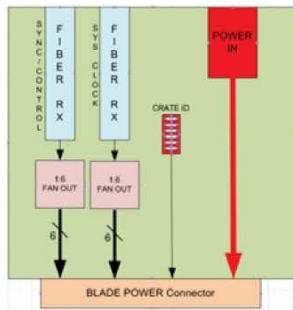
Cryostat: SBND Interface - 3D model



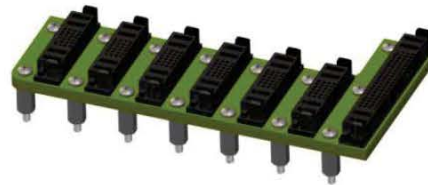
WEC



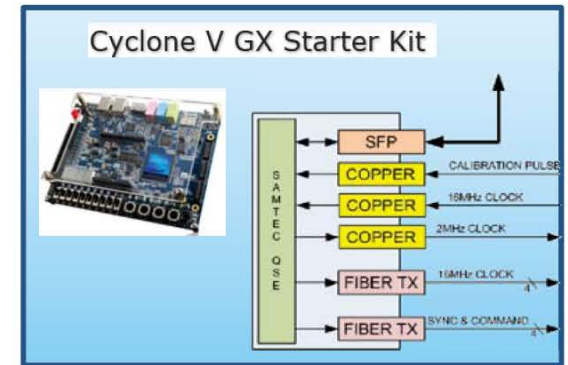
WIB



PTC

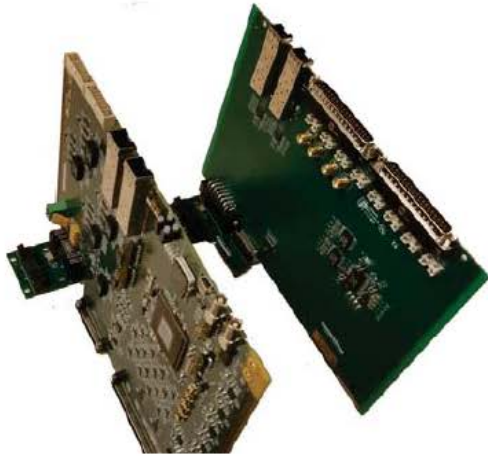


PTB



MBB

Cryostat: SBND Interface - prototypes



PTC/PTB/WIB



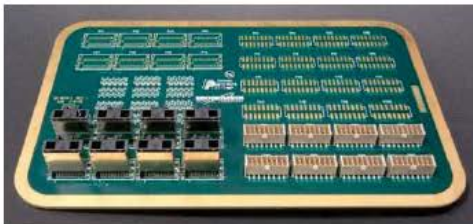
WEC



WIB



MBB



SBND FLANGE
(prototype)

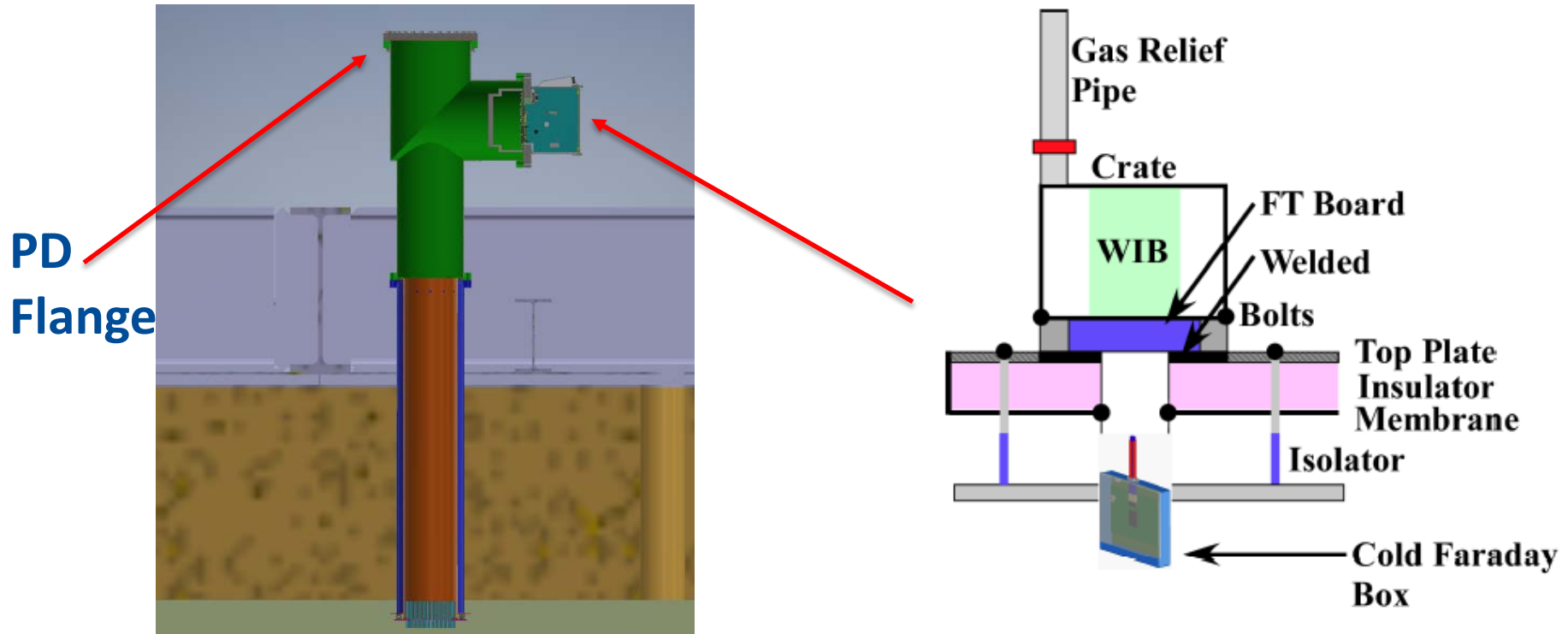


SBND PTC



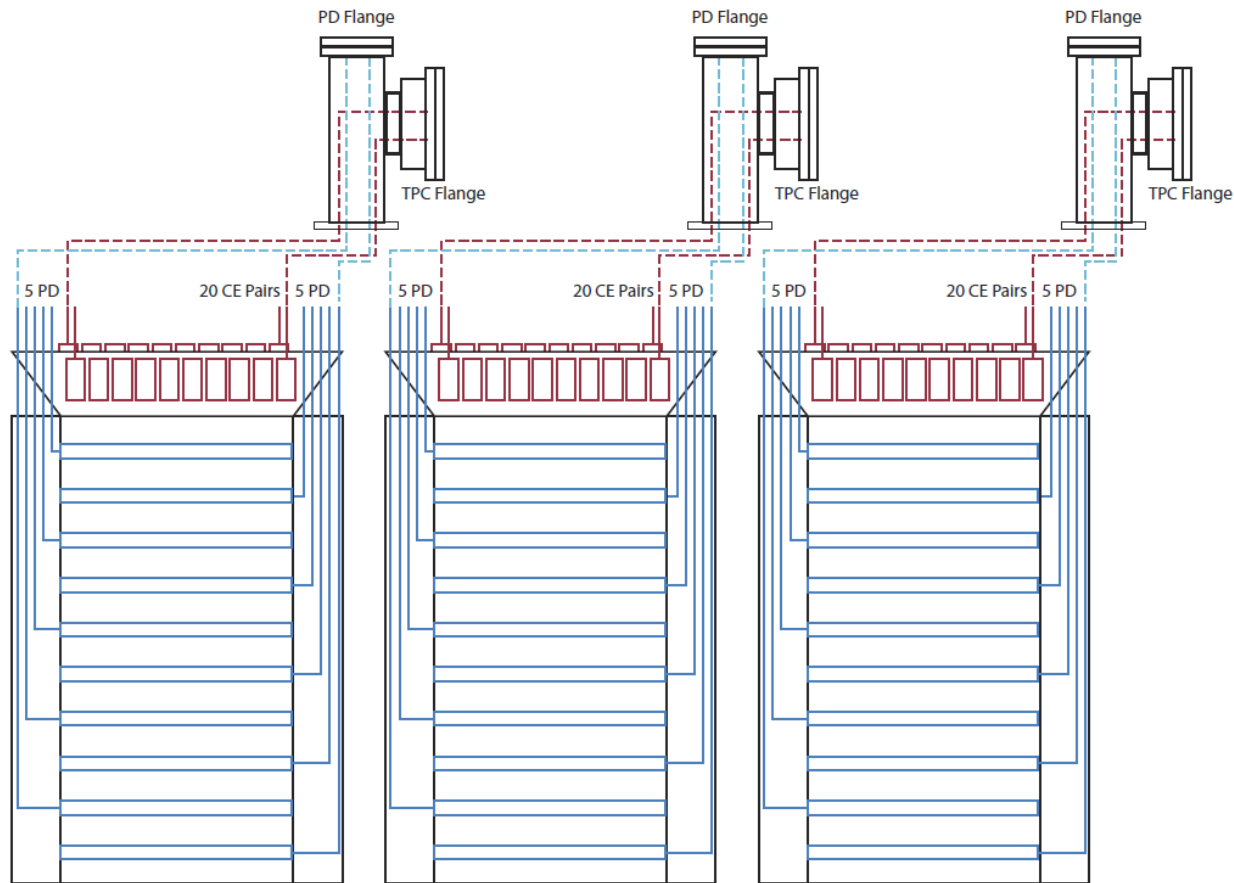
PTB

Cryostat Interface: ProtoDUNE SP Electronics



- ProtoDUNE cold electronics to cryostat interface takes place at the cold feedthrough
- Almost identical to SBND
- Grounding details explained earlier in previous grounding talk (L. Bagby)

ProtoDUNE SP APA Cable Routing Concept



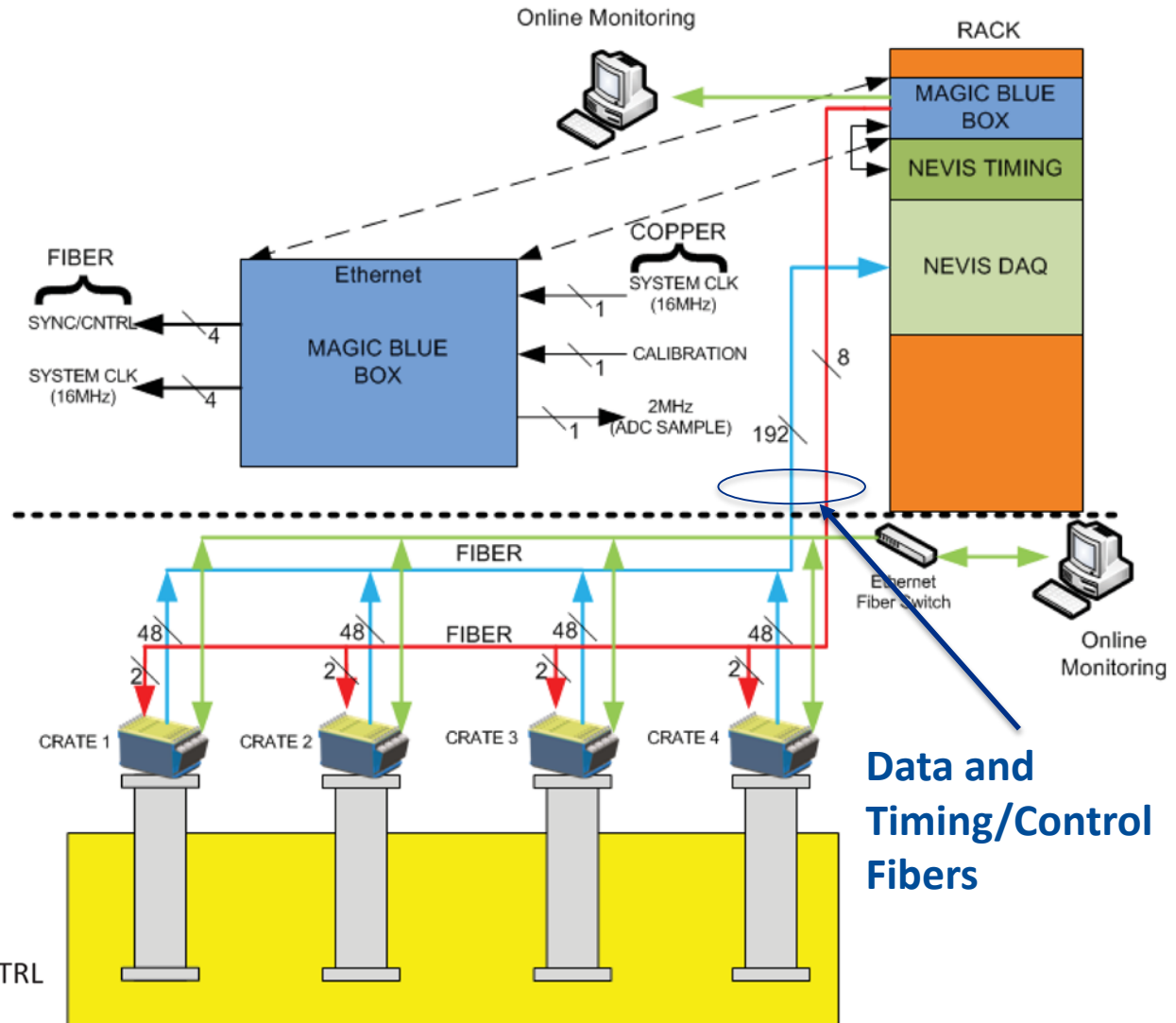
Photon Detector system will read out ganged SiPMs from paddles inserted into APA slots.

Note that cable paths share the same feedthrough, but different Flange.

PD readout design will allow for grounding of cable shields at Flange consistent with grounding and shielding plan.

DAQ Interface: SBND

- DAQ
 - WIB -> Nevis DAQ RACK
 - 192 Fibers
- System Clock
 - Nevis timing to MBB
 - Copper
 - MBB_(DAQ_RACK) -> PTC
 - Four Fibers
- Sync/Cntrl
 - MBB_(DAQ_RACK) -> PTC
 - Four fibers
- Ethernet
 - To online monitoring
 - Six per WEC 24 total
 - WIB <-> switch
 - Fiber
 - One MBB
 - Fiber or copper
- Calibration
 - Nevis timing to MBB
 - Copper
 - MBB_(DAQ_RACK) -> PTC
 - Encoded on SYNC/CNTRL

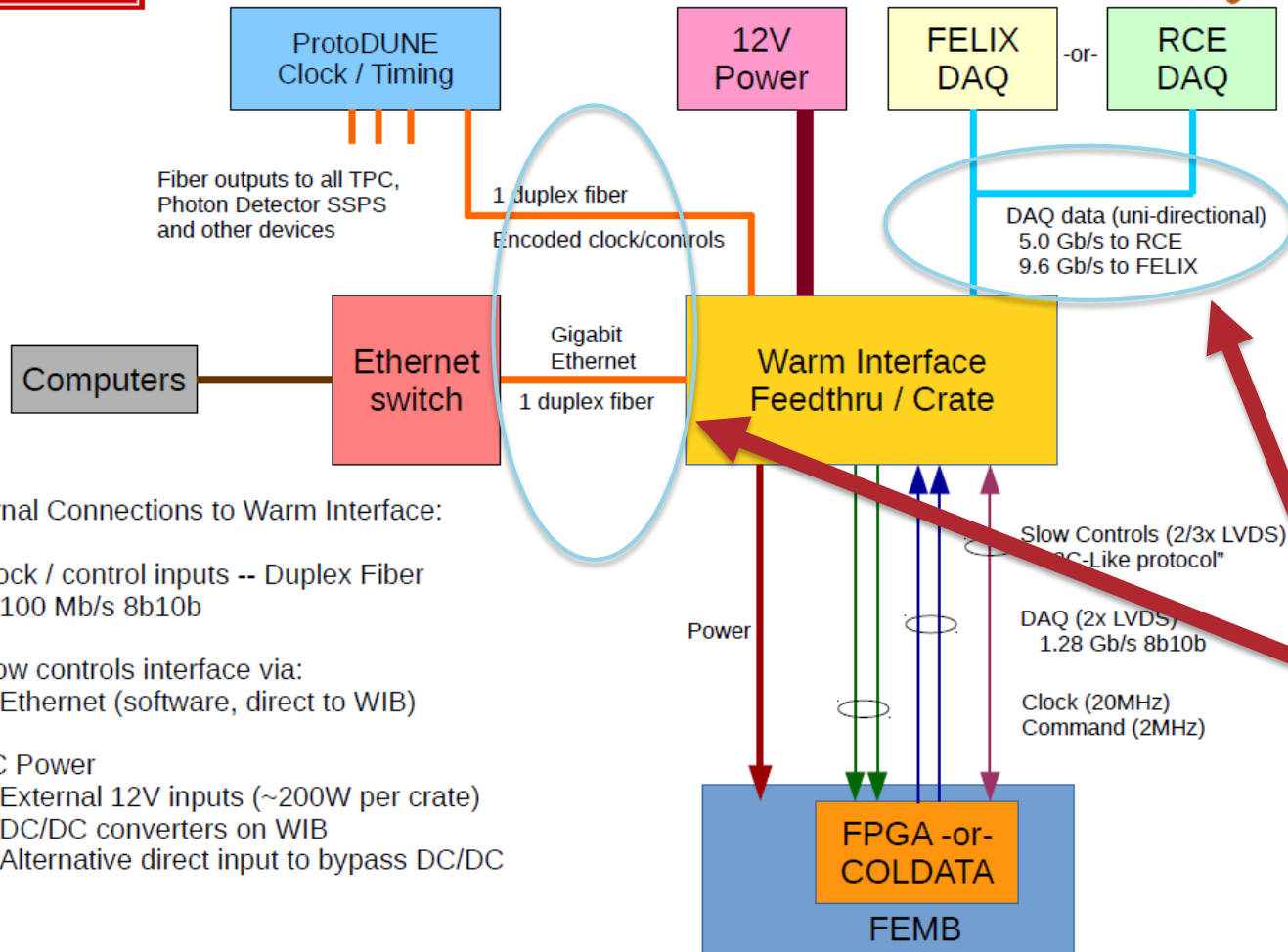


Data and Timing/Control Fibers

DAQ Interface: ProtoDUNE SP Electronics



ProtoDUNE Single Phase TPC Electronics



External Connections to Warm Interface:

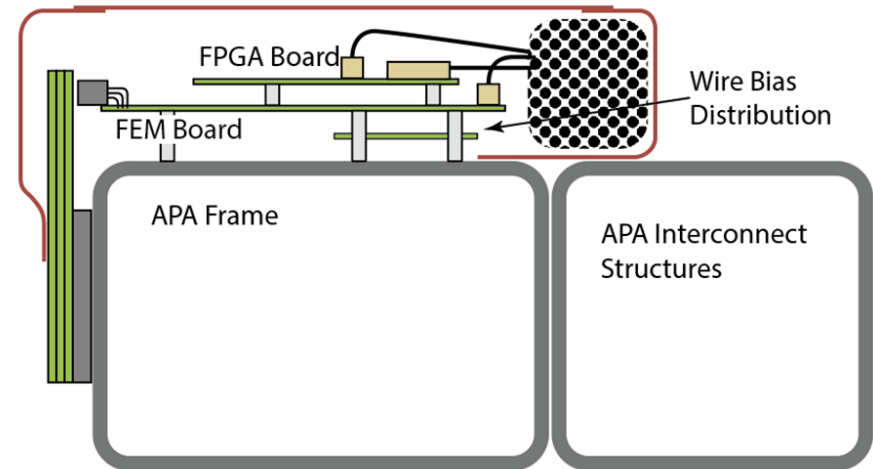
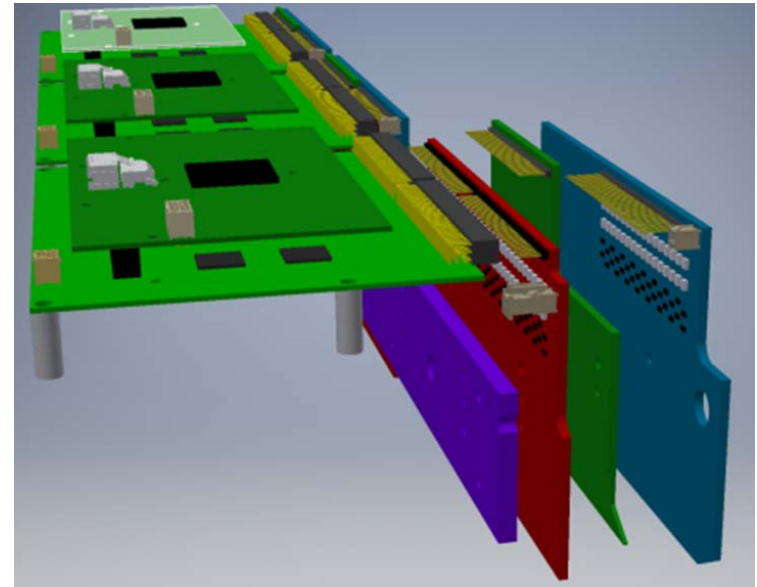
- Clock / control inputs -- Duplex Fiber
 - 100 Mb/s 8b10b
- Slow controls interface via:
 - Ethernet (software, direct to WIB)
- DC Power
 - External 12V inputs (~200W per crate)
 - DC/DC converters on WIB
 - Alternative direct input to bypass DC/DC

DAQ Interfaces



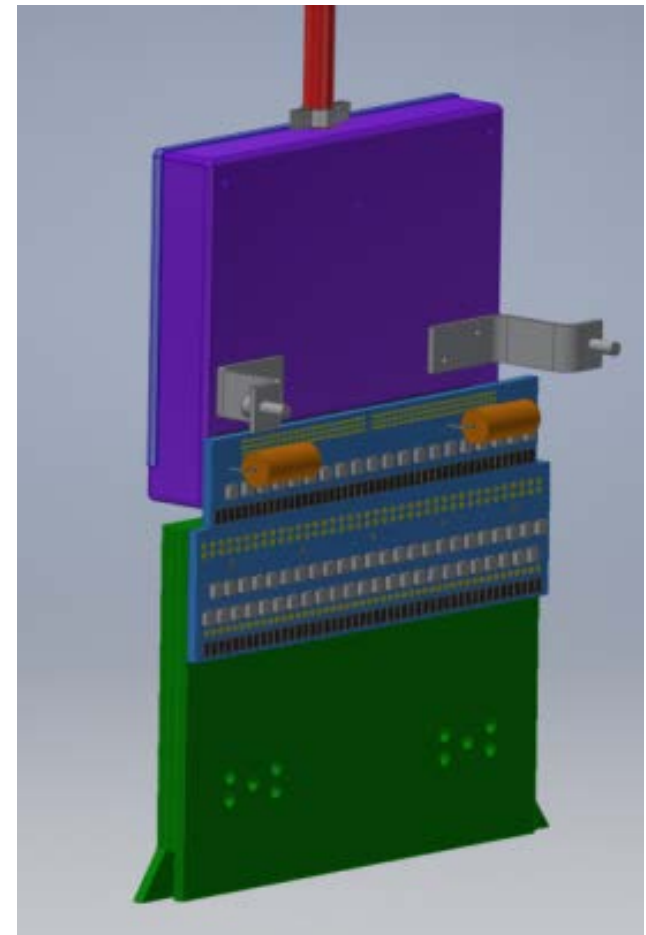
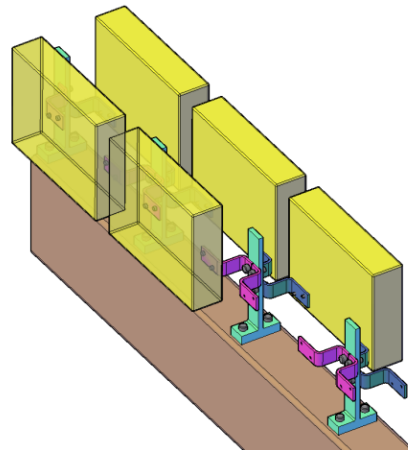
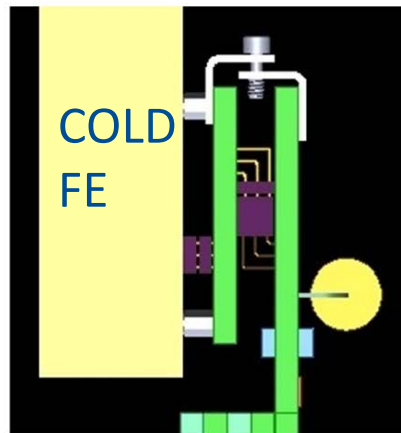
TPC – APA Wire Interface - SBND

- SBND CE and Geometry board stack
- 3 Faraday cages over CE
- Room for cabling inside the enclosure
- FE card ground connected to APA frame via screws and standoffs.



TPC – APA Wire Interface : ProtoDUNE SP Electronics

- Cold Electronics interface to TPC occurs at the locations that the FE card cold boxes are plugged into the APA wire boards.
- The implemented interface will provide a low impedance ground connection between the APA frame and the cold electronics board set.

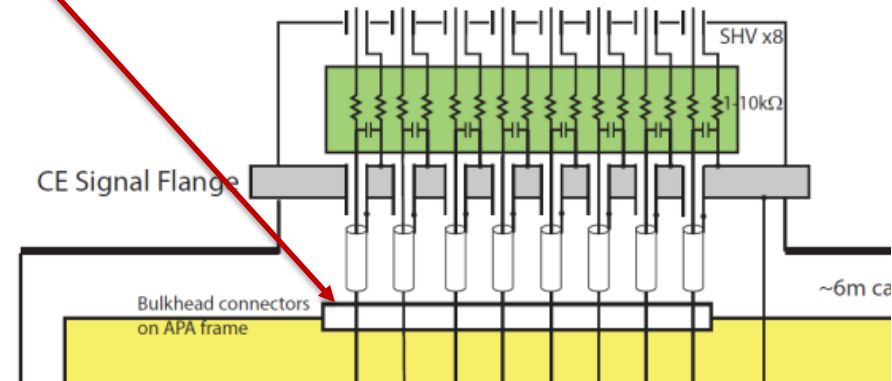
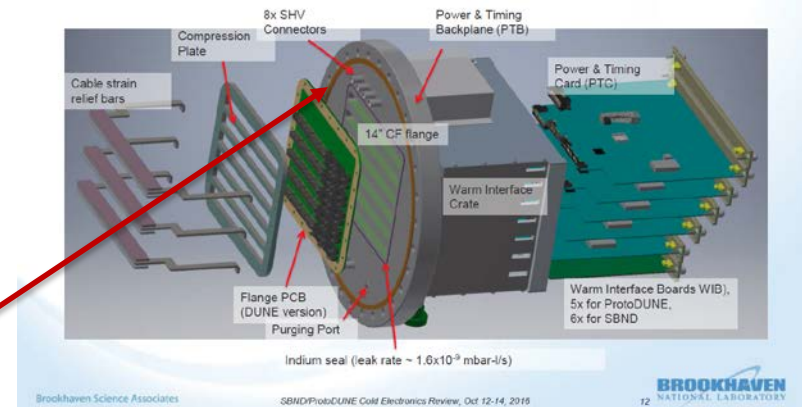


ProtoDUNE SP wire board stack and cold electronics box

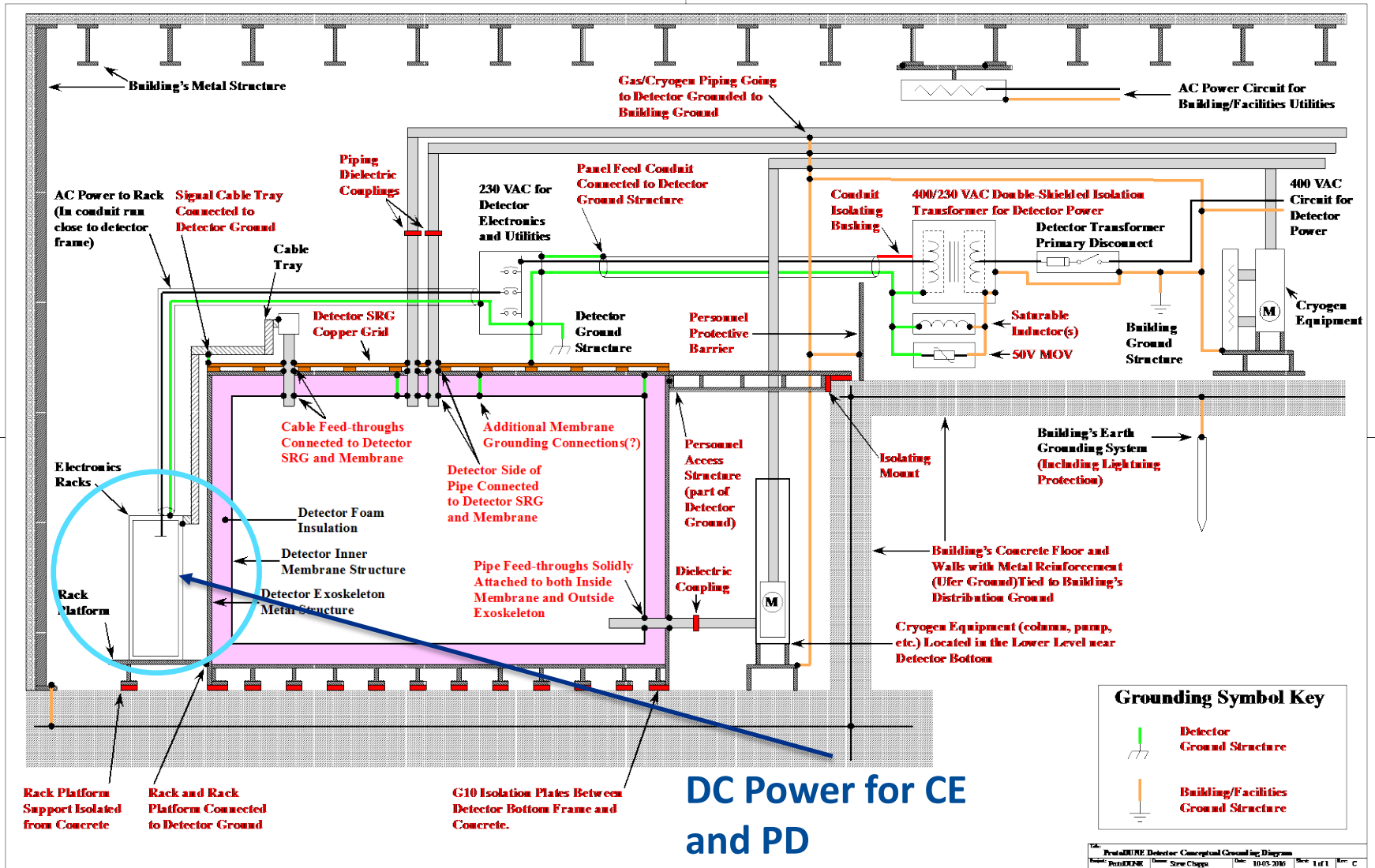
TPC – APA Wire Bias Interface

- The Cold Electronics Warm Box and feedthrough flange also provide for the pass through of the wire bias lines.
- 8 SHV connectors are on the CE feedthrough flange.
- The cables (RG316) need to be terminated on the APA top end on a patch panel, with single ended wires reaching various connection points around the APA.

Exploded View of the Flange and Warm Interface Boards



Racks and Power Supplies



Conclusion

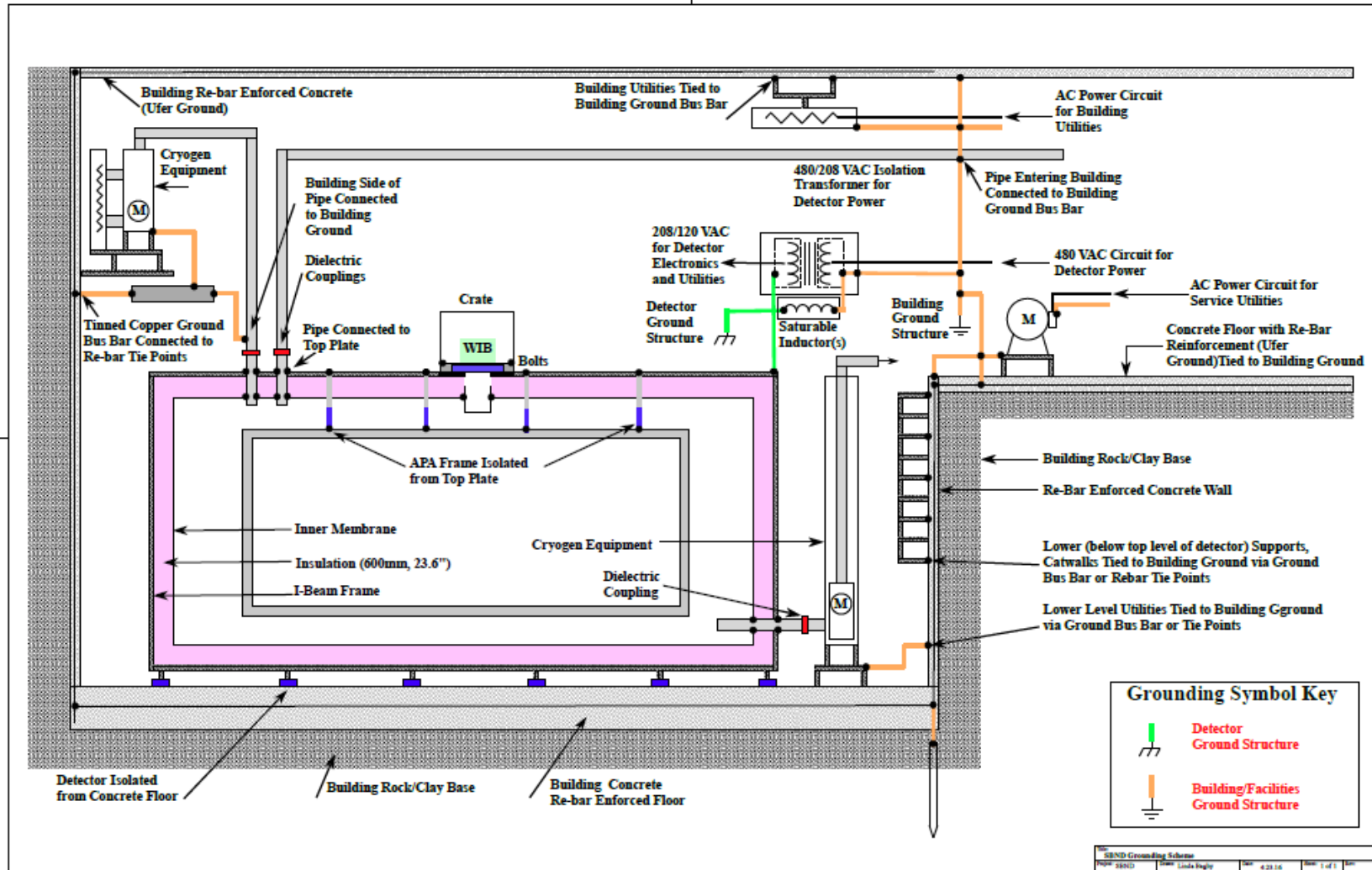
Charge question 5

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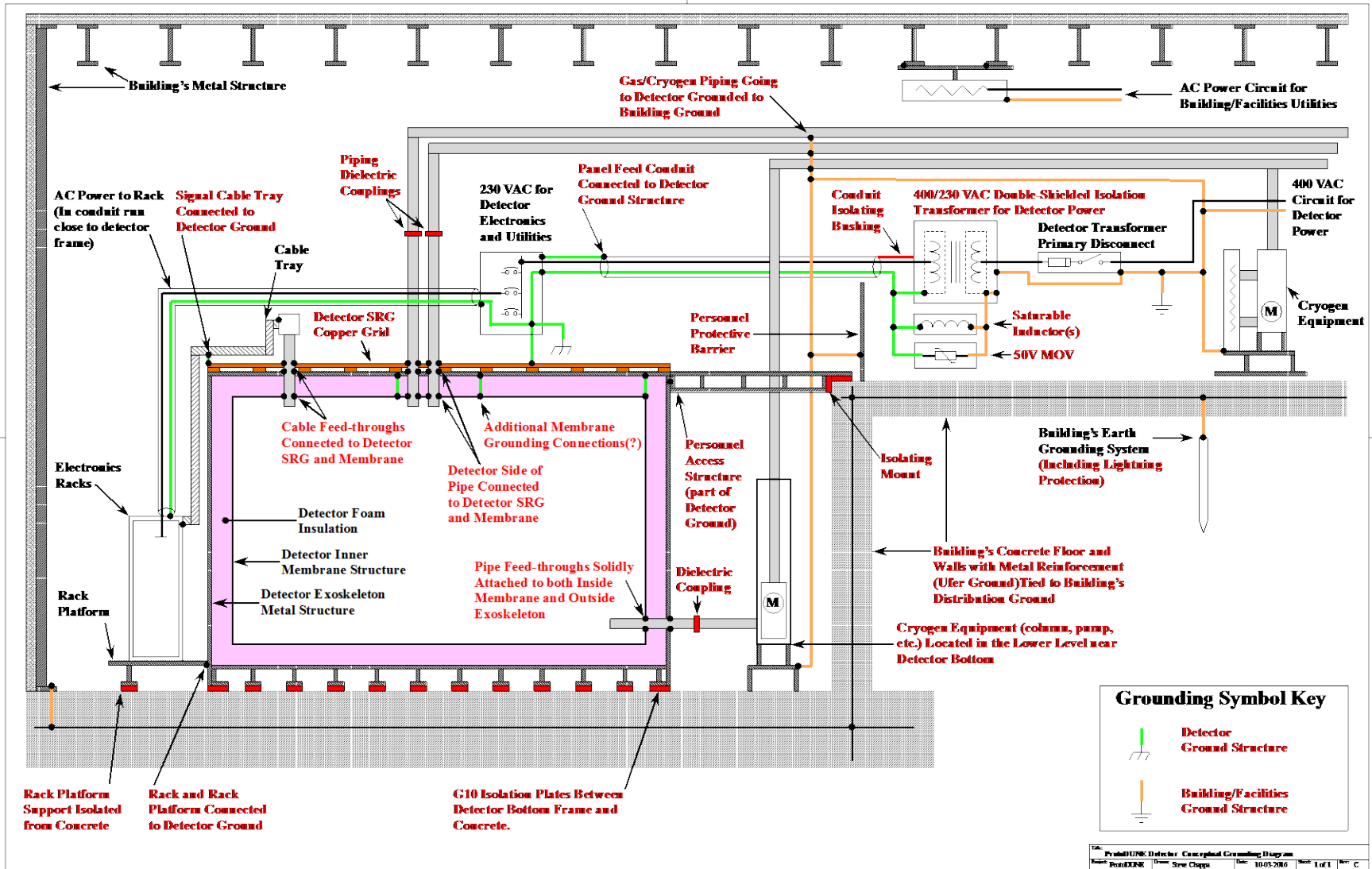
- All interfaces are well understood
- Prototypes are being produced
- Final design details will be documented over the next few months

BACKUP

SBND Grounding Concept Graphic



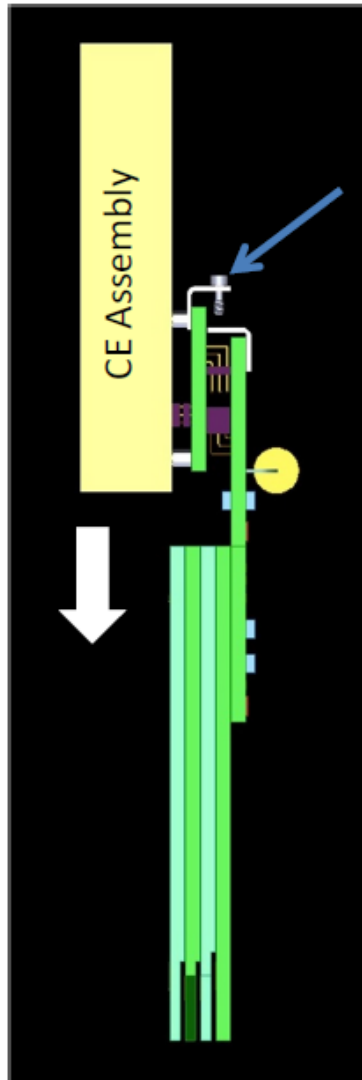
ProtoDUNE Grounding Concept Graphic



ProtoDUNE

CE motherboards are not stressed during attachment

CE enclosures and Interface Boards travel downward during the mating process; forces are mostly in the plane of the CR boards



Captive screws in L-shaped brackets mate with threaded brackets attached to the CR boards

ProtoDUNE

All connectors, screws, brackets, and standoffs shown are COTS parts

