

PEPI updates and installation

Jason Andrews,

Brian Hamilton, Hassan Jawahery, Tom O'Bannon, Will Parker, Jack Wimberley

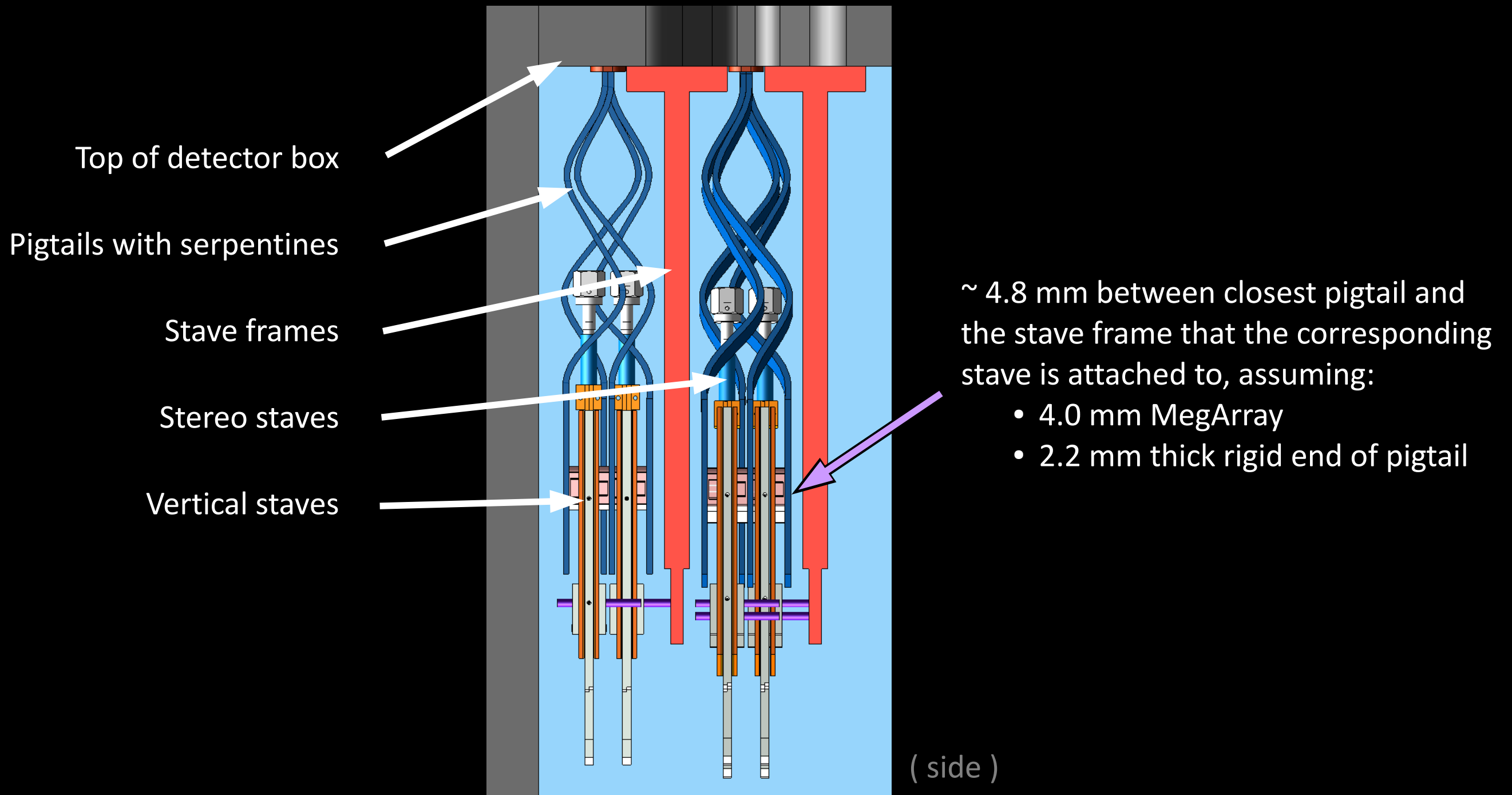
University of Maryland

May 17th, 2016

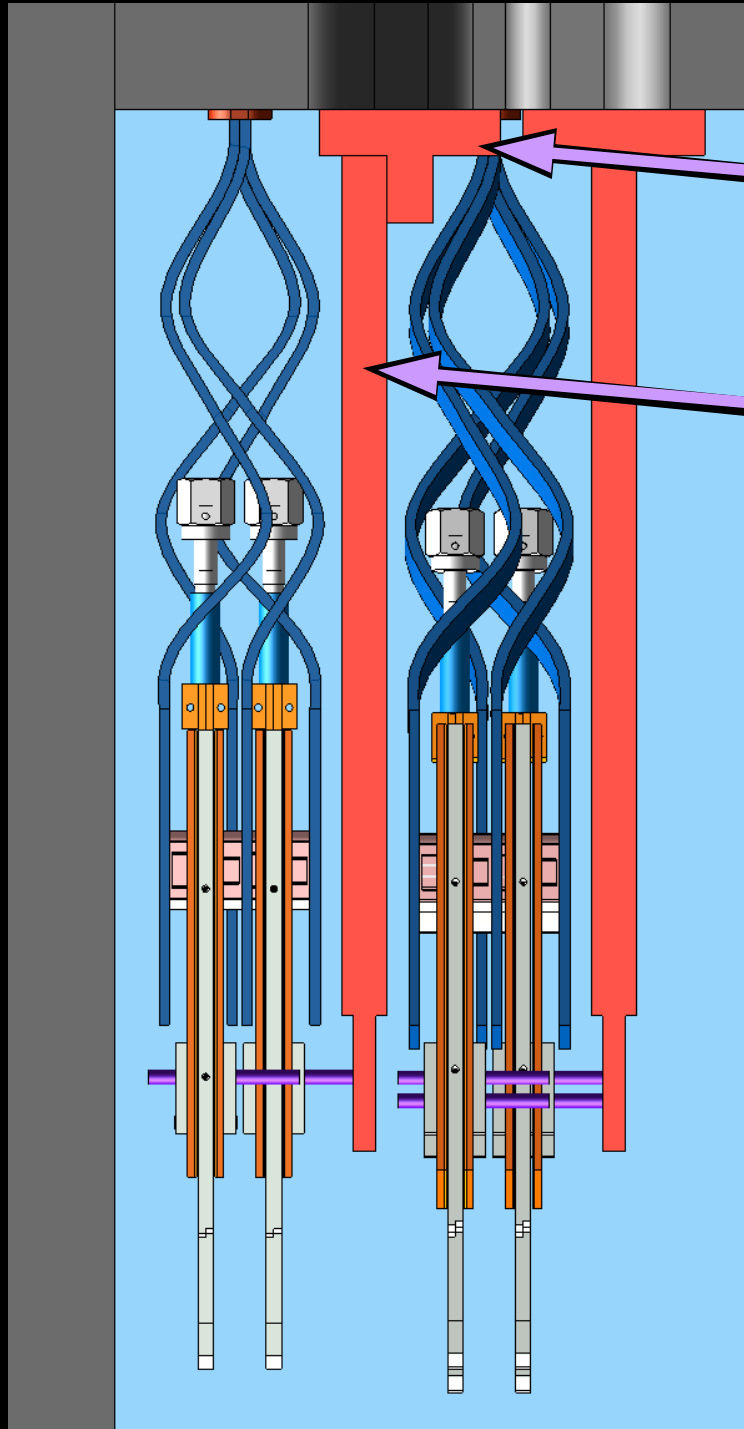


Brief miscellaneous topics

Distance of staves from stave frames



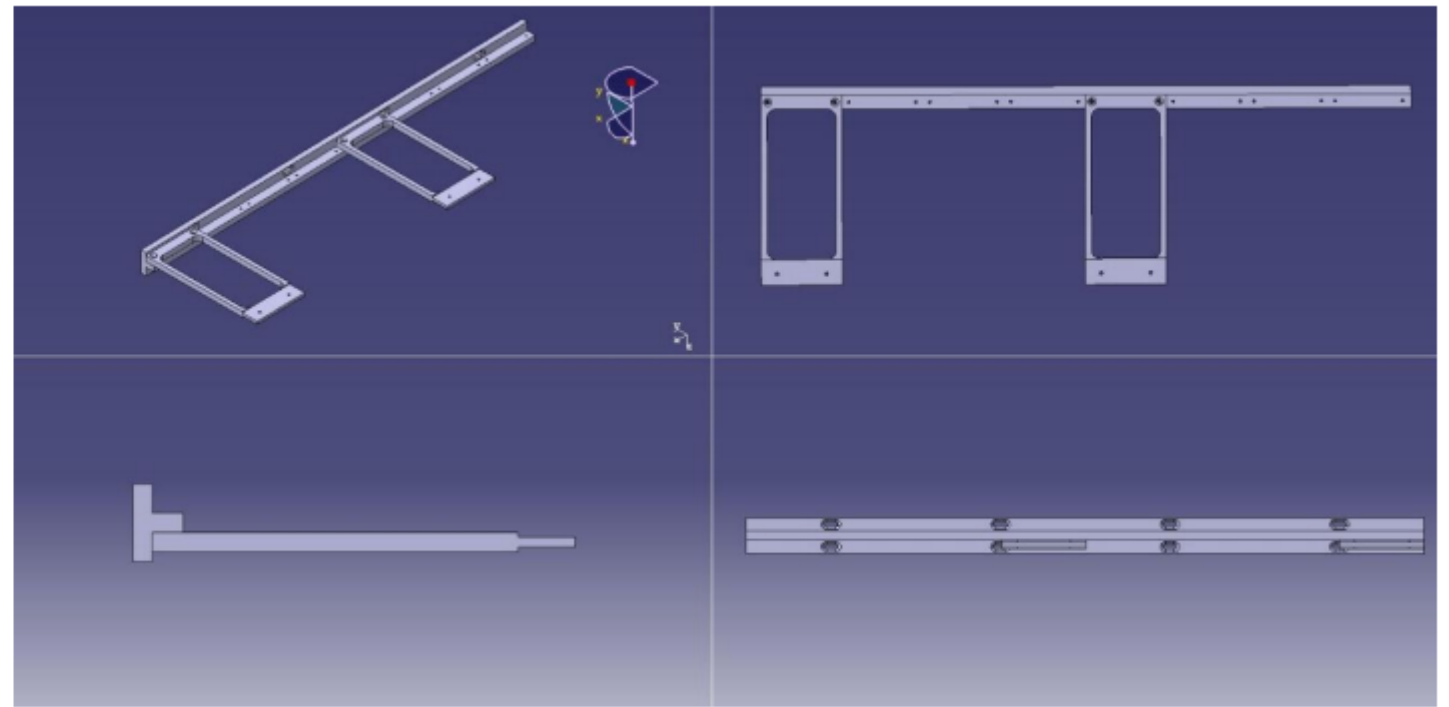
Segmented stave frames



Rail

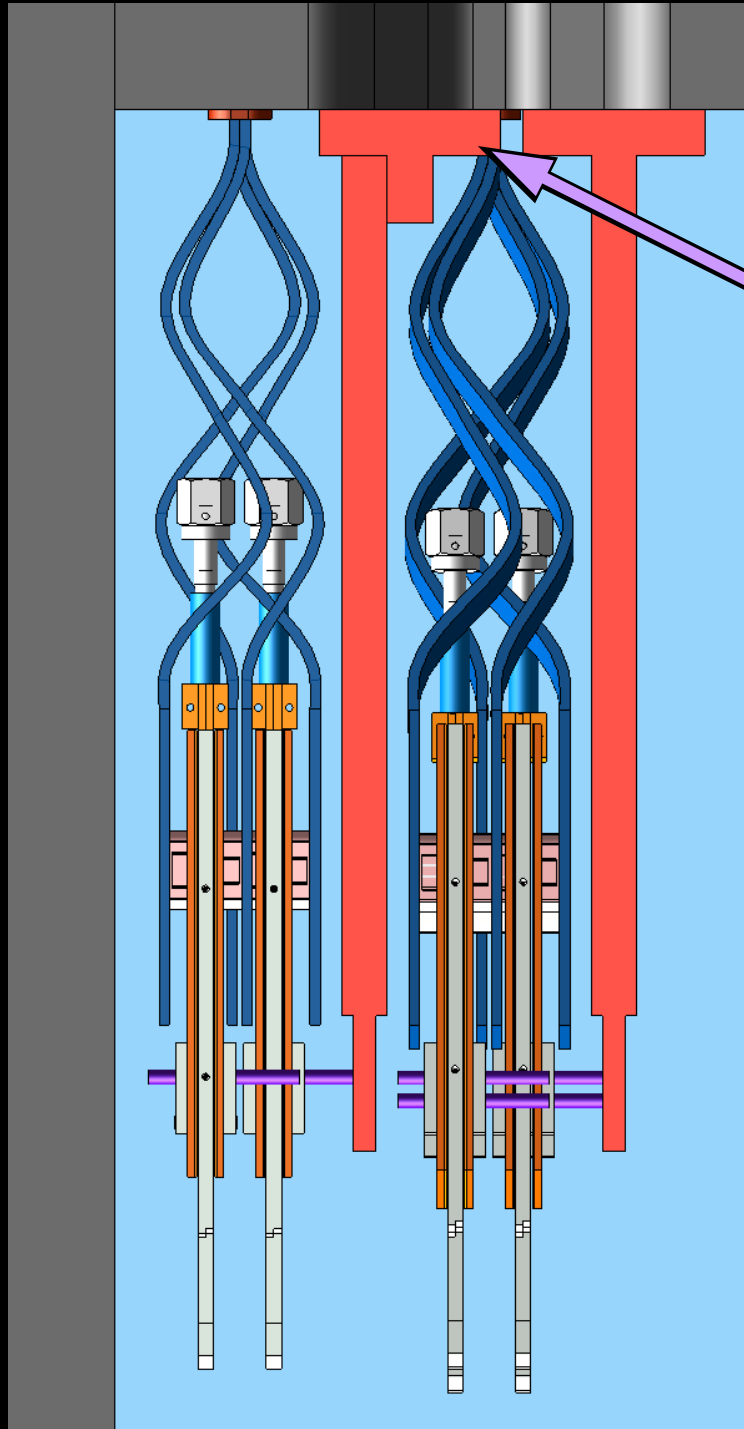
Sub-frame at same z-position as previous design

UTaX and UTbX:

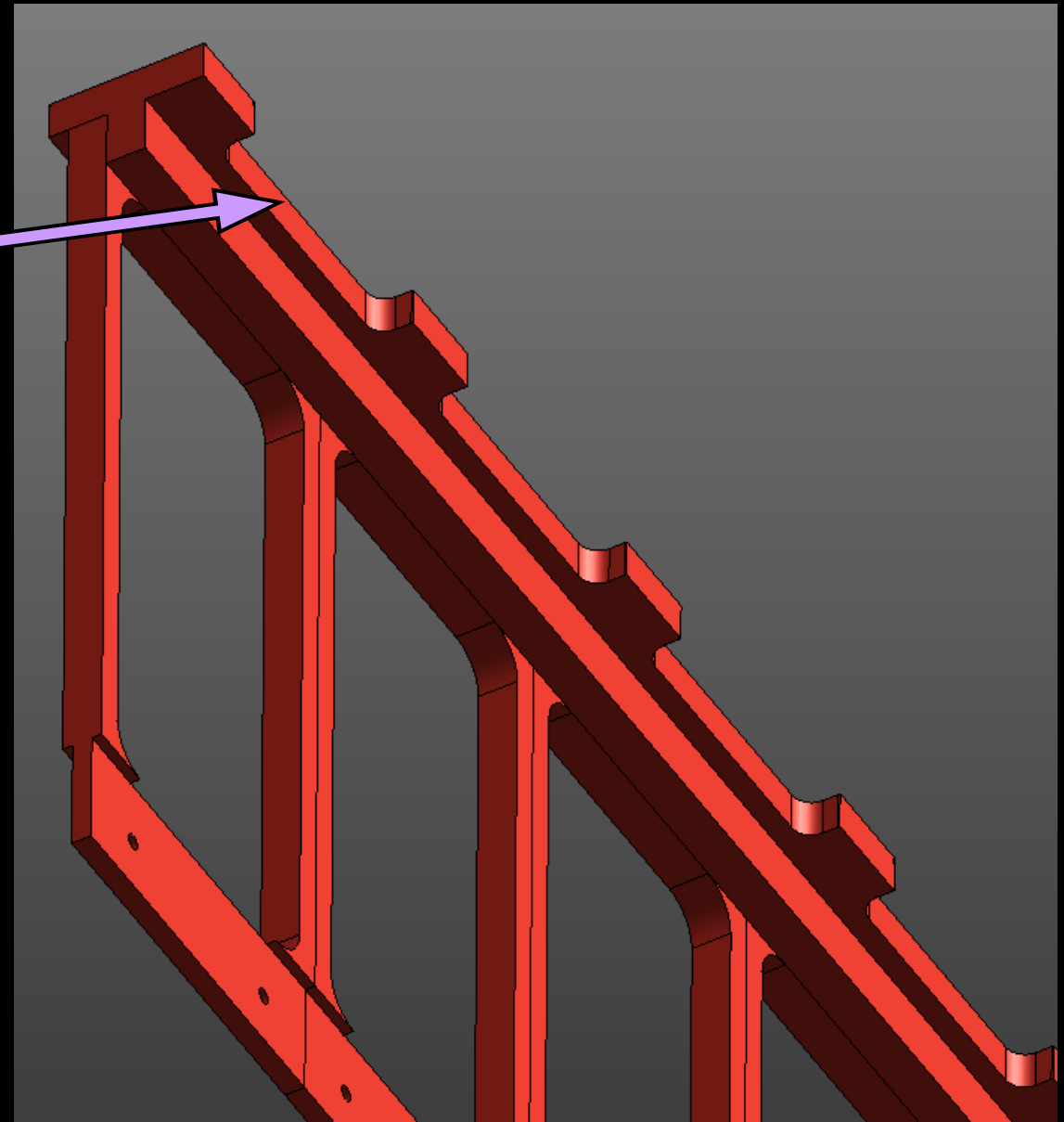


From Burkhard's May 13th presentation

Segmented stave frames

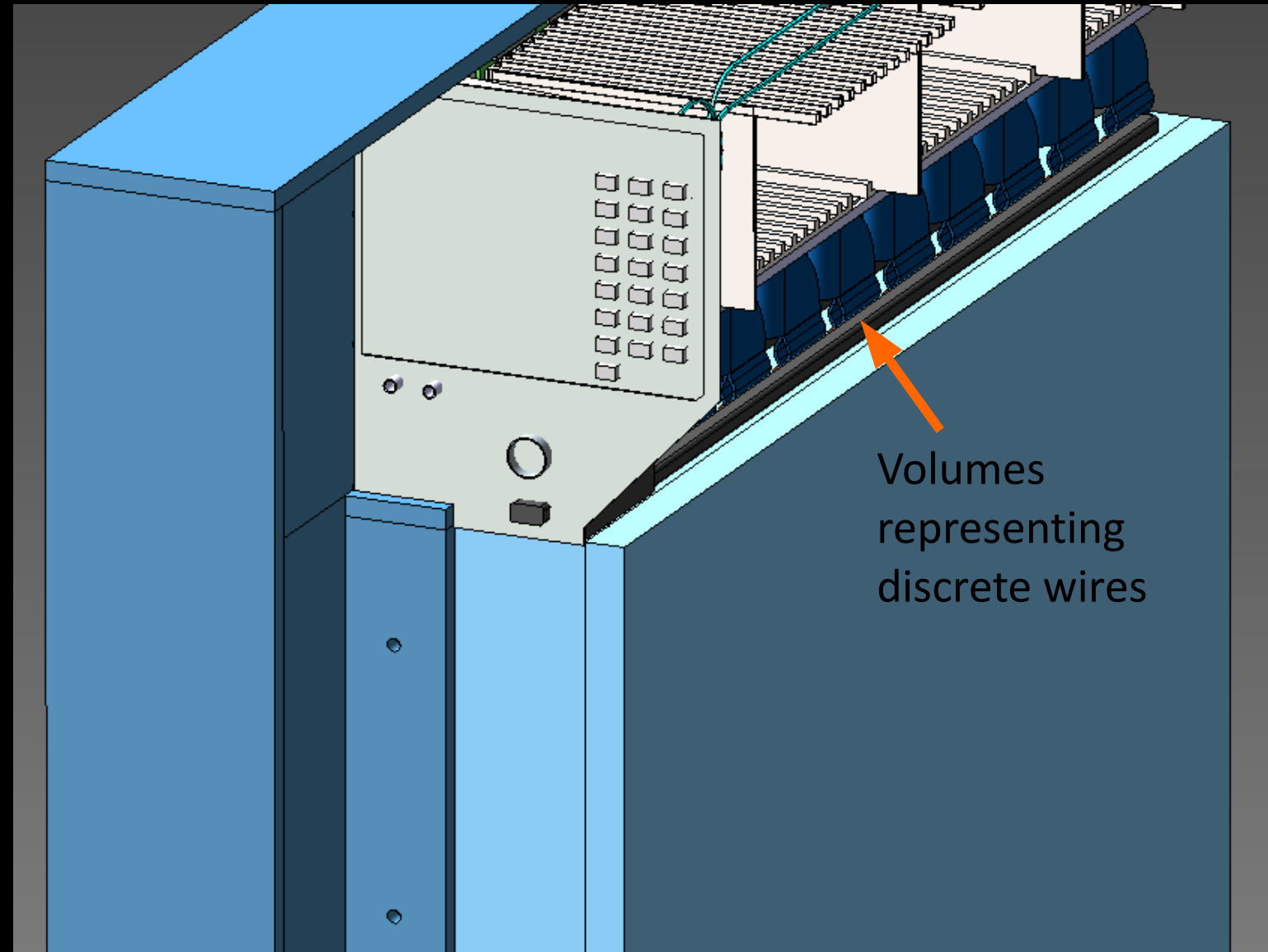
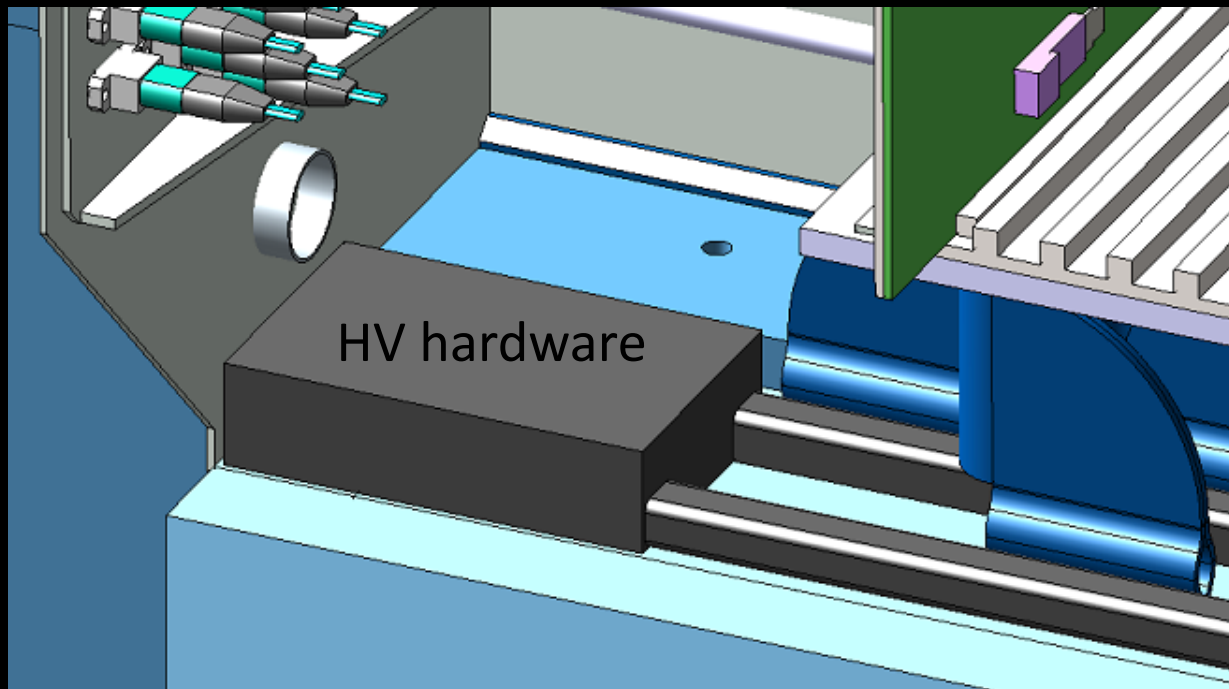


Rail will need cutouts to accommodate pigtail openings in detector box



High voltage

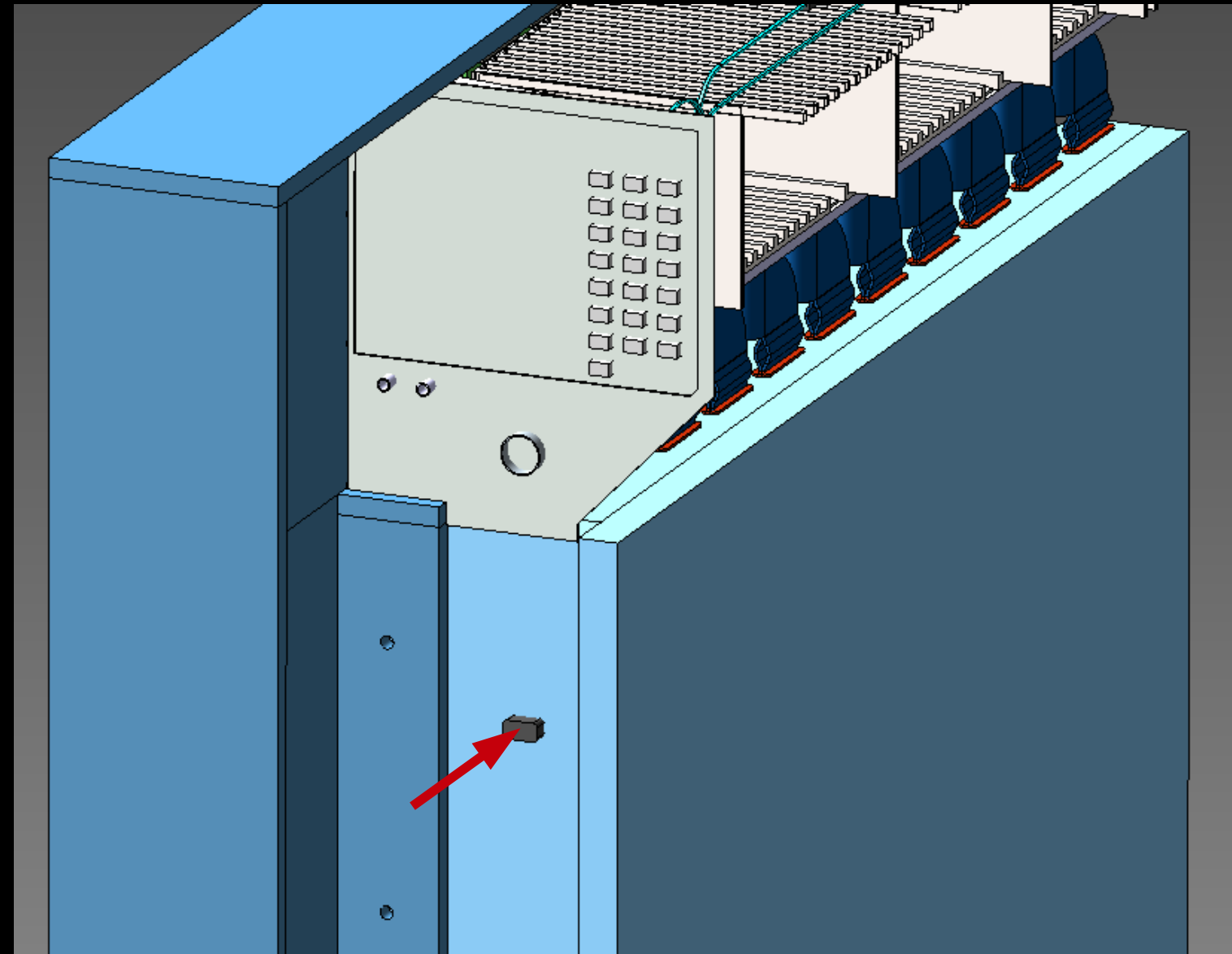
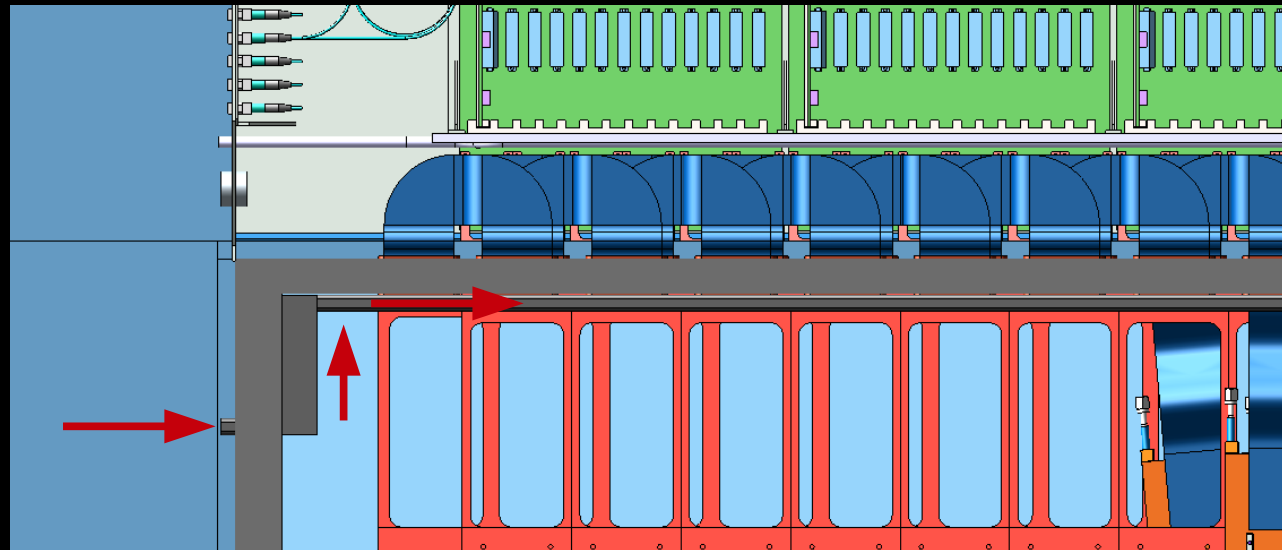
HV has thus far have been drawn entering the side of the PEPI chassis, with insulated discrete wires following pigtails down into detector box



High voltage

HV could alternatively enter the side of the detector box and travel along stave frames

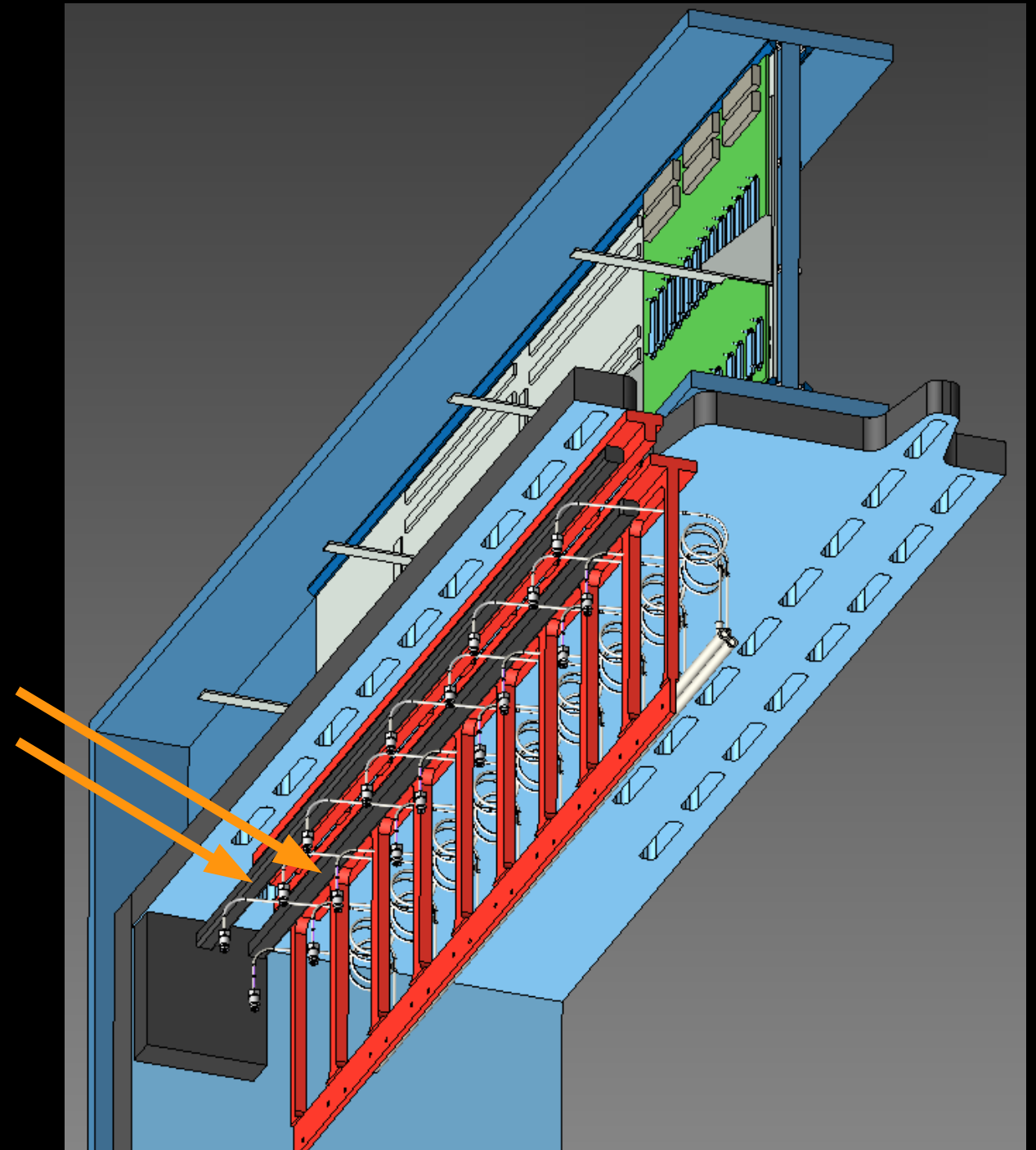
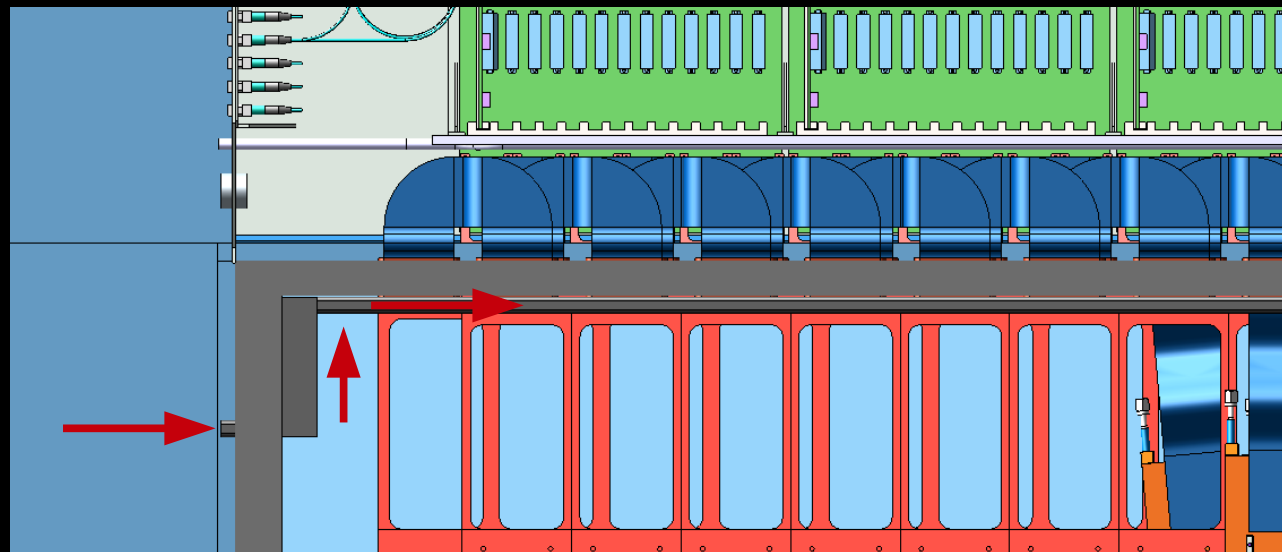
- Creates another hole to seal
- Simplifies pigtail gaskets
- Decouples insertion of pigtails into the box with the routing of the HV



High voltage

HV could alternatively enter the side of the detector box and travel along stave frames

- Creates another hole to seal
- Simplifies pigtail gaskets
- Decouples insertion of pigtails into the box with the routing of the HV

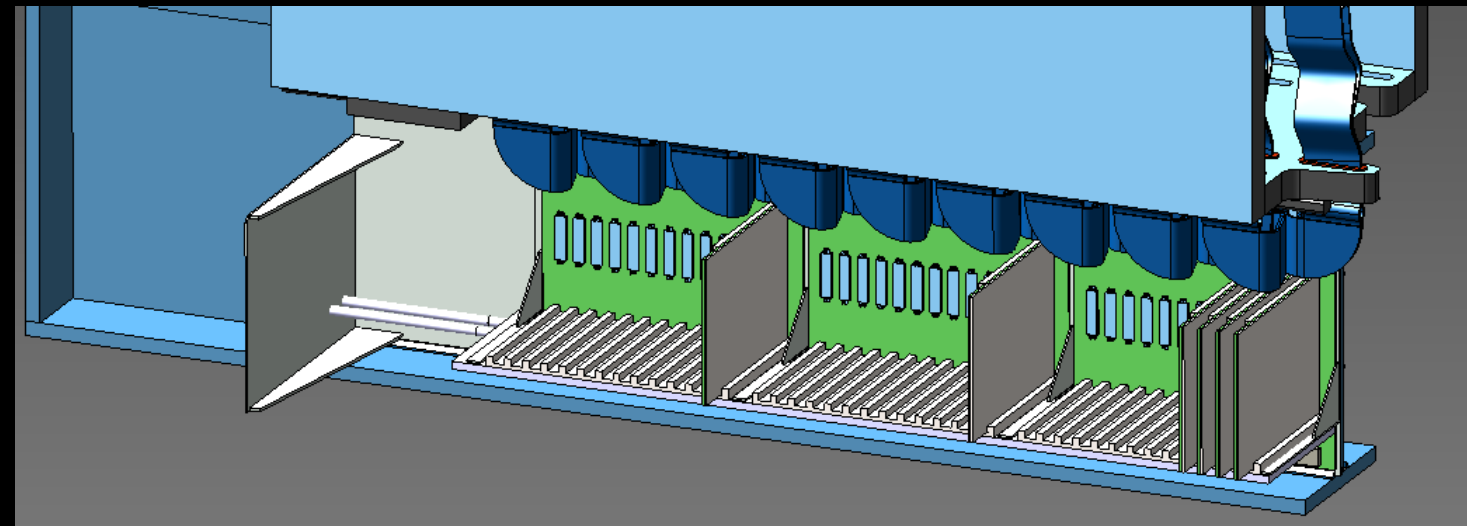
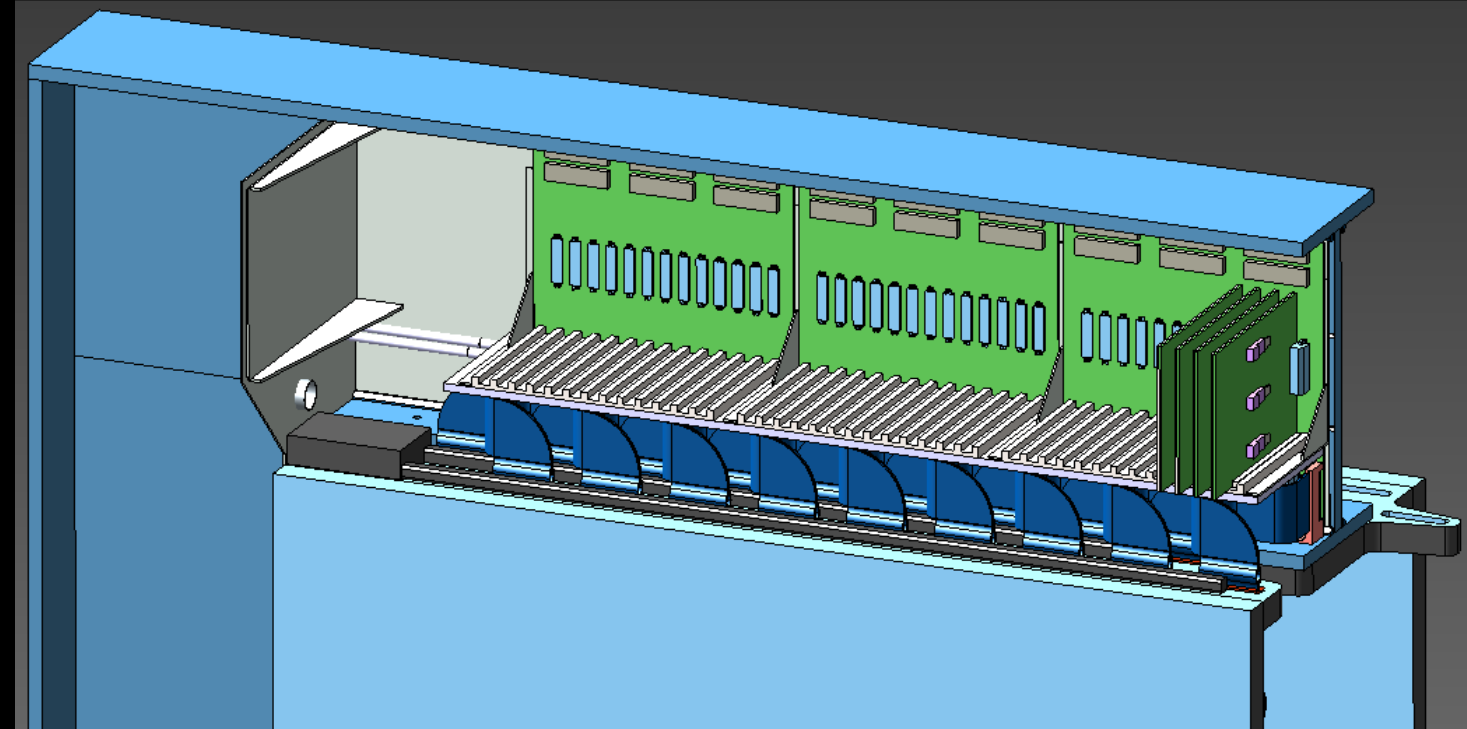


location(s) of the water jackets

There may be reason to have the water jackets on the opposite side of the DCBs for the PEPI chassis on the bottom of the detector

There are two (contradicting) considerations

- Risk mitigation in case of condensation: water jackets below DCBs in case of dripping
- Optimization of heat transport: water jackets above DCBs where the heat is going



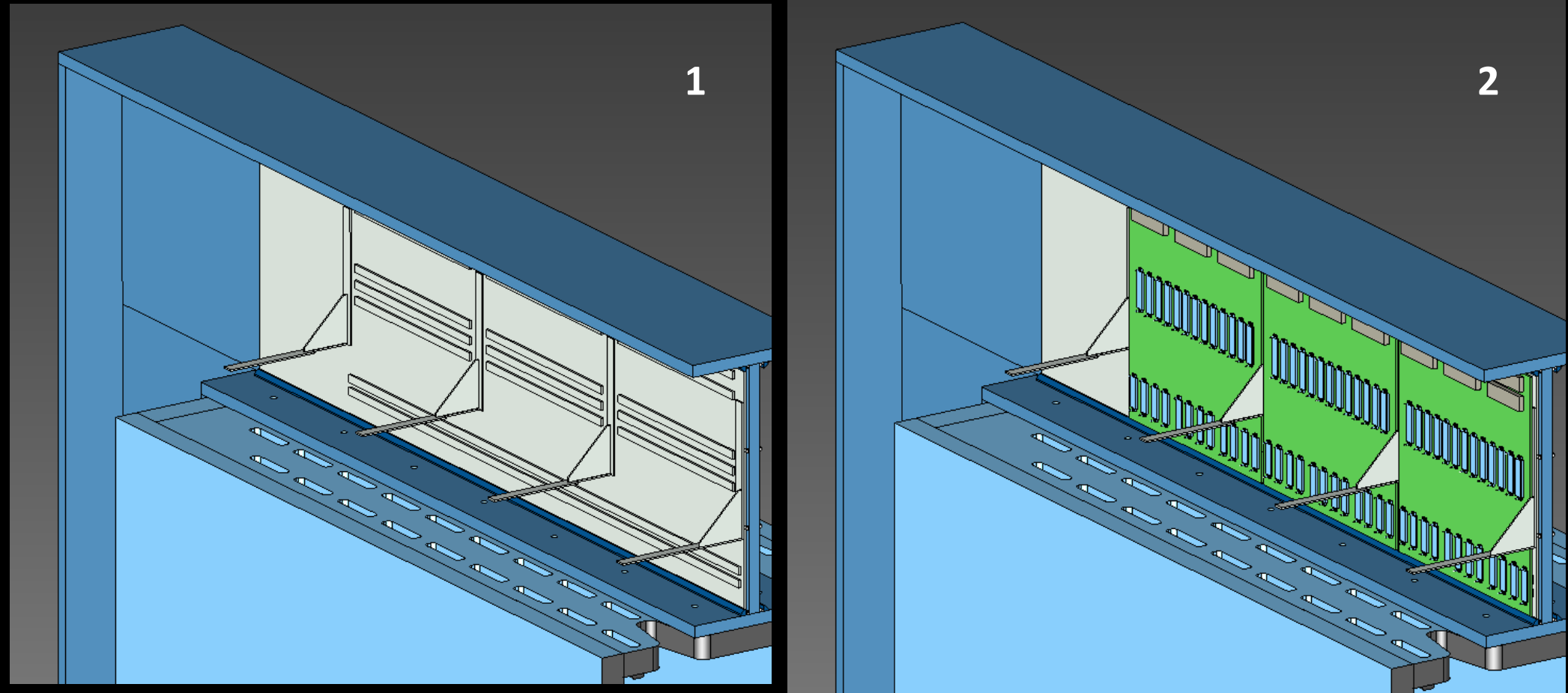
Sketch of an installation procedure

Assuming PEPI chassis installed board-by-board
in surface clean room

Sketch of an installation procedure

The basic order is:

- 1 Rigid support and water jacket brackets
- 2 Backplanes
- 3 Pigtails
- 4 Water jacket
- 5 DCBs
- 6 Optics and power
- 7 Dust cover

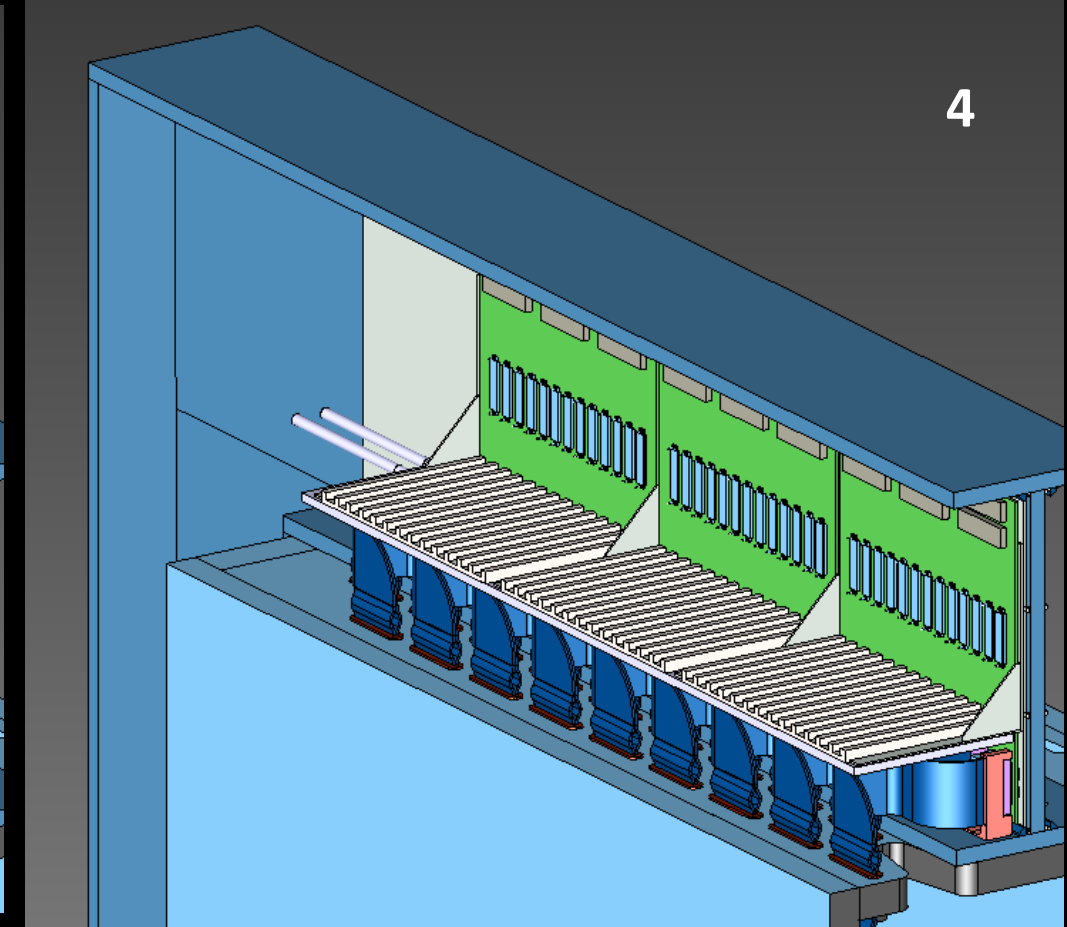
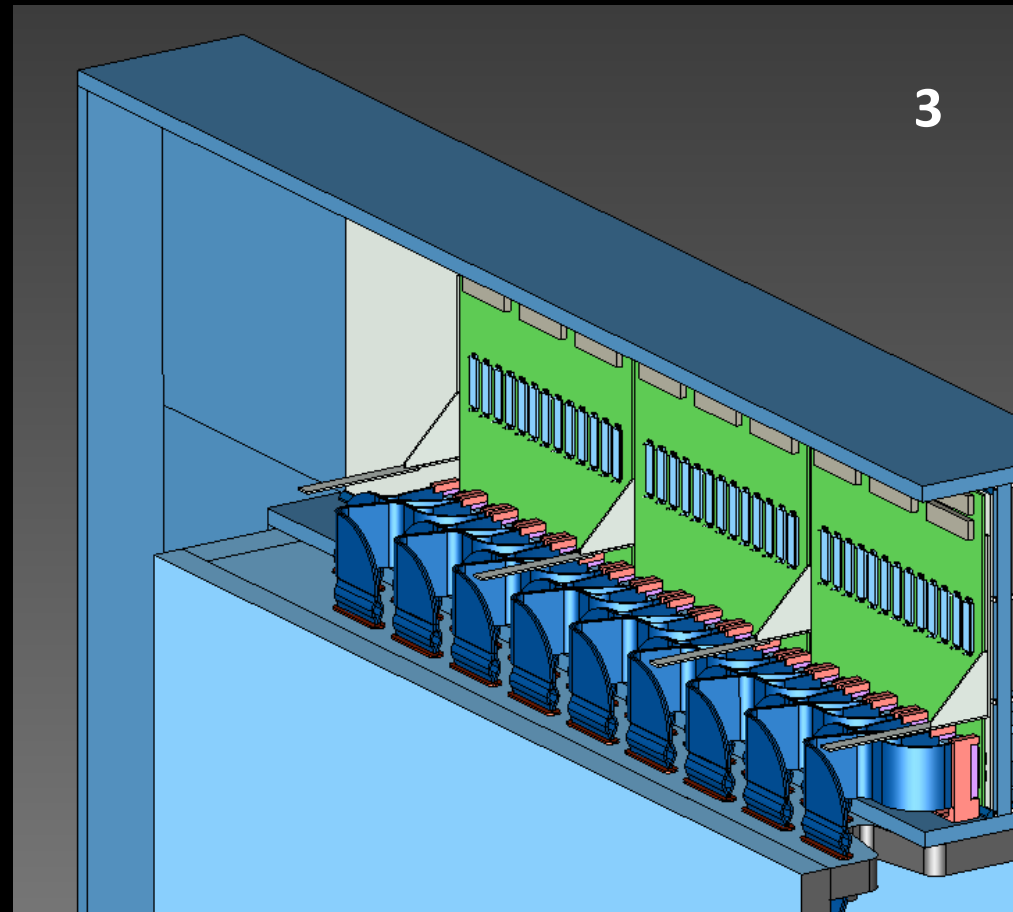


*Need better water jacket bracket design:
those drawn here obstruct pigtail installation

Sketch of an installation procedure

The basic order is:

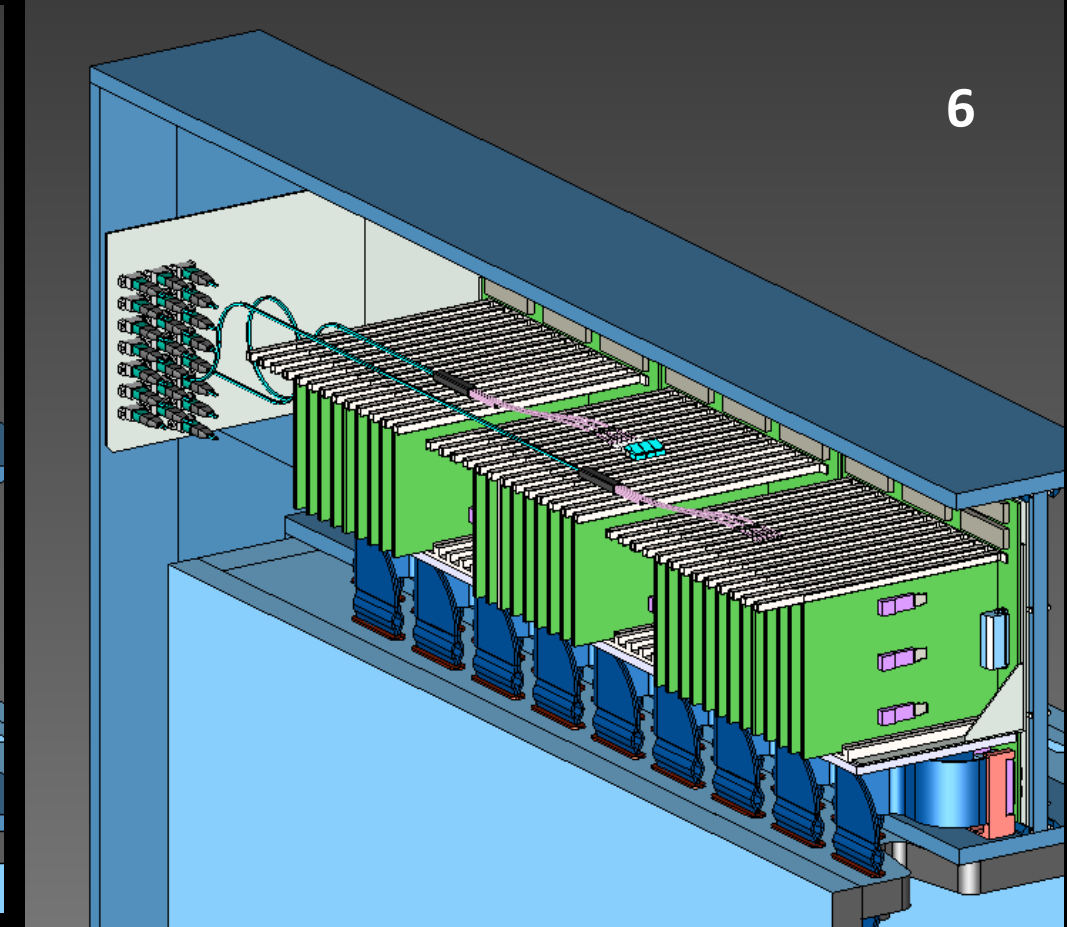
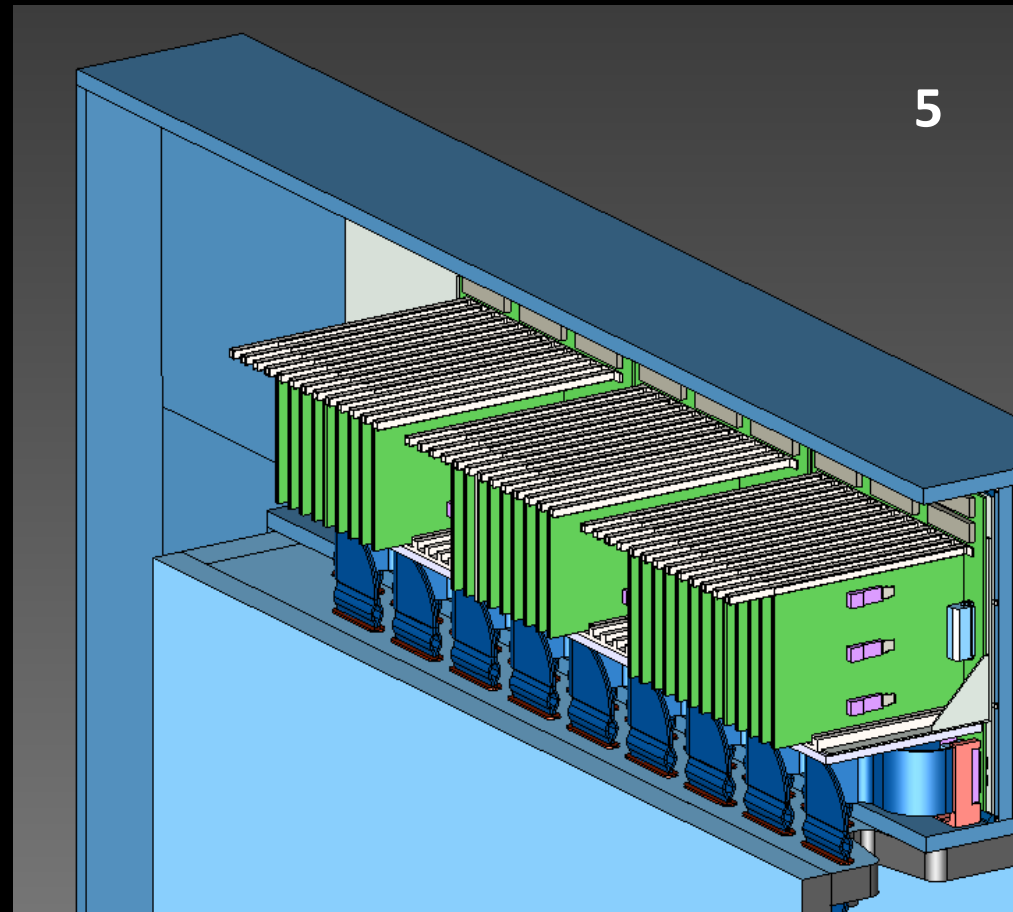
- 1 Rigid support and water jacket brackets
- 2 Backplanes
- 3 Pigtails
- 4 Water jacket
- 5 DCBs
- 6 Optics and power
- 7 Dust cover



Sketch of an installation procedure

The basic order is:

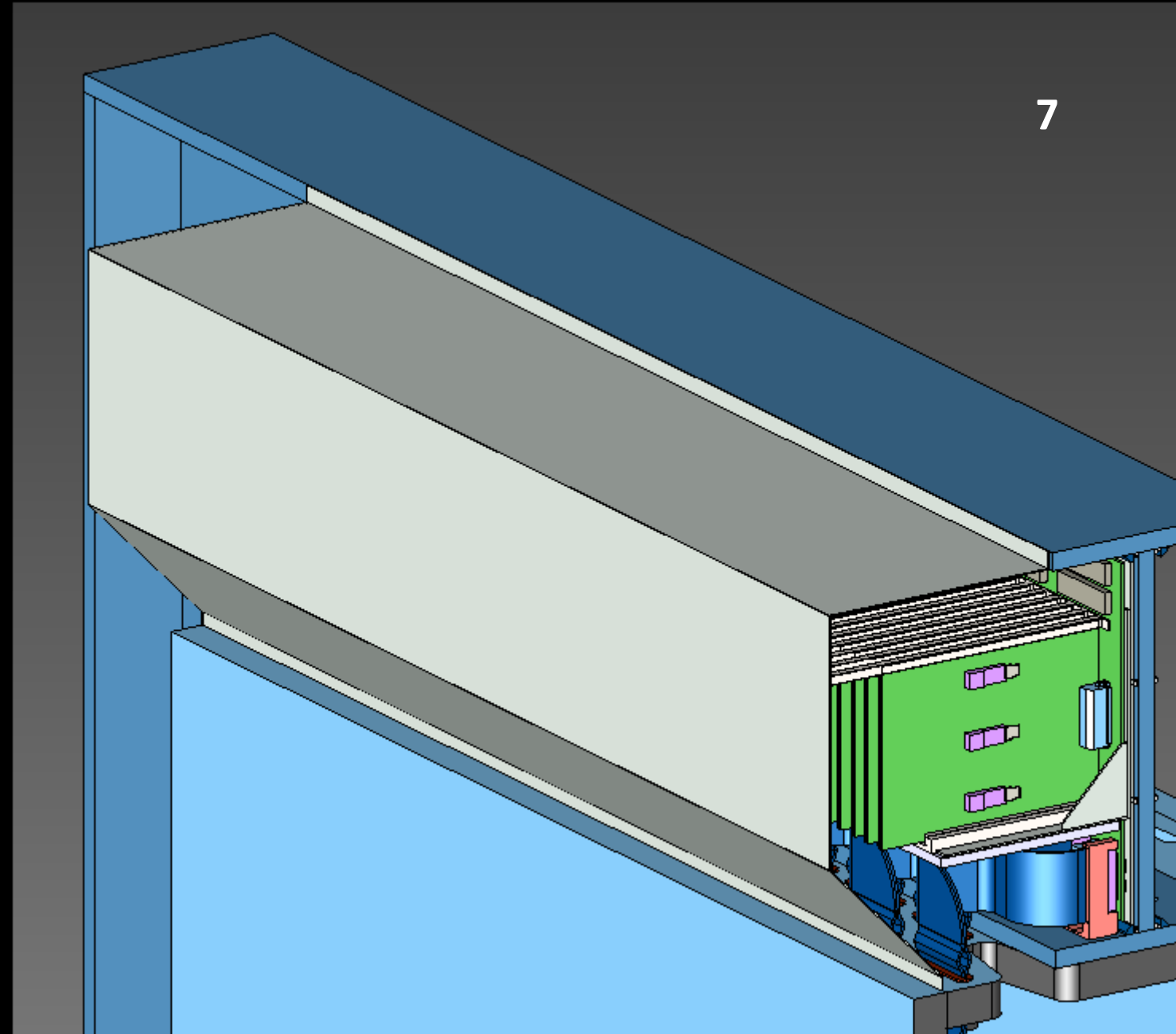
- 1 Rigid support and water jacket brackets
- 2 Backplanes
- 3 Pigtailed
- 4 Water jacket
- 5 DCBs
- 6 Optics and power
- 7 Dust cover



Sketch of an installation procedure

The basic order is:

- 1 Rigid support and water jacket brackets
- 2 Backplanes
- 3 Pigtails
- 4 Water jacket
- 5 DCBs
- 6 Optics and power
- 7 Dust cover

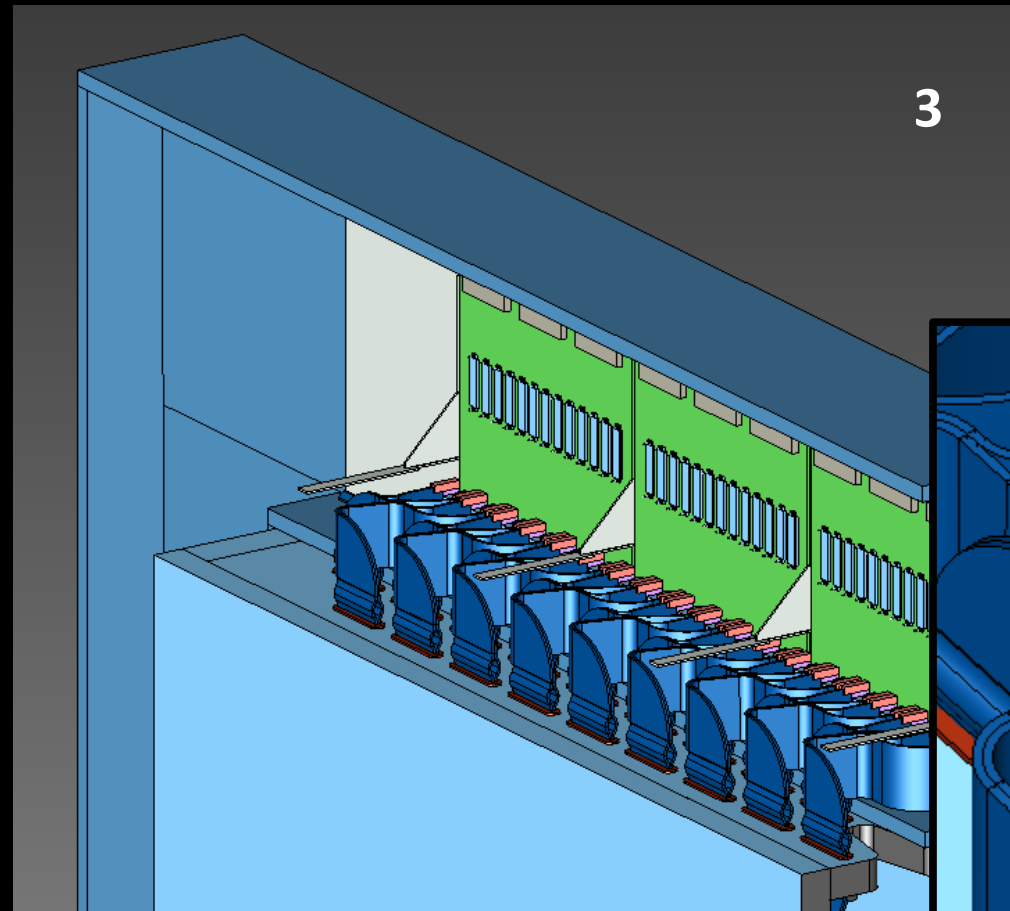


Sketch of an installation procedure

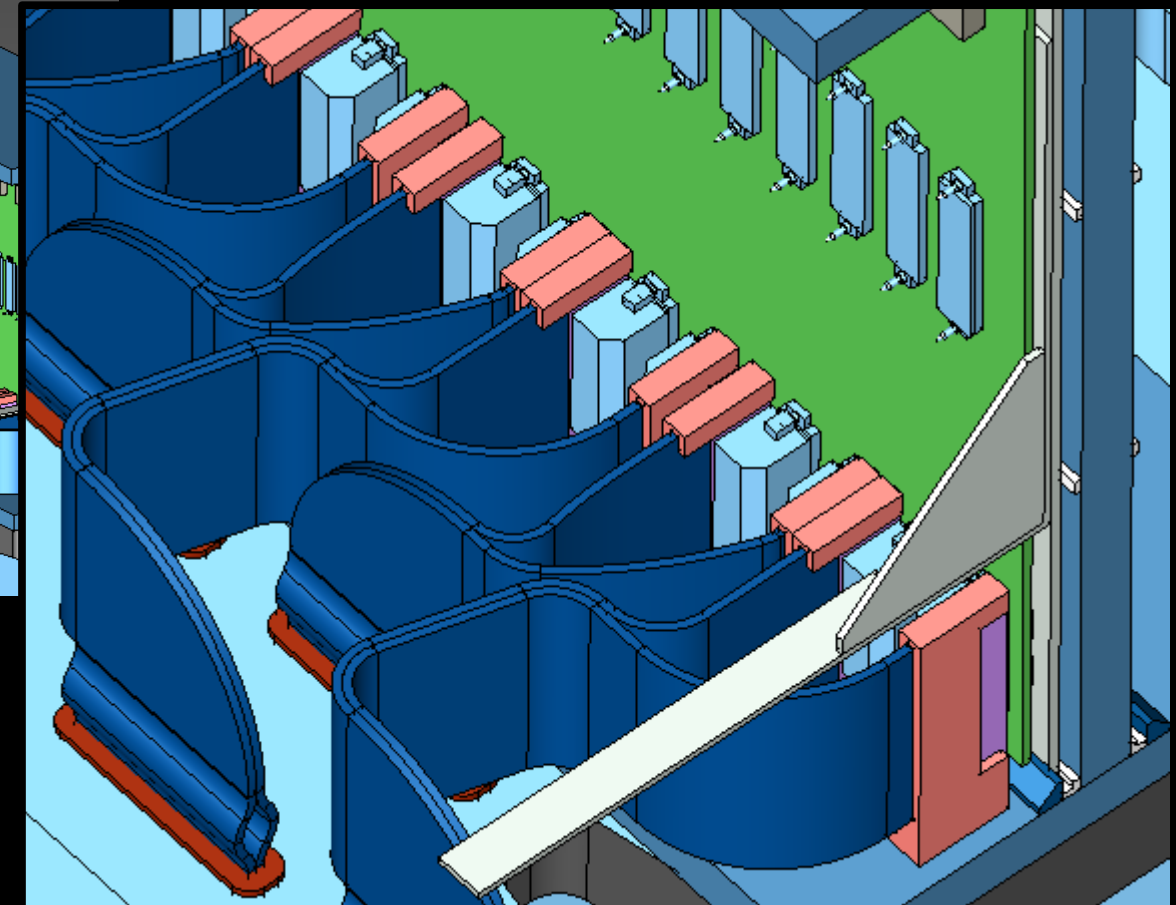
Step number three is not trivial

The basic order is:

- 1 Rigid support and water jacket brackets
- 2 Backplanes
- 3 **Pigtails**
- 4 Water jacket
- 5 DCBs
- 6 Optics and power
- 7 Dust cover

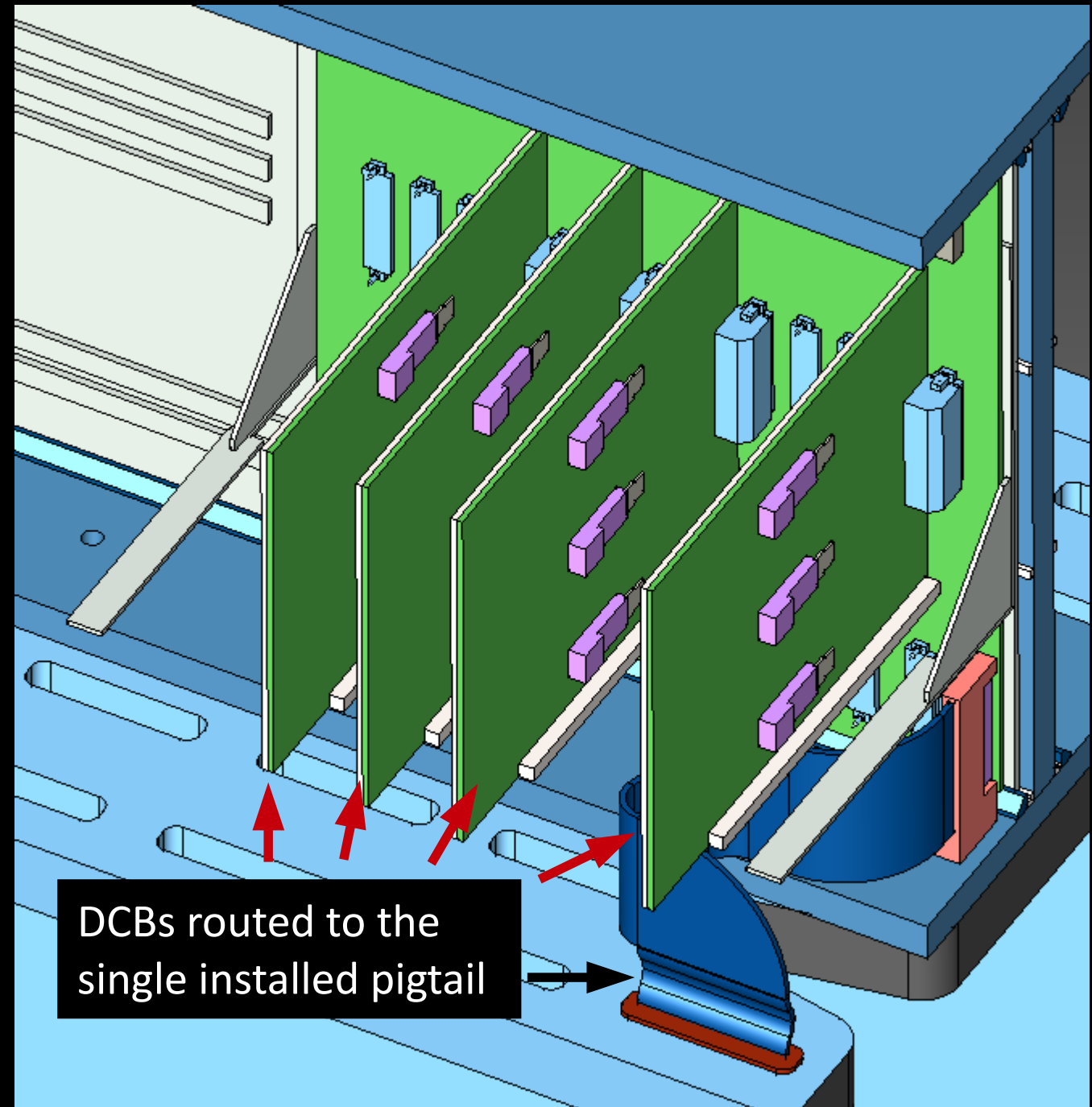


Pigtails can likely be connected from above without DCBs and water jacket in the way (though the water jacket brackets are still in the way)

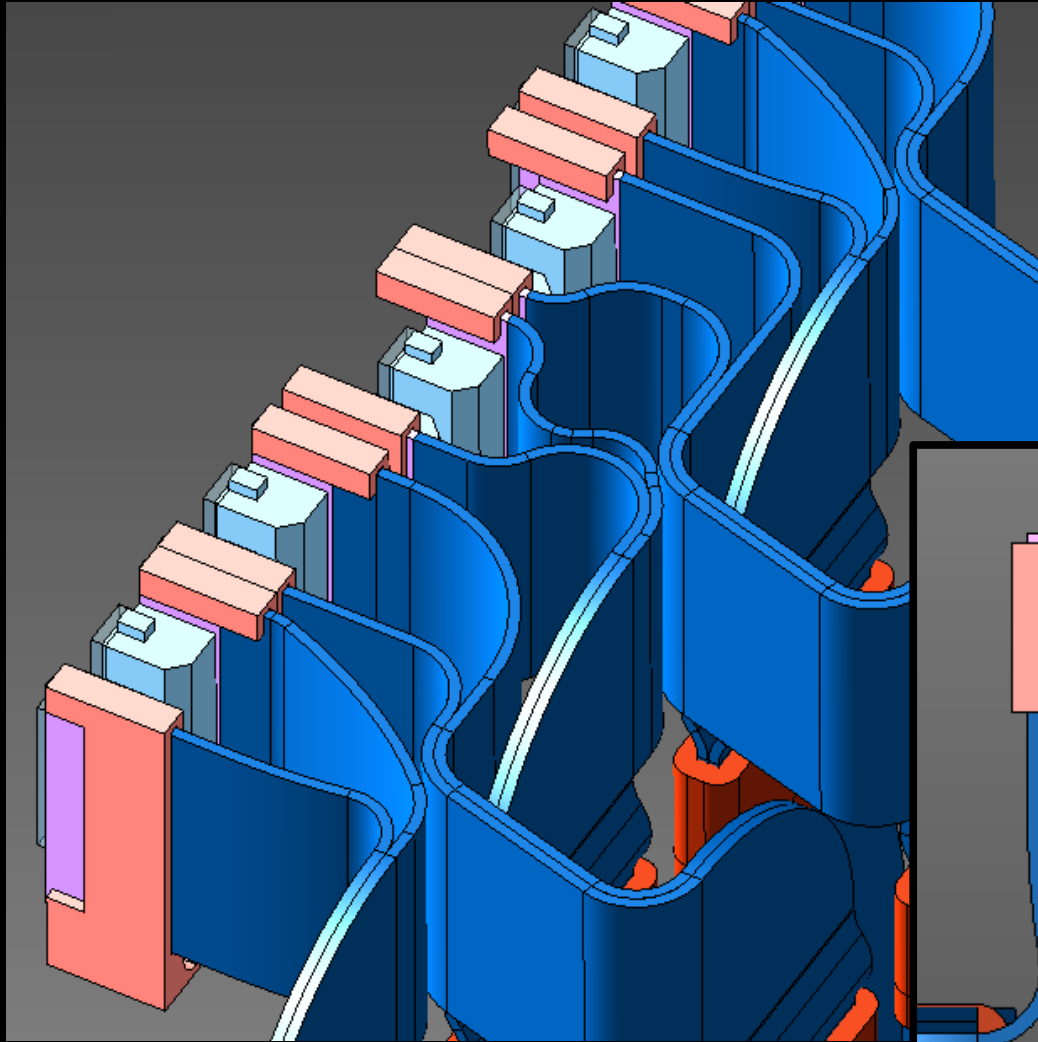


Sketch of an installation procedure

Testing connections during the pigtail installation sequence would involve installing and then removing DCBs; they obstruct pigtail installations in general

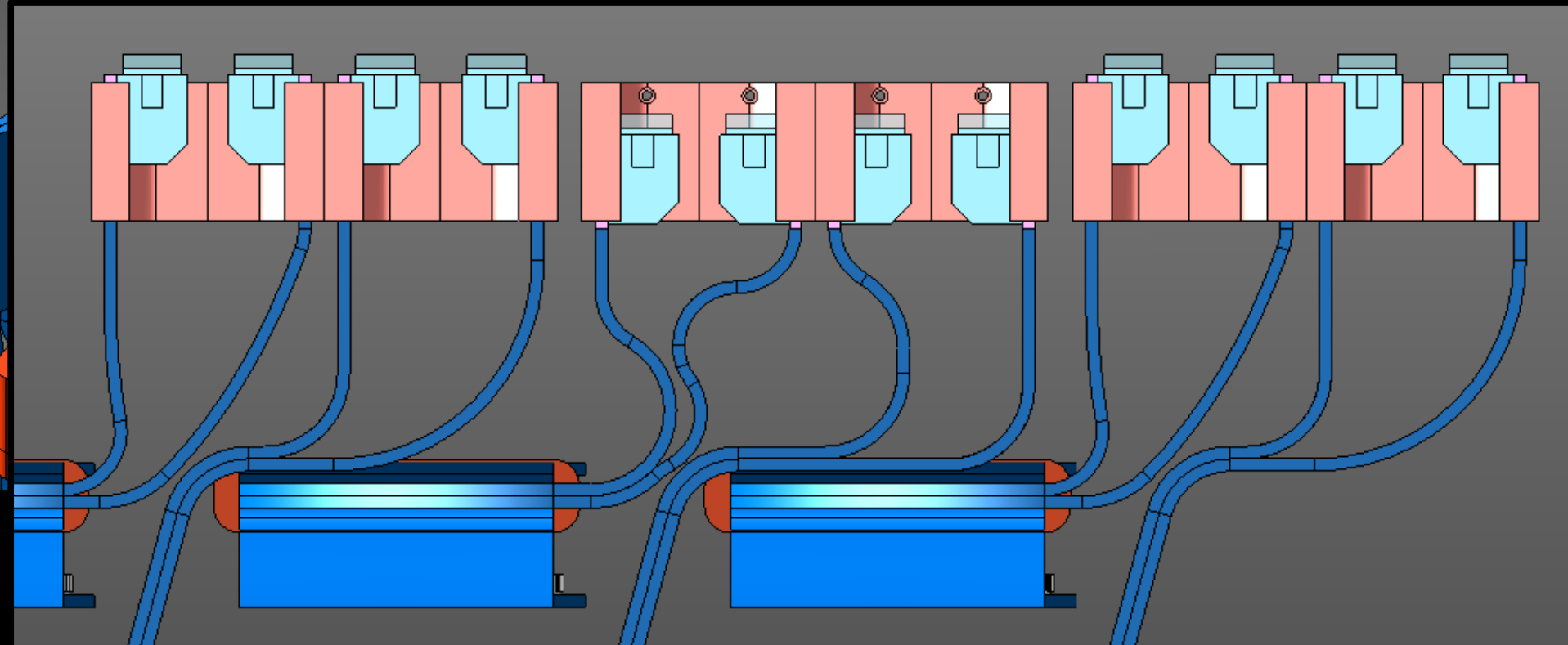


Sketch of an installation procedure



It may be possible to route the pigtails such that any one of them could be retracted without interfering with its neighbors

This is significant: it would allow the pigtails to be installed or removed in any order even with the backplanes already in place

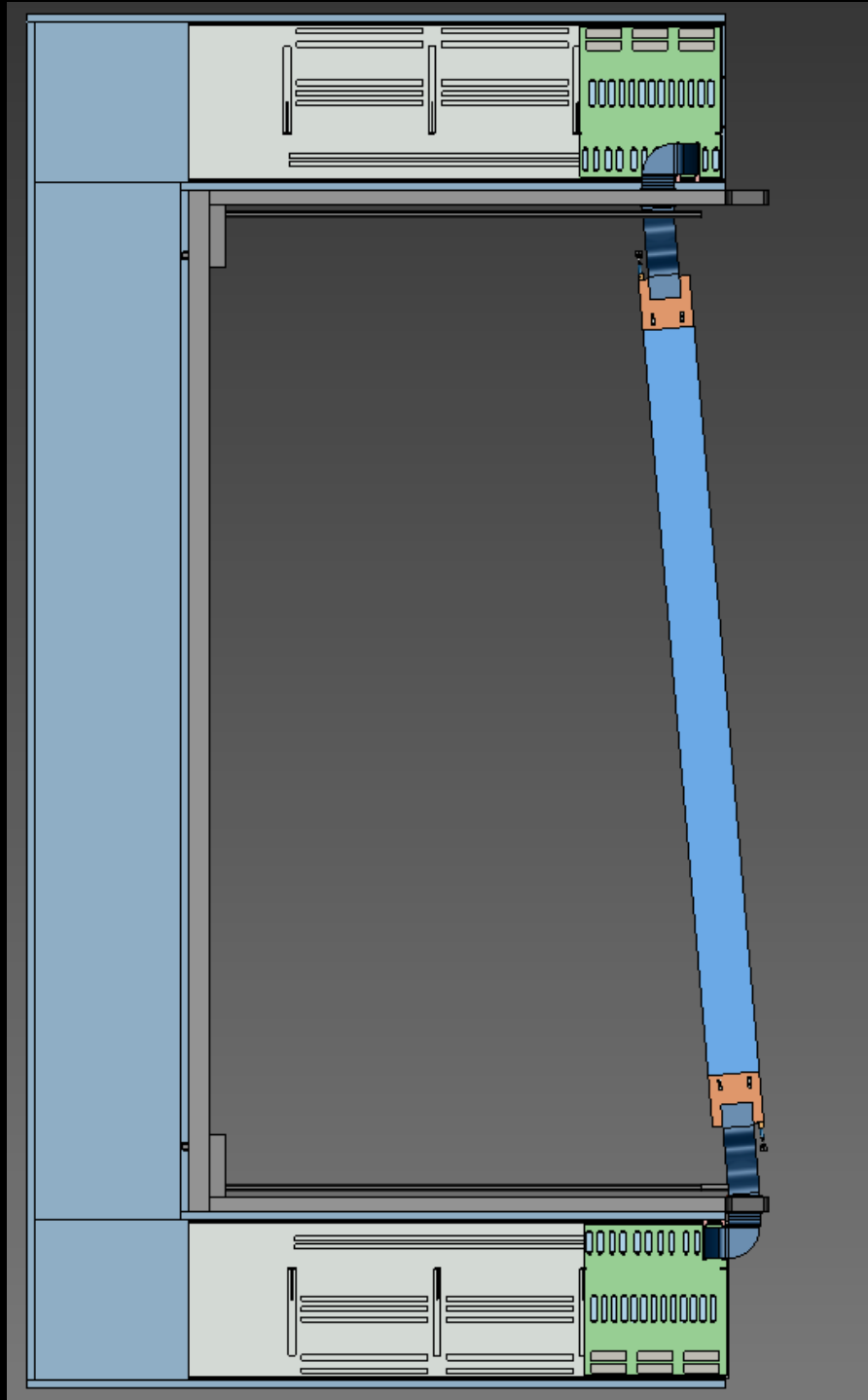


engaged

retracted

engaged

Sketch of an installation procedure

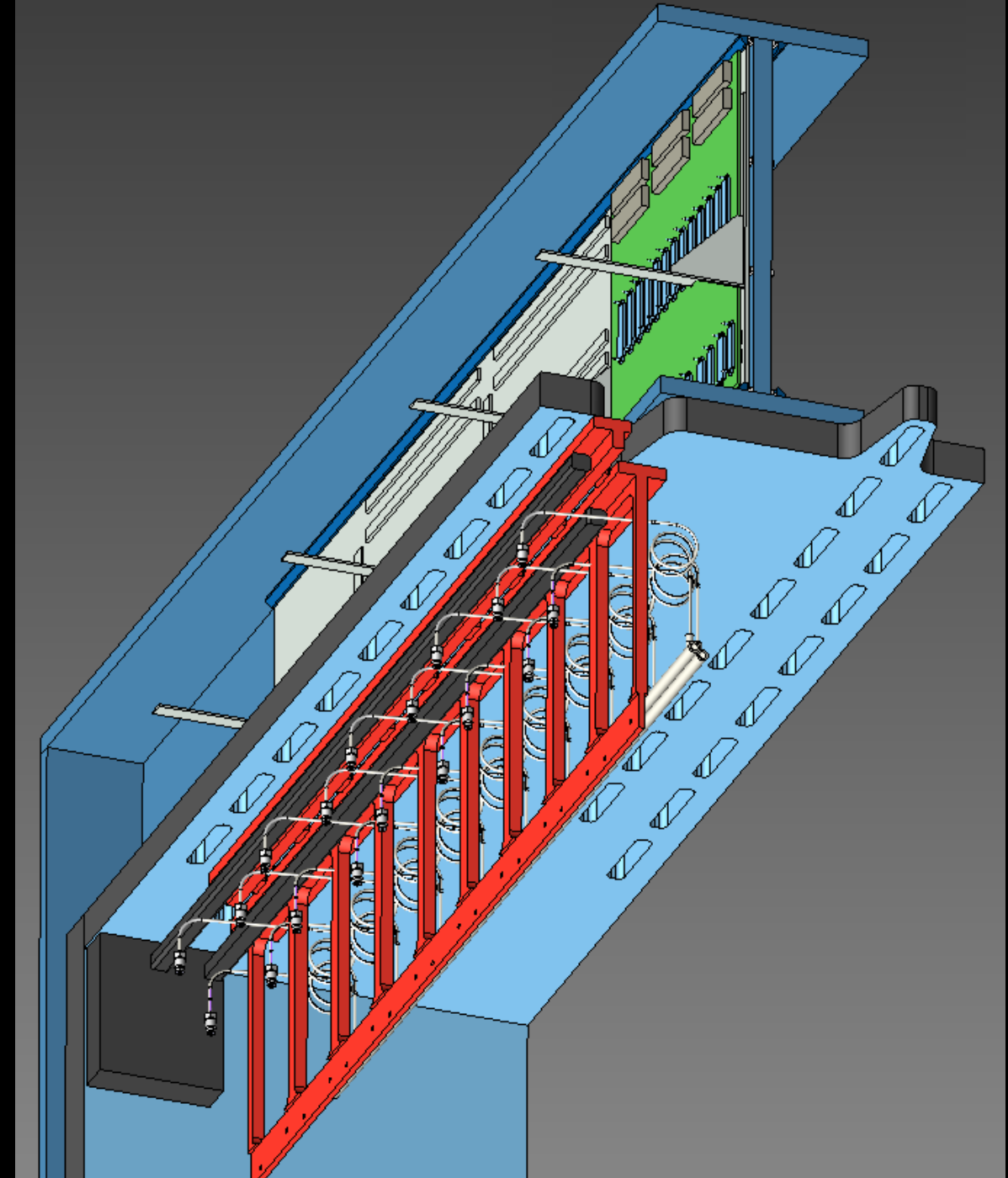


- The PEPI installation is coupled with the pigtail installation
- An important property to determine is if the pigtail installation is coupled with the stave installation
- If this is true, then the PEPI installation is coupled with the stave installation, and two PEPI chassis must be installed simultaneously

Sketch of an installation procedure

Inside the box, start with these components in place before installing pigtails:

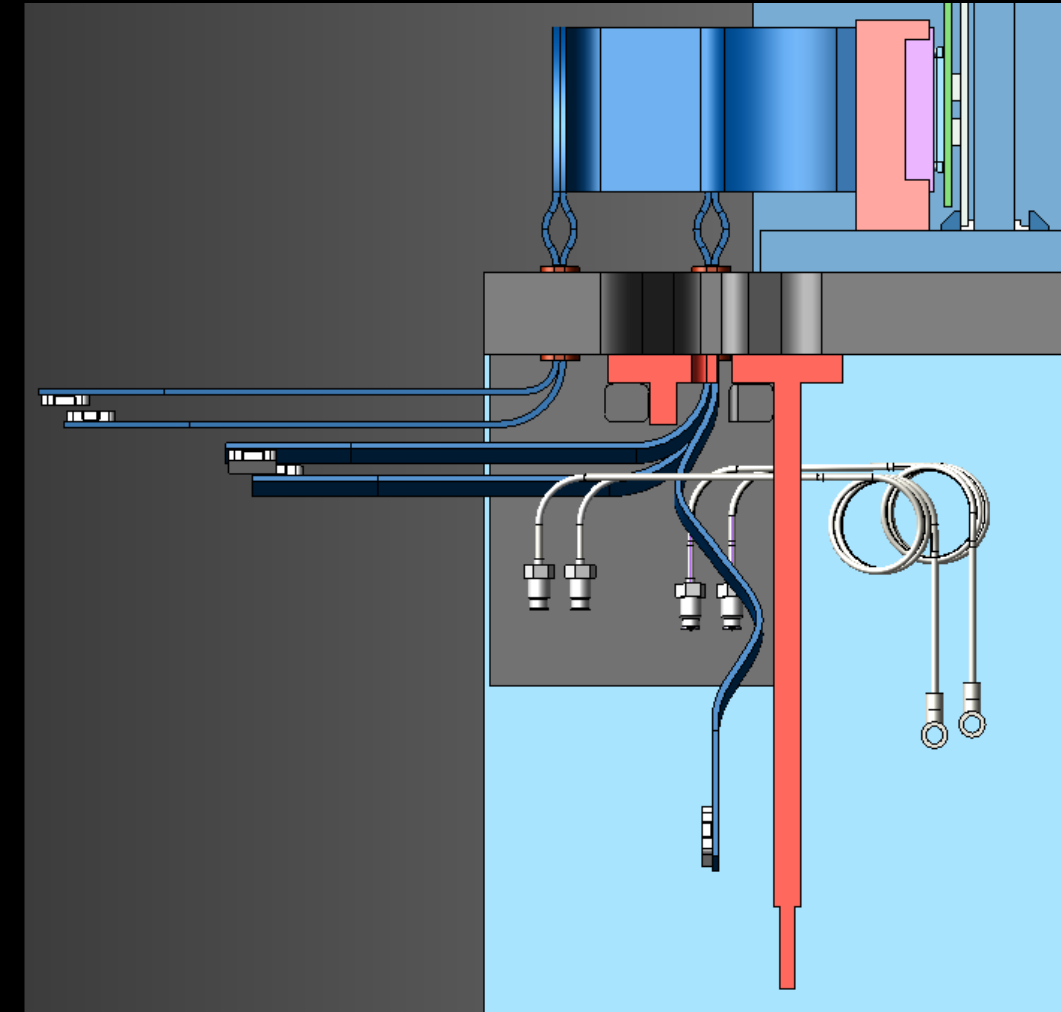
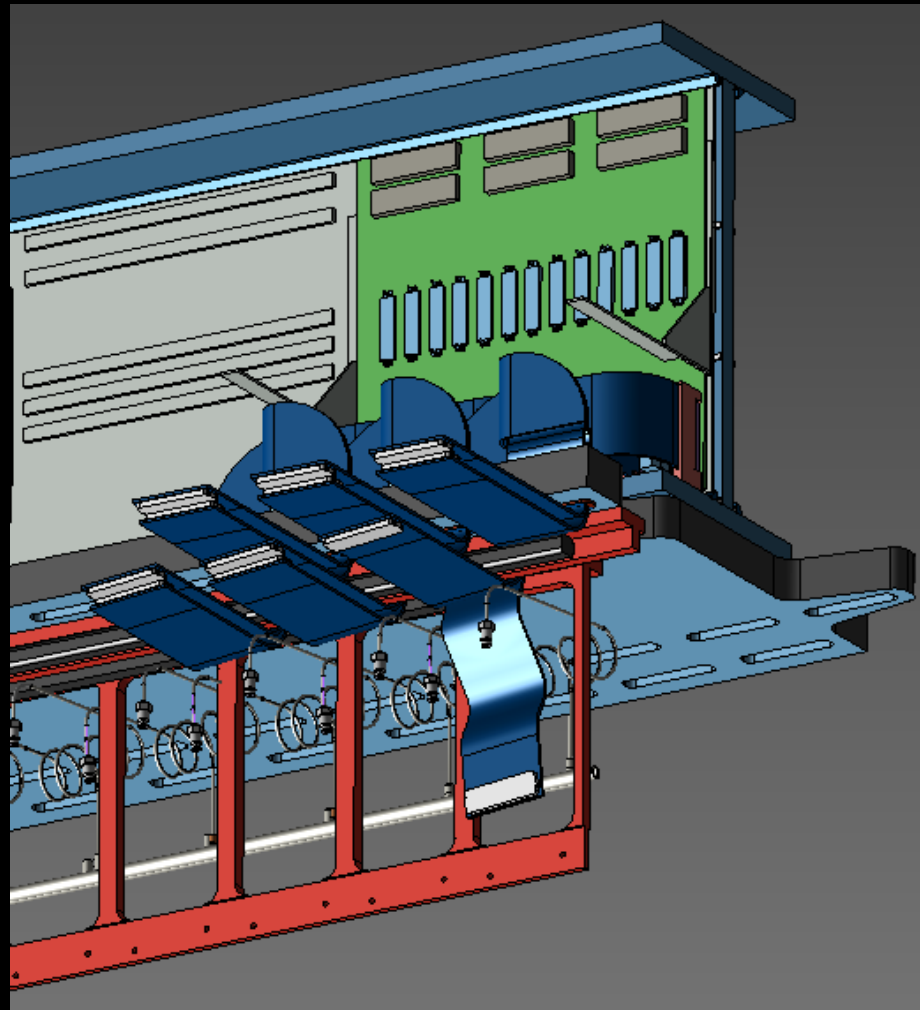
- Rigid back-plate of PEPI chassis
- Backplane
- Stave frame and stave rail
 - (sub-frames not installed yet)
- Cooling manifolds
- High voltage



Sketch of an installation procedure

Segmented stave frames allow pigtailed to be bent forward after they are inserted and gaskets are sealed

- Allows staves to be installed after pigtailed and PEPI chassis, if desired
- Reduces complexity of repairs

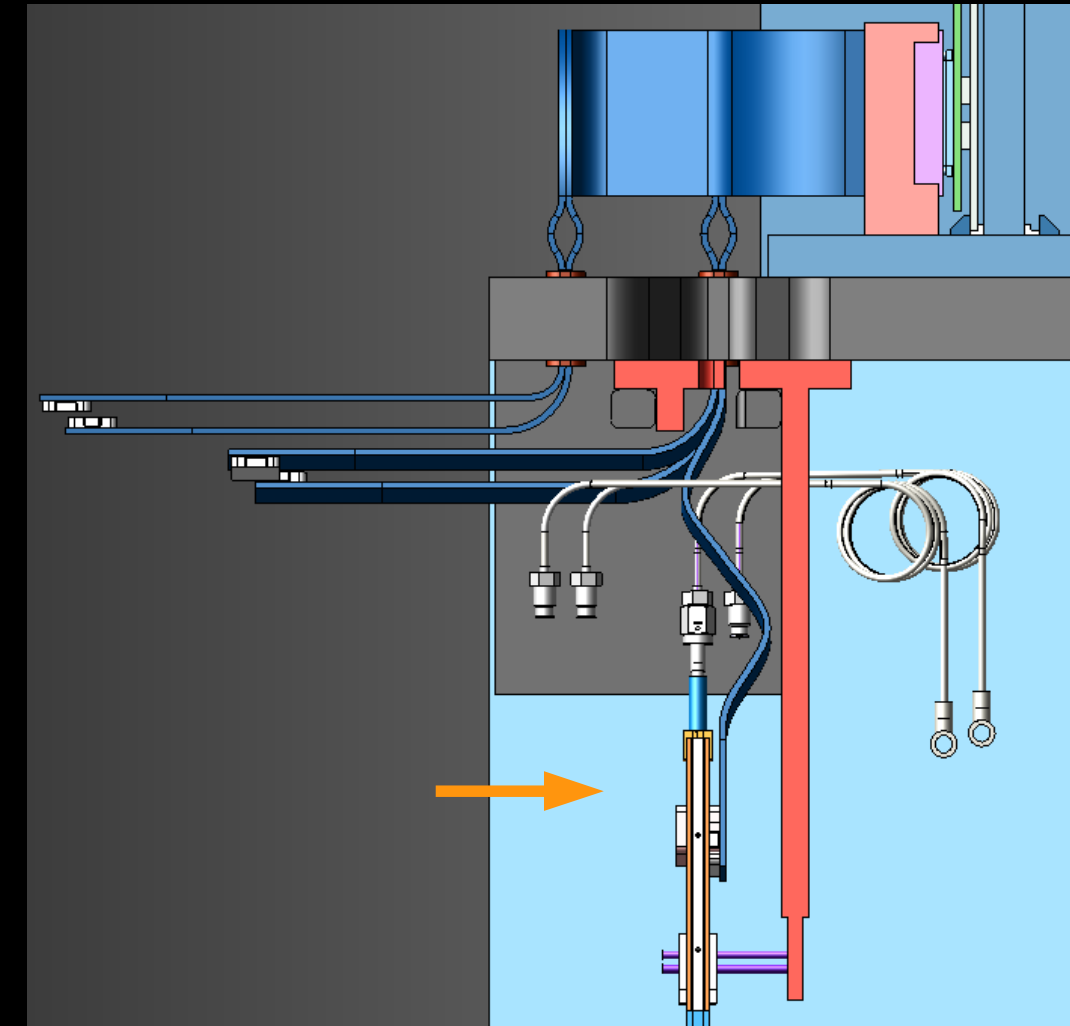
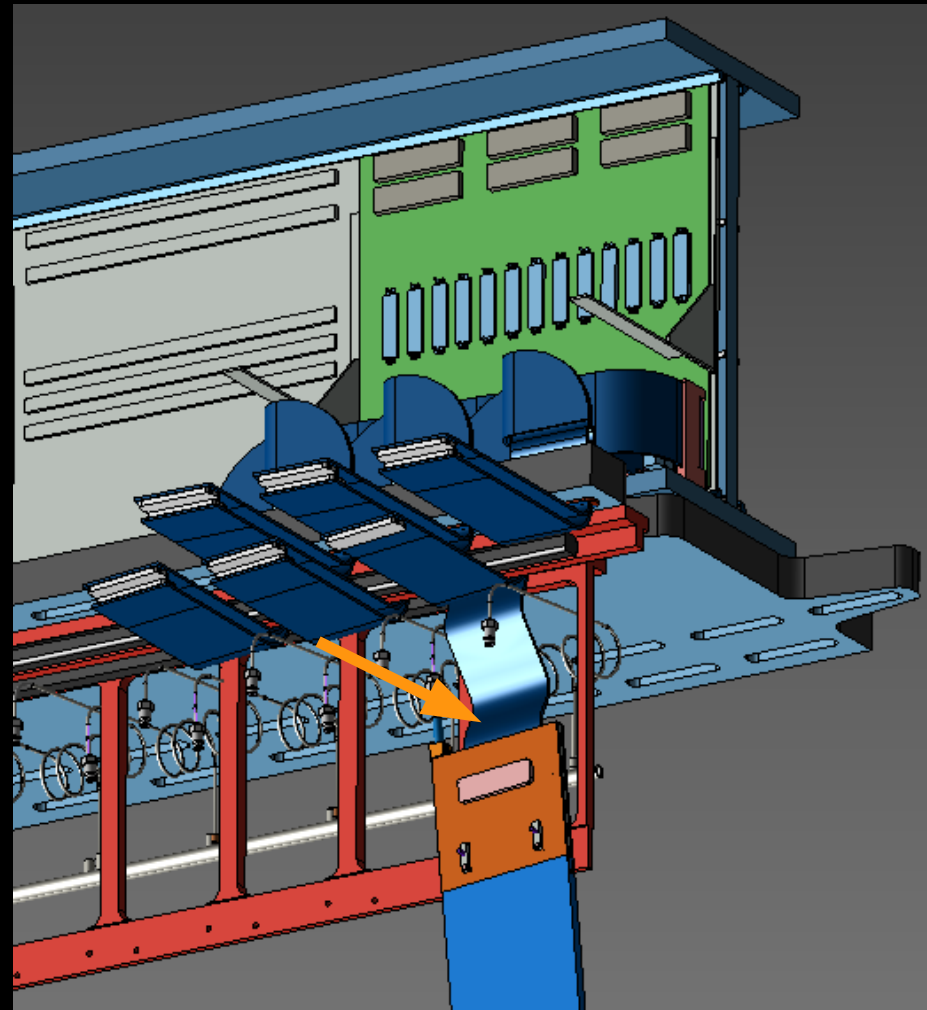


(side)

Sketch of an installation procedure

Segmented stave frames allow pigtailed to be bent forward after they are inserted and gaskets are sealed

- Allows staves to be installed after pigtailed and PEPI chassis, if desired
- Reduces complexity of repairs

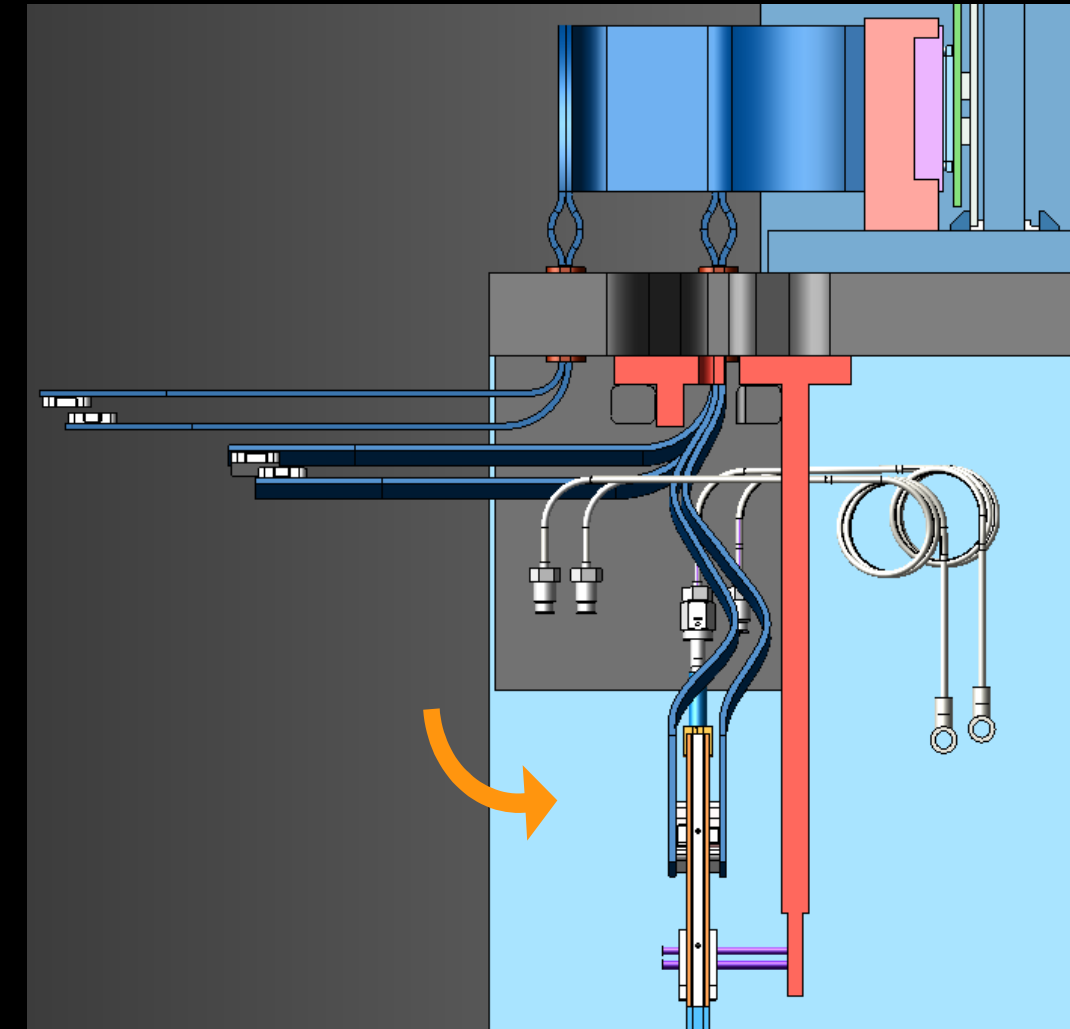
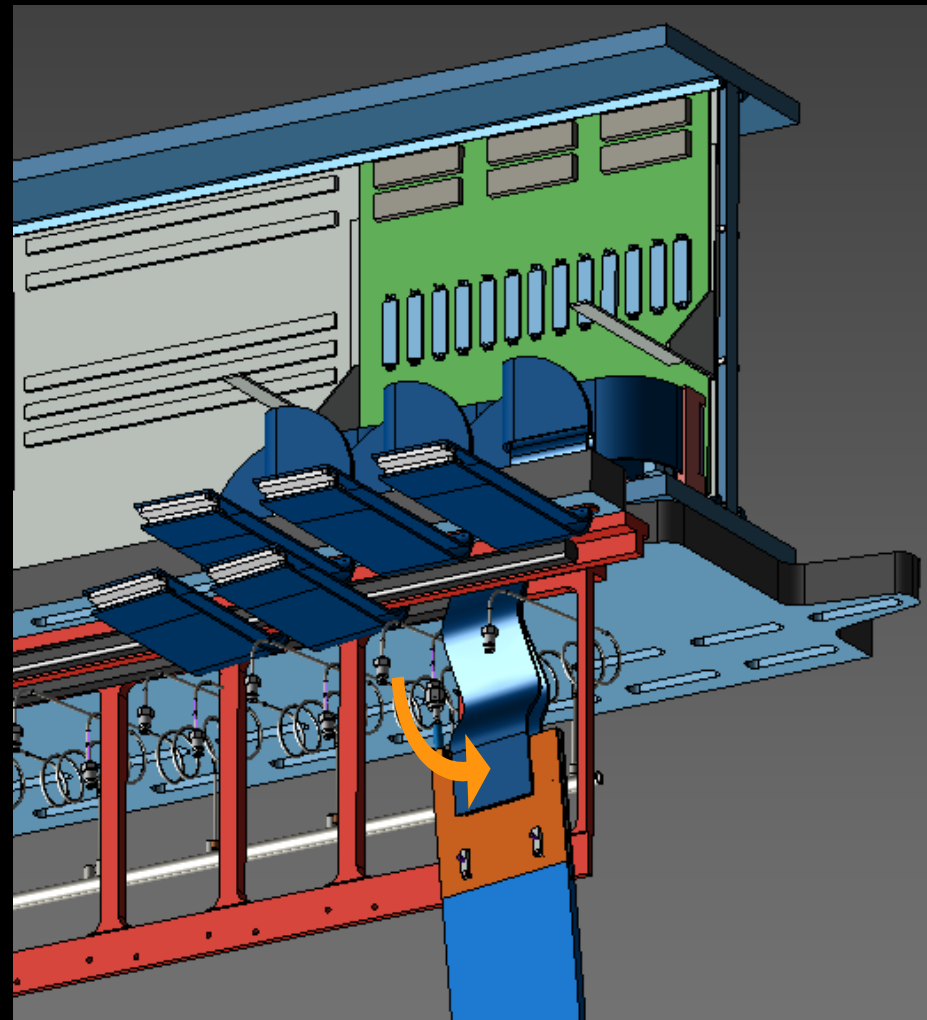


(side)

Sketch of an installation procedure

Segmented stave frames allow pigtails to be bent forward after they are inserted and gaskets are sealed

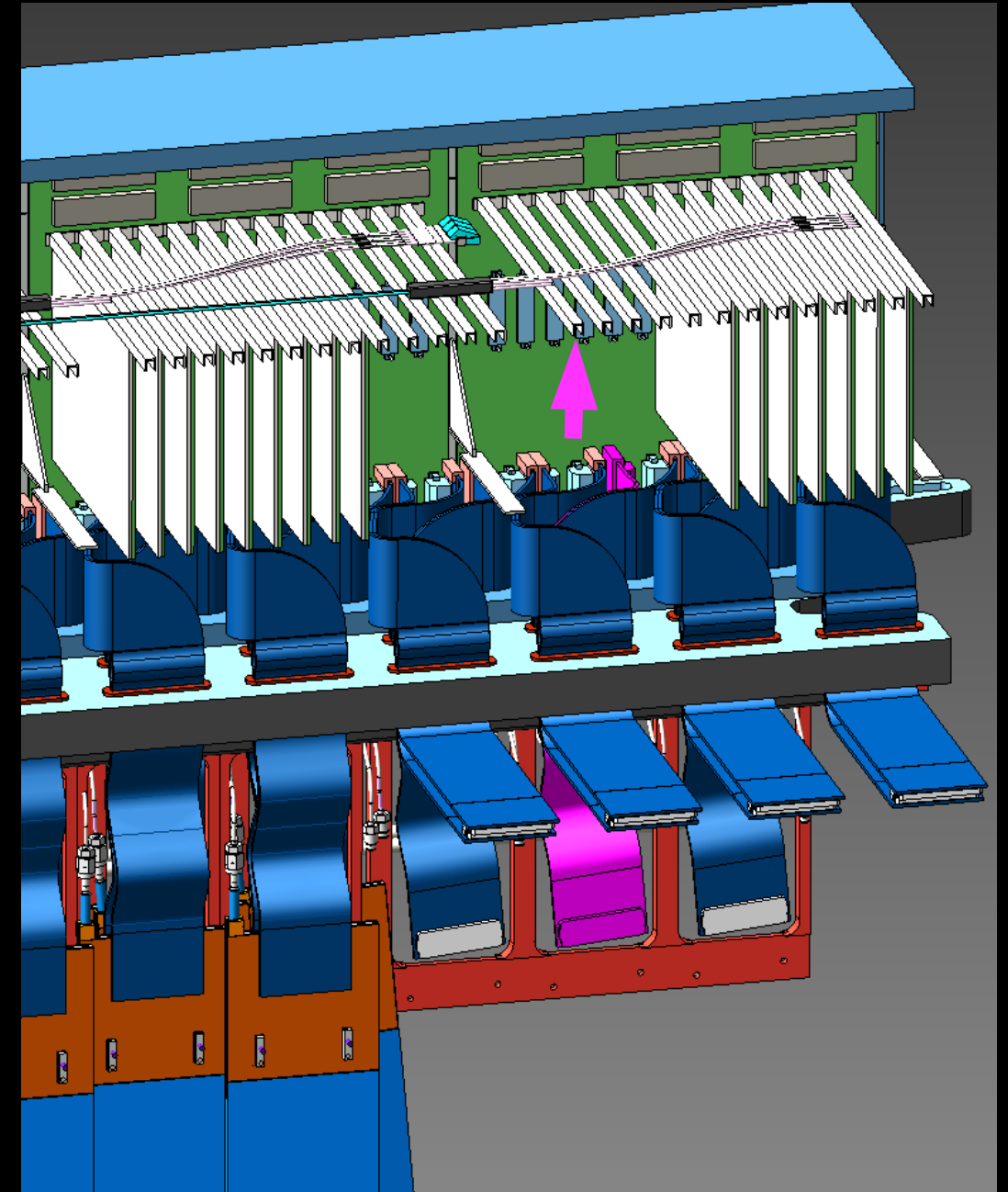
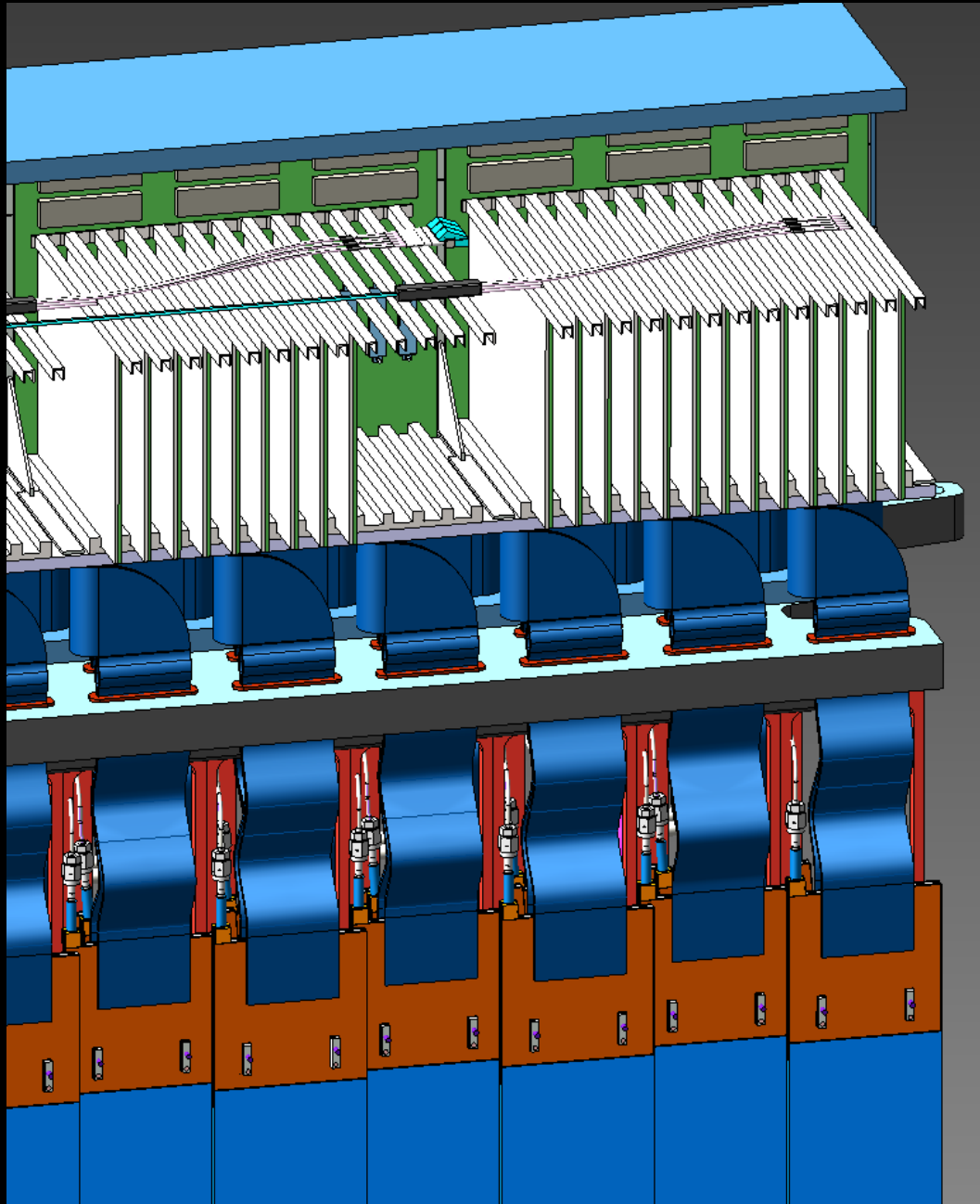
- Allows staves to be installed after pigtails and PEPI chassis, if desired
- Reduces complexity of repairs



(side)

Replacing a pigtail

Suppose we need to replace the hardest-to-get-to stereo pigtail



Replacing a pigtail

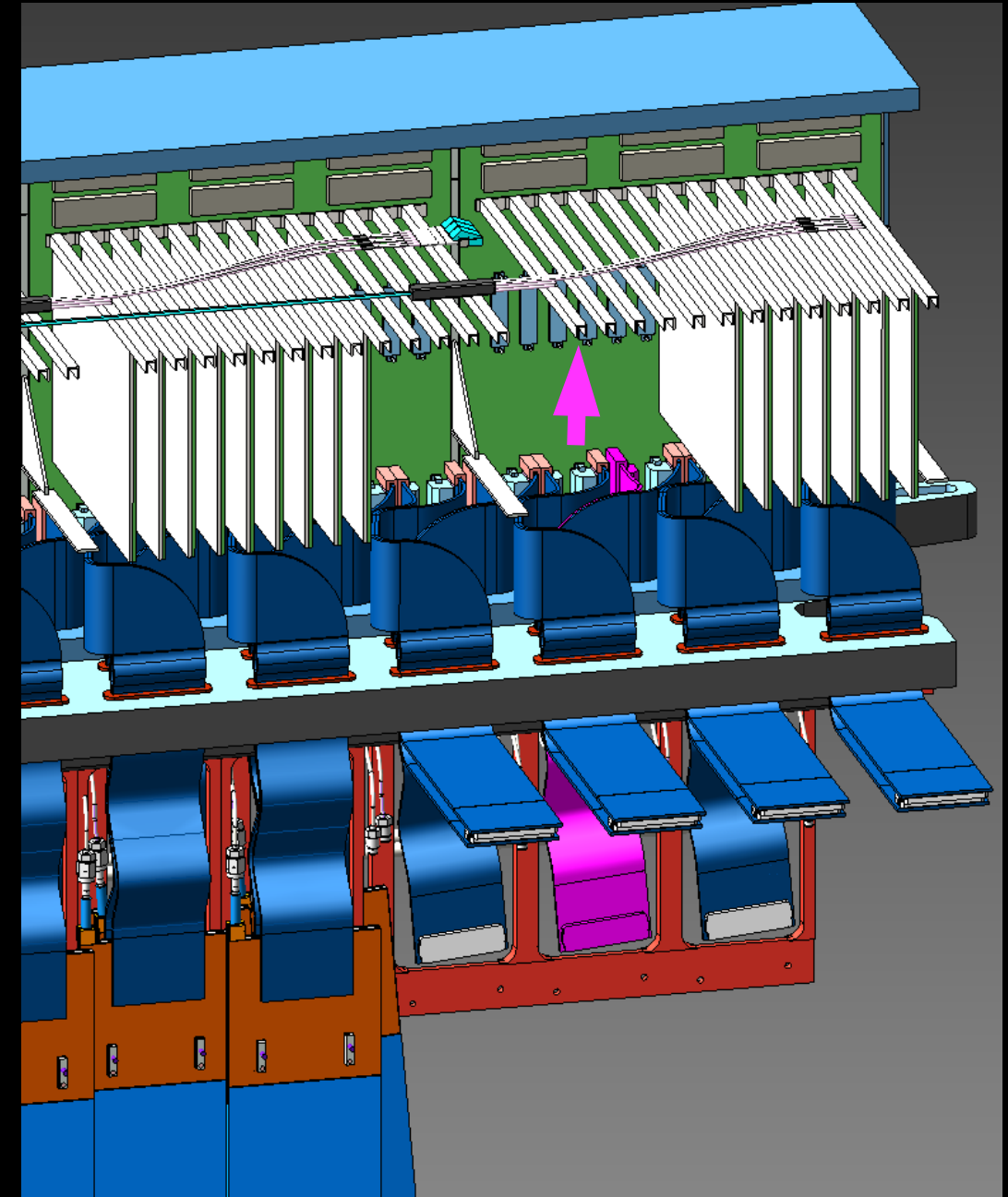
Suppose we need to replace the hardest-to-get-to stereo pigtail

This involves:

- Removing 8 staves
 - Removing 4 stave sub-frames
 - Disconnecting $8 \times 2 \times 2 = 32$ pigtails from staves (pigtails at both ends)
 - Disconnecting HV for these staves
 - Disconnecting stave cooling tubes
- Removing 6 DCBs
 - Disconnecting 6 x 3 optical duplex cables
 - Removing water jacket
 - Disengaging wedge-locks for all 31 cards

This cycles 15,800 connections in the MegArrays and Samtec connectors

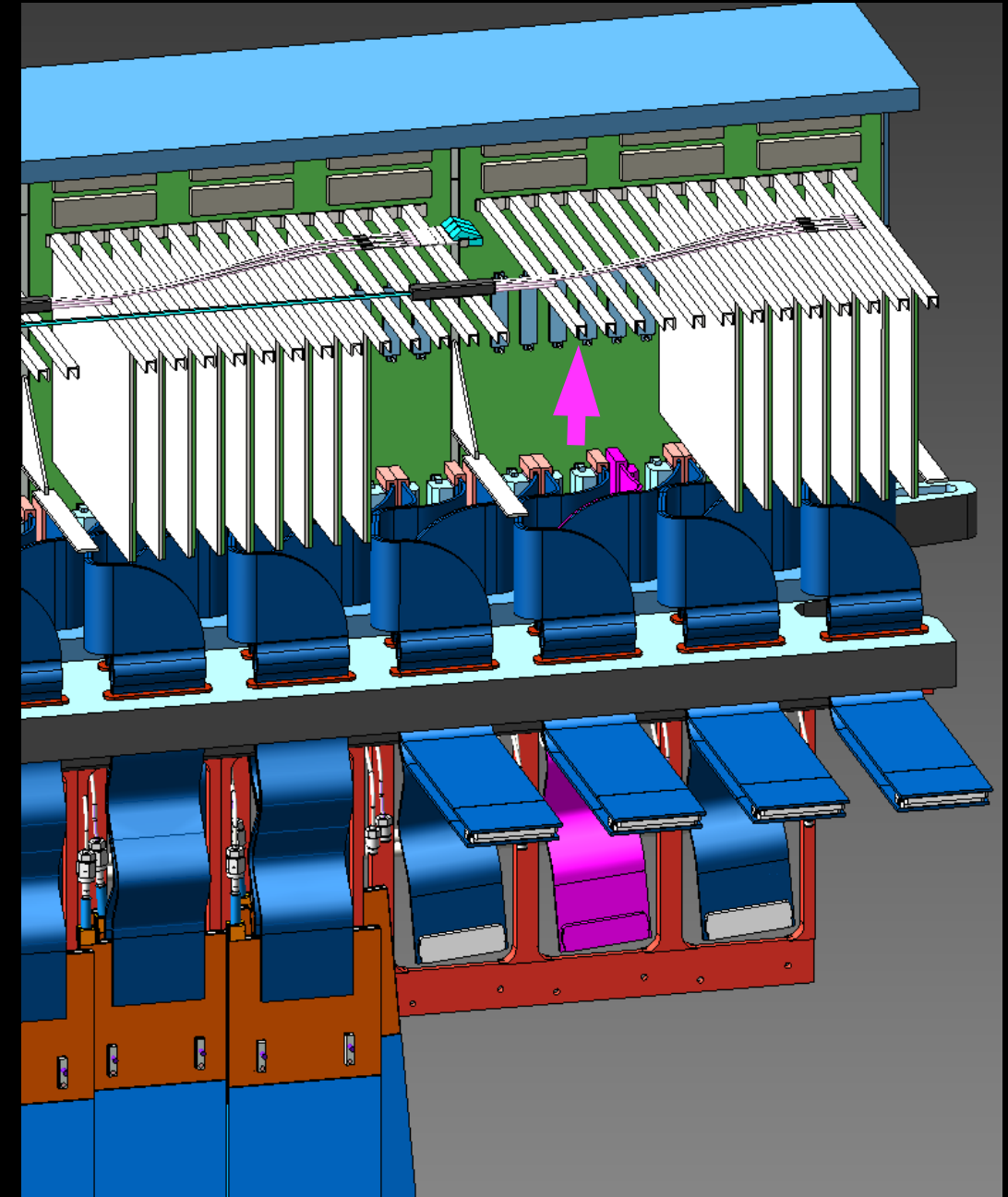
- Though not all of these channels are used



Replacing a pigtail

This can be used as a basis of comparison for similar maintenance scenarios

- Removing only the stave corresponding to this pigtail does not require removing any DCBs or the water jacket
 - The PEPI chassis can stay closed if the pigtail gasket mechanism is on the inside
- Removing adjacent pigtails instead of this one sometimes requires removing fewer staves but more DCBs



The end!