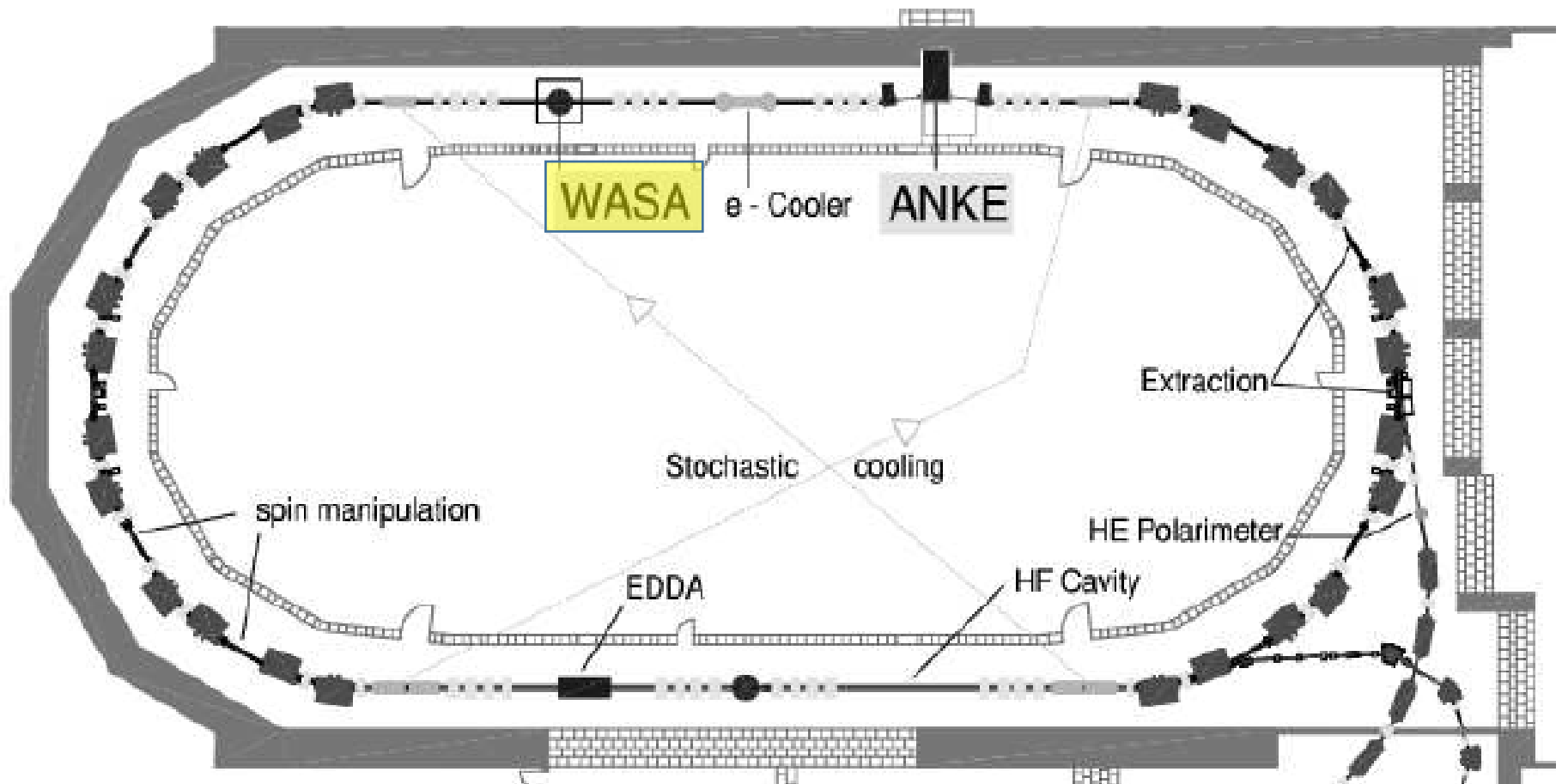


# Julich Research Center Trip Report – Tim Whitlatch

- ❖ The reason for the visit was to scope out the 4 detectors that will become part of the KLONG KFM installation at Jefferson Lab
- ❖ The detectors were part of WASA detector in COSY
- ❖ The trip spanned April 2, 2024 through April 7, 2024
- ❖ Contacts
  - ❖ Mikhail Bashkanov – University of York
  - ❖ Frank Goldenbaum – [Forschungszentrum Jülich](#)
  - ❖ Volker Hejny - [Forschungszentrum Jülich](#)
- ❖ Pictures of the trip can be found on the JLAB group drive O:\halld\_engineering\Pictures\KLong\Julich-WASA

# Cooler Synchrotron - COSY – Juelich Research Center

<https://www.fz-juelich.de/en/research/infrastructure/cooler-synchrotron-cosy>



# WASA detector – those detectors in yellow will come to JLAB

Table 2.1: Performance of the PTS

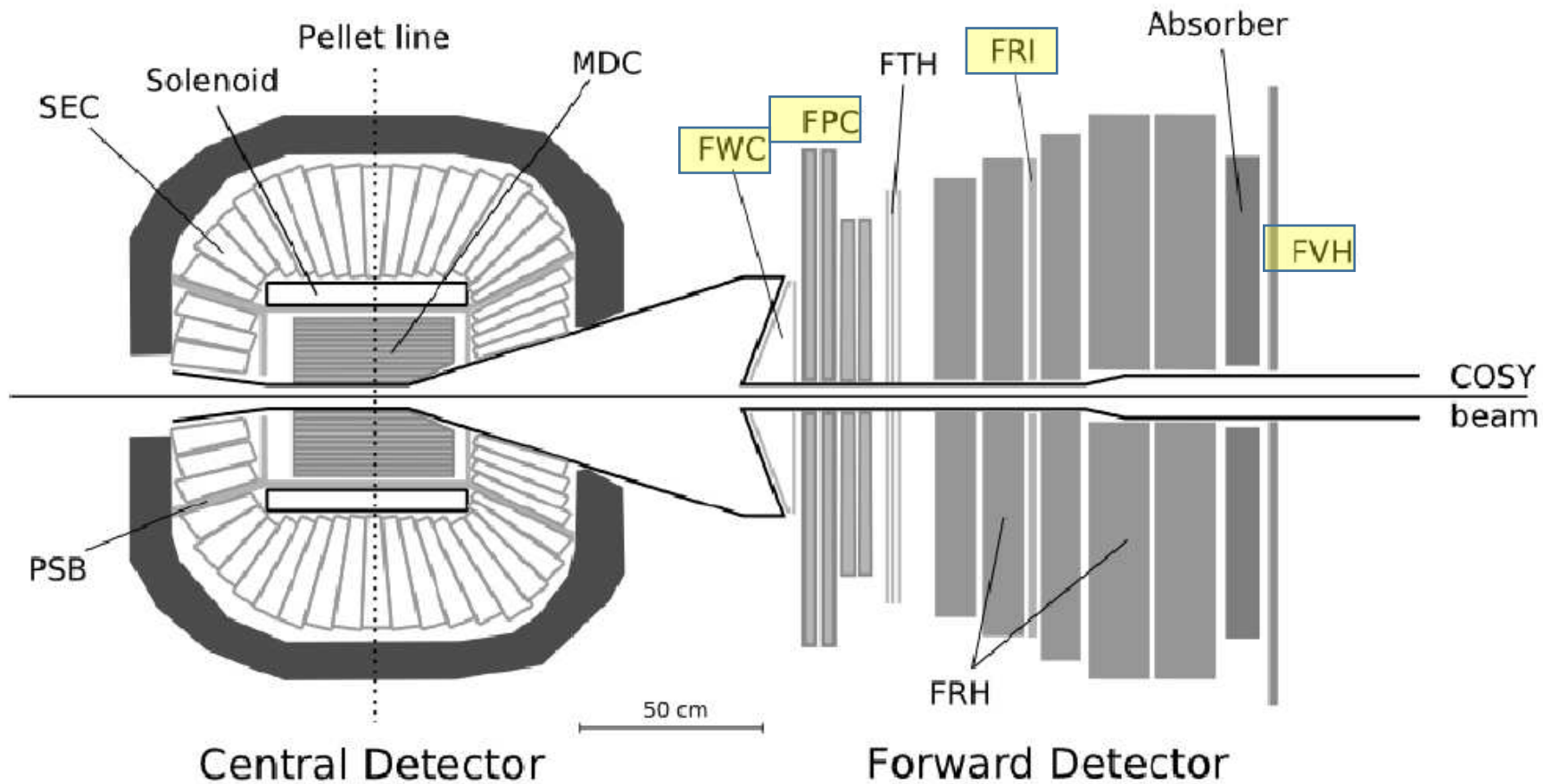
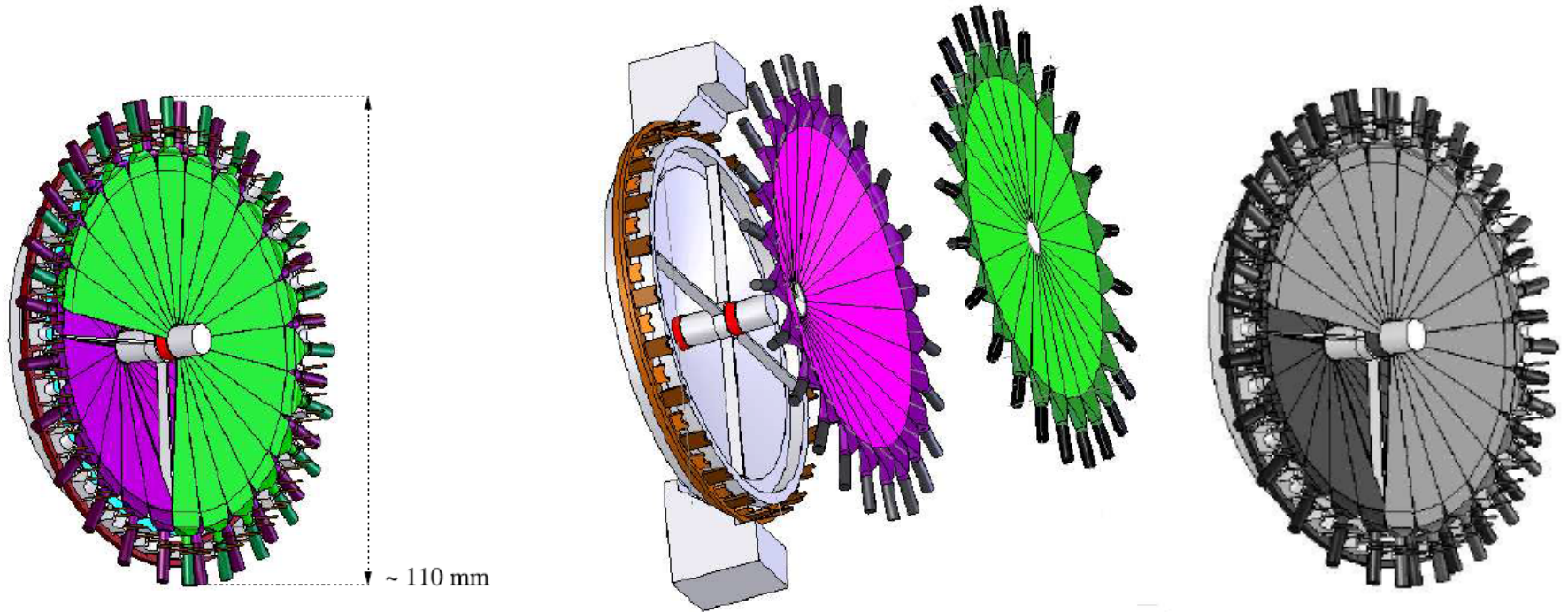


Figure 2.3: Schematic view of the WASA detector [Red10]

# Components to be transferred from Juelich to JLAB this summer

- FWC (Forward Window Counter) currently installed as part of WASA at COSY
  - Plastic scintillator/PMTs
  - About 1.6m diameter including supports
  - Attach to beampipe on ID and additional supports horizontal/vertical
  - Cone tip to face upstream at JLAB
- FPC (Forward Proportional Chamber) currently installed in WASA at COSY
  - Straw tubes
  - 4 layers, 2 different sizes
  - 80/20 supports and rails
  - About 2.3m (Y) , 3.1m (X), 22cm (Z) including 80/20
  - Need to modify bottom frame to fit on 1m beamline height
- FVH (Forward Veto Hodoscope) currently installed in WASA at COSY
  - Plastic Scintillator paddles/PMTs
  - 80/20 frame
  - Supported from ground at COSY
  - 3.6m (Y), 2.8m (X), 0.6m (Z, includes PMTs)
  - Modify center paddle for 1m beamline height
- FRI (Forward Range Intermediate) Currently at COSY but not installed
  - Plastic Scintillator/PMTs
  - Supported from ground with anti tipping support – not currently installed at COSY
  - 2.2m (Y), 2.35m (X), 11cm (Z)
  - Need to shorten bottom to accommodate 1m beamline height

# FWC Assembly



**Figure 3.2:** Sketch of the new FWC. The right side shows the layers and the scattering window separated in an explosion view. The vacuum tubes and the ring of screws at the scattering window are adumbrated.

(a) Forward  
Window Counter

# FWC installation – supports on sides, top and bottom

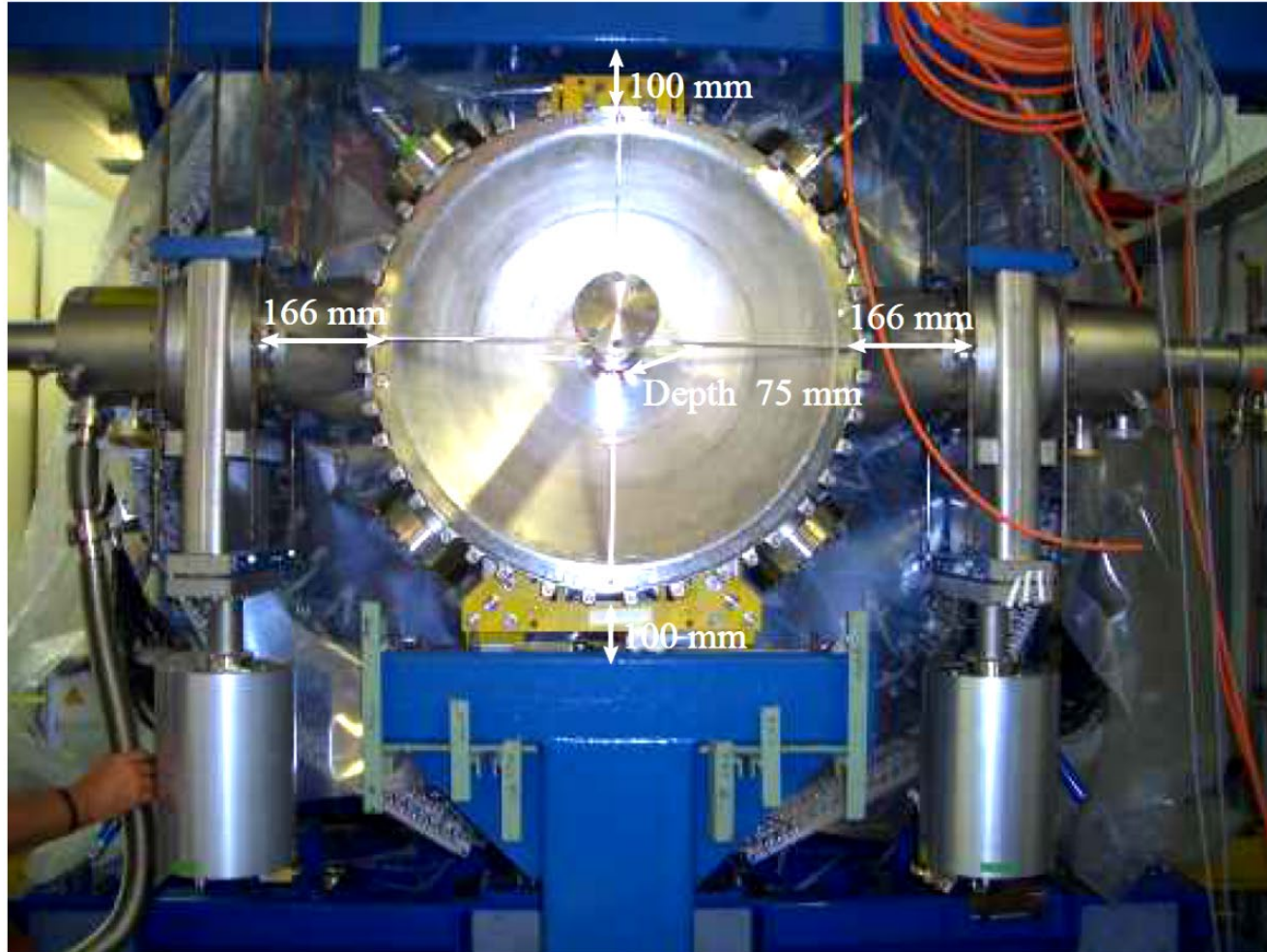


Figure 3.4: Photo of the place where the FWC was installed later on.

FWC installed on beampipe. It will be completely dis-assembled for shipment to JLAB

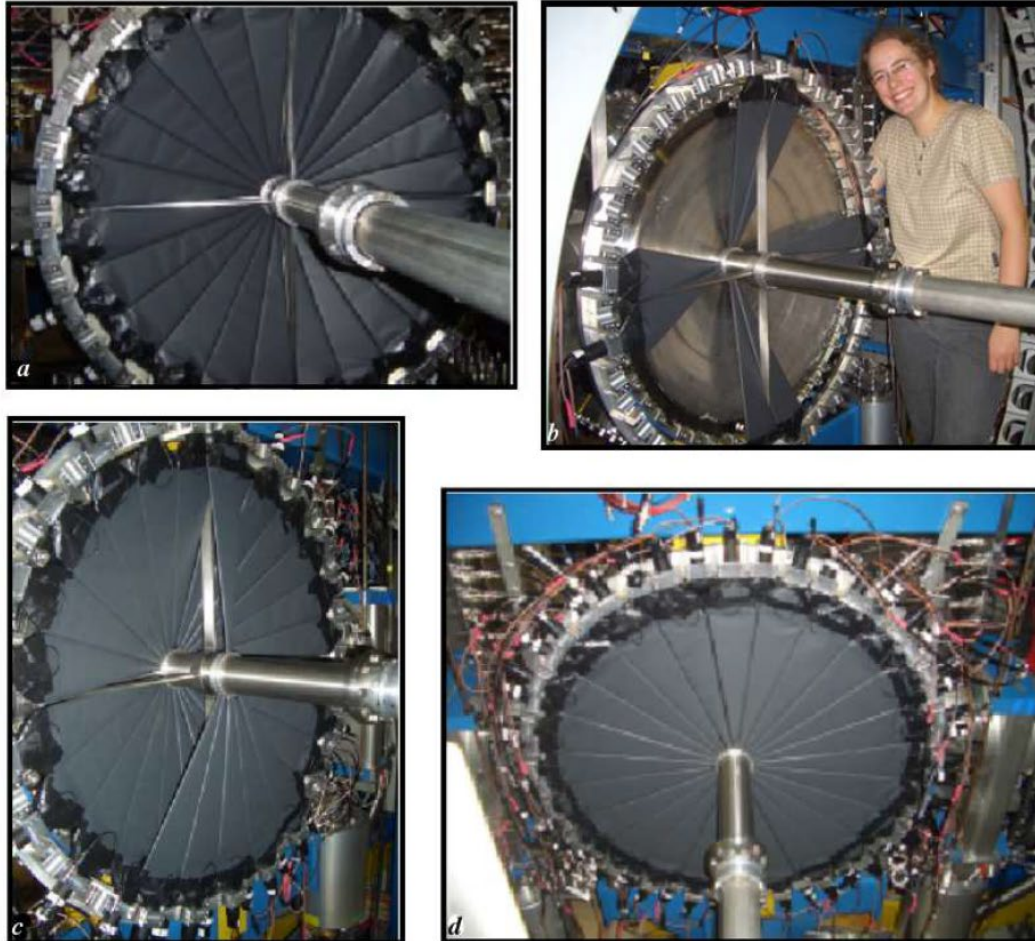
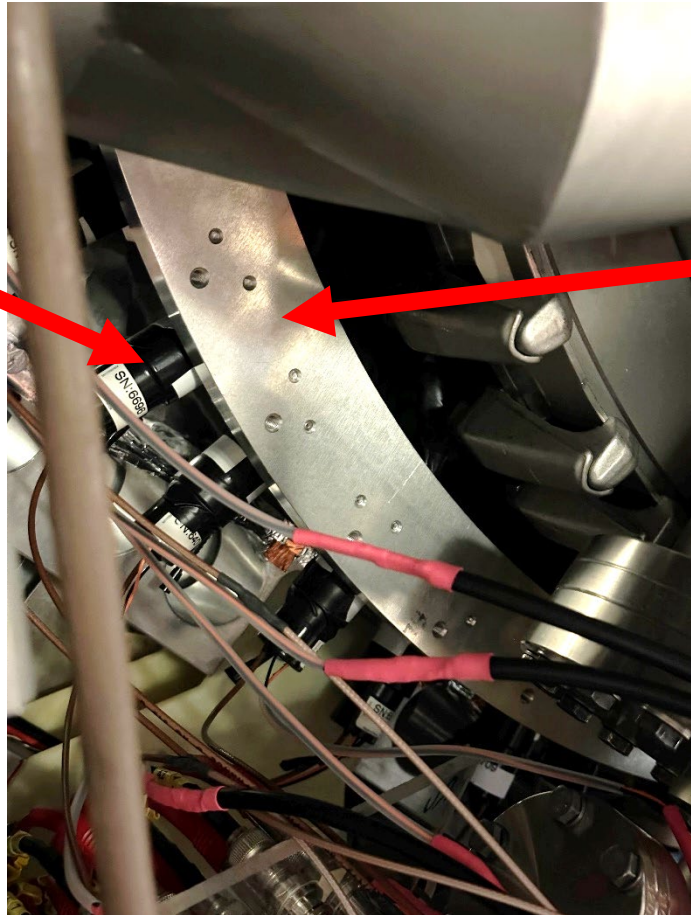


Figure 3.14: Installation of the FWC at WASA: Photo a) the fully mounted conical layer, photo b) shows the elements of the conical layer at the cross. Photo c) shows the

# FWC installed in WASA – closeup of ring where there will be supports

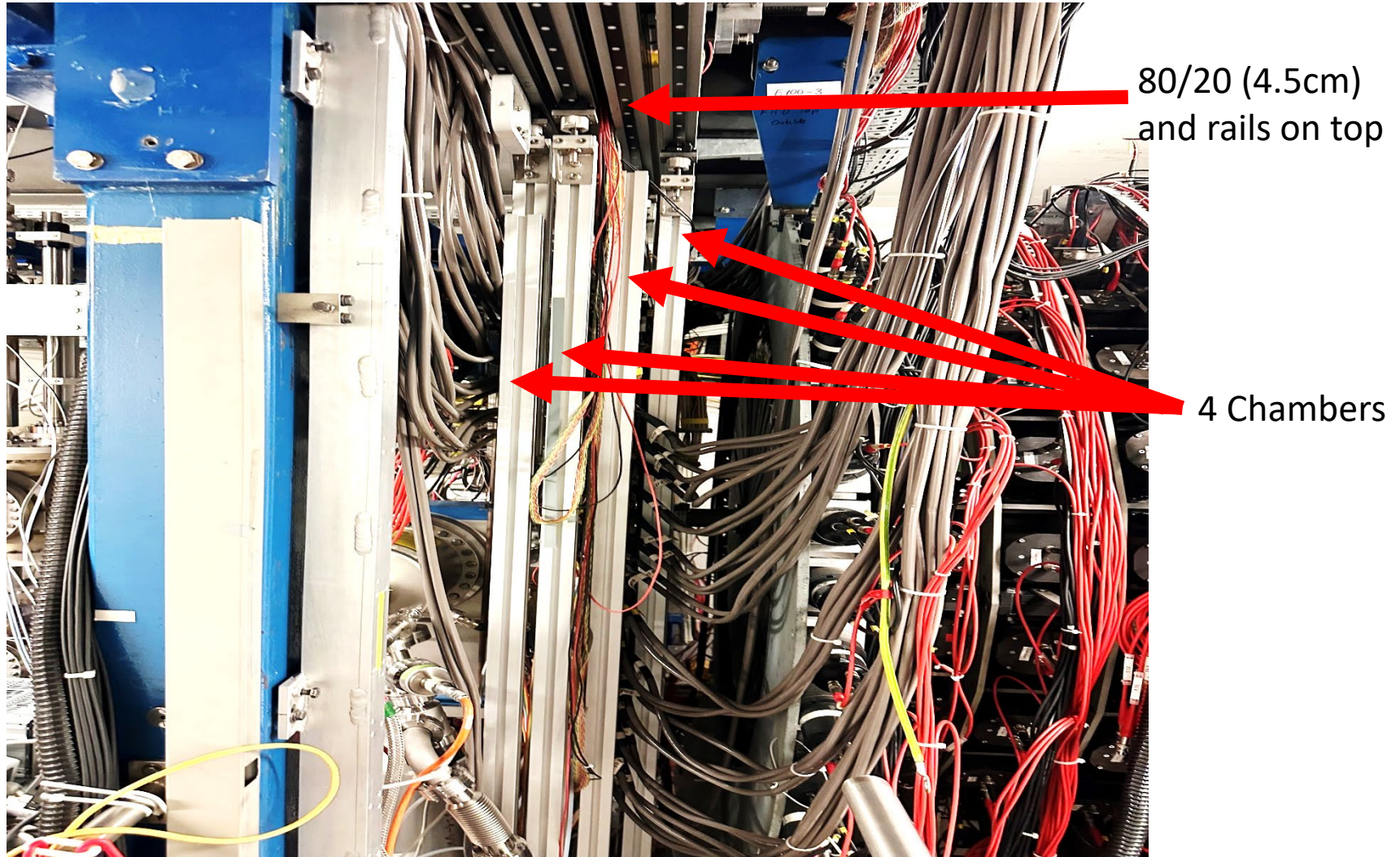
PMT

Support Ring

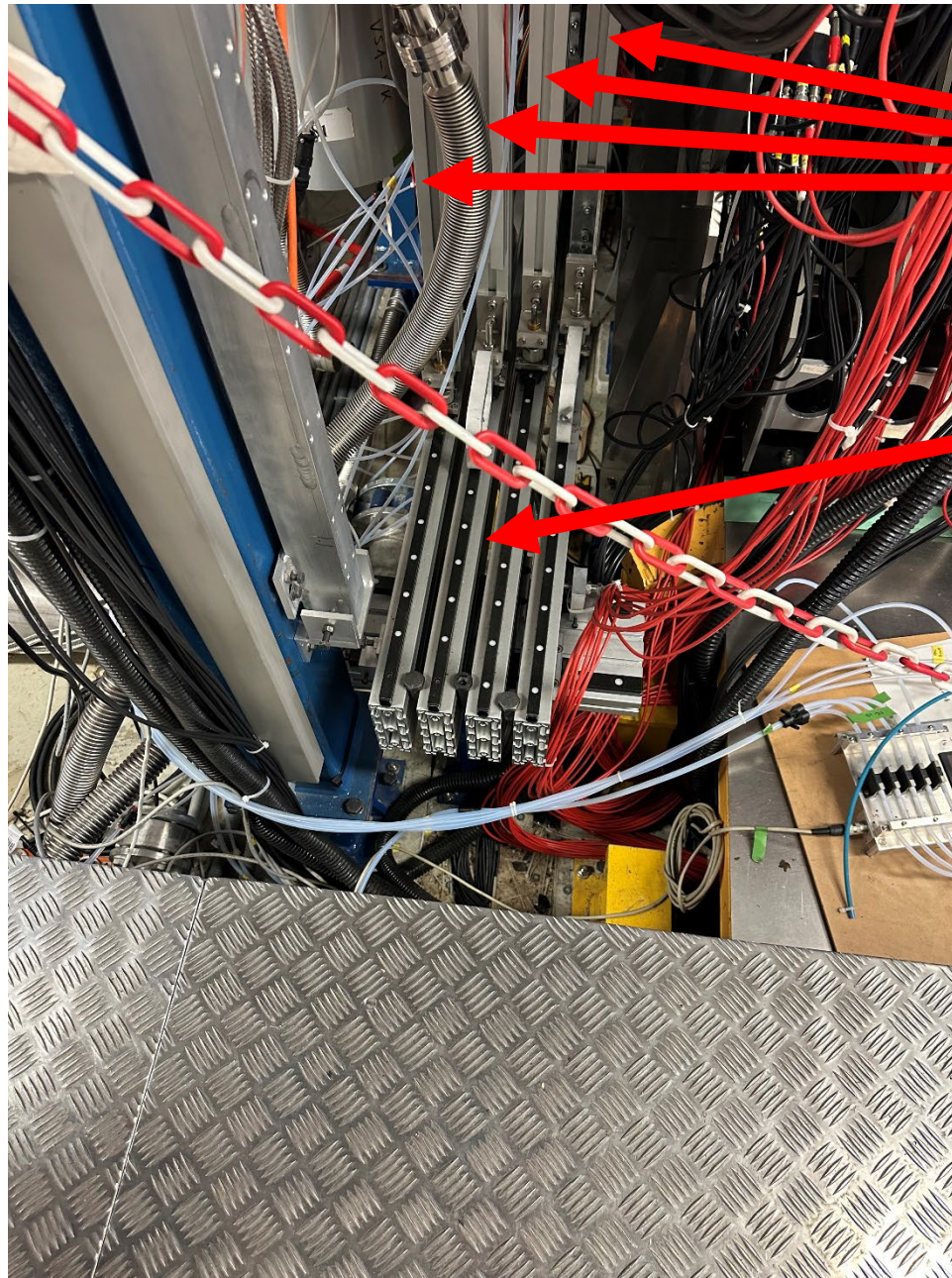




# FPC installed in WASA



# FPC installed in WASA



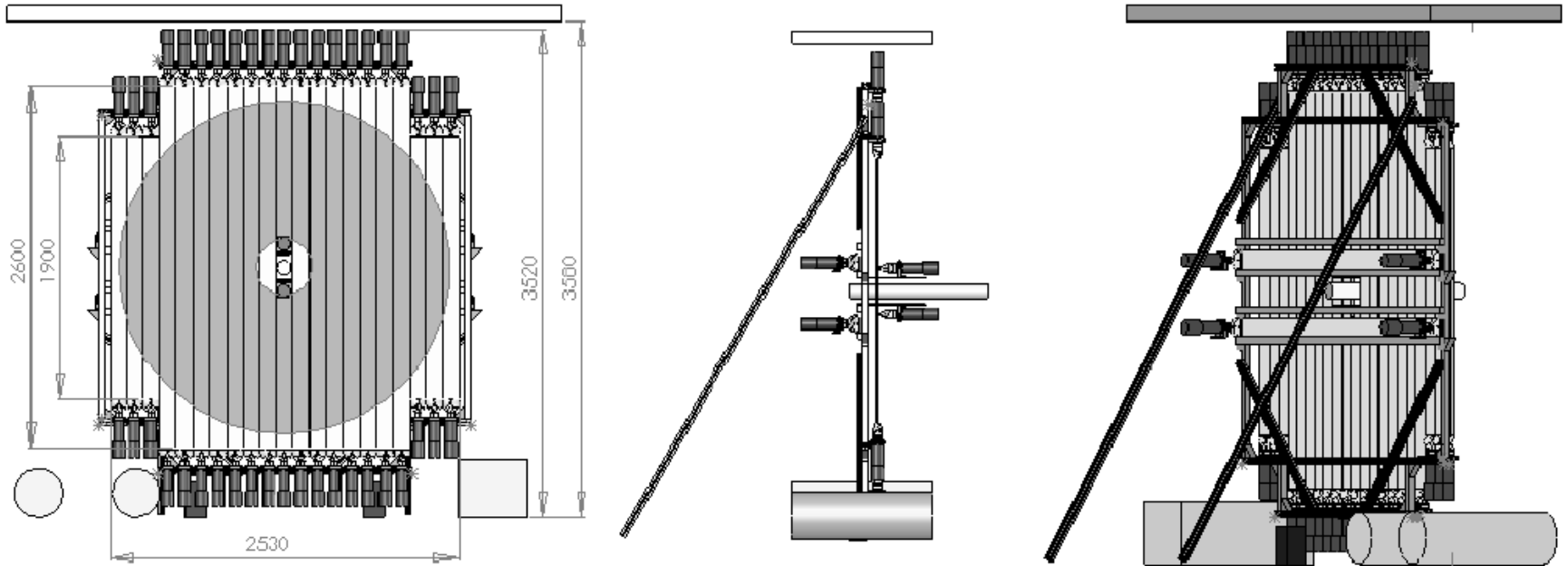
4 Chambers

As the current dimension to beam centerline is too large for hall D (approx. 1m), the 80/20 (4.5cm) and rails on bottom, will need to remove bottom 80/20 and attach rails directly to platform or remove rails completely. They may not be needed for install in Hall D.

# FPC cables

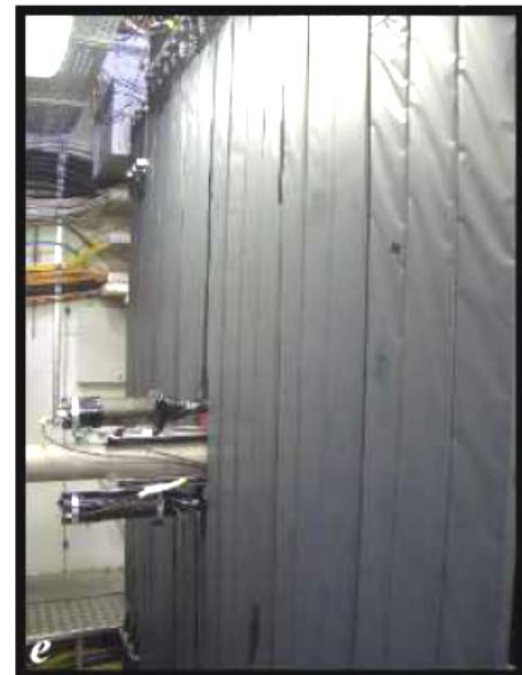
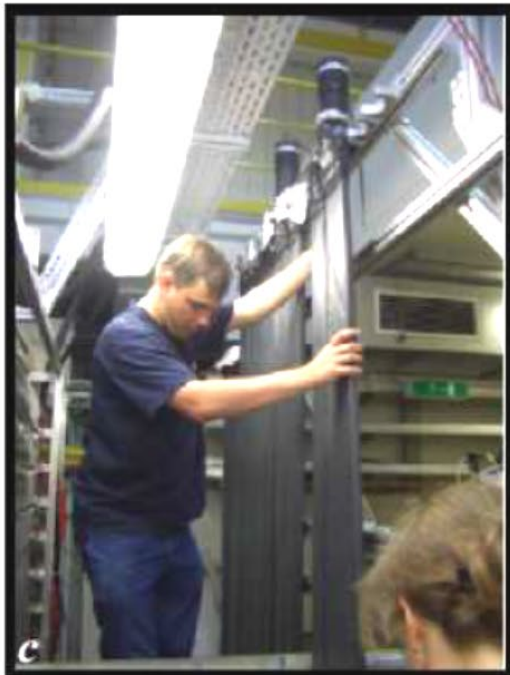
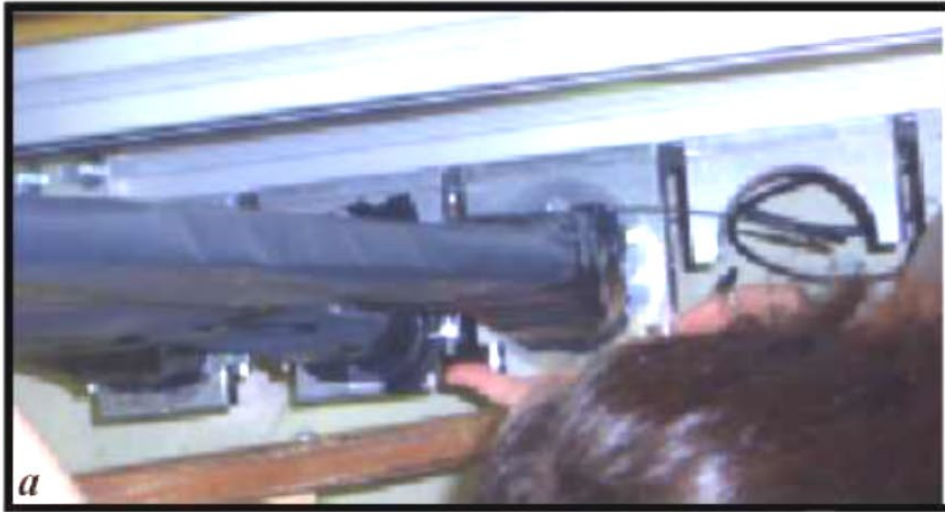


# FVH

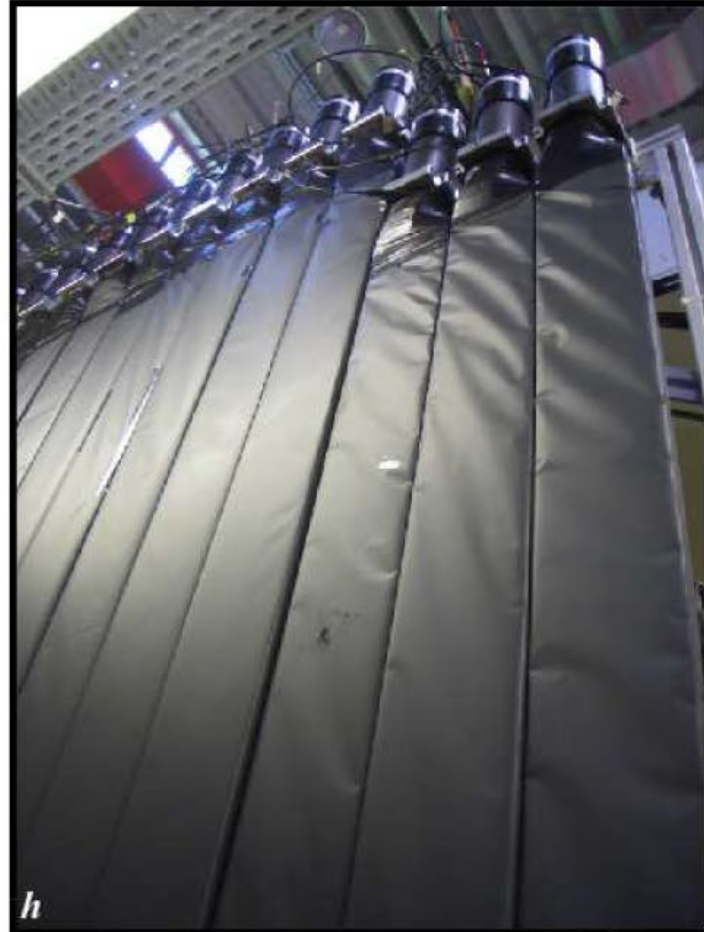


**Figure 3.21:** Sketch of the new FVH. Left: looking onto the detector from the interaction point. The red shaded area marks the acceptance range of the FD. Middle: The PMTs of the horizontal bars point in beam direction, the PMTs of the middle bars point towards the beam direction, because on the backside no space is available due to the quadrupole. Right: inclined view on the rear side, the two horizontal bars are visible.

# FVH being installed for WASA



# FVH install for WASA



**Figure 3.24:** Installation of the new FVH layer: First the element is put on the lower holding system, which holds the weight of the element (a). After that the upper part is attached (b, c) and both clamps are fixed. The exact position of the upper clamp is not fixed to allow tolerances in the length of the element. Photo d) shows the first two installed elements, photo e) the elements at the beam pipe. Photo f) shows

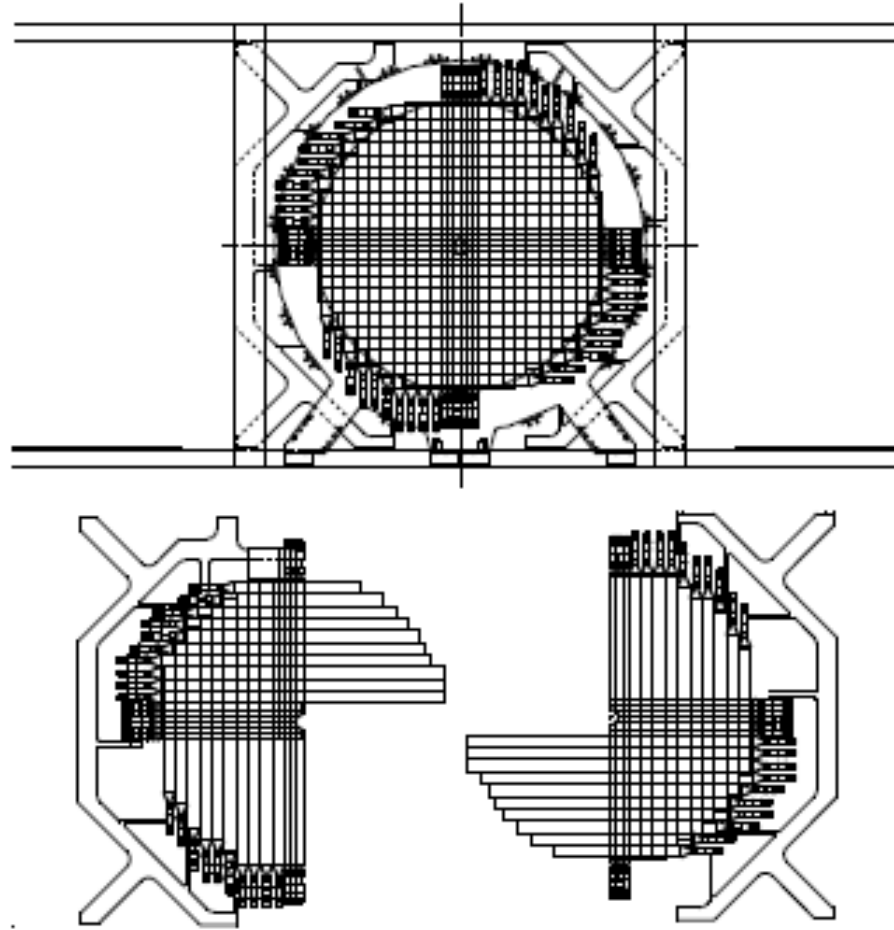
# FVH



Tipping support –  
attach to platform

Existing Bottom Feet can attach  
to Hall D platform

# FRI (Forward Range Intermediate) Currently at COSY but not installed

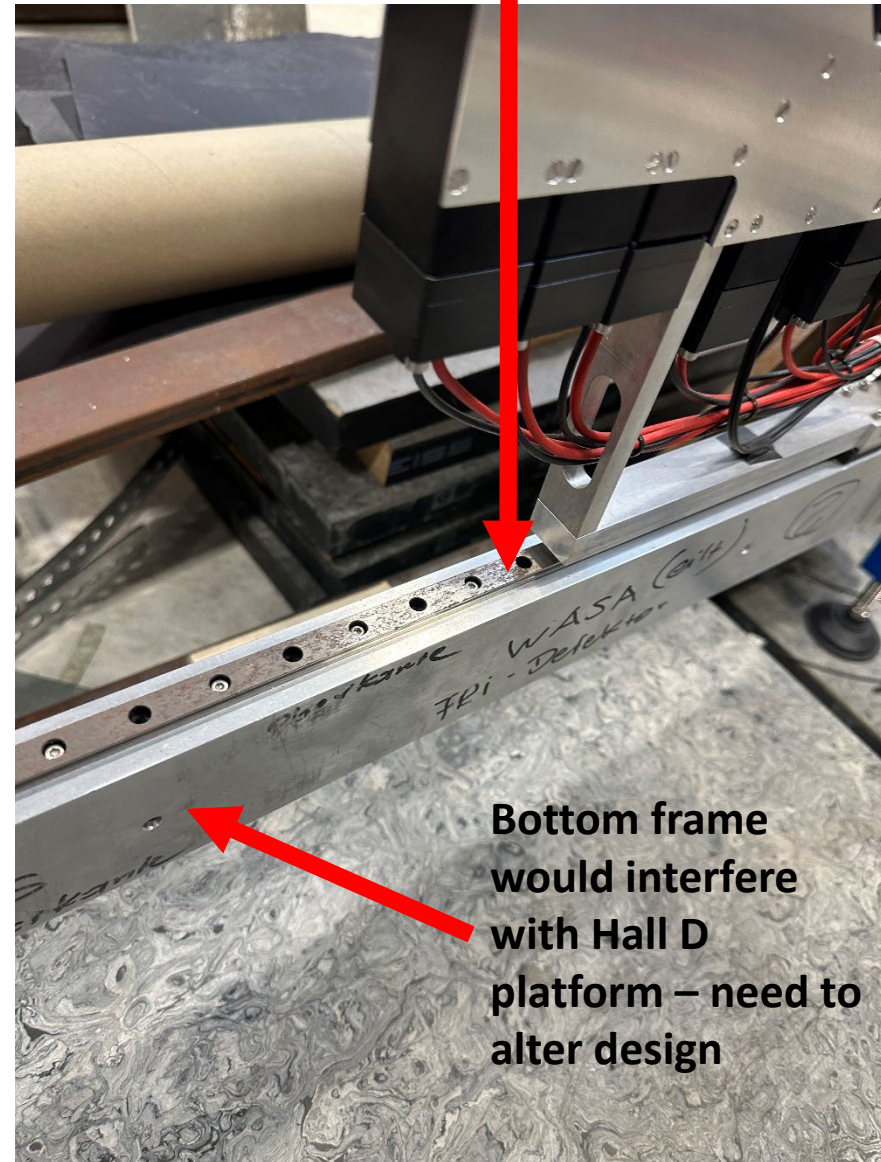


(e) *Forward Range Intermediate Hodoscope FRI*

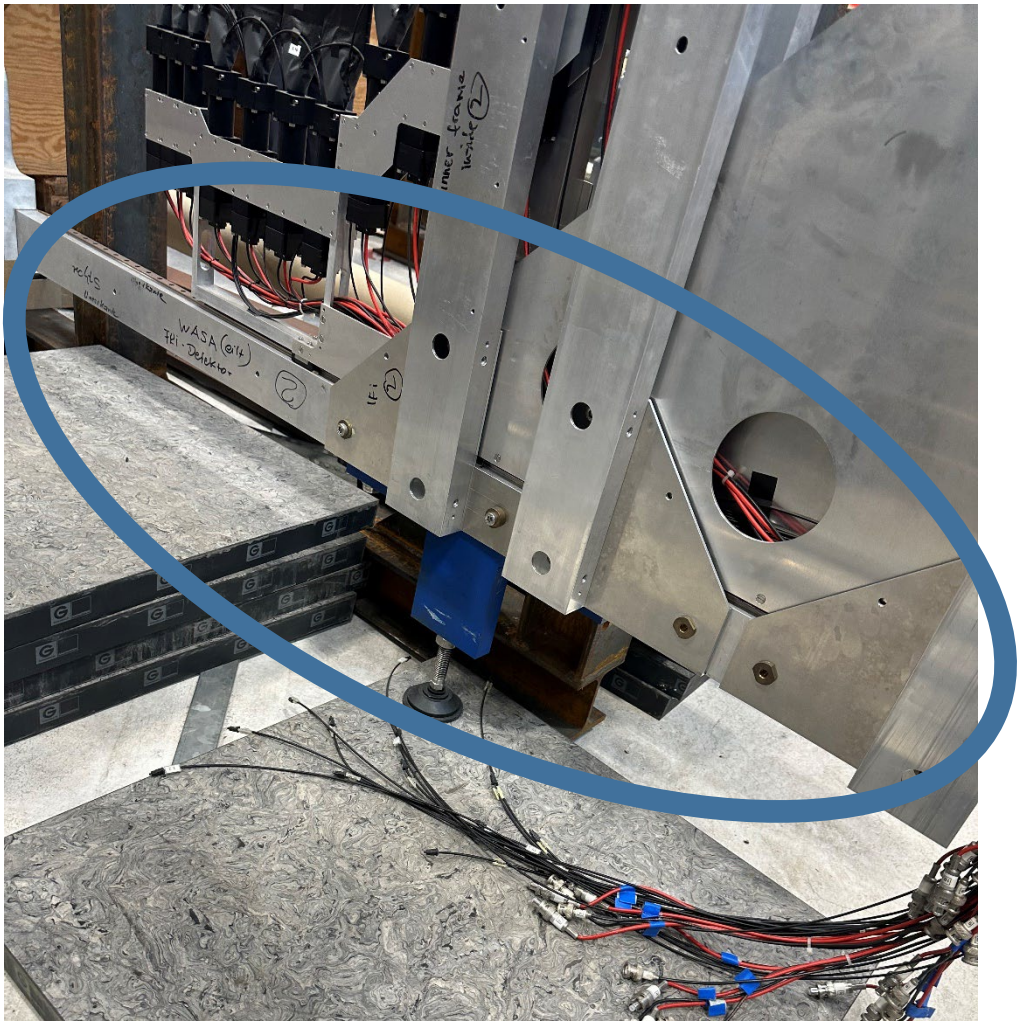


# FRI – separated position

Adjustable in X on rails  
Y is 1m from beam  
center



# FRI (Forward Range Intermediate) Currently at COSY but not installed



Entire lower structure  
will need to be modified  
to fit on 1m beamline  
height

# WASA Cables



WASA Cables;  
Can they be used  
at JLAB?



# Take-Aways - FWC

- Detector need to be re-assembled at JLAB
- Horizontal and vertical supports will need to be designed
- Cables need to be verified

# Take-Aways - FPC

- We will need to re-assemble detectors at the lab
- The FPC base will need to be modified (shortened) to accommodate our lower beamline relative to the platform
  - It is about 1m from center to the rails on top of the 80/20. We will need to remove the bottom 80/20 and maybe attach the rails to the platform as well as the side 80/20 extrusions
  - Horizontally, the detector fits between the racks on the upstream platform with no issues. About 3.5m is available
  - We will need to make structural supports to hold the 80/20 frames
  - The four layers will be arranged differently at JLAB. Maybe 2 further upstream
  - Cables?

# Take-Aways - FVH

- Will need to re-assemble detectors at JLAB
- The detector is too tall to be set up as is. The middle paddles will need to be modified to accommodate the 1m beamline height
- Bottom feet attach to platform and angular supports should be used to stabilize
- Detector fits between racks but may limit access to certain crates
- Cables need to be verified

# Take-Aways - FRI

- Detector needs to be re-assembled at JLAB?
- Detector frame currently too tall to be in beam center. Will need to remove bottom support and maybe attach rails to platform or redesign support



# Acknowledgments;

- Many of the diagrams contained in this report are from Annette Pricking's dissertation titled "Double Pionic Fusion to  $4\text{He}$  - Kinematically Complete Measurements over the Energy Region of the ABC Eff