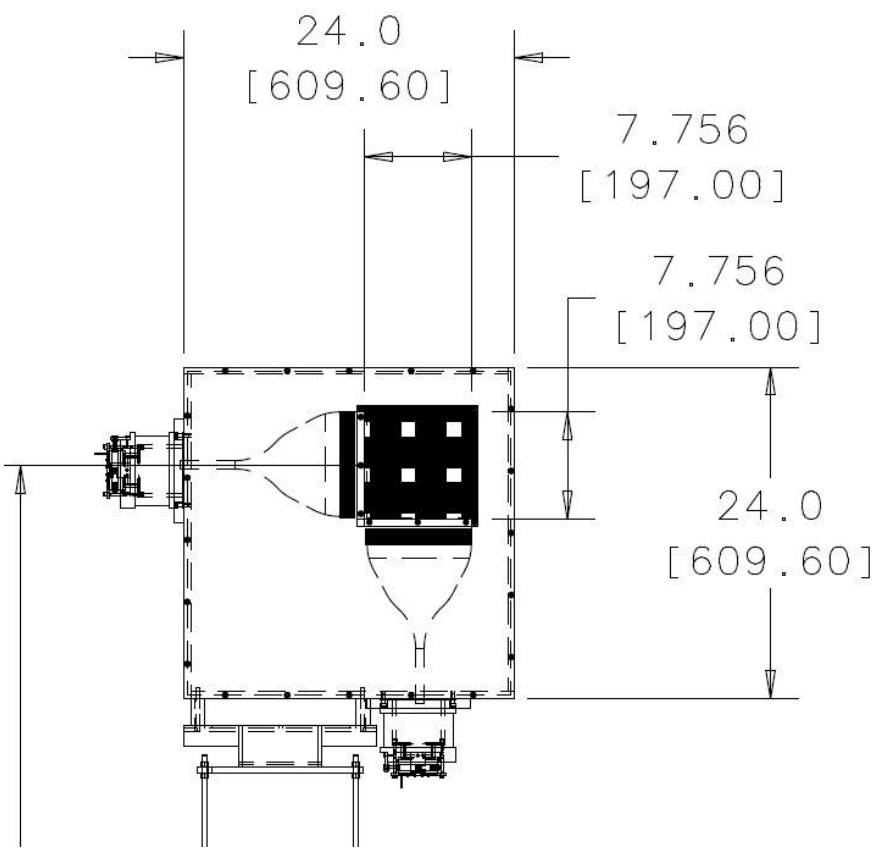
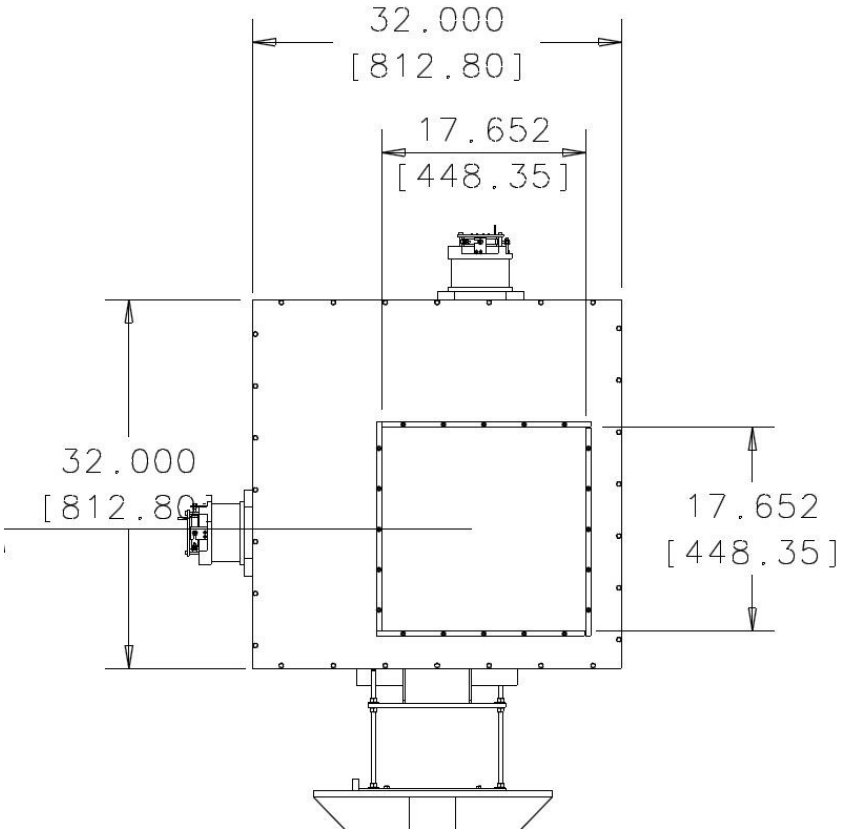
Beam Profile Monitors

Beam Profile Monitors

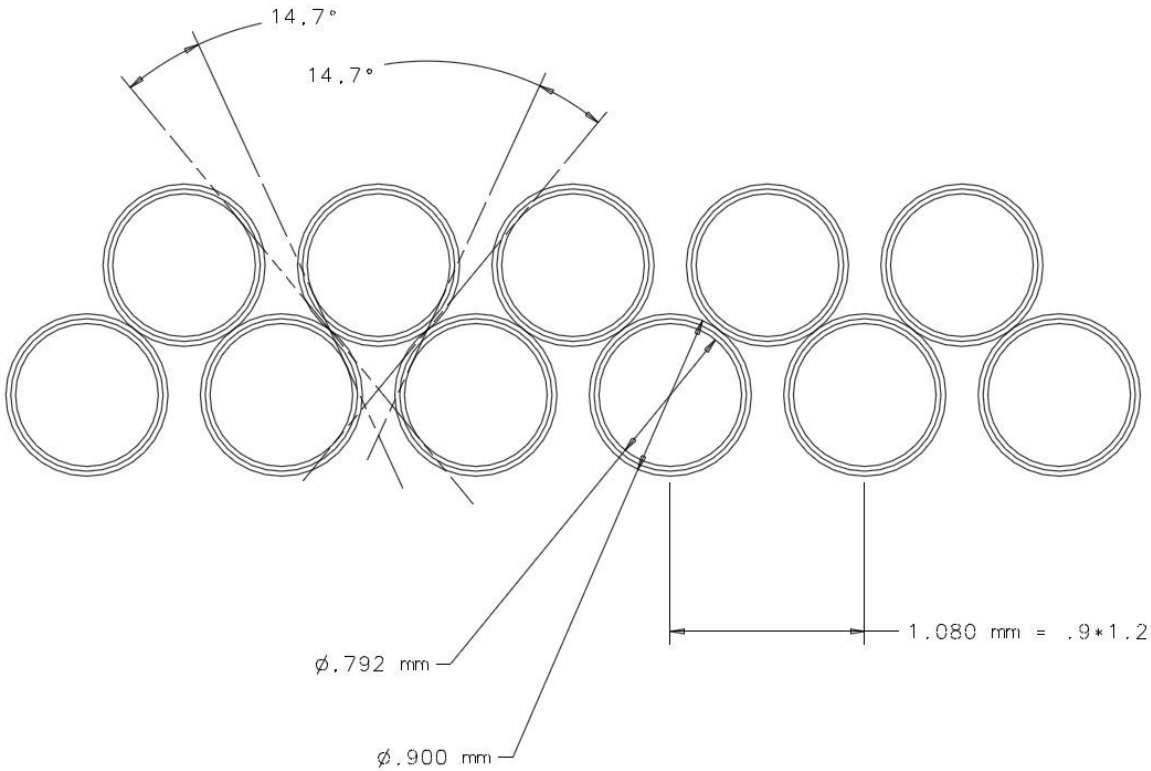
- Small (20 X 20 cm)
- Large (45 X 45 cm)





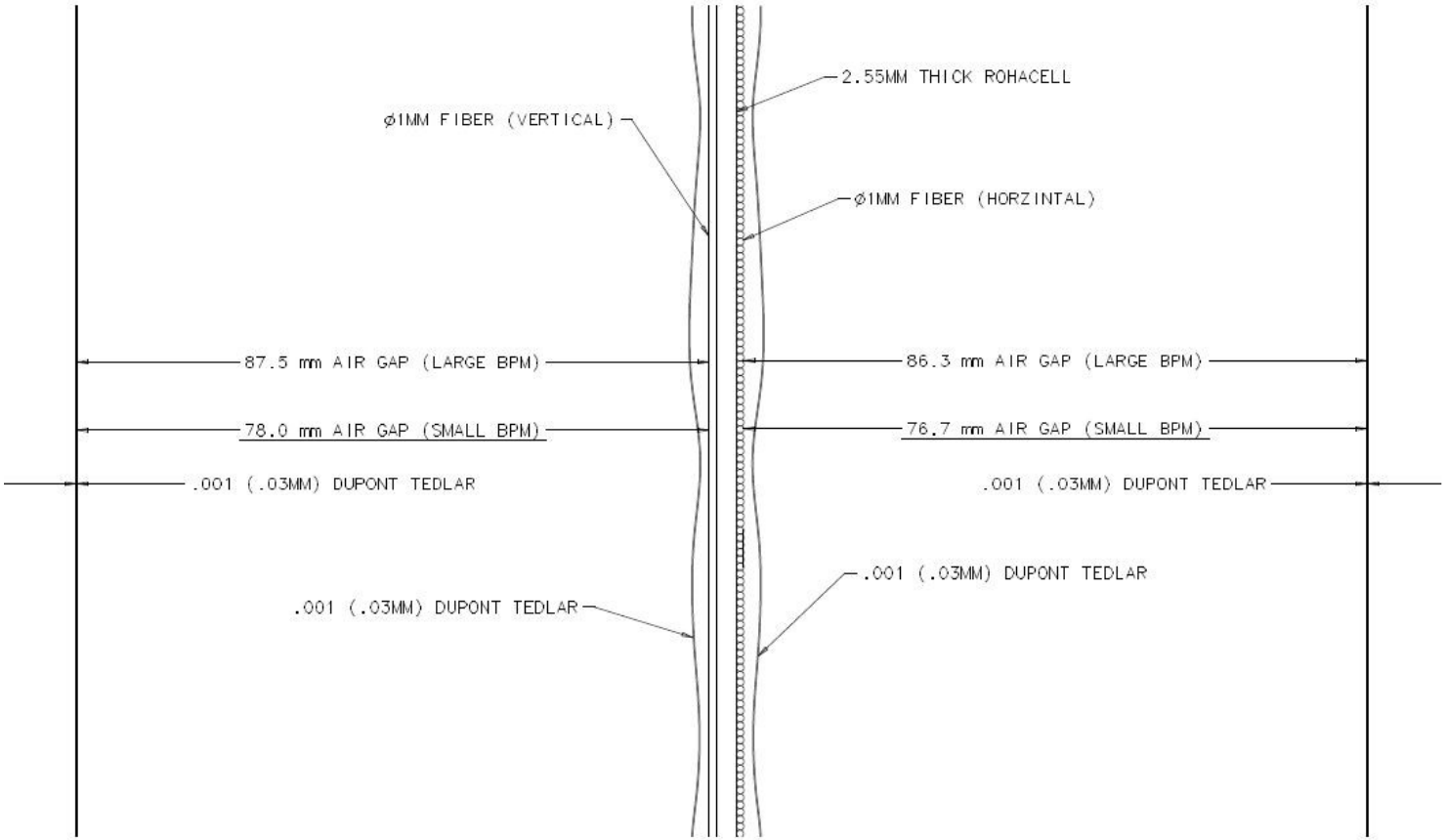
Fiber Planes

- Active detector is Kuraray scintillating fiber (blue)
- Fiber planes are doublet structure like fiber tracker



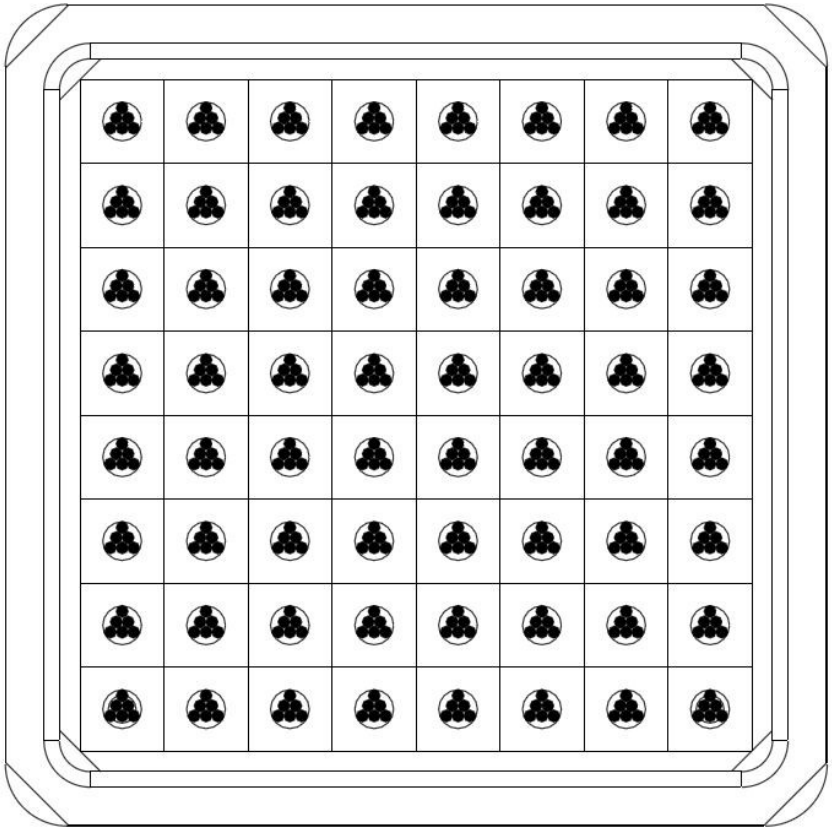
Material Budget

4 X 0.9 X 0.7 mm polystyrene = 2.5 mm

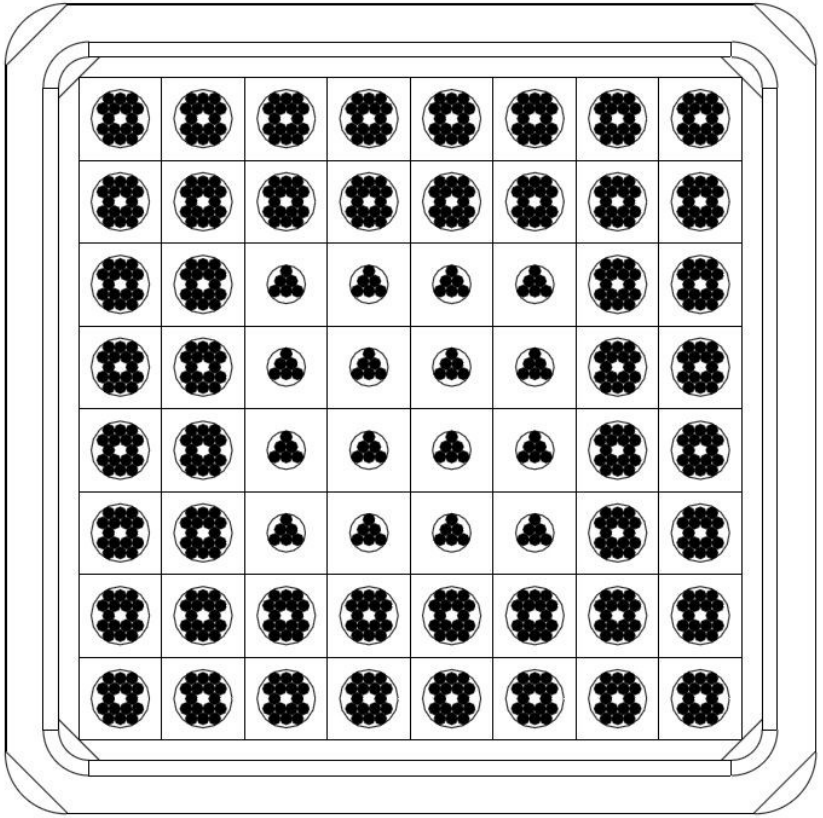


Fiber Mapping

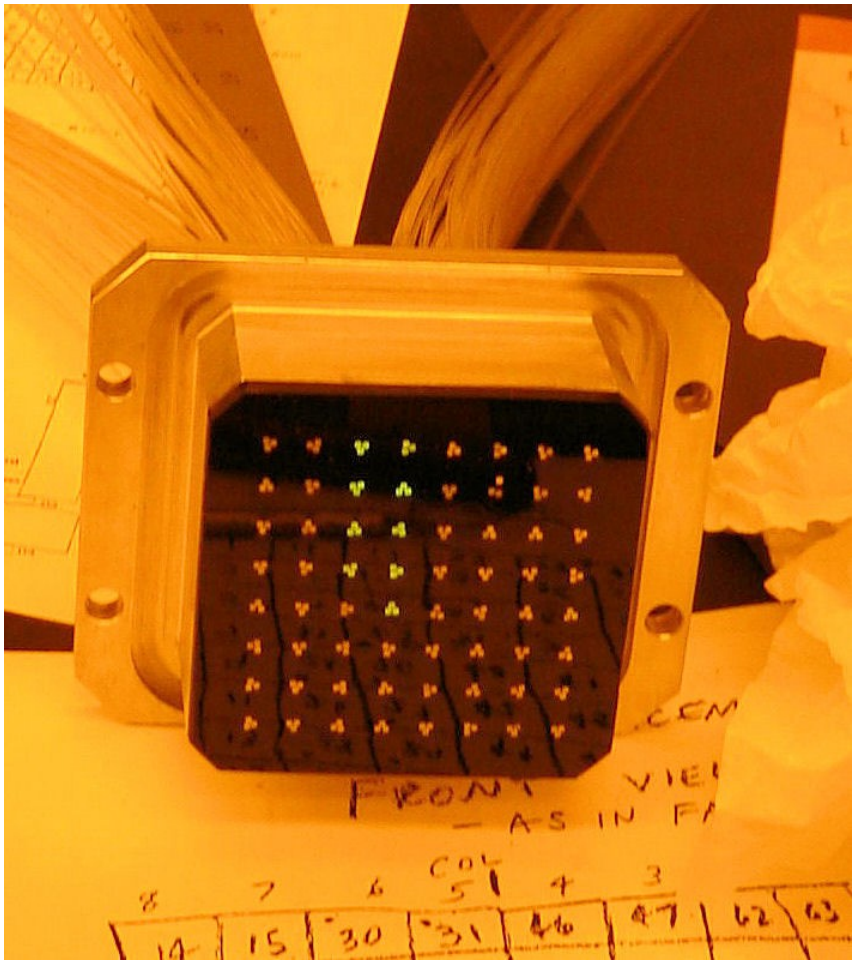
Small: 64 ch – 3 fiber wide



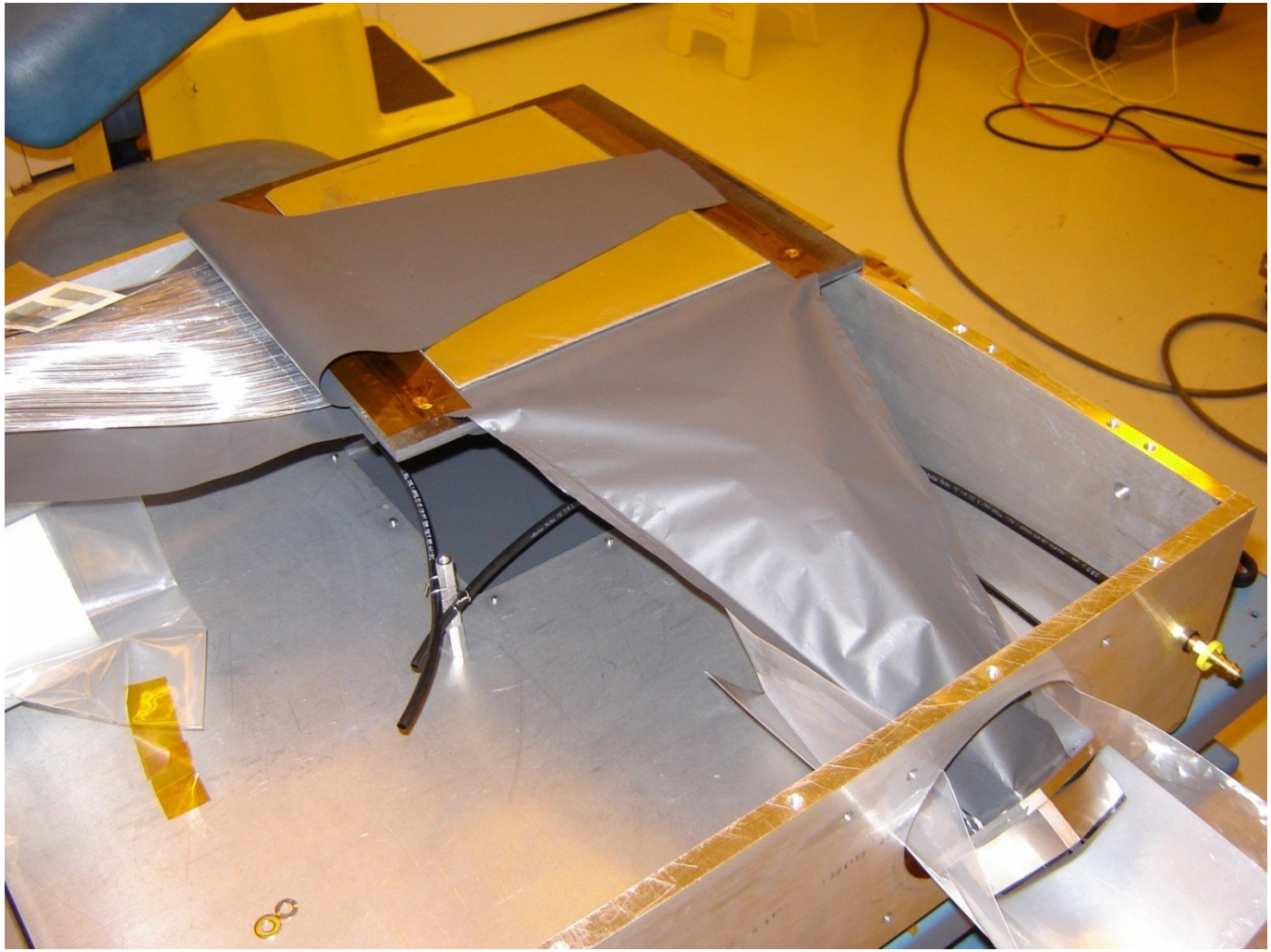
Large: 16 ch – 3 fiber wide
48 ch – 8 fiber wide



Fiber Connector



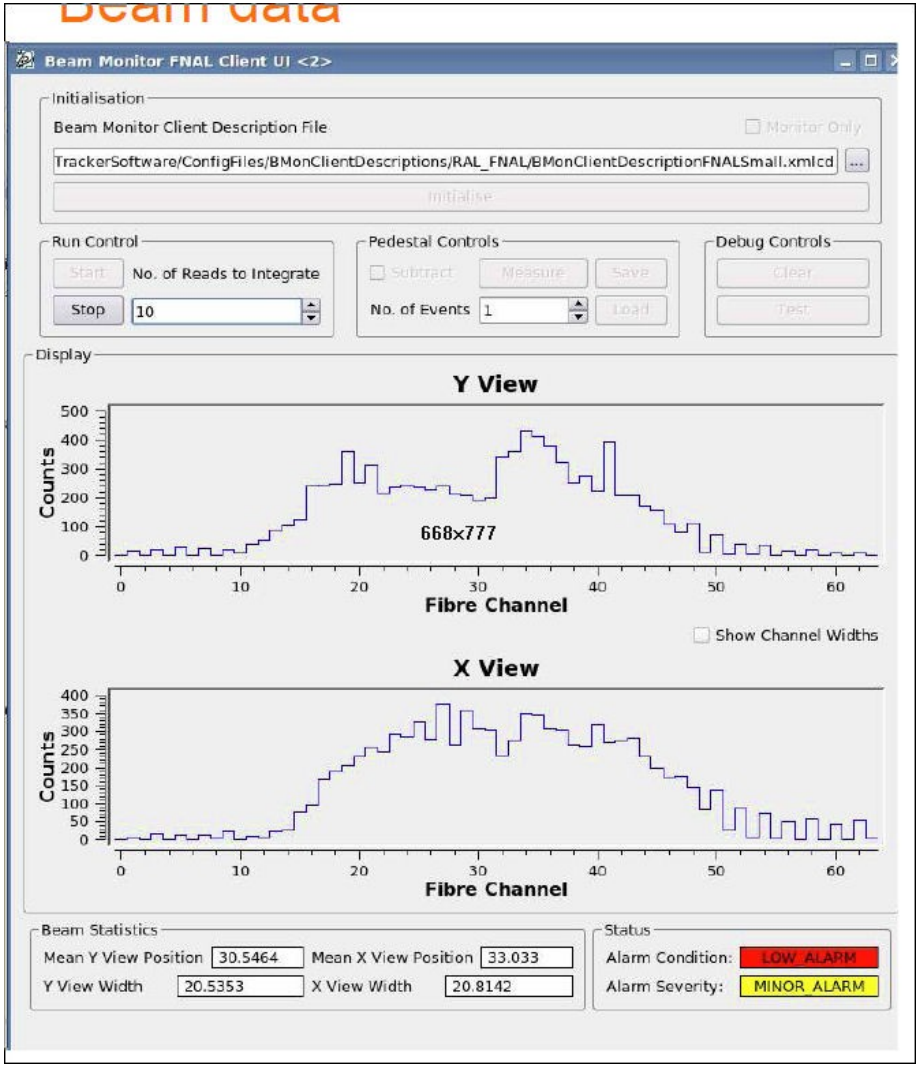
Small BPM Fiber Planes



Status

- The Electronic Noise that was seen has been completely removed
  - Shielding
- Both BPMs have been calibrated to some extent with a ^{60}Co source
  - However the activity was so low that we had some difficulty
- As a rate monitor the Global "Or" output from the X or Y views (or both) and X•Y gives an instantaneous beam rate measurement and should be linear up to ½ a GHz or so (we wish)
  - Signals are routed to MLCR
  - Only issue has been overheating. This was solved with the addition of an external fan on the cans that contain the MAPMT and electronics
- We did get some beam data with the small BPM

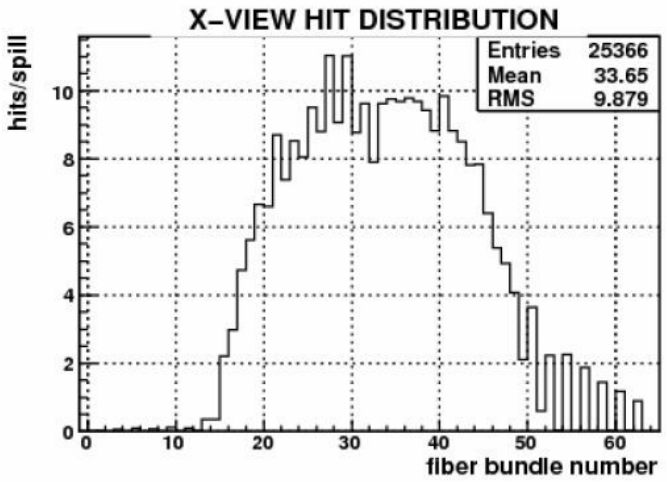
Beam Data in Small BPM

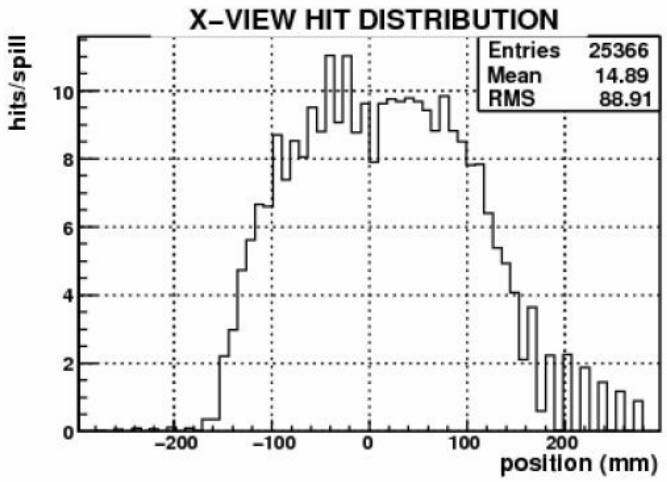


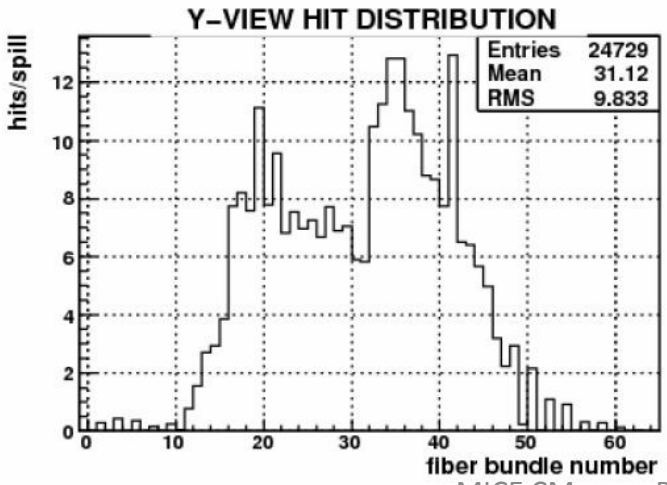
- Dip in Y profile is a threshold-set issue
  - A very strong X-ray source would be most efficient way to calibrate
- Once we have beam again, we can continue calibration, if there is interest
  - Not needed for rate monitoring , really

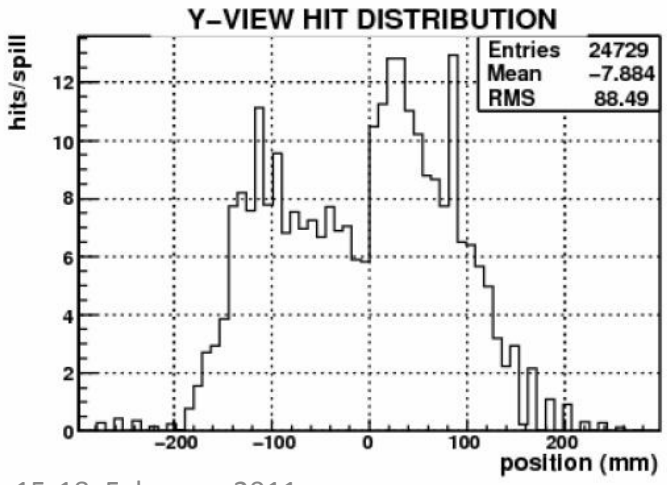
Small BPM Beam Data II

Normalised hits distribution (beam data)









Conclusions

- Both the small and the large BPM are working
  - No dead channels
  - Electronic noise rate is ZERO
  - PMT noise is low - <<1 hit/channel
- The small BPM has taken beam data
  - At that time there was a dip in the response in the Y view
    - We believe that this is now fixed by adjusting thresholds
- The large BPM has been calibrated with the 1 μC ^{60}Co source

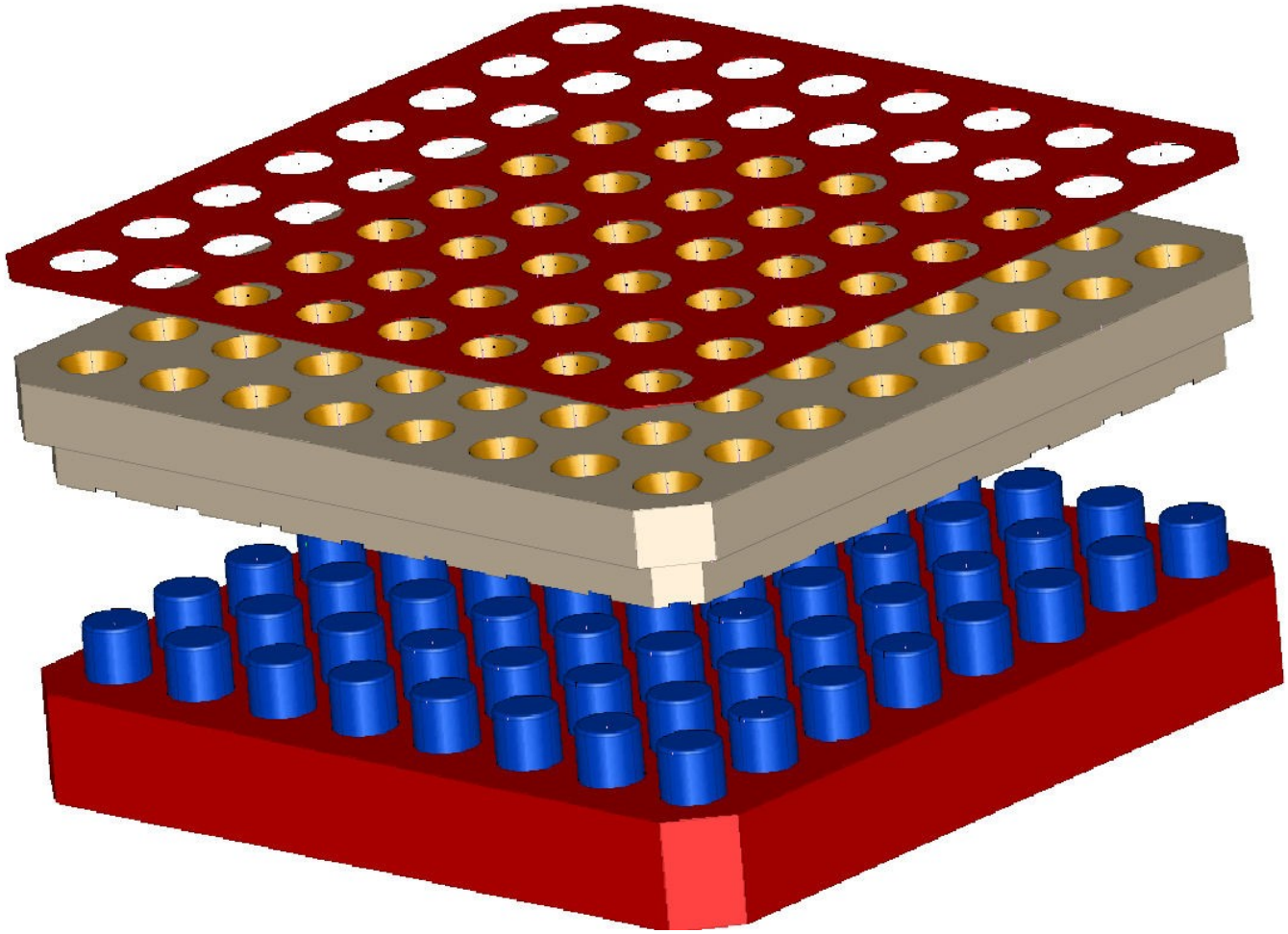
Conclusions II

- Not much more to do if BPM only used for rate
  - Make sure external fans are robust
- Currently, there is no request from experiment for other use

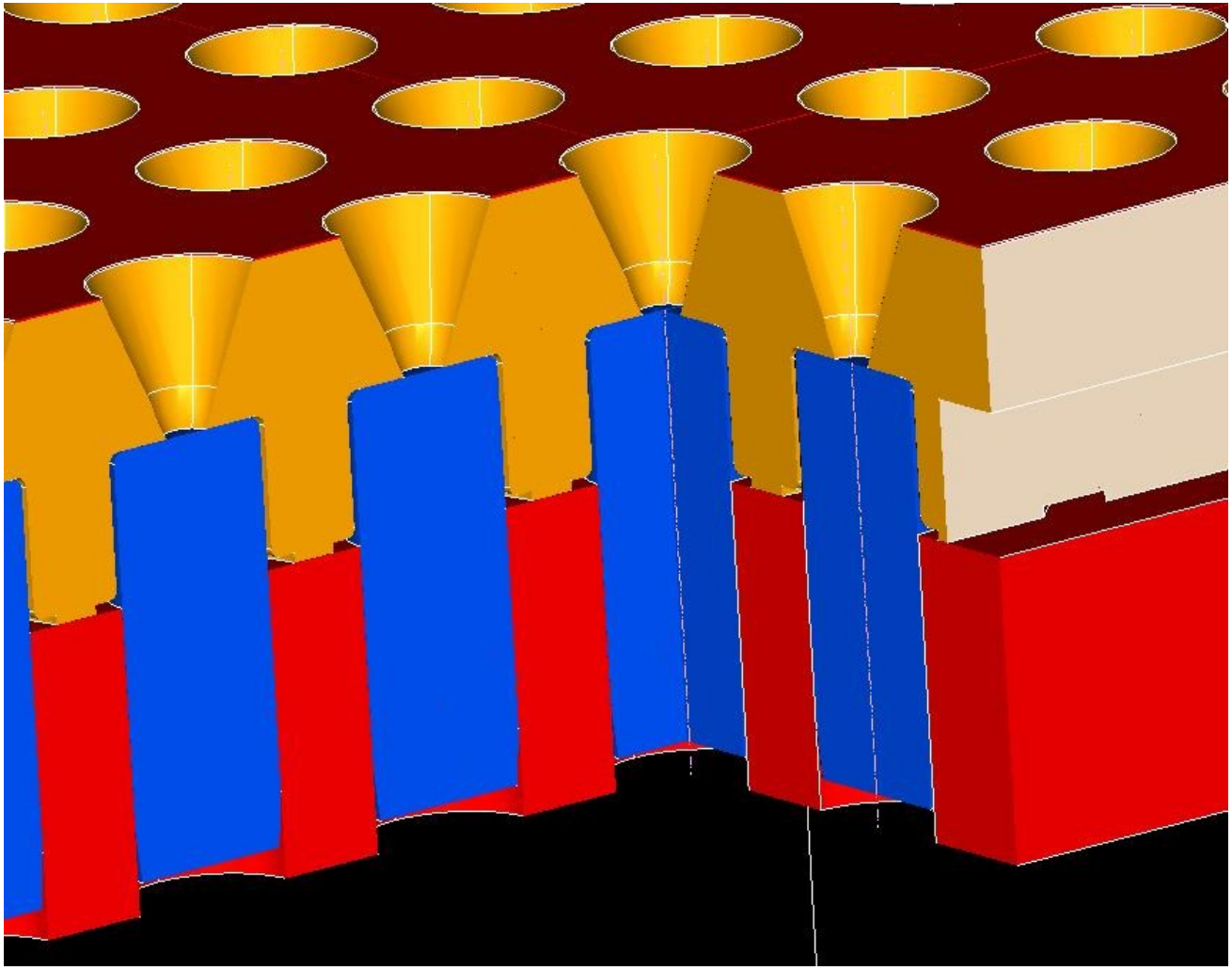
Upgrade

- The Burle MAPMTs have large non-uniformity and gain variation
- A number of systems at Fermilab use them
- Replace MAPMTs with SiPMs
- For us this would be easy if 1 to 1 SiPM to fiber
  - But then many channels!
- Use Winston Cone
  - Pin for Pin replacement of readout module

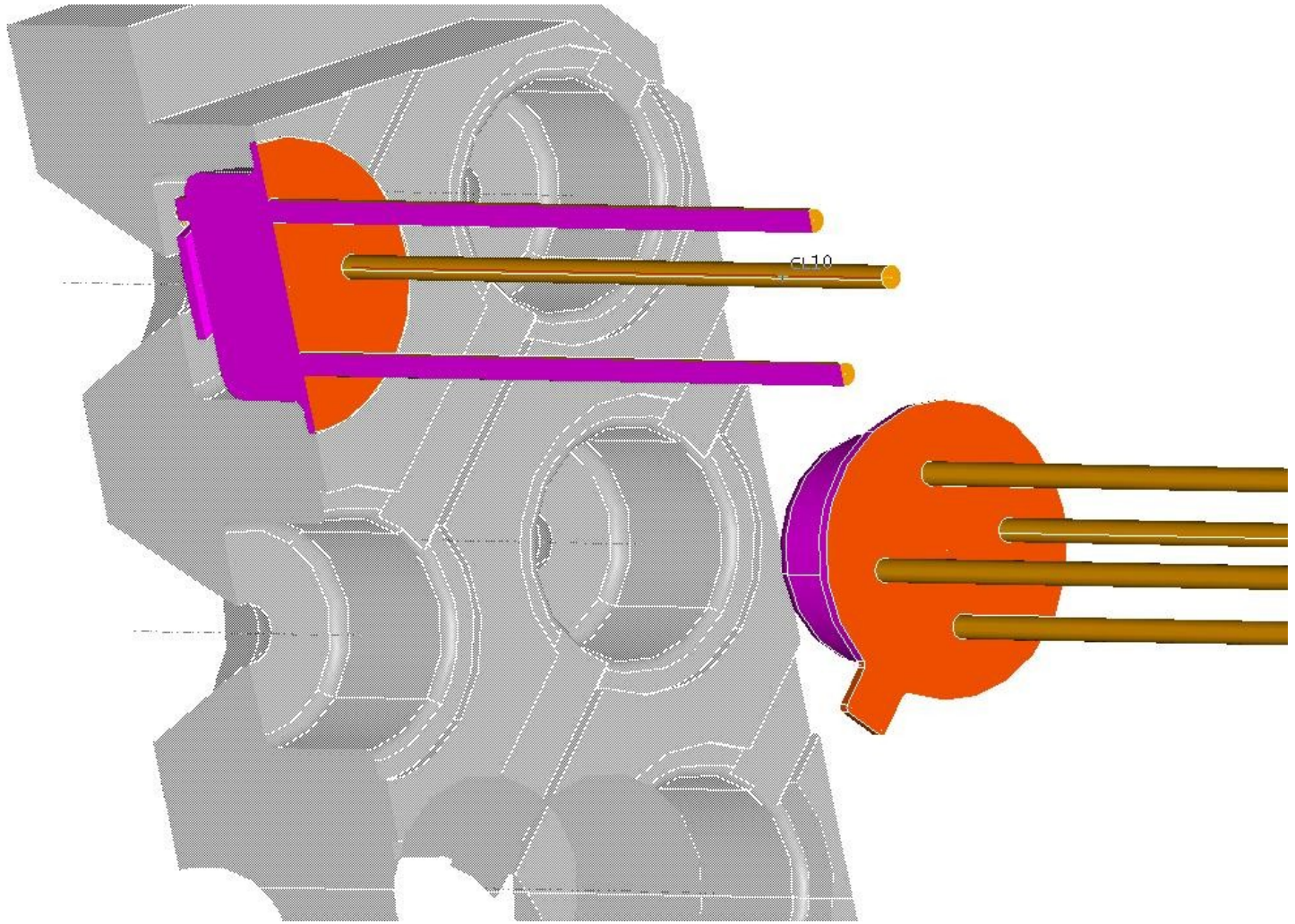
Winston Cone



Winston Cone II



SiPM/TO5 can



BPM for Emittance Measurement

- With SiPM Readout
  - Much better uniformity & maybe better light yield
- To do an analysis similar to what was done with the TOFs (10X better spatial resolution)
  - Need to add TDCs
    - Not hard conceptually and Lecroy modules exist
    - New front-end board preamp board is being developed
    - Need software development, however
- For MICE, would need motivation