

HMB v3

Nomenclature and Resources

1. Every time we change configuration (adding/removing/moving detector components), it can impact:
 - a. Data structure (packer/unpacker)
 - b. Monte Carlo simulation
 - c. Alignment
 - d. User analysis code, etc.
2. Proposing a convention for tracking this in a uniform way
3. Code should be written in a way that is aware of these changes (can pull from database?)
4. Document, along with Run information in eLog (register)

<https://elog.phys.hawaii.edu/elog/>

Hawaii Muon Beamline version 3
Hawaii Muon Beamline version 3

Hawaii Muon Beamline version 3, Page 1 of 1				
Find Login Help				
Full Summary Threaded				
ID	Date	Author	Type	Subject

HMB 3.abcd

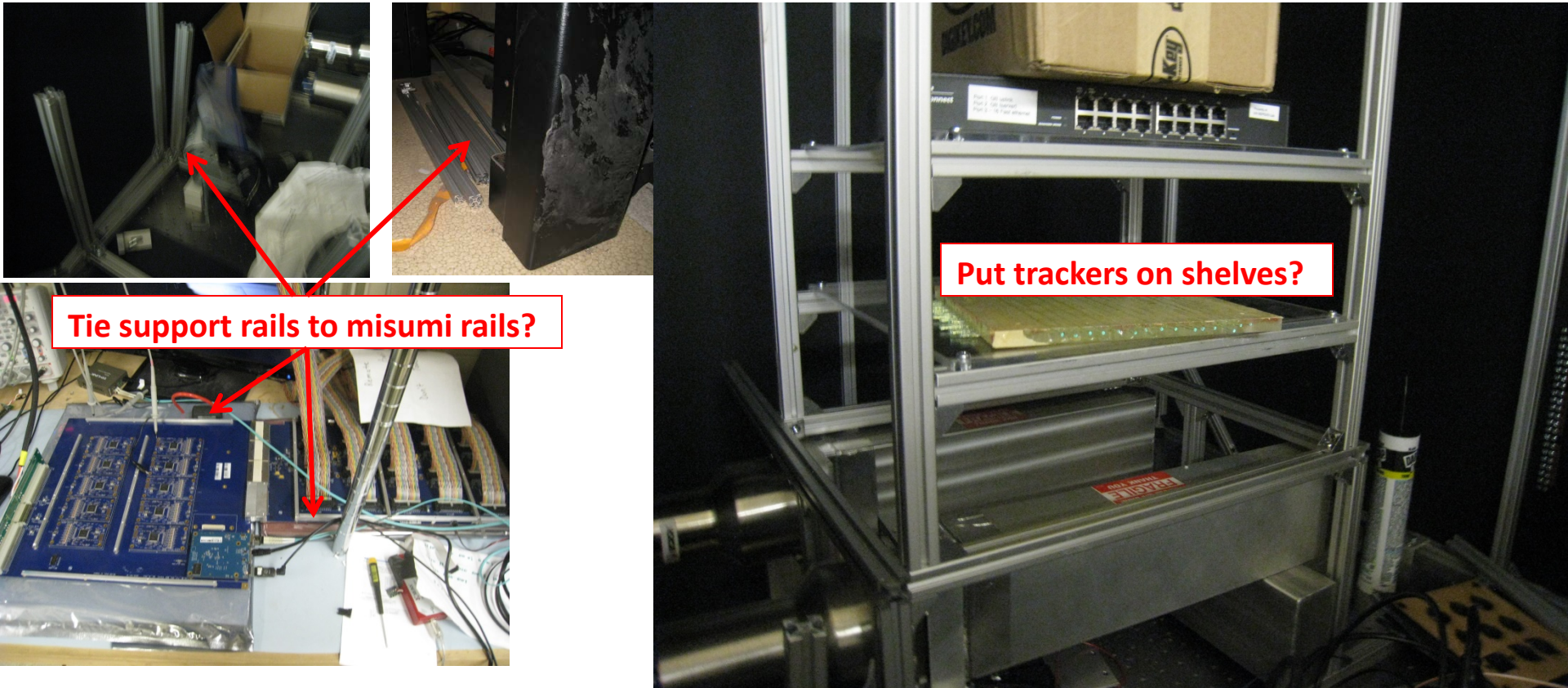
1. **Version 3. is without semiconductor tracker/magnet (v4)**
 - a. **Tracker configuration**
 - b. **Calorimeter configuration**
 - c. **RICH configuration**
 - d. **DUT configuration**

So for example: HMB 3.1000

Will be the first set-up (just 2 existing layer pairs) with KLM Motherboard and pre-amp/cable readout

Will switch to 3.2xxx when scint planes ready (could be 3.2100 or 3.2011 or ... depending upon which other systems ready first)

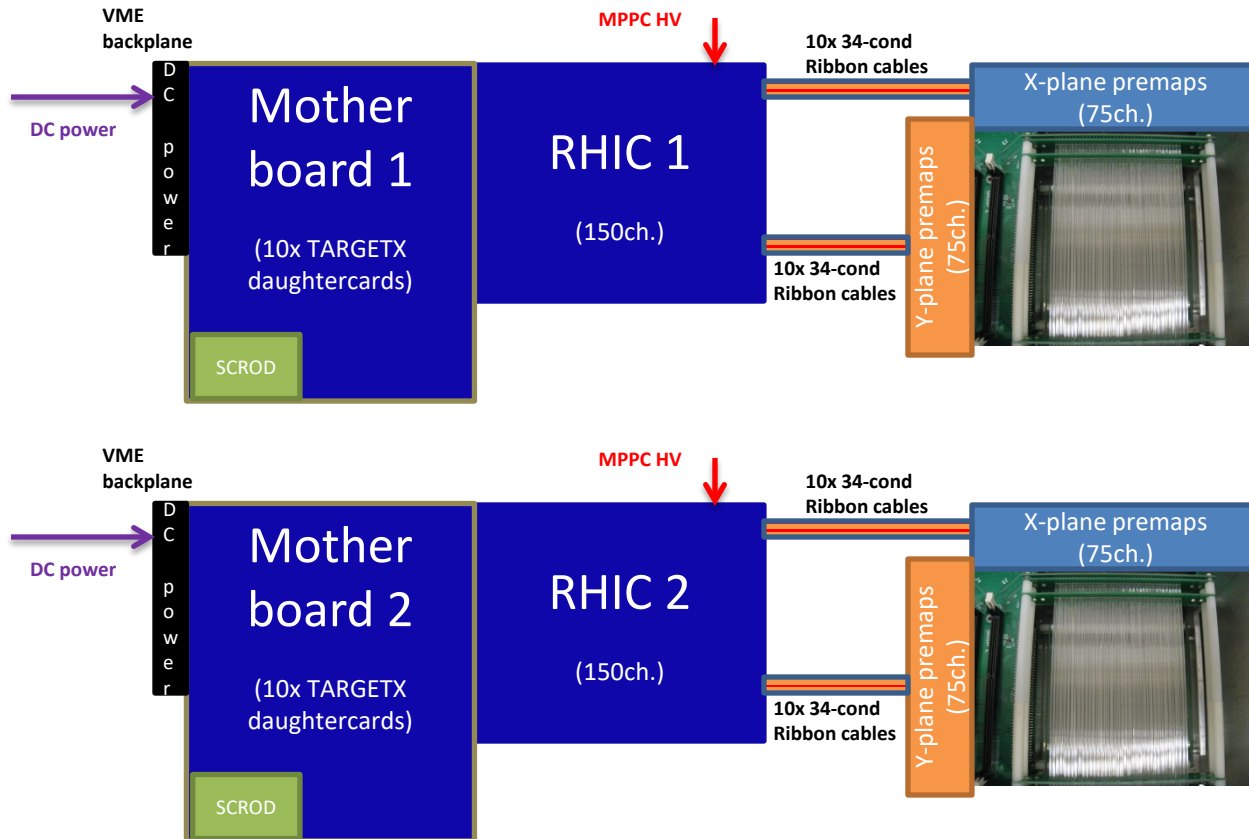
HMB 3.1000 mechanical



2 tracking planes:

- Put initially close together to boost event rate?
- 3 of 4 coincidence?
- Need 2 MB + RHIC combos

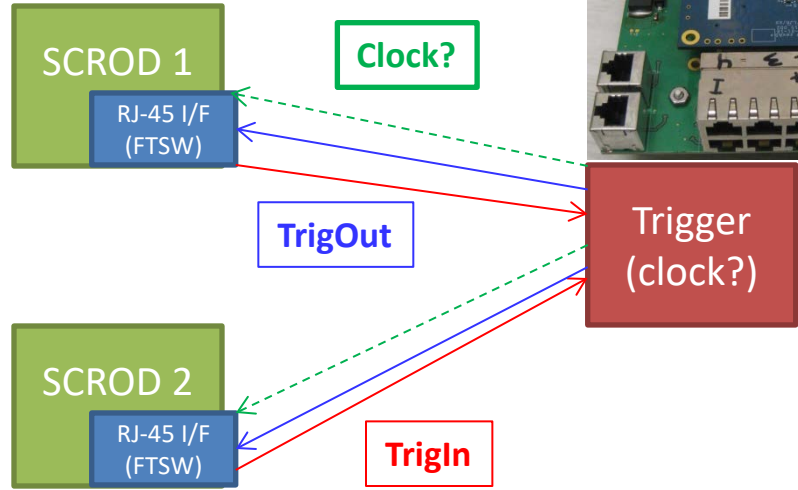
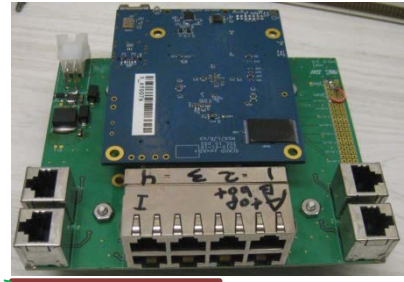
HMB 3.1000 block diagram



Questions/comment:

- Excelsys power supply?
- MPPC HV?
- Need 2 MB + RHIC combos

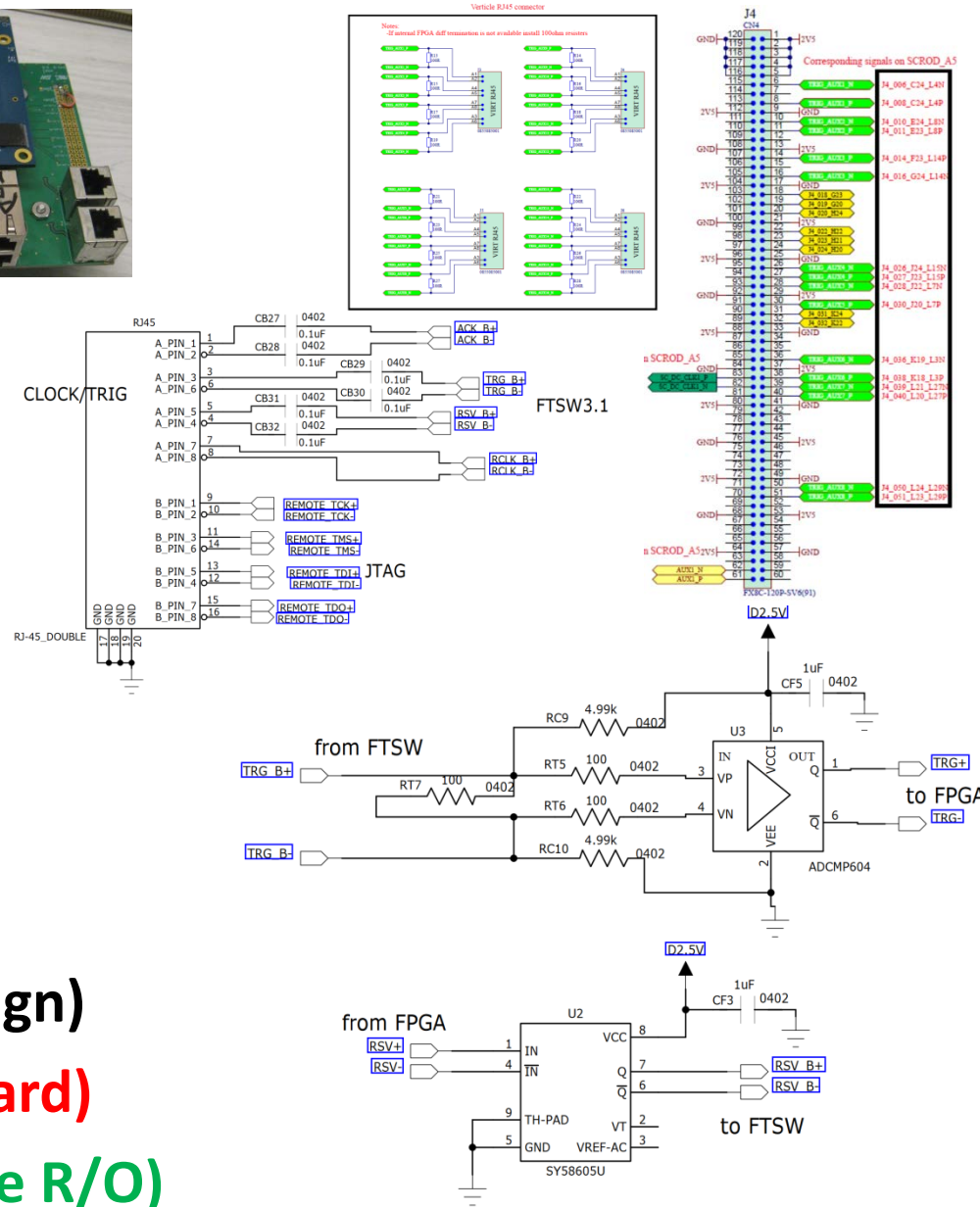
HMB 3.1000 (clock) trigger logic ?



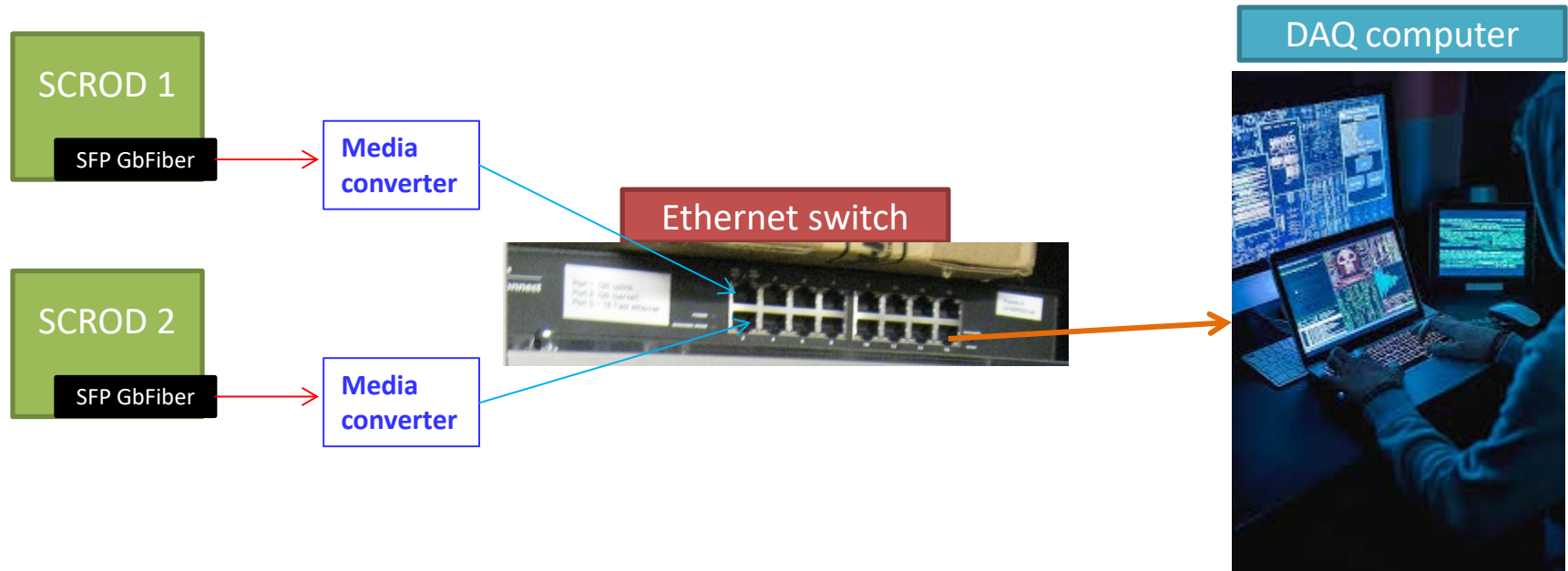
2 lines, 1 per layer?
Loose 2 of 4 ? OR?

3 options:

- X) TLU (buy or fab posted design)
- 2) Pynq (fabricate adapter board)
- 1) Use RJ-45 board (scint plane R/O)



HMB 3.1000 Data Acquisition (DAQ)?



EUDET2 needs?:

- **Collector/sender for SCROD**
- **How to manage IP Addr? (DHCP by default?)**
- **Fault tolerance for missing event packet?**

HMB 3.1000

Task list (24-AUG-2020)

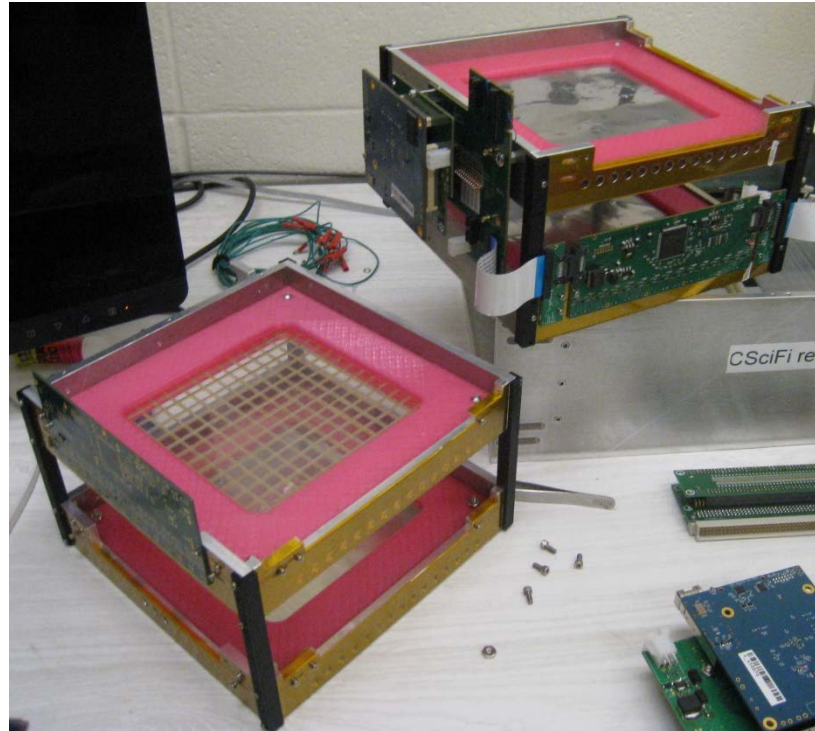
1. Design/fabricate KLM MB/RHIC mounts
2. Design/fabricate Sci-Fi mounts
3. Identify 2nd KLM MB/RHIC pair
4. Identify/test 2nd preamps
5. Determine which Sci-Fi MB to use (compatible?)
6. Identify/fabricate enough ribbon cables for 2nd Sci-Fi tracker assembly
7. Identify/set-up DAQ computer
8. Identify/set-up media converters
9. Identify/set-up DC power/power cabling/backplanes
10. Explore trigger options (present next time)



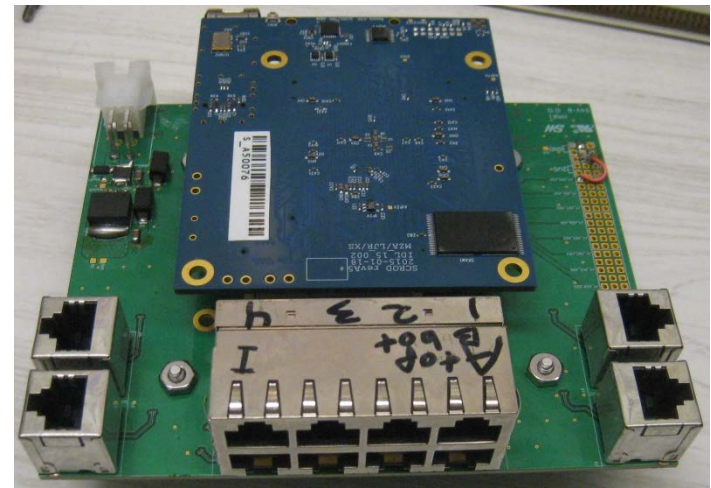
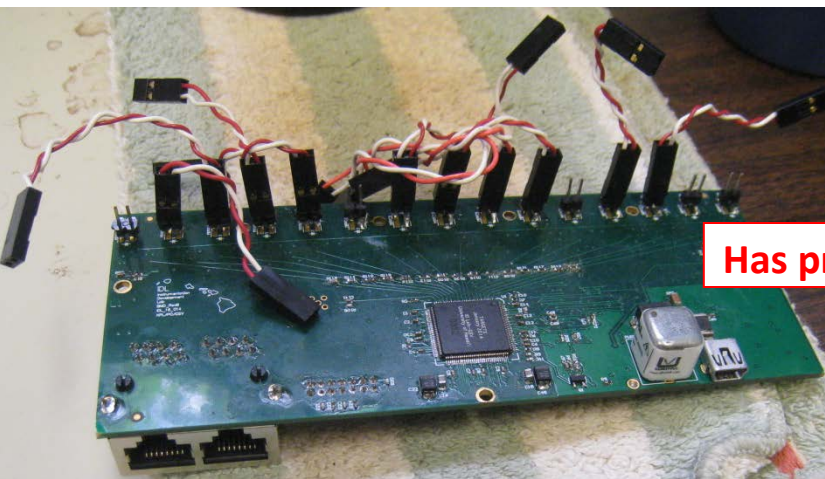
Towards 3.2xxx

- 2 full tracking planes

- Not sure about BMD

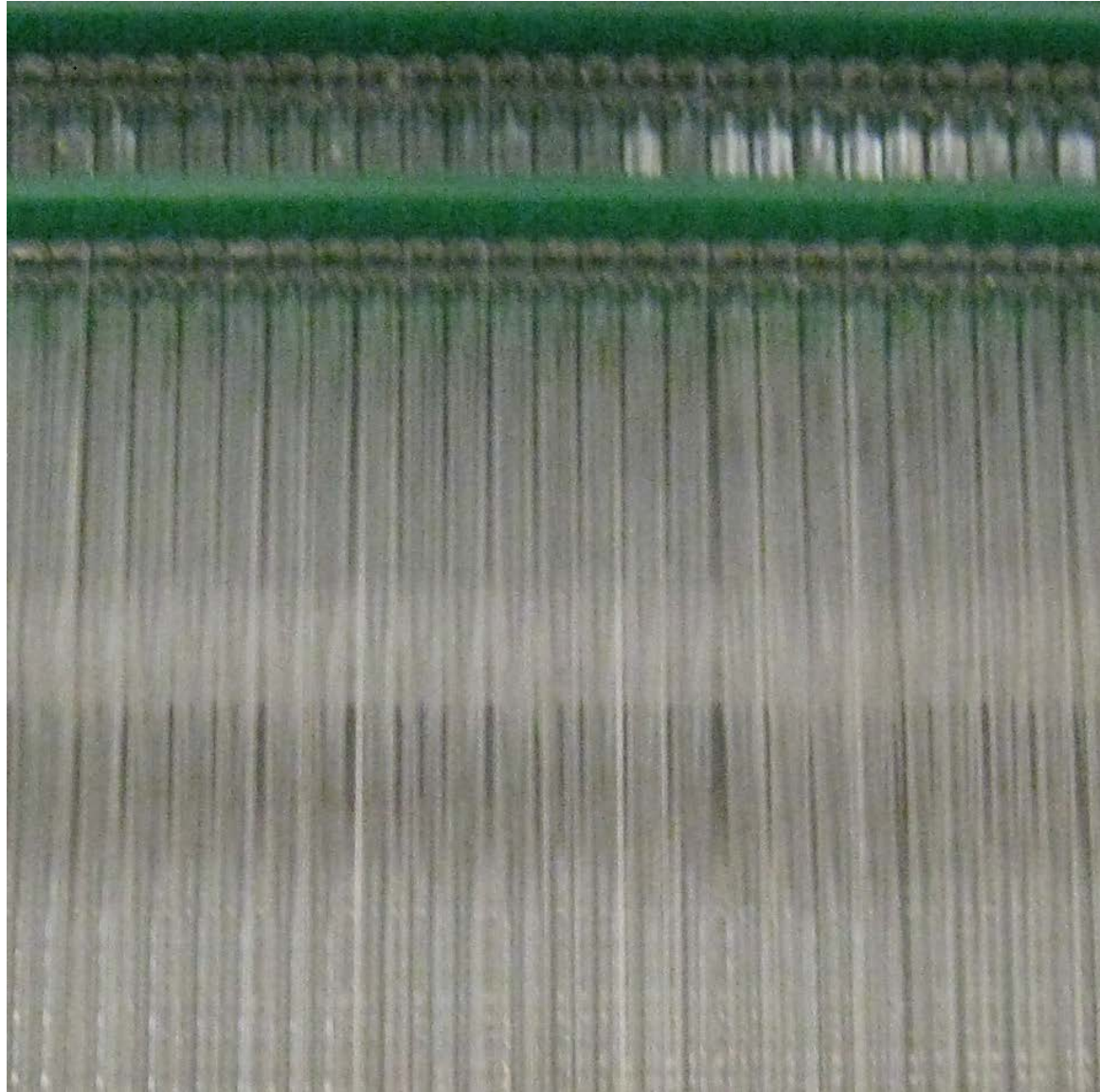


- RJ-45 readout (4 hodoscope DCs fabbed – 1 plane pair)



Resources for improved tracker

Current Sci-Fi has gaps, more layers/stagger?



Resources for improved tracker

Additional scintillating fiber

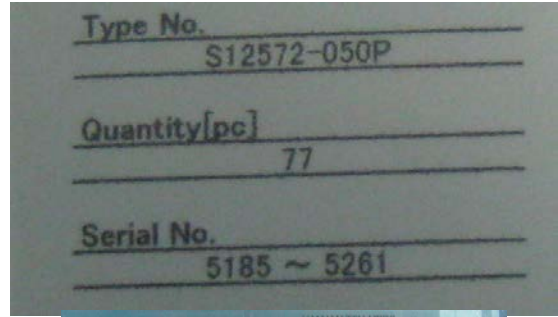


Resources for improved tracker

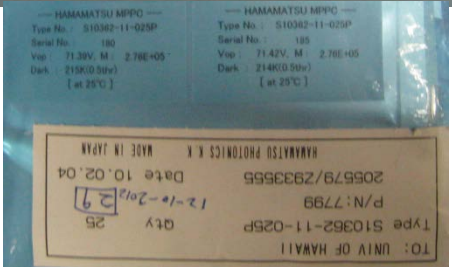
Additional MPPCs, of 4 different types



~500 of these
100um pixels



~70? of these
50um pixels



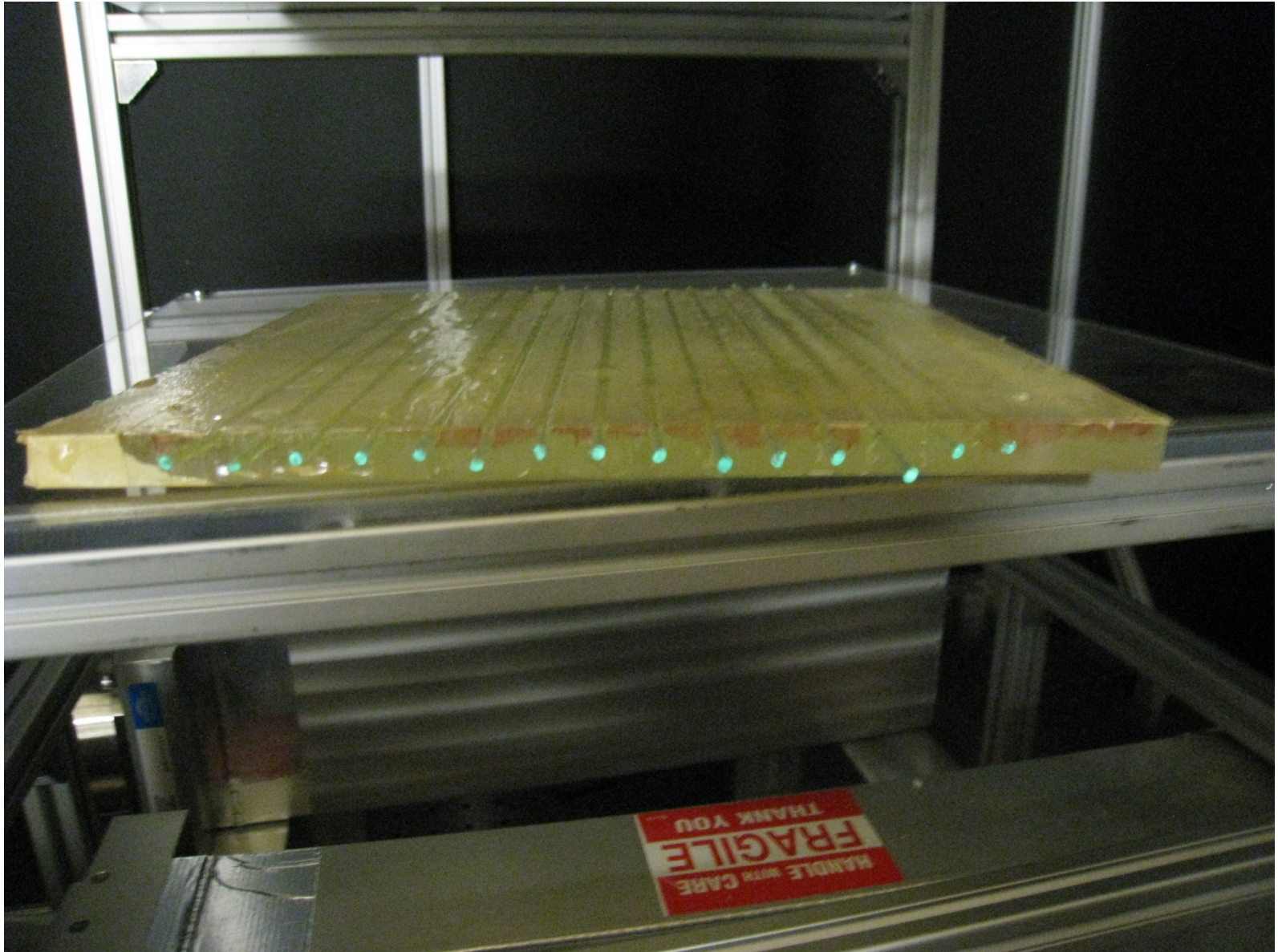
~20 of these
25um pixels

Resources for improved tracker

Populate additional boards

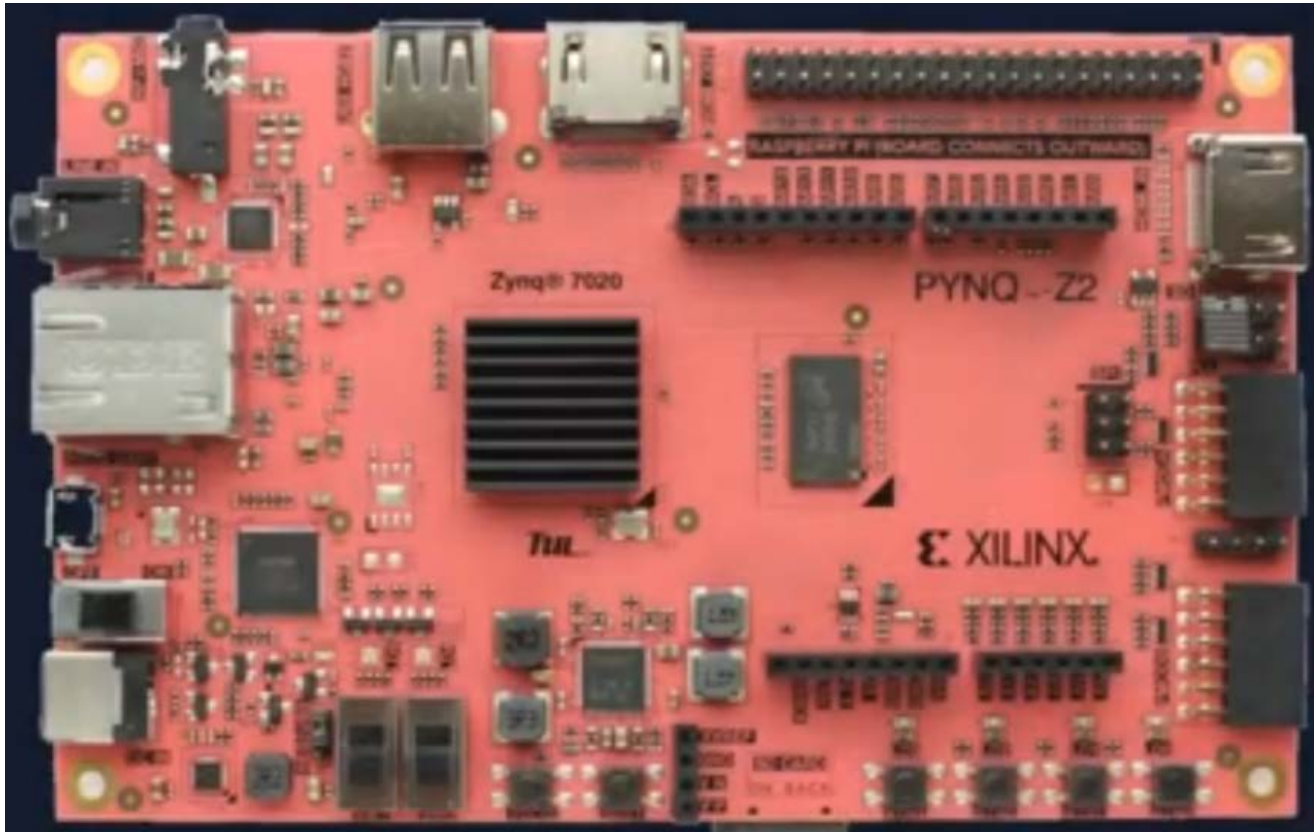
- **Probably makes sense to populate 4 more Hodoscope boards**
- **If do this and populate and additional RJ-45 board, can complete both scint plane layer pairs (with same technology)**
- **Spatial/timing resolution comparisons between BMD and SciFi Trackers**
- **Longer term, higher density (high ASIC channel density) boards**

Backup



Task 2

Interface board to Pynq? (depends upon trigger)
Available I/O not set up for diff pairs

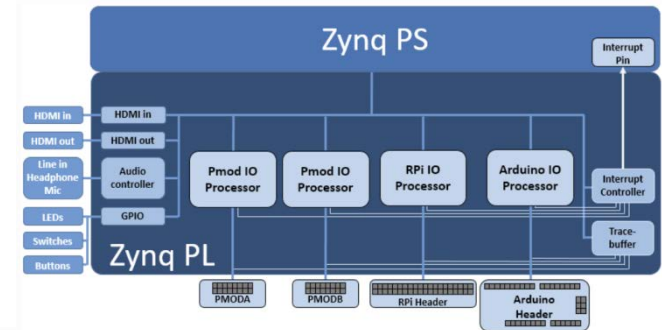
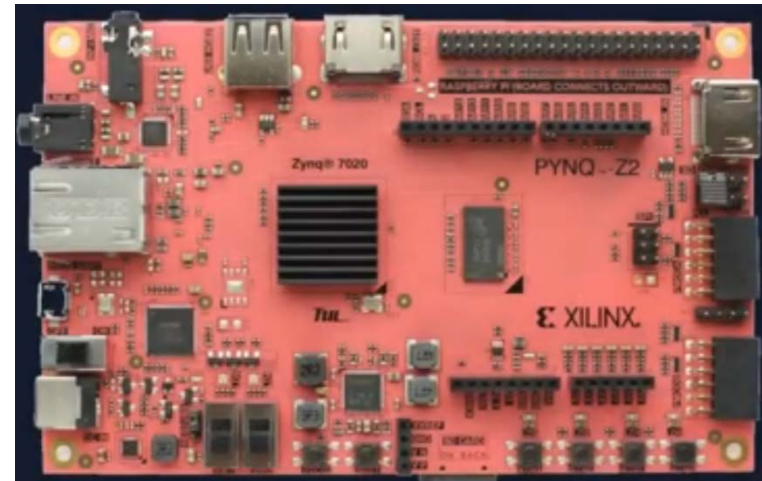


- Scint planes using QuadByteLink for communication, ethernet cables (and trigger in/out); SCROD control (ethernet) – maybe EUDET directly?

Python productivity for Zynq (Pynq)

- **History**

- Proposal to Xilinx for new demo boards
- Received donation maximum (5)
- Will use in PHYS475 (476) class
- Pynq architecture
 - Python Zynq (PYNQ) Jupyter Notebook
 - Other languages/kernels available
 - Hardware (PL) overlays
 - SD card for filesystem, DDR3 RAM
 - Proper (Arm-9 dual-core), with hardware assist
 - HDMI in/out (object recognition)
 - Hardware computation assist (DSPs)



192.168.153.217:9090/tree?

jupyter

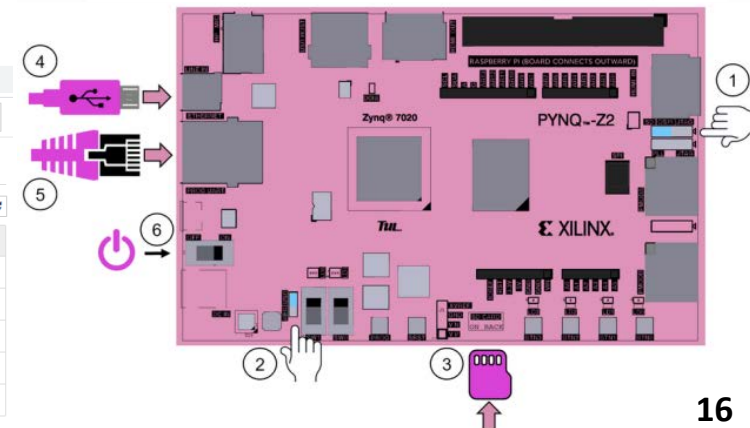
Logout

Files Running Clusters Nbextensions

Select items to perform actions on them.

Upload New

	Name	Last Modified
<input type="checkbox"/>	base	10 months ago
<input type="checkbox"/>	common	10 months ago
<input type="checkbox"/>	getting_started	10 months ago
<input type="checkbox"/>	logictools	10 months ago
<input type="checkbox"/>	Welcome to Pynq.ipynb	10 months ago

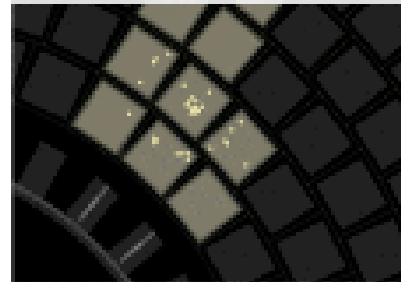
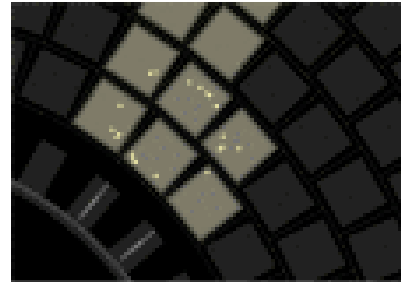


HMB v3

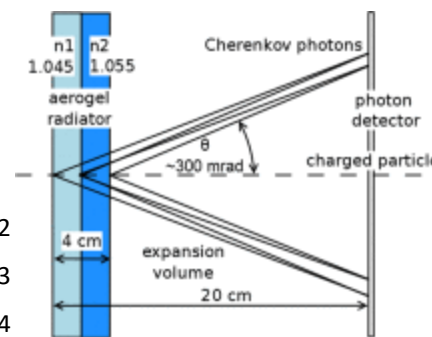
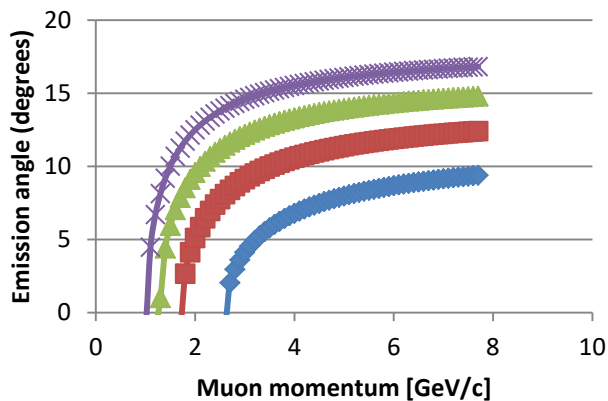
Aerogel Ring Imaging Cherenkov (ARICH)

- **mRICH using ARICH technique**

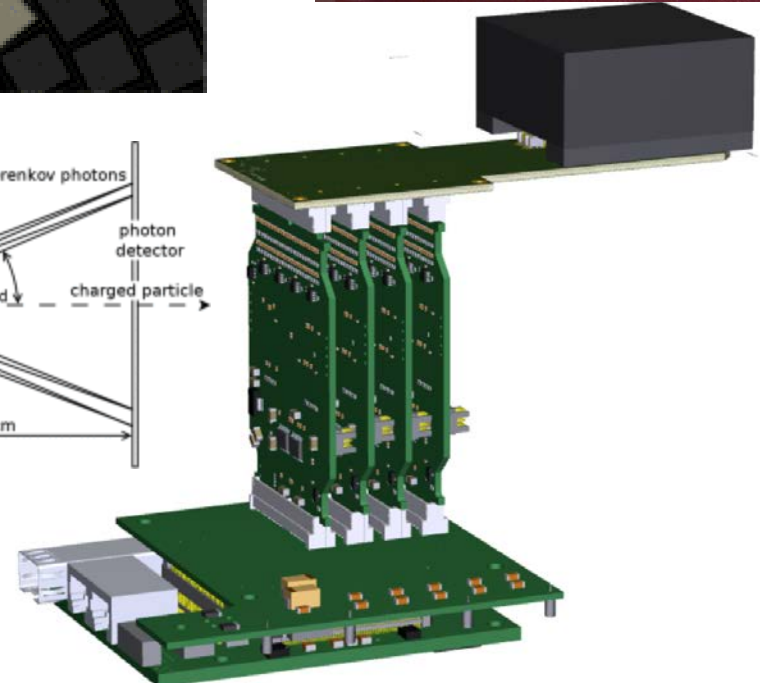
- Proximity focus
- Can measure ring image to determine muon momentum



Aerogel Radiator



- ◆ n=1.02
- n=1.03
- ▲ n=1.04
- ✕ n=1.05

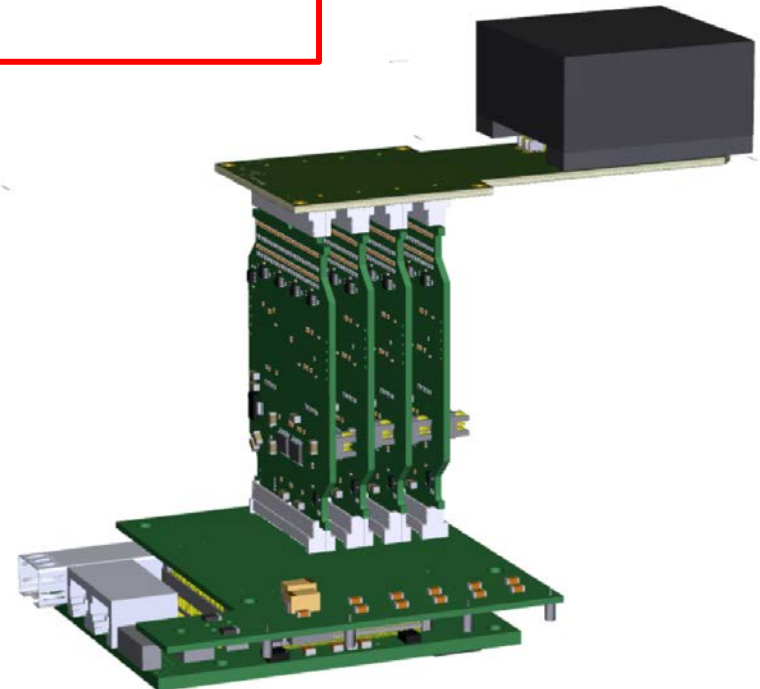
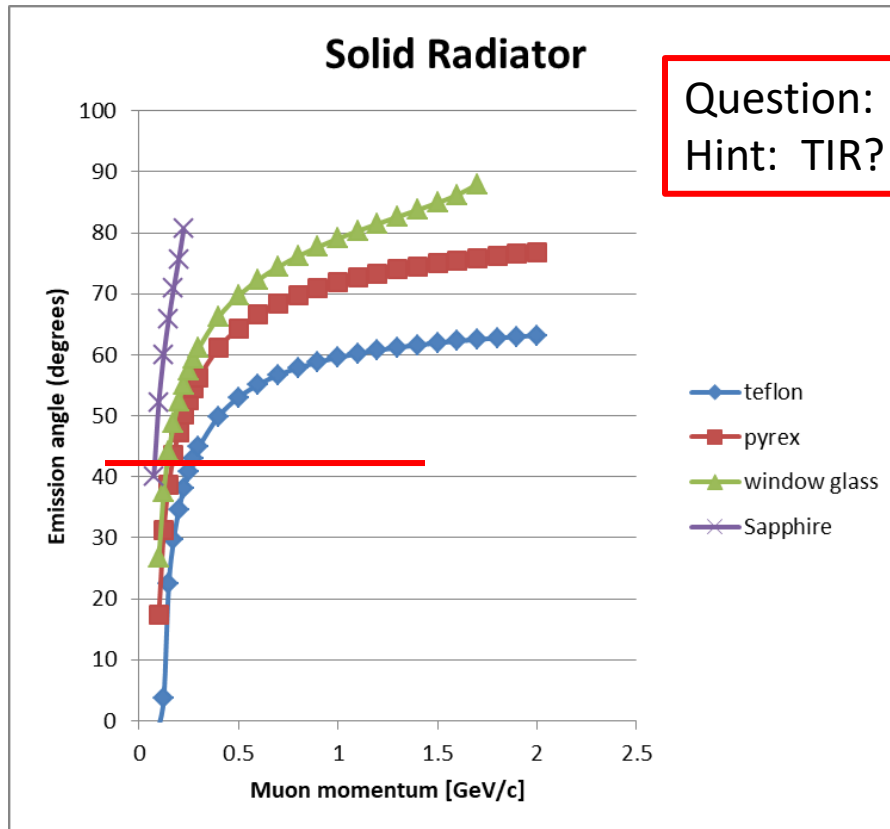


HMB v3

compact Ring Imaging Cherenkov (cRICH)

- **ARICH technique**

- Works well at high p , but many atmospheric muons at lower momentum
- Can make compact if use dense, thin material

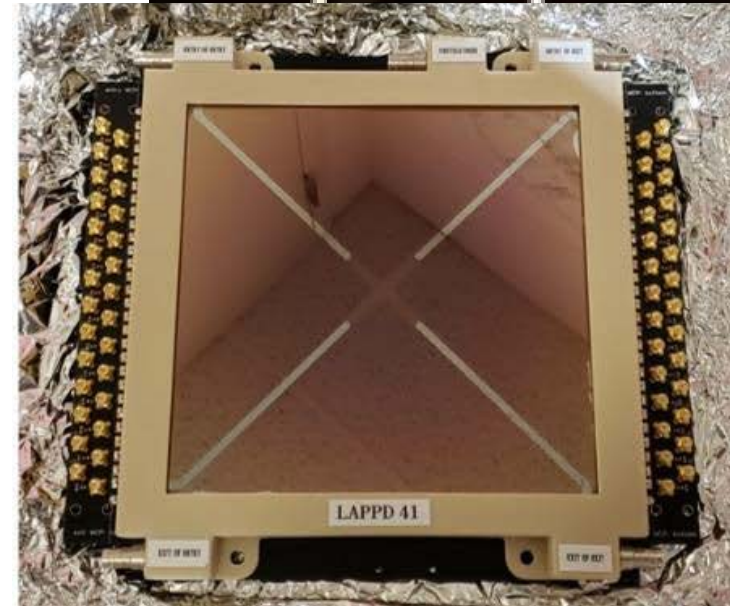
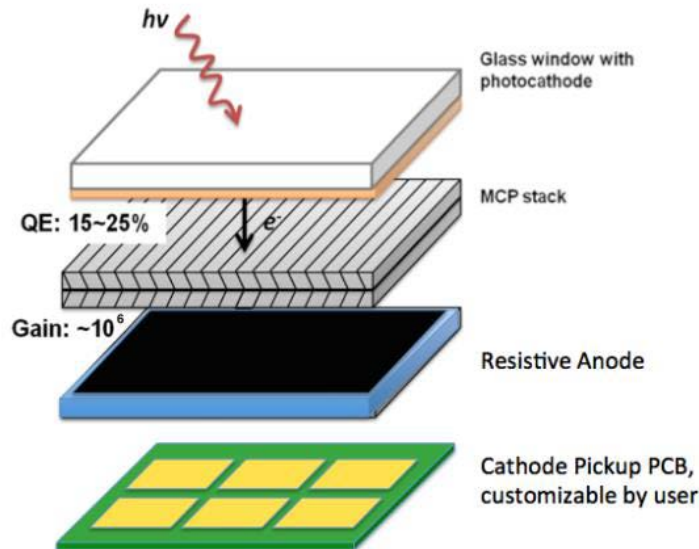
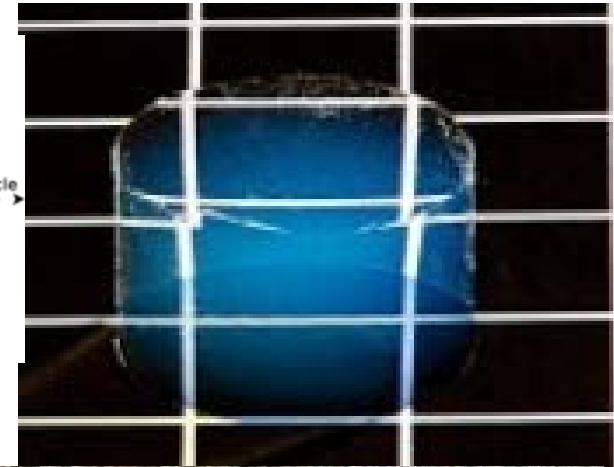
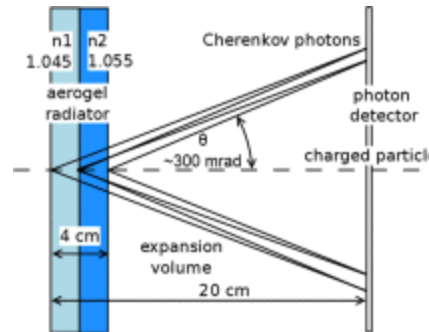


HMB v3.1

Large Area Picosecond PhotoDetector (LAPPD)

- In addition to laser testing, can also image Cherenkov rings

- Initially DRS4 readout
- Transition to AARDVARC readout



HMB v3

Other tests

- Timing of long scintillator strips with WLS fibers (KLM scint upgrade)
- Characterize WATCHMAN 10" PMT response to direct muon hits
- Spatial/timing resolution comparisons between BMD and SciFi Trackers

- Minimize cables, board size

