BAND: Installation and Readout

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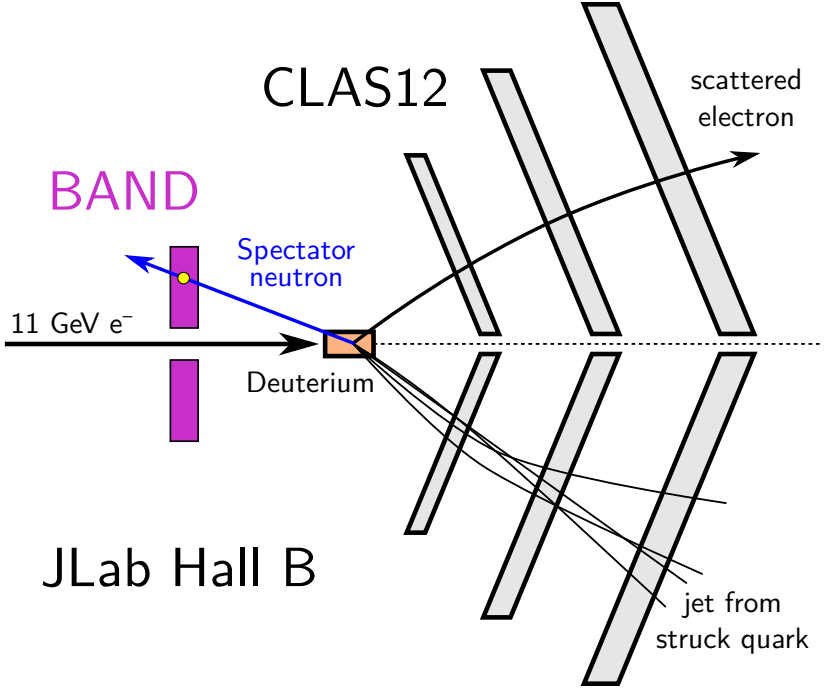
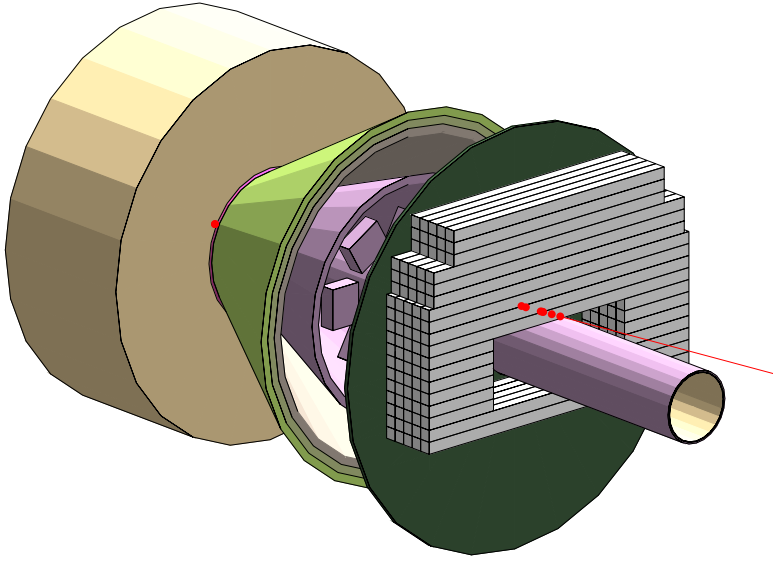
CLAS Meeting 11/15/18

BAND in Hall Context





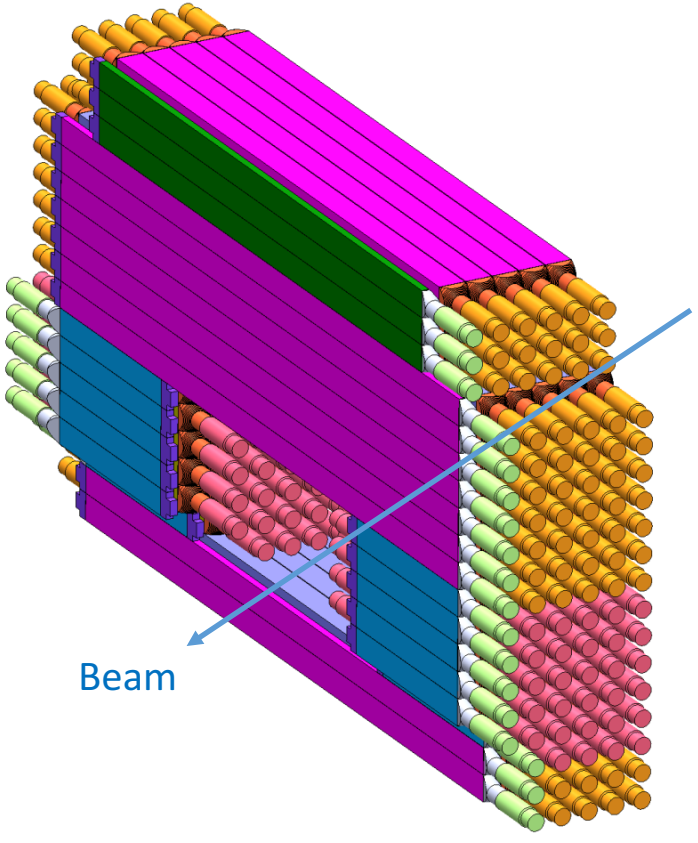
BAND Layout

Plastic scintillator detector

- Covers 160 to 170^{o}
- 40% neutron efficiency
- 116 7.2 x 7.2 cm^2 bars
  - two 2” PMTs per bar
  - 3 scintillator lengths (51, 164 and 202 cm)
  - BC-408 Scintillant
- Hole for beam line

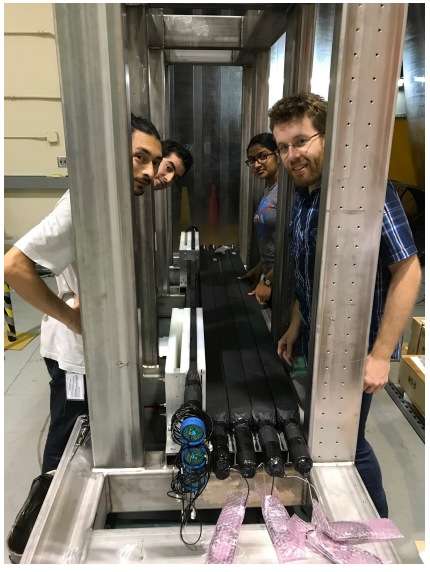
Veto layer

- 2 cm x 7.2 cm
- one 2” PMT per bar
- 24 PMTs



BAND Construction

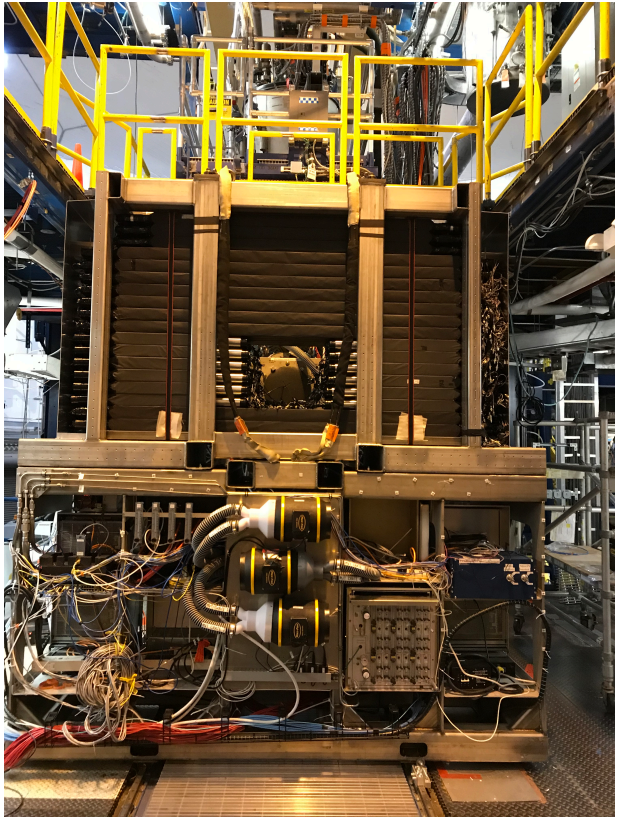
- July:
  - Glue PMTs to bars
  - Test bars and fix light leaks
  - Assemble all bars and some Veto bars into frame
- August:
  - Transport to the hall
  - Install cables and electronics
- First data taking with cosmics
- Still need (in January)
  - Optical fibers for laser calibration system
  - More mu-metal shields
  - More readout channels

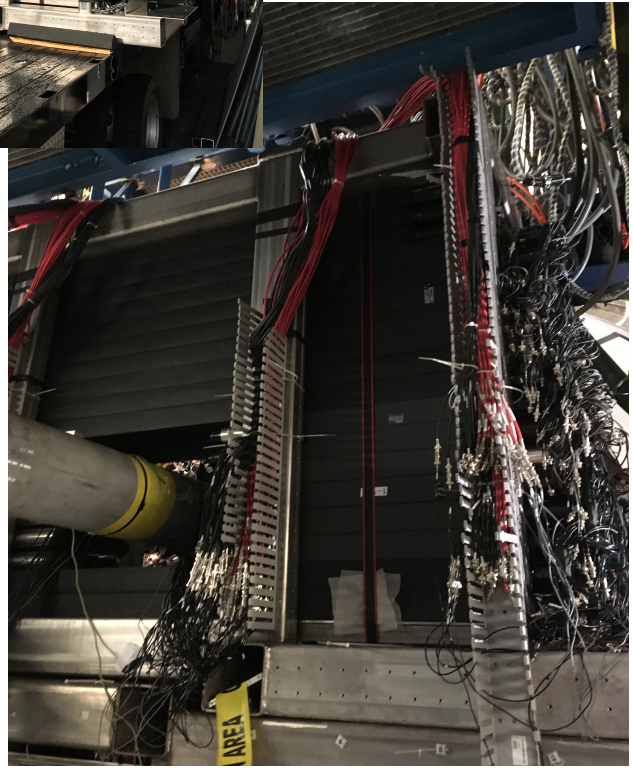


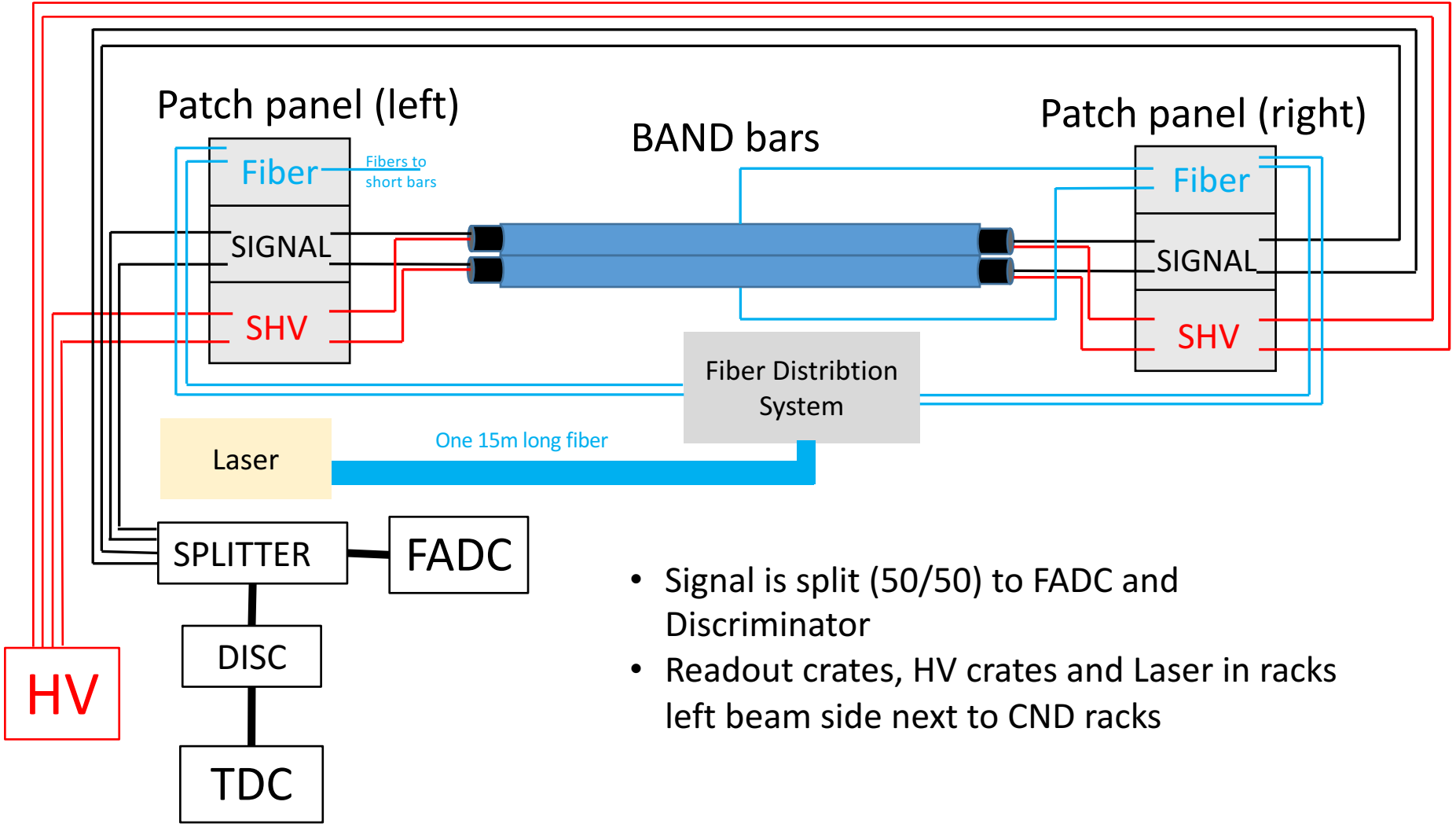
BAND is finished

BAND in the Hall

Transport to the hall





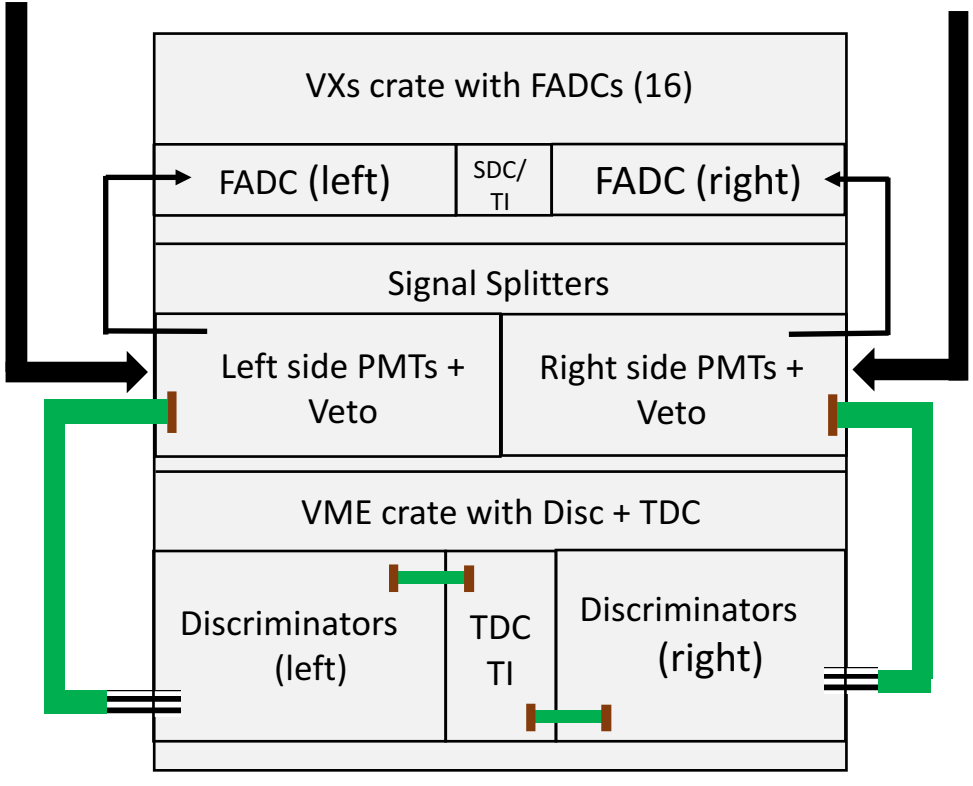


- Signal is split (50/50) to FADC and Discriminator
- Readout crates, HV crates and Laser in racks left beam side next to CND racks

DAQ Full Setup

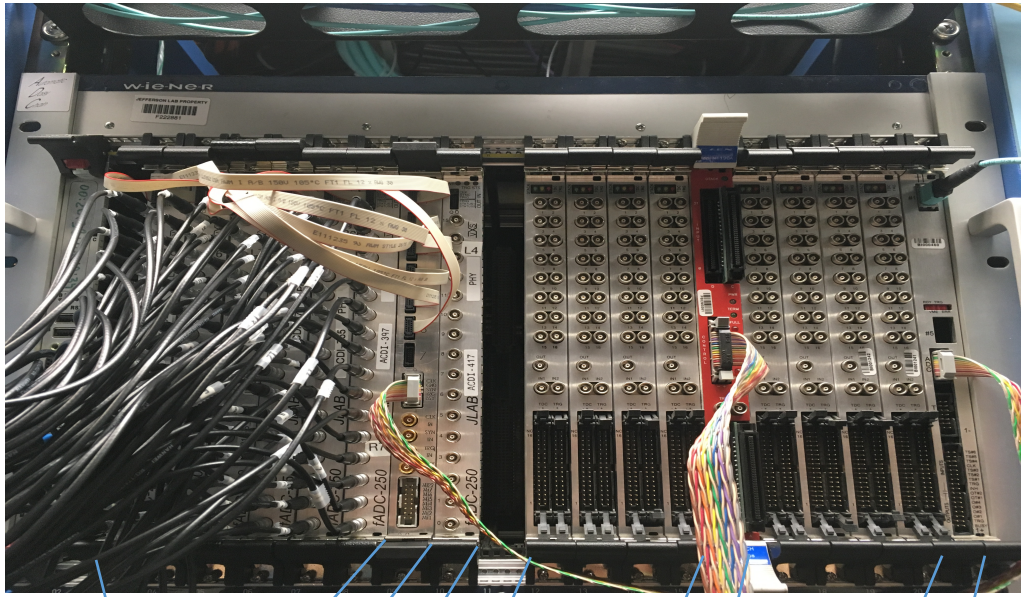
Left side PMTs (116 chan.)
+ 12 Veto Layer channels

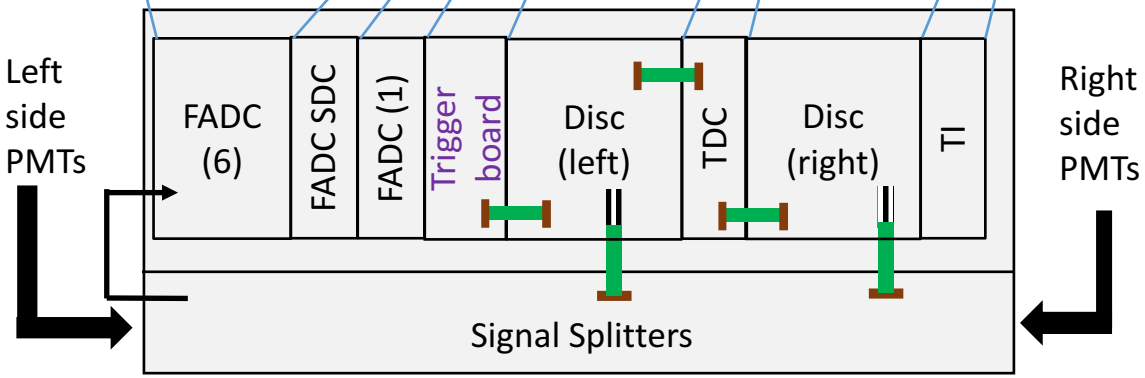
Right side PMTs (116 chan.)
+ 12 Veto layer channels



- 1 VXs crate for FADCs
- 1 VME crate for TDC and discriminators
- Splitters between crates
- Groups of 16 channels from nearby PMTs (besides Vetos)
- Detailed mapping files available for each signal

VME crate with FADCs (7), Disc (8) and TDC
(Trigger board not in the picture)

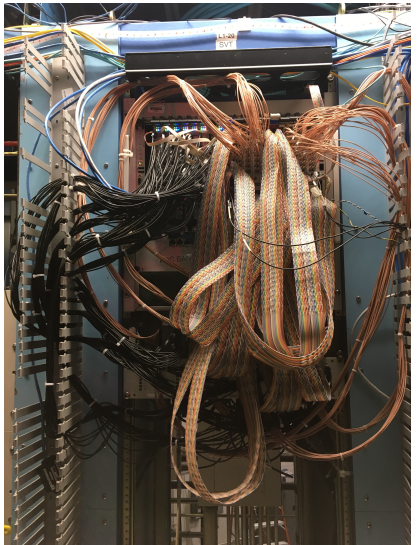




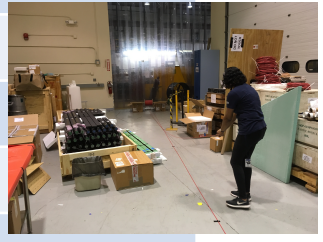
DAQ Fall Setup

- 40% instrumented
- Trigger:
  - stand-alone readout or
  - combined with CLAS

- Extra Trigger board for Fall-2 setup

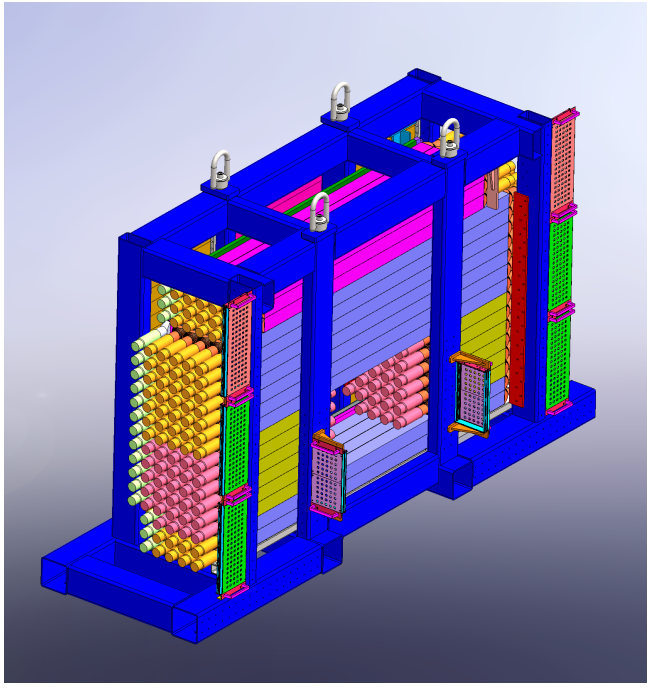


Electronics and Cables

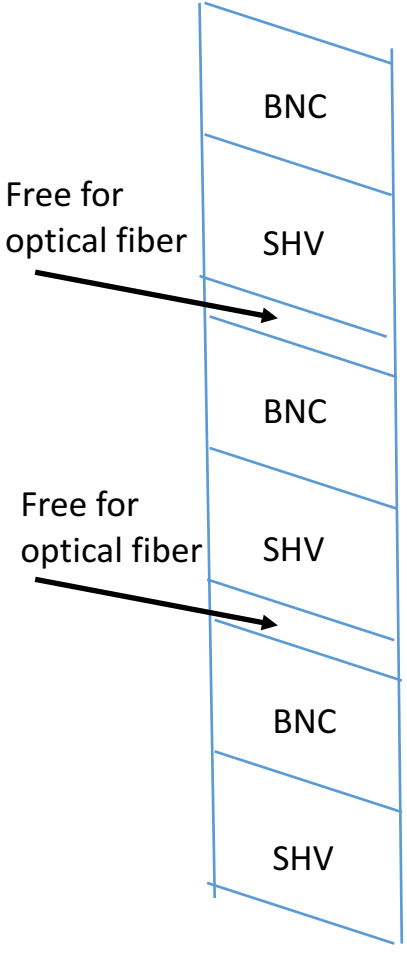


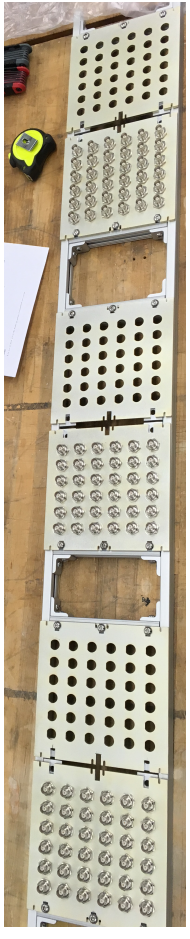
Item	Count	Progress
Signal long cables	256	100%
Signal patch panel connectors	256	100%
Splitters	256	100% available (50% installed)
Discriminators	16	8 installed in fall (rest available)
TDC	2	1 installed in fall (rest available)
FADC	16	7 installed in fall, waiting for repairs of rest
Cable splitter to FADC	256	50% done, rest in production
Cable splitter to Disc	256	50% done, connectors for rest ordered
SHV crate and modules	2 + 11	2 + 9 installed (1 in repair + 1 ordered)
SHV long cables	256	100%
SHV patch panel connectors	256	100%
VXS crate and CPU	2	CPU delivered, VXS should arrive next week

Patch Panel



- 2 long and 2 short panels
- 2 Fiber patch panels
- Panels and frames finished
- Installation in January

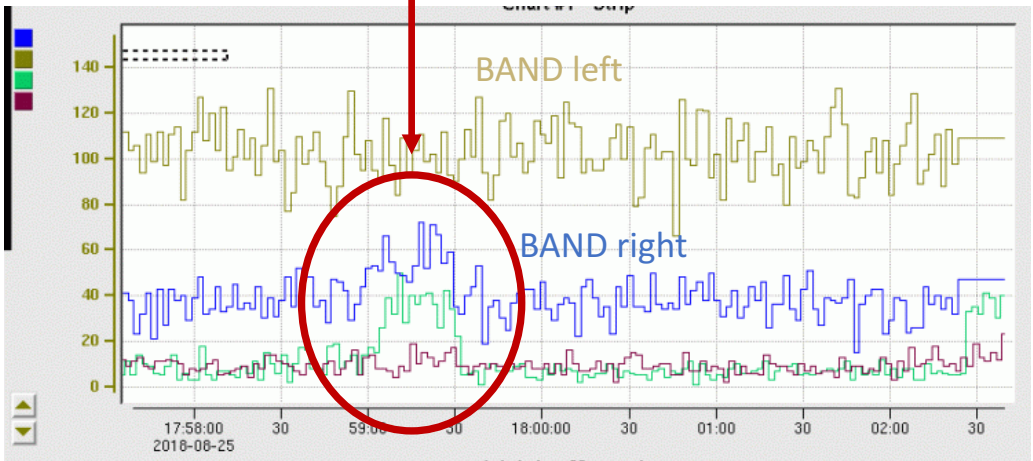


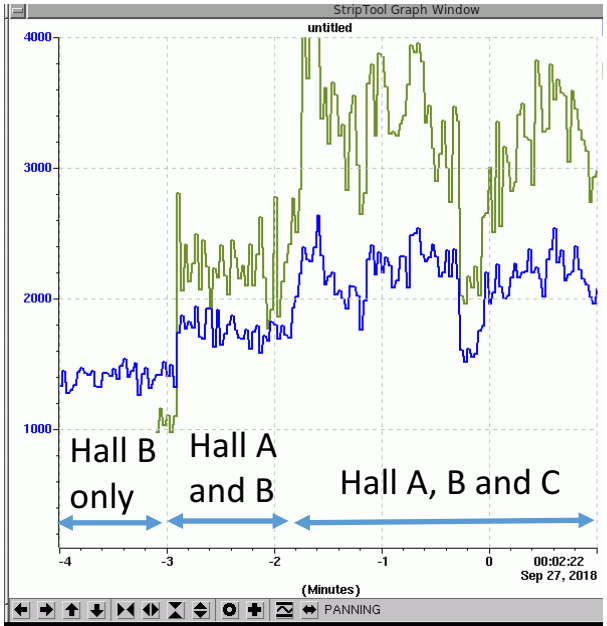


Setup 1 - Fall 18

- Startup with only 65 PMTs equipped with available mu-metals, mainly inner PMTs of short bars
- Simple trigger (any PMT fires)
- Stand-alone readout

Correlated neutrons with PCAL during beam setup
Beam to BSY dump

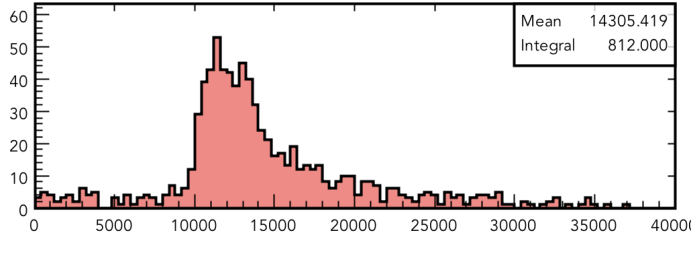




Setup 2 – Fall 18

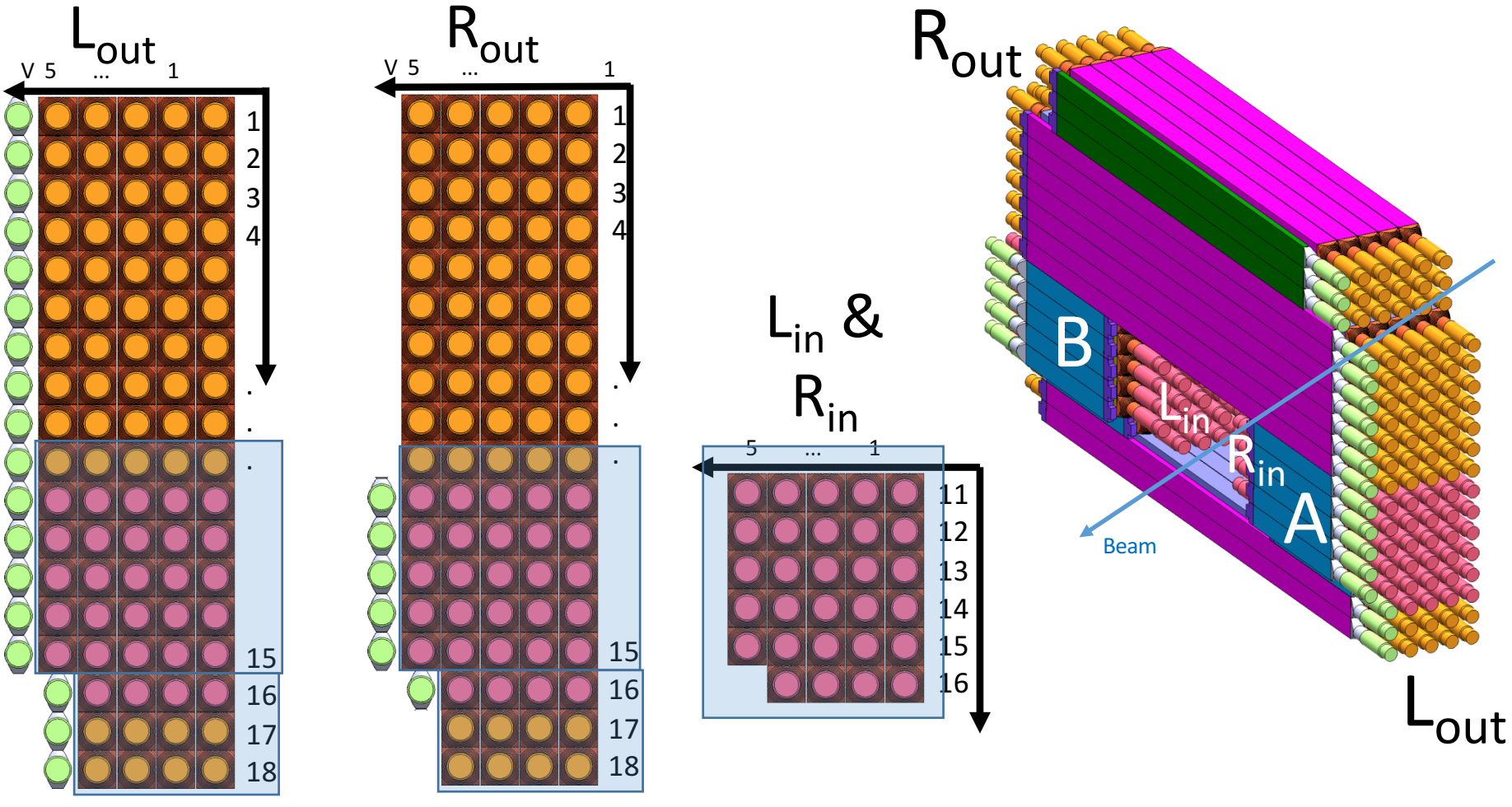
- Mu-metal shields on PMTs Row 10 and below
- Readout both sides
  - short bars in row 11 to 15
  - long bars 410 and 510
  - 4 short bars in row 16
- Cosmics trigger with at least 3 coincidence bars per column

ADC spectrum with cosmics

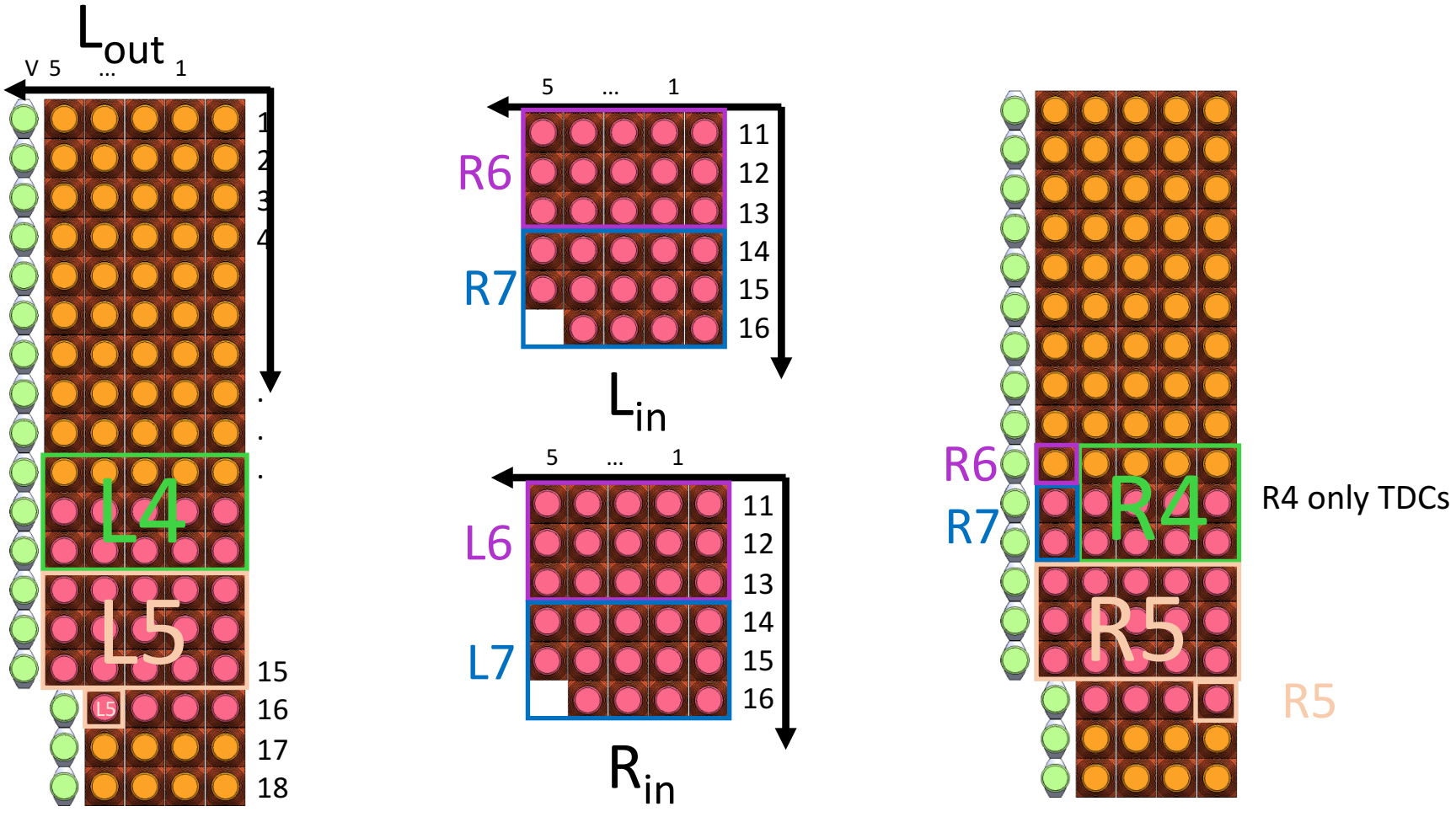


Rates with beam at 45nA

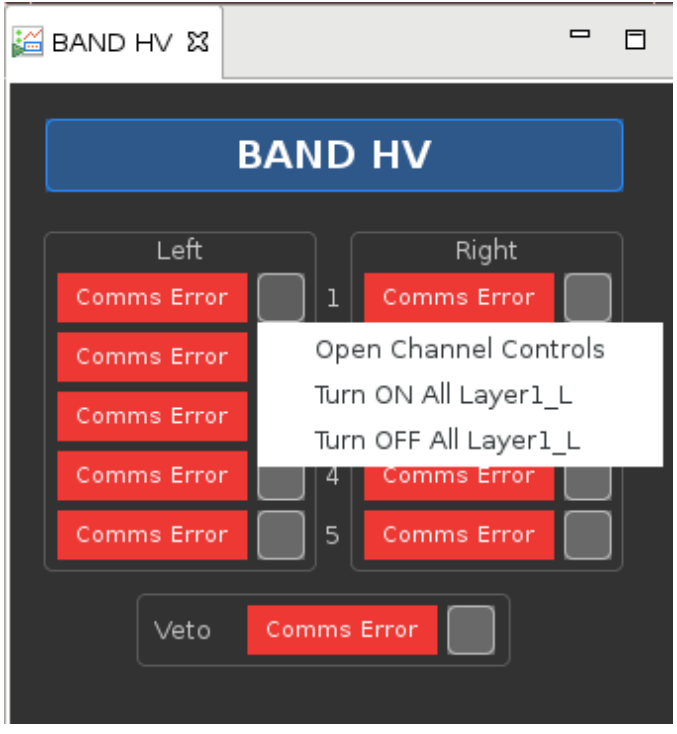
Setup 2 – Fall 18 (PMTs with shields)



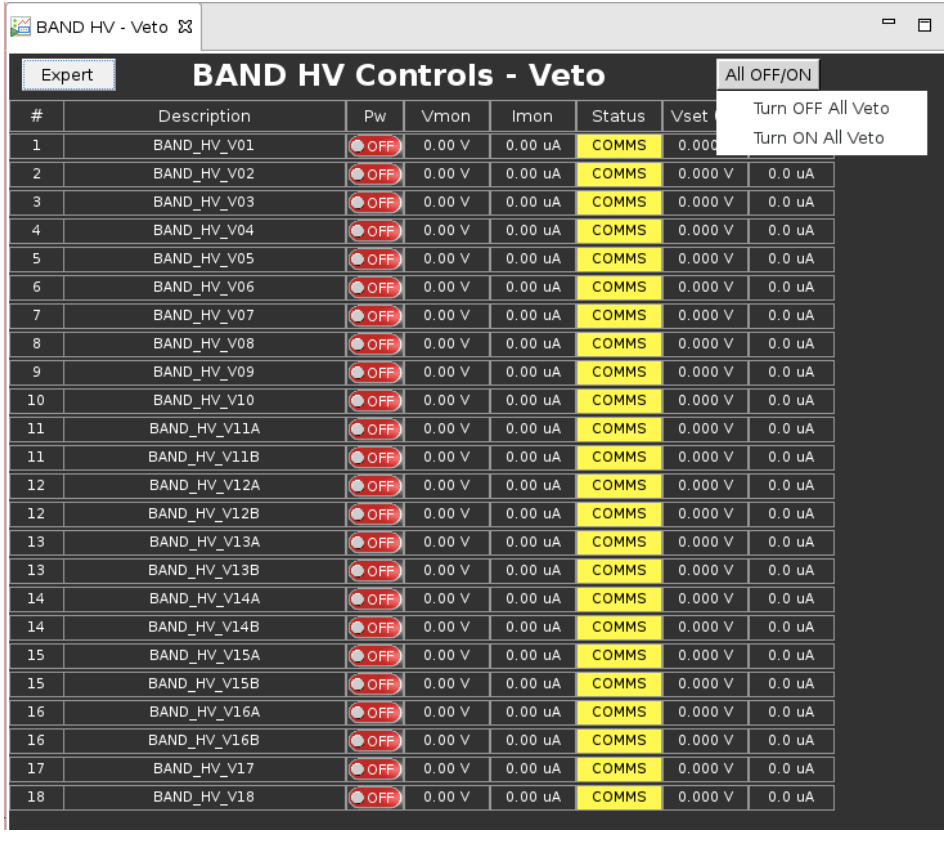
Setup 2 – Fall 18 (readout PMTs)



BAND HV GUI

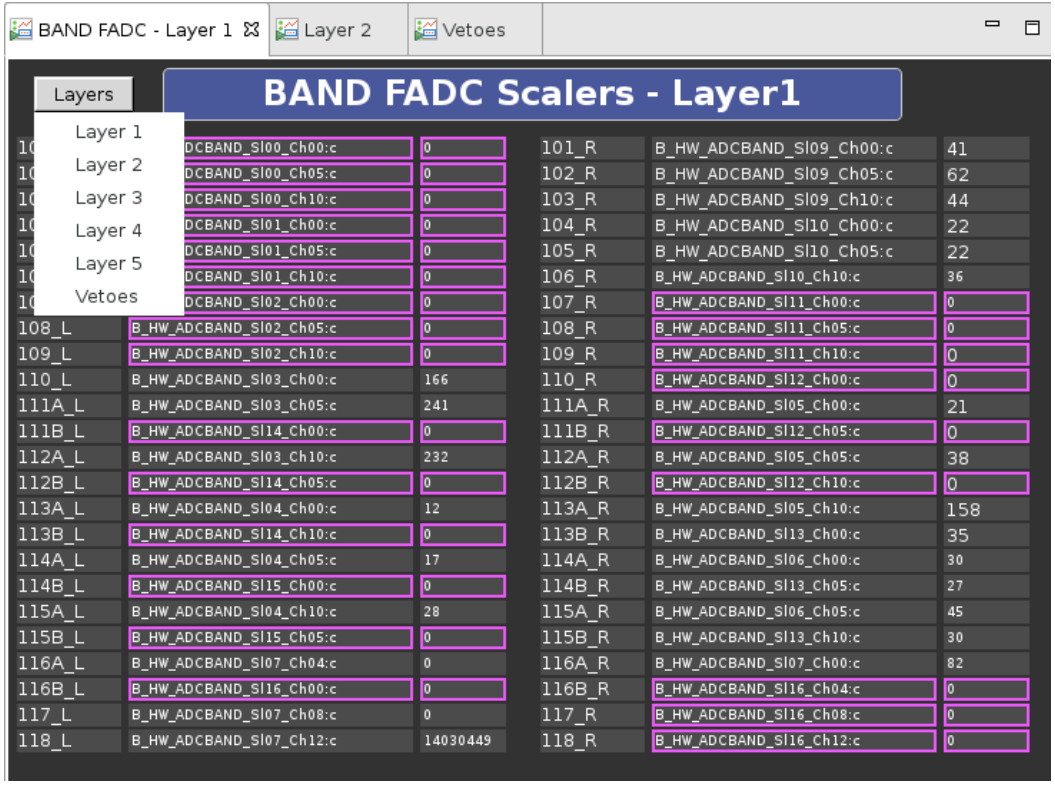


Left and Right side of each column + Veto



Detailed GUI to control each channel

BAND Scaler GUIs



Summary

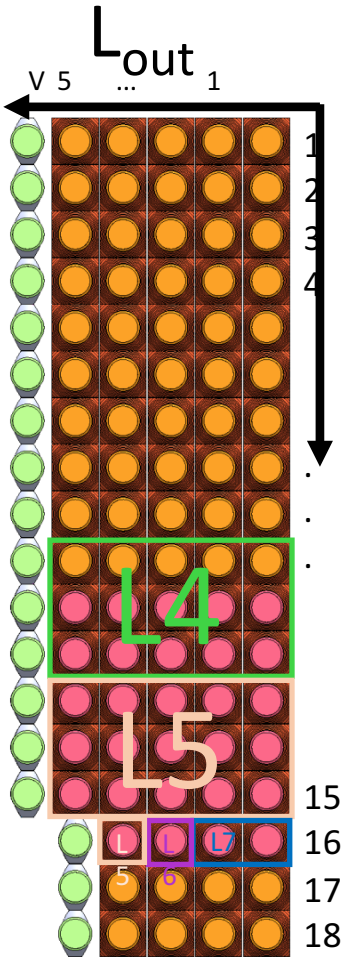
- Total of 116 scintillator bars (+ 24 vetos in BAND)
  - 58 long ones (2m and 1.6 m) + 12 Veto
  - 58 short ones (0.5 m) + 12 Veto
- BAND installed in the hall (without all Veto bars)
- ~40% cabled up for fall for background studies and commissioning
- Mapping files available for next year as well as fall
- Data available with standalone triggering on cosmics
- Readout of BAND with CLAS is available, tests in the next days

Fall 18 Signal channels (group of 16)

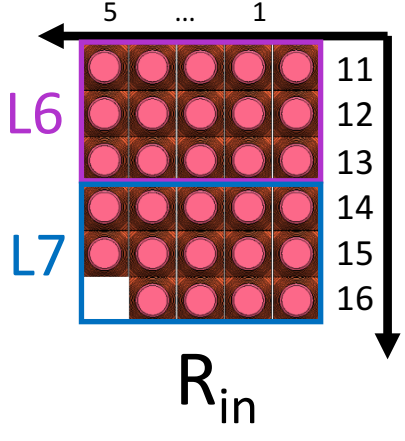
VETO LAYER

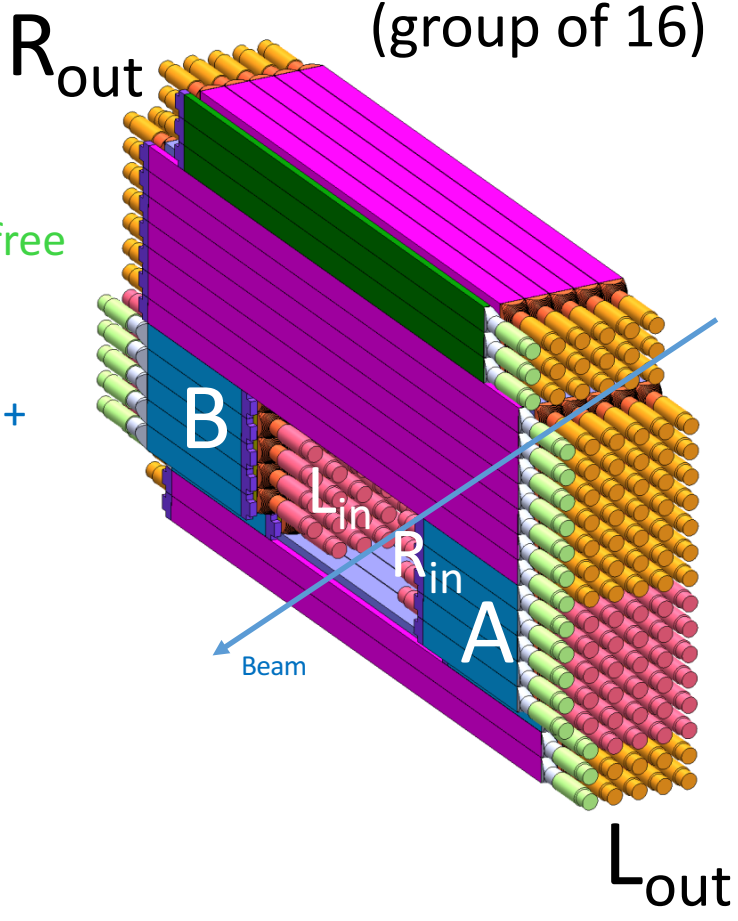
MAIN DETECTOR (TOW DIFFERENT TYPES OF PMTs)

- R_{in} fully used and Part of other short and long bars
- 7 FADCs total
- L4-7 means splitter not fully cable strang
- Need mu-metal installed



- L4: (1-5)10_L + (1-5)(11-12)A_L + free
- L5: (1-5)(13-15)A_L + 416A_L
- L6: (1-5)(11-13)A_R + 316A_L
- L7: (1-5)(14-15)A_R + (1-4)16A_R + + (1-2)16A_L



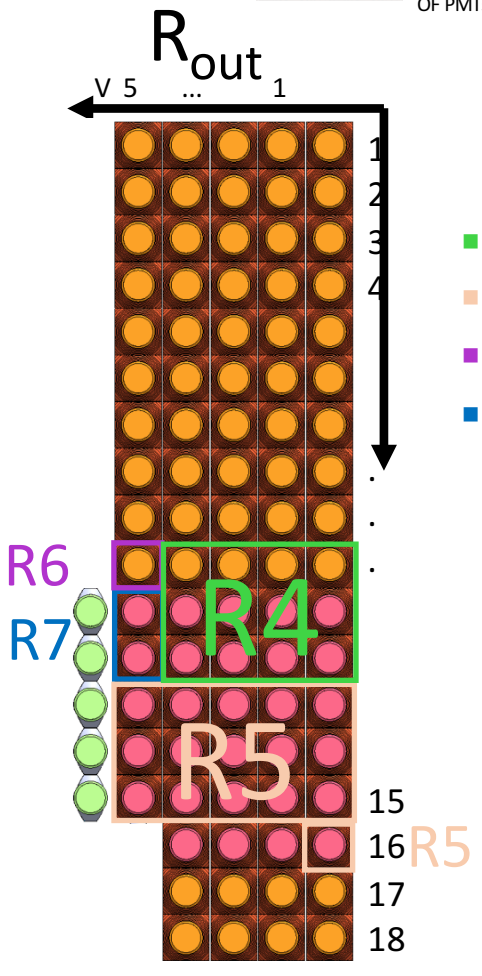


Fall 18: Signal channels (group of 16)

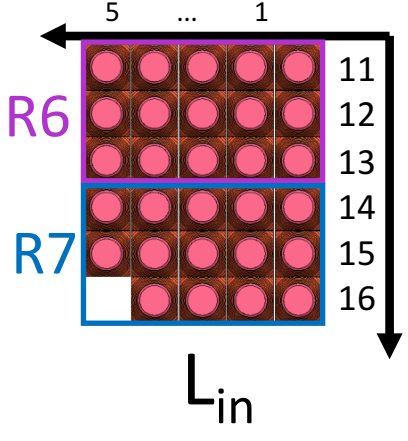
VETO LAYER

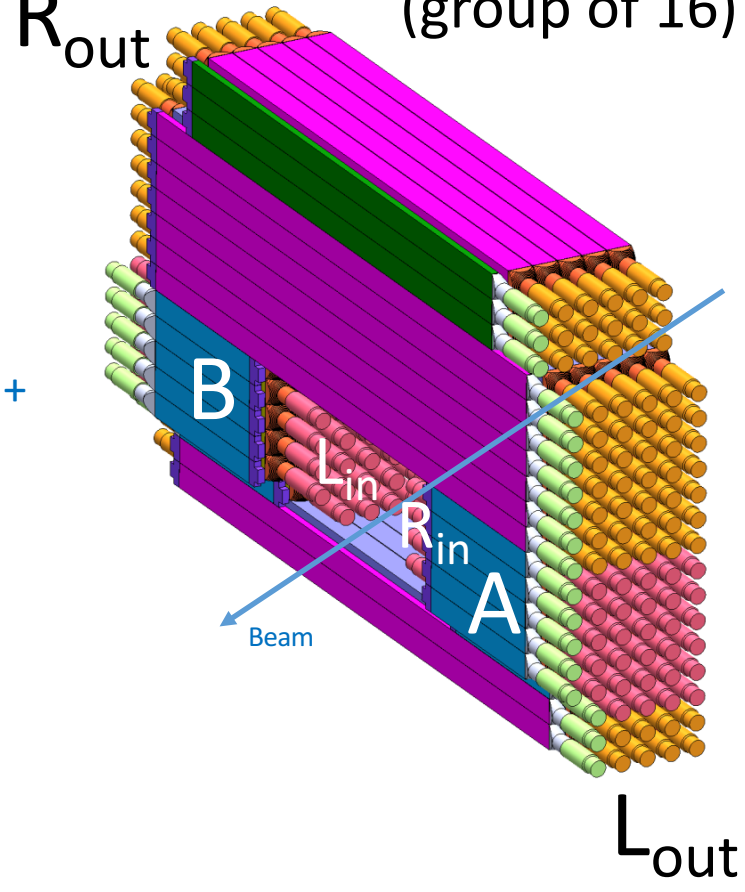
MAIN DETECTOR (TOW DIFFERENT TYPES OF PMTs)

- L_{in} and part of R_{out} used (maybe Layer 1 instead of 5)
- R5-7 means splitter not fully cable strang itself
- R4 only TDC and trigger

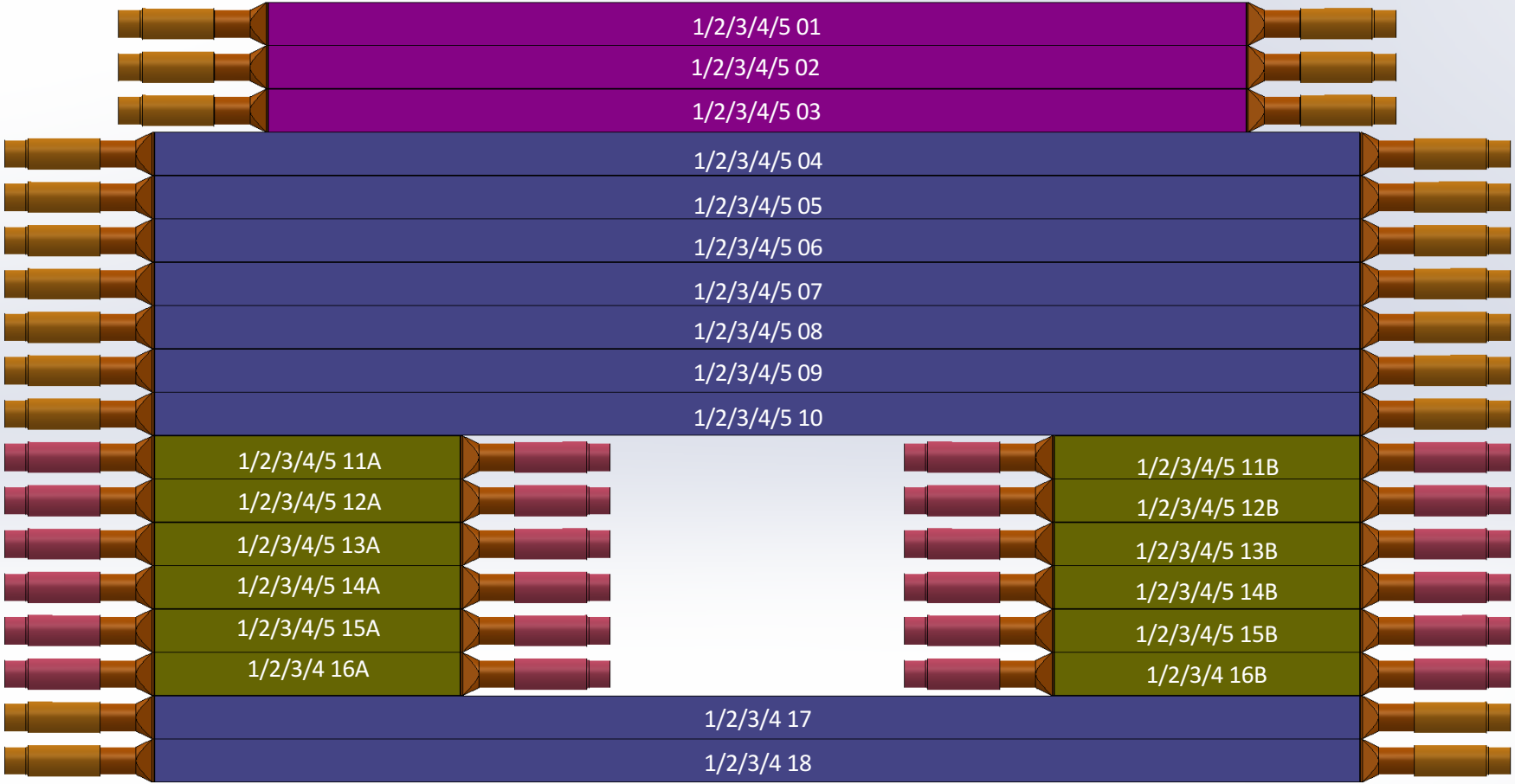


- R4: (1-4)(10-12B)_R (only TDC)
- R5: (1-5)(13-15)B_R + 116B_R
- R6: (1-5)(11-13)B_L + 510_R
- R7: (1-5)(14-15)B_L + (1-4)16B_L + + 5(11-12)B_R





Row labeling for each column (5th column without row 15-18)



Veto Row labeling