

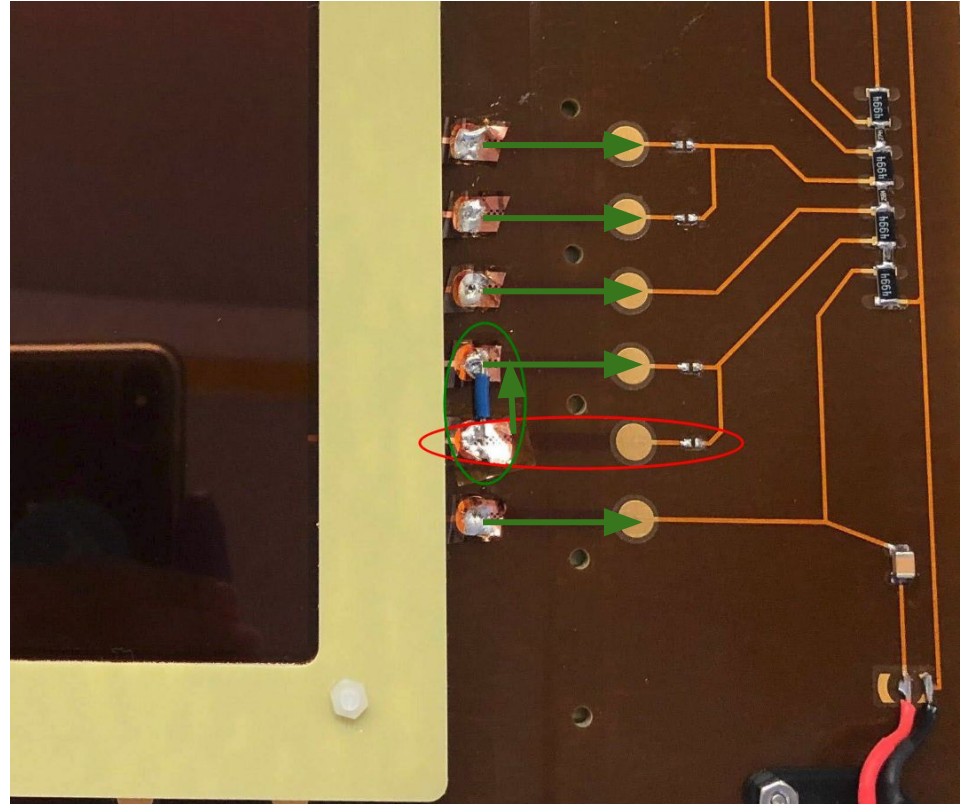
GEMs

Chandan Ghosh

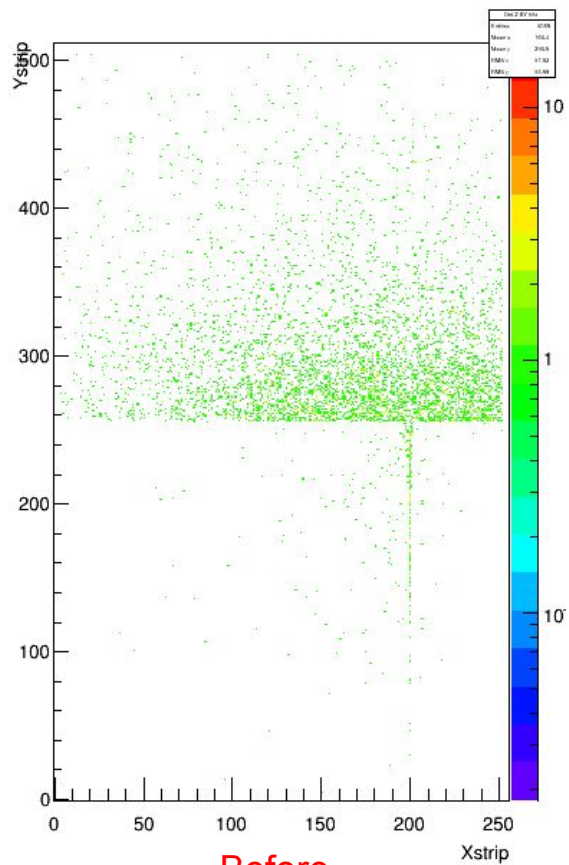
April 9, 2019

GEM-4 Problem

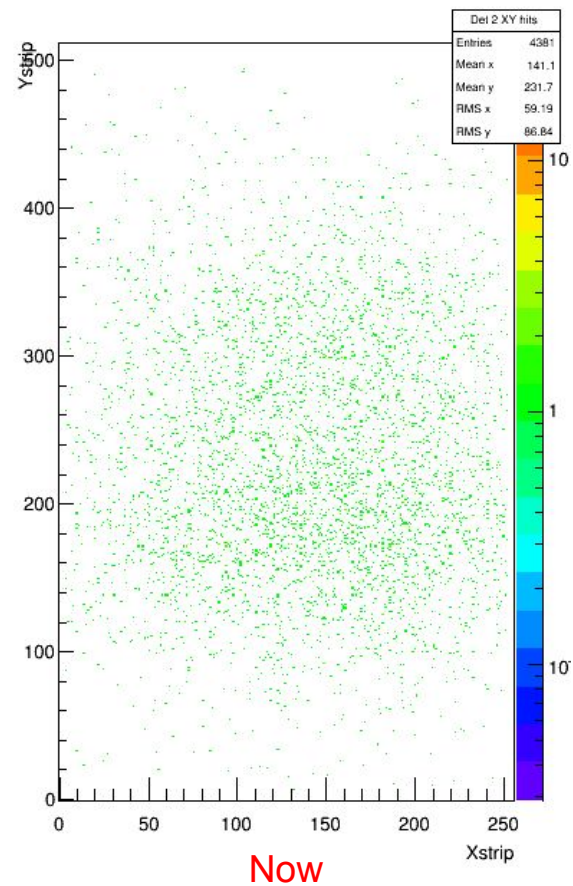
- Connection showing in red introduces very small ($\sim 5\text{pF}$) in series with the GEM foil ($\sim 6\text{ nF}$)
- This is board problem!!
- The two segments of the bottom most foil (near to the readout) are connected.
- Purge nitrogen for one day. Applied HV (-4.2 kV) in nitrogen environment.
- Purge Ar- Co_2 for one day and applied HV (-4.0 kV).



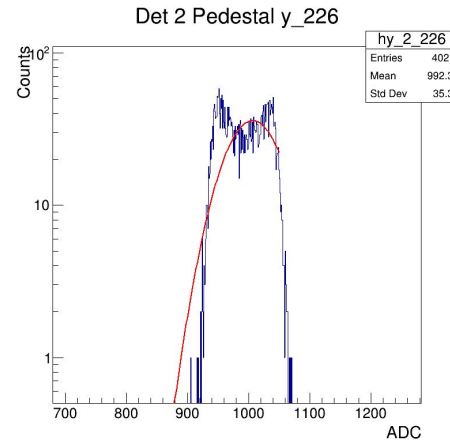
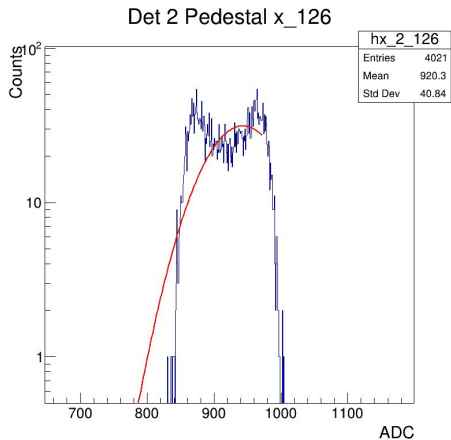
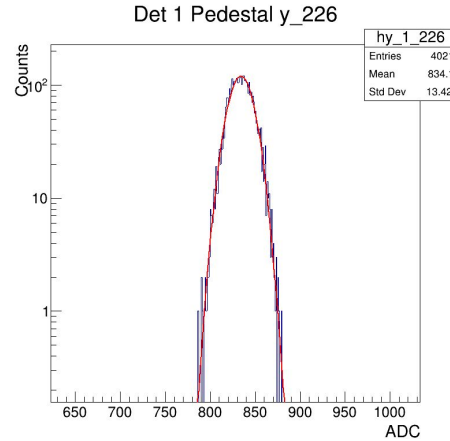
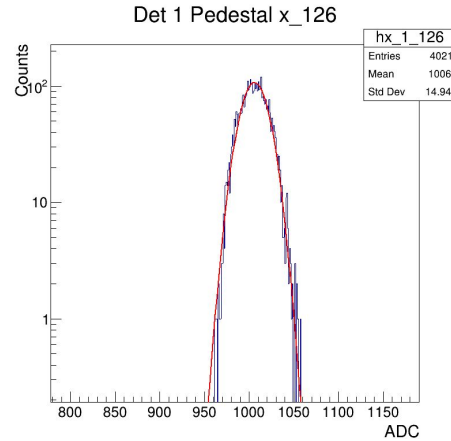
Det 2 XY hits



Det 2 XY hits



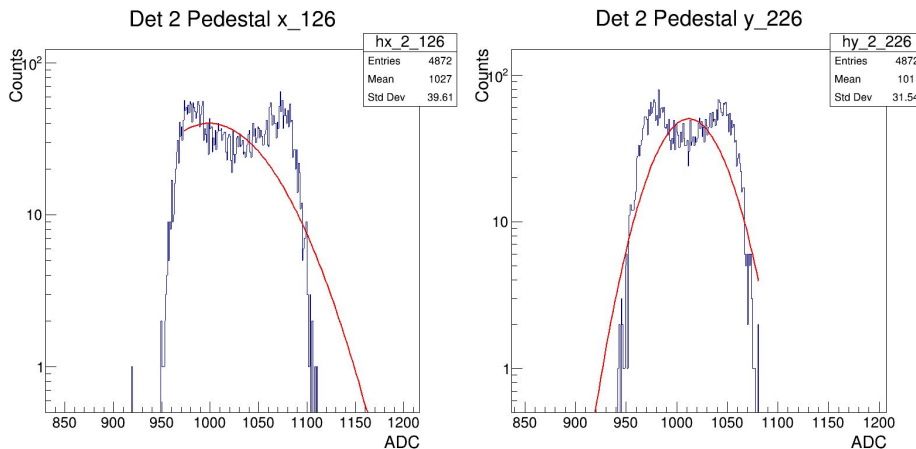
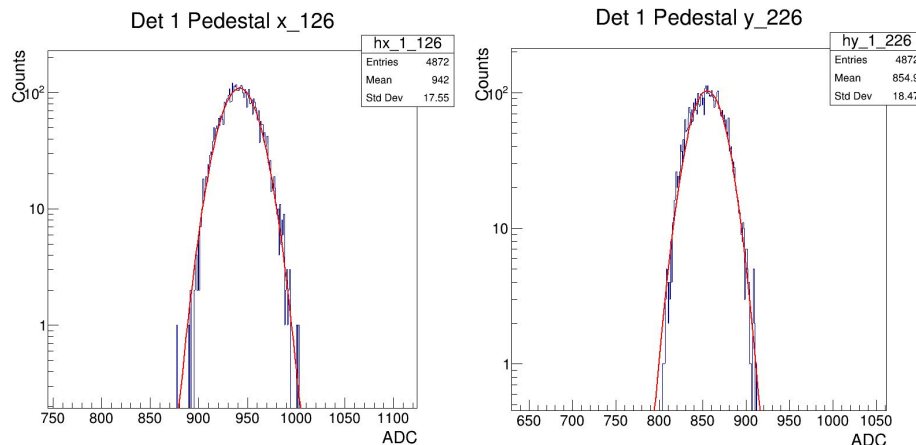
ADC channel is swapped with Det 1 (HV off)



- Same ADC channels give good pedestal for detector 1.
- The ADC channels which gave good pedestal with detector 1 give bad pedestal with detector 2

ADC channel is okay!!

2-Slot APV card is swapped with Det 1 (HV off)

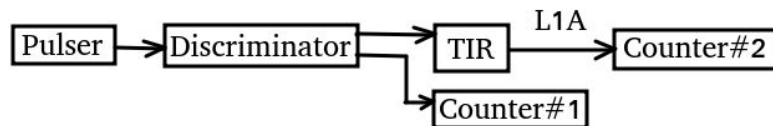


- Same 2-slot backplane (with APV card) give good pedestal for detector 1.
- The 2-slot backplane which gave good pedestal with detector 1 give bad pedestal with detector 2

Backplane is okay!!

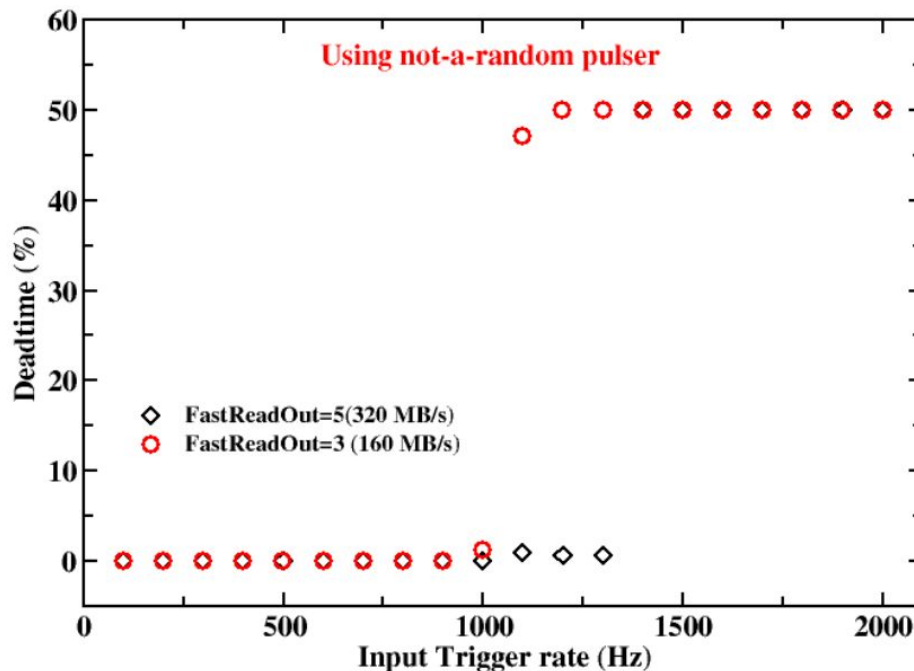
Still investigation..

Deadtime issue



$$\text{Deadtime} = (\#1 - \#2) * 100 / \#1$$

Using 18 APVs (12+6) and with two MPDs

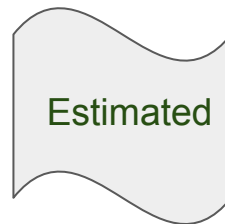


Ryan did this measurement

Trigger rate estimation based on data processing time (6 samples/strip)

- With FastReadout=5: The busy signal $\sim 760 \mu\text{s}$

- MPD data processing $\sim 450 \mu\text{s}$
- MPD data readout $\sim 178+94 = 272 \mu\text{s} \sim 15 \mu\text{s/APV}$ data reading
- Data rate $\sim 53 \text{ MB/s}$ (for 1 kHz trigger)

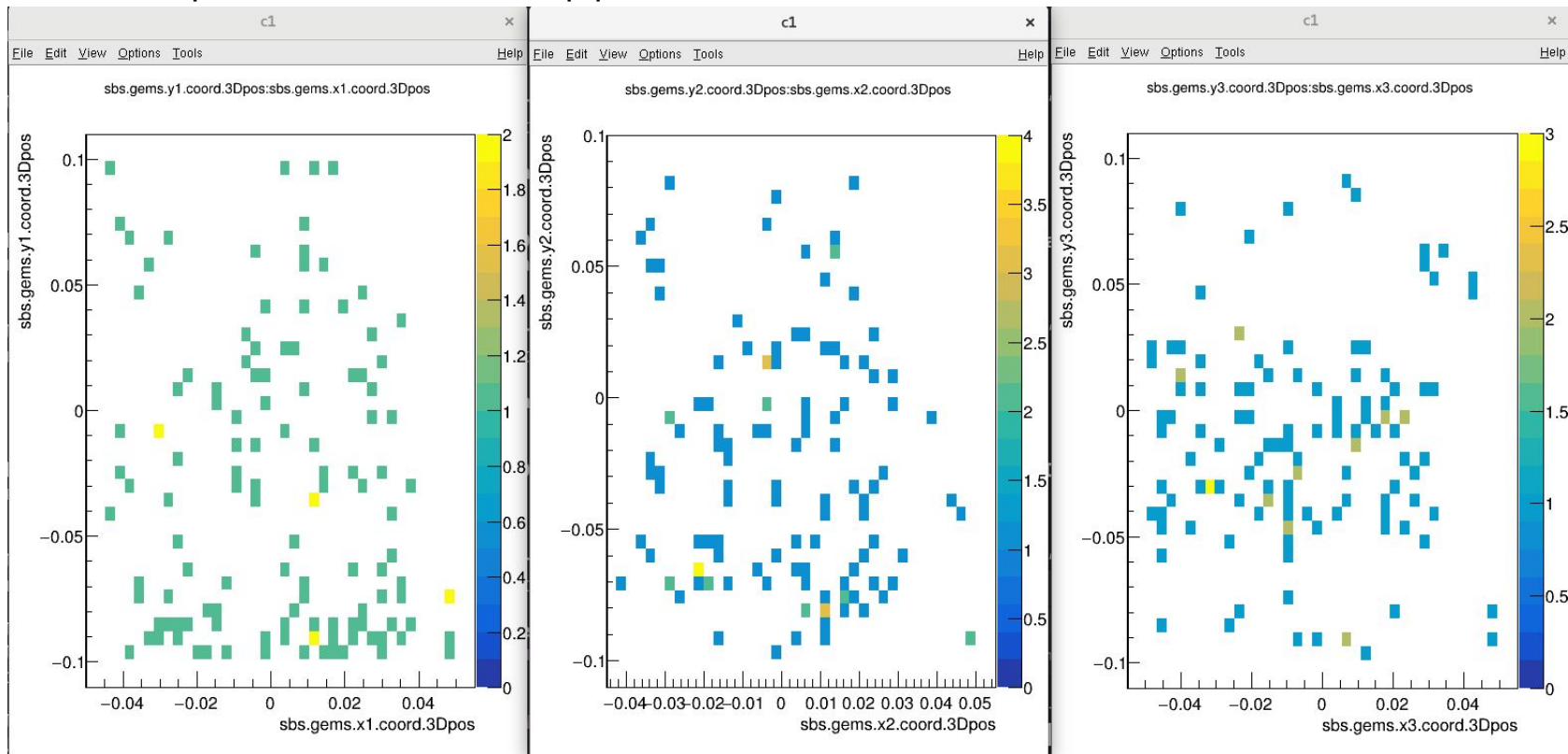


- ❖ For 84 APVs: Readout = $15 \times 84 = 1260 \mu\text{s}$
- ❖ Busy signal $\sim 1260+450 \sim 1700 \mu\text{s} \sim$ Trigger rate $\sim 600 \text{ Hz}$
- ❖ At 600 Hz, data rate $\sim 150 \text{ MB/s}$ (beyond transfer capability (max 100 MB/s) network cable!!) - we have to use at least two crate if we readout 84 APVs without zero-suppression
- ❖ For 100 MB/s - two crates (having 42 APV cards in each) - maximum trigger rate can be achieved = $100/(42 \times 768 \times 32/(8 \times 1024^2)) \sim 800 \text{ Hz}$
- ❖ For 42 APV cards, the busy signal would be $\sim 15 \times 42 + 450 = 1080 \mu\text{s} \sim$ trigger rate: $\sim 925 \text{ Hz}$

Even for two crates the bottleneck is the data transfer rate through network cable, not the DAQ

TreeSearch

- Implemented individual strip pedestal subtraction, common-mode-noise calculation



- Hit reconstruction efficiency is very bad (123/2000). Now debugging this

Other updates

- Devi and I went through all the existing logic circuits in the RHRS
- The LHRS shield door is partially open. We don't have access to the top level.
- It is decided to use LeCroy 1881M fastbus ADC for counting mode DAQ
- We have received SBU HV unit from CAEN (after repair). Tested - it is working
- We received another (backup) 10x20 GEM detector - Now at SBU.
- One of the ISU GEM is not working. Resistance and capacitance measurements show that one sector of all three GEM foils is damaged. Need to replace the foils