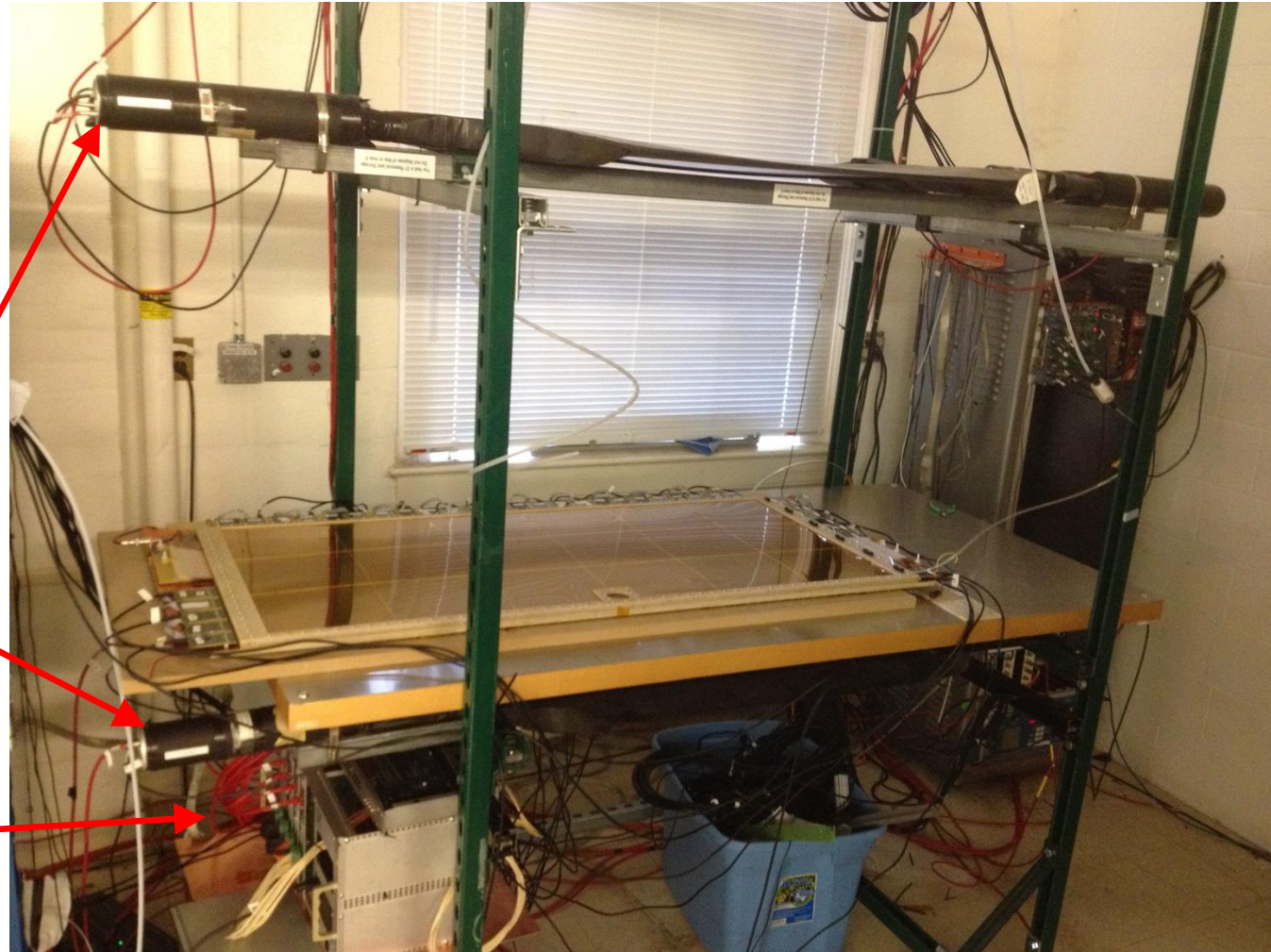


pRad GEM1: Preliminary results with cosmics

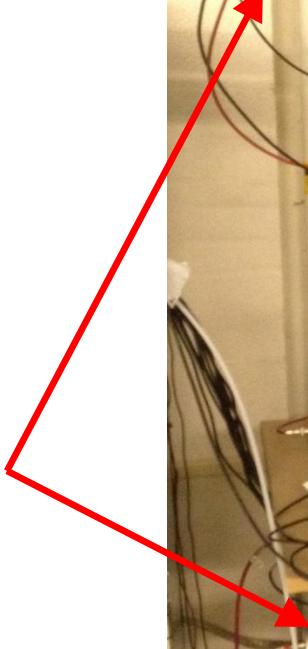
K. Gnanvo, UVa

pRad Weekly Meeting, August 13, 2015

pRad GEM1: Cosmic bench setup



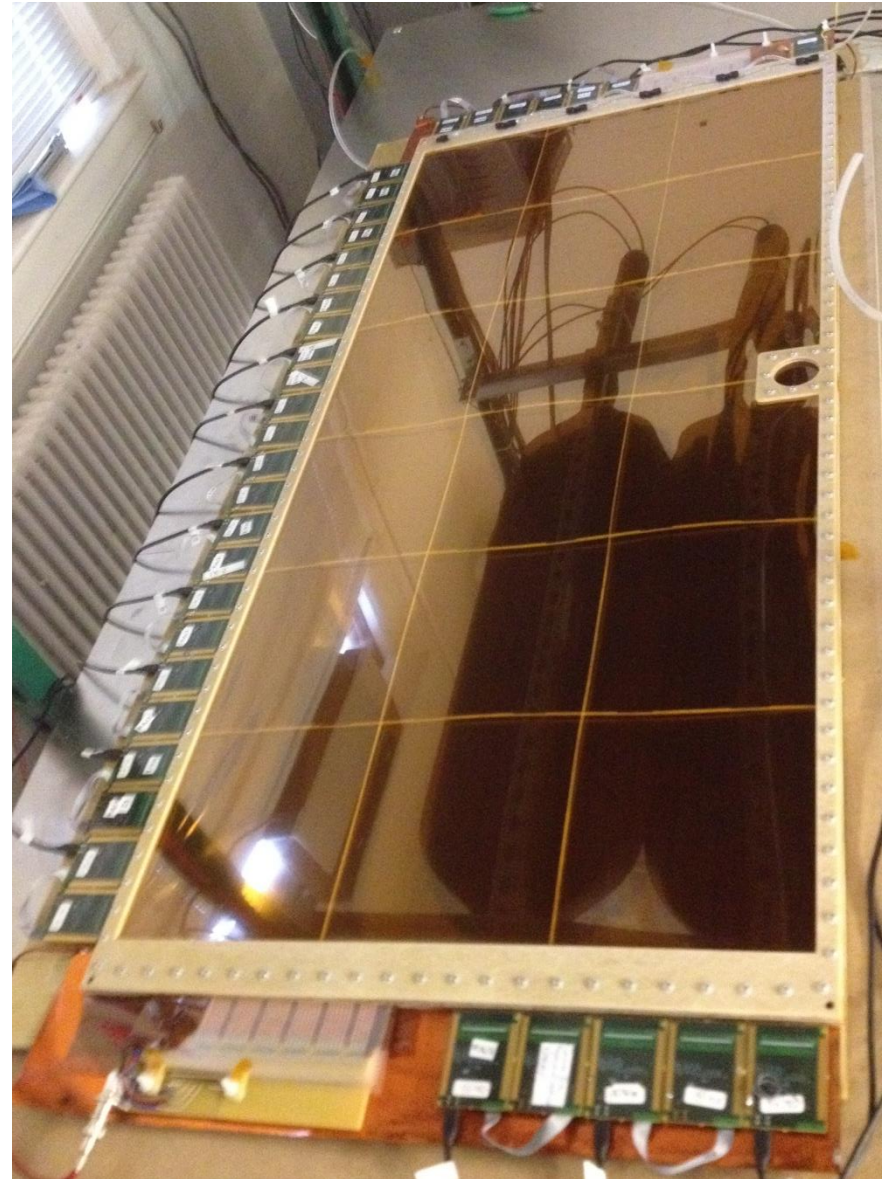
PMT/Scintillators
for trigger



SRS Readout electronics

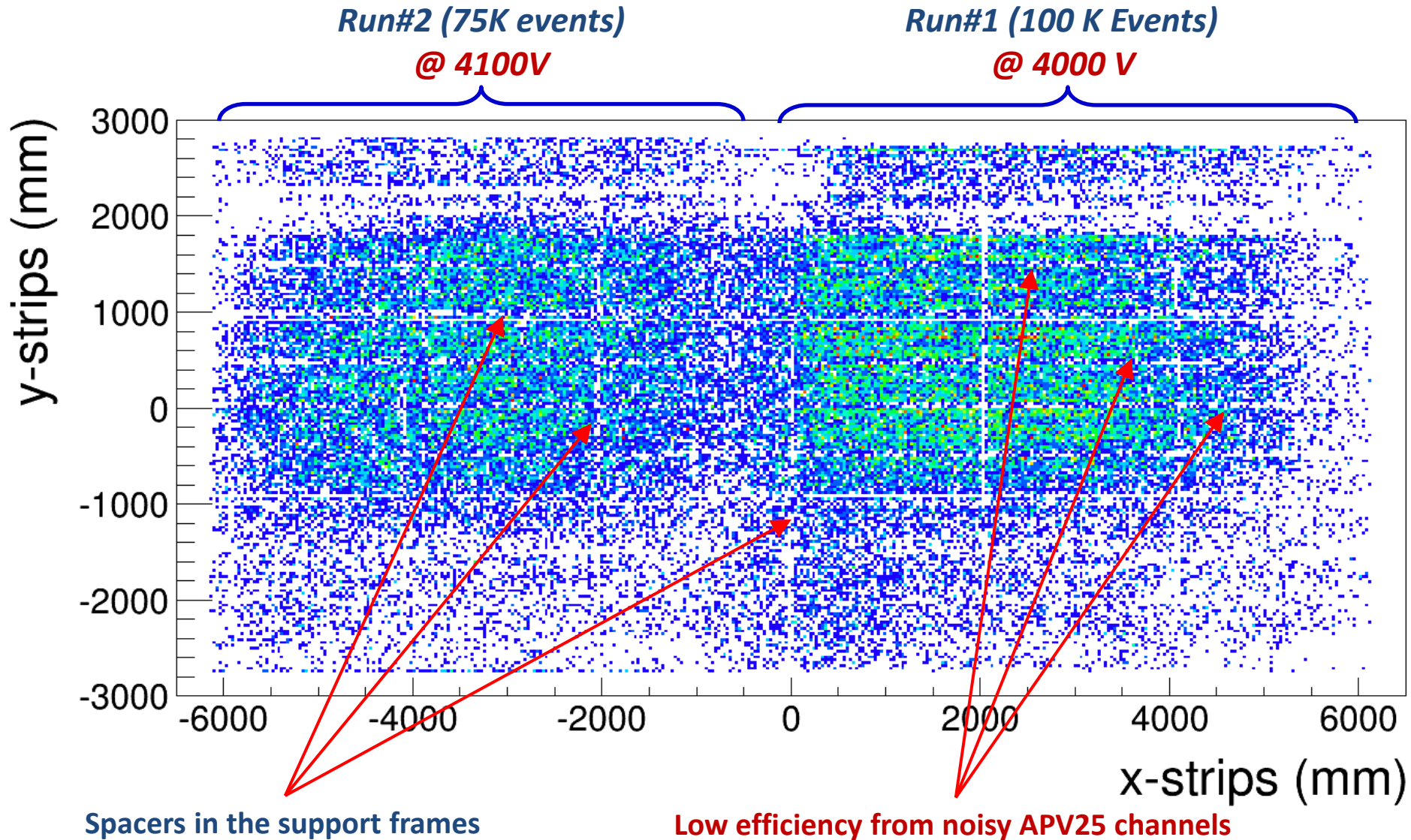
pRad GEM1: APV25-SRS FE cards

- The chamber is fully equipped and readout with SRS electronics:
- 24 APV25-SRS FE along the long direction (short strips) and 12 along the short side (long strips) → 5 on one side, 7 on the other
- PMT/scintillators cover about less than 30 % of the pRad GEM active area
- Have to move the chamber between two runs to covers as much area as possible
 - Run#1 100K events (3 days)
 - Run#2 75K events (2 days)
- Need far more statistics → about 1 month cosmic data
- **But the chamber is working fine**

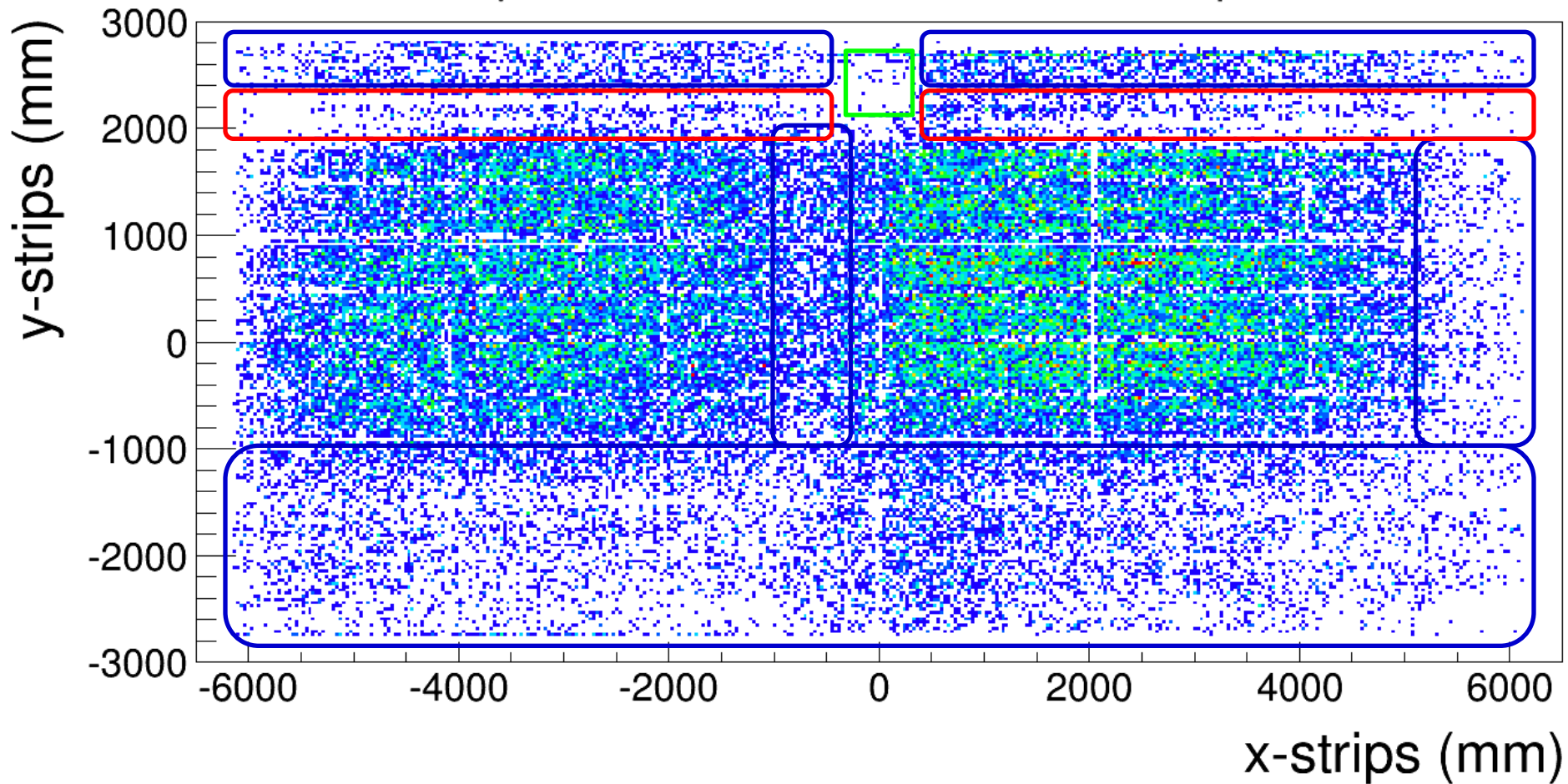


pRad GEM1: 2D Map of the event cluster position

Overall good response of the chamber on its active area



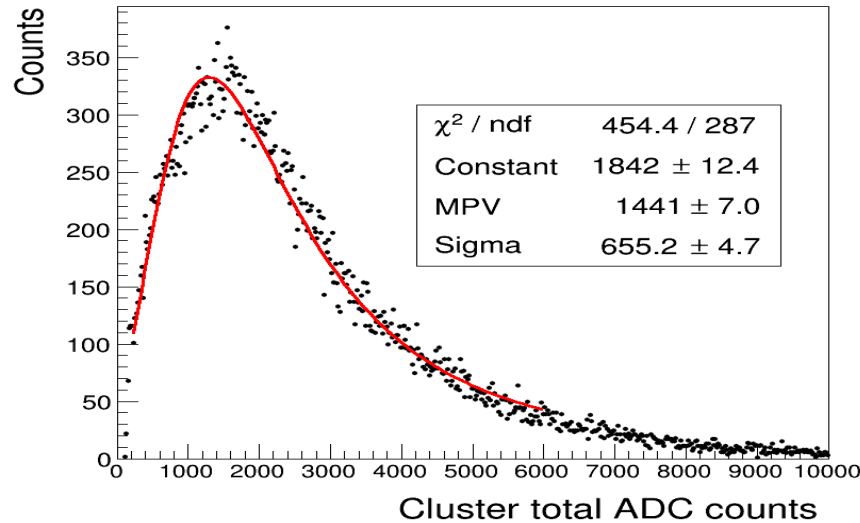
pRad GEM1: Origin of the non-uniform coverage



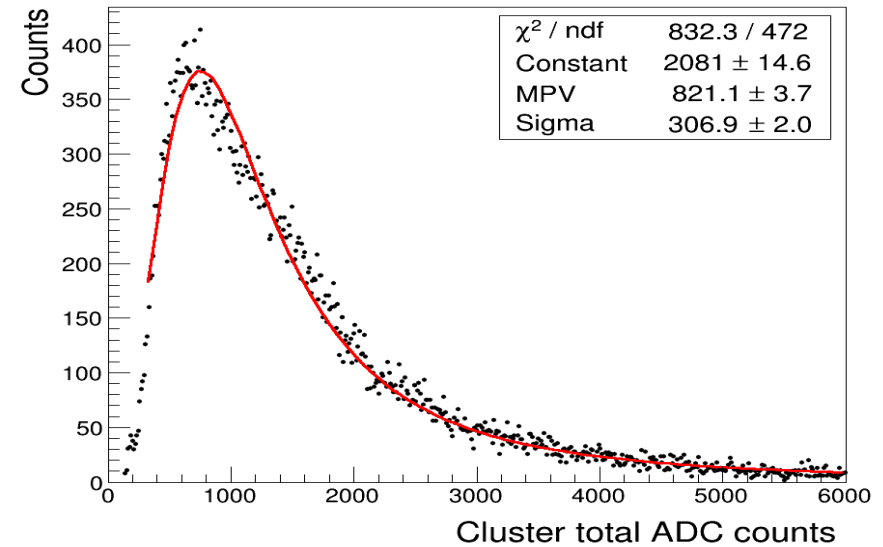
- **Blue square:** low coverage of the PMT/scintillator
- **Green square:** Beam pipe dead area
- **Red square:** Few dead channels → readout strips or APV25 channels? **Under investigation**

pRad GEM1: ADC distribution and X/Y charge sharing

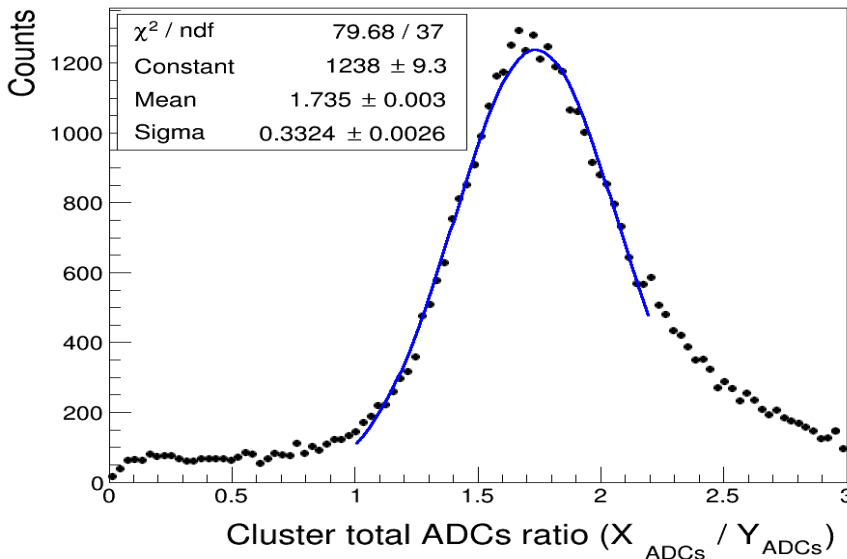
pRadGEM1: ADCs distr in X-Strips



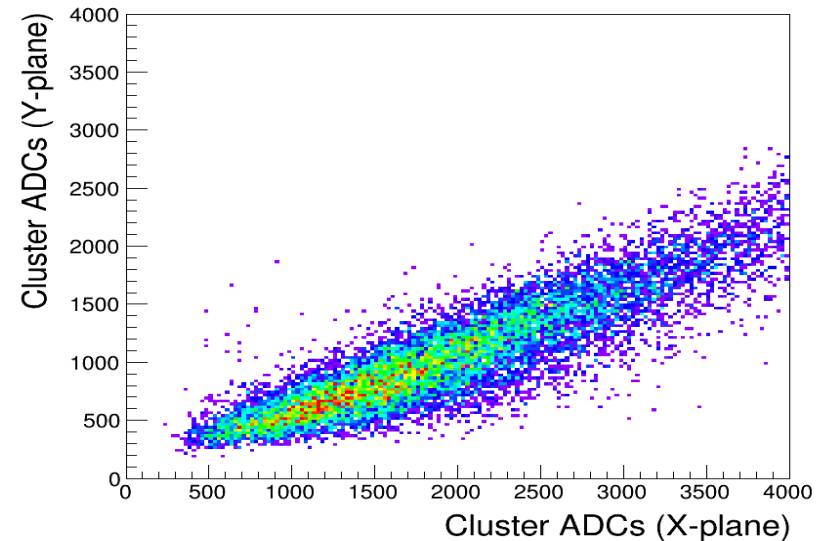
pRadGEM1: Cluster charge Distr in Y-strips



pRADGEM1: cluster charge sharing ratio

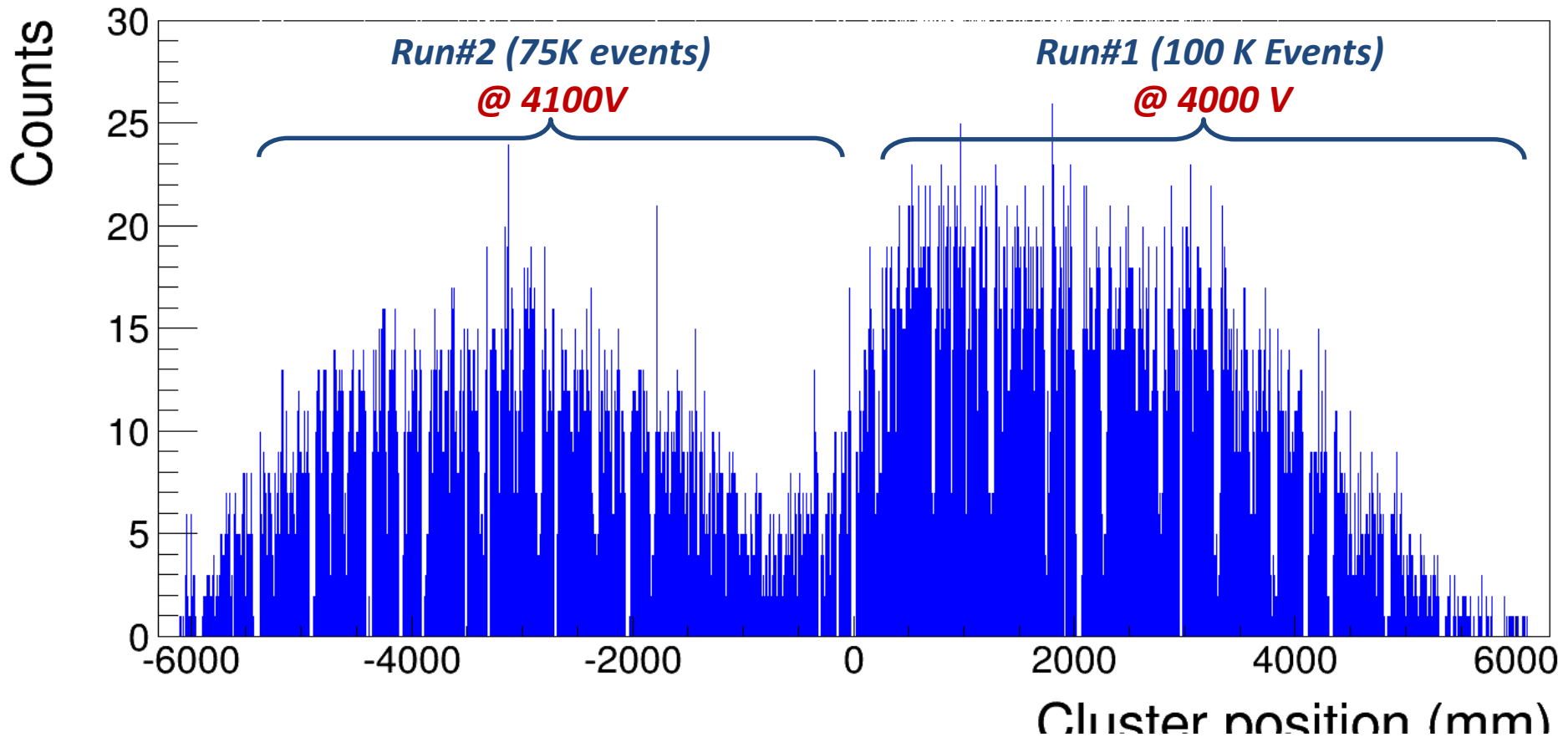


pRadGEM1: cluster Charge Sharing



pRad GEM1: Hit distribution on x-strips

pRadGEM1: Cluster Position Distr. in X

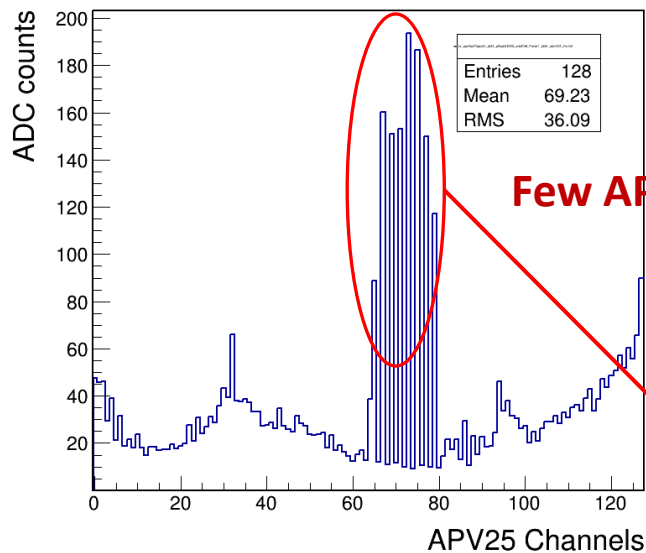


Low efficiency caused by noisy APV25 channels → long strips

pRad GEM1: Hit distribution on y-strips

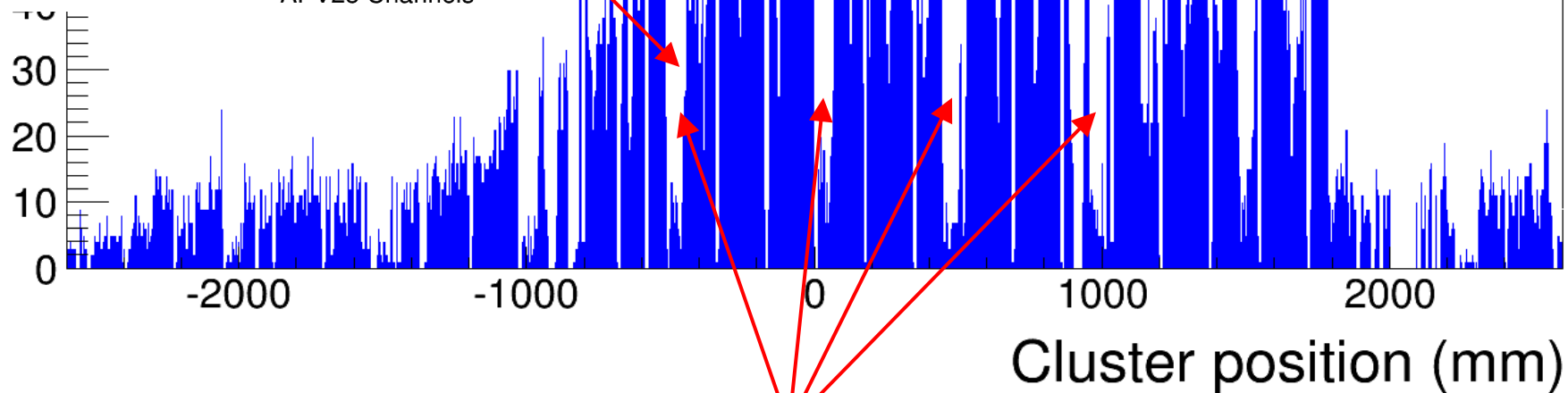
Pedestal noise (rms) on APV25

pedestal rms noise apvNo20 pRadGEMX adcCh8 FeclD1



IGEM1: Cluster Position Distr. in Y

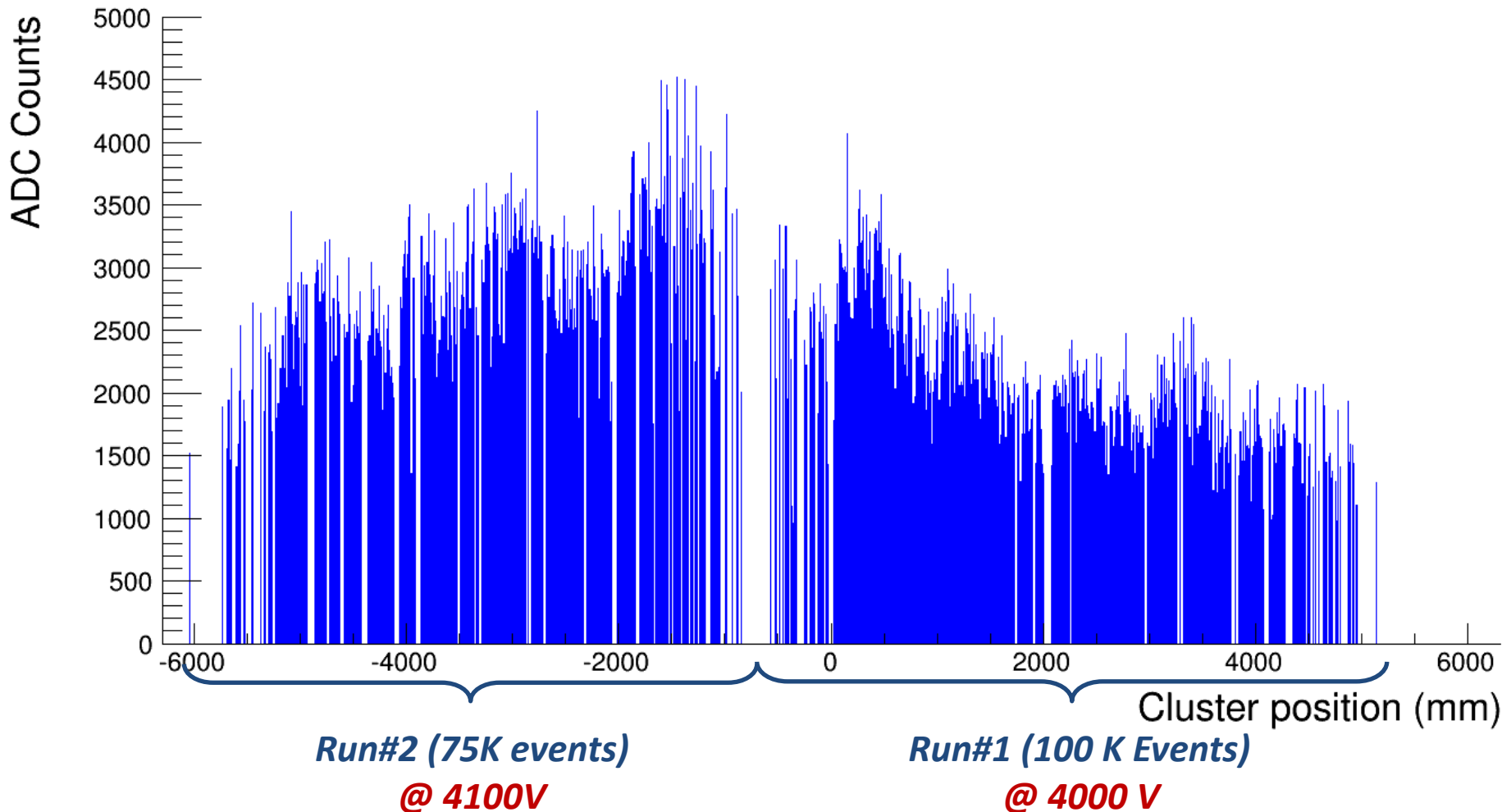
Few APV25 channels with very high pedestal noise



Low efficiency caused by noisy APV25 channels → long strips

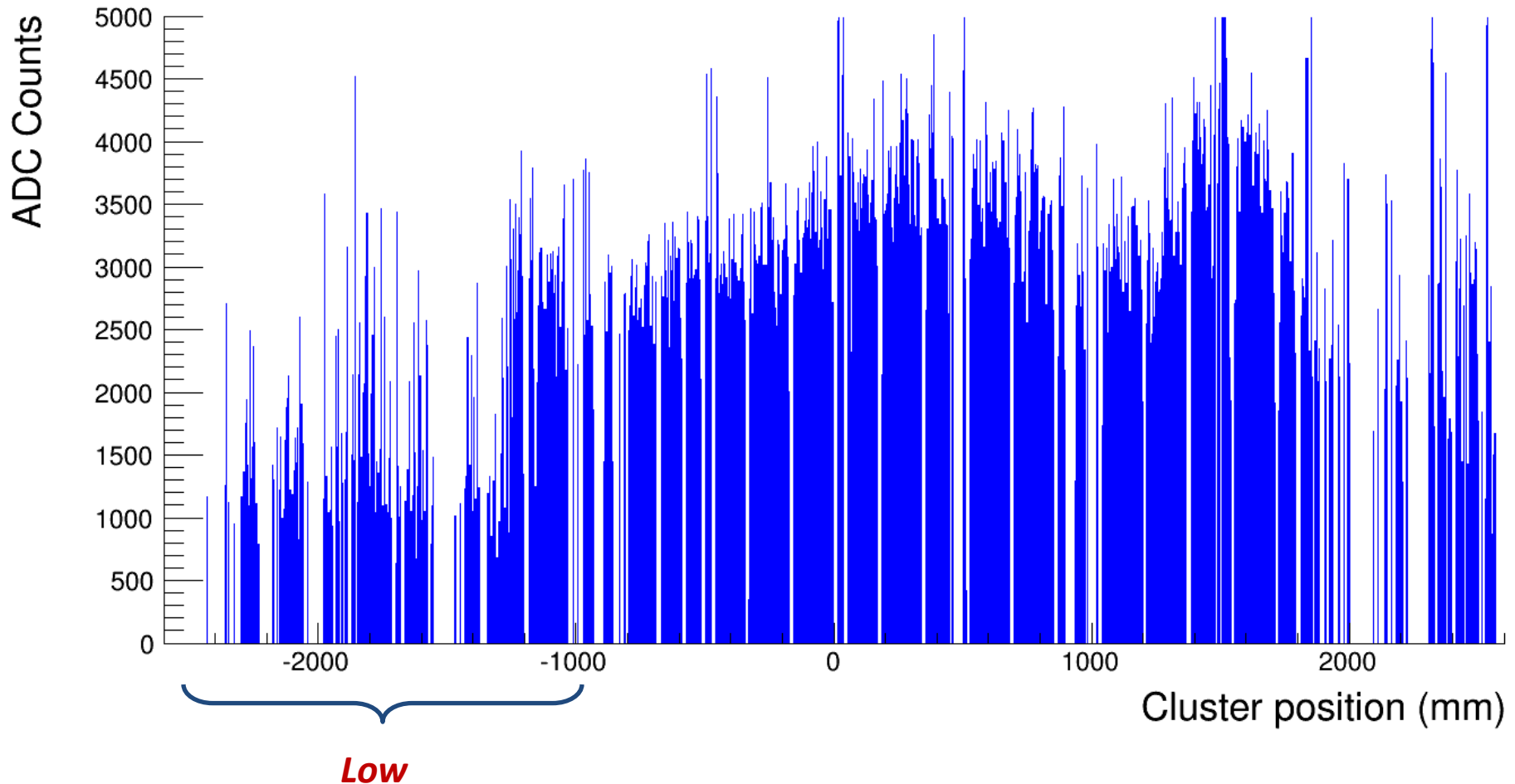
pRad GEM1: Average ADC distribution in x-strips good gain uniformity

pRadGEM1: Cluster Avg strip ADC Distr. in X



pRad GEM1: Average ADC distribution in y-strips good gain uniformity

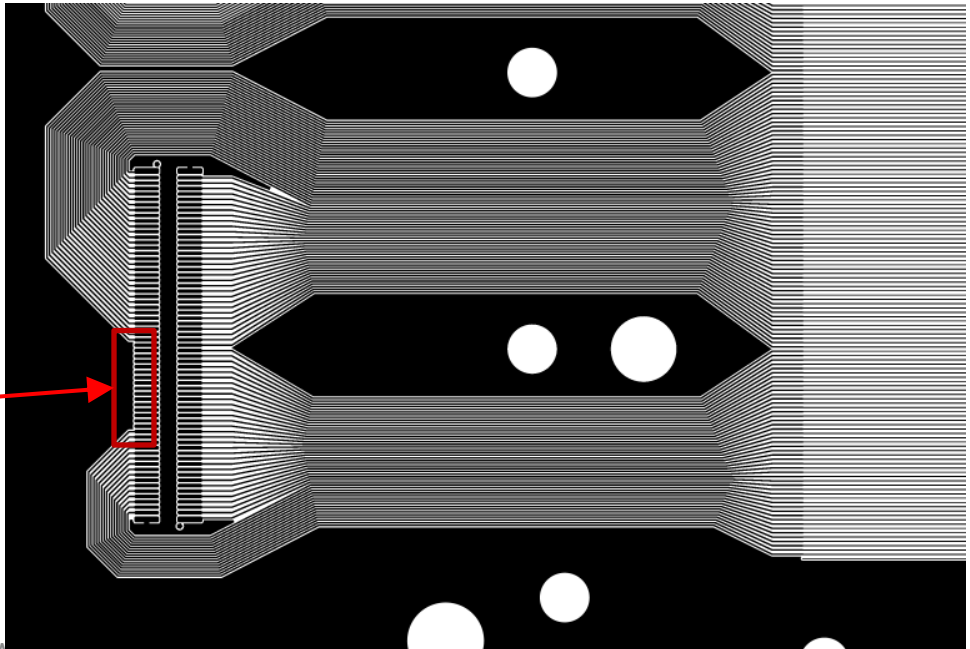
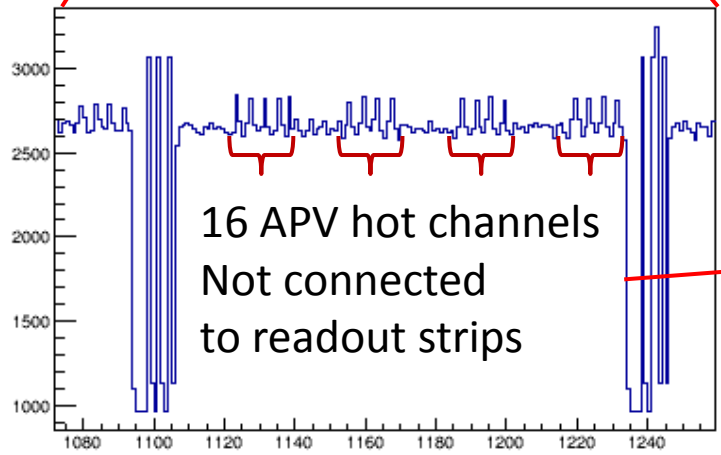
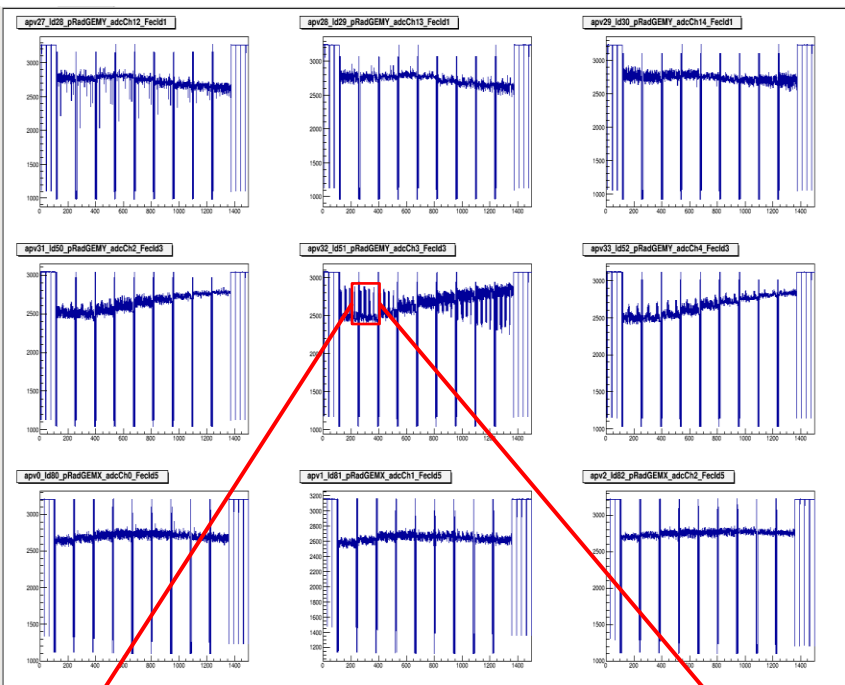
pRadGEM1: Cluster Avg strip ADC Distr. in Y



pRad GEM1 open issues: Floating readout electronic channels

- Two connectors on the readout board that connect the strips to the FE cards have more channels than strips
- These channels were not grounded on the readout board
- Channels can be easily removed from offline analysis
- affect the level of the baseline during the data acquisition
- **Solution: ground the 16 channels on the readout board**

Layout of one Panasonic connector on the pRad readout strips layer



pRad GEM1 open issues: Noise level is still too high

- Noise of the APV25 channels is still too high
- This is mainly due to the size of the detector and the length of the strips (top strips are more than 1.3 m long)
- We tried to reduce noise with grounding and shielding but no significant improvement
- We want to try better shielded HDMI cable and see impact on the data quality
- We are also exploring some ideas to reduce the noise
 - Implement some ideas that have been developed by previous studies (APV25 for Belle Experiments)
 - Require some additional work to do but seems a promising solution to improve the signal to noise ratio → Performances of the chamber in term of efficiency

Summary

- pRad GEM1 Chamber on cosmic bench test → Chamber is working fine
- No dead HV sector → Uniform response everywhere in the chamber
- Preliminary results → Gain is uniform as well
- Will continue Cosmics, x-ray and radioactive sources tests
- However noise on the electronic is too high → affect the efficiency in these preliminary cosmic data
- We have some idea on how to reduce the noise level → Need a fair amount of time and people to try to understand the noise issue and to test the solutions
- Plan to start assembly of second chamber pRad GEM2 in November 2015 → About one month for the assembly