GEM DAQ Status

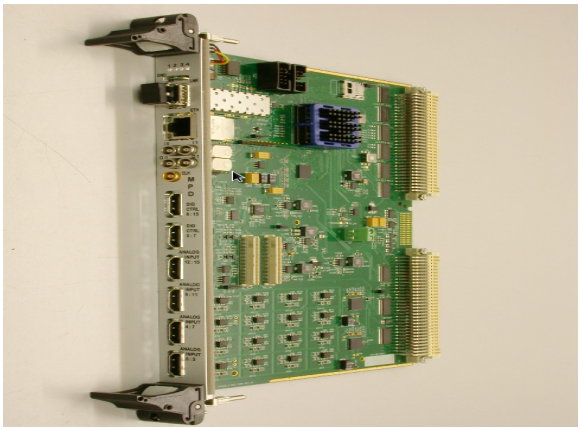
Danning Di

Jun08 SBS weekly meeting

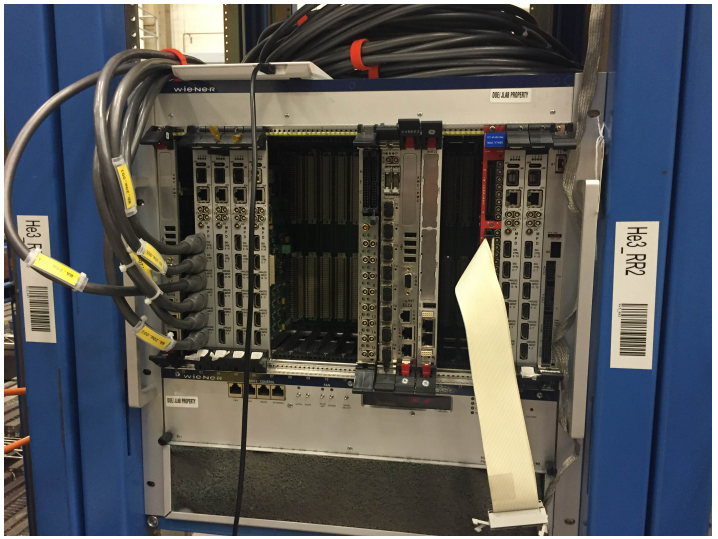
Outline

- Current setup
- Rate capability
- Gem data
- Analysis software
- Summary and plan

Current MPD setup

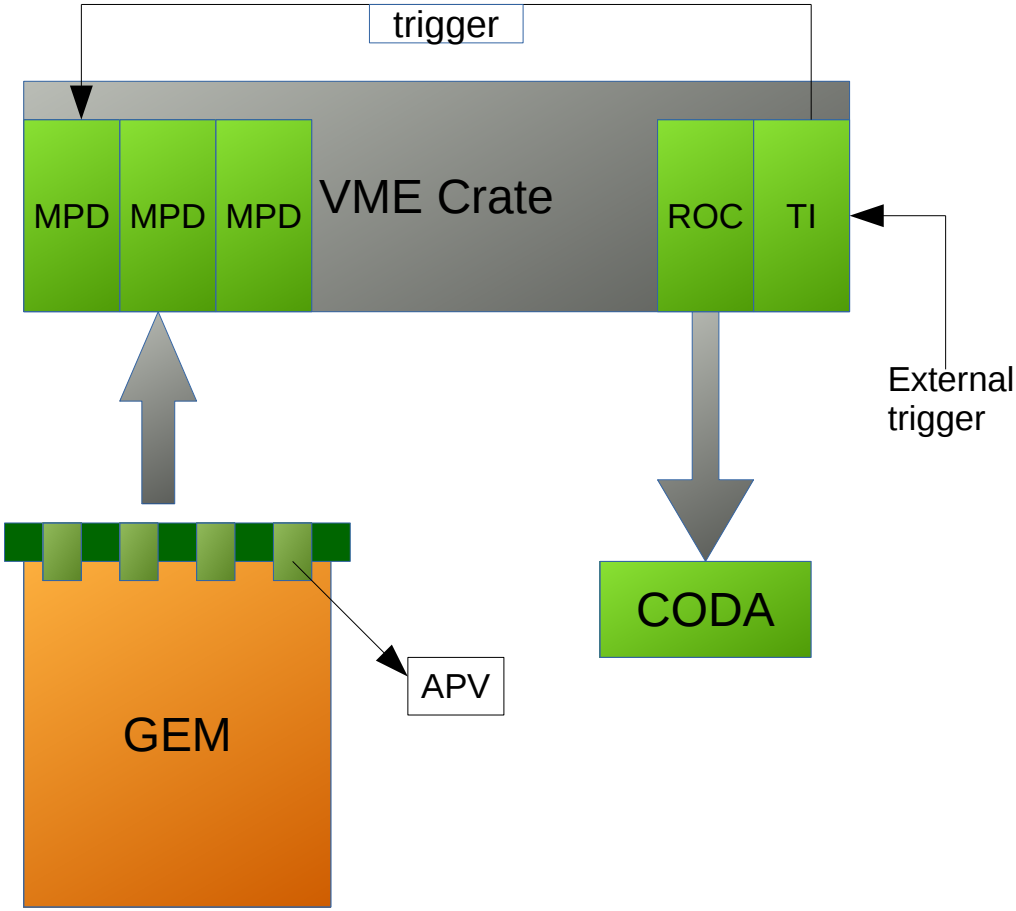


MPD(Multipurpose Digitizer)



VME crate with ROC, MPD and TI

Each MPD module reads up to 16x128 channels

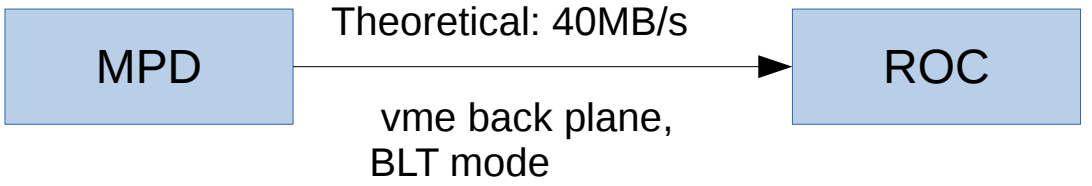


Rate capability

Busy time measured with 1 APV in BLT block transfer mode(theoretical maximum: 40MB/s)

Readout mode	Total busy time (overhead+data transfer) (μs)	Number of words transferred	Actual transfer speed
3 time sample	130(60+70)	390(1560Bytes)	~20 MB/s
6 time sample	200(60+140)	780(3120Bytes)	

- DAQ was running stably at 3000 Hz with periodic trigger.
- Fully loaded MPD(15 APVs):
  Rate cap(15 APV, 6 time sample, BLT mode): ~300Hz



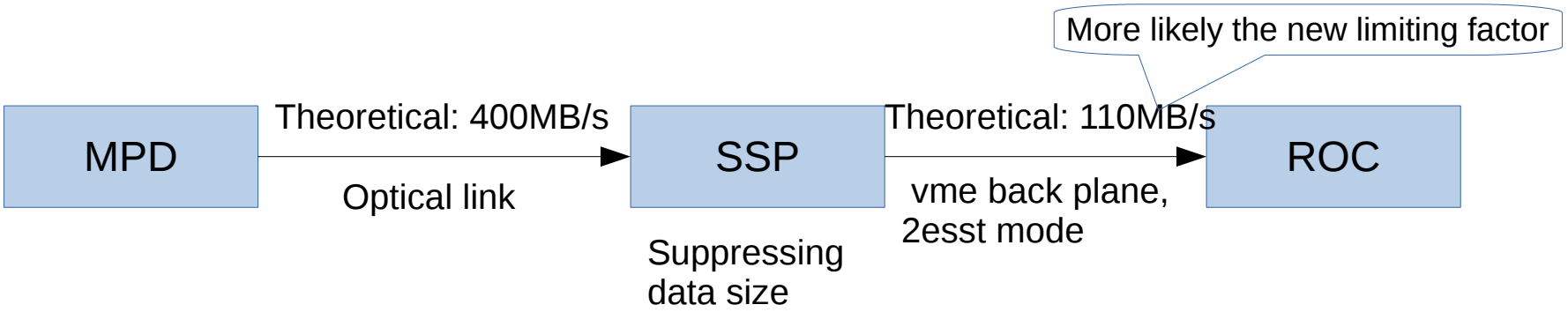
Rate capability

Busy time measured with 1 APV in BLT block transfer mode(theoretical maximum: 40MB/s)

Readout mode	Total busy time (overhead+data transfer) (μs)	Number of words transferred	Actual transfer speed
3 time sample	130(60+70)	390(1560Bytes)	~20 MB/s
6 time sample	200(60+140)	780(3120Bytes)	

- DAQ was running stably at 3000 Hz with periodic trigger.

- Fully loaded MPD(15 APVs):
  Rate cap(15 APV, 6 time sample, BLT mode): ~300Hz
- Expect huge increase with new setup



Analysis code

Data format

3KB/apv/event

MPD_ID

--ADC_ID

Time sample

----Header

----channel 1

----channel 2

.

..

…

----channel 128

----trailer

----Header

.

..

…

----trailer

--ADC_ID

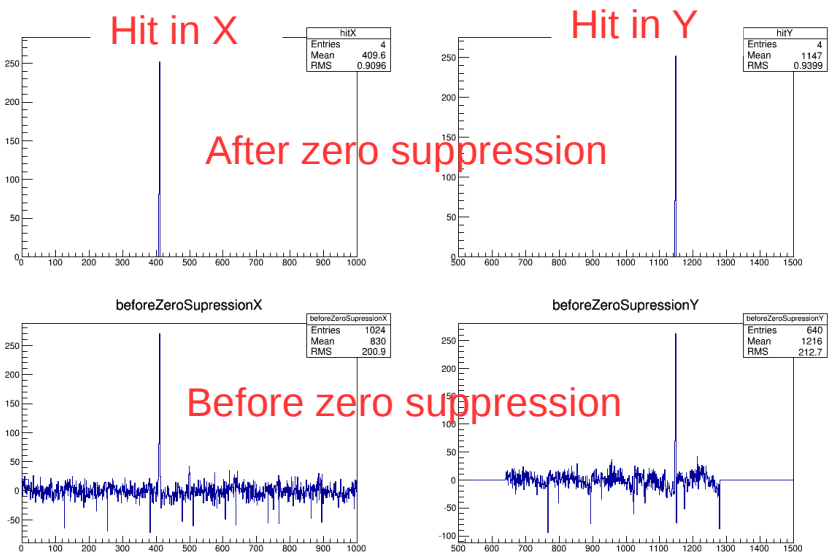
.

..

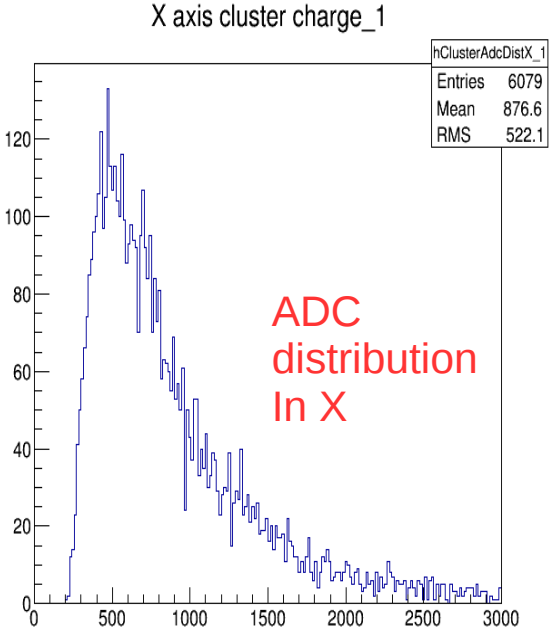
...

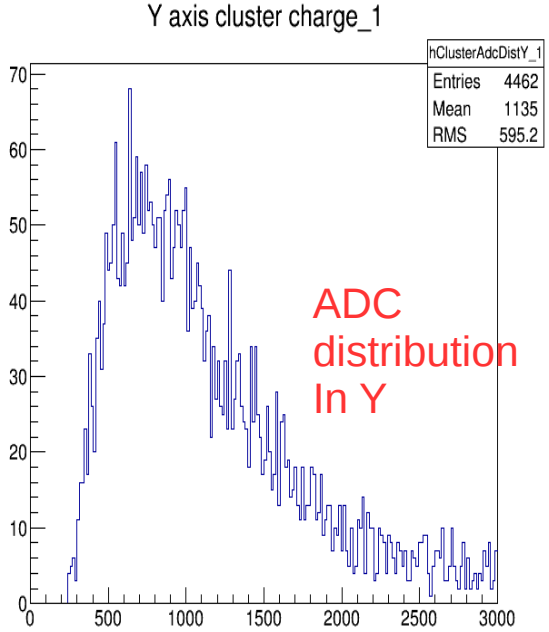
1. c++ and evio library
2. Decode coda file and do zero suppression, save hit information into root file.
3. Reconstruct cluster and plot diagnostic plots

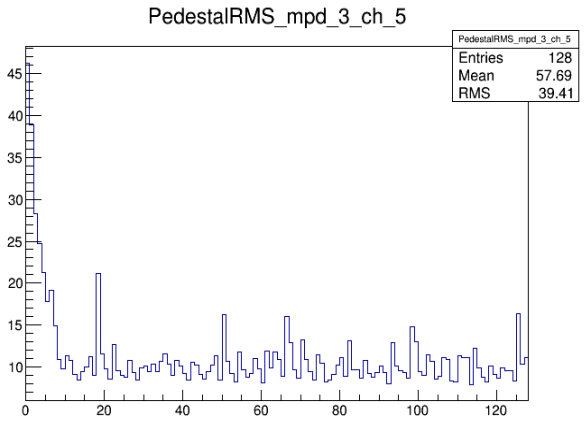
^{90}Sr data on a 60x50cm GEM at Test Lab



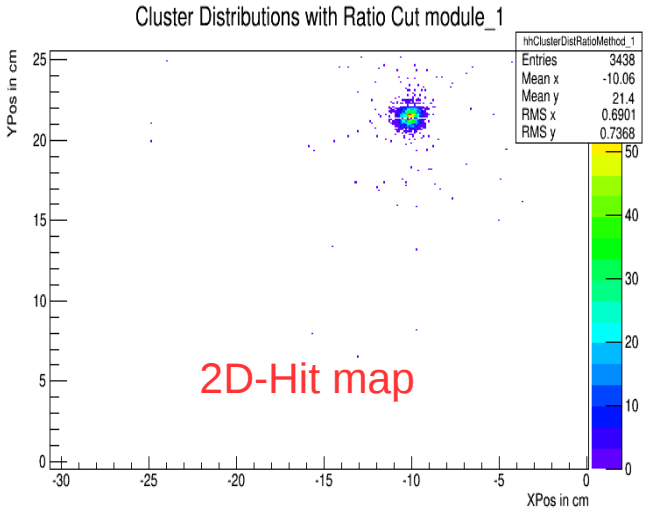
Zero suppression

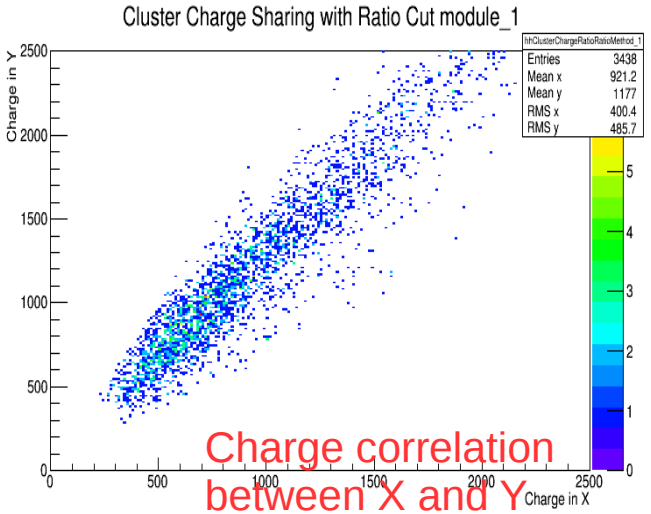






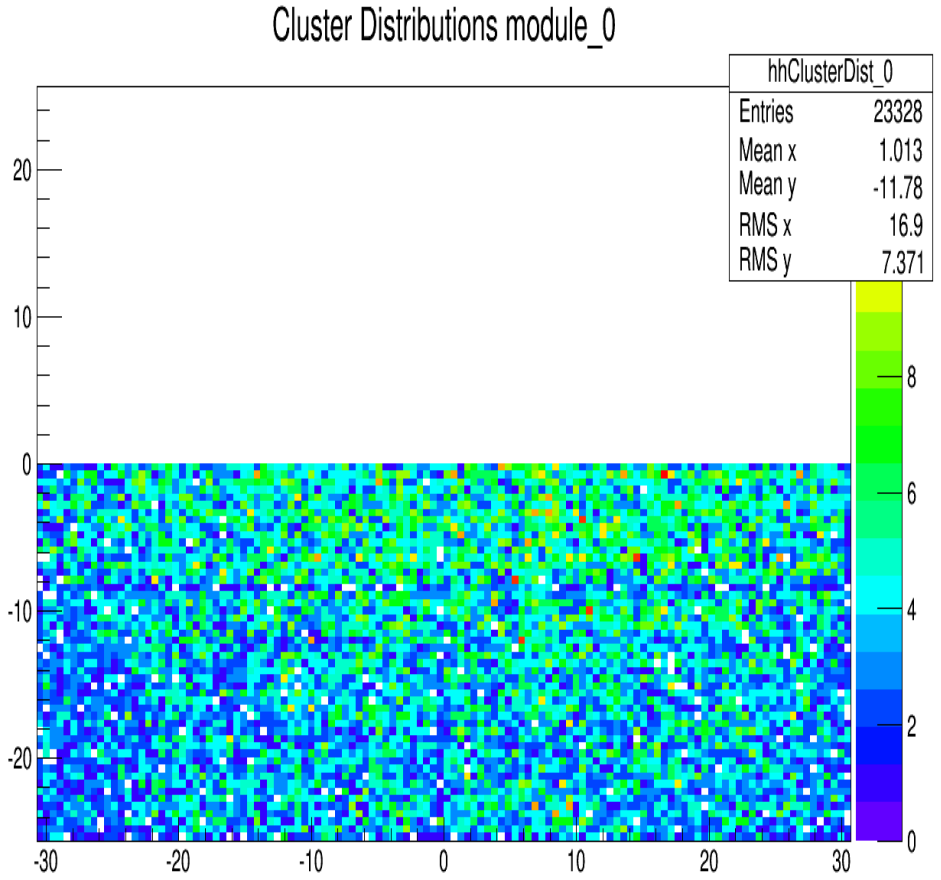
RMS of pedestal noise of
128 channels on APV-25

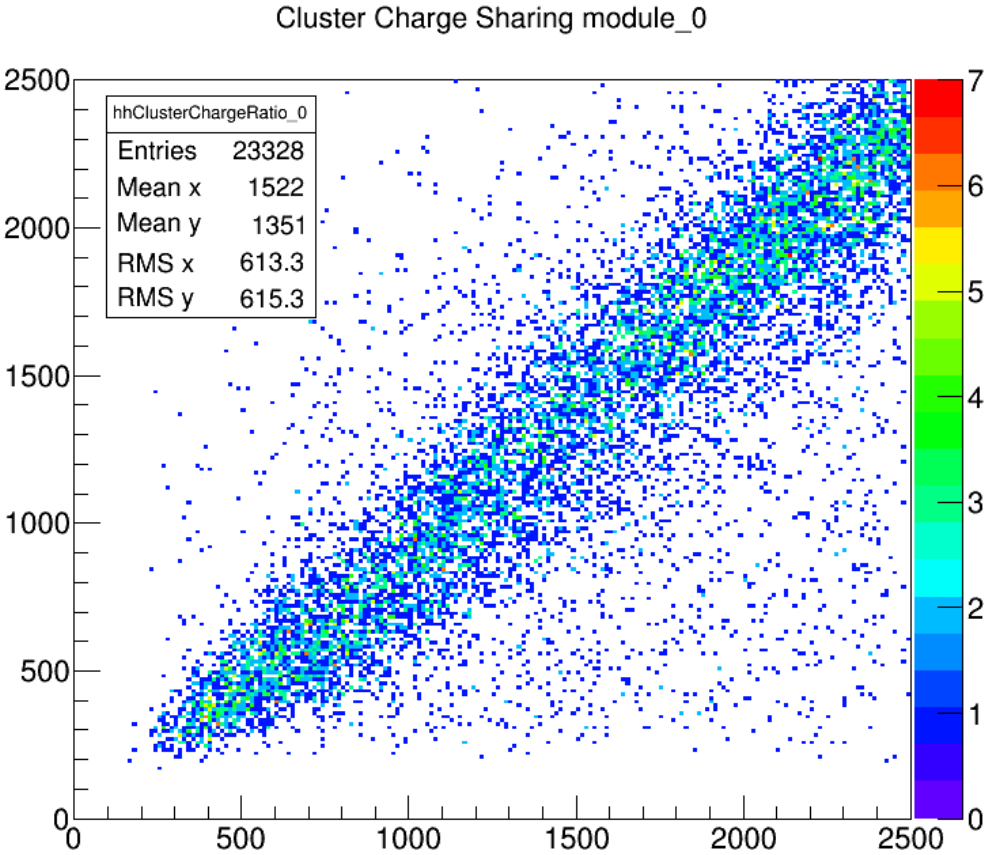




Hit cluster reconstruction

X-ray data on a 60x50cm GEM at UVa



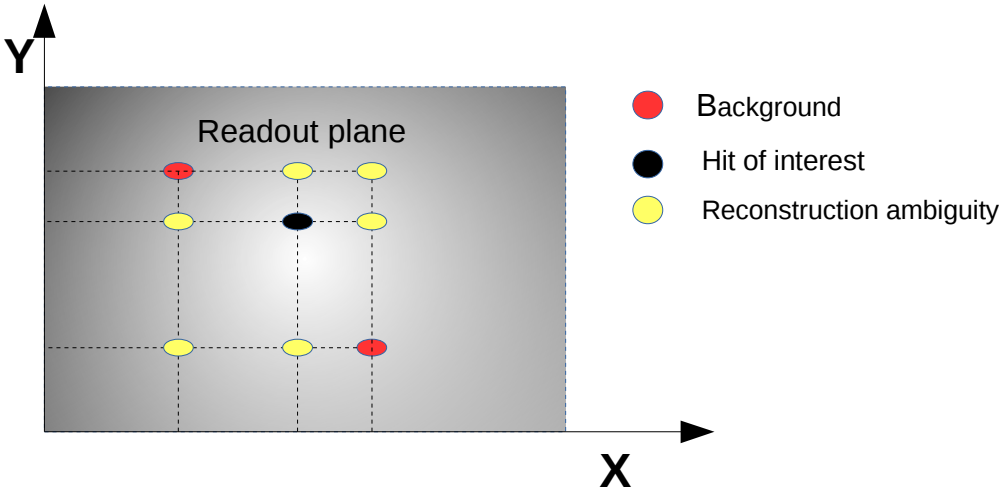


Summary

- The MPD-CODA system is working stably after debugging and reasonable GEM data is coming out from MPD.
- Readout rate increased from a few Hz to 300 Hz by using BLT mode block transfer through vme back plane. Next is to introdue SSP to the setup to increase the rate cap.
- Software analyzing the coda file is developed. Merge code into Hall A analyzer
- Test DAQ and GEM in Hall A in fall 2016. 10x10cm GEM in front of HRS, 5 layers of 60x50cm UVa GEM at large angle.

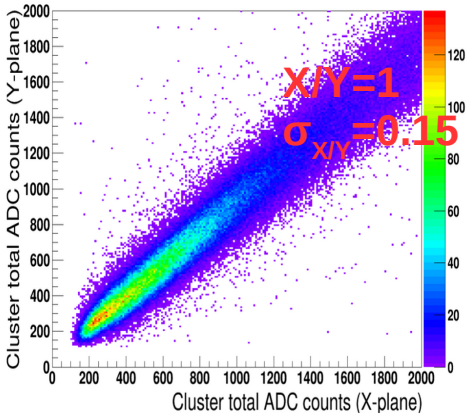
Solution to Multi-hit and ambiguity

- **Problem:** At background rate of 0.5MHz/cm^2 MIP, there will be about 300 background hit collected over the active area 3000cm^2 each event.
- Need to select 1 out of 300 background hit
- With the 2-D readout scheme, comes with the reconstruction ambiguity problem



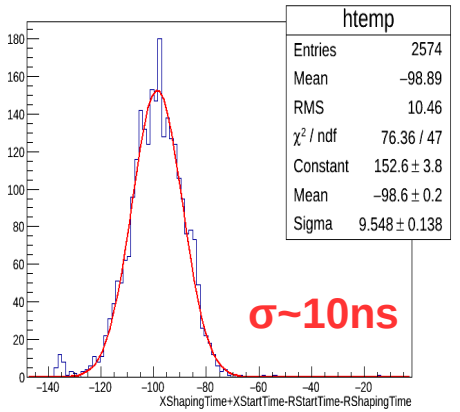
Solution

Do cuts according to characteristics of GEM

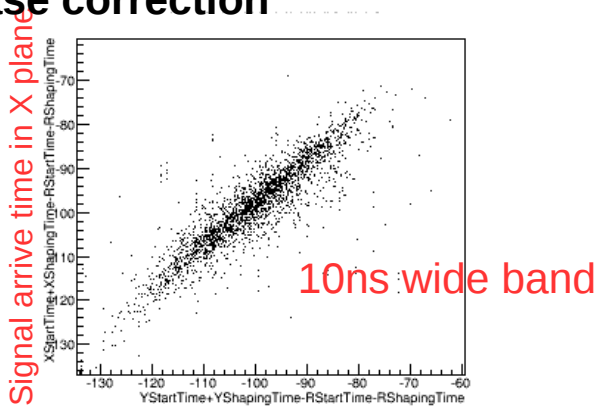


Charge correlation between X and Y plane

Time resolution after clock phase correction



Time resolution(after DAQ clock phase correction, from fit)



Timing correlation between X and Y plane