BigBite Wire Chamber ch1+ch3 Test
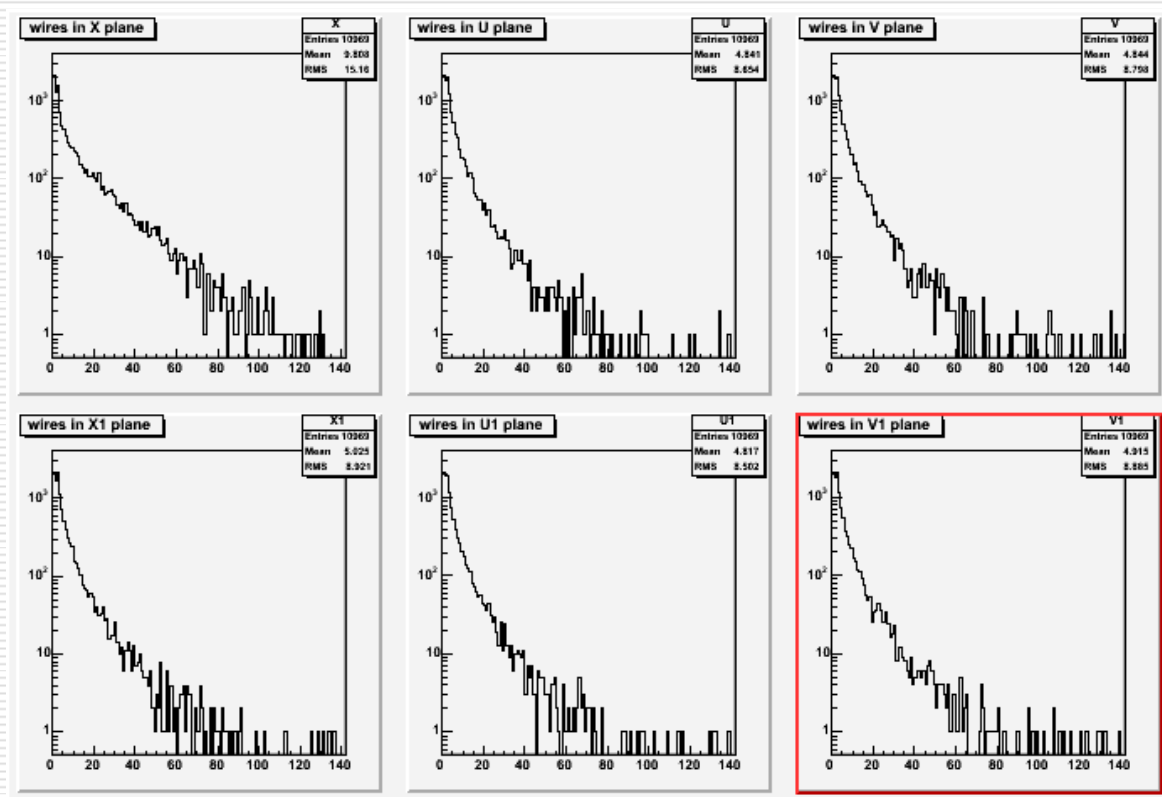
Xin Qian, Kalyan Allada

Chiranjib Dutta, Huan Yao

☐ Solve Chamber-1 Background Problem.

☐ Chamber-1 + Chamber-3 VME Test.

☐ Other issues.

☐ Future Plan.

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Chamber-1 Background Problem

☐ More hits/event than expected.

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Problem Solved

- ☐ Ground all devices properly.
  - ■ 9 MHz noise disappear.
- ☐ Enhance threshold on amplifier cards.
  - ■ 3.4 V on first chamber now (original 2.1V).
- ☐ Change trigger setup.
  - ■ One scintillator in front of the chamber-1
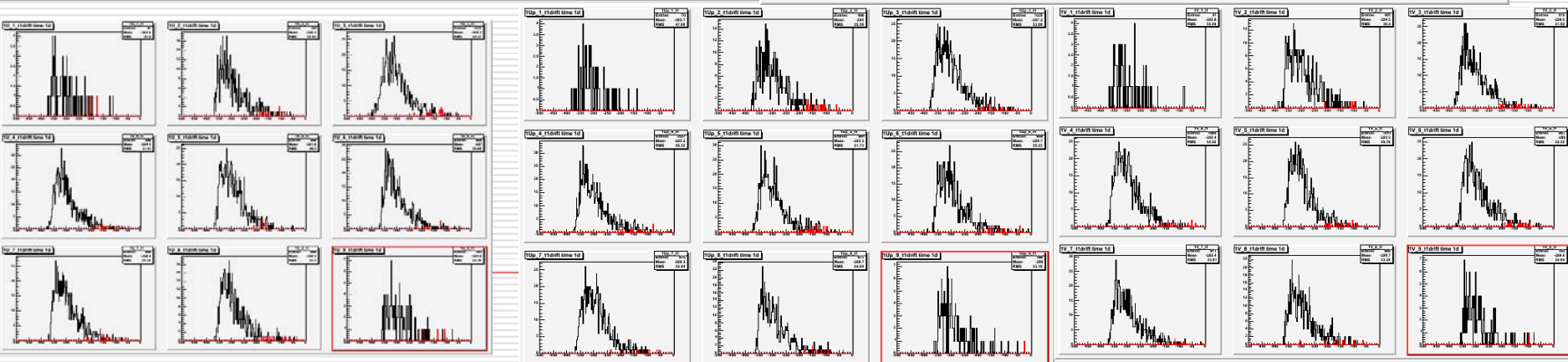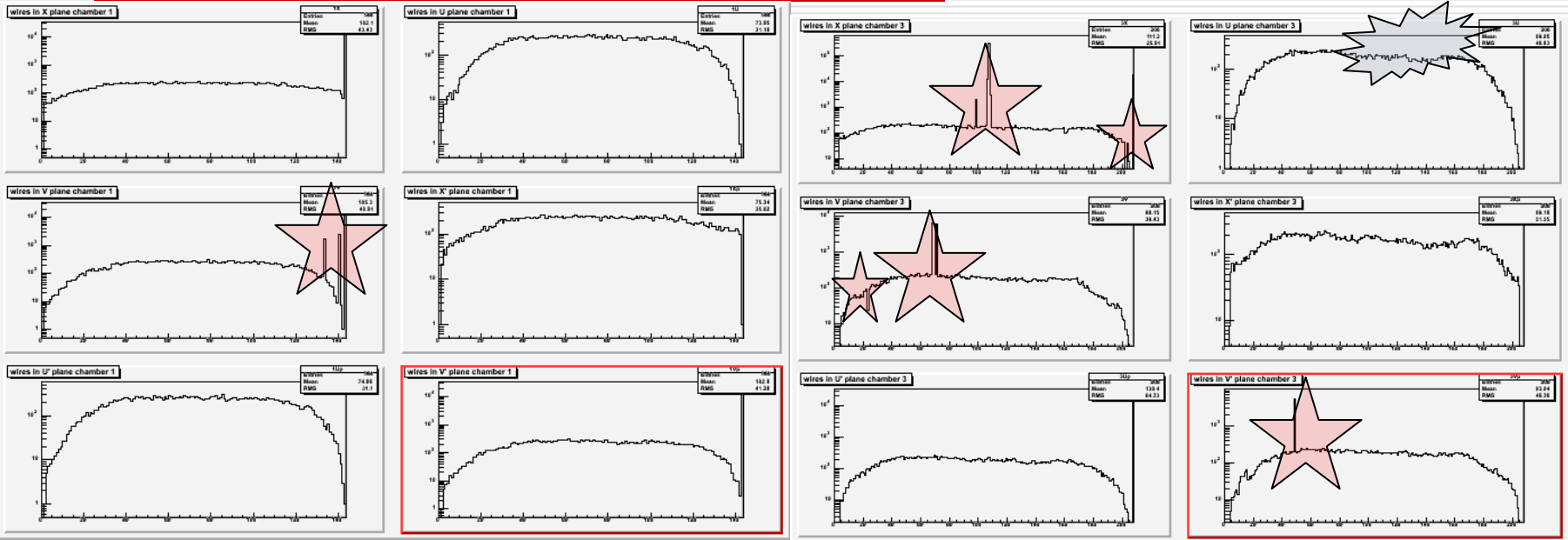 - ■ Trigger setup: ½ .and. (any one firing from back scintillator)
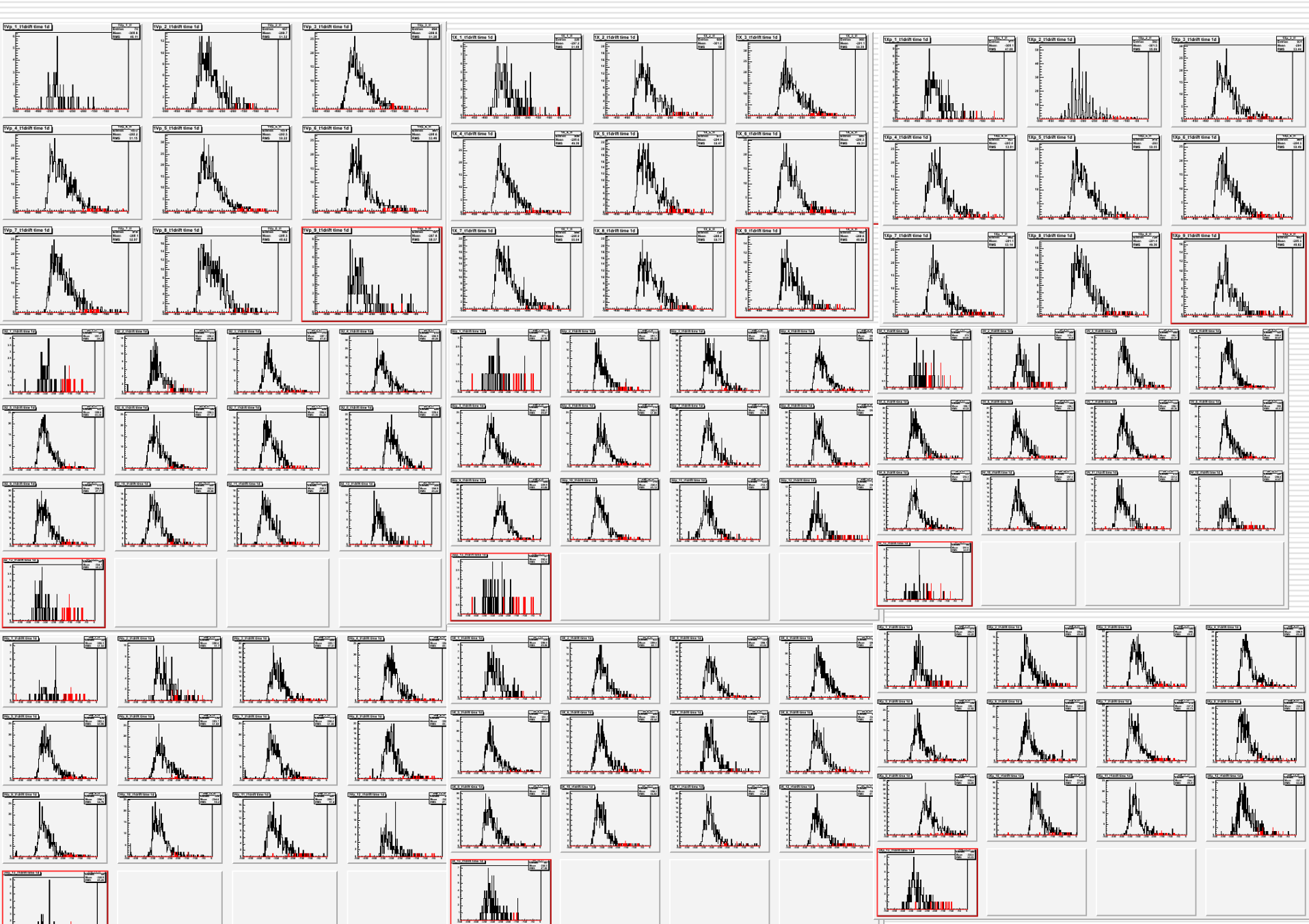
Chamber-1

□ Trigger 2/2
lead to huge
background.

NOW

Trigger:2/2

BEFORE
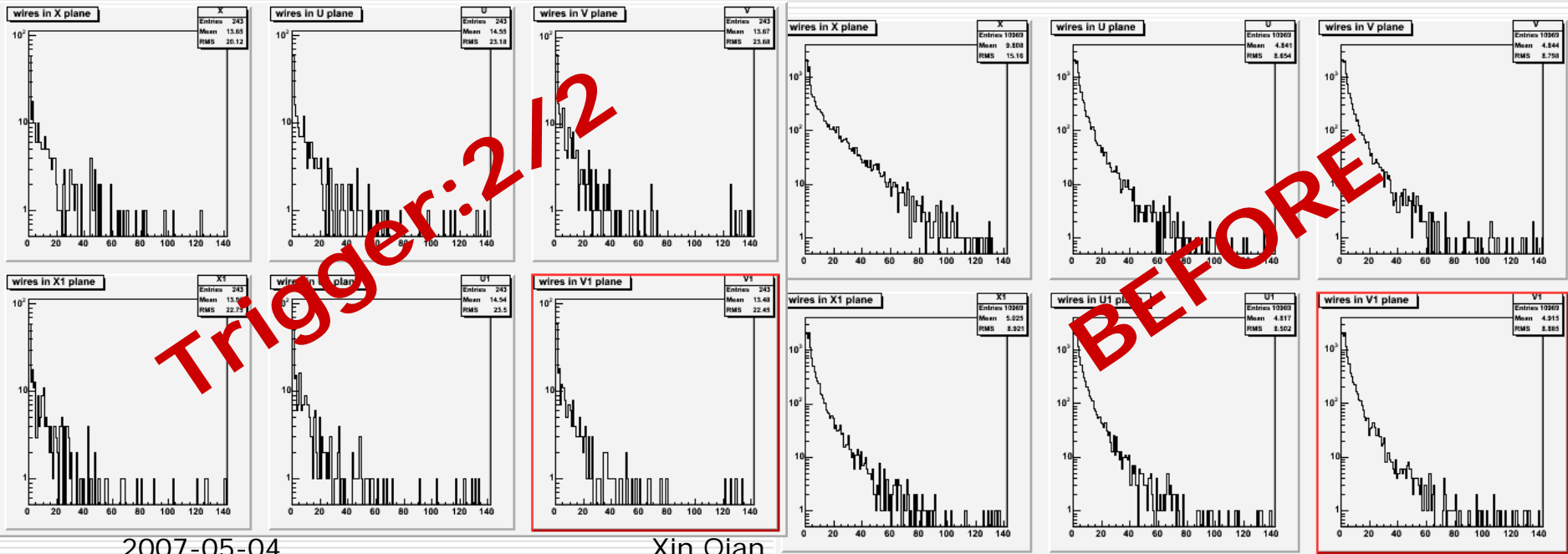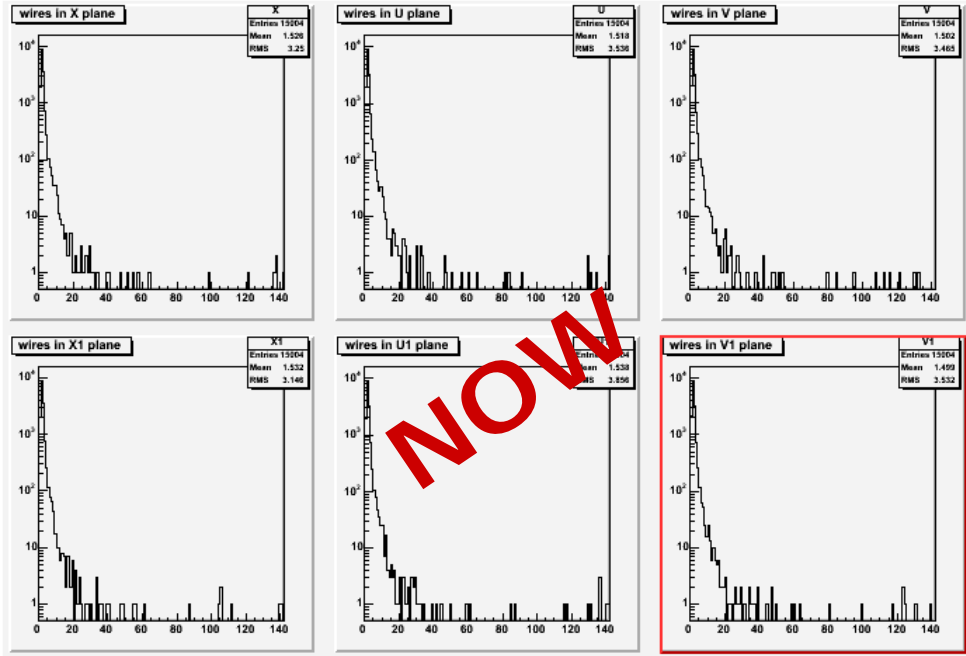
Ch1+Ch3 VME Test

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Multi-hit for chamber-1

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Multi-hit for chamber-3

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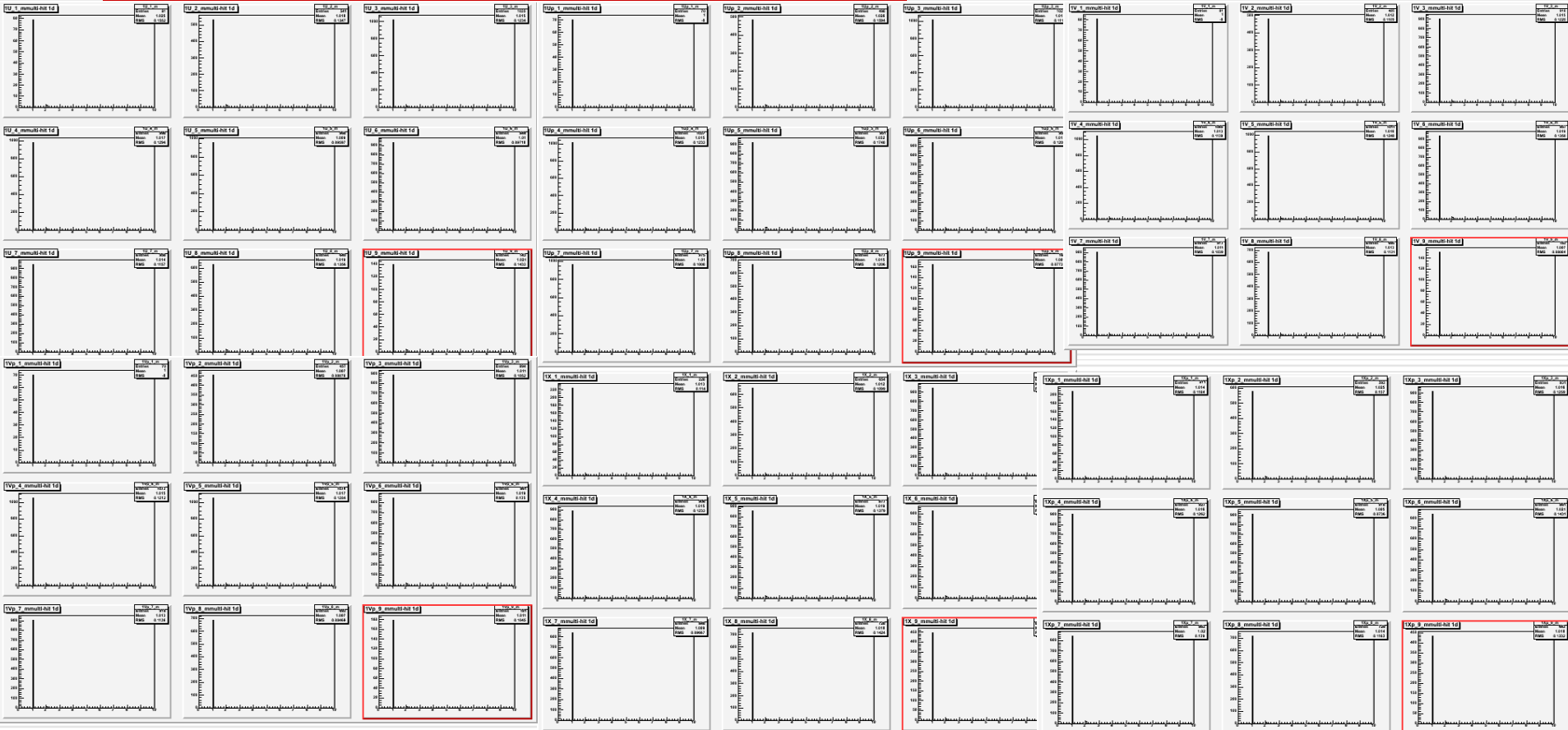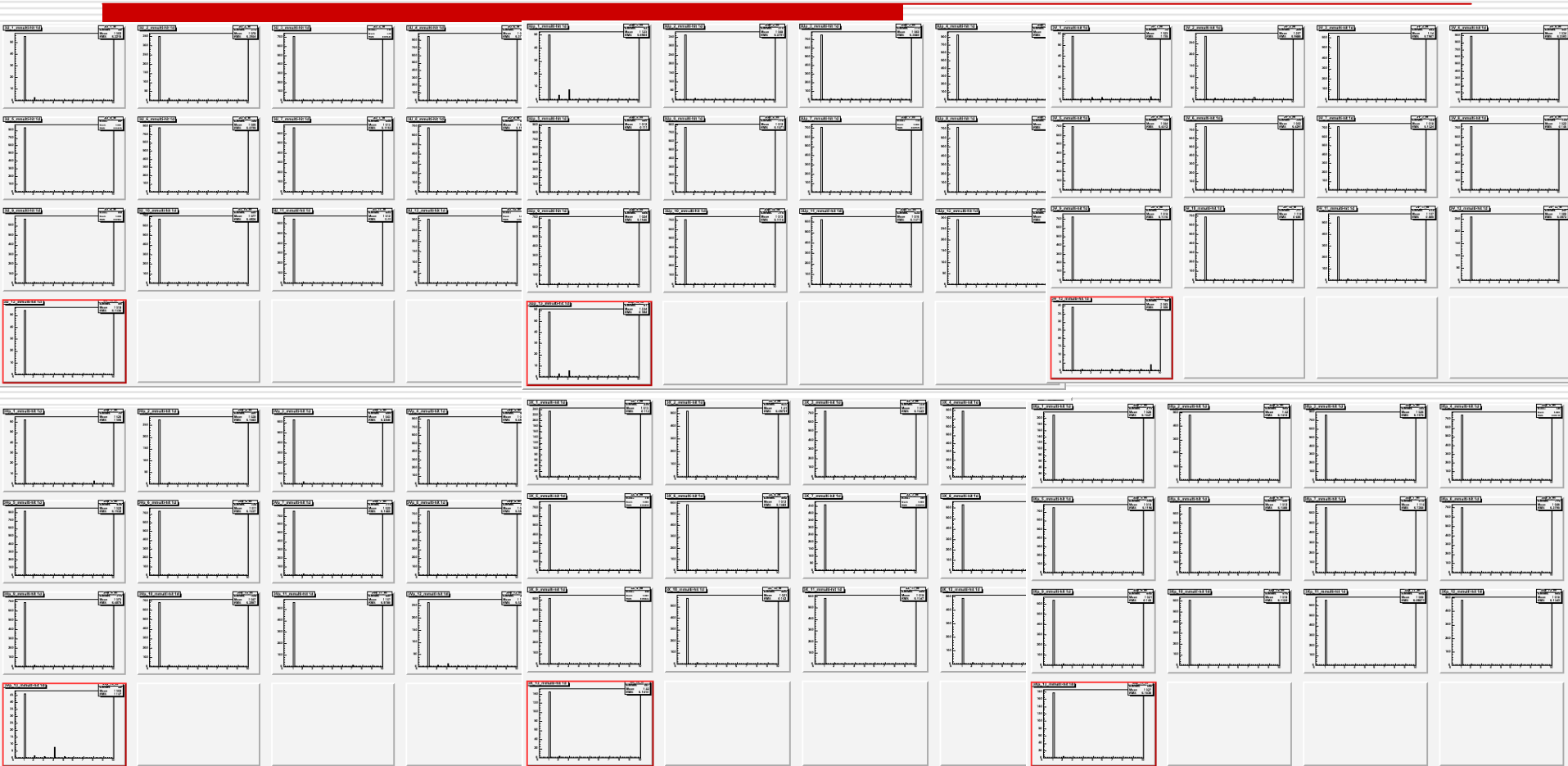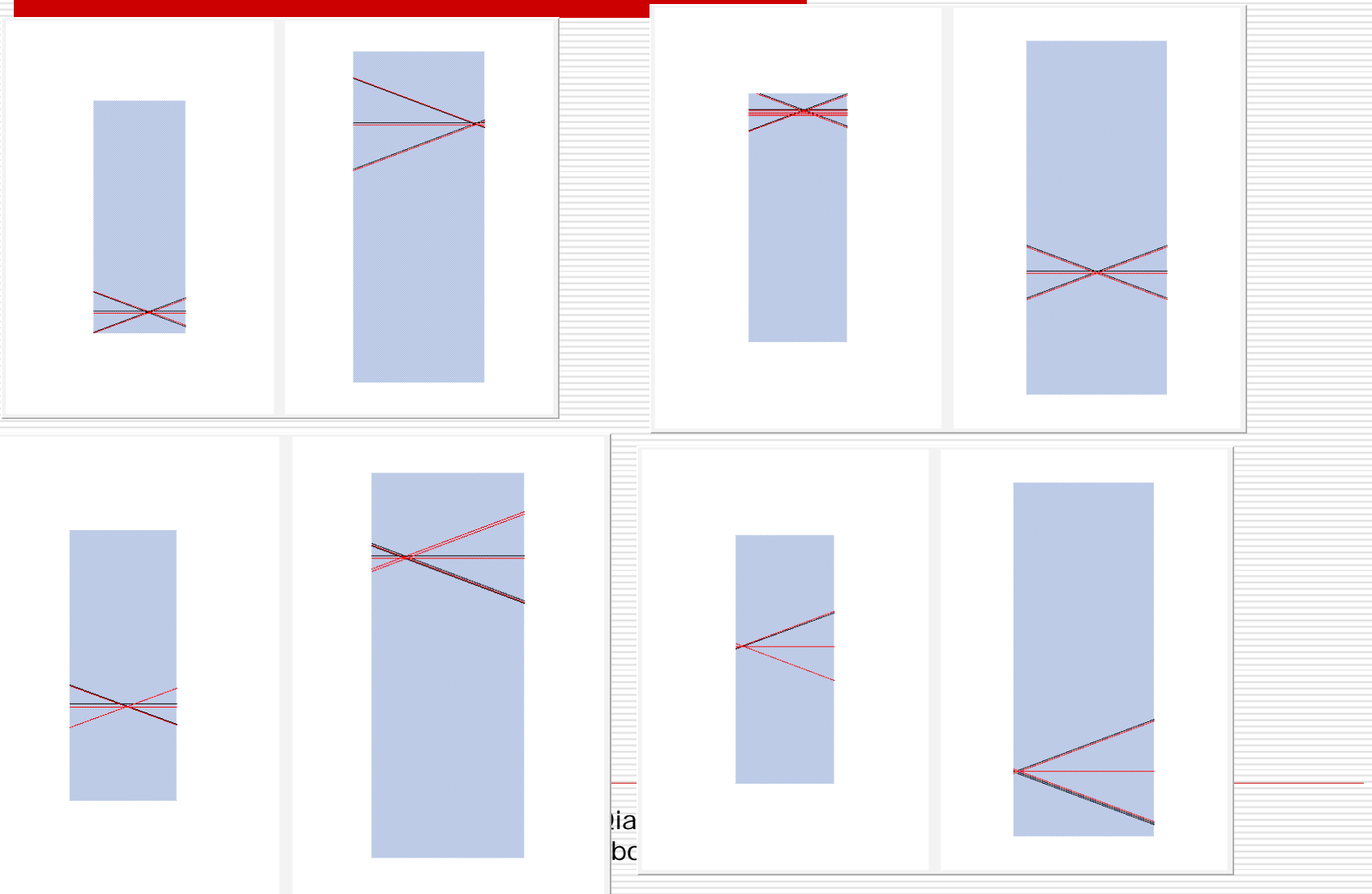
Event Display (Sample)

☐ Chamber-3 Threshold 5.4V
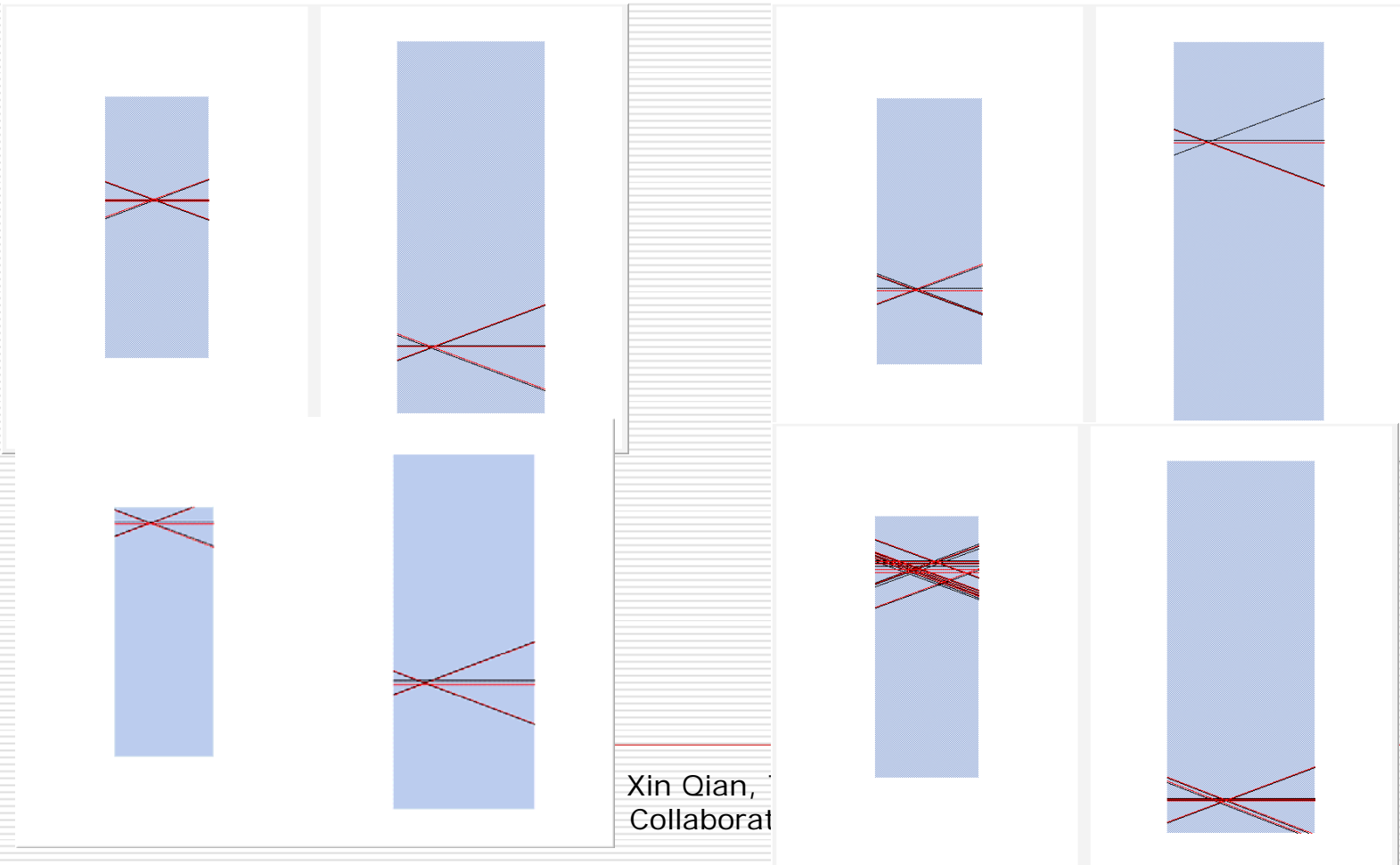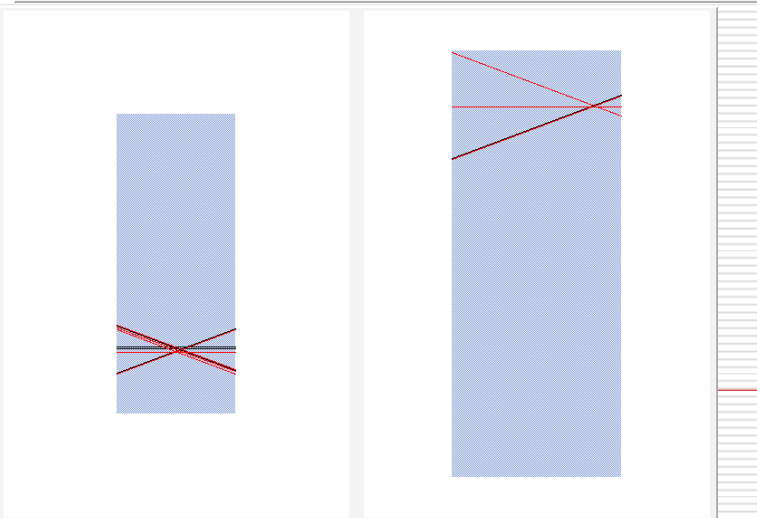

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Event Display

Event Display

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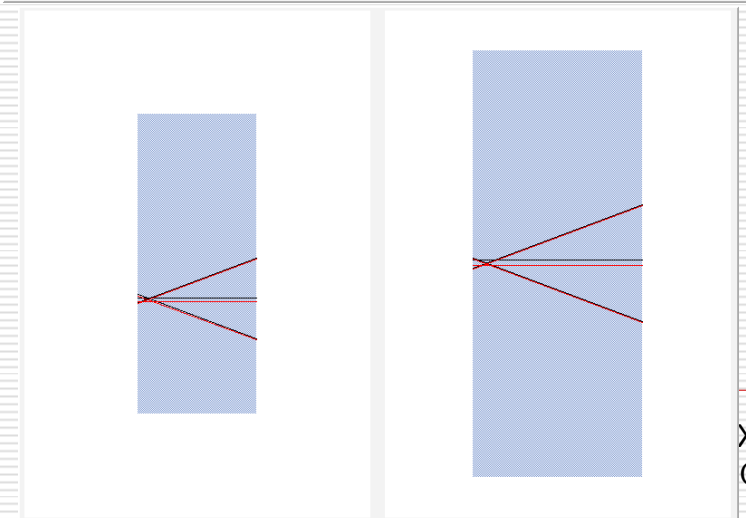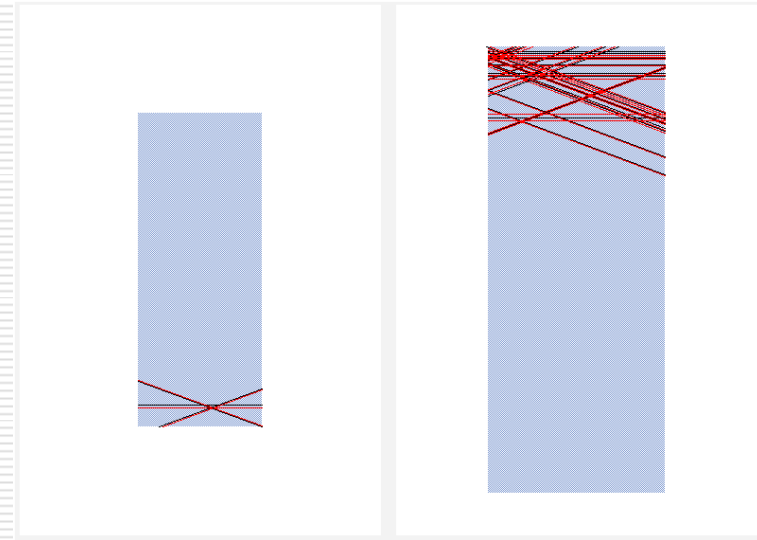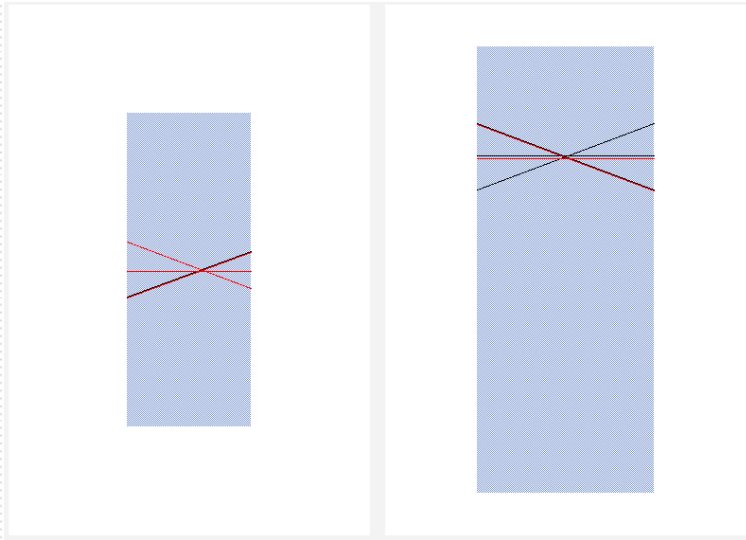
Other Issues

- ☐ GEN replay software for future tracking test
  - ■ Working at agen4 machine (Huan).
  - ■ Utilizing latest analyzer and GEN library
- ☐ Event display development in progress. (Chiran)
- ☐ HV control
  - ■ To be done

Future Plan

- ***<u>Reach the ch1+ch3 VME readout milestone. (Done)</u>***
  - Threshold too high for chamber-3?
  - Understand the local behavior on chamber-3.
- Fix the bad cables.
- Cosmic tracking using GEN software.
- FASTBUS test for ch1+ch3.

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Tracking Monte Carlo Development Progress Report

Xin Qian

Duke University

MEP Group

Shower system   Wire chamber

Optics
Slot-slit

Scintillator

Gas Cerenkov

Magnetic field
shielding
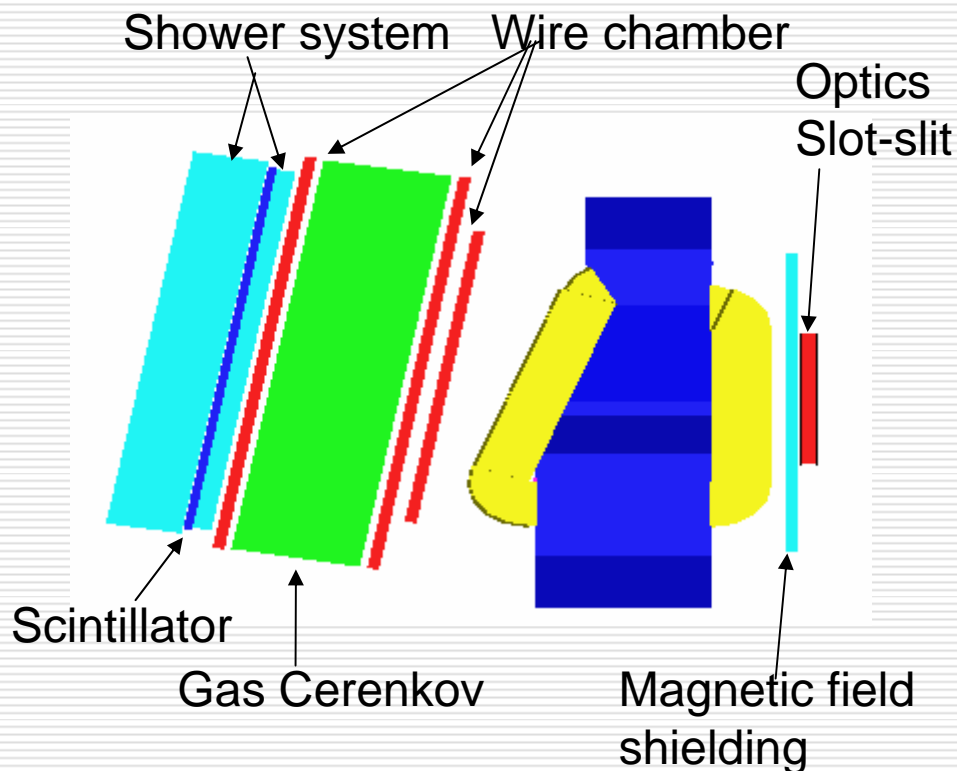
Outline

- ☐ Why do we need a tracking Monte-Carlo?

- ☐ Challenge in Tracking

- ☐ Current status of the tracking Monte-Carlo

- ☐ Future work

- ☐ Conclusion

Why Tracking Monte-Carlo?

- ☐ Diagnostic/improve current tracking algorithm.
- ☐ Calculate tracking efficiency.
- ☐ Evaluate new tracking algorithm.
- ☐ Determine running luminosity limit together with tracking strategy.
- ☐ Help in determining optics.

Challenge In Tracking (1)

□ High Background:

▪ Expect ~30 MHz (Average 6 hits per plane in 200 ns window) at 15 uA in TRANSVERSITY configuration with 40 cm long ^{3}He target.
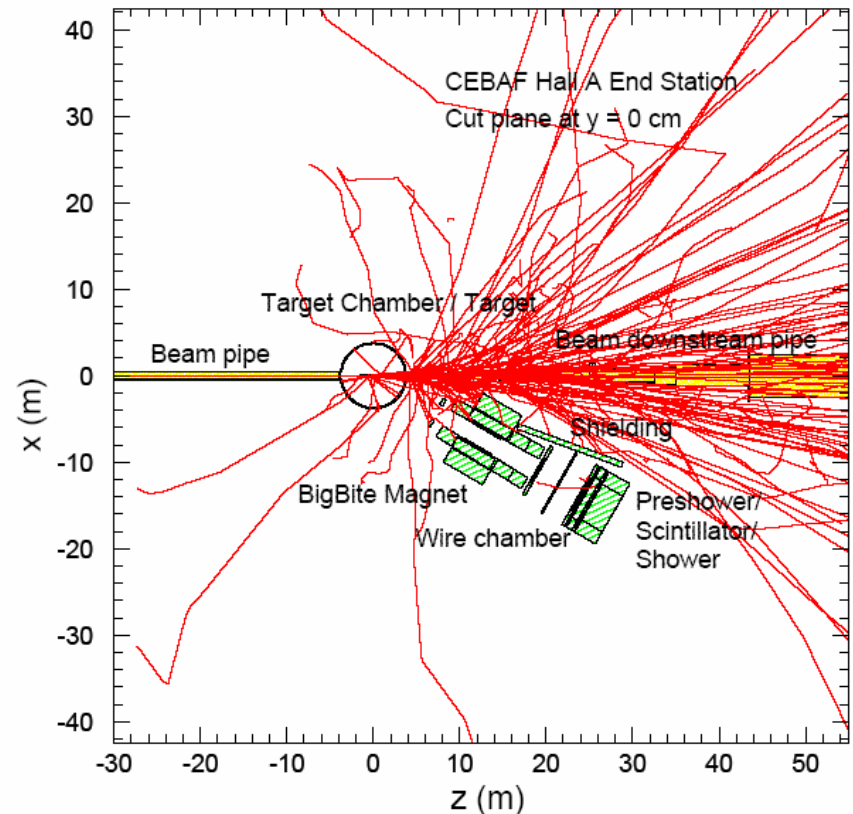
Challenge In Tracking (2)

☐ 3-Full chamber (18 planes) compared with 2.5-full chamber (15 planes)

- ■ Help in reducing faked track
- ■ Help in enhancing hardware tracking efficiency
- ■ Lead to longer time in tracking.
  - ☐ Tracking time is very sensitive to the luminosity
  - ☐ Could be the limit of the luminosity

Current Status of Tracking Monte-Carlo

□ Event generator is based COMGEANT (Eugene) GEANT3 Monte-Carlo.

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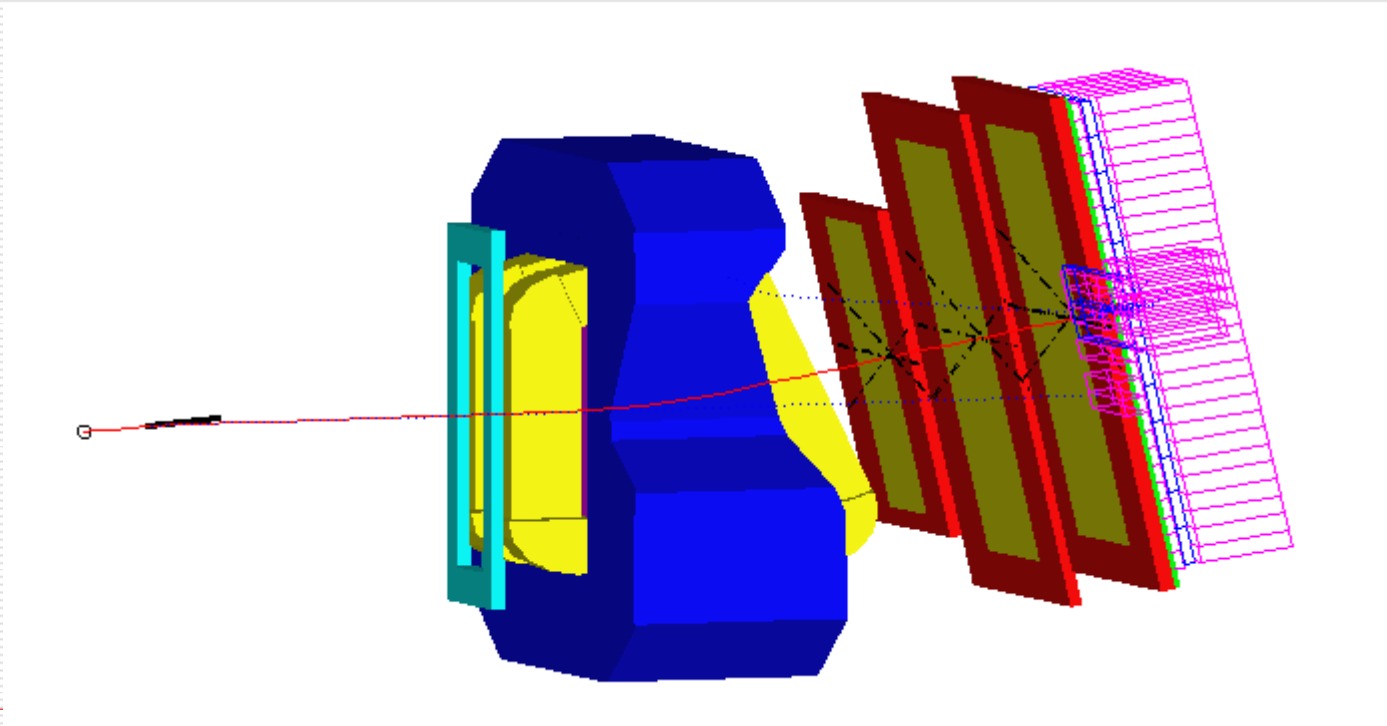
Event generator

- ☐ Geometry are constructed from the analyzer library:
  - ■ Ensure geometry are same between Monte-Carlo and analyzer.
- ☐ Digitization and simulation are based on comgeant.
  - ■ Wire chamber digitization: wire number and drift time.
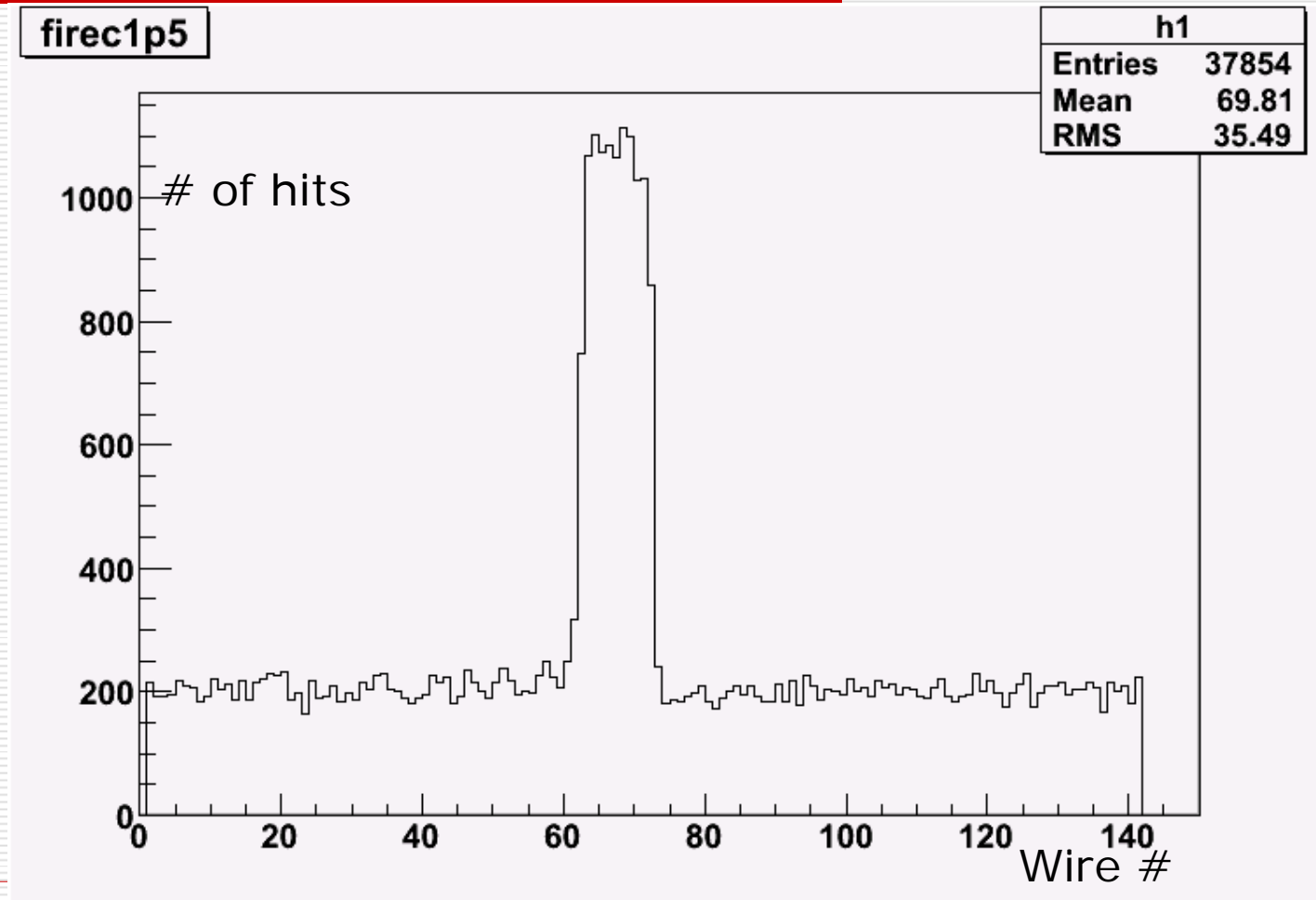 - ■ Shower/scitillator: energy deposit

Extracted information from simulation

- ☐ Initial information about particle are recorded.
  - ■ Position, momentum etc
- ☐ Digitization on different detectors are recorded.
- ☐ Additional timing resolution can be added.
- ☐ Efficiencies for each wire can be added.
- ☐ ADC pedestal can be added as offset, same as scale factor.
- ☐ The relaxation time of the wire can be adjusted as input.

Wire chamber background

- Wire chamber background can be added in chamber level.

- Wire chamber TDC offset can be added.

- Merging method are developed
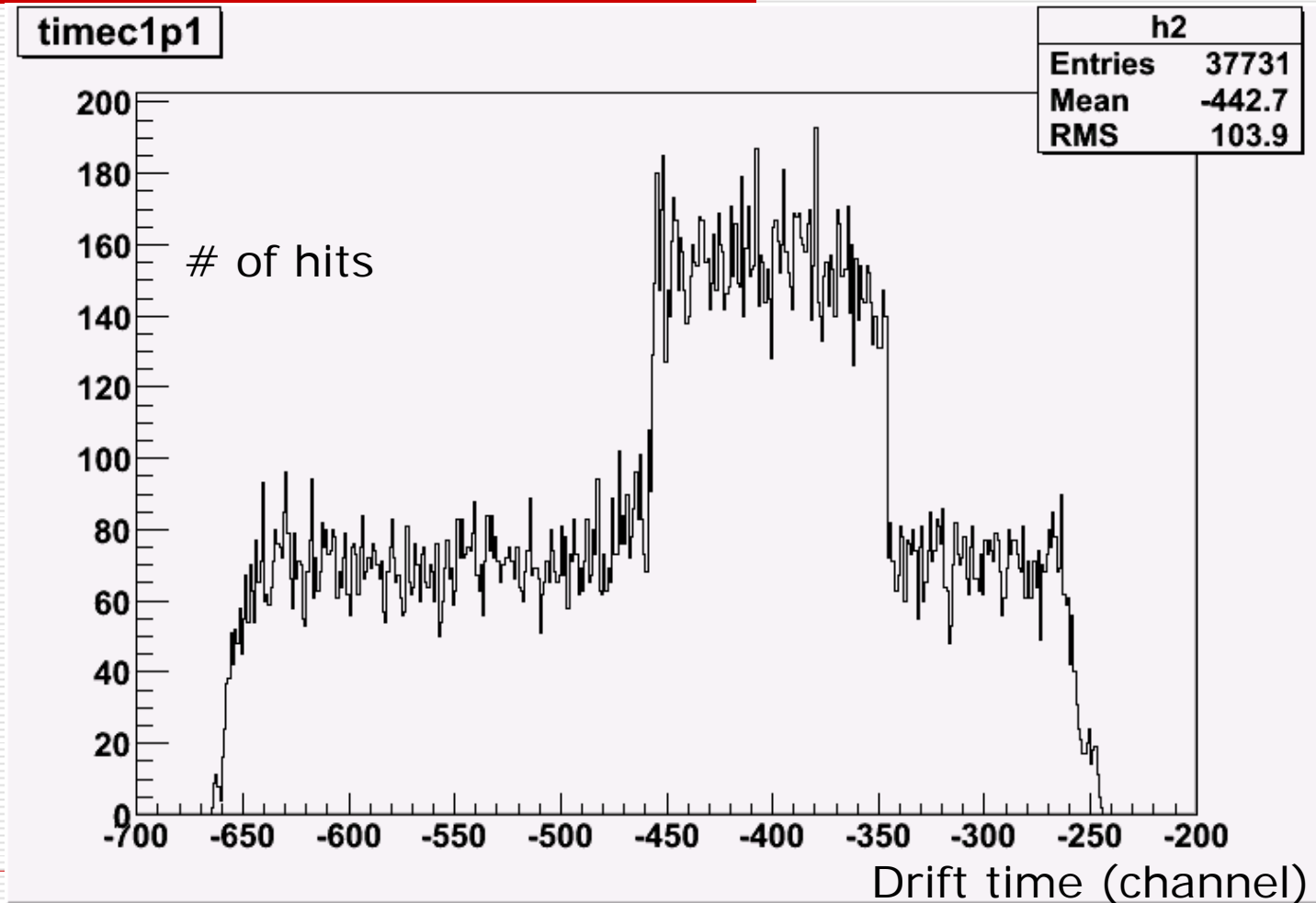 - In case, two hits on same wire (controlled by relaxation time)

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Background (example)

firec1p5

h1	
Entries	37854
Mean	69.81
RMS	35.49

# of hits

Wire #

Drift time (example)

Future work

- ☐ Not user friendly: need to improve.
  - ■ Only work for 15 planes for now.
- ☐ Add interface to analyzer
  - ■ New decoding method need to be developed
- ☐ Several initial test:
  - ■ Fix position of the middle chamber.
  - ■ Fix the luminosity limit with existing tracking algorithm for TRANSVERSITY configuration.
- ☐ Move to new tracking algorithm/improve old one?

Acknowledgement

- ☐ Eugene Chudakov
- ☐ Ole Hansen
- ☐ Xiaodong Jiang