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Simulation for the FTK_IM test

FTK Workshop

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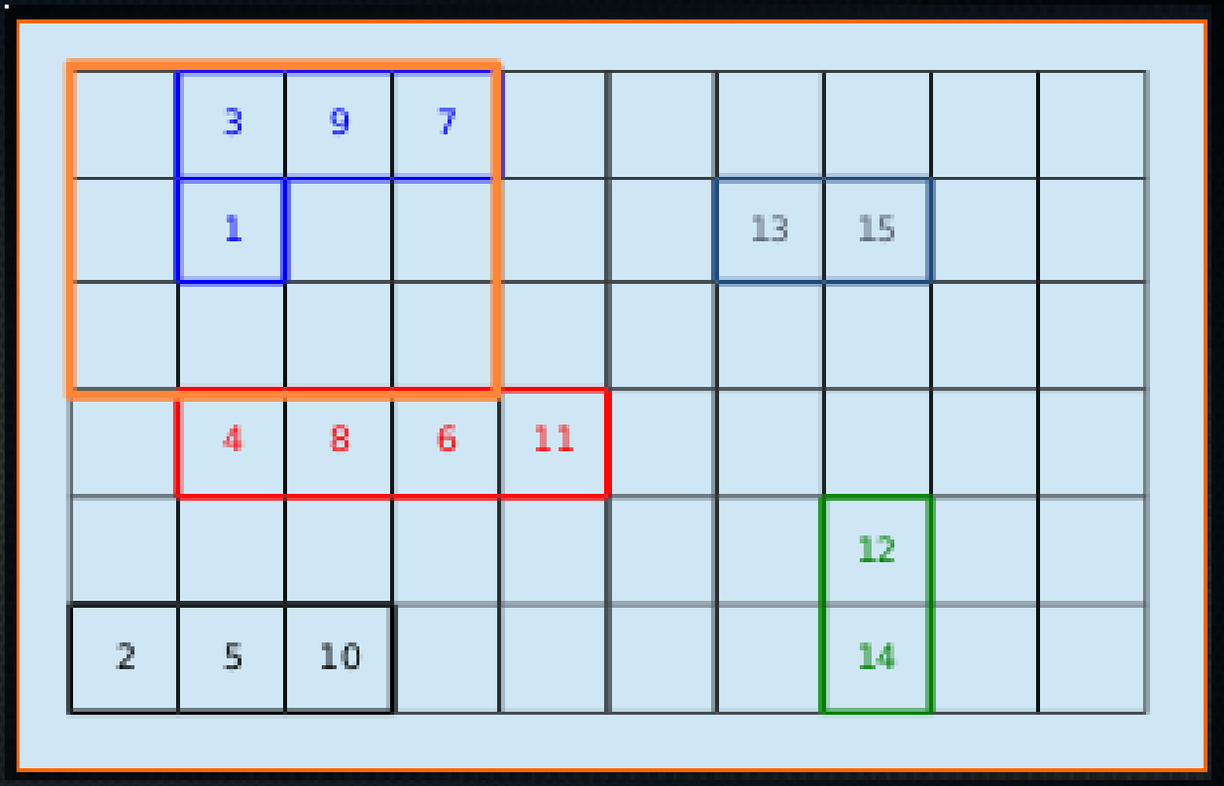
FTK_IM Summary

- Hit Decoder
  - Transform input data to the necessary format
- Clustering implementation
  - Moving window implementation
- Centroid calculation
  - Find the location of each cluster



The Data Formatter IM Simulation

- About 500 lines
  - Inherits heavily from the previous clustering implementation
  - Previous clustering did not use moving window
- Bit accurate simulation of the FW developed by Luiza
  - Implements the moving window algorithm
  - Mimicks Hit Decoder & Clustering algorithm
  - Centroid calculation ready, soon to be tested
- Will be part of the TrigFTKSim package after successful test of centroid calculation

Firmware – Software comparison

- Generate input for firmware
  - FW uses binary words which have to be generated from an RDO file
  - RDO: simulation of real data
  - Python script manipulates RDO to generate input for FW
  - TrigFTKSim uses different input
- Compare output of Calliope's output and SW output
  - Python script written for comparison
  - Comparison almost accurate: 2 different clusters out of 10.703 - 0.02%
- And, of course, the code!

Example output of FW – SW comparison

Event: 013A9 Module: 02 - Clusters in FW but not in SW: 2001508F

Event: 013A9 Module: 02 - Clusters in SW but not in FW: 2001408F

Event: 013AA Module: 10 - Clusters in FW but not in SW: 20012116 20013115

Event: 013AA Module: 10 - Clusters in SW but not in FW: 20012115

Event: 013AA Module: 60 - Clusters in FW but not in SW: 20013020

Event: 013AA Module: 60 Reference: 20012020

310000A | 060200A

None | 260100A

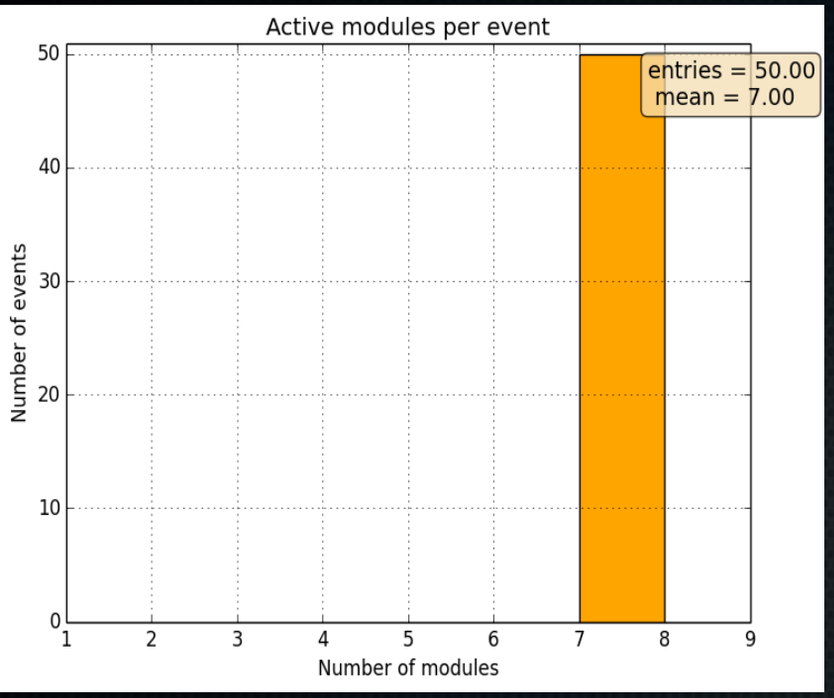
None | 310000A

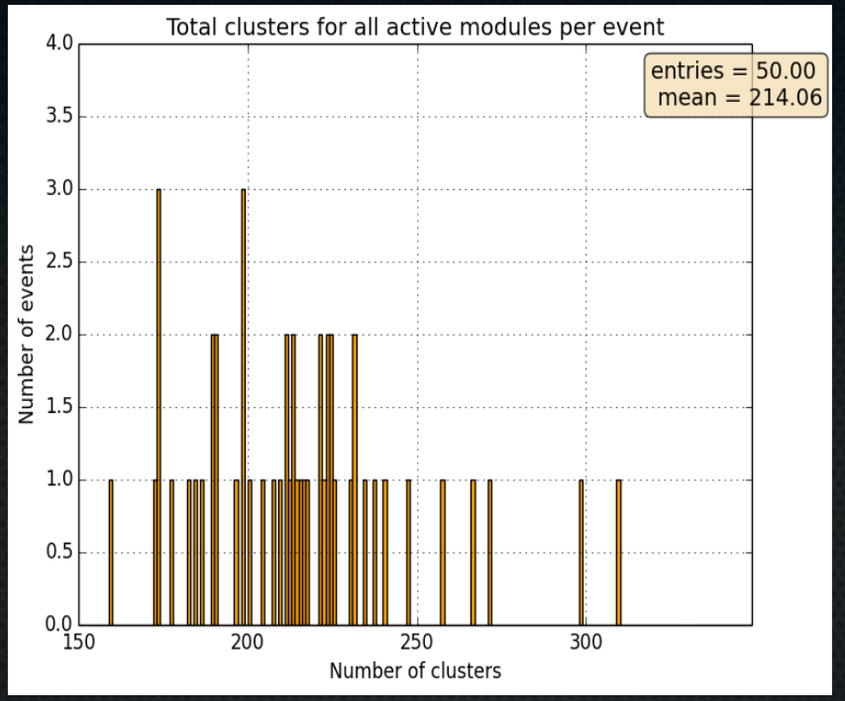
Event: 013AA Module: 72 - Clusters in FW but not in SW: 20011138

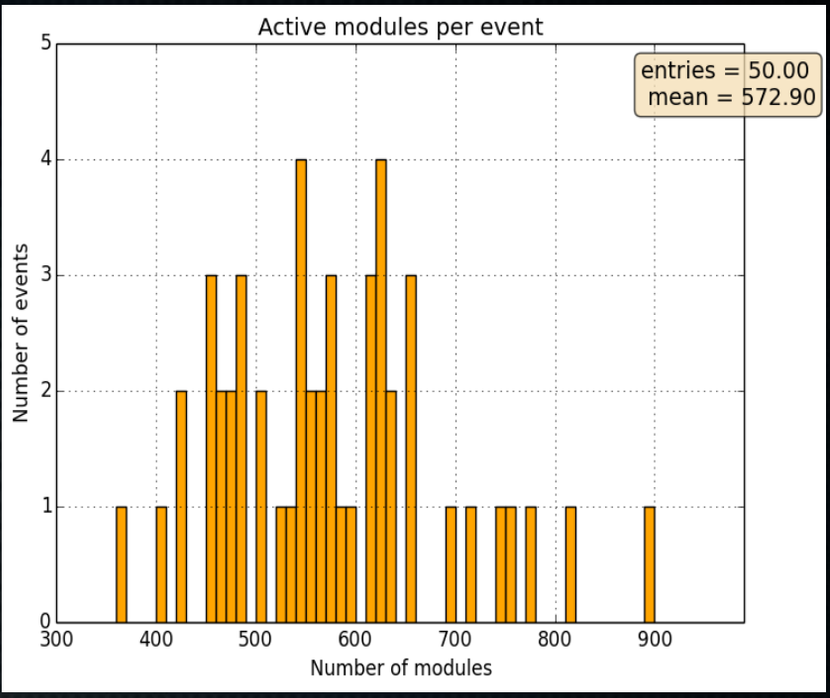
Sample

- ZH->nunubb
- 80 pile up
- B Layer examination
- 50 events, 7 modules

Event level statistics

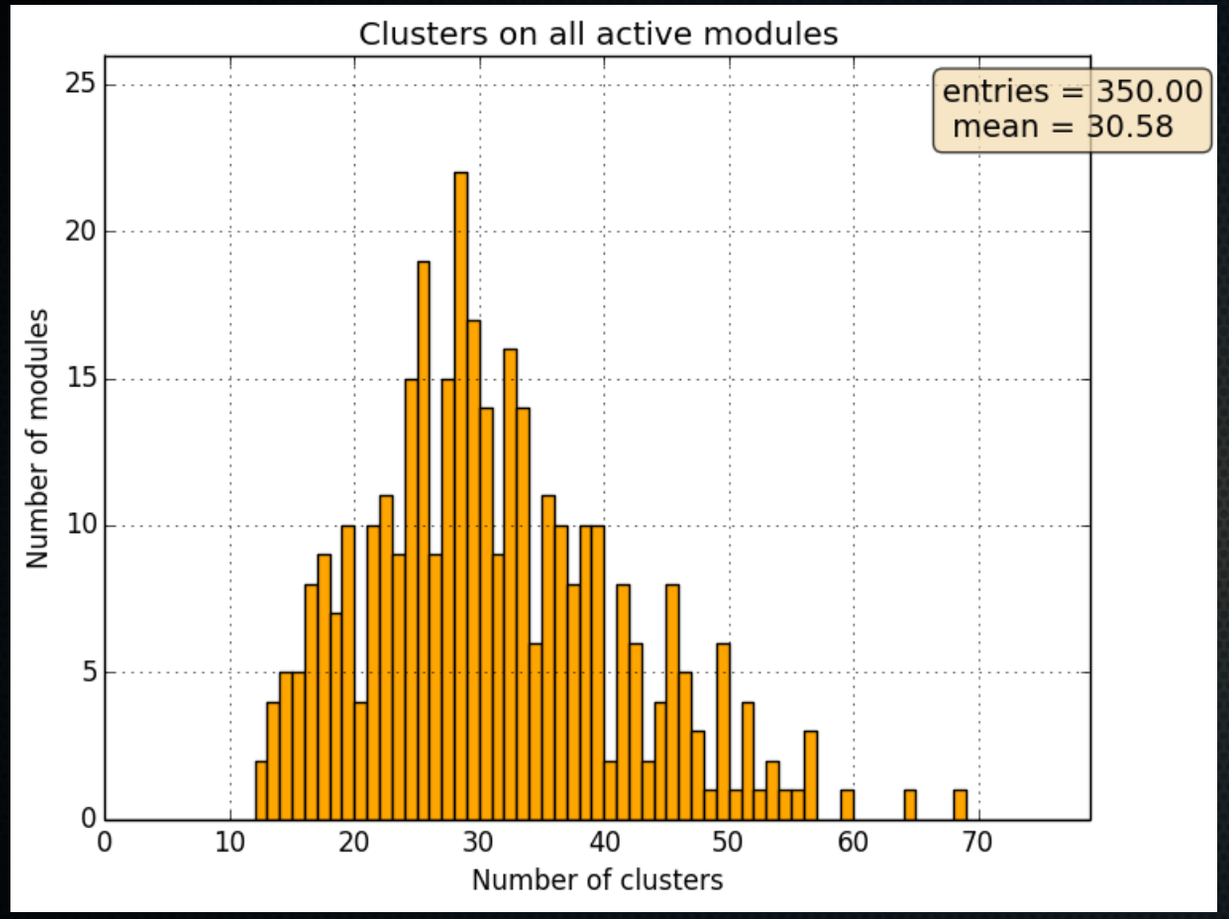


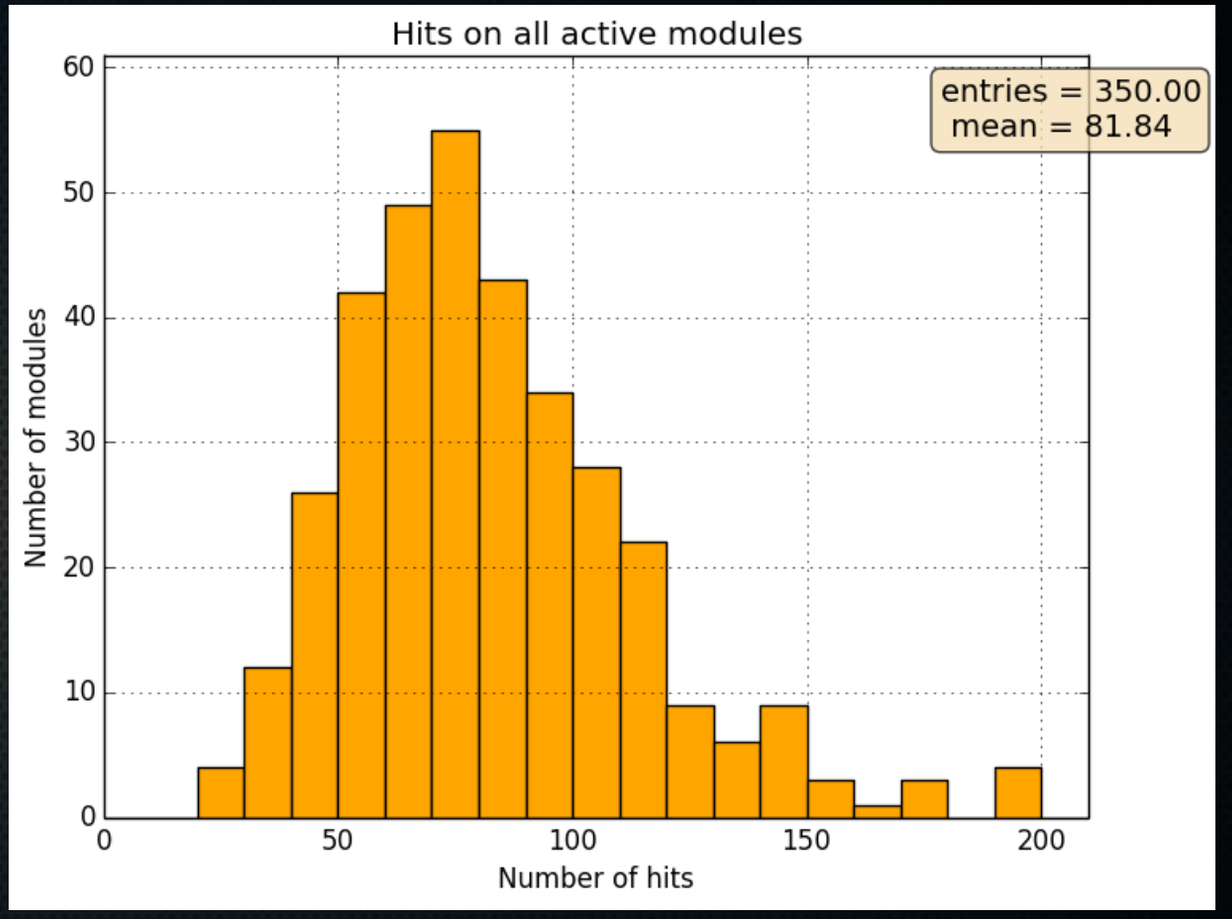




All events have 7 active modules on the test phase.
Average cluster size per event for these 7 modules: 214 clusters
Average number of hits per event for 7 modules: 572 hits

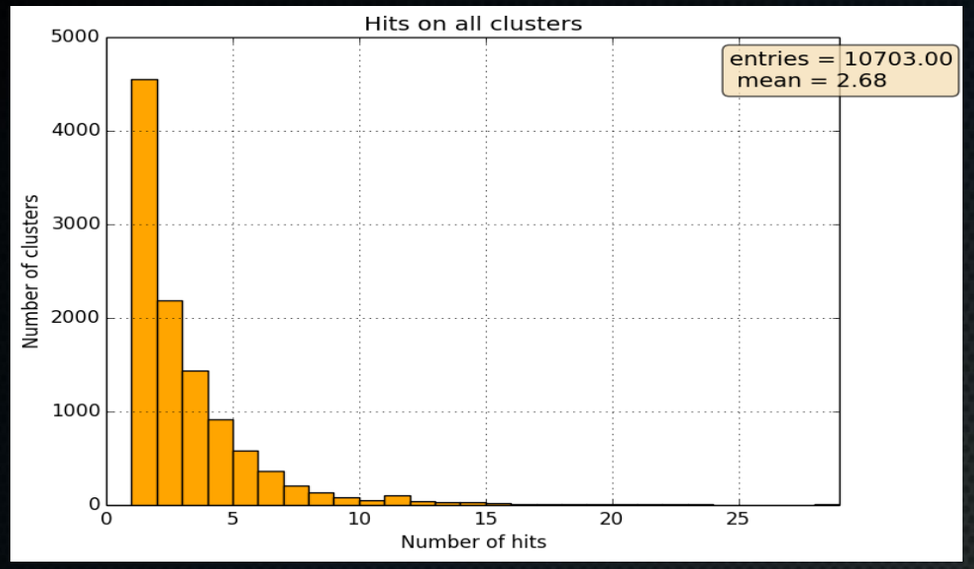
Module statistics

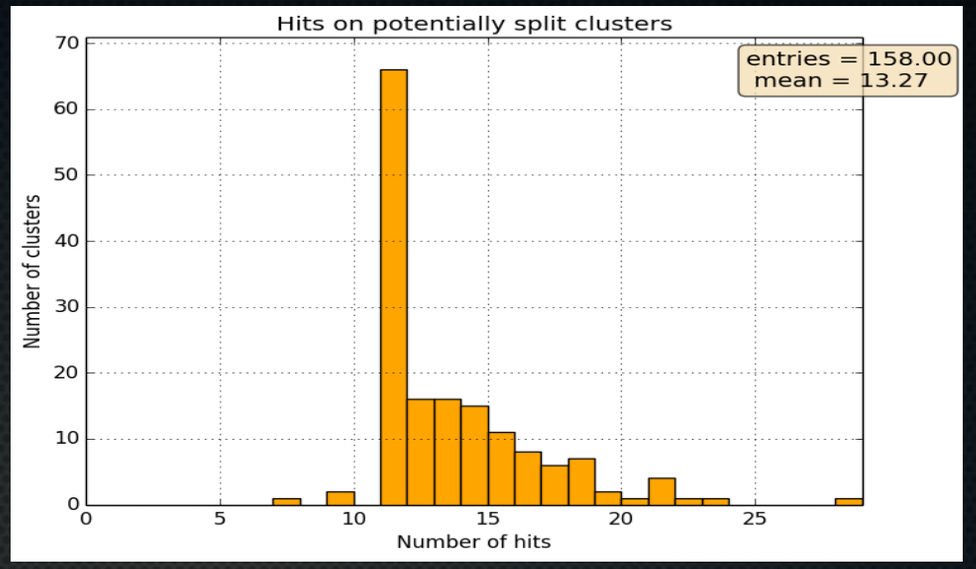


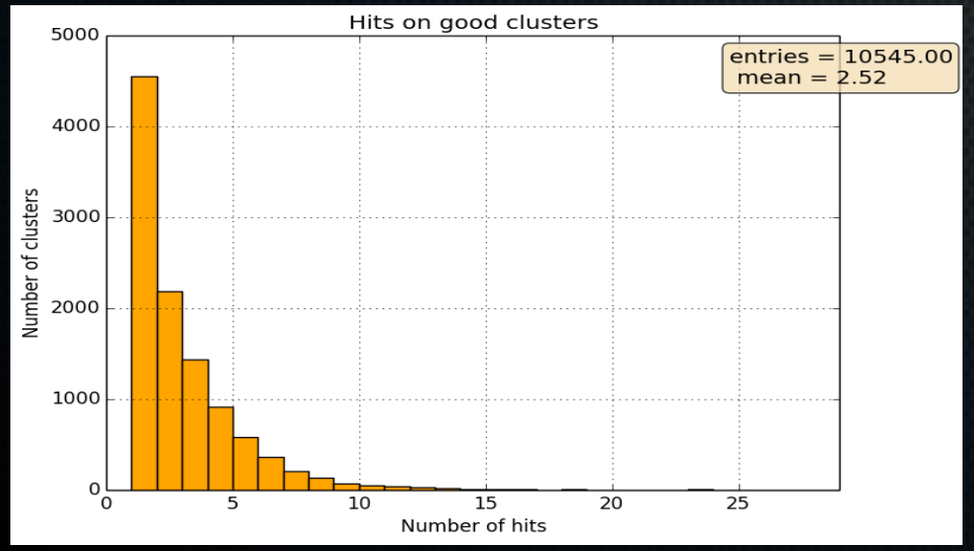


Maximum number of hits per module important for FIFO & Circular buffer size

Hits per cluster







On potentially split clusters, the cluster touches the grid window.

Window size of 10x21 means that the potentially split clusters are significantly bigger in size.

Split clusters: 1.47% of total clusters.

Conclusions

- Hit decoder & clustering implementation finished in FTKSim
  - Clustering finished but not yet tested
  - Also performs great on the actual hardware :)
  - Close to inclusion in TrigFTKSim
- Minor differences in between FTKSim and firmware
  - 2 different clusters out of 10703 clusters
  - Differences have to be investigated