

# Online Monitoring for Calorimetry with EUDAQ

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# Need for Common DAQ

- No current common DAQ and online monitoring solution for CALICE testbeams
- Most testbeams using custom or hacked solutions from various existing programs
- Commonality will allow less work setting up new testbeams and easier sharing of data
- Less time setting up means faster science



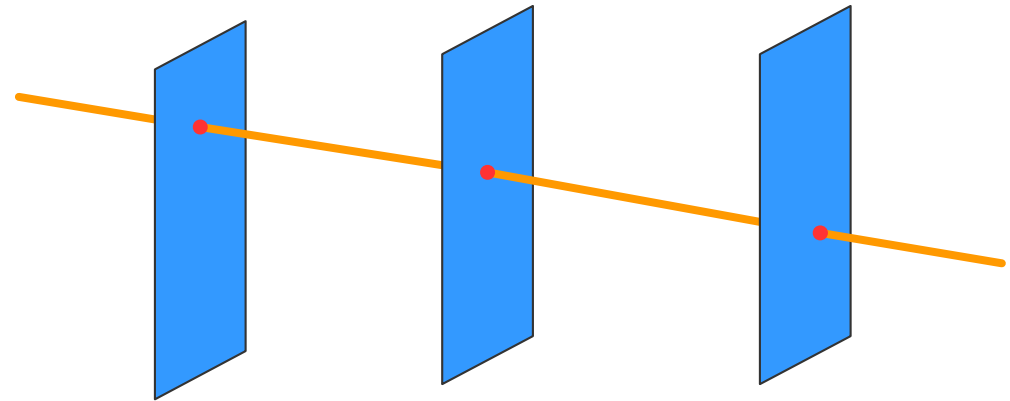
# EUDAQ

- EUDAQ proposed as common CALICE DAQ suite
- Structure allows plug-and-play usage and elements distributed over a network, compatible with Windows, Linux and Mac
- Faster set-up – only the producer needs to be custom-made for each testbeam
- Currently designed only for beam telescopes; no provision for other instrument types (e.g. calorimeters)



# Monitoring Structure

- EUDAQ currently functions with 'events'. Each event includes:
  - Trigger which begins event
  - Series of planes, each plane composed of pixels
  - Particle passes through planes, activating pixels on each plane
- Path and speed of particles reconstructed from information



# Monitoring Structure

- Event-based structure makes sense for beam telescopes but meaningless for calorimeters
- New set of 'primitives' must be determined – elements that allow meaningful online analysis of data
- Requires in-depth knowledge of several testbeams so common elements can be abstracted into code



# Additional Considerations

- Continued compatibility with EUDAQ is a priority – cannot create a separate branch/fork
- Cannot introduce features which break backwards-compatibility
- Code must work within existing framework – cannot break compatibility with beam telescopes
- Future updates must be kept in mind – code must be 'future-proof' for structural changes in version 2.0



# Plan for Structure

- Create new discrete event structure to replace StandardEvent, StandardPlane, SimpleStandardPlane, etc.
- Initially, developing this in a parallel fork with duplicated and altered online monitor to test functionality separately
- Once new event structure works as intended, begin merging functionality back into EUDAQ core
- Ideally, expand StandardEvent class and related classes to include “calorimeter events”, making core of EUDAQ generic enough to handle both beam telescopes and calorimeters



# Collaborators

- Adrian Irles (DESY) working on AHCAL testbeam, currently using EUDAQ for data acquisition but LabView for online monitoring. Has provided dummy data for testing, as well as consulting for data interpretation and developing new structure.
- Remí Ete (IPNL) developed DQM4HEP, the online monitoring solution for SDHCAL. DQM4HEP also intended as a generic monitoring solution – hoping to re-purpose as much code as possible





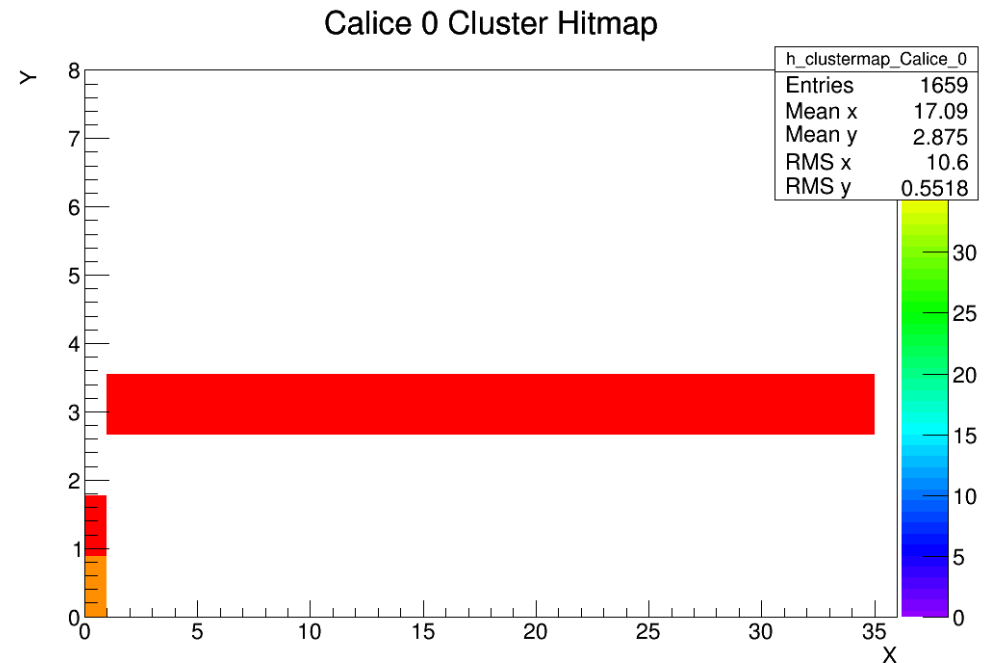
# Current Progress

- Identifying key program structures and dataflow
- Developing plan of final online monitoring data structure
- Developing logical structure for showing calorimetry monitoring data only when a calorimeter is used (compatibility a priority)

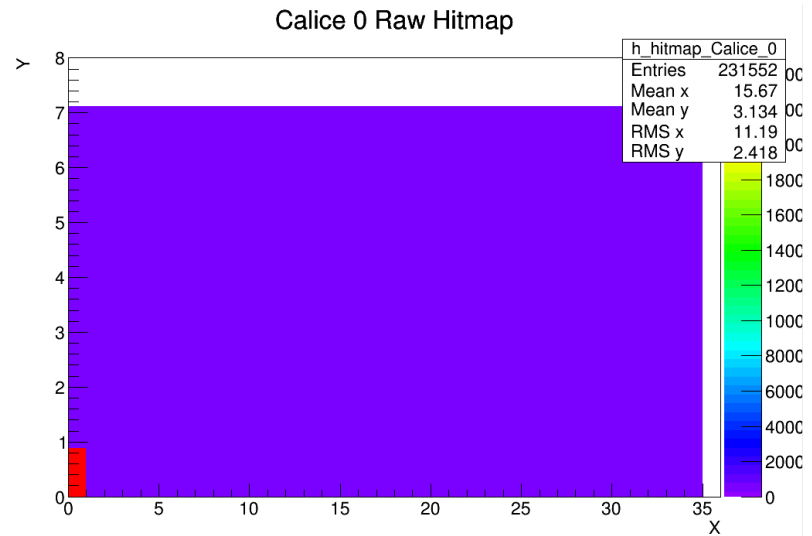
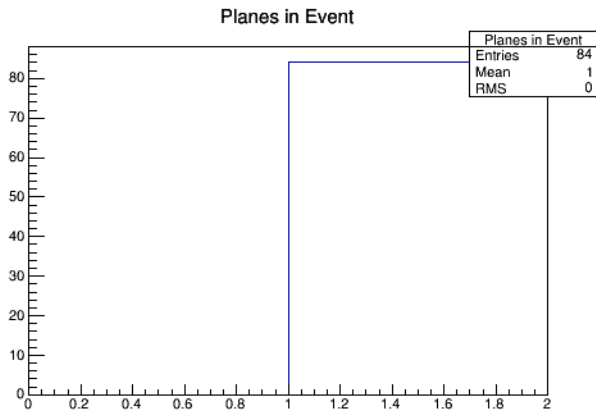
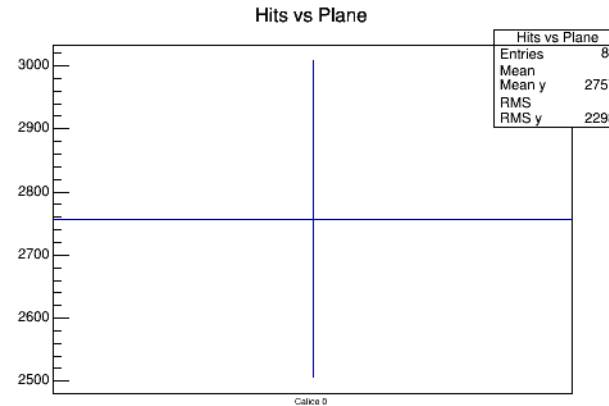
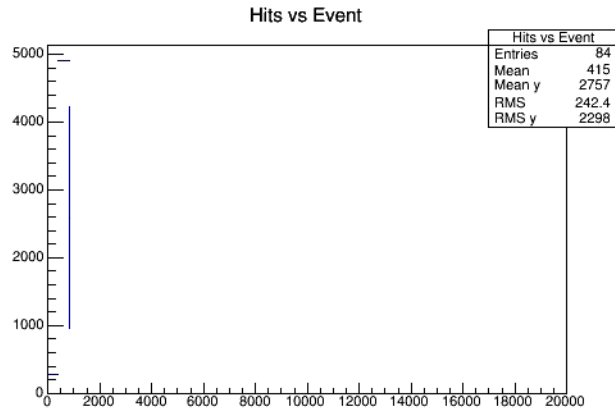


# Current Progress

- 'Dummy' data from AHCAL loaded into existing EUDAQ online monitor
- No structure to graphs or histograms, heatmaps are meaningless.
- Data cannot be interpreted correctly – it is 'junk'



# Current Progress



# Short-Term Goals

- Develop list of useful and important histograms
- Collect and understand any existing online monitoring code
  - AHCAL monitoring in LabView
  - SDHCAL monitoring in DQM4HEP
  - XDAQ?
  - Others?
- Develop outline of a generic structure for calorimeter monitoring
  - Basic components, shape of system, triggering timing and mechanism...



# Medium-Term Goals

- Successfully interpret AHCAL test/dummy data in EUDAQ
  - Replicate histogram samples
  - Verify actually correct and not 'nearly correct'
- Code ready to deploy for AHCAL testbeam
  - First attempt in May
  - Fix bugs, make refinements, optimise, etc.
  - Second attempt in June
- Begin rewriting code to remove any instrument-specific features; generalise code to expand to other instruments



# Long-Term Goals

- Complete generalisation of framework to be compatible with other known testbeams
- Work with teams to establish configuration files and histogram collections for known testbeams/instruments
- Create useful default histogram collections for unrecognised calorimeters and instruments
- Continue to provide support for updated or new testbeams and technologies



Thank you for listening



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