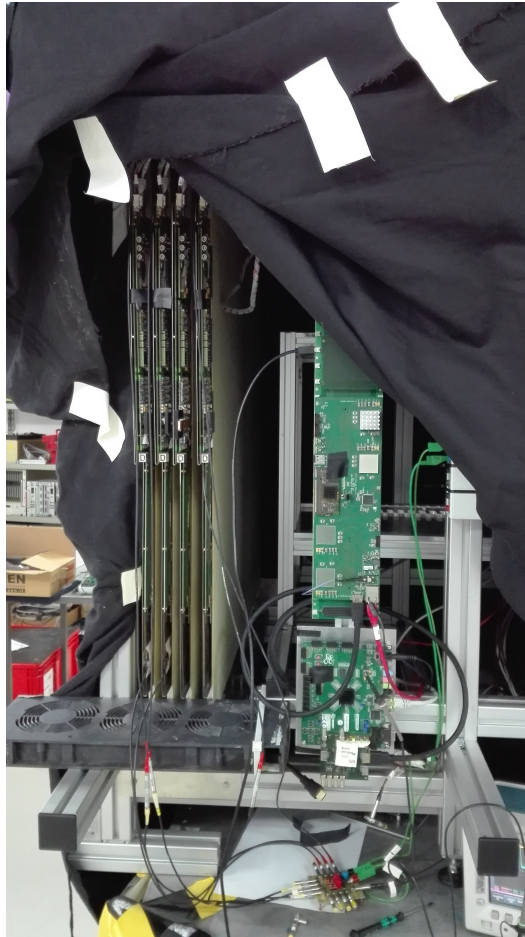


AHCAL & BIF common test beam with EUDAQ.

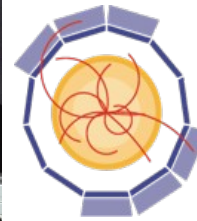
AIDA-2020 First Annual Meeting: WP5



[Adrian Irles](#),

DESY

Hamburg 14th June 2016



AIDA 2020

Outline of the talk

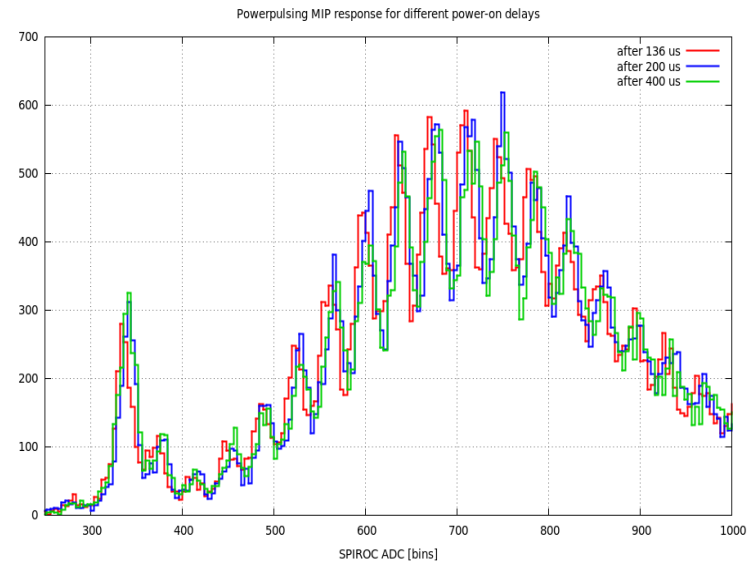
- > Usage of EUDAQ 1 during past testbeam
- > EUDAQ 1 performance during testbeam
- > EUDAQ 2 tests in the lab
- > Monitoring: DQM4HEP
- > Summary and comments



Last testbeam setup: DESY TB22, May2016

- > 1) 4 big layers (4 HBUS making a matrix of 4x4 chips)
 - Electron showers adding a 3 radiation length aluminium block between the beam and the detector
→ timing calibration using BIF as reference
- > 2) 1 new SMD HBU + 2sensl HBUs (single HBUs)
 - MIP calibration
 - Test new DAQ improvements (new DAQ interfaces)
 - **Power pulsing + ILC mode tests**

MIP distribution taken on power pulsing mode:



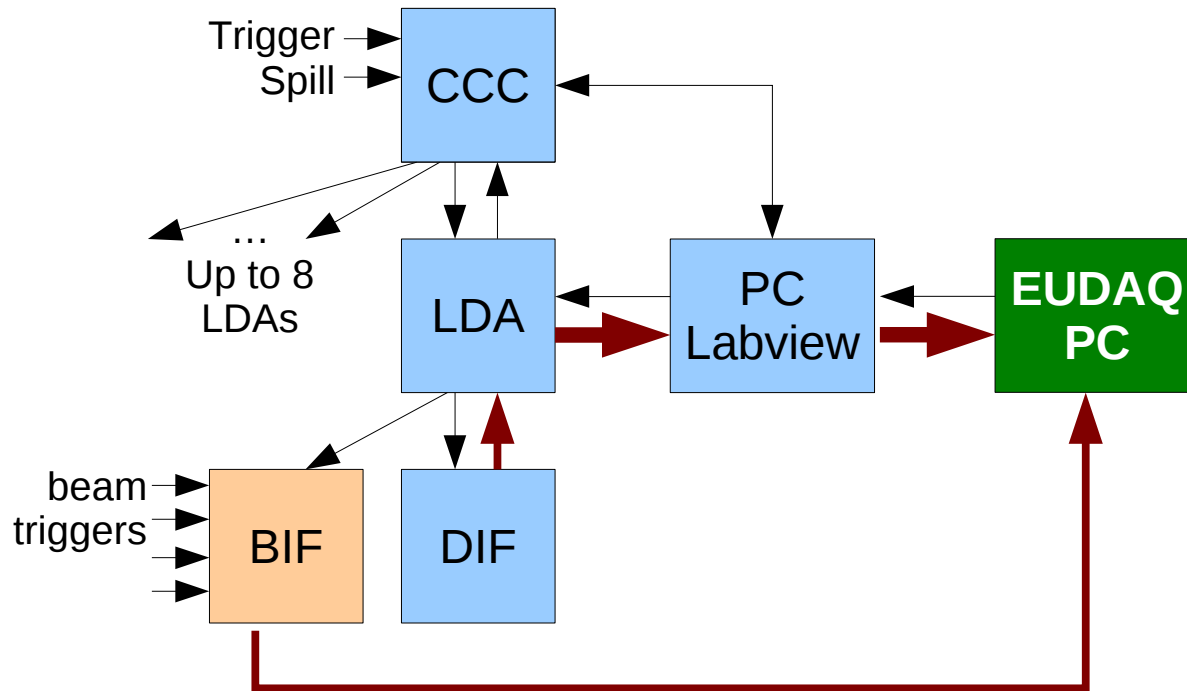
Usage of EUDAQ during testbeam

- > EUDAQ was successfully used in almost all AHCAL standalone testbeams during 2015 and in a common testbeam Scintillator AHCAL+ECAL and Silicon ECAL (end 2014). Two different collections in the same LCIO file
- > **EUDAQ1.6dev is our high level DAQ**
 - Our AHCAL detector configuration is controlled by a Labview Interface (automated options are available now)
 - EUDAQ is used as controlling interface (start/stop+receiving the data and therefore make the conversion to **lcio**)
- > **Two producers:**
 - **AHCALProducer.exe** (ScReader to decode the data)
 - **caliceahcalbif_producer.exe** (modification of the existing miniTLU producer)
- > **One Converter: CaliceGenericConverterPlugin:** from RawDataEvent blocks of different kind of integers to **LCGenericObjects** filled with integers



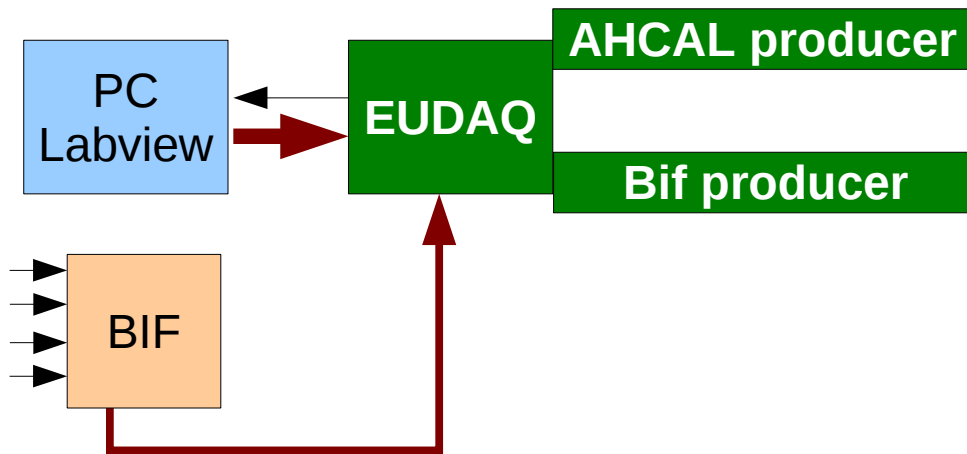
AHCAL & BIF

- > First test: November 2015, DESY TB24
 - Separated data stream
 - Correlation offline using readout cycle number
- > Testbeam May 2016, DESY TB22
 - Both data stream are, online, merged together



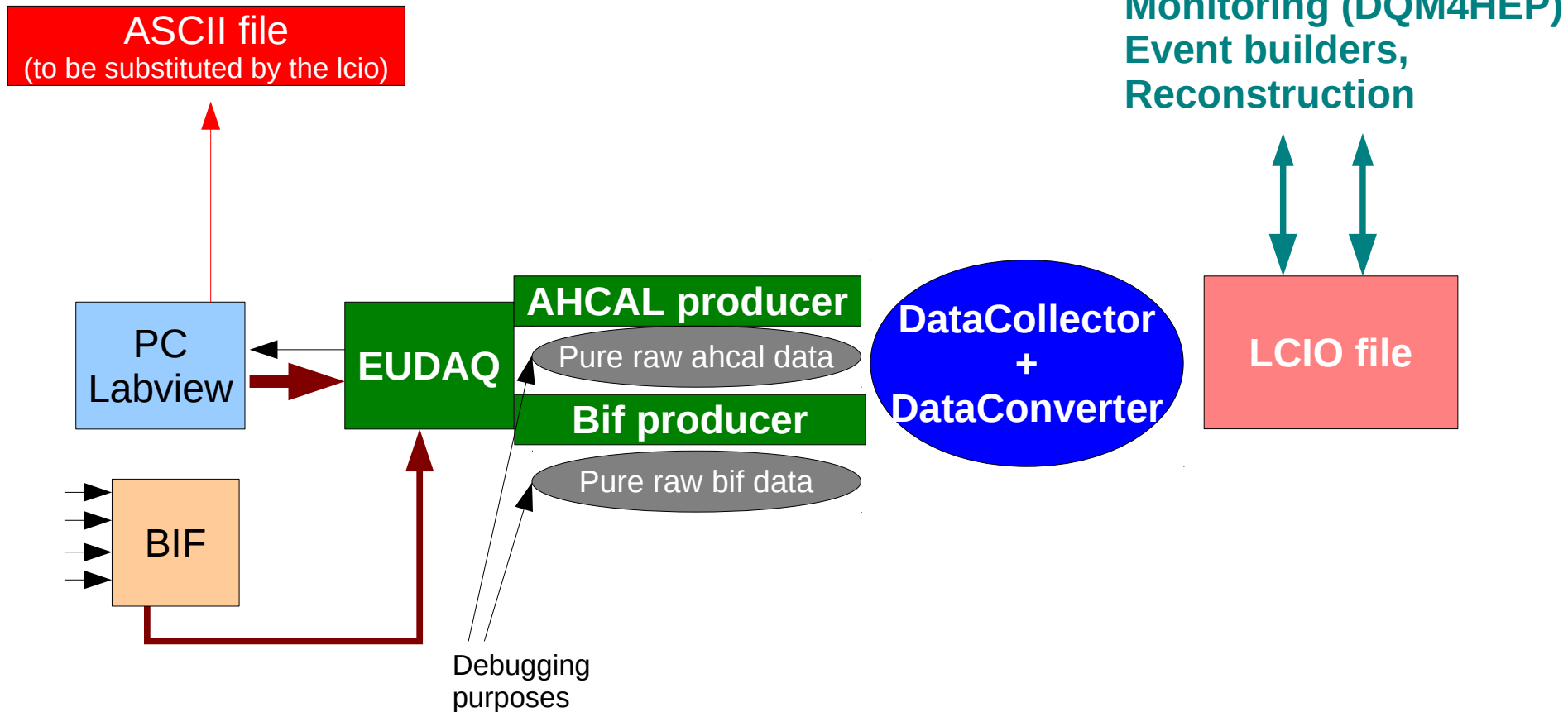
Data format: using EUDAQ1

> Data chain schematics



Data format: using EUDAQ1

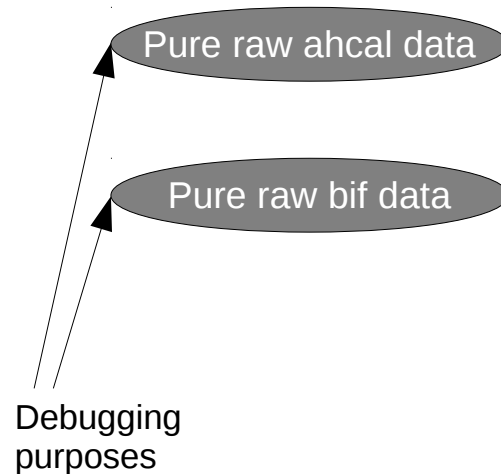
> Data chain schematics



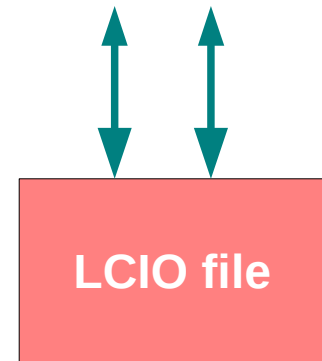
Data format: using EUDAQ1

> Data chain schematics

ASCII file
(to be substituted by the lcio)



Monitoring (DQM4HEP)
Event builders,
Reconstruction



EUDAQ1.6 performance during BIF+AHCAL testbeam

- > Using latest **eudaq1.6 stable release**: ~ 640 runs
 - ~ 127 GB of slcio data (lcio uses standard zlib compression)
 - a factor 1/3 smaller than the raw data files
 - a factor 1/10 smaller than the ASCII files
 - > Most of them where **automatized runs** (the eudaq control run stops the run after 5000 cycles and restarts the next by its own).
 - > Debugging during testbeam:
 - small corrections in the DataConverter to make it usable by the BIF producer (convert uint32 to int)
 - From time to time, a crash of uhal (BIF producer software) that created:
 - > a mismatch between event number in both data streams.
 - > a eudaq crash
- this problem was solved during the testbeam → no more eudaq crashes.



EUDAQ 2 performance in the laboratory

- > With support from R. Peschke and Y. Liu.
- > EUDAQ1 producers are exportable to EUDAQ2
- > **BIF + AHCAL setup in the lab** to test and debug EUDAQ1 and 2.
- > Currently working with **EUDAQ 2 (master branch): two producers with two data collectors :**
 - Only “native format” for the moment, the converters do not work yet... under investigation.
- > Restructuring of EUDAQ 2 folders and libraries:
 - Move everything that is detector specific to the producers folder (including DataConverterPlugins)



Creates an executable
bin/AHCALProducer.exe

Creates a set of executables
bin/BIFAHCALProducer.exe
bin/BIFAHCALControl.exe

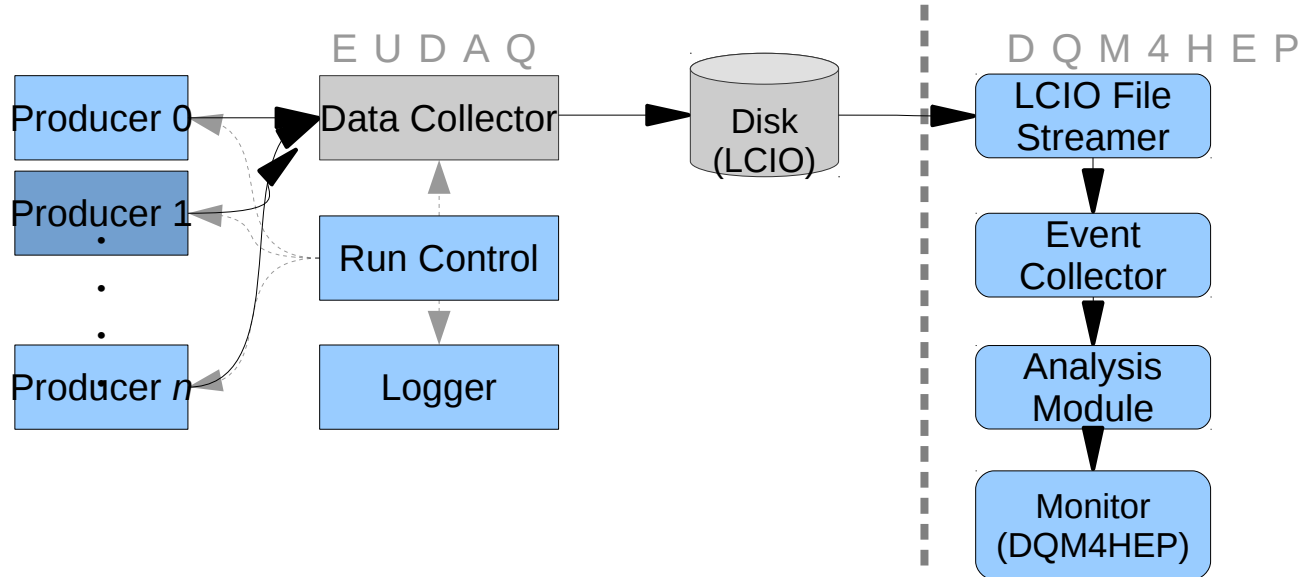
Source files for

lib/libcalice.plugin.so → contains the
ConverterPlugin classes



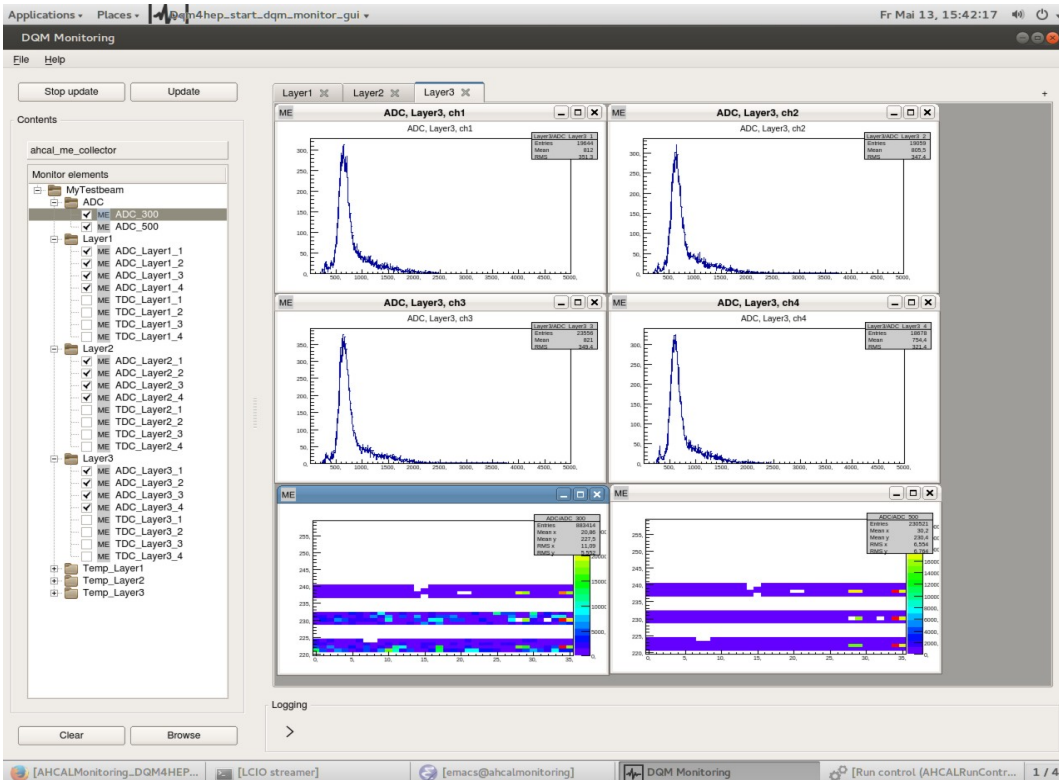
Monitoring: EUDAQ + DQM4HEP

- > Very nice and flexible tool, but need to learn how to use it (only one experience in testbeam). Thanks to R. Ete and T. Coates for the support.
- > DQM4HEP reading Lcio files written by EUDAQ
 - Next step: read directly Lcio stream from EUDAQ: using shared memory facility (Shm) similarly to SDHCAL ?



- > The EUDAQ producers and DQM4HEP analysis modules are the only “detector dependent” parts

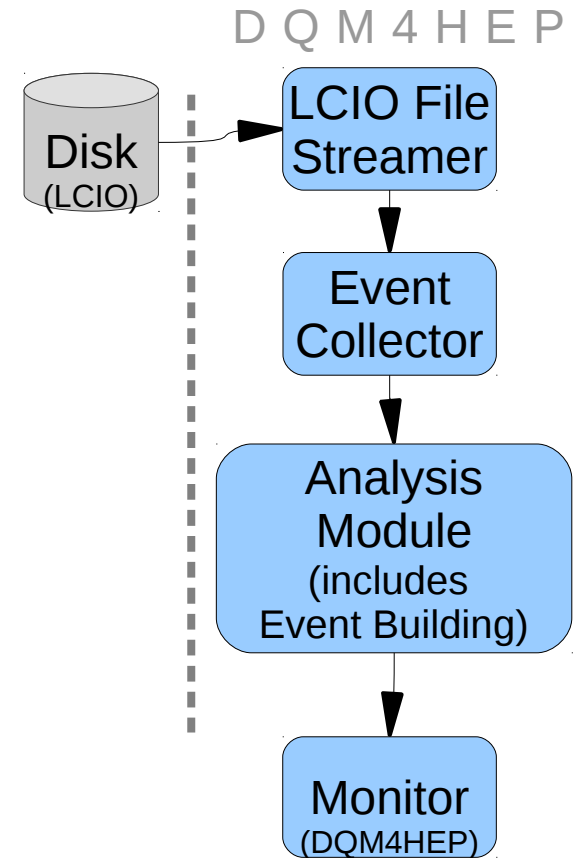
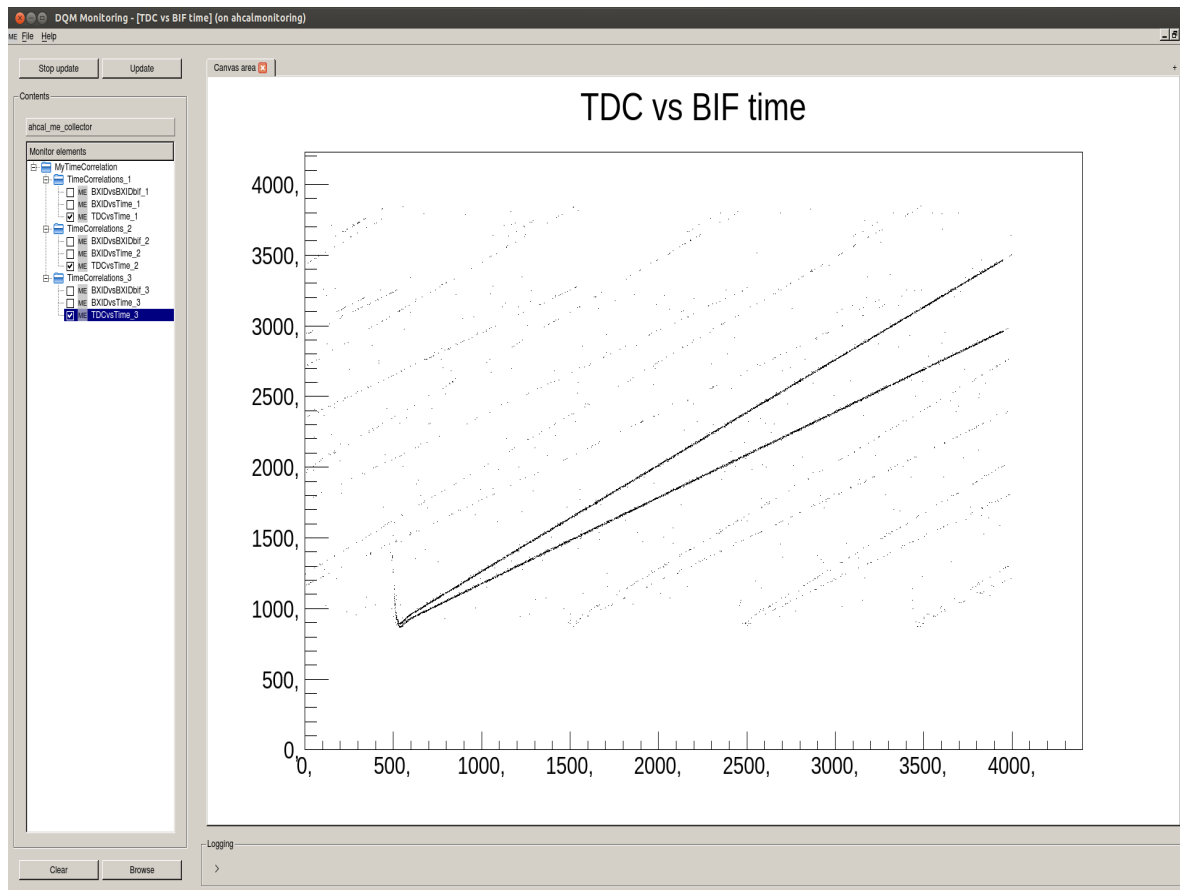
Monitoring: DQM4HEP



- Raw data monitoring: hit maps (without geometry corrections) and channel by channel histograms.
- Perfect to study global distributions.
- Needs better understanding how to monitor individual channels:
 - MIP calibration
 - Booking all the histograms (O(1000) channels) may take too much memory.



Monitoring: DQM4HEP



> Online Time Correlation of two detectors: BIF+AHCAL

- Event building done in the analysis module



Summary

- > We had a successful integration of our DAQ with EUDAQ as master DAQ (for AHCAL standalone and combined testbeams)
- > Successful common testbeam: BIF + AHCAL with online Event Building implemented in the monitoring.
 - Time correlation between detectors for first time!
- > EUDAQ2 testcase setup at the lab:
 - BIF+AHCAL working with EUDAQ 2.
 - Success in take data with two independent data collectors.
 - Work in progress together EUDAQ and EUTelescope crews.
- > DQM4HEP successfully used in last testbeam.
- > Next testbeam at the end of July !!
 - Time to work in the few missing pieces: EUDAQ 2 online conversion to LCIO, EUDAQ+DQM4HEP interface (?).

