

Report from the Technical Board

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CALICE meeting
UTA
14 September 2016

Since Kyushu CALICE meeting

- > 4 TB meetings since Kyushu meeting
- > testbeams
 - at CERN
 - SDHCAL+SiECAL: 2 weeks in June 2016 at SPS
 - MAPS (ALICE FOCAL): 1 week in September 2016 at SPS
 - planned: SDHCAL: 1 week in October 2016 at SPS
 - at DESY
 - AHCAL: 2 weeks in June 2016
 - AHCAL: 2 weeks in July/August 2016
 - planned: AHCAL + telescope: 1 week in October 2016
 - planned at ELPH, Tohoku: strip calorimeter: 4 days in November 2016 (see Katsu's talk)
- > software
- > ASIC submission
- > AIDA-2020
- > common DAQ



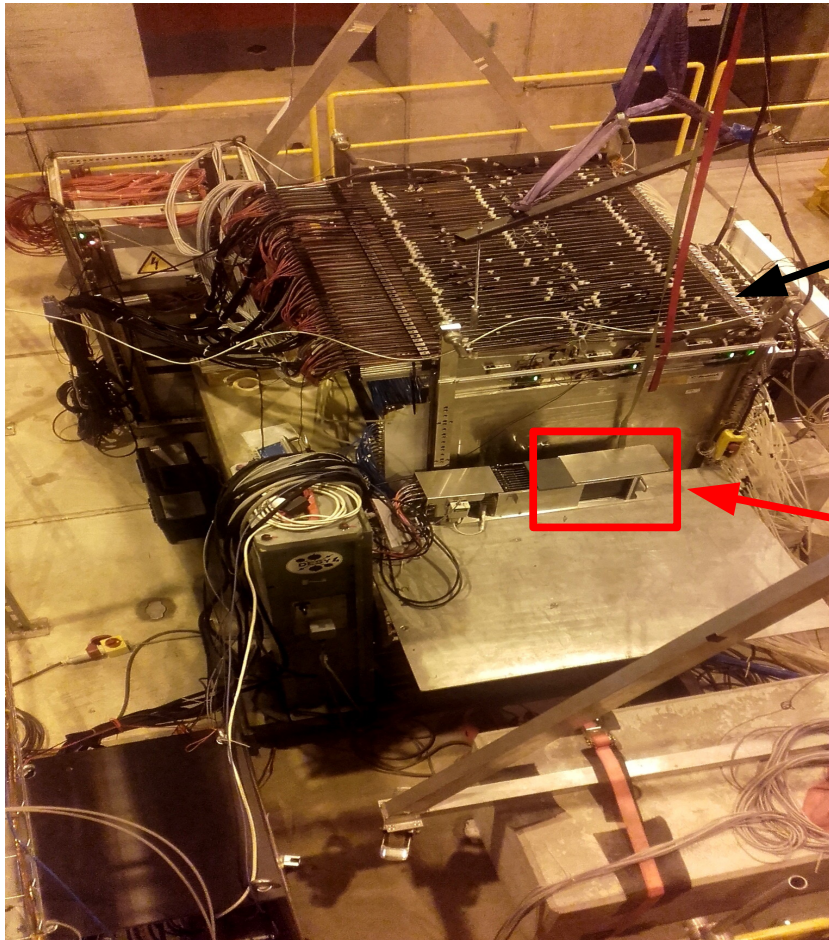
SDHCAL+SiECAL testbeam at SPS

- > 2 weeks at SPS in July 2016
- > main goals:
 - combined testbeam of 2 technological prototypes
 - new calibration schemes for SDHCAL
 - hadron shower shapes with pure pion/kaon/proton beams (Cerenkov and CEDAR information)
- > a lot of preparation and effort for combined DAQ
 - minimum changes to existing DAQ systems
 - modified DCC card to provide HW synchronisation of the 2 detectors
 - configuration: both data streams are sent to DAQ PCs of both systems
 - impossible with EUDAQ1, EUDAQ2 not ready in time
 - used software connectors to send data to the DAQ of the other detector (XDAQ for SDHCAL, PYRAME for SiECAL)
 - preparation: several dedicated tests with 1 SiECAL slab and full SDHCAL at IPNL
 - data transmission fully worked towards the end of the test beam time



SDHCAL+SiECAL testbeam at SPS

- configuration: 10 SiECAL slabs (no absorber) + complete SDHCAL



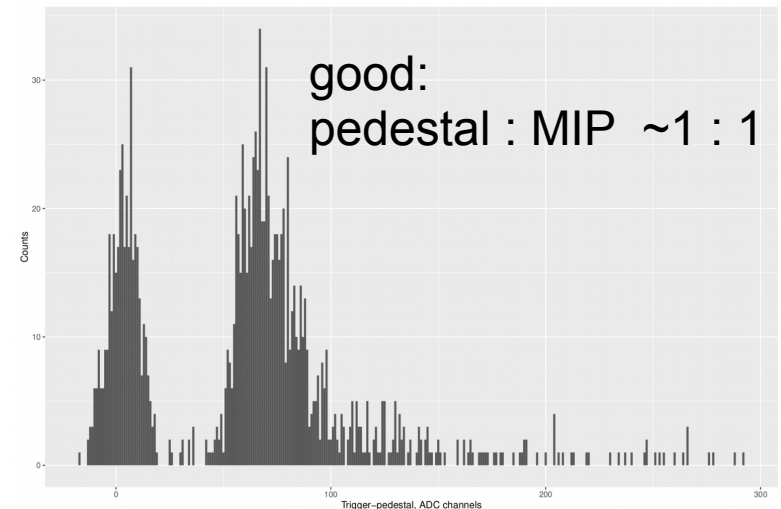
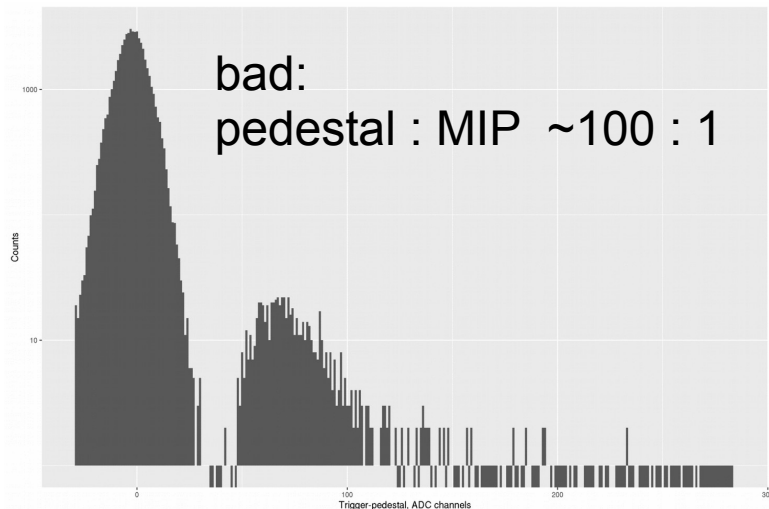
SDHCAL

SiECAL

SDHCAL+SiECAL testbeam at SPS

> SiECAL

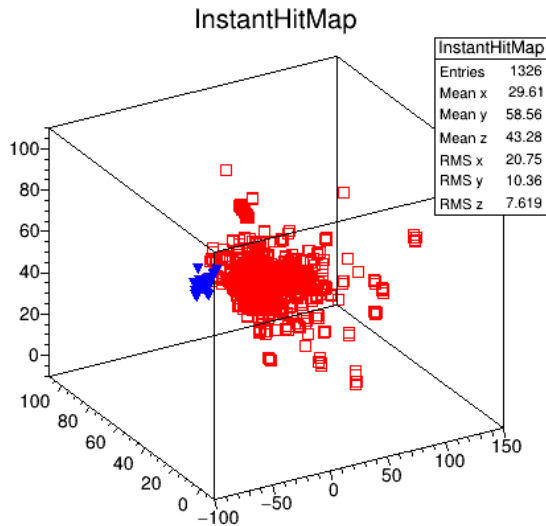
- 7 of 10 layers working (2 not answering, 1 not working after power cut)
- observed very high noise levels in 6 of the 7 layers
 - much more than in November 2015 in the same beam line
 - new setup should have been better (better mechanics)
 - debugging needed



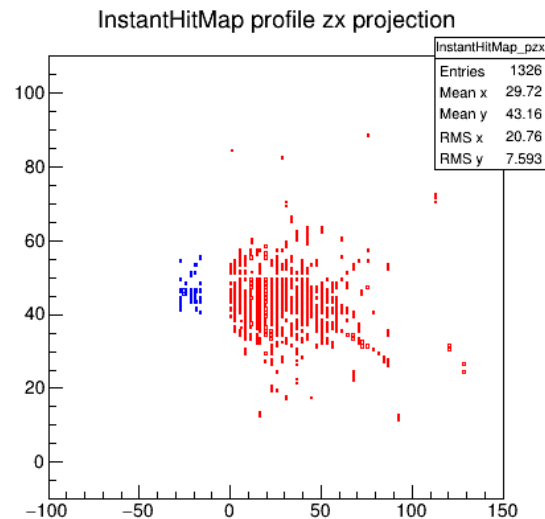
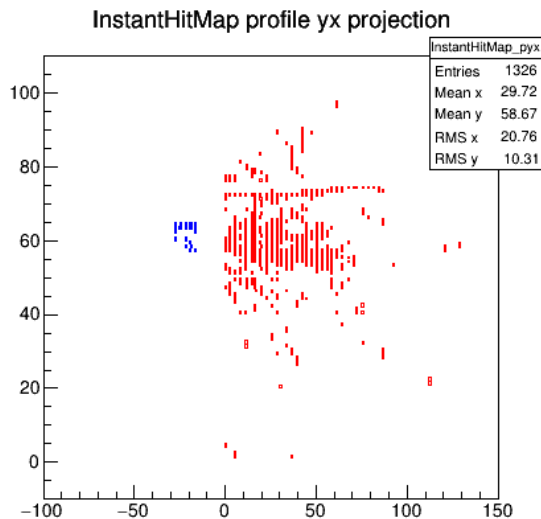
> SDHCAL

- working well
- 10 ASICs (at the edges, not affecting shower core) damaged by power cut
- due to wobbling, lower energies (< 80 GeV) not accessible for most of the beam time
- data taken:
 - positive hadron runs 80 \rightarrow 30 GeV using CEDAR to tag protons: study difference between pion and proton showers
 - muons with different gains: study impact on efficiency and multiplicity
 - during the last 3 days, one multi-gap RPC inserted in the last slot of the SDHCAL, HV scan: study efficiency and multiplicity

SDHCAL+SiECAL testbeam at SPS



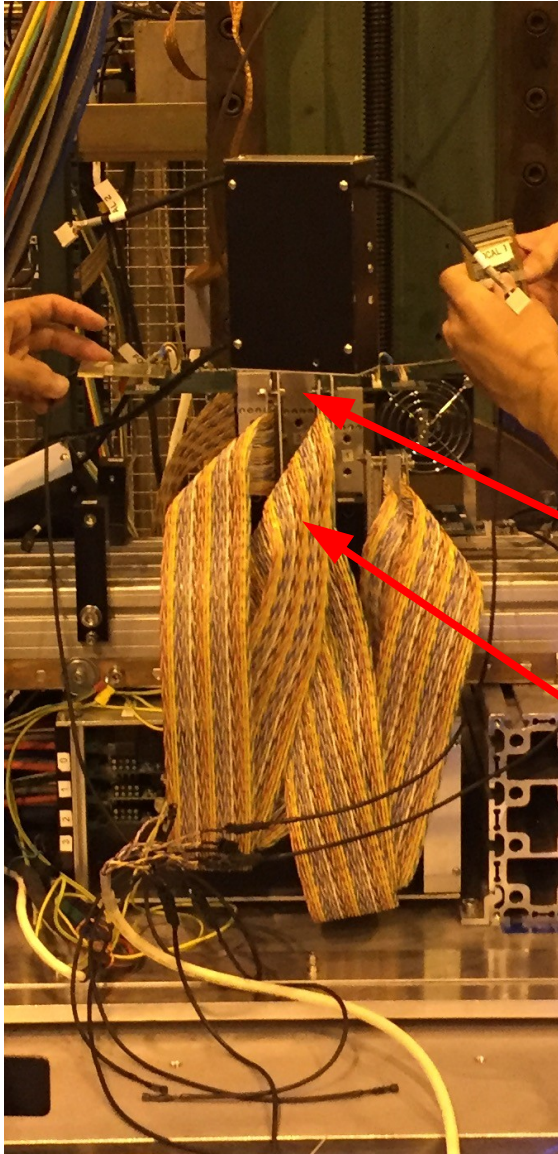
- most important goal was common running: achieved
- data quality not optimal due to many effects, but got useful data



offline analysis after
adjusting for time offset
(not yet aligned)



MAPS / FoCal testbeam at SPS



- > 1 week at SPS 7-14 September 2016
- > dedicated mainly to test of the low granularity technology ($1 \times 1 \text{ cm}^2$ pads), led by Tsukuba
- > MAPS layers used to simulate hybrid setup
 - every few (4-5) pad layers a MAPS layer is interleaved

boxes with pad layers

cables to MAPS layers

AHCAL: testbeam at DESY

> 2 weeks in May 2016

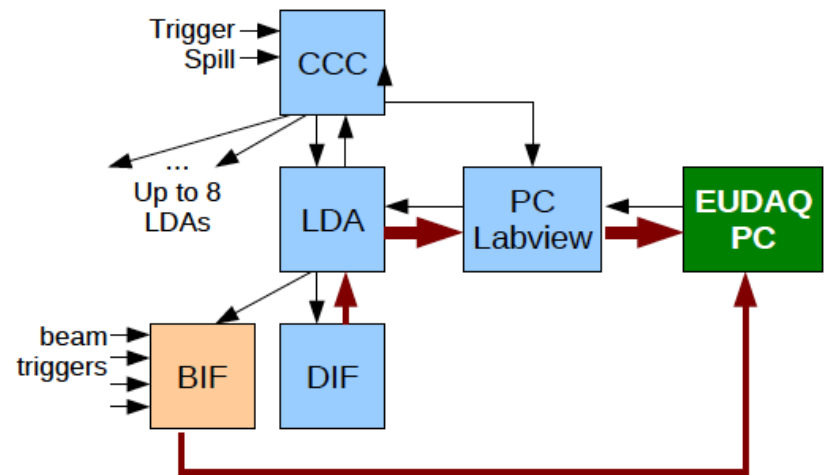
- 1 week for DAQ tests and time calibration of 4 (old) large layers
- 1 week for tests of new electronics and calibration of first new surface-mount HBU, power pulsing tests

> EUDAQ 1.6 as high level DAQ

> DQM4HEP for online monitoring

> running with Beam InterFace (BIF):

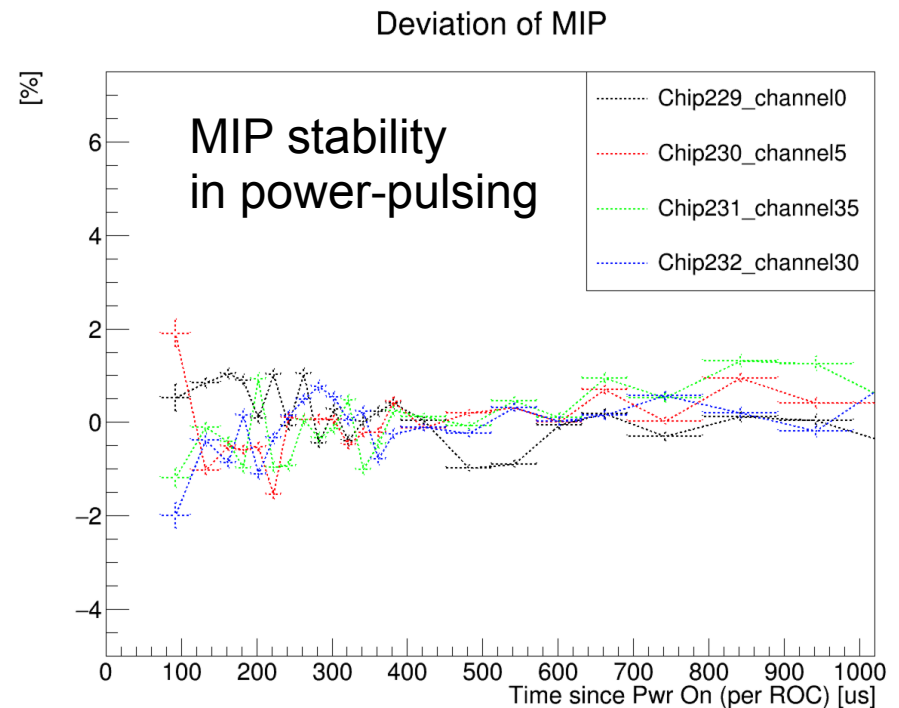
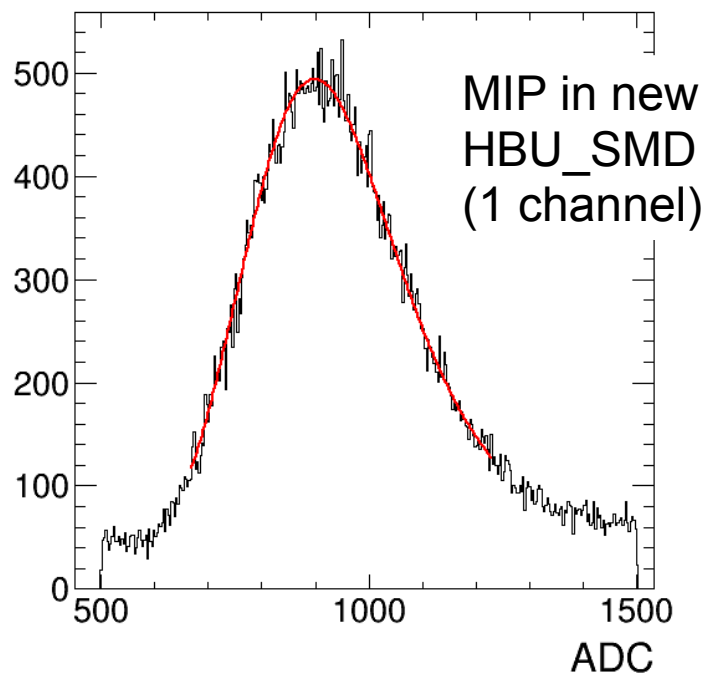
- time stamp external signals (beam trigger scintillators)
- treated as separate detector in EUDAQ



AHCAL: testbeam at DESY

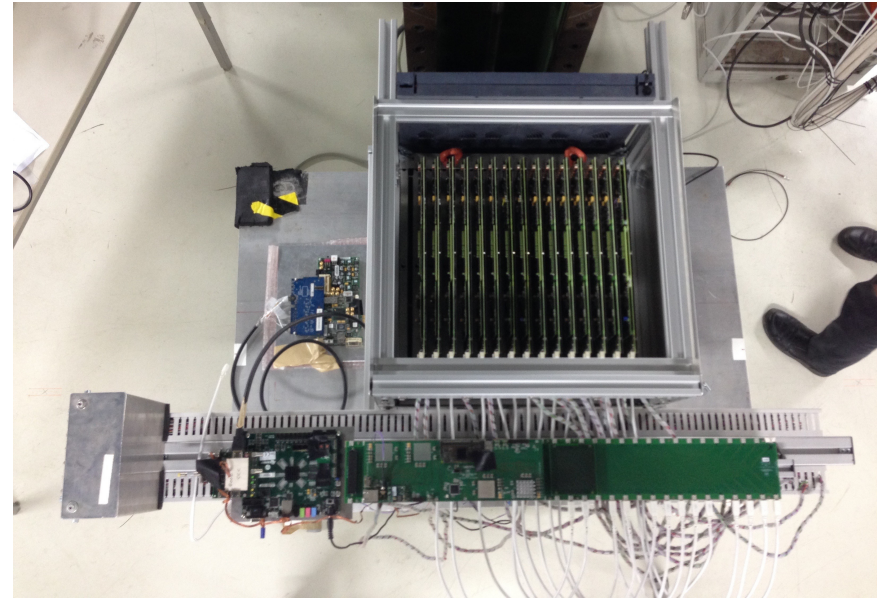
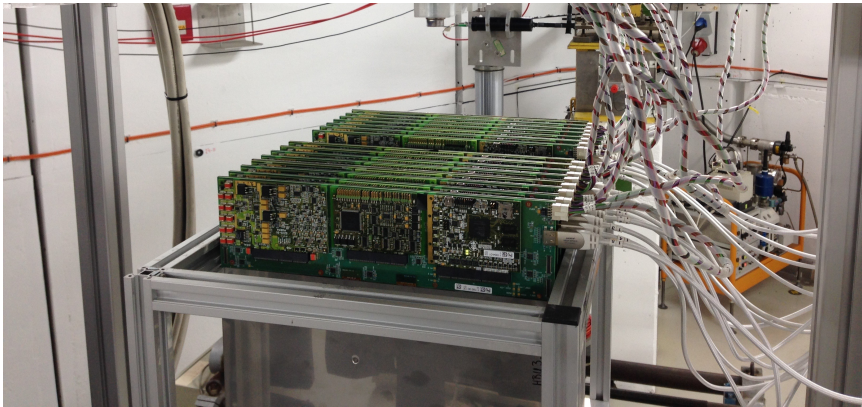
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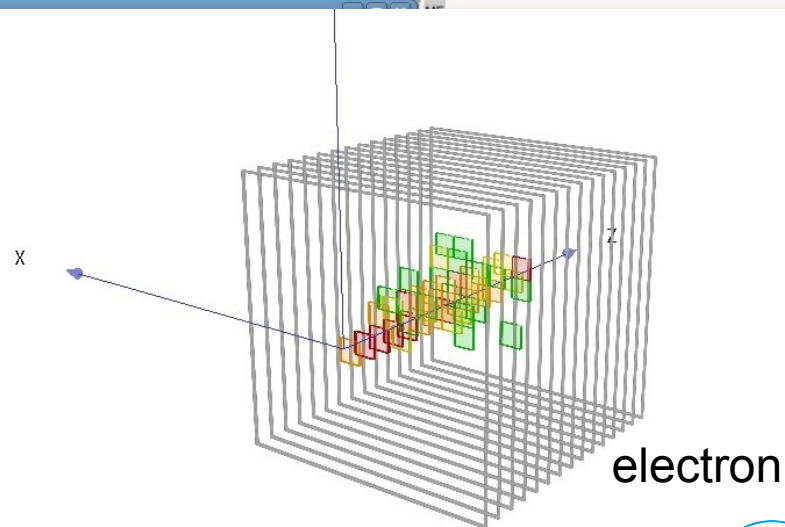
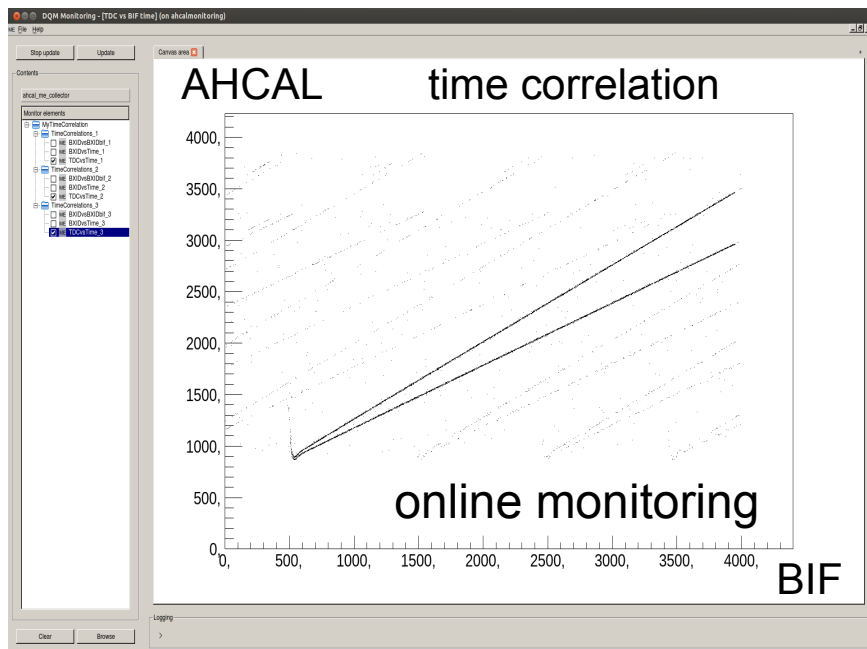
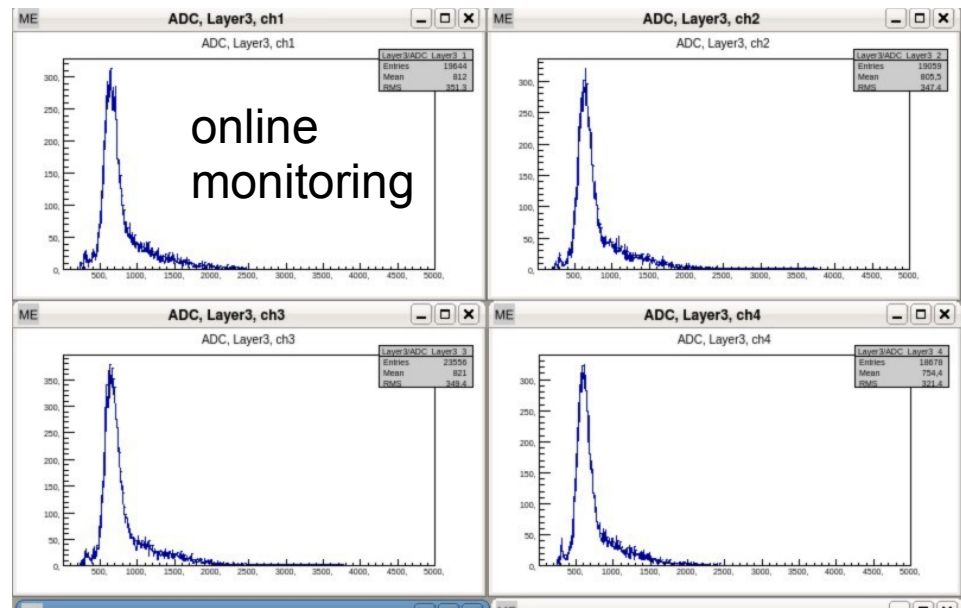
AHCAL: testbeam at DESY

- 2 weeks in July/August 2016
 - 1 week for tests and MIP calibration (air stack)
 - 1 week for EM showers and more power pulsing tests (steel absorber stack)
- setup: 15 layers of 1 HBU
 - 6 new HBU_SMD
 - 9 good “old” layers



AHCAL: testbeam at DESY

- after fixing a few small problems, very smooth and stable running
- all layers working well in nominal conditions
- quality of new HBUs very good
 - all 864 channels operational, 863 show nice MIP spectrum



Software status

“Physics prototype” software stable

last update (v04-08-02, December 2015)

corrected ECAL calibration constants for FNAL runs (R. Poeschl)

Software for technological prototypes

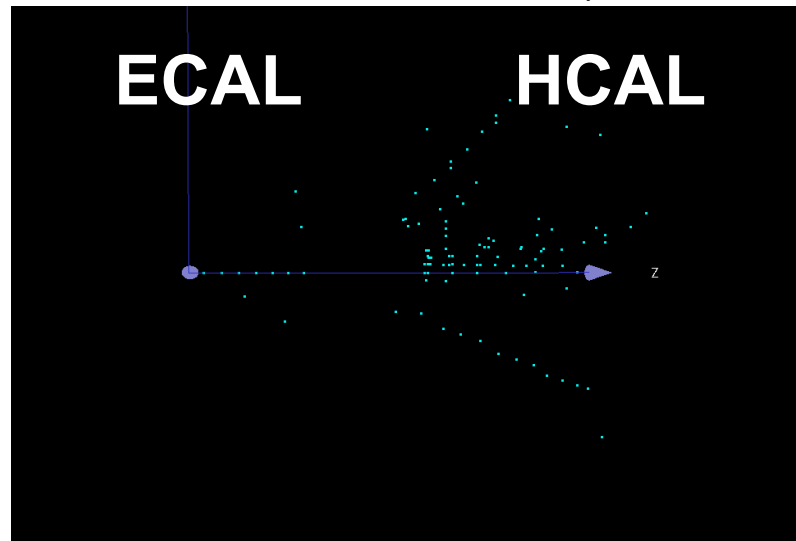
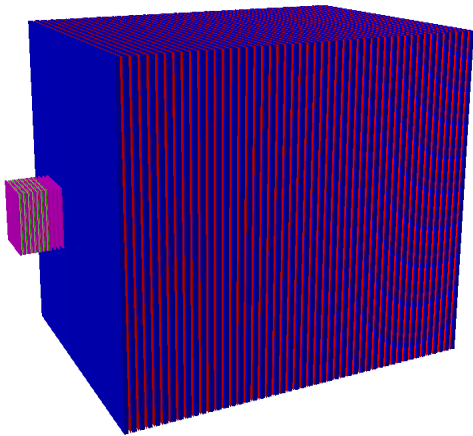
Updated AHCAL calibration processors (E. Brianne)

Discussion of LCIO data structure ongoing within DAQ taskforce
aim: dedicated and common LCIO object for CALICE

Testbeam simulation using dd4hep

simple driver for rectangular prototypes (S. Lu)

implementation for last summer's Si-W + SDHCAL testbeam (D. Jeans, T. Kurca)



- > engineering run: submission 15 January 2016
 - SKIROC2CMS (CMS)
 - SKIROC2A (CALICE)
 - SPIROC2E (CALICE)
- > chips were expected end of April 2016, finally received beginning of June
- > SKIROC2CMS: many changes compared to SKIROC2 to adapt to CMS needs, driving the schedule
- > SKIROC2A:
 - few bug corrections and small internal improvements
 - same package as SKIROC2, pin compatible
- > SPIROC2E:
 - many improvements that were introduced in SPIROC2C and D
 - some bug fixes: correct triggering, avoid empty columns (memory cells)
 - a few chips tested in CQFP package: look OK (for details see talks in electronics session)
 - chips packaged in BGA, PCBs allowing tests are in production



- > WP14: Infrastructure for advanced calorimeters
 - test infrastructure for **innovative calorimeters with optical readout**: includes test stands for AHCAL tiles, SiPMs, HBUs and temperature stabilisation
 - test infrastructure for **innovative calorimeters with semiconductor readout**: includes assembly line and test stand for SiECAL sensors and PCBs
 - **readout systems** for innovative calorimeters: includes new DIFs, test stand for ASICs, common running of calo prototypes!
 - **mechanical and thermal tools** for innovative calorimeters: includes SDHCAL absorber welding and SiECAL and AHCAL cooling
 - > WP5: Data acquisition system for beam tests
 - includes central DAQ software and run control, data model and data quality monitoring
 - goal: common running with other detectors (beam telescopes, TPC?)
 - > WP3: Advanced software
 - > WP4: Micro-electronics and interconnects
 - > regular phone and face-2-face work package meetings
 - > testbeam support possible!
- <http://aida2020.web.cern.ch/content/how-apply-transnational-access>



- > efforts on common DAQ
 - within CALICE: DAQ taskforce
 - within AIDA-2020:
 - central DAQ in WP5
 - interfaces to calorimeters, common running in WP14
- > agreed on EUDAQ as common high-level DAQ
 - unfortunately not ready for SDHCAL+SiECAL testbeam in June
 - EUDAQ1 does not allow desired configuration
 - EUDAQ2 not ready then
 - had to find a solution with the existing SDHCAL and SiECAL DAQ systems
 - hardware and software requirements for AIDA-2020 common testbeams now defined in WP5 deliverable/milestone report
 - development of EUDAQ ongoing, e.g. finite state machine extended according to CALICE requirements

Future Testbeams 2016 and 2017

- > SDHCAL run at SPS
 - 1 week in October 2016
 - SiECAL will not participate, need to solve noise problem first
- > AHCAL + beam telescope at DESY
 - 2 weeks in October 2016: 1 week without beam for setup and DAQ tests, 1 week with beam
 - proof-of-principle for combined running of an externally triggered detector (telescope) with an auto-triggered detector (AHCAL)
 - requires some adaptations in DAQ
 - uniformity scan of AHCAL signal within tile and across tile boundaries
- > SciECAL + strip HCAL layers in Tohoku
 - 4 days in November 2016
 - combines different DAQ systems
- > need to define testbeam plans for 2017 (deadline for requests at CERN and DESY ~15. Nov. 2016)



Conclusions

- > increasing testbeam activity of second generation prototypes
- > efforts towards common DAQ
 - in CALICE DAQ taskforce and AIDA-2020 WP 5
 - progress, but still some way to go
- > growing interest in common testbeams
 - SDHCAL + SiECAL
 - AHCAL + beam telescope

