Charge Particle Veto in offline

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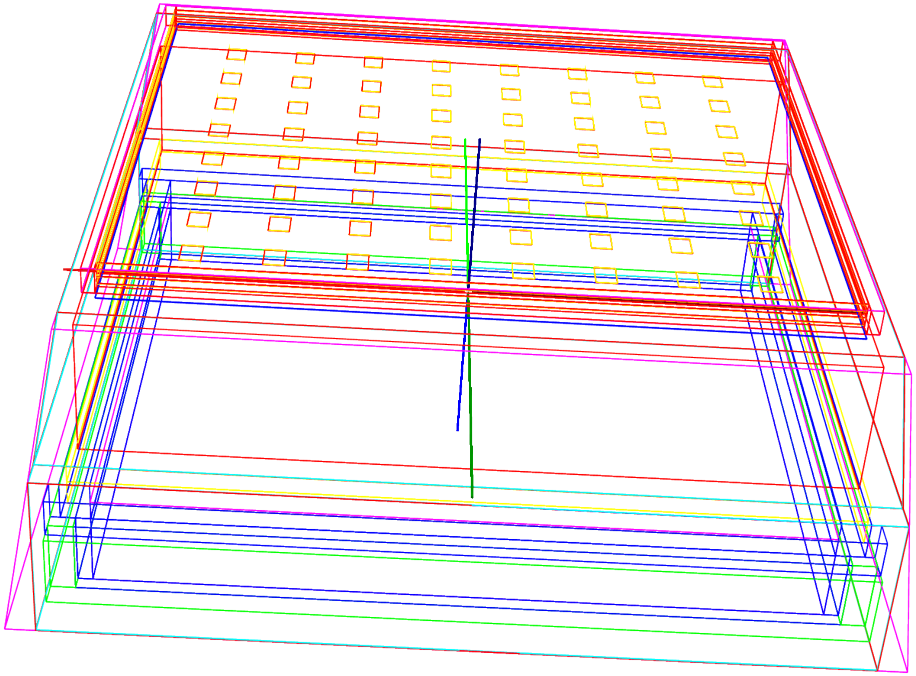
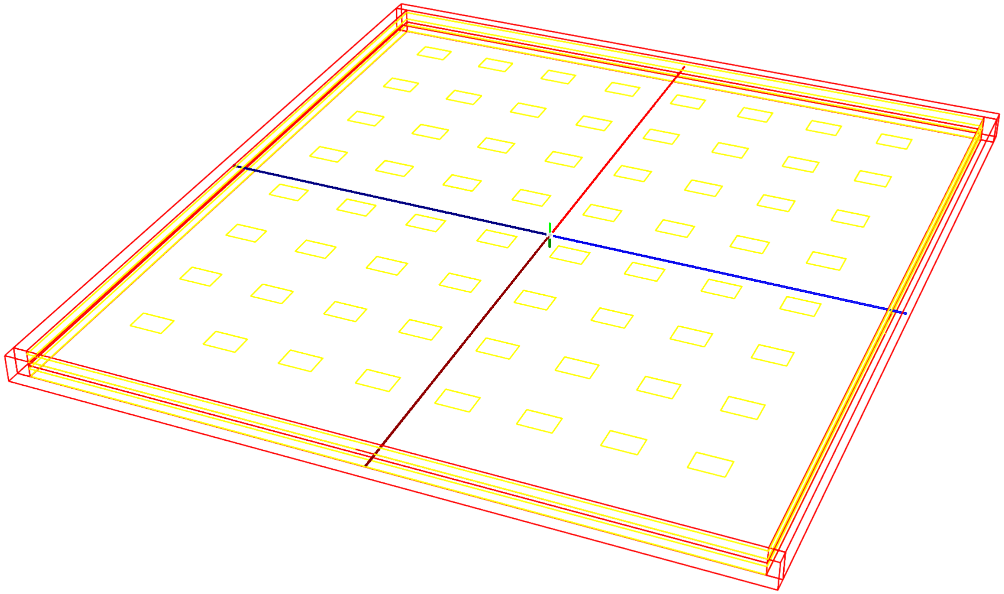
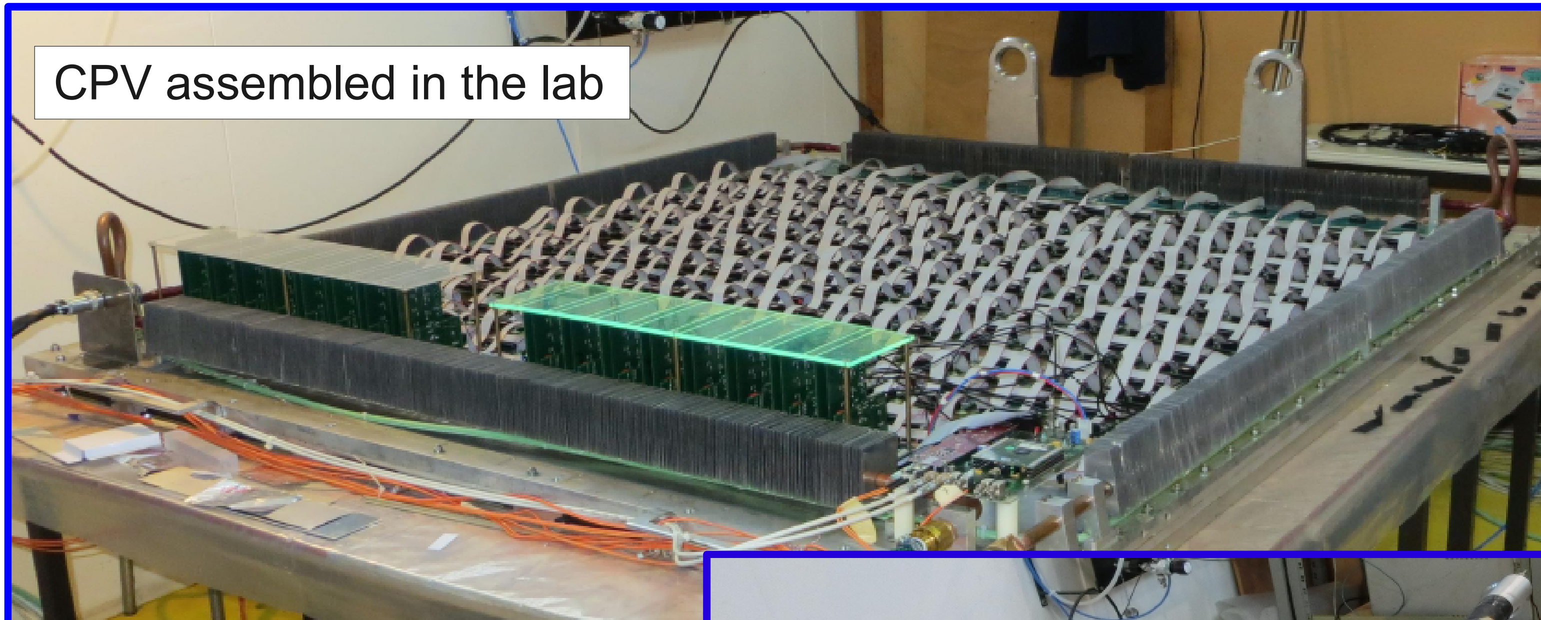
CPV geometry in aliroot

- The purpose of CPV is to identify and suppress PHOS clusters produced by charged particles → improve photon purity
- CPV will installed on the top of each PHOS module.
- For Run2, one CPV module will be installed on the top of the PHOS module M2 (6 o'clock sector)
- CPV is a proportional chamber with cathode pad readout
- CPV geometry is described in aliroot since 2002, it is a part of PHOS.

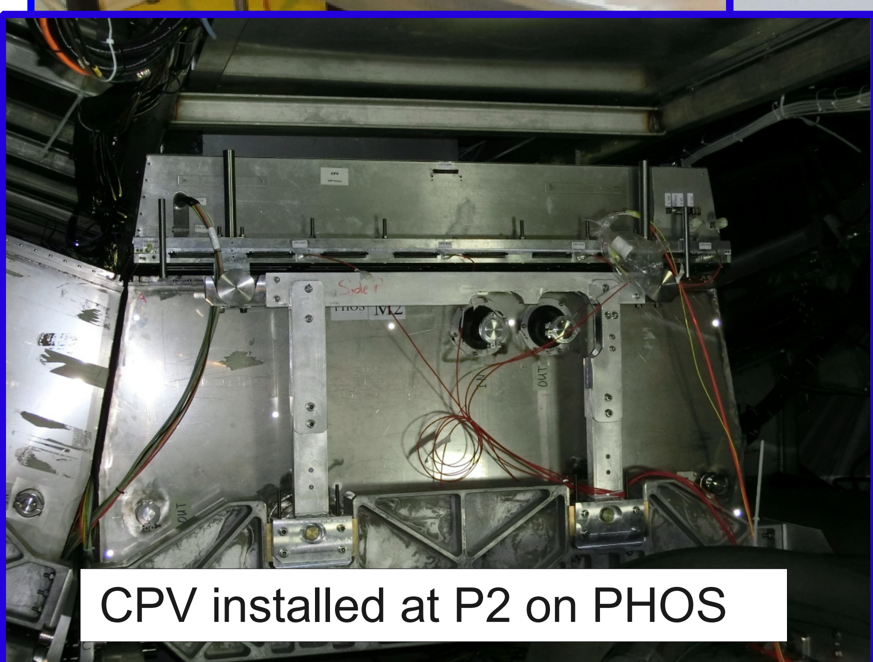




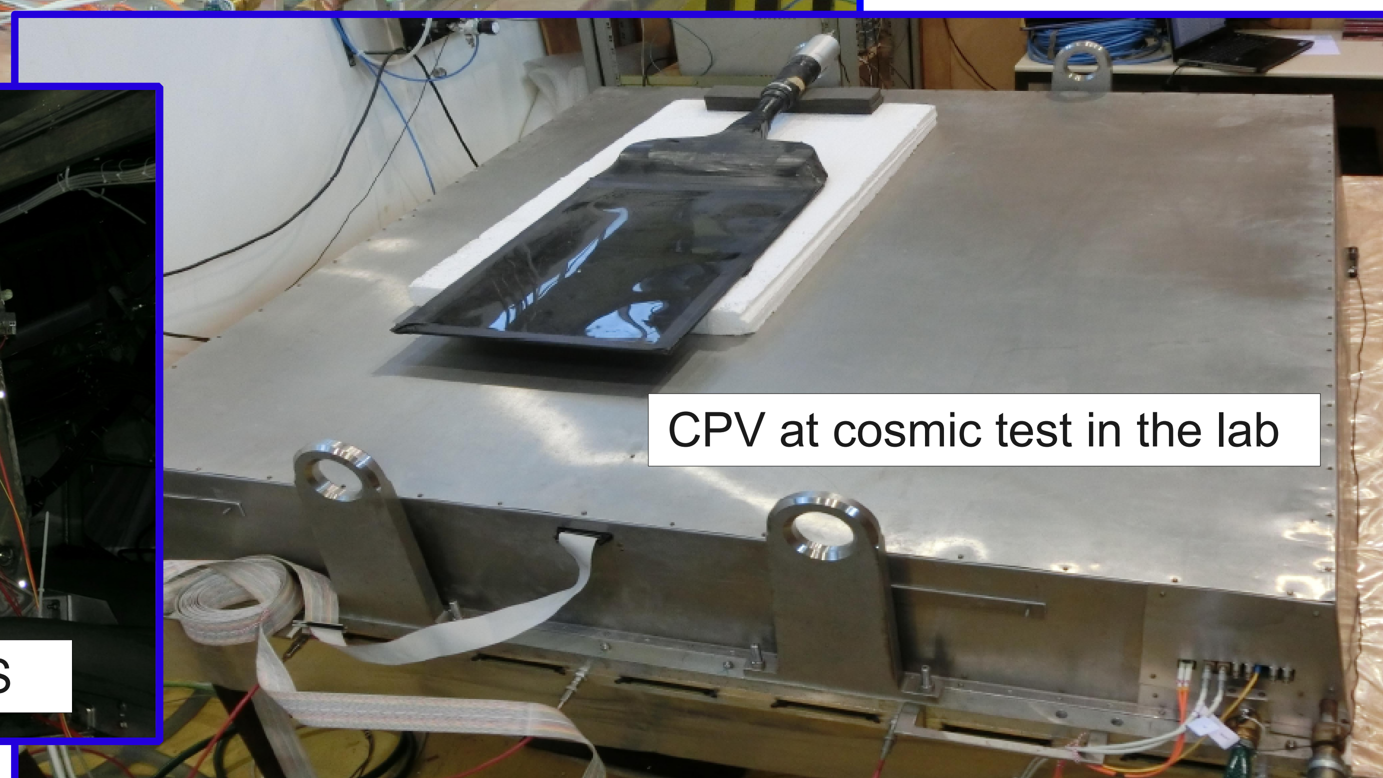
CPV geometry in reality



CPV assembled in the lab



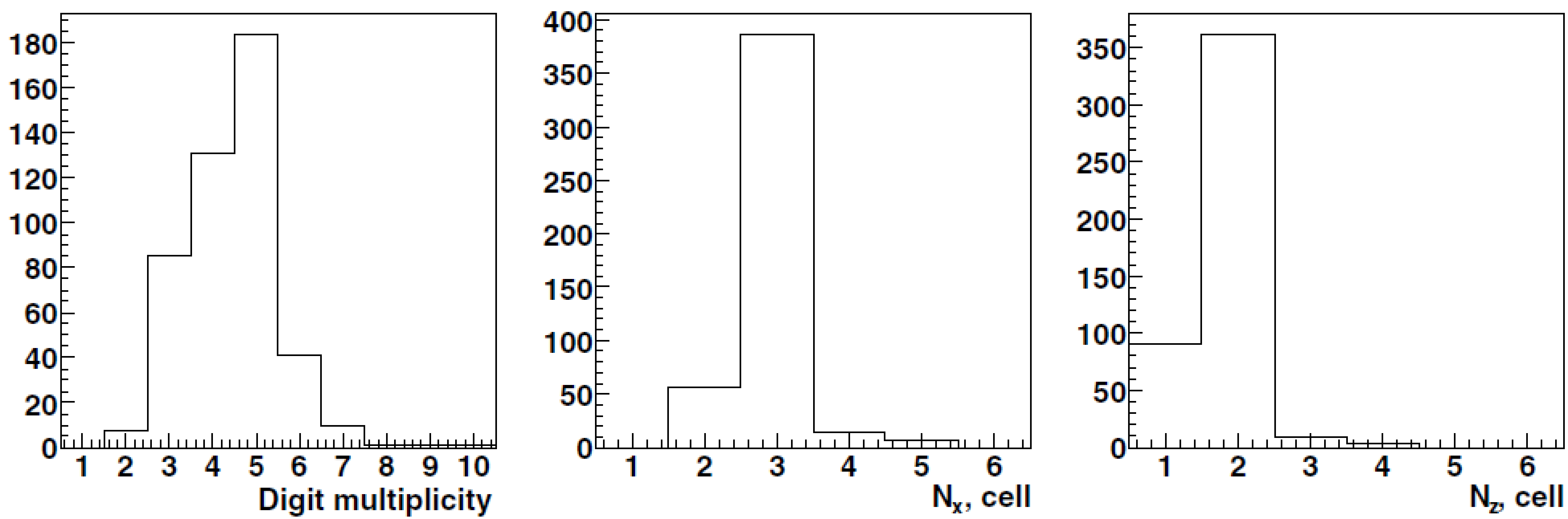
CPV installed at P2 on PHOS



CPV at cosmic test in the lab

CPV simulation

- CPV simulation model was implemented in aliroot since 2002.
- It simulates realistic charge distribution on the cathode pad plane.
- Cluster finder combines pads with non-zero amplitudes with a common edge into clusters
- Coordinate of charge particle hit in the CPV is reconstructed as a cluster gravity center with log weights



ALICE PPR vol.II

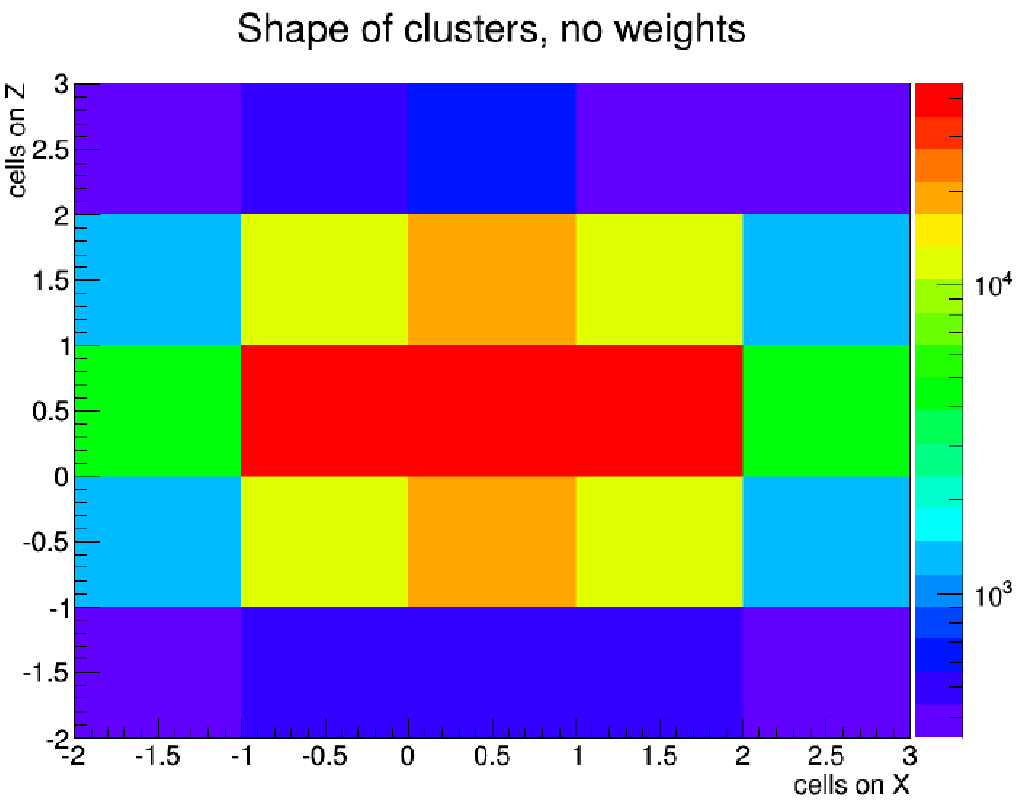
Raw data reconstruction

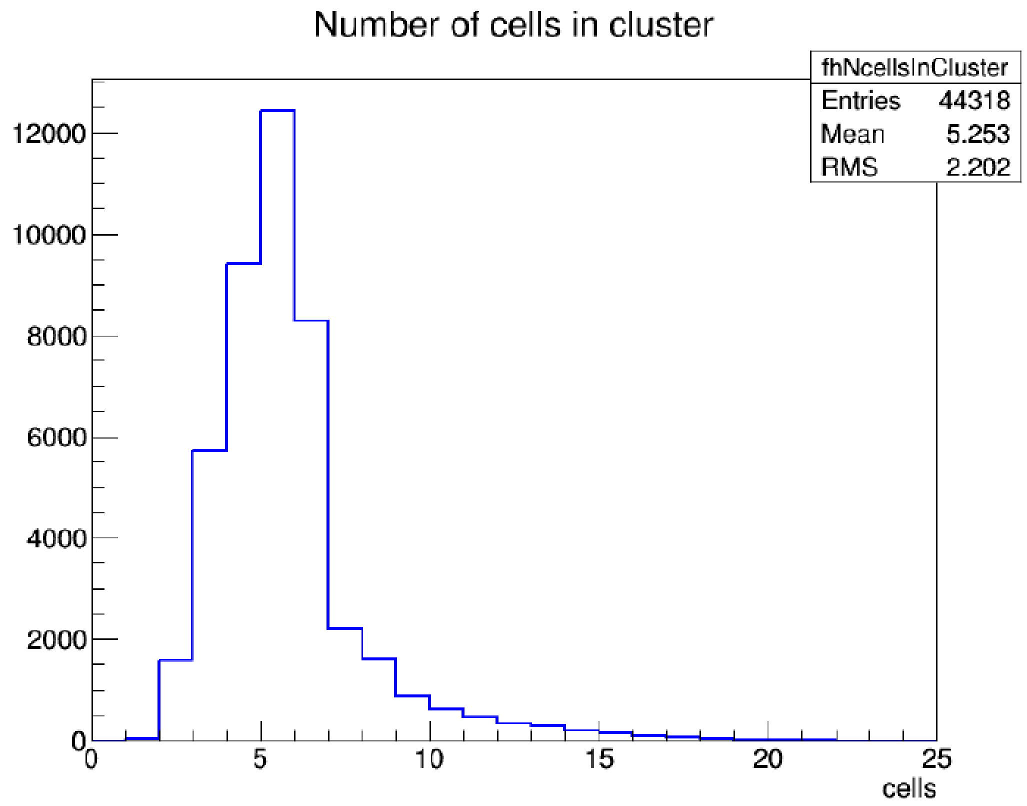
- Raw data format of CPV is similar with that of HMPID, only geometry is different:
  - 1 DDL reads 16 column controllers
  - 1 column controller reads 10 ADC channels
  - 1 ADC channel reads 48 channels with amplitudes
  - In total, 7680 channels per DDL
- Data decoding is implemented in a set of classes:
  - **AliCPVRawStream** – decodes CPV raw data stream to geometry indexing and amplitudes
  - **AliCPVParam** – CPV FEE parameters
  - **AliPHOSCPV3gassiplexConnection** – geometry mapping within one 3Gassiplex card
  - **AliPHOSCPVDigit** – result of raw data decoding, used for further reconstruction (cluster finding)
- Currently, the classes are under development and commissioning with real raw data. To be committed to aliroot by the end of 2014

Online calibration

- Two calibration parameters are needed for CPV:
  - Pedestal value and r.m.s. per channel: is needed to subtract from the measured amplitudes
  - Gain per channel: is needed to convert the digitized amplitude to the induced charge in each pad.
- Respectively, two run types are needed for CPV: pedestal and physics
  - **Pedestal run**: zero suppression is switched off, amplitude spectra are accumulated during run, their mean and σ are calculated at EOR and stored in OCDB. DA was implemented, to be uploaded to aliroot and to be packaged for DATE
  - **Physics run**: zero suppression is on, amplitude spectra are accumulated during run, their per-channel shape are equalized at EOR, relative gains are calculated and stored in OCDB

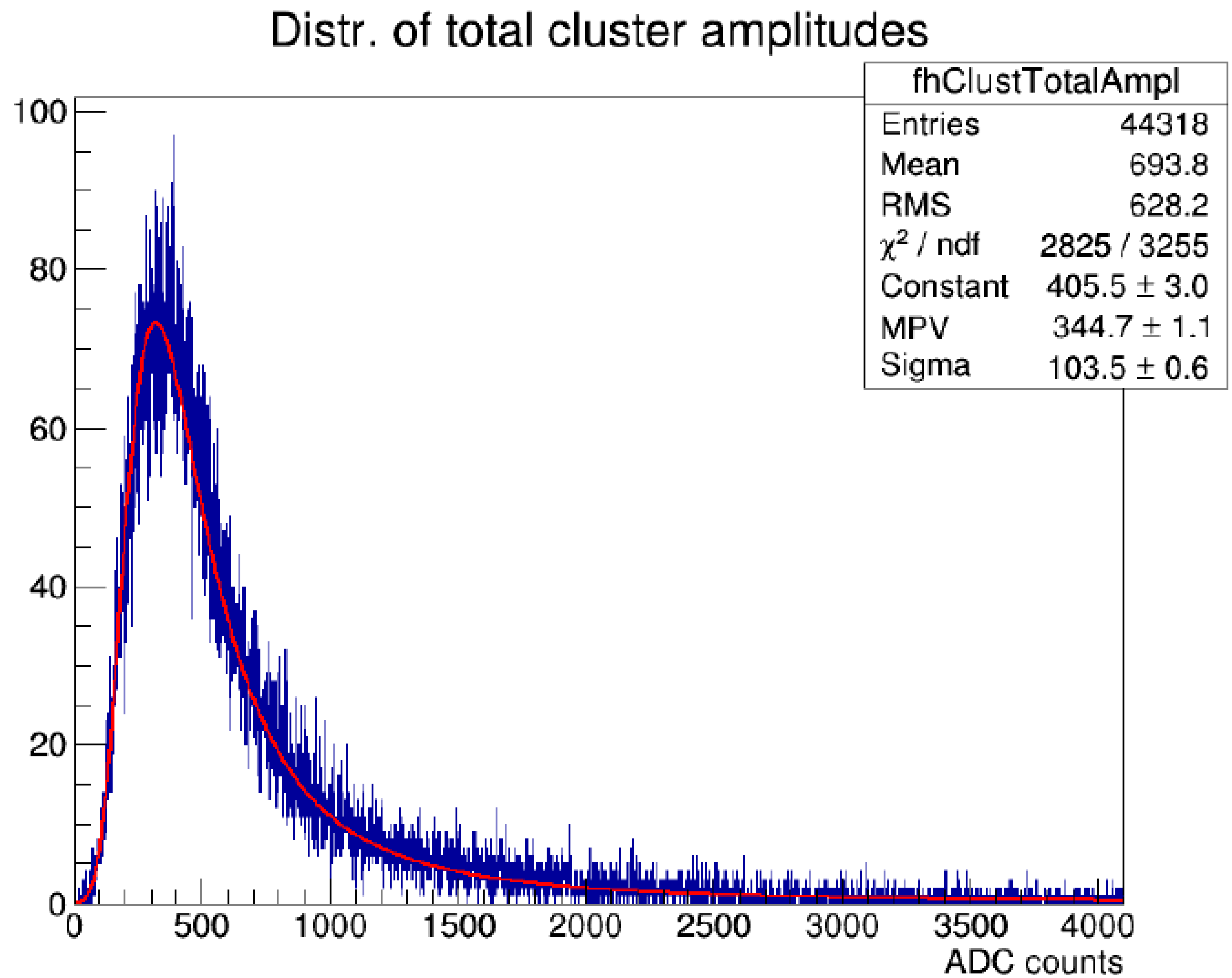
Results of reconstruction and calibration





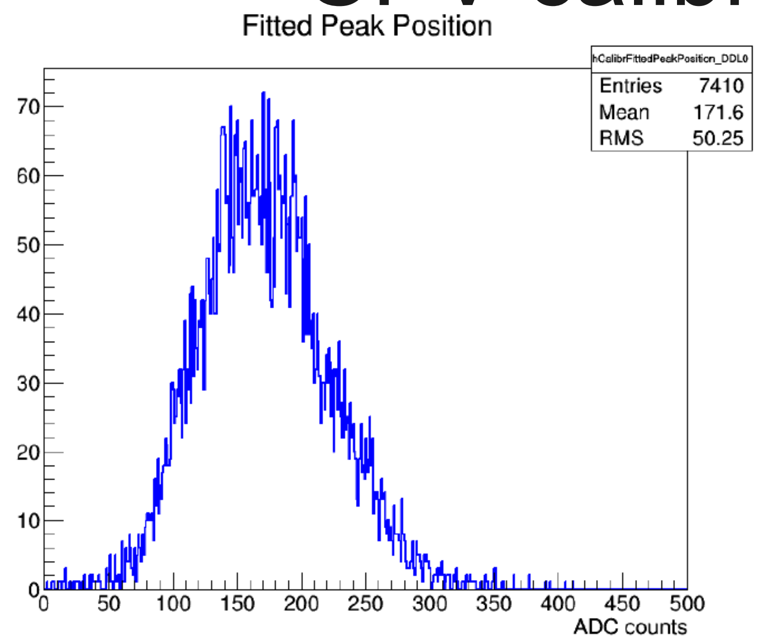
CPV recorded cosmic data in the lab in 2014. Data were used to implement and test reconstruction and calibration algorithms.
Cluster shape in real CPV is consistent with aliroot simulation model of 2002.

Cluster amplitude in CPV from cosmic data

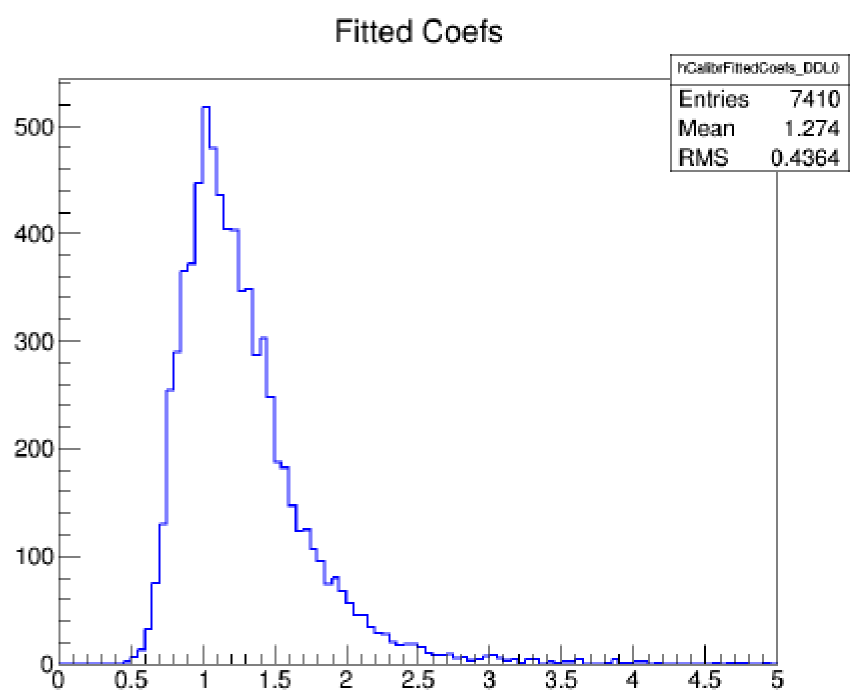


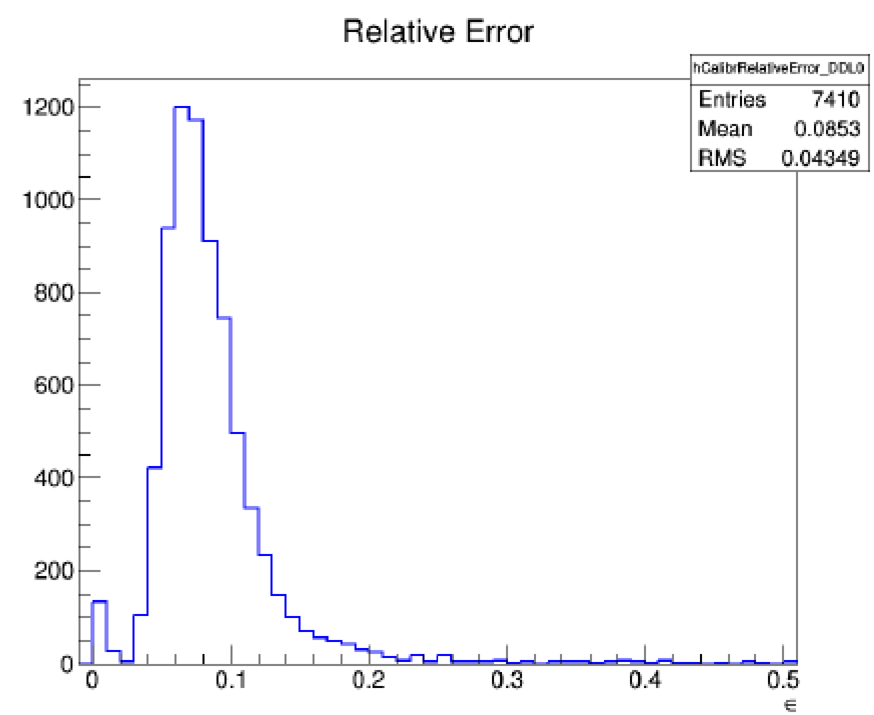
Amplitude spectrum is well described by ionization loss in the CPV gas volume

CPV calibration with cosmic data



MPV is found in every channel, then a gain is calculated to equalize all MPV value.
These gains should be used in further physics data reconstruction.
Statistical uncertainty is calculated, too.





CPV alignment

- Photogrammetry was measured for the CPV after installation.
- The module position is defined by (x,y,z) coordinates of 4 upper corners → x,y,z shift can and angles can be extracted from these measurement.
- Accuracy of the photogrammetry method is ~2-4 mm.
- Further improvement of alignment is possible with tracks from physics events.

Further CPV integration to offline and online

- Add a possibility to switch on/off every CPV module independently
- Commit the reconstruction code to aliroot, port to the aliroot release
- Convert the stand-alone program for pedestal and gain calculations to preprocessor
- Put the two DAs to the DATE repository, install them in the P2 environment
- Implement DQM agent within AMORE
- Create OCDB entries and populate them from pedestal and physics runs

- Manpower: Sergey Evdokimov, Yuri Kharlov (0.2 FTE)