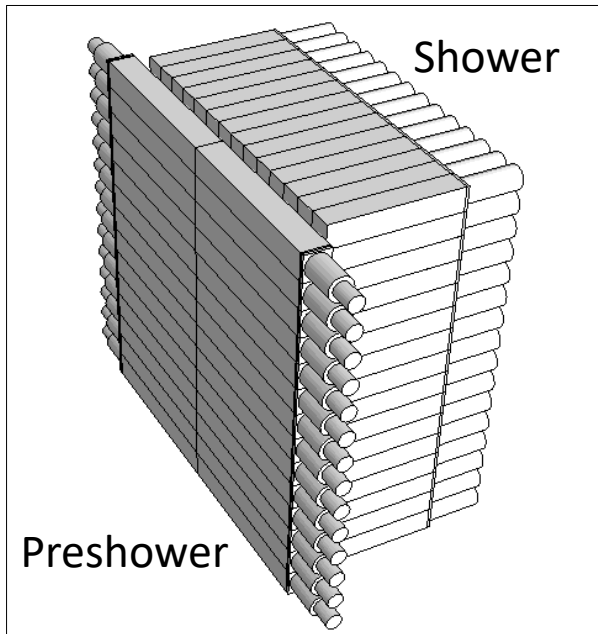


SHMS Calorimeter Calibration

V.Tadevosyan

Hall A/C Analysis Workshop, June 26 – 27, 2017



SHMS Electromagnetic Calorimeter

Preshower

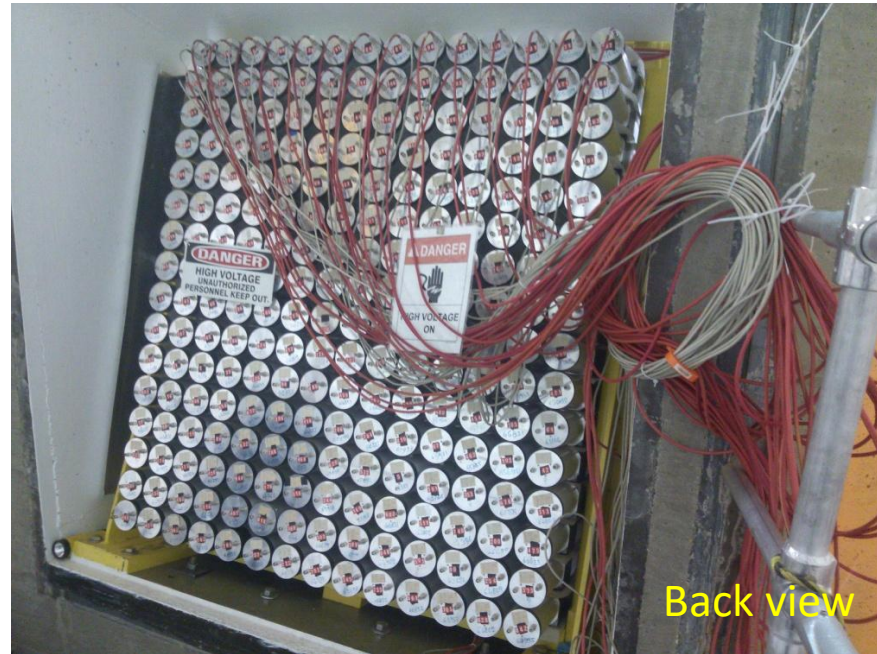
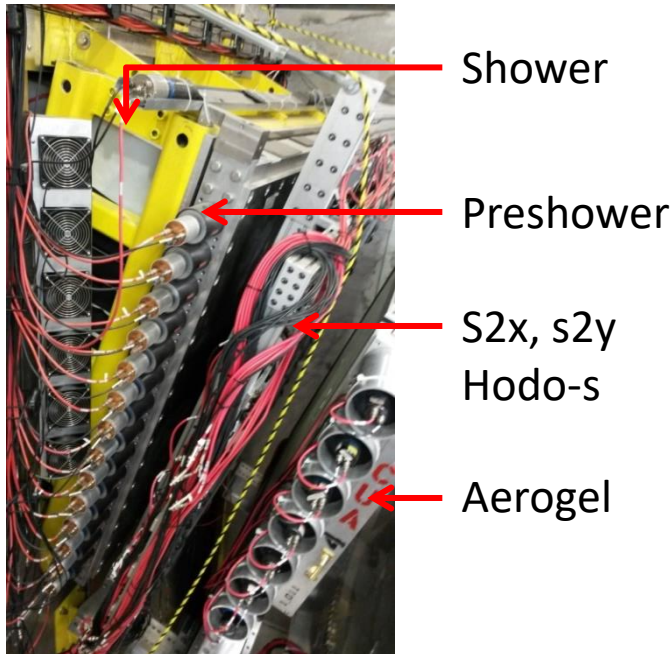
28 $10 \times 10 \times 70 \text{ cm}^3$ TF-1 lead glass blocks
 3.6 Rad. Length thickness

Shower

224 $9 \times 9 \times 50 \text{ cm}^3$ F-101 lead glass blocks
 18 Rad. Length thickness

$116 \times 134 \text{ cm}^2$ effective area

21.6 Rad. Length total thickness, full absorption
in GeV range



Algorithm:

- Minimize deviation of the reconstructed energy deposition $E_{DEP} = \sum C_i \cdot ADC_i$ relative to measured momentum of incoming electron P .
- With constrain: mean values of E_{DEP} and P are equal.

Developed by Ts.Amatuni in 1990's.

Implementation:

- Coded in C++/Root.
- Consists of:
 - pcal_calib.cpp – steering routine;
 - THcPShowerCalib.h, THcPShHit.h, THcPShTrack.h -- header files with declarations and definitions of classes and methods.
- Works on output Root files from hcana.

Uses:

- Track quantities: momentum (deviation), focal plane coordinates and directions;
- Hodoscopes: β_{TOF} velocity;
- Heavy and Noble Gas \check{C} : signals in pe units;
- ADC signals from Preshower and Shower.

How to calibrate:

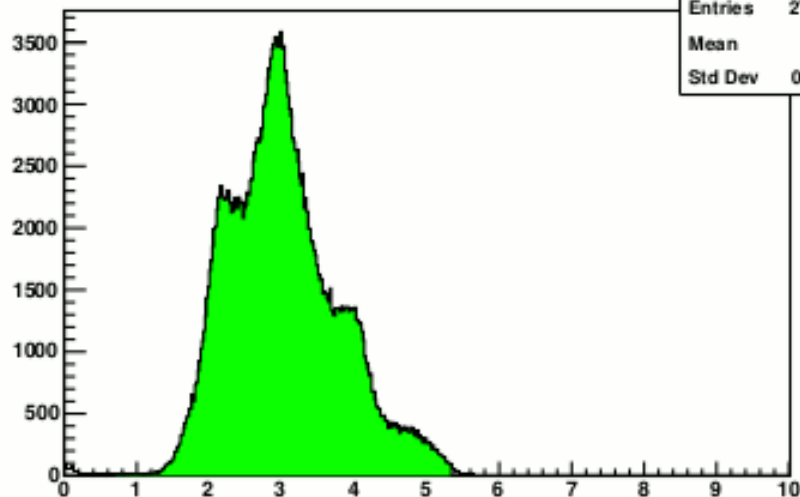
- Have pcal_calib.cpp and the header files in your work directory;
- Have a hcana replayed run, output in ROOTfiles/shms_replay_<run_number>.root;
- Have hcana executable;
- Invoke hcana;
- At the prompt execute:
 .x pcal_calib.cpp+("<run_number>")
 Note: <run_number> is a string, must be in quotation marks.
- Be patient if calibrating big runs...

At the end, canvas with representative plots will pop up (see next slide).

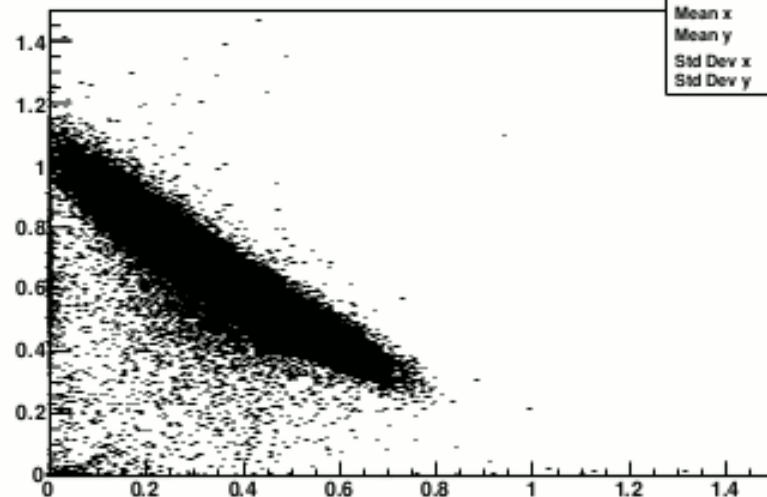
The code outputs calibration constants in pcal.param.<run_number> text file, in the format suitable for pcal.param file.

Edep/P uncalibrated**hEunc_copy**

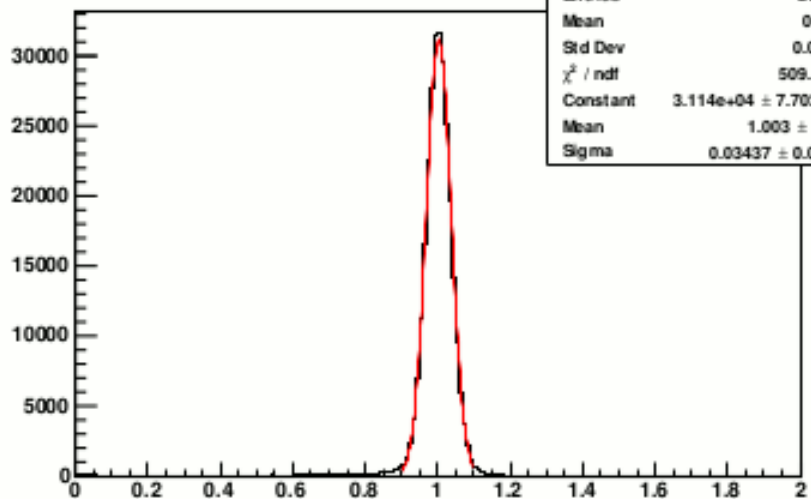
Entries	275099
Mean	3.022
Std Dev	0.7737

 **E_{SH} versus E_{PR}** **hESHvsEPR**

Entries	275099
Mean x	0.3516
Mean y	0.6458
Std Dev x	0.121
Std Dev y	0.1274

**Edep/P calibrated****hEcal**

Entries	275099
Mean	0.9974
Std Dev	0.07084
χ^2 / ndf	509.7 / 17
Constant	$3.114e+04 \pm 7.702e+01$
Mean	1.003 ± 0.000
Sigma	0.03437 ± 0.00005

 **ΔP versus Edep/P****hDPvsEcal**

Entries	275099
Mean x	0.9974
Mean y	4.109
Std Dev x	0.07084
Std Dev y	9.209

