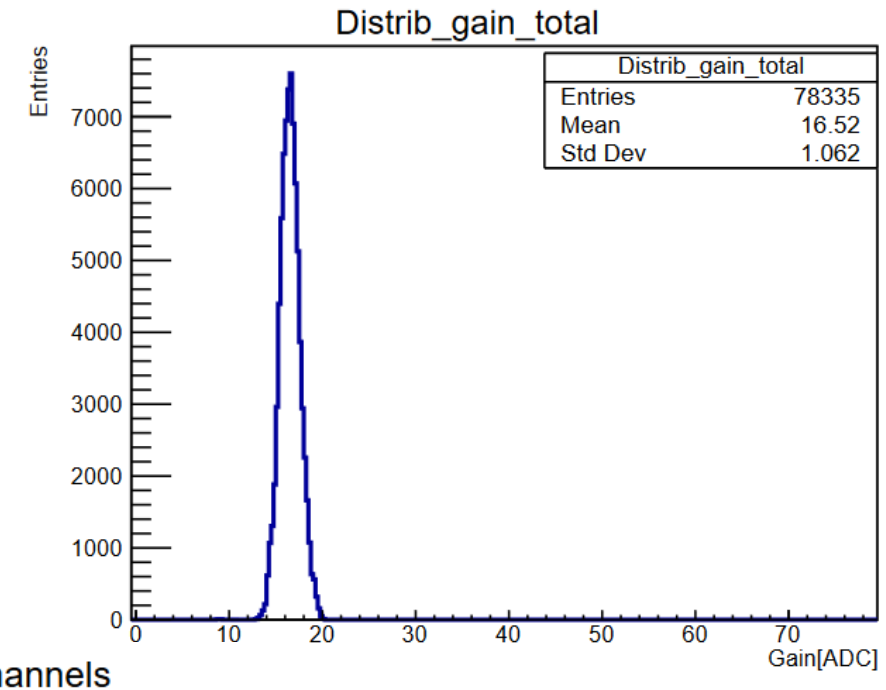
Gain calibration

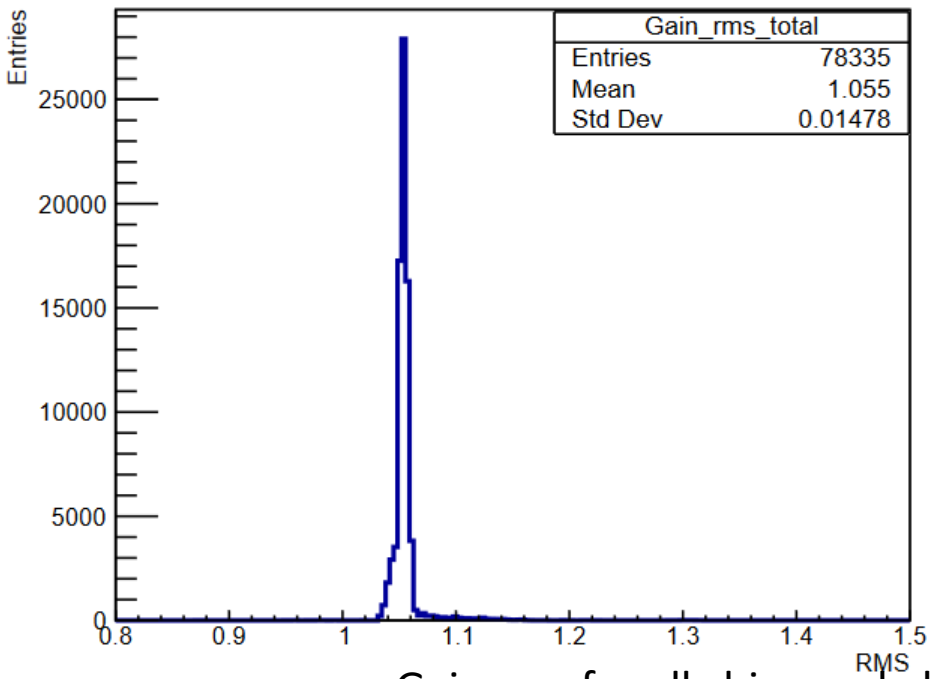
Data from May 2018

Olin Pinto
21/08/2018



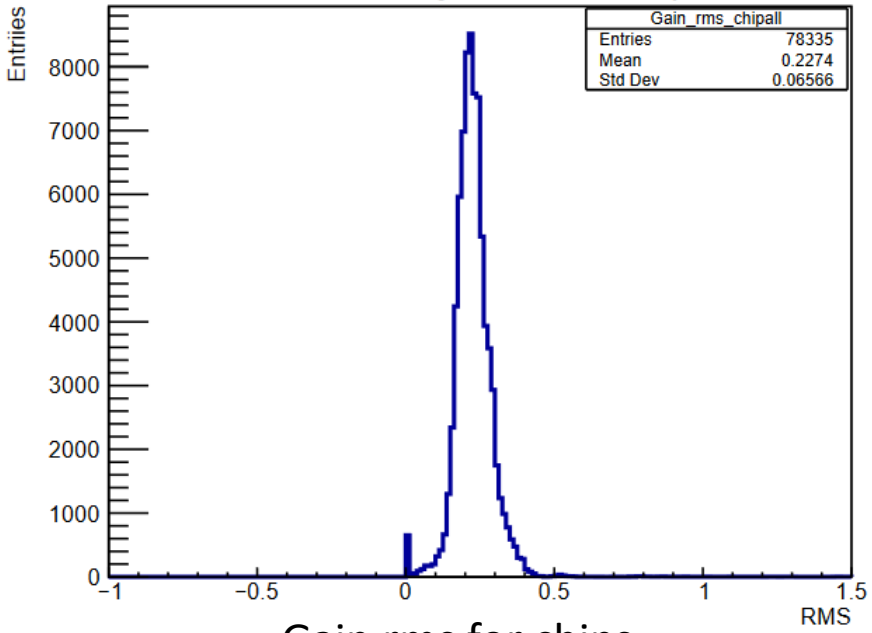
Gain mean for all chips and all channels

rms of the gain from all channels



Gain rms for all chips and all channels

rms of the gain from all chips



Gain rms for chips

From pedestal to gain

Data from May 2018

Olin Pinto
20/08/2018

Need for calibration

Cell equalization

- For trustworthy data measurements with the AHCAL large prototype - requires reliable and robust calibration.
- To have a uniform response with all the channels individually.
- Acquire constants needed for further analytical study.
- Identifying dead, noisy and unstable channels.

Pedestal dependency

- Channel-wise

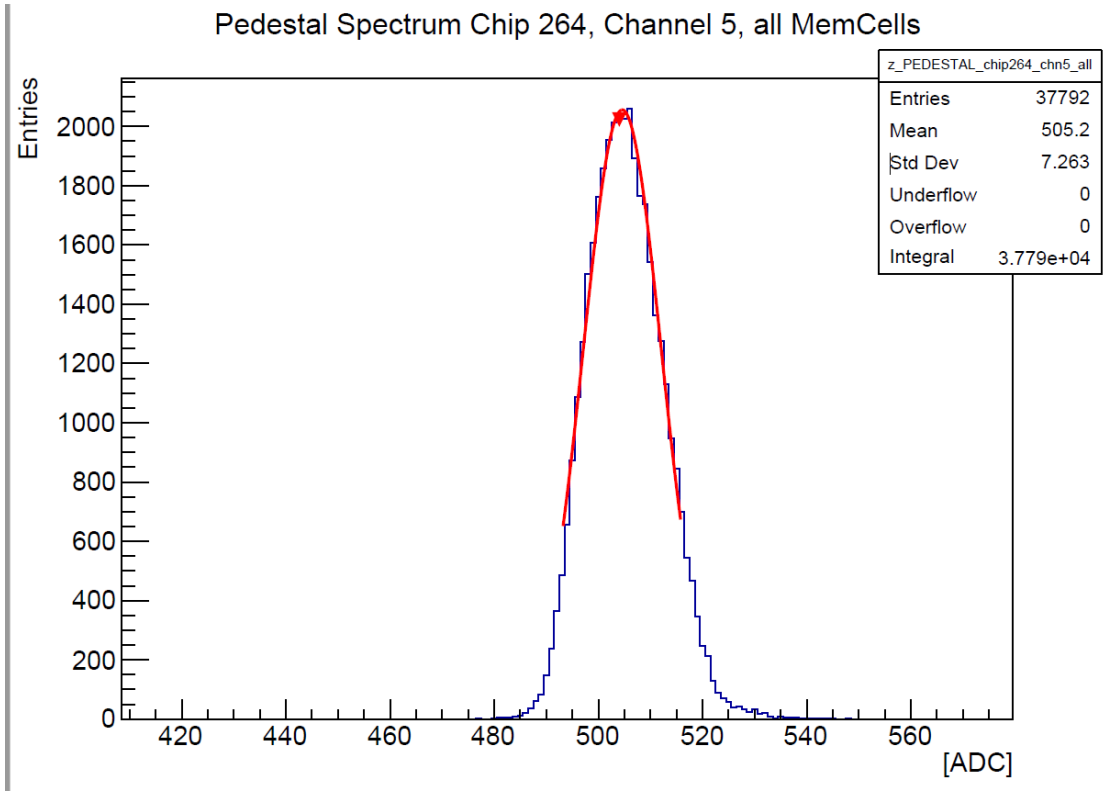
- The **pedestal** depends not only on the channel and gain mode, also depends on the memory cells.
- Data from all memory cells can not be simply merged together.
- Assumption: The signal in memory cells does not deteriorate much during the acquisition time.

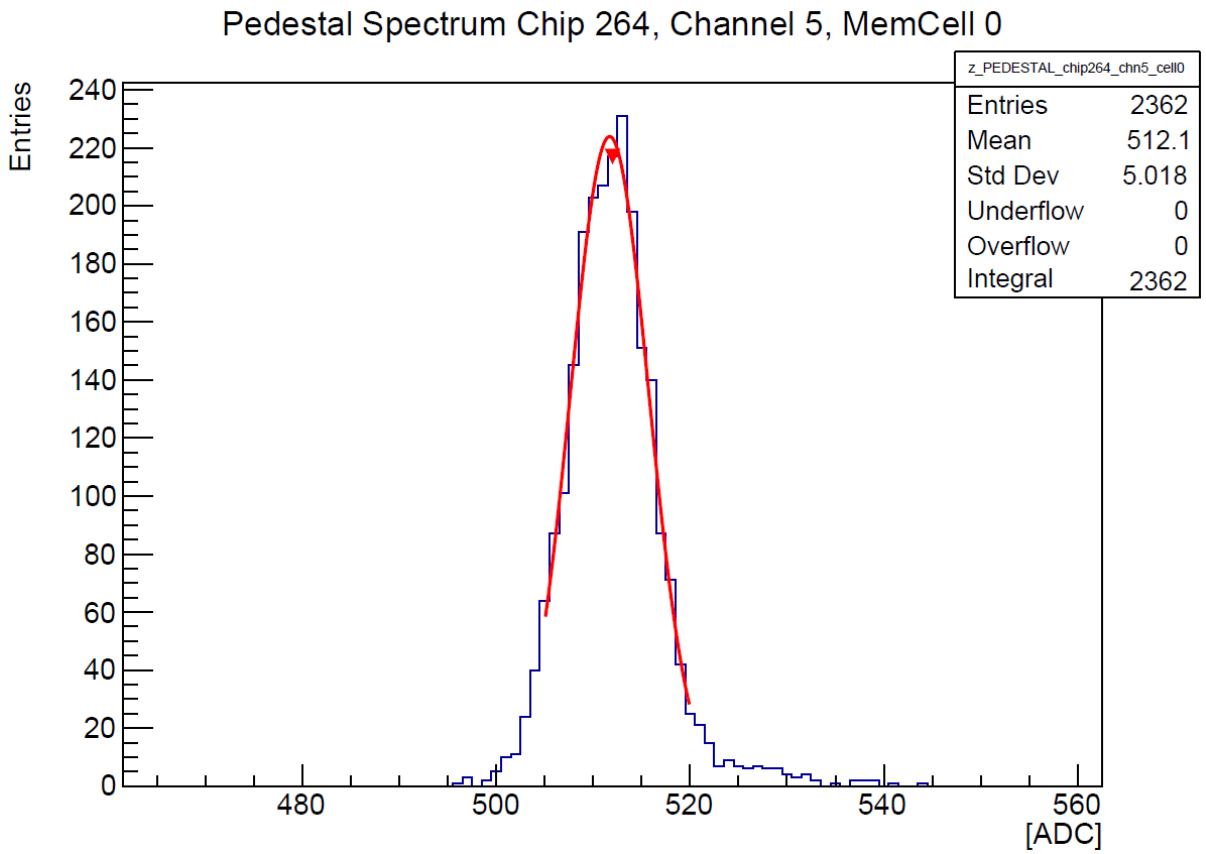
Dead and noisy cells

Module	Chip_ID	Chip(0-15)	Channel(0-15)	comments
1	264	8	5	MIP O.K., bad LED
3	523	11	12	no signal, dead
6	1538	2	3	noisy, dead
15	3848	8	32	no signal, dead
24	6145	1	19	noisy or too low LY
33	8455	7	5	no signal, dead
34	8765	1	9	LED O.K., bad MIP shape
37	9476	4	20	LED O.K., bad MIP shape
38	9743	15	14	Hit-Bit configuration not changing, empty pedestal, all memory cells

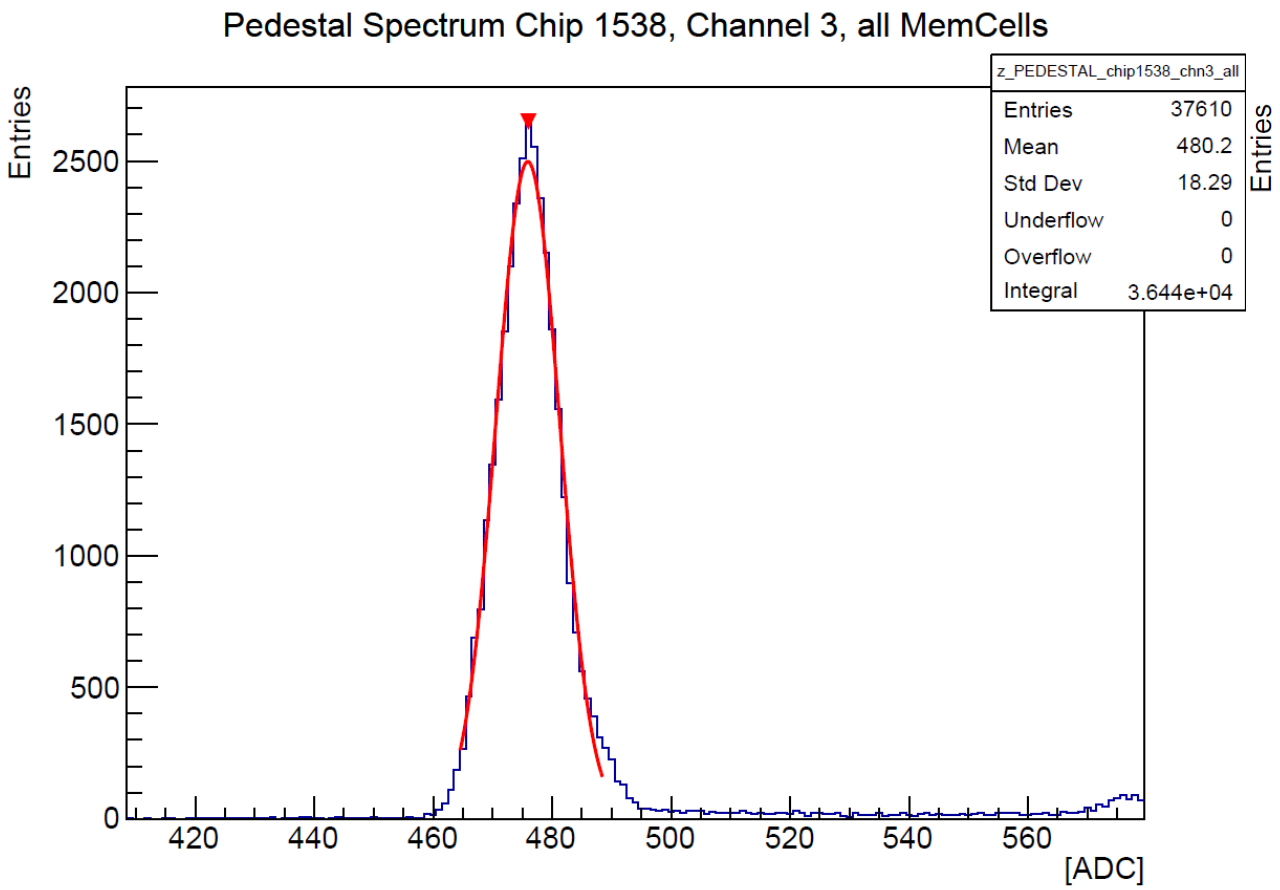
http://flcwiki.desy.de/AHCALTestBeamCERN2018-May

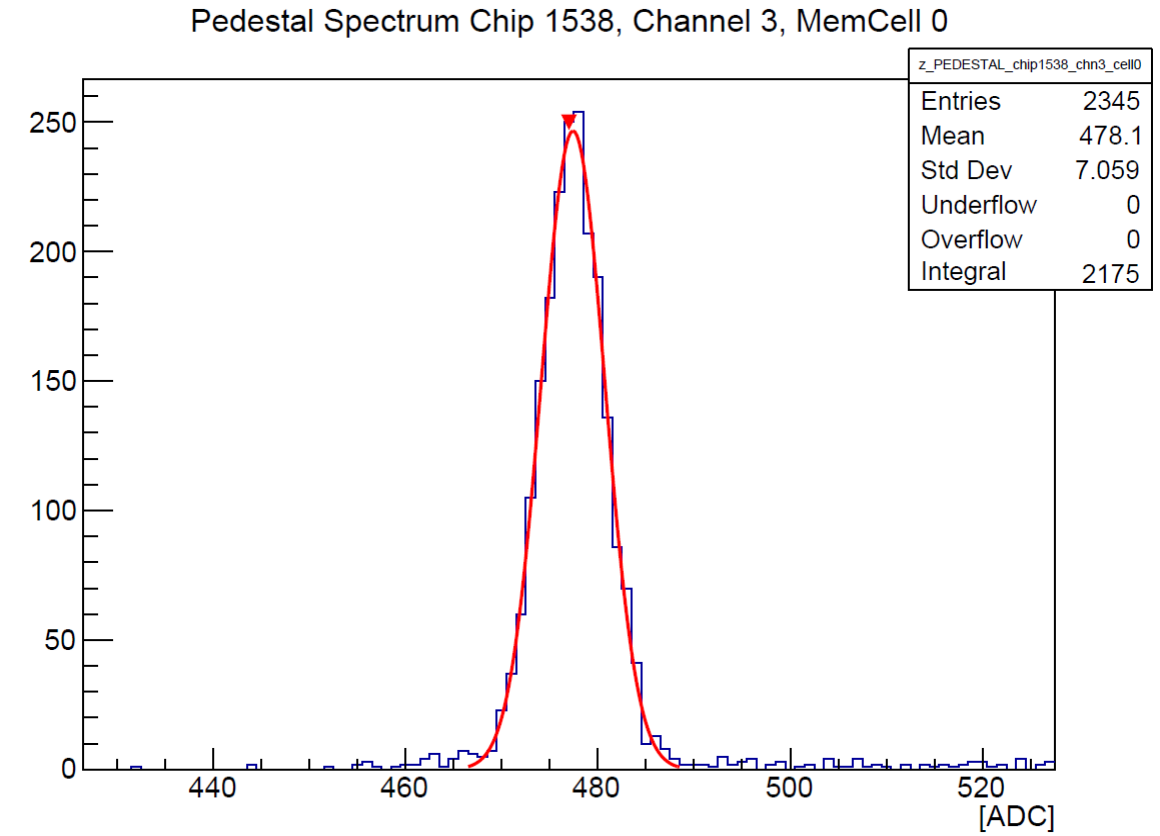
Revisit to dead and noisy cells



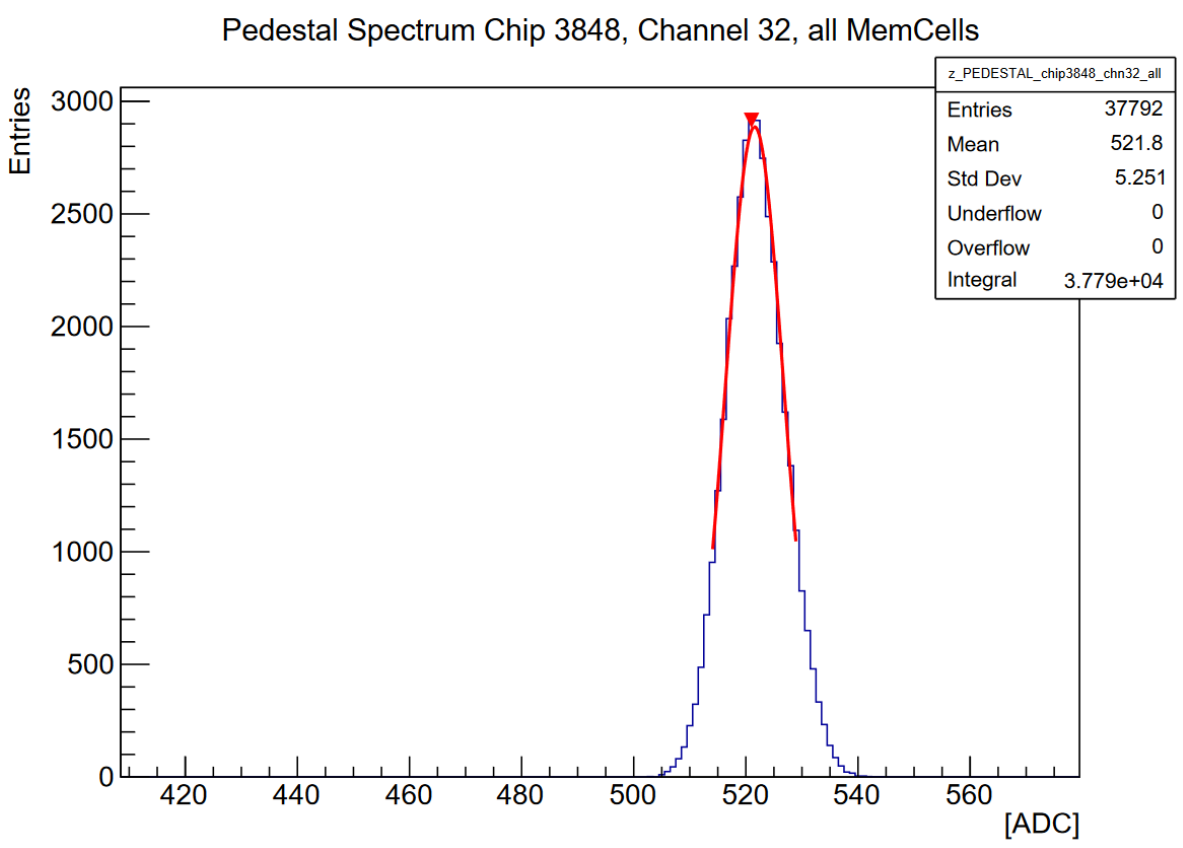


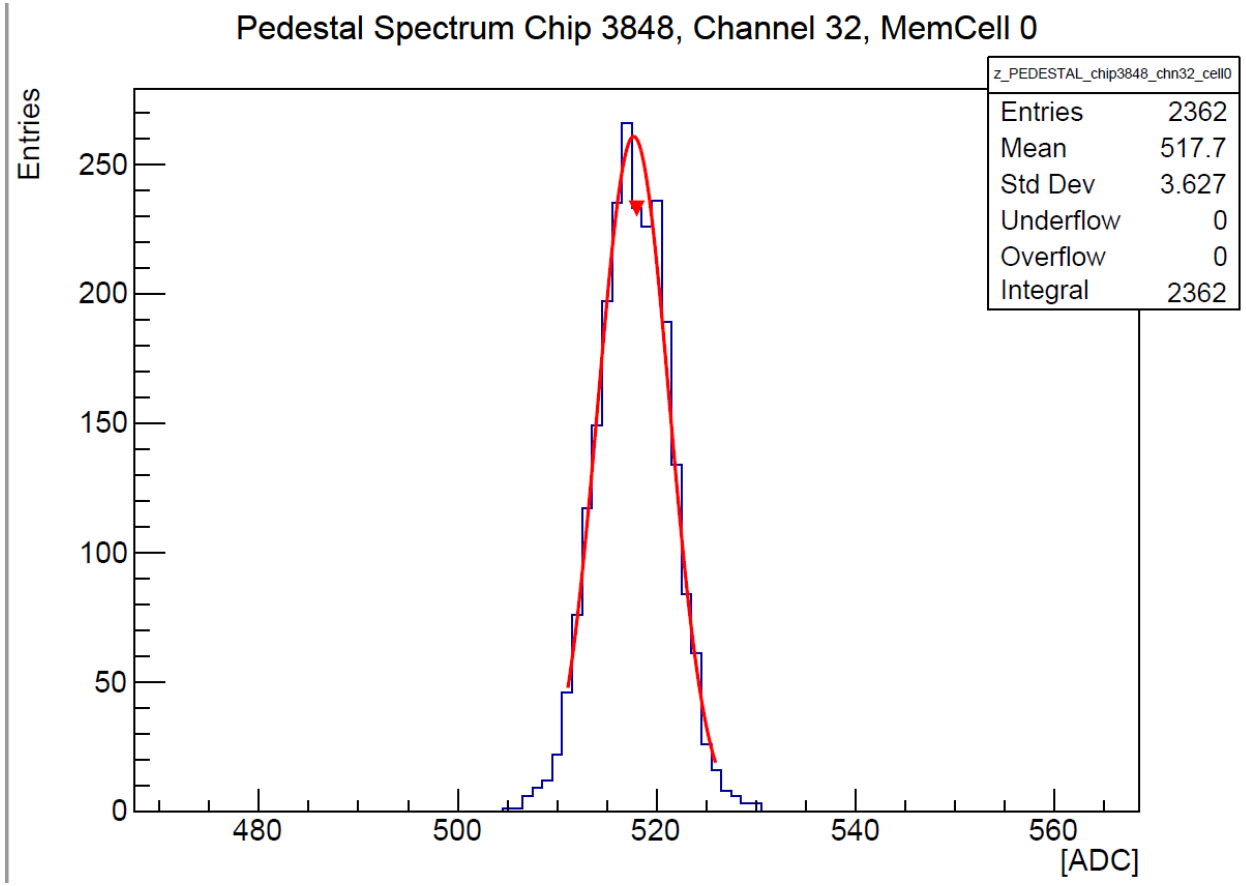
Revisit to dead and noisy cells



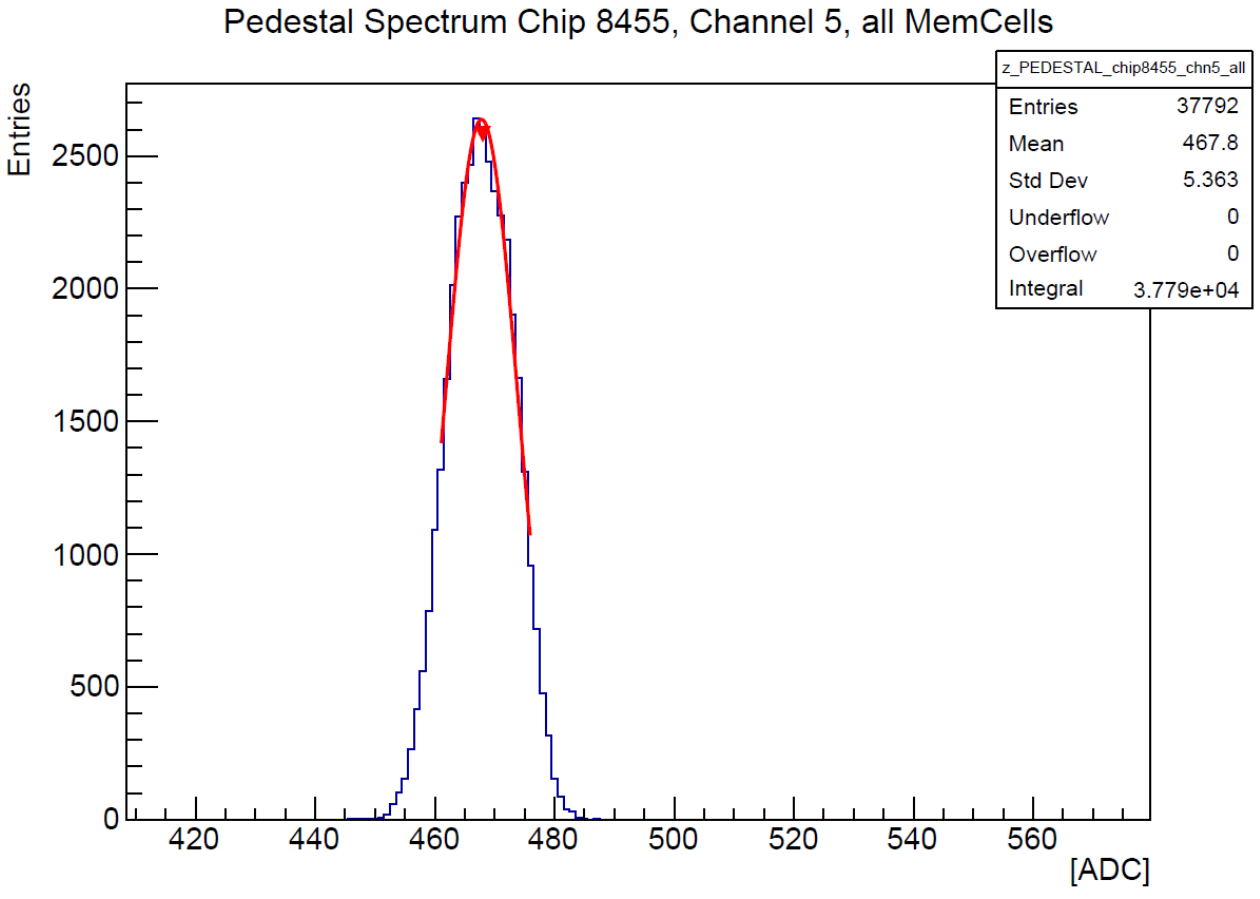


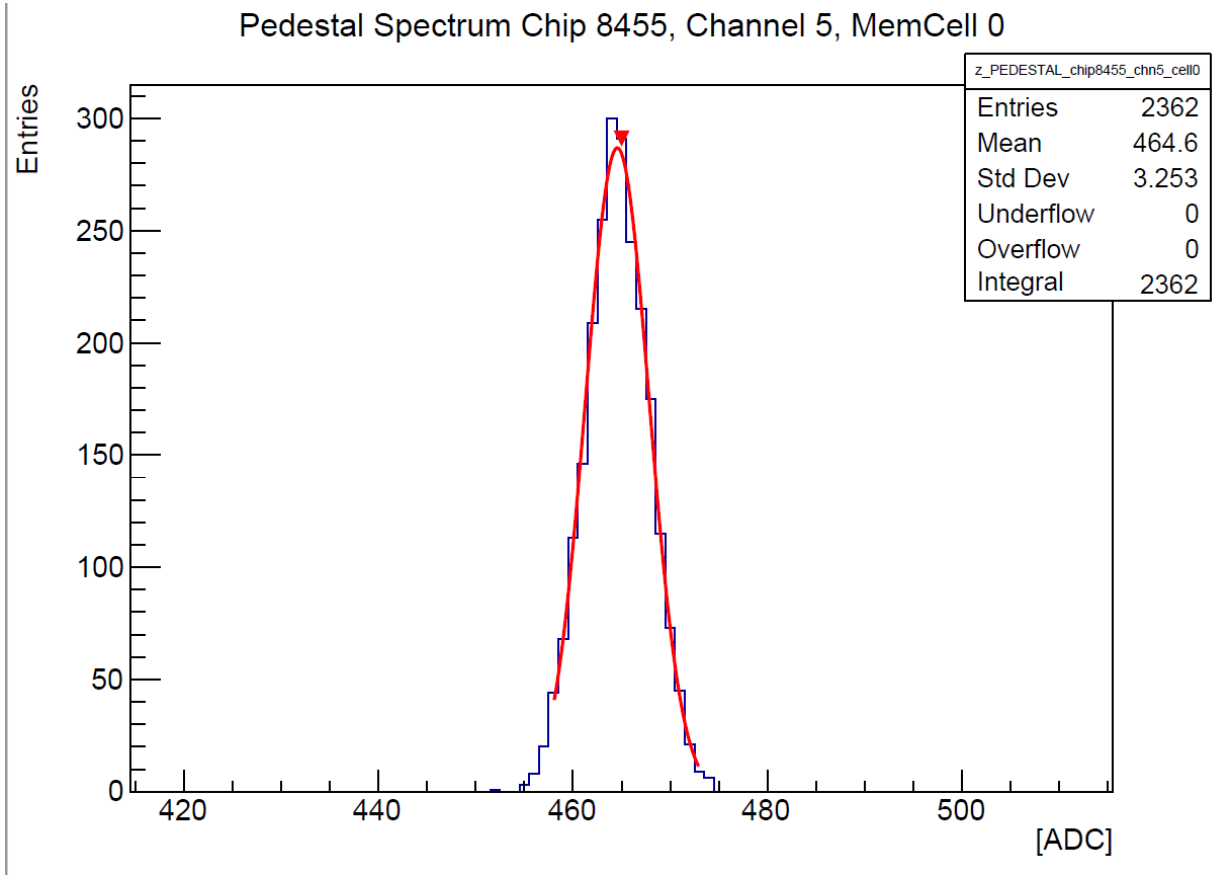
Revisit to dead and noisy cells





Revisit to dead and noisy cells





Pedestal study

- The pedestal width => standard deviation of the signal for random-trigger events.
- SiPMs shows an increased pedestal width for Chip_1538 and channel 3.

/pnfs/desy.de/calice/tb-cern/native/cernAhcalMay2018/slcio/LED/20180507/

Gain stability

- A crucial start

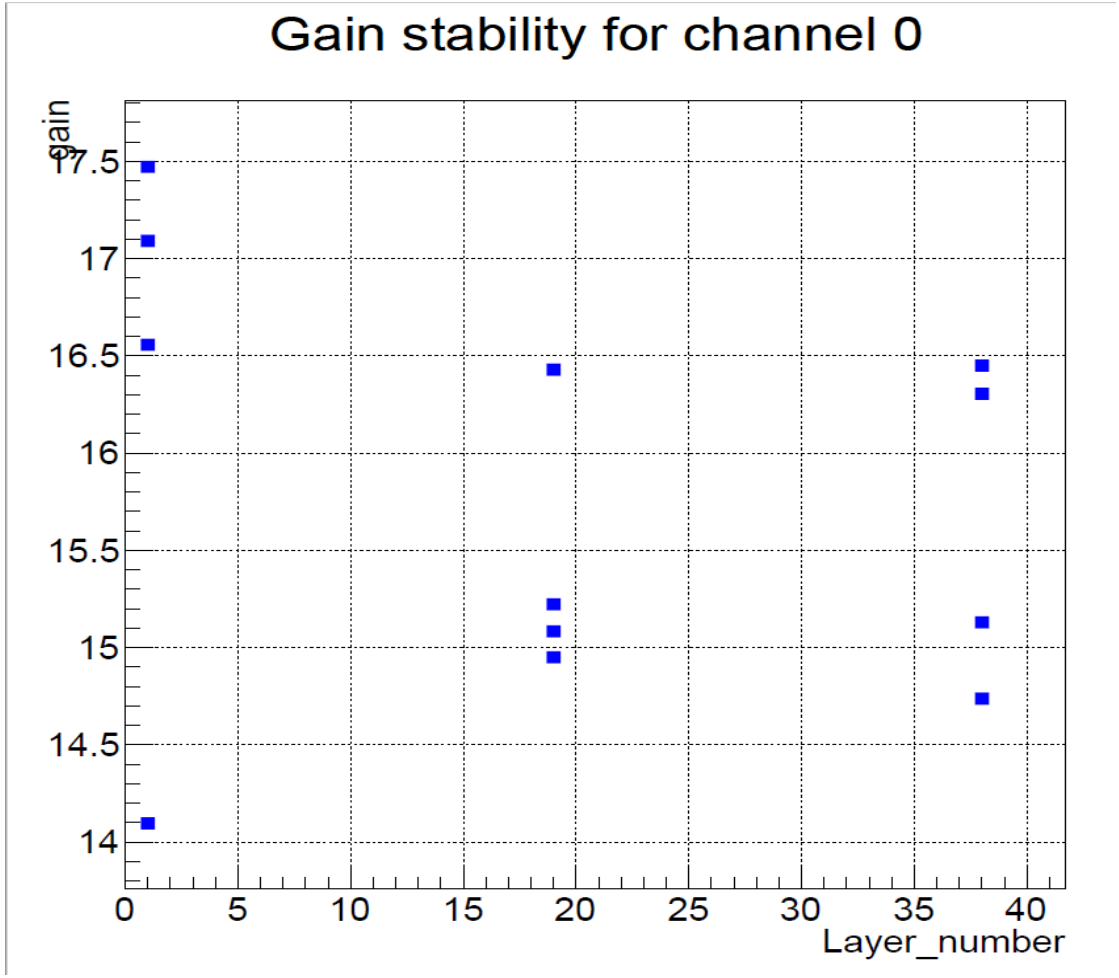
- The **gain** is defined as a distance between 2 photopeaks in the single pixel spectrum.
- Assumption: Gain is same for all memory cells belonging to a single channel.
- Parameter gain is needed:
  - Light Yield determination
  - Temperature dependence
  - Saturation function

Gain variation

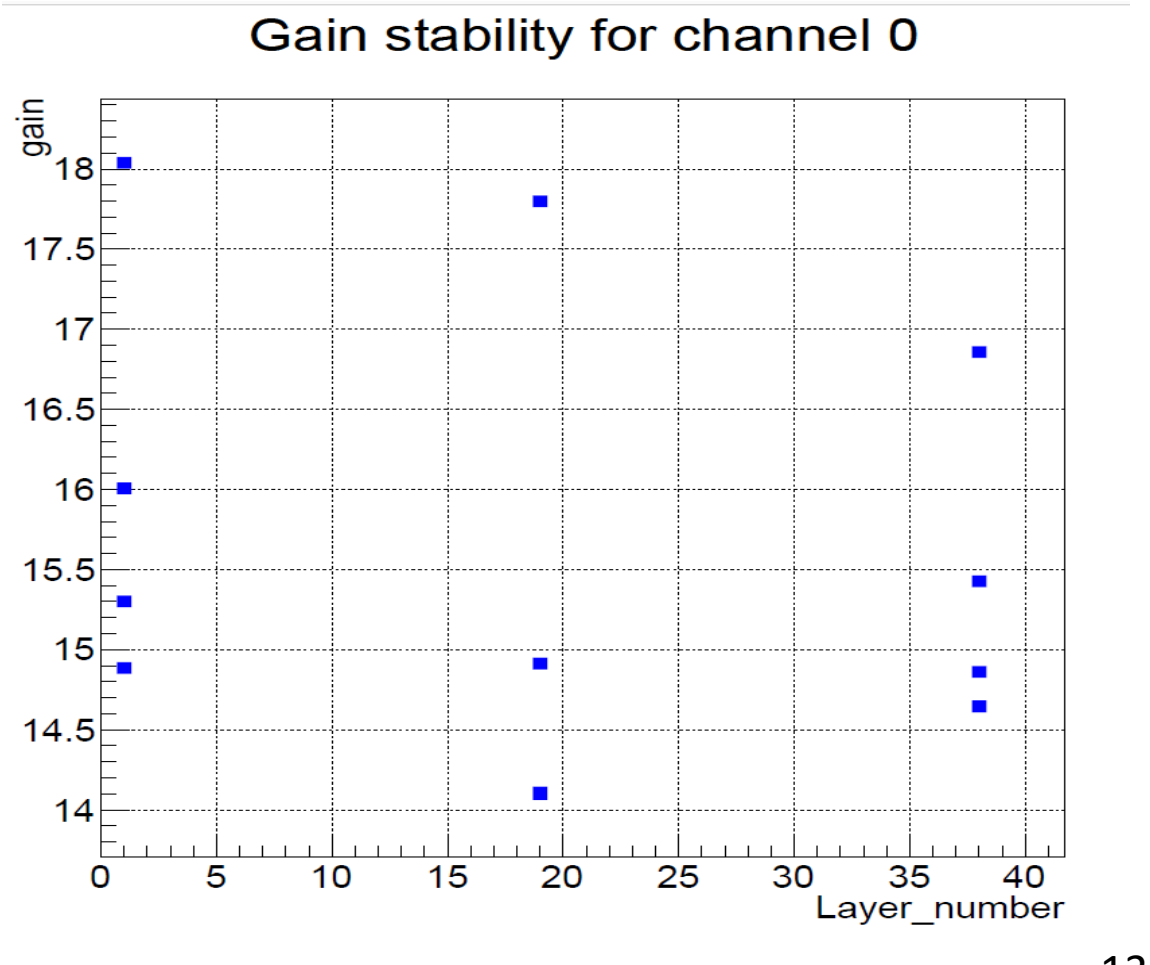
- Check for layer: 1, 19 and 38 for channel zero ……Comparison between 20180507 & 20180519

Center 4 chips of Layer 1, Layer 19, Layer,38

20180507



20180519

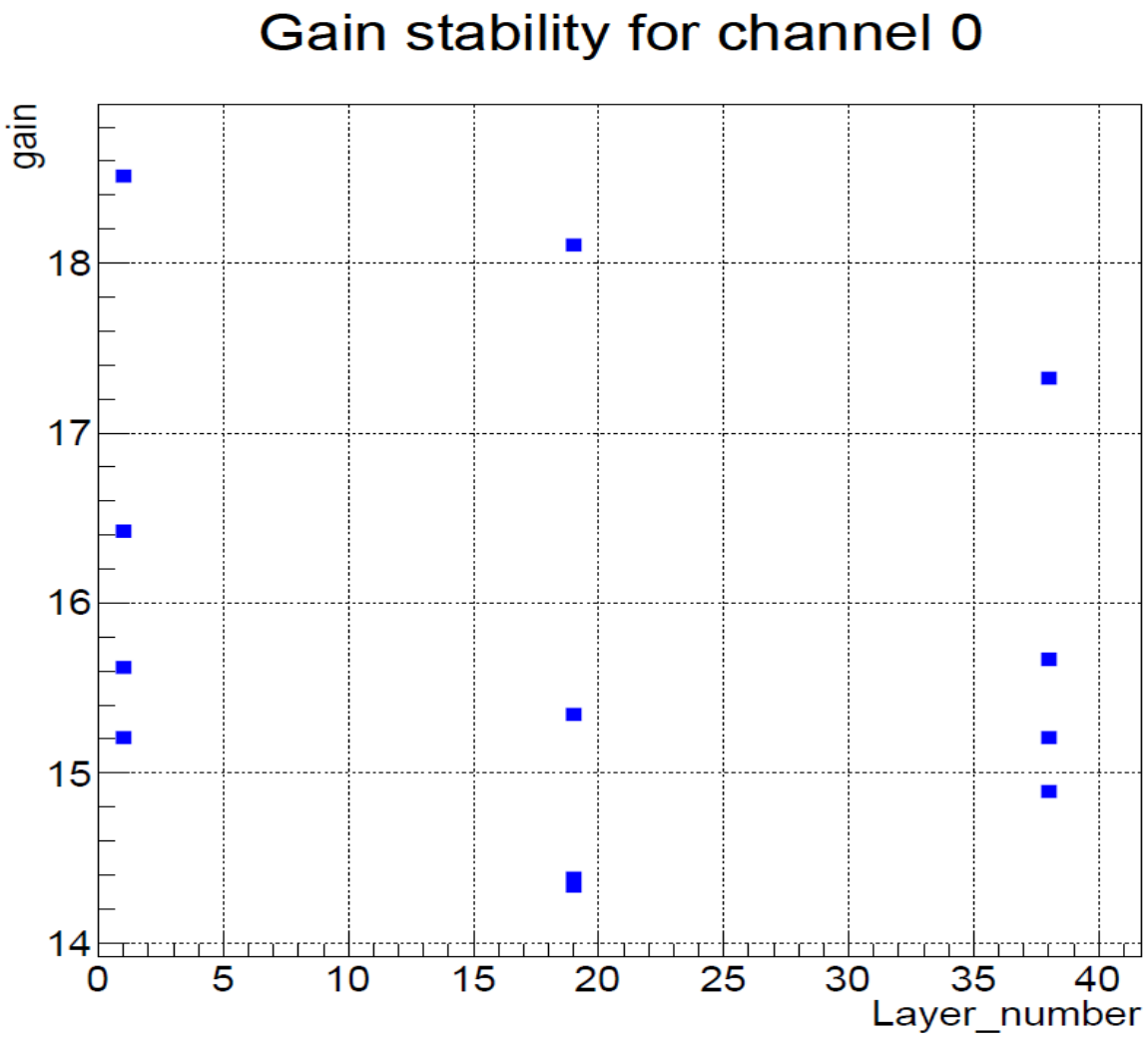


Gain variation

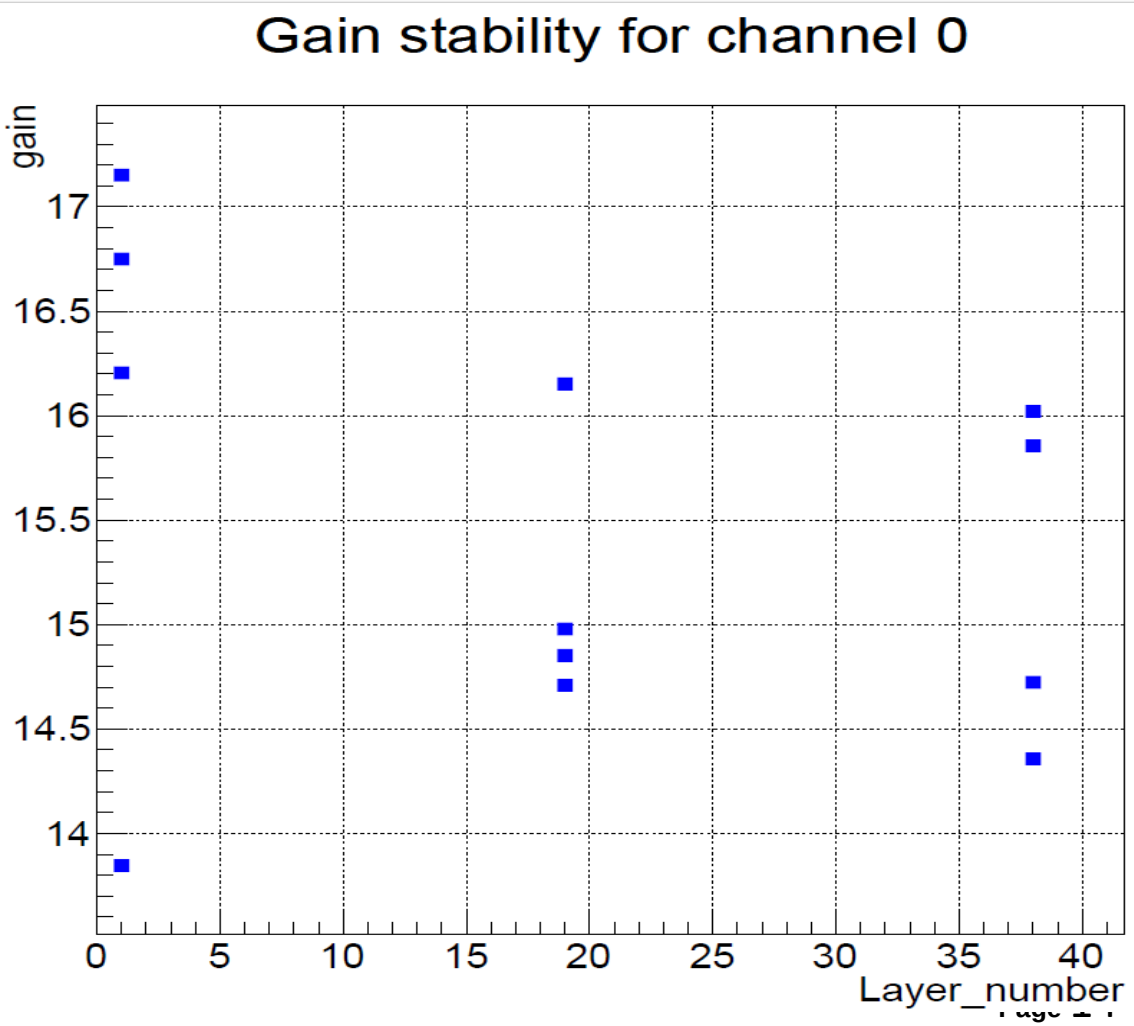
- Check for layer: 1, 19 and 38 for channel zero ……Comparison between 20180507 & 20180519

Corner 4 chips of Layer 1, Layer 19, Layer,38

20180507



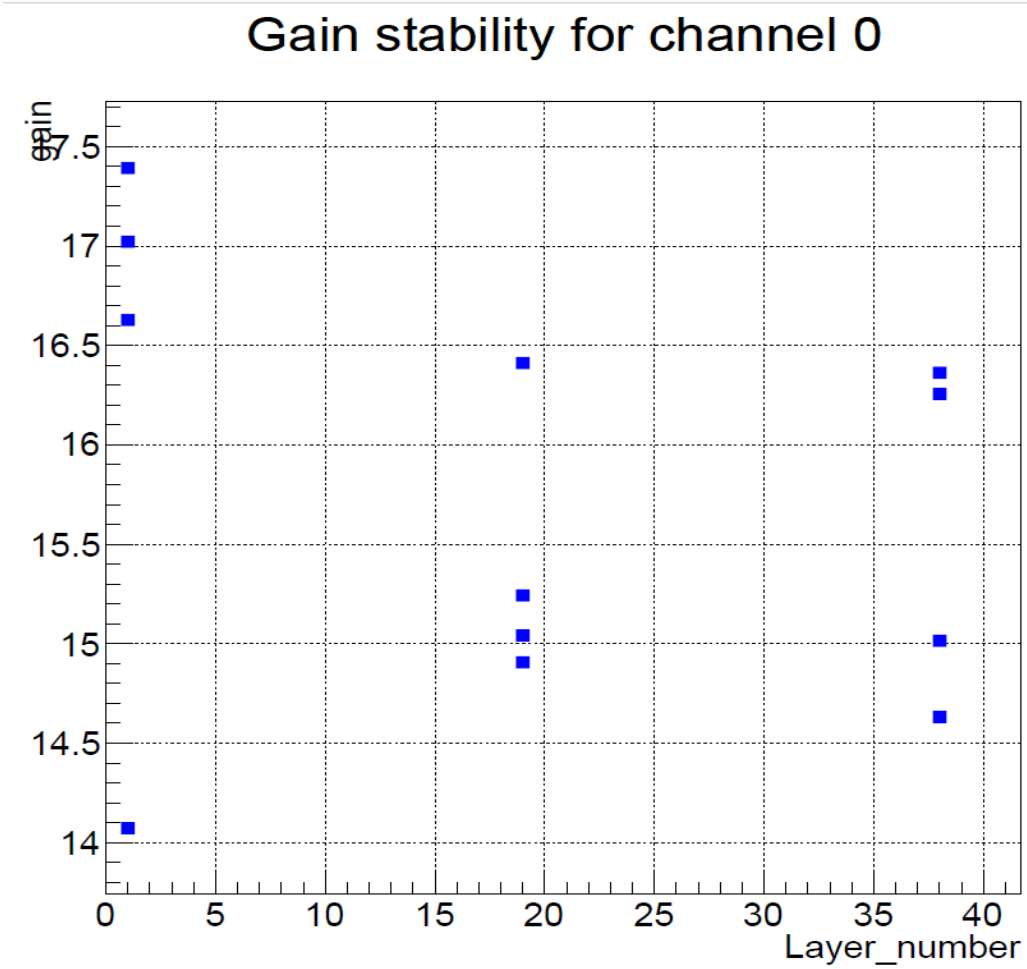
201805019



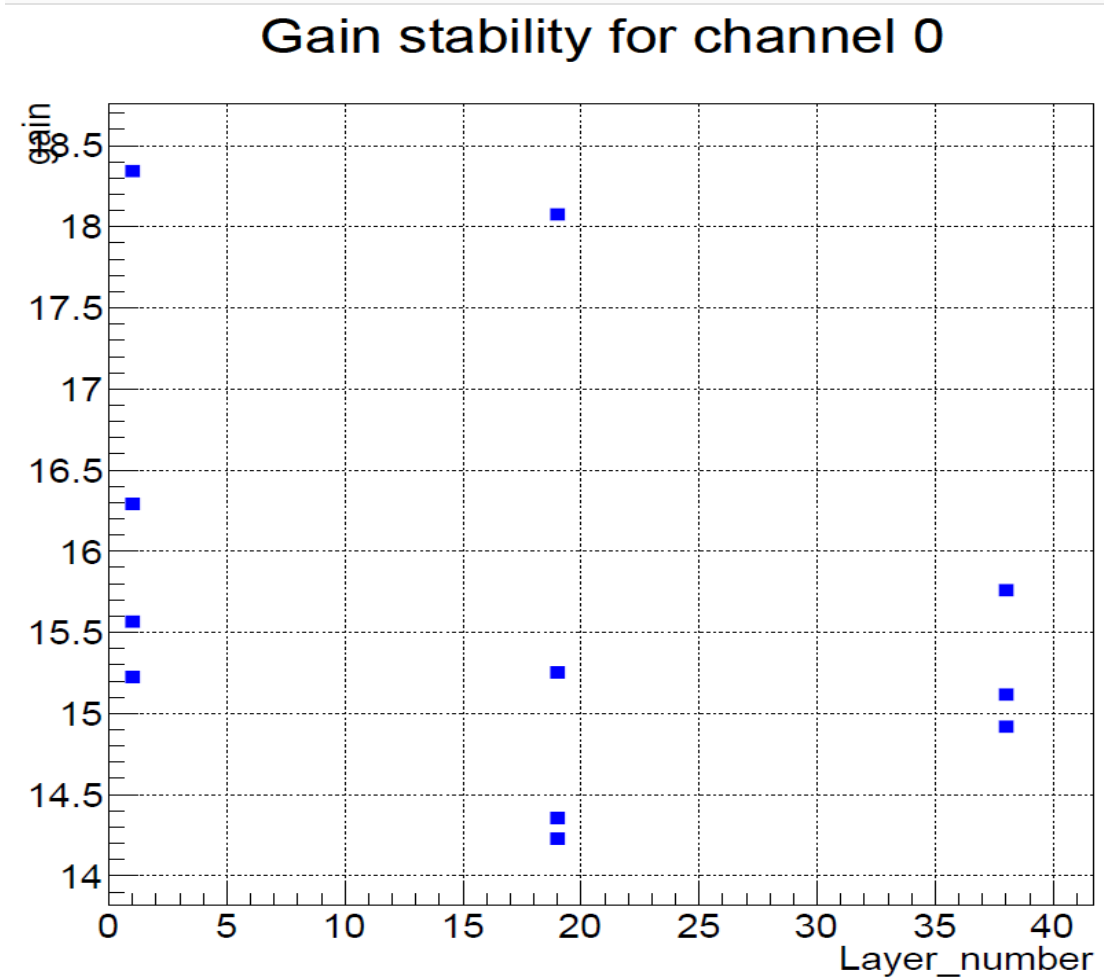
Gain variation

- Check for layer: 1, 19 and 38 for channel zero…… May 2018

Central 4 chips of Layer 1, Layer 19, Layer,38



Corner 4 chips of Layer 1, Layer 19, Layer,38



Conclusion and Outlook

- Pedestal value is memory cell dependent.
- Chip 1538 channel 3 looks strange compared to other channels flagged as dead or noisy.
- Investigated the variation in gain variation between the AHCAL layers.
- Gain quality: 20,517 fitted (~95% fit quality).

- Look for the remaining 1,371 channels.
- Check if gain is highly dependent on memcell level
- Update the gain mean procedure

Thank you