From pedestal to gain

Data from May 2018

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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

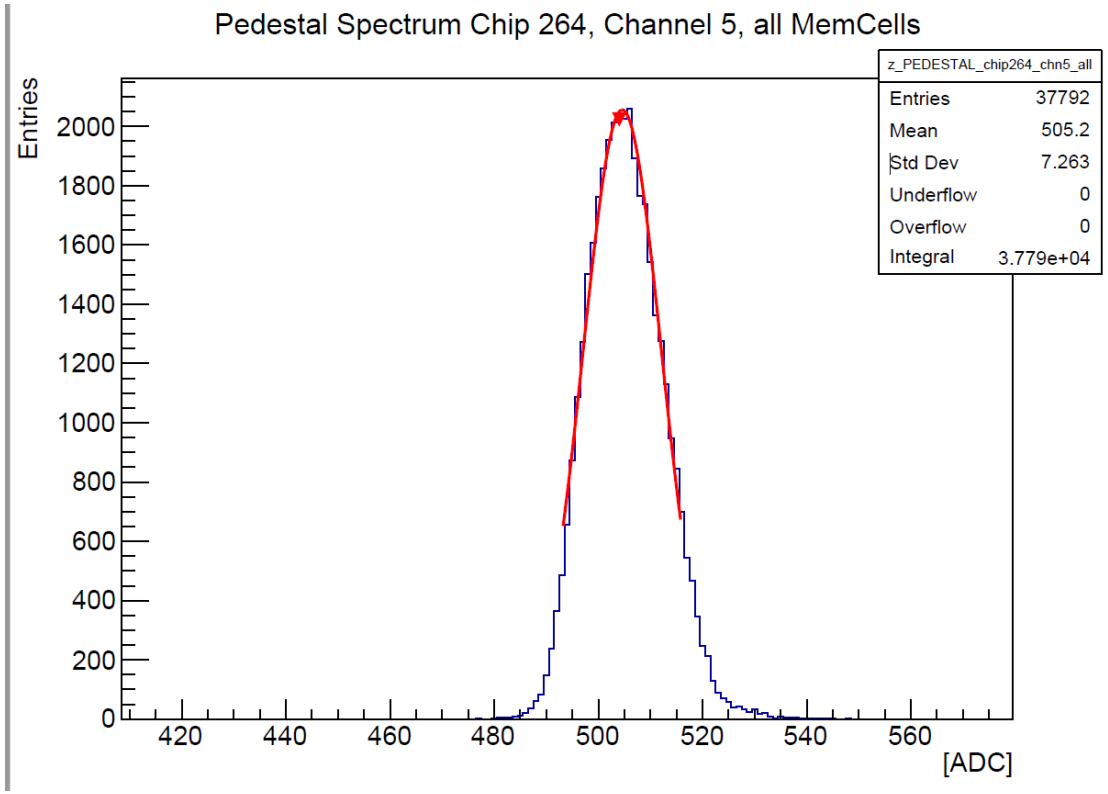
- The **pedestal** depends not only on the channel and gain mode, also depends on the memory cells.
- Data from all memory cells can not be simply merged together.
- Assumption: The signal in memory cells does not deteriorate much during the acquisition time.

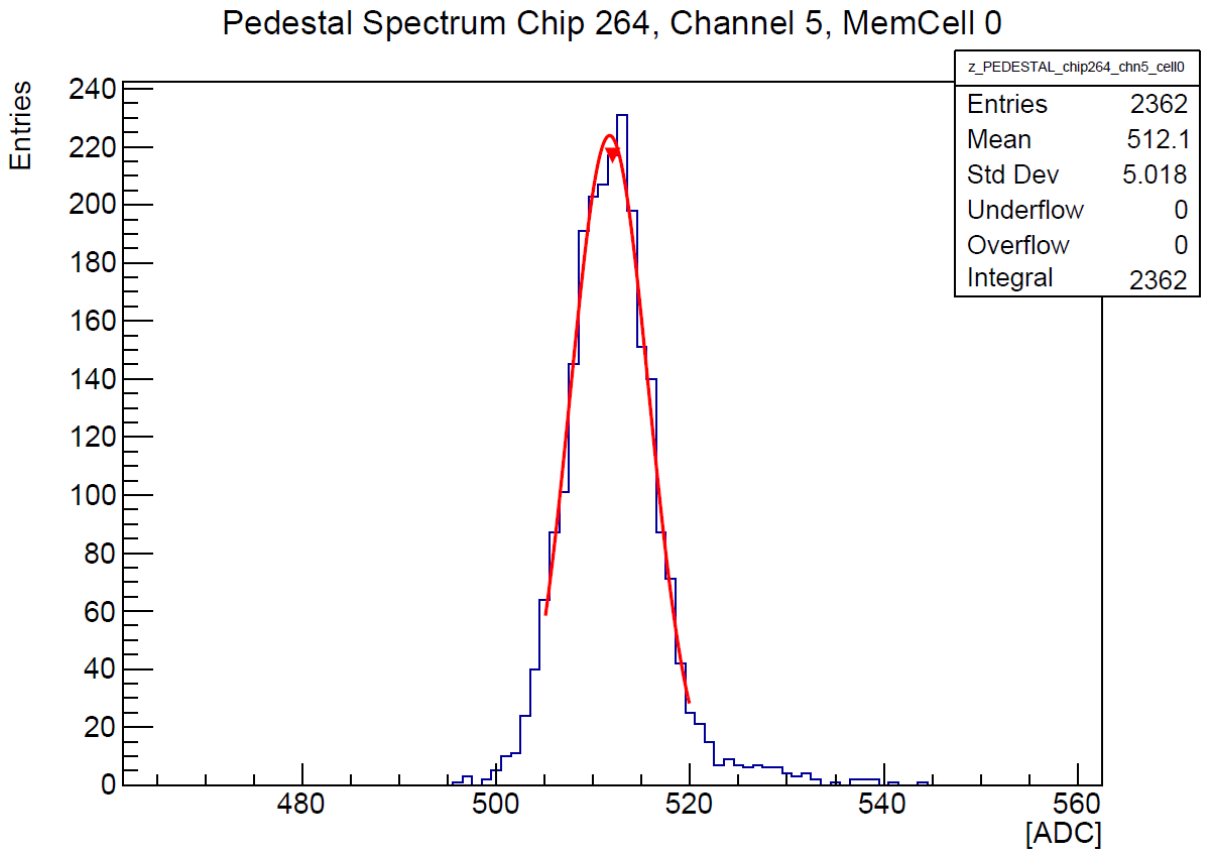
Dead and noisy cells

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

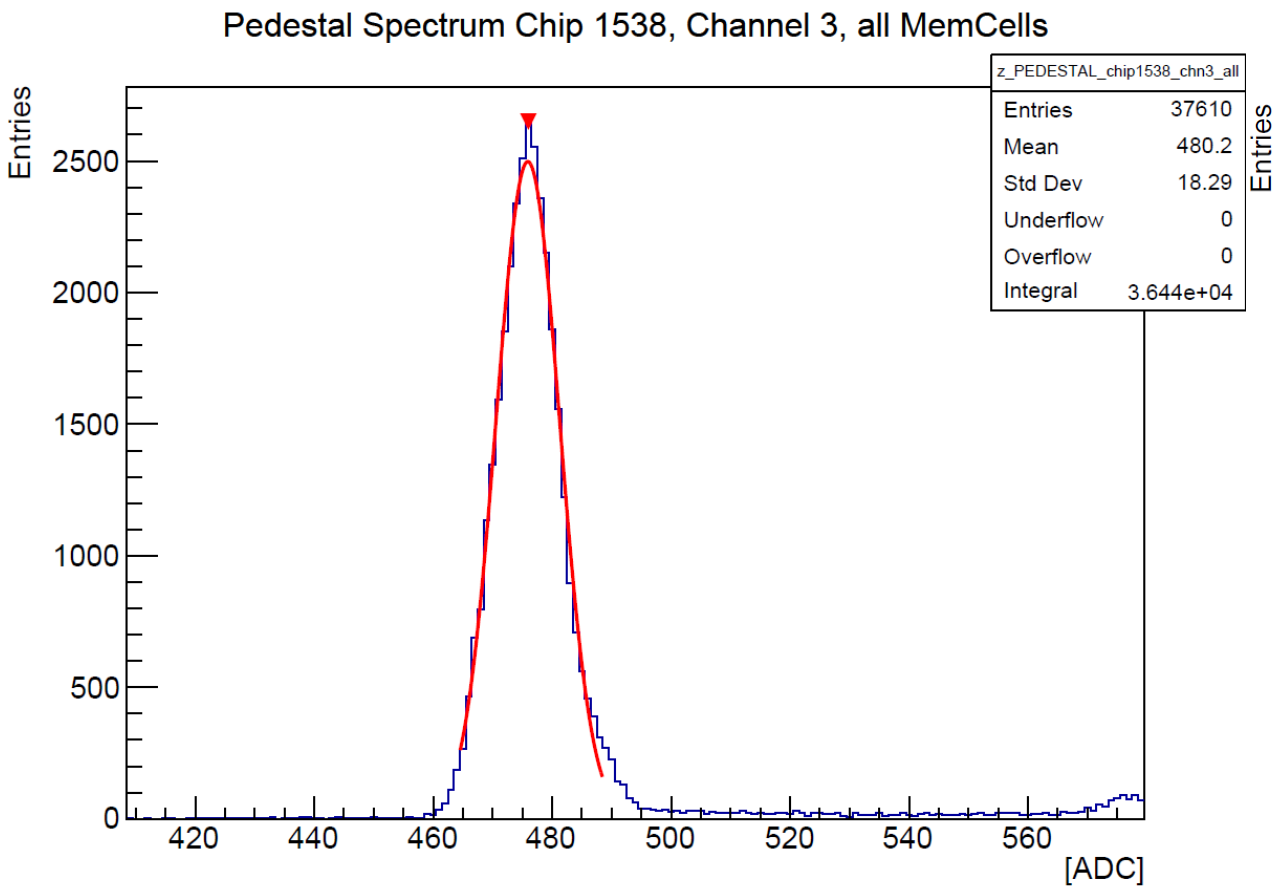
http://flcwiki.desy.de/AHCALTestBeamCERN2018-May

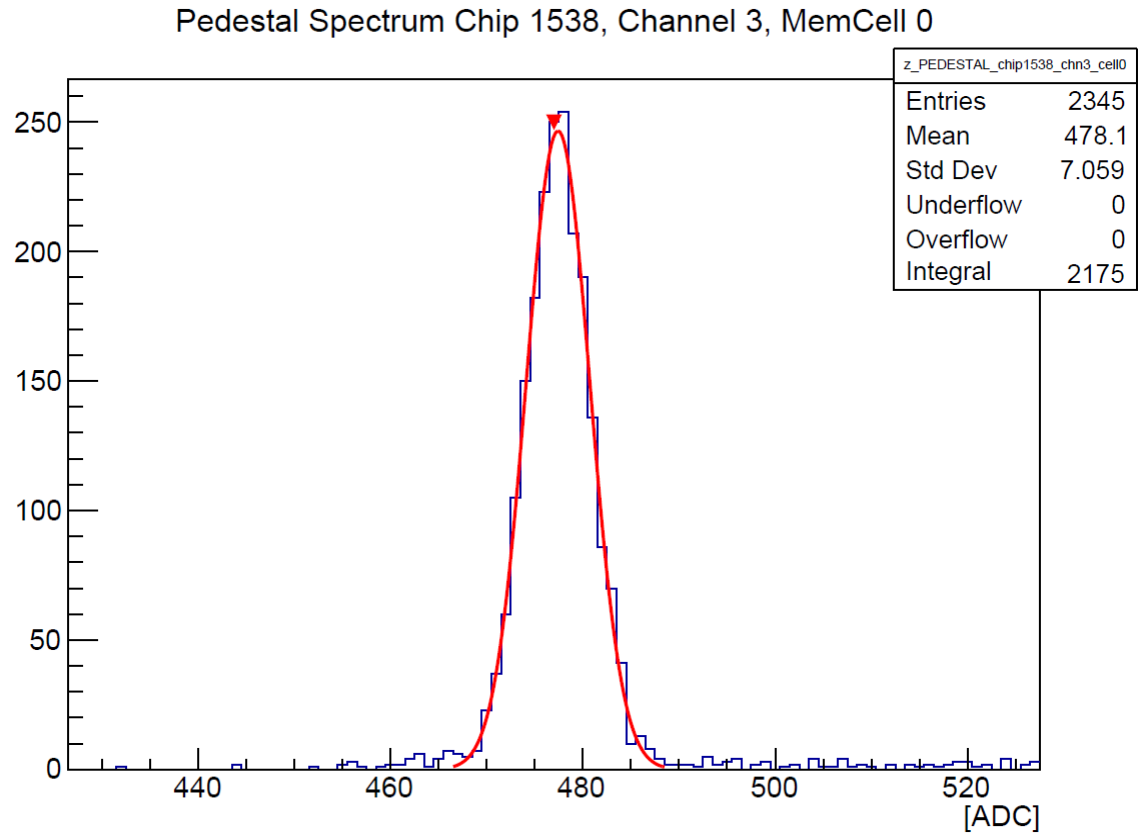
Revisit to dead and noisy cells



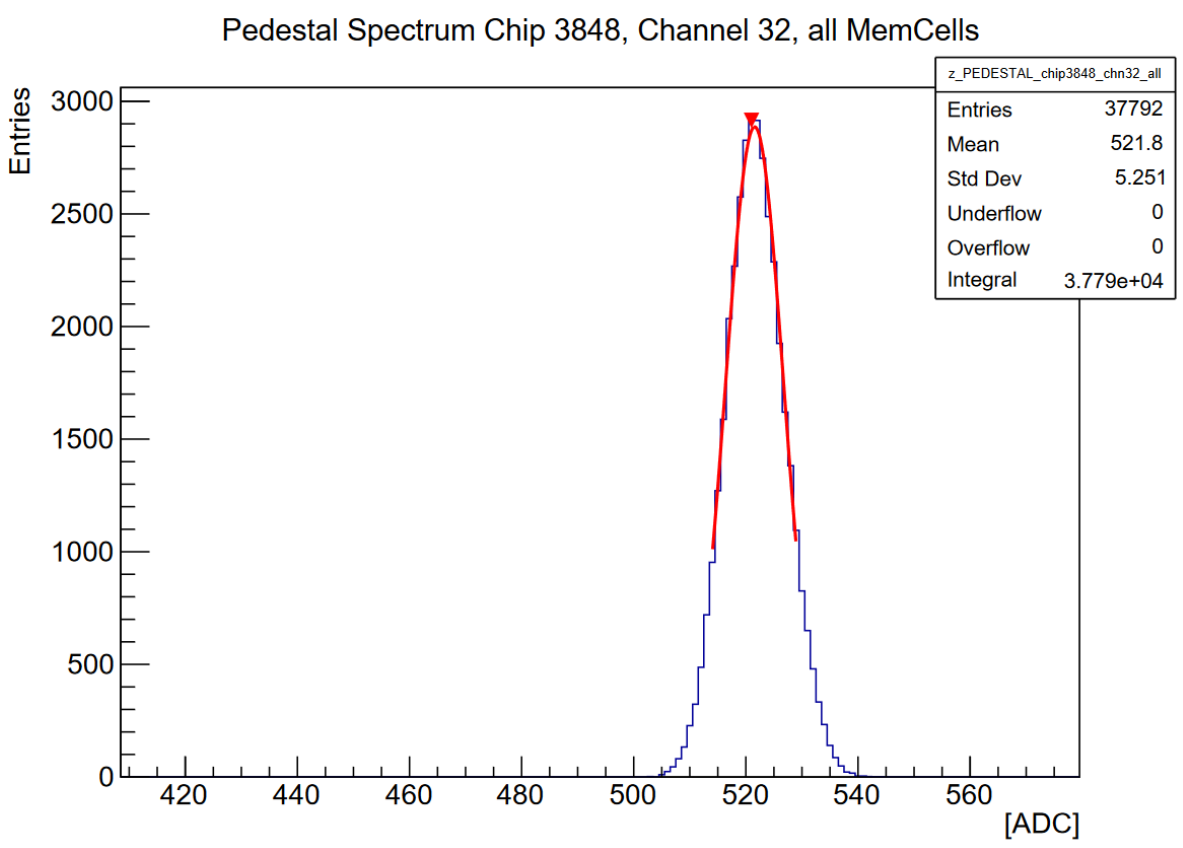


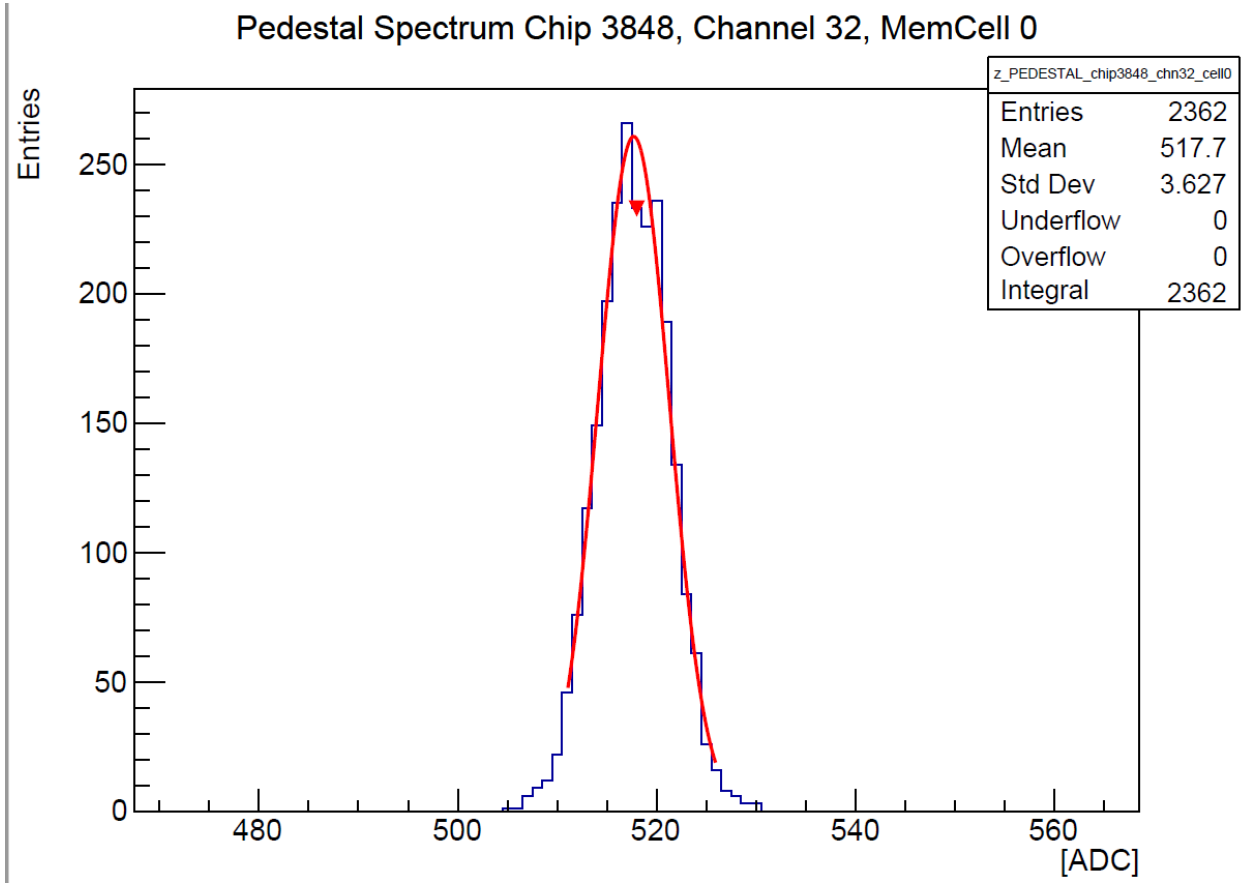
Revisit to dead and noisy cells





Revisit to dead and noisy cells





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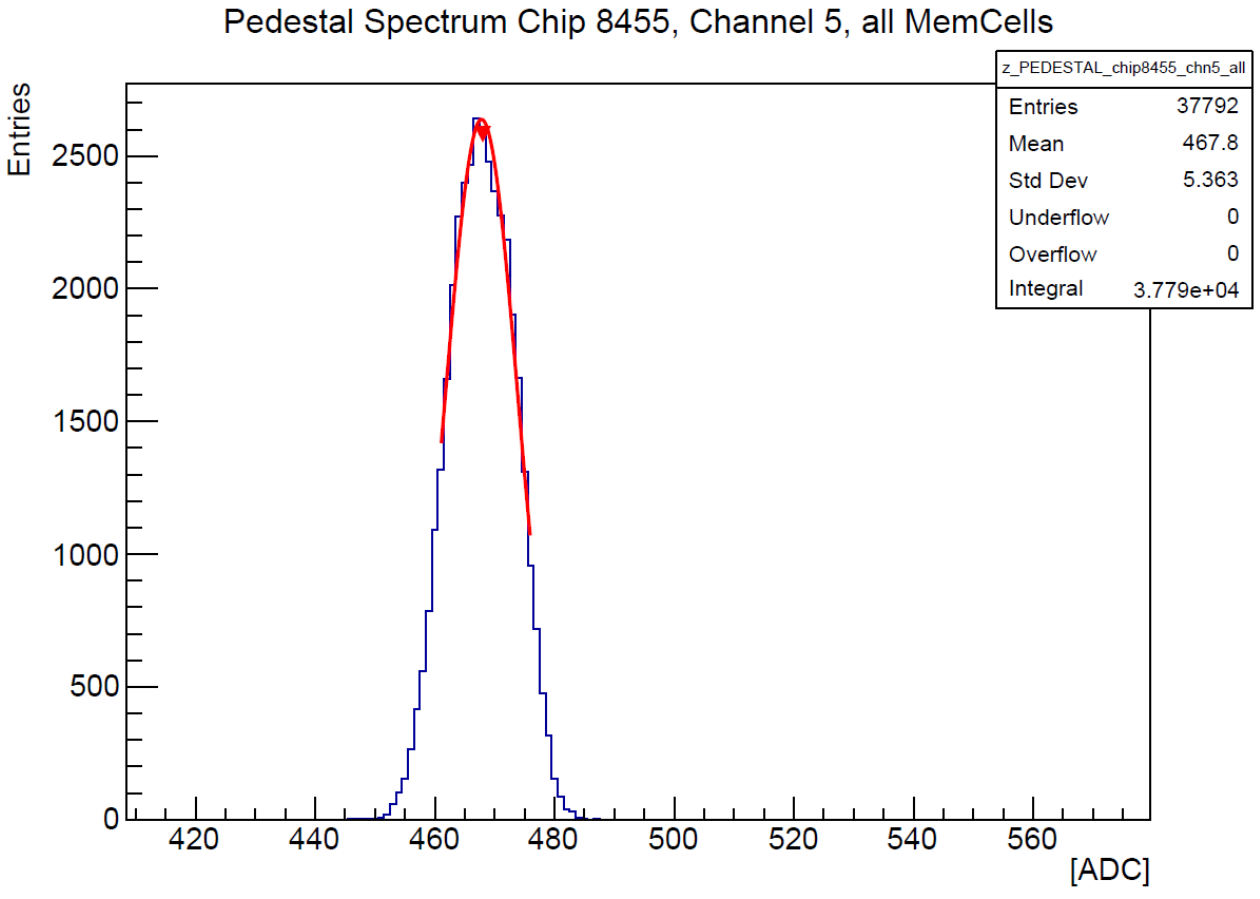
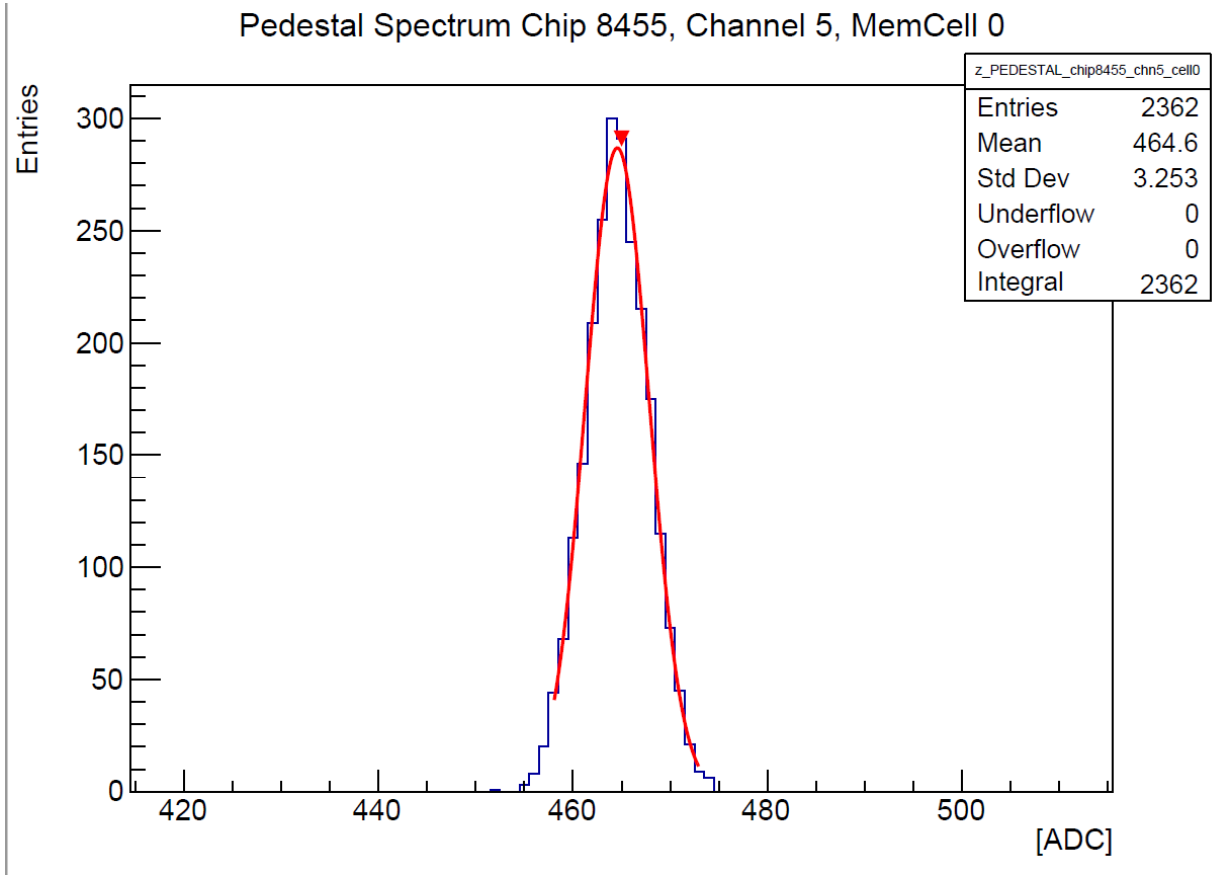




Pedestal study

- 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

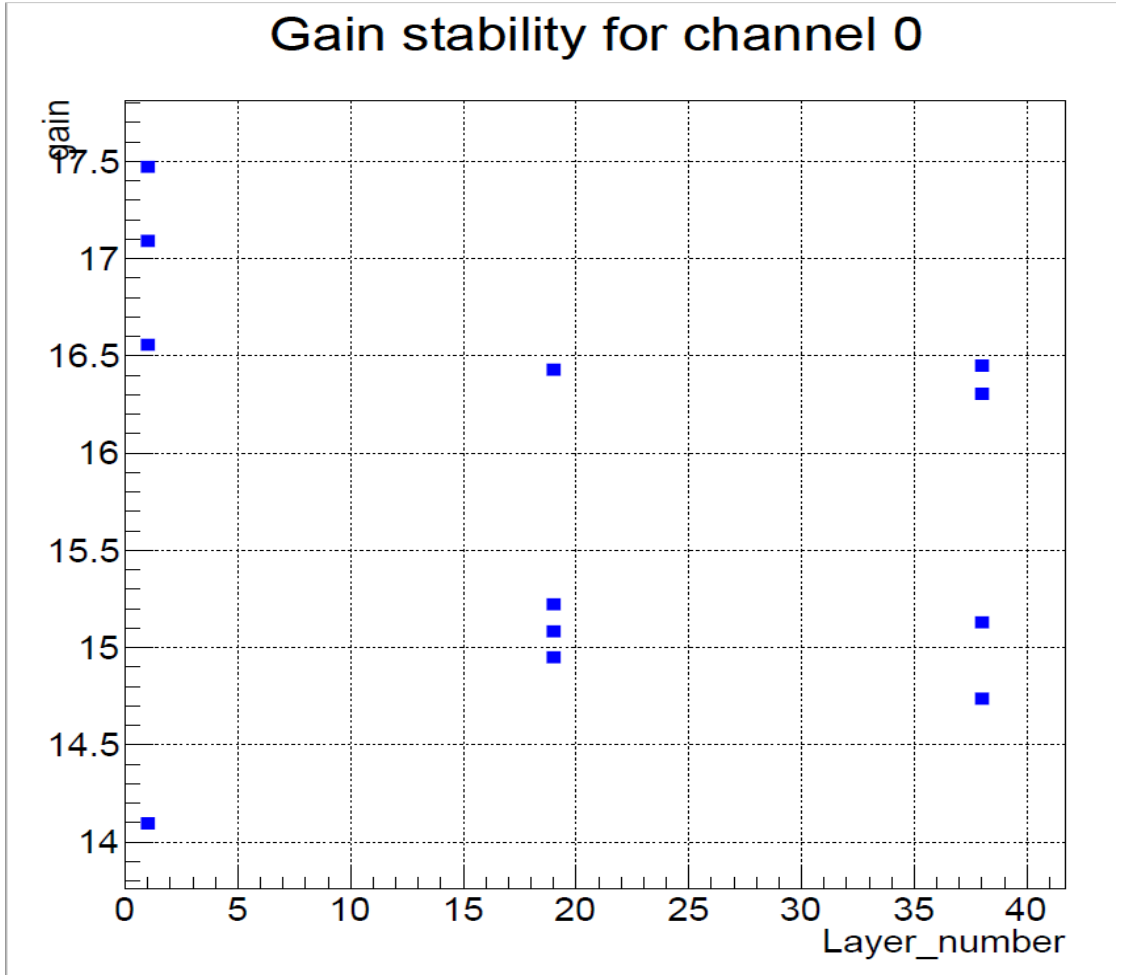
- The **gain** is defined as a distance between 2 photopeaks in the single pixel spectrum.
- Assumption: Gain is same for all memory cells belonging to a single channel.
- Parameter gain is needed:
  - Light Yield determination
  - Temperature dependence
  - Saturation function

Gain variation

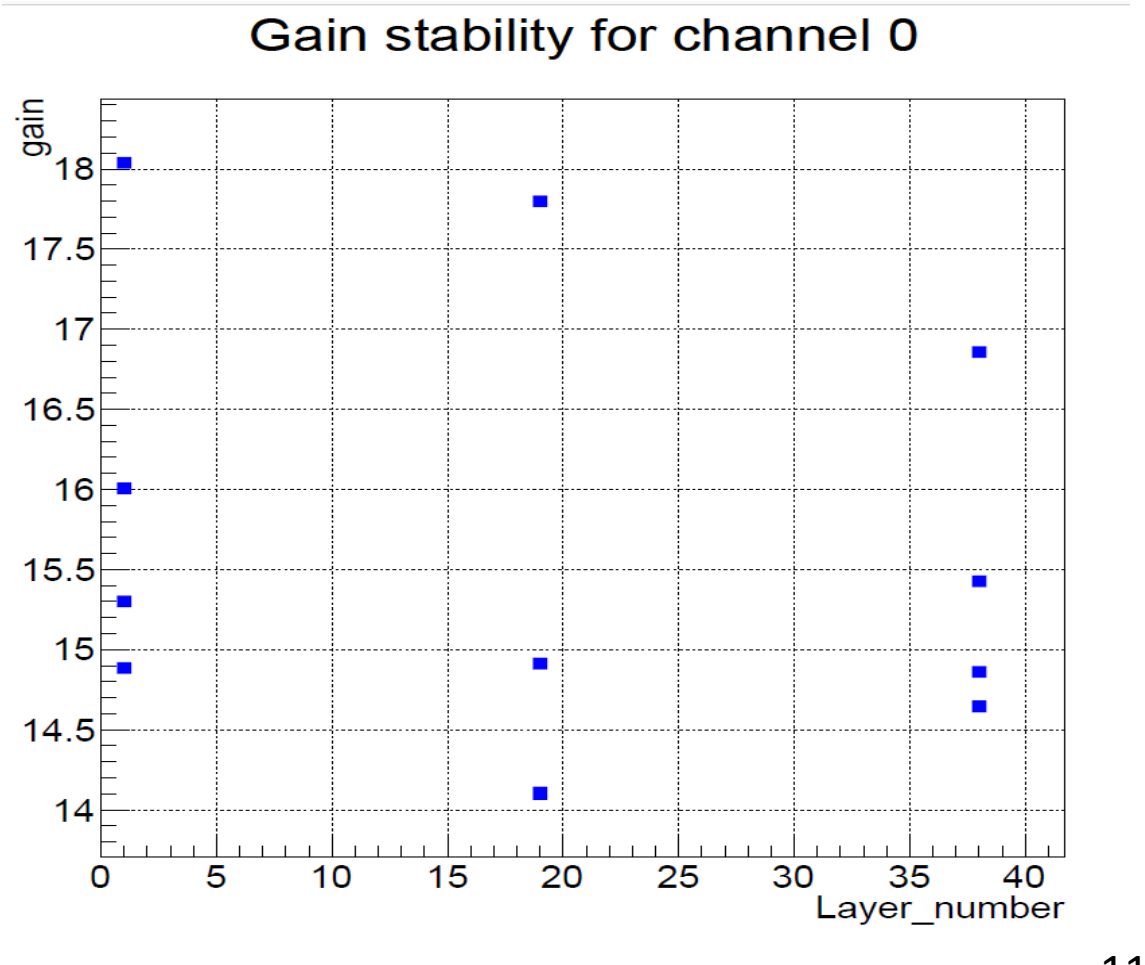
Check for layer: 1, 19 and 38 for channel zero ……Comparison between 20180507 & 20180519

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

20180507



20180519

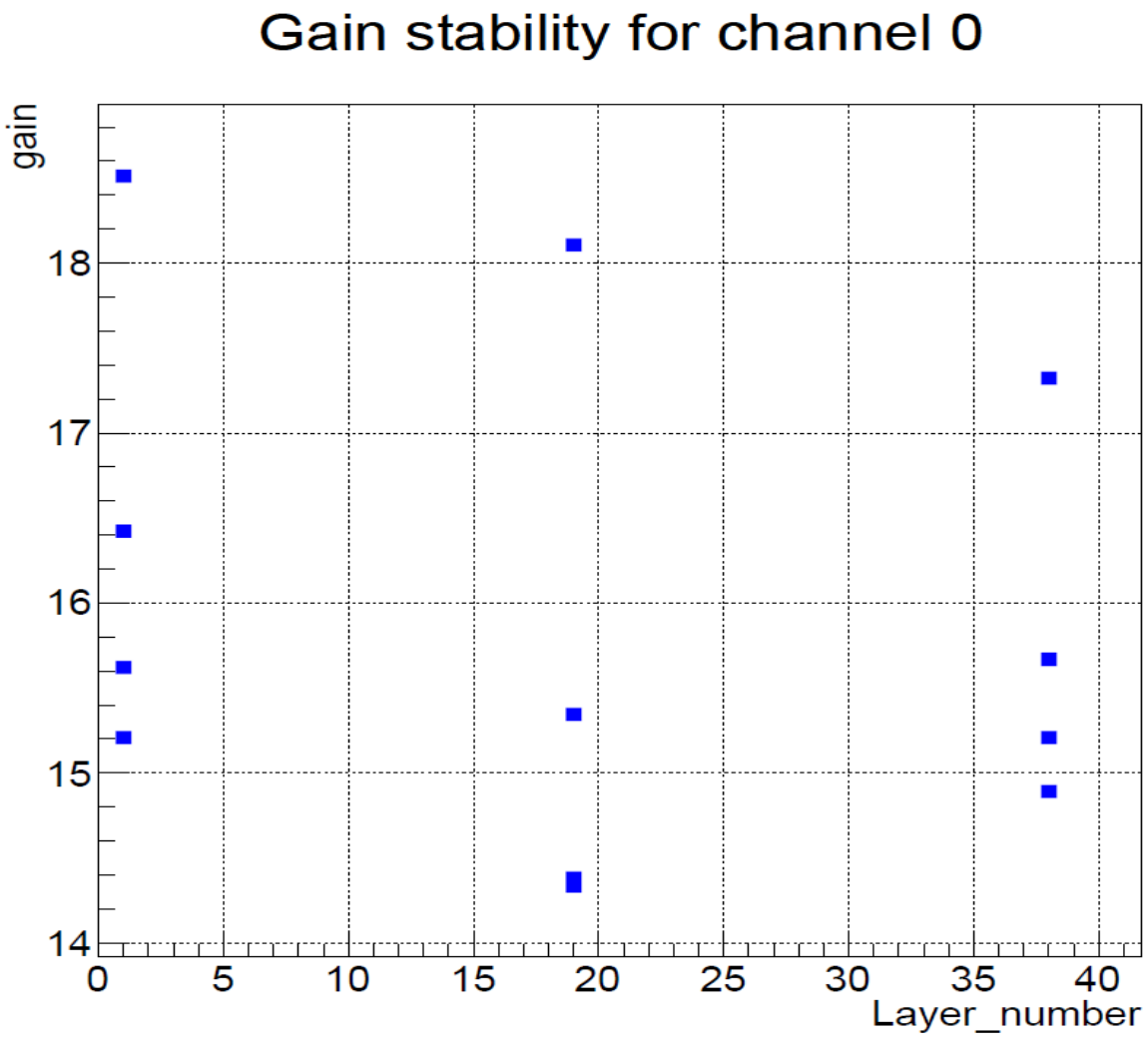


Gain variation

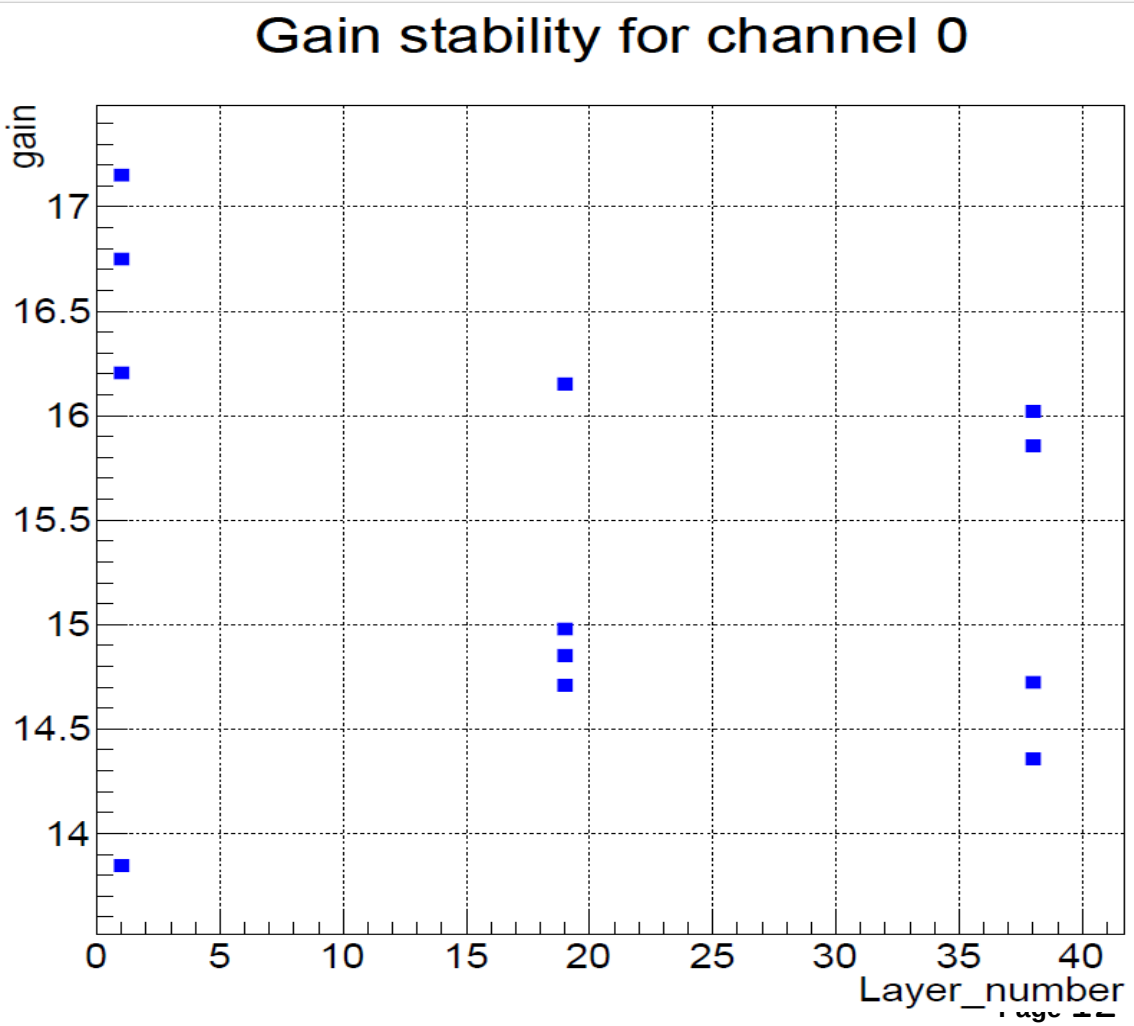
Check for layer: 1, 19 and 38 for channel zero ……Comparison between 20180507 & 20180519

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

20180507



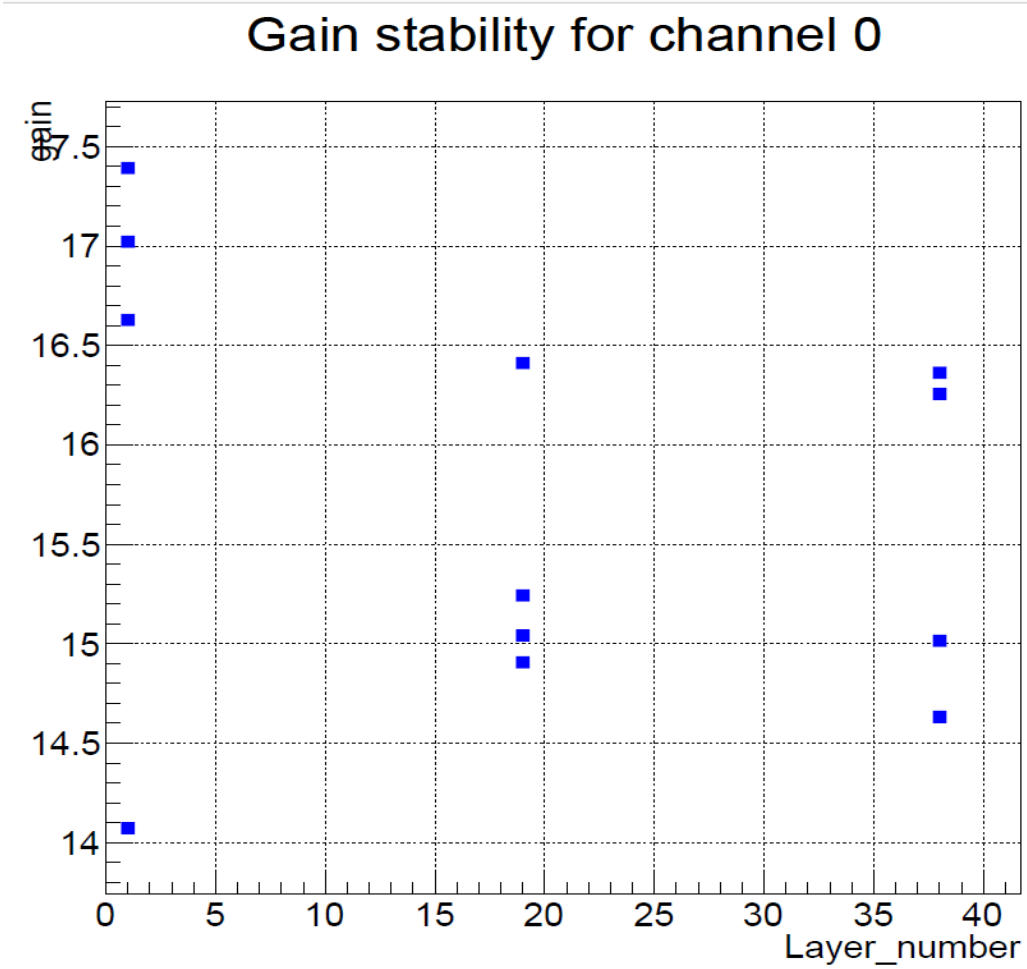
201805019



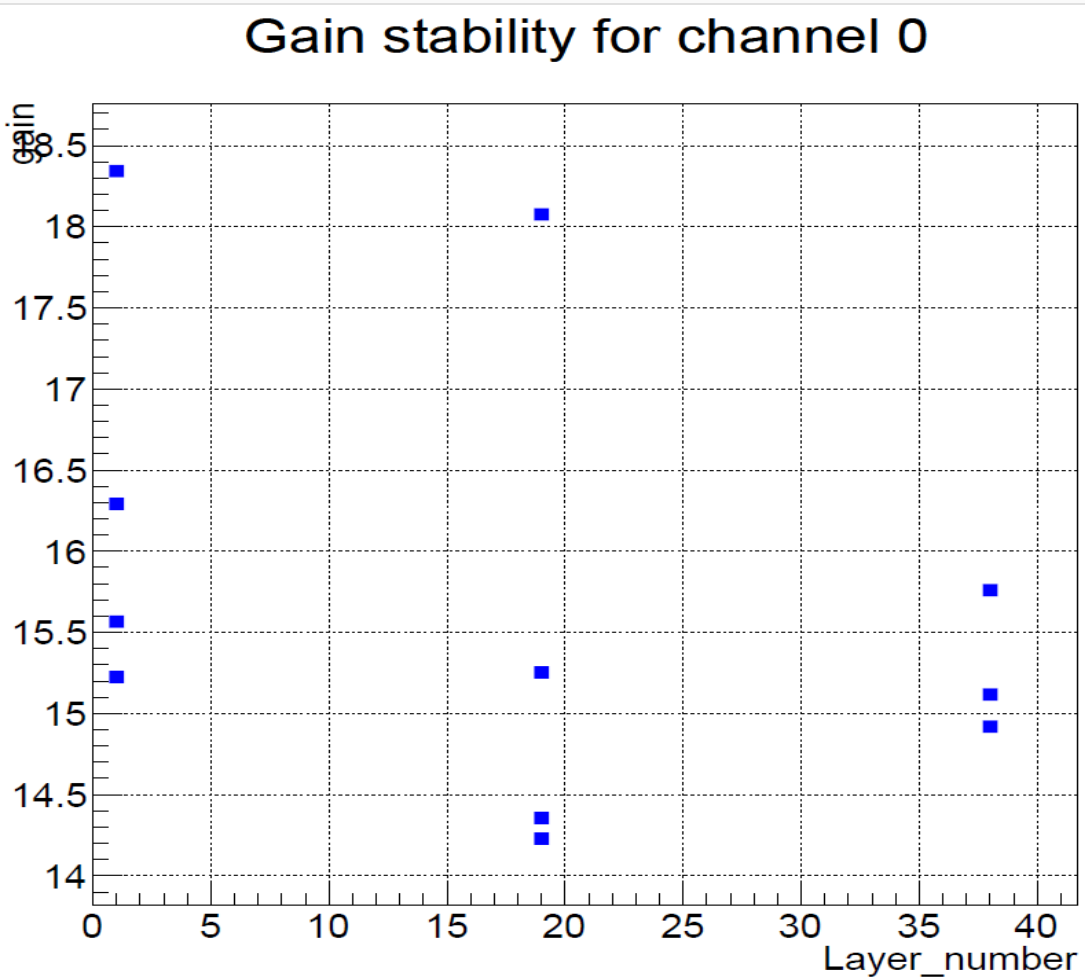
Gain variation

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