
IST Calibration with cosmic data

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IST offline calibration – run calibration QA

1. Run IST offline calibration maker and generate calibration QA files for all runs (there will be three files produced for each run/jobId as shown below):

`st_cosmic_adc_15038009_raw_1000005.istCaliQa.root` (pedestal/rms/CM noise histograms)
`st_cosmic_adc_15038009_raw_1000005.istCmNoise.dat` (chip geometry Id/time bin/CM noise)
`st_cosmic_adc_15038009_raw_1000005.istPedNoise.dat` (channel electronics Id/time bin/pedestal/rms)

Note:

- (1) One DAQ file with random job Id was chosen for each run.
- (2) The pedestal/rms/CM noise histograms over all detected channels/chips can be obtained from calibration QA root file (as the following slide shown). 1536 dead channels (12 chips) were excluded due to one dead section.
- (3) For each channel's pedestal/rms, its average value over all time bins (9 time bins set in the past cosmic runs) is taken as its pedestal/rms to compare with the threshold.
- (4) For each chip's CM noise, its average value over all time bins is taken as its CM noise to compare with the threshold.

IST Offline Calibration – cuts setting

2. Cuts for bad chip/channel candidates

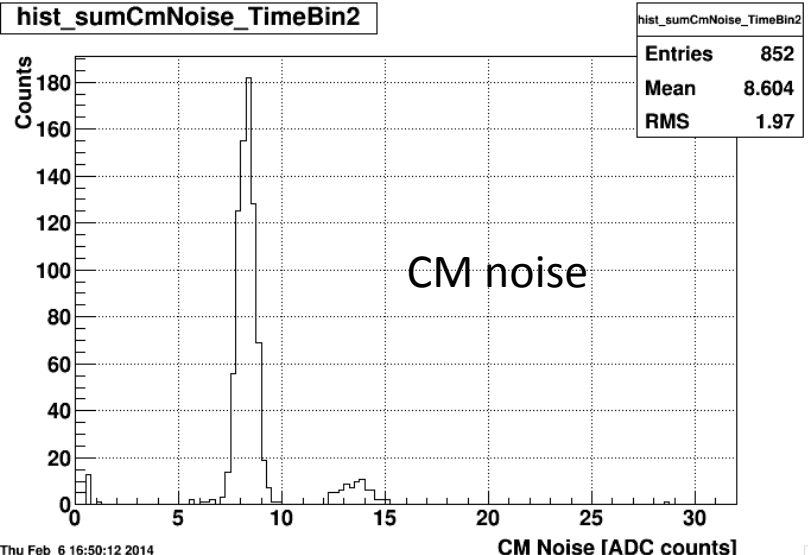
(1) As right plot shown, the chip is identified as bad candidate when

$$|CM\ noise - \langle CM\ noise \rangle| > 3 * \sigma_{CM\ noise}$$

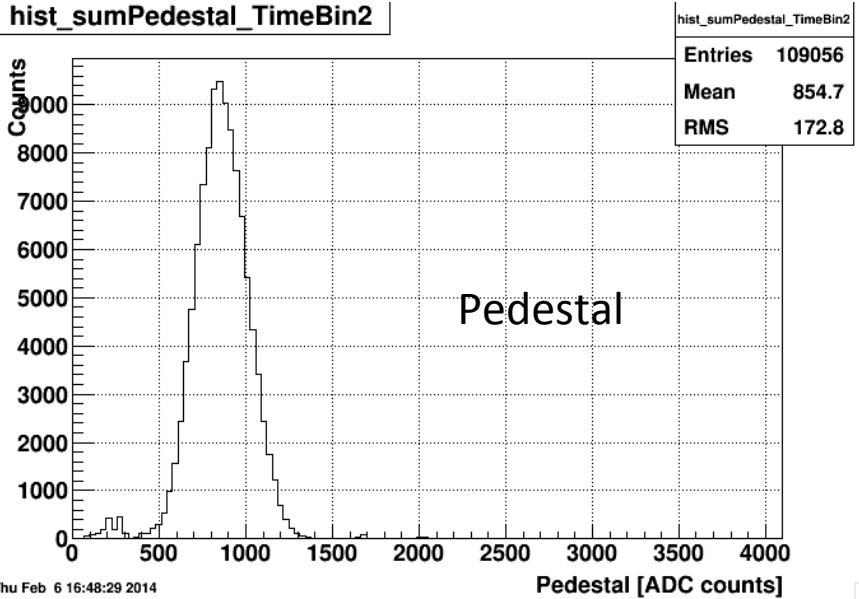
(2) As bottom plots shown, the channel is identified as bad channel when

$$|pedestal - \langle pedestal \rangle| > 3 * \sigma_{pedestal} \text{ or}$$

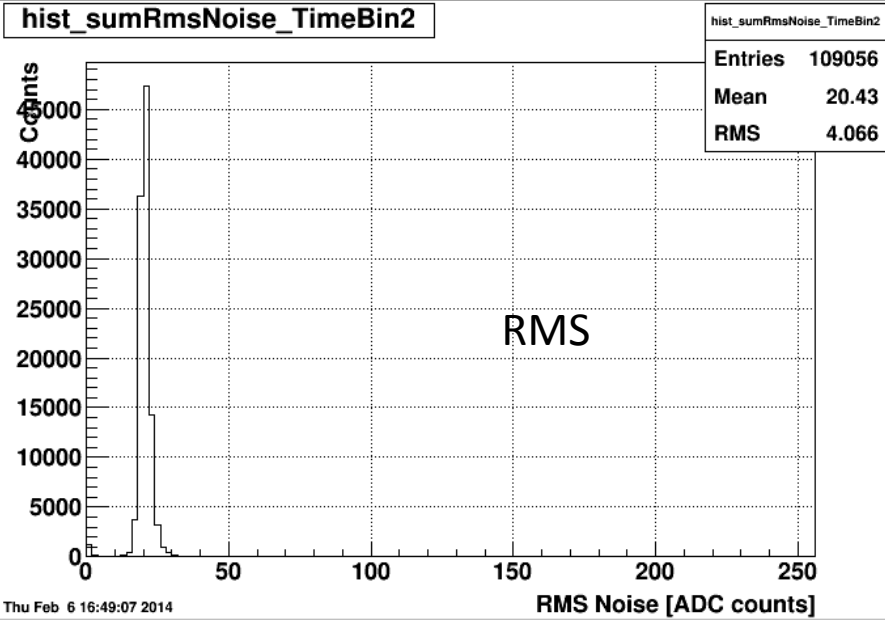
$$|rms - \langle rms \rangle| > 3 * \sigma_{rms}$$



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IST Offline Calibration – fixed bad chip/channel

3. Print out bad chip/channel candidates lists for each run (macro can be found at: [/star/u/ypwang/disk01/offlineQA_ist/DB/printBadChipChannel.c](#)):two lists generated

badChipMap_IST_15038008.dat

badChannelMap_IST_15038008.dat

4. Fixed bad chip determination (28 chips), and fill chip masking list with chip ID.

Dead section: 12 chips, 1-3-0 to 1-3-11

Sensor bias HV fluctuations: 6+6 chips, 6-0-12 to 6-0-17 and 6-1-0 to 6-1-5

Flaky behavior: 4 chips, 1-1-13, 5-3-5, 6-3-19 and 6-4-14

5. Fixed bad channel determination (269 channels), and fill channel masking list with channel ID.

Except for the above 28 chips, the fixed bad channels will be determined by comparison several runs' bad channel lists (manual cross-check by data day32, day33 and day 34 currently, need to be automatical)

The fixed bad chips/channels are mis-bahavioring in all runs and have been cross-checked with Tonko and Gerrit's list. These chips/channels will be masked out on DAQ level too.

```
RDO/ARM/APV/Channel/Comments
1 1 -13 0 #ped=304, rms=0; ladder 21 chip 1 channel 0-127
1 3 -0 0 #ped=0, rms=0; ladder 20 chip 0 channel 0-127
1 3 -1 0 #ped=0, rms=0; ladder 20 chip 1 channel 0-127
1 3 -2 0 #ped=0, rms=0; ladder 20 chip 2 channel 0-127
1 3 -3 0 #ped=0, rms=0; ladder 20 chip 3 channel 0-127
1 3 -4 0 #ped=0, rms=0; ladder 20 chip 4 channel 0-127
1 3 -5 0 #ped=0, rms=0; ladder 20 chip 5 channel 0-127
1 3 -6 0 #ped=0, rms=0; ladder 20 chip 6 channel 0-127
1 3 -7 0 #ped=0, rms=0; ladder 20 chip 7 channel 0-127
1 3 -8 0 #ped=0, rms=0; ladder 20 chip 8 channel 0-127
1 3 -9 0 #ped=0, rms=0; ladder 20 chip 9 channel 0-127
1 3 -10 0 #ped=0, rms=0; ladder 20 chip 10 channel 0-127
1 3 -11 0 #ped=0, rms=0; ladder 20 chip 11 channel 0-127
5 3 -5 0 #ped=2058.09, rms=7.44419; ladder 4 chip 5 channel 0-127
6 0 -12 0 #ped=272, rms=0; ladder 2 chip 12 channel 0-127
6 0 -13 0 #ped=272, rms=0; ladder 2 chip 13 channel 0-127
6 0 -14 0 #ped=272, rms=0; ladder 2 chip 14 channel 0-127
6 0 -15 0 #ped=272, rms=0; ladder 2 chip 15 channel 0-127
6 0 -16 0 #ped=272, rms=0; ladder 2 chip 16 channel 0-127
6 0 -17 0 #ped=272, rms=0; ladder 2 chip 17 channel 0-127
6 1 -0 0 #ped=208, rms=0; ladder 2 chip 24 channel 0-127
6 1 -1 0 #ped=272, rms=0; ladder 2 chip 25 channel 0-127
6 1 -2 0 #ped=144, rms=0; ladder 2 chip 26 channel 0-127
6 1 -3 0 #ped=250.667, rms=0; ladder 2 chip 27 channel 0-127
6 1 -4 0 #ped=90.6667, rms=0; ladder 2 chip 28 channel 0-127
6 1 -5 0 #ped=208, rms=0; ladder 2 chip 29 channel 0-127
6 3 -19 0 #ladder 24 chip 19 channel 0-127
6 4 -14 0 #ped=304, rms=0; ladder 23 chip 2 channel 0-127
```

IST Offline Calibration – scan random bad chip/annel

6. Generate the istPedNoise Db table (28 bad chips + 269 individual channels)

Macro can be found here: [/star/u/ypwang/disk01/offlineQA_ist/DB/createPedNoiseTableLocal4Cosmic.C](#)

7. Move the istPedNoise Db table to local StarDb/Calibrations/ist/

8. Run IST offline chain to generate ist QA root file using the updated Dbs.

9. Macro to scan the individual bad channel by macro: [/star/u/ypwang/disk01/offlineQA_ist/DB/printIndividualBadChannel.C](#)

(1) Scan all channels' entry in analyzed events.

(2) The channel is masked as bad when one channel's entry number is bigger than 5% of the total events

(3) Fill the newly found channel ID into the bad channel list.

(4) Need to scan all runs to find possible individual bad channels and fill the found channel ID into the list.

10. Repeat the step 6, generate the istPedNoise Db with the full bad channel/chip map

11. Repeat the step 7 and check the IST offline QA plots using the new Db.

Shell scripts can be found at: http://www4.rcf.bnl.gov/~ypwang/public_html/istCalibration.html