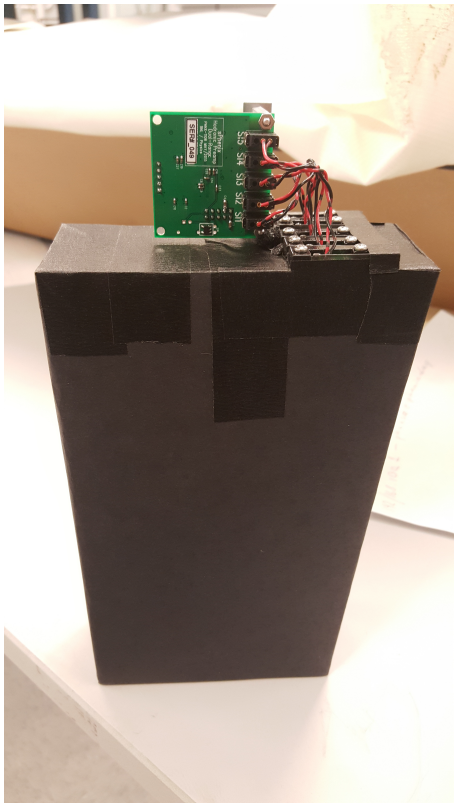
Tile testing at BNL

Abhisek, Megan, Andrey, John Haggerty

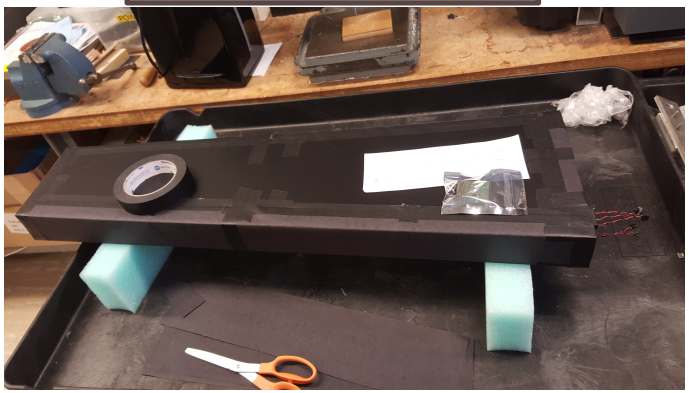
Towers for test

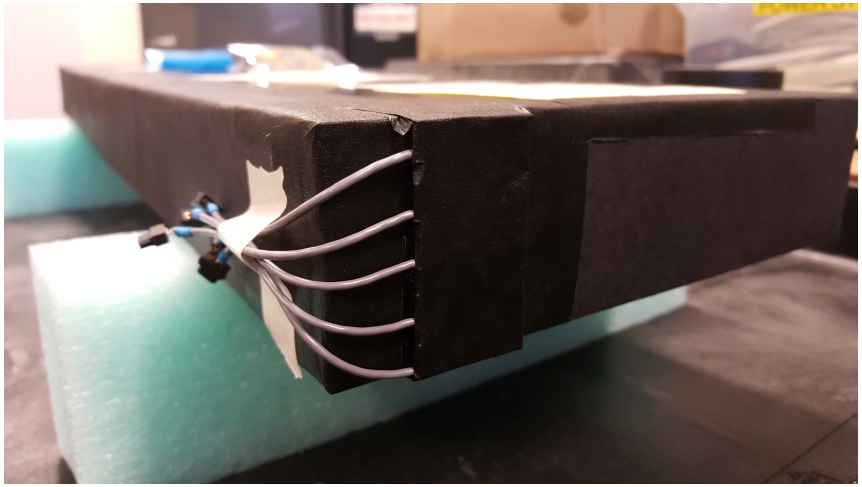
Inner Hcal Tower



Observed huge light leaks since the holders are not covered.

Outer Hcal Tower





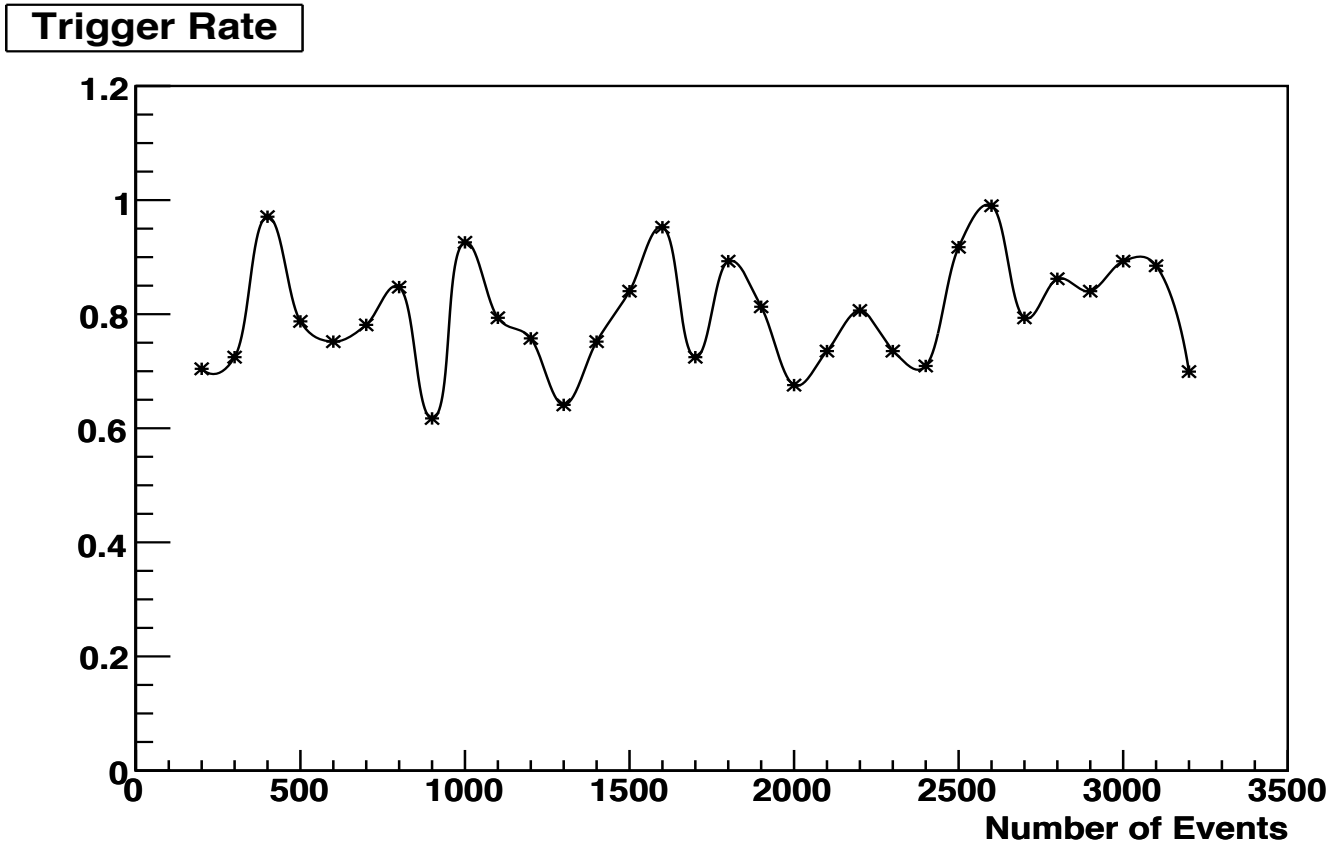
New holders, new connectors and covered with tapes. No light leak found. Extra tape makes it little thicker.

Cosmic setup with small tiles

5 tiles are connected to 5 separate preamps. All get same bias voltage from a distribution board.

Cosmic rate

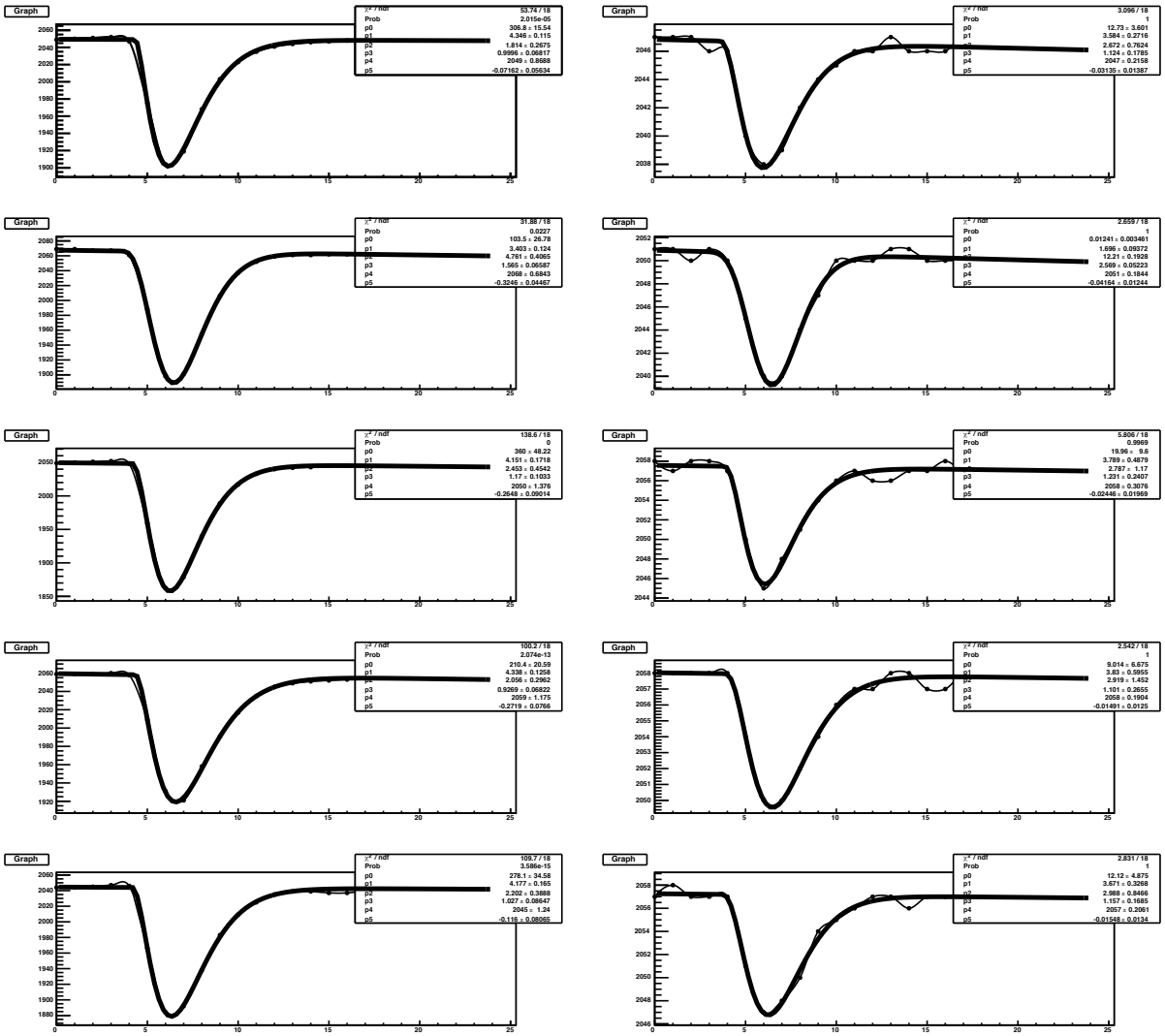
- JH predicted with 10.5cmX19cm and 5cm apart, rate~2Hz.
- Active area we measured for the scintillators: 10.5cmX12cm
  - Rate estimate ~1Hz



Negative polarity

HG LG

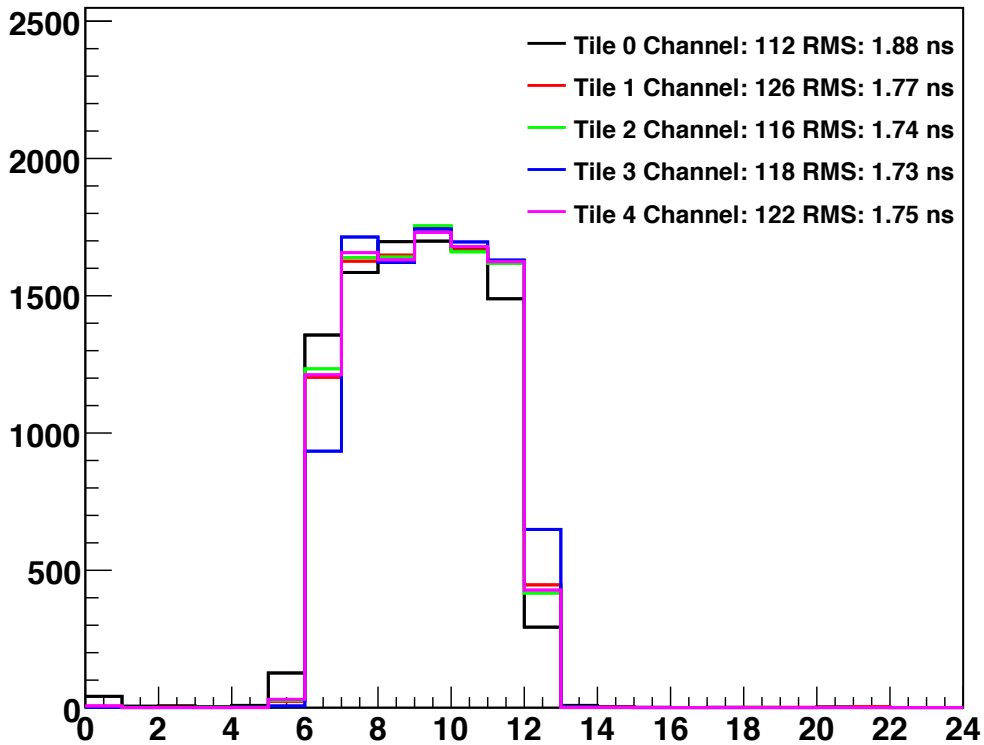
Tile 0



Tile 4

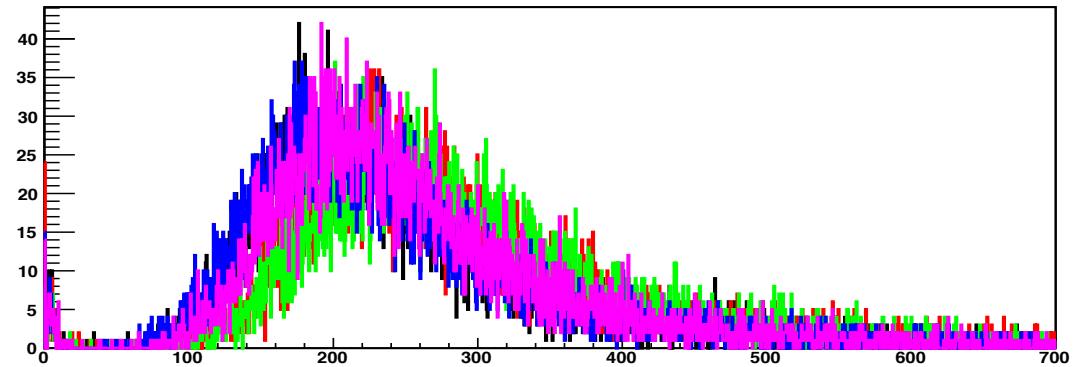
A convoluted power and exponential fit works better than Landau fit.

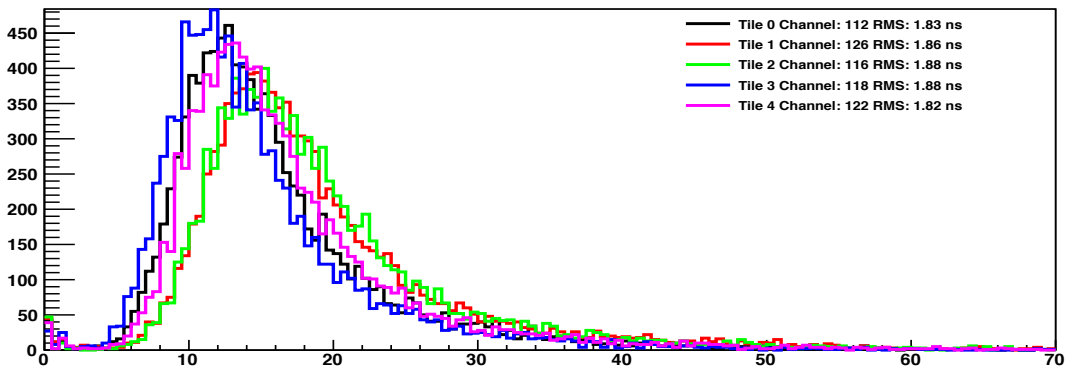
Timing resolution



Peak position of the signal (ns).

MIPS from the small tiles

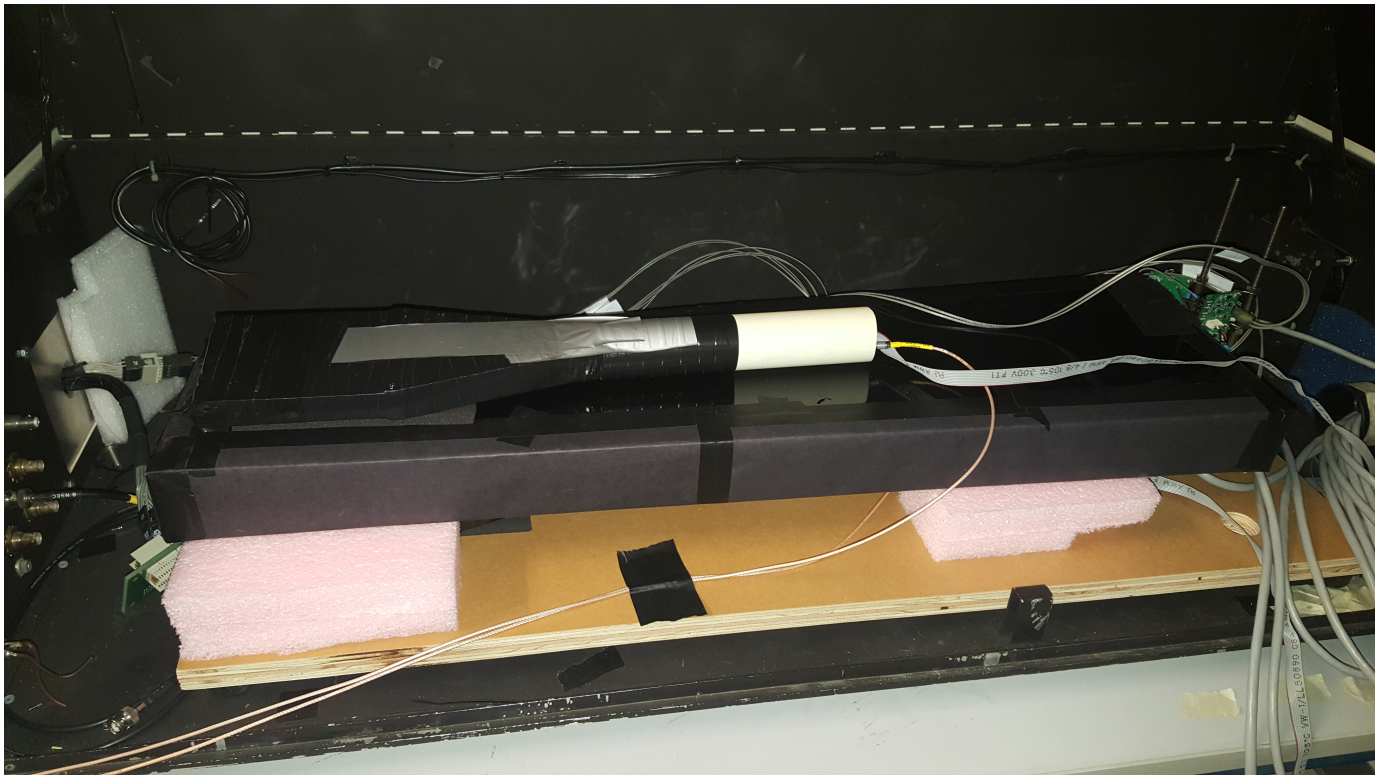




Signal from all the tiles looks very consistent with each other.

Consistent with earlier estimate from Edward, 30Pixels/MIP, 1Pixel~5mV for HG.

Cosmic setup with big tiles



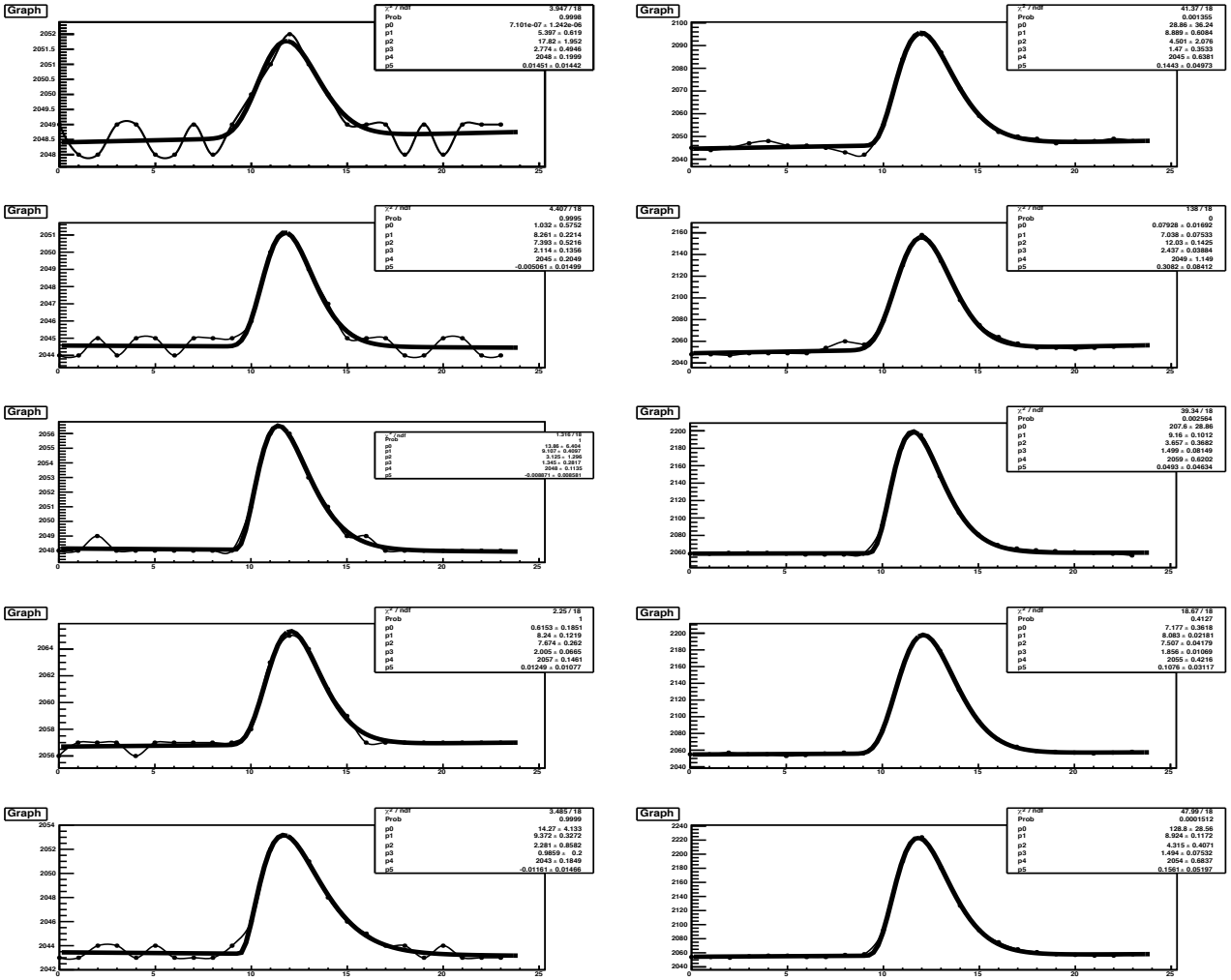
Cosmic counters are placed at the other end of the readout.

Positive signal

LG

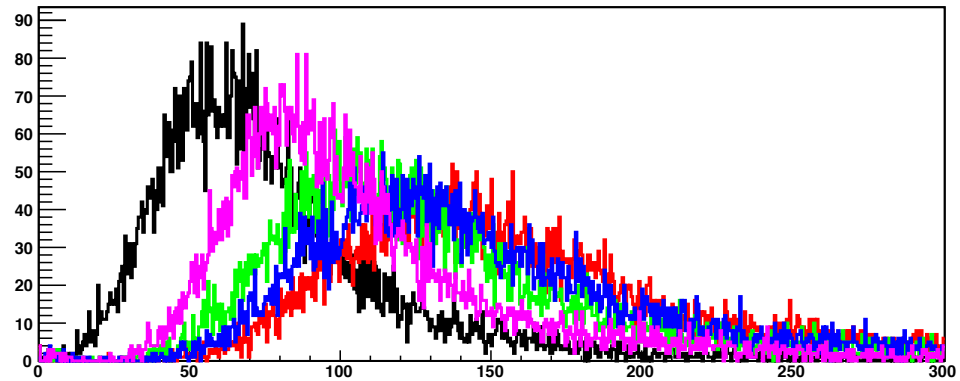
HG

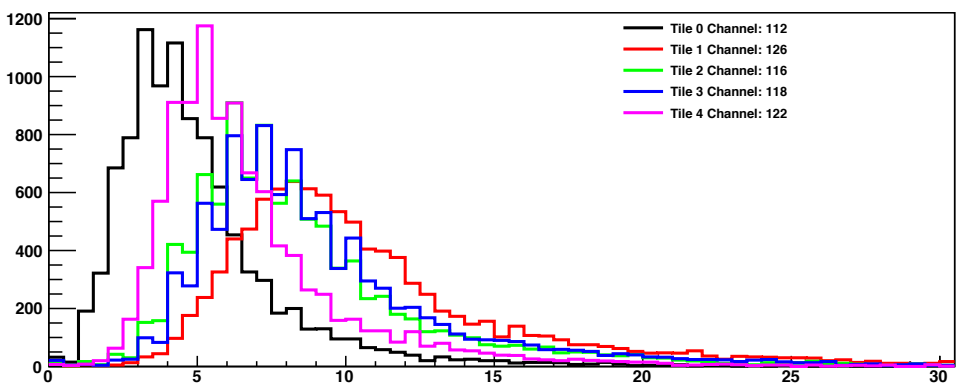
Tile 0



Tile 4

MIPs with the big tiles



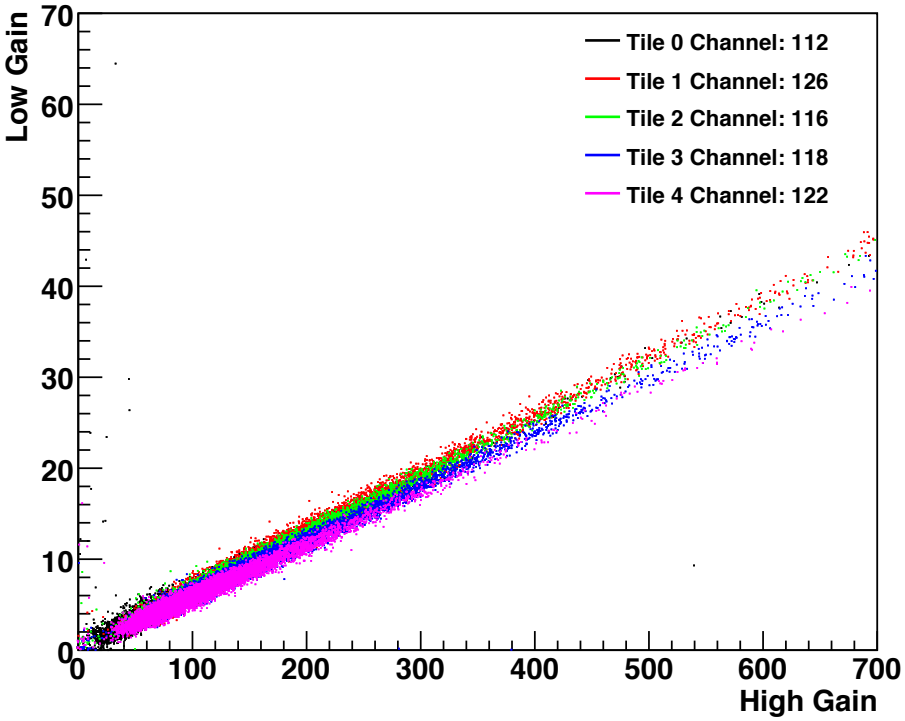


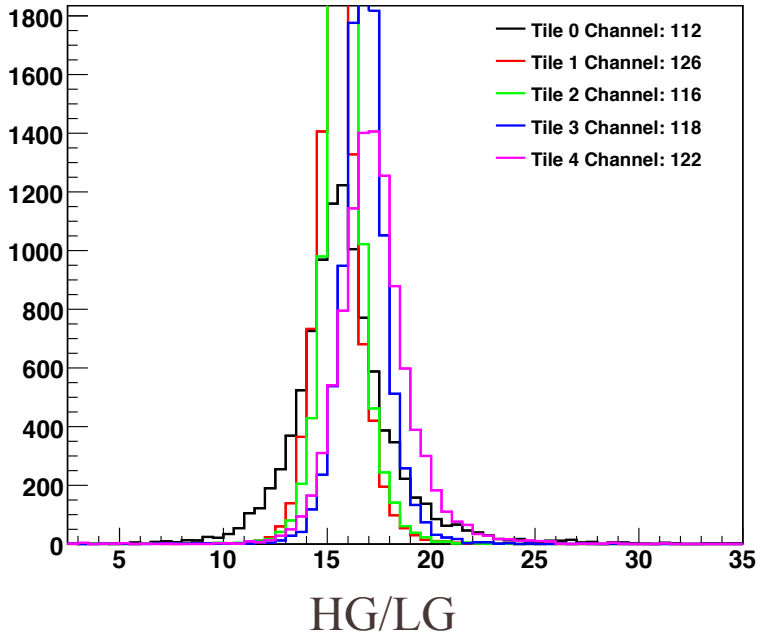
Several things to ask:

1/ Why the light output is smaller? (Attenuated?)

2/ Where the relative difference coming from?

HG and LG





PreAmps looks alright. Is the bias voltage responsible?

SIPM configurations

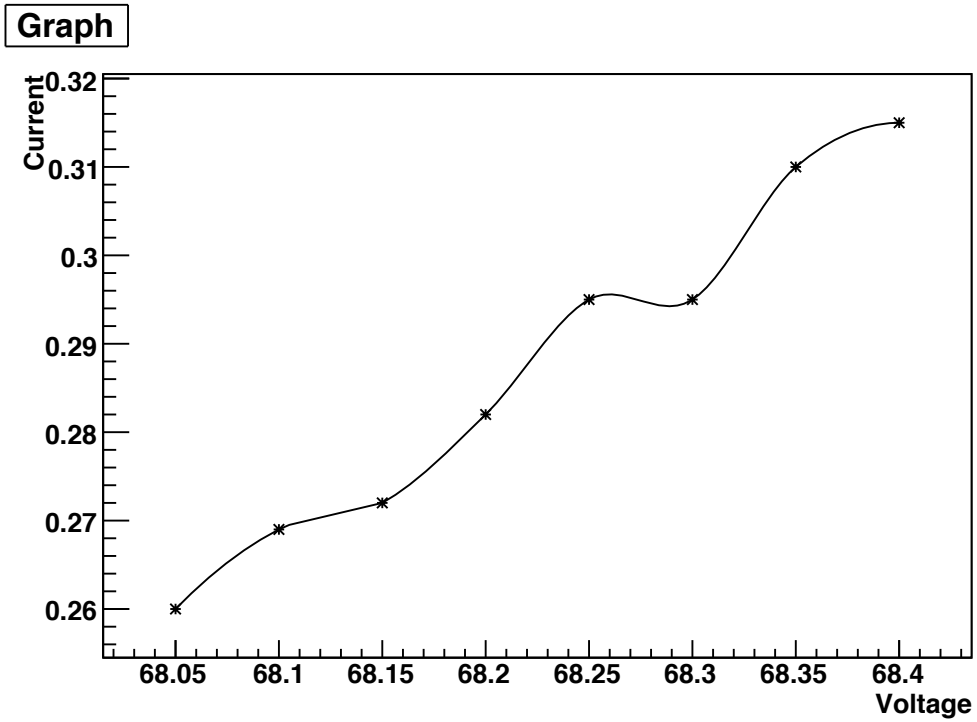
From HAMAMATSU data-sheet

Tower	SIPM	Vop	Gain
Inner1	905	68.16	2.28E+05
	927	68.3	2.32E+05
	972	68.06	2.29E+05
	973	68.15	2.32E+05
	992	68.31	2.31E+05
Outer 1	919	68.16	2.31E+05
	969	68.32	2.28E+05
	928	68.34	2.30E+05
	996	68.34	2.29E+05
	948	68.12	2.29E+05

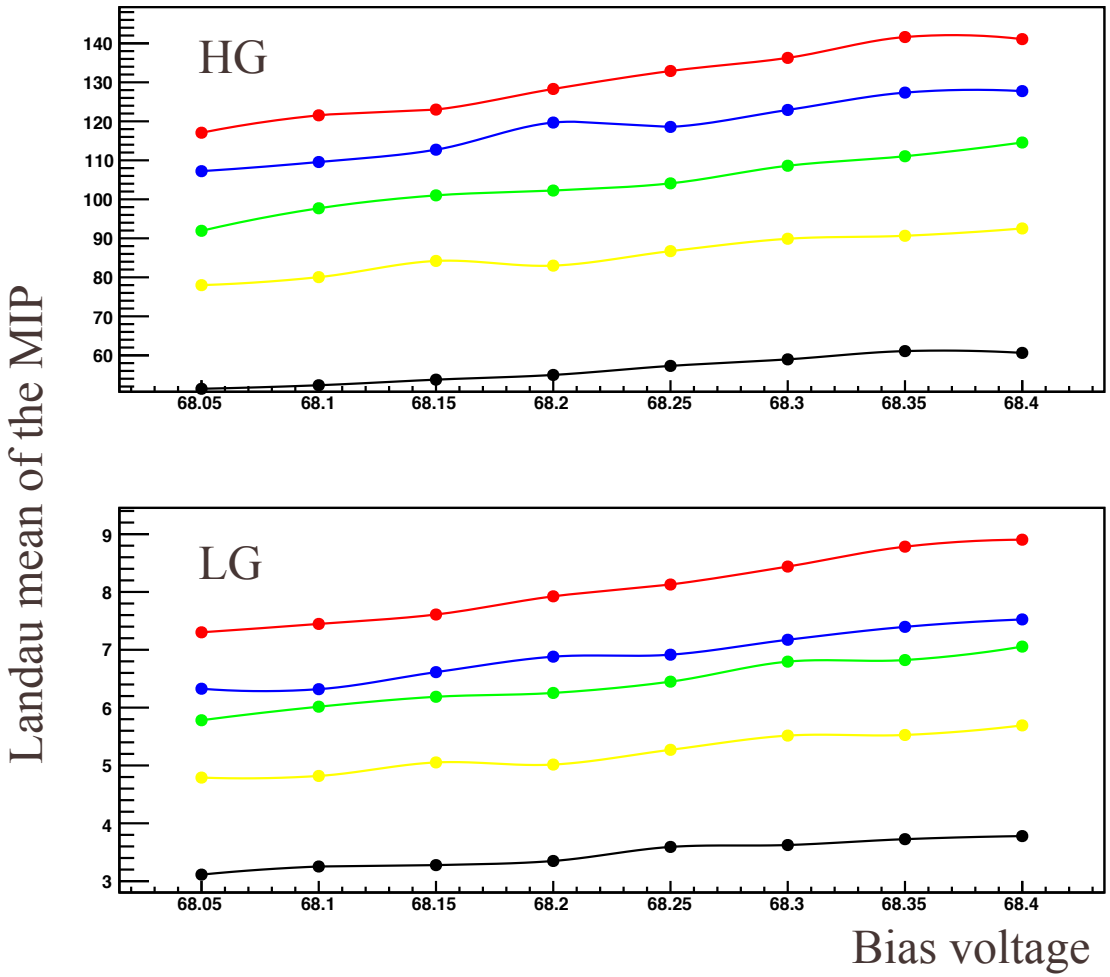
We operated all the SIPMs at bias voltage -68.2V for both the towers.

Bias scan

- SIPMs have slight variation of the operating voltage (68-68.4V).
- All 5 SIPMs are at same voltage.



Landau mean vs bias voltage



Tile 0
Tile 1
Tile 2
Tile 3
Tile 4

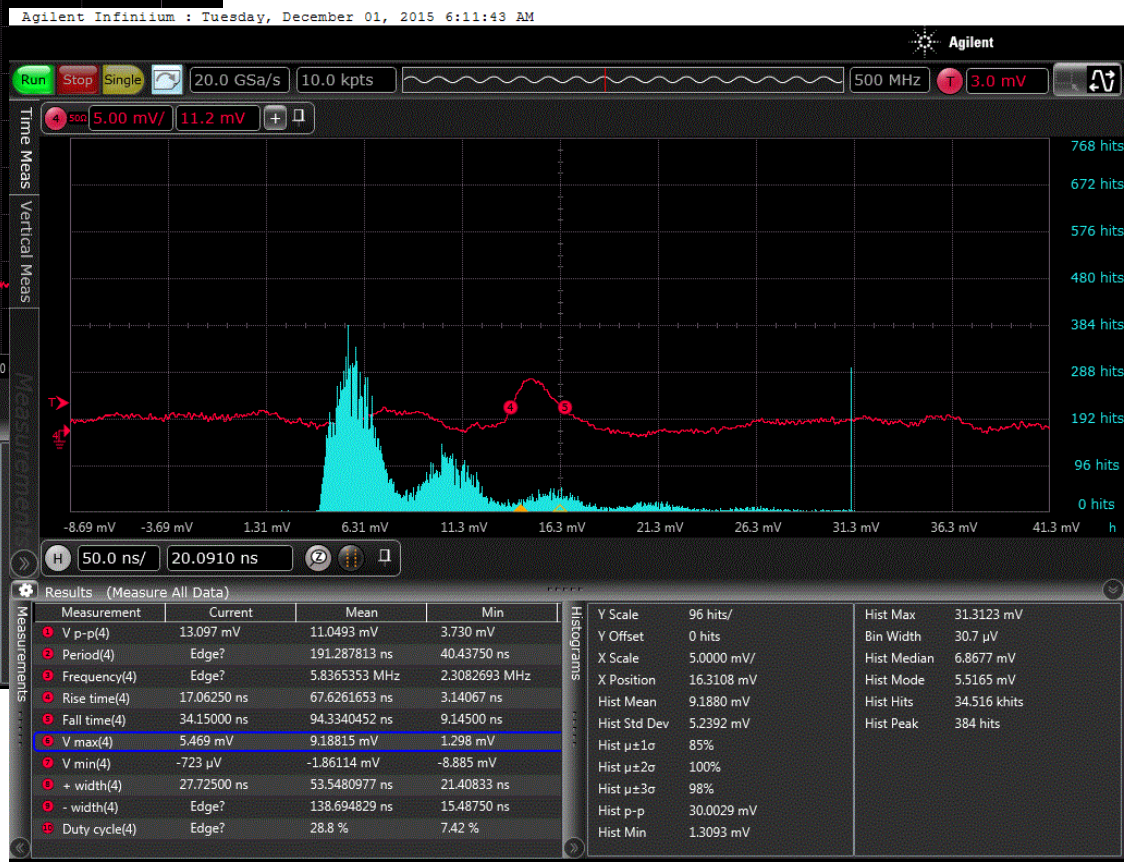
What about the single pixel peaks?

Higher signal as expected but similar trend across the tiles.

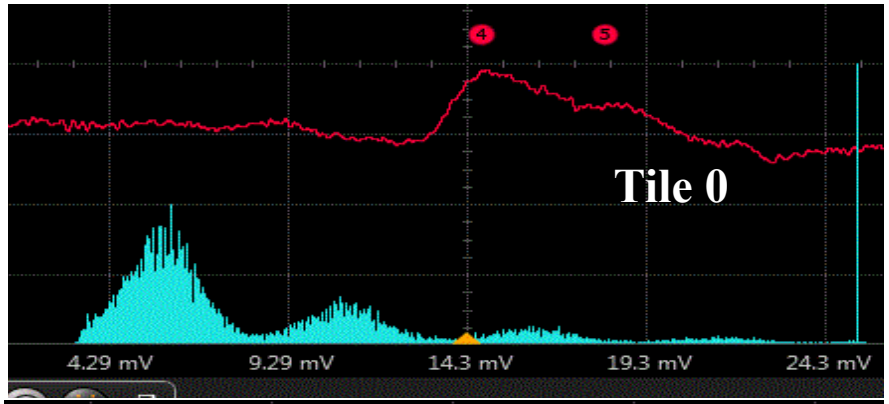
Single Pixel peaks

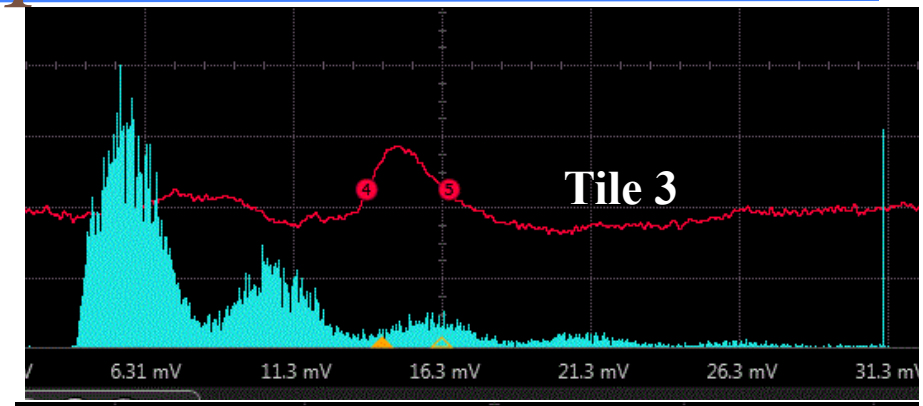
Self trigger (noise)

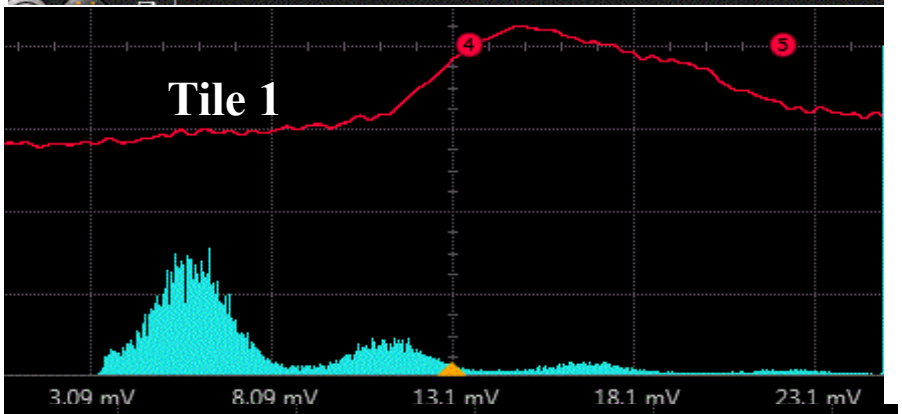
Bias at 70V instead of 68.2V

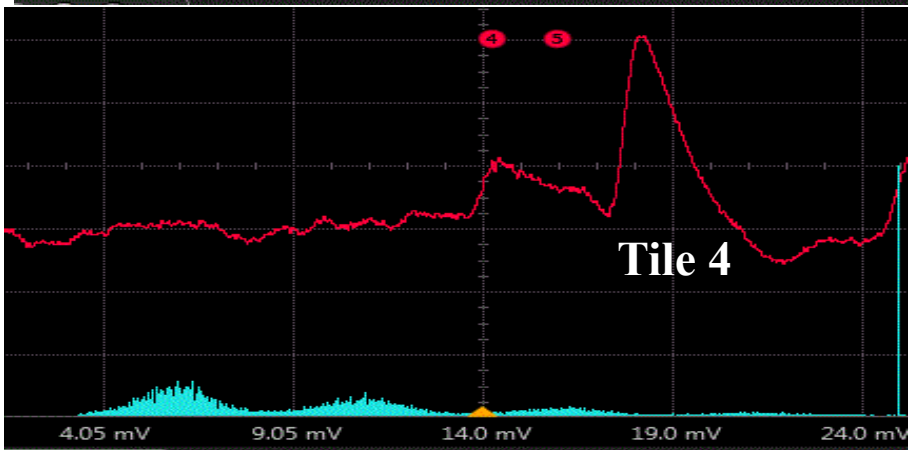


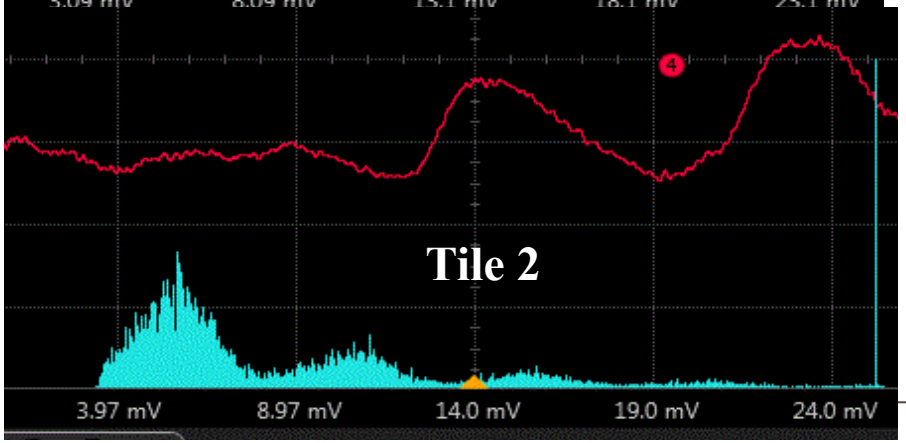
Pixel peaks







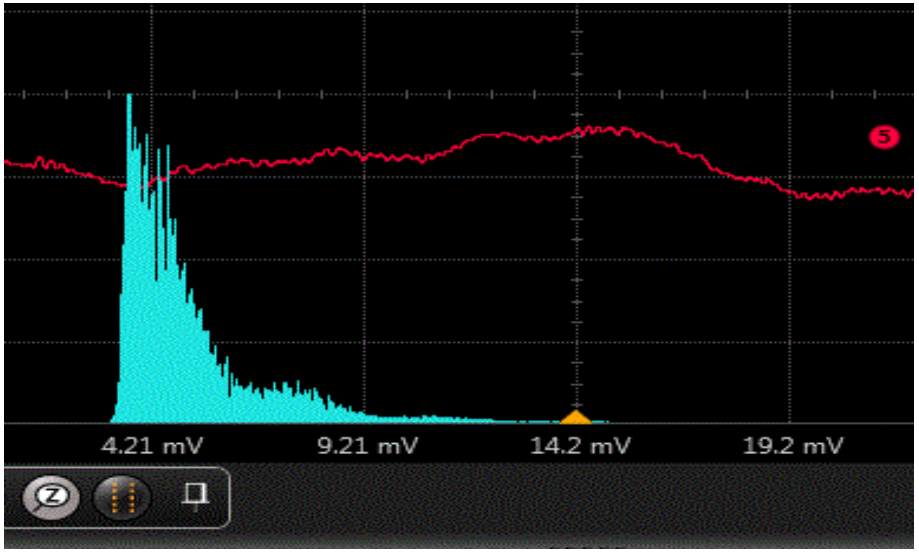




All at 70V.
1 Pixel ~ 5mV for all the tiles.
Consistent with each other.

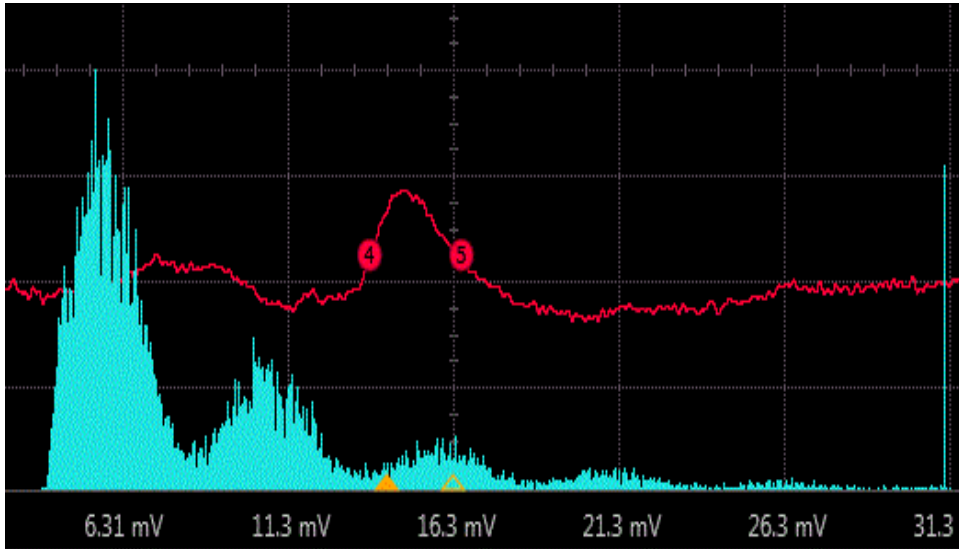
Pixel peaks at lower voltage?

Tile 3: Bias voltage 68.2V, cosmic setting



Accumulation time: 12 hours

Tile 3: Bias voltage 70V

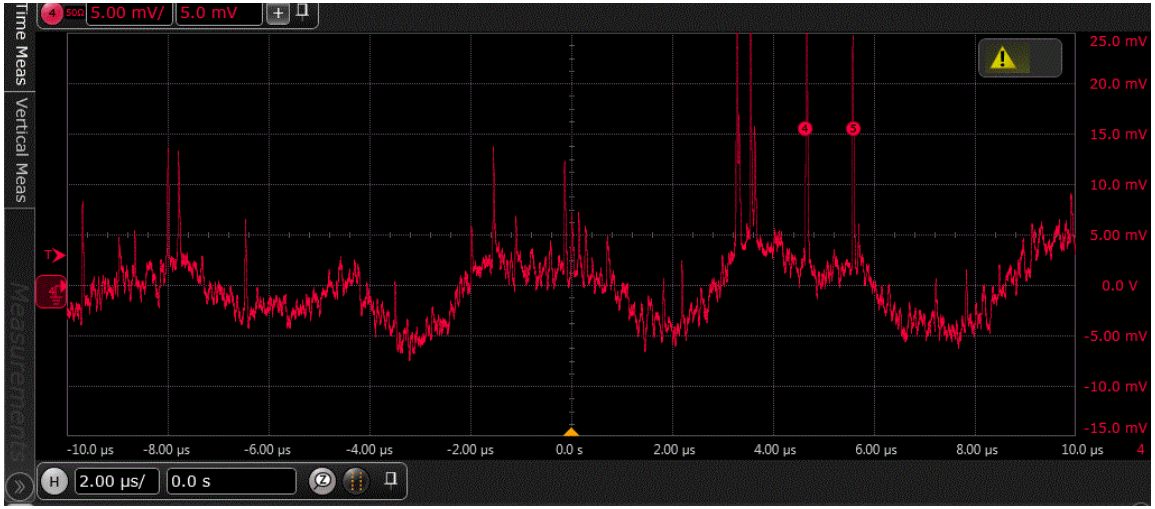


Accumulation time: 30 mins

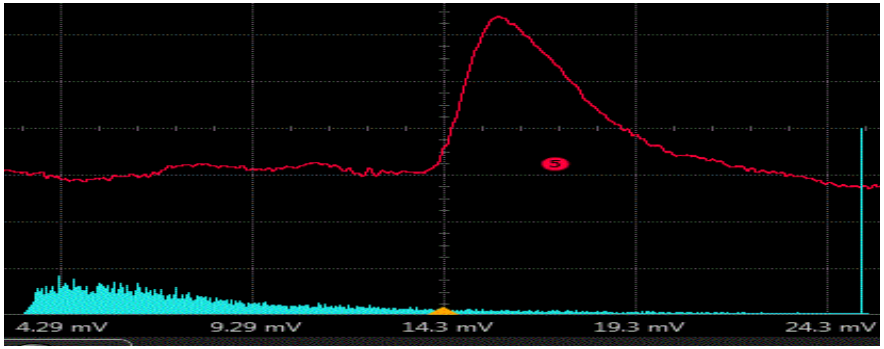
Harder to get the pixel peaks at operating voltage. What can we do?

Pedestal fluctuations

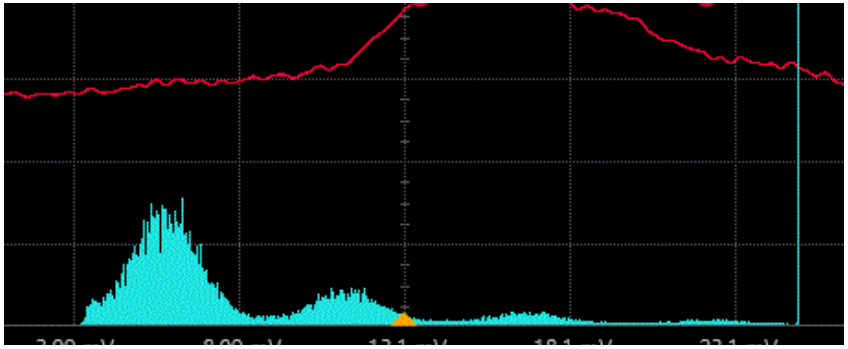
We lost pixel peaks because of large pedestal flactuations. I think they are mostly because of bad connections.



Tile 1



Tile 1: After changing preamp



Summary and to-do

- Investigate more on the signal from big tiles.
- Add the missing control software and add bias voltage and temperature to the PRDF.