2008 ECAL Calibration

Hengne Li

LAL Orsay
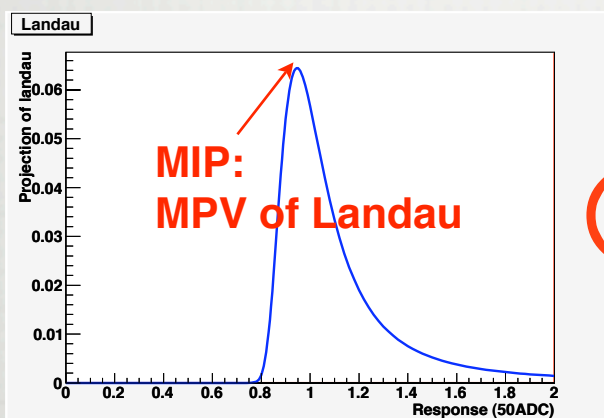
Introductory Remarks
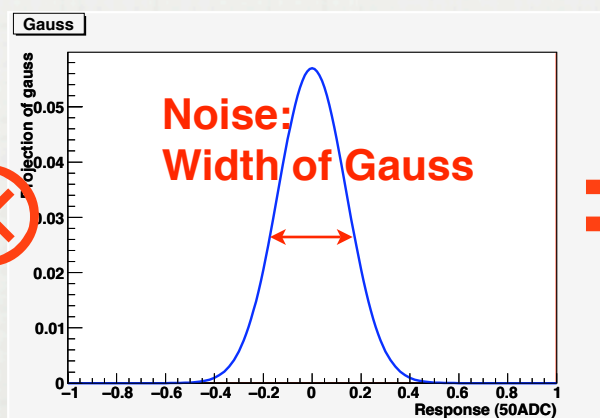
MIP Calibration of ECAL:

    Find out the minimal energy deposition of each cell, e.g. 1MIP=?ADCs, and apply it as the energy unit
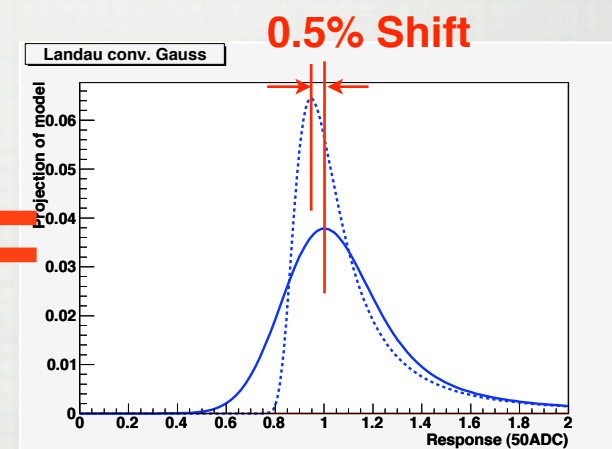
Fitting Method:

    Convolution of Landau and Gaussian*

Landau:
Energy Loss Spectrum

Gaussian:
Uncertainty of the Detector Response

Final Spectrum:
From Data

**Thanks to the Previous Contributions from:**

    Goetz Gaycken, Marcel Reinhard

*Refer to: Goetz Gaycken: "Calibration of the Calice ECAL Prototype"
http://polywww.in2p3.fr/~gaycken/Calice/Notes/CalibrationNote.ps.gz

Hold Value vs. Calibration Constants

- Hold Value
  - The time to read the analog signal after the trigger opened the DAQ gate, in the unit of tick, 1 tick=6.25 ns
  - The correct hold value should be the one that on the peak of the analog signal
  - Different triggers may have different delays to open the daq gate, so the hold value should be adjusted for different triggers

For illustration

P. Dauncey

- Situation at FNAL
  - The Cerenkov Trigger comes too late that the signal peak has already passed.
  - We do calibration runs off-peak

- Solution
  - For each trigger/hold setup, determine a group of calibration constants from muon runs, and apply them to the data with the same trigger /hold setup
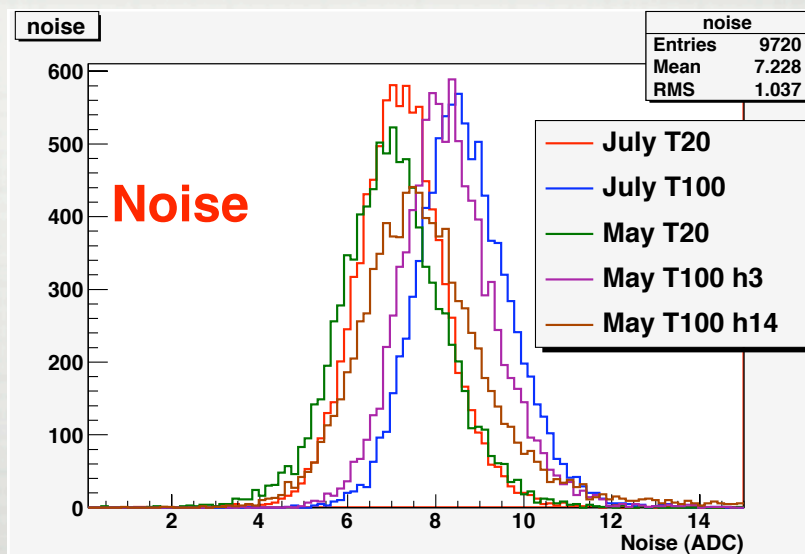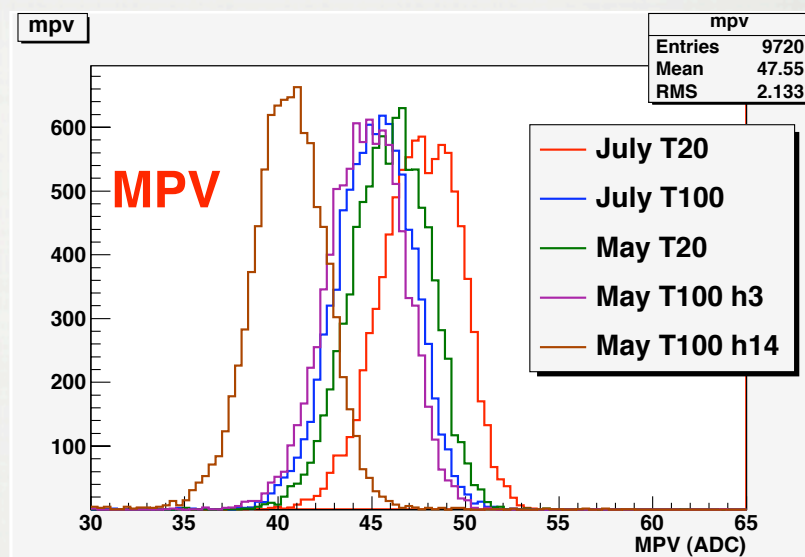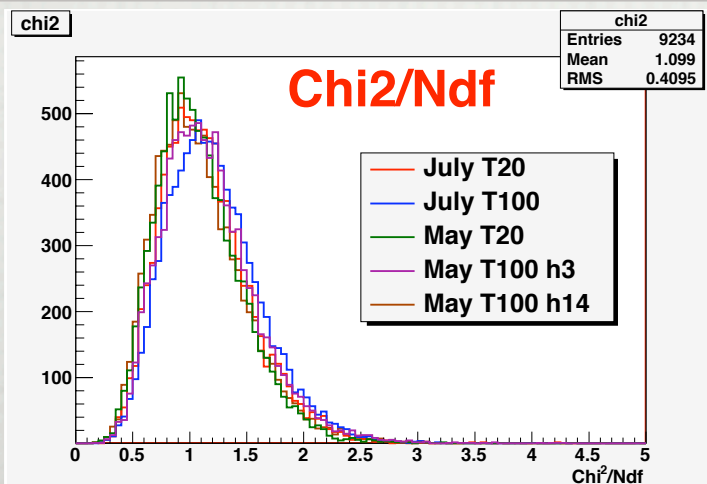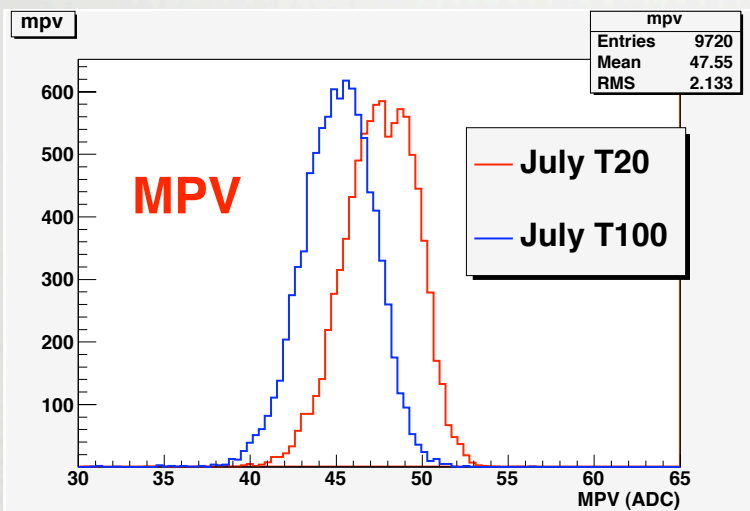 - Validity can be confirmed by pion runs

R. Poeschl

Hold Scan Result
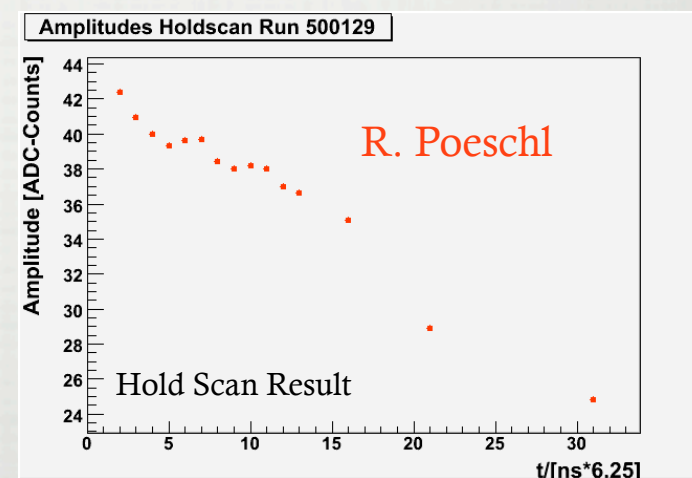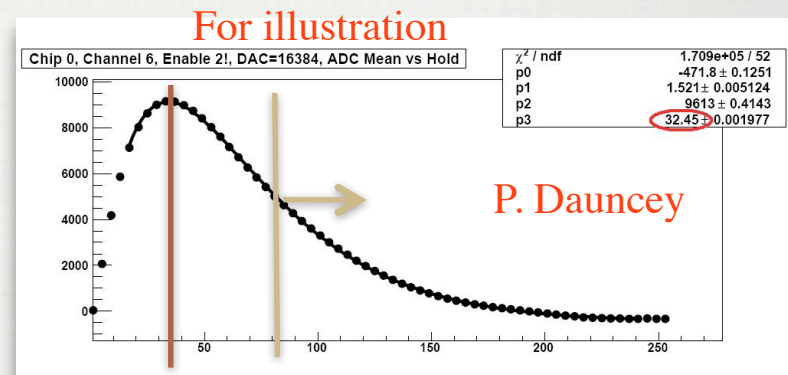
Data List

MAY

Trigger	Statistics of Each Cell
20x20 hold=13	~600
100x100 hold=3	~1000
100x100 hold=14	~600

JULY

Trigger	Statistics of Each Cell
20x20 hold=2 ?	~1100
100x100 hold=2 ?	~1000

mpv

mpv	
Entries	9720
Mean	47.55
RMS	2.133

MPV

- July T20
- July T100
- May T20
- May T100 h3
- May T100 h14

MPV (ADC)

chi2

chi2	
Entries	9234
Mean	1.099
RMS	0.4095

Chi2/Ndf

- July T20
- July T100
- May T20
- May T100 h3
- May T100 h14

Chi^2/Ndf

noise

noise	
Entries	9720
Mean	7.228
RMS	1.037

Noise

- July T20
- July T100
- May T20
- May T100 h3
- May T100 h14

Noise (ADC)

Results (I): July T20 vs. T100

MPV

Smaller MPV goes with Larger Noise

Noise

For illustration

Chip 0, Channel 6, Enable 2!, DAC=16384, ADC Mean vs Hold

	χ^2 / ndf	1.709e+05 / 52
p0		-471.8 ± 0.1251
p1		1.521 ± 0.005124
p2		9613 ± 0.4143
p3		32.45 ± 0.001977

T20 Hold

T100 Hold

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T20 Gate Open

T100 Gate Open
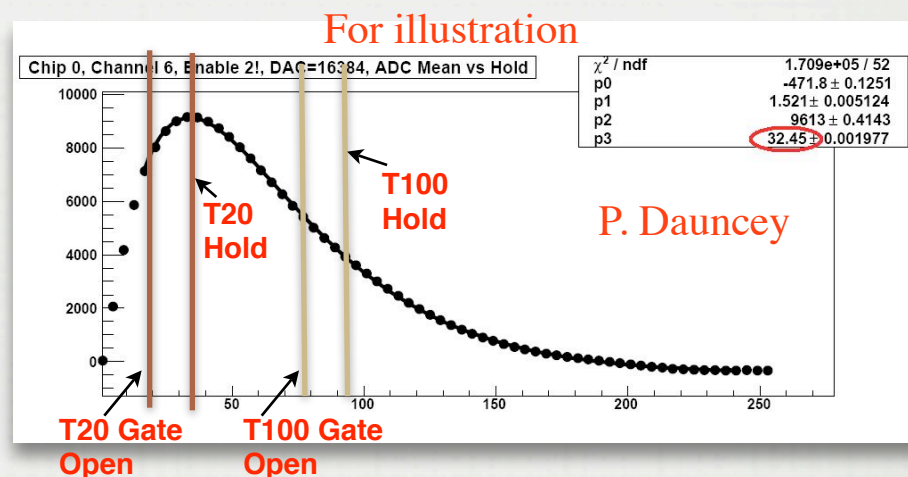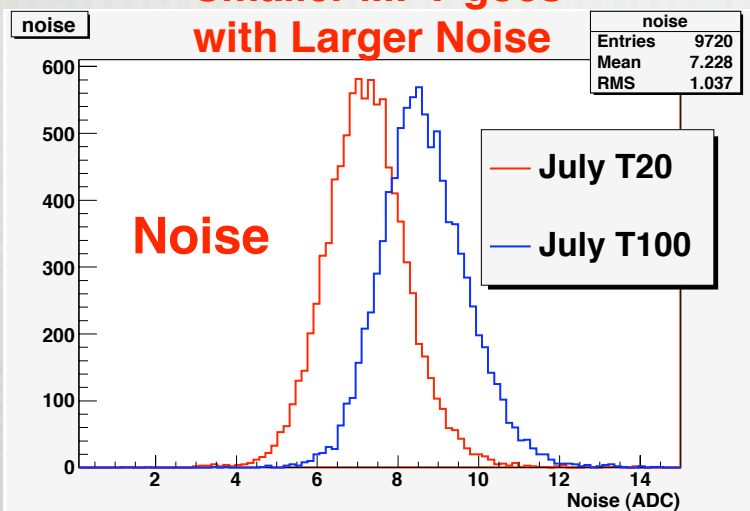
	MPV (ADC)	Noise (ADC)	S/N
July T20 h=2 ?	**47.89 ± 0.03**	**7.18 ± 0.01**	**6.7**
July T100 h=2 ?	**45.20 ± 0.02**	**8.54 ± 0.02**	**5.3**

Assume T20 July hold on-peak, while T100 July hold off-peak.
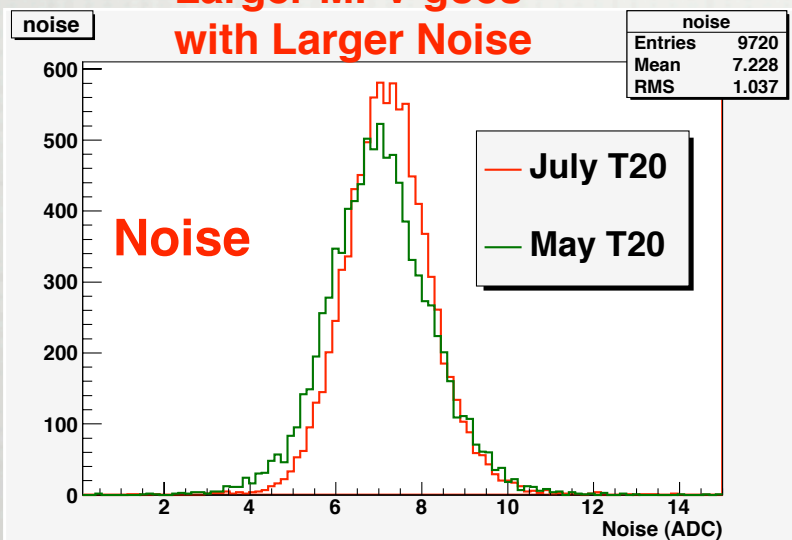
It was believed that, holding off-peak introduced larger noise, due to the jitter fluctuation
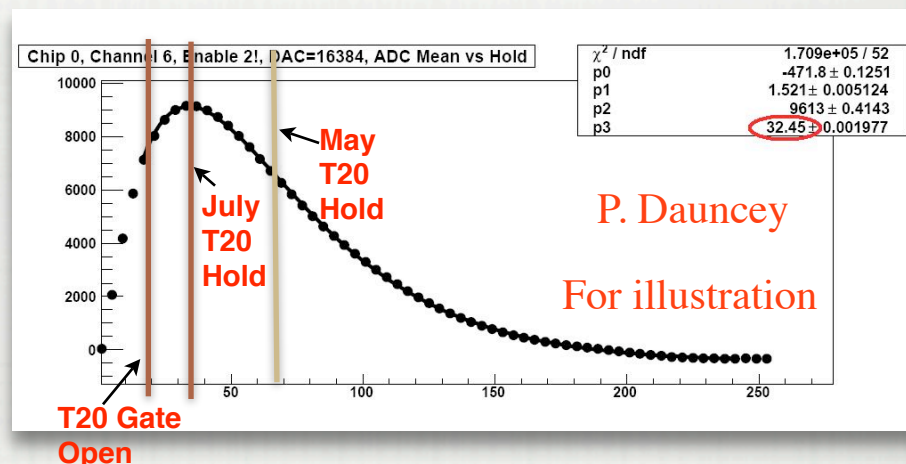
BUT, is the jitter noise that large??

Results (II): July T20 vs. May T20

MPV
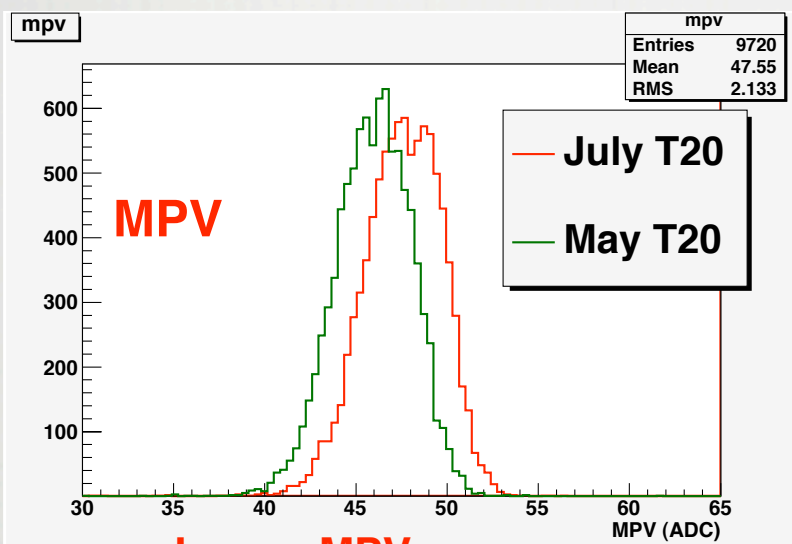
Larger MPV goes with Larger Noise

Noise

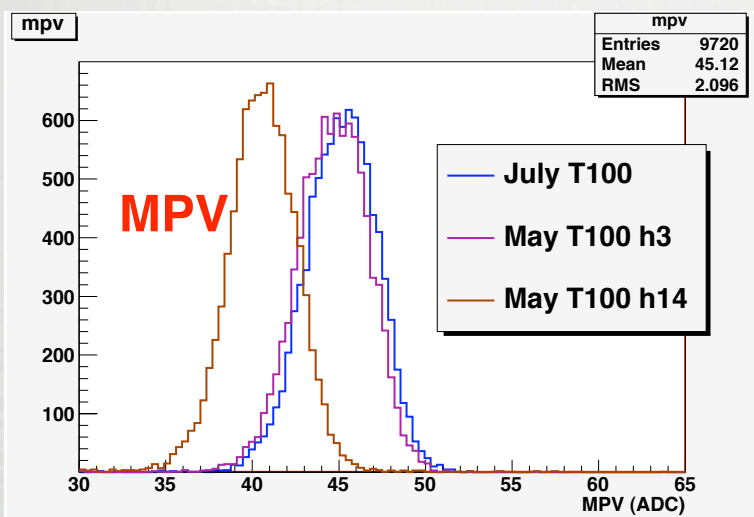|	MPV (ADC)	Noise (ADC)	S/N
July T20 h=2	**47.89 ± 0.03**	**7.18 ± 0.01**	**6.7**
May T20 h=13	**46.12 ± 0.02**	**6.99 ± 0.01**	**6.6**

P. Dauncey

For illustration

For the two groups of T20 muon runs, except the hold value, all the other setups are the same.
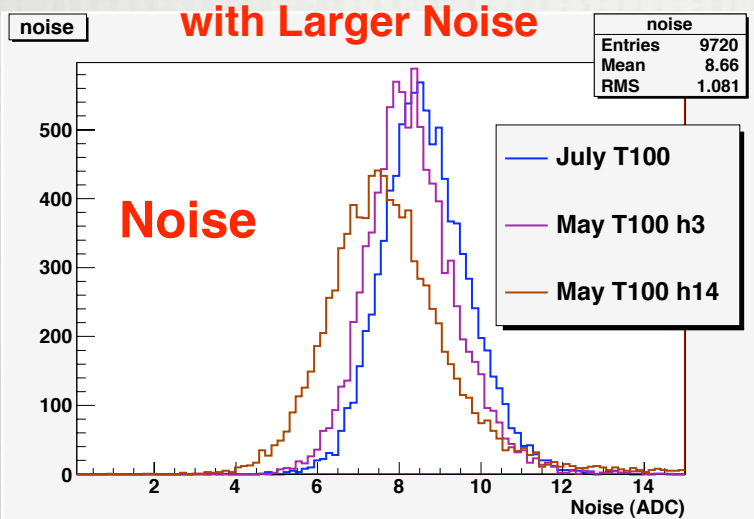
The evidence argues the explanation showed in the previous slide.

Preliminary Conclusion: Holding off-peak may NOT introduce large noise, jitter noise is not that large.
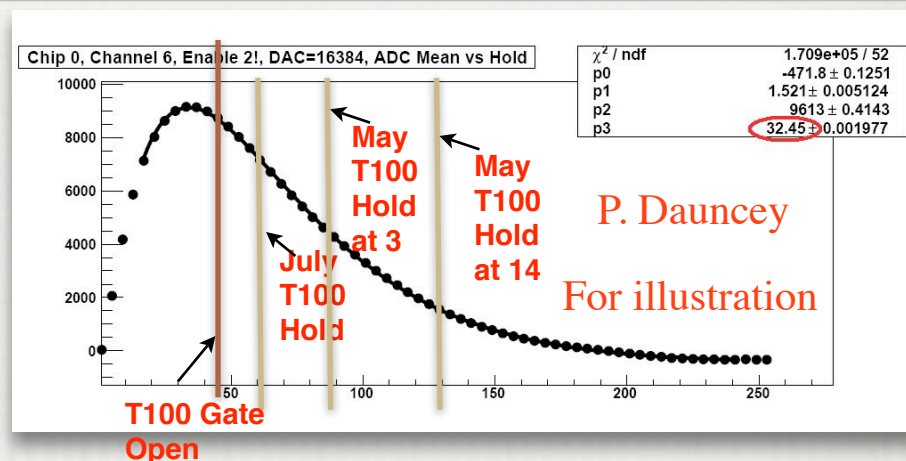
Results (III): July T100 vs. May T100s

MPV

Larger MPV goes with Larger Noise

Noise

	MPV (ADC)	Noise (ADC)	S/N
July T100 h=2	**45.20 ± 0.02**	**8.54 ± 0.02**	**5.3**
May T100 h=3	**44.74 ± 0.02**	**8.18 ± 0.01**	**5.5**
May T100 h=14	**40.63 ± 0.02**	**7.54 ± 0.02**	**5.4**

Similar situation happens for T100s, confirmed what happened in T20s

So, There must have other noise sources than the off-peak reason, that make the T100 noise larger than that of T20

Discussions About the Hold Issue

**NEED TO HAVE A PROFOUND STUDY TO UNDERSTAND THIS ISSUE!**

☐ To confirm what observed in slide 6 and 7:

   ☐ Hold scan analysis: not only the signal amplitude vs. hold value, but also the noise vs. hold value

☐ To confirm the noise measurements are correct:

   ☐ Is the noise measured from the convolution fitting is the same as measured from the pedestals?

☐ If the inference above is correct:

   ☐ What is the real reason that makes the T100 S/N smaller than that of the T20?

To Do List..

- ☐ Fitting to get the Calibration Constants for several groups of muon runs is done, detailed adjustments is going on.

- ☐ Finding out which group of Calibration Constants should be apply to which data, is going on

  - ☐ Looking up the trigger setups for each data runs

  - ☐ Take pion runs to check the validity of application

- ☐ Need to understand the Hold issue

The End
Thanks!

Results (I)
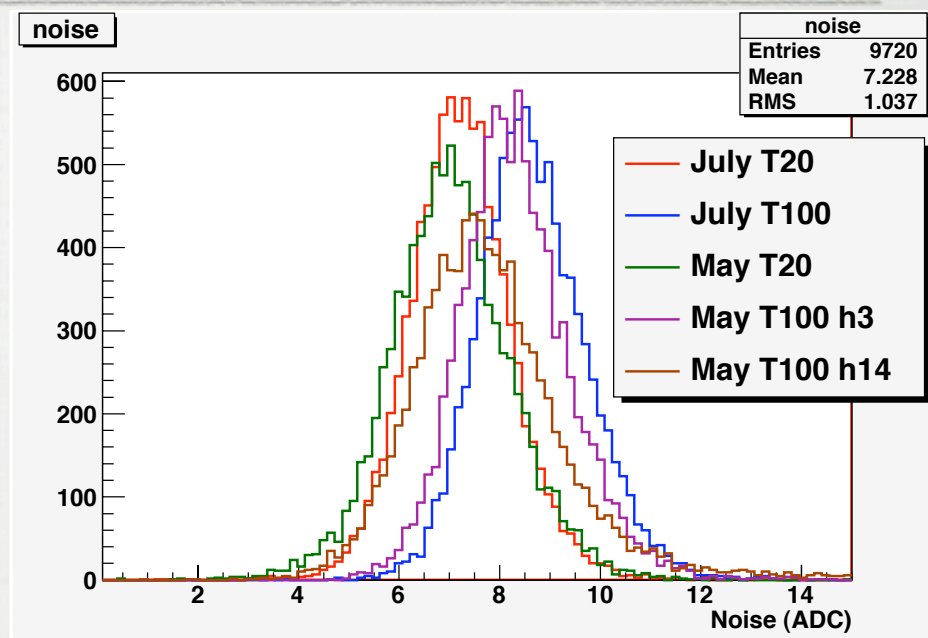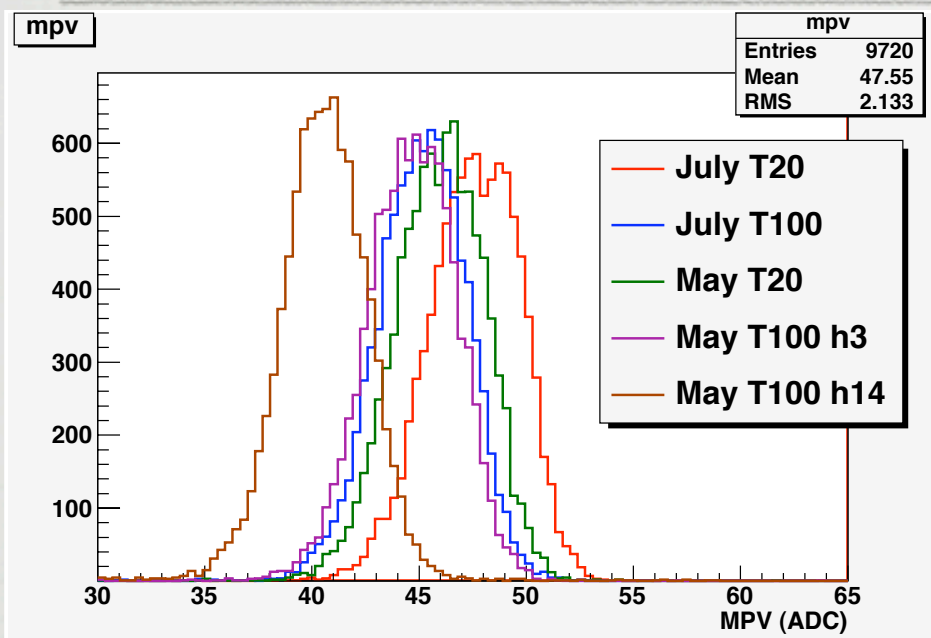
Results (I)
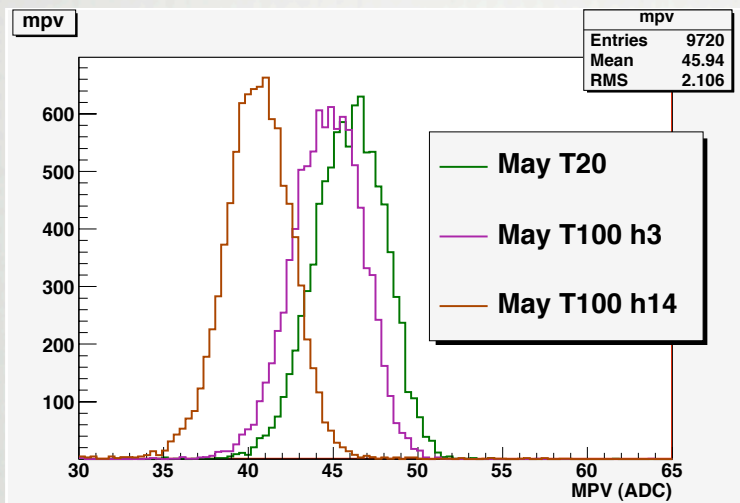
	MPV (ADC)	Noise (ADC)	S/N
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