EMCal LEDs Testing

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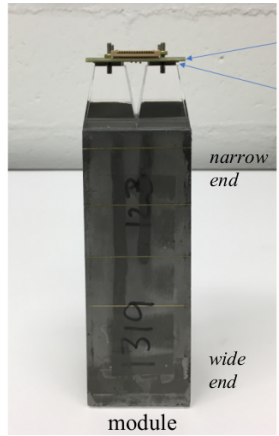
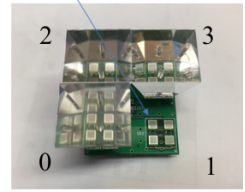
Introduction

- Each block has four towers (readout channels) with four SiPMs (Silicon Photomultipliers) each, resulting in a total of:
  - 24,576 readout channels
  - 98,304 SiPMs
  - 16.5 million fibers.
- There are 1,560 scintillating fibers extending along the length direction are embedded in the block.
- Each tower represents 1 ADC (Analog-to-digital converter) readout channel and is equipped with a light guide coupled to 4 SiPMs that collect the light from the fibers.



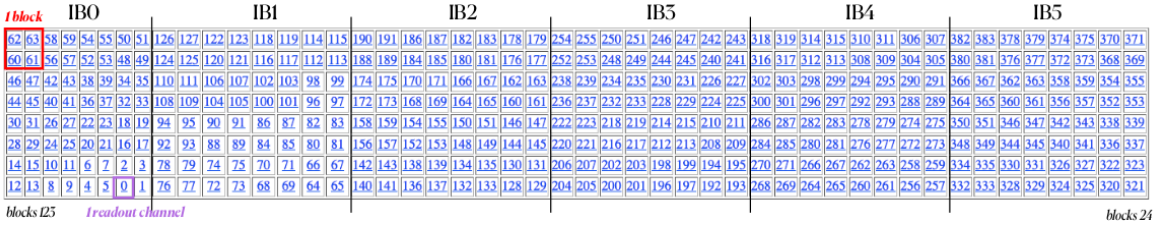
module



4 towers per block
with channel ordering

Readout Channels and Interface Board

- There are $96 \times 4 = 384$ distinctive ADC channels in each sector.
- No physical boundary between neighboring readout towers within a block.
- Channels are organized into groups of 64, each group (6 total) controlled by an interface board (IB).



LEDs Testing

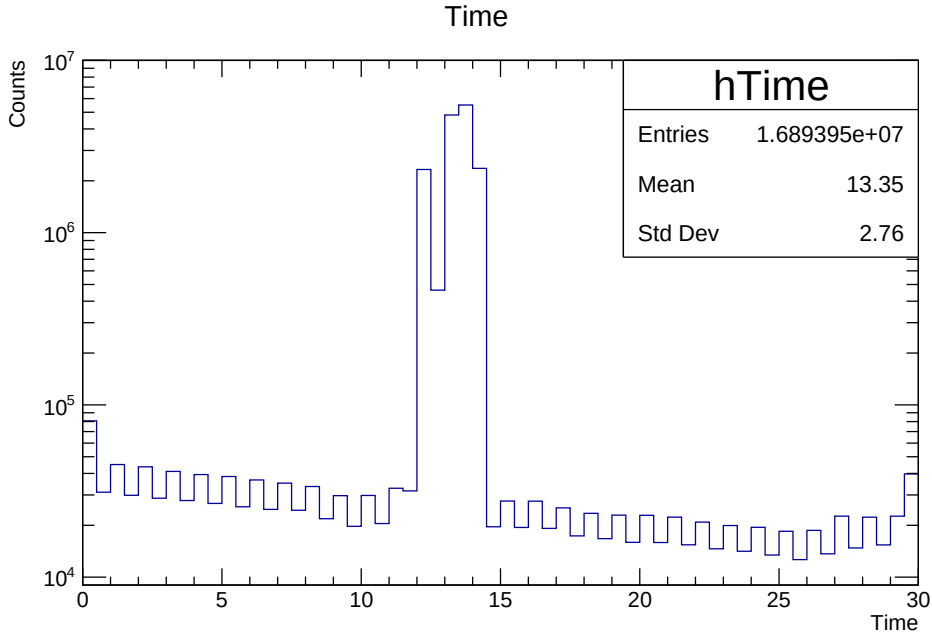
- Electronics to readout chain: Signal $\rightarrow$ SiPM $\rightarrow$ Readout.
- LED's go in place of "Signal".
- Test pulse circumvents the SiPM and goes directly to readout.
- Test pulses act as the ideal response whereas LEDs are used to measure the performance of the SiPMs.

Test Pulse Data

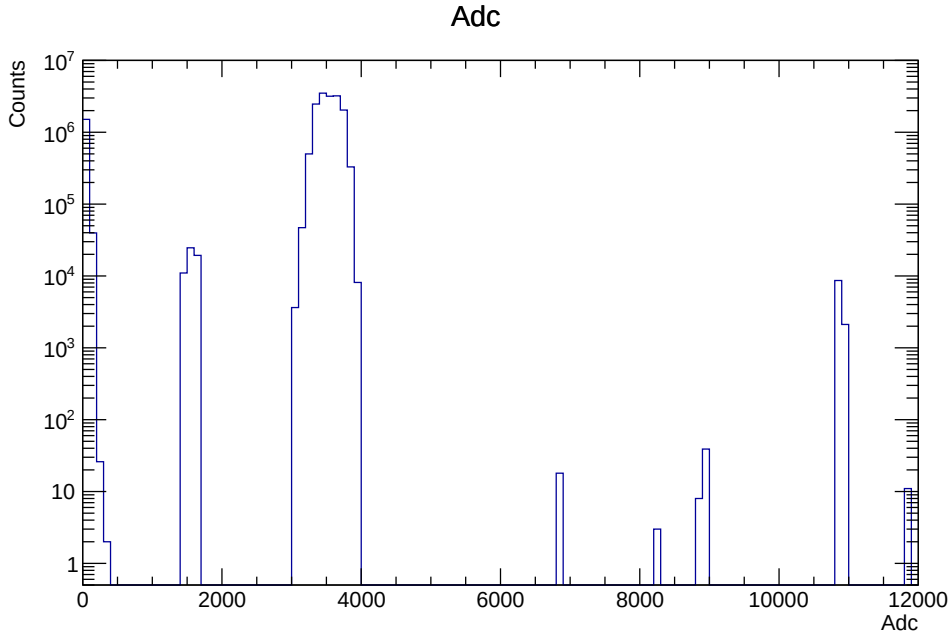
- Location:

  /sphenix/lustre01/sphnxpro/commissioning/emcal/calib/calib-00005027-0000.prdf
- Events: 10,999.
  - Each event contains data for time, adc, and pedestal for each channel.
- Currently data is only for 4 sectors.
- Total Channels: 1,536 = 4 sectors $\times$ 384 channels per sector.
  - Note: Event 0 has data for 1,152 channels and event 1 has data for 1,408 channels.
  - Remaining events have data for 1,536 channels.
- Packets: 6009 to 6016 (8 packets total).
- 1 sector = 2 packets, 1 packet = 3 IBs, 1 IB = 64 channels.

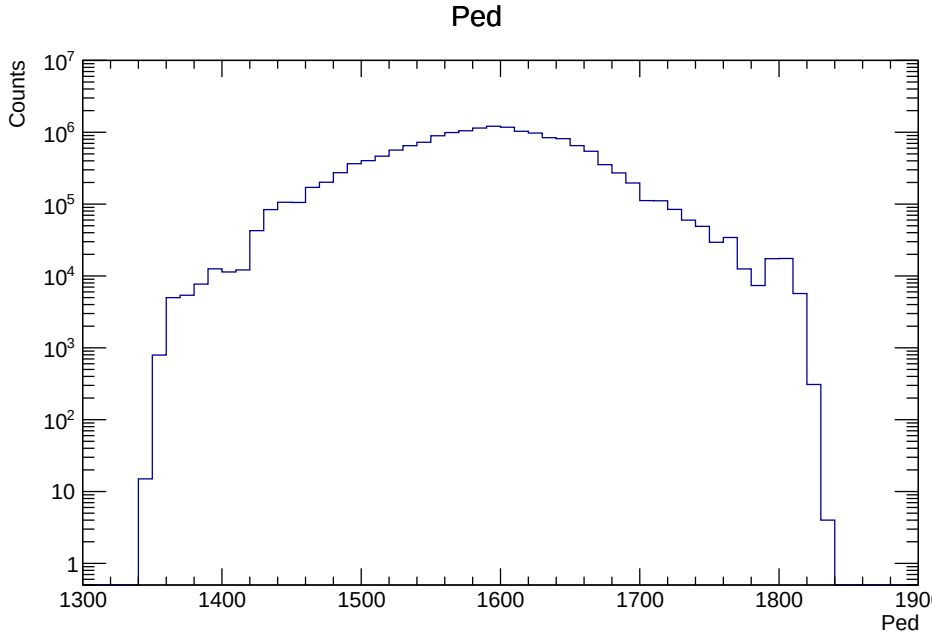
Time


Time
Counts
10^7
10^6
10^5
10^4
0
5
10
15
20
25
30
Time
hTime
Entries 1.689395e+07
Mean 13.35
Std Dev 2.76

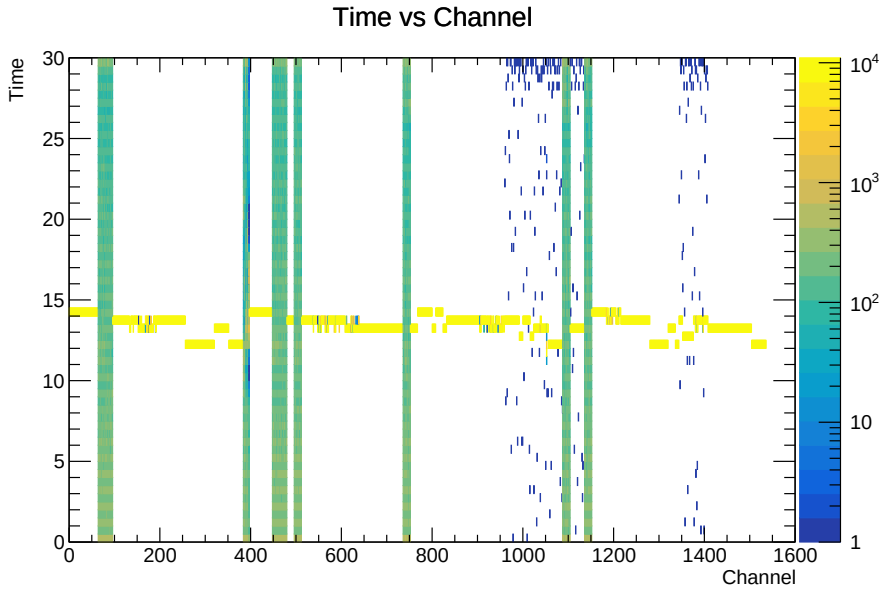
Adc


Adc
Counts
10^7
10^6
10^5
10^4
10^3
10^2
10
1
0
2000
4000
6000
8000
10000
12000
Adc

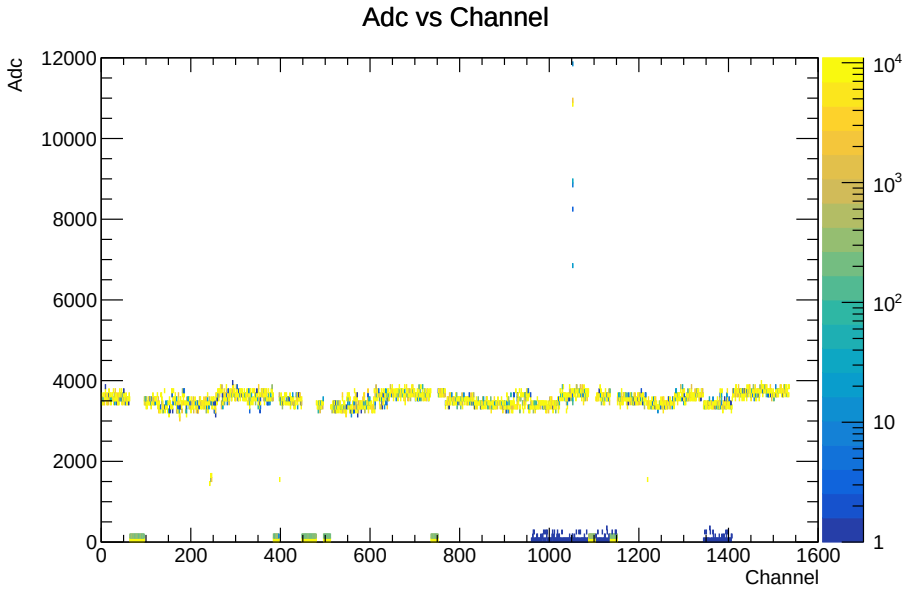
Pedestal


Ped
Counts
10^7
10^6
10^5
10^4
10^3
10^2
10
1
1300
1400
1500
1600
1700
1800
1900
Ped

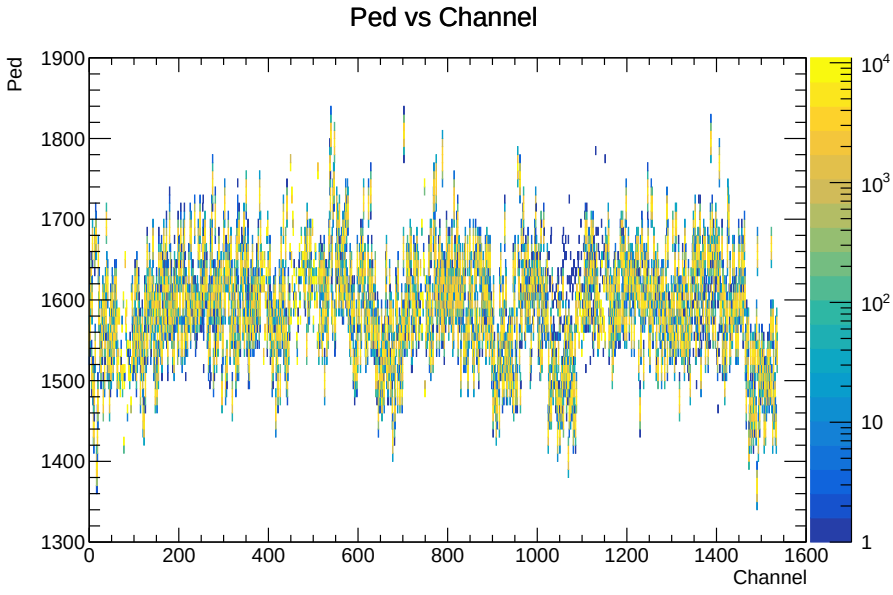
Time vs Channel



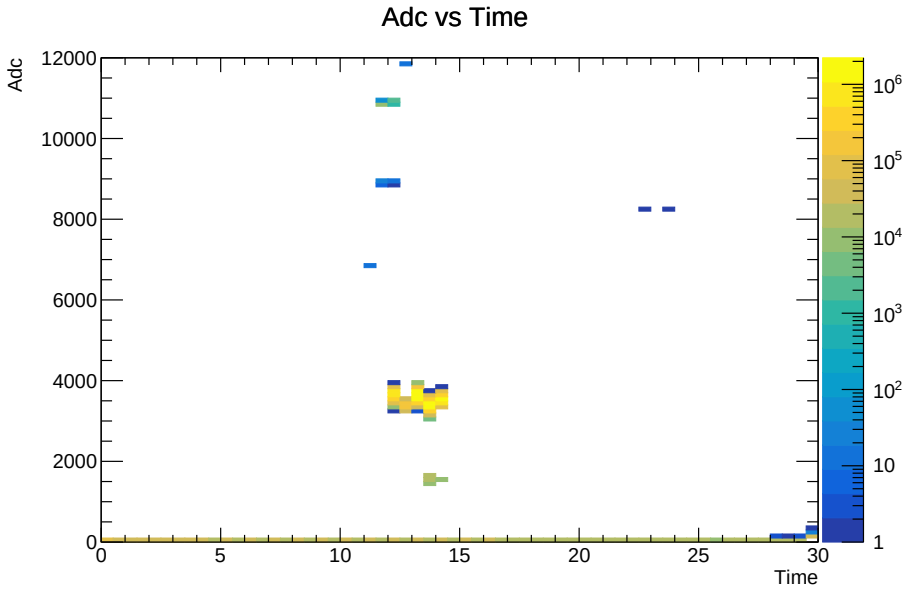
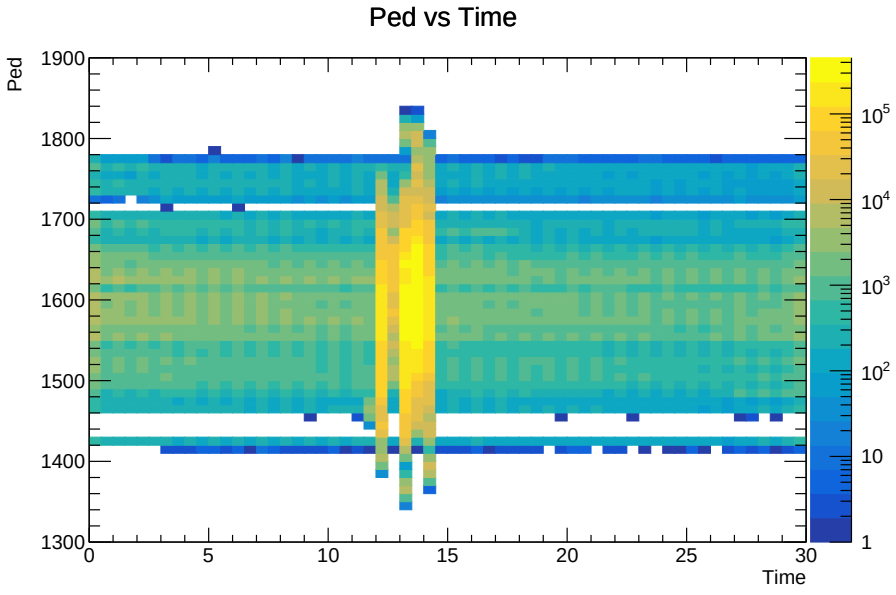
Adc vs Channel



Pedestal vs Channel



Adc vs Time


Adc vs Time
Adc
12000
10000
8000
6000
4000
2000
0
0
5
10
15
20
25
30
Time
10^6
10^5
10^4
10^3
10^2
10
1

Pedestal vs Time