

FCAL LED monitoring GlueX data

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introduction

- FCAL bad channel maps needed for efficiency from simulations
 - main issue: HV stability
- setup:
 - four acrylic panes each covering the upstream end of one quadrant
 - each pane is illuminated by forty LEDs, ten violet, ten blue, and twenty green
 - the different colors are used to study the wavelength dependence of the transmission
 - transmission of blue is sensitive to radiation damage which causes brownish color of lead glass
- usage:
 - during production running the FCAL LEDs are cycled through 6 configurations, each 10 minutes long and tied to the wall clock

| | | |
|------------|------|--------------------|
| Violet | 12 V | (00 to 09 minutes) |
| Blue | 10 V | (10 to 19 minutes) |
| Green | 29 V | (20 to 29 minutes) |
| Violet | 22 V | (30 to 39 minutes) |
| Blue | 15 V | (40 to 49 minutes) |
| No pulsing | | (50 to 59 minutes) |

- goal: efficiencies per run per detector channel
 - detector channels are called blocks (ref to shape of the lead glass detectors :)

bad channel maps needed for efficiency from simulations

known issues:

- sudden HV failure
 - loss of communication
 - hot channels
-
- LEDs are used to check the status of blocks
 - analyze **FCAL-LED skims**

plugin for histograms (hd root file) records ADC integrals per hit

```
ADCintegral per hit =  
  (digihit->pulse_integral) -  
  (((double)digihit->pedestal/digihit->nsamples_pedestal) * digihit->nsamples_integral);
```

Hit bank has associated block number, row, column.

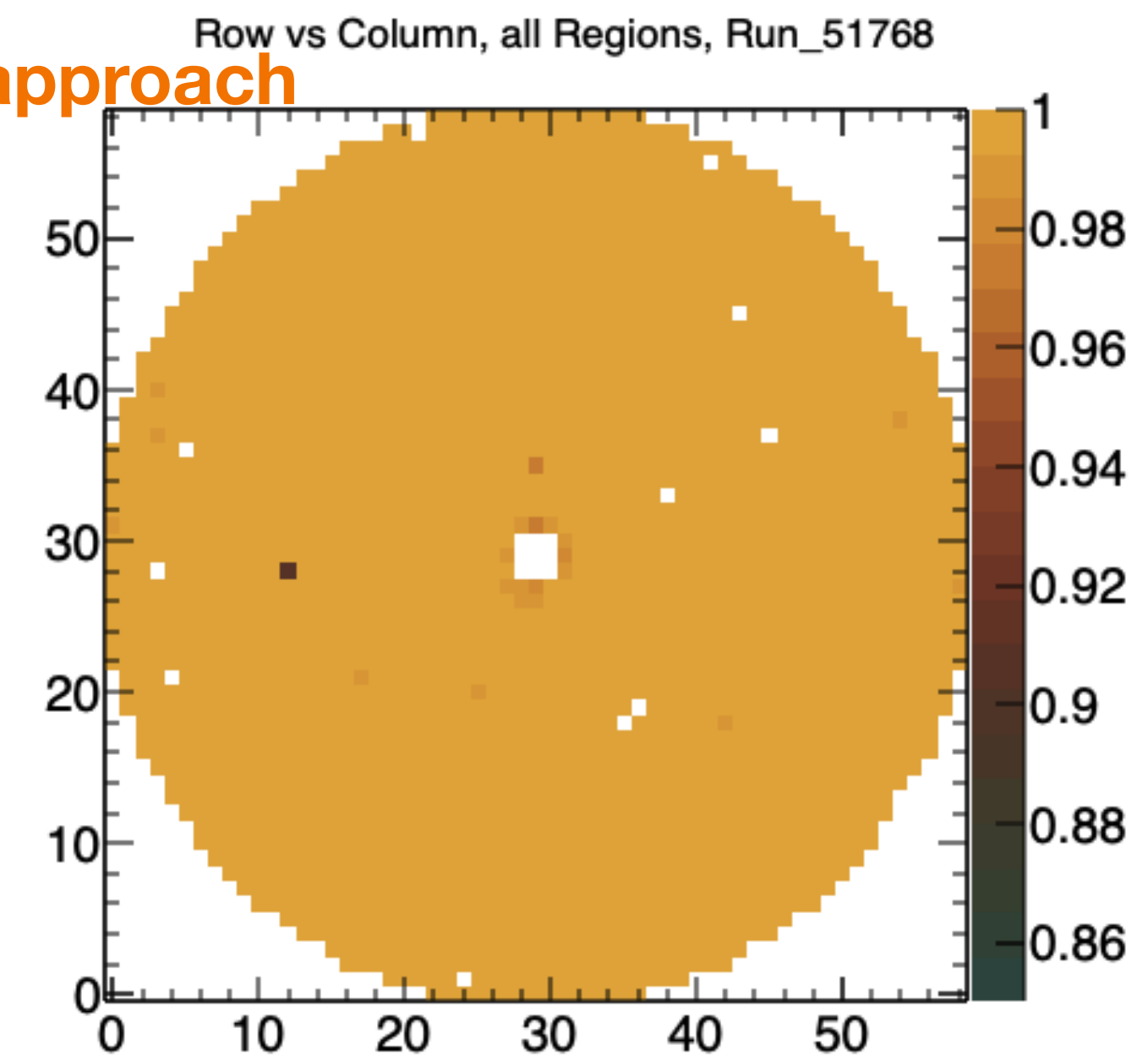
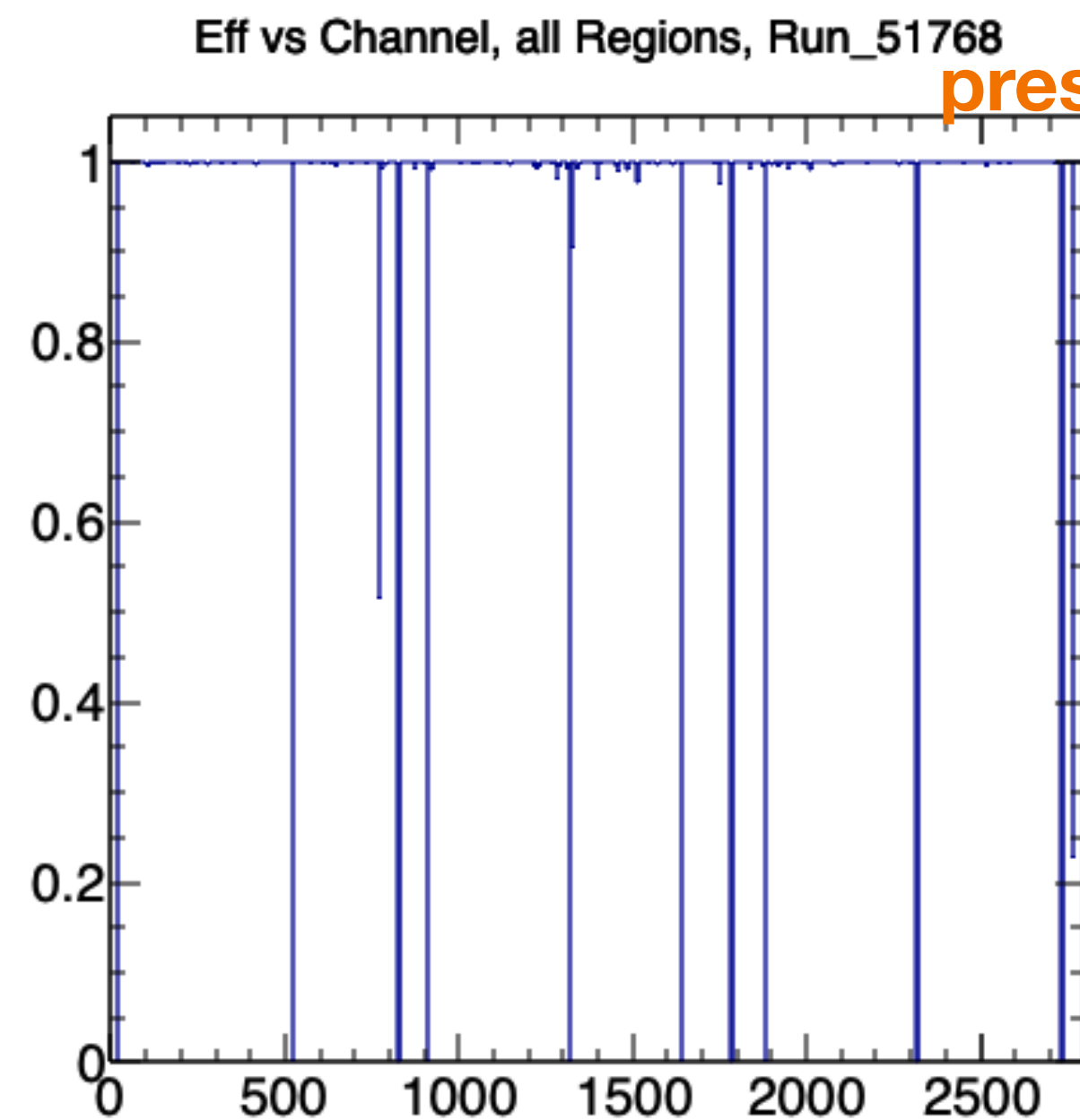
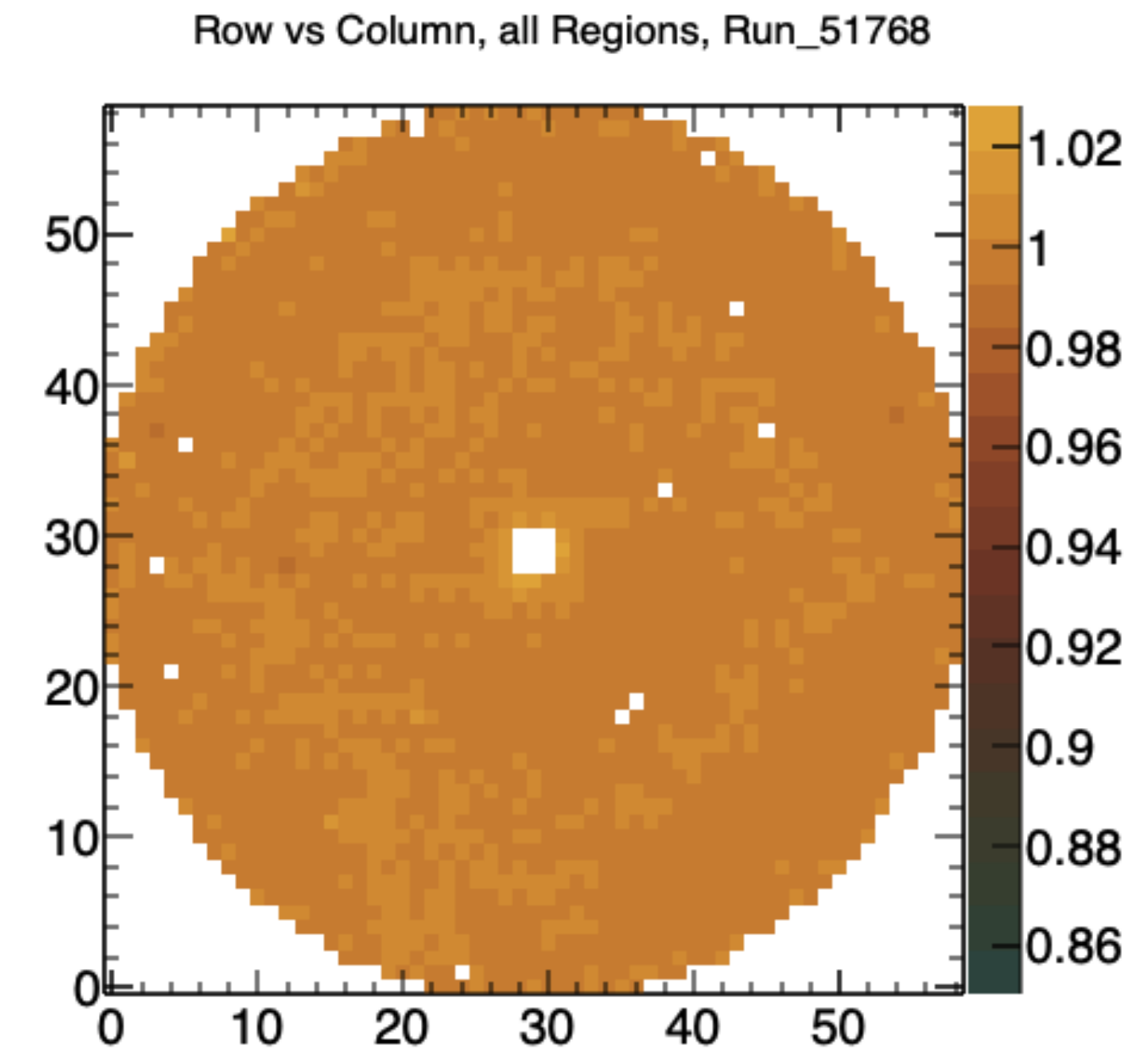
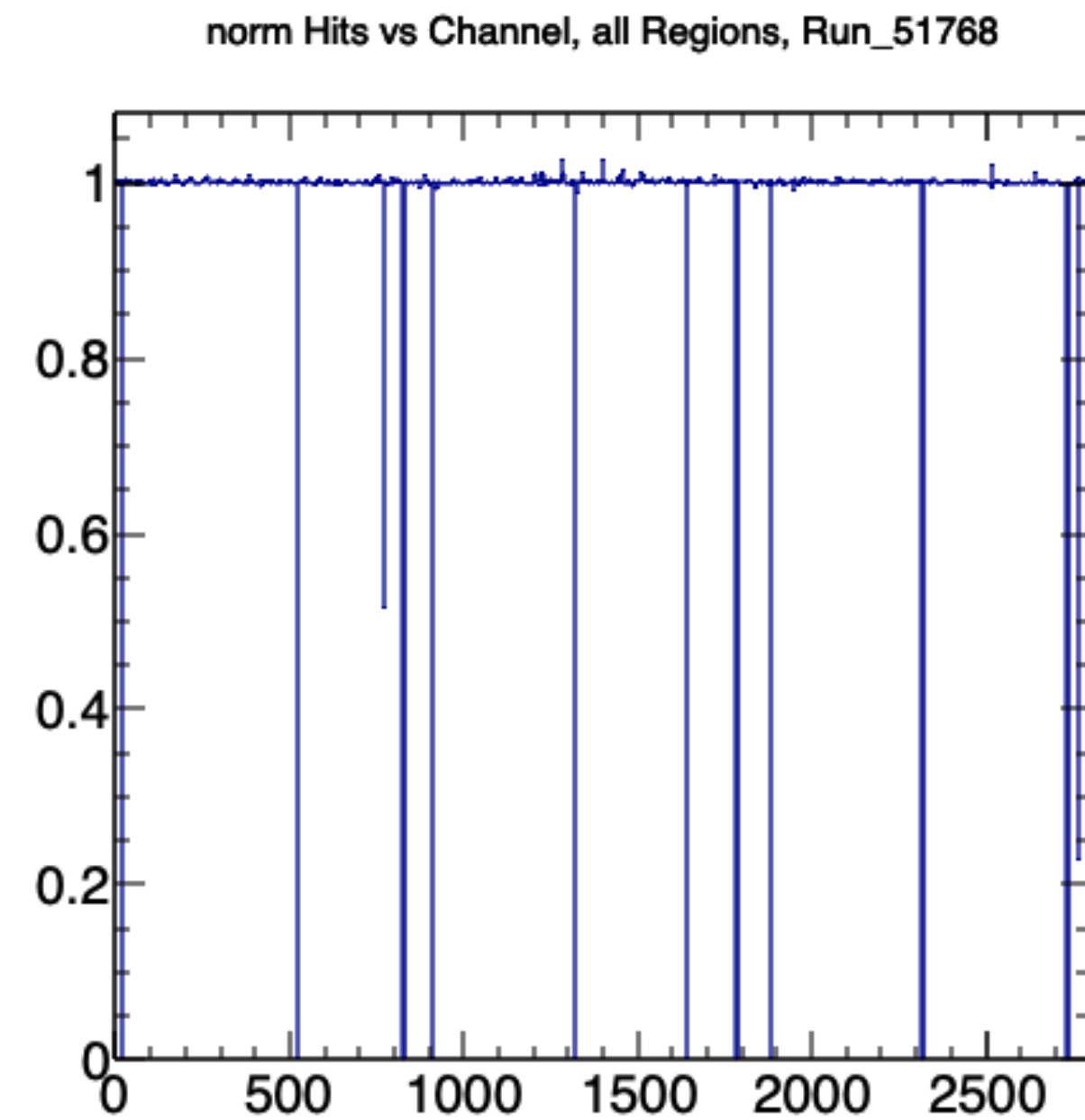
FCAL LED efficiency

- old approach:
 - Entries of normalized histograms (ADC integrals (pulses), per block)
 - Entries > 1 were later set to 1 \rightarrow “efficiency”
 - > 1 hits per block can result from double pulsing (at high rates) and switching noise

- present approach:**
 - increment Entries only once for blocks with 1 or more hits

\rightarrow **no more efficiencies > 1**

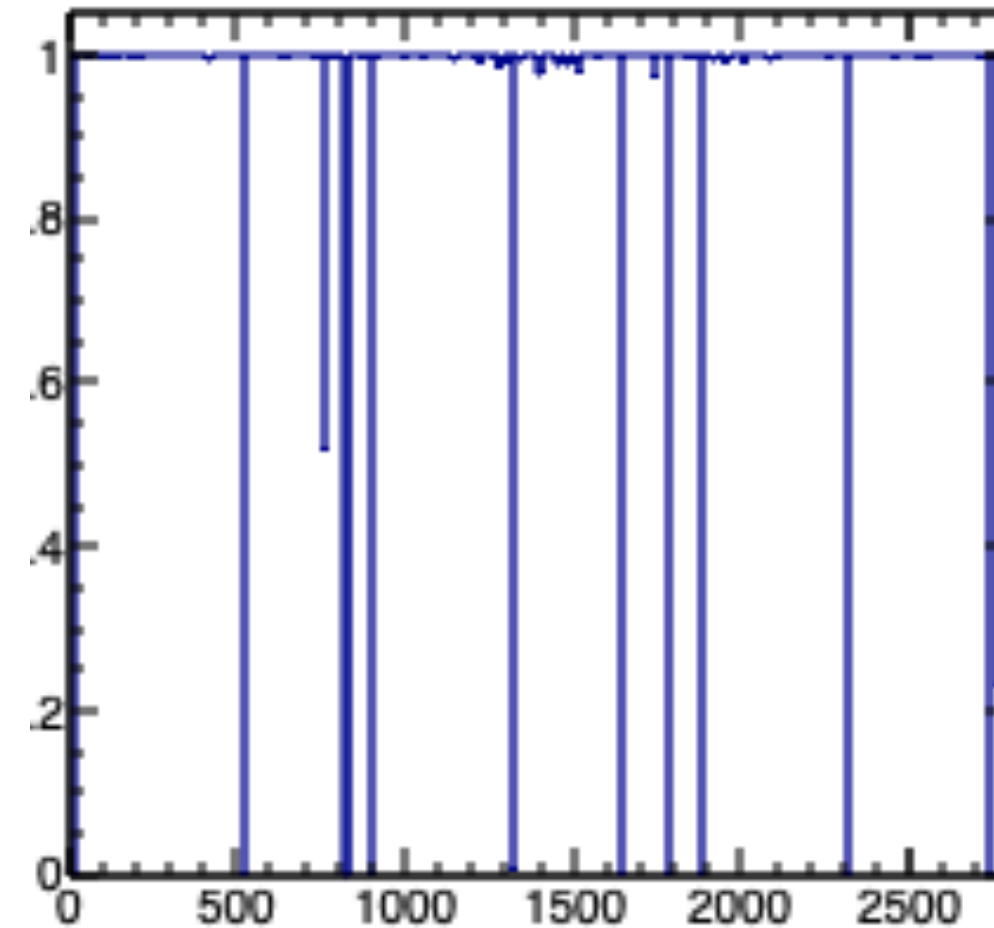
* all Regions means regardless of Regions



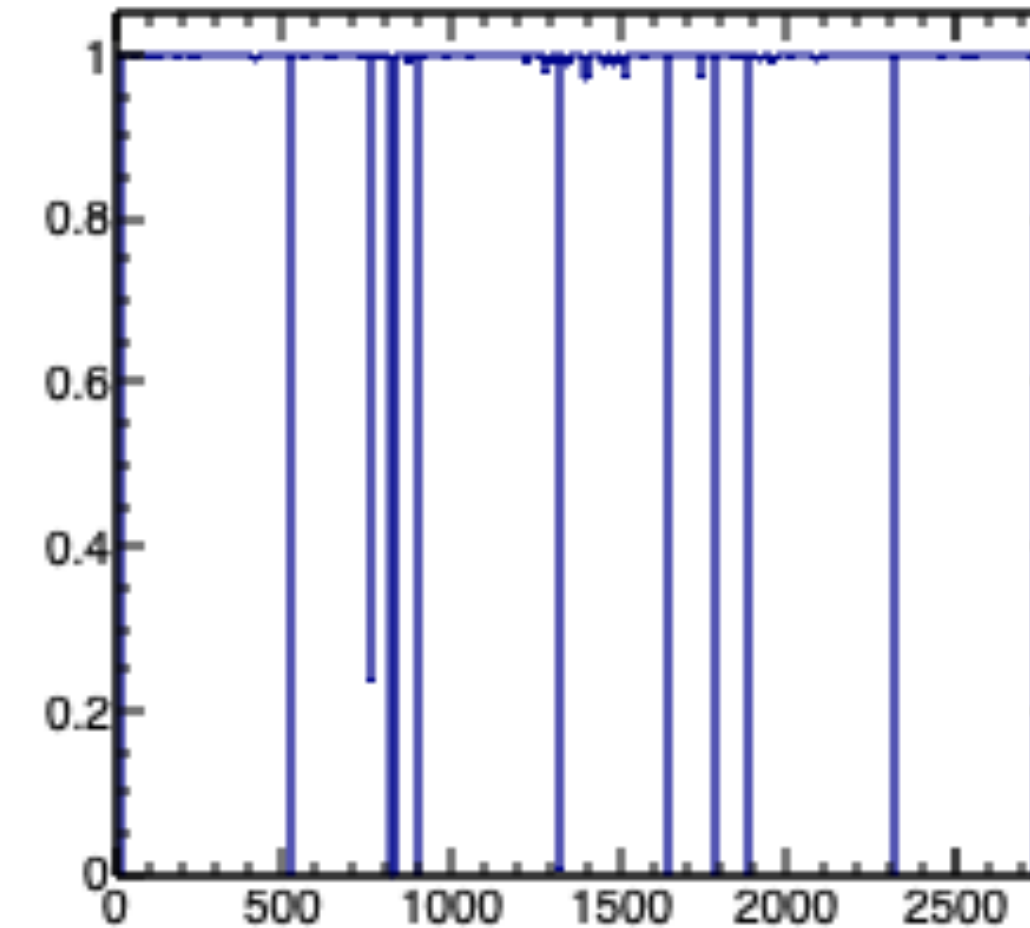
FCAL LED efficiency compare LED regions

overall efficiency

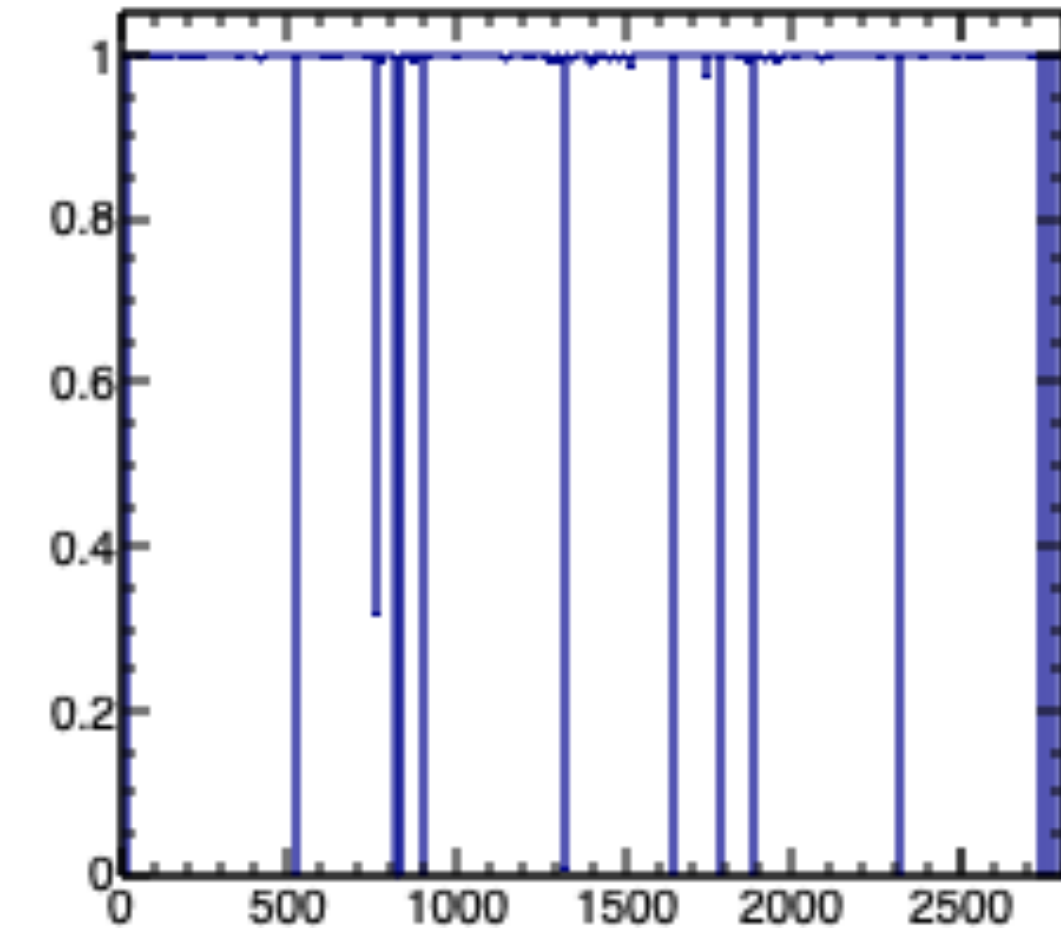
Eff vs Channel, all Regions, Run_51768



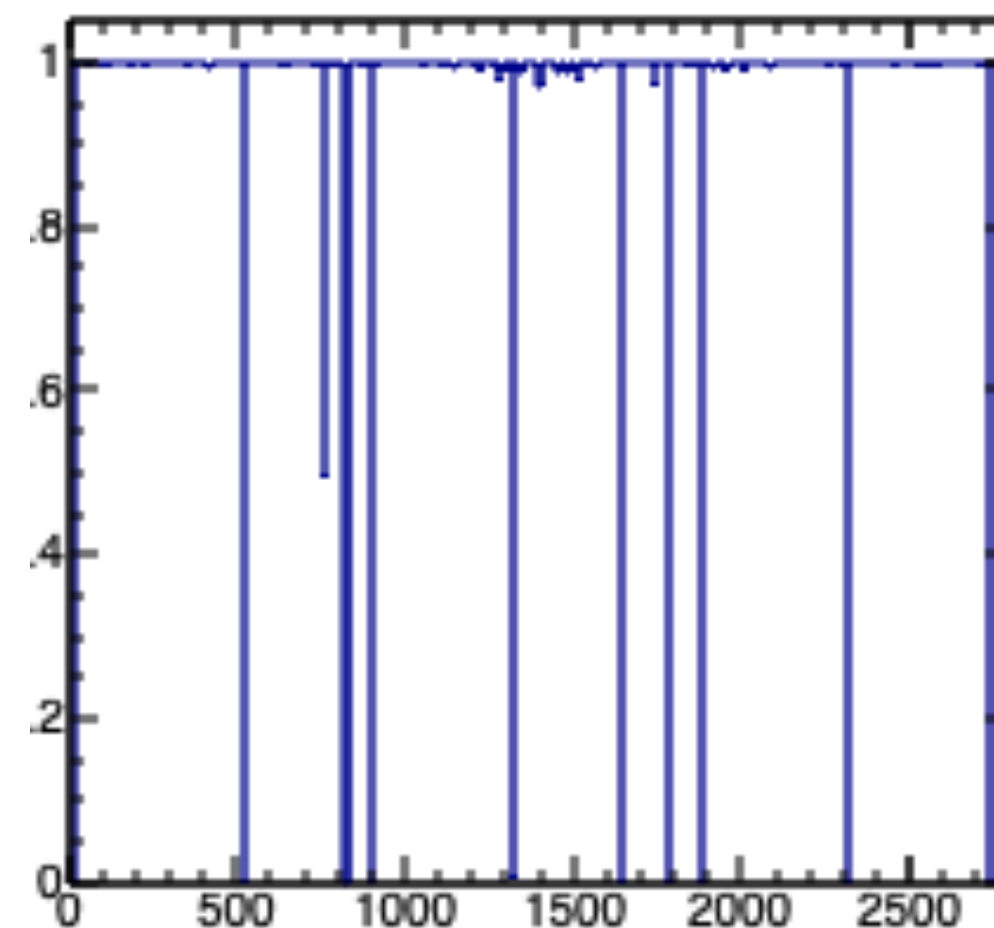
Eff vs Channel, Region 0, Run_51768



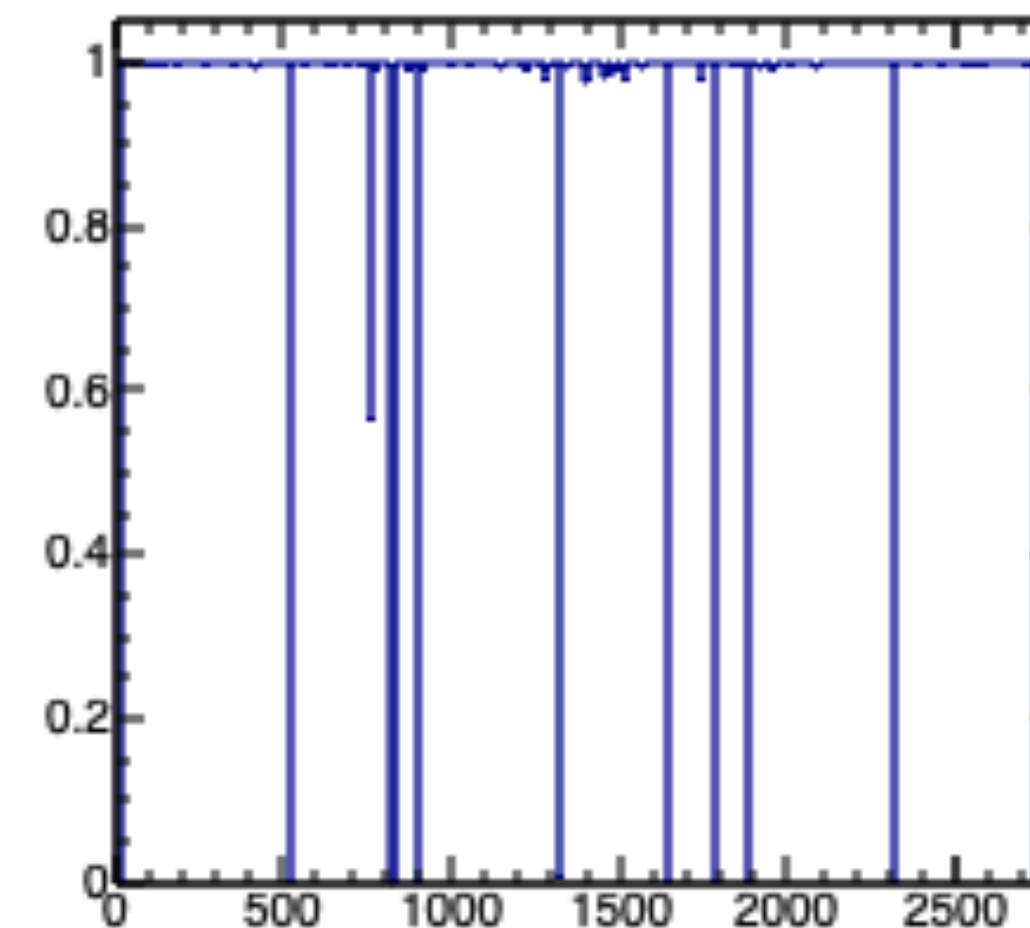
Eff vs Channel, Region 1, Run_51768



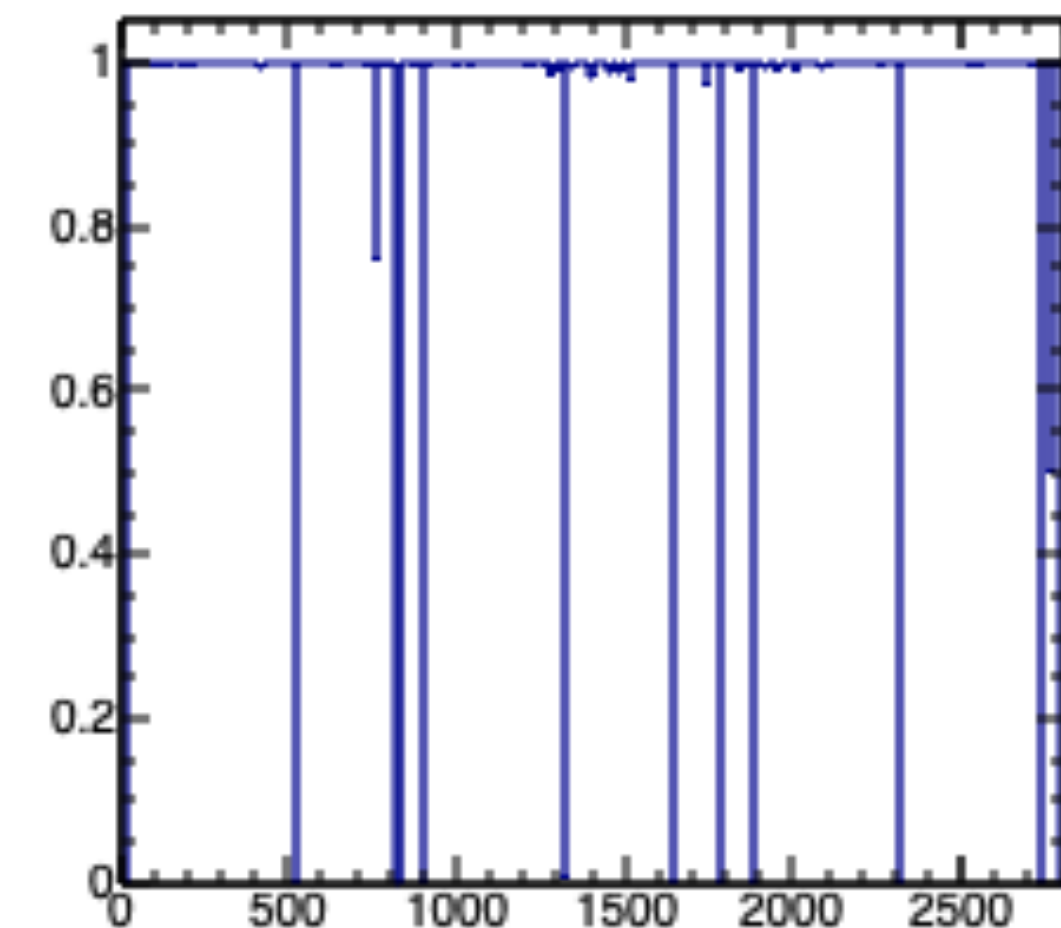
Eff vs Channel, Region 2, Run_51768



Eff vs Channel, Region 3, Run_51768



Eff vs Channel, Region 4, Run_51768



reminder:

- HV situation changes rapidly
- LEDs cycle through 6 configurations
- -> using only one Region provides info for only part of a run

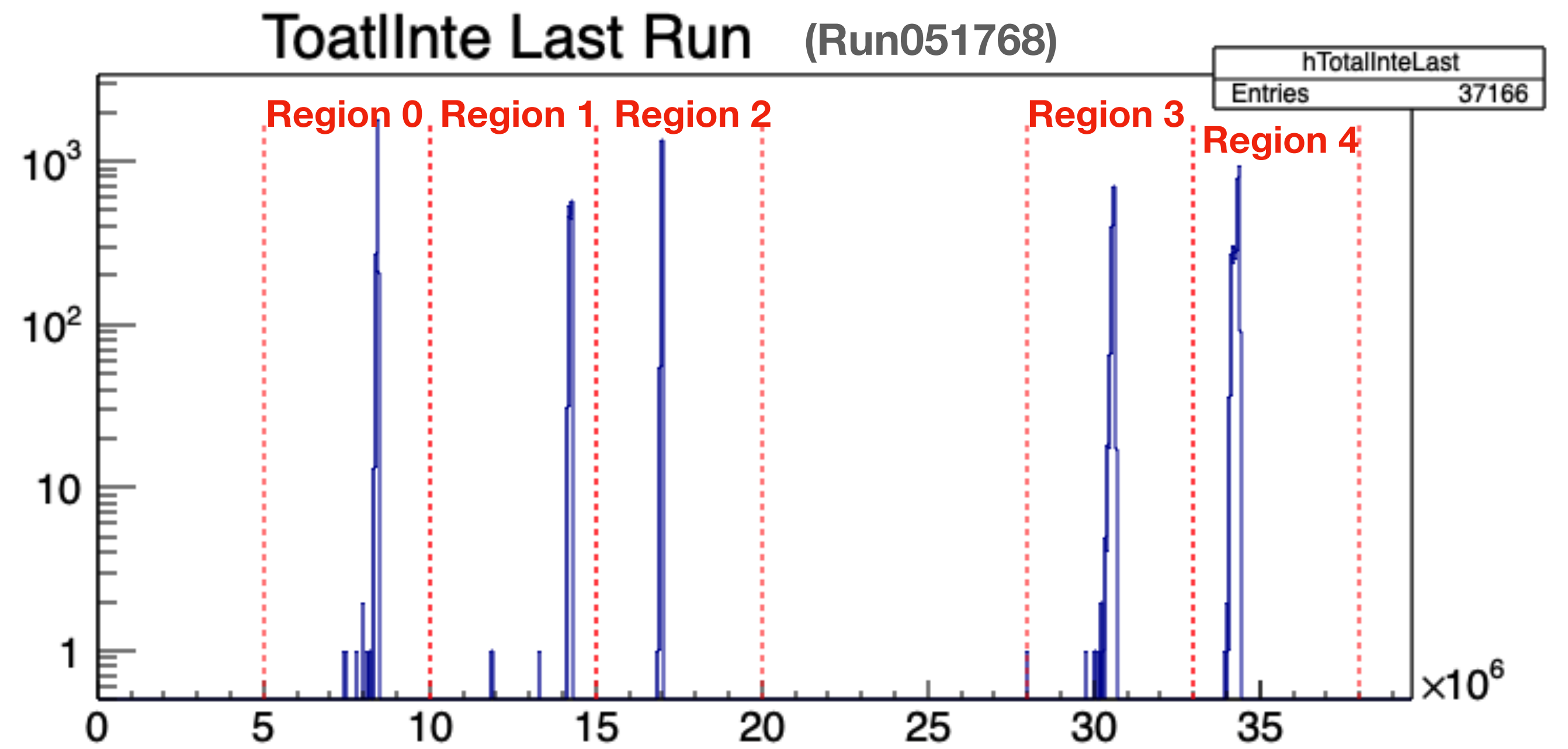
- the efficiencies for the various Regions are sufficiently similar to **use overall efficiency** (regardless of Regions)

FCAL LED efficiency normalization

normalization and identification of LED Regions:

via histogram TotalInte which is ADC integrals, summed over hits

red dashed lines: definition of LED Regions



another reason to suggest to **use overall efficiency** (regardless of Regions):

counts outside the defined Regions

* the peak at 0 is not from pedestals

