FCAL bad channels GlueX data

Susan Schadmand, 11.11.2020

bad channel maps needed for efficiency from simulations

known issues:

FCAL Base Manual (JonZ)
- sudden HV failure
- loss of communication
- hot channels

method adapted from Chandra Akondi
(fcalbadchannels05aug2020presentation.pdf, see previous calorimeter meetings)

- LEDs are used to check the status of detector channels

- analyze **FCAL-LED event skims**

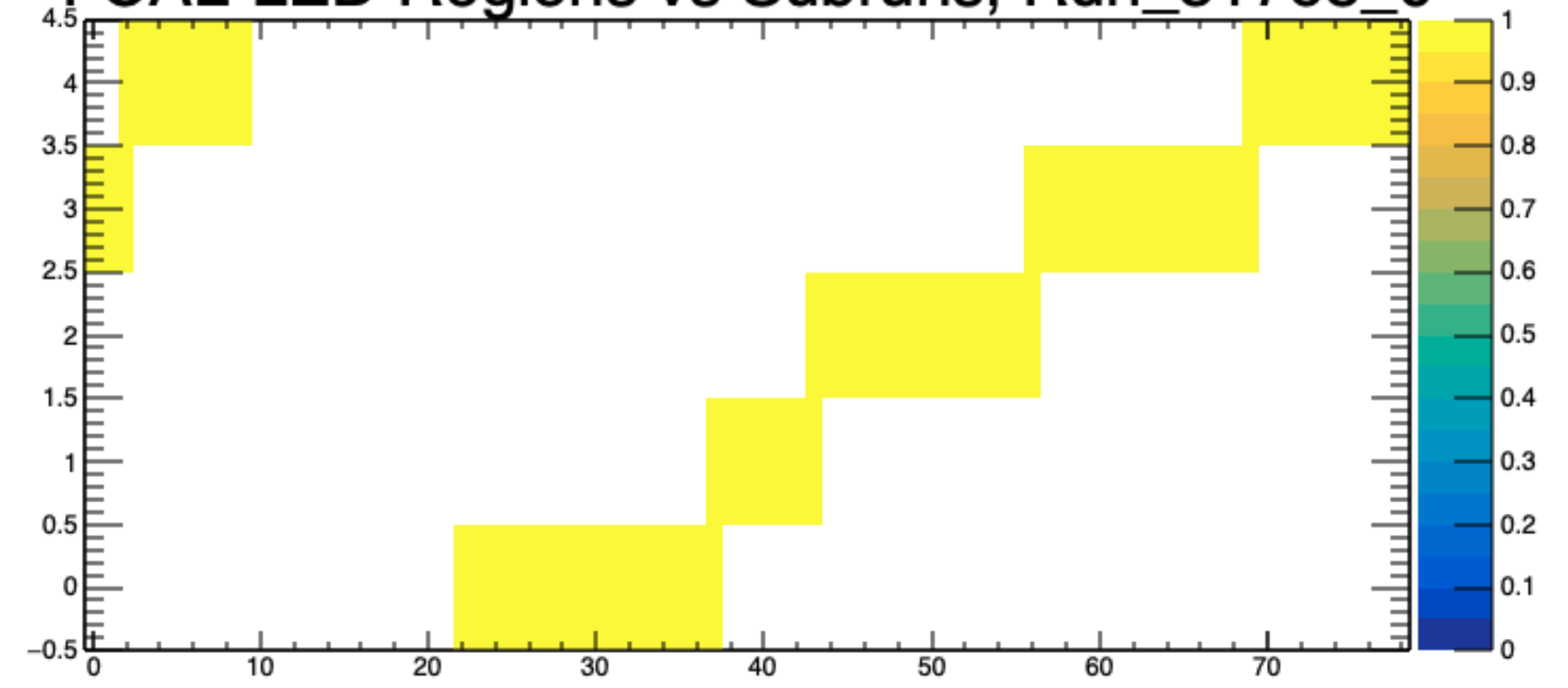**plugin for histograms (hd_root file) records ADC integrals per detector channel**

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

- 3 LED colors, run with different voltages, periodically switching voltages -> seen in ADC integrals
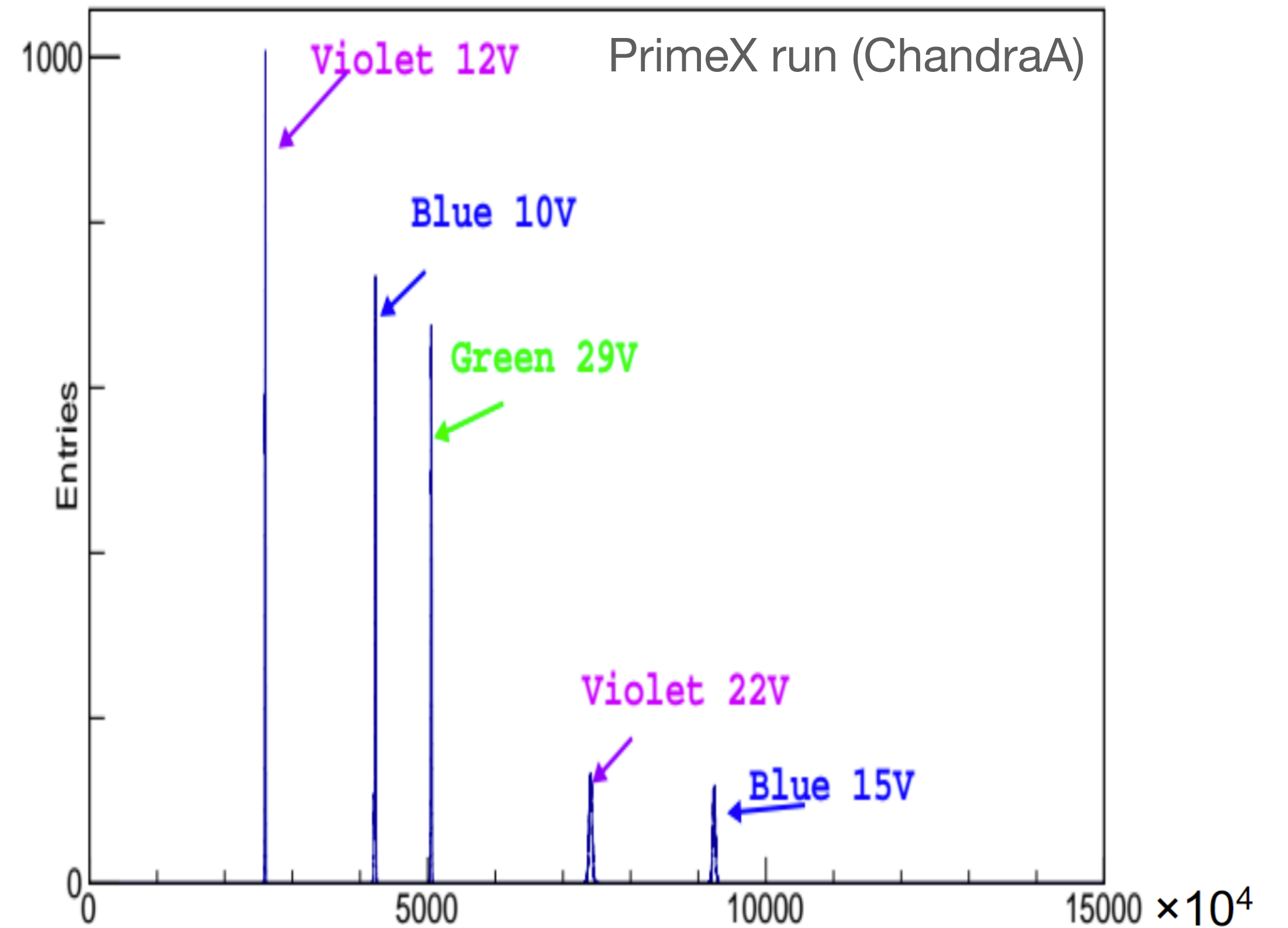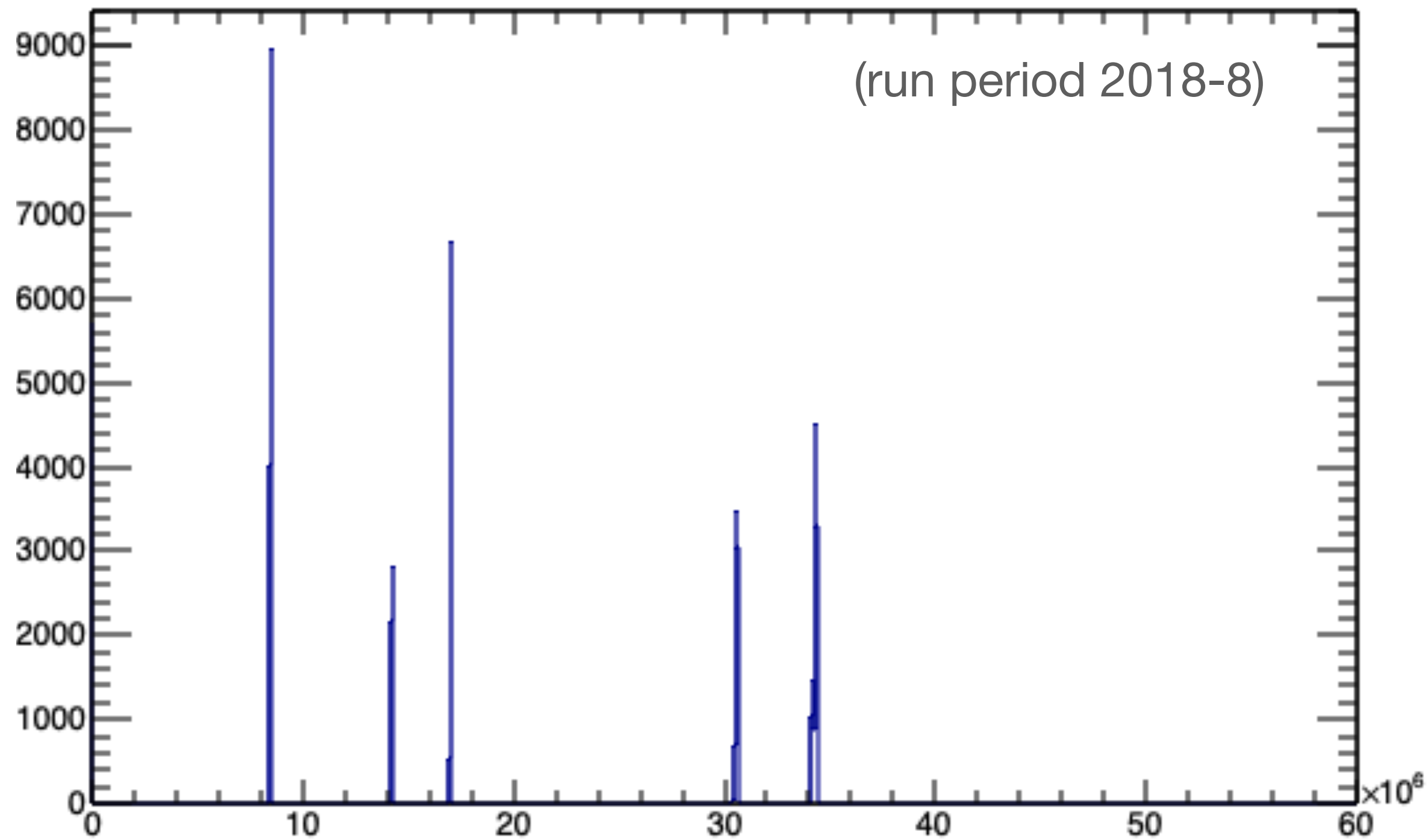
★ **sub-runs without LED events**
★ sub-runs with more than one LED region

- **sum over ADC integrals shows distinct peaks for the different "LED Regions"**

FCAL-LED Regions vs Subruns, Run_51768_0

Total ADC Integral, Run_51768

(run period 2018-8)

PrimeX run (ChandraA)

Violet 12V
Blue 10V
Green 29V
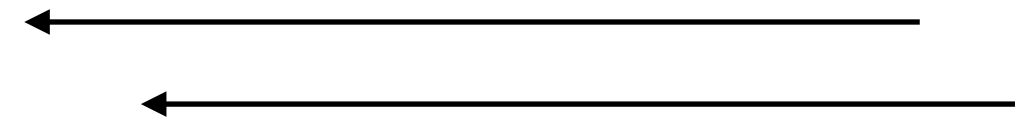Violet 22V
Blue 15V

finding bad channels:

look at ADC integrals, per run and per region

status is bad if

- number of peaks in histogram > 2 (there may be a pedestal peak)
- or Gauß fit to the peak returns the status 4
- or averaged* histogram entries < 0.9
- or the averaged* area under the Gauß is < 0.9

the overall bad status of the detector channels has to be a logic OR over the regions

for the data base, need a txt file with numbers for the 2800 channels

- 1 for good ; 0 for bad

- or an efficiency

these two types of spectra do not seem to have the same features

the Gauß area seems more sensitive to inefficiencies?

or simply preferable because it does not count additional peaks like pedestals?

(see next page)

* averaged to 1 over the channel numbers
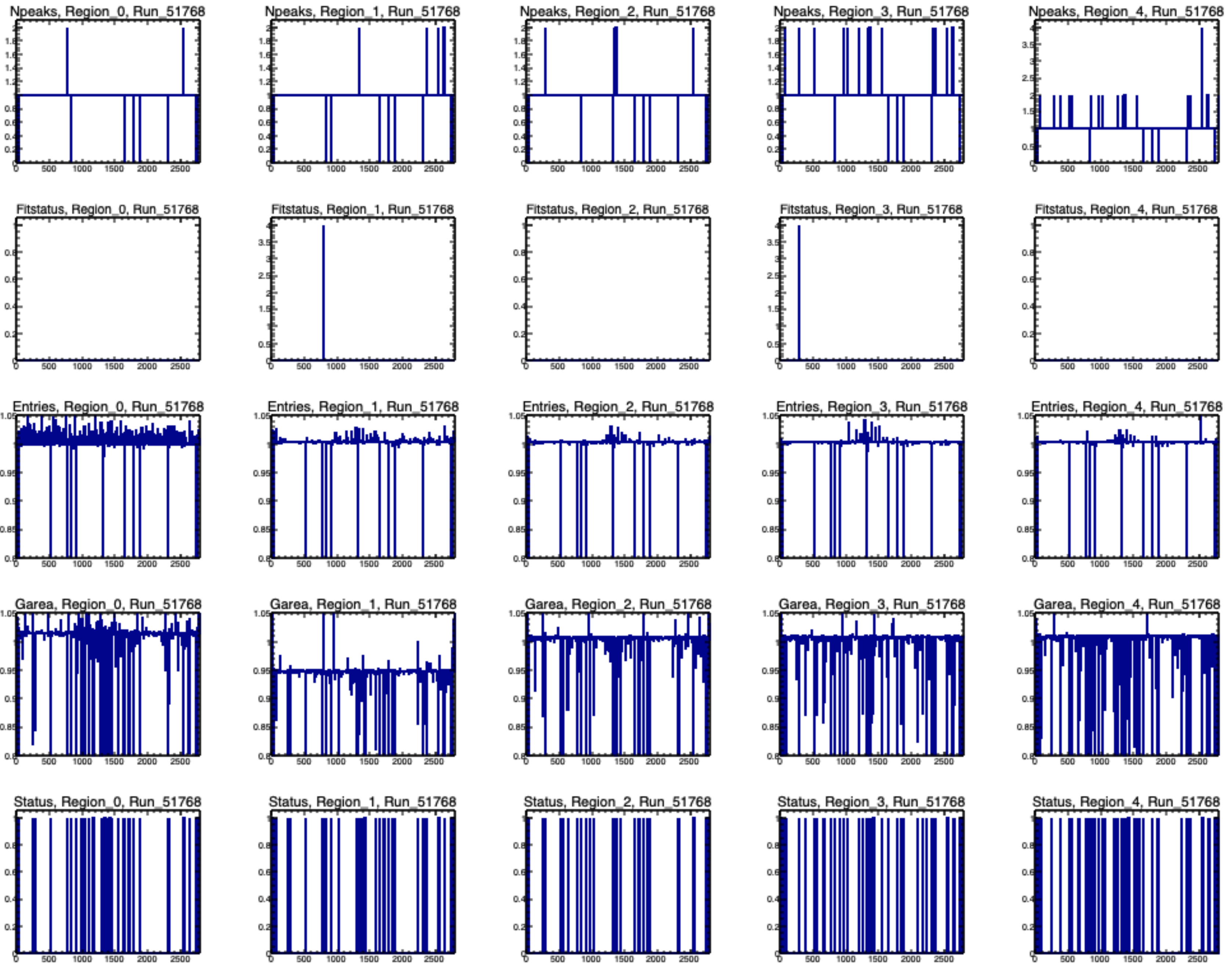
for example:

there is >=2 peaks in the ADC integral histograms

Gaussian fitstatus is good (=0), the peak with the highest x-position is fitted.

there is hot channels in the middle of the detector (beam).

this is not seen as extremely in the averaged Gauß areas … because of counting in only one peak, the one with the highest x-position.
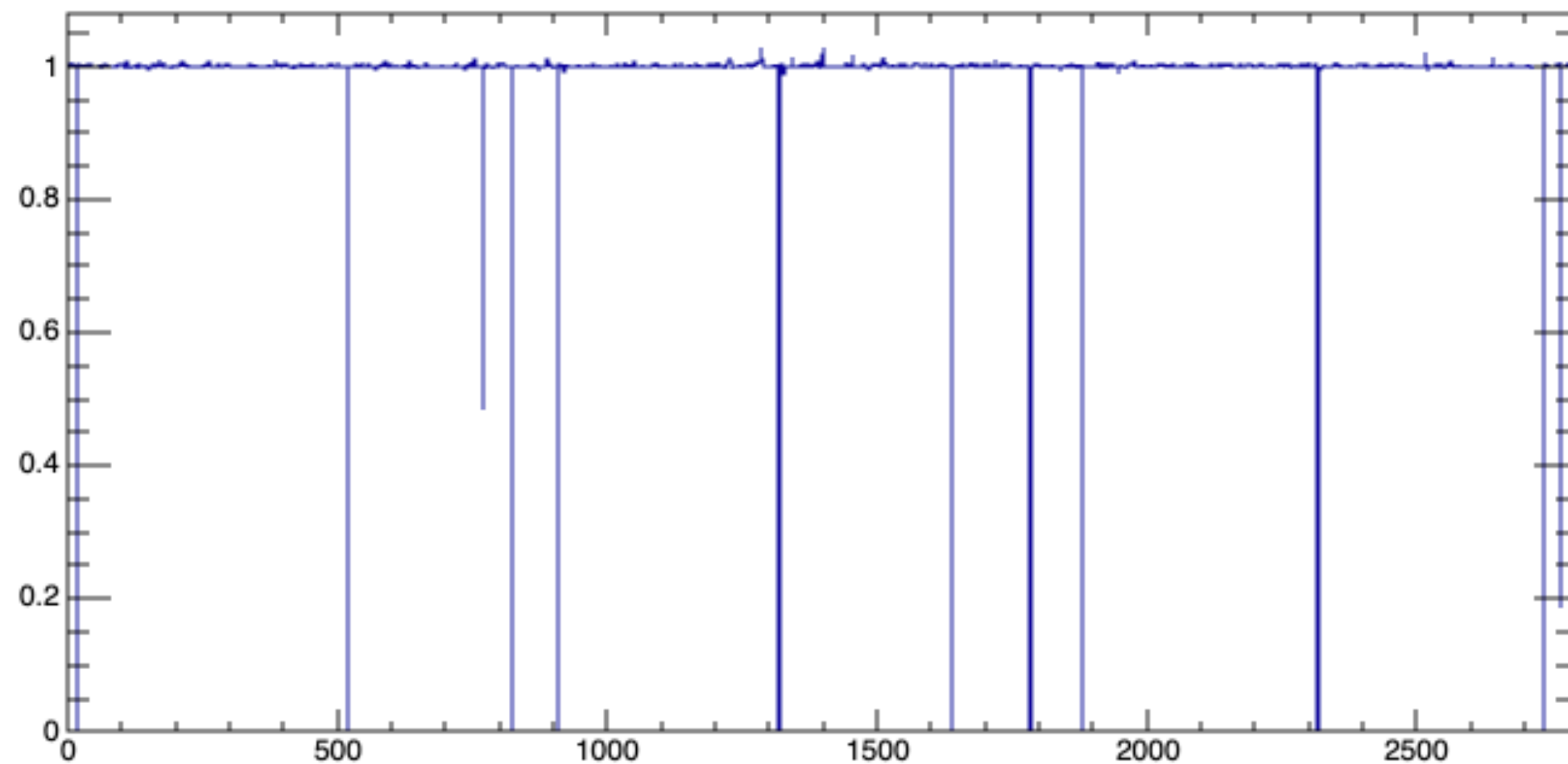but **the Gauß area seems more sensitive to inefficiencies?**

here, the bad channels (status=1) are based on the Gauß areas.

in total 57 channels would be bad

Efficiency from Gauss area, Run_51768
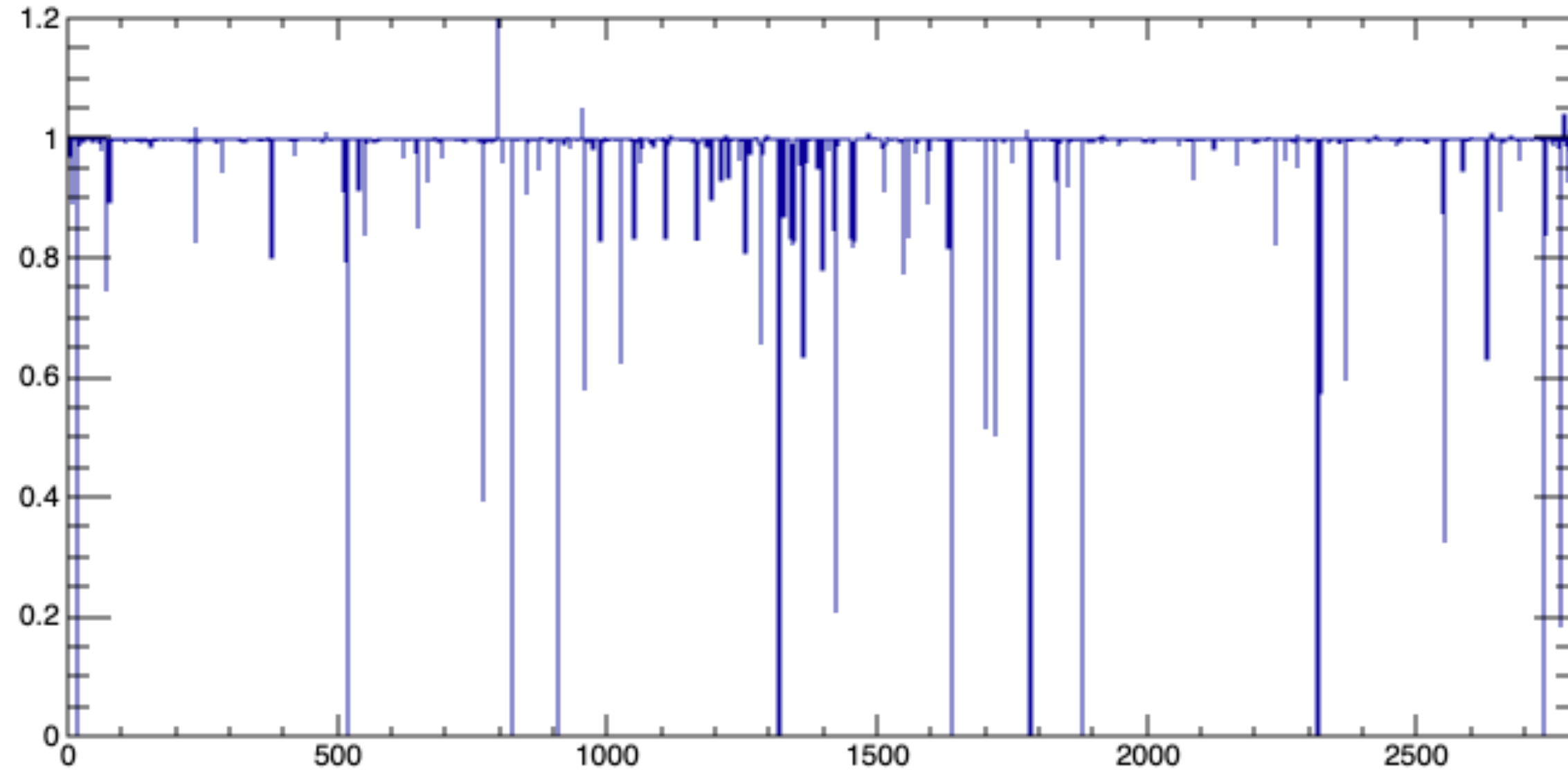
Efficiency from Entries, Run_51768

efficiencies

- ignoring LED Regions
- integrated over Run
  - including sub-runs without LED events

- normalized with FCAL-LED trigger count

- consider as inefficiency (set efficiency>1 to 1)

- **suggestion**:

  - **provide per-run files with inefficiencies**

  - **from which**, Gauss areas or Entries or both**?**

  - by applying a **cut on the inefficiencies** this could easily be turned into a 0/1 decision