

# BFEM cosmic-run (May 25th) results for XGT and expected threshold level in flight.

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Four sets of plastic scintillator block and photo multiplier tube, called external gamma-ray targets (XGTs), are newly introduced to GLAST Balloon Flight Experiment Model (BFEM). XGTs should select events where large energy is deposited in scintillator block. Therefore we analyzed BFEM cosmic-run data taken on May 25th and estimate the threshold level in flight.

## 1 Calibration curve of DAQ for XGT

We have measured gain and offset of XGT DAQ board. There are four Channels in this board, and Ch 0 handles the XGT 0 input, Ch 1 the XGT 1, and so on. The test setup is described in other report (“Report on Calibration of the XGT DAQ after Modification on April 25”). Here we re-plot the relation between “input charge” and “ADC peak channel” in Figure 1-4, and fit the relation with a linear function. Please note the following items.

- At the experiment on May 25th, ADC channels of XGT histograms are subtracted by 180 artificially. Here (in Figure 1-4) we compensate this subtraction, so we can directly compare these figures with BFEM Cosmic-ray data (shown in Figure 7-10).
- As described in the previous report, Ch 1 and Ch 2 showed large non-linearity when charge input is smaller than 16–20 pC. To get the model function for small-charge input region, we also fitted the data with quadratic function (See Figure 5 and 6).
- Ch 0 and Ch 3 showed good linearity down to  $\sim 8$  pC input.
- All four Channels have good linearity up to  $\geq 40$  pC input. In other words, with XGT+DAQ, we can select events where charge input exceeds 40 pC.

## 2 BFEM Cosmic-run Results

We extracted XGT histograms for BFEM cosmic-ray data taken on May 25th. We processed all the data in `/nfs/farm/g/glast/u04/bfem/test/rootfiles` (total 10 files). The obtained histograms are given in Figure 7-10 <sup>1</sup>.

We can see clear MIP peak in each histogram. The peak channel and corresponding amount of input charge are as follows;

- XGT0: peak is  $\leq 260$  channel, and the input charge is calculated as  $\sim 8.5$  pC
- XGT1: peak is  $\leq 250$  channel, and the input charge is calculated as  $\sim 7.5$  pC
- XGT2: peak is  $\geq 220$  channel, and the input charge is calculated as  $\sim 9$  pC
- XGT3: peak is  $\geq 260$  channel, and the input charge is calculated as  $\sim 8.5$  pC

All the four channels show linear response up to  $\sim 40$  pC input, so we can discriminate events of 4–5 MIP in flight.

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<sup>1</sup>Each figure corresponds to 150 minutes run, but the data statistics is somewhat poor with unknown reason

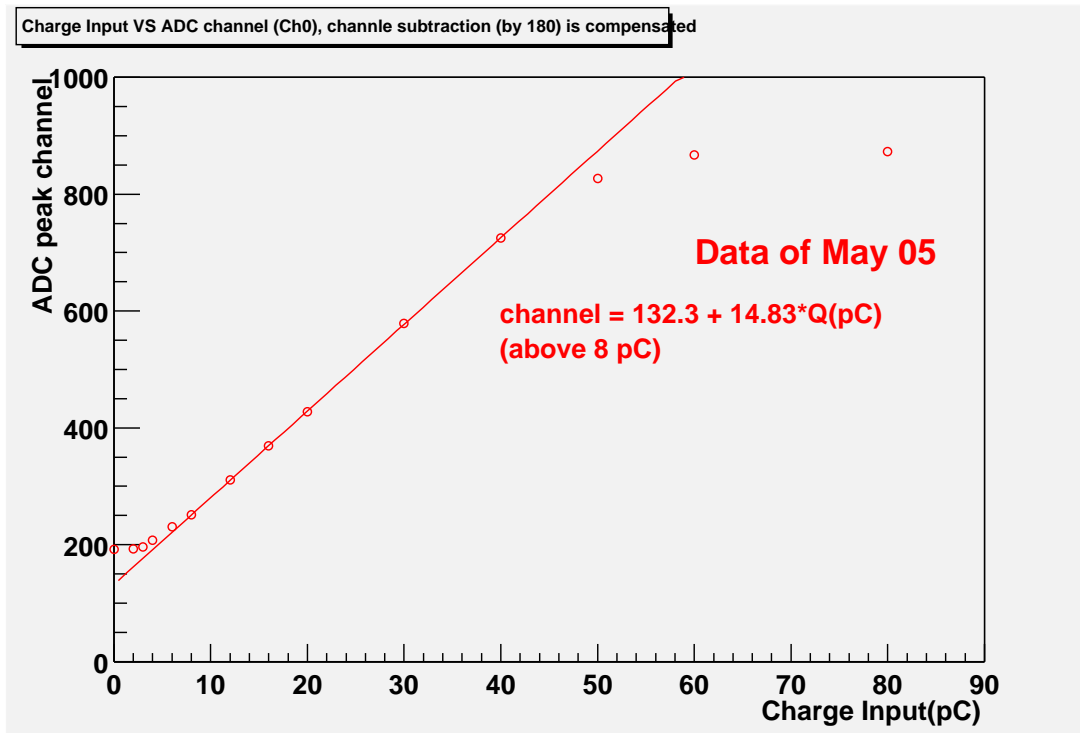


Figure 1: XGT Ch0 charge input and ADC peak channel.

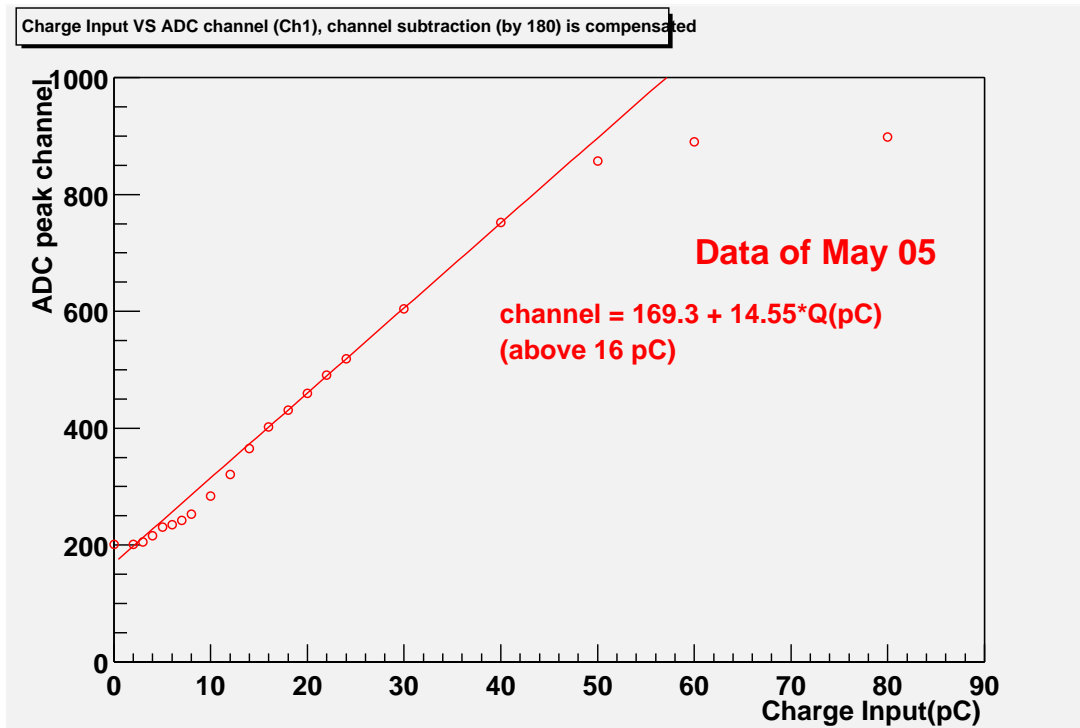


Figure 2: XGT Ch1 charge input and ADC peak channel.

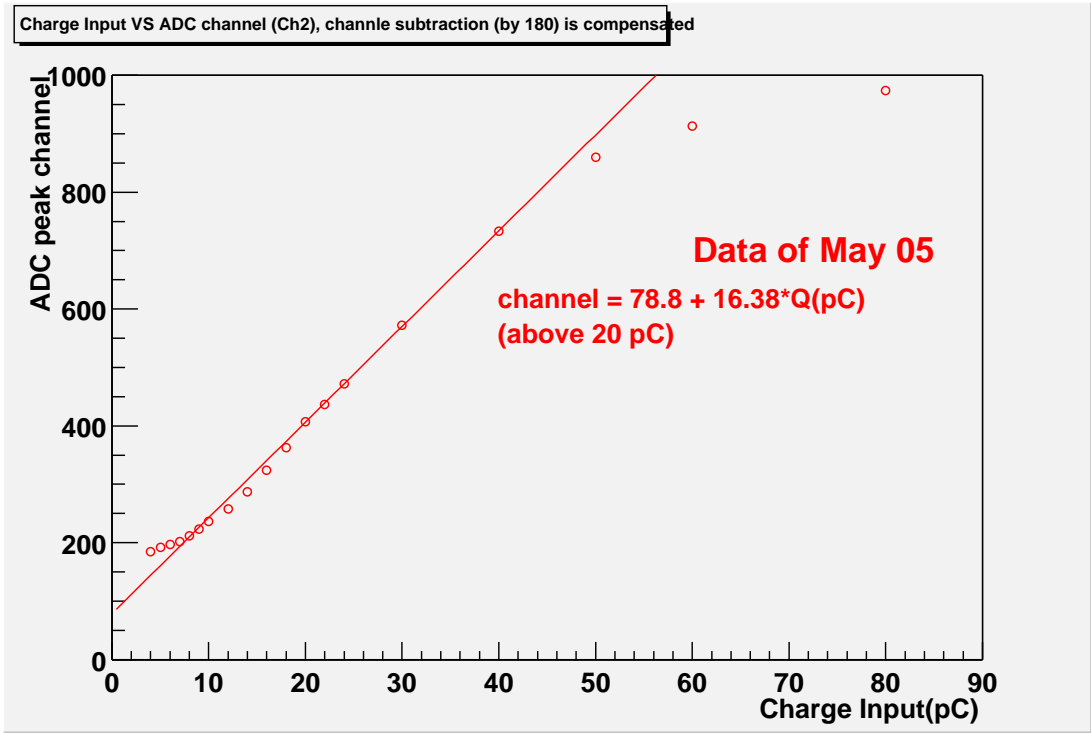


Figure 3: XGT Ch2 charge input and ADC peak channel.

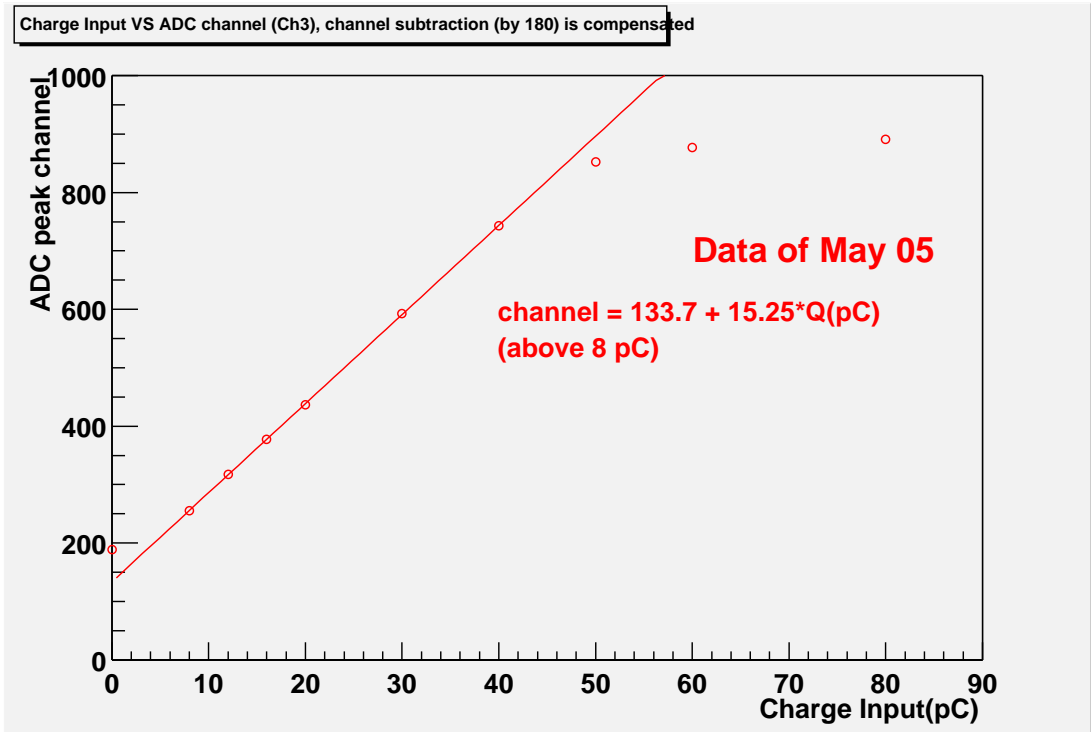


Figure 4: XGT Ch3 charge input and ADC peak channel.

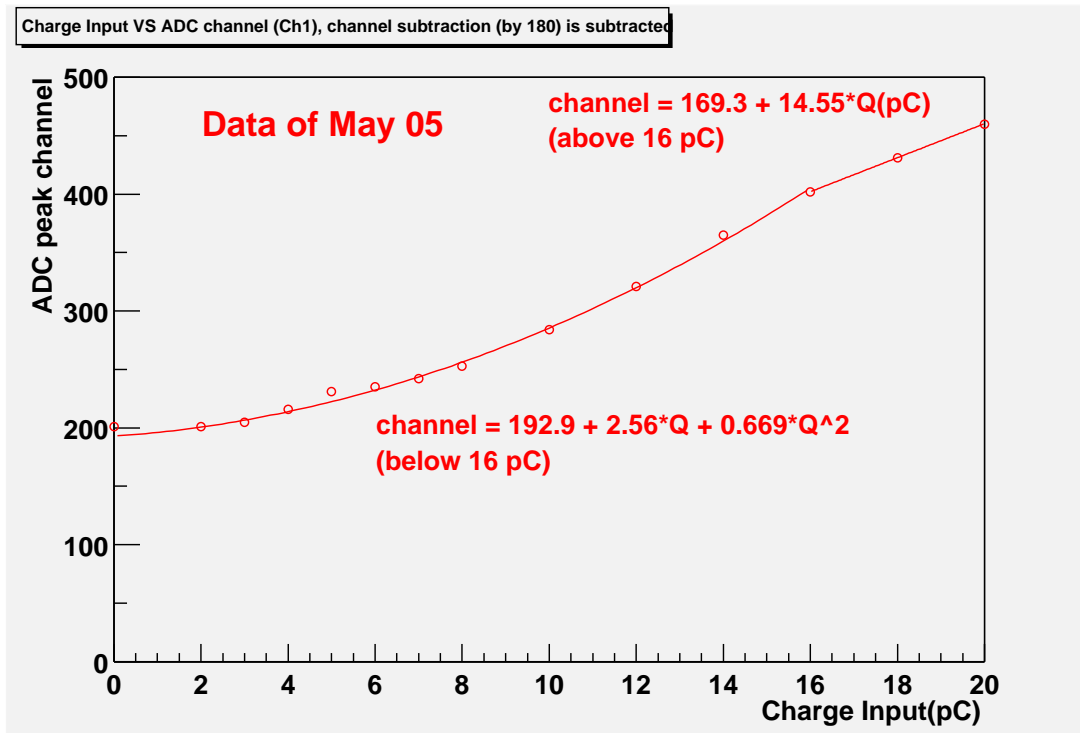


Figure 5: XGT Ch1 charge input and ADC peak channel in low-charge-input region.

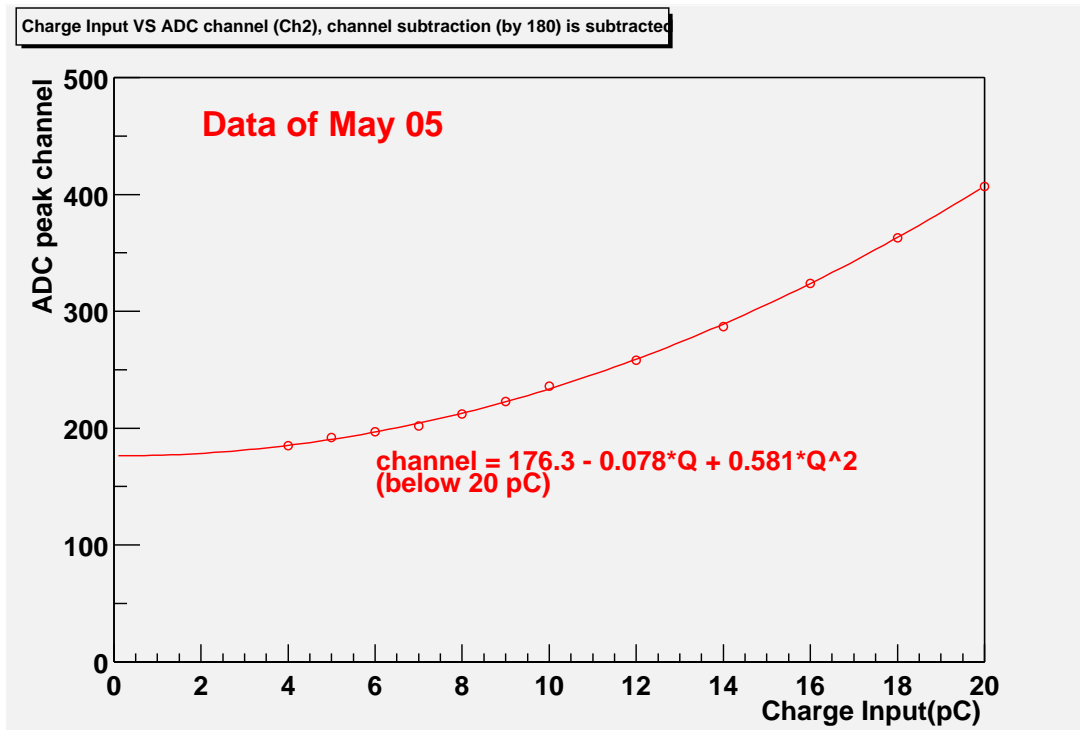


Figure 6: XGT Ch2 charge input and ADC peak channel in low-charge-input region.

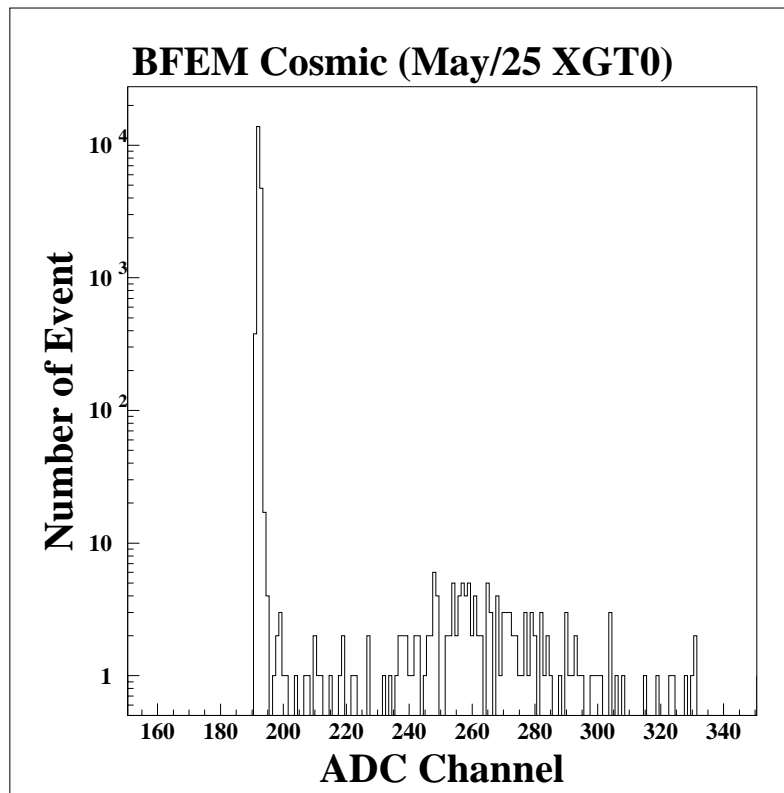


Figure 7: XGT 0 cosmic-run histogram taken on May 25th.

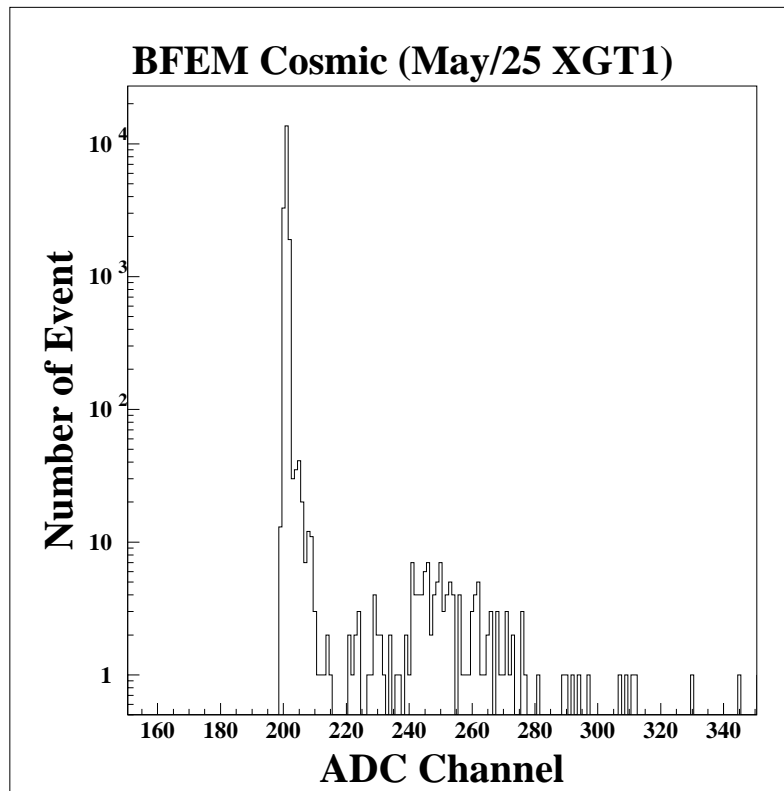


Figure 8: XGT 1 cosmic-run histogram taken on May 25th.

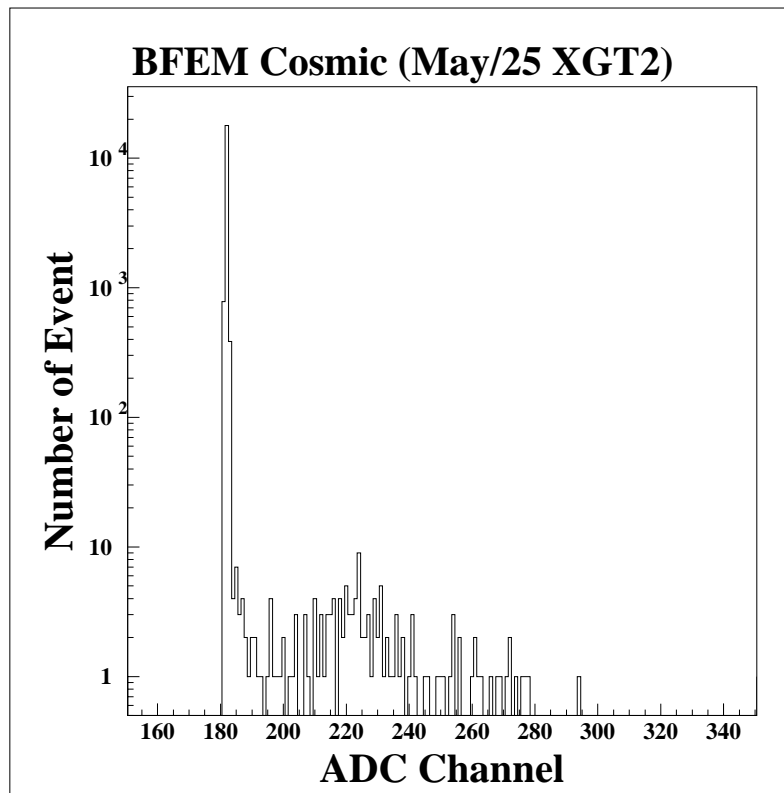


Figure 9: XGT 2 cosmic-run histogram taken on May 25th.

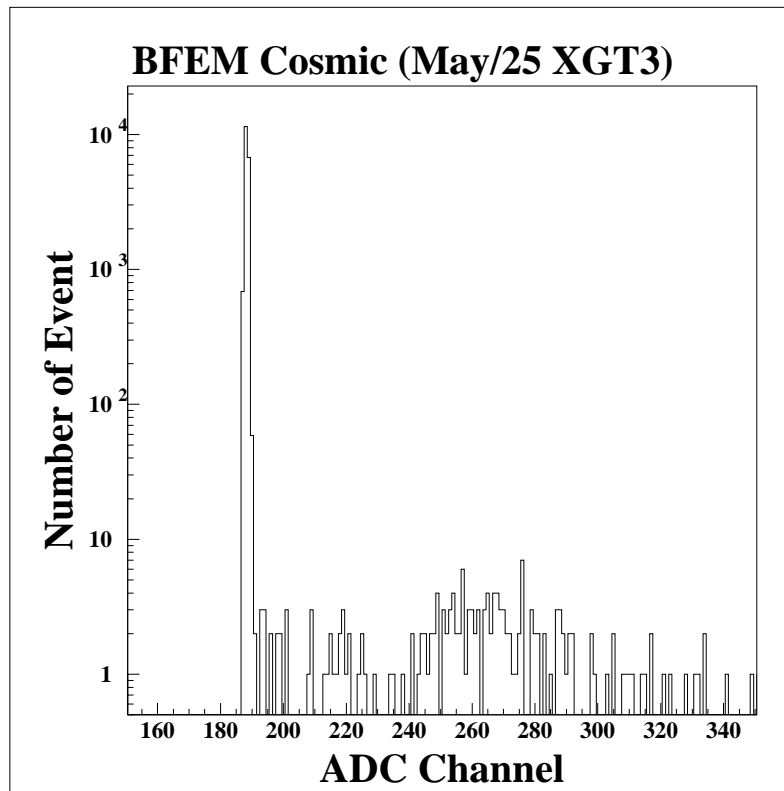


Figure 10: XGT 3 cosmic-run histogram taken on May 25th.