UUB Charge and Peak histograms

Mauricio Suárez Durán and Ioana C. Mariş

IIHE-ULB

April 9, 2021
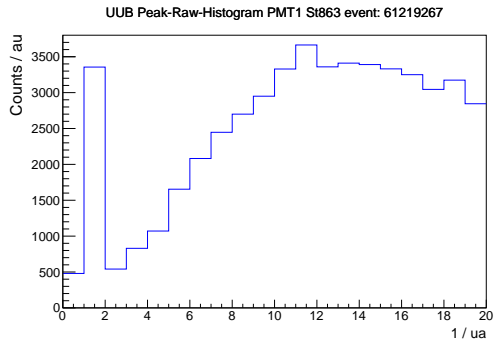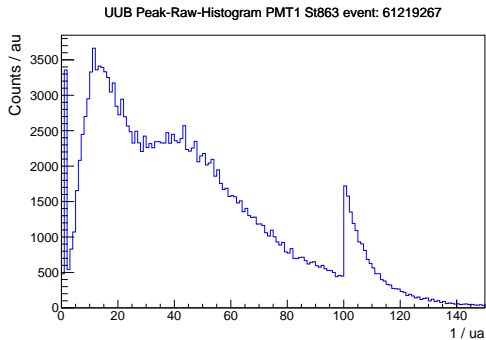
UNIVERSITÉ
LIBRE
DE BRUXELLES

UUB Charge and Peak histograms

- Station studied: 863
- Data from CDAS.
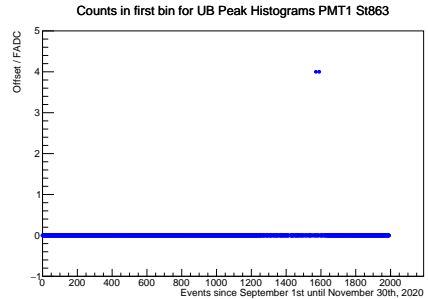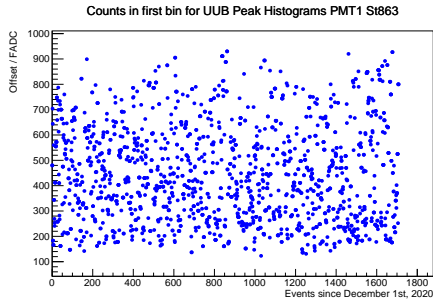- Software CDAS, pre-production version.

PMT 1: UUB Peak Histogram

Raw UUB Peak Histogram

Not cero counts in the first bin

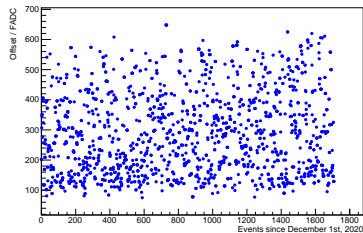# PMT 1: UUB and UB counts in the first bin in Raw Peak Histogram
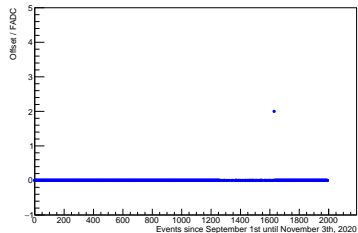
IoSdHisto::Peak[pmtId][0]

PMT 1: UUB and UB counts in the first bin in Raw Peak Histogram
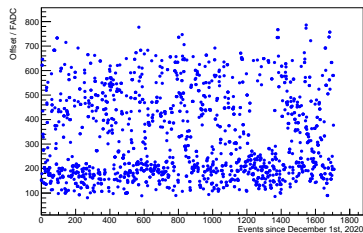
IoSdHisto::Peak[pmtId][0]

From UUB raw Peak histogram to the correct format
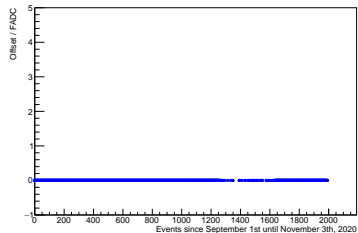
Applying IoSdStation::HPeak method

Each bin (j) of raw histogram is corrected as:

xp[j] = j*mult + offset; xp[100 + j] = 100 * mult + bigbins * j * mult + offset;

Here, *mult* and *bigbins* are constants and equal to 4; the *offset* is set for each event.

As instance, for event 61219267 the offset = 273, so a value of 273 for the first bin of the Peak histogram.

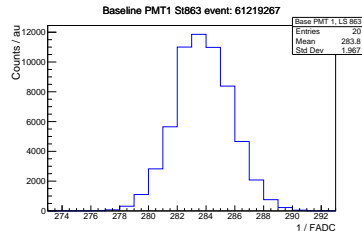UUB Peak-Histogram PMT1 St863 event: 61219267 Offset: 273
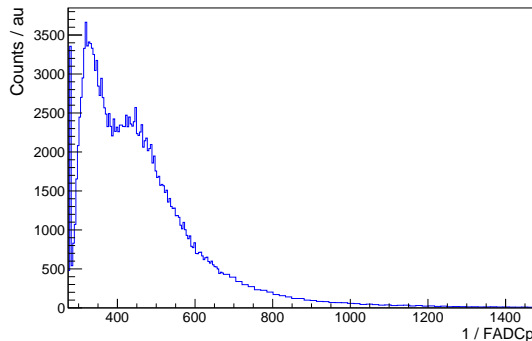
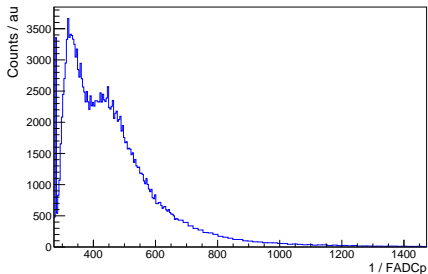# UUB Peak histogram Correcting for baseline

Baseline histogram getting from
IoSdStation::HBase
xb[j] = j+offset;
yb[j] = Histo->Base[pmt][j]
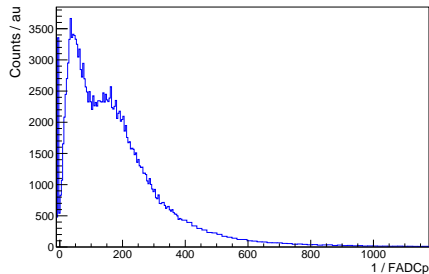

Baseline PMT1 St863 event: 61219267

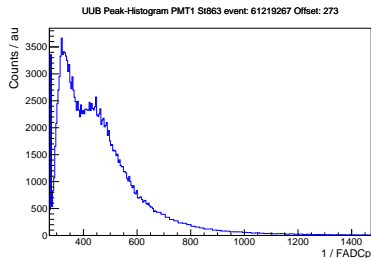UUB Peak-Histogram PMT1 St863 event: 61219267 Offset: 273

Not corrected

UUB Peak-Histogram PMT1 St863 event: 61219267 Corr. BL: 284

Corrected, but shows negative bins

UUB Peak histogram Correcting for Offset

UUB Peak-Histogram PMT1 St863 event: 61219267 Offset: 273

Not corrected
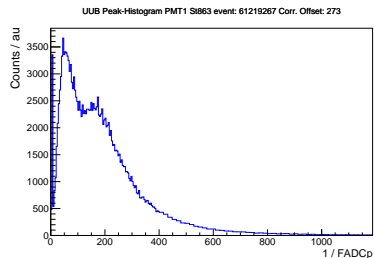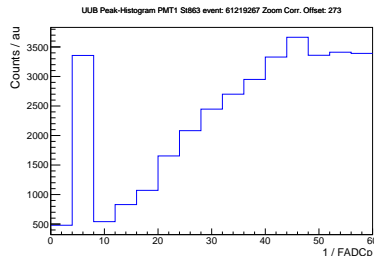

UUB Peak-Histogram PMT1 St863 event: 61219267 Corr. Offset: 273

Corrected

Zooming to check the threshold,
but no one can be seen.

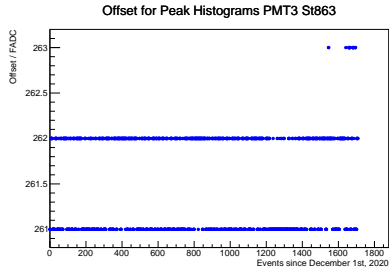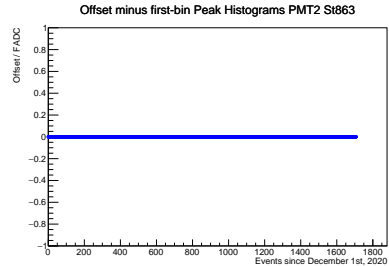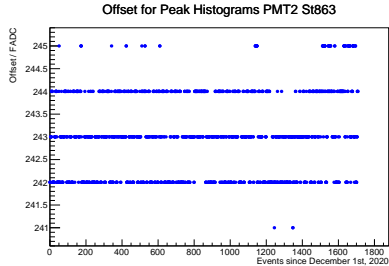UUB Peak-Histogram PMT1 St863 event: 61219267 Zoom Corr. Offset: 273
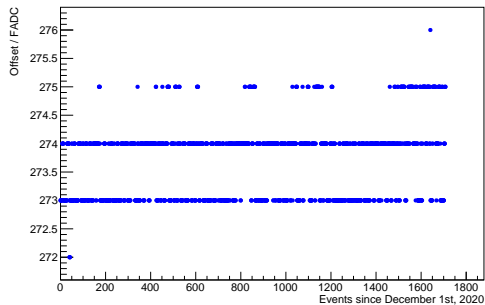
Offset values for UUB Peak histograms
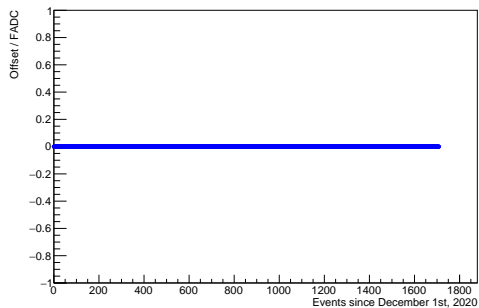
For LPMT1

Offset values for UUB Peak histograms

## For LPMT2 and LPMT3
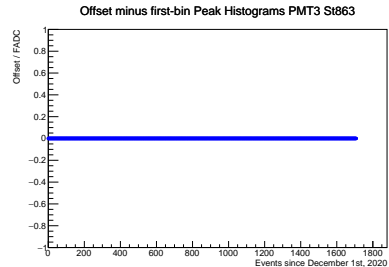
How to correct to obtain the right format?

Here, the correct format is one that shows some threshold.

Two methos to check the baseline:

1. IoSdStation::HBase[pmt], return a histogram with the baseline ditribution, according with: histo->GetXaxis()->Set(20, offset, offset + 20); so, this method depends on the Offset.
2. Calib->Base[pmt] of the IoSdCalib class. This returns the value of the baseline, I guess it coming from some measurement performed at the WCD, but I am not sure.

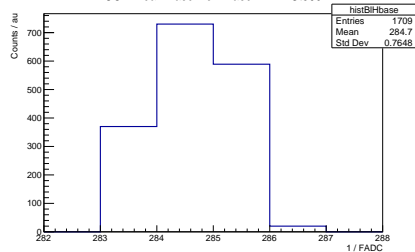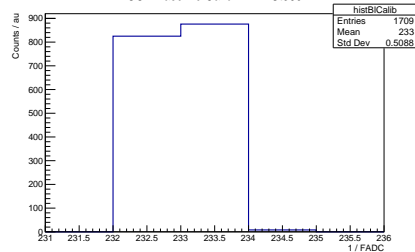# Comparison: UUB Baseline IoSdStation::HBase[pmt] and Calib.Base[pmt]
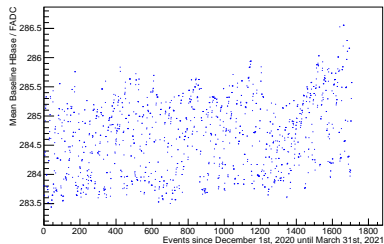
UUB Baseline values IoSdStation::HBase[pmt] and Calib->Base[pmt]

UUB Baseline Difference HBase - Calib.Base PMT1 St863

p1*x + p0	
p0	51.366644
p1	0.000374
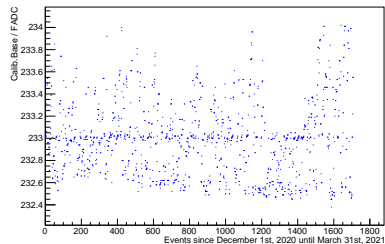
UUB Baseline values IoSdStation::HBase[pmt] and Calib->Base[pmt]

UUB Offset-Peak - Calib.Base PMT1 St863
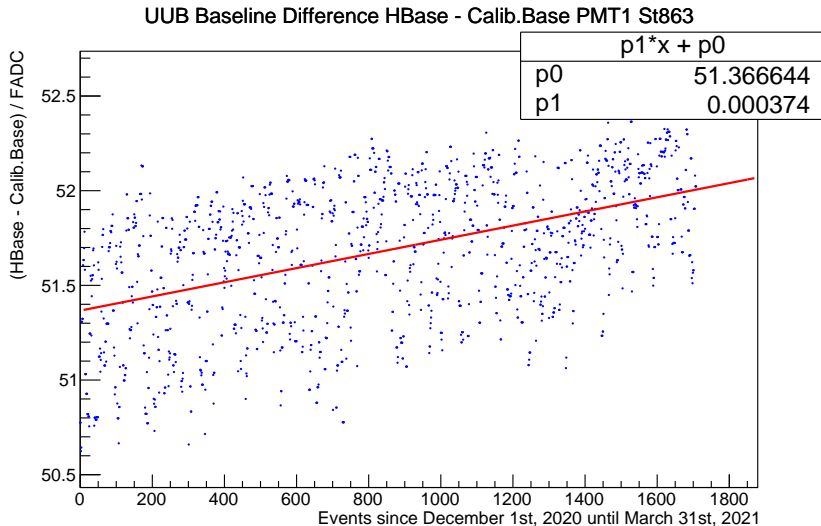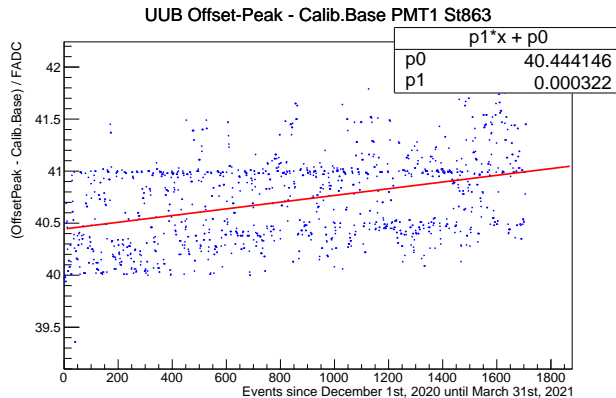
The Offset is increasing with the time, so this explain why the baseline from HBase is increasing too.

From UUB raw Peak histogram to the correct format, via Calib.Base[pmt]
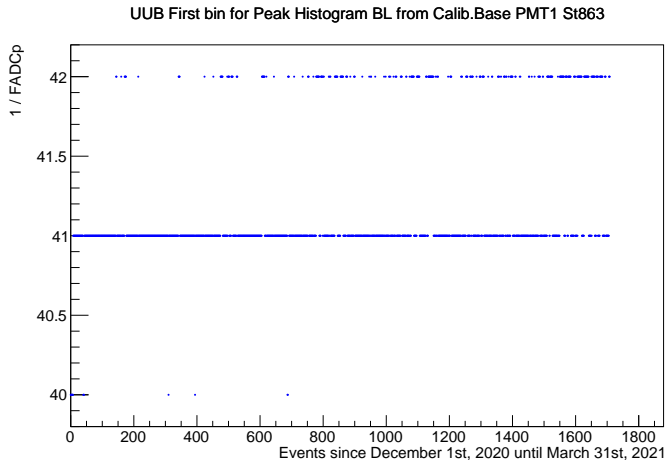

UUB Peak histogram PMT1 St863 Corr. for Calib.Base

UUB Peak histogram PMT1 St863 Corr. for Calib.Base
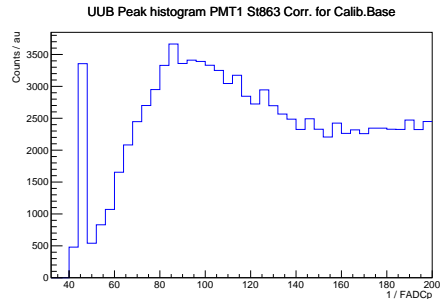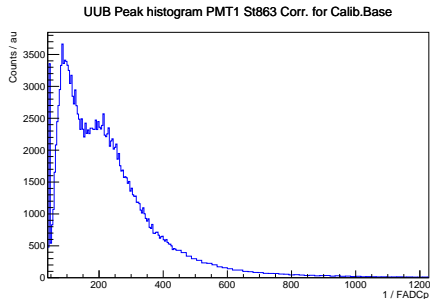
Now, a threshold is seen, the correct one?

From UUB raw Peak histogram to the correct format, via Calib.Base[pmt]
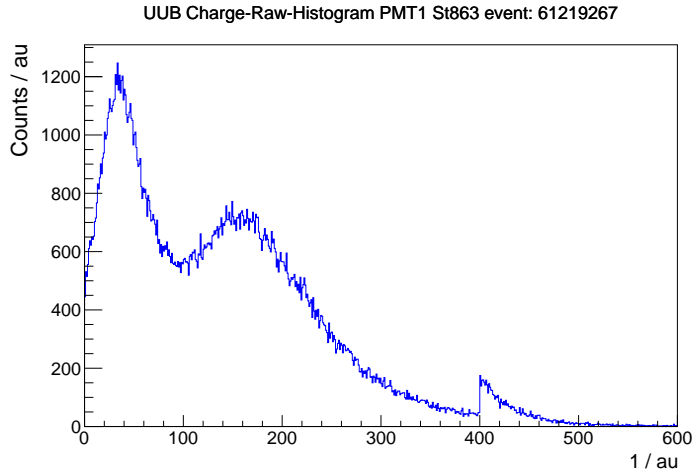
UUB first bin for peak histograms:

UUB First bin for Peak Histogram BL from Calib.Base PMT1 St863

The threshold should be a constant, not too much here...

Applying the previous steps to UUB Charge histograms

Raw UUB Charge histogram

UUB Charge-Raw-Histogram PMT1 St863 event: 61219267

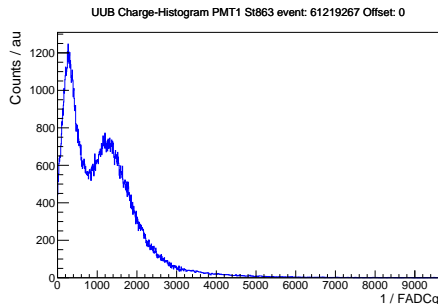# From UUB raw Charge histogram to the correct format

IoSdStation::HCharge

Each bin (j) of the raw histogram is set as:

xc[j] = mult*j + offset; xc[400+j] = 400*mult + bigbins*mult*j + offset

Here, *mult*=8 and *bigbins*=4, both of them constants;
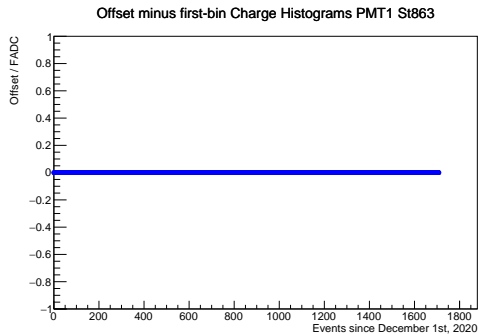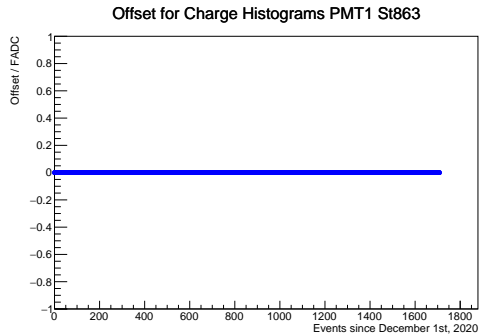the *offset* is set for each event.

For event 61219267 offset = 0, with
a value of 0 for the first bin of the

UUB Charge histogram.
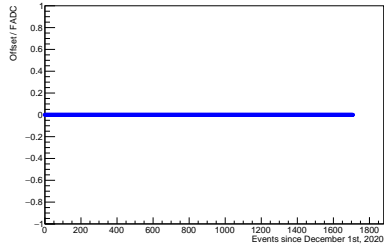Not correction for baseline?

UUB Charge-Histogram PMT1 St863 event: 61219267 Offset: 0
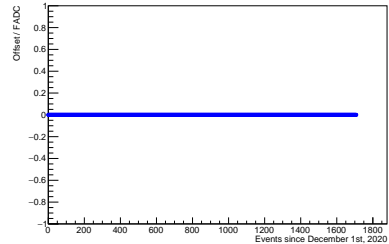
Offset values for UUB Charge histograms

For LPMT1

Offset values for UUB Charge histograms

For LPMT2 and LPMT3

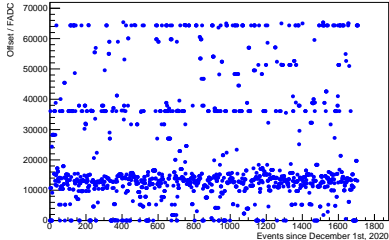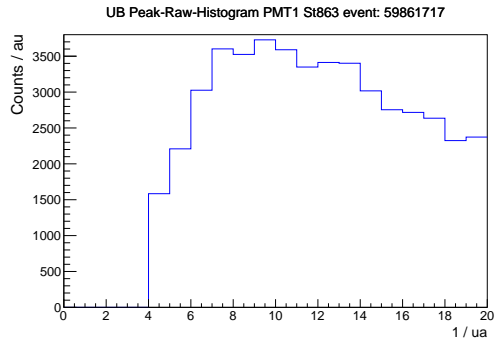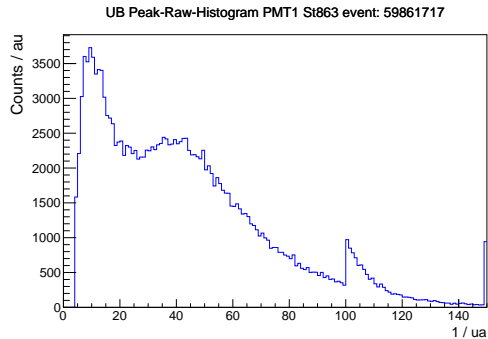# Comparison with UB version, same station

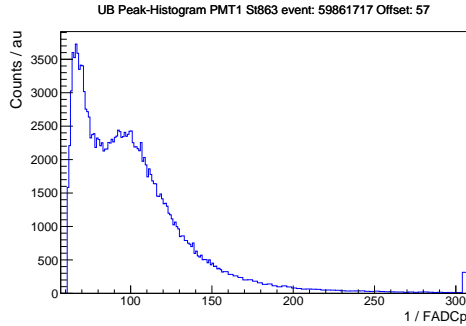Raw UB Peak Histogram

From UB raw Peak histograma to the correct format

IoSdStation::HPeak

Each bin (j) of raw Peak histogram is set as:

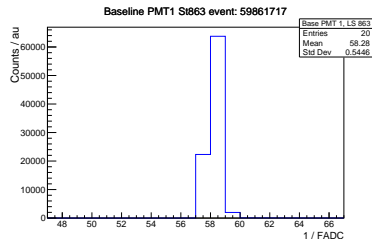xp[j] = j*mult + offset; xp[100 + j] = 100 * mult + bigbins * j * mult + offset;

Here, *mult*, *bigbins*, and *offset* are constants and fixed in the code with values of: mult=1, bigbins=3 y offset = 0.

For event 61219267 offset = 57, with
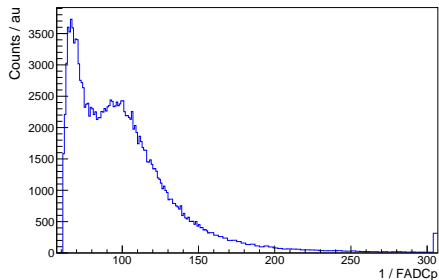a value of 57 for the first of the histogram.

UB Peak-Histogram PMT1 St863 event: 59861717 Offset: 57

UB Peak histogram Correcting for baseline

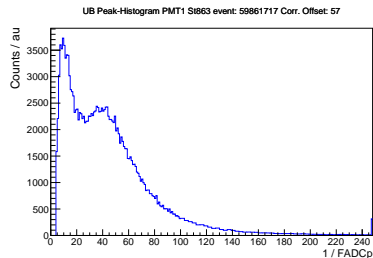Baseline from IoSdStation::HBase

Not corrected   Corrected

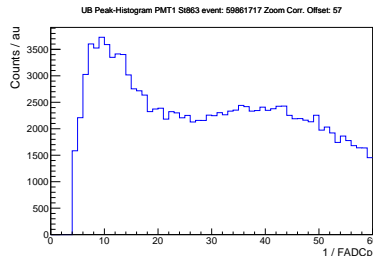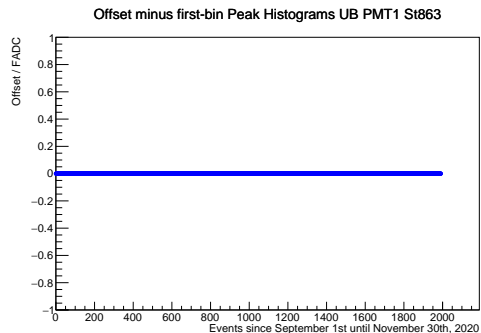# UB Peak histogram Correcting for Offset
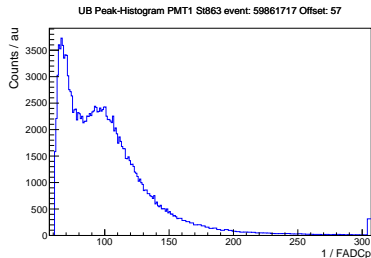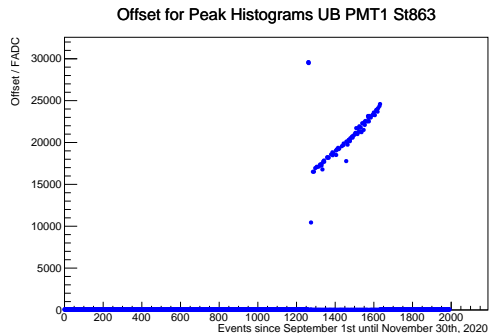

Not corrected

Corrected

Zooming to check the threshold

Offset values for UB Peak histograms

For LPMT1

Offset for Peak Histograms UB PMT1 St863
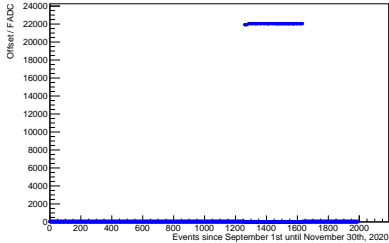

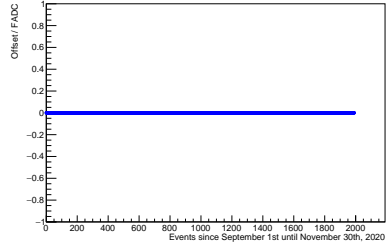Offset minus first-bin Peak Histograms UB PMT1 St863

Offset values for UB Peak histograms
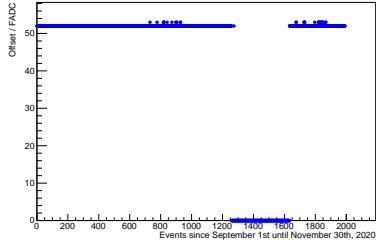
For LPMT2 and LPMT3

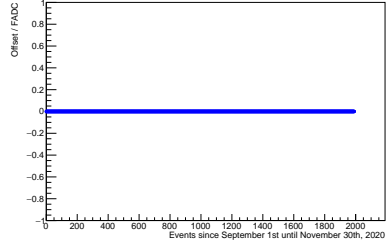Offset for Peak Histograms UB PMT2 St863

Offset minus first-bin Peak Histograms UB PMT2 St863

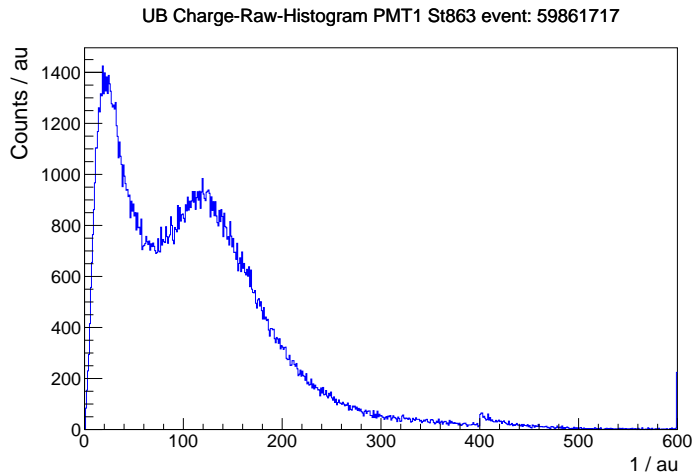Offset for Peak Histograms UB PMT3 St863

Offset minus first-bin Peak Histograms UB PMT3 St863

Applying the previous steps to UB Charge histograms

Raw UB Charge histogram

UB Charge-Raw-Histogram PMT1 St863 event: 59861717
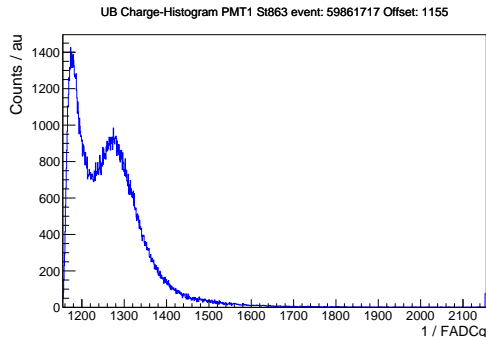
From UB raw Charge histogram to the correct format

IoSdStation::HCharge

Each bin (j) of the raw Charge histogram is set as:

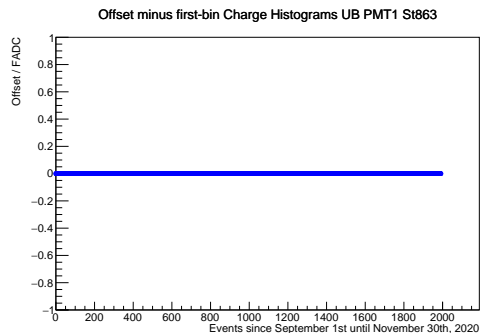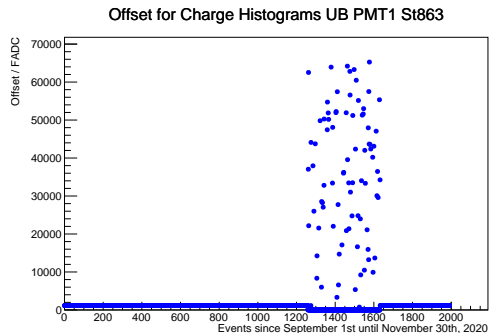xc[j] = mult*j + offset; xc[400+j] = 400*mult + bigbins*mult*j + offset

Here, *mult*, *bigbins* and *offset* are constants and fixed in the code with values of:
mult=1, bigbins=3 y offset = 0.

For event 61219267 offset = 1155, with
a value of 1155 for the first bin of the
UB Charge histogram.

UB Charge-Histogram PMT1 St863 event: 59861717 Offset: 1155
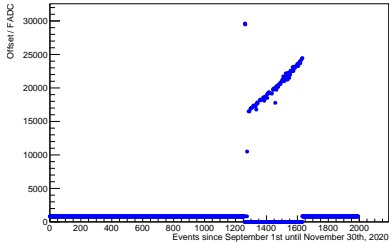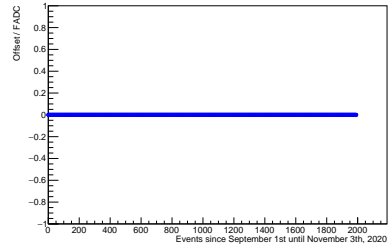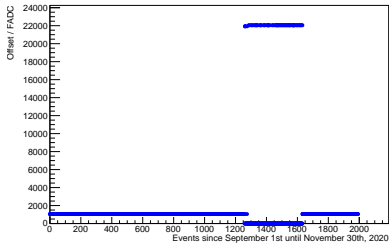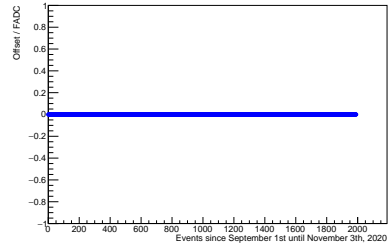
Offset values for UB Charge histograms

For LPMT1

Offset for Charge Histograms UB PMT1 St863

Offset minus first-bin Charge Histograms UB PMT1 St863

Offset values for UB Charge histograms

For LPMT2 and LPMT3

Checking Offset differences for more UUB Satations

Stations to check:

0871 1224

0868 0804 1225

0859 0864 1220 1218

+0863 0866 +1222 +1219 +1211

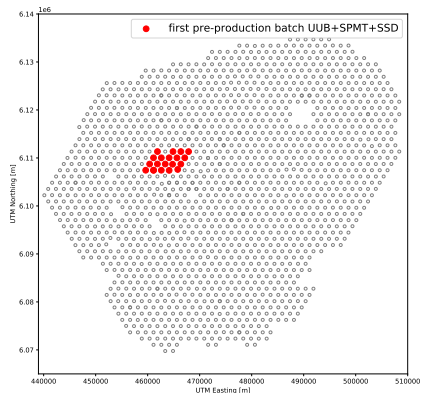+1740 +1743 +1221 +1223 +1217

=1747 =1741 =1745 =1818 =1851

=1729 =1735 =1746 =1819 =1791

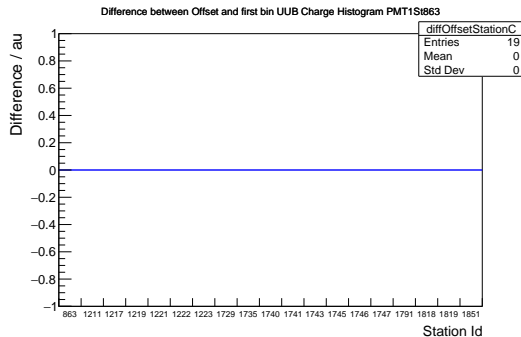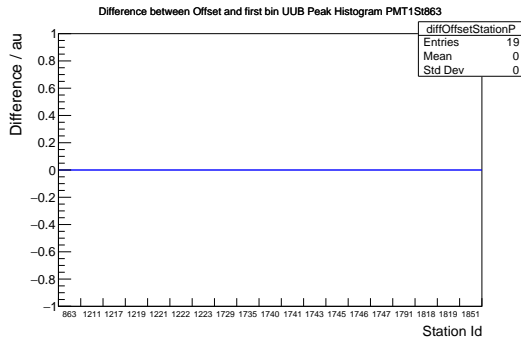The stations installed are:

Dec. 07-11: "+"
until Dec. 04: "="
The others which are not marked, still need to installed.

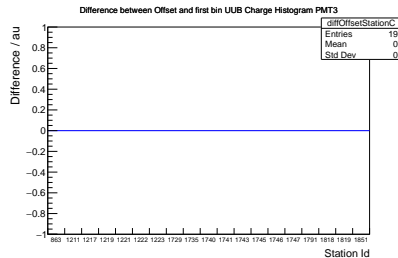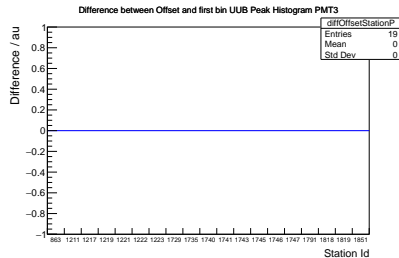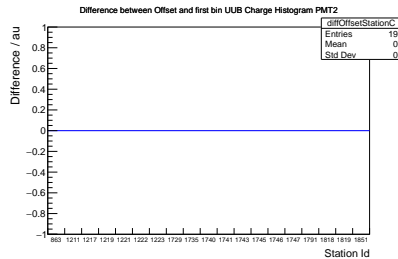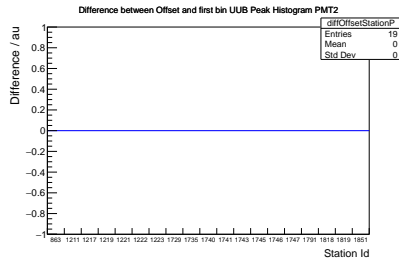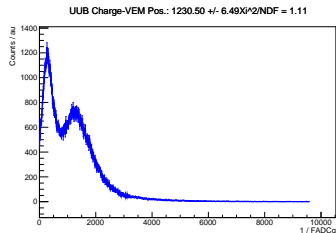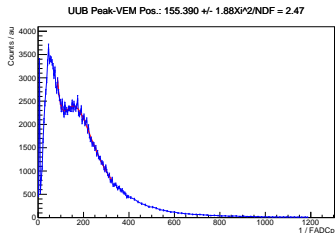**Checking for LPMT1, Peak and Charge**

Checking Offset differences for more UUB Satations
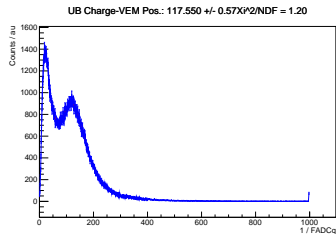
Checking for LPMT2 and LPMT3, Peak and Charge

Area/Peak: Fitting histograms

for UUB LPMT1

UUB Peak-VEM Pos.: 155.390 +/- 1.88 Xi^2/NDF = 2.47

UUB Charge-VEM Pos.: 1230.50 +/- 6.49 Xi^2/NDF = 1.11

for UB LPMT1

UB Peak-VEM Pos.: 37.2900 +/- 1.05 Xi^2/NDF = 1.75

UB Charge-VEM Pos.: 117.550 +/- 0.57 Xi^2/NDF = 1.20

Area/Peak: Fitting histograms

UUB A/P PMT1 St863 Here A/P*(8.33/25)

UB A/P PMT1 St863