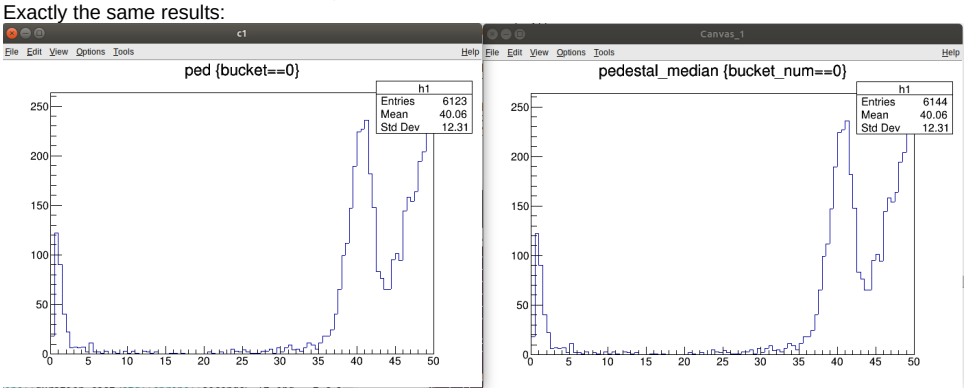
New Analysis Framework - DONE

Summary: the code is done see here https://github.com/Lycoris2017/KPiX-Analysis/blob/experimental/core/include/rawData.h

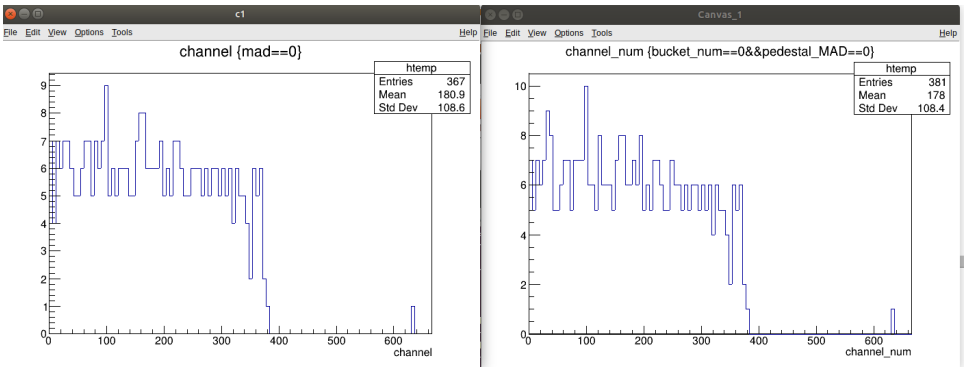
Proofing

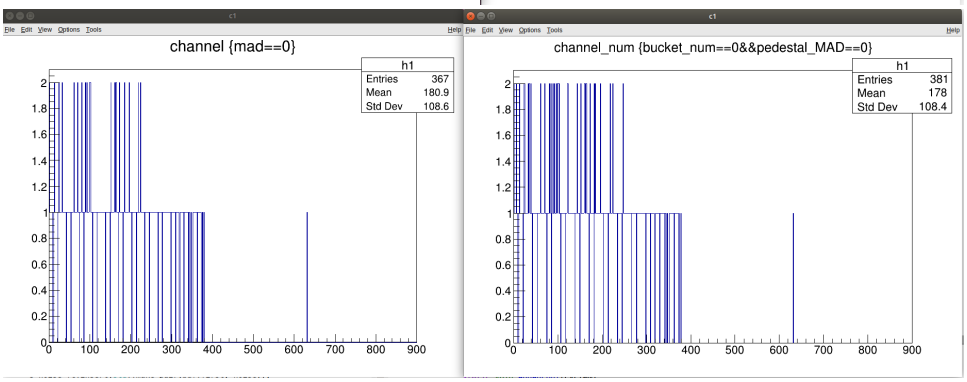
The analysis procedure is:

1. **Pedestal & MAD:** operated on charge over all cycles, per bucket, per channel, per kpix.
    a. **Pedestal median**: left is from new, right is from old
    b. Exactly the same results:



    c. **channel at bucket ==0 with charge response == 0**: left from new, right from old





    d. **DONE** check into these channels and find what are the charge response of them. to understand what happened inside.
        i. Notice the following difference
            1. old one determine a median out of ADC/slope values
            2. new one uses the original ADCs
            3. how to get the slopes: old one look over fit results from every channel's calibration graph, new one take a csv input dumped from slope_vs_channel histo with a precision to a certain digits.

        ii. Difference comes from how the slopes are dealt, Uwe's pedestal + cluster analysis code does not filter slope==0, I did it. that s why:
            1. if you check the **pedestal value** of **pedestal tree** output from Uwe: you get **6144 channels** with bucket ==0
            2. do the same check with the **test tree with new framework:** you get **6123 channels** with bucket==0
            3. Then you check how many channels of the calibration slopes: you have **6144 lines**
            4. however, check it out, there are many with slope==0 or close to 0 see below:

            Left is print out of running pedestal_tree.cxx, right is the slope database for new analysis

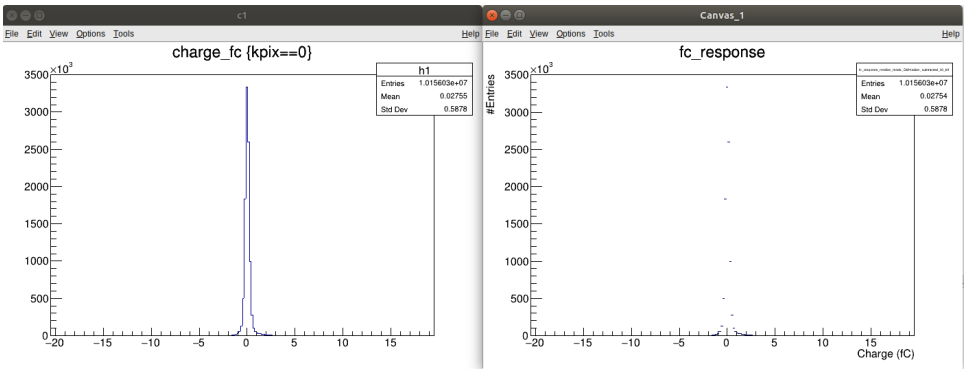
```
Slope of KPiX 3 and channel 6 is 2.39919e-14
Slope of KPiX 3 and channel 7 is 21.0983
Slope of KPiX 3 and channel 8 is 10.5794
Slope of KPiX 3 and channel 9 is 15.4663
Slope of KPiX 3 and channel 10 is 0.146019
Slope of KPiX 3 and channel 11 is 0
Slope of KPiX 3 and channel 12 is 17.9006
Slope of KPiX 3 and channel 13 is 16.7602
Slope of KPiX 3 and channel 14 is 20.1142
Slope of KPiX 3 and channel 15 is 14.5768
Slope of KPiX 3 and channel 16 is 19.4087
```

```
3,4,0,12.97998
3,5,0,17.51672
3,6,0,0.0
3,7,0,21.09831
3,8,0,10.57935
3,9,0,15.46628
3,10,0,0.14602
3,11,0,0.0
3,12,0,17.90059
3,13,0,16.76022
3,14,0,20.11418
```

```
Slope of KPiX 3 and channel 33 is -5.99798e-15
Slope of KPiX 3 and channel 34 is 12.1981
Slope of KPiX 3 and channel 35 is 5.99798e-15
Slope of KPiX 3 and channel 36 is 1.1996e-14
Slope of KPiX 3 and channel 37 is 20.3341
Slope of KPiX 3 and channel 38 is 14.2455
Slope of KPiX 3 and channel 39 is 5.99798e-15
Slope of KPiX 3 and channel 40 is 11.9273
Slope of KPiX 3 and channel 41 is 14.8932
```

```
3,31,0,17.48019
3,32,0,14.37311
3,33,0,-0.0
3,34,0,12.19807
3,35,0,0.0
3,36,0,0.0
3,37,0,20.33411
3,38,0,14.24549
3,39,0,0.0
```

2. **Noise & fC response** after Pedestal & CM removal: per bucket, per channel, per kpix.
   a. **Common mode noise**: calculated per cycle with conditions of MAD!=0 & slope is valid
   b. **fC response**: **left** is from **new**, **right** is from **cluster_analysis.cxx**



   c. Noise distribution: left is new, right is from cluster_analysis.cxx