

Analysis of data using calibration, noise and cosmic run function of KPiX

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Data analysis enables us to process raw data we get from the system to something that is understandable to human, in forms such as graphs. For data that we collect from Kpix, we analyze and try to make sense of it using prewritten root programs to generate different graphs.

Initialize the environment

1. Go to the terminal, Go to a Linux terminal. Input

```
$ cd /data-disk/GEM/local/kpixSW/bin
$ su
$ Password: *****
$ tcsh
$ source setup_env.csh
```

Noise run Data analysis

Open file browser(GUI) and go to the directory: /data-disk/GEM/local/kpixSW/bin

1. Open the txt file: PlotHistogram.txt
2. Change both pedestal file and the data file to the noise run file that you wish to analyze. Be sure that the Range is set at "0".
3. Hit save. You can close the txt file.
4. Run the PlotHistogram program:

```
$ PlotHistogram
```

Now you have generated 64*4 graphs that can be seen using TBrower of root.

5. To see the 64 channels of bucket 0 in the form of a map, we use the program

"PlotHistoMap.c"

```
$ root -l
```

```
$ .L PlotHistoMap.c
```

```
$ MakePlots()
```

Please enter the name of the histogram: (Enter the name of the histogram here, it should be in the format of yyyy_mm_dd_hh_mm_ssh.root) where yyyy_mm_dd_hh_mm_ss corresponds to the name of the histogram file.

6. You can go to TBrower to look at the mapped histogram

```
$ root -l
```

```
$ TBrower k
```

A Gui will appear, get to the /bin/ directory. To open the histogram file.

7. Save the histogram as a Jpeg by clicking on "File" and then "Save As". It is easier than it looks!

Cosmic Run Data Analysis

1. Open file browser(GUI) and go to the directory:/data-disk/GEM/local/kpixSW/bin/
2. Open the txt file: maxChargeSum.txt
3. Change the calibration file pedestal file and data file name.
4. You should see either 0 or 1 behind the line that says "Pressure_correction". Put 0 if you do not want the data to be pressure corrected; or 1 if you want the data to be pressure corrected. If you wish to do a pressure corrected analysis, please first refer to the appendix to analysis the pressure data before you continue on with the following.
5. Hit save. You can now close the txt file.
6. Go to a Linux terminal. Initialize the environment if it is not done. Look at the first session of this note.
7. Then to run the maxChargeSum program, input:
\$ maxChargeSum
8. The file is now analyzed! To open the file, input the following in the terminal:
\$ root -l
\$ TBrowser k
A window should pop up.
9. In the window, click bin.
10. Then find the folder that contain the file that was just processed. It should always be in the format of yyyy_mm_dd_hh_mm_ssmcs.root, where the date and time is the same as that of the cosmic run file.
(A sample: 2012_12_05_12_05_21mcs.root)
Double click to open the root folder, then the file until you see this:
11. The h.summed hit is the summed hit plot, whereas the other files corresponds to the highest hit file, the next highest hit file, and the hit map respectively.
12. Since there isn't much that need to be done with the hit map, (you can simply processed it by saving the file as jpg) I will only show the procedure to processing the summed charge plot, the highest hit plot and the next highest hit plot. Please note that in most procedure we only process the summed charge plot and the highest hit plot.
13. Open the h.summedhit.

14. To fit the graph, we can either do it by a computer program or the cursor. I would show the method done by the computer mouse in the following:
15. Move your cursor to the histogram until you see that the cursor turn into a black solid arrow.
16. Right click, choose fit panel from the menu that comes up.
17. Change the predefined from gaus to landau, and the fit range from the trough right after the noise signal.
Hit fit. Check to see if the curve is desirable. If so, close the panel.
18. Now you should be back to the window where the graph is in. Select "options" from the top row of the window, hit "Show fit parameters". Drag on the bottom left corner of the parameters shown next to the graph to enlarge the box.
19. Last but not least, don't forget to save the file! Go to the top row to find "File" choose "Save As" to save the file as a jpeg. I usually have the picture files saved in /data-disk/Pictures/. And all the file that are generated of the week are all saved into a folder that is dated as the Friday of that week.
20. Repeat the procedure for the highest hit graph and next highest hit graphs. You have just completed your first data analysis!

Appendix Pressure correction

Generate a pressure correction file

In generating a pressure correction file, we use weather data from weather-underground. The weather station we use is Central, Arlington.

Here is the link to the webpage:

<http://english.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KTXARLIN18>

1. In the webpage above get to the
2. Open the pressure excel file
Input in cell A1 your starting time, in the format of hh:mm:ss. Input in cell A2 the consequent time from our starting time where the weather underground station has pressure recorded. In A3, enter a time that equals to A2+00:10:00. Highlight cell A2 and A3, drag from the right bottom corner of A3 down to AXX, where XX is the number of hours the cosmic run took, you can approximate XX. In B1, enter 0. In B2, enter the value that you calculated from subtracting A2 by A1, in seconds. In B3, enter the value that is 3600+B2. Highlight B2 and B3, drag from the bottom right corner of B3 to BXX.
3. Input the pressure using weather underground pressure data, that correspond to the time in column A, in column C.
4. Highlight column B and C and put it into a txt file. Name it as the date when you started the run. "Save as" on the pressure folder on desktop.
5. Save as again, this time save the file in the /data-disk/GEM/local/kpixSW/bin/ directory as pressure.txt.
6. Go back to step 7 of the Cosmic run analysis to analyze the pressure corrected file.