Weekly Report 8/27/2018

Christina Chen

Git Commands

```
Git branch

Git checkout

Git add

Git commit -m “message”

Git pull

Git push -u origin

Git status
```

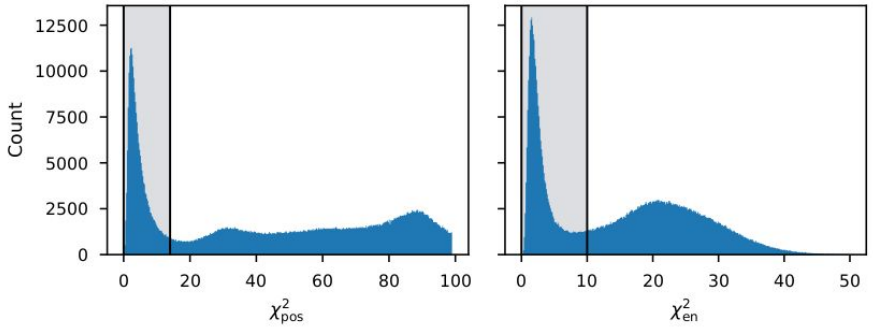
Tasks

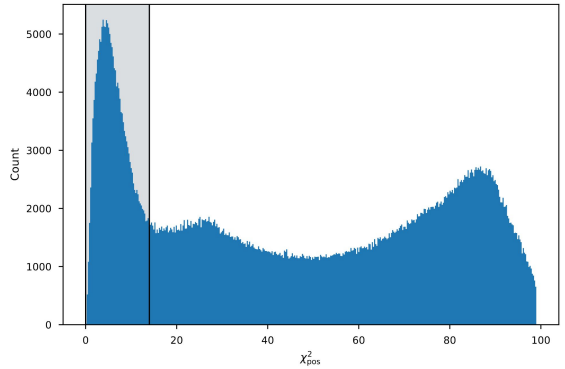
To improve the Chi^2 histogram for Ar46's Monte Carlo fitting results

The current plot is different from that of Josh's because the first peak (around Chi^2 = 20, supposedly "proton" events) is much smaller than the second peak ("junk" and "proton" events).

Previous plots

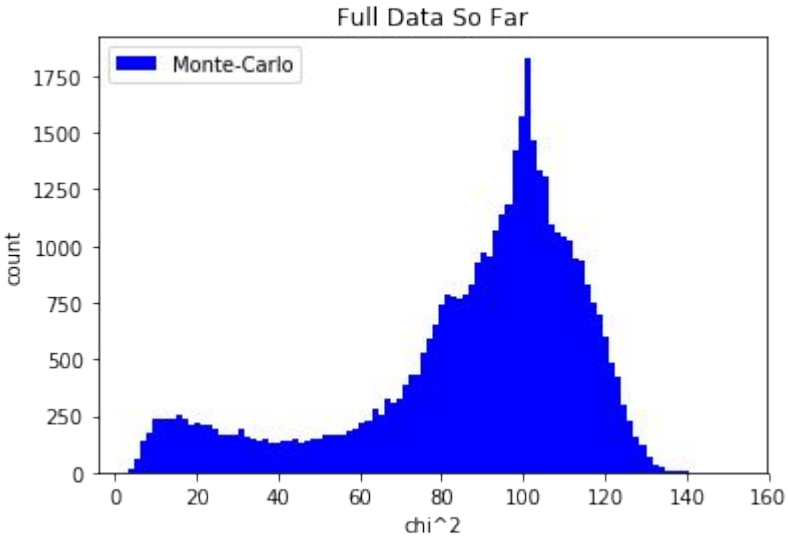
Top: Josh, Bottom: Jack





My (original) plot

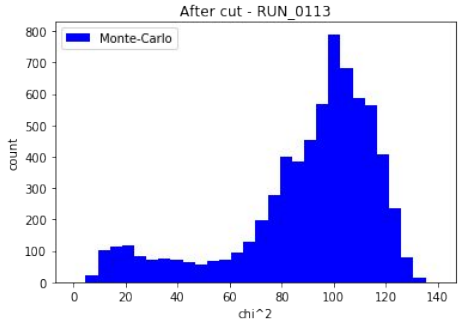
- What could go wrong?

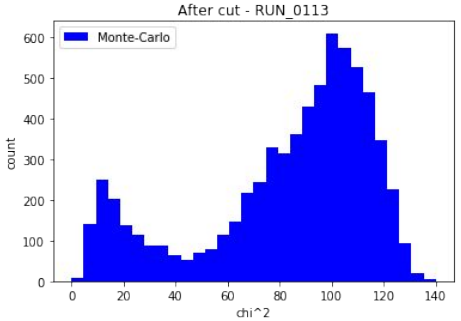


Pile-up events would result in data points being out of the range of the detector

Ex. run_0113
Total number of events: 9699
10% proton events?

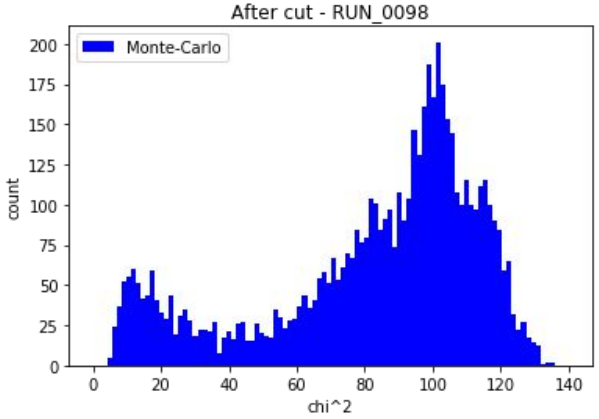
```
#check if the z-coordinate is located within the length detector
try:
    for point in xyzs:
        if (point[2] > DETECTOR_LENGTH):
            raise ValueError('event is not physical') #disregard the non-physical events
except ValueError:
    logger.exception('Event index %d deleted: non-physical evet', evt_index)
    continue
```

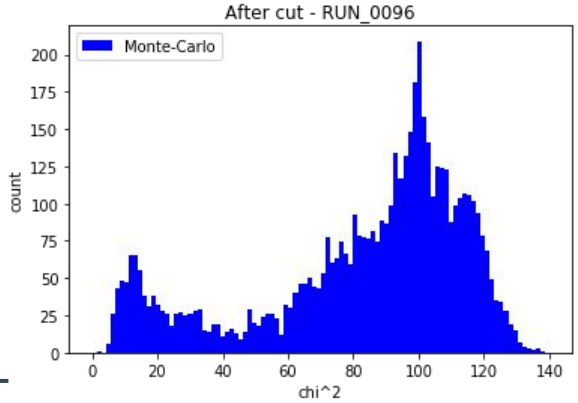




Does “z-shift due to trigger delay” influence fitting results?

- Put the Python file in the same folder as the modified pytpc package
  - Ex. run_0098
  - Ex. run_0096





Other modifications:
Deleted the events that result in “NaN” in Monte Carlo Fitting
Deleted more points that are too far away from the unfolded spiral

Josh's Thesis: 5.3.6 Track Fitting

A cut was applied to the data to keep only points that:

1. Less than 40 mm from the nearest Hough line (unfolded spiral)
2. Had more than two neighbors within radius of 15mm
3. Time bucket index less than 500 (to eliminate a narrow noise pulse)

Any event that had fewer than 50 data points was discarded as well

$$z = \frac{v_d z_0}{v}$$

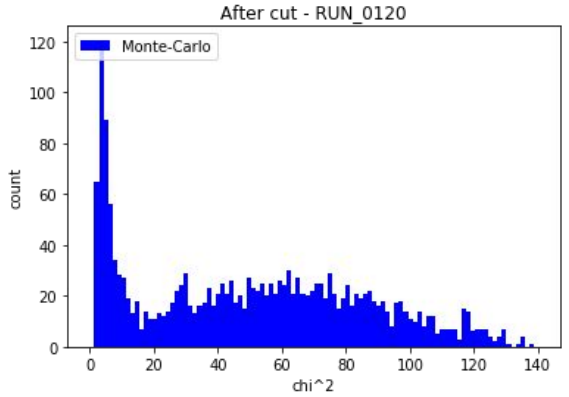
Z0: z in time units
Z: z in distance units
V: clock frequency
Vd: electron drift velocity

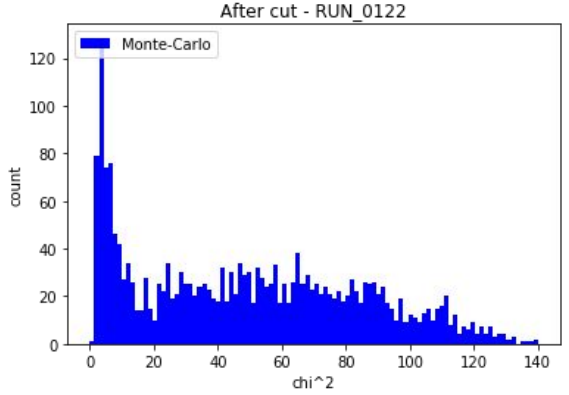
```
del_list = []
for i in range(len(xyzs)):
    #disregard the points that have time bucket index<500
    if (xyzs[i][2])*CLOCK/DRIFT_VEL < 500.0:
        del_list.append(i)
    #disregard the points that have less than two neighbors
    elif (xyzs[i][5] < 2.0):
        del_list.append(i)
    #delete points that are more than 40mm away from the unfolded spiral
    elif xyzs[i][6] > 40.0:
        del_list.append(i)
xyzs = np.delete(xyzs, del_list, axis=0)
```

```
#delete events that have less than 50 data points
try:
    if len(xyzs) < 50:
        raise ValueError('event has too few data points')
except ValueError:
    logger.exception('Event index %d deleted: non-physical evet', evt_index)
    continue
```

Results

Since the HPC needs to fit a large amount of data, most of the runs are still being processed





Proton Classification

In progress
Right now the model (which has 0.86 accuracy) is not showing a significant classification result