## ASTR 288C Homework 5

Due: 3:30pm, Oct. 9, 2017

- The BAT Rate Data contain raw light curves collected by BAT in different time bins. Use HEASARC data to create BAT raw light curve from around 10:00 pm to 10:30 pm on Aug. 10, 2017. Specifically, perform the following steps:
  - (a) [3 points] From HEASARC website, find Swift data that are collected between 10:00 pm to 10:30 pm on Aug. 10, 2017. Write down all the names of the observed object during this time.
  - (b) Download the "BAT Rate Data (rate)" from observations with observation ID (obsid) of 00767284000 and 00093527010. You should see two folders created for each observation ID. Inside these folders, you will find the rate data that you downloaded in *obsid*\bat\rate.
  - (c) [3 points] Use relevant FTOOLS to merge the 1-s raw light curve (files with names end in "brt1s.lc.gz") from these two observation IDs to one single FITS file called BAT\_1s\_raw\_lc.fits. Write down the full command (including all the file names) you use to merge the light curve.
  - (d) [3 points] Use relevant FTOOLS to find out the highest count in light curve file? Write down the command you used, and the value of the highest count that you found.
  - (e) [3 points] Use relevant FTOOLS to sort the merged light curve in time order, named the sorted light curve BAT\_1s\_raw\_lc\_sort.fits. Write down the full command (including all the file names) you use to sort the light curve.
  - (f) [**3 points**] Use the program "fv" to plot the light curve, Print out the light curve plot and turn it in with the rest of your homework.
  - (g) [3 points] What causes the large pulse that reach  $\sim 10000$  counts? Does it have an astrophysical origin?
- 2. For the light curves created for the BAT GRBs, there are light curves with just one energy channel (i.e., data ending in 1chan\_1s.lc) and light curves with four energy channels (i.e., data ending in 4chan\_1s.lc). Find out the answers to the following questions:
  - (a) [3 points] What is the energy range for the light curves with just one energy channel? Write down both the energy range and the method (or commands) that you used to find it.

- (b) [3 points] What are the energy ranges for the four energy channels? Write down both the energy ranges and the method (or commands) that you used to find it.
- 3. [6 points] When BAT triggered a burst, *Swift* will slew to the burst and start observing it with XRT and UVOT. For GRB 170810A, find out when XRT start collecting data for this burst. List the time relative to the BAT trigger time (that is, how many seconds since the BAT trigger). Your answer need to be precise down to the hundredth place. Also, include a brief description on how you find the answer.