# Homework Assignment
# Data Analysis IV: X-ray Spectroscopy
# Due: 3:30 PM, Wednesday, November 24

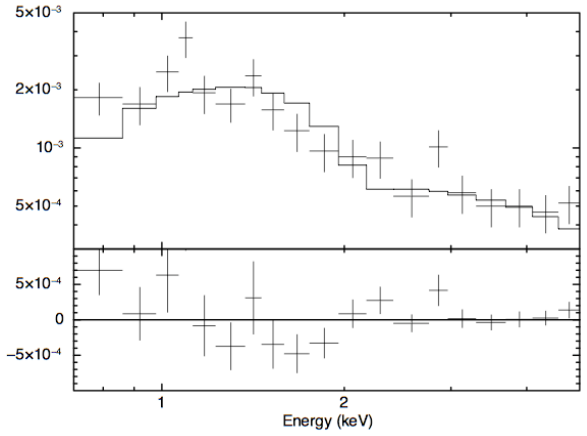
1. From among the point sources used to make the composite spectrum in Lab 11, identify the four sources with the highest significance (see Lab 11 question 1) and construct region files for each that can be used to extract the corresponding spectra using **Xselect.** One way to do this is to insert a line in **xregions.pro** that prints out *ind_close* and *sig_srcs(ind_close)*, and use this information to edit four copies of (what I called) *composite.reg*.

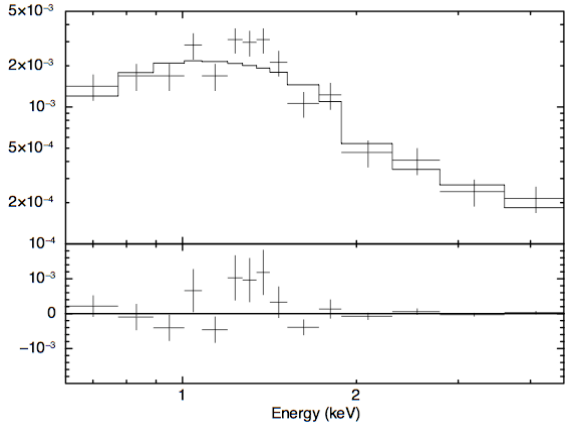
2. Once these region files are constructed, extract spectra for these sources using **Xselect**. Note that you can do this in a single session by typing *clear region* after each spectral extraction, and then applying the next region filter.

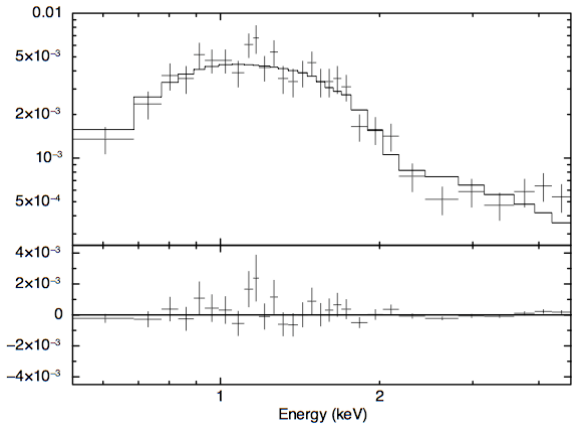
3. Apply **grrpha** as in the lab to create spectra with a minimum of 20 counts per bin.

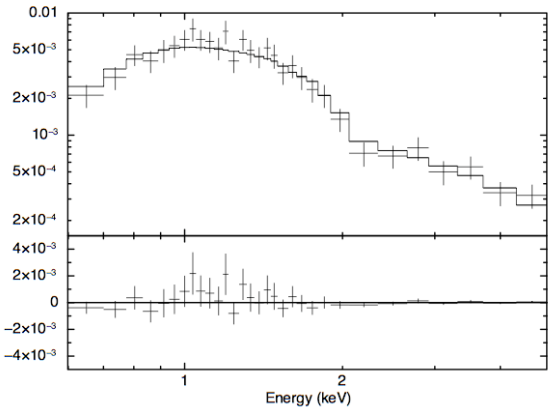
4. Fit these spectra with absorbed power-law models, fixing the absorption at the Galactic value as in the lab. Save the best-fit model information in the form of **.xcm** command files, and **hand these in with your assignment**. Record the count rate and the best fit photon index in the table below. Derive the $\Delta\chi^2$=2.706 confidence range for the index and the *soft* band (0.5-1.5 keV), *hard* band (1.5-5 keV), and *total* band(0.5-5 keV) fluxes as in the lab. Record the total flux, and the ratio of soft-to-hard flux in the table below. A scatter plot of these quantities is akin to an optical color-magnitude diagram. Create hardcopy plots of the spectra and **hand these in with your assignment.** Note that there is an entry in the table for the composite spectrum you extracted in the lab, as well.

| | **0.5-5 keV count rate** | **photon index** | **$\Delta\chi^2$=2.706 confidence range** | **total flux** | **soft/hard flux ratio** |
|---|---|---|---|---|---|
| composite | 0.0305 | 1.65 | 1.58-1.71 | 2.64e-13 | 0.582 |
| source 7 | 0.00394 | 1.10 | 0.905-1.29 | 3.81e-14 | 0.308 |
| source 8 | 0.00311 | 1.90 | 1.69-2.11 | 2.65e-14 | 0.777 |
| source 11 | 0.00655 | 1.81 | 1.66-1.96 | 5.61e-14 | 0.706 |
| source 12 | 0.00697 | 2.06 | 1.93-2.19 | 5.93e-14 | 0.938 |


5x10⁻³
2x10⁻³
10⁻³
5x10⁻⁴
5x10⁻⁴
0
−5x10⁻⁴
1
2
Energy (keV)


5x10⁻³
2x10⁻³
10⁻³
5x10⁻⁴
2x10⁻⁴
10⁻⁴
10⁻³
0
−10⁻³
1
2
Energy (keV)


0.01
5x10⁻³
2x10⁻³
10⁻³
5x10⁻⁴
4x10⁻³
2x10⁻³
0
−2x10⁻³
−4x10⁻³
1
2
Energy (keV)


0.01
5x10⁻³
2x10⁻³
10⁻³
5x10⁻⁴
2x10⁻⁴
4x10⁻³
2x10⁻³
0
−2x10⁻³
−4x10⁻³
1
2
Energy (keV)