Observing Project #3: Using the SBIG Self-Guided Spectrometer
(16 October 2012)

Procedure: You will go to the observatory in small groups. Work closely together, but take your own notes and make sure that you would be able to reproduce everything if you were working alone. Before next class, prepare a brief report on your observations (not a full analysis of your spectrum), addressing the questions posed below.

Before you go upstairs, make sure you know if your star is feasible, and if not, select an alternative target. When you get up there, the telescope and spectrometer will already be up and running. You might need to re-initialize the pointing on a nearby bright star in order to find a faint target. Otherwise, you should be able to find your target by carefully using the Telrad.

Once your group has found its first target:

1. Determine the field of view, image scale (in arcsec/pixel), and image size (arcmin x arcmin) for the "Tracking" camera. Do this by placing your star in one corner of the image and carefully recording the RA and Dec from the TCS window. Then place your star in the opposite corner and do the same. Calculate the x and y distances in arcminutes and divide by the number of pixels (use the cursor to measure this). Then put your star back on the middle of the slit, focus the telescope, and save an image (always save your data in a subdirectory of C:\ASTR377) of the tracking camera showing a star on the slit. If possible, measure the FWHM of the star image using the cross hairs. What does this correspond to in arcseconds?
2. Determine the orientation in the tracking camera. Which direction is North? Which is East? When you print out your image later, make sure to label this.
3. Which direction is the slit (north-south, east-west, northeast-southwest, etc)? Does the "top" of the slit in the tracking camera correspond to the "top" or to the "bottom" of the slit in the "Imaging" camera?
4. Place your star about 1/4 of the way down from the top on the slit in the tracking camera and take and save a sample spectrum (say 10 seconds). Then place your star about 1/4 of the way up from the bottom in the tracking camera, take and save another spectrum of the same duration. Use the tools in CCDOps to measure the intensity of these spectra. How do they compare?
5. What is the size of the "Imaging" CCD? What is the binning factor (X by Y)? Roughly how many pixels is the spectrum spread over? What is the "focus/seeing" (measure FWHM of profile along the slit)? If possible, use this calculate the image scale (arcsec/pixel) in the spatial dimension on the imaging CCD. Alternatively, you may move the telescope a certain number of arcseconds along the slit and measure the distance traveled in pixels.

Each member of the group should then obtain 5 spectra of your target star, using an exposure time that gives at least 10000 total counts (in the combined image) at the faintest part of your spectrum. Use the crosshair and a "horizontal plot" to get a quick look at the spectrum. Use the crosshair and a "vertical plot" (or just the cross hair and the statistics) to measure the exposure level.

Finally, the group should obtain one long spectrum (5 two-minute exposures will probably do the trick) of blank sky (no stars, no milky way). You should clearly see some emission lines from the sky (reflected from streetlights). You will use these to calibrate your wavelength scale.

Copy all of your data from /mnt/lestrade on sherlock to your ASTR377 working directory.