Astronomy 3130 – Spring 2017
Lab 4 – Astronomical CCD Color Imaging with the Fan Mountain 24-inch or 40-inch Reflector

Summary: You will go to Fan Mountain Observatory and use the Rapid Response Robotic Telescope, a CCD-equipped 24-inch reflecting telescope, or the 40” telescope with a CCD to collect the data needed to construct a fully calibrated color image of the astronomical target of your choosing. The class will conduct this lab divided into four groups. The lab report writing (and data reduction) will be a group exercise. That is, there will be only one single lab report submitted for each group that is the collective work of the group (just like writing a multi-author astronomical paper).

A step-by-step approach:

1) Familiarize yourself with the telescope and its capabilities. What is the field of view of the CCD? What filters are available? How faint a star can you observe in 5 minutes of integration with a telescope like this (consult an exposure time calculator...)?

2) Decide on a target. The primary goal of this lab is CCD image calibration and combination of “finished” images taken through different filters to produce an impressive color image. Your choice of targets will be limited by the accessible sky during your observation. Given that we need to work around the Moon it might be good to have an “early evening” and a “late morning” target. Although producing a “pretty” picture is the primary goal here, you should also consider the science motivating your choice of target. Find some scientific context to justify your target selection. The fact that you are doing simple direct broadband filter imaging will limit that science, and your motivation can be limited to demonstrating simple ASTR 2110/20 principles – locating actively star forming regions in late type galaxies, estimating the size of the HII region in the Orion Nebula, measuring the diameter of the Ring Nebula etc. Just try to make it one step more than making a pretty picture.

3) Decide on the three filters to be used in the observation. What exposure times will be required in each filter? How many frames per filter to get a good median to clean up image artifacts? Will you be dithering?

4) Generate an airmass curves for your two targets.

5) Head for Fan and acquire the necessary images at the 24”/40”. Don’t forget to acquire the appropriate calibration images (flat fields, biases, darks...) at the beginning and/or end of the night.

6) Use python data processing to calibrate the images and use ds9 to construct a full color representation of your target experimenting with different stretches and scalings.

7) As a group write the paper, that is the lab report cast as a scientific paper.