Astronomy 3130 – Spring 2017
PreLab 4 - Gaining familiarity with data acquisition and calibration using a CCD imager.

In both Lab 4 and Lab 5 you will be using a CCD imager being operated by MAXIM-DL software. In this prelab you will become familiar with operating the software and with obtaining the necessary data to produce a clean calibrated image (dark frames, bias frames, flat fields, and “science” data).

The “optics” for this experiment will be a 200 mm diameter pinhole located approximately 4 cm from the CCD focal surface.

The commercial CCD system is an Apogee ALTA U9000. The data sheet for this CCD can be found at https://www.optcorp.com/apogee-alta-f9000-d07-monochrome-ccd-camera.html

There is an abundance of information about pinhole cameras on line. One interesting article is archived at http://faculty.virginia.edu/skrutskie/ASTR3130/PinholePhotographyEd2.pdf

Prelab Goals:

1) Collect the necessary scene frames and calibration data to produce a fully calibrated picture of the room (or whatever you want to target). Also...

   a) Make measurements of object sizes and distances to those objects to determine the angular scale of the pixels and the size of the full field of view. Check for consistency with the pinhole geometry.

   b) Observe the resolution chart and determine the limiting resolution of the system.

   b) Explore the unique depth-of-field characteristics of the pinhole camera. Everything is in focus regardless of distance.

   c) Acquire dark frames with the cooler turned off as well as on and compare.

2) Observe the pinhole diffraction pattern through the two bandpass filters provided (one blue and one infrared) and show that the first diffraction ring matches the angular size expected for the wavelength.

Rather than providing step-by-step instructions, the plan for this lab is that you will carry out this work coached by Matt or Robby during the Tuesday/Wednesday evening session during the coming week. Be prepared with a memory stick so that you can carry away and share the FITS images captured by the computer.

Deliverables, submitted on Collab, include your typed up/scanned notes for the data acquisition activities (learning to keep a log sheet of observational details exposure-by-exposure is an
important skill) and a finished/calibrated FITS image of the scene of your choice. Since this is a “prelab” don’t go overboard on the presentation, just demonstrate that you have an understanding of the issues addressed in the Goals above.