GRS AS710
Night Lab #1: Boston Sky Brightness and Seeing
Due, Friday, October 7th, 2011 by 5pm EDT

-> must be submitted via email as a PDF file to Clemens@bu.edu <-

Purpose: The goal of this lab exercise is to measure the dark Boston night sky brightness in three colored glass filters and to measure the apparent seeing for at least one night in Boston.

Tools: The Celestron 14" telescope, along with the current CCD camera and the computer controlled telescope mount. Computer tools include the MaximDL software on the CAS606 computers.

Procedure:

1) ***Orient the CCD Camera:*** Rotate the CCD camera as needed to put North "up" on the CCD display window.

2) ***Plate Scale:*** Measure the ratio of sky angle to pixel size with the telescope+CCD combination. Deep exposures for a star field can be matched to 2MASS cataloged star positions.

3) ***Seeing***: Measuring the seeing requires focusing the telescope to the smallest stellar image size (the smallest "point source function" or PSF), measuring the full-widths at half-maximum (FWHM) of several in-focus images, and measuring the plate scale (in arcseconds per pixel) of the CCD.

4) ***Filter Identification:*** Determine which filters are in the filter wheel locations

5) ***Calibration:*** Determine the "zero point magnitudes" for the B, V, R filters from observations of standard stars

6) ***Sky Brightness***: The filter brightnesses of a standard star need to be measured in three optical passbands (e.g., "B", "V", and "R"). The standard star should be chosen to be close to the zenith, to reduce extinction effects. To measure the sky brightness, long exposures with the CCD are necessary to reach several tens of counts above the bias background and above the dark current background. The bias level should be measured in a zero exposure image. The dark current should be measured for exposure times similar to the sky brightness exposure times.

7) ***Perform all necessary calculations***. Note that the seeing should be reported as the mean seeing profile FWHM in arcseconds and the standard deviation of the seeing profile FWHM values. Sky brightness should be reported in units of filter magnitudes per square arcsecond with appropriate uncertainties reported for each filter value.