

Texas Tech University    Department of Physics & Astronomy  
Astronomy 2401    Observational Astronomy  
OBSERVING EXERCISE 4 - VARIABLE STAR PHOTOMETRY

**Objectives:**

There are two principle objectives for this observing session.

- (a) To obtain at least 120 minutes of CCD images of a variable star.
- (b) To gain more experience in using a CCD and computerized telescope.

**Procedure:**

For tonight's observing lab, you will be acquiring images of a variable star for later analysis. Although the variable star has a short period, you will still need to get at least 2 hours of images during the lab, and longer would be better. Since you will need at least 20 minutes at the start of the lab to obtain your calibration frames, this will mean that you will have to be very prompt in getting your telescope/CCD combination operational.

The variable star you will be imaging will be one of those listed below:

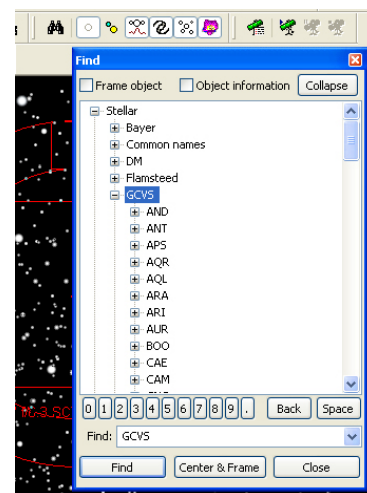
Star	DY Peg	CY Aqr	GP And	BL Cam	V959 Oph
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Before you start imaging the star, you need to take a number of images of the twilight sky for flat fielding. To do this, you need to aim the telescope towards the west where the sky is still bright with twilight. Move the telescope to this region and take a 0.05 – 0.1 second test image depending on how bright the sky is. Once you have this image, check the pixel value near the center. It should be somewhere between 10,000 and 35,000. If it is outside this range, you need to either increase or decrease the exposure depending on if it is above or below the range. Also check for any bright stars that might be visible in the image. If there are any, you will need to move the telescope so that they are not in view. Once you are set, take 20 images, depending on the length of your exposures, and follow those up with 10 dark frames of equal exposure.

Once you have taken these images, Take 10 dark frames of the same duration as your images. **Make sure you name the darks differently so that you can tell which are for the flat fields and which are for the star images.** While you are taking your dark frames, move the telescope to Altair and get ready to synchronize the telescope. Once your darks are finished, synchronize the telescope and then slew to your object.

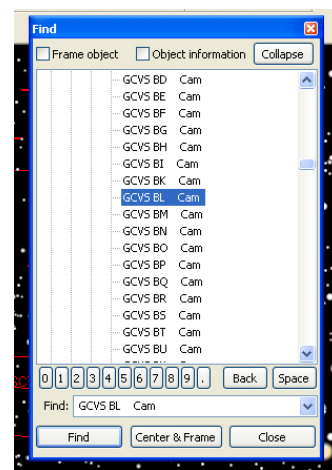
Use “The Sky” to point the telescope at your star. To locate your star, use the “Find” icon, and then click on “Stellar” and then “GCVS”. This will bring up a constellation list.

Scroll down the list until you find the constellation to which your star belongs. e.g.; if you are trying to find a variable star in Aries, you would scroll down until you find the constellation “Ari”. (The official abbreviation for Aries)



Once you have found your constellation, click on the “+” sign beside it. This will display a list of all the variable stars in that constellation. Scroll down this list until you come to your star, then click “Find”. Now you will be able to slew the telescope to the star as per usual.

Use the finder chart included in this lab for your selected star and make sure the Telescope is pointed at the correct field. The finder charts are at 26’ by 26’ and the red box corresponds to the 16’ by 16’ CCD FOV for the 12-inch with the focal reducer attached. Once you have the star centered in the CCD and you have a suitable guidestar in the guider, start taking images. Since the stars are generally quite bright, the exposures required will be relatively short. Also, as far as possible, try to ensure that there are no very bright stars in the field when you are imaging.



The approximate exposures for each variable star are given in the table below.

Star	DY Peg	CY Aqr	GP And	BL Cam	V959 Oph
Exposure	20 seconds	20 seconds	20 seconds	30 seconds	30 seconds

Once you are ready, start taking images of the star. ***Do not forget to make sure the AutoSave box is checked!*** Keep taking images for **at least 120 minutes**, or until 10:45pm, whichever comes later.

When you are finished with the dark frames, disconnect the CCD and close “CCDSOft” and “The Sky”. Then copy the images on to your memory stick.

Finding Charts

