Taking Stellar Spectra

By M.L. West

The spectroscope sits between the source of light (telescope and star) and the camera (digital or CCD). Its purpose is to spread the light out into its constituent colors. Larger resolution means more spread out light, and also longer exposure times because any section of the spectrum is fainter. A spectroscope consists of a slit, a grating or prism to disperse the light into its colors, and several collimating lenses.

We have a Sivo spectroscope made by Joe Sivo in NJ. The "slit" is made by a row of thin glass fibers held next to each other in a line. This group of fibers is eventually bunched together and inserted into a cylinder of the same size as a standard eyepiece. This brass cylinder is slid into the eyepiece end of the telescope once your object is in view and focused.

The "slit" end of the optic cable fits into one end of the spectroscope box. This can be on a table near the telescope, so does not have to be supported by the telescope and mount. Inside the box are the grating and the collimating lenses.

1. Lining up the slit. Before going outside point the brass cylinder at some light source. Using a parfocal eyepiece, look at the spectra coming out of the spectroscope box. Gradually turn the fiber optic cable until the spectrum is as wide as possible. Lock the cable in place.

2. Focusing the camera. Remove the parfocal eyepiece and attach the CCD camera to the output of the spectroscope box. Take images, while gradually moving the camera in or out of the box. When the individual fiber cables can be seen clearly, then the camera is focused. Tighten the screw to hold this connection securely.

3. Take the CCD/spectroscope outside by the telescope. Align and aim the telescope at your chosen star.

4. Remove the eyepiece and attach the phi-view positioner in place of the eyepiece. Look through its port and carefully aim the telescope so that all the light from your star goes down the little hole right into the fiber optic bundle. Now all the light is on its way to the spectroscope box.

5. Take CCD images. A common setup is 3x3 binning, 20 or 60 seconds, temperature = -10 C.

6. Inside, take spectra of excited gas tubes. Use the setup of 3x3 binning, 1 sec, temperature = -10 C. Include: argon, carbon dioxide, helium, hydrogen, mercury, neon, nitrogen, water vapor.