

GRATING SPECTROGRAPH

CONSTRUCTION DETAILS

A re-design of my present reflection grating-based spectrograph is currently underway. The current design will allow differing camera bodies to be attached, adjusted and removed with greater ease; provide better access to its internal elements and the reduction of overall weight. The earlier spectrograph was originally conceived as a visual instrument; a spectrometer with camera facilities almost an afterthought. When a Cookbook 211 CCD camera was constructed in 1996 (doesn't seem that long ago!) it was a "cob" job integrating it well enough to capture spectra. Shown at left are the beginnings of the new layout which has been fashioned from 1/16" aluminum which is light weight and easy to tool. The entrance slit is of a semi-fixed type since rarely have I had the necessity to adjust the slit width between full open for point sources and 20 to 40 microns for solar and calibration lamp spectra. To set this narrow width a strong backlight and shim stock (thickness gauge material) is used which covers .0005 to .010". New single-edged razor blades are utilised for the slit hardware. The collimator used for this project is a 140mm f4 lens from an old pair of binoculars which although not of the finest quality for this application does a fine job nevertheless. The mounting allows a range of adjustment to bring the entrance slit into focus when the collimator and slit are viewed with a small telescope

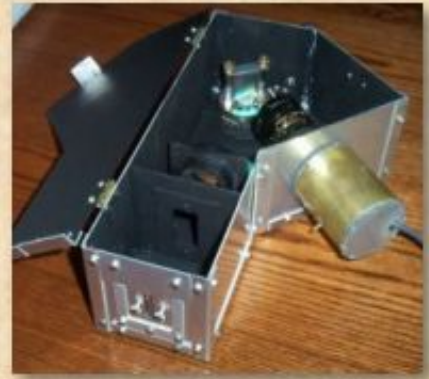


focused at infinity. The grating turntable is constructed from a variety of materials including components from an old hard drive; some black bakelite and a few machined pieces of aluminum. The whole mechanism is spring-loaded and acts against a micrometer head which sets the grating position relative to the camera. When calibrated the grating position can be read on the micrometers dial markings and give a hopefully reliable spectral region. The current grating is a 25mm square 1200 lines/mm obtained from Edmund Scientific.



The cameras currently employed are a Quickcam B/W model of 320 x 240 10-micron pixels using a TI 255P CCD chip; a Quickcam VC colour with 352 x 288 8.2/3.8 micron pixels; a QuickcamPro 3000 with 640 x 480 5.6 micron pixels and a Cookbook 211plus comprising 192 x 165 13.75/16 micron pixels. All of the cameras with the exception of the QCPro3000 allow for long exposures (bulb mode) using either Astrovideo or each camera's boxed software. The long exposure modification is a work in progress and hope to have completion by Winter 2003/04. Its current maximum of 1/5 sec does not permit closing down the entrance slit more than about 40-50 microns. I generally image stack 5 separate exposures to increase the signal to noise ratio but have stacked up to 20-25 depending on the spectral region of interest. The camera lens employed range from a 25mm / f2.7 to a 17mm / f4.7. Both require manual barrel focusing and for a future enhancement of the instrument a motorized arrangement would be of benefit.

Currently several outstanding issues are being tackled; the Addition of some black velvet for lining the instrument inner lid for improved light tightness; adding a calibration lamp source using a bundle of fiber optic cable to pipe the source to the entrance slit and an interchangeable front panel with eyepiece adapter for mounting to a telescope. I've included several additional images of spectrograph's progress below.



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