



MULTIPLE MIRROR TELESCOPE OBSERVATORY

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MMTO Internal Technical Memorandum 85-1

Subject: Autoguiding with the New Top Box

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Summary: Automatic guiding, that is closed loop control of the secondaries, was tested during M&E time June 14. The data show a factor of three improvement in tracking error between auto-guiding and open loop corrections, though the closed-loop errors are expected to be much better with a better selection of coefficients for the terms in the tracking algorithm.

Test setup: The experiment was conducted using the following equipment (refer to figure 1):

1. The new top box with the prism wheel at the pupil plane, the Fairchild intensified CCD TV camera as the acquisition camera, the 200 mm lens, and the AWP's at the home position (no offsetting).
2. A beam splitter on the "feed select" stage in the top box to deflect half of the telescope beam to a Pulnix unintensified CCD TV camera located in the lower level of the top box.
3. The MMT spectrograph 2 x 3 aperture plate at the focal plane.
4. The TCS computer and Grinnell image processor performing the usual auto-guiding operations.
5. The spare computer controlling the prism wheels in the top box proportional to paralactic angle.
6. The instrument computer and Grinnell image processor measuring star positions from video supplied by the Pulnix camera, using software transported from the TCS routine.

Test procedure: A 2.1 magnitude star was selected from the MMTO star catalogue with an azimuth of 235° and an elevation of 60° , and velocities of 20 and 10 arcseconds per second, respectively. The TCS routine was used to place the images in the "stacker" format, that is, in a line in elevation. Software limits were set for the instrument rotator of +5 PA and -20 PA to prevent damage to the spectrograph umbilical, and SKY-PA changed on the mount routine to bring ROT-PA within the MIN and MAX PA limits. The scale of the Pulnix was found to be 21.6 pixels per arcsecond as measured at the instrument computer. The auto-guiding update rate was set at 1 Hz. The FWHM of the individual images and the stacked images were taken before and after each test.

The prism wheel was inspected using close-up optics and the acquisition TV to insure that the individual telescope pupils were lined up with their respective wedges. To further insure that the pupils were aligned the 200 mm lens was selected, then each secondary was "nodded" and the video inspected to insure that the motion of one secondary did not introduce motion in more than one image at the acquisition camera.