

heavy duty, severely customized electronic rack slides and at it's full open position it latches at a height of 13". There are black, round bar, type handles on each side of the shield and these should be used to raise the shield to it's full open position.

To bring the shield down it is necessary to turn each black handle **IN** toward the shield and this action will release the latch mechanism which locks the shield in the up position. The movement of the shield is also counterbalanced for easier lifting and even though the shield was shaped from 16 gauge aluminum, the final force required to move it was around 20lbs.

Quantex were the suppliers of the polyvinyl chloride material for the actual viewing window. This material, measuring 50cm x 33cm x 0.7mm thick, was sandwiched between two sheets of plexiglass and mounted in the front panel of the shield. The polyvinyl chloride material is green in color, 40% luminous transmittance, a minimum optical density of 2 and suitable for our Nd-YAG laser which operates at a wavelength of 1064nm. With an optical density of 2, our first tests indicate that some illumination in the form of a small spot light, mounted inside the shield would be desirable. We will also consider mounting a miniature video camera, also within the shield, so that the cutting operation can be monitored from other stations in our building.

Another feature we hope to add is a more, user friendly platform for the cutting of mask blanks. At present we have a rather crude aluminum plate onto which we place the material to be cut and hold it flat with two pieces of thick aluminum blocks. A design is in progress for a platform which will lock into the existing mask holder slot and will have a quick clamp arrangement through which the material will be fed. Eventually we may have a company supply mask blanks which have been produced via a metal cutting laser machine, initially we considered having the blanks punched out but the cost became prohibitive, given the high degree of accuracy we were calling for.

So at this point we are measuring all the holders to ensure the repeatability of the blanks fitting into any of the holders, since we may have to order the blank masks in quantities of a thousand or so to keep the cost acceptable.

P. Sydserff

Installation of the Primary Mirror Autocollimation

The Primary Mirror Autocollimation system was installed during the July 1993 shutdown. While the mirror was out of the cell, the fixed 'bendix' style mirror support defining pads were removed and the new computer controlled roller screws installed. The system was installed with a DOS control computer with no interaction with TCS. Currently the system detects mirror support air pressure and rises to a pre-determined height every night. A drop in air pressure would cause them to be lowered, to avoid too much stress on the primary mirror.

The Institute for Astronomy fabricated the three primary mirror autocollimation actuators using SKF high-precision roller screw capable of 56,000 kg each. The total usable motion is 1.75 mm with position accuracy and repeatability of 0.04 mm mechanical. The encoders are capable of 0.01 mm. The maximum loads seen have been 2700 kg/actuator with 375 kg/actuator normal load. The units have two sets of limit switches. One set for computer control and indexing and the other for

failsafe motor power cut-off. In addition to these failsafes the screw itself also has two sets of mechanical hard limits.

During its first night of commissioning the unit performed flawlessly. In less than two hours, 12,900 kg of glass and steel were effortlessly collimated from the fourth floor control room. Early in 1994 we have scheduled coma mapping engineering nights. The data from these nights will bring the system to its next level. The data will be used, along with a new VxWorks control system, to provide a look up table to recollimate the primary for each telescope pointing.

E. Stokes

The Summer 1993 Telescope Shutdown

Congratulations to all for a very successful shutdown period. All the 8 major activities were completed within the schedule of seventeen days.

The Optical group put a beautiful new coating of aluminum on the primary mirror, one that should last us another two years. Removal and re-installation of the primary mirror was carried out exactly by the book, but as usual it is a lot of hard work for the mechanical crew which included a number of volunteers from other groups. The strong team spirit and good humor made the work go smoothly.

Art Brown from Cast Steel and two people from Arakaki Mechanical completed repair of the dome shutter cam followers which was started two years ago. They also re-installed the motor/gearbox that was removed during the previous repairs. The shutter is now making far less noise when it opens and closes, making us a lot happier and confident in its operation.

Three people from Transcrane in Montréal were here to complete work on the dome crane which failed about 18 months ago. They replaced one of the drive sprockets and the two heavy roller chains that the bridge uses to drive up and down the arch girder. While making a lot of noise following the installation of the new chains and sprocket, the bridge drive system has now worn in to its new pieces and is running smoothly. It will be at least ten years before we have to face this very heavy job again.

The Primary Mirror active collimation system was installed in the primary mirror cell. The concept of this system was designed in house and the detail and fabrication done by IFA. ASA of Sidney BC Canada designed and fabricated the control system. The integration of the components and installation was done by the Operations and Mechanical Groups. Many people including Ed Stokes, Grant Matsushige, Scot McArthur and Bill Cruise worked long and hard on the final details. The system has worked flawlessly since installation.

The Cass Bonnette was removed from the telescope, transported to the shop on the first floor where it was cleaned and examined thoroughly. This was the first time since initial installation that the Cass Bonnette has received such attention. Much of the work was done in preparation for the rebuild of the drive and control systems which is planned to be complete mid next year. Peter Sydserff built up and test fitted a template of the Cass Bonnette's mounting bolt circle to the telescope in preparation for fabrication of a counter weight. This weight will be used on

the telescope when the Cass Bonnette is removed for several months to allow the rebuild to occur in Waimea. A major improvement to the way the Bonnette is removed and installed was fabrication of a carrying cart. This allowed the easy handling of the 1350 lb Bonnette both in the shop and on the blue platform used to remove and install the Bonnette on the telescope.

The Cass environment was again removed from the primary mirror cell to allow work on the cable windups. Removal of the environment was done last shutdown for the first time since installation. This time the job went very smoothly, although we should consider building a cart similar to the one for the Cass Bonnette if the environment is to ever be removed again.

Considerable work was done on the system to alternately open and close the mirror covers. The computer racks in the computer room on the fourth floor were also completely reorganized by the Electronics and Software groups in preparation for TCS 4 and other improvements.

Again, it was alot of hard work, and the shutdown involved just about everyone in the company. Thanks to all!

D. Cowley

Aluminizing and Cleaning of the CFHT Primary

One of the activities of the July 1993 shutdown was the recoating of the 3.6 meter primary. Although the process of realuminizing the polished front surface of 20 tons of glass may appear to be anything but routine it was, in fact, as close to routine as one would want thanks to the thorough planning and professional training of CFHT's staff.

After the mirror was lowered by crane to the Summit Aluminizing Room on July 2 and before it was coated on July 7 several cleaning tests were performed to learn about non-contact methods of cleaning the bare aluminum coating. We determined by Scatterometer measurements, directly on the

primary, that an alcohol-based solution cleaned the 2-year old Aluminum coating better than a detergent-based solution. The results of these tests along with the preparation and distribution of witness slides have allowed me to design an experiment that hopes to answer two questions; 1) What is the best method to clean the primary? 2) When exactly should the the primary be realuminized? The investigations are planned to continue for the next four years.

When these cleaning tests were completed the realuminizing work began with first, the removal of the old coating and second, the application of the new coating. This process took two days and the involvement of five members of the Optics group, J. Seerveld, G. Barrick, M. Laurance, M. Krismer and myself. A new wrinkle on the cleaning process was the use of CO₂ "snow" immediately before putting the mirror into the chamber. Nominal chamber operation, perfected by former CFHT technician T. Gregory, left a thin film of 797 Angstroms of pure aluminum on the front surface. A witness slide coated simultaneously with the primary was tested for Absolute Reflectance and is reported in Figure 12.

There is nothing quite as dazzling as the sight of this freshly coated mirror emerging from the Vacuum chamber or as startling as the sight of falling dust that immediately begins to collect on this pristine surface. The removal of this dust optimizes the reflectance of the primary and is the main goal of the CO₂ cleaning program. Once a month CO₂ "snow" is swept over the primary and once every two months the resultant surface is evaluated by a portable Scatterometer. A typical set of measurements gives Relative reflectance and Scattered light both before and after the CO₂ cleaning. The reflectance usually increases by a few percent but the scattered light measurement typically decreases by a factor of 3.

The bottom line for all these activities is the hope that we can extend the life of the Aluminum coating. In turn, this will minimize the risk of handling the primary and allow the possibility of returning more nights to our Astronomers.

B. Magrath

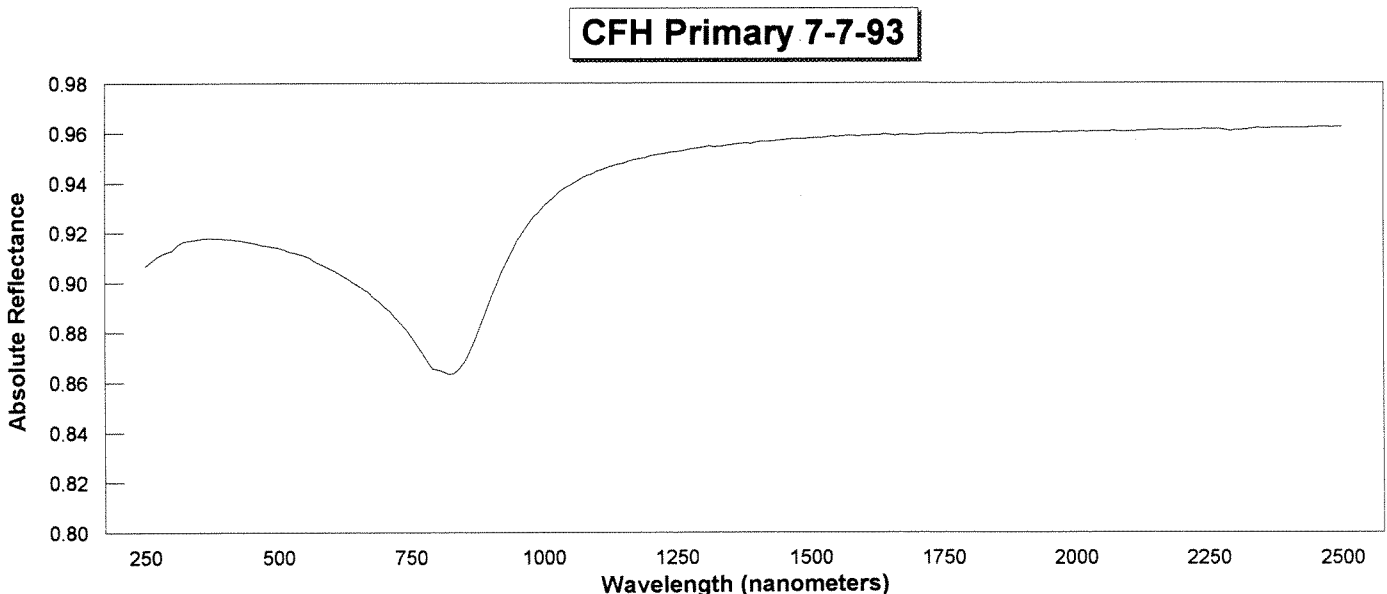


Figure 12.