

## 4. F/35 Upper End Upgrade

It has been recognized that the infrared upper end has a number of severe shortcomings which affect image quality. The past eight months at CFHT have been spent correcting the structural and mechanical design problems. Currently, we are in the process of building, with Automation Systems Associates LTD. of B.C, a new focus and collimation assembly. This new unit will eliminate the collimation and erratic focus problems currently faced and provide CFHT with a base for tip-tilt capabilities. The ASA unit will have focus and collimation adjustment features incorporated into a very stiff and compact design. Attached to this unit will be a modular chopping secondary. The rebuilt rotator and newly commissioned f/35 secondary mirror will be removable from ASA's focus unit so that if, in the near future a tip/tilt capability is required, it may be switched with the chopping modula. The IR support spiders are also to be replaced with ones made of a composite design. The new spiders, being made of a stiffer material, will improve the structural stability, yet provide improved damping characteristics. The resonant vibrations of the whole assembly are being thoroughly investigated and every effort is being made to make CFHT's IR capabilities the best possible whether chopping or tip/tilt correcting. Installation will take place between January 15 and March 2, 1993.

*E. Stokes*

## CFHT CCD Status Report

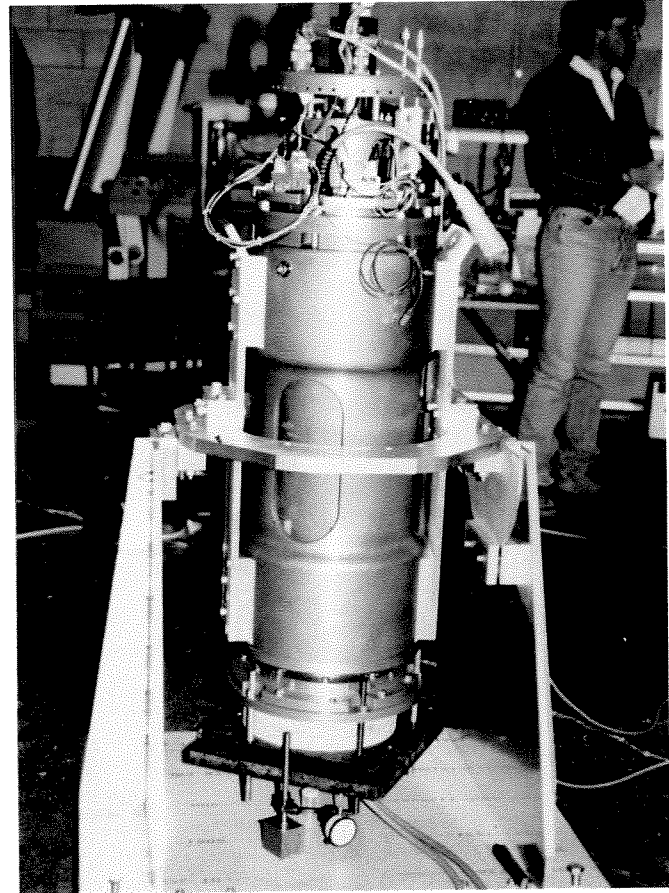
The last six months have seen the bulk of our efforts focused on the development of the Generation III CCD controller system, development of the Redeye camera, pursuing acquisition of new devices, and the usual detector support efforts.

We have made good progress with the Generation III controller having completed several units, operated the system many nights at the telescope, solved the last (we hope) of the remaining major bugs, and integrating the STIS1 and Lick1 CCDs, along with the Redeye camera, into the system. So far we are quite pleased with the controller's performance and are now entering a phase of optimization that includes minimizing readout times through optimized CCD clocking code, multiple-amplifier usage where possible, and development of a video focus mode.

The Redeye camera development has passed the point where simple imaging is possible and is now concentrated on the reduction of the read noise. We are adapting a low noise readout technique that has been demonstrated by other groups that should improve the cameras overall performance. Also, in parallel with the Generation III controller development, we are modifying the existing camera control hardware and software to utilize a true quadrant readout technique. This work will help to increase the cameras data rate, making it more attractive to applications that require a rapid series of short integrations.

Looking to the future, CFHT has joined a collaboration with two other groups with the goal of acquiring thinned, hi-QE 2048x2048 15 micron square pixel CCDs. The thick devices are now being thinned with the hope that a successful device will be available to CFHT towards the end of 1992. If this venture succeeds, we will make every effort to integrate the detector into our system and release it as rapidly as we can.

*C. Clark*



*Figure 10*

## Primary Mirror Cleaning

An accurate way of measuring the efficiency of primary mirror cleaning has been introduced. A new portable instrument, a scatterometer, has been used to measure changes in reflectivity and amount of scattered light. This newly developed instrument, also in use by ESO and Keck, works by shining 670nm laser light onto the aluminized front surface and detecting the amount of reflected light at 3 different angles. One angle yields a "relative" reflectance measurement and the other two record scattered light.

We have measured the mirror before and after a cleaning, using different washing techniques. When the primary is "washed" using water and sponges (no Windex please!) the reflectivity increases, at 670nm, by 3.5%. A so-called "snow cleaning", i.e. blowing CO<sub>2</sub> tangentially to the mirror surface, increases the reflectivity by 1.3%. Scattered light readings show the same trend. After "washing" the scattered light decreases by a factor of 4.2 while after the "snow cleaning" it diminishes by a factor of 1.6. Thus we have been able to clearly establish a difference between the two cleaning techniques.

This work was made possible by the generous loan of the scatterometer from the W. M. Keck Observatory. In the not to distant future, they will face the task of having to keep track of the cleanliness of 72 mirrors!

*B. Magrath*