Table 4: IQE Results		
Statistic	Low Declination Gain	Normal Gains
Pritchet Value	1.45	1.14
αFwhm (arc-sec)	0.83	0.90
δFwhm (arc-sec)	0.83	1.22
Maximum	26865	18781
Background (edge average)	770	770
Mean	1214	1213

5. Other Changes:

A series of minor changes was also found to be in order.

Background Rejection: It was noted that the auto-guider would sometimes 'drop out', while the observer could clearly see the guide star. An edge based background calculation is now used instead of a full image based background. This appears to help during poor seeing and with very dim guide stars.

Big Error Error: A bug had crept into the main TCS control loop which caused guiding to be stopped when the 'BIG ERROR' state was entered. The auto-guider would still be running but its requests for error correction were ignored. This caused the guide star to sit at the edge of corner of the box. It also made it hard to recognize flipped optical senses. Now when the optical sense is flipped, the star is driven halfway off the screen. Also, the star can be bumped a long way out of the visual guide box and the telescope will now drag itself back.

Bonnette Rotation Encoder: Fully half of the complaints attributed to the auto-guider were in fact associated with the 'calibrate' program. And the primary reason to run calibrate was to determine the bonnette rotation angle. Since we now have encoders, it is a simple matter to include their use in the coordinate transformations found within the auto-guider. In short, calibrate does not need to be run just because the bonnette has been rotated. We not only have more precise guiding but we also save set-up time.

Configuration Files: Auto-guider parameters are now savable in named files for set-up tuning and run to run duplication. The most important parameters are the optical flip senses and the camera image scale. A standard set of files have been determined by the engineering staff. This feature when coupled with the use of the bonnette rotation encoder means that we can decommission the calibrate program altogether.

Camera Scales: It has been known for some time that the camera used for guiding does not have square pixels. With our new knowledge of the importance of separate α and δ gains it was time to take this into account. Otherwise, bonnette rotation would disturb our carefully chosen gain values. At prime focus it was found that our image scale was 0.218 arc-seconds/pixel horizontally and 0.317 arc-seconds/pixel vertically. The other foci have similar numbers. Keeping careful track of our camera scales has also made it possible to use a single set of gains for all foci.

Dynamic Tuning During Runtime: Parameters can now be modified while the auto-guider is running. The auto-guider parameters are now all in common memory so that a series of new commands can be used to change these parameters 'on the fly.' This provides for an extremely efficient way to fine tune these parameters during engineering sessions. It also provides the T.O.'s with a supportable set of control knobs for the auto-guider system.

6. Summary:

We have not seriously considered radical new approaches. We believe that we have a close to optimum implementation given our basic control approach. however, there is one further area that may be considered in the future. The pointing model should be differentiated and fed back into the tracking rate. This should have the effect of making our telescope track better when the auto-guider is not running.

Jon Brewster and William Cruise

RECENT TECHNICAL ACTIVITIES

The CFHT Network and Its Services

I. Background

CFHT has made rapid progress towards its goal of using modern computers to acquire, process and store the large amounts of data acquired on Mauna Kea. A brief outline of this expansion is detailed below

- September 1986 — CFHT has Vax 11/750 and HP1000's
- January 1987 — CFHT adds a Microvax II in Waimea
- September 1987 — CFHT purchases first Sun Workstation
- September 1988 — CFHT has 18 Unix machines on network

The reasons CFHT has been able to accomplish this expansion without a similar increase in manpower to implement and support this capability has been through the adoption of industry and astronomical standards. These are:

- IRAF: a vendor independent image reduction and analysis facility from N.O.A.O.
- Unix: an industry standard operating system supported across many architectures by different vendors
- X Windows: a vendor independent windowing system
- TCP/IP: a vendor independent networking protocol

This network currently includes the Waimea Headquarters and the Telescope Dome on Mauna Kea. In addition, the network is connected to the Internet through the University of Hawaii. With this connection CFHT will be joining the three major networks: Bitnet, Internet and Span.

The advantages to CFHT of this network of computers is that they are able to offer the services available on any one machine to any other machine on the network. These services can currently be considered as data, peripheral and support services.

II. Data Services

Data Acquisition: The combination of the telescope, instrument and detector control computers can be viewed as a service serving data to the network.

Data Preprocessing: The current Sun-4 merged with the IRAF package is a powerful combination. CFHT can completely preprocess a routine 3 day imaging run in less than 4 hours with this capability.

Data Reduction: CFHT provides access to Sun-3 workstations to its staff for the actual reduction of astronomical and engineering data.

Archiving: CFHT currently uses magnetic tapes to store, transport and archive the data from the telescope. The addition of the Waimea-Summit link now offers the possibility of directly recording the data in Waimea and using the tape as a copy of the observers data.

III. Support Services

Accounting: Our accounting function is one of the few remaining VMS based services at CFHT. As it is not vendor independent one must log on directly to a Vax in order to use it. This, however, provides an additional layer of security.

Word Processing: The network provides a number of text editors and allows users to choose a text formatter of choice. In addition, text may be mailed to the word processing staff for formatting with the CFHT standard documentation utility; WordPerfect.

Electronic Mail: Electronic mail is available both within CFHT and between CFHT and the rest of the 'connected' world. CFHT is currently a registered internet site and is working towards becoming a Bitnet and SPAN node.

File Transfer: CFHT supports the "ftp" (file transfer protocol) and has a public directory where files may be sent and delivered.

Graphics, Plotting Services: CFHT supports a VMS based plotting utility called "DISSPLA" and a Unix based package "SuperMongo". Output from these graphics packages can be directed to one of three Waimea based laser plotters.

Peripheral Services:

- **Disk** — both network file systems and diskless. A majority of the workstations in use at CFHT have no disk drives directly connected to them. It has proven more economical to provide centrally located disks which are served on the network to users requiring disk space.
- **Display** — all workstations serve ~ 10^3 by 10^3 color displays. CFHT supports a total of some 14 color displays for data preprocessing, image reduction and software development.
- **Tape** — all Unix machines can access all tape drives on network. Like the disks, these drives are served to the network from centrally located machines.
- **Compute** — all Unix machines can use Sun 4/280 for number crunching. The Sun-4 is numerically similar to a Vax 8700 in capability. This power may be used from both the summit and Waimea.

V. Benefits to CFHT

Enhanced Capabilities:

- total of 60 MIPS on network versus 0.6 in 1986
- 19 CPU's on network versus 1 in 1986
- 15 high resolution color displays versus 1 in 1986
- better and faster electronic mail

New Capabilities:

- use Summit computers from Waimea and *vice versa*
- file transfer between any machine at CFHT
- file transfer to/from any machine on Internet
- remote log in to/from any machine on Internet
- remote devices — use peripherals in Waimea from Summit

Immediate Benefits:

- backup summit systems from Waimea
- maintain summit code from Waimea
- test software from Waimea
- access to public domain software and resources on Internet

Richard McGonegal

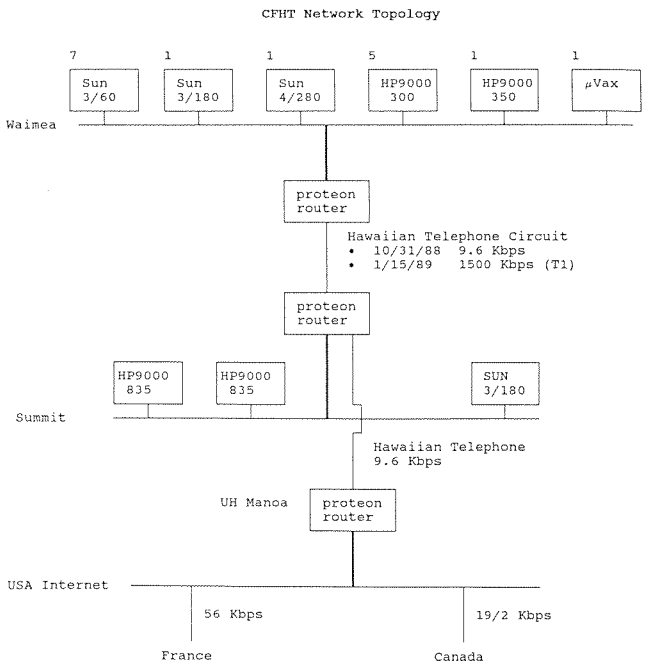

Figure 9: CFHT computer network.