

LATEST NEWS ON INSTRUMENTATION

Multi-Object Spectrography

As everyone inside CFHT knows, this is one of the three main present development areas suggested by SAC, one of the so-called three legs.

As an interim development, a contract has been issued with B. Fort, Observatoire de Toulouse, for an upgrading of the Observatoire de Marseille focal reducer. It will be commissioned in early May in the PUMA mode, and is expected in general use by September 1st. Inter alia, this means a lot of software development for the CFHT relevant group.

Concerning the new generation M.O.S., a number of early milestones have been reached:

- October 1st — Detailed Specifications sent by CFH
- November 1st — Letters of Intent received from the prospective builders:

"A very faint Object Spectrograph with multi slit capability for the prime focus of CFHT".

L. Vigroux and G. Lemaître.

"Proposition Française pour le M.O.S."

Y. Georgelin.

"Canadian Letter of Intent"

D. Crampton.

- November 18th, 19th — Group of Experts meeting in Waimea (D. Crampton, Y. Georgelin, A. Stockton, G. Monnet, D. Salmon).

A bi-national development of the Instrument has been decided, with D. Crampton as Principal Investigator and Y. Georgelin as Co-P.I. The general concept is that of a folded mounting incorporating an easily accessible central hole for modular field environments, a multi-object spectrograph (MOS) on one side, a sub arc second imaging spectrograph (SIS) on the other side. End of the feasibility study is scheduled for February 1st and it is expected that a formal contract could be issued soon after.

In parallel a French group (G. Lemaître, J.P. Picat, L. Vigroux) is looking at a YAG laser drilling machine for the making of optical quality PUMA masks. A final offer will be in hand soon.

CFHT CCD's

At this time, six CCD's have been commissioned for astronomical use (see Table 1). The highlights of the CCD development include:

- improved performance of RCA3 for the UV Prime Spectrograph
- acquisition of a 'flat' double density RCA chip, RCA4, which is still bonded to its support glass
- acquisition of two commercially available (Texas Instruments and Thomson) low noise CCD's
- commissioning of the UV coated TH1 with optimum preflash procedures.

The expected quantum efficiencies are listed in Table 1.

device name	array size	pixel (μ)	area mm	noise electrons	qe			Note
					400nm	500nm	700nm	
RCA1	320x512	30	9.8x15.6	78	50	75	70	UBC dewar
RCA2	640x1024	15	9.8x15.6	45	60	93	70	rms surface $\pm 35\mu\text{m}$
RCA3	320x512	30	9.8x15.6	50	50	75	70	mini cryostat (UV')
RCA4	640x1024	15	9.8x15.6	55	50	75	70	flat, glass support
TH1	384x576	23	8.8x13.2	12	25?	30	45	special preflash
VTI1	390x584	22	8.6x12.8	12	40	45	55	many 'traps'

At the summit, the CCD's are controlled by the HP1000F computers with a new display, the IVAS (from International Imaging Systems), which provides 1024x1024 resolution. A major project is now in progress to upgrade the Data Acquisition Computers as well as to provide a preprocessing environment for the observer. The new computers will include standard architecture, networking, window environments and operating systems, which have a great potential for growth and flexible use.

The Waimea Data Reduction Facility provides an environment for full pre-processing of CCD data and auxiliary evaluation of engineering and commissioning data for each device. Most of the processing is done with the IRAF version 2.5, which includes the 'CCDRED' package from NOAO as well as procedures developed in house. Each CCD is commissioned on the telescope with a 1-3 night observing run in which the performance of the device in the observing environment (cabling, software, etc.) is examined. Standard fields are observed to derive 'typical' calibration coefficients. The commissioning data is pre-processed in the nominal way, and the data are examined to test for unusual processing problems or spurious effects. Nominal calibration coefficients are presented in Table 2. This table contains the extinction coefficient, α , a color term, β , and the zero point, γ , which is defined as the magnitude corresponding to a detected flux of 1 electron/second at the detector for an object with color = 0.0 observed at an airmass = 1.0. Each coefficient can change from night to night and run to run, where it is anticipated that the color term should be the most stable. However, these coefficients also will vary depending upon the number, quality and type of standards observed due to external errors in the standards photometry. Typically the internal measuring errors are less than 0.02 mag.

By far, the RCA4 coefficients appear the most reliable, as they were determined during an excellent 3 night run. The σ 's given are for a typical calibration solution. Notice that the B filter exhibits a strong color term for each chip. This is primarily due to the mismatch of the B filter to the 'standard' system. The filters themselves are degrading and a new set including a better B filter has been ordered from Barr Associates. Note that the V, R and I zero points do not differ significantly in relative QE. Unfortunately engineering data in the blue is nonexistent for RCA2, but there is some marginal evidence that the U and