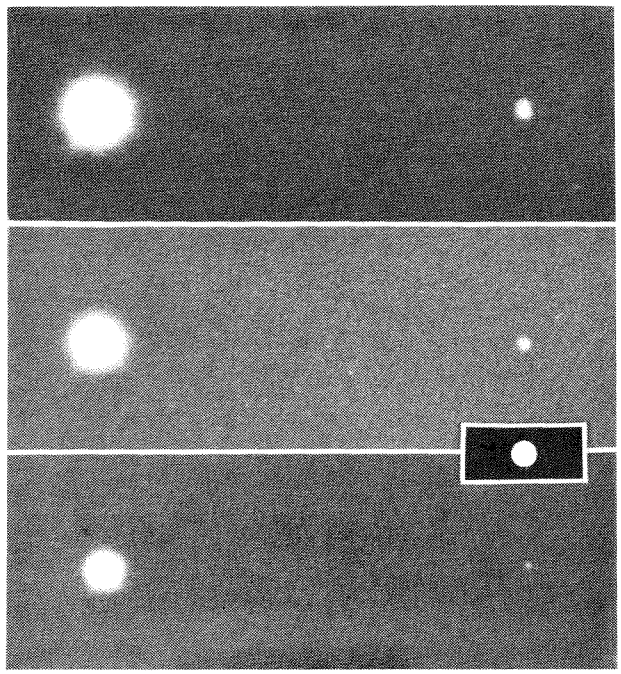
VHR Camera: First Tests

Early in the semester the prototype of the VHR Camera (Very High Resolution or FWHM less than 0.5 arc-sec) was sky-tested at the prime focus. This instrument, whose purpose is to sample the best images, was developed at CFHT by C. Christian, R. Racine, D. Salmon and P. Waddell. It is essentially a "smart" shutter which only opens when the image quality is better than a preselected value and the centering is nearly perfect. These parameters are evaluated in real time by a photomultiplier measuring the flux of a field star through a 0.4 arc-sec diameter aperture. The detector in use is either the photographic plate or the 90-mm ITT image tube. A counter gives the effective exposure time accumulated.

The figure illustrates the performances of the VHR camera on a bright double star observed when the seeing was typically 0.8 arc-sec. Under these conditions, and since an image stabilizer is not yet available, the duty cycle of the system becomes very low, (10^{-3}) as soon as one attempts to achieve FWHM less than 0.4 arc-sec. Thus, the image of HR 8348B (FWHM less than 0.25 arc-sec) is under-exposed. They demonstrate that the instrument works and that the CFHT can yield images of FWHM of 0.25 arc-sec or less.



Double star HR 8348 (sep-17 arc second, Δ m = 3.3). Three images obtained at different settings of the seeing selector: 0.75, 0.50, and 0.25 arc second. The white dot gives the scale and has a diameter of 1.0 arc second. The overlying aperture is lost in the overexposed image of the brighter component (V = 5.7).

Reticon News

Some interesting (and disturbing) effects have been discovered with the 1872 Reticon at coudé; there is dark current in very long exposures. This was unexpected based on previous experience with Reticons.

The situation is complicated by a phenomenon called "array self-heating". This causes short, dark exposures to give small, negative signals. The maximum negative signal is about -12 analog-to-digital converter units (ADCU) on high gain after about one hour. In most applications, this dc offset is negligible.

After about two hours, the dark signal becomes positive. For a five hour exposure, the dark current is about 100 ADCU (high-gain). Further tests of the dark current are required, but observers should be aware of this problem when reducing their long exposure spectra.

Another persistence phenomenon has also been discovered. If the array is flooded with light, then completely erased, there is a roughly exponentially decreasing leakage of charge, possibly from surface trap sites. It is therefore necessary to wait several minutes after flooding the array before beginning a long exposure. This is especially true after comparison lamp exposures.

The speed of the coudé spectrograph plus Reticon has been computed at various wavelengths from recent log book data. The unit of speed is high gain analog-to-digital converter units per second for a star of magnitude 0 at the observed wavelength, or $(ADCU/s)_0$. No attempt has been made to account for imperfect transparency, seeing, or guiding. Hence, these numbers give only an estimate of the average system speed.

But, by first semester 1983, new electronics will be provided by UBC with a two or three fold reduction of noise. Without changing the values of this table, the observing time will be cut by the same factor for a similar signal-to-noise ratio.

COUDE SPECTROGRAPH PLUS RETICON SPEED

λ(Å)	$(ADCU/s)_0$
First Order:	
5800	160
6600	260
7400	400
8700	175
10830	3.5
Second Order:	
3900	125
4300	75
5800	65
Third Order:	
3130	1.3