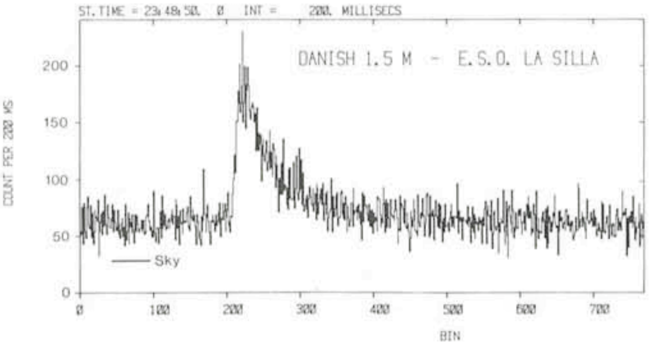


An example of a typical application of the fast-photometry software. The figure shows an optical outburst of the X-ray burster MXB 1636–53 recorded on July 8, 1980. The burst rises in about 2 seconds to nearly 5 times its pre-burst average. The observation was made in white light at the Danish 1.5 m telescope at La Silla.

starts/stops the data acquisition. Other commands allow changes of the time base and scale parameters for the pen recorder. The observer can also request to be informed about the average of the following N integrations, N being an observer-defined integer.

After the end of the observations, the magnetic tape or selected parts of it can be replayed on a graphic terminal or plotted on an x-y plotter. This can eventually be done at a lower time resolution than used for the observations. The off-line programme, together with similar editing, copying and listing programmes, have been written by Dr. C. Motch. We intend also to write a conversion programme that will transform the data to the FITS format.

So far, the programme has been used with the Behr photometer, the IR photometer and the new general-purpose photometer, all at the 3.6 m telescope and at the Danish 1.5 m with the Roden photometer, the Strömgren photometer and a Danish double-channel photometer. At the two remaining photometric telescopes, the ESO 50 cm and 1 m, the new fast-photometry software cannot be used because of different hardware configurations. When used with the IR and general-purpose photometers at the 3.6 m telescope, the diaphragm and filter wheels have to be set in advance. Later on, however, we intend to merge the fast-photometry programme with the normal photometry programmes, thereby giving the observer full command over the instrument.

Pointing of the 3.6 m Telescope

André B. Muller, ESO

The pointing of a telescope on a certain celestial object is achieved when the object is acquired in the field of view of the telescope and on the centre of a cross-wire system or any marking that indicates the centre of this field. Star acquisition with the 3.6 m telescope is computer-controlled. However, the behaviour of the telescope, mainly concerning flexures in the telescope structure, misalignments in the telescope axes and optics, must be known in detail. To find the different contributions to the total pointing error, a pointing programme was developed at the Anglo-Australian Observatory by P. Wallace for the pointing of the Anglo-Australian telescope, and this programme was made available to the author, thanks to Donald Morton, Director of the AAO, and P. Wallace.

The author performed the first pointing tests at the prime focus of the 3.6 m telescope, and the data were reduced at the AAO by P. Wallace, who developed a pointing model for this telescope. Basically, this pointing model is still in use. For some errors, which were discovered in the long run, corrections to the existing ones were added.

Pointing at the Cassegrain focus showed large erratic errors, and it took quite some time to locate the cause. Pointing tests showed a weakness in the support of the Cassegrain mirror, caused by the collimation device. Transducer measurements performed by J. van den Brenk, P. Halleguen and J. van der Ven of the TRS (Technical Research Support) group of ESO-La Silla clearly demonstrated this weakness. It was effectively cured by J. van der Ven, and new tests showed a considerable improvement in pointing.

The pointing programme was implemented in the telescope computer by D. Hofstadt, head of the TRS, and is used for pointing in the prime focus with the Gascoigne corrector and in the Cassegrain focus with any auxiliary equipment.

The programme for the remote control of the triplet adapter in the prime focus does not yet allow the implementation of the pointing programme. However, for the time being, an HP 41 calculator can take care of the pointing with this equipment.

Results

Table 1 shows the pointing results of last August 23/24 and 24/25 at the prime focus equipped with the triplet adapter; r being the distance between the centre of the cross wire and the calculated pointing position:

$$r = \sqrt{(\Delta h \cos \delta)^2 + (\Delta\delta)^2}$$

where Δh is the error in hour angle and $\Delta\delta$ the error in declination for the acquired object.

The first line contains the rms errors in r, $\Delta h \cos \delta$ and $\Delta\delta$. The remaining part of the table shows how many stars in quantity and percentage were acquired within 5, 10, 15 and 20 arcseconds. The table shows that the pointing in declination is better than in right ascension.

Table 2 gives the results of the pointing test at the Cassegrain focus last August 27/28. It needs no further explanation. Here again the pointing in declination is better than in right ascension.

Table 1

Prime focus Aug 23/24 + 24/25. 83 objects.

n (83)	r = 0″ ± 7″.1	$\Delta h \cos \delta$ = 0″ ± 6″.1	$\Delta\delta$ = 0″ ± 3″.6
n ≤ 5″	38 = 45.8 %	51 = 61.4 %	71 = 85.5 %
n ≤ 10″	74 = 89.2 %	78 = 94.0 %	83 = 100 %
n ≤ 15″	82 = 98.8 %	82 = 98.8 %	−6″ ≤ $\Delta\delta$ ≤ + 8″
n ≤ 20″	83 = 100 %	83 = 100 %	

Table 2

Cassegrain focus Aug 27/28. 53 objects.

n (53)	r = 0″ ± 6″.5	h cos δ = 0″ ± 6″.4	$\Delta\delta$ = 0″ ± 3″.8
n ≤ 5″	30 = 56.6 %	41 = 77.4 %	46 = 86.8 %
n ≤ 10″	46 = 86.8 %	48 = 90.6 %	51 = 96.2 %
n ≤ 15″	53 = 100 %	53 = 100 %	53 = 100 %

Conclusion

For prime focus and Cassegrain focus, acquisition of visible objects, as a rule, is better than 10″. All stars during the above-mentioned tests were acquired within 20″, covering a sky area 5 hours east to 5 hours west in right ascension and from −85° to +25° in declination.

For invisible objects, a visible pointing calibrator and off-set coordinates for acquisition of the invisible object must be used. The invisible object can then be acquired with an accuracy of ± 1.5 arcsec in right ascension and ± 1 arcsec in declination, which is the resolution of the telescope encoders.

For infrared observations, scanning an area of 10 x 10 arcsec^2 will, as a rule, acquire the object. Scanning an area of 20 x 20 arcsec^2 may sporadically be necessary.

Off-set may be desirable for very faint objects, where object acquisition may require a long integration time. It goes without argument that off-set coordinates should be calculated in day time and that the observer knows the coordinates of his object accurately for a certain equinox to enable the calculation of the apparent places.

Future Pointing Investigations

A programme for data reductions has been prepared by K. Teschner, programmer of the TRS. This enables the fast calculation of the telescope coefficients from new pointing data.

A plotting programme to visualize the residual errors is being prepared, which may guide the decisions on pointing improvements. Recently, J. Lub (ESO astronomer) has joined in the pointing activity at the 3.6 m telescope. The limiting pointing accuracy is set by the hysteresis effects of the telescope, to which the reaction arms in right ascension and declination contribute largely, being respectively, ± 7 and ± 5 arcsec.

The ESO 1 m Schmidt Telescope Equipped with a Racine Wedge

André B. Muller, ESO

Since November 1980 a Racine wedge can be used in photometric programmes with the ESO Schmidt telescope.

Optical Data

The wedge has an aperture of 144 mm, a thickness of 10 mm and is made of UBK 7 glass. The effective surface of the Schmidt corrector plate, taking into account the vignetting of the wedge, the plateholder device and the spider arms, is 5745 cm^2. Therefore, the magnitude difference Δm between direct image and wedge image, taking into account 8% light loss due to the wedge reflection, is $3^m\!.96$. The magnitude range can be enlarged using diaphragms in front of the wedge. Design and construction of the wedge support were done at La Silla (J. van der Ven and W. Vanhauwaert).

The wedge was optically tested in Geneva (M. Le Luyer and M. Wensveen). The transmission is

30 % at λ = 300 nm
50 % at λ = 308 nm
70 % at λ = 318 nm
90 % at λ = 375 nm
92 % at λ = 700 nm

The 8 % light loss is due to the reflections at the two uncoated surfaces. The F/D for the wedge beam is 21.2 producing an airy disk at the best focus of 1.5 arcsec diameter at λ = 420 nm.

The wedge causes a defocusing of 1 mm in the focal plane of the Schmidt telescope which, for F/D = 21.2, gives a spread of 47 microns or 3 arcsec. The image is perfect as was found from interferometric tests.

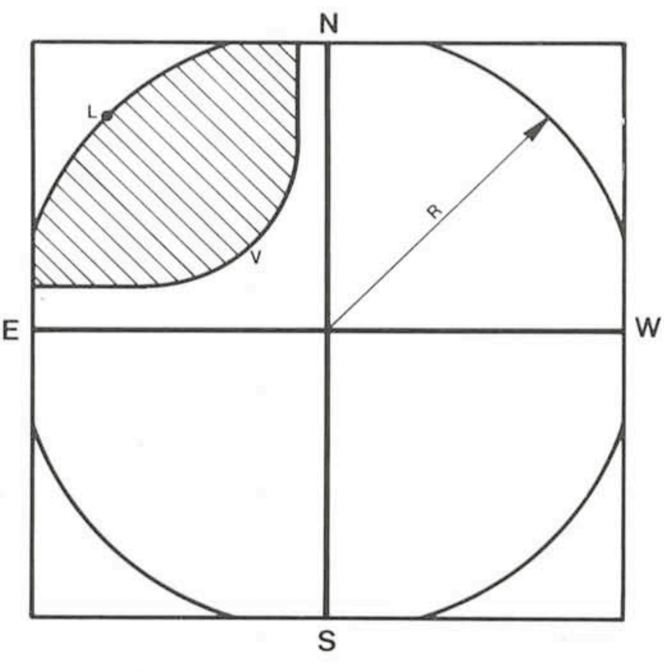
The refracting angle of the wedge is 60 arcsec resulting in an angular separation between the main beam and the wedge beam of 31″ or about 0.5 mm on the photographic plate.

Vignetting

The Racine wedge is mounted directly in front of the corrector plate in the north-east corner. Mounting or demounting the wedge is a matter of minutes.

Although somewhat better vignetting conditions exist by mounting the wedge in the focal plane on the plateholder device, this possibility was abandoned for reasons of mechanical stability of the plateholder device.

The exposed area of the Schmidt plate is 290 × 290 mm^2. The drawing shows the critical radius R of the unvignetted area



of the plate. R = 154.9 mm. This means that for stars situated on the circle with this critical radius, the projection of the corrector plate on the mirror in the direction of the incident parallel beam is tangent to the circumference of the mirror. Stars outside this circle in the four plate corners are vignetted and cannot be used for photometry without special plate corrections.

The plateholder device and the spider arms obstruct 24.1 % of the incident parallel beam. As the dimension of this obstruction is much smaller than that of the corrector plate, its shadow on the mirror is well within the projection of the corrector plate on the mirror. The vignetting due to this obstruction is, there-