A New Echelle Grating... for EFOSC!

As this issue of the Messenger goes to press, we start analysing the results of some successful test observations with a new transmission echelle mounted on EFOSC. In combination with two different cross-dispersers it provides echelle spectra in two standard formats: the first covering the spectral region from 3700 to 7400 Å, the second from 5400 to 10000 Å.

From a first rough estimate the limiting magnitude in the continuum is about 18. (S/N ≃ 20), the resolving power with a 1 arcsecond slit 2,300. This grating should satisfy both EFOSC users who have longed for a resolution higher than the one presently available and those CASPEC fans who want to work on fainter objects, even at a loss of resolution. In combination with broad-band filters, it gives also the possibility to do long slit work on extended objects.

The reduction of the test observations requires some modification in the MIDAS Echelle reduction package and will take a few weeks.

Some minor mechanical modifications to the instrument are also necessary.

We will make an effort to make this new option available to EFOSC users from the start of period 38.

A New Camera and a CCD Detector for the Coudé Echelle Spectrograph

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The concept of a new, faster camera for the CES originated in 1981, when it was pointed out that because of the narrow wavelength band covered at one time by the CES, the required correction for chromatic dispersion would be rather small. A dioptric design was worked out at ESO and the optics were manufactured by Carl Zeiss, FRG. F. Maaswinkel tested the optical quality in Garching and installed the camera at La Silla in November 1985.

At the same time a new CCD Camera was installed at the CES. It mounts a double density RCA CCD (ESO CCD # 8, 640 × 1,024 pixels, 15 μm square). The characteristics of the camera, of the CCD and the first astronomical results are discussed below. At comparable resolution, a gain of at least 2 magnitudes is achieved with respect to the Long Camera with the reticon detector.

1. Design and Optical Properties of the New "Short" Camera

The design of the Short Camera is shown in Figure 1. The camera consists of 5 lenses, mounted in a tube; the last lens is moved by a focusing motor to correct for the chromatic dispersion. The cryostat is coupled to the camera with a field lens in front of the vacuum window. The focal length of the camera is 516 mm (at 632.8 nm), its effective aperture is f/2.58. The corrected field at the detector is 30 mm, therefore in principle also a reticon can be used. The transmission as measured at ESO is shown in Figure 2. Comparing it with the Long Camera, which has an average transmission of 65%, one sees that for the useful range the new Camera performs better.

The camera has been tested extensively in the optical laboratory. Using red light and the Twyman-Green interferometer it showed a quality of 0.7 λ (on axis) and 1.2 λ (field position 12 mm); by scanning the image of a pinhole over the detector the point spread function of the camera was derived. This gave an energy concentration of 80% within 8 μm (on axis) at 480 nm. From these two measurements one expects that the energy concentration of the camera + CES will be 80% within a 15 μm pixel for the total wavelength range (360–1,100 nm): This conclusion agrees with the original computations of image quality. In tests with a position-sensitive detector it was verified that upon moving the focusing lens a point image did not suffer a lateral shift larger than ± 3 μm.

2. The Operation of the New Camera and of the CCD at the CES

To facilitate the operation of the CCD detector and the switching between Short and Long (Maksutov) cameras, and also to bring the CES instrumentation programme in accordance with those at other instruments (EFOSC, CASPEC), the control programme of the CES had been rewritten by E. Allaert. In the new programme the user can select the camera of his choice by softkeys (assuming that it has been mounted!). The only difference the user "sees", is in case of the Short Camera the display of the two-dimensional CCD picture on the Ramtek screen. In the instrumentation programme a focusing curve for the Short Camera is included, which should not be changed if the camera + CCD are not disassembled between observation runs. One nice feature of this curve is that during future maintenance of the instrument one easily could introduce

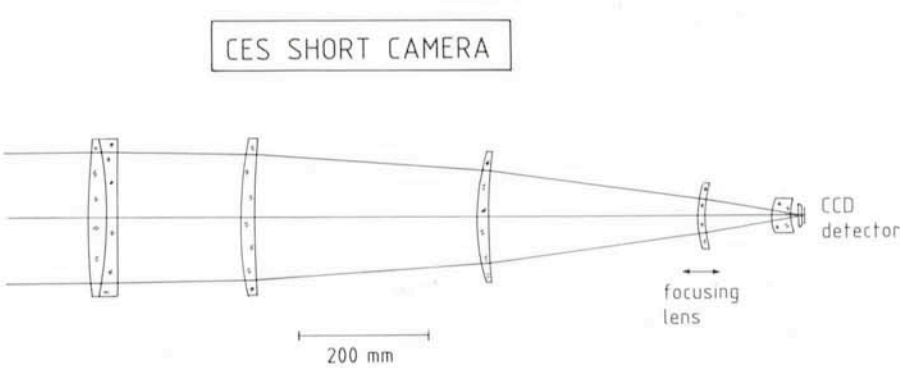

Figure 1: *The optical layout of the new camera.*