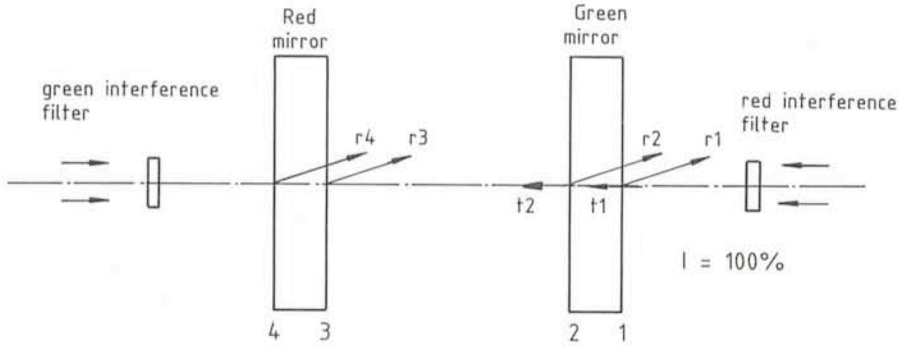

Figure 2: *Schematic diagram. Please note that the numbering is in accordance with the direction of the light. In this example, the light enters from the right-hand side.*

Figure 2 shows how the system functions. Surfaces 2 and 3 are coated. In a non-absorbing material the energy conservation formula is $r + t = 1$ and the transmitted amplitude is given by $t = 1 - r$.

The main objective of this design was to obtain the highest ratio of image intensities reflected by surface 3 with respect to surface 2. In the "classic" case of half coated mirrors, this ratio has a very low value of 0.25. Our new arrangement (red dielectric mirror used at 646.6 mm) achieves a ratio of 37.2, about 150 times higher! In the second case (green dielectric mirror), using an appropriate narrow filter, we could achieve a value of 2.4, a gain of about 10 times. However, with a filter operating at a slightly shorter wavelength, which was not available at that time, a value of 10.5 would be achieved, a gain of about 40 times. A small harmonic leak was the reason why the green case was somewhat less efficient than the red.

EFOSC 2

W. ECKERT, D. HOFSTADT, J. MELNICK, ESO

Late in 1987 it became clear that, before the implementation of the ESO Multi Mode Instrument (EMMI), the NTT would require an optical instrument with imaging and spectroscopic capabilities.

To build a second EFOSC was a logical choice in view of its moderate size and above all, the possibility of retrofitting the instrument later on at the 2.2-m telescope. EFOSC is in high demand at the 3.6-m telescope where it caters for nearly one-third of the observations and a similar potential use exists at the 2.2-m.

The initial idea was to build a copy of the present version but it soon became evident that a new mechanical design was required to adapt different optical scales and to allow for a larger detector format. It was also clear from our experience with the 3.6-m version that a number of improvements were desirable, particularly for the setting and handling of the optical components.

While the basic configuration layout was maintained (see Fig. 1), the intention was to acquire optical components with an improved blue transmission. Early in 1988 a contract was placed with the Swiss firm FISBA Optik for the delivery of the camera, collimator and field lens units within 6 months. Figure 2 shows the overall response curves for the three components combined. It compares favourably with the optical transmission of EFOSC. Since the final

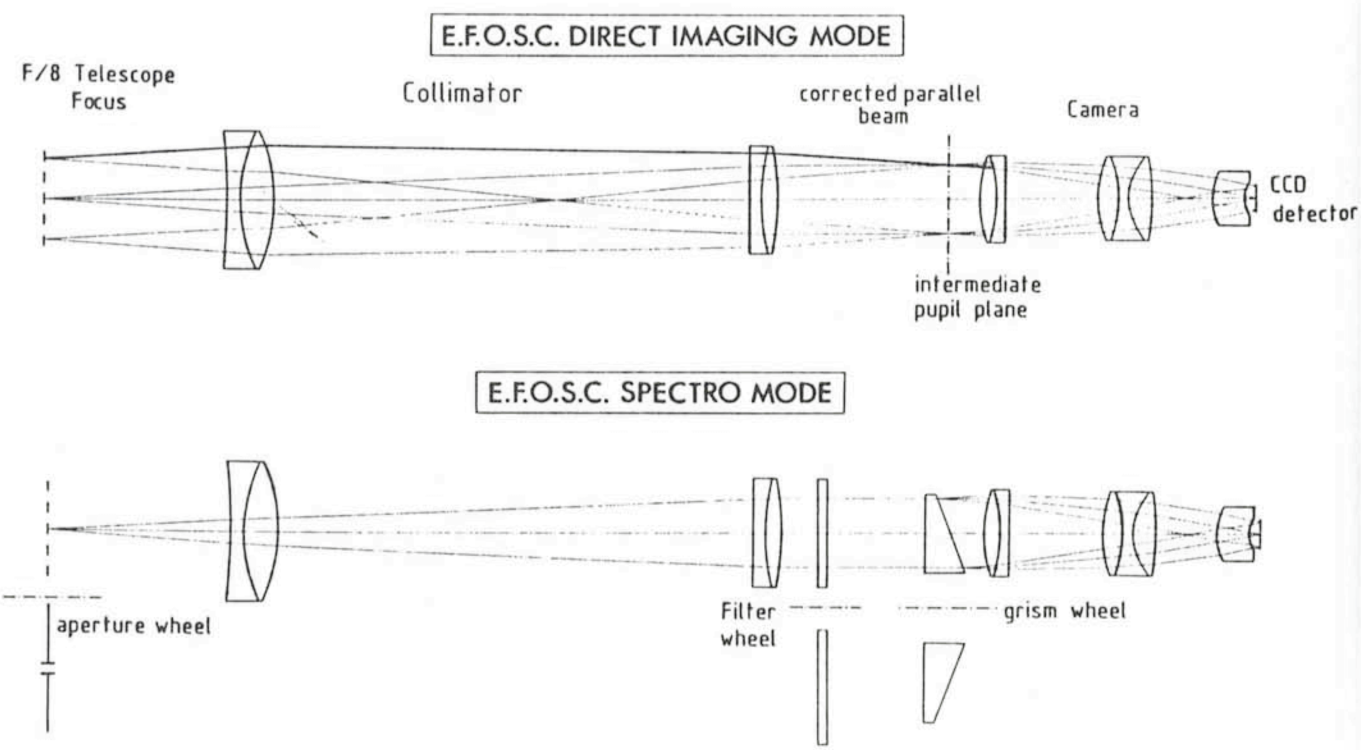

Figure 1: *Optical Layout of EFOSC 2.*

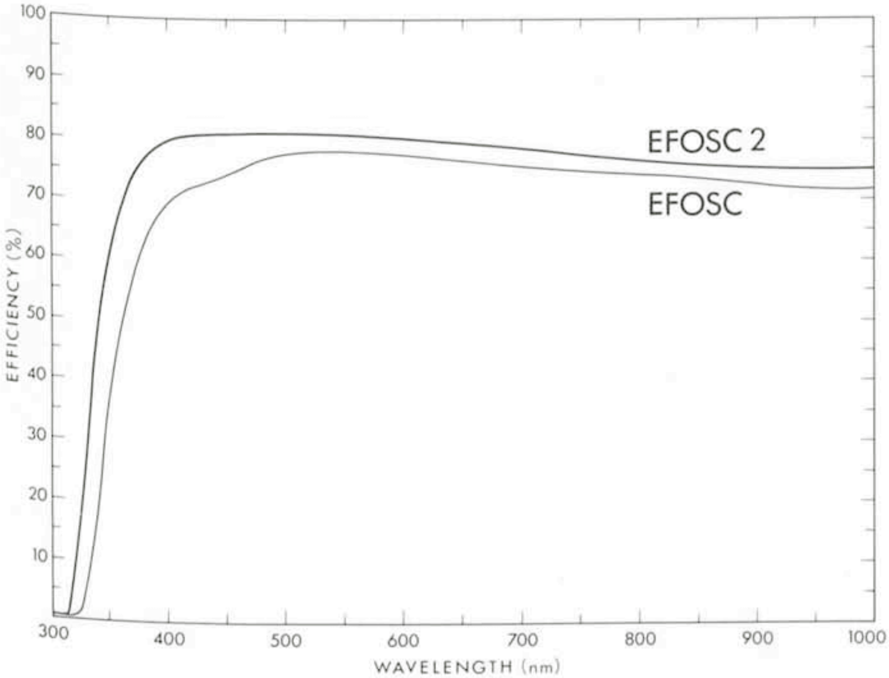

Figure 2: *Overall optical transmission of EFOSC 2 compared with EFOSC (see also note by H. Dekker, on page 64 of the March 89 issue of the* Messenger*).*

destination of the instrument was the 2.2-m, we decided to optimize the design for this telescope. The focal plane scale at the NTT is 187 μm/″ while the 2.2-m rates 85 μm/″. Table 1 shows the pixel-size matching at both telescopes for different detector formats. Obviously, oversampling is unavoidable in the case of the NTT. A photograph of EFOSC 2 mounted on one of the Nasmyth foci (the "EMMI arm") of the NTT is shown in Figure 3.

For spectroscopy, a set of six grisms with 100 g/mm and 300–400 g/mm gratings have been purchased (Table 2). The long focal length of the EFOSC 2 camera combined with the 10 × 15 mm RCA CCD formats does not warrant the use of higher dispersions at present. Once the larger format CCDs become available, higher-dispersion gratings in the 600 g/mm range will be introduced. It is possible to interchange these components between the two EFOSCs. The same applies for the filter and the slit units. In general, a large degree of compatibility has been maintained in order to reduce the maintenance and operational burden at La Silla which is why we also plan to make use of the calibration units available inside the adapter/rotator of the NTT. At the 2.2-m telescope the housing of the DISCO unit, which contains the necessary calibration sources, will be adapted to interface EFOSC 2 to the telescope.

The instrument controls are CAMAC and NIM based to be fully compatible with the 3.6-m arrangement. During the first tests an HP 1000 computer system identical to the standard instrumentation setups was installed at the NTT and

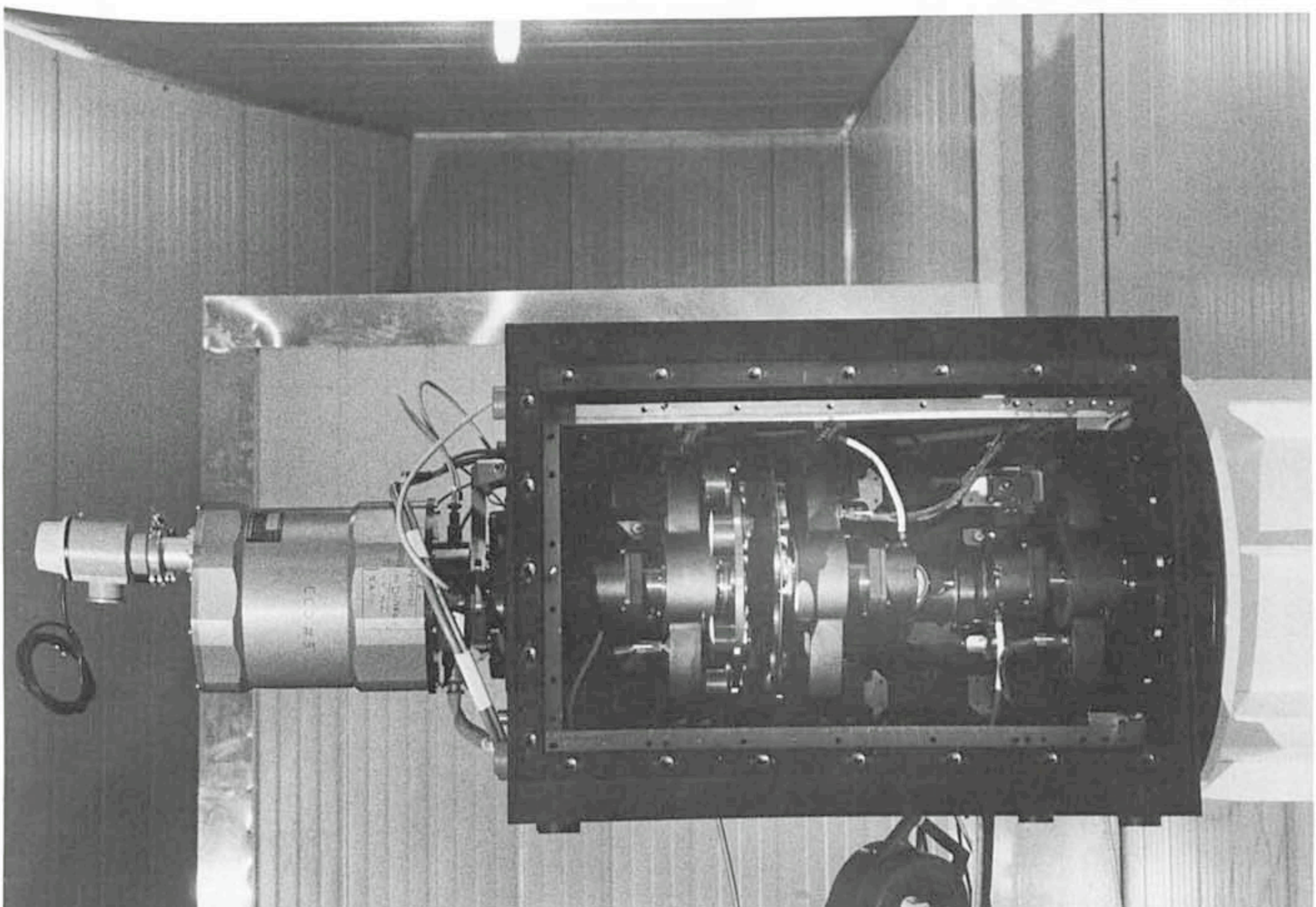

Figure 3: *Photograph of EFOSC 2 fitted with an RCA CCD.*

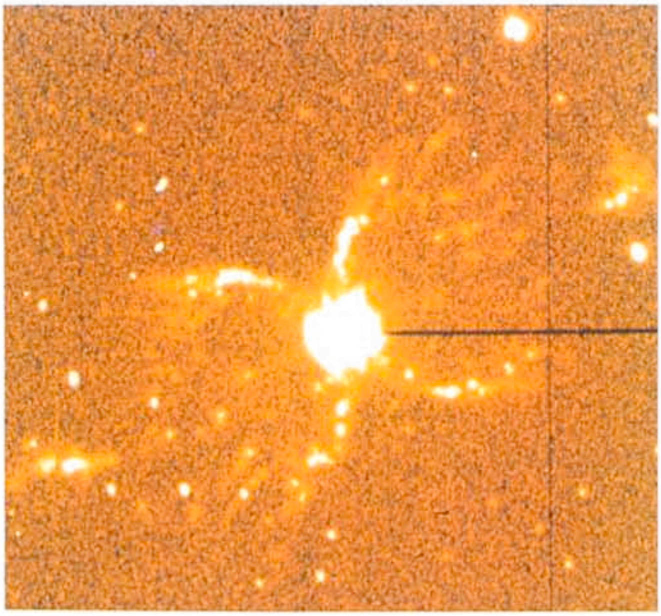

Figure 4: *H_α image of the Southern Crab (He 2-104) obtained with EFOSC 2 at the NTT. Notice the features visible in this image that are not visible or not resolved in the images published in the March 89 issue of the* Messenger.

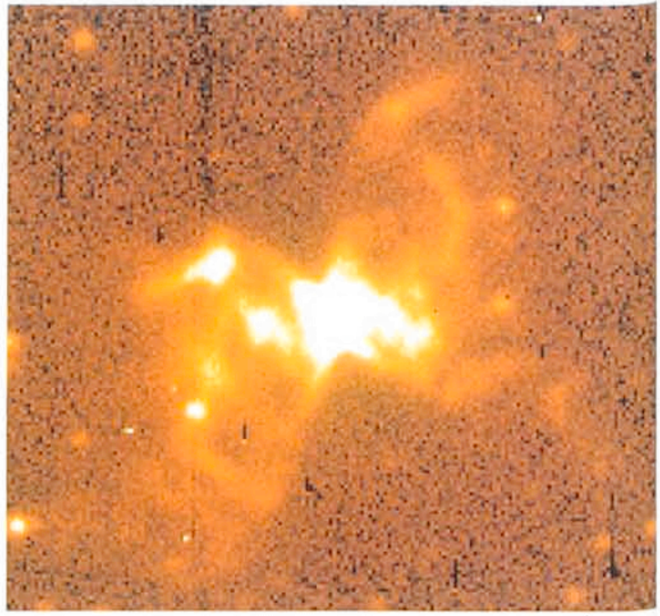

Figure 5: *H_α image of the planetary nebula He 2-84 for which very little information exists in the literature.*

Table 1: *Pixel matching EFOSC 2*

2.2-m telescope		
Detector	10 × 15 mm	25 × 25 mm
Pixel Field of view Scale	15 μm 3.2 × 4.7 arc min 1 pixel = 0.29 arc sec	25 μm 7.9 × 7.9 arc min 1 pixel = 0.48 arc sec
NTT		
Detector	10 × 15 mm	25 × 25 mm
Pixel Field of view Scale	23 μm 1.5 × 2.2 arc min 1 pixel = 0.20 arc sec	25 μm 3.7 × 3.7 arc sec 1 pixel = 0.22 arc sec

Table 2: *EFOSC 2 grism*

	g/mm	blaze λ
B1000	100	4500
R1000	100	6500
UV300	400	3800
B300	360	4500
R300	300	6000
new grating	300	4900

only minor software modifications were required to handle the data acquisition.

EFOSC 2 saw the first astronomical light on May 11 at the NTT. The first scientific programme of EFOSC 2 was to make a pictorial atlas of compact southern planetary nebulae. About 200 nebulae were imaged through narrow-band Hα and [O III] filters, many for the first time. But many previously well studied nebulae were imaged with unprecedented detail thanks to the superb seeing conditions which prevailed during the first EFOSC 2 run and to the outstanding quality of the NTT. Figures 4 and 5 show Hα images of two planetary nebulae observed with EFOSC 2. The elongated shapes of stellar images are due to field rotation, unavoidable during exposures lasting a few minutes until the installation of the adapter later this year.

EFOSC 2 has been largely a background task adventure for the La Silla mechanical, electronic and optical workshops. W. Eckert was responsible for the mechanical design and supervision of the assembling while A. Macchino and J. Santana built and integrated the electronic part. L. Baudet aligned the optical path. We are grateful to B. Delabre for the layout calculations, to H. Dekker for handling the FISBA contract and to B. Buzzoni for the optics commissioning at Garching.

At La Silla we were happy to see a new instrument emerging from our workshops. A change in our activity scope where patching, mending and grumbling around equipment delivered from other horizons is our usual fate.

Improved Shutter Timing at La Silla

The shutter timing accuracy of most instruments using shutters at La Silla are to be considerably improved. By the time that you read this, new CAMAC module cards will have been installed which control exposure times independent of the acquisition computers. These new cards allow an on-card timing resolution of 1 mS between 1 mS and 32,000 mS. From 32 S to 32,000 S, the timing resolution is 1 S but the internal counting accuracy remains at 1 mS in all cases. Some exposure definition forms are being updated to allow a 0.1 S resolution between 0 S to 32 S. For ex-