A F/5.2 Camera with a Thinned 2048² CCD at the EMMI Red Arm

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Characteristics of the New Camera

The red arm of the EMMI spectrograph/imager at the Nasmyth focus of the NIT (D'Odorico, 1990, The Messenger, 61, 51) was designed and built to operate with a F/5.2 and a thinned 2048², 27-μm CCD. When the instrument was under construction, the development of large-size, thinned CCDs was delayed, forcing ESO to build a faster camera to feed a smaller-size CCD. The instrument started to operate in 1990 in this configuration. After the delivery of a thinned SITe (former TEK) 2048², 24-μm CCD of relatively good quality, the F/5.2 camera was in February 1994 installed at EMMI. Figure 1 shows the camera and the CCD cryostat mounted on the side of the red arm of EMMI. In the imaging and spectroscopic mode, the new set-up provides a better sampling with a scale of 0.27 arcsec/pixel and an unvignetted field of view of 9.1 x 8.6 arcminutes. The image quality is better than two pixels over the entire field, even with the current curved CCD (see below). Figure 2 shows the FWHMs for stellar images distributed over the CCDs from an image obtained during the test time.

The New CCD at the Red Arm of EMMI (ESO #36)

The new CCD with its dedicated ESO VME controller was fully characterized and optimized in its performance in the ESO Laboratory. The quantum efficiency curve is shown in Figure 3. With respect to the coated Loral chip which was installed until February 1994, the new CCD and the new camera bring an efficiency gain of 4.2 at 4500 Å, 2.2 at 5500 Å, 1.9 at 6500 Å and 1.8 at 8000 Å. This gain has been confirmed by the determination of the efficiency curves of the instrument obtained from standard star observations. Other key parameters of the chip are summarized in Table 1. They have been confirmed by measurements at the telescope and will be regularly monitored.

It is important to notice two limitations of this CCD. The active surface is convex with a peak at its centre in the direction of the camera, an artifact of the manufacturing process which was not known in advance. The curvature can be well approximated by a paraboloid. The difference between the centre and the corners of the CCD is approximately 200 μm. If the instrument is focused on an intermediate plane, the image blur due to this effect will be one pixel or less, with the exception of the extreme corners of the image. A new field lens which matches this curvature has now been ordered. The second limitation is the relatively long reading time of the large chip: a little less than six minutes are needed from the closure of the shutter to the display of a slow read-out frame. This is reduced to about 4 minutes for the fast readout mode.
is then 80 seconds. A quick-look mode
(2 outputs, fast read-out, binning 2 × 2)
requires about 1 minute.

An Updated EMMI Operating
Manual

As of April 1st, 1994, the NTT has
entered a new operation scheme which
also foresees a major upgrading of the
control hardware and software with the
goal to fully exploit the unique
capabilities of this telescope (see Baade
et al. in The Messenger, 75, 1). As part
of this effort, version 2 of the EMMI and
SUSI Operating Manual is being pre­
pared by E. Giraud and it will be re­
leased in June 1994. More detailed in­
formation on performance and data for­
mat of the instrument with the new cam­
era and CCD will be included there.

Acknowledgements

The successful installation of the new
camera and CCD is the result of the
effort of several persons. H. Dekker
planned and coordinated the activi­
ties in Garching and La Silla. O. Iwert,
S. Oeiries and R. Reiss put into opera­
tion and tuned the CCO in the laborato­
ry. Again O. Iwert, R. Reiss together
with P. Moore and P. Sinclaire installed
the CCO and its controller at the tele­
scope and optimized the performance
there. T. Abbott has collected CCO test
data at the telescope and verified the
operating characteristics.

J.L. Uzon, H. Dekker and S. Moreau
tested the optical camera in the labora­
tory. The first two later installed it at the
Telescope. They also conducted with
Ph. Gitton a general check up of many
EMMI functions. Astronomical test ob­
servations and/or their analysis were
carried out by S. O‘Odorico, J. Storm,
and R. Mignani of the Dipartimento di
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Test of an R4 Echelle Mosaic

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Why an R4 Echelle Grating?

The term “R4” describes one of the
most important characteristics of an

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echelle, namely the tangent of
the blaze angle. An R4 grating has a
nominal blaze of 76 degrees, whereas
the classical R2 has 63.5 degrees. Multi­
plied by the beam diameter, the tangent
of the blaze angle yields the optical
depth of the grating which determines
the resolution that can be attained. The
R4 echelle mosaic described here has a
size of 450 × 130 mm, it is a down­
scaled prototype version of the UVES¹

Figure 3: Quantum efficiency curve of the thinned 2048×2048 CCD (ESO #36) as measured in the
ESO detector laboratory.