used on the plates in the punched slits and it should hopefully be eliminated in the future by the use of a different paint.

Removal of radiation events on the CCD (of the order of one per row) was done by a two-step filtering procedure which does minimal damage to the data. First, all pixels exceeding by more than a factor of 2 the value of the pixel at the same position on the other 1-hour exposure were replaced by the pixel value from the other exposure. Second, a median filtering over a few pixels perpendicular to the dispersion direction with a high threshold for data modification was applied and further removes all but a couple of events. This second filtering was necessary for removing the cosmic rays affecting identical pixels in both exposures.

Each object spectrum was finally extracted using all rows within the half width of the object profile along the slit, and was calibrated in wavelength using He and Ar calibration exposures. The resulting dispersion is ~ 3.7 Å/pixel, the resolution ~ 10 Å. As much sky as available in each slit was independently wavelength calibrated and then removed from the corresponding object spectrum. A long slit calibration procedure with a signal-weighted extraction procedure will clearly yield a cleaner sky subtraction, a crucial problem for faint and extended objects, and a better S/N ratio in the extracted data but it has not yet been applied to this set of data. Figure 5 shows the sum of the two 1-hour spectra for a galaxy with $R \sim 19$. The H and K lines, the G band and the $H\beta$ absorption line are clearly identifiable and yield $z \simeq 0.321$. The S/N ratio of the spectrum at 5500 Å is ~ 15.

The eight galaxies observed in this first MOS field with EMMI have R magnitudes ranging from ~ 18 to ~ 20. The derived redshifts range from $z \simeq 0.120$ to $z \simeq 0.431$. The sum of the two 1-hour exposures is sufficient in all objects for rough ($\Delta z \sim 0.001$) but reliable redshift measurement using the positions of the H and K lines or the [OII] and other emission lines. Cross-correlation analyses with a reference spectrum will yield smaller uncertainties in the redshift measurement.

In conclusion, the first tests of the MOS mode of EMMI have proven that the multi-slitlet plates can be prepared at the instrument with the required quality and immediately used for astronomical observations without manual intervention.

The results from the quick reduction of the data from the October run can be used for an estimate of the capability of the system. Assuming an optimal extraction procedure of the spectra, it should be possible with EMMI to measure the redshift of as many as 15 objects down to an R magnitude of 21–22 in a field of 5×8 arcmin with three 1-hour exposures.

The MOS mode of EMMI will be released to visiting astronomers in the course of Period 47 (April-September 1991).

4. References

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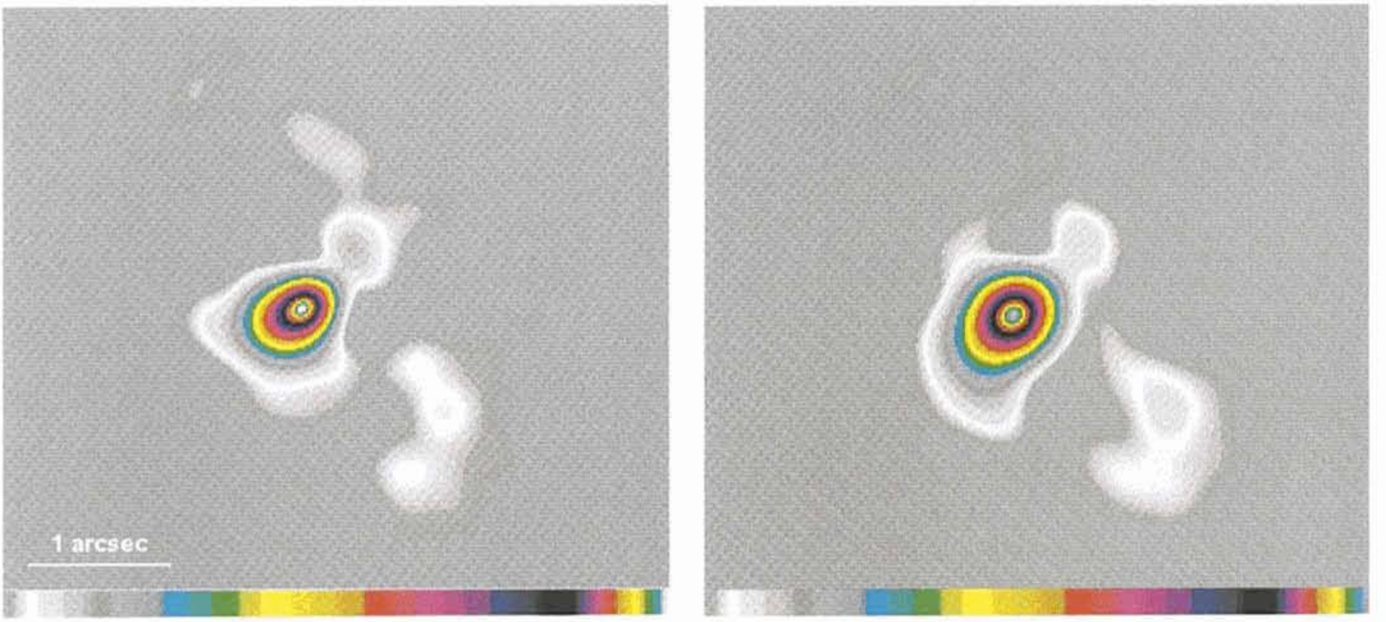
New Year's Eve with Adaptive Optics

From December 31, 1990 through January 8, 1991 a second observing run with the VLT adaptive optics prototype system – fully devoted to scientific programmes – took place. During this period, astronomers could benefit not only from diffraction-limited images which are now given routinely by the adaptive optics system, but also from new features like a coronograph, designed and built at Observatoire de Meudon, and an infrared wavefront sensor. For standard observation the Electron-Bombarded CCD (EB-CCD) of the visible wavefront sensor (see *The Messenger* No. 62, p. 64) is used for wavefront sensing, allowing objects up to the 13th magnitude to serve as reference sources.

The observations with the adaptive optics prototype system started with the



ηCarinae in the L- (left) and M-band (right). Both images are composed of five sub-images (four quadrants and additional frame in the centre) like a mosaic. The scales for both images are the same. The two mosaics have been deconvolved with the measured point spread function at the corresponding wavelength. These observations show new features around the central object (some people say it looks like a carrot-eating vizcacha).

initial set-up of the system which required half of the first night. As for the previous scientific observing run (November 1990) the system worked for the astronomers in a fully reliable and reproducible way. During these observations the seeing conditions varied from good to excellent. Unfortunately, during part of the observing time the programme suffered under cloud coverage.

The scientific goals of the November 1990 run concentrated on the solar system (i.e. Pallas), extragalactic astronomy (i.e. NGC 1068), and the search for brown and red dwarfs (i.e. G29-38, G1866). For this run the major interests were in the area of circumstellar features (i.e. Z CMa, FU Ori, VY CMa), jets (Red Rectangle), and ejected material from luminous blue variables (i.e. η Car, AG Car). Out of this list of objets one of the most exciting was η Carinae, where new amazing structures of arcsecond scale have been revealed around the central object in the L- (3.8 μm) and M-band (4.5 μm) (see Figure).

In addition, during the test and set-up, night images were taken in the visible wavelength band with a commercial CCD. These experiments demonstrated that even in this range a significant improvement in image quality (corrected image FWHM ~ 0.4 arcsec for an initial seeing of ~ 0.7 arcsec) was possible with the current prototype system.

The last and final run with the current prototype system is planned for April this year. Extensive technical tests will be performed before the system goes back to Europe for a major upgrade programme (Called COME-ON PLUS). It will be equipped with a fifty actuator mirror and a modified wavefront computer to reach 40 Hz closed-loop bandwidth. This will allow to produce diffraction-limited images at shorter wavelengths, typically down to 1.7 μm. All optical parts will receive new, more efficient coatings, pushing the limiting magnitude for the reference star up to magnitude 14. This upgrade will make the VLT adaptive optics prototype system a very powerful tool for higher angular resolution observation of the southern sky.

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New 2D Array Detectors Installed in IRSPEC and IRAC

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IRSPEC at the NTT and IRAC at the 2.2-m telescope were equipped with new SBRC 58×62 InSb and Philips Components 64×64 Hg:Cd:Te arrays respectively during late January and early February. In the case of IRSPEC the new array has not only brought more than an order of magnitude s/n gain at $\lambda<2.5$ μm but also provides a long-slit capability which both extends the scientific capabilities of the instrument and simplifies its operation compared with the old 1D array which it has replaced. The present upgrading of these instruments has, at some risk, been done between normally scheduled observing runs in order to keep them available for visitors and so that they can benefit from any improved performance as soon as possible. Due to the need to complete this article within a few days of the end of both test runs we are only able at this stage to present a few preliminary results based on partially reduced data at the telescope but will report more fully in a future issue of the *Messenger*. In the present evolutionary stage of infrared arrays, however, the situation can change rather rapidly. New InSb arrays have already been received and will be tested as soon as possible in Garching and a 256×256 Hg:Cd:Te array should be delivered later this year. Visitors planning to apply for observing time are therefore encouraged to contact Alan Moorwood in Garching or the astronomers responsible on La Silla – Roland Gredel and Andrea Moneti for IRSPEC and IRAC respectively for the latest information. (EMail: @DGAESO51 or ESOMC1::ALAN or RGREDEL or MONETI).

IRSPEC

New Features at the NTT

In its new home at the NTT IRSPEC is attached permanently to the telescope structure (and hence free of instrumental flexure effects) and employs an optical de-rotator in front of the slit to counter the field rotation at the telescope Nasmyth focus and to permit orientation of the slit at any position angle on the sky. The detector pixels of 76 μm are a factor of 2.7 smaller than in the old array, corresponding to ~ 2.″2 on the sky, and the maximum slit length using all 58 pixels in the cross dispersion direction would therefore correspond to ~2′. Unfortunately only the central 1′ at present is free of vignetting – believed to be mainly due to a radiation stop installed several years ago when the slit was only 6″ long! This will be removed as soon as possible. Alignment of the slit and de-rotator to the telescope optical axis (rotation axis) was achieved within 1″ and combined telescope/derotator tracking errors in the worst case of objects transiting within 1° of zenith were measured to be less than 1″. For objects with accurately known coordinates the excellent NTT pointing does pose a small problem in that they usually disappear in the slit which then has to be closed in order to see them!

For calibration purposes the slit can be illuminated by an integrating sphere equipped with spectral line lamps plus a halogen lamp and black body source for flat fielding which is mounted in the telescope adapter and viewed via a retractable diverter mirror.

During the recent test the IRSPEC functions were controlled via an HP1000 computer using the existing software while the detector integration parameters were set by form filling on the A900 instrument computer with status display on a RAMTEK monitor which is also used to control the measurements (start, stop, repeat, etc.) by 'mouse' clicking on a menu bar. In future all parameters will be set via the A900. IHAP is available on-line with a RAMTEK monitor for image display and a graphics terminal for obtaining 1D spectrum plots, traces, etc. In addition, images and 1D traces can be displayed in real time on a monitor connected directly to the pre-processor in the detector acquisition system. Cut levels and any averaging desired for the 1D display, e.g the spectrum averaged over n pixels along the slit can be easily set via the A900 terminal and the monitor automatically displays the coordinates and value of the pixel (plus values of the surrounding pixels) indicated by a mouse driven arrow.