catalogues, and a longer physical block length of FITS tapes. Both the European FITS Committee and the AAS Working Group on Astronomical Software have during this year endorsed these proposals to be effective from January 1, 1987.

The proposal for generalized FITS extensions provides a design for future extension to the FITS tape format. It preserves compatibility with existing FITS tapes and software, including the "random groups" and other extensions of FITS, but its generalized design will permit a wide variety of new types of extensions in the future. A specific "Table" extension was also endorsed. This format provides a FITS standard to transmit tables and catalogues of astronomical data on tapes. A detailed description of the format can be found in Harten et al. 1985, *Mem. S.A. It.* Vol. **56,** p. 437.

In view of the increasing amount of digital data and the high tape densities available now, the original physical block length of FITS tapes (i.e. 2880 bytes) has become inefficient for transfer of large amounts of data. The long block proposal will allow FITS tapes to be blocked by a factor of up to 10 while the logical record length will remain 2880 bytes. If a FITS tape is written with long physical blocks according to this proposal, it MUST have the logical keyword "BLOCKED" equal to true in the first logical header record. This only indicates that the tape may be blocked. The detailed proposal can be obtained from the FITS committee.

The 87JAN15 release of the FITS read/write commands in MIDAS will support both table extensions and long blocks. However, it is recommended not to write long block FITS tapes during the first time since it will still take some time before most of the old FITS reading programmes from other institutes have been upgraded.

3. System

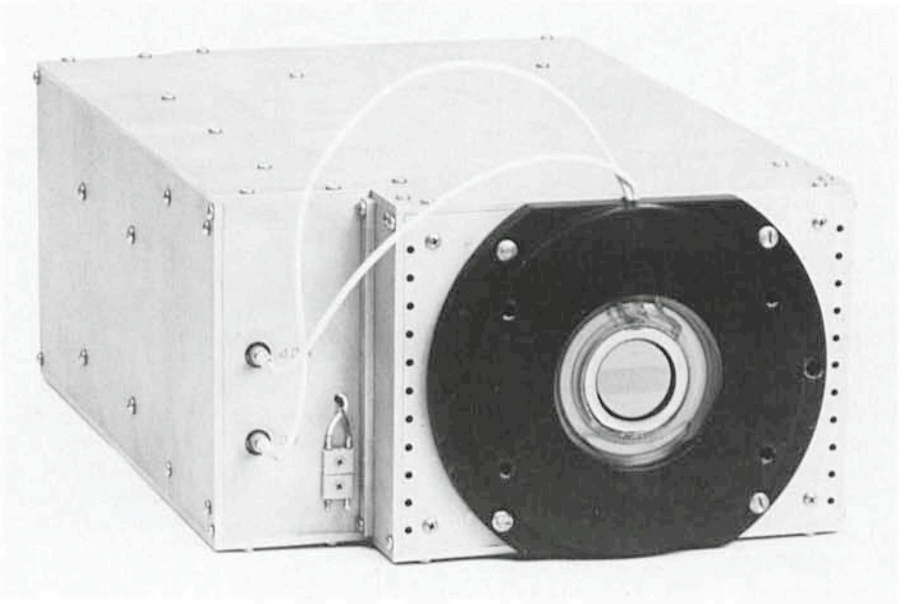
The MIDAS system has had two new improvements:

- It is now possible to have several MIDAS sessions working on the same disk directory in parallel.
- The user-mode options have been expanded to include the possibility of executing commands in a "prompt" mode, i.e. you are prompted for each parameter (also displaying the current default value) when executing a MIDAS command.

A "MAMA" for ESO

A photograph of the MAMA photon-counting detector system which was recently delivered to ESO. This detector, manufactured by Ball Aerospace Systems, has a bi-alkali photocathode and 1024 × 256 pixels. The head unit contains the detector tube and the front-end electronics. A second box (not shown) contains the event location and memory electronics. It will be tested in Garching in the coming months, and the first astronomical tests will take place at the Coudé Echelle Spectrograph in mid-1987.

M. Cullum



First Results with PISCO

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1. Introduction

PISCO is the acronym for the new ESO polarimeter and stands for Polarimeter with Instrumental and Sky COmpensation. The design of the instrument has been developed by K. Metz and the main principles have been published in two articles in *Astronomy and Astrophysics* (Metz, 1984, 1986). The instrument has been built at the Universitätssternwarte München with the technical and financial support of ESO and is now offered to visiting astronomers at the 2.2 m telescope at La Silla. This article briefly describes the instrument and first results obtained during a test run in September 1986.

2. Optical Layout

The outline of the whole instrument is shown in Fig. 1. PISCO can be described as a two-channel polarimeter (see e.g. Serkowski, 1974, for polarimeter designs). In contrast to the usual design it uses, however, no Wollaston prism but a modified Foster prism to separate the ordinary and the extraordinary beam. This design has the advantage of a large (45°) and wavelength-independent beam separation.

The principal new feature of PISCO is the possibility to correct directly for the sky polarization and partly also for the instrumental polarization. The sky compensation is achieved by using two apertures and two phase plates with different orientation of the optical axes. The combined sky light is then unpolarized. However, the sky compensation mode is normally useful only for linear polarization measurements since the sky light exhibits an extremely low circular contribution. In addition, the sky compensation only works well if the sky intensity is not too large compared to the intensity of the object and if the sky

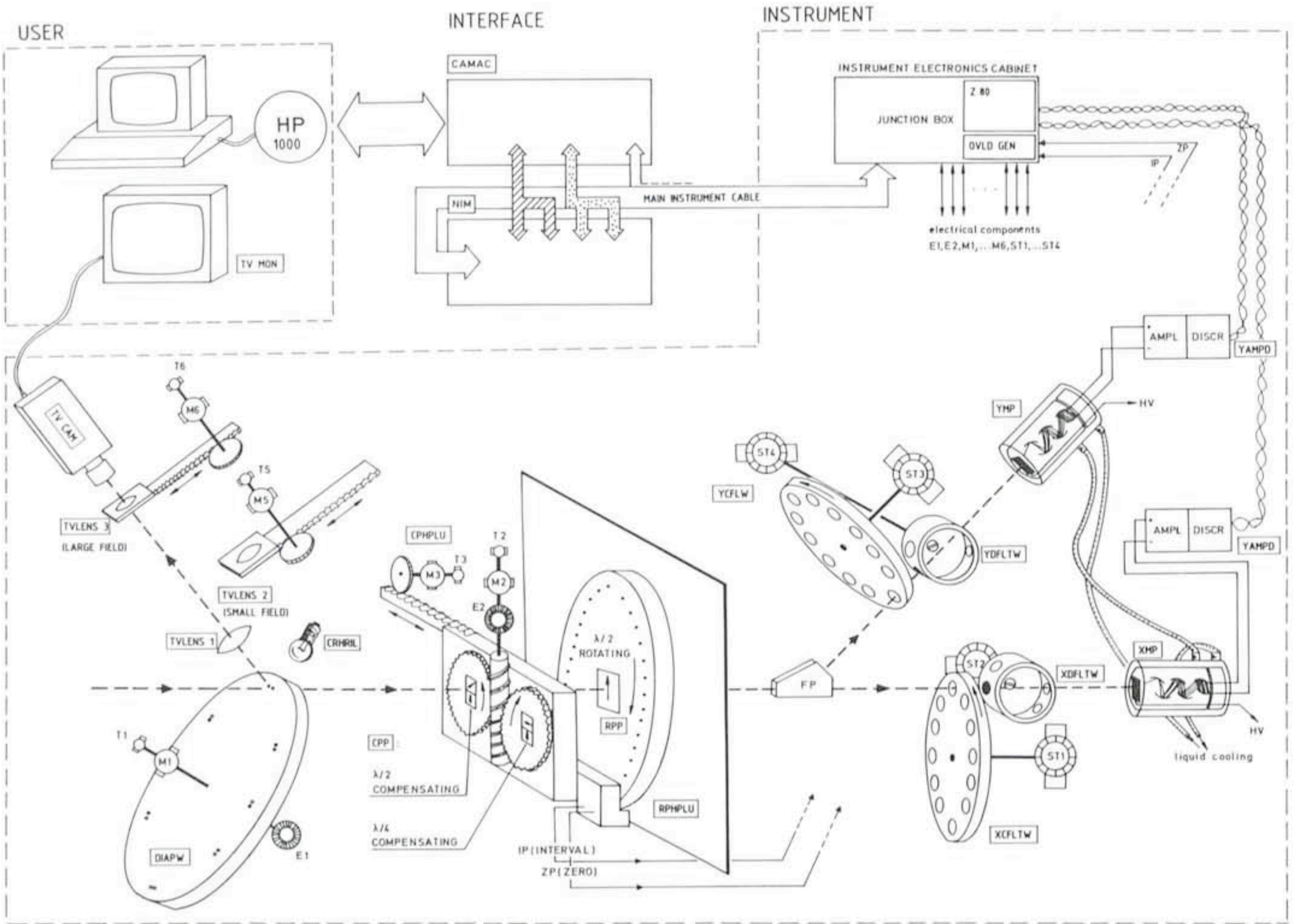

Figure 1: *Schematic drawing showing the most important parts of the instrument. The light enters the instrument through the diaphragm wheel DIAPW. Via the mirrored surface of this wheel, a TV camera views the observed field. Setting and guiding is done with the use of this camera. The compensating phase plate unit CPP corrects for the errors of the rotating half-wave plate RPP and automatically compensates for the sky polarization if a two-hole integration is selected. The Foster prism FP separates the ordinary and the extraordinary beam. The selection of the wavelength range is done via the colour filter wheels XCFLTW and YCFLTW separately for the X and Y channel. If the same filters are chosen for both channels, the instrument operates in the two-channel mode. The density filters XFDLTW and YDFLTW are inserted if very bright stars are observed. The photons are detected by the multipliers XMP and YMP. A Z80 micro-processor performs the integration of the counts in 2 × 32 channels. The user controls all functions of the instrument via the HP 1000 computer and a CAMAC interface.*

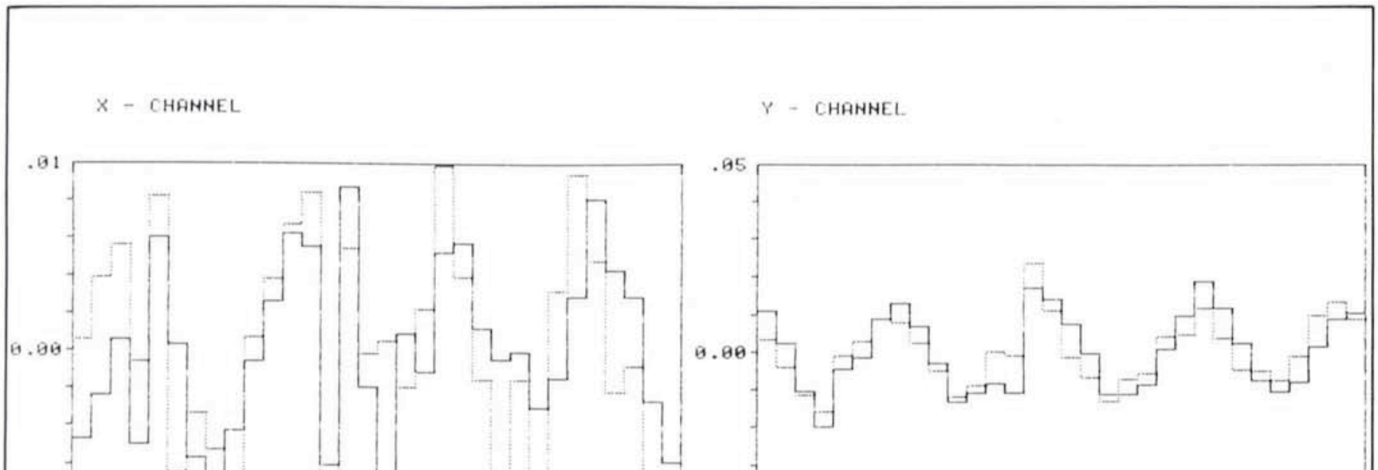

Figure 2: *Typical example for the on-line graphics display of the accumulated data counts. In this case two different filters have been used for the X and Y channel. For a polarized object the counts are modulated (as a function of the channel number, i.e. the angular position of the rotating half-wave plate) with a frequency of 4 times the rotation frequency. The degree of polarization is given by the degree of modulation.*

intensity is at least roughly constant. The instrumental polarization of the phase plate is compensated, if the whole compensating phase plate unit is rotated by 180°.

The signal modulation is effected by a rotating half-wave plate which rotates with 6 cycles sec^{-1} in our case. Each turn of this half-wave plate is divided into 32 equidistant sectors, corresponding to 32 counter channels.

The sinusoidal modulation of the count-rate with rotation describes the polarimetric signal which can be extracted by Fourier techniques. Typical signals look like the histograms of Fig. 2.

3. Detectors

PISCO is designed to work in the wavelength range 0.3 to 1.1 μm. Hamamatsu photomultipliers with a GaAs photocathode have been selected as detectors. They have a fairly high quantum efficiency over the whole wavelength range. The main disadvantage of these photomultipliers is that they have to be cooled in order to keep the dark current within acceptable limits. For PISCO, a Peltier cooling was originally planned. It was later decided to use a cooling system with liquid glycol because it could be realized much faster but it turned out that this cooling is not efficient enough to reach the desired temperature of −10°C or less. We measured a dark current of 100–200 counts/sec which limits the use of the instrument for fainter objects. A more efficient cooling could decrease the dark current by about a factor of ten with a corresponding gain in signal-to-noise ratio for faint stars and/or for narrow-band observations.

4. Instrument Control and Data Acquisition

The polarimeter PISCO offers a variety of options to the observer: She/he can observe linear or circular polarization, in two-channel mode (the same filters in the X and Y channel) or in one-channel mode (different filters in the X and Y channel, i.e. the polarimeter works like two independent one-channel polarimeters, with reduced seeing compensation, but two filters can be observed simultaneously) with or without sky compensation and with or without instrumental error compensation. The optimal choice will depend on the programme to be carried out and on the conditions during the observations. The observer has to know well the different possibilities to make optimum use of the observing time. However, once she/he knows what she/he wants to observe,

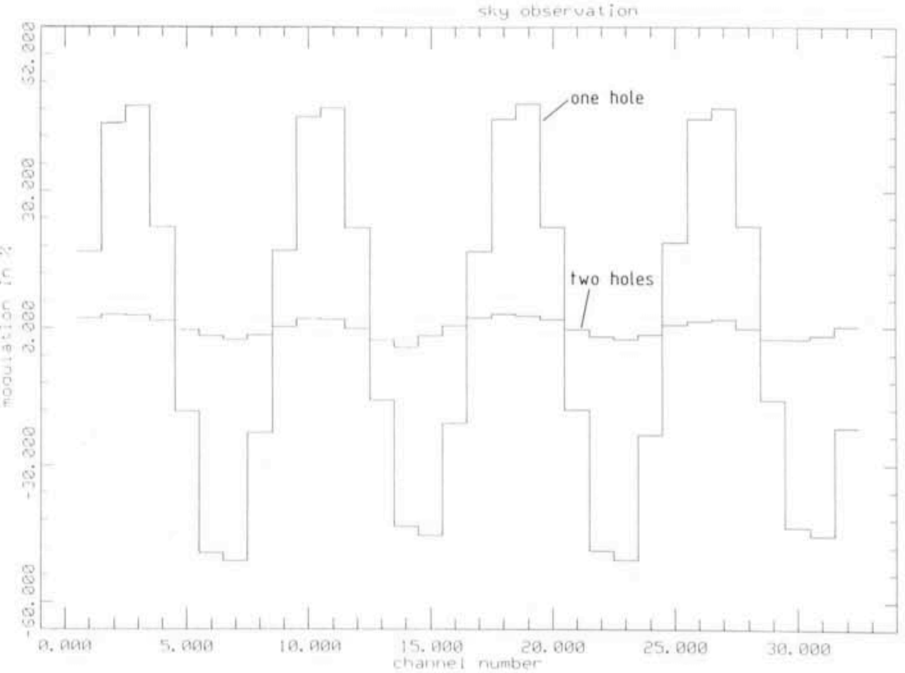

Figure 3: *Observed modulation of the count-rate as a function of the channel number with (two holes) and without (one hole) sky compensation. This measurement has been done observing a clear patch of moon-lit sky. The degree of modulation is a measure of the degree of polarization. It can be seen that the modulation is reduced by about a factor of twenty. Since the sky intensity is a factor of two larger if sky compensation is used, and the disturbing sky signal is given by sky intensity × sky polarization, the background signal is reduced by a factor of about ten.*

the actual operation of the instrument is quite simple.

The whole instrument is remotely controlled from the control room via an HP terminal. Commands can be sent to the instrument via form-filling, softkey menus or typed commands, in a manner very similar to other ESO instruments. The accumulated counts in the 2 × 32 channels are displayed every 30 seconds on the graphics screen. In addition, an on-line data reduction is performed, so that the observer can immediately check the quality of her/his observations. All data are stored in IHAP files and can be transferred to magnetic tape in either IHAP or FITS format.

If a suitable guide star is visible on the reflecting diaphragm wheel which is viewed by the TV camera, the normal ESO autoguider system can be used. According to our experience, the field of view and the sensitivity of the instrument are such as to allow the use of the autoguider in almost all cases.

5. First Results

PISCO was tested at the 2.2 m telescope at La Silla in the five nights from September 15 to September 20, 1986 and immediately afterwards the first normal observing programme was performed.

Apart from initial problems with the optics, the instrument worked smoothly during the whole period. Since the test period was scheduled around full moon and the weather conditions were quite poor, there was ample opportunity to

Filter	U	B	V	R	I
Counts/sec	$1.2\ 10^4$	$8.0\ 10^4$	$1.4\ 10^5$	$1.3\ 10^5$	$6.5\ 10^4$
Limiting magnitude	11.4	13.5	14.1	14.0	13.2

Table 1: *Sensitivity of the instrument. We give in the Table the count-rate (in counts/sec) which can be expected for a star which has magnitude 10.0 in all filters, if the counts of the X and the Y channel are added (two-channel mode). These numbers have been computed from observations of standard stars. The corresponding limiting magnitude for a given integration time and a maximum photon noise error ε for the normalized Stokes parameters can then be calculated from the formula $\varepsilon(Q/I) = \varepsilon(U/I) = \sqrt{2N}$, where Q/I and U/I are the normalized Stokes parameters and N is the total number of photons counted (cf. Serkowski 1974). We give in the Table as an example the limiting magnitude for an integration time of 10 min and a photon noise error of 0.1%. It should be noted that the actual limiting magnitudes are somewhat brighter, since photon shot noise is not the only source of errors. Nevertheless, the numbers can serve as an orientation for planning observations.*

Filter	U	B	V	R	I
PKS 2005-489, Sept. 23	1.44 ± 1.04	1.70 ± 0.33	1.49 ± 0.29	1.77 ± 0.23	1.93 ± 0.26
PKS 2155-304, Sept. 23	2.86 ± 0.30	2.21 ± 0.17	1.95 ± 0.11	2.05 ± 0.09	1.78 ± 0.12
PKS 2005-489, Sept. 24	1.75 ± 1.36	1.34 ± 0.22	1.71 ± 0.26	1.56 ± 0.27	1.00 ± 0.35
PKS 2155-304, Sept. 24	5.91 ± 0.51	5.44 ± 0.33	4.97 ± 0.14	4.86 ± 0.18	4.13 ± 0.31

Table 2: *Observed degree of linear polarization in % in the UBVRI filters of two BL Lac objects. Both objects are of about 14th magnitude. The object PKS 2005-489 has only recently been classified as a BL Lac object (Wall et al. 1986). Our observations confirm this classification, although the degree of polarization is not very high for a BL Lac object. The listed results have been obtained in an integration time of about 10 minutes per filter. The results for PKS 2155-304 are also presented in Fig. 5.*

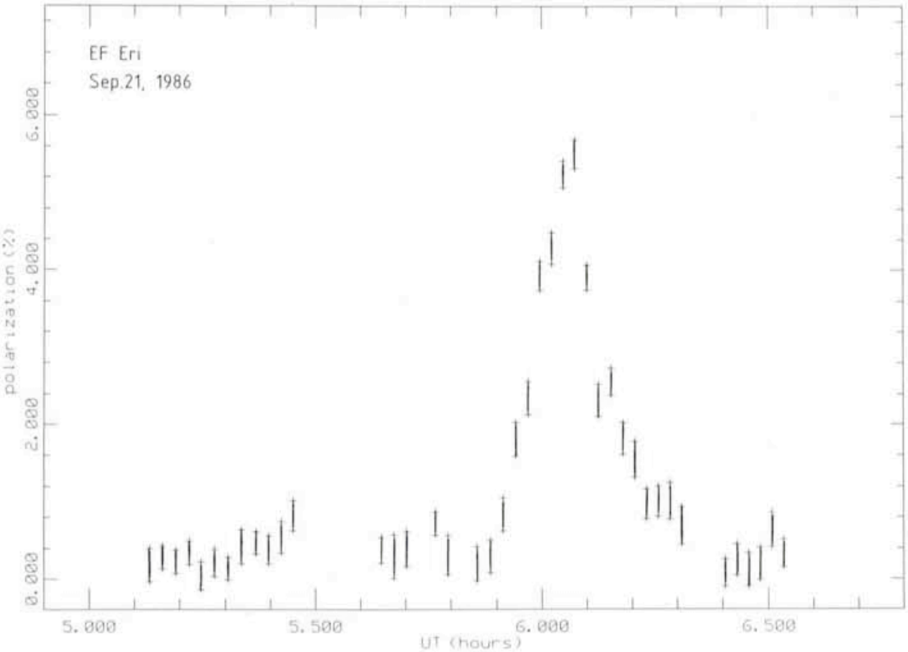

Figure 4: *The degree of linear polarization of the AM Her star EF Eri as a function of time. Note the pronounced peak of polarization at about 6 h UT. The observations have been done without filter in moonlight. The individual observations consist of 1 min integrations and have errors of typically 0.2 %. The sky intensity was slightly variable (due to clouds) and about 1/3 of the total signal (in two-hole mode). In spite of these very unfavourable conditions our results compare very well with the previous observations of Bailey et al. (1982) and Cropper (1985).*

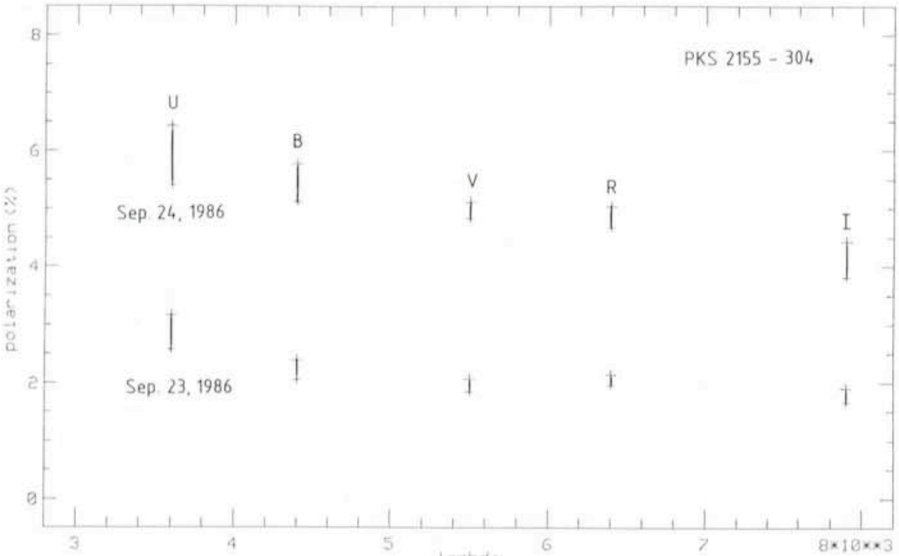

Figure 5: *Degree of linear polarization as a function of wavelength for PKS 2155-304. It is obvious that the polarization of the object is wavelength-dependent and strongly variable on the timescale of one day. This basically confirms the results of Griffiths et al. (1979) and Luna (1986).*

test the sky compensation of PISCO.

Fig. 3 shows the results of a test of the sky compensation observing just the moon-lit sky. In sky compensation mode, the polarization of the signal is not completely zero, but it is reduced by a factor of about 20. Since the intensity of the sky is twice as high when sky compensation is used, the modulation of the total signal introduced by the moonlight is reduced by a factor of ten—a very important gain compared to a normal polarimeter.

The sensitivity of the instrument has been measured by observing standard stars. The measured values are listed in Table 1 for the UBVRI filters. These measured values conform to the expectations.

In order to demonstrate the capabilities of the instrument, we give in the following a few results which have been obtained for fainter objects. In Fig. 4 we show the results obtained for the 15th magnitude AM Her star EF Eri, which shows a short peak of high polarization once during its orbital cycle. The reduction was done with the ESO image processing system MIDAS using a command procedure. The error bars have been derived directly from the data and should be realistic.

In Table 2, we list several observations of the BL Lac objects PKS 2005-489 and PKS 2155-304. The results for PKS 2155-304 are also given graphically in Fig. 5.

The first measures with PISCO have clearly been successful. The results, all of which have been obtained with rather bad photometric conditions, demonstrate that PISCO can indeed provide useful results even in rather poor weather. To measure the limiting performance of the instrument, dark and photometric nights will be needed.

Acknowledgements

We wish to thank all people from the Universitätssternwarte München and from ESO, both in Garching and on La Silla, who have contributed to the development of PISCO.

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NEW ESO CONFERENCE AND WORKSHOP PROCEEDINGS

In addition to the Proceedings of the Second Workshop on "ESO's Very Large Telescope" (see page 10: "VLT Documentation"), the following Conference and Workshop Proceedings have been published:

Second ESO-CERN Symposium on

"Cosmology, Astronomy and Fundamental Physics"

held at Garching from 17 to 21 June 1986

The price for this 326-p. volume, edited by G. Setti and L. Van Hove, is DM 35.– (including surface mail postage).

ESO-OHP Workshop on

"The Optimization of the Use of CCD Detectors in Astronomy"

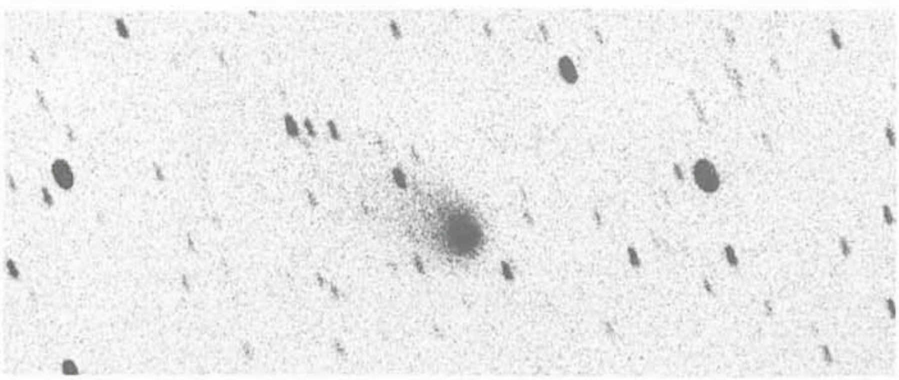
held at Observatoire de Haute-Provence from 17 to 19 June 1986

This 356-p. volume, edited by J.-P. Baluteau and S. D'Odorico, is available at DM 45.–.

All Proceedings have to be prepaid. Orders should be addressed to: ESO Information and Photographic Service, Karl-Schwarzschild-Str. 2, D-8046 Garching bei München (F.R.G.).

Comet Wilson (1986 l)

This picture of Comet Wilson was obtained with the ESO 1 m Schmidt telescope on November 6, 1986. The exposure lasted 15 minutes on red-sensitive 098-04 emulsion behind a RG630 filter. On this date, the magnitude of this new comet was around 11. A short, stubby tail extends towards northwest.



Observations of Comet Wilson from La Silla are being planned by several groups. When it is closest to the Earth towards the end of April 1987 (~ 95 million kilometres), it will be far down in the southern sky at declination − 78° and ideally placed for investigations from the ESO observatory. At this time it will not be visible from Europe.

Although this comet was rather bright when it was discovered, it has faded somewhat during the past weeks, and by early November 1986, it was more than 1 magnitude fainter than originally predicted. This effect is typical for new comets and is believed to result from initial sublimation of a thin layer of ices on the surface of the cometary nucleus. It is therefore difficult to predict its brightness, but a conservative estimate places it at around magnitude 4.5 in April 1987. It will therefore be an easy, visual object for southern observers. Nevertheless, comets are notoriously unpredictable, and it may well become brighter and more impressive than now foreseen.

ALGUNOS RESUMENES

El proyecto del VLT: estado actual

Durante los últimos meses el proyecto del Gran Telescopio ha dado un importante paso hacia su realización. Más de 80 científicos e ingenieros de los países miembros de la ESO (y otros) se reunieron en Venecia a fines de septiembre de 1986. Durante una semana dieron un detallado informe sobre esta ambiciosa empresa que tiene como meta la construcción del telescopio óptico más grande del mundo. Hubo un acuerdo unánime que el presente concepto está cerca de ser óptimo, que es técnicamente factible y que puede ser realizado dentro de aproximadamente 10 años, una vez que estén aprobados los fondos, y que permitira a astrónomos europeos realizar nuevas y espectaculares investigaciones del universo, sin paralelo en ninguna parte. Su conclusión se espera para el año 1997, pero parte del VLT podría ya funcionar en el año 1993.

Durante la reunión del 3 de octubre de 1986 el Comité Científico y Técnico de la ESO (STC) decidió recomendar que el proyecto del VLT fuera aprobado provisoriamente, en su estado actual, por el Consejo de la ESO. Se espera que el proyecto definitivo y detallado se presente al Consejo en junio de 1987 y que se llegue a una decisión final, incluyendo el financiamiento por los países miembros, hacia fines de 1987.

Fotografía de gran campo de la Vía Láctea

En la ESO recientemente se ha tomado una nueva fotografía panorámica de la Vía Láctea. Esta fotografía panorámica difiere en algunos aspectos de las imágenes tomadas anteriormente de la Vía Láctea. Sin usar un filtro y con una emulsión sensible a la luz visible, la impresión general de la fotografía panorámica es similar a la impresión que se obtiene cuando se observa la Vía Láctea en el cielo nocturno.

La completa fotografía panorámica