an increase of the barium abundance by a factor of three, whereas La and Ca change by less than 15 % – in agreement with what we find in HD 65699, α TrA, and ε Peg.

The distinguishing feature of this alternative scheme is that it involves weak processing, yet of a large fraction of the stellar envelope. HD 65699, α TrA, and ε Peg appear to be extreme cases. The data so far obtained from high-resolution spectroscopy of K-type giants and Ba stars are collected in Fig. 3, which also includes the analyses of ζ Cap and HD 774 by Smith et al., and by Tomkin and Lambert cited above. Fig. 3 suggests that a whole sequence of combinations of neutron irradiation and mixing exists – while standard theory of stellar evolution does not predict any production of heavy elements at the relatively high effective temperatures and low luminosities of our objects!

The Optical Pulsar H 2252-035 (AO Psc)

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The optical counterpart of the pulsating X-ray source H 2252-035 appeared to be an interesting object for optical astronomers also. In the X-ray domain it shows the same characteristics as other pulsars. Its X-ray emission is modulated with a period of about 805 s, the pulse amplitude being about 25 % in the energy range 5–15 keV, 50 % in the range 2–5 keV and almost 100 % between 0.1 and 4 keV. The increase of pulse amplitude with decreasing energy is the only feature distinguishing this object from the other neutron star pulsars.

For the optical astronomers the source looks like a typical cataclysmic variable, most probably consisting of a compact object (magnetic white dwarf or neutron star) and a low mass star orbiting with a period of about 3.6 h, revealed by both photometric and spectroscopic observations. What makes, however, the object particularly interesting is the presence of additional light modulations with periods of about 805 and 859 s. The first period corresponds exactly to the period of X-ray flux modulation; the second one, however, is not independent from the two others: the difference of frequencies corresponding to the 805 and 859 s periods is equal to the frequency of the orbital motion. As all three periods are real and can be observed as independent light modulations, this means that the 859 s period is connected with radiation emitted originally with an 805 s period and "reflected" somehow from an element of the system taking part in (prograde) orbital motion.

Thus, we can adopt the following working model of the system (J. Patterson and Ch. Price, 1981 *Astrophysical Journal,* Letters, **243,** L83): A close binary contains a compact object – the pulsar – fed by the matter being lost by a dwarf secondary and accreted via a disk by the magnetized compact primary. A moderately strong magnetic field of the primary channels the accretion at the polar regions, giving rise to intense X-ray and optical radiation emitted mainly within a cone the aperture of which depends on the details of the emission mechanism. Rotation of the compact star modulates the X-ray and optical emission with the period of 805 s. A part of the X-ray flux is reprocessed – in the secondary's atmosphere or somewhere in the accretion disk – and observed by an external observer as the 859 s modulation in the X-ray emission.

In order to enlarge somewhat our knowledge of the optical characteristics of the system, H 2252-035 was observed on five nights, between 3 and 10 October 1982, with the standard UBV

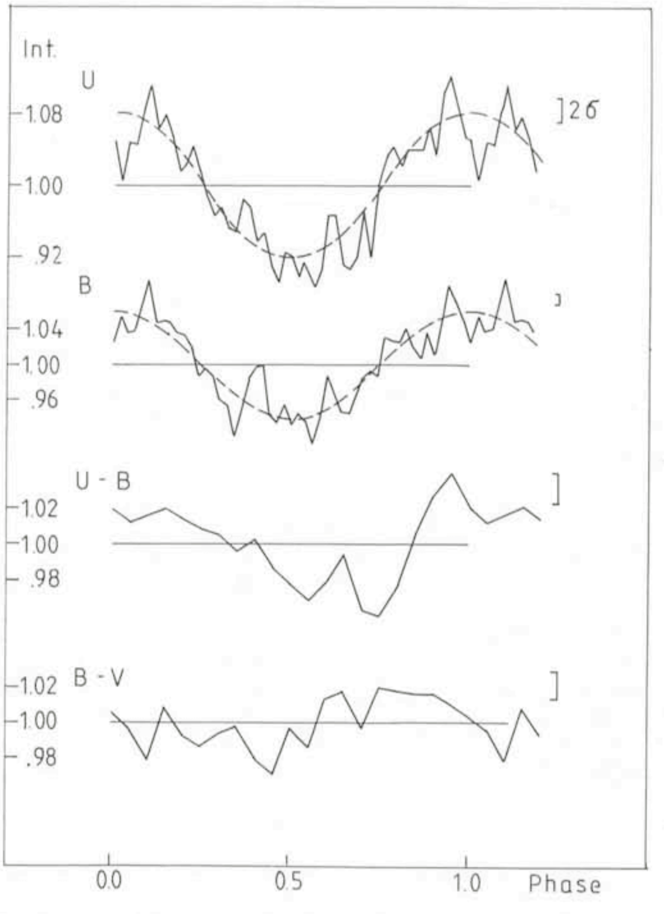

Fig. 1: *Mean brightness and colour changes with orbital period (in intensity scale). Broken curves – sinusoids resulting from periodogram analysis.*

Table 1. Results of periodogram analysis

Periodicity	U amp	U Φ	B amp	B Φ	V amp	V Φ	U – B amp	U – B Φ	B – V amp	B – V Φ
orbital	0.083	– 0.19	0.062	– 0.02	0.047	0.19	0.025	0.36	0.016	– 1.19
reprocessed	0.044	– 1.50	0.036	– 1.62	0.021	– 1.93	0.013	– 1.97	0.008	– 0.98
pulsar rotation	0.025	1.29	0.012	1.51	0.013	0.15	0.011	1.38	0.007	2.69

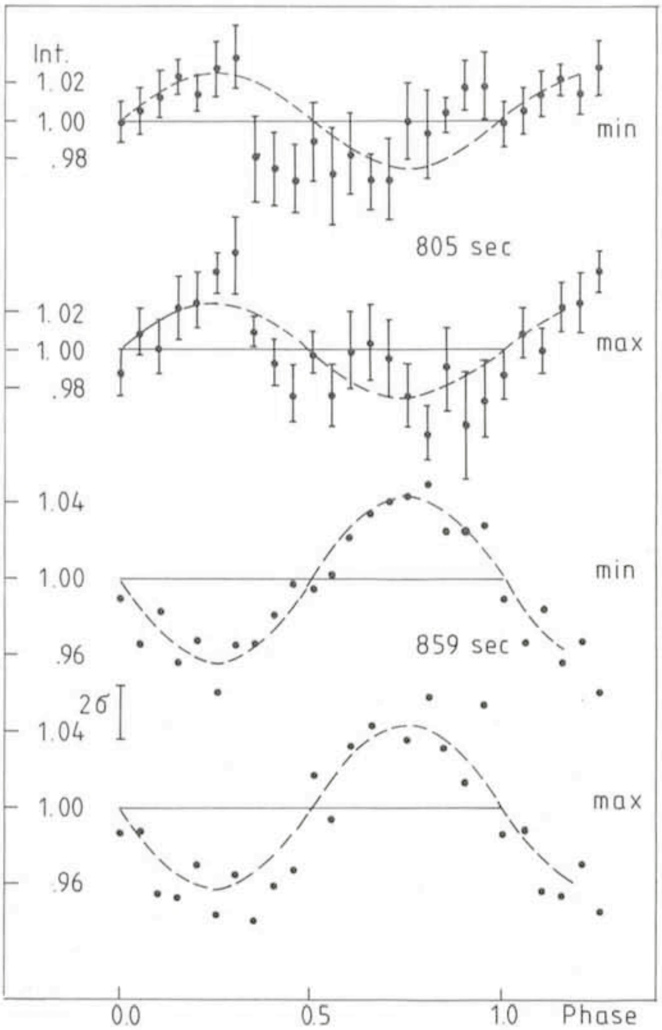

Fig. 2: *Mean light-curve of both short period modulations at minimum and maximum light of the orbital period, respectively.*

photometer attached to the 1 m photometric telescope on La Silla. Integration time was 5 seconds in each pass-band. A nearby 13-magnitude star was used as comparison. Altogether 1,333 integrations in U and V, and 2,083 integrations in B have been secured. The average magnitude and colours are: V= 13.35 ± 0.03, B – V = 0.01 ± 0.01, U – B = –0.86 ± 0.02.

Table 1 shows the results of the periodogram analysis of the data. Amplitudes are given in intensity units, and are practically the same in magnitude scale. Phases, given in radians, are counted from HJD 2445246.59480. The average 3σ noise, remaining in the periodograms after subtracting the three frequencies, is of the order of 0.002 and characterizes the accuracy of amplitude determination.

The data, after subtracting the short period modulations, were folded with the orbital period, giving the average light and colour curves shown in Fig. 1. Broken curves in this figure represent the sinusoids resulting from the Fourier analysis. The average orbital light-curves seem to be well defined in all pass-bands and their following features are worth to be stressed: (i) if we accept the results of the periodogram analysis (i.e. that the light-curve is a sinusoid best fitted to the observations) then the maximum light occurs between two remarkable peaks of brightness at phases 0.95 and 0.1; (ii) the light-curve contains other permanent features like, e.g., the peak at orbital phase of about 0.4 or the dips near the phases 0.0, 0.5, and 0.7; (iii) colour variations, although more or less sinusoidal, seem to show asymmetry relative to phase 0.5.

The interpretation of the light-curve in this case is not an easy task. In fact, it is even difficult to say if there is an eclipse in the system or if we only see the different aspects of the revolving accretion disk. The presence of secondary minima and maxima in the light-curve (if they are permanent indeed) could be, for example, the result of successive eclipses of hot spots by obscuring matter present in the system (secondary star, clouds in other Lagrangian points?). Somewhat different conclusions result, however, from the slopes of the continuous spectrum. The constant part of the observed flux appears to be flat, decreasing with wavelength as $\lambda^{-1.8\pm.2}$. The modulated part goes down much steeper, approximately as $\lambda^{-3.6}$. This does not completely exclude the possibility of eclipses, but suggests that the main part of the modulated light is produced by a different mechanism than the constant component.

The collected observations give also a possibility to study in more detail the remaining two short period variations. Their amplitudes and phases have already been given above. Phase difference is such that the two sinusoids are always in anti-phase at maximum of the orbital light-curve (and in phase at minimum light). This means that at maximum orbital light the site of reprocessed light is in upper conjunction with the primary source of radiation. Folding of all the data with 805 and 859 s respectively shows that the reprocessed light-curve is very regular and practically sinusoidal in all three pass-bands. The 805 s variations have smaller amplitude and a shape deviating more from a sinusoid. As the averaging over the whole observational period can smooth the picture too much, it may be instructive to look at the behaviour of both variations as a function of orbital phase. Fig. 2 shows the mean light-curves for both periodicities but within ± 0.15 of the orbital period around maximum and minimum light, respectively. Only results for U-

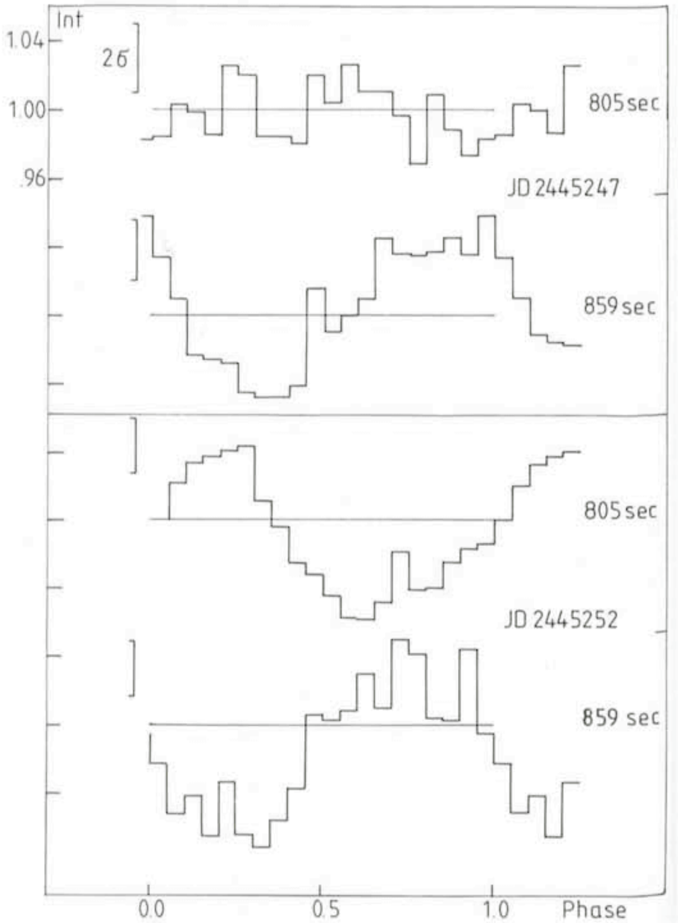

Fig. 3: *Mean short period light variations on two different nights.*

band are given, but essentially the same is observed in B and V.

In spite of a relatively larger scatter, it seems obvious that there is no phase dependence in the reprocessed light and a slight phase dependence in the 805 s modulation. The latter shows also a remarkable cycle to cycle variability. This may be seen from Fig. 3 where the mean short period light-curves are shown for two different nights. The 859 s modulation is practically the same on both nights and essentially not different from the overall mean. On the contrary, the 805 s modulation is almost invisible on one night and very strong on the other.

Apparently the site where the original radiation is being reprocessed is located far enough from the disk so that both illuminating and reprocessed radiations can travel to and from it practically undisturbed. The changes in the 805 s optical light modulation cannot be interpreted unambiguously: they can reflect the changes in its source as well as the changes in the system.

Another feature of H 2252-035 which perhaps is worth mentioning is the stability of the 859 s period (and implicitly the 805 s period also). The present observations combined with previous determinations lead to the following light elements:

HJD maximum = 2445246.60275 + 0.009938388·E

The orbital period can be determined with less accuracy but its new ephemeris,

HJD maximum = 2445246.59480 + 0.14960·E

proves the constancy of the period over more than 5,400 cycles. The fact that the pulsar rotation period changes less than about $7 \cdot 10^{-7}$ cycle per year suggests that the rotating body is a white dwarf rather than a neutron star. The rotation of the pulsar is not bound – during one orbital period the white dwarf makes 16.05 revolutions – and this situation seems to be satisfying for the system.

In this note only fragmentary facts about H 2252–035 are given; the full account of observations is in preparation.

The New Data Acquisition System for ESO Instrumentation

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New instrumental control and acquisition software has been developed for the on-line minicomputers on La Silla. This has been done to allow easy portability of programmes between the various installations, to shorten the development time for new programmes, to ease software maintenance problems, and to provide the observer with a common, high-level interface to the various instruments.

Introduction

Over recent years, problems have often been experienced due not only to the ever increasing number of instruments, detectors, not to mention telescopes installed on La Silla, but also because the detectors and instruments themselves tend to be used in new configurations. The CCD camera, for example, was initially used only for direct imaging on the Danish 1.5 m telescope. Now CCDs are used, in addition, on the 3.6 m telescope for direct imaging (prime focus), with CASPEC (Cassegrain Echelle Spectrograph), with the Boller & Chivens spectrograph, (soon) with EFOSC (ESO Faint Object Spectrograph and Camera), and also with the Boller & Chivens and for direct imaging on the 2.2 m telescope.

Developments such as these can naturally lead to a software implementation and maintenance nightmare as well as making the instrument control often confusing to the observer. It is precisely these sort of problems that the new software package has been designed to cope with. The new software is therefore modular like today's instruments, and these modules, being independent of other parts of the system, are completely portable. The system comprises three main components: general-purpose programmes, libraries of subroutines, and protocols that govern the communications between the different parts. All of these components are detector-, instrument- and telescope-independent. Most of the programmes referred to are new, although a few are older ones that have been adapted to the new software environment.

The "user interface" is implemented by means of a Terminal Handler programme that is used by all instruments and provides a high-level standard interface to the user. This package allows an easy implementation of many desirable features such as the possibility of carrying out automatic sequences of integrations with pre-selected instrumental and telescope parameters.

This article is intended to give a general overview of the system. Full documentation is available from the TPE group, ESO Garching.

System Features

The new instrumentation software runs on Hewlett-Packard HP 1000 minicomputers, under the RTE-4B operating system. Fig. 1 shows a diagram of the standard configuration for an ESO instrumentation computer in the case of a CCD-based instrument. The software components of the data-acquisition system are shown in Fig. 2 and the main features are described below.

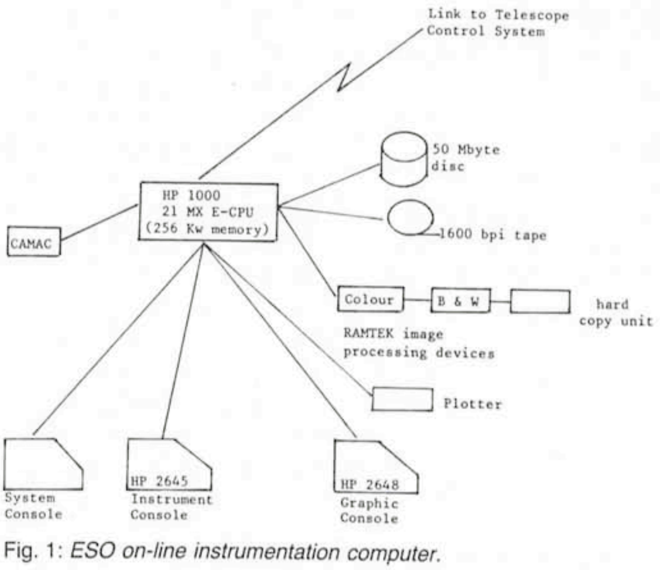

Fig. 1: *ESO on-line instrumentation computer.*