UBV OBSERVATIONS OF THE ECLIPSING BINARY
FW MONOCEROTIS

J.B. SRIVASTAVA and C.D. KANDPAL
Uttar Pradesh State Observatory, Manora Peak, Naini Tal, India

(Received 11 August, 1993)

Abstract. Photoelectric observations of FW Monocerotis in U, B, and V filters have been discussed. The depths of the primary minimum in UBV colours are 2′.63, 2′.17 and 1′.76, respectively. No variation in the period has been found and its revised value is 3′.8735868.

1. Introduction

Variability of the system FW Monocerotis = BD−6°2376 was discovered by Chang in 1947. Yuin (1947) estimated the light changes of this star on Harvard patrol plates taken over a period of more than forty-seven years. He found it to be a normal eclipsing system with a constant period of 3.8735833 days. The photographic light curve of FW Mon given by Yuin (1947) shows a small reflection effect and the primary minimum is total. The shallow secondary minimum is slightly asymmetrical to primary minima. Photometric elements and absolute dimensions of the system are given. Chang (1947) has given the spectroscopic elements of the system. The spectral types of the brighter and fainter components have been reported as B5 and F2 respectively. Lucy and Sweeney (1971) have reanalysed the spectroscopic data given by Chang (1947). Lavrov and Lavrova (1986) have revised the photometric elements of FW Mon. Gimenez and Garcia (1990) have given the mass ratio and effective temperature of the primary component of FW Mon. Many visual times of minima have appeared in the BBSAG bulletins. Photoelectric observations of this system do not exist in the literature. The observations of sixteen nights taken during the period March 1973 to February 1981 are being reported here.

2. Observations

The star FW Mon was observed on the 104 cm Sampurnanand telescope of the Uttar Pradesh State Observatory in U, B and V filters using an EMI 6094S photomultiplier cooled to −20 °C. The stars BD−6°2380 and BD−7°2279 were observed as comparison stars. We have chosen BD−7°2279 as our final comparison star. The magnitudes and colours of comparison and variable stars are listed in Table I. The differential standard magnitudes of the system in the sense comparison minus variable are listed in Table II. The standard errors of observations lie in the range 0′.01 to 0′.05 for U, B and V filters.

3. Light Curve and Period

The light curves in \( U \), \( B \) and \( V \) filters are shown in Figures 1a, 1b and 1c. The phases at the beginning and end of primary eclipse are not covered, so only the duration of eclipse could be estimated. The total eclipse is visible only in \( V \) filter and its duration is 40 minutes. The depths of primary minima in \( U \), \( B \) and \( V \) filters are \( 2^{m}63 \), \( 2^{m}17 \) and \( 1^{m}76 \). For calculating the depth of minimum, average value of the magnitudes between the phase intervals \( 0.14 \) to \( 0.34 \) and \( -0.003 \) to \( +0.003 \) were taken. This average value of magnitude at maximum phase is reported in Table I. Outside the eclipse light curve shows undulations which are more prominent in \( V \) and \( B \) than in \( U \). If we consider the variations in magnitude near the phase 0.5 as due to secondary eclipse then the depth of secondary minimum will be around \( 0^{m}1 \) in \( B \) and \( V \). Variation in magnitude near phase 0.5 in \( U \) filter is not prominent.

Ascending and descending branches of the primary minimum were covered only on one night, and this has been used for the determination of time of primary minimum by the method of Kwee and Van Woerden (1956). Average value of the time of primary minimum in \( U \), \( B \) and \( V \) filters is \( JD(Hel) \ 2443188.27404 \pm 0.0006 \). Phases for Figures 1a, 1b and 1c, were computed using this as epoch. All the times of primary minima that were found in the literature have been listed in Table III, column 1. These times of minima have been analysed by the method of least squares to find a period for the system. Now an improved ephemeris can be given as:

\[
\text{Primary Min.} = JD \ (\text{Hel}) \ 2427562.234 \ + \ 3^{h}8735868 \ E \\
\pm 0.025 \quad \pm 4.9 \times 10^{-6}
\]

The \( O - C \) values obtained from the above ephemeris are listed in column 3 of Table III, with their respective sources in column 4. These values are plotted in Figure 2. The figure shows no variation in the period.

4. Discussion

The photographic amplitude of \( 1^{m}2 \) given by Yuin (1947) and quoted in the GCVS 1985 is much less than the visual amplitude of \( 1^{m}7 \pm 0.1 \) found by Locher (1987).