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STUDY OF THE ECCENTRIC-ORBIT BINARY GSC 03152-01202

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Name of the object:
GSC 03152-01202=UCAC3 84806478

Equatorial coordinates:	**Equinox:**
R.A.= $20^{\rm h}27^{\rm m}17\overset{\rm s}{.}27$ **DEC.**= $+37°56'26\overset{''}{.}9$	2000

Observatory and telescope:
U.S. Air Force Academy Observatory, 41 cm and 61 cm Cassegrains

Detector:	CCD SBIG ST-2000XM and CCD SBIG STL-11000M

Filter(s):	Green

Date(s) of the observation(s):
UT 30 May, 31 May, 20 June, 27 August 2010

Comparison star(s):	GSC 3151-1174 = UCAC3 84806456, $20^{\rm h}27^{\rm m}11\overset{\rm s}{.}2$, $+37°56'51\overset{''}{.}1$

Check star(s):	UCAC3 84806530, $20^{\rm h}27^{\rm m}31\overset{\rm s}{.}2$, $+37°55'14\overset{''}{.}4$

Transformed to a standard system:	No

Availability of the data:
At the IBVS website (5962-t2.txt)

Type of variability:	EA

Remarks:

Bulut et al. (2007) listed GSC 3152-1202 as a candidate for eccentric orbits. Otero et al. (2006) gave light elements stating possible confusion of the primary and secondary eclipses and the phase of the secondary eclipse to be 0.489. Kozyreva et al. (2009) provided new times of minimum light for the primary and the secondary eclipses and found the phase of the secondary to be 0.5475(5). They proposed a period of apsidal motion of 15 or 50 years. We were unable to find any other photometric timings of minimum light in the literature. Due to this possible rapid motion we measured two additional times of primary and two additional times of secondary minimum, and we studied a comparison and a check star that proved stable (Figure 1). We extracted magnitudes from the flat-fielded images with AIP4Win. Our new times of minima are given in Table 1 along with those of Kozyreva et al. We show our typical light curves for the two minima in Figure 2 indicating that Otero's identification of the primary and secondary to be correct: the depth of the primary in green light is $0.^m075$ deeper than the secondary eclipse. Figure 3 shows the O-Cs of the primary and secondary eclipses using the current mean elements of the two minima. One year after Kozyreva's results, we found the phase of the secondary to be 0.5506(3) based on our new elements. This is significantly different from Kozyreva et al. Rapid rotation of the line of apsides seems likely and this star is worthy of additional observations. We have computed new light elements for the system using primary eclipse times from Kozyreva and this paper: Min I = HJD 2455004.4386(1) + 2.093745(1)×E. The light elements for the secondary are: Min II = HJD 245505.5824(1)+2.093799(2)×E.

Table 1. New Times of Minimum Light for GSC 3152-1202

Type Minimum	HJD Time of Minimum	Uncertainty	Source
I	2455004.4386	0.0002	1
II	2455066.3026	0.0003	1
II	2455346.8715	0.0005	2
I	2455347.8127	0.0006	2
II	2455367.8097	0.0003	2
I	2455435.7502	0.0002	2

1 Kozyreva et al.
2 This paper

Acknowledgements:

Zimmerman and Todt acknowledge support of the Appalachian College Association's Ledford grants, and Bloomer acknowledges the support of King College.

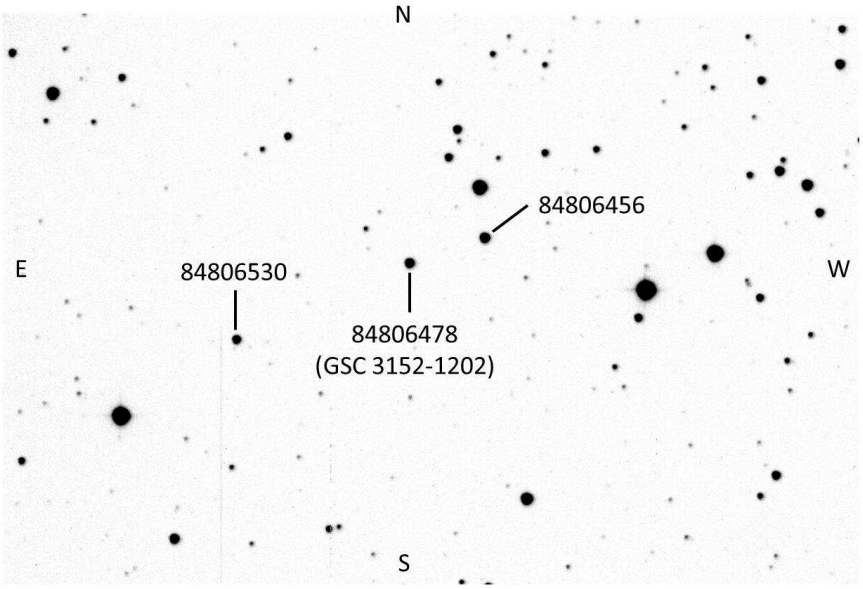

Figure 1. The comparison, check and variable stars for this study. The average standard deviation of the differences between the comparison and check stars for the four nights of this work was $0\overset{m}{.}015$ indicating their good stability for photometry.

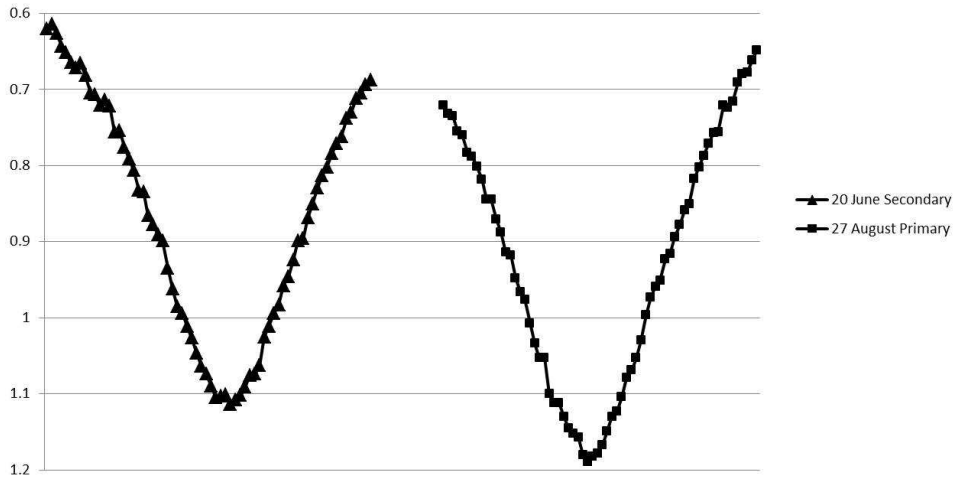

Figure 2. Light curves for 20 Jun 10 (secondary) and 27 Aug 10 (primary). The magnitude and times scales are identical for both curves, and the data points were about five minutes apart. This shows that the elements of Otero, Kozyreva and this paper correctly identify the eclipses. All images were checked to be sure no pixels were above 50% percent saturation.

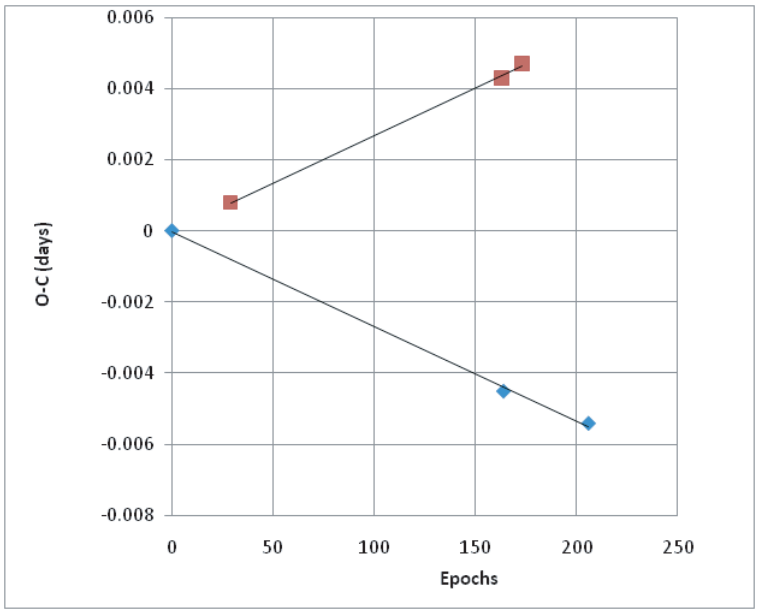

Figure 3. The O-Cs of the primary times (squares) and the secondary times (diamonds) including the times reported by Kozyreva et al. These are based on the mean elements from this study.

References:

Bulut, I. and Demircan, O., 2007, *MNRAS*, **378**, 179
Kozyreva, V.S., Kusakin, A.V., Bagaev, L.A., 2009, *IBVS*, 5909
Otero, S.A., Wils, P., Hoogeveen, G, Dubovsky, P.A., 2006, *IBVS*, 5681

*This version of the paper contains corrections, and differs from the one appeared on-line originally. Date of last modification: Jan 11 2011