

# The Apsidal Motion of the Eclipsing Binary Systems GSC 4487 0347 and GSC 4513 2537

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**Abstract.** The eclipsing variable stars GSC 4487 0347 and GSC 4513 2537 are recently discovered binary systems (Otero *et al.*, 2006) with orbital periods  $1^d.99$  and  $6^d.33$  days. We carried out the photometric observations of these eclipsing binaries from 2009-2010 using a CCD-array at the Tien-Shan Observatory in Kazakstan, at the Crimea Station of the Sternberg Astronomical Institute, at the Astrokolkhoz Observatory in New Mexico (AAVSO), while the spectrophotometric observations were obtained at the Starlight Farm Observatory in Barnesville, USA.

**Keywords.** eclipsing binary, multicolour photometry, apsidal motion

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## 1. The investigations of GSC 4487 0347

The recently discovered binary system GSC 4487 0347 has a neighbor star at a distance of  $3.5''$  and is fainter than the variable star in the V-band by approximately  $2.5^m$ . We have observations in the V band during Min I and B, V, R observations during Min II, and we obtained the B, V, R magnitudes of the total system (the eclipsing binary with the third star) outside minima. The V-observations obtained in 2009 at Tian-Shan Observatory are shown in Fig. 1.

The photometric elements of the system have been derived. The spectra of GSC 4487 347 including the optical component have been obtained by J. Menke. The most likely hypothesis is also that the spectral classes of all three stars are close to late B or early A.

The moments of minima and periods of this system are:

$$\text{Min I} = \text{JD}_{\odot} 2455122^{\text{d}}.1581(2) + 1^{\text{d}}.988726(1)$$

$$\text{Min II} = \text{JD}_{\odot} 2455121^{\text{d}}.3154(3) + 1^{\text{d}}.988719(5).$$

The apsidal motion of this binary was derived by us:  $\dot{\omega}_{obs} = 2.8 \pm 0.6^{\circ}/\text{year}$ . The average internal structure constants of stellar components  $\bar{k}_2^{obs} = 0.0041 \pm 0.008$  is in agreement with the theory.

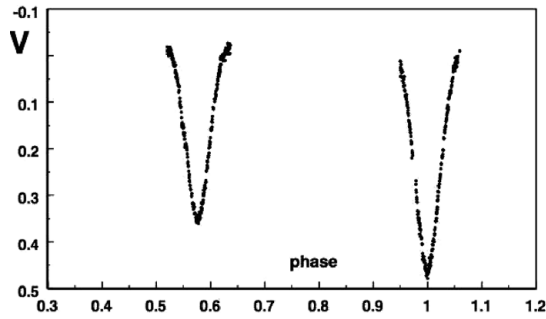


Figure 1. The V- light curves of GSC 4487 0347.

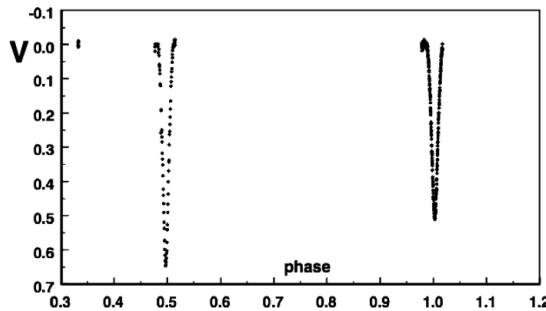


Figure 2. The V- light curves of GSC 4513 2537.

## 2. The investigation of GSC 4513 2537

GSC 4513 2537 is a rather faint eclipsing binary system with secondary minimum expected at phase  $0^p.494$  (Otero *et al.* 2006). However, the latest observation shows that this minimum occurs at phase  $0^p.5053$  (see Fig.2). The V-observations obtained in 2009 at Tian-Shan Observatory (Min I) and at the Astrokolkhov Observatory in New Mexico (Min II) are shown in Fig. 2. Observations relative to a standard comparison star were obtained by G. V. Komissarova at the Crimean Observatory with a Zeiss-600 telescope and a *UBV*-photometer.

The spectra of stars outside the minimum and within the primary minimum have been obtained by J. Menke. Given the photometric findings, it can be concluded that the spectra of the component stars of this system are G2V + G4V. The estimation of apsidal motion with consideration of data by Otero *et al.* (2006) is:  $\dot{\omega}_{obs} = 1.0 \pm 0.3 \text{ }^\circ/\text{year}$ .

The moments of minima and periods of this system are:

$$\text{Min I} = \text{JD}_\odot 2455192^d.84405(20) + 6^d.334436(2)$$

$$\text{Min II} = \text{JD}_\odot 2455050^d.3527(2) + 6^d.334427(2).$$

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### References

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