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**SHORT-PERIOD OSCILLATIONS FOUND IN  
THE ALGOL-TYPE SYSTEM GSC 4550-1408**

DIMITROV, D.; KRAICHEVA, Z.; POPOV, V.

<sup>1</sup> Institute of Astronomy, BAS, Tsarigradsko Shossee 72, 1784 Sofia, Bulgaria,  
e-mail: dinko@astro.bas.bg; zk@astro.bas.bg; vpopov@astro.bas.bg

GSC 4550-1408 was discovered as an eclipsing binary by Biyalieva and Khruslov (2007), in their search for new variables in the NSVS database (Wozniak et al. 2004). This star is suitable for more detailed study taking into consideration its period  $P = 1.23837$  days, amplitude of primary minimum  $A_R \simeq 0.4$  mag, and visual magnitude  $V_T = 11.26$  mag.

The CCD photometry of GSC 4550-1408 was carried out with the 60cm Cassegrain telescope at NAO Rozhen, equipped with the CCD camera FLI PL09000 (3056x3056,  $12\mu$  pixel), and Bessell (1990) standard  $UBVRI$  filters. The standard IRAF procedures were used for the reduction of the photometric data.

The phased light curve is shown on Fig. 1. Light curves for several nights, acquired in the  $BVR$  passbands are shown in Fig. 3 and 4. Oscillations with a peak-to-peak amplitude up to 0.02 mag in R, and 0.04 mag in B, were detected in four of the observational runs (including secondary minimum). A preliminary analysis of the out-of-eclipse data shows a main periodicity about 37 c/d ( $\sim 39$  min.).

Spectral observations of GSC 4550-1408 were obtained with the Coudé spectrograph (resolution of  $0.19 \text{ \AA}/\text{pixel}$ ) with the 2m RC telescope at NAO Rozhen. The spectral domain covered three regions around  $H_\alpha$ ,  $H_\beta$ , and MgII 4481 lines. The data reduction of the spectra was made with the standard IRAF procedures. The corresponding radial velocities were measured with the cross-correlation technique using synthetic spectrum, calculated with the programme SPECTRUM (Gray & Corbally 1994) and a grid of LTE atmosphere models for a solar-type chemical composition (Castelli & Kurucz 2003), as a template spectrum. Comparing the synthetic and the observed spectra (Fig. 5), the parameters of the primary component were estimated (Table 4).

The preliminary orbital and physical parameters were computed using both Rozhen and NSVS data, with the PHOEBE software (Prša & Zwitter 2005). The new ephemeris is as follows:

$$HJD(\text{MinI}) = 2451403.832(\pm 0.004) + 1.2383832(\pm 0.0000008)E \quad (1)$$

The amplitude of the RV curve is  $A_{RV} = 15 \text{ kms}^{-1}$ , and the  $\gamma$  velocity is  $-52.3 \text{ kms}^{-1}$  (Fig. 2). The physical parameters of the secondary component, computed with the PHOEBE, are shown in Table 4. The spectral types of the two components were estimated using Gray & Corbally (1994) calibration.

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Table 1. Data of the variable, comparison, and check stars used for the CCD photometry

ID	Name	RA (J2000)	DEC (J2000)	Spectral type
Var	GSC 4550-1408	11 <sup>h</sup> 40 <sup>m</sup> 01.44 <sup>s</sup>	+75° 09' 21.3''	
C1	SAO 7402	11 <sup>h</sup> 38 <sup>m</sup> 38.42 <sup>s</sup>	+75° 10' 51.1''	G5
C2	GSC 4550-1520	11 <sup>h</sup> 37 <sup>m</sup> 15.62 <sup>s</sup>	+75° 11' 50.6''	F5

Table 2. Observational runs of GSC 4550-1408

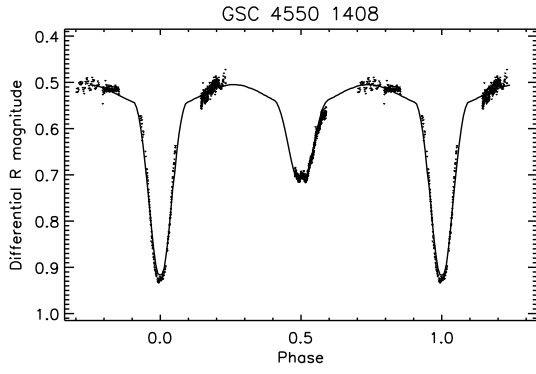
Date	HJD(start)	Length	Filter	Exp. [s]	N	Phase
12.05.2008	2454599.4533	03 <sup>h</sup> 19 <sup>m</sup>	<i>R</i>	20	485	0.479–0.590
13.05.2008	2454600.2794	01 <sup>h</sup> 53 <sup>m</sup>	<i>R</i>	20	260	0.146–0.209
16.05.2008	2454603.4463	02 <sup>h</sup> 22 <sup>m</sup>	<i>BVR</i>	120,60,20	60	0.703–0.783
03.06.2008	2454621.3795	00 <sup>h</sup> 33 <sup>m</sup>	<i>BVR</i>	120,60,20	9	0.182–0.200
29.06.2008	2454647.3367	02 <sup>h</sup> 38 <sup>m</sup>	<i>R</i>	60	136	0.145–0.233
30.06.2008	2454648.3087	03 <sup>h</sup> 44 <sup>m</sup>	<i>R</i>	60	175	0.930–0.055
01.07.2008	2454649.3814	01 <sup>h</sup> 35 <sup>m</sup>	<i>R</i>	60	100	0.796–0.855

Table 3. Rozhen spectra of GSC 4550-1408

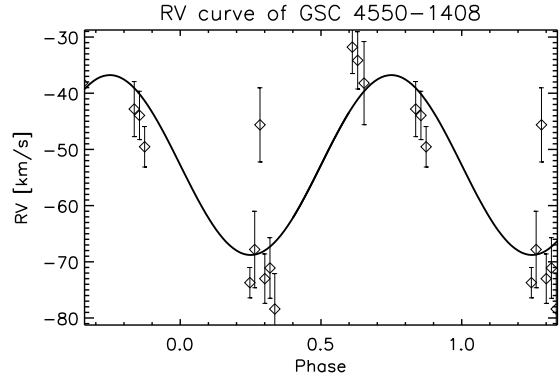
Date	HJD(mid)	S/N	Exp. [s]	RV [kms <sup>-1</sup> ]	Region [Å]	Phase
13.05.2008	2454600.4071	28	1800	-73.7 ±2.7	4400-4600	0.251
13.05.2008	2454600.4282	28	1800	-67.8 ±6.8	4400-4600	0.268
13.05.2008	2454600.4516	33	1800	-45.6 ±6.6	4800-5000	0.287
13.05.2008	2454600.4727	31	1800	-73.0 ±4.4	4800-5000	0.304
13.05.2008	2454600.4953	38	1800	-71.1 ±5.4	6500-6700	0.322
13.05.2008	2454600.5166	38	1800	-78.4 ±6.3	6500-6700	0.340
10.06.2008	2454628.3810	29	1800	-42.8 ±4.9	4400-4600	0.840
10.06.2008	2454628.4041	37	1800	-43.9 ±4.3	4800-5000	0.859
10.06.2008	2454628.4268	46	1800	-49.5 ±3.6	6500-6700	0.877
11.06.2008	2454629.3406	26	1800	-31.8 ±4.7	4400-4600	0.615
11.06.2008	2454629.3641	33	1800	-34.2 ±5.1	4800-5000	0.634
11.06.2008	2454629.3870	33	1800	-38.2 ±7.4	6500-6700	0.653

#### References:

- Bessell, M., S., 1990, *PASP*, **102**, 1181  
 Biyalieva, N., Khruslov, A., 2007, *PZP*, **7**, 17  
 Castelli, F., Kurucz, R., 2003, *in IAU Symp.*, **210**, 20  
 Gray, R., Corbally, C., 1994, *AJ*, **107**, 742  
 Prša, A., Zwitter, T. 2005, *ApJ* **628**, 426  
 Wozniak, P., Vestrand, W., Akerlof, C., et al., 2004, *AJ*, **127**, 2436



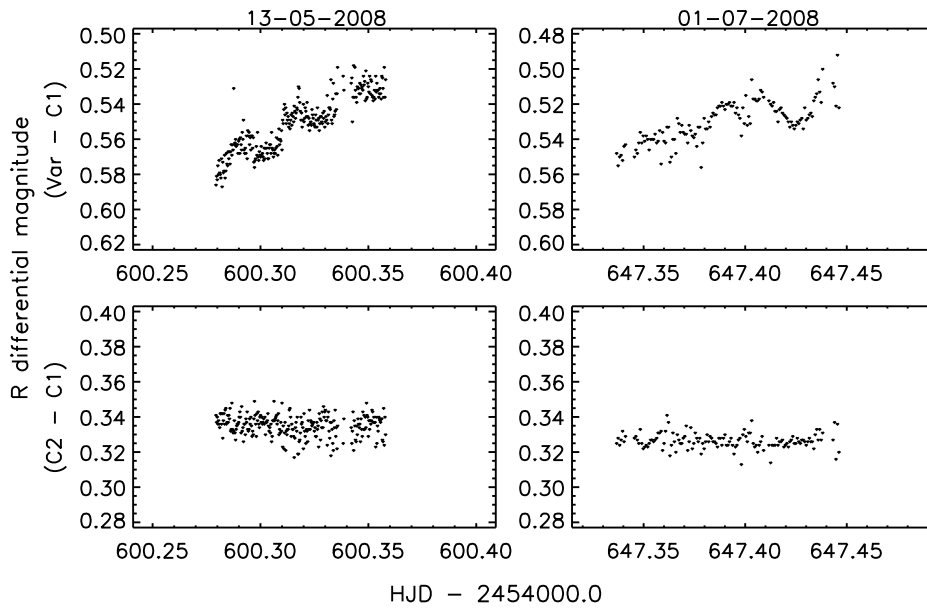
**Figure 1.** R band light curve of GSC 4550-1408 observed at NAO Rozhen (dots), and the synthetic light curve (solid line)



**Figure 2.** The Radial Velocity curve of GSC 4550-1408 (diamonds), and the best fit for the circular orbit assumption (solid line).

Table 4. Physical parameters of the primary and secondary components of GSC 4550-1408

Parameter	Primary star	Secondary star
$T_{\text{eff}}$ [K]	8500	6900
$\log g$	4.0	3.6
$v \sin i$ [kms $^{-1}$ ]	$\sim 60$	
Spectral type	A3 V-IV	F2 III



**Figure 3.** Nightly light curves of GSC 4550-1408: differential magnitudes between the variable and comparison stars  $\Delta R(\text{Var} - C1)$ , and between the check and comparison stars  $\Delta R(C2 - C1)$

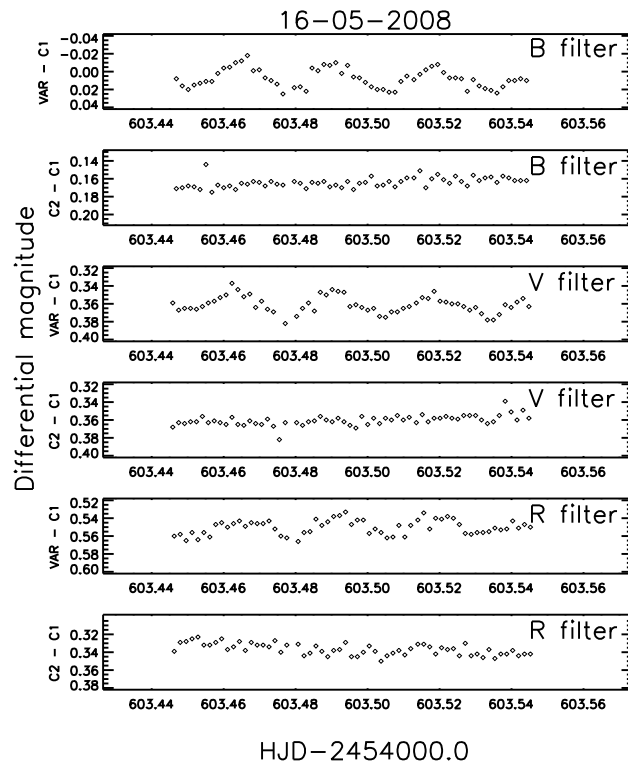


Figure 4. *BVR* light curves of GSC 4550-1408 and the check star observed on 16.05.2008

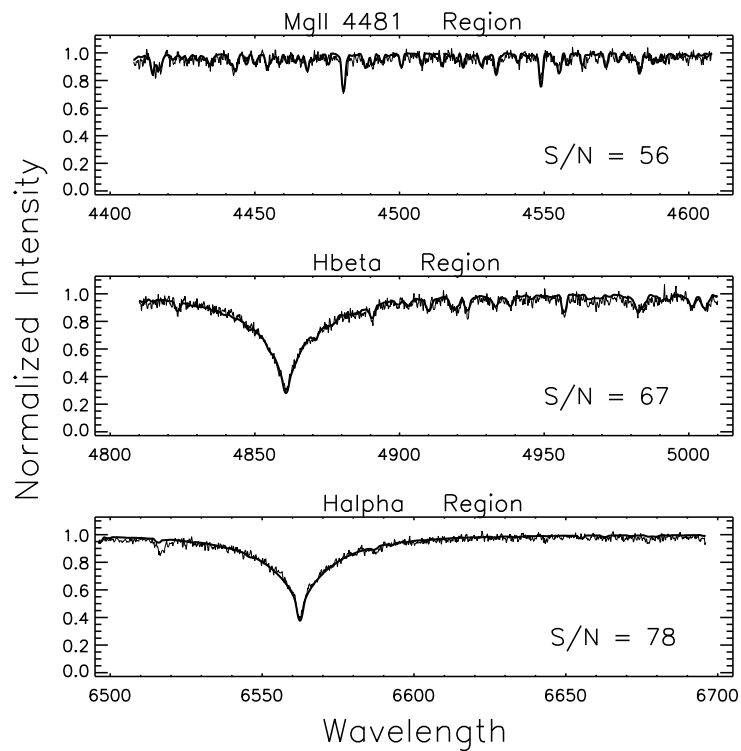


Figure 5. Rozhen combined spectra (thin line) of GSC 4550-1408 and the best synthetic spectra (thick line)