"Peremennye Zvezdy",
Prilozhenie,
vol. 13, N 17 **(2013)**

V Photometry for Four Variables

V. S. Kozyreva##1, A. V. Khruslov##2, A. V. Kusakin##3

##1. Sternberg Astronomical Institute, Moscow University, Moscow, Russia.
##2. Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia.
##3. Fesenkov Astrophysical Institute, Almaty, Kazakhstan.

Received: 28.11.2013; accepted: 19.12.2013
(E-mail for contact: valq@sai.msu.ru, khruslov@bk.ru, un7gbd@gmail.com)

#	Name	Other	Coord (J2000)	Type	Max	Min	System	Period	Epoch (JD)	type	Sp	Comment	L.Curve	Find.Chart	Data
1		USN0-B1.0 1495-0051755	01 31 57.89, +59 30 14.2	DSCT	13.23	13.30	V	(see Comments)	(see Comments)	max		Comm. 1	1.PNG	chart.PNG	data1.txt
2		USNO-B1.0 1494-0051943	01 32 01.88, +59 29 13.0	EA	14.15	14.55	V	1.03475	2456521.220	min		Comm. 2	2.PNG	chart.PNG	data2.txt
3		TYC 3682 1267 1, BD+58 257, HD 236771	01 32 02.77, +59 27 52.3	EA	9.30	9.80	V	3.195093	2456573.474	min	A0	Comm. 3	3.PNG	chart.PNG	data3.txt
4		TYC 3682 1407 1	01 32 09.72, +59 28 00.7	DSCT	12.09	12.17	V	(see Comments)	(see Comments)	max		Comm. 4	4.PNG	chart.PNG	data4.txt

Comments:

1. USN0-B1.0 1495-0051755 is a small-amplitude Delta Scuti variable with a nonradial pulsation co-existing with the fundamental mode. The light elements are:

Mode	Frequency, c/d	Semi-amplitude, V mag	Period, days	Epoch, HJD
f_1	13.93656	0.0132 (0.0191)	0.0717537	2456500.0376
f_2	11.40268	0.0078 (0.0053)	0.0876987	2456500.0873

In the Semi-amplitude column, the values in brackets are from observations with the 360-mm reflector; those without brackets are from the 1000-mm reflector. J–K = 0.353 (2MASS), B–V = 0.740 (APASS).

2. D = 0.17 P. MinII = $14^m.47$: (V).

3. TYC 3682 1267 1 is a known eclipsing variable star. Its variability was reported in 2009 by Gregor Srdoc in the VSX database (VSX J013202.7+592752; http://www.aavso.org/vsx/). The star was classified by the discoverer as an Algol variable with the light elements: HJD(min) 2455135.67338 + 1.59684×E. According to our observations, this is an Algol star with a circular orbit; more likely, P = 3.195093 days. A twice shorter period, 1.5975465 days, seems less probable. D = 0.09 P. We obtained observations of two minima of this star: HJD 2455439.216 and 2456573.474.

4. TYC 3682 1407 1 is a multiperiodic Delta Scuti variable star with a small amplitude. The harmonics have low amplitudes and are probably nonradial. The light elements are:

Mode	Frequency, c/d	Semi-amplitude, V mag	Period, days	Epoch, HJD
f_1	7.63983	0.0130	0.130893	2456300.030
f_2	8.14445	0.0077	0.122783	2456300.025

f_3	8.94438	0.0065	0.111802	2456300.061
f_4	5.23262	0.0080:	0.191109	2456300.120

Our elements have been derived for combined observations from the 360-mm and 1000-mm telescopes. The number of observations being small is the reason for the low determination accuracy of secondary frequencies. B–V = 0.740 (Tycho2), J–K = 0.317 (2MASS). B–V = 0.660 (APASS).

Remarks:

We present our discovery of three new variable stars and a new study of one known variable.

Our initial program was to study TYC 3682 00837 1, an eclipsing binary system contained in the list of 50 new eccentric eclipsing binaries published by Otero et al. (2006). It turned out later that the cited paper had erroneous coordinates for the star, and actually GSC 3682-00736 = NSVS 1740729 was meant (called V1103 Cas in the GSVS). During the study of TYC 3682 00837 1, found constant by us, we discovered three new variable stars in its neighborhood.

Our CCD observations in the Johnson V band were performed at the Tien Shan Astronomical Observatory of the V.G. Fesenkov Astrophysical Institute, at the altitude of 2750 m above the sea level, using a Ritchey-Chretien 360-mm reflector (CCD SBIG ST-402) and a Zeiss 1000-mm reflector (CCD Apogee U9000 D9). Reductions were performed using the MuniWin and MaxIm DL programs. These observations were analyzed using the period-search software developed by Dr. V.P. Goranskij for Windows environment.

The finding chart identifies the variable stars, comparison star, and check star. The comparison star was GSC 3682-01371 and the check star, TYC 3682 00837 1. The V magnitude of the comparison star is $12^{m}.244$ (Johnson's system) in the AAVSO Photometric All-Sky Survey (APASS) catalog .

The coordinates were drawn either from the Tycho-2 or 2MASS catalogs.

Acknowledgements: The authors are grateful to Dr. V.P. Goranskij for providing software for the light-curve analysis. We wish to thank M.A. Krugov for technical assistance during the observations, N.N. Samus and E.N. Pastukhova for helpful discussions. This study was supported by the Russian Foundation for Basic Research (grant 13-02-00664), the Programme "Non-stationary Phenomena of Objects in the Universe" of the Presidium of Russian Academy of Sciences, and the program "Studies of Physical Phenomena in Star-forming Regions and Nuclear Zones of Active Galaxies" of the Ministery of Education of Science (Republic of Kazakhstan).

References:

Otero, S., Wils, P., Hoogeveen, G., and Dubovsky, P. 2006, Inform. Bull. Var. Stars, No. 5681