

NEW ECLIPSING BINARY STAR IN FIELD OF V430 Lac

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Abstract: The new EW eclipsing binary HKV8 Lac = CzeV161 = USNO-B1.0 1347-0483658 (R.A. = 22h 27m 04.28s, Decl. = +44° 45' 59.7", J2000.0, R = 14.84 - 15.38 mag; Min. I = HJD 2455068.50679 + 0.2576355 x E) has been found near the variable star V430 Lac by 0.40-m f/5 reflector at Hradec Králové observatory.

The new eclipsing binary HKV8 Lac = CzeV161 = VSX J222704.2+444559 = USNO-B1.0 1347-0483658 (R.A. = 22h 27m 04.28s, Decl. = +44° 45' 59.7", J2000.0, R = 14.84 - 15.38 mag) has been found near the variable star V430 Lac on 30th August 2008, by Martin Lehký at Hradec Králové observatory (HPHK) using a 0.40-m f/5 JST (Jan Šindel Telescope) reflector and SBIG ST-7 CCD camera + R band filter. Discovery of HKV8 Lac has been preliminary published in the Czech Variable Star catalogue (CzeV 161) on 31st August 2008 and in the International Variable Star Index (VSX J222704.2+444559 on 21st December 2008.

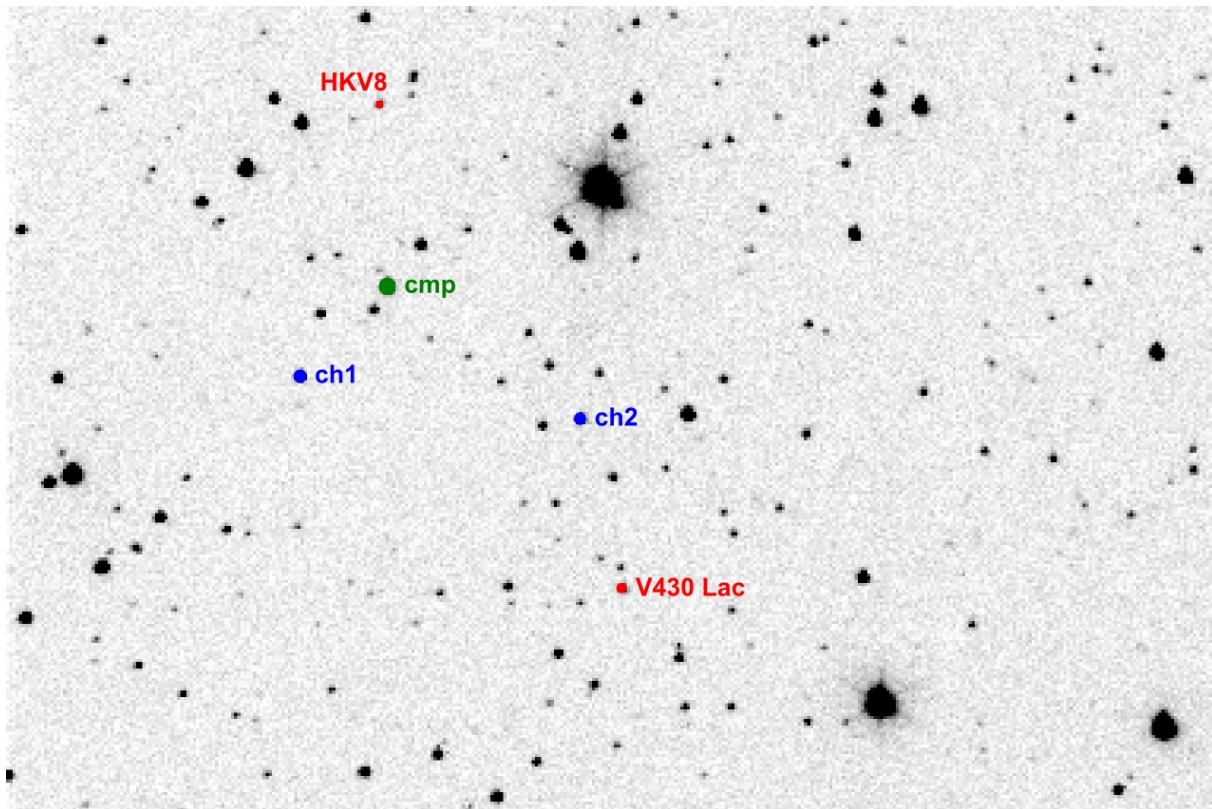


Figure 1. Close vicinity of HKV8 (field of view is 13' x 9', N is to the top, E to the left).

Comparison stars are *cmp* USNO-B1.0 1347-0483653 (R.A. = 22h 27m 03.674s, Decl. = +44° 44' 10.51", J2000.0, R2mag = 12.11), *ch1* USNO-B1.0 1347-0483700 (R.A. = 22h 27m 08.924s, Decl. = +44° 43' 24.46", J2000.0, R2mag = 13.32) and *ch2* USNO-B1.0 1347-0483544 (R.A. = 22h 26m 52.826s, Decl. = +44° 42' 52.79", J2000.0, R2mag = 13.62). Magnitudes were taken from the USNO-B1.0 catalogue.

During six nights (2008 August – 2009 September; time span 366 days) I obtained a total of 1432 CCD frames of HKV8 Lac. Images were processed using C-Munipack (Motl, 2006). I obtained minima timings using the Kwee and Van Woerden method implemented in AVE (Barbera, 2000).

I obtained rough period estimates from the nights when I observed the full phase light curve (JDs 2454719 and 2455067). Approximate period valid for the whole time span of my data was obtained using PerSea 2.01 (Maciejewski, 2004) and further refined using linear least-squares analysis of all minima timings. The basic minimum was improved upon as well in the process. The one-day aliases during period search could be easily eliminated using the prior knowledge on the period from the nights I observed the full phase light curve. I checked one-year aliases of the determined period and found that they are inconsistent with the dataset of JD 2454830. This shows that a long time span of observations in one observing season is important to remove period aliases arising during multi-year observing campaigns.

The differential light curve of the comparison and check stars was constant with a standard deviation of 0.021 mag in the case of cmp-ch1 and 0.025 mag in the case of cmp-ch2, respectively.

My phased R band light curve (folded with period 0.2576355 d) is shown in Figure 3; minima timings are given in Table 1. All times given are heliocentric UTC. Final ephemeris is:

$$\text{Min. I} = \text{HJD } 2455068.50679 + 0.2576355 \text{ d} \times E \\ \pm 0.00075 \pm 0.0000009$$

Figures 2, 3 and the period given above suggest that HKV8 Lac is an EW type eclipsing binary with depth of primary minimum 0.54 mag ($R = 14.84 - 15.38$ mag) and depth of secondary minimum 0.46 mag.

Table 1: Minima timings of HKV8 Lac

Hel. J.D.	Error	Type	O – C	Observer	Remarks
2454709.49006	0.00038	Min II	– 0.00167	ML ^{*)}	DISCOVERY
2454719.28279	0.00046	Min II	0.00091	ML ^{*)}	
2454719.41160	0.00075	Min I	0.00090	ML ^{*)}	
2454719.53597	0.00034	Min II	– 0.00355	ML ^{*)}	
2454830.19715	0.00073	Min I	0.00319	ML ^{*)}	
2454830.32474	0.00052	Min II	0.00196	ML ^{*)}	
2455067.34791	0.00040	Min II	0.00048	ML	
2455067.47573	0.00093	Min I	– 0.00052	ML	
2455067.60228	0.00050	Min II	– 0.00278	ML	
2455068.38023	0.00032	Min II	0.00225	ML	
2455068.50598	0.00040	Min I	– 0.00081	ML	
2455075.33387	0.00047	Min II	– 0.00026	ML	
2455075.46298	0.00050	Min I	0.00003	ML	

^{*)} These minima timings were preliminary published in Open European Journal on Variable Stars # 107 (Brát et al., 2009) before the analysis of variability was performed. These minima timings are given here again for sake of completeness.

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References:

- Barbera, R., 2000, AVE, <http://www.astrogea.org/soft/ave/aveint.htm>
 Brat L. et al., 2009, B.R.N.O. Contributions #36, Times of minima (2009OEJV..107....1B) <http://adsabs.harvard.edu/abs/2009OEJV..107....1B>
 Maciejewski, G., 2004, PerSea 2.01, <http://sun.astr.uni.torun.pl/~gm/down.html>
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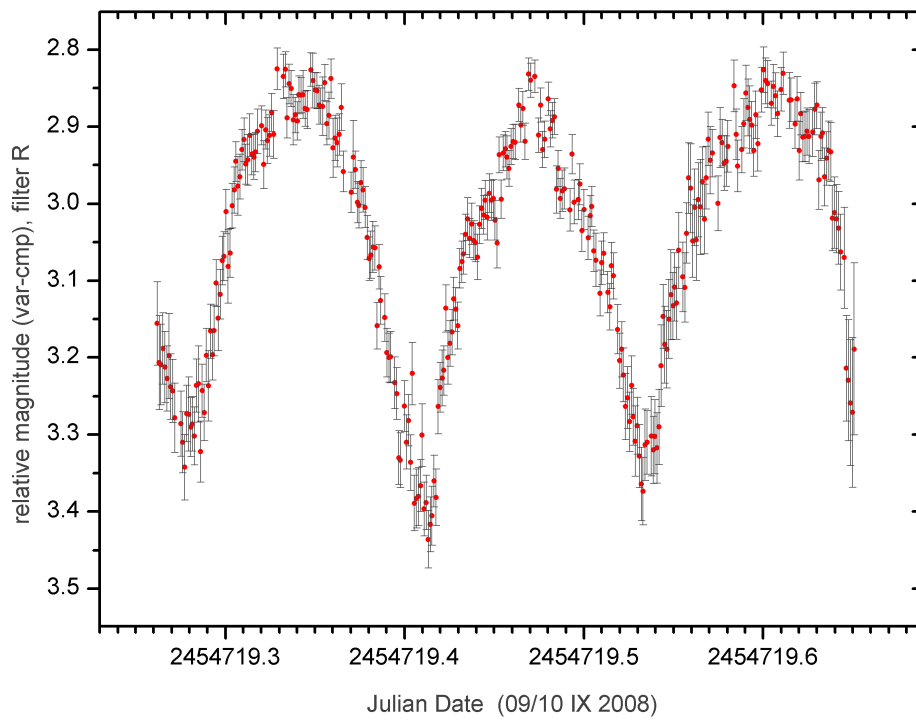


Figure 2. CCD R band light curve of HKV8 Lac showing primary and two secondary minima.

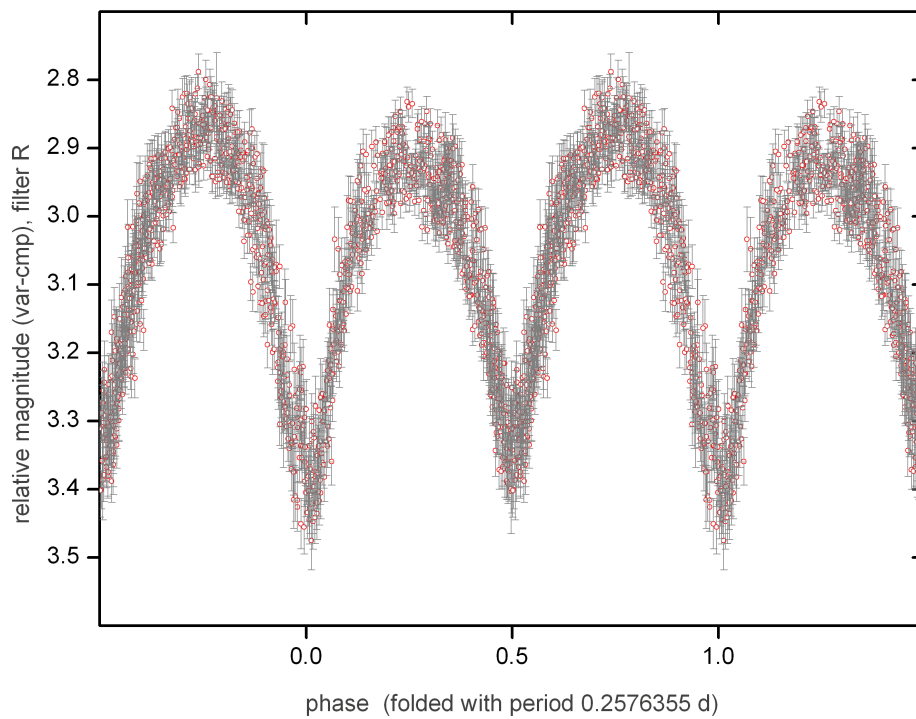


Figure 3. Phased CCD R band light curve of HKV8 Lac.