

GSC 4232-02515 - a New Eclipsing Binary Star

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Star Name:	GSC 4232-02515, NSVS 3147658, NSVS 3174760
Coordinates (J2000):	20 04 16.84, +61 05 32.4
Variability type:	EW; Limits, System: 14.2-14.9 (R, NSVS);
Period:	0.250762 d; Epoch(min): JD 2451550.8745

Remarks:

During observations of a secondary eclipse of GSC 04232-02830 (Goranskij et al., 2005) on August 8, 2007, we identified GSC 4232-02515 as a W UMa eclipsing binary.

Our observations were carried out at the Ka-Dar Public Observatory, Moscow Region (<http://www.ka-dar.ru>), with the Vixen (D=102mm, F=795mm) refractor equipped with a SBIG ST2000XM unfiltered CCD camera. The all-night series of images was analyzed with VAST software (Sokolovsky & Lebedev, 2005) to check if the eclipse of our target star was detected. Our large field of view resulted in detection of two more variable objects in the same field, GSC 4232-02515 (discussed here) and GSC 4232-02059 (discussed in a separate paper).

VAST software was used for aperture photometry. No specific comparison star was selected, instead, all stars were matched with stars on the reference image (typically, a few hundred stars), used as comparison stars simultaneously. This method produces a light curve with an arbitrary zero point.

The spectral response curve of KAI-2020M CCD chip used in our ST-2000XM camera is completely different from that of Thomson TH7899M chips used in ROTSE-I/NSVS AP10 cameras. KAI-2020M reaches its maximum quantum efficiency in the 410 - 550 nm range, while TH7899M, at 650 - 800 nm. Fortunately, we do not expect any significant color change during eclipses, at least within the precision of NSVS photometry. Thus, we have simply shifted the zero point of the light curve to match its magnitude at maximum light to the magnitude at maximum of the NSVS light curve.

After combining our photometry with NSVS data (Wozniak et al., 2004; see also <http://skydot.lanl.gov/nsvs/nsvs.php>), the light elements of GSC 4232-02515 were determined:

$$\text{HJD}_{\text{min}} = 2451550.8745 + 0.250762x\text{E}.$$

The secondary minimum has approximately the same depth as the primary minimum.

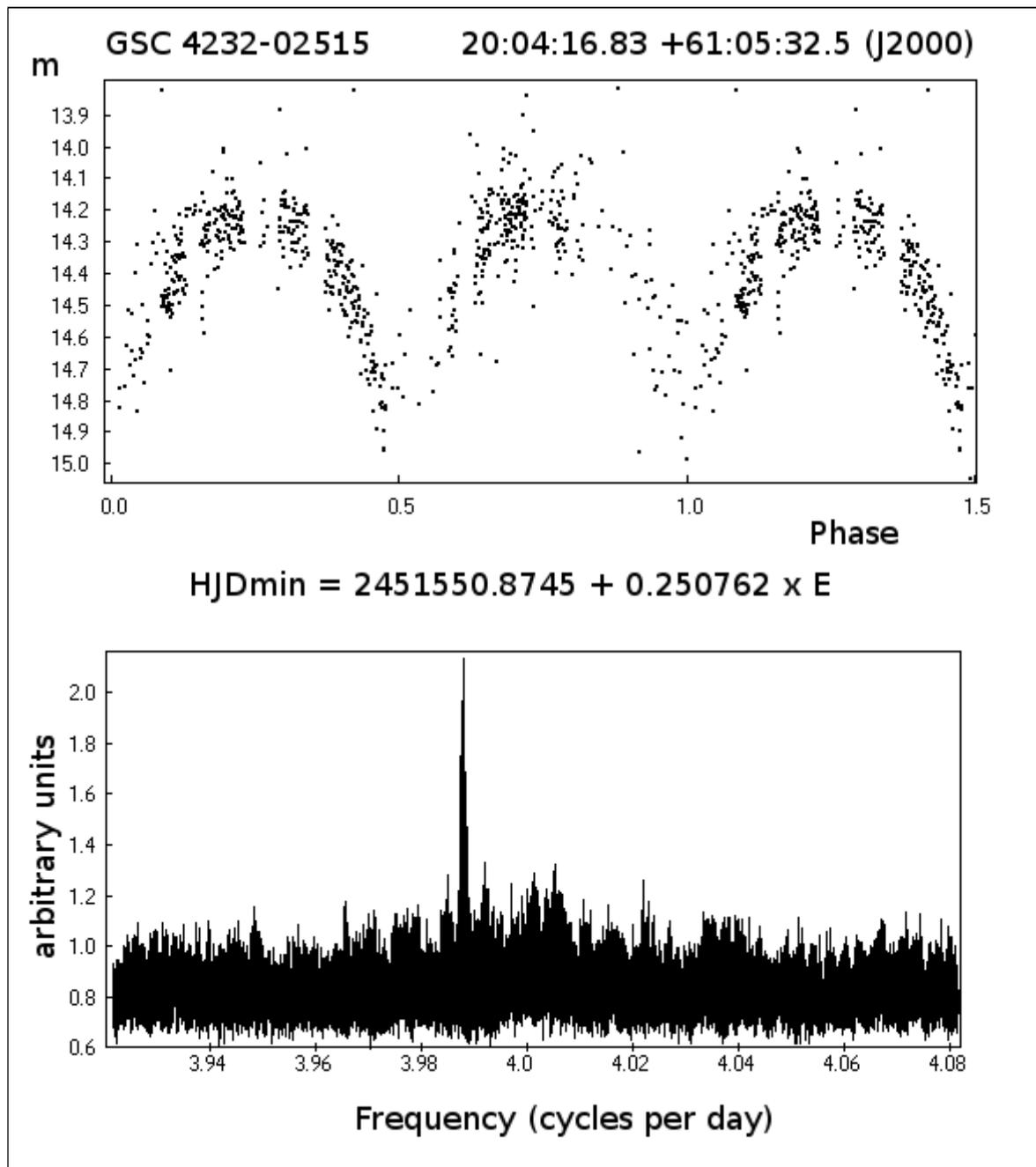
GSC 4232-02515 is a short-period EW star, so a simplified Period-Luminosity relation for W UMa eclipsing binaries can be applied (Rucinski, 2007; Rucinski, 2004). We have no Johnson V photometry for the system, so the empirical magnitude system conversion formula by John Greaves (http://www.aerith.net/astro/color_conversion.html) was used. Information on the galactic extinction in the direction of the system was extracted from NED. Taking into account uncertainties coming from the period-luminosity relation itself (0.2m), the NSVS-to-V magnitude conversion formula (0.2m), and the uncertainty in the interstellar extinction (can be any from 0 to 0.4m), the distance to GSC 4232-02515 is estimated to be 380 (-60/+180) pc.

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References:

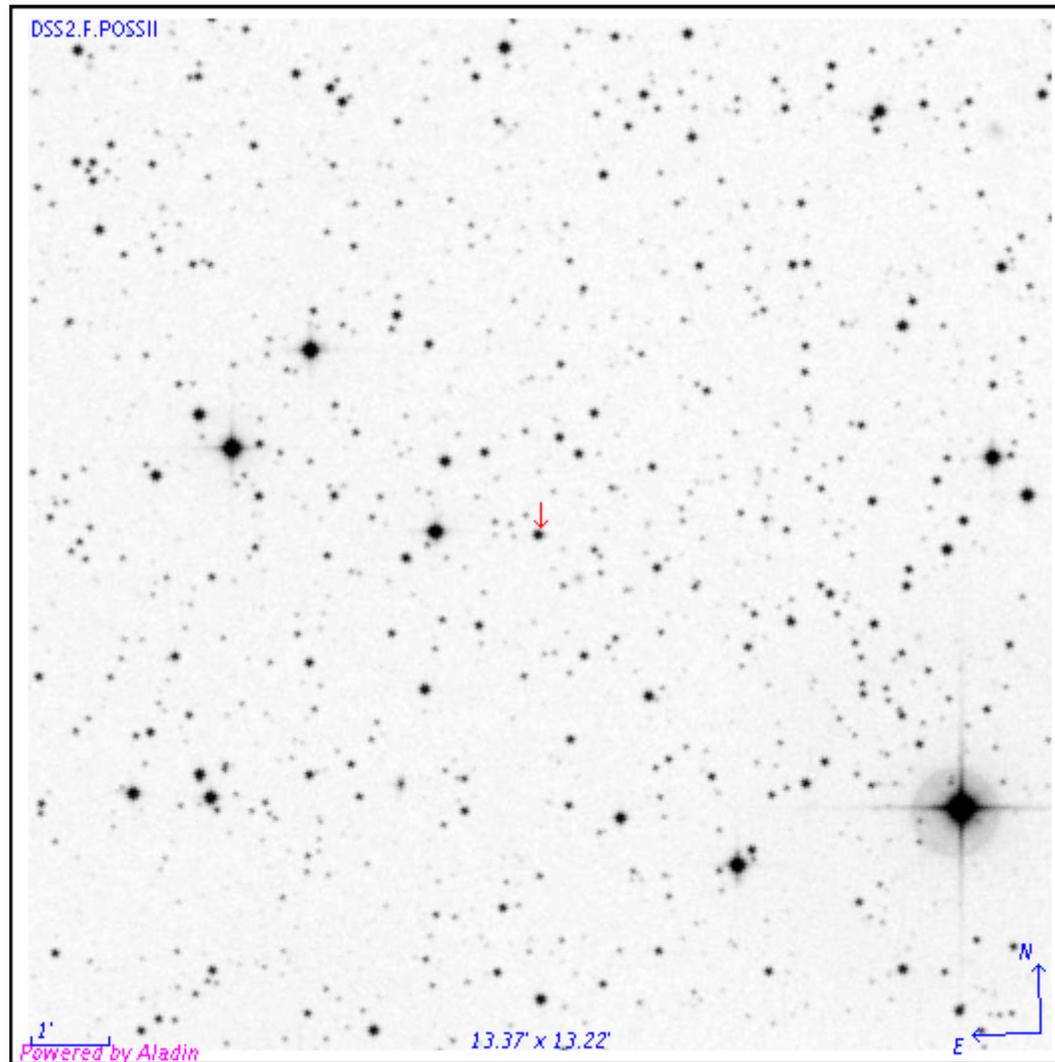
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Simon, A., Golovin, A., p.79 (VAST: <http://saistud.sai.msu.ru/vast>)
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Light Curve



Light curve of GSC 4232-02515 in NSVS magnitude scale.

Finding Chart



Data Source

1. [gsc423202515_kadar_nsvs.dat](#)