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NSV 2544 Cam: A W UMa TYPE ECLIPSING BINARY

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NSV 2544 (= Zi402 = CSV 635 = GSC 4344.123; $\alpha = 05^{h}43^{m}05^{s}$, $\delta = +68^{\circ}40'07''$ [J2000]) was first noted as a variable star on the basis of visual observations by Yendell (1894), suggesting long period nature of the object. Böhme (1937) gives additional photographic observations suggesting variability between 11.3 and 12.5 mag and an approximate period of 20 days with a note that not all observations can be folded with this period. Mayall (1951a) announced an independent discovery of the same object, which she later (Mayall 1951b) identified with a star now catalogized as GSC 4344.697. However, Jefremov (1963) examined 20 photographic plates and clearly showed that the real variable is another star (GSC 4344.123) with range 10.9 to 11.9 mag. Unfortunately, the wrong identification of Mayall (1951b) is still persisting in the literature. Close vicinity of NSV 2544 is shown in Figure 1.

NSV 2544 was chosen for visual monitoring on the basis of the PROSPEKTOR catalogue which contains eclipsing binaries lacking precise elements in the literature (Haltuf 2001). Using visual estimates of one of us (MH) carried out with a 15 cm Dobsonian telescope at his private observatory at Kolin, we preliminary concluded that NSV 2544 is probably a β Lyr type eclipsing binary.

We have done CCD photometry conducted by ML at Hradec Králové observatory using a 25 cm telescope and SBIG ST-5 CCD camera, by PS at Nicholas Copernicus Observatory (Brno) with a 40 cm telescope employing SBIG ST-7 CCD camera and by LŠ at Valašské Meziříčí Observatory using an Astrokamera 120/540 mm (Carl Zeiss Jena) and an SBIG ST-7 CCD camera, respectively. All observatories have used V band filters from the same manufacturer, which were proven to be closely matched to the standard Johnson one. Each observatory have used different comparison stars, which were found constant using nearby check stars. Further observations were done visually by one of us (OP) using a 25 cm Dobsonian telescope at his private observatory at Brno. We obtained a total of 1183 CCD frames of NSV 2544. All data are available upon request.

From our CCD observations we conclude that NSV 2544 really is GSC 4344.123 and either a β Lyr or a W UMa type eclipsing binary. Depth of primary minima is 0.63 mag and depth of secondary minima 0.44 mag in V band. We were also able to derive 13 times



Figure 1. Close vicinity of NSV 2544 based on the GSC catalogue showing also the former wrong identification. Coordinates are J2000



Figure 2. Our phased CCD V band light curve of NSV 2544

of minimum light seen in Table 1, which were determined using Kwee and Van Woerden method implemented in AVE (Barbera 2000). As secondary minima occur almost exactly at the phase 0.5, analysis of both primary and secondary minima yields to the following ephemerides:

Min. I = HJD 2451975.6040 + 0.4341474 $\times E$. ±0.0006 ±0.0000043

The best observed primary minimum was chosen as the basic one. Errors of minima time determination were treated as weights, error of 0.004^{d} was attributed to all minima based on visual observations. Our phased V band light curve is shown in Figure 2. The fact that different comparison stars have been used at each observatory have been eliminated by empirical shifts of the zero points.

We have computed a preliminary (due to the fact we have data only in V passband) model of the binary using programme Nightfall (Wichmann 2000). The inclination angle is $i = (74 \pm 2)^{\circ}$ and the filling factor of both components (1.06 ± 0.02) suggests overcontact binary of the W UMa type. We haven't been able to find any reasonable solution with filling factor lower than 1.

Hel. JD	Error	Type	O - C	Observer	Remarks
2451956.287	0.004	Min II	0.003	MH	visual
2451965.394	0.003	Min II	-0.007	$ m L\check{S}$	CCD, uncertain
2451965.6204	0.0003	Min I	0.0018	ML	CCD
2451968.4381	0.0007	Min II	-0.0025	ML	CCD
2451968.6559	0.0006	Min I	-0.0017	ML	CCD
2451971.4800	0.0006	Min II	0.0004	ML	CCD
2451975.3873	0.0003	Min II	0.0005	ML	CCD
2451975.6040	0.0006	Min I	0.0000	ML	CCD, basic minimum
2451980.387	0.004	Min I	0.007	OP	visual
2452000.352	0.004	Min I	0.002	OP	visual
2452005.334	0.004	Min II	-0.009	OP	visual
2452024.4456	0.0002	Min II	0.0000	\mathbf{PS}	CCD
2452024.4466	0.0007	Min II	0.0011	ML	CCD

Table 1: Minima timings of NSV 2544

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This work has made use of the SIMBAD database, operated at CDS, Strasbourg, France. The NASA ADS Abstract Service was used to access data and references.

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