COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 4696

Konkoly Observatory
Budapest
14 April 1999

HU ISSN 0374 – 0676

B AND V PHOTOELECTRIC LIGHT CURVES AND FIRST EPHEMERIS OF NSV 11321, A NEW W UMa SYSTEM

NICOLA BELTRAMINELLI[1], DAVIDE DALMAZIO, JOSEPH REMIS, ANDREA MANNA

GEOS (Groupe Européen d'Observation Stellaires), 3, Promenade Vénézia, F-78000 Versailles, France

[1] E-mail: nbeltram@eliot.unil.ch

New photoelectric observations were carried out on NSV 11321, a short period suspected variable in the constellation Lyra (Hoffmeister 1965, Kholopov *et al.* 1982). The variability was detected on the basis of 2478 visual estimates obtained from 1995 to 1997 by several GEOS members. Subsequently observations were carried out using the 76-cm reflector of the Jungfraujoch in the Swiss Alps, operated by the Geneva Observatory. We collected 322 Geneva BV photoelectric measurements on NSV 11321, using the All Sky method, concentrated in 5 nights over a 2 year interval.

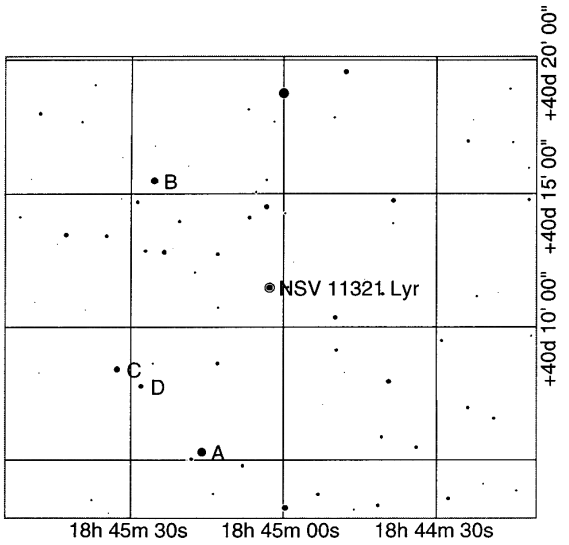

Figure 1. Finder chart of NSV 11321. Labeled stars were chosen to perform visual estimates, but they can be used for differential photometry too.

Plotted in Figure 1 is the star field used for identifying NSV 11321. Listed in Table 1 are the star's identification numbers, coordinates (J2000) and magnitudes from the Hubble Space Telescope Guide Star Catalogue (GSC, Jenkner *et al.* 1990).

Table 1: Comparison stars in the field of NSV 11321

Label	GSC No.	R.A. (J2000)	Dec. (J2000)	GSC Mag
A	3122:298	$18^h45^m19^s.8$s	$+40°05'01''$	9.8
B	3122:2732	$18^h45^m29^s.1$s	$+40°15'12''$	10.6
C	3122:809	$18^h45^m36^s.4$s	$+40°08'06''$	10.9
D	3122:2341	$18^h45^m31^s.7$s	$+40°07'29''$	11.4

There was no ambiguity in the determination of the period of NSV 11321, since two of the nights covered more than one third of the light curve. Using the method of Kwee and Van Woerden (1956), the heliocentric Julian Dates of three photoelectric minima were found and are tabulated in Table 2.

Table 2: Times of Photoelectric Minima of NSV 11321

HJD	Error
2450700.3444	± 0.0011
2451041.4344	± 0.0006
2451051.5484	± 0.0009

The Phase Dispersion Minimization method (PDM, Stellingwerf, 1978) for period finding and O−C diagrams were applied to the photoelectric data to obtain an improved ephemeris:

$$\text{Min I or II} = \text{HJD}\,2450700.3444(11) + 0^d.577639(4) \times E.$$

The uncertainties in the final digits, using the mean square error, are given in brackets. The period found is very close to that coming from visual estimates based on 44 observed minima, which is $0^d.577642$ (Beltraminelli and Dalmazio, 1999; a copy can be requested from the GEOS).

The V magnitudes and the B−V color index folded on this period are plotted in Figure 2 with different symbols for each night. The V light curve and the B−V behavior leads us to expect this to be a contact system belonging to the W UMa type rather than to be a pulsating star for the following reasons. First, the light curve shows sharp minima and well rounded maxima, as expected for an eclipsing binary. Second, the B−V amplitude is not larger than 0.04 mag, a very small value for a pulsating star. The faint reddening at both minima is probably due to the eclipse of the neck of contact binaries, which has normally an increased temperature. Third, when plotted on the $0^d.289$ period, the measurements show a wider scatter.

The variation ranges in V from 11.47 ± .01 for both minima to 10.96 ± .01 for the maxima. Uncertainties of the measurements do not allow us to discriminate which is the primary minimum.

The slight asymmetry in the maxima, is probably indicative of star spots distributed asymmetrically over the surface(s) of the star(s).

The average B−V color index is −0.451 ± .004 at maximum light. Using the conversion formula described by Meylan and Hauck (1981), the resulting B−V color index, considering NSV 11321 as a system belonging to the luminosity class V, is equal to 0.417. Applying the conversion table published by Cousins (1981), NSV 11321 Lyr belongs approximately to the spectral class F5. This evaluation is in agreement with Rucinski's

(1997) "period-color" diagram, in which it is shown that the evolution leads to longer periods and redder colors for more evolved contact systems .

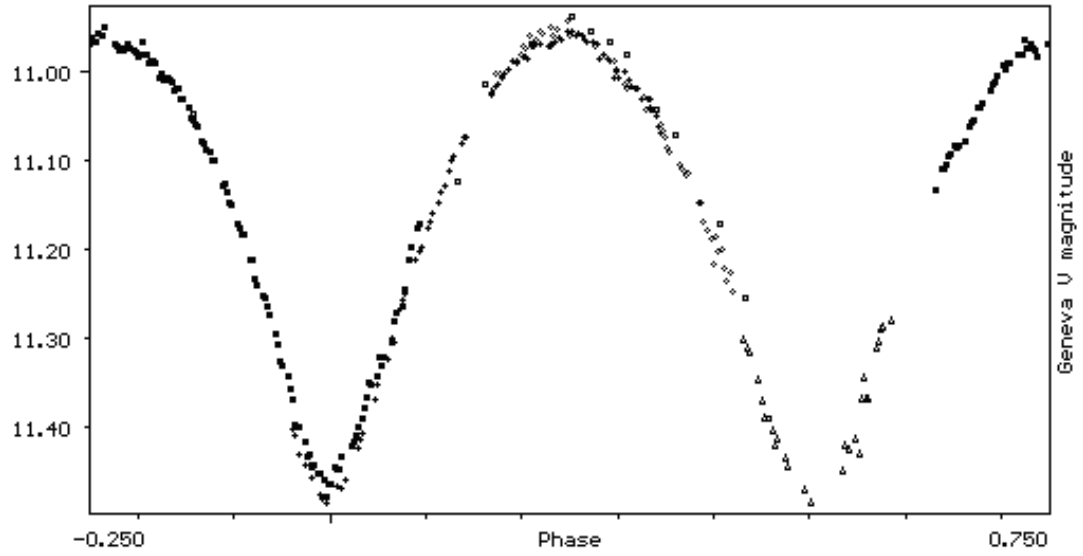

Figure 2. V band light curve of NSV 11321

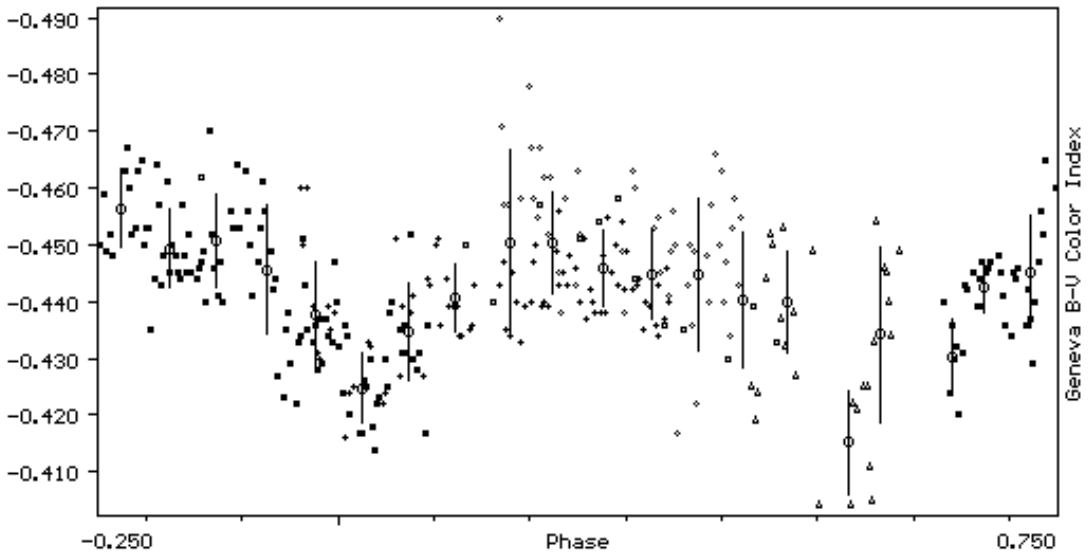

Figure 3. B−V color index. Open circles represent mean values every 0.05 phase, and error bars represent the mean square error

In conclusion we have shown that NSV11321 is an eclipsing binary of the W UMa type and spectral class F5, and have proposed a first ephemeris.

We acknowledge Paolo Bernasconi for critical reading, Julie Guignard and Gilles Allenbach for their contribution to photoelectric measurements.

References:

Beltraminelli, N., Dalmazio D., 1999, *GEOS Circular EB*, **25**
Cousins, A. W., 1981, *SAAO Circ.*, **6**, 4
Hoffmeister, C., 1965, *Mitt. Ver. Sterne*, **B3**, 113
Jenkner, H., Lasker, B., Sturch, C., McLean, B., Shara, M., Russel, J., 1990, *AJ*, **99**, 2082
Kholopov P. et al., 1982, *New Catalogue of Susp. Var. Star*, Nauka, Moscow
Kwee, K. K., van Woerden, H., 1956, *BAN*, **12**, 327
Meylan G., Hauck B., 1981, *A&AS*, **46**, 281
Rucinski, S. M., 1997, *AJ*, **113**, 407
Stellingwerf, R. F., 1978, *ApJ*, **224**, 953