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NSV 12615 - An Eclipsing Cataclysmic Variable.

with Ultrashort Period

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ABSTRACT

We report the discovery of an ultrashort binary period in the star NSV 12615 $\equiv$ S 7273. The object shows deep eclipses ($\Delta m \approx 1.2$) and has a period of 88.45 minutes. We suggest that the star belongs to the SU UMa subclass of dwarf novae.

Subject headings : stars: U Geminorum - stars: eclipsing binaries.

INTRODUCTION

The star under the entry number 12615 ($\alpha = 19^h55^m31^s$, $\delta = -39^{\circ}04'1''$, epoch 1950, finding chart in Plate L1) in the New General Catalogue of Suspected Variable Stars (Kukarkin et al. 1982) was discovered by Hoffmeister (1963) who catalogued it under the number S 7273. That author measured the magnitude of the star on 3 plates, taken in 1959 to be $m_{ph} \approx 15.5$. On other plates it was not seen with magnitude brighter than 16.5. Based on this information, Hoffmeister suggested that the star could be a U Gem like dwarf nova. We included the star in our program of studies of cataclysmic variables and related objects and found that the object is indeed a cataclysmic variable with deep eclipses and with an orbital period of 88.45 minutes.

OBSERVATIONS AND RESULTS

The observations were carried out in the nights of July 15, 16 and 17, 1985, using the 1.6m telescope of the Laboratório Nacional de Astrofísica. A one channel, offset guided photometer equipped with an uncooled pulse counting EMI 9789Q photomultiplier was used to collect the data. As the star is quite faint, no filter was used and a 9 arcsec field diaphragm was chosen. The measurements consisted of sequential 30 sec (20 sec in the second night) integrations with a dead time of 45 msec. We have obtained a total of 9.5 hours of photometric data, registering eight eclipses. In order to take into account any slow variation in the sky background, measurements at a position 30 arcsec North from the star were made every 15 minutes. Figure 1 shows the light curve of NSV 12615 taken in July 16, 1985. The depth of the eclipses has the average of 1.2 magnitudes in integral light. In Table 1 we summarize the times of minimum light. The best ephemeris that describes these timings is

$$T_{\min} \approx \text{HJD } 2,446,261.6715 (\pm 2) \pm 0.061425 (\pm 13) \text{ E}$$

The magnitude and colors of the system at phase 0.3 are

$$V = 17.7$$

$$B - V = +0.16$$

$$U - B = -0.86$$

DISCUSSION

The large amount of flickering seen in all our observations clearly suggests that the star is a cataclysmic variable. The light curves show that the object has an accretion disk, since they display the characteristic "hump" from the hot spot before the eclipses as well as a less steep ascending branch in the eclipses, typical of systems with accretion disk.

As no spectral information is available, the only other measurements we can analyse are the ones made by Hoffmeister (1963). He remarks that the object was bright ($m_{ph} \sim 15.5$) on 1959, April 17 and July, 9 and 10. It is unlikely that the object is a dwarf nova of the U Gem type since these objects have orbital periods larger than 3.9 hours. It is also unlikely that it belongs to the subclass of stars like WZ Sge, which show large amplitude eruptions spaced by several years, since Hoffmeister registered two eruptions spaced by about 3 months, both with small amplitude ($\Delta m \sim 2 - 2.5$). It could belong to the subclass of SU UMa dwarf novae. These objects have short orbital periods and frequent small amplitude eruptions. If this is the case, we predict that searches in old plates or future monitorings should reveal that the star also undergoes superoutbursts.

Finally we would like to remark that this object is one of the cataclysmic variables with shortest orbital period known. Robinson's (1983) compilation only shows EF Eri and WZ Sge with shorter orbital periods. Among the binaries with deep eclipses this is the system with the shortest period.

This work was supported by Ministério da Ciência e Tecnologia, FINEP and FAPESP. We are grateful to the staff of the Data Processing Center of the Escola Federal de Engenharia de Itajubá, where the data reduction work was carried out. The data discussed in this work were obtained while one of us (FJJ) was a resident astronomer at the CNPq/Laboratório Nacional de Astrofísica.

TABLE 1

Timings and residuals with respect to the ephemeris given in the text for the eclipses of NSV 12615.

$T_{\min}$ (HJD 2,446,000+)	Cycle	O-C (cycles)
261.67145	0	-.0008
261.73279	1	-.0022
261.79482	2	+.0077
262.59274	15	-.0022
262.65427	16	-.0005
262.71575	17	+.0004
262.77711	18	-.0007
263.51442	30	+.0028

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Related Objects*, Eds. M. Livio and G. Shaviv (Dordrecht, Holland:
Reidel), p.1.

PLATE CAPTION

Plate 1 - Finding chart for NSV 12615, from the ESO sky survey.
(R.A. = $19^{\text{h}} 55^{\text{m}} 31^{\text{s}}$, DEC. = $-39^{\circ} 04'11''$; epoch 1950). North
is up, East to the left. The vertical mark represents 5
arcmin in the sky.

FIGURE CAPTION

Figure 1 - The light curve of NSV 12615 corrected for sky background and atmospheric extinction, in July 16, 1985. Starting time is HJD 2,446,261.64140. Each dot represents one 20 sec integration.

Plate 1

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