

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

Number 4364

Konkoly Observatory
Budapest
9 August 1996

HU ISSN 0374 – 0676

NSV 07968 IS AN OVERCONTACT ECLIPSING BINARY STAR

The variability of NSV 07968 (BV 105, CSV 007493) was announced by Geyer et al. (1955) who indicated that this star was a possible Cepheid with a photographic magnitude variation from 10^m9 to 11^m5. According to Kholopov (1982), the spectral type of this object is A6. NSV 07968 can be unambiguously identified with GSC 3070.0345, a star with a photovisual magnitude (PAL-V1 filter) of 9.92±0.40.

For 10 nights, from 6 May 1996 to 21 May 1996, NSV 07968 was observed in the V band using the 0.4-m telescope at Mollet del Valles Observatory (Spain) and a Starlight Xpress CCD camera. As comparison star was used GSC 3070.0265 with a photovisual magnitude (PAL-V1 filter) of 10.11±0.40.

Observations show that NSV 07968 is not a Cepheid but an overcontact eclipsing binary star with a period over 8 hours. Phase curve shows that primary minimum is a transit with a 0^m28 depth and secondary minimum is an occultation with an average depth of 0^m25. It was also observed that Min.I has a distorted shape whereas shape and depth of Min. II changed from cycle to cycle during the observational period.

The following ephemeris was derived:

$$\text{Min.I} = \text{HJD } 2450219.5238 + 0^{\text{d}}3825 \times E \\ \pm 0.0010 \pm 0.0002$$

Light curve was preliminary solved using Binary Maker 2.0 (Bradstreet, 1993). For this purpose, the phase curve was reduced to 100 normal points by dividing it into 100 non overlapping identical intervals, and averaging individual observations within each interval. Average points were finally converted to flux. In computing the photometric solution the following parameters were initially adopted: a mean surface temperature T₁=8300K according to the spectral type of the system, and gravity darkening coefficients g₁=g₂=1 and bolometric albedos A₁=A₂=1, which correspond to stars with radiative external layers. Limb darkening coefficients x₁ and x₂ were set to 0.5.

Since there is no spectroscopic information about mass ratio, a search for the solution was carried out from q=0.13 to q=0.07, in mass ratio steps of 0.01 between q=0.13 and q=0.10, 0.005 between q=0.1 and q=0.08, and 0.0025 between q=0.08 and q=0.07. Simple inspection showed that there were no adequate solutions out of the search interval. As best fit criterion, minimum scatter of residual values obtained by subtracting the synthetic flux curve from normals points was used. Elements of the best solution are given in Table 1. Figure 1 shows superimposed phase and synthetic curves.

Solution of the light curve of NSV 07968 indicates that this object is an A-type W UMa system with one of the smallest known mass ratios. Additional spectroscopic and photometric observations should be carried out in order to more accurately determine the physical parameters of this binary star.

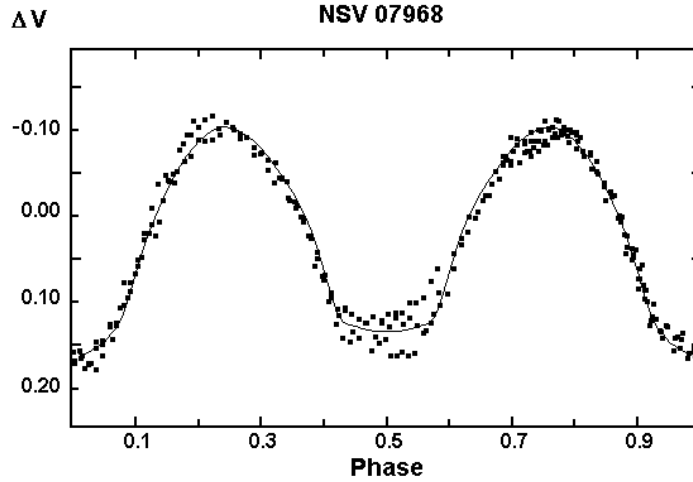


Figure 1

Table 1

mass ratio= 0.0725 ± 0.050
 $i=90^\circ \pm 10^\circ$
 fill out= 0.80 ± 0.10
 $\Omega_1=\Omega_2=1.832 \pm 0.010$
 $a_g=0.665 \pm 0.005$ $a_s=0.261 \pm 0.010$
 $b_g=0.646 \pm 0.006$ $b_s=0.198 \pm 0.007$
 $c_g=0.565 \pm 0.004$ $c_s=0.188 \pm 0.007$
 $d_g=0.742 \pm 0.013$ $d_s=0.258 \pm 0.005$
 $g_1=g_2= 1.0$
 $x_1=x_2= 0.5$
 $A_1=A_2= 1.0$
 $T_1=8300\text{K}$ $T_2=7950\text{K} \pm 350\text{K}$
 $L_1=0.9095 \pm 0.0010$ $L_2=0.0905 \pm 0.008$

Josep M. GOMEZ-FORRELLAD
 Grup d'Estudis Astronòmics
 Apartado 9481
 08080 Barcelona
 Spain
 e-mail:jmgomez@astro.gea.cesca.es

Enrique GARCIA-MELENDO
 Esteve Duran Observatory
 El Montanya - Seva
 08553 SEVA
 (Barcelona)
 Spain
 e-mail:durobs@astro.gea.cesca.es

References:

- Bradstreet, D. H., 1993, Binary Maker 2.0 User Manual, Contact Software, Norristown, Pennsylvania
 Geyer, E., Kippenhahn, R., Strohmeier, W., 1955, *KVB*, No. 11
 Kholopov, P. N. editor, 1982, New Catalogue of Suspected Variable Stars, Moscow