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

Number 4782

Konkoly Observatory
Budapest
2 November 1999

HU ISSN 0374 – 0676

NEW ANALYSES OF V909 CYGNI LIGHT CURVES

CLAUD H. LACY[1], MAMNUN ZAKIROV[2], G.C. ARZUMANYANTS[2], N.R. BAIRAMOV[2], A.S. HOJAEV[2]

[1] Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA

[2] High Altitude Maidanak Observatory, Astronomical Institute, Tashkent 700052, Uzbekistan

Lacy (1997) reanalyzed the photometry of Gülmen et al. (1988) and combined the results with his spectroscopic orbit to determine the absolute properties of this triple star. He found anomalies in the absolute properties of this system. The primary component appeared to be very small for its mass, and the secondary appeared to be less massive, but considerably larger than the primary, which seemed to imply it might be a pre-main-sequence object. A new set of B, V light curves is now available for this system. They were obtained at the High Altitude Maidanak Observatory in Uzbekistan with a 0.6-m reflector. Times of minima derived from these data have been reported (Lacy et al. 1998). From these times of minima and those of Gülmen et al. (1988) we find an improved ephemeris: Min I = 2.80538720(60)n + 2450305.3731(20), where the uncertainty in the last digits is shown in parentheses. We have now fit an orbit to these new data and find significant differences with the previous photometric orbit.

The new data were analyzed with the NDE model (Etzel 1981, Popper & Etzel 1981) as were the older data. The results are presented in Table 1 and shown in Fig. 1 and 2.

Table 1: Analyses of V909 Cyg Light Curves

Parameter	Gülmen et al. (1988) Data		Maidanak Data	
	B	V	B	V
J_s	0.719 ± 0.006	0.760 ± 0.007	0.744 ± 0.009	0.798 ± 0.008
r_p	0.117 ± 0.002	0.113 ± 0.001	0.122 ± 0.002	0.125 ± 0.001
k	1.01 ± 0.04	1.08 ± 0.02	0.95 ± 0.03	0.93 ± 0.02
i (deg)	89.1 ± 0.2	89.5 ± 0.5	89.7 ± 0.7	89.9 ± 1.9
L_A	0.447 ± 0.016	0.401 ± 0.008	0.473 ± 0.017	0.454 ± 0.009
L_C	0.230 ± 0.008	0.248 ± 0.008	0.218 ± 0.012	0.234 ± 0.011
u_A	0.550	0.500	0.280	0.470
u_B	0.599	0.539	0.315	0.498
s.e. (mag)	0.010627	0.011908	0.024486	0.020515
N	720	696	523	536

Note: $L_A + L_B + L_C = 1$.

Some of the parameters are consistent across all analyses: the orbital inclination i, and the third light L_C. All other parameters differ significantly. The ratio-of-radii, for instance, is less than 1 in the analysis of the newer data, which would remove the anomalies

found by Lacy (1997). Internally estimated uncertainties of the fitted parameters are comparable in both analyses, although the residual standard errors (s.e.) are smaller for the light curves of Gülmen et al. (1988).

Our conclusion is that the individual radii are much more poorly known than are implied by the internal errors of the model fits. Although the sum-of-radii is well-determined, the ratio-of-radii is poorly known. A much more accurate set of light curves will be needed to definitively determine the radii of the components of this binary star.

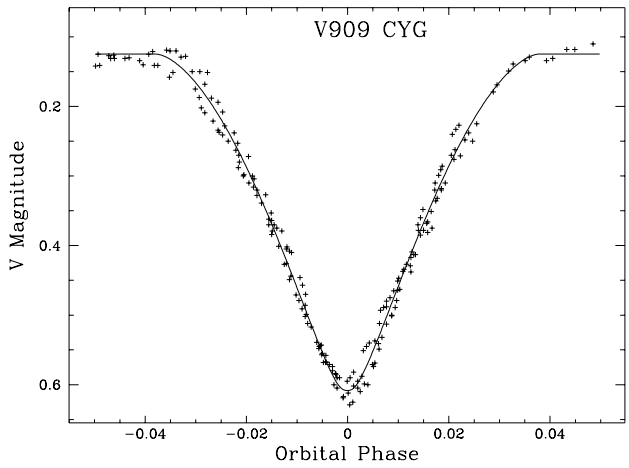

Figure 1. Light curve of Gülmen et al. (1988) with fitted orbit

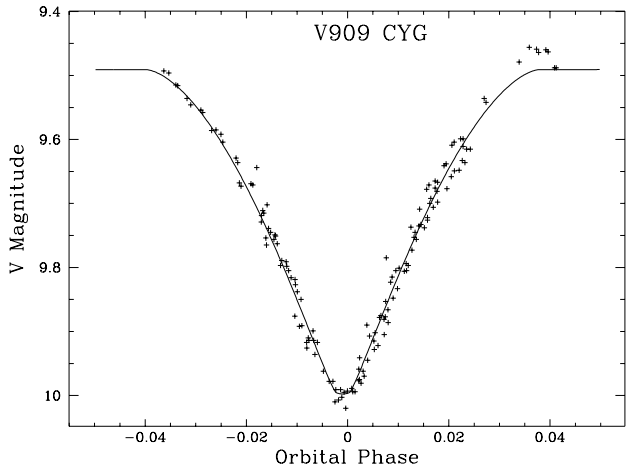

Figure 2. Light curve obtained at Maidanak Observatory and fitted orbit

References:

Lacy, C.H.S. 1997, *AJ*, **114**, 2140

Lacy, C.H.S., Clem, J.L., Zakirov, M., Arzumanyants, G.C., Bairamov, N.R., & Hojaev, A.S. 1988, *IBVS*, No. 4597

Etzel, P.B. 1981, in Photometric and Spectroscopic Binary Systems, ed. E.B. Carling & Z. Kopal (NATO ASI Ser. C, 69) (Dordrecht: Reidel), 111

Gülmen, O., Sezer, C., & Güdür, N. 1988, *A&AS*, **73**, 255

Popper, D.M., Etzel, P.B. 1981, *AJ*, **86**, 102