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PHOTOMETRIC ORBITS OF KU AURIGAE AND SW CANCRI

LACY, CLAUD H. SANDBERG

Physics Department, University of Arkansas, Fayetteville, AR 72701, USA; email: clacy@uark.edu

I am measuring light curves in the V filter of about 3 dozen eclipsing binary stars with the aim of providing photometric orbits for systems in which the light ratio is large enough to detect double lines in the spectra with existing spectrometers. The target list was selected in a number of different ways, and sometimes I find that a binary will not be suitable for the determination of absolute dimensions and masses because the light ratio is too large to show double lines. Still, it may be useful for future studies to publish a photometric orbit for these systems. In this paper are the photometric orbits of 2 such binaries selected from the list of Popper (1996). Popper gives an estimate of the spectral type of the combined light, but not the individual spectral types. I have estimated the individual spectral types by using the central surface brightness of the secondary component and the equation in Lacy et al. (1987) that relates the central surface brightness to the difference in visual surface brightness parameter Fv. Popper (1980) gives a calibration of the visual surface brightness parameter that allows the spectral type of the secondary to be estimated from the combined spectral type.

Observatory and telescope:
URSA Observatory at the University of Arkansas (ursa.uark.edu); 10-inch Schmidt-Cassegrain reflector.

Detector:	1020x1530 pixels SBIG ST8EN CCD cooled to (typ.) −20 C; 1.15 arcsec square pixels; 20′(N-S)×30′(E-W) field of view.

Method of data reduction:
Virtual measuring engine (Measure 1.97) written by C.H.S. Lacy in 2003.

KU AURIGAE

Name of the object:
KU Aur = GSC 02422 00020

Comparison star(s):	GSC 02422 01381

Check star(s):	GSC 02422 00931

Eclipse ephemeris and source or method:
HJD Min I = 2451923.43191 + 1.31957012 E $\pm 0.00010 \pm 0.00000045$ The ephemeris is a least-squares fit to primary minima of Agerer & Hubscher (2002), Nelson (2002), and Lacy (2003).

Light curve fitting technique and references:
Nelson-Davis-Etzel (NDE) model as implemented in the code EBOP (Etzel 1981; Popper & Etzel 1981).

Table 1: Auxiliary fitting parameters and sources:

Component	Hotter	Cooler	Reference
Limb-darkening coefficient	0.60	0.81	Diaz-Cordoves et al. 1995
Gravity-brightening coefficient	0.25	0.25	Claret 1998
Effective temperature (K)	6500	4000	Popper 1980
Spectral class	F5	K7	Popper 1996

Table 2: Fitted orbital parameters and uncertainties:

Parameter	Hotter	Cooler
Central surface brightness	1	0.069 ± 0.004
Radius	0.268 ± 0.002	0.231 ± 0.003
Ratio of radii	0.862 ± 0.015	
Angle of inclination (degrees)	88.0 ± 0.5	
Reflected light	0.001	0.008
Photometric mass ratio	0.167 assumed	
Luminosity	0.950 ± 0.014	0.050 ± 0.014
Third light	0.176 ± 0.017	
Standard error of residuals (mag)	0.006066	
Number of observations (9-pt normals)	150	

Availability of the data:
May be obtained from the author (clacy@uark.edu).

Remarks:
The secondary star appears to be a subgiant. The system is assumed to be semi-detached.

SW CANCRI

Name of the object:
SW Cnc = GSC 00812 00052

Comparison star(s):	GSC 00812 00083

Check star(s):	GSC 00812 00121

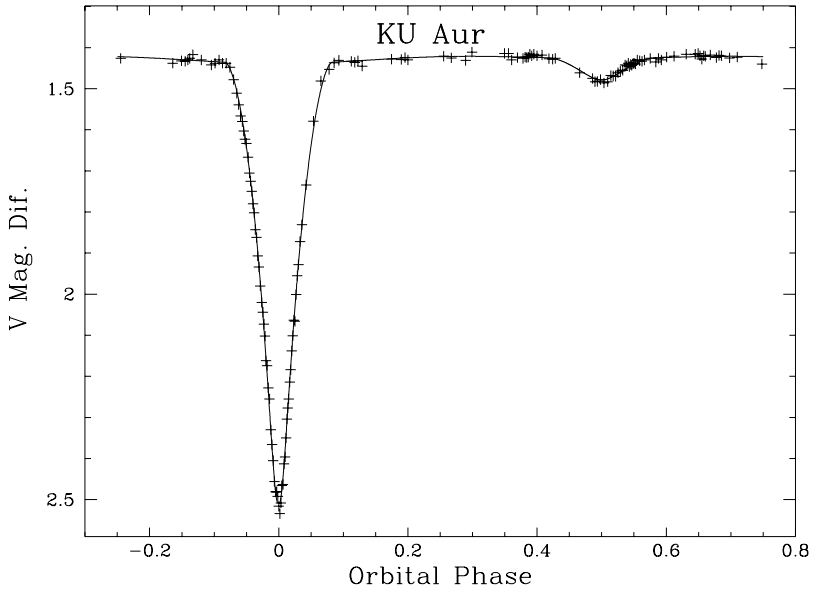

Figure 1. Fitted light curve and data plot (the data are 9-point normals).

Eclipse ephemeris and source or method:
HJD Min I = 2452598.89788 + 1.79920613 E ±0.00014 ± 0.00000040
The ephemeris is a least-squares fit to primary minima of Zejda (2002), Lacy (2002), and the epoch in the GCVS (1985).

Table 3: Auxiliary fitting parameters and sources:

Component	Hotter	Cooler	Reference
Limb-darkening coefficient	0.60	0.81	Diaz-Cordoves et al. 1995
Gravity-brightening coefficient	0.25	0.25	Claret 1998
Effective temperature (K)	6700	4000	Popper 1980
Spectral class	F2	K7	Popper 1996

Table 4: Fitted orbital parameters and uncertainties:

Parameter	Hotter	Cooler
Central surface brightness	1	0.1265 ± 0.0024
Radius	0.1931 ± 0.0022	0.1962 ± 0.0030
Ratio of radii	1.016 ± 0.019	
Angle of inclination (degrees)	85.26 ± 0.19	
Reflected light	0.002	0.004
Photometric mass ratio	2.89 ± 0.16	
Luminosity	0.889 ± 0.014	0.111 ± 0.014
Standard error of residuals (mag)	0.006730	
Number of observations (9-pt normals)	335	

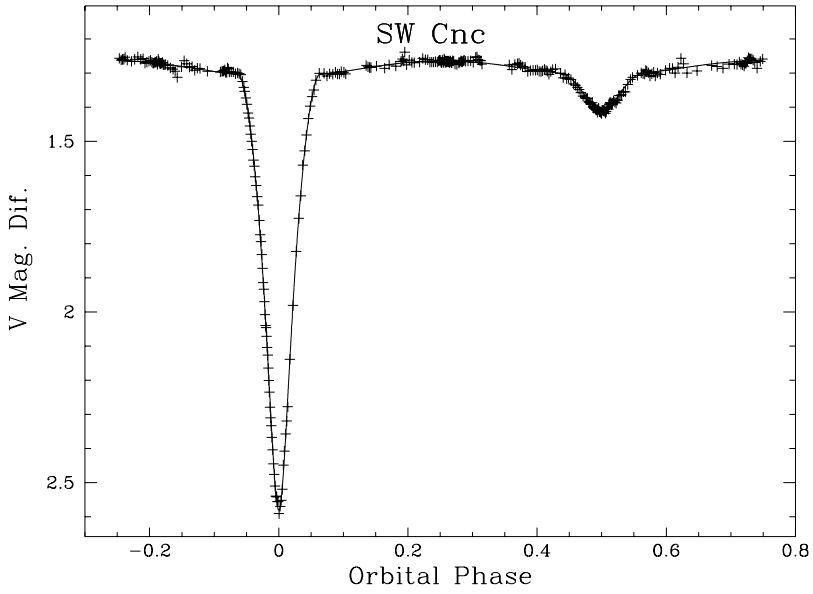

Figure 2. Fitted light curve and data plot.

Availability of the data:
May be obtained from the author (clacy@uark.edu).

Remarks:
The model would not converge with third light as a variable parameter. The secondary star appears to be a subgiant. The system is detached.

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