V 2021 CYG : ANOTHER KAISER'S DISCOVERY

Summary: visual observations of V2021 Cyg confirm the validity of light elements given by Kaiser. The light curve of this EA-type eclipsing binary shows a duration of eclipses greater than that proposed and a clear difference between the depth of minima.

Introduction

In 1992 D.H. Kaiser, examining the Harvard patrol plates, discovered several new variable stars not included in the General Catalogue of Variable Stars 1985 and the subsequent Name Lists of Variable Stars. Among these new variable stars there was DHK 29 or SAO 70629, a star which soon seemed an eclipsing binary[1]. Following discovery, Baldwin began regular visual monitoring and visual minima were detected. Meanwhile, Kaiser was able to obtain a few photoelectric measures of the final portion of the eclipse light curve. DHK 29 was following designated V 2021 Cyg. It is at position RA(1950)= 20h 51m 10s and Dec(1950)= + 33° 55.7'. The variable star type found is EA and the variability range is 8.9-9.5 V. Furthermore, the eclipses are 5 hours in duration[2]. Examining 320 Harvard plates from the years 1918-1952 and 1968-1989 Kaiser found 16 additional minima. in this way he was able to determine the following light elements by the least squares method:

$$\text{Min.(HJD)} = 48909.558 + 1.9021093 * E \qquad (1)$$
$$\pm 0.015 \pm 0.0000017$$

The hypothesis of Kaiser that "the interval 1.9 days between eclipses is probably half of the orbital period because of the two components of the binary system are similar in spectral type and produce primary and secondary eclipses of nearly equal depth"[2], was confirmed by other photoelectric measures which provided new, more accurate, light elements and a complete light curve in B and V band[3]:

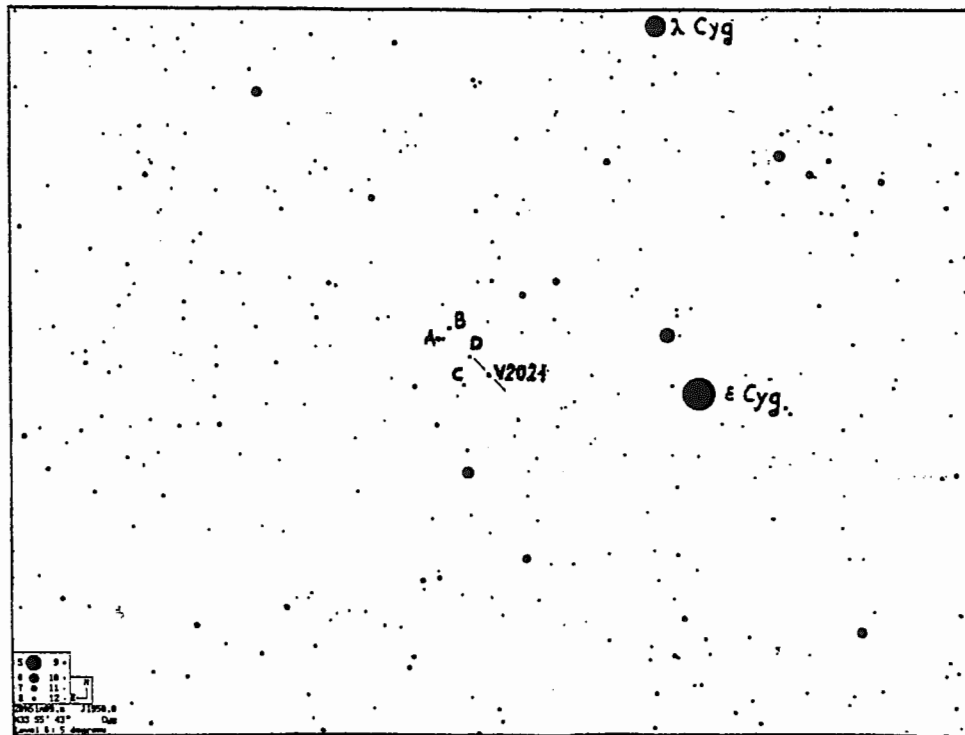$$\text{Min.(HJD)} = 48909.5641 + 3.80421555 * E \qquad (2)$$

Fig.1 : V2021 Cyg's photoelectric light curve (Kaiser)
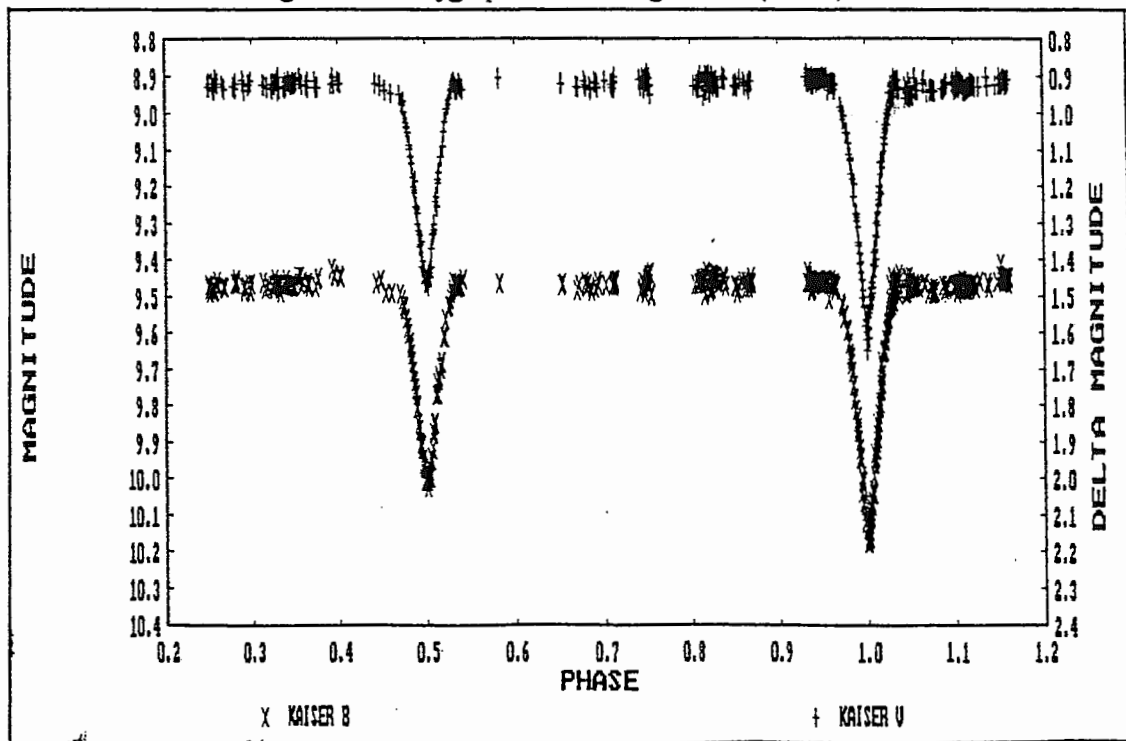
Results and discussion

In 1995 I collected about 200 visual estimates of V2021 Cyg using a finding chart provided by Kaiser[3], and reported below together with the comparison stars I have chosen:

Fig.2 : V2021 Cyg's finding chart

Processing data with SOP program[4], 5 timings of light minimum were obtained and compared with the elements (2) in order to inspect the stability of the period. The next tab.1 shows these timings with the O-C difference and the type of observed minimum, primary or secondary:

Tab.1 : V2021 Cyg's timings of minimum in 1995

| HJD	O-C(2)	TYPE
49923.388 ± 0.010	0.000	II
50001.371 ± 0.008	- 0.003	I
50003.270 ± 0.007	- 0.006	II
50043.211 ± 0.007	- 0.009	I
50081.262 ± 0.009	0.000	I

I only can confirm the elements (2) proposed by Kaiser. The mean O-C is shorter than the calculated error bars:

$$O-C_{mean} = -0.004 \pm 0.008 \text{ day}$$

The light curve

Visual data of 1995 have been phased according to the light elements (2) in order to obtain a visual light curve. In this way it is possible to estimate the duration of eclipses, which Kaiser fixed in 5 hours, and the depth of primary and secondary minimum, of about 0.7 magnitude. In the next fig.3 the visual light curve is presented.

Fig.3 : V2021 Cyg's visual light curve
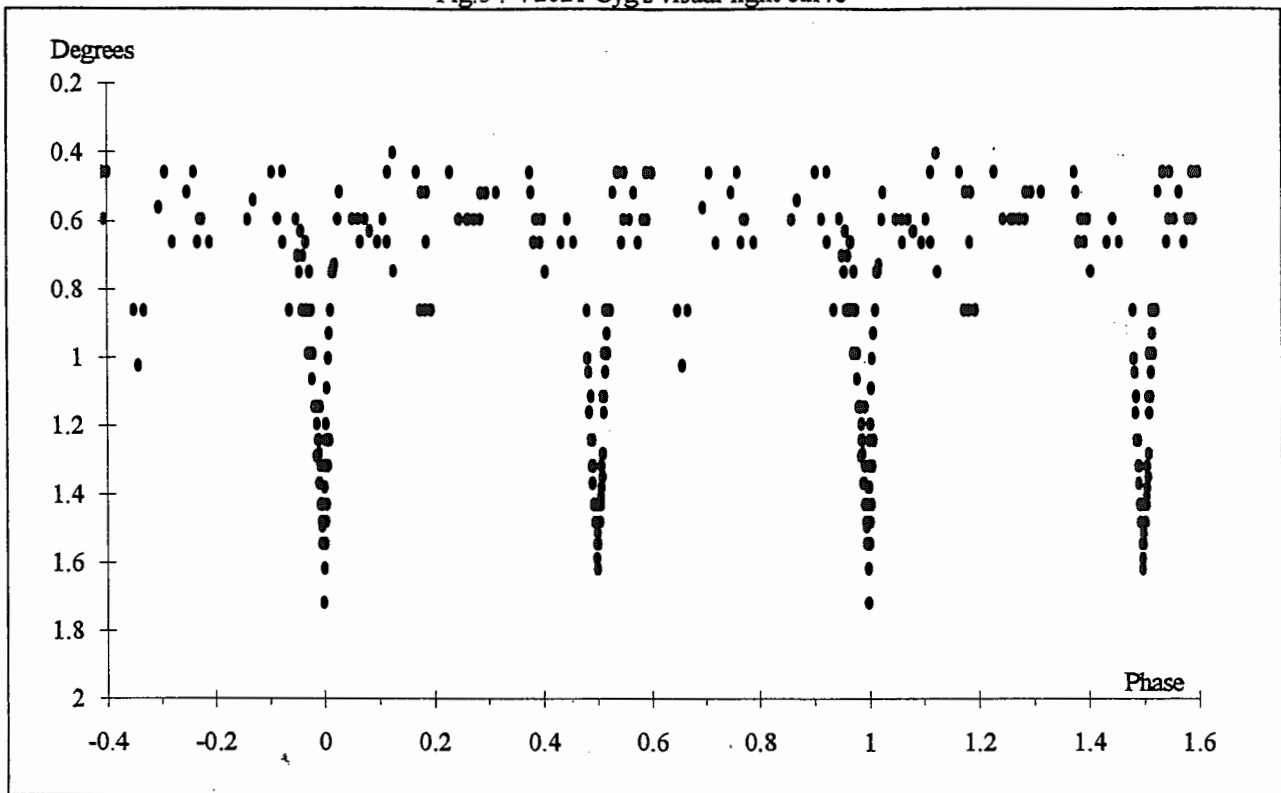
It is evident the duration of eclipses is greater than 5 hours (D>0.05 P) and the difference in the depth of minima is confirmed to be small but marked.

Conclusions

Visual observations of V2021 Cyg, a new eclipsing binary discovered by Kaiser, confirm the validity of light elements (2) given by the same Kaiser. Furthermore, the visual light curve shows a D value greater than 0.05 P and a difference between the depth of minima.

Davide DALMAZIO (DDL)

References:

(1) D.H.KAISER, *Information Bulletin on Variable Stars*, **3814** (1992)
(2) D.H.KAISER, M.E.BALDWIN, *Information Bulletin on Variable Stars*, **3815** (1992)
(3) D.H.KAISER, *finding chart and photoelectric light curve*, (priv.comm.)
(4) A.GASPANI, *Stochastic Optimization Program*, ver.5 (priv.comm.)