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SEVEN MORE UNDESIGNATED VARIABLE STARS

A photographic sky patrol by Kaiser has resulted in the discovery of seven more variable stars that are not included in the General Catalogue of Variable Stars (Kholopov et al. 1985) or the subsequent Name Lists of Variable Stars (Kholopov et al. 1985, 1987, 1989). The positions and the preliminary magnitude ranges, types, and periods are given in Table I, which continues the list in Kaiser et al. (1989).

Table I.

Var. designation	RA (1950)	Dec (1950)	Range	Type	P (days)
DHK 6 = NSV 12178	19 ^h 32 ^m 36 ^s	+23 ^o 46.7'	9.7-10.9 b	Lb	-
DHK 7	-	-	-	cst.	-
DHK 8	21 37 45	-02 00.8	9.7-11.0 b	SR	343
DHK 9	03 23 08	+40 17.0	8.1- 8.6 v	EA	3.045
DHK 10 = NSV 2622	05 42 57	-04 15.6	12.0-12.6 b	SR:	200:
DHK 11	02 17 46	+54 16.9	6.9- 7.4 v	EA	2.111
DHK 12 = NSV 12387	19 43 44	+30 08.8	7.5- 7.9 v	SRb:	60:
DHK 13	19 58 28	+07 16.4	8.2- 8.6 v	E:	?

(The designation DHK 7 was used prematurely in AAVSO Eclipsing Binary Bulletin No. 46 to refer to a suspected eclipsing variable. However, Kaiser has re-examined the original plates and finds that the initial impression of variability was erroneous.)

In this report, we present observational results for the three eclipsing systems. The four red variables will be discussed by Williams (1990).

DHK 9 = BD +39^o784, HD 21155, SAO 38830 (Per)

The spectral type is B8. Following discovery by Kaiser, regular visual monitoring by Baldwin found additional minima at 3.05-day intervals (Baldwin and Kaiser 1989). Kaiser and Baldwin have estimated this star on 365 Harvard plates of the AI, FA, and Damon series, 1905-1948 and 1975-1989. Table II gives the times when the star was estimated to be at minimum on these plates and the Kaiser discovery photo, as well as the times of Baldwin's faintest visual estimates.

Table II -- DHK 9

HJD		O-C	HJD		O-C
2423088.478	H	+0. ^d 023	2430981.796	H	-0. ^d 071
26051.518	H	-0.012	45227.756	H	-0.013
27680.841	H	+0.077	46488.523	H	+0.001
27799.517	H	-0.014	47383.841	H	+0.001
28478.656	H	+0.024	47502.610	K	+0.004
28484.743	H	+0.020	47505.664	H	+0.012
28877.553	H	-0.013	47636.590	B vis	-0.009
30296.595	H	-0.080	47718.839	B vis	+0.017
30573.811	H	+0.014			

H = Harvard, K = Kaiser, B = Baldwin

The O-C residuals refer to preliminary light elements derived from these data by the least-squares method, with mean errors:

$$\text{Min. I} = \text{HJD } 2435938.336 + 3.^d0452976 \text{ E} \\ \pm .009 \quad \pm .0000029$$

Two photoelectric measures by Williams near phase 0.5 of this period do not reveal a secondary minimum greater than 0.03 V. We therefore cannot eliminate the possibility that the alternate minima are primary and secondary eclipses of nearly equal depth, and the true period could be 6.09 days. The photoelectric observations are continuing.

DHK 11 = BD +53°507, HD 14384, SAO 23229 (Per)

The spectral type is F5V. Kaiser and Baldwin have estimated this star on 137 Harvard plates of the AI and FA series, 1938-1948, as well as Kaiser's patrol photos. The small amplitude and overexposed images make minima difficult to recognize on the long-exposure Harvard plates. Table III also includes visual timings of a predicted eclipse by each of us, derived from individual series of estimates by the tracing paper method.

Table III -- DHK 11

HJD		O-C	HJD		O-C
2429535.713	H	+0. ^d 009	2447808.594	W vis	+0. ^d 001
29898.776	H	-0.021	47808.606	K vis	+0.013
30240.798	H	+0.017	47808.608	B vis	+0.015
47736.826	K	+0.008	47922.570	K	-0.017
47789.586	K	-0.008			

H = Harvard, K = Kaiser, W = Williams, B = Baldwin

The O-C residuals refer to the preliminary least-squares light elements:

$$\begin{aligned} \text{Min. I} &= \text{HJD } 2436324.707 + 2.1110084 \text{ E} \\ &\quad \pm .006 \quad \pm .0000012 \end{aligned}$$

Photoelectric observations by Williams show an amplitude of 0.54 V. The eclipses are partial and 5 hours in duration. The secondary eclipse has not been observed, so the true period may be 4.2 days with equal primary and secondary minima. Photoelectric photometry by Williams and others will be reported at the end of the observing season.

DHK 13 = BD +7^o4335, HD 189676, SAO 125354 (AQL)

The spectral type is B9. Williams has examined 429 Harvard plates of the AI, FA, and Damon series, 1903-1910, 1930-1946, and 1973-1988. Again, the small amplitude and long exposures makes minima very difficult to detect on the Harvard plates. The star was estimated within 0.1 magnitude of maximum on almost all plates, but five showed the star 0.4 magnitude fainter. Table IV gives these times and that of Kaiser's discovery photo.

Table IV -- DHK 13

HJD		HJD	
2417366.755	H	2443280.798	H
18495.781	H	47356.716	H
27062.478	H	47684.848	K

H = Harvard, K = Kaiser

Perhaps because of the small number of minima and large time intervals, we have not been able to determine an unambiguous period from these data. Williams obtained V-band photoelectric photometry for one to two hours on eight nights at the end of the 1989 observing season. The star was 0.15 magnitude fainter than maximum on one occasion and showed systematic changes of 0.03 - 0.05 magnitude on the other nights, suggesting cycles of about 0.2 day. We assume that DHK 13 is an eclipsing binary, but another type of variability may be occurring instead of, or in addition to, eclipses. Extensive photometry is planned for the next observing season to reveal the true nature of this variable.

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