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THE VARIABILITY OF W134

Padgett and Stapelfeldt (1994) discovered this member of NGC 2264 to be a double-line Pre-Main Sequence(PMS) close binary. They also pointed out that its near-IR flux excess indicates the presence of a circum-binary disk of warm dust.

The possibility of removing the projection factors from the spectroscopic masses and orbital radius suggested exploratory photometry, for the object could be an eclipsing or ellipsoidal variable. The prospect for the second of these possibilities could not be high since the stars are fractionally small in terms of the orbital radius. But for PMS binaries with less than MS central condensation, those chances were also not negligible. In addition, the published *V* magnitudes from Walker (1956), Mendoza and Gomez (1980), Sagar and Joshi (1983), and Feldbrugge and van Genderen (1991) vary from +12.30 to +12.67. Some variability, therefore, had already been demonstrated.

W134 had also been studied by Koch and Perry (1974) who noted that their KPNO *V* magnitudes were too faint, the star being vignettted (by the internal north edge of the camera). Even though this geometrical optical bias exists, the plate/filter response is still on the *V* system. Furthermore, because the plates were taken with the automatic, image-dissecting guider using the same scale setting on the same guide star for each of the 4 nights, the vignetting is constant for all the nights. These data, for which the standard deviation for 1 plate is ± 0.06 mag, are shown in Figure 1. It is clear that the object did vary in light in December, 1970 with an amplitude of about 0.35 mag in *V*. According to the ephemeris of Padgett and Stapelfeldt, the orbital nodes were passed at 49.79 and 52.98 and the inferior conjunction of the A-component occurred at 51.38 (all on the given abscissa scale). A minimum of light appears to have occurred around this conjunction but higher frequency variability is also prominent and forbids identifying the minimum with an eclipse or an ellipsoidal-variable minimum. Because of the hyperboloid's diffraction pattern from S Mon, the 20 FCO plates described by Koch and Perry are not useful for extending the 1970s history of W134.

As soon as the binarity of W134 was announced and even though the observing season was more than half over, the object was added to the local photometric observing program using the 4-channel polarimeter as a single-channel photometer. The instrument was mounted on the 0.72-m reflector of the Flower and Cook Observatory. W158 and W137 were chosen as local reference stars despite a history of possible variability for the latter. W158 appeared to be constant within ± 0.03 . Among the 8 measures of W137 in 1994, peak-to-peak variability is 0.10 in *V* and 0.05 in *R*. These ranges fall within its historical range so most probably the object is slightly variable in light. Nebulosity and scattered

light from S Mon could be troublesome so care was taken always to measure sky brightness halfway between W158 and W134. The observations of W134 listed in Table 1 are nightly means of 15 15-sec integrations each and were accumulated within 20 minutes each night. The internal standard deviation of each mean is ± 0.02 , and the nightly standardizings are accurate to ± 0.03 . Phase is calculated from Padgett and Stapelfeldt's ephemeris.

Table 1. *V* and *R* Observations of W134

JD minus 2,449,000	Phase	<i>V</i>	<i>R</i>
390.501	0.819	+12.54	+11.40
398.555	0.087	+12.47	+11.30
402.520	0.712	+12.60	+11.45
410.514	0.970	+12.65	+11.47
411.509	0.126	+12.56	+11.49
422.532	0.861	+12.45	+11.38
423.526	0.018	+12.47	+11.30
428.516	0.803	+12.44	+11.37
442.530	0.009	+12.78	+11.66
443.550	0.170	+12.47	+11.30
449.546	0.113	+12.63	+11.40

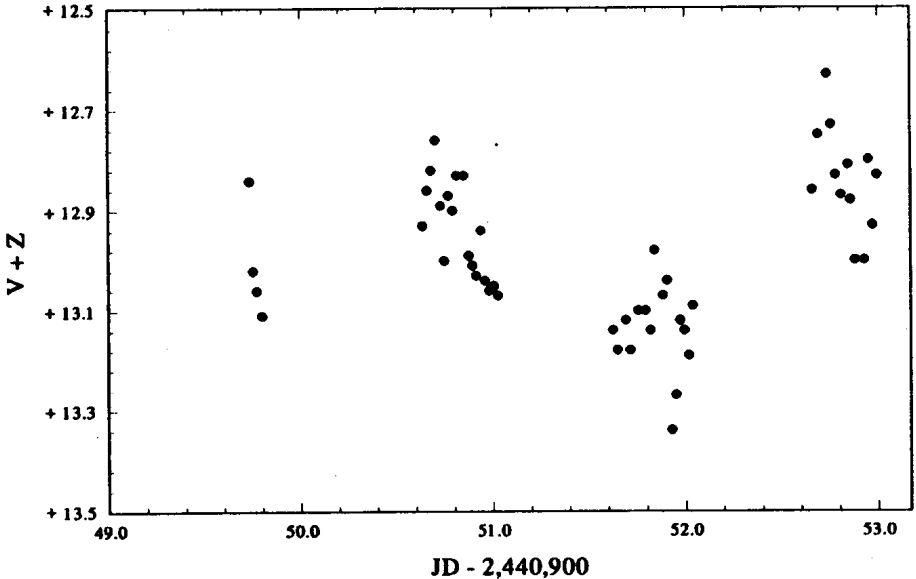


Figure 1. The photographic *V* light curve of W134 in December, 1970 with the No. 1 0.9-m KPNO reflector. The unknown value of the camera vignetting is signified by the unspecified zero-point correction (*Z*) for the ordinate.

The object varies over ranges of about 0.35 mag in V and R . Each of these amplitudes is comparable to the historical ranges already reported by other photoelectric observers and is also comparable to the KPNO photographic range. Furthermore, V is not correlated with $V-R$. The 1994 observations contain data close to the descending node (0.00P) of the A-component and also close to both conjunctions (0.25P, 0.75P) of the stars. No phase-locked variability is apparent and, if any is present, it is lost in the sporadic variability. Most likely, the persistent peak-to-peak variability of about 0.35 mag is the characteristic activity level associated with the systemic disk. The observing season ended after the last measure listed in Table 1.

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