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SAO 23229: A NEW DOUBLE-LINED SPECTROSCOPIC ECLIPSING BINARY

The discovery of eclipses of the bright star SAO 23229 (HD 14384; $V=6.9$; Spectral Type F5 V) by Indiana observer Dan Kaiser was described in a recent article in Sky and Telescope magazine (MacRobert, 1990). Photoelectric observations by H. Landis and D. Williams, reproduced in that article, show eclipses of 0.55 mag depth and period of 2.111 days. No secondary eclipses are reported, leaving open the question of whether the system contains a very dim secondary or whether it consists of two identical stars with an actual period of 4.2 days. We report here observations that favor the latter interpretation.

We have observed SAO 23229 spectroscopically, using echelle spectrographs on the 1.5 m Wyeth reflector at Oak Ridge Observatory and the 1.5 m Tillinghast reflector at Fred L. Whipple Observatory. High-resolution (10 km/sec) spectra, each covering a region 45 Angstroms wide centered on 5187 Angstroms were reduced by cross-correlating them with a high-signal-to-noise template spectrum of the twilight sky. The procedure is standard for spectra reduced at the Center for Astrophysics, and details of the reduction and velocity-measurement techniques have been documented elsewhere in the literature (Latham 1985).

Two spectra observed in February, 1990, along with the corresponding cross-correlations, are shown in Figure 1. The correlations appear double-peaked, evidence that two components are present in the binary system. Velocities derived from these peaks for two nights are presented in Table 1. We have here a

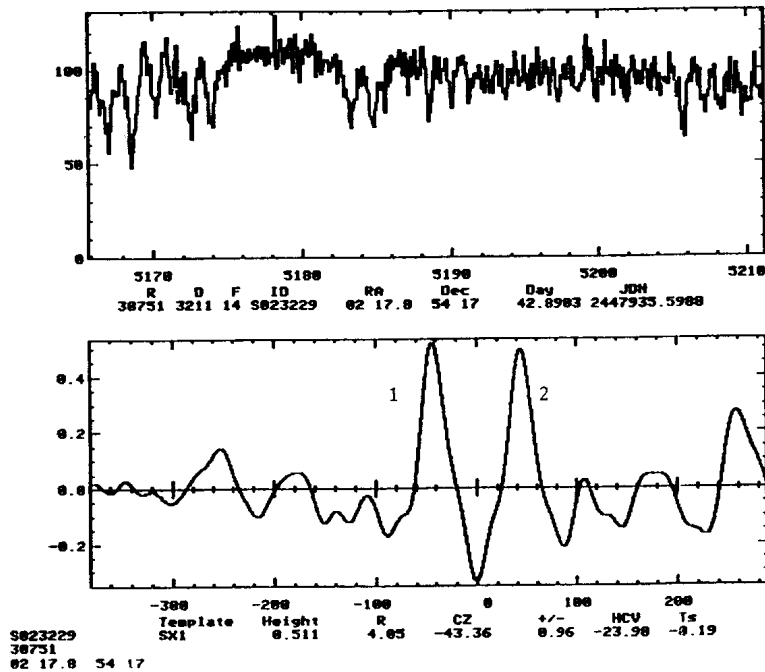


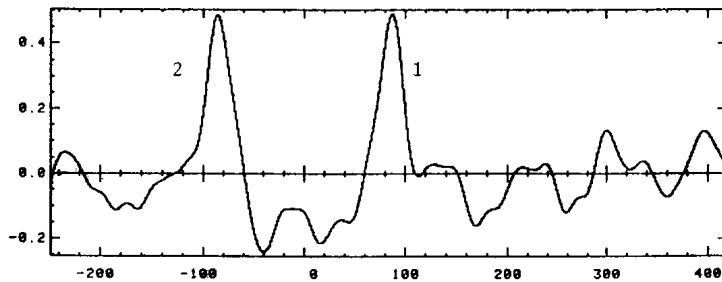
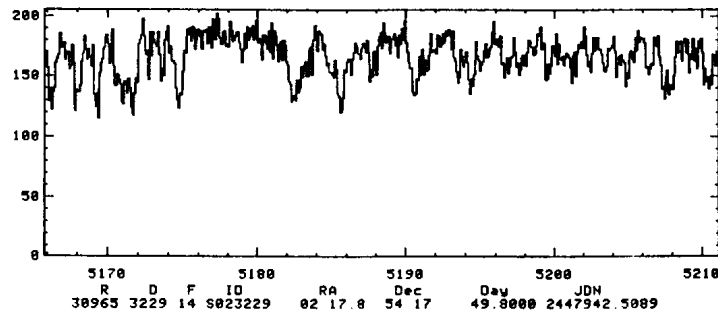
Figure 1a: Spectrum and cross-correlation of SAO 23229 observed at Oak Ridge Observatory, H.J.D. 2447935.5988. Two nearly equal peaks are observed, labeled 1 and 2. Velocities for these components are given in Table 1.

TABLE 1

Radial Velocity Observations of SAO 23229

<u>Heliocentric Julian Date</u>	<u>V1(km/sec)</u>	<u>V2(km/sec)</u>
2447935.5988	-43.4	+43.3
2447942.5089	+85.6	-86.9

clearly separated double-lined spectroscopic binary with a velocity semi-amplitude of at least 85 km/sec for each component. The nearly equal height of the correlation peaks indicates that the two components of the system are close to one another in luminosity (Marschall and Mathieu, 1988), while the symmetry of the velocity excursions around the mean suggests that the com-



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Figure 1b: Spectrum and cross-correlation of SAO 23229 observed at Oak Ridge Observatory, H.J.D. 2447942.5089. Two nearly equal peaks are observed, labeled 1 and 2. Velocities for these components are given in Table 1.

ponents are of nearly equal mass. Finally, the velocity semi-amplitude is consistent with that expected for two F5 V components of period 2 to 4 days seen in the plane of the orbit.

Thus it seems likely that primary and secondary eclipses are nearly equal in depth and that the 2.1-day period of recurring eclipses is actually the half the true period of the binary system. Photometric observers of SAO 23229 should therefore exercise care to see if one eclipse can be distinguished from another, allowing precise determinations of the photometric characteristics of the individual components of the system.

The two reduced spectra presented here only give a qualitative estimate of the relative masses of the components. A full characterization of the masses of this binary system requires a determination of the spectroscopic orbital elements along with precise photometry. We continue to obtain radial velocity measurements of SAO 23229 with the aim of deriving the full velocity curve and the orbital elements of the system.

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REFERENCES

- Latham, D.W. 1985 In Stellar Radial Velocities, IAU Colloquium No. 88, edited by A.G.D. Philip and D.W. Latham (Davis, Schenectady), p. 21.
MacRobert, Alan 1990, Sky and Telescope, 79, 188.
Marschall, L. A. and Mathieu, R.D. 1988, Astronomical Journal, 96, 1956.