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B and V photometry and the ephemeris of the W-UMa type star RS Serpentis

RS Ser (HV 3073, Sp=F8, V=10.8) with coordinates α_{1950} $18^h14^m29^s$ δ_{1950} $-13^\circ04'.7$ is listed in the GCVS (Kholopov *et al.*, 1985) as a W-UMa type star with a 0.598140369 day period. According to the Rocznik Astronomiczny (Rudnicki, 1990), the star was not the subject of a published investigation since 1954.

From 23 visually determined minima collected by GEOS observers (1982-1990) and from 3 minima taken from the literature (1915-1954), Walas (1991) derived the following ephemeris :

$$\text{Min I} \quad JJ_{Hel} \quad \underset{\pm 16}{2447355.4509} + \underset{\pm 2}{0.5981434} \qquad (1)$$

(95% of level confidence)

This paper reports new photoelectric measurements obtained by M. Dumont, E. Joffrin, A. Kucinskas, J. Remis and T. Vezauskas with the 76-cm cassegrain telescope and the Geneva photometer, during a run organized by the Palais de la Découverte.

The B and the V filter values of the Geneva system and the B-V ones have been converted into the Johnson and Morgan system using the formula suggested by Meylan (1981). The correlation to standard was ensured by frequent observations of standard stars selected from the Geneva catalogue which were used to compute the first and second order atmospheric coefficients for each night. The complete method of reduction is described by Dumont (1983).

Although the relative accuracy obtained with the standards photometry method is rather low compared with the differential one, it allows more measurements on the variable stars and computation of the B and V magnitudes from the same set of standards. The observations were carried out during 5 nights between August 9 and August 18, 1991. All the observations are listed in Table 1.

For all the observations, the air-mass was larger than 2, which is an unavoidable consequence of the southern declination of RS Ser. Because of that, there are only 2 decimals in the listed V values. Despite the fact that the air-masses were so high, our results show a fair degree of consistency, which reflects the quality of this high-alpine site.

Table 1

V and B-V measurements of RS Ser

JD (Hel) +2440000	V	B-V	Air-Mass	JD (Hel) +2440000	V	B-V	Air-Mass
48478.4206	11.18	0.70	2.17	48484.4448	11.68	0.74	2.65
48478.4226	11.20	0.71	2.19	48484.4462	11.69	0.74	2.68
48478.4265	11.23	0.71	2.22	48484.4476	11.68	0.72	2.70
48478.4289	11.25	0.72	2.23	48484.4490	11.68	0.74	2.73
48478.4310	11.26	0.72	2.25	48484.4524	11.62	0.75	2.80
48478.4348	11.31	0.72	2.29	48484.4538	11.59	0.73	2.83
48478.4362	11.32	0.71	2.31	48484.4552	11.57	0.74	2.86
48478.4390	11.35	0.71	2.33	48484.4566	11.56	0.75	2.89
48478.4417	11.40	0.73	2.37	48487.4335	11.68	0.68	2.60
48478.4438	11.41	0.71	2.40	48487.4355	11.67	0.69	2.64
48478.4459	11.43	0.70	2.42	48487.4369	11.68	0.72	2.66
48478.4501	11.48	0.68	2.48	48487.4383	11.67	0.72	2.69
48478.4522	11.52	0.70	2.51	48487.4418	11.65	0.71	2.75
48478.4556	11.53	0.69	2.55	48487.4432	11.61	0.71	2.78
48478.4605	11.65	0.69	2.63	48487.4446	11.57	0.75	2.81
48478.4626	11.69	0.69	2.66	48487.4480	11.51	0.74	2.89
48478.4653	11.67	0.69	2.71	48487.4501	11.47	0.76	2.94
48478.4674	11.65	0.76	2.75	48487.4515	11.46	0.75	2.97
48478.4723	11.58	0.74	2.86	48487.4557	11.39	0.74	3.08
48478.4744	11.[illegible]5	0.70	2.92	48487.4571	11.37	0.72	3.12
48478.4765	11.53	0.71	2.97	48487.4585	11.35	0.71	3.16
48478.4813	11.46	0.73	3.09	48487.4598	11.34	0.72	3.20
48478.4841	11.48	0.69	3.16	48487.4633	11.27	0.73	3.31
48479.3813	11.58	0.79	2.00	48487.4647	11.24	0.72	3.35
48479.3837	11.54	0.80	2.01	48487.4661	11.24	0.72	3.40
48479.3861	11.49	0.81	2.01	48487.4675	11.24	0.72	3.45
48482.3891	11.21	0.78	2.10	48487.4710	11.14	0.74	3.58
48484.4344	11.60	0.75	2.49	48487.4723	11.12	0.74	3.64
48484.4358	11.61	0.73	2.51	48487.4737	11.11	0.72	3.70
48484.4372	11.61	0.74	2.53	48487.4751	11.13	0.70	3.76
48484.4385	11.64	0.72	2.55				

The V-Phase diagram in Figure 1 shows that only the secondary eclipse has been covered. The mean B-V index is equal to 0.72.

Two secondary eclipses have been observed, and a part of the ascending branch for the primary one. The method of Kwee and Van Woerden (1956) for computing the epochs of minima of eclipsing variables was applied using phase intervals of 0.425 to 0.575 (secondary eclipse). Table 2 shows the photoelectric O-C's referring to the revised ephemeris (1).

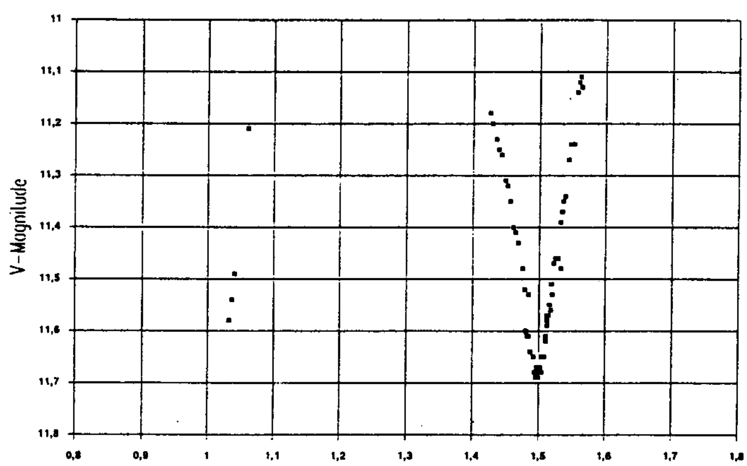

Fig-1 : V-Phase diagram of RS Ser according to ephemeris (1)

An analysis of these data shows that the light parameters mentioned for this star in the last edition of GCVS (Kholopov *et al.*, 1985) are erroneous. As was suggested in a GEOS Circular (Walas, 1991), the minima are deeper than previously stated. The net difference of about 0.1 magnitude noticed by all the visual observers leads to the following light parameters for the two eclipses :

<u>Min I</u> : 11.8 V ? (GCVS 85 : 11.5 V)
<u>Min II</u>: 11.69 ± 0.01 (V) (GCVS 85 : 11.4 V)
12.40 ± 0.02 (B)

Table 2

Photoelectric times of minima

Date	Hel. Julian Day	O-C(1)
09.08.1991	24448478.4649	-0.0002
15.08.1991	24448484.4441	-0.0025

The large eclipse depth suspected from the slope of the ascending and descending branches (near 0.8 magnitude if the star was an EW-type), the duration of the observed eclipse, the net difference between the primary and the secondary ones, make us doubt about the EW nature of RS Ser. We tend to believe that RS Ser may be an EA or an EB-type star.

RS Ser deserves further attention. A complete light curve, based on differential data obtained at an appropriately located site, will allow a more accurate determination of the light elements and the consequent computation of a synthetic solution for the system.

These efforts are planned at GEOS in the next months.

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