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HD 20301: AN ECLIPSING, DOUBLE-LINED EARLY G GIANT

Recently, Andersen and Nordström (1977) found HD 20301 to be a double-lined spectroscopic binary with sharp lines, equal components and small velocity amplitudes. Subsequently the system was found to show eclipses (Olsen 1977). The star is an early G giant, judging from both the photometry and the spectra, and it is a prime candidate for determination of fundamental masses and radii of evolved stars.

The system is not an RS CVn binary and does not show any convincing CaII H and K emission on the five 20Å/mm coudé spectra available so far (Andersen, private communication). In the group of 24 giant binaries discussed by Lloyd Evans (1977), HD 20301 fits in as a somewhat atypical early member without, or with extremely faint H and K emission.

Additional photometry in 1976 and 1977 by Drs.J.Andersen, B.Reipurth and the author has now made it possible to give three tentative ephemerides for the eclipses. The photometry has been obtained with the simultaneous four-channel spectrograph-photometer on the Danish 50 cm reflector on Cerro La Silla, ESO,Chile. The Table gives the individual observations reduced to the standard four-colour and V systems. This table is a continuation of Table 2 in Olsen (1977). The deepest minimum found as yet is $0^m.28$, $0^m.25$, $0^m.21$ and $0^m.19$ in u, v, b and y, respectively.

We strongly urge observers to observe more eclipses of this extremely interesting system in order to fix the period and improve the epehemeris. The most probable ephemeris is

$$\text{HJD (MinI)} = 2443216^d.14+37^d.805\times E \qquad (1)$$

with the next eclipses expected at U.T. 1977 Aug. 11.9, Sep.18.7, Oct. 26.5, Dec. 3.3, 1978 Jan. 10.1, Feb. 16.9 and Mar. 26.7.

Primary eclipse may last about 24 hours. An observation within 9 hours of phase 0.5 has not revealed any eclipse. The double period $75^{d}.61$ cannot be excluded, but the available velocities favour the shorter period.

Another possible, but slightly less likely ephemeris is

$$\text{HJD (MinI)} = 2443216^{d}.67+50^{d}.46xE \qquad (2)$$

with nearly equal primary and secondary eclipses expected at U.T. 1977 Aug. 12.6, Sep. 6.8, Oct. 2.0, Oct. 27.2, Nov. 21.5, Dec. 16.7, 1978 Jan. 10.9, Feb. 5.2, Mar. 2.4 and 27.6.

A third possibility, with an excentric orbit and the secondary minimum displaced to phase 0.44 is

$$\text{HJD (MinI)} = 2443216^{d}.71+44^{d}.18xE \qquad (3)$$

with eclipses expected at U.T. 1977 Aug. 13.3, Sep. 6.9, Sep. 26.5, Oct. 21.1, Nov. 9.7, Dec. 4.3, Dec. 23.9, 1978 Jan. 17.5, Feb. 6.0, Mar. 2.7 and 22.2.

The 1980.0 coordinates of HD 20301 are $3^{h}13^{m}53^{s}$ and $-35^{o}37'.8$.

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References:

Andersen, J. and Nordström, B. 1977, Astron.Astrophys.Suppl., in press

Lloyd Evans, T. 1977, MNASSA 36, 41

Olsen, E.H. 1977, Astron.Astrophys.Suppl., in press

Table

HJD 2440000+	V	b-y	M1	C1	Observer
3029.80535	6.875	0.466	0.258	0.437	BR
3029.88713	6.878	0.467	0.257	0.434	BR
3030.77558	6.883	0.466	0.253	0.456	BR
3030.88539	6.878	0.474	0.245	0.442	BR
3031.83323	6.879	0.468	0.254	0.443	BR
3031.89801	6.879	0.469	0.258	0.438	BR
3032.75178	6.876	0.466	0.263	0.446	BR
3034.82254	6.880	0.464	0.257	0.441	BR
3034.89308	6.865	0.478	0.260	0.417	BR
3036.78249	6.877	0.469	0.256	0.437	BR
3049.78634	6.883	0.465	0.256	0.452	BR
3050.89130	6.875	0.462	0.265	0.438	BR
3051.75804	6.879	0.469	0.255	0.447	BR
3051.85721	6.880	0.469	0.260	0.438	BR
3052.76996	6.886	0.459	0.276	0.422	BR
3123.75091	6.879	0.461	0.265	0.443	BR
3124.56473	6.874	0.470	0.262	0.437	BR
3125.67673	6.875	0.465	0.268	0.425	BR
3126.77094	6.876	0.465	0.262	0.437	BR
3132.72024	6.889	0.453	0.274	0.452	BR
3133.71853	6.885	0.458	0.272	0.443	BR
3135.70173	6.875	0.458	0.275	0.422	BR
3136.72083	6.879	0.469	0.244	0.464	BR
3142.65766	6.882	0.470	0.245	0.452	BR
3147.69260	6.886	0.474	0.241	0.437	BR
3212.51030	6.874	0.463	0.262	0.422	EHO
3212.52919	6.875	0.467	0.251	0.434	EHO
3212.55007	6.873	0.469	0.249	0.440	EHO
3213.50629	6.868	0.468	0.253	0.432	EHO
3213.52677	6.864	0.465	0.256	0.441	EHO
3213.54912	6.869	0.468	0.248	0.450	EHO
3214.51173	6.876	0.468	0.249	0.446	EHO
3214.53842	6.879	0.462	0.255	0.448	EHO
3215.50912	6.865	0.472	0.248	0.433	EHO
3215.53921	6.883	0.471	0.241	0.458	EHO
3216.50982	7.045	0.489	0.286	0.416	EHO
3216.53556	7.050	0.486	0.287	0.416	EHO
3216.55798	7.055	0.491	0.284	0.418	EHO
3217.51024	6.876	0.471	0.249	0.443	EHO
3217.53876	6.880	0.466	0.257	0.444	EHO
3218.50864	6.881	0.462	0.264	0.431	EHO
3218.53981	6.888	0.464	0.256	0.444	EHO
3219.51239	6.879	0.468	0.252	0.440	EHO
3220.50919	6.877	0.465	0.262	0.432	EHO
3221.51055	6.870	0.468	0.253	0.439	EHO
3222.50940	6.877	0.466	0.257	0.431	EHO
3223.52	6.87:				EHO
3224.50	6.87:				EHO
3225.50	6.87:				EHO
3226.50307	6.879	0.469	0.251	0.422	EHO
3227.49834	6.859	0.461	0.253	0.426	EHO
3228.49854	6.881	0.464	0.258	0.441	EHO
3229.49308	6.881	0.470	0.254	0.439	EHO
3230.49486	6.902	0.467	0.266	0.448	EHO

Table (cont.)

HJD 2440000+	V	b-y	M1	C1	Observer
3231.49516	6.874	0.455	0.276	0.413	EHO
3232.49367	6.866	0.461	0.268	0.423	EHO
3234.49432	6.886	0.465	0.261	0.437	EHO
3235.49148	6.869	0.470	0.250	0.436	EHO
3235.51365	6.882	0.471	0.247	0.467	EHO
3236.49170	6.904	0.479	0.256	0.425	EHO
3237.49130	6.874	0.470	0.256	0.414	EHO
3238.48817	6.874	0.464	0.259	0.445	EHO
3240.488	6.87:				EHO
3242.48031	6.895	0.471	0.246	0.452	JA
3245.47404	6.887	0.458	0.264	0.438	JA
3251.47251	6.877	0.461	0.259	0.434	JA
3252.47774	6.917	0.464	0.262	0.417	JA
3254.47612	6.934	0.469	0.247	0.439	JA
3255.47528	6.882	0.463	0.257	0.438	JA
3256.47515	6.856	0.449	0.262	0.400	JA
3256.48065	6.843	0.458	0.258	0.381	JA
3259.47363	6.887	0.449	0.261	0.410	JA
3260.47625	6.907	0.462	0.278	0.395	JA