

REMARKS ON SPECTROSCOPIC AND SPECKLE INTERFEROMETRIC
SYSTEM PARAMETERS OF THE BINARY 53 CAMELOPARDALIS

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53 Cam is one of the best investigated Ap stars. The binary nature was remarked by Deutsch, approximate orbital elements were at first derived in Potsdam. Recently, 53 Cam was directly resolved by speckle-interferometric measurements of McAlister et al. and Balega. Combining with the spectroscopic elements the determination of the absolute values of the system parameters should be possible.

In the present paper a revision of the spectroscopic orbital elements and a comparison of spectroscopic and speckle data have been carried out. For the determination of the spectroscopic elements 136 radial velocity values were used, namely 3 from Harper, 64 from Babcock, 14 from Zelenchuk and 55 from Potsdam. A representation of all measurements is given in Fig. 1.

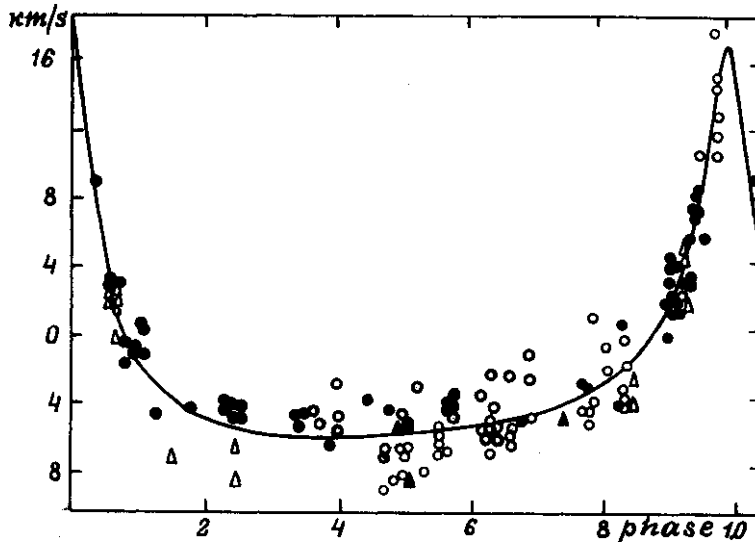


Fig. 1. Radial velocities of 53 Cam. Calculated curve with orbital elements of the indicated elements: Δ - Harper (3), \circ - Babcock (64), Δ - Zelenchuk (14), \bullet - Potsdam (55).

The preliminary period was determined using the method of Lafler and Kinman, the other preliminary orbital elements were derived by the graphical method of Lehmann-Filnes. After that iterative differential corrections were calculated with their standard deviations by least squares fitting after Schlesinger. In Table 1 the orbital elements are compiled. Remarkable is the large eccentricity; it is the highest one in the group of binaries with an Ap component.

Table 1. Radial velocity observations.

element	diff. corrected value	standard deviation
V (km/s)	-2.4	3.2
e	0.688	0.011
P (days)	2432.4	5.5
K (km/s)	11.7	1.6
ω ($^{\circ}$)	8.4	2.5
T (days)	2439844	12
$a_A \sin i$ (km)	284 10	44 10
f (M ₀)	0.154	0.070

The known speckle observations are represented in Fig. 2.

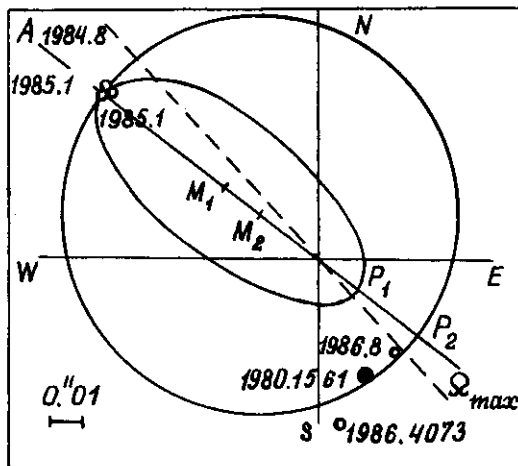


Fig. 2. Speckle measurements of 53 Cam.
 o - Balega, • - McAlister et al.
 Inner ellipse $e = 0.68$, $i = 55^{\circ}$, outer ellipse $e = 0.35$, $i = 0^{\circ}$.

In comparison with the spectroscopic orbital elements some differences are to be noted. Corresponding to our elements the apastron has been passed in 1984.6; consequently at the same time when some speckle observations were made. Therefore, these measurements give a hint at the position of the large axis of the line ellipse in the apparent visual orbit.

Let us consider the separation ρ of the speckle data. Presupposing the separation in apastron is correct, the distance values in the domain periastron yield an eccentricity of about 0.35 only. On the other hand with the eccentricity found by the spectroscopic observations the speckle values should be expected on the inner ellipse in Fig. 2. A similar inconsistency exists for the position angle θ . Comparing the time-dependent behaviour of the speckle data in the vicinity of the periastron the period of the visual orbit should be near 2360 days. Further, the change of the position angle, that is practically the projected line anomaly, between the observed orbital phases is inexplicably large.

Corresponding to the accuracy indicated in the speckle data as well as in the orbital elements we are at present not able to state the reasons for the incompatibility of both data sets and to give the exact parameters of the system. Nevertheless, if we assume alone the speckle observations in the neighbourhood of the apastron as correct, an estimation of the inclination angle of the orbit gives $i \approx 60^\circ$. Furthermore, postulating that the primary 53 Cam is a Main Sequence star, the system may have the following parameters.

Table 2. Possible orbital parameters of the system 53 Cam.

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MA ( 53 Cam, A2V )      2.5 Mo
MB                      1.6 Mo (or larger, F0V or earlier)
aA                      2.2 AU (or smaller)
ao                      3.5 AU (or smaller)
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Obviously no outstanding parameters describe the system. The detailed text will be published in Astron. Nachr., 1988.