THE ORBIT OF VISUAL BINARY ADS 4396 = A 2657

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RESUMO

Determinação dos elementos físicos e orbitais da estrela dupla ADS 4396 = A 2657. As reduções e amelhoração pelo método dos mínimos quadrados foram efetuadas no LCC-Laboratório de Computação Científico do CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico).

ABSTRACT

The physical and orbital elements of the binary star ADS 4396 = A 2657 are determined. The reductions were performed on the IBM 370/145 computer at the LCC-Laboratório de Computação Científica do CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico).

I. INTRODUCTION

The binary star ADS 4396 = A 2657 ($\alpha = 05^h43^m1$; $\delta = +01°35'$; 1900.0) was observed for the first time by Aitken at the Lick Observatory. The orbital elements and the physical characteristics of the visual binary have been computed and are given in what follows.

II. OBSERVATIONS

Table 1 contains all observations obtained by us. We have made the reductions of the position angles to the equator of 1900.0.

III. THE ORBIT

The calculation of the orbital elements has been carried out following the Thiele-Innes methods as improved by Arend and Freitas-Mourão (1968).

The double of the areal constant was found to be $c = 0.00205$. Adopting the 3 fundamental positions:

t	θ	ρ
1914.0	139°.0	0".18
1939.0	209.0	0.22
1962.0	346.0	0.12

the following preliminary elements were obtained:

P = 94.554	e = 0.266
T = 1957.997	i = 50°.355
n = 3.8074	Ω = 269°.270
a = 0.221	ω = 38°.432

These elements give systematic residuals. A final orbit was derived by use of the least squares method.

The final orbital elements are:

P = 61.877	e = 0.427
T = 1964.613	i = 28°.267
n = 5.81886	Ω = 19°.269
a = 0.153	ω = 343°.655

TABLE 1
OBSERVATIONAL DATA

Number	t (1900+)	θ (o)	ρ (")	n	Observer
1	13.91	126.0	0.16	2	Aitken
2	20.76	148.4	0.15	1	Aitken
3	21.72	158.5	0.17	2	Aitken
4	30.99	173.7	0.20	1	Aitken
5	36.079	191.7	0.19	4	Van den Bos
6	37.855	198.4	0.22	3	Voute
7	38.100	197.1	0.21	4	Van den Bos
8	39.816	199.5	0.20	4	Simonov
9	44.33	210.1	0.18	2	Van Biesbrock
10	44.603	211.0	0.22	4	Van den Bos
11	44.81	208.9	0.23e	4	Voute
12	51.80	234.7	0.14	2	Van Biesbrock
13	52.08	223.7	0.20	1	Van den Bos
14	54.79	256.4	0.12	4	Van Biesbrock
15	59.081	simple	0.2	1	Couteau
16	61.913	336.0	0.12	5	Van den Bos
17	64.14	345.8	0.14	3	Van den Bos
18	66.866	40.0	0.08	2	Muller
19	69.9	round	....	2	Muller
20	79.93	146.3	0.17	3	Heintz

The residuals for this adjusted orbit are shown in Table 2, where the subscripts o and c stand for observed and computed, respectively.

TABLE 2
OBSERVED POSITIONS AND RESIDUALS

t (1900+)	θ_o (°)	ρ_o (")	$\theta_o - \theta_c$ (°)	$\rho_o - \rho_c$ (")
13.91	126.0	0.16	7.2	0.03
20.76	143.4	0.15	− 1.5	− 0.02
21.72	158.5	0.17	5.4	− 0.01
30.99	173.7	0.20	− 4.8	− 0.01
36.08	191.7	0.19	1.4	− 0.03
37.85	198.4	0.22	4.0	0.00
38.10	197.1	0.21	2.1	− 0.00
39.82	199.5	0.20	0.4	− 0.01
44.33	210.1	0.18	− 0.6	− 0.02
44.60	211.0	0.22	− 0.4	0.02
44.81	208.9	0.23	− 3.1	0.03
51.80	234.7	0.14	− 1.7	− 0.02
52.08	223.7	0.20	− 14.0	0.05
54.79	256.4	0.12	4.1	− 0.01
61.91	336.0	0.12	10.8	0.03
64.14	245.8	0.14	− 12.1	0.05
66.87	40.0	0.08	4.3	− 0.01
79.93	146.3	0.17	6.7	0.01

IV. PHYSICAL CHARACTERISTICS

From the observed values of the total apparent magnitude 8.1, the difference of magnitude 0.2 and spectral type F0, we determined the dynamical parallax and masses, given in Table 3, using the Russell and Moore (1940) formulae:

V. EPHEMERIS

In Table 4 we give the ephemeris computed up to 2020 for the equator of each listed date.

TABLE 3
DYNAMICAL PARALLAX AND PHYSICAL CHARACTERISTICS

Method	Russell and Moore	
Dynamical parallax	0."007	
Component	A	B
Absolute visual mag. (M_v)	3.02	3.22
Mass (solar units)	1.73	1.63
Radius (solar units)	1.43	1.37
Density (solar units)	0.60	0.63
Effective temperature (°K)	6996	6766
Spectral type	F2	F2

TABLE 4
EPHEMERIS

t	θ (°)	ρ (")
1980.0	139.9	0.16
85.0	157.6	0.19
90.0	171.5	0.21
95.0	183.5	0.22
2000.0	195.1	0.21
05.0	207.4	0.20
10.0	222.2	0.18
15.0	242.9	0.15
20.0	278.6	0.10

We suggest that future observations include the Mac Alister speckle interferometric technique for the determination of the position angles and distances of these binary stars.

REFERENCES

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