

NEW ORBITAL ELEMENTS OF 5 INTERFEROMETRIC DOUBLE STARS

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SUMMARY: In this paper, for the first time, are presented elliptical and Thiel-Innes orbital elements for the following interferometric pairs: WDS 00416+2438 = WRH, WDS 03271+1845 = CHARA 10, WDS 04044+2406 = McA 13 Aa, WDS 17095+4047 = McA 45 and WDS 23019+4219 = *o* And Aa. For the pairs WDS 03271+1845 = CHARA 10 and WDS 04044+2406 = McA 13 Aa are calculated total masses and dynamical parallaxes which are compared with corresponding Hipparcos parallaxes.

1. INTRODUCTION

Observations of the pairs WDS 00416 + 2438 = WRH, WDS 03271 + 1845 = CHARA 10, WDS 04044 + 2406 = McA 13 Aa, WDS 17095 + 4047 = McA 45, WDS 23019 + 4219 = *o* And Aa are taken from CHARA 3 Catalogue; a significant number of them are incomplete. Only estimated values of the separations are given. However, even a small number of complete observations shows that all analyzed pairs are orbital pairs possessing considerable arcs. All of them, except WDS 17095+4047 = McA 45, are also observed within the Hipparcos program. The magnitudes, spectra and parallaxes from Hipparcos are used for our analysis.

2. RESULTS

2.1 Orbital elements

According to our calculations, four pairs have periods less than 20 years, while WDS 17095 + 4047 = McA 45 has a period of about 47 years. In this case

the results are doubtful due to small observational arc. Table 1. contains the elliptical and Thiel-Innes orbital elements for all pairs, and their graphical presentation is given in Figs. 1 - 5. The measurements and residuals (O - C) are given in Table 2. The ephemeris of the pairs CHARA 10, McA 13 Aa and McA 45 are given in Table 3a for the next 10 years with 1 year step. Table 3b contains the ephemeris of other pairs given for the next 5 years with 0.5 year step.

2.2 Masses and parallaxes

Total masses and dynamical parallaxes are computed for the pairs CHARA 10 and McA 13 Aa, using mass-luminosity relation for the main sequence of the H-R diagram, given by Angelov (1993). Our results for these pairs are in good agreement with Hipparcos parallaxes. It seems that pairs WRH and *o* And Aa are not located on the main sequence of the H-R diagram, in view of great discrepancies between our and Hipparcos parallaxes which came out. Calculated total masses, dynamical and corresponding Hipparcos parallaxes are also given in Table 1.

Table 1. Orbital elements, masses and parallaxes

<i>WDS</i>	00416+2438	03271+1845	04044+2406	17095+4047	23019+4219
<i>ADS</i>	–	–	2965	–	–
Name	WRH	CHARA 10	McA 13 Aa	McA 45	o And Aa
<i>m</i>	6.089	6.557	5.599	5.08	3.62
Sp.	A7m	A3V	G0III	K3III	B6pvSB
<i>P</i> (y)	3.151	19.757	19.234	47.546	8.933
<i>n</i> (°/y)	114.26180	18.22118	18.71661	7.57158	40.30088
<i>T</i>	1982.986	1987.24	1984.198	2027.68	1976.393
<i>a</i> (″)	0.2853	0.0886	0.0421	0.2550	0.1955
<i>e</i>	0.6903	0.1450	0.1462	0.9404	0.1269
<i>i</i> (°)	95.0	40.6	133.6	82.3	81.0
Ω (°)	13.0	119.0	154.4	89.1	15.0
ω (°)	89.8	21.1	258.9	280.0	107.0
<i>A</i> (″)	0.006648	-0.061284	-0.004991	0.034198	-0.062924
<i>B</i> (″)	-0.023827	0.060596	-0.029182	0.043592	0.013459
<i>F</i> (″)	-0.277958	-0.039483	-0.039664	-0.002012	-0.178181
<i>G</i> (″)	-0.064078	-0.058343	0.012791	0.251219	-0.057077
<i>C</i> (″)	± 0.284176	± 0.020737	∓ 0.029912	∓ 0.248911	± 0.184573
<i>H</i> (″)	± 0.001130	± 0.053803	∓ 0.005861	± 0.043720	∓ 0.056583
<i>M</i>	–	1.47	-1.59	–	–
ΣM_{\odot}	–	2.01	4.16	–	–
π''_{dyn}	–	0.0096	0.0037	–	–
π''_{HIP}	0.00706	0.0078	0.0034	–	0.0047

Table 2. Measurements and (O – C)

WDS 00416+2438 = WRH						
<i>t</i>	θ_t	ρ_t	<i>n</i>	<i>Obs.</i>	$\Delta\theta$	$\Delta\rho$
1975.7129	–	<0.033	1	McA78c	–	–
1976.8597	–	<0.035	1	McA78c	–	–
1976.9224	–	<0.035	1	McA78c	–	–
1980.7232	179°.3	0″.170	1	McA83	-1°.6	0″.010
1981.6846	–	<0.025	1	Bal84a	–	–
1982.7601	15.6	0.178	1	McA87b	1.1	-0.001
1983.8237	/–	<0.022	1	Bal85	–	–
1983.9307	182.5	0.145	1	Bon84	2.9	-0.005
1983.9362	–	<0.07	1	Bon84	–	–
1983.9575	–	<0.022	1	Bal85	–	–
1984.8482	–	<0.022	1	Bal87	–	–
1984.9991	28.5	0.148	1	McA87b	-5.1	0.039
WDS 03271+1845 = CHARA 10						
1985.8403	110.0	0.077	1	McA87b	1.0	0.000
1986.8562	127.3	0.075	1	McA89	-1.0	0.000
1990.7551	:221.8	:0.065	1	Har94	-1.6	0.000
1991.8938	250.0	0.075	1	Har94	1.2	0.000

Table 2. (continued)

WDS 04044+2406 = McA 13 Aa						
1973.0405	V101.0	0.025	1	Eit77	-	-
1973.0405	V101.0	0.025	1	Eit77	-	-
1973.0405	V156.3	0.0322	1	Dun73	-	-
1976.8575	-	<0.035	1	McA78c	-	-
1976.8601	-	<0.035	1	McA78c	-	-
1976.9229	-	<0.035	1	McA78c	-	-
1977.742	-	<0.030	1	Har84	-	-
1979.771	-	<0.030	1	Har84	-	-
1980.7208	332.7	0.041	1	McA83	-3.3	0.001
1981.6822	-	<0.034	1	Bal84a	-	-
1983.9579	277.4	0.027	1	Bal85	8.9	0.001
1984.0527	-	<0.036	1	Mas96b	-	-
1984.0581	-	<0.036	1	Mas96b	-	-
1984.8433	-	<0.022	1	Bal87	-	-
1985.8383	-	<0.036	1	Mas96b	-	-
1985.8410	-	<0.036	1	Mas96b	-	-
1986.8862	:186.0	:0.036	1	McA89	4.7	0.001
1987.7655	159.2	0.036	1	McA89	-7.8	-0.003
1988.6609	164.5	0.044	1	Mas96b	9.1	0.002
1988.6636	157.1	0.041	1	McA90	2.2	-0.001
1989.7068	134.8	0.041	1	Har92	-7.3	-0.002
1990.7551	:129.2	:0.042	1	Har92	0.1	0.000
1993.8418	-	<0.030	1	Bal94	-	-
WDS 17095+4047 = McA 45						
<i>t</i>	θ_t	ρ_t	<i>n</i>	<i>Obs.</i>	$\Delta\theta$	$\Delta\rho$
1977.487	-	<0.035	1	Har84	-	-
1978.615	-	<0.030	1	Har84	-	-
1979.363	-	<0.030	1	Har84	-	-
1979.529	-	<0.030	1	Har84	-	-
1980.157	-	<0.030	1	Har84	-	-
1980.477	-	<0.030	1	Har84	-	-
1980.4820	94°.1	0".039	1	McA83	0°.6	0".002
1980.485	-	<0.025	1	Har84	-	-
1981.468	-	<0.030	1	Har84	-	-
1981.471	-	<0.030	1	Har84	-	-
1981.473	-	<0.030	1	Har84	-	-
1985.517	-	<0.038	1	McA87a	-	-
1985.523	-	<0.038	1	McA87a	-	-
1986.6509	-	<0.022	1	Bal89	-	-
1990.2677	167.5	0.051	1	Har94	-3.7	-0.001
1991.3192	182.6	0.054	1	Har94	2.9	0.001
1991.3300	180.0	0.054	1	Har94	0.2	0.000
WDS 23019+4219 = o And Aa						
1921.300	-	<0.030	1	Mer22	-	-
1975.7809	45.	0.046	1	Bla77a	-1.1	-0.005
1976.3981	168.	0.057	1	Bla77a	-0.5	0.000
1980.4799	139.3	0.042	1	McA83	4.6	0.003
1984.7042	43.7	0.060	1	McA87b	-1.5	0.008

Table 3a. Ephemeris

	WDS 03271+1845		WDS 04044+2406		WDS 17095+4047	
t	θ	ρ	θ	ρ	θ	ρ
1999.0	338°.4	0".088	349°.1	0".041	219°.8	0".084
2000.0	353.7	0.080	335.5	0.040	222.8	0.089
2001.0	12.2	0.073	320.5	0.037	225.5	0.094
2002.0	33.8	0.069	301.6	0.032	227.9	0.099
2003.0	56.6	0.069	274.8	0.027	230.1	0.103
2004.0	78.3	0.072	239.6	0.025	232.1	0.108
2005.0	98.0	0.076	206.8	0.028	233.9	0.112
2006.0	116.4	0.077	183.6	0.034	235.6	0.117
2007.0	135.3	0.074	167.0	0.039	237.2	0.121
2008.0	156.7	0.068	153.7	0.042	238.7	0.125

Table 3b. Ephemeris

	WDS 00416+2438		WDS 23019+4219	
t	θ	ρ	θ	ρ
1999.0	190°.9	0".189	357°.0	0".100
1999.5	183.5	0.181	5.0	0.147
2000.0	165.6	0.087	9.4	0.181
2000.5	56.7	0.060	12.7	0.200
2001.0	25.3	0.157	15.7	0.197
2001.5	17.0	0.205	19.1	0.172
2002.0	194.4	0.120	24.6	0.125
2002.5	185.9	0.200	39.9	0.062
2003.0	174.2	0.118	143.2	0.034
2003.5	94.1	0.042	181.5	0.096

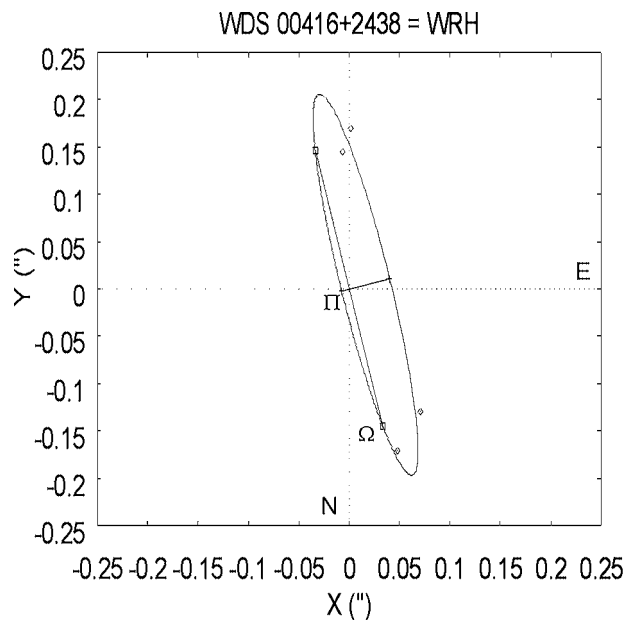


Fig. 1.

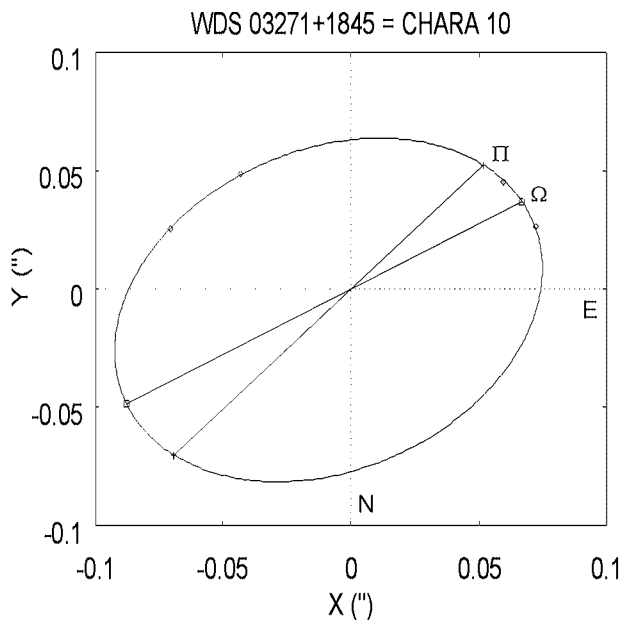


Fig. 2.

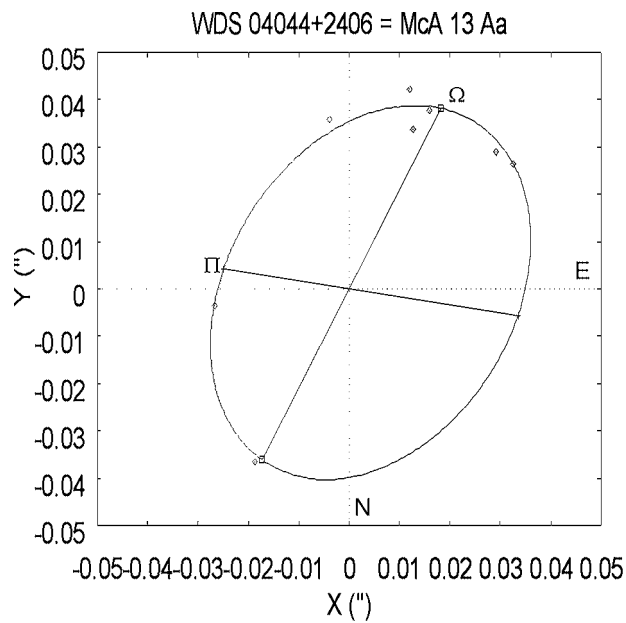


Fig. 3.

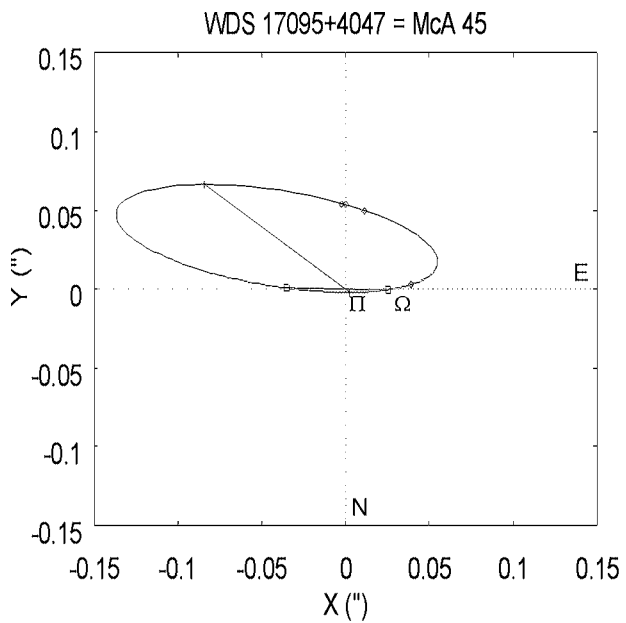


Fig. 4.

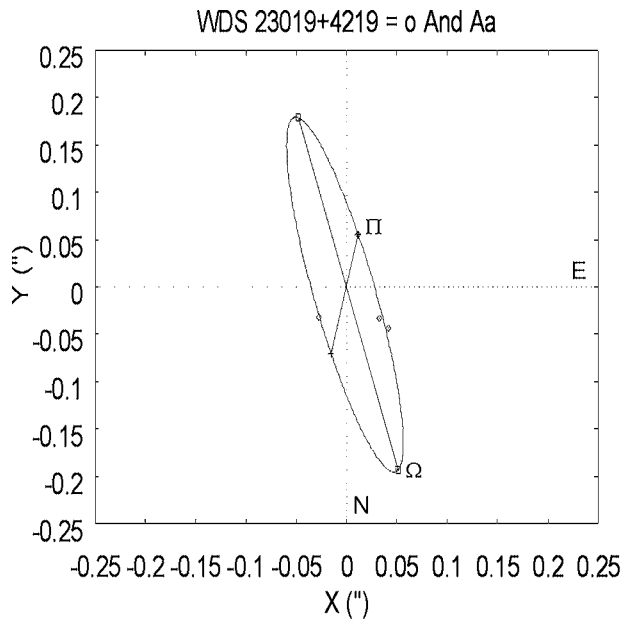


Fig. 5.

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НОВИ ОРБИТАЛНИ ЕЛЕМЕНТИ ЗА ПЕТ ИНТЕРФЕРОМЕТРИЈСКИХ ДВОЈНИХ ЗВЕЗДА

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Претходно саопштење

У овом раду су по први пут дати елиптички и Тил-Инес-ови орбитални елементи за интерферометријске парове: WDS 00416+2438 = WRH, WDS 03271+1845 = CHARA 10, WDS 04044+2406 = МсА 13 Аа, WDS 17095+4047 =

МсА 45 и WDS 23019+4219 = σ And Аа. За парове WDS 03271+1845 = CHARA 10 и WDS 04044+2406 = МсА 13 Аа су израчунате укупне масе и динамичке паралаксе које су упоређене са одговарајућим Хипаркос-овим паралаксама.