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SPECKLE INTERFEROMETRY AT THE OBSERVATORIO ASTRONÓMICO NACIONAL. IV

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RESUMEN

Presentamos resultados de mediciones hechas mediante interferometría de motas de algunas estrellas estrellas binarias, llevadas a cabo durante septiembre y octubre de 2009 con el telescopio de 2.1-m del Observatorio Astronómico Nacional en SPM (México). Presentamos 200 mediciones de 196 pares con magnitud límite $V = 12.3$ para la estrella primaria. Las separaciones angulares medidas varían desde $0''.115$ a $5''.26$. Noventa y siete pares tienen separaciones menores que $1''$. El error medio en las separaciones es $0''.03$ y $1°.5$ en el ángulo de posición. La ambigüedad habitual de 180° se corrigió para la mayoría de los ángulos de posición, comparando con mediciones realizadas por otros observadores.

ABSTRACT

We present speckle interferometric measurements of binary stars performed during September and October of 2009 with the 2.1 m telescope of the Observatorio Astronómico Nacional at SPM (Mexico). We report here the results of 200 measurements of 196 pairs with a primary limiting magnitude of $V = 12.3$. The measured angular separations range from $0''.115$ to $5''.26$. Ninety seven pairs have separations less than $1''$. The mean error in separation is $0''.03$ and $1°.5$ in position angle. The usual 180° ambiguity was corrected for a majority of position angles by comparison with observations performed by other observers.

Key Words: binaries: visual — stars: fundamental parameters — techniques: high angular resolution — techniques: interferometric

1. INTRODUCTION

This is the fourth paper in the series of publications presenting the results of speckle interferometric observations of binary stars performed with telescopes of the Observatorio Astronómico Nacional (OAN) of the Instituto de Astronomía-Universidad Nacional Autónoma de México. Regular speckle interferometric measurements of binary stars have been made with telescopes of the OAN since 2008 (Orlov et al. 2009). This paper presents the results of double star observations carried out with the 2.1-m Telescope of Sierra San Pedro Mártir National Astronomical Observatory (OAN-SPM) in September and October of 2009.

2. OBSERVATIONS AND RESULTS

The observations were performed at the 2.1-m telescope of the Observatorio Astronómico Nacional which is located at the San Pedro Mártir (Mexico). For these observations we used the DRAGON equipment (Voitsekhovich et al. 2005). This equipment was used for various observations at OAN telescopes during 2009 (Orlov et al. 2010). During the observations we had good seeing conditions. We estimated it was between 0.6 to 0.9 arcsec. Aberrations introduced by the telescope have similar values. As a result, long exposure images have a resolution of about 1.5 arc seconds. All the measurements were

TABLE 1

DISTRIBUTION OF PAIRS BY THEIR SEPARATIONS

$> 1''.5$	$1''.5 - 1''$	$1'' - 0''.5$	$0''.5 - 0''.25$	$< 0''.25$
73	27	52	31	13

TABLE 2

SPECKLE MEASUREMENTS ON THE 2.1 M TELESCOPE

WDS (α, δ J2000.0)	Disc. Name	Date Besselian	P.A. (deg)	Sep. (arcsec)	Δ P.A. ($O-C$) (deg)	Δ Sep. ($O-C$) (arcsec)	Ref.
00015+3044	HO208	2009.6850	189.5	1.09			
00039+2759AB	A429	2009.7506	330.8	0.55			
00039+2759AB,C	HJ1929	2009.7506	289.1	5.26			
00043+3705	TDS1281	2009.7587	335.1	1.54			
00077+3711	A1501	2009.7477	238.3	0.93			
00086+3228	COU647	2009.7477	34.6	0.26			
00098+3731AB	COU847	2009.7587	1.1	1.69			
00126+3325	COU650	2009.7506	49.1	1.24			
00174+3303	ES2274	2009.7506	173.3	1.85			
00230+2735	TDS16	2009.7477	121.1	1.39			
00256+3629	HO210	2009.7506	76.8	0.95			
00287+3718AB	A1504	2009.7477	42.8	0.58			
00318+2346	COU74	2009.7506	5.6	2.06			
00339+2419	COU349	2009.7588	222.1	2.67			
00382+3357	COU655	2009.7506	212.1	0.49			
00423+2919	COU658	2009.7478	128.3	0.64			
00444+3337	STF55	2009.7506	330.6	2.21			
00464+3243	COU748	2009.7588	180.4	1.08			
00481+2533	HO306	2009.7478	159.1	1.46			
00551+2811AB	A437	2009.7478	29.1	2.96			
00554+3040	BU500	2009.7506	122.3	0.48			
01012+3704	BRT2585	2009.7507	246.1	2.47			
01053+3117	COU549	2009.7588	255.1	1.32			
01058+2655	BRT121	2009.7507	193.1	2.71			
01062+2509	COU77	2009.7478	230.8	2.75			
01127+3536	DOO27	2009.7589	203.3	1.46			
01128+3700	COU1058	2009.7478	248.6	0.79			
01157+3712AB	A1519	2009.7507	72.8	1.64			
01187+3345	COU663	2009.7478	354.8	0.34			
01247+3510	J2387	2009.7507	307.8	3.25			
01266+3126	ES318	2009.7507	66.8	3.19			
01268+3633	A1908	2009.7479	345.1	1.62			
01328+3553	A1911	2009.7507	177.3	0.33			
01349+2532	TDS1920	2009.7479	246.6	0.41			
01360+2646	BU507	2009.7535	145.8	2.15			
01388+3453	COU1060	2009.7589	192.3	0.56			
01394+3729	COU1216	2009.7589	32.3	1.46			
01398+3415	COU667	2009.7589	210.3	1.92			
01399+3525	ES2082	2009.7507	298.6	2.45			
01414+3408	A1916	2009.7479	227.3	0.93			
01421+3559	TDS59	2009.7588	161.3	0.96			
01428+3749	COU1062	2009.7588	88.6	0.28			
01448+2351	COU450	2009.7535	171.3	1.54			
01467+3310AB	STF158	2009.7507	269.6	2.15	−2.5	0.09	Hartkopf & Mason 2011
01510+2551	COU452	2009.7535	180.1	0.27			
01579+3310	A1920	2009.7535	234.6	1.74			
01590+3640	TDS2079	2009.7508	197.6	2.15			
02062+2507	STF212	2009.7508	161.8	1.93			
02080+2618	TDS2132	2009.7535	26.6	1.58			
02099+3449	HU1034	2009.7535	110.1	0.33			
02108+3005	COU456	2009.7508	70.3	0.42			
02145+3650	COU1367	2009.7535	19.1	0.80			
02164+3628BC	ES270	2009.7589	356.4	3.05			
02172+3729AB	A206	2009.7508	152.6	0.40			
02212+2751	COU457	2009.7589	161.0	0.53			
02239+3330AB	BU876	2009.7508	241.1	1.23			
02291+2331Ba,Bb	VBS6	2009.7508	49.1	0.41			
02372+3024	COU671	2009.7508	111.6	0.63			
02393+2552	A2023	2009.7536	228.3	0.51			
02434+3148	A825	2009.7508	129.1	1.86			
02489+3714	COU1073	2009.7536	318.8	1.61			
02503+3230	COU675	2009.7589	56.8	0.54			
02506+2629	COU553	2009.7536	127.3	0.56			
02535+3134	A973	2009.7536	254.3	0.41			
02585+2328	COU679	2009.7536	223.1	1.54			
03005+3339Aa,Ab	KU11	2009.7509	21.3	0.18			
03005+3339AB	KU11	2009.7509	61.3	2.97			
03099+3332	COU682	2009.7590	138.1	1.29			
03117+3403	COU683	2009.7536	253.6	3.35			
03136+3649	ES2331	2009.7509	129.8	1.77			
03204+2341AB	STF375	2009.7509	316.3	2.67			

TABLE 2 (CONTINUED)

WDS (α, δ J2000.0)	Disc. Name	Date Besselian	P.A. (deg)	Sep. (arcsec)	Δ P.A. ($O-C$) (deg)	Δ Sep. ($O-C$) (arcsec)	Ref.
03241+3705	COU1223	2009.7536	201.8	1.52			
03242+2347AB	WOR4	2009.7509	341.3	2.48			
03308+3319	COU 871	2009.7537	199.3	1.30			
03333+3522AB	COU1079	2009.7537	39.3	0.33			
03337+2351	COU465	2009.7537	30.3	0.32			
03343+2625	OL152	2009.7590	50.3	2.31			
03389+2703	TDS2610	2009.7510	348.3	1.51			
03414+2602	TDS2629	2009.7590	270.1	1.47			
03513+2621AB	A1830	2009.7510	194.1	0.39	16.5	0.25	Olević & Cvetković 2005
04030+2425	TDS2728	2009.7591	78.6	1.04			
04117+3133	COU880	2009.7510	41.6	0.77			
04244+3326	COU882	2009.7510	168.6	1.69			
04275+3538	COU1228	2009.7482	185.1	1.62			
04296+2321	COU566	2009.7511	162.3	0.71			
04402+2749	COU705	2009.7511	108.8	1.63			
04491+3301	COU1086	2009.7511	78.8	1.72			
04550+3653	HU1089	2009.7511	352.1	0.54			
05000+3244	COU887	2009.7511	83.3	3.35			
05070+3004	A1028	2009.7511	217.3	0.42			
05131+2424	COU468	2009.7511	37.3	0.61			
05193+3453	SEI180	2009.7511	21.1	1.52			
19208+3711	COU1801	2009.7500	340.3	0.34			
19281+3521AB	HU1194	2009.7500	37.3	0.95			
19326+3649	COU2204	2009.7582	231.8	0.33			
19399+2835	TDT1614	2009.7582	139.3	0.71			
19448+2621	TDT1699	2009.7501	23.1	2.99			
19460+3717	COU2284	2009.7583	331.1	0.56			
19541+2657	TDT1834	2009.7583	344.8	0.64			
20030+3701	COU2211	2009.7528	255.6	0.94			
20043+3033	STF2626	2009.7473	128.1	1.00			
20050+3707	COU2212	2009.7473	196.6	0.49			
20072+2611	A2996	2009.6846	251.0	3.00			
20074+3543AB	STT 398	2009.6846	83.5	0.98			
20083+2950	A1198	2009.6846	230.8	1.51			
20090+2401	TDS1047	2009.7528	102.8	1.70			
20151+3742	COU2416	2009.7583	117.3	0.26	−0.6	0.02	Docobo et al. 2008
20250+3034	HDS2921	2009.7583	356.1	0.81			
20280+3128	TDS1074	2009.7473	333.8	1.46			
20381+2953	A744	2009.7502	272.8	0.71			
20384+2455	TDT2446	2009.7583	280.1	0.45			
20424+3455	COU1965	2009.6846	275.5	0.32			
20432+3350	HDS2949	2009.6846	164.5	0.96			
20442+3404	TDT2507	2009.7502	164.8	0.94			
20503+3615	TDT2569	2009.7502	54.5	0.41			
20511+2630	TDT2579	2009.7584	37.6	1.97			
20530+3136	TDT2602	2009.7529	62.6	0.55			
20531+2909AB	STT417	2009.6846	27.8	0.90			
20536+3514	HO146	2009.6847	46.0	0.37			
20570+2340AB	A175	2009.7502	293.1	2.00			
20579+3002	TDT2662	2009.7584	99.6	1.46			
21004+3411AB	BU1329	2009.6847	39.8	0.31			
21026+3041	COU1182	2009.6847	180.1	1.00			
21035+3549BC	B2	2009.7474	28.3	2.80			
21125+2821	HO152	2009.6847	137.3	0.18	5.5	−0.09	Scardia et al. 2002
21152+2753	COU531	2009.7474	143.3	0.92			
21171+3546AB	BU162	2009.7502	252.3	1.23			
21230+2726	COU533	2009.6847	289.3	0.70			
21243+3740	WSI7	2009.7530	79.8	0.18			
21284+3447	COU1638	2009.6847	226.8	1.30			
21284+3447	COU1638	2009.7530	226.1	1.31			
21299+2353	J612	2009.7503	280.1	2.44			
21330+2408Aa,Ab	HDS3065	2009.7530	233.6	0.31			
21368+3217	COU1184	2009.6847	157.8	0.22			
21372+3142	TDT3064	2009.7474	89.8	0.78			
21392+2451	TDT3084	2009.7585	300.1	0.80			
21439+2751	HO166	2009.6847	318.5	0.19	−15.5	−0.02	Couteau 1958
21461+2448	TDT3149	2009.7585	213.6	0.70			
21493+3451	COU1483	2009.7474	130.3	0.71			
21501+3151AB	BU692	2009.6848	9.8	2.85			
21521+2748	HO171	2009.6848	341.8	0.76			
21566+3053	HDS3119	2009.6848	35.0	0.58			
21566+3421AB	BU1214	2009.7475	207.3	1.46			
21581+3650	TDT3263	2009.7585	163.1	0.79			
21593+3516	COU1340	2009.6848	190.3	0.19			

TABLE 2 (CONTINUED)

WDS (α, δ J2000.0)	Disc. Name	Date Besselian	P.A. (deg)	Sep. (arcsec)	Δ P.A. ($O-C$) (deg)	Δ Sep. ($O-C$) (arcsec)	Ref.
22012+2650	A306	2009.7503	308.8	1.40			
22116+3727	COU1486	2009.7475	33.1	0.56			
22126+3013AB	HO179	2009.7503	280.3	0.89			
22154+3727	COU1342	2009.7503	163.3	1.90			
22163+2616	STF2889	2009.6848	197.8	2.26			
22230+3443	TDT3498	2009.7585	159.3	0.70			
22231+2932	TDT3499	2009.7475	53.6	0.55			
22248+2841	HDS3176	2009.6848	327.8	0.33			
22278+3227	TDT3533	2009.7586	360.1	0.37			
22287+3514	POP99	2009.6848	257.8	0.29			
22306+2411	J918	2009.7475	283.3	2.54			
22307+3729BC	ES2072	2009.7504	273.3	1.70			
22328+2625Aa,Ab	HO475	2009.6848	49.3	0.20			
22328+2625AB	HO475	2009.6848	307.3	1.10			
22344+3424	ES2202	2009.7586	278.8	2.80			
22364+3007	MLB624	2009.7475	298.6	1.93			
22372+2645Aa,Ab	COU737	2009.6848	35.0	0.16			
22391+2715	TDT3636	2009.7504	159.1	0.94			
22396+2822	A413	2009.6848	14.5	1.13			
22430+3013BC	BU1144	2009.7475	73.1	0.25	14.2	0.23	Hummel et al. 1998
22438+2935	HDS3225	2009.6849	1.8	0.94			
22455+3359	HU782	2009.7504	321.3	1.98			
22528+2926CD	COU541	2009.7504	68.1	1.39			
22587+3422	ES2204	2009.6849	165.8	2.86			
23002+2409	TDT3834	2009.7504	16.3	2.45			
23015+3516	COU842	2009.7476	51.6	0.71			
23039+3510	ES2134	2009.6849	119.5	1.51			
23067+3302Aa,Ab	COU741	2009.7504	190.8	0.93			
23083+2642	COU438	2009.7476	65.1	0.86			
23083+3028	HO196	2009.6849	296.8	1.90			
23121+2656AB	HDS3305	2009.6849	169.8	1.31			
23199+2844	COU439	2009.6849	337.0	0.12	8.5	−0.02	Docobo & Ling 2003
23199+3444	COU742	2009.6849	27.3	0.19			
23206+3621AB	POP68	2009.7476	320.6	1.24			
23232+2439	TDT4012	2009.7587	36.6	2.30			
23239+3456	COU1346	2009.7505	62.3	0.18			
23239+3456	COU1346	2009.6849	60.3	0.20			
23272+3026	POP21	2009.7476	30.1	0.79			
23296+2617AB	A420	2009.7505	287.6	0.57			
23326+3011	MLB628	2009.7587	324.1	1.72			
23326+3127AB	WNC6	2009.6849	154.5	1.70			
23345+2703	COU440	2009.7476	235.6	1.78			
23362+3226	A1240	2009.6850	351.0	2.13			
23368+3045	ES401	2009.7587	68.6	2.31			
23372+3741	COU1045	2009.7505	42.6	1.40			
23382+3250	HU792	2009.6850	236.0	0.19			
23407+3107	ES403	2009.7477	294.3	2.75			
23409+3339	HU795	2009.6850	226.8	2.67			
23436+2506	BU994	2009.7505	314.8	1.38			
23467+2521	TDT4186	2009.7505	230.3	1.84			
23485+3608	COU944	2009.7477	87.8	0.18			
23519+2648	MLB630	2009.7587	293.6	1.97			
23542+2443	COU145	2009.7477	147.6	2.45			
23572+3751	AG297	2009.7505	312.6	2.08			
23597+2305	TDT4311	2009.7587	148.6	1.12			

made through the R filter with a 640/130 nm bandpass window. After calibration we determine the pixel scale = 0.019 arcsec/pixel and detector orientation. During six nights of observations we made 200 measurements of 196 pairs. Half of the observed binaries have separations less than 1″. Table 1 shows how these 196 pairs are distributed according to their separations.

Table 2 contains 200 measurements concerning 196 binary or multiple stars. The presentation of measurements is the same as in our previous publication (Orlov, Voitsekhovich, & Guerrero 2011). The first column contains the epoch-2000 coordinates in the format used in the Washington Double Star (WDS) Catalog (Worley & Douglass 1997). The second column gives the name of the star or the discoverer designation. The third column gives the epoch of the observation in fractional Besselian years. The two following columns contain the measured position angles given in degrees and the angular distances in arcseconds. The last three columns give the difference between observation and the ephemerides cal-

culated for the date of observation, as well as references to publications in which orbital elements can be found (Hartkopf & Mason 2003).

3. CONCLUSION

We have presented the results of binary star observations focused on binaries from WDS catalogue. In particular, we have been interested in new binaries discovered by *Hipparcos*. We confirmed 38 new binaries detected by *Hipparcos*. The main aim of this study was the selection of binaries with a fast relative motion, allowing to obtain candidates for determination of new orbits.

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