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Multicolour CCD measurements of visual double and multiple stars. III*,**

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ABSTRACT

Context. Recent CCD observations were performed in the period 1998-2004 for a large sample of visual double and multiple stars selected from the Hipparcos Catalogue and/or from the Gliese Catalogue of Nearby Stars.
Aims. Accurate astrometric and photometric data allowing us to characterise the individual components are provided. These data are compared to Hipparcos data or to data from an older epoch to assess the nature of the observed systems.
Methods. We simultaneously apply a Moffat-Lorentz profile with a similar shape to all detected components and adjust the profile parameters from which we obtain the relative astrometric position (epoch, position angle, angular separation) as well as differential multi-colour photometry (filters (B)VRI).
Results. We thus acquired recent data for 71 visual systems of which 6 are orbital binaries, 27 are nearby, and 30 are multiple systems. In three of these cases, the systems remained unresolved. 23 new components were detected and measured. Two new visual double stars of intermediate separation were also found. The estimated accuracies in relative position are 0.04° and 0.01″ respectively, while those in differential photometry are of the order of 0.01-0.02 mag in general.
Conclusions. The nature of the association of 55 systems is evaluated. New basic binary properties are derived for 20 bound systems. Component colours and masses are provided for two orbital binaries.

Key words. stars: binaries: visual – techniques: photometric – stars: fundamental parameters

1. Introduction

The context of the present work is the field of visual binaries (double) and multiple stars. We report on the acquisition of recent astrometric and multi-passband photometric data following the procedure described in our previous work (Lampens & Strigachev 2001 (Paper I), Strigachev & Lampens 2004 (Paper II)). During the years 1998-2004, we performed regular CCD observations of a sample of visual double and multiple stars selected from the Gliese Catalogue of Nearby Stars and/or from the Hipparcos Catalogue (ESA 1997) at the National Observatory of Rozhen (NAO) and at the Astronomical Observatory of Belogradchik (AOB), both situated in Bulgaria. Our goal is to improve the knowledge of the distributions of the true separations, relative motions, (total and individual) masses, luminosity ratios, and temperature differences of the main-sequence visual binaries situated in the near Solar neighbourhood. An accurate determination of the distributions of the binary properties is needed to provide observational constraints to the various existing scenarios of binary star formation, and offers a direct calibration tool for basic stellar properties. As the field main-sequence binaries serve as a reference for various binary populations in different environments (e.g., in clusters, in metal-poor or star-forming regions), it remains worthwhile to improve their statistics and the data obtained in the past (at a time when visual double stars were still "fashionable"), more particularly also for the wide binaries that carry the largest angular momenta, but that are also the ones most prone to dynamical disruption (Mathieu 2001). For these purposes, monitoring of the (changing) astrometric parameters providing the fun-

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[⋆] Based on observations collected at the National Astronomical Observatory, Rozhen, and the Astronomical Observatory, Belogradchik, both operated by the Institute of Astronomy, Bulgarian Academy of Sciences. Also based on data obtained by the Hipparcos astrometry satellite.

[⋆⋆] Appendix A and Tables 4-6 are only available in electronic form, respectively at http://www.edpsciences.org (App. A), or via anonymous ftp at cdsarc.u-strasbg.fr or at http://csdweb.u-strasbg.fr/cgi-bin/qcat?/A+A/XXX/YYY (Tab. 4-6).

damental binary data as well as precise measuring of the individual magnitudes and colour indices of the components is absolutely needed. Accurate photometric differences allow the characterisation of the evolutionary stage of the components since basic properties such as luminosity/mass ratios as well as temperature differences may be derived.

The paper is structured in the following way: firstly, we describe the sample (Sect. 2), next we report on the observations, the reduction method and the astrometric calibration (Sect. 3). In Sect. 4 we present new astrometric and photometric measurements including a discussion of the errors. We compare our measurements to Hipparcos or older data, derive the properties of individual systems, and discuss some unresolved systems in Sect. 5. A short summary of the observational results can be found in Sect. 6.

2. Description of the sample

We present high-accuracy relative astrometry and (B)VRI differential photometric data for a large sample of visual double and multiple stars pertaining to the Hipparcos Catalogue (ESA 1997). Complementary ground-based, multi-colour observations of the components of double stars observed during the Hipparcos mission are valuable because they provide accurate colour differences and independent monitoring of the relative position with the same high accuracy, provided that the angular separation is large enough. At the start of this project, a careful comparison between the CCDM catalogue (Dommanget & Nys 2002) on the one hand and the Hipparcos relative data of visual double stars (i.e., the Hipparcos Double and Multiple Systems Annex or Vol. 10, mainly Component Solutions (DMSA, Part C)) on the other hand showed that, in almost 10% of the ≈ 9000 cases explored, a discrepancy was noted. This discrepancy can refer to the relative astrometry being discordant (with limits for target selection as a function of angular separation as shown in Table 1) found in 3.2% of the cases or to the relative photometry showing an excess of 1.2 mag at least in Δm (independent of the used filter) found in 6.4% of the cases. This may seem a significant fraction whereas a comparison between Hipparcos and a sample of speckle binaries showed good agreement at the mas level (Mignard et al. 1995). When the relative astrometry is obviously conflicting with the previous (generally much older) ground-based data for systems with larger angular separations, we can expect to be able to validate the space results and to show evidence of relative motion between the components, or a new component might have been detected by the satellite, or the space results maybe refuted, permitting us to correct the "ambiguous" solution proposed in the Hipparcos Catalogue (typically at an angular separation larger than 10″). When a large difference in differential magnitude is detected, one may also expect various reasons: a different signal in the considered passband, flux variability, a wrong component identification, a new component detection, or an "ambiguous" Hipparcos solution. Further criteria adopted to select the programme double stars were:

Table 1. Adopted limits of target selection as a function of angular separation

Limit	$\rho \leq 1.5$"	$\rho \leq 5$"	$\rho \leq 12$"	$\rho > 12$"
$\Delta\rho/\rho$ (%) Absolute	55 0.8″	20 1.0″	8 1.0″	10 > 1.5″

- accessibility from the Northern hemisphere ($\delta > 0°$)
- they should be of 'intermediate' angular separation ($1.5'' \leq \rho < 15''$)

The initial target list consisted of 245 candidate visual double or multiple systems listed in the Hipparcos Catalogue. Due to their apparent brightness, it appeared that several among these systems were also listed in the Catalogue of Nearby Stars (GJ, Gliese & Jahreiss 1991).

From 2000 onward, we focused our attention specifically on those visual double and multiple stars of our target list that are in the Catalogue of Nearby Stars (GJ, Gliese & Jahreiss 1991) and/or have Hipparcos parallaxes larger than 0.04″. As before, we chose systems of 'intermediate' angular separation fainter than apparent visual magnitude 7 and for which CCD observations can provide both accurate and complementary data on each component (cf. Paper I). To complete our sample of nearby systems, we also added a small number of faint systems that are not included in the Hipparcos Catalogue (because they were beyond the Hipparcos magnitude limit; they will accordingly be designated by their Gliese number). The absolute parallax measurements, obtained in space of the nearby systems from the sample, are generally very accurate. In a few cases, however, the ground-based parallaxes from 'The General Catalogue of Trigonometric Stellar Parallaxes' (van Altena et al. 1995, vALH) attain a higher accuracy and supersede the Hipparcos parallax.

3. Observations and data reduction

3.1. Instrumentation and limitations

The observations were performed at two observatories – with the 2-m telescope of NAO (Rozhen, Bulgaria) and with the 0.6-m telescope of AOB (Belogradchik, Bulgaria). The main characteristics of the telescopes and their cameras are listed in Table 2. The telescope and the camera used at AOB are described in great detail in Bachev et al. (1999). During this period, out of a total of 25 allocated nights, some 35% of the available time was effectively used.

The CCD frames were taken from October 1998 to November 2004 through standard Johnson V and Cousins R, I filters. At a later stage at NAO, we also used the Johnson filter B. During the observations the exposure

Table 2. Telescopes and instrumentation

Site	NAO Rozhen	AO Belogradchik
Telescope	2-m Ritchy-Chrétien	60-cm Cassegrain
CCD type	Photometrics AT200	ST8
Chip	Site SI003AB UV-AR	KAF 1600
Chip size	1024 × 1024 pixels	765 × 510 pixels^1
Pixel size	$24 \times 24\ \mu$m	$18 \times 18\ \mu$m^1
Scale	$0.31''$/pixel	$0.49''$/pixel^1
Field	$5.3' \times 5.3'$	$6.2' \times 4.2'$
Gain	$4.93\ e^-$/ADU	$2.3\ e^-$/ADU
RON	1.03 ADU/rms	10 ADU/rms

^{1}With a binning factor of 2 × 2

times were adjusted to get the highest possible counts for the primary (brighter) component; exposure times were usually several seconds long. On each night, a set of biases was taken every few hours. Flat-fields were obtained during evening and/or morning twilights: a set of 3 to 6 flats per filter was taken every night. Typical seeing values ranged from 1.5 to 3″.

3.2. The reduction method

All the primary reduction steps were performed using ESO-MIDAS standard routines. The frames were processed for bias and flat-field corrections. They include: subtraction of the residual bias pattern using a median master zero exposure frame and flat-fielding using a median master flat-field frame.

Next, we computed the angular separations (in pixel units), the position angles, and the magnitude differences in the various filters for the components of the double stars. For this we used a two-dimensional Moffat-Lorentz profile (Moffat 1982) fitting method. The code was developed within the ESO-MIDAS environment (Cuypers 1997) and used in previous work (Lampens et al. 2001, Paper I, Paper II).

3.3. The astrometric calibration

To convert the instrumental angular separations and position angles into absolute values we applied the astrometric corrections as computed from stars observed in various standard astrometric fields (see Table 3). We measured the (x, y) positions and computed a multi-linear regression fit between the (x, y) positions and the catalogued (α, δ) values of the standard stars. Typically, we used 8-9 or more stars (cf. Col. 8 in Table 3) with reference coordinates in each field. On one occasion, only 3 stars were used. To compensate for this low number of reference stars (particularly in NGC 1647), we computed the mean calibration obtained from two such fields whenever possible. We then determined the pixel scale and the orientation of the CCD chips (measured from North towards East). For this computation we made use of the software package Mira AP[1] as well as of self-made codes. Both gave equivalent results for the same field. The adopted corrections are listed in Table 3. In Col. 9 we mention the source of the coordinates of the standard fields. The relative astrometric data were corrected using the appropriate values. The computed scale values of Table 2 are not exactly the same as the nominal instrumental specifications (Sect. 3.1).

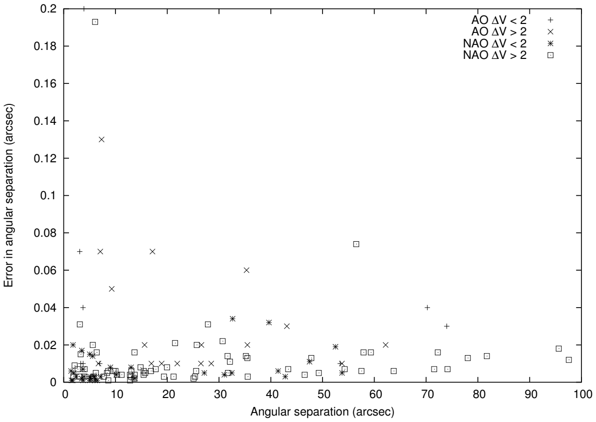

Fig. 1. Astrometric error vs. angular separation (in arcsec)

4. CCD astrometry and photometry

4.1. Astrometric measurements

The astrometric data are listed in Table 4. The first column mentions the Hipparcos identification number, followed by the component identification, the epoch (Bessel year), the number of frames, and the angular separation (ρ) and the position angle (θ) measured from North to East, with the respective standard errors $\sigma(\rho)$ and $\sigma(\theta)$. The values of ρ and θ are the means of several frames measured in different filters. Typically, as many as 20-30 frames were obtained for each target, all filters included.

The standard errors of the mean values are quoted. These values are systematically better in the case of the NAO measurements: the mean uncertainties are 0.01″ in angular separation and 0.04° in position angle. Such errors are typical for this range of angular separation (i.e., 'intermediate', Lampens et al. 2001). The resolution is also higher, as shown by the measurement of HIP 97237, with the smallest angular separation measured (ρ=1.4″). At AOB, the mean uncertainties are somewhat larger, i.e., 0.04″ in angular separation and 0.26° in position angle. Figure 1 illustrates the uncertainty in ρ as a function of angular separation and of differential V magnitude between the components.

4.2. Photometric data

In Table 5 we list the photometric magnitude and the colour differences in the following order: the Hipparcos

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[1] The software Mira AP is produced by Axiom Research Inc., http://www.axres.com/

Table 3. Astrometric calibration

Observatory[1]	Astrometric standard field	Date	Scale (″/px)	σ(Scale) (″/px)	Orient. (°)	σ(Orient.) (°)	N_Stars	Source of coordinates
NAO	M 15	1998	0.311	0.002	-1.68	0.03	13	Guide Star Catalogue (V7)
NAO	NGC 1647	2000	0.310	0.001	-1.5	0.1	3[2]	Geffert et al. 1992
NAO	M 15	2001	0.310	0.001	-2.04	0.02	8	Le Campion et al. 1996
NAO	M 67	2002	0.310	0.001	0.716	0.003	9	Tycho Catalogue (ESA 1997)
NAO	M 67	2004	0.314	0.001	1.42	0.02	15+[3]	Girard et al. 1989
AOB	NGC 1647	1998	0.493	0.01	2.29	0.1	10[4]	Geffert et al. 1992
AOB	M 15	1999	0.495	0.001	0.4	0.1	5	Guide Star Catalogue (V7)
AOB	M 16	2000	0.493	0.001	-1.62	0.04	9	Hillenbrand et al. 1993

(^{1}) NAO Rozhen: 2-m telescope — AO Belogradchik: 0.6-m telescope
(^{2}) Field I — (^{3}) Fields I and III — (^{4}) Fields I and IV

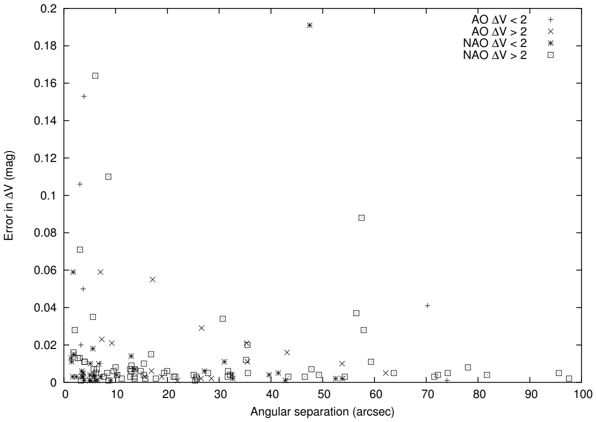

Fig. 2. Photometric error vs. angular separation (in arcsec)

number (Col. 1), the component identification (Col. 2), the heliocentric Julian Date (Col. 3), the differential V magnitude (ΔV) (Col. 4), and the colour differences (ΔB-ΔV), (ΔV-ΔR), and (ΔV-ΔI) (Cols. 5, 7, 9, and 11), as well as the respective standard errors of the differences (Cols. 6, 8, 10, and 12). As before, we consider that these values reflect the true colour differences between the components (e.g., Δ(B-V)). The standard errors of the mean values are quoted. The mean error of the differential V magnitude is 0.01 mag for the NAO observations while it is 0.03 mag for the AOB observations. Again, such mean internal errors are conform with expected values (Lampens et al. 2001). Figure 2 illustrates the uncertainty in ΔV as a function of angular separation and of the difference in V magnitude between the components.

5. The nature of the association of individual systems and some unresolved systems

In Table 6 we show the difference in relative position, ΔPos, (Col. 9) between the new values and those from the Hipparcos Catalogue (for mean epoch 1991.25). When no Hipparcos data were available, we used the (sometimes much) older data from the CCDM (Dommanget & Nys 2002). Also listed are the catalogue's epoch (Col. 4), the published position angle (Col. 5) and angular separation (Col. 6), the computed differences in ρ (Col. 7), and θ (Col. 8). Lastly, we briefly comment on the nature of the association of the system using a number of codes ('S'=stable; 'L'=showing a linear relative motion (optical system); 'M'=showing (orbital) motion; and 'O'=with known orbital motion). Code 'L' is used when the difference in relative positions is compatible with the (measured or estimated) relative proper motion of the components considered, while code 'M' is assigned when this is not the case. The derived properties for some of the orbital binaries in the sample under study have already been published (Paper II). Therefore, we will not include these binaries in the discussion, unless they are part of a complex (e.g., multiple) system. However, they are included in Table 7, where a comparison is made with the ephemeris computation based on previously known orbits (Mason et al. 2001).

The comments addressing specific systems of Tables 6 and 7, which for various reasons do not form stable configurations (i.e., are not fixed systems) can be found in the Appendix. In Tables 8 and 9, we list newly derived binary properties for 20 bound systems of Table 6. We provide the system's (B-V) colour index (Col. 2), the component colours (Cols. 3 and 4), the bolometric correction difference (Col. 5), the bolometric magnitude difference (Col. 6), and the subsequently derived fractional mass, β, (Col. 7) (Table 8). In Table 9, we provide (lower limits of) the linear separations based on the observed angular separations (generally corresponding to larger semi-major axes) by making use of the most precise parallaxes known to-date (a note in Col. 13 indicates the use of a ground-based trigonometric parallax).

In seven cases, the companion (component B) was not detected and thus not measured. This was the case for the following systems: HIP 8414 (1991: ρ=1.7″), HIP 21765 (1960: ρ=2″), HIP 30920, HIP 101150, HIP 105747 (1991: ρ=0.1″), GJ 1047 AB (1966: ρ=1″), and GJ 1103 AB. In six cases (not GJ 1103), the angular separation previously measured was (well) below 2″. We also did not resolve the binary GJ 1103 AB, which was measured with an angular separation of about 3″ in 1960. On the other hand, we know that the adopted lower limit of 1.5″ in angular

Table 7. Orbital systems and comparison with the ephemeris based on the best-fitting orbit(s)

Identifier	ρ_{obs}	θ_{obs}	ρ_{eph}	θ_{eph}	$\delta\rho$	$\delta\theta$	ΔPos	Source
HIP 473	6.079	178.49	6.068	182.61	0.011	-4.120	0.437	Kiyaeva et al. (2001)
HIP 67422	3.30	170.70	3.320	173.48	-0.020	-2.780	0.162	Heintz 1988
HIP 72659	6.72	314.20	6.636	317.28	0.084	-3.080	0.369	Söderhjelm 1999
HIP 79607	6.96	232.80	6.955	236.13	0.005	-3.330	0.404	Ruymaekers 1999
HIP 88601	3.73	145.60	3.780	147.24	-0.050	-1.640	0.119	Ruymaekers 1999
HIP 97237	1.418	46.98	0.940	82.54	0.478	-35.560	0.852	Heintz 1990
HIP 97237	1.418	46.98	1.521	47.44	-0.103	-0.460	0.104	Söderhjelm 1999

Table 8. Basic binary properties: component colours and masses

Identifier	$(B-V)_{AB}$	$(B-V)_{A}$	$(B-V)_{B}$	ΔBC	ΔM_{Bol}	β	M_{A+B} $(M_\odot)$	$\sigma(M_{A+B})$ $(M_\odot)$	M_A $(M_\odot)$	M_B $(M_\odot)$
HIP 473[1]	1.443	1.444	1.442	0.004	0.064	0.496	1.496	0.27	0.75	0.74
HIP 1860	1.450	1.453	1.402	0.109	2.973	0.328	–	–	–	–
HIP 15844	1.500	1.512	1.463	0.130	1.407	0.416	–	–	–	–
HIP 17666	0.799	0.751	0.887	-0.113	0.474	0.471	–	–	–	–
HIP 29316	1.450	1.446	1.469	-0.053	1.575	0.406	–	–	–	–
HIP 43422	1.355	1.216	1.521	-0.578	-0.536	0.532	–	–	–	–
HIP 44295	1.285	1.191	1.395	-0.308	-0.244	0.515	–	–	–	–
HIP 92836	1.370	1.367	1.429	-0.118	3.186	0.317	–	–	–	–
HIP 97237	1.720	1.739	1.709	-0.612	-0.003	0.500	0.463	0.086	0.23	0.23
HIP 110640[1]	1.190	1.162	1.480	-0.530	1.848	0.390	–	–	–	–
HD 23713	0.544	0.156	1.346	-0.849	-0.638	0.538	–	–	–	–

(1)cf. also Paper II

Table 9. Basic binary properties: (lower) linear separations for 20 bound systems

Identifier	Cp	Epoch (*Bessel yr*)	N_ima	ρ ($''$)	σ_ρ (*mas*)	θ (°)	σ_θ (°)	π (*mas*)	σ_π (*mas*)	A_{low} (*A.U.*)	σ_A (*A.U.*)	Note
HIP 473	B	2001.8583	24	6.079	1	178.49	0.01	85.10	2.74	71	2	
HIP 1860	B	2001.8611	58	11.178	4	58.13	0.03	50.71	2.72	220	12	vALH
HIP 4258	B	2001.8584	24	6.488	1	66.52	0.01	8.59	2.24	755	202	vALH
HIP 9275	B	2000.8238	40	3.926	3	54.57	0.07	33.53	5.29	117	18	
HIP 15844	B	2000.8213	23	2.397	3	340.90	0.05	50.54	4.66	47	4	
HIP 17666	B	2000.8267	48	7.139	3	51.81	0.02	40.83	2.24	175	10	
HIP 21088	B	2000.8213	15	9.022	8	61.81	0.08	180.60	0.80	49.9	0.3	vALH
HIP 22715	B	2000.8324	5	3.980	3	216.32	0.03	37.09	1.37	107	4	
HIP 29316	B	2000.8216	20	1.803	20	27.04	0.50	97.90	3.90	18	1	vALH
HIP 39896*	B	2004.8843	15	13.750	2	240.32	0.02	48.26	3.16	285	19	
HIP 41824	B	2000.8353	18	10.149	4	344.76	0.01	78.05	5.69	130	10	
HIP 43422	B	2002.9106	12	1.717	1	153.07	0.04	31.24	19.30	55	34	
HIP 44295*	B	2004.8845	15	5.100	3	180.80	0.01	54.57	3.21	93	5	
HIP 92836	B	2001.8637	48	4.021	7	32.92	0.02	50.30	2.70	80	4	
HIP 97237	B	2000.8342	19	1.418	6	46.98	0.21	94.70	4.40	15	1	vALH
HIP 110640	B	2001.8582	55	2.103	9	220.94	0.27	46.74	1.66	45	2	
HIP 113437	B	2001.8610	24	1.515	1	252.96	0.09	8.19	1.52	185	34	
HD 23713	B	2000.8296	15	1.935	5	126.96	0.11	45.00	15.00	43	14	vALH
GJ 1047	C	2000.8321	24	31.025	4	233.25	0.04	46.20	3.60	672	52	vALH
GJ 1245	B	2000.8344	20	7.035	3	79.63	0.02	220.20	1.00	32.0	0.2	vALH

* This flag denotes another epoch for the same target (cf. Table 4)

separation can be reached under good circumstances (depending, e.g., on seeing and on the observed magnitude difference, e.g., HIP 97237 and HIP 113437). We therefore claim that the most probable reason for non-detection in these systems is the fact that the binaries presently have an angular separation equal to or below 1.7$''$ (1.5$''$ for Δm < 1 mag). They were presently unresolved by the adopted CCD technique. In the case of HIP 30920, component B is actually situated at an angular separation of 1.3$''$ (Mason et al. 2001), whereas the Hipparcos angular separation of HIP 101150 was only 0.8″ (epoch 1991.25). HIP 12781 and HIP 28368 are two newly discovered doubles according to the Hipparcos Catalogue (ESA 1997) for which we report no detection of an additional component with a separation above 1.7″ (1.5″ for Δm < 1 mag).

6. Conclusions

We provided high-accuracy astrometric and photometric measurements for 71 visual systems, of which 27 are nearby (with parallax less than 30 pc) and 30 are multiple systems. In three additional cases, the binary systems remained unresolved. From a comparison with the relative positions from the Hipparcos Catalogue (for mean epoch 1991.25) or, when no Hipparcos data were available, with the data from the CCDM Catalogue, we evaluated the physical status of 55 systems. To summarize, we found that:

- 8 systems show a linear relative motion (optical),
- 17 systems are true binaries showing motion,
- 22 systems show a fixed configuration,
- 5 systems probably show a fixed configuration,
- 3 binaries have a published orbit.

Comparison of the new measurements and the ephemerides computed with the orbits found in the literature shows a reasonably good agreement in the case of three binaries (HIP 67422, HIP 88601, and HIP 97237), but too large residuals in the other cases (HIP 473, HIP 72659, and HIP 79607)(cf. Table 7). The long-term monitoring of these orbital pairs should be pursued with an adequate angular resolution. Two new visual double stars of intermediate separation were also discovered, one of which (HD 218587) was already reported elsewhere (Strigachev et al. 2001). 23 new components of known systems were measured and basic binary properties were newly determined for 20 bound systems. In the case of two orbital binaries, we derived a full set of fundamental parameters including new component colours and corresponding component masses.

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ON-LINE DATA

Appendix A: List of comments addressing specific systems of Tables 6 and 7, which for various reasons do not show a fixed binary configuration

HIP 473: GJ 4 AB is a nearby orbital pair (π_{Hip} = 85.10 ± 2.74 mas) in a multiple system showing a high common proper motion (comp A: total proper motion (pm) of $0.891''$/yr in the direction 100°, comp B: total pm of $0.853''$/yr in the direction 101°), also for example HIP 428 (comp F: total pm of $0.883''$/yr in the direction 100°) (ESA 1997). The relative position of component E is consistent with a change in the position of GJ 4 AB over a period of 77 years. The comparison with the ephemeris of Kiyaeva et al. (2001) is less concordant than previously (in Paper II we already stated that this orbit may not be definitive). The observed change of rate of the position angle is opposite to the expected one. The system was recently also measured by Pavlovic et al. (2005) who have found good agreement with the proposed ephemeris, but less accuracy than our data. For this reason also, we thoroughly checked the determination of the zero point of the orientation angle.

HIP 1397: shows a significant proper motion, definitely L-type. This is confirmed by the Hipparcos difference in proper motion of the order of 0.1”/yr between the ”components” in the direction 10°, which is fully compatible with the observed change in relative position of almost 1” (i.e., ΔPos=0.942”) over slightly more than 10 years (π_{Hip} = 11.30 ± 1.39 mas, ESA 1997).

HIP 1860: GJ 1010 AB, a nearby system with a high proper motion, possibly M-type (total pm of $0.800''$/yr in the direction 273° and π_{tr} = 62.8 ± 4.0, van Altena et al. 1995). There is no double-star solution mentioned in the Hipparcos Catalogue (since it is listed in DMSA/X, Part X which contains the stochastic solutions for objects for which no single nor double star solution could be found in reasonable agreement with the standard errors of the Hipparcos observations)(ESA 1997). It forms a common proper-motion binary listed in Gould & Chaname (2004) (=NLTT 1186 and 1189).

HIP 3589: shows a significant proper motion, most probably L-type. This is confirmed by the Hipparcos difference in proper motion of the order of 0.1”/yr between the ”components” (π_{Hip} = 20.56 ± 1.69 mas).

HIP 4258: GJ 1023 AB shows a significant proper motion (total pm of $0.100''$/yr in the direction 250°, ESA 1997), most probably M-type. It has π_{tr} = 53.0 ± 15.9 mas (van Altena et al. 1995), whereas π_{Hip} = 8.59 ± 2.24 mas.

HIP 7495: the new measurement confirms the Hipparcos ”alternative” solution rather well (ESA 1997).

HIP 9275: GJ 1041 AB has a high proper motion (total pm of $0.260''$/yr in the direction 84°, ESA 1997), probably M-type (π_{Hip} = 33.53 ± 5.29 mas). There is no differential proper motion known.

HIP 9867: GJ 84.2 AB, also BD +44°423 (not BD +44°422), is a high proper motion (pm of $0.510''$/yr in the direction 148° (van Altena et al. 1995)) and a possible EA variable star (=V 374 And) (π_{tr} = 53.5 ± 5.2 mas). Component B is in the field but was at first not identified (this component is mentioned in the CCDM but not in the NLTT catalogue). GJ 84.2 AB (Wor 1) is evidently an optical pair. Though they are background stars, two ”components” (B?, E') were also measured. We think that background star B? probably corresponds to component B (located at (307°,$4.4''$) in 1959). Note that another recent position of component B? has also been attributed to component B (Mason et al. 2001). The relative position is concordant with a change in the position of component A over a period of 42 years. The relative position of component C is also concordant. The Hipparcos stochastic solution was rejected because it had a ”cosmic error” greater than 100 mas (ESA 1997).

Unresolved system HIP 12781: GJ 109 (=LHS 1439), also the flare star VX Ari, has a huge proper motion (total pm of $0.924''$/yr in the direction 114°(van Altena et al. 1995) and π_{Hip} = 127.3 ± 4.2 mas). It is included in the Double and Multiple Systems Annex with a variable component (DMSA/V, Part V which contains the VIM solutions for objects where the duplicity has been inferred by a photocentric motion caused by the variability of one of the components (i.e., Variability Induced Movers))(ESA 1997). We report no detection of an additional component with a separation above $1.7''$ ($1.5''$ for Δm < 1 mag).

HIP 15844: GJ 140 AB has a high proper motion (pm of $0.253''$/yr in the direction 121°, ESA 1997), the binary motion is confirmed (π_{Hip} = 50.54 ± 4.66 mas) (Paper II). Component C was not in the field (=NLTT 10808 at (118.2°,$99.5''$)), but forms a common proper-motion pair with component A (Gould & Chaname 2004).

HIP 17102: Wo 9119 AB. This measurement does not agree with the Hipparcos nor with the Hipparcos ”alternative” solution. The observation is nevertheless consistent with it as the difference with the Hipparcos solution is almost exactly 1 gridstep (equal to $1.2''$)(π_{Hip} = 20.03 ± 2.14 mas).

HIP 17666: GJ 1064 AB, also a variable star with a huge proper motion (comp A: pm of $1.377''$/yr in the direction 154°, comp B: pm of $1.384''$/yr in the direction 155°, ESA 1997), shows a binary motion (π_{Hip} = 40.83 ± 2.24 mas). There is an important difference in position angle between the two observations (this work; Paper II). A note in the Hipparcos Catalogue reports ”Possibly E type. The double-star analysis indicates that it is probably the fainter (B) component which is variable.”

HIP 21088: GJ 169.1 AB has a huge proper motion (pm of $2.383''$/yr in the direction 145°; π_{tr} = 180.6 ± 0.8 mas, van Altena et al. 1995). Both measurements (this work; Paper II) agree very well. Compared to the Hipparcos double-star solution, the system shows a distinct orbital motion (M-type) in agreement with older data. It also has an ”alternative” Hipparcos solution that is less consistent. Since ΔPos is, however, close to 1 gridstep, the Hipparcos double-star solution should be treated with caution. Both components (=NLTT

13373 and 13375) form a common proper-motion binary (Luyten 1979).

HIP 22715: GJ 2035 AB has a high proper motion (pm of 0.197″/yr in the direction 131°, ESA 1997). The Hipparcos Catalogue gives no double-star solution (π_{Hip} = 37.09 ± 1.37 mas). The proper motion applied over a period of 100 years does not explain the relatively small value of ΔPos of 1.4" (we would expect a 10-fold increase if it were an optical binary and the change in relative position was entirely caused by the difference in proper motion between the companions). Orbital motion is possibly detected with a rate in position angle of about 0.2°/yr.

Unresolved system HIP 28368: NN 3371 A has a high proper motion (pm of 0.253″/yr in the direction 177° (ESA 1997). The star was first treated as a double in the Hipparcos Catalogue (DMSA/X), but later on reprocessed as a single star ($\pi_{Hip} = 74.17 \pm 1.82$ mas). No new component at a separation above 1.7″ was found in the vicinity. Component B, situated at (119.6°, 161.2″), was not in the field of view centred on the primary.

HIP 29316: GJ 228 AB has a huge proper motion (pm of 0.970″/yr in the direction 176° and π_{tr} = 97.9 ± 3.9 mas, van Altena et al. 1995), definitely M-type (orbital) motion. There is a notable difference in angular separation with the Hipparcos double-star solution.

HIP 31635: GJ 239 A has a huge proper motion (pm of 0.844″/yr in the direction 293°, ESA 1997), definitely with L-type motion due to the large differential proper motion between the "components". It furthermore has no Hipparcos double-star solution (π_{Hip} = 101.59 ± 2.35 mas).

HIP 34222: GJ 265 A has a significant proper motion (pm of 0.122″/yr in the direction 205°, van Altena et al. 1995), definitely L-type motion based on our measurements obtained at two different epochs. It has no Hipparcos double-star solution (π_{Hip} = 41.63 ± 2.16 mas).

HIP 39721: Wo 9251 AB has a significant proper motion (pm of 0.136″/yr in the direction 181°, van Altena et al. 1995), possibly M-type (π_{Hip} = 24.85 ± 3.92 mas). There is a notable difference in angular separation with the Hipparcos double-star solution.

HIP 39896: GJ 1108 AB (pm of 0.196″/yr in the direction 195° (van Altena et al. 1995)) has a wrong Hipparcos double-star solution (π_{Hip} = 48.26 ± 3.16 mas). Our two measurements are, however, consistent with the older CCDM data at a separation of 13″. It is also the variable star FP Cnc.

HIP 41824: GJ 2069 AB has a significant proper motion (pm of 0.246″/yr in the direction 249° and π_{Hip} = 78.05 ± 5.69 mas, ESA 1997). It has no Hipparcos double-star solution (but is in DMSA/V). Component A is the variable star CU Cnc. Compared to the older data, the configuration is almost similar. Both components (=NLTT 19685 and 19684) form a common proper-motion binary (Luyten 1979). This system is actually quintuple with three recently resolved new close components (Beuzit et al. 2004).

HIP 43422: GL 323 AB has a significant proper motion (pm of 0.146″/yr in the direction 271° and π_{Hip} = 31.24 ± 19.30 mas, ESA 1997). It has a Hipparcos stochastic solution only (DMSA/X). It may present orbital motion.

HIP 44295: GJ 1120 AB is a nearby system with a high proper motion (pm of 0.343″/yr in the direction 201° (van Altena et al. 1995) and π_{Hip} = 54.57 ± 3.21 mas). A clear binary motion was detected. From a comparison of our two measurements and the Hipparcos double-star solution, we obtain a decrease of 0.2°/yr in position angle, fully consistent with the rate of change detected by Hipparcos.

HIP 92836: GJ 734 AB is a nearby system with a significant proper motion (pm of 0.120″/yr in the direction 95° and π_{tr} = 61.5 ± 7.6 mas, van Altena et al. 1995). Orbital motion is possibly detected. One component is variable (V1436 Aql). The Hipparcos stochastic solution was rejected because it had a cosmic error greater than 100 mas (ESA 1997). It was reprocessed as a single star later on (pm of 0.120″/yr in the direction 9° and π_{Hip} = 50.30 ± 2.70 mas).

HIP 95071: GL 754.1 BA is a nearby system with a significant proper motion (pm of 0.199″/yr in the direction 198° and π_{tr} = 99.2 ± 2.5 mas, van Altena et al. 1995). Component B (= NLTT 47693) is variable (NSV 11920). It has a Hipparcos stochastic solution only (DMSA/X) (π_{Hip} = 89.08 ± 7.16 mas). Orbital motion is clearly detected between components B and Q. There is a fainter common proper-motion companion showing an almost fixed configuration over more than a century (comp A = NLTT 47691) (Gould & Chaname).

HIP 97237: GL 766 AB has a huge proper motion (total pm of 1.226″/yr in the direction 181° and π_{tr} = 94.7 ± 4.4 mas (van Altena et al. 1995)). The orbital motion with respect to 40 years ago is clearly detected with a rate of change of 0.5°/yr in position angle. The Hipparcos stochastic solution was rejected because it had a cosmic error greater than 100 mas (ESA 1997). Two orbits exist for this binary (Kui 95) in the literature. From the comparison in Table 7, only the orbit by Söderhjelm 1999 (P_{orb}= 228 yr) is reliable (ΔPos = 0.1″).

HIP 101150: Wo 9697 AB is a nearby system with a significant proper motion (pm of 0.195″/yr in the direction 228° (van Altena et al. 1995) and π_{Hip} = 43.24 ± 4.37 mas). We were not able to resolve the orbiting companion at a separation below 1″ (ESA 1997). The position of the known component C has shifted due to the high differential proper motion over the last 40 years (see also the different parallax attributed by van Altena et al. 1995). Another "component" (D') was measured, but it has no link with the known component D. This binary needs further monitoring using the speckle-interferometric technique.

HIP 104210: shows a distinct motion of L-type. Previous analysis of all available data (Mason et al. 2001) suggested that this is an optical pair. Using the colour difference between the components, we concluded that the secondary is a foreground star probably lying within 100 pc (Strigachev et al. 2001). The difference in relative position of about 0.7″with the Hipparcos value is entirely caused by the differential proper motion (0.089″/yr in the direction 40°) over the interval of 7.5 years (ESA 1997).

HIP 105421: is a fixed system. The errors are much smaller than those of the Hipparcos Catalogue.

HIP 108888: is most probably a fixed system. Component A is the variable star V394 Lac. This measurement does not agree with the Hipparcos double-star solution. However, the difference in relative position is very probably due to a gridstep ambiguity affecting the determination of ρ_{Hip}.

HIP 108892: $\Delta\rho$ is a bit large for a fixed system (though only at the $2\sigma_{Hip}$-level). Our two observations do concord in angular separation, but not in position angle. One component is the pulsating variable star V378 Lac. In view of the overall consistency with the old CCDM relative position however, it probably is a fixed system.

HIP 110326: shows a distinct motion of L-type. There is a difference in relative position of about 0.4″ with the Hipparcos value (ESA 1997). It is most probably an optical pair whose components are moving apart at the relative speed of about 0.06-0.07″/yr.

HIP 110640: GL 857.1 AB has a significant proper motion (pm of 0.200″/yr in the direction 244° (van Altena et al. 1995) and π_{Hip} = 46.74 ± 1.66 mas). The orbital motion was described in Paper II. The position of component C has shifted in agreement with the high differential proper motion over more than one century. Our differential photometric data, however, indicates that "component" C is about 1 mag fainter than expected.

HIP 111279: is probably a fixed system. Component A is HIP 111277 for which the Hipparcos stochastic solution was rejected because it had a cosmic error greater than 100 mas (ESA 1997). The difference with the double-star solution proposed by Hipparcos (DMSA/C) approximates 1 gridstep. Our measurements agree very well with the older CCDM data.

HIP 113411: is perhaps a fixed system. Our observation does not agree with the Hipparcos solution even though this target has insignificant proper motion. The accuracy of our measurement is not very high, therefore an extra observation is needed to confirm whether some kind of relative motion is present or not.

HIP 113437: has a significant proper motion (pm of 0.096″/yr in the direction 74° and π_{Hip} = 8.19 ± 1.52 mas). Orbital motion has probably been detected since $\Delta\theta$ is important.

HD 23713: Cou 80 AB has an intermediate proper motion (pm of 0.041″/yr in the direction 166° and π_{tr} = 45.0 ± 15.0 mas, van Altena et al. 1995). The comparison with older CCDM data indicates orbital motion.

GJ 1047 AB: (=NLTT 7710) has a huge proper motion (pm of 0.919″/yr in the direction 128° and π_{tr} = 46.2 ± 3.6 mas). Component C (=NLTT 7708) shares the same proper motion (van Altena et al. 1995).

GJ 1103 AB: has a high proper motion (pm of 0.766″/yr in the direction 161° and π_{tr} = 114.0 ± 3.3 mas, van Altena et al. 1995). Component B (=NLTT 18546) formerly situated at (78.0°, 3.0″) forms a common proper-motion pair with component A (=NLTT 18545) (Luyten 1979), but was not detected (with $\Delta m_R \approx 2.5$ mag). The other "components" (C', D', E') have no physical link with the binary system.

GJ 1245 AB: has a high proper motion (pm of 0.731″/yr in the direction 143° and π_{tr} = 220.2 ± 1.0 mas, van Altena et al. 1995) and shows a clear orbital motion. Component B (=NLTT 48414) forms a common proper-motion pair with component A (=NLTT 48415) (Luyten 1979) and shows a slight change in position angle since 1997. There is a low mass companion (estimated to $0.1M_\odot$) close to GJ 1245 A (Gliese & Jahreiss 1991).

Table 4. Astrometry of the observed stars

Identifier	Cp	Epoch (*Bessel yr*)	N_frames	ρ ($''$)	$\sigma(\rho)$ ($''$)	θ ($^\circ$)	$\sigma(\theta)$ ($^\circ$)	Telesc.[1]	Remark/ Other identifier
HIP 473	B	2001.8583	24	6.079	0.001	178.49	0.01	2	GJ 4 AB
HIP 473	C’	2001.8583	23	9.628	0.006	11.66	0.02	2	Not a true cmp
HIP 473	E	2001.8583	23	54.265	0.007	352.04	0.01	2	
HIP 1397	B	1998.7948	26	8.368	0.005	221.67	0.03	2	
HIP 1860	B	2001.8611	58	11.178	0.004	58.13	0.03	2	GJ 1010 AB (DMSA/X)
HIP 3589	B	1999.7727	12	3.10	0.07	83.3	1.4	0.6	
HIP 3589	C	1999.7727	13	43.10	0.03	94.2	0.1	0.6	
HIP 3589	D’	1999.7727	13	17.15	0.07	70.8	0.1	0.6	Not a true cmp
HIP 4258	B	2001.8584	24	6.488	0.001	66.52	0.01	2	GJ 1023 AB
HIP 7495	B	2001.8638	55	1.859	0.003	303.84	0.10	2	
HIP 7495	C	2001.8638	55	13.645	0.002	300.14	0.01	2	New cmp
HIP 8414	B	2001.8642	0	-	-	-	-	2	B not detected
HIP 8414	C	2001.8642	2	53.172	0.024	322.72	0.01	2	
HIP 9275	B	2000.8238	40	3.926	0.003	54.57	0.07	2	GJ 1041 AB
HIP 9488	B	2001.8642	24	17.767	0.007	11.15	0.01	2	Wo 9067 AB
HIP 9867	B?	2000.8267	52	25.351	0.003	323.51	0.01	2	Probably B, previously ρ=4.4”
HIP 9867	C	2000.8267	52	9.996	0.006	230.89	0.02	2	A=GJ 84.2
HIP 9867	E’	2000.8267	52	42.804	0.003	287.73	0.01	2	Not a true cmp
HIP 10023	B	1998.7948	5	6.199	0.005	254.53	0.01	2	
HIP 11390	B	1999.7728	13	74.00	0.03	31.7	0.1	0.6	A=VW Ari
HIP 11390	C	1999.7728	13	62.18	0.02	155.1	0.1	0.6	
HIP 11511	B	1998.8063	22	15.63	0.02	214.6	0.1	0.6	A=HIP 11510
HIP 11511	C	1998.8063	14	53.40	0.01	291.1	0.1	0.6	New cmp
HIP 11572	B	1998.7948	21	5.865	0.003	231.18	0.02	2	C not measured
HIP 12781	-	2000.8239	37	-	-	-	-	2	GJ 109 (DMSA/V), no detection
HIP 15844	B	2000.8213	23	2.397	0.003	340.90	0.05	2	GJ 140 AB, C not in the field
HIP 17102	B	2000.8351	48	15.445	0.004	291.30	0.01	2	Wo 9119 AB
HIP 17102*	B	2004.8842	15	15.467	0.006	294.11	0.02	2	Wo 9119 AB
HIP 17666	B	2000.8267	48	7.139	0.003	51.81	0.02	2	GJ 1064 AB, B=V580 Per
HIP 21088	B	2000.8213	15	9.022	0.008	61.81	0.08	2	GJ 169.1 AB
HIP 21765	B	2000.8324	14	-	-	-	-	2	Wo 9163 AB, B not detected
HIP 22715	B	2000.8324	5	3.980	0.003	216.32	0.03	2	GJ 2035 AB
HIP 22715*	B	2004.8843	15	3.972	0.006	220.03	0.04	2	GJ 2035 AB
HIP 24220	B	1998.8095	6	7.07	0.07	299.6	0.6	0.6	
HIP 24220	C	1998.8095	30	53.74	0.01	322.5	0.1	0.6	New cmp
HIP 24220	D	1998.8095	29	35.32	0.06	234.2	0.1	0.6	New cmp
HIP 24220*	B	2004.8819	30	5.620	0.020	301.82	0.08	2	
HIP 24220*	C	2004.8819	30	53.769	0.005	322.56	0.01	2	New cmp
HIP 24220*	D	2004.8819	30	35.187	0.014	234.15	0.02	2	New cmp

Table 4. - continued

Identifier	Cp	Epoch ($Bessel\ yr$)	N_frames	ρ ($''$)	$\sigma(\rho)$ ($''$)	θ ($^\circ$)	$\sigma(\theta)$ ($^\circ$)	Telesc.^{1}	Remark/ Other identifier
HIP 28368	-	2000.8325	20	-	-	-	-	2	NN 3371 A (DMSA/X), no detection
HIP 29316	B	2000.8216	20	1.803	0.020	27.04	0.50	2	GJ 228 AB
HIP 29316	C	2000.8216	20	12.804	0.004	124.31	0.05	2	New cmp
HIP 30920	B	2000.8325	0	-	-	-	-	2	GJ 234 AB (DMSA/G), B not detected
HIP 30920	C’	2000.8325	44	13.677	0.016	10.38	0.01	2	Not a true cmp
HIP 30920	D’	2000.8325	44	25.704	0.020	158.07	0.02	2	Not a true cmp
HIP 31635	C’	2000.8298	50	12.827	0.001	111.65	0.02	2	Not a true cmp
HIP 31635	D’	2000.8298	48	19.365	0.003	205.88	0.01	2	Not a true cmp
HIP 31635	B	2000.8298	47	35.551	0.003	105.33	0.01	2	GJ 239 AB, previously ρ=3.7”
HIP 34222	B	2002.9104	12	13.006	0.003	316.85	0.01	2	GJ 265 AB
HIP 34222*	B	2004.8821	30	13.081	0.006	318.89	0.02	2	GJ 265 AB
HIP 34222	C’	2004.8821	30	74.134	0.007	125.43	0.01	2	Not a true cmp
HIP 34222	D’	2004.8821	30	81.733	0.014	145.38	0.01	2	Not a true cmp
HIP 34222	E’	2004.8821	30	97.571	0.012	204.77	0.01	2	Not a true cmp
HIP 34222	F’	2004.8821	30	95.613	0.018	218.56	0.01	2	Not a true cmp
HIP 39721	B	2004.8844	15	5.042	0.001	240.10	0.01	2	Wo 9251 AB
HIP 39896	B	2002.9103	12	13.710	0.004	239.31	0.01	2	GJ 1108 AB, A=FP Cnc
HIP 39896*	B	2004.8843	15	13.750	0.002	240.32	0.02	2	GJ 1108 AB, A=FP Cnc
HIP 41824	B	2000.8353	18	10.149	0.004	344.76	0.01	2	GJ 2069 AB (DMSA/V)
HIP 41824	C	2000.8353	18	21.518	0.021	304.90	0.01	2	New cmp; A=CU Cnc
HIP 43422	B	2002.9106	12	1.717	0.001	153.07	0.04	2	GJ 323 AB (DMSA/X)
HIP 44295	B	2002.9104	12	5.119	0.002	179.87	0.02	2	GJ 1120 AB
HIP 44295*	B	2004.8845	15	5.100	0.003	180.80	0.01	2	GJ 1120 AB
HIP 54658	B	2002.9105	12	3.736	0.001	79.56	0.01	2	
HIP 67422	B	2000.4212	27	3.30	0.01	170.7	0.1	0.6	
HIP 72659	B	2000.4211	27	6.72	0.01	314.2	0.1	0.6	GJ 566 AB
HIP 79607	B	2000.4213	27	6.96	0.01	232.8	0.1	0.6	
HIP 88601	B	2000.4214	27	3.73	0.04	145.6	0.6	0.6	
HIP 92836	B	2001.8637	48	4.021	0.007	32.92	0.02	2	GJ 734 AB
HIP 95071	BQ	2000.8343	19	5.030	0.015	246.57	0.14	2	GJ 754.1 B (DMSA/X)
HIP 95071	C	2000.8343	19	19.961	0.008	312.22	0.06	2	New cmp
HIP 95071	BA	2000.8343	19	27.152	0.005	123.26	0.11	2	GJ 754.1 BA
HIP 95593	B	1998.7918	9	5.599	0.014	84.80	0.10	2	
HIP 95593	C	1998.7918	9	59.331	0.016	223.96	0.02	2	New cmp
HIP 96019	CD	1998.7919	7	5.875	0.003	50.36	0.04	2	
HIP 96019	CE	1998.7919	7	31.654	0.014	72.16	0.01	2	
HIP 96019	CA	1998.7919	7	52.491	0.019	67.50	0.01	2	AB=HIP 96025
HIP 96019	CB	1998.7919	7	56.500	0.074	64.16	0.10	2	AB=HIP 96025
HIP 97237	B	2000.8342	19	1.418	0.006	46.98	0.21	2	GJ 766, Kui 95
HIP 97237	C	2000.8342	19	14.848	0.008	36.51	0.01	2	New cmp

Table 4. - continued

Identifier	Cp	Epoch (*Bessel yr*)	N_frames	ρ ($''$)	$\sigma(\rho)$ ($''$)	θ ($^\circ$)	$\sigma(\theta)$ ($^\circ$)	Telesc.[1]	Remark/ Other identifier
HIP 101150	B	2000.8341	0	-	-	-	-	2	Wo 9697 AB, B not detected
HIP 101150	C	2000.8341	20	10.310	0.004	298.38	0.02	2	
HIP 101150	D'	2000.8341	20	46.550	0.004	247.52	0.01	2	Not a true cmp
HIP 102518	B	1998.7849	20	6.372	0.016	37.55	0.07	2	
HIP 103822	B	1999.7723	23	18.91	0.01	299.2	0.1	0.6	
HIP 103822	C	1999.7723	23	26.60	0.02	248.4	0.1	0.6	
HIP 104210	B	1998.7946	5	3.510	0.017	30.58	0.13	2	
HIP 104210	C	1998.7946	5	57.918	0.016	150.20	0.01	2	
HIP 104210*	C	1999.7750	8	58.59	0.02	150.8	0.1	0.6	
HIP 104210	D'	1998.7946	5	30.689	0.022	9.52	0.04	2	Not a true cmp
HIP 104837	B	1998.8054	7	3.91	0.20	254.3	1.1	0.6	
HIP 105421	B	1998.7945	4	5.325	0.009	307.46	0.03	2	
HIP 105421*	B	2001.8608	24	5.307	0.002	303.15	0.02	2	
HIP 105747	B	1998.8087	0	-	-	-	-	0.6	B not detected
HIP 105747	C	1998.8087	9	26.51	0.01	241.4	0.1	0.6	
HIP 107554	B	1998.7945	6	3.279	0.015	201.56	0.14	2	
HIP 108888	B	1998.8059	5	7.32	0.13	188.6	0.3	0.6	V394 Lac
HIP 108888	C	1998.8059	10	24.41	0.02	315.6	0.1	0.6	New cmp
HIP 108892	B	1998.7946	1	8.619	0.001	131.58	0.01	2	
HIP 108892*	B	2001.8610	36	8.592	0.006	127.27	0.02	2	V378 Lac
HIP 108892	C	2001.8610	36	57.513	0.006	39.97	0.01	2	New cmp
HIP 110326	B	1998.7946	10	13.012	0.008	46.93	0.02	2	
HIP 110640	B	2001.8582	55	2.103	0.009	220.94	0.27	2	GJ 857.1 AB
HIP 110640	C	2001.8582	55	71.557	0.007	47.39	0.01	2	
HIP 111172	BC	1998.7945	9	3.728	0.007	31.90	0.07	2	
HIP 111172	BD	1998.7945	9	16.864	0.006	116.06	0.02	2	
HIP 111172	BE	1998.7945	9	35.488	0.013	78.63	0.02	2	New cmp
HIP 111172*	BC	1999.7751	12	3.75	0.01	32.2	0.2	0.6	
HIP 111172*	BD	1999.7751	12	16.94	0.01	115.9	0.1	0.6	
HIP 111172*	BE	1999.7751	12	35.48	0.02	78.3	0.1	0.6	New cmp
HIP 111172	BF	1999.7751	8	70.25	0.04	65.2	0.1	0.6	New cmp
HIP 111279	B	1998.8088	15	21.94	0.01	218.7	0.1	0.6	A=HIP 111277
HIP 113017	B	1998.7947	16	7.755	0.003	329.10	0.02	2	
HIP 113411	B	1998.8061	13	9.28	0.05	97.7	0.2	0.6	
HIP 113437	B	2001.8610	24	1.515	0.001	252.96	0.09	2	
HIP 113876	B	1998.7947	21	2.689	0.007	172.66	0.07	2	
HIP 113876	C	1998.7947	21	47.829	0.013	234.21	0.01	2	New cmp

Table 4. - continued

Identifier	Cp	Epoch (*Bessel yr*)	N_frames	ρ ($''$)	$\sigma(\rho)$ ($''$)	θ ($^\circ$)	$\sigma(\theta)$ ($^\circ$)	Telesc.^{1}	Remark/ Other identifier
HIP 117365	B	1998.7947	9	3.464	0.002	176.88	0.03	2	
HIP 117390	B	1998.8090	15	28.51	0.01	220.2	0.1	0.6	
GJ 1047	B	2000.8321	0	-	-	-	-	2	B not detected
GJ 1047	C	2000.8321	24	31.025	0.004	233.25	0.04	2	
GJ 1047	D	2000.8321	24	47.486	0.011	9.64	0.01	2	New cmp
GJ 1103	B	2000.8326	0	-	-	-	-	2	B not detected
GJ 1103	C'	2000.8326	18	27.855	0.031	176.73	0.01	2	Not a true cmp
GJ 1103	D'	2000.8326	18	43.361	0.007	243.98	0.04	2	Not a true cmp
GJ 1103	E'	2000.8326	18	49.270	0.005	254.66	0.03	2	Not a true cmp
GJ 1245	B	2000.8344	20	7.035	0.003	79.63	0.02	2	A=V 1581 Cyg
HD 23713	B	2000.8296	15	1.935	0.005	126.96	0.11	2	Wo 9132=Cou 80
HD 218587	B	1998.7947	8	3.073	0.003	146.21	0.06	2	New cmp
HD 218587*	B	2000.8238	20	3.112	0.031	143.57	0.24	2	New cmp
HD 251617	B	2000.8324	19	31.717	0.005	312.78	0.01	2	New cmp
HD 251617	C	2000.8324	19	25.085	0.002	243.03	0.01	2	New cmp
BD+24°692	B	2000.8297	19	32.111	0.011	203.98	0.01	2	New cmp
BD-0°4073	B	1998.7944	9	72.260	0.016	330.42	0.01	2	New cmp
BD-0°4073	C	1998.7944	9	78.043	0.013	77.64	0.01	2	New cmp
BD+22°3800	B	1998.7944	8	21.228	0.003	266.82	0.01	2	New cmp
SA 96 36	B	2000.8281	45	2.364	0.017	179.32	0.15	2	New cmp
SA 96 737	B	2000.8216	20	23.325	0.013	199.41	0.01	2	New cmp
SA 98 193	B	2000.8337	34	22.615	0.006	259.10	0.02	2	New cmp

* This flag in Col. 1 denotes another epoch for the same target

(^{1}) Instrumentation:
2 means 2-m telescope at NAO, Rozhen
0.6 means 60-cm telescope at AOB, Belogradchik

Table 5. Differential photometry of the observed stars

Identifier	Cp	HJD 2450000.+	ΔV	σ(ΔV)	ΔB-ΔV	σ(ΔB-ΔV)	ΔV-ΔR	σ(ΔV-ΔR)	ΔV-ΔI	σ(ΔV-ΔI)
HIP 473	B	2223.2713	0.060	0.001	-0.001	0.001	0.009	0.001	0.023	0.002
HIP 473	C’	2223.2716	4.109	0.006	-0.767	0.006	-0.536	0.013	-0.831	0.030
HIP 473	E	2223.2716	3.060	0.003	-0.840	0.003	-0.599	0.005	-1.081	0.004
HIP 1397	B	1104.3415	2.242	0.005	–	–	0.138	0.010	0.272	0.013
HIP 1860	B	2224.2923	2.864	0.002	-0.051	0.003	0.356	0.002	0.701	0.003
HIP 3589	B	1461.5280	1.514	0.106	–	–	–	–	-0.969	0.131
HIP 3589	C	1461.5279	4.539	0.016	–	–	0.010	0.016	-0.064	0.017
HIP 3589	D’	1461.5279	5.130	0.055	–	–	0.215	0.055	0.229	0.055
HIP 4258	B	2223.2938	0.430	0.001	0.035	0.001	0.018	0.001	0.033	0.001
HIP 7495	B	2225.2678	2.216	0.016	0.397	0.026	0.225	0.022	0.390	0.017
HIP 7495	C	2225.2678	4.781	0.003	0.341	0.007	0.227	0.015	0.498	0.011
HIP 9275	B	1845.4376	1.070	0.001	-0.027	0.002	0.277	0.002	0.625	0.002
HIP 9488	B	2225.4056	2.321	0.002	0.168	0.002	0.625	0.012	0.913	0.005
HIP 9867	B?	1846.4764	3.844	0.001	-0.484	0.010	-0.414	0.002	-0.722	0.004
HIP 9867	C	1846.4764	3.707	0.008	-0.089	0.011	-0.161	0.010	-0.279	0.011
HIP 9867	E’	1846.4764	1.934	0.001	-0.392	0.011	-0.394	0.002	-0.731	0.002
HIP 10023	B	1104.3527	2.201	0.005	–	–	0.176	0.005	0.352	0.005
HIP 11390	B	1461.5582	1.639	0.001	0.007	0.003	0.001	0.002	–	–
HIP 11390	C	1461.5582	5.120	0.005	0.149	0.025	0.287	0.007	–	–
HIP 11511	B	1108.5385	3.106	0.003	–	–	0.255	0.004	0.553	0.004
HIP 11572	B	1104.3647	1.724	0.003	–	–	0.264	0.007	0.573	0.031
HIP 15844	B	1844.5051	1.277	0.003	-0.049	0.007	0.250	0.008	0.539	0.014
HIP 17102	B	1849.5655	3.926	0.004	0.023	0.037	–	–	–	–
HIP 17102*	B	3328.4708	3.866	0.010	–	–	0.783	0.021	1.851	0.012
HIP 17666	B	1846.4959	0.587	0.003	0.137	0.006	0.087	0.004	0.142	0.004
HIP 21088	B	1844.5269	1.398	0.001	-1.025	0.002	-1.272	0.004	-2.480	0.008
HIP 22715	B	3328.4952	4.359	0.011	–	–	0.718	0.014	1.540	0.014
HIP 24220	B	1109.7223	4.835	0.059	–	–	–	–	–	–
HIP 24220	C	1109.7308	2.046	0.010	–	–	0.221	0.133	0.926	0.060
HIP 24220	D	1109.7305	4.463	0.021	–	–	-0.172	0.152	0.289	0.023
HIP 24220*	B	3327.6271	3.344	0.035	–	–	0.071	0.039	0.126	0.039
HIP 24220*	C	3327.6271	1.991	0.002	–	–	0.545	0.003	0.956	0.003
HIP 24220*	D	3327.6271	4.605	0.012	–	–	0.169	0.016	0.393	0.018
HIP 29316	B	1844.6290	1.629	0.059	0.023	0.067	-0.056	0.062	0.154	0.066
HIP 29316	C	1844.6290	4.450	0.007	-0.759	0.008	-0.834	0.008	-1.521	0.021
HIP 30920	C’	1848.6091	3.857	0.002	-0.064	0.004	-0.810	0.004	-1.585	0.010
HIP 30920	D’	1848.6091	3.267	0.002	-0.589	0.003	-1.093	0.006	-2.096	0.017
HIP 31635	C	1847.6097	5.327	0.003	–	–	–	–	–	–
HIP 31635	D	1847.6098	5.694	0.005	–	–	–	–	–	–
HIP 31635	E	1847.6097	4.726	0.005	–	–	–	–	–	–

Table 5. - continued

Identifier	Cp	HJD 2450000.+	ΔV	$\sigma(\Delta V)$	ΔB-ΔV	$\sigma(\Delta B-\Delta V)$	ΔV-ΔR	$\sigma(\Delta V-\Delta R)$	ΔV-ΔI	$\sigma(\Delta V-\Delta I)$
HIP 34222	B	2607.5388	4.380	0.006	-0.240	0.010	-0.270	0.008	-0.437	0.026
HIP 34222	B	3327.6817	4.410	0.009	–	–	-0.226	0.015	-0.318	0.024
HIP 34222	C	3327.6817	4.027	0.005	–	–	-0.493	0.014	-0.839	0.021
HIP 34222	D	3327.6817	4.357	0.004	–	–	-0.486	0.017	-0.842	0.048
HIP 34222	E	3327.6817	2.741	0.002	–	–	-0.436	0.006	-0.735	0.011
HIP 34222	F	3327.6817	4.627	0.005	–	–	-0.547	0.022	-0.937	0.043
HIP 39721	B	3328.5223	0.282	0.004	–	–	-0.127	0.005	-0.229	0.005
HIP 39896	B	2607.5013	2.066	0.007	0.075	0.009	0.397	0.020	0.964	0.020
HIP 39896	B	3328.5068	1.101	0.007	–	–	-0.524	0.011	-1.010	0.008
HIP 41824	B	1849.6093	1.458	0.004	-0.094	0.005	0.155	0.006	0.208	0.008
HIP 41824	C	1849.6093	3.872	0.003	-0.602	0.005	-1.013	0.008	-2.030	0.009
HIP 43422	B	2607.6096	0.305	0.003	0.042	0.009	0.052	0.014	0.114	0.004
HIP 44295	B	2607.5365	0.204	0.010	0.064	0.010	0.025	0.012	0.079	0.014
HIP 44295	B	3328.5448	0.205	0.001	–	–	0.073	0.003	0.035	0.004
HIP 54658	B	2607.5714	0.114	0.003	-0.010	0.004	0.023	0.004	0.053	0.005
HIP 67422	B	1698.3758	0.31	0.02	–	–	0.06	0.02	0.15	0.02
HIP 72659	B	1698.3392	2.24	0.01	–	–	0.32	0.01	0.60	0.02
HIP 79607	B	1698.4123	0.88	0.01	–	–	0.01	0.02	-0.06	0.01
HIP 88601	B	1698.4489	1.67	0.05	–	–	0.28	0.10	0.48	0.08
HIP 92836	B	2225.2124	3.304	0.011	0.061	0.011	0.518	0.013	1.054	0.060
HIP 95071	BQ	1849.2403	0.619	0.001	-0.161	0.004	–	–	–	–
HIP 95071	C	1849.2403	4.017	0.006	-0.239	0.008	–	–	–	–
HIP 95071	BA	1849.2403	0.242	0.006	-1.415	0.006	–	–	–	–
HIP 95593	B	1103.2554	0.368	0.018	–	–	-0.021	0.018	-0.064	0.029
HIP 95593	C	1103.2554	5.890	0.011	–	–	1.733	0.011	3.758	0.013
HIP 96019	CD	1103.2866	0.366	0.004	–	–	0.028	0.004	0.057	0.006
HIP 96019	CE	1103.2866	4.123	0.003	–	–	0.454	0.003	0.899	0.005
HIP 96019	CA	1103.2866	0.037	0.002	–	–	-0.009	0.002	-0.004	0.004
HIP 96019	CB	1103.2866	3.620	0.037	–	–	-0.031	0.037	0.048	0.095
HIP 97237	B	1849.2115	0.609	0.013	0.030	0.028	0.161	0.044	0.316	0.074
HIP 97237	C	1849.2115	3.447	0.006	0.343	0.011	-0.288	0.016	-0.638	0.034
HIP 101150	C	1849.1984	3.324	0.004	-0.673	0.006	–	–	-0.830	0.005
HIP 101150	D’	1849.1984	3.608	0.003	-0.750	0.006	–	–	-0.864	0.006
HIP 102518	B	1100.7335	3.637	0.007	–	–	0.196	0.009	0.508	0.020
HIP 103822	B	1461.3837	3.282	0.003	–	–	-0.666	0.004	-1.356	0.009
HIP 103822	C	1461.3837	7.212	0.029	–	–	1.482	0.030	3.307	0.030
HIP 104210	B	1104.2639	0.709	0.003	–	–	0.084	0.003	0.229	0.009
HIP 104210	C	1104.2639	3.089	0.028	–	–	0.804	0.028	1.742	0.030
HIP 104210*	C	1462.3546	3.463	0.004	–	–	0.755	0.008	1.693	0.006
HIP 104210	D’	1104.2639	5.222	0.034	–	–	0.301	0.034	0.510	0.039

Table 5. - continued

Identifier	Cp	HJD 2450000.+	ΔV	σ(ΔV)	ΔB-ΔV	σ(ΔB-ΔV)	ΔV-ΔR	σ(ΔV-ΔR)	ΔV-ΔI	σ(ΔV-ΔI)
HIP 104837	B	1108.2303	1.331	0.153	–	–	0.139	0.163	–	–
HIP 105421	B	2224.1943	3.919	0.002	0.738	0.005	(0.432)	(0.016)	0.766	0.004
HIP 105747	C	1109.4354	2.062	0.002	–	–	0.120	0.005	0.247	0.002
HIP 107554	B	1104.2359	2.852	0.001	–	–	0.074	0.053	0.241	0.031
HIP 108888	B	1108.3842	3.173	0.023	–	–	–	–	–	–
HIP 108892	B	1104.2690	2.960	0.001	–	–	–	–	–	–
HIP 108892*	B	2224.2363	3.118	0.110	-1.166	0.110	-0.742	0.110	-1.295	0.111
HIP 108892	C	2224.2363	3.346	0.088	-0.773	0.089	-0.582	0.089	-1.024	0.090
HIP 110326	B	1104.2870	1.766	0.014	–	–	-0.260	0.031	-0.096	0.014
HIP 110640	B	2223.2229	2.378	0.028	0.319	0.079	0.371	0.030	0.814	0.033
HIP 110640	C	2223.2229	4.277	0.003	-0.655	0.006	-0.376	0.005	-0.620	0.007
HIP 111172	BC	1104.2439	0.902	0.005	–	–	0.085	0.007	0.140	0.011
HIP 111172	BD	1104.2439	4.125	0.015	–	–	0.219	0.017	0.452	0.033
HIP 111172	BE	1104.2439	5.063	0.020	–	–	-0.011	0.029	-0.069	0.028
HIP 111172*	BC	1462.3869	0.979	0.004	–	–	-0.009	0.016	0.098	0.016
HIP 111172*	BD	1462.3869	4.042	0.006	–	–	0.173	0.011	0.516	0.014
HIP 111172*	BE	1462.3869	5.072	0.011	–	–	-0.059	0.036	-0.053	0.012
HIP 111172*	BC	1462.3833	0.946	0.041	–	–	0.031	0.101	0.116	0.077
HIP 111279	B	1109.4570	2.789	0.001	–	–	0.021	0.006	0.106	0.002
HIP 113017	B	1104.2978	2.594	0.003	–	–	0.331	0.006	0.713	0.006
HIP 113411	B	1108.4828	2.517	0.021	–	–	0.147	0.022	0.424	0.021
HIP 113437	B	2224.2609	0.355	0.011	0.043	0.014	0.019	0.024	0.051	0.013
HIP 113876	B	1104.3094	2.187	0.013	–	–	0.201	0.031	0.340	0.016
HIP 113876	C	1104.3094	5.664	0.007	–	–	0.184	0.014	0.273	0.011
HIP 117365	B	1104.3199	0.127	0.006	–	–	0.025	0.008	0.033	0.008
HIP 117390	B	1109.5318	2.087	0.002	–	–	-0.128	0.002	–	–
GJ 1047	C	1848.4714	0.809	0.011	-0.045	0.081	0.017	0.016	0.057	0.012
GJ 1047	D	1848.4714	1.972	0.191	-0.601	0.213	-0.710	0.191	-1.632	0.191
GJ 1103	C’	1848.6455	2.594	0.005	-0.489	0.008	-1.153	0.010	-2.239	0.012
GJ 1103	D’	1848.6455	4.219	0.003	-0.492	0.007	-1.096	0.012	-2.178	0.008
GJ 1103	E’	1848.6455	3.910	0.004	-0.241	0.006	-0.911	0.012	-1.839	0.008
GJ 1245	B	1849.2899	0.627	0.004	-0.077	0.002	0.141	0.004	0.152	0.004
HD 23713	B	1847.5296	1.190	0.015	0.211	0.016	0.126	0.032	0.127	0.035
HD 218587	B	1104.3270	3.076	0.013	–	–	0.364	0.014	0.574	0.032
HD 218587*	B	1845.4075	3.032	0.071	0.533	0.075	0.339	0.074	0.569	0.075
HD 251617	B	1848.5585	2.728	0.006	0.859	0.006	0.542	0.017	1.018	0.008
HD 251617	C	1848.5585	3.885	0.004	1.140	0.007	0.658	0.005	1.223	0.006
BD+24°692	B	1847.5639	3.857	0.004	0.614	0.005	–	–	–	–
BD+40°73	B	1104.2052	2.283	0.004	–	–	0.081	0.007	0.139	0.005
BD+40°73	C	1104.2052	5.404	0.008	–	–	-0.108	0.009	-0.192	0.009

Table 5. - continued

Identifier	Cp	HJD 2450000.+	ΔV	σ(ΔV)	ΔB-ΔV	σ(ΔB-ΔV)	ΔV-ΔR	σ(ΔV-ΔR)	ΔV-ΔI	σ(ΔV-ΔI)
BD+22°3800	B	1104.1939	4.244	0.003	–	–	0.167	0.004	0.336	0.006
SA 96 36	B	1846.9934	2.925	0.032	0.481	0.046	0.245	0.054	0.564	0.037
SA 96 737	B	1844.6131	0.241	0.001	-0.822	0.002	-0.488	0.003	-0.874	0.002
SA 98 193	B	1849.0464	0.566	0.012	-0.948	0.014	-0.504	0.015	-0.901	0.017

* This flag in Col. 1 denotes another epoch for the same target

Table 6. Relative position compared to the Hipparcos/CCDM data

Identifier	Cp	N_frames	Epoch	$\rho('')$	$\theta(^\circ)$	$\delta\rho('')$	$\delta\theta(^\circ)$	ΔPos($''$)	Code
HIP 473	B	24	1991.25	6.041	178.25	0.038	0.240	0.046	O (cf. Tab 7)
HIP 1397	B	26	1991.25	7.519	224.61	0.849	-2.940	0.942	L (high pm)
HIP 1860	B	58	1965	11.2	63.3	-0.022	-5.165	1.009	M (high pm; CPM)
HIP 3589	B	12	1991.25	3.802	90.3	-0.705	-6.962	0.819	L (high pm)
HIP 4258	B	24	1991.25	6.486	71.	0.002	-4.110	0.465	M (high pm; orbital?)
HIP 7495	B	55	1991.25	1.86	**309.0	-0.001	-5.164	0.168	S
HIP 8414	C	2	1878	53.4	*146.	-0.228	-3.284	3.062	S
HIP 9275	B	40	1991.25	3.798	59.4	0.128	-4.826	0.350	M (high pm)
HIP 9488	B	24	1944	17.6	14.	0.167	-2.850	0.895	S
HIP 9867	B?	52	2001	26.1	326.	-0.749	-2.487	1.344	L (high pm; probably B)
HIP 9867	C	52	2001	10.	238.	-0.004	-7.107	1.239	L (high pm)
HIP 10023	B	5	1991.25	6.173	254.4	0.026	0.130	0.030	S
HIP 11390	B	13	1875	73.8	31.	0.200	0.700	0.925	S
HIP 11390	C	13	1898	62.3	155.	-0.120	0.100	0.162	S
HIP 11511	B	22	1991.25	15.74	215.0	-0.110	-0.406	0.156	S
HIP 11572	B	21	1991.25	5.814	230.9	0.051	0.280	0.058	S
HIP 15844	B	23	1991.25	2.247	347.1	0.150	-6.195	0.292	M (high pm; Pap II)
HIP 17102*	B	15	1991.25	14.2	294.	1.267	0.112	1.268	S ?
HIP 17666	B	48	1991.25	7.307	54.17	-0.168	-2.356	0.341	M (high pm; CPM; Pap II)
HIP 21088	B	15	1991.25	8.350	69.4	0.672	-7.593	1.331	M (high pm; CPM; Pap II)
HIP 22715	B	15	1901	4.4	201.	-0.428	19.032	1.447	M (orbital ?)
HIP 24220	B	30	1991.25	5.656	301.7	-0.036	0.120	0.038	S
HIP 29316	B	20	1991.25	2.537	25.	-0.734	2.039	0.738	M (high pm; binary)
HIP 31635	B	47	1962	3.7	77.	31.851	28.330	32.342	L (high pm)
HIP 34222*	B	30	1959	12.1	299.	0.981	19.892	4.455	L (high dm)
HIP 39721	B	15	1991.25	5.163	239.4	-0.121	0.703	0.136	M ? (high pm)
HIP 39896*	B	15	1960	13.3	242.	0.450	-1.680	0.600	S
HIP 41824	B	18	1936	12.	348.	-1.851	-3.238	1.953	M (high pm; CPM)
HIP 43422	B	12	1965	2.6	121.	-0.883	34.070	1.521	M (high pm; orbital ?)
HIP 44295*	B	15	1991.25	5.169	183.3	-0.069	-2.498	0.234	M (high pm; binary)
HIP 54658	B	12	1991.25	3.794	79.7	-0.058	-0.140	0.059	S
HIP 92836	B	48	1946	5.2	14.	-1.179	18.925	1.911	M (high pm; orbital ?)
HIP 95071	BQ	19	1951	4.9	7.	0.330	-119.432	8.404	M (high pm; binary)
HIP 95071	BA	19	1892	27.5	310.	-0.347	-6.740	3.231	S (high pm; CPM)
HIP 95593	B	9	1991.25	5.622	85.92	-0.023	-1.120	0.112	S
HIP 96019	CD	7	1991.25	5.88	50.	-0.005	0.360	0.037	S
HIP 97237	B	19	1960	0.9	*67.	0.518	-20.022	0.650	O (cf. Tab 7)
HIP 101150	C	20	1959	15.	273.	-4.690	25.382	7.201	L (high pm)
HIP 102518	B	20	1991.25	6.412	36.5	-0.040	1.050	0.124	S

Table 6. - continued

Identifier	Cp	N_frames	Epoch	$\rho('')$	$\theta(^\circ)$	$\delta\rho('')$	$\delta\theta(^\circ)$	ΔPos$('')$	Code
HIP 103822	B	23	1991.25	18.83	299.3	0.083	-0.103	0.089	S
HIP 103822	C	23	1878	25.9	250.	0.704	-1.605	1.018	S
HIP 104210	B	5	1991.25	2.786	27.9	0.724	2.680	0.739	L
HIP 104210	C	5	1903	60.	152.	-2.082	-1.800	2.786	L
HIP 105421	B	4	1991.25	5.39	308.	-0.065	-0.540	0.082	S
HIP 105747	C	9	1991.25	26.55	241.34	-0.044	0.034	0.047	S
HIP 107554	B	6	1991.25	3.298	201.0	-0.019	0.560	0.037	S
HIP 108888	B	5	1991.25	8.531	189.6	-1.210	-1.032	1.218	S ?
HIP 108892	B	1	1991.25	8.485	131.2	0.134	0.380	0.146	S ?
HIP 108892*	B	36	1991.25	8.485	131.2	0.107	-3.925	0.595	S ?
HIP 110326	B	10	1991.25	12.589	46.10	0.423	0.830	0.462	L
HIP 110640	B	55	1991.25	1.613	228.	0.490	-7.059	0.540	O (high pm; Pap II)
HIP 110640	C	55	1895	45.5	51.	26.057	-3.613	26.304	L (high pm)
HIP 111172	BC	9	1991.25	3.682	32.2	0.046	-0.3	0.050	S
HIP 111172	BD	9	1892	16.6	118.	0.264	-1.940	0.625	S
HIP 111279	B	15	1991.25	21.351	216.3	0.593	2.431	1.093	S ?
HIP 113017	B	16	1991.25	7.766	328.8	-0.011	0.3	0.042	S
HIP 113411	B	13	1991.25	9.103	96.1	0.182	1.607	0.316	S ?
HIP 113437	B	24	1991.25	1.545	257.6	-0.030	-4.640	0.127	M (orbital ?)
HIP 113876	B	21	1991.25	2.678	172.0	0.011	0.660	0.033	S
HIP 117365	B	9	1991.25	3.446	177.	0.018	-0.120	0.019	S
HD 23713	B	15	1966	0.5	109.	1.435	17.959	1.468	M (orbital ?)
GJ 1047	C	24	1959	34.	233.	-2.975	0.248	2.978	M (high pm; CPM)
GJ 1245	B	20	1954	7.9	106.	-0.865	-26.370	3.509	M (high pm; CPM)

Epoch: 1991.25 from Hipparcos else epoch from CCDM

Code: L=optical; M=motion, O=orbital; S=stable; *=180°converted; **=alternative Hipparcos solution

* This flag in Col. 1 denotes another epoch for the same target