Speckle observations with PISCO in Calern (France): I. Astrometric measurements of visual binaries in 2015–2016

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We present relative astrometric measurements of visual binaries, made in 2015-2016 with the speckle camera PISCO at the 1-m Epsilon telescope of the C2PU facility (Observatoire de la Côte d'Azur, Calern site). Our observing list contains orbital couples as well as binaries whose motion is still uncertain. From our 1233 observations of 1173 multiple stars, we obtained 1170 new measurements with angular separations in the range $0''.1$ — $8''.2$, and an average accuracy of $0''.0078$. The mean error on the position angles is $0^\circ.54$. Most of the position angles were determined without the usual 180° ambiguity with the application of the direct vector autocorrelation technique and/or by inspection of the long integration files.

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1 Introduction

This paper presents the results of speckle observations of visual binary stars made in Calern (France) in 2015-2016 with the Pupil Interferometry Speckle camera and COronagraph (PISCO) on the 104-cm 'Epsilon' (East) telescope of the *Centre Pédagogique Planètes et Univers* (C2PU) facility (Bendjoya et al. 2012, https://www.oca.eu/fr/c2pu-accueil, Lat=43° 45' 13.2" N, Lon=06° 55' 22.7" E). This telescope is located in the Calern site of the *Côte d'Azur Observatory* (OCA, France).

The purpose of this paper is to contribute to a better knowledge of the apparent relative motion of long-period binaries so that very accurate orbits could be determined in the future and fundamental parameters such as stellar masses could be inferred from them. This papers opens a new series that will be the counterpart of the series of papers that have reported the results of observations with PISCO in *Brera Astronomical Observatory* (Merate, Italy): Scardia et al. 2005, 2006, 2007, 2008, Prieur et al. 2008, Scardia et al. 2009, Prieur et al. 2009, Scardia et al. 2010, Prieur et al. 2010, Scardia et al. 2011, Prieur et al. 2012, Scardia et al. 2013, Prieur et al. 2014, Scardia et al. 2015, Prieur et al. 2017, and Scardia et al. 2018, herein: Papers I to XVI. The focal instrument PISCO (Prieur et al., 1998) was developed at *Observatoire Midi-Pyrénées* (France) and first used at *Pic du Midi observatory* (France) from 1993 to 1998. It was moved to Merate in 2003 and installed on the INAF Zeiss telescope that was dedicated to binary star observations until the first semester of 2015. In summer 2015, PISCO was moved to the Calern observing site of the *Côte d'Azur Observatory* in France. It was mounted on the Epsilon telescope and has been operated there since then. This paper presents the first observations made in Calern in 2015-2016.

In Sect. 2, we briefly describe our observations. In Sect. 3, we present and discuss the astrometric measurements. We also compare those measurements with the ephemerides computed with the published orbital elements, when available.

2 Observations

The observations were carried out with the Epsilon telescope in the Calern observing site (Fig.1) with the PISCO speckle camera equipped with the Andor iXon Ultra 897 back-illuminated EMCCD detector. We present in detail this detector in Section 2.3. PISCO was mounted on the side of the telescope (Fig.2) which allowed other experiments to be installed at the Cassegrain focus, when the telescope time was allocated to other observers. The procedure we used for observing binary stars with PISCO in Calern was the same as the one used in Merate (see Paper VI). For each observation, a series of about 10,000 short-exposure frames were processed in real-time with a PC running on Microsoft Windows 7 that was used for performing real-time processing with our program `PiscoSpeck2`. This program controlled the Andor camera, displayed the images and for each elementary image computed the mean auto-correlation with Worden's (1977) method (which subtracted most of the continuum), the mean power spectrum, the integration of the individual frames, the mean restricted triple correlation frame used for the quadrant determination (Aristidi et al. 1997) and the mean direct vector autocorrelation image which provided another way of obtaining this quadrant with the method proposed by Bagnuolo et al. (1992). Each set of 10,000 elementary frames was also recorded as a FITS cube on an internal SATA disk, for archiving and further processing if needed.

Our program `PiscoSpeck2` had many parameters that could be changed by the user according to the observing conditions. We are giving here the usual values of some of those parameters. The Andor camera was used in the Electron-Multiplied mode with an exposure time of 20 ms and a cooling temperature of -85°C. Our program processed sets of 200 elementary frames of 256×256 pixels, which led to a field of $10''.8\times10''.8$ with the 20 mm eyepiece (see Table 1). To achieve real-time processing during the acquisition, the processing of one set of frames was done by one thread of our program, while another thread was acquiring the frames of the next set. Our observations required rather good seeing conditions, (i.e., FWHM seeing less than $2''$), and we added a selection of the best frames according to the seeing. Another selection criteria based on the mean value of the frame, was sometimes used to discard abnormal frames generated by the electronics. The background of each autocorrelation of index k was estimated from the cross-correlation of the frame of index k with the frame of index $k-4$. There was therefore a time delay of 80 ms between those two (uncorrelated) elementary frames, which led to a good estimation of the background (see Worden 1977) .

The scale of the eyepieces was calibrated with a grating mask placed on top of the telescope (see Fig. 1), as described in Paper III and Paper XII. This procedure allowed an absolute astrometric calibration of PISCO. The values found for the 10, 20, and 32 mm eyepieces are given in Table 1. In Calern we could use the metallic mask that was originally made for the 1-m Zeiss telescope in Merate, since the Epsilon telescope has the same diameter.

Table 1 Scale values obtained with a grating mask for the three magnifications that have been used in Table 2.

Eyepiece (mm)	scale (mas/pixel)	error (mas/pixel)
10	18.01	0.14
20	42.35	0.33
32	89.86	0.66

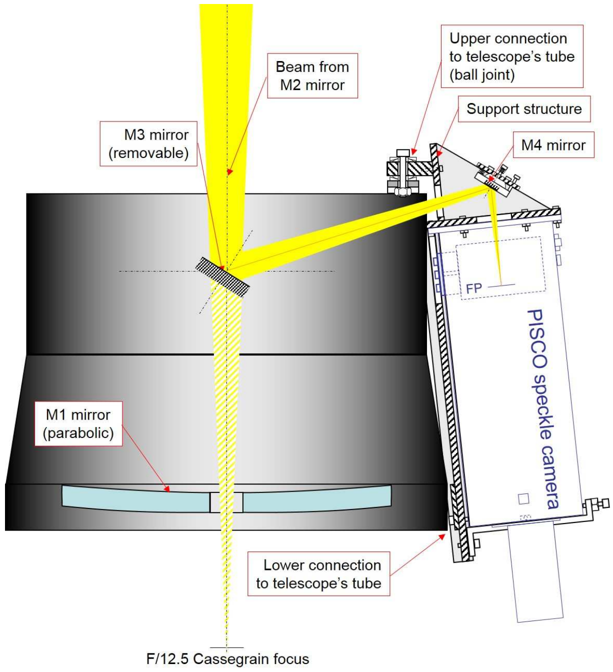

Fig. 2 PISCO was mounted on the side of the Epsilon telescope tube. The F/12.5 Cassegrain beam was deviated into PISCO through two flat mirrors M3 and M4. If needed, the M3 mirror could be removed to give access to the Cassegrain beam for other observations.

2.1 Observing list

Our observing list basically includes all the visual binaries from the Washington Double Star Catalog (Mason et al. 2019, hereafter WDS catalog) that require new measurements to improve their orbits, and that meet the technical constraints of our setup (declination range, magnitude, magnitude difference, and angular separation).

Compared to the Merate site, the new site in Calern is better, with a higher rate of observable nights (about twice as much). During the night, the artificial lighting is considerably reduced in Calern and the sky background is much darker, which allow us to observe fainter objects. The gain in air transparency is also explained by the higher altitude of Calern, which is 1270 m above the sea level, compared to the altitude of 320 m of Merate.

The EMCCD detector that we now use with PISCO is more sensitive than the ICCD detector we used in Merate. This leads to a substantial gain in sensitivity

Fig. 1 Photographs of PISCO mounted on the 1-m Epsilon telescope in Calern. From top to bottom and left to right: overview of the observatory (the Epsilon telescope dome is the central one), upper part of the telescope, grating mask fitted on top of the telescope during scale calibration, telescope before the installation of the instrument (May 2015), PISCO mounted on the side of the telescope tube, EMCCD Andor iXon Ultra 897 camera attached to PISCO.

and the limiting magnitude is now around V=13 mag (see Fig. 4b), which is about three magnitudes fainter than in Merate. The equatorial yoke mount of the Epsilon telescope has unfortunately some constraints that were not present with the equatorial German mount of the Zeiss telescope. For instance, objects close to the Northern pole with a declination north of 60° cannot be observed with the Epsilon telescope (see Fig. 3). The atmospheric seeing becomes seriously degraded at low heights and generally prevents observations of objects with declinations south of −5° (although objects with smaller declination, down to −10° have been observed in good seeing conditions).

Our sample consists of visual binaries with the following characteristics, that are linked to instrumental or atmospheric limitations:

– declination north of −5° and south of 60°,
– brighter than 13th magnitude in V,

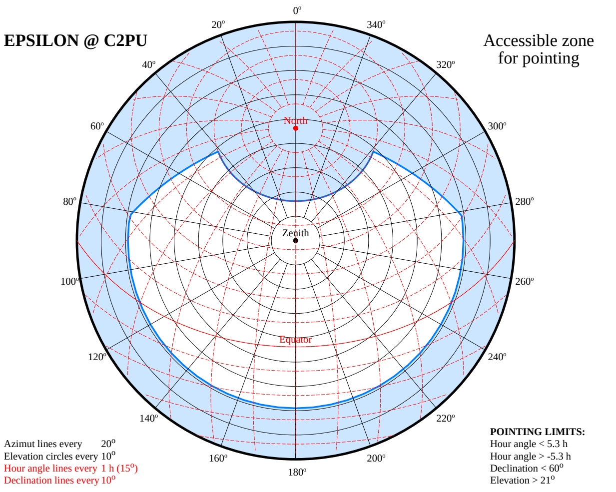

Fig. 3 Azimuthal boundaries of the targets imposed by the equatorial yoke mount of the Epsilon telescope.

– magnitude difference less than 4,
– angular separation smaller than $\approx 8''$.
– angular separation larger than $0.''13$.

The last two limitations were chosen so that the binary systems fit inside the field of the camera and that their separation is larger than the diffraction limit of the telescope. The closest separation that can be measured with PISCO in Calern is of the order of this diffraction limit, which is $\rho_d = \lambda/D = 0''.13$ with the R filter (i.e. $\lambda = 650$ nm) and the Epsilon telescope whose diameter is $D = 1.04$ m. Our targets are taken from the WDS catalog data base when imposing the limitations given above. Our sample thus contains of a few thousands objects.

2.2 Statistics on our observations made in 2015-2016

The distribution of the angular separations measured in this paper is displayed in Fig. 4a and shows a maximum for $\rho \approx 0''.6$. The largest separation of $8''.2$ was obtained for 03579+5142 SCA176BC. The smallest separation was measured for 15009+5745 MLR 602 with $\rho = 0''.130$, which is very close to the diffraction limit of $\rho_d = 0''.13$ for the Epsilon telescope and the R filter.

The distribution of the apparent magnitudes m_V and of the difference of magnitudes Δm_V between the two components are plotted in Figs. 4b and 4c, respectively. The telescope aperture and detector sensitivity led to a limiting magnitude of $m_V \approx 13$ (Fig. 4b) and a maximum Δm_V for speckle measurements of about 3.7 (Fig. 4c).

Using the Hipparcos parallaxes, we were able to construct the HR diagram of those binaries, which is displayed in Fig. 5. Out of the 491 objects whose parallax was measured by Hipparcos, we only plotted the 378 objects for which the relative uncertainty on the Hipparcos parallax was smaller than 50%.

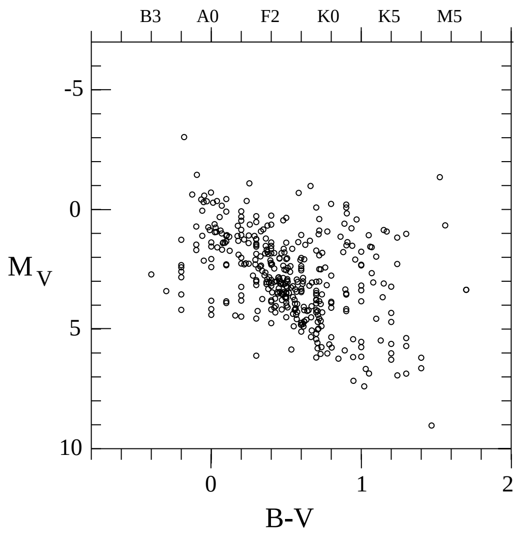

Fig. 5 HR diagram of the binaries measured in Table 2, for which the Hipparcos parallaxes have a relative error smaller than 50% (i.e., 378 objects).

2.3 The EMCCD Andor iXon Ultra 897 camera

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The camera we have used for our observations is a back-illuminated Andor iXon Ultra 897, with a sensor format of 512×512 and 16×16 μm square pixels. It uses the Electron Multiplying CCD ultra-sensitive technology, which is well adapted to very low light intensities. Its low read-out noise allows single photon detection. The theoretical quantum efficiency of the chip is shown in Fig. 6. It is much better than the ICCD camera that we used in Merate from 2004 to 2015, whose quantum efficiency was about 6%. The corresponding gain in sensitivity is about of 15x, which corresponds to $2.5 \times log(15) \approx 3$ mag. Indeed, we experimentally confirmed this expected gain: the limiting magnitude of our instrumentation increased from V=10 in Merate to V=13 in Calern.

The Andor iXon Ultra 897 is fitted with a four-stage Peltier cooling assembly which utilizes the thermoelectric effect (TE) to rapidly cool the sensor down to the stable operating temperature. TE coolers have a cold end (in contact with the sensor) and a hot end where heat must be efficiently dissipated for effective cooling of the sensor. Although water cooling is possible with that camera and would be more effective, we use a simpler (and cheaper) system, with forced air cooling (in-built fan) which allow us to operate the sensor with a cooling temperature of −85°C. The iXon Ultra

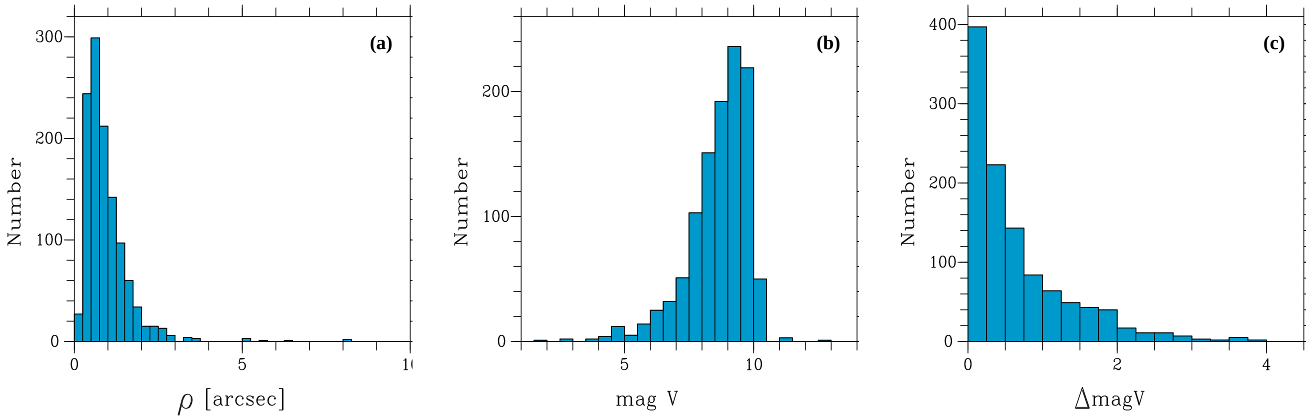

Fig. 4 Distribution of the angular separations of the 1170 measurements of Table 2 in (a), of the total visual magnitudes of the corresponding binaries in (b) and of the differences of magnitude between their two components in (c).

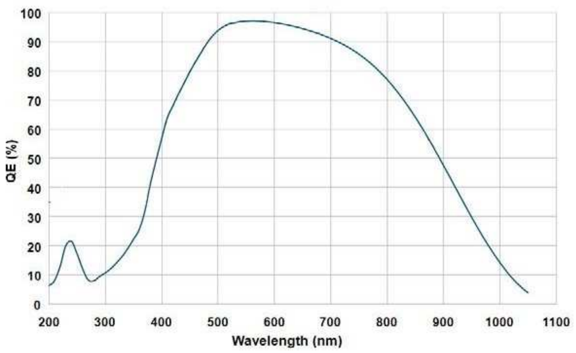

Fig. 6 Quantum efficiency of the back-illuminated EMCCD Andor iXon Ultra 897 (from the Andor user manual).

camera also contains temperature control components, which regulate the cooling of the camera and ensure that a stable temperature is maintained between and throughout measurements. We have found this regulation very effective for reaching the set point in a few minutes only, and very stable during the observations with a variation of temperature less than 0.1°C.

The sensor has a frame transfer architecture. The frame-transfer EMCCD uses a two-part sensor in which one-half of the array is used as a storage region and is protected from light by a light-tight mask. Incoming photons are allowed to fall on the uncovered portion of the array and the accumulated charge is then rapidly shifted into the masked storage region for transfer to the serial output register. While the signal is being integrated on the light-sensitive portion of the sensor, the stored charge is read out. Frame transfer devices have typically faster frame rates than full frame devices, and have the advantage of a high duty cycle i.e. the sensor is always collecting light.

Essentially, the EMCCD sensor is capable of detecting single photon events without an image intensifier, achievable by way of a unique electron multiplying structure built into the chip. Traditional CCD cameras offered high sensitivity, with readout noises in single figure $< 10e-$ but at the expense of slow readout. Hence they were often referred to as 'slow scan' cameras. The fundamental constraint came from the CCD charge amplifier. To have high speed operation the bandwidth of the charge amplifier needs to be as wide as possible. However, it is a fundamental principle that the noise scales with the bandwidth of the amplifier, hence higher speed amplifiers have higher noise. Slow scan CCD's have relatively low bandwidth and hence can only be read out at modest speeds, typically less than 1MHz. EMCCD cameras avoid this constraint by amplifying the charge signal before the charge amplifier and hence maintain unprecedented sensitivity at high speeds. By amplifying the signal the readout noise is effectively by-passed and, as such, EMCCD readout noise is no longer a limit on sensitivity (and can often be considered negligible).

We have developed a program, `PiscoSpeck2`, in C++ with the Widget graphic library that allows full control of most of the functions of this camera and performs real-time processing of the elementary frames. It has similar functionality and user-interface as the program `vcrb` that we had written for the ICCD mounted on PISCO in Merate and that we have used there for more than ten years. Although `PiscoSpeck2` was designed for the Andor iXon Ultra 897 camera which has a serial USB2 interface, our new program is generic and has been successfully tested and used with different EMCCD cameras, such as the Andor LUCA and Andor DV885 that we employ for observing binaries with the OCA 76cm-refractor (see Gili et al., 2014). It can also be used for processing FITS files obtained with other cameras and can be easily installed on any 64-bit

Windows PC (please contact us if you are interested in using `PiscoSpeck2`).

3 Astrometric measurements

The 1233 observations made in 2015-2016 with PISCO at Calern Observatory are presented in Table 2. They concern 1173 visual binaries or multiple objects. For each object, we report its WDS name in Col. 1, the official double star designation in Col. 2 (sequence is "discoverer-number"), and the ADS number in Col. 3 (Aitken, 1932) when available. For each observation, we then give the epoch in Besselian years (Col. 4), the filter (Col. 5), the focal length of the eyepiece used for magnifying the image (Col. 6), the angular separation ρ (Col. 7) with its error (Col. 8) in arcseconds, and the position angle θ (Col. 9) with its error (Col. 10) in degrees. In Col. 11, we report some notes and some information about the secondary peaks of the autocorrelation files (e.g. diffuse, faint or elongated) or about the power spectrum (NF: no fringes). The mention "artifacts" was used when some spurious noise horizontal pattern was present on the autocorrelations. This was caused by the detector noise at low levels.

We had to face some technical problems in 2015, when setting up the new configuration of PISCO in Calern (e.g. when focusing the eyepieces). This explains why some measurements in separation are missing in Table 2 for some of the first measurements made in 2015, because they appeared to be unreliable. Those problems slightly changed the magnification scale only, and had no implications on the position angle measurements.

For the systems with a known orbit, the $(O - C)$ (Observed minus Computed) residuals of the ρ and θ measurements are displayed in Cols. 13 and 14, respectively. The corresponding authors are given in Col. 12, using the bibliographic style of the "Sixth Catalog of Orbits of Visual Binary Stars" (Hartkopf & Mason, 2019, hereafter OC6).

When not explicitly specified, the measurements refer to the AB components of those systems. We precise 'AB' when that the system is multiple and known to have other components. In Col. 14, an exponent ^{Q} is appended to the values for which a quadrant inconsistency was found between our measures and the positions derived from the orbital elements published for this object.

The characteristics of the R and RL filters used for obtaining those measurements are given in Table 2 of Paper XII. Some objects were observed without any filter because they were too faint. This is indicated with W (for "white" light) in the filter column (Col. 5 of Table 2). In that case, the bandpass and central wavelength correspond to that of the EMCCD Andor detector (see Fig 6).

As for the other papers of the Merate observations series, position measurements were obtained by an interactive processing of the autocorrelation files computed in real time during the observations. This processing led to a series of measurements with different background estimates and simulated noise, from which we derived the mean values and the standard deviation of those multiple measurements (see Paper III for more details). The final measures and their errors are displayed in Table 2. The average error values of the measurements reported in this table are $\langle\sigma_\rho\rangle = 0''.0078 \pm 0''.0049$ and $\langle\sigma_\theta\rangle = 0^\circ.54 \pm 1^\circ.41$, for the angular separations and the position angles, respectively.

3.1 Quadrant determination

As our astrometric measurements were obtained from the *symmetric* autocorrelation files, the θ values first presented a 180° ambiguity. To resolve this ambiguity and determine the quadrant containing the companion, we used the "direct vector autocorrelation" (DVA) method proposed by Bagnuolo et al (1992) which is now implemented in our new real-time processing software. The other method which is also implemented in our software is the "restricted triple correlation" (RTC) of Aristidi et al. (1997), which was widely used in Merate with our old Intensified CCD camera. In this paper we prefer not using it, since the RTC often led to wrong results with that data, even for wide binaries. The reason may be due to low light levels and photon noise effects. Conversely, we used the DVA method that led to better results with the observational data presented here. Of course, for the couples with the largest separations, a straightforward quadrant determination was done when the companions could be directly spotted on the long integration files.

As a result, in Table 2, we have been able to give the unambiguous (i.e. "absolute") position angles of 454 out of 1170 measurements, i.e. 39% of the total. They are marked with an asterisk in Col 9. When our quadrant determination procedure failed, the angular measurement was reduced to the quadrant reported in the WDS catalog, which is extracted from the Fourth Catalog of Interferometric Measurements of Binary Stars (Hartkopf et al. 2018, hereafter IC4). For HU1267, our two observations of April 20th and May 2nd 2016, clearly show that the brightest component was not in the same quadrant (see Fig. 7), which may be an indication that one of the components is a variable star.

In Table 3, we display some information about the objects for which our "absolute" θ values are not consistent with the values tabulated in the WDS. In Col. 3, we indicate the quadrant (Q) that we obtained from our observations, using the usual convention of numbering it from 1 to 4 to indicate the North-East, South-East, South-West and North-West quadrants, respectively. In

Table 2 Table of speckle measurements and O-C residuals with published orbits (begin.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
00013+3351	TDS1248	–	2016.715	W	20	–	–	–	–	Unres.			
00013+3351	TDS1248	–	2016.677	W	20	–	–	–	–	Unres.			
00014+3937	HLD60	17178	2015.940	R	20	1.331	0.015	166.0*	0.3		Hrt2011a	0.03	−1.2
00015+3044	HO208	17167	2016.035	R	20	1.108	0.006	185.6*	0.3	Elongated			
00026+5534	A1499	3	2016.854	R	20	1.560	0.008	208.4*	0.3				
00028+0208	BU281AB	9	2016.879	R	20	1.565	0.008	159.8*	0.3		Lin2015a	0.01	0.2
00029+4715	A800	10	2015.915	R	32	1.653	0.035	113.2	0.4				
00029+4715	A800	10	2015.940	R	20	1.620	0.015	113.8*	0.3	Elongated			
00037+5329	WOR30	–	2016.854	R	20	0.851	0.006	181.9*	0.5				
00039+2759	A429AB	24	2015.920	R	20	0.546	0.006	329.6	0.3				
00048+3810	BU862	34	2015.940	R	20	0.878	0.015	26.6*	0.5		Cou1986b	0.04	−1.7
00048+3810	BU862	34	2016.650	R	20	0.883	0.004	27.8	0.4		Cou1986b	0.04	−0.8
00112+3331	COU648	–	2015.920	V	20	0.425	0.008	308.2	0.6				
00112+3331	COU648	–	2015.920	R	20	0.424	0.007	308.4	0.4				
00115+2936	HO1	142	2016.704	R	20	1.259	0.010	157.9	0.3				
00134+2659	STT2AB	161	2015.915	R	20	0.431	0.025	156.3	0.6		Hrt2008	0.02	1.5
00134+2659	STT2AB	161	2015.915	R	20	0.436	0.025	156.9	0.7		Hrt2008	0.02	2.1
00149+5315	A903	186	2015.920	V	20	0.943	0.010	134.0	0.3				
00151+1907	A2202	196	2016.704	R	20	0.626	0.007	154.2	0.3	Elongated			
00187+1559	STF25AB	257	2016.704	R	20	1.052	0.005	195.5	0.4				
00209+1059	BU1093	287	2016.879	R	20	0.777	0.017	119.1*	0.8		Lin2010c	0.01	−0.5
00211+3539	HU1202	291	2016.879	R	20	1.101	0.025	195.3*	0.8	Elongated			
00220+4033	A1502	301	2016.879	R	20	0.942	0.016	245.3*	1.6				
00256+3629	HO210	344	2016.879	R	20	0.962	0.010	77.6*	0.3	Diffuse			
00297+5855	A909AB	399	2016.854	R	20	0.998	0.005	40.9*	0.3				
00335+4006	HO3	463	2016.876	R	20	0.399	0.004	141.1*	0.3		Tok2017a	0.02	−0.3
00344+1844	COU250	–	2016.876	R	20	1.305	0.007	39.0*	0.3				
00351+0209	RST5182	–	2016.876	R	20	1.415	0.007	166.9	0.3				
00357+3429	HU1011	492	2016.857	R	20	0.339	0.009	81.7	1.8	Elongated	Ole2002a	−0.08	−7.4
00364+1213	A807	506	2016.876	R	20	0.835	0.004	233.4*	0.3				
00364+5621	A913	501	2016.857	R	20	0.711	0.004	89.9	0.7				
00366+5609	A914	504	2016.718	R	20	0.453	0.004	21.0	0.7		Lin2007c	0.03	1.0
00367+3814	A1506	511	2016.718	R	20	1.223	0.006	19.9	0.3				
00378+4915	HU512	522	2016.879	R	20	0.918	0.009	168.2	0.3				
00391+5128	HU513	545	2016.718	R	20	0.987	0.005	210.7	0.3	Elongated			
00440+4658	A652	614	2016.718	R	20	0.349	0.012	163.0	0.7				
00508+3203	A922Aa,Ab	691	2016.873	R	20	0.575	0.010	335.5	0.4	Elongated	Msn2001c	0.08	−5.1
00525+1740	A2306	715	2016.721	R	20	1.395	0.007	302.1	0.3				
00542+5108	HU1018	739	2015.940	R	20	0.936	0.015	58.2	0.3				
00544+5432	A1258	741	2015.942	R	20	0.568	0.015	200.4*	0.3	Elongated			
00546+1911	STT20AB	746	2015.942	R	20	0.611	0.015	176.4	0.3	Elongated	Doc2014a	0.02	−0.6
00549+1928	A2208	756	2016.721	R	20	1.553	0.008	91.5	0.3				
00554+3040	BU500	768	2015.942	R	20	0.477	0.015	122.4	0.3				
00587+4457	A925	808	2016.876	R	20	1.099	0.005	106.8*	0.3				
01004+1803	BRT1927	–	2015.942	R	20	1.927	0.015	170.3*	0.3	Elongated			
01006+4719	MAD1	829	2015.942	R	20	0.840	0.015	0.3	0.3	Elongated	Lin2012a	0.08	1.3
01010+4830	COU2256	–	2016.726	R	20	0.575	0.008	126.5	0.3				
01014+1155	BU867	828	2015.942	R	20	0.675	0.015	351.8*	0.4	Elongated	Hrt2008	0.06	−0.7
01021+3658	TDS1731	–	2016.726	R	20	0.772	0.011	235.6	0.3	Uncertain			
01041+2635	COU351	–	2016.033	R	20	0.804	0.005	243.5*	0.3	Elongated			
01047+0029	RST4744	–	2016.726	R	20	0.423	0.009	104.3	0.5				
01055+2107	AG14	896	2016.873	R	20	0.810	0.012	309.6	0.4	Elongated	Fmr2014f	−0.03	−0.5
01070+3014	A929AB	887	2016.942	R	20	0.672	0.007	307.7*	1.0	Elongated			
01071+4744	A931	916	2016.942	R	20	–	–	–	–	Unres.			

Note: In column 9, the exponent * indicates that the position angle θ could be determined without the 180° ambiguity.

Table 3 Discrepant quadrant measures with WDS catalog. The difference of magnitude between the two components, from the Hipparcos and Tycho Catalogues (ESA, 1997) is reported in Col. 5.

WDS	Name	Q	Filter	Δm_V
01070+3014	A929AB	4	R	0.08 Tycho
01365+4336	ES1495	1	R	0.11 Tycho
01509+4037	COU1361	4	W	—
03279+4551	COU1687	2	R	0.20 Tycho
03354+3529	POP83	1	R	0.57 Tycho
03584+5645	TDS2700	3	R	0.04 Tycho
04123+0939	STT74	4	R	—
05065+4347	COU2465	3	R	0.02 Tycho
06318+2124	TDS254	2	R	0.05
10192+2034	STF1423	2	R	0.68 Tycho
10382+2636	STF1454	2	R	1.96 Tycho
11080+2659	TDS7688	1	R	0.07 Tycho
11098+1009	A2775	2	R	1.28 Tycho
11468+1500	BU602	4	R	1.82 Tycho
12093+1525	A2056	2	R	0.36 Tycho
12111+1228	HDS1719	4	R	0.08 Tycho
12120+1300	A1780	2	R	1.98 Tycho
12167+3004	AG176	1	R	0.00 Tycho
12194+1744	A2059	3	R	1.70 Hipparcos
12340+2650	COU595	1	R	0.92 Tycho
13041+5227	MLR704	3	R	0.53 Hipparcos
13222+2710	A565	3	R	0.43 Tycho
13223+2631	A566	3	R	0.92 Tycho
14122+4411	STT278	2	R	0.33 Hipparcos
14188+5934	HU1267	1-3	R	0.12 Tycho
14333+2725	A688	3	R	0.26 Tycho
15100+2807	TDS768	3	R	0.45 Tycho
15368−0438	RST4545	2	R	1.24 Hipparcos
20238+4146	COU2641	2	R	0.02 Tycho
21555+5232	STT456AB	3	R	0.68 Tycho

Col. 4 we indicate which filter we have used (W indicates the absence of filter). We report the difference of magnitude between the two components from the IC4 in Col. 5. For those objects, the small value or the uncertainty in of the magnitude difference Δm_V may account for the discrepancy. For many others, the small number of published observations may account for this discrepancy. However, since our determination is based on statistical optics, we cannot rule out some spurious results due to statistical noise.

3.2 Comparison with published ephemerides

The $(O-C)$ (Observed minus Computed) residuals of the measurements for the systems with a known orbit in Table 2 are displayed in Cols. 13 and 14 for the separation ρ and position angle θ, respectively. Those residuals were obtained with a selection of valid orbits found in the OC6 catalog. We did not always use the most recent orbits since sometimes older orbits led to equivalent or even smaller residuals.

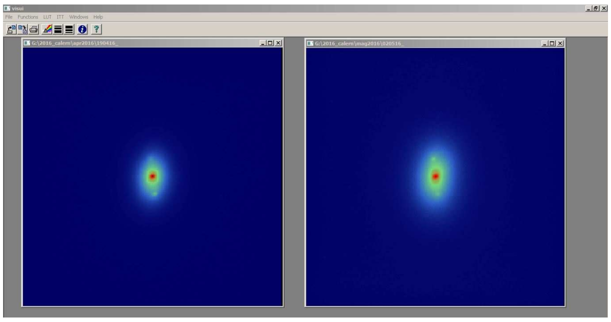

Fig. 7 The Direct Vector Autocorrelation (DVA) images of HU1267 made in April 20th (left) and May 2nd 2016 (right) show an inversion of quadrant which suggests that one of the two components is a variable star.

The $(O-C)$ residuals are plotted in Fig. 8. They have a rather large scatter which is naturally explained by the (old) age of many orbits that will need revision in the future. The mean values computed with the residuals of Table 2 are $\langle \Delta\rho_{O-C} \rangle = 0''.007 \pm 0''.05$ and $\langle \Delta\theta_{O-C} \rangle = -0^\circ.2 \pm 1^\circ.7$. The small values obtained for those offsets provide a good validation of our calibration (see Paper XII).

Let us discuss now the origin of the large residuals found in Fig. 8 for the objects (and the orbits) of A764AB (Hei1995), A1315 (Doc1984b), COU812 (Cou1999), HJ2562 (Pop1996b), and STT260 (Zir2008).

For A764AB (Hei1995), the orbit is old (with observations made before 1994) and it is badly determined (grade 5 according to the grading scale of the OC6). The last observation before our measurement which is indicated in the WDS is from 2016.

For A1315 (Doc1984b), the orbit is very old (with observations made before 1982), with a long period and was not well determined (grade 5) from visual measurements only. The last measurement reported in the WDS was made in 1997 and is also visual.

For HJ2562 (Pop1996b) the orbit is old, has a long period and was not well determined (grade 5). It was only based on visual observations made before 1983. According to the WDS, the last observation of HJ2562 was made in 1996, but the IC4 only report Hipparcos measurements (in 1991.25).

For COU812 (Cou1999), the orbit is also not well determined (grade 5) and is based on a small arc with a small curvature. It has never been published in a journal or in the Double Stars Information Circular of the International Astronomical Union. The observations indicate a rectilinear trajectory rather than an elliptical orbit.

For STT260 (Zir2008), the orbit is rather recent but the last observation used for this calculation was made in 1997. It is only based on visual measurements and on the Hipparcos measurement. The small grade of 3

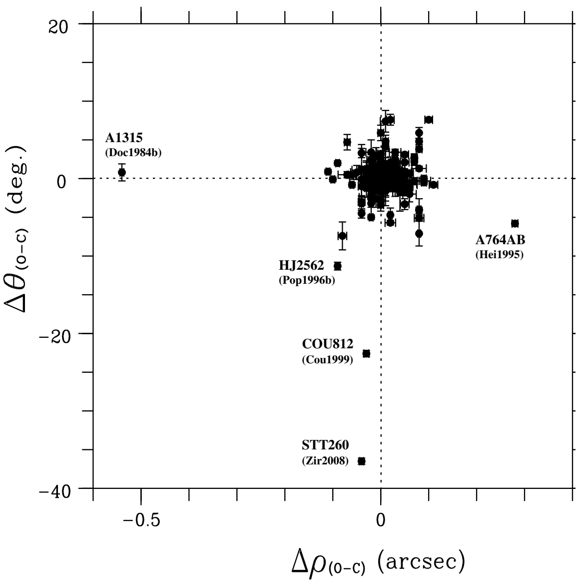

Fig. 8 Residuals of the measurements of Table 2 computed with the published orbits.

that is reported in the OC6 for this orbit seems too optimistic.

4 Conclusion

We have presented here the first observations obtained with PISCO with the Epsilon telescope of OCA in the Calern site and an Andor iXon EMCCD camera. The transfer from Merate to Calern included mechanical and optical changes with the development of a new software to control the telescope, the instrument and its camera with real-time processing. This transfer to a more modern environment and better site was successfully completed in less than one year. Compared to the speckle observations made previously with PISCO in Merate, we have been able to increase the overall output efficiency and reach a larger sample of stars with fainter magnitudes.

The data presented here consisted of 1233 observations of 1173 visual binaries or multiple objects made in 2015-2016. The corresponding 1170 new measurements have an average accuracy of $0''.0078$ and $0^{\circ}.54$ for the angular separation and position angle, respectively. Our PISCO group has thus succeeded his moving to another telescope and has been pursuing his efforts in providing a good contribution to the continuing monitoring of long period visual binary systems, which is fundamental for refining systemic stellar masses of long period binary systems.

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Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
01099+4011	AG15	953	2015.918	R	32	2.862	0.009	69.2	0.3				
01108+5141	DOO3	968	2016.939	R	20	0.956	0.011	354.4*	0.8	Elongated			
01119+4748	BU398	978	2016.035	R	20	1.819	0.009	43.2*	0.3	Elongated			
01125+3747	COU1057	–	2016.035	R	20	0.428	0.004	173.0*	0.7				
01128+3700	COU1058	–	2016.035	R	20	0.777	0.004	248.4*	0.3				
01128+3700	COU1058	–	2016.939	R	20	0.777	0.004	249.7*	0.6	Elongated			
01132+5106	HU1024	989	2016.942	R	20	0.742	0.007	205.9*	0.4				
01146+2804	A1904	1002	2016.704	R	20	1.210	0.006	72.1	0.3				
01147+4829	COU1858	–	2016.942	R	20	0.366	0.006	257.8	0.8				
01151+3416	HU803	1005	2016.704	R	20	0.912	0.006	214.9	0.4				
01161+5554	MLR654	–	2016.939	R	20	0.366	0.005	210.2*	0.8				
01178+4901	STF102AB	1040	2016.939	R	20	0.472	0.007	270.8*	0.8				
01180+3750	COU856	–	2016.939	R	20	1.166	0.006	23.6*	0.3				
01194+0731	HEI834	–	2016.950	R	20	1.057	0.008	276.7*	0.3	Elongated			
01205+5740	MLR561	–	2016.950	R	20	0.236	0.008	222.9	2.2				
01207+5136	HU523	1083	2016.950	R	20	0.363	0.004	87.7*	0.3				
01208+1813	A2212	1094	2016.953	R	20	1.322	0.007	213.8*	0.3				
01226+1449	MRL1	–	2016.950	V	10	0.180	0.003	290.6	0.7	Diffuse			
01226+1449	MRL1	–	2016.950	R	10	0.189	0.007	291.3	2.2	Diffuse			
01229+0144	LV1	1110	2016.953	R	20	0.773	0.006	327.4	0.3				
01234+5809	STF115AB	1105	2016.950	R	20	0.428	0.006	158.5*	0.5		Sod1999	0.00	1.2
01258+2733	COU666	–	2016.953	R	20	0.427	0.010	144.4	0.4	Diffuse			
01275+4915	HU525	1150	2016.876	R	20	1.159	0.006	321.3*	0.3				
01276+2104	COU148	–	2016.953	R	20	1.211	0.006	247.0*	0.4	Diffuse			
01280+5821	A940	1156	2016.732	R	20	0.561	0.006	85.8	0.4				
01283+4247	AC14	1161	2016.033	R	20	0.773	0.004	91.4*	0.3	Elongated			
01286+0009	RST4748	–	2016.876	R	20	0.330	0.010	266.9	1.2				
01292+2004	A2214	1177	2016.953	R	20	0.724	0.004	214.2*	0.6				
01330+0542	J640	1213	2016.953	R	20	1.459	0.007	49.4*	0.3	Diffuse			
01352+5150	A112	1235	2016.953	R	20	1.121	0.006	334.7*	0.3				
01359+5502	MLR629	–	2016.953	R	20	0.446	0.005	132.0*	0.4				
01365+4336	ES1495	1255	2016.876	R	20	1.294	0.006	66.5*	0.4	Elongated			
01372+4843	A817	1263	2016.718	R	20	0.457	0.004	22.8	0.9				
01374+3837	TDS1935	–	2016.953	R	20	–	–	–	–	Unres.			
01386+5651	MLB111AB	1277	2016.876	R	20	1.952	0.010	40.0*	0.3				
01391+2656	BU508AB	1294	2016.955	R	20	0.590	0.004	52.5*	1.1	Elongated			
01403+3844	BU1167	1310	2016.956	R	20	1.482	0.007	51.3*	0.3				
01406+4447	COU1661	–	2016.956	R	20	1.174	0.006	242.2*	0.7				
01437+0934	BU509	1360	2016.033	R	20	0.748	0.004	42.8*	0.3	Elongated	Hrt2010a	−0.03	−1.2
01445+3957	STF149	1368	2016.033	R	20	1.437	0.007	80.7*	0.3	Elongated			
01509+4037	COU1361	–	2016.939	W	20	1.125	0.011	281.9*	0.3				
01528−0447	RST4188	–	2016.936	R	20	0.351	0.006	42.2	0.9		Tok2015c	−0.00	0.3
01532+1526	BU260	1503	2016.041	R	20	1.118	0.006	259.8	0.3		Cve2006e	0.03	−1.2
01535+4437	STF3113	1502	2016.041	R	20	0.625	0.006	278.7	0.3				
01548+1728	A2323	1520	2016.936	R	20	1.758	0.009	147.0*	0.3				
01550+5817	A954	1514	2016.041	R	20	0.759	0.004	208.9*	0.3				
01563+2520	COU453	–	2016.936	R	20	0.707	0.006	282.4	0.3				
01565+5900	MLB48	1532	2016.854	R	20	1.277	0.006	77.4*	0.5				
01565+5912	MLR486	–	2016.936	R	20	0.522	0.007	188.0*	0.3				
01573+4620	COU1860	–	2016.854	R	20	–	–	–	–	Unres.			
02016+4107	COU1510	–	2016.945	R	20	0.379	0.007	137.4*	0.5				
02018+4040	A1923	1609	2016.854	R	20	0.664	0.010	324.2*	0.3				
02019+4831	COU2009	–	2016.857	R	20	0.582	0.004	59.8	0.7				
02020+0246	STF202AB	1615	2015.915	R	32	1.862	0.035	262.6	0.7		Pru2017	0.03	−0.2
02020+0246	STF202AB	1615	2016.879	R	20	1.837	0.009	262.3*	0.6		Pru2017	0.00	0.1

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
02021+4311	TDS2091	–	2016.945	R	20	–	–	–	–	Unres.			
02034+5048	TDS2094	–	2016.945	R	20	0.690	0.008	333.5*	0.9				
02055+3018	COU455	–	2016.879	R	20	0.307	0.015	112.1	2.1				
02062+2207	COU149	–	2016.879	R	20	0.378	0.004	60.5	0.6				
02064+3854	A1926	1653	2016.854	R	20	1.064	0.007	146.8*	0.3				
02123+2357	STF226AB	1696	2016.098	R	20	1.717	0.009	231.0*	0.3				
02128+3722	HO497	1701	2016.098	R	20	0.466	0.004	86.8*	0.3				
02134+5753	MLR562	–	2016.879	R	20	0.714	0.004	242.5*	0.7				
02140+4729	STF228	1709	2015.915	R	20	0.662	0.025	300.5	0.3		Pru2017	−0.04	−0.1
02144+3454	HU807	1720	2016.942	R	20	0.500	0.005	146.0*	0.7	Elongated			
02144+3946	A205	1718	2016.942	R	20	1.741	0.009	310.4*	0.8	Elongated			
02150+3742	COU1368	–	2016.942	R	20	0.628	0.006	13.6	0.3				
02150+5903	MLR447	–	2016.879	R	20	0.668	0.013	342.0*	0.3				
02162+0919	HEI438	–	2016.942	R	20	0.705	0.018	160.8	0.7				
02172+5048	COU2563	–	2016.879	R	20	0.873	0.009	274.3	0.3				
02172+5555	STF235	1738	2016.945	R	20	1.896	0.009	48.2*	0.3				
02173+5228	STF236AB	1745	2016.855	R	20	1.449	0.007	248.6*	0.3				
02178+5638	A1272	1748	2016.854	R	20	1.197	0.006	23.6*	0.3				
02193−0259	JOY1Aa,Ab	1778	2016.704	R	20	–	–	–	–	Unres.			
02211+2956	A962	1792	2016.098	R	20	0.886	0.005	66.0	0.4	Elongated			
02211+4246	STF248	1786	2016.945	R	20	0.717	0.005	205.2*	0.3		Pbx2000b	0.03	1.2
02218+3830	STT40	1799	2015.942	R	20	0.675	0.015	48.1*	0.3				
02218+3830	STT40	1799	2016.937	R	20	0.683	0.004	48.8*	0.5				
02218+4349	COU1671	–	2016.937	R	20	0.886	0.004	255.7*	0.4				
02223+5737	TDS2229	–	2016.945	R	20	0.600	0.005	68.9	0.7				
02231+5233	HU536	1814	2016.937	R	20	0.634	0.011	319.9*	0.3				
02239+5751	MLR656	–	2016.874	R	20	0.638	0.004	40.7*	0.8				
02248+5719	FOX55	1825	2016.874	R	20	0.835	0.005	262.5*	0.3				
02254+5812	HLD7	1832	2016.874	R	20	1.702	0.009	181.8*	0.4				
02259+3913	A1814	1842	2016.937	R	20	0.603	0.004	33.5	0.8				
02270−0510	RST4205	–	2016.945	R	20	0.762	0.012	353.0*	0.3				
02275+5416	MLR685	–	2016.874	R	20	0.388	0.008	318.3*	1.0				
02284+1722	A2330	1874	2016.035	R	20	1.192	0.006	208.4*	0.5	Elongated			
02292+5637	A1275	1872	2016.874	R	20	0.843	0.004	20.9*	0.6				
02313+4703	A968	1908	2016.016	R	20	1.716	0.009	26.5*	0.3				
02314+4234	A660	1913	2016.035	R	20	0.528	0.004	310.9*	0.3	Elongated			
02332+4018	ES1611	1942	2016.939	R	20	1.524	0.008	106.7*	0.3				
02333+5619	A1276AB	1934	2016.874	R	20	0.917	0.005	201.4*	1.2				
02348+5246	HU203	1951	2016.874	R	20	0.609	0.010	91.4*	0.5				
02368−0334	BU520	1984	2016.939	R	20	0.872	0.007	189.8*	0.8	Elongated			
02393+2552	A2023	2010	2016.016	R	20	0.513	0.004	228.8	0.5				
02409+0452	STT45	2043	2016.016	R	20	0.795	0.004	260.5*	0.3				
02409+0452	STT45	2043	2016.939	R	20	0.788	0.009	259.8*	0.8				
02446+5643	MLR598	–	2016.857	R	20	0.759	0.005	79.7*	0.6	Diffuse			
02466+4728	TDS2358	–	2016.879	R	20	0.609	0.004	52.8*	1.0				
02471+3533	BU9AB	2117	2016.016	R	20	0.916	0.005	215.0	0.3		Zir2015a	−0.01	−0.8
02574+5539	A1282	2227	2016.874	R	20	0.641	0.005	201.6*	1.0				
03012+4852	HU1051	2280	2016.947	R	20	0.512	0.006	120.8	0.6	Elongated			
03014+4021	COU1379	–	2016.947	R	20	0.728	0.006	76.7	0.4				
03056+5744	KR18	2327	2016.947	R	20	1.501	0.008	273.2*	0.3				
03058+4342	BU1175	2334	2016.036	R	20	0.700	0.006	272.6*	0.3				
03069+2052	AG61	2353	2016.036	R	20	0.519	0.004	23.2*	0.3	Elongated			
03076+5230	MLR658	–	2016.874	R	20	0.407	0.004	87.8*	0.3				
03085+5639	A975	2360	2016.947	R	20	1.611	0.009	204.6	0.3				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
03153+5955	A977	2412	2016.874	R	20	0.703	0.009	165.1*	0.6	Elongated			
03163+1920	A2224	2439	2016.041	R	20	0.896	0.004	331.8*	0.3				
03194+5025	COU2264	–	2016.874	R	20	1.270	0.013	92.3*	0.3				
03212+2109	COU259	–	2016.036	R	20	0.890	0.004	216.6*	0.3				
03217+0845	STF380	2491	2016.937	R	20	0.946	0.006	5.4*	0.4		Pop1996b	0.07	2.6
03248+4159	A1288	2516	2016.033	R	20	0.684	0.004	3.5*	0.4	Elongated			
03252+3837	COU1383	–	2016.937	R	20	0.762	0.005	284.0*	0.3				
03261+2015	A2344AB	2529	2016.033	R	20	1.244	0.006	193.7*	0.3	Elongated			
03279+4551	COU1687	–	2016.937	R	20	0.795	0.004	112.0*	0.3				
03282+5628	ES1777	2539	2016.876	R	20	2.317	0.012	249.7*	0.3				
03291+5732	MLR663	–	2016.937	R	20	0.624	0.007	21.4*	0.6				
03294+4931	BU1179	2558	2016.041	R	20	0.563	0.004	141.4*	0.7				
03306+4947	HLD8	2574	2016.041	R	20	2.363	0.012	175.9*	0.3				
03310+2937	A983	2578	2016.877	R	20	0.548	0.008	144.5*	0.4		Doc2010d	0.02	0.7
03314+5340	MLR664	–	2016.953	R	20	0.664	0.006	200.4*	0.5				
03318+0749	A1931	2588	2016.041	R	20	0.842	0.004	47.6*	0.3				
03318+0749	A1931	2588	2016.956	R	20	0.849	0.004	47.4*	0.5				
03331+5159	HU101	2590	2016.877	R	20	0.313	0.006	42.5*	1.7				
03333+3643	COU1224	–	2016.855	R	20	0.388	0.004	31.9	1.3				
03344+2428	STF412AB	2616	2015.915	R	20	0.743	0.025	351.4	0.3		Sca2002a	−0.01	−0.0
03344+2428	STF412AB	2616	2015.943	R	20	0.761	0.015	351.0	0.3	Elongated	Sca2002a	0.01	−0.4
03344+2428	STF412AB	2616	2016.855	R	20	0.774	0.006	352.1*	0.3		Sca2002a	0.02	0.6
03346+2350	COU466AB	–	2016.956	R	20	0.396	0.005	20.6*	0.3				
03354+3529	POP83	–	2016.956	R	20	0.761	0.004	87.6*	0.3	Elongated			
03370+1632	HEI29	–	2016.953	R	20	0.794	0.004	77.7*	0.4				
03374+4538	TDS2605	–	2016.953	R	20	–	–	–	–	Unres.			
03375+4321	A1536	2641	2016.855	R	20	1.283	0.006	227.9*	0.3				
03389+4243	A1538	2652	2016.877	R	20	0.572	0.006	263.0*	0.6				
03404+1144	HEI316	–	2016.942	R	20	0.868	0.014	277.6	0.3				
03412+1936	A2421	2684	2016.942	R	20	1.186	0.011	153.0	0.3	Elongated			
03425+2946	A987	2703	2016.942	R	20	1.142	0.013	189.9	0.3				
03431+0158	RST5201AB	–	2016.942	R	20	0.506	0.014	339.6	1.1				
03440+5228	A1289	2710	2016.950	V	20	0.280	0.004	84.6	0.9		USN2002	0.00	0.1
03463+2411	BU536AB	2755	2016.033	R	20	1.057	0.006	177.7*	0.3		Hrt2009	0.04	−1.5
03473+4011	COU1388	–	2016.953	R	20	0.522	0.008	300.1	0.5				
03484+5202	HU546	2768	2016.950	R	10	0.331	0.004	359.6	0.5		Drt2009	−0.00	−2.8
03492+5023	HU209AB	2777	2016.937	R	20	1.402	0.008	106.5*	0.3				
03503+2241	STF457AB	2801	2016.033	R	20	0.807	0.004	90.3	0.3				
03537+5759	DRS27AB	–	2016.950	R	20	0.942	0.007	69.0	0.6				
03554+5630	STF461	2845	2016.950	R	20	0.993	0.008	121.0*	0.5				
03556+5216	BU743	2852	2016.950	R	20	1.082	0.012	260.8*	0.3				
03570+5427	MLR659	–	2016.953	R	20	0.619	0.013	157.0	0.5				
03573+5051	COU2357	–	2016.953	R	20	0.839	0.009	97.5*	0.6				
03579+5142	SCA176BC	–	2016.947	R	32	8.185	0.009	76.8*	0.3	New pair			
03579+5142	SCA176BC	–	2016.950	R	32	8.178	0.009	76.8*	0.3	New pair			
03579+5142	COU2358Aa,Ab	–	2016.947	R	20	0.360	0.005	76.5	0.3				
03584+5645	TDS2700	–	2016.953	R	20	0.668	0.004	261.5*	0.4				
03590+0947	HU27	2911	2016.945	R	20	0.450	0.010	337.6*	0.4		Lin2004a	0.07	−0.3
03594+4321	A1708	2907	2016.945	R	20	0.813	0.004	339.6*	0.4				
03597+1128	HU28	2918	2016.945	R	20	1.217	0.007	2.0*	0.3				
03598+5013	J893	2906	2016.945	R	20	1.079	0.005	231.3*	0.3	Elongated			
04016+5044	COU2458	–	2016.953	R	20	0.615	0.011	145.9	0.3				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
04017+5611	HDS507	–	2016.137	R	20	0.530	0.005	131.4	0.6				
04081+4535	COU2025	–	2016.953	R	10	0.293	0.002	344.3*	0.3				
04081+4535	COU2025	–	2016.953	V	10	0.297	0.002	344.0	0.5				
04087+5016	HU211	3002	2016.874	R	20	1.600	0.010	273.6*	0.3	Elongated			
04091+2839	HO326	3021	2016.096	R	20	0.397	0.006	294.6	0.8		Hrt2008	0.00	−3.4
04103+5310	A1297	3025	2016.874	R	20	0.522	0.004	348.5*	0.3				
04115+4152	BU546	3038	2016.099	R	20	0.937	0.005	227.9	0.3				
04123+0939	STT74	3053	2016.099	R	20	0.442	0.008	290.6*	0.3	Elongated	Alz2003a	0.10	7.6^Q
04139+0916	BU547AB	3072	2016.099	R	20	1.264	0.006	338.9*	0.3	Elongated	Zir2015a	0.00	−0.6
04140+4235	A1711	3062	2016.033	R	20	0.682	0.004	74.3*	0.4				
04170+1941	HO328	3102	2016.096	R	20	0.441	0.004	357.5	0.5		Hei1978a	0.03	0.5
04199+1631	STT79	3135	2016.096	R	20	0.550	0.004	184.7	0.5		Alz1999	0.00	−0.1
04233+1123	STF535	3174	2016.137	R	20	1.105	0.006	268.9*	0.5	Elongated	Hrt2000c	0.07	2.2
04243−0452	RST4239	–	2016.945	R	20	0.810	0.008	107.9*	0.7				
04247+1346	HEI217	–	2016.945	R	20	0.489	0.014	150.2	1.0				
04253+1436	HEI36	–	2016.945	R	20	0.782	0.008	355.2*	0.5				
04254+5623	A834AB	3184	2016.036	R	20	0.720	0.004	219.3*	0.3				
04287+5355	BU745	3227	2016.877	R	20	0.383	0.008	103.3	0.9				
04289+4103	A1712	3242	2016.877	R	20	0.399	0.004	36.3*	1.4				
04294+4407	A1713	3246	2016.877	R	20	0.442	0.005	200.2*	0.5				
04324+3849	A1839	3283	2016.033	R	20	0.770	0.004	272.2*	0.3				
04324+3849	A1839	3283	2016.877	R	20	0.785	0.004	273.1*	0.3				
04335+1801	STF559	3297	2015.913	W	32	3.130	0.035	276.4	0.3				
04335+1801	STF559	3297	2015.913	R	32	3.125	0.035	276.2	0.3				
04347+1130	A2034	3314	2016.016	R	20	0.531	0.004	239.5	1.3				
04349+3908	HU1082	3303	2016.877	R	20	0.244	0.006	189.0*	2.7		Cou1975c	0.04	−1.5
04353+4141	A1716	3310	2016.041	R	20	0.629	0.006	89.3	0.3	Faint			
04353+4141	A1716	3310	2016.877	R	20	0.642	0.004	90.1*	0.4				
04366+1946	STT86	3329	2016.096	R	20	0.492	0.004	356.0	0.3		Zir2010	0.02	−0.8
04378+4442	A1010	3332	2016.041	R	20	0.510	0.004	343.9	0.5				
04400+5328	STF566AB,C	3358	2016.016	R	20	0.716	0.004	166.7*	0.3		Cve2008a	−0.10	−0.1
04433+5931	A1013	3391	2015.913	R	20	0.392	0.025	296.9	0.3		Doc1990c	−0.02	−2.4
04573−0545	RST4260	–	2016.939	R	20	1.594	0.011	147.4	0.3	Elongated			
04573+1524	HEI38	–	2016.939	R	20	0.628	0.004	226.6	0.9	Elongated			
04574+4204	COU1716	–	2016.041	R	20	0.700	0.004	151.2	0.3				
05010+1430	D6	3600	2016.033	R	20	1.139	0.006	101.0*	0.3				
05013+4717	COU2461	–	2016.937	R	20	1.501	0.008	7.2*	0.3				
05018+4112	A1552	3607	2016.939	R	20	0.594	0.004	221.9*	0.7				
05055+1948	STT95	3672	2016.036	R	20	0.938	0.005	295.1*	0.3		Jas1996b	−0.02	−1.2
05055+4655	A1023	3659	2015.913	R	20	0.227	0.035	57.3	3.6				
05065+4347	COU2465	–	2016.937	R	20	0.469	0.004	227.3*	0.8				
05069+4415	COU2466	–	2016.939	R	20	0.902	0.008	136.7	0.3				
05071+5920	A1025	3673	2016.937	R	20	–	–	–	–	Unres.			
05073+2244	HU446	3700	2016.939	R	20	0.867	0.006	189.7*	0.4				
05079+5459	STF635	3689	2016.137	R	20	1.024	0.005	304.6	0.3				
05092+1629	HEI40	–	2016.939	R	20	0.926	0.005	179.5	0.4				
05105+0137	RST5212	–	2016.939	R	20	0.714	0.005	187.9	0.7	Elongated			
05115+3938	COU1868	–	2016.956	R	20	0.509	0.004	189.6*	0.7				
05118+0102	STF652	3764	2016.036	R	20	1.666	0.009	179.5	0.3	Elongated			
05130+0828	A2701	3785	2016.096	R	20	0.500	0.004	13.4	0.3				
05138+3323	HU1223	3791	2016.942	R	20	0.563	0.014	198.5	0.7				
05140+5126	HU821	3780	2016.942	R	20	0.817	0.013	173.1*	0.4		Doc2016c	0.05	0.6
05153+4710	A1031	3812	2016.033	R	20	0.385	0.006	106.0*	1.0		Zir2008	−0.07	4.7

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
05163+4447	COU2468	–	2016.942	R	20	0.661	0.013	327.8*	1.1				
05172+3928	HU1101	3851	2016.956	R	20	0.418	0.004	301.1*	0.3				
05173+3302	COU1089	–	2016.956	R	20	0.932	0.005	258.2*	0.7				
05185+0052	RST5214	–	2016.948	R	20	0.951	0.007	144.7	0.4				
05188+5250	STF657	3870	2016.017	R	20	0.955	0.005	310.3*	0.3				
05196+4420	COU2469	–	2016.948	R	20	1.046	0.005	257.9*	0.3				
05222+4505	STF684	3932	2016.017	R	20	1.500	0.007	140.9*	0.3				
05240+2458	STF694AB	3981	2016.017	R	20	1.370	0.008	13.6	0.3				
05243+3939	BU1317	3976	2016.017	R	20	0.699	0.004	15.2	0.4				
05269+3017	A1033AB	4029	2016.945	R	20	0.391	0.007	146.6*	0.3				
05270+2737	HO226AB	4032	2016.016	R	20	0.664	0.004	91.6	0.3		Zir2014a	0.01	−0.6^{Q}
05273+2306	TDS3196	–	2016.945	R	20	–	–	–	–	Unres.			
05275+1830	A2432	4049	2016.945	R	20	1.146	0.006	293.6*	0.3				
05295+4807	COU2583	–	2016.945	R	20	0.982	0.008	60.2*	0.6				
05313−0029	RST4782	–	2016.950	R	20	0.751	0.006	67.3*	0.3				
05323+1526	TDS3231	–	2016.950	R	20	–	–	–	–	Unres.			
05340+2225	A2106	4154	2016.950	R	20	1.497	0.007	302.2*	0.3				
05349+5025	COU2585	–	2016.950	R	20	0.670	0.012	126.1	0.5				
05361+5003	COU2586	–	2016.937	R	20	–	–	–	–	Unres.			
05371+2655	STF749AB	4208	2016.033	R	20	1.178	0.006	319.0	0.3		Sca2007a	0.01	−0.9
05384+5105	HU557	4215	2016.937	R	20	0.483	0.005	285.1*	0.9				
05416+1913	STF770	4268	2016.099	R	20	1.077	0.006	329.5*	0.3	Elongated			
05436+1300	A117AB	4304	2016.033	R	20	0.859	0.004	247.7	0.4				
05447+3118	A1040	4317	2016.033	R	20	0.879	0.004	84.7*	0.3				
05449+2149	TDS3322	–	2016.937	R	20	0.642	0.006	89.6*	0.7				
05449+2149	TDS3322	–	2016.937	R	20	0.636	0.007	89.5*	0.5				
05450+2255	HU38	4325	2016.096	R	20	0.459	0.004	132.4	0.3				
05459+3558	HU1232	4335	2016.877	R	20	0.557	0.004	86.5	0.8	Elongated			
05460+2119	STF787AB	4349	2016.033	R	20	0.664	0.004	53.7*	0.3		Zir2014a	−0.02	−1.0
05474+2939	BU560	4371	2016.096	R	20	1.695	0.008	123.7	0.3	Elongated	Sca2008c	0.01	−0.7
05475+5938	A1309	4347	2016.877	R	20	0.440	0.005	322.6*	0.5				
06000+4643	A1727	4565	2016.134	R	20	0.577	0.004	247.3	0.5	Elongated			
06003+0942	J407	4585	2016.134	R	20	2.156	0.011	198.2	0.3	Elongated			
06011+4609	COU2473	–	2016.953	R	20	0.892	0.006	270.6*	0.3				
06013+2927	A119	4593	2016.099	R	20	0.563	0.004	200.3*	0.5	Elongated			
06032+5813	A1315	4604	2016.953	R	20	0.423	0.004	90.5*	1.1		Doc1984b	−0.54	0.8^{Q}
06040+3138	A214AB	4638	2016.953	R	20	0.636	0.007	284.0*	0.5				
06040+5106	COU2595	–	2016.953	R	20	0.475	0.011	112.9*	1.6				
06046+4535	A1729	4639	2016.953	R	20	0.750	0.004	74.4*	0.6				
06049+4938	HU560	4640	2016.953	R	20	0.858	0.006	20.8*	0.6				
06059+5917	MLR565	–	2016.953	R	20	0.349	0.004	226.8*	0.3				
06102+3136	TDS223	–	2016.134	R	20	1.451	0.008	168.2	0.3				
06109+5330	A1572	4754	2016.137	R	20	0.989	0.005	99.8*	0.3				
06113+3040	STF861BC	4779	2016.137	R	20	1.698	0.008	315.0	0.3				
06126+4733	COU2476	–	2016.948	R	20	0.683	0.009	101.1	0.3	Elongated			
06152+0631	A2717AB	4856	2016.044	R	20	0.529	0.009	348.2	0.3				
06189+1347	HO230	4919	2016.044	R	20	1.608	0.008	65.2	0.4				
06211+3619	A1954	4955	2016.874	R	20	0.671	0.010	108.1*	0.3	Elongated			
06254+3544	HU831	5032	2016.874	R	20	0.370	0.013	295.7	1.4	Elongated			
06277+1822	COU41	–	2016.033	R	20	1.223	0.006	39.3	0.3	Faint			
06293+1233	A2726	5109	2016.096	R	20	0.580	0.004	123.9	0.3	Elongated			
06307+4336	COU2372	–	2016.950	R	20	0.799	0.004	3.0	1.0				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
06315+2707	TDS3895	–	2016.950	R	20	1.269	0.006	113.0*	0.3				
06316+3210	BU896AB	5151	2016.951	R	20	0.871	0.011	179.1*	0.3				
06317+2823	BU1021	5157	2016.041	R	20	0.683	0.004	73.7*	0.3				
06318+2124	TDS254	–	2016.951	R	20	0.834	0.008	107.3*	0.3	Elongated			
06363+3800	BU194	5221	2016.940	R	20	1.537	0.009	276.1*	0.5	Elongated			
06368+4415	A1051	5224	2016.940	R	20	0.658	0.005	219.5	0.8				
06379+0855	A2822	5273	2016.945	R	20	0.745	0.004	122.1*	0.4	Elongated			
06380−0130	RST4818	–	2016.945	R	20	1.011	0.005	182.9*	0.3	Elongated			
06383+4201	A2451	5261	2016.940	R	20	0.616	0.009	145.8*	0.6				
06385+1020	HEI702	–	2016.940	R	20	0.828	0.004	42.2*	0.6				
06392+0939	STH1	5290	2016.041	R	20	0.735	0.004	284.3	0.3				
06474+1812	STT156	5447	2016.033	R	10	0.180	0.008	137.5	0.7		Pru2017	0.02	7.6
06511+5425	MLR688	–	2016.956	R	20	1.101	0.006	94.1*	0.4				
06555+3010	STF981	5570	2016.044	R	20	0.899	0.004	118.5	0.3	Faint	Kiy2017	−0.06	−0.8
06557+1209	TDS299	–	2016.940	R	20	0.997	0.009	328.1*	0.3				
07004+3008	TDS318	–	2016.134	R	20	1.246	0.006	20.0	0.6	Faint			
07010+2927	COU1242	–	2016.099	R	20	0.347	0.006	194.6	1.0				
07028+1305	HO342	5725	2016.033	R	20	1.188	0.006	87.5*	0.3				
07030+5403	A1575	5704	2016.099	R	20	0.802	0.004	282.7*	0.3				
07031+5410	STF1001BC	5706	2016.099	R	20	1.626	0.008	4.9*	0.3				
07062+4023	COU2186	–	2016.953	R	20	0.535	0.008	94.1*	1.1				
07065+3736	COU2062	–	2016.953	R	20	0.316	0.004	247.9	1.3				
07097+4457	COU2484	–	2016.953	R	20	0.984	0.005	88.7*	0.3				
07128+2713	STF1037AB	5371	2016.033	R	20	0.916	0.005	304.8*	0.3		Sca2015b	−0.00	−0.5
07162+5618	MLR567	–	2016.953	R	20	–	–	–	–	Unres.			
07170−0004	RST5261	–	2016.937	R	20	0.538	0.007	347.6	0.6				
07176+0918	STT170AB	5958	2016.266	R	20	0.460	0.007	295.6	0.5	Elongated	Sca2016a	0.01	−0.5
07176+0918	STT170AB	5958	2016.268	R	20	0.461	0.005	295.4*	0.3		Sca2016a	0.01	−0.7
07181+1035	HEI725	–	2016.937	R	20	1.143	0.006	349.4*	0.3				
07260+5310	ES772AB	6054	2016.951	R	20	1.099	0.005	99.5*	0.3				
07346+3153	STF1110AB	6175	2016.036	R	32	5.147	0.026	53.3*	0.3		DRs2012	0.05	−0.8
07359+4302	STT174	6191	2016.041	R	20	2.156	0.011	87.9*	0.3				
07401+0514	STF1126AB	6263	2016.271	R	20	0.859	0.005	175.9	0.4		Zir2015a	0.03	−1.0
07486+2308	WRH15AB	6378	2016.036	R	10	0.258	0.002	27.7*	1.2		USN2002	−0.00	0.0
07556+3630	COU2075	–	2016.033	R	20	0.848	0.004	142.0*	0.3				
07573+0108	STT185	6483	2016.290	R	20	0.410	0.004	20.2*	0.3		Msn2009	0.01	−0.1
08005+0955	A2954BC	6511	2016.266	R	20	3.356	0.017	233.2	0.5				
08005+0955	A2954AB	6511	2016.266	R	20	0.642	0.012	338.3	0.4				
08005+0955	A2954AC	6511	2016.266	R	20	3.577	0.018	223.3	0.3				
08006+4200	ES1538	6501	2016.266	R	32	2.862	0.017	221.5*	0.7				
08015+2355	A2540	6518	2016.099	R	20	1.283	0.006	168.4	0.4				
08033+2616	STT186	6538	2016.042	R	20	0.995	0.005	73.4*	0.3				
08122+1739	STF1196AB	6650	2016.268	R	20	1.138	0.006	17.8*	0.3		WSI2006b	0.01	1.9
08122+1739	STF1196AB	6650	2016.268	R	32	1.156	0.009	17.8*	0.3		WSI2006b	0.03	1.9
08122+1739	STF1196AC	6650	2016.268	R	32	6.353	0.032	61.3*	0.3				
08122+1739	STF1196BC	6650	2016.268	R	32	5.573	0.028	69.5*	0.3				
08285−0231	A551AB	6828	2016.268	R	20	0.336	0.005	61.1*	1.0		Doc2017a	−0.01	−0.7
08285−0231	A551AB	6828	2016.287	R	20	0.339	0.004	61.2	1.7		Doc2017a	−0.00	−0.6
08413+2029	BU585	6930	2016.042	R	20	0.291	0.005	72.1*	0.7				
08444+1555	A2472	6963	2016.033	R	20	0.813	0.004	261.0	0.3				
08482+0235	BU335	7003	2016.287	R	20	2.565	0.013	265.4	0.3	Faint			
08500+3935	STF1279	7019	2016.271	R	20	1.251	0.006	88.5	0.3				
08507+1800	A2473	7039	2016.287	R	10	0.247	0.003	92.4	1.6		Doc2016d	0.08	−7.1
08512+0820	PER1	7046	2016.042	R	20	0.902	0.006	351.4*	0.3	Elongated			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
08514+5732	STF1275AB	7053	2016.271	R	20	1.877	0.009	198.2	0.3				
08539+1958	COU773	–	2016.287	R	10	–	–	–	–	Unres.			
08561+4341	STF3120AB	7092	2016.271	R	20	1.350	0.007	1.2	0.3				
08571+1045	A2968	7102	2016.290	R	20	1.174	0.007	133.7	0.3				
08580+3014	HO252	7107	2016.268	R	10	–	–	–	–	Unres.			
09006+4147	KUI37AB	–	2016.096	R	20	0.479	0.004	169.8*	0.8		Mut2010b	0.01	−0.8
09006+4147	KUI37AB	–	2016.134	R	20	0.465	0.005	169.7*	0.6	Elongated	Mut2010b	−0.01	−0.9
09007+3208	COU1253	–	2016.134	R	20	0.722	0.004	189.7	0.6	Elongated			
09020+0240	BU211	7152	2016.137	R	20	1.093	0.005	269.3	0.3				
09033+4740	HU720	7153	2016.042	R	20	0.748	0.004	133.7	0.3				
09035+3750	MUG1	–	2016.096	RL	20	1.689	0.009	1.0	0.4	Faint			
09067+5038	HU722	7177	2016.293	R	20	0.494	0.004	236.8	0.7				
09088+4416	COU2619	–	2016.304	R	20	1.161	0.006	240.1*	0.4				
09095+0256	STT197	7215	2016.134	R	20	1.392	0.007	66.3*	0.4	Elongated			
09096+1606	A2475	7213	2016.266	R	20	0.379	0.011	173.8	0.5				
09097+0013	J424	7216	2016.268	R	20	1.352	0.011	141.8*	0.3	Faint			
09101+3534	TDS6367	–	2016.265	R	20	–	–	–	–	Unres.			
09127+1632	STF1322	7236	2016.134	R	20	1.777	0.009	52.9	0.3	Elongated			
09136+4659	STF1318	7243	2016.290	R	20	2.589	0.013	228.4	0.3				
09143−0430	RST4432	–	2016.268	R	32	1.483	0.009	172.8	0.5	Faint			
09149+0413	BU455	7257	2016.137	R	20	1.846	0.009	68.0*	0.4				
09168−0050	RST4906	–	2016.342	R	20	0.859	0.009	154.2	0.3				
09184+3522	STF1333	7286	2016.165	R	20	1.930	0.010	50.0*	0.4				
09186+2049	HO43	7294	2016.293	R	20	0.607	0.007	97.8	0.4	Faint	Sca2016a	0.00	−0.3
09186+2049	HO43	7294	2016.296	R	20	0.600	0.010	97.2	0.3	Elongated	Sca2016a	0.01	0.4
09210+3643	STF1339	–	2016.042	R	20	1.460	0.007	64.8*	0.3				
09210+3811	STF1338AB	–	2016.096	R	20	1.129	0.006	309.1*	0.3		Sca2002b-II	−0.03	−0.2
09215+1943	A127	7321	2016.296	R	20	1.430	0.007	32.5	0.3				
09232+1008	J386	7337	2016.296	R	20	0.459	0.012	52.6	2.2	Elongated			
09233+2211	AG165	7336	2016.137	R	20	1.330	0.007	14.1	0.3				
09239+2754	STT201AB	7344	2016.099	R	20	1.243	0.006	204.2*	0.3				
09245+1808	A2477	7341	2016.287	R	20	0.456	0.013	4.9*	1.9	Elongated	Fmr2014a	0.03	−0.4
09247+3641	VBS16	–	2016.296	R	20	1.612	0.031	282.4	0.6				
09249+5134	STT200	7348	2016.282	R	20	1.257	0.024	334.3*	0.4				
09252+1449	HU869	7359	2016.099	R	20	0.775	0.007	273.0*	0.3				
09260+2839	A222	7365	2016.342	R	20	0.390	0.005	5.1*	1.0	Elongated	Hrt2014b	−0.01	−0.2
09277+4456	A1762	7378	2016.099	R	20	0.789	0.004	104.6	0.3				
09285+0903	STF1356	7390	2016.282	R	20	0.830	0.018	111.1*	0.8		Mut2010b	−0.01	0.5
09290+1917	COU936	–	2016.282	R	20	0.950	0.005	2225.1*	0.3				
09300+4216	A1985	7398	2016.288	R	20	1.591	0.008	24.4	0.3				
09435+0612	A2761	7499	2016.301	R	20	1.043	0.005	251.1	0.3				
09478+1004	HO253	7517	2016.329	R	20	1.250	0.006	298.3*	0.3				
09496−0017	RST5339	–	2016.329	R	20	0.805	0.004	195.8	0.6				
09498+2111	KUI44AB	–	2016.282	R	10	0.172	0.005	227.0	3.1		Doc2005g	0.01	1.8
09498+2111	KUI44AB	–	2016.282	R	10	0.178	0.002	225.7	4.0		Doc2005g	0.01	0.5
09502+5706	MLR568	–	2016.329	R	20	0.569	0.004	56.5	0.3				
09521+2916	A344	7547	2016.329	R	20	0.647	0.005	70.4*	0.6	Elongated			
09521+5404	STT208	7545	2016.282	R	10	0.408	0.009	307.0	0.3		Hei1996c	−0.02	−0.1
09566+4359	POP151	–	2016.326	R	20	0.479	0.004	265.5	0.3				
09571−0121	A1766AB	7592	2016.326	R	20	0.521	0.005	189.9*	0.4	Elongated			
09581+3856	COU2086	–	2016.326	R	10	–	–	–	–	Unres.			
09584+4045	HDS1437	–	2016.268	R	20	–	–	–	–	Unres.			
09591+5316	A1346	7598	2016.326	R	20	0.580	0.004	178.8*	0.3		Hrt2009	−0.02	−0.4
09593+3746	COU2088	–	2016.268	R	20	0.448	0.007	131.3*	0.7				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
10022+5323	MLR678	–	2016.268	R	20	–	–	–	–	Unres.			
10026+4622	STT210	7613	2016.135	R	20	1.276	0.006	256.6*	0.3				
10040+3239	HU631	7624	2016.268	R	20	0.805	0.005	256.3	0.4				
10057+4103	A2142	7631	2016.135	R	20	1.070	0.005	294.9*	0.3				
10083+0802	A2564	7652	2016.266	R	20	0.771	0.011	285.4*	0.6	Elongated			
10095+4126	A2143	7660	2016.326	R	20	0.305	0.004	159.0	0.4				
10131+2725	STT213AB	7685	2016.135	R	20	1.130	0.006	121.3*	0.3		Sca2008e	0.05	0.8
10140+2227	COU169Aa,Ab	–	2016.326	R	20	0.528	0.011	325.8	0.3		Cou1999b	0.02	−5.7
10152+1153	HU1254	7696	2016.329	R	20	0.585	0.004	14.8	1.0	Elongated			
10163+1744	STT215	7704	2016.271	R	20	1.487	0.007	176.5	0.3		Sca2018	−0.01	−0.1
10182+0805	A2765	7718	2016.326	R	20	0.413	0.005	34.6*	1.8	Elongated			
10184+3730	HU875	7717	2016.329	R	20	1.177	0.006	74.5*	0.3				
10184+4346	POP117	–	2016.337	R	20	0.763	0.004	261.8*	0.3				
10192+2034	STF1423	7721	2016.337	R	20	0.699	0.006	133.7*	0.3	Elongated	WSI2004a	0.08	3.8^Q
10227+1521	STT216	7744	2016.288	R	20	2.283	0.011	230.8	0.3		Sca2009c	0.03	0.2
10234+2630	A1990	7747	2016.288	R	20	1.485	0.007	291.1	0.3	Elongated			
10236+2617	A1991	7748	2016.288	R	20	1.380	0.013	189.8	0.4	Elongated			
10256+0302	HEI761	–	2016.329	R	20	1.185	0.006	171.9	0.3	Faint			
10261+5347	MLR679	–	2016.329	R	20	1.100	0.006	83.1	0.3	Faint			
10262+0302	DJU2	–	2016.337	R	20	–	–	–	–				
10279+3642	HU879	7780	2016.288	R	20	0.549	0.008	226.9*	1.3		Msn2001c	0.00	0.5
10362+0041	J84	7845	2016.301	R	20	0.435	0.005	204.4	1.1				
10376+3446	COU1417	–	2016.301	R	20	0.312	0.005	211.8	0.6				
10382+2636	STF1454	–	2016.340	R	20	1.296	0.006	178.0*	0.3	Faint			
10382+4558	COU2092	–	2016.340	R	20	0.613	0.008	281.2	0.3				
10397+0851	STT224AB	7871	2016.288	R	20	0.492	0.006	132.8*	0.6		Hrt2010a	0.00	−0.4
10426+0335	A2768	7896	2016.288	R	20	0.626	0.004	242.7*	1.9		Hrt2010a	0.02	0.4
10474−0053	RST4931	–	2016.301	R	20	0.838	0.011	309.3	0.3				
10480+4107	STT229	7929	2016.247	R	20	0.657	0.004	258.2	0.5	Elongated	Alz1998a	0.03	2.1
11000−0328	STF1500	8007	2016.135	R	20	1.322	0.007	299.4*	0.3	Elongated	Hrt2013a	−0.01	−0.3
11018+2952	COU961AB	–	2016.269	R	20	1.169	0.006	327.5*	0.3				
11023+3049	STF1501	8023	2016.247	R	20	1.303	0.007	185.3	0.3				
11029+3541	HO47BC	8031	2016.337	R	20	0.883	0.008	338.7	0.3				
11035+5432	A1590	8032	2016.282	R	20	1.465	0.007	328.4*	0.3		Baz1985b	−0.04	−3.0
11040+0338	STF1504	8043	2016.296	R	20	1.211	0.017	124.5	0.3				
11040+2309	HO48	8041	2016.269	R	20	1.833	0.009	355.3*	0.4				
11046+5058	COU2505	–	2016.326	R	20	0.474	0.004	254.1	0.6				
11050+3825	HO378AB	8047	2016.290	R	20	1.073	0.005	237.1*	0.4	Elongated			
11078+3946	COU1749	–	2016.296	R	20	0.524	0.004	109.2	0.6	Faint			
11080+1012	J81	8067	2016.296	R	20	1.901	0.039	137.8*	0.3				
11080+2659	TDS7688	–	2016.337	R	20	0.538	0.008	14.0*	1.3				
11098+1009	A2775	8077	2016.337	R	20	0.569	0.009	122.2*	0.5				
11100+2138	COU176	–	2016.326	R	20	0.809	0.007	76.3*	0.4	Faint			
11107+3110	HJ2562	8082	2016.291	R	20	0.977	0.005	222.8*	0.5	Elongated	Pop1996b	−0.09	−11.3
11125+3205	COU963	–	2016.337	R	20	1.705	0.009	191.2	0.3				
11128+1031	HEI500	–	2016.337	R	20	1.544	0.008	80.5	0.4	Faint			
11136+5525	A1353	8092	2016.282	R	20	0.566	0.004	208.6	1.0		Doc2015f	0.01	0.1
11151+3735	STT232AB	8102	2016.247	R	20	0.622	0.004	245.2	0.3				
11158+4227	COU1904	–	2016.291	R	20	0.379	0.004	213.6	1.1				
11190+1416	STF1527	8128	2016.266	R	10	0.324	0.003	265.7*	0.6		Tok2012b	0.00	1.3
11190+1416	STF1527	8128	2016.288	R	10	0.314	0.004	266.0	2.2		Tok2012b	0.01	1.3
11203+3603	COU1259	–	2016.266	R	20	0.742	0.005	310.5*	0.4				
11221+3705	COU1260BC	–	2016.342	R	20	0.404	0.008	13.3*	0.5				
11237−0442	RST4475	–	2016.386	R	20	0.619	0.006	131.3	0.3	Elongated			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
11252+1608	HEI156BC	–	2016.386	R	20	–	–	–	–	Unres.			
11258+5527	MLR601	–	2016.326	R	20	1.056	0.005	56.0*	0.3				
11277+4410	A1848	8169	2016.326	R	20	0.554	0.005	193.6	0.5	Elongated			
11290+0105	RST5354	–	2016.301	R	20	0.891	0.011	287.8	0.7				
11292+0606	HEI851	–	2016.296	R	20	0.923	0.016	145.1	0.5				
11294+4206	COU1905	–	2016.266	R	20	–	–	–	–	Unres.			
11308+4117	STT234	8189	2016.285	R	20	0.444	0.004	179.9	0.6	Elongated	Doc2009g	0.01	−1.6
11321+1809	HDS1635	–	2016.296	R	20	–	–	–	–	Unres.			
11330+0938	A2576AB	8211	2016.340	R	20	0.541	0.004	262.0*	0.5	Faint	Sca2016a	0.00	−0.9
11330+0938	A2576AB	8211	2016.342	R	20	0.551	0.006	262.0*	0.3		Sca2016a	0.01	−0.9
11332+4927	HU727	8210	2016.331	R	20	1.247	0.006	204.9	0.3	Artifacts			
11333+5748	MLR551Aa,Ab	8209	2016.266	R	20	0.948	0.007	125.0*	0.3				
11336+4729	COU1573	–	2016.326	R	20	0.630	0.006	89.5	0.3				
11352+3524	HU887	8225	2016.342	R	20	1.290	0.013	304.9*	0.3				
11361+1251	STF1554	8230	2016.329	R	20	0.298	0.004	214.7	1.5	Elongated	Zir2011b	−0.02	−3.2
11362−0223	RST4946	–	2016.301	R	20	1.032	0.008	231.3	0.7				
11366+0834	HEI502	–	2016.329	R	20	1.020	0.006	330.9	0.3				
11367+2128	STF1558AB	8238	2016.288	R	20	1.277	0.028	167.8	0.5				
11371+4040	A1996	8241	2016.389	R	20	1.991	0.011	190.2*	0.3	Elongated			
11383−0029	RST5357	–	2016.301	R	20	0.866	0.004	36.8	1.1				
11409−0247	A1356	8267	2016.342	R	20	1.427	0.012	296.6*	0.3				
11428+2105	HU888	8275	2016.288	R	20	0.546	0.012	179.2	0.4				
11468+1500	BU602	8302	2016.340	R	20	0.536	0.007	307.8*	0.5				
11478+4949	HU729	8307	2016.329	R	20	1.501	0.008	346.6*	0.3				
11487+3937	COU1263	–	2016.329	R	20	0.408	0.008	240.3	0.4	Faint			
11487+4030	COU1262	–	2016.329	R	20	0.668	0.004	248.8	0.3	Elongated			
11510+3653	HU889	8319	2016.331	R	20	0.977	0.005	295.5	0.3				
11540+2239	TDS8101	–	2016.340	R	20	–	–	–	–				
11569+4021	STF1586	8358	2016.332	R	20	1.477	0.007	254.9	0.3				
11579+2458	A680	8365	2016.389	R	20	0.455	0.009	318.9	1.2				
11598+5324	STT243	8378	2016.389	R	20	1.197	0.008	8.5	0.4	Elongated			
12006+4337	STF1589	8386	2016.269	R	20	2.214	0.011	158.3*	0.3				
12022+2108	A2163	8396	2016.269	R	20	0.689	0.006	170.2*	0.4				
12024+1916	A2165	8399	2016.269	R	10	–	–	–	–	Unres.			
12056+5659	A1358AB	8415	2016.340	R	20	0.533	0.004	48.9	0.6				
12061+3850	STF1601	8421	2016.269	R	20	2.013	0.011	298.0*	0.3	Elongated			
12093+1525	A2056	8439	2016.337	R	20	0.583	0.010	125.7*	0.3	Elongated			
12094+5758	TDS8247	–	2016.337	R	20	0.555	0.007	325.8	0.3				
12111+1228	HDS1719	–	2016.337	R	20	0.559	0.007	275.8*	0.7				
12120+1300	A1780	8456	2016.337	R	20	1.252	0.008	135.6*	0.3	Elongated			
12160+4807	HU736	8485	2016.329	R	20	0.367	0.004	181.7*	0.3		USN2006a	0.04	0.0
12167+3004	AG176	8496	2016.397	R	20	2.360	0.012	3.5*	0.3	Elongated			
12189+5622	STF1630	8507	2016.296	R	20	2.524	0.031	170.3*	0.7				
12194+1744	A2059	8508	2016.340	R	20	0.453	0.004	219.4*	1.6		Lin2017a	0.01	-1.3^Q
12238+5410	STT249AB	8535	2016.296	R	20	0.388	0.006	257.1	2.3				
12244+4305	STT250	8540	2016.340	R	10	0.301	0.009	353.2*	1.4				
12265−0153	HLD13AB	8549	2016.389	R	20	1.324	0.007	133.9	0.3	Elongated			
12268−0011	AGC4	8550	2016.329	R	20	0.530	0.008	144.7*	0.5				
12291+3123	STT251	8569	2016.288	R	20	0.739	0.014	59.5*	1.0		Sca2003c	0.06	−2.0
12295+2931	BU1324AB	8570	2016.397	R	20	2.402	0.012	224.5*	0.3				
12306+0943	STF1647	8575	2016.285	R	20	1.289	0.009	248.6	0.7		Hop1970	0.05	−3.3
12329+5448	A1600	8594	2016.291	R	20	0.880	0.004	8.4	0.4	Diffuse			
12334+3410	HO537	8596	2016.397	R	20	2.429	0.012	174.4*	0.3				
12340+2650	COU595	–	2016.340	R	20	0.993	0.006	2.3*	0.3				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
12345+0558	BU797AB	8598	2016.288	R	20	0.619	0.018	145.9	0.5				
12349+2238	WRH12	–	2016.288	R	10	0.340	0.008	12.0*	1.0		Hrt2014b	−0.01	0.2
12349+2238	WRH12	–	2016.288	R	10	0.341	0.003	12.0*	0.9		Hrt2014b	−0.01	0.2
12372+2112	STF1663	8611	2016.291	R	20	0.636	0.004	66.5*	0.3		Zir2013a	0.00	−1.0
12417−0127	STF1670AB	8630	2016.266	R	20	2.452	0.042	3.7	0.3		Sca2007c	0.00	0.3
12429+0516	A1602	8639	2016.386	R	20	0.598	0.004	27.2	1.0		Doc2015d	−0.00	0.4
12437+4942	TDS8505	–	2016.386	R	20	0.505	0.004	174.6	0.9				
12441+3546	HO256	8651	2016.296	R	20	0.522	0.004	120.4*	0.5				
12454+0331	J432	8658	2016.386	R	20	1.216	0.006	249.3	0.3				
12501+2408	A563	8677	2016.389	R	20	0.400	0.004	180.1	0.6				
12507+2032	HU640AB	8680	2016.389	R	20	0.444	0.004	250.2	0.5		Hrt2014b	0.02	1.8
12510+5959	HU1140	8683	2016.302	R	20	0.615	0.006	261.3	0.3				
12515+2714	ES439	8686	2016.397	R	20	2.111	0.011	67.4*	0.4				
12526+2342	COU396	–	2016.302	R	20	0.884	0.011	314.5	0.5	Elongated			
12533+2115	STF1687AB	8695	2016.291	R	20	1.179	0.006	199.2*	0.4	Elongated	Dru2014	0.01	0.5
12547+2206	MET9	–	2016.302	R	20	1.685	0.008	50.4*	0.3				
12549+0919	HEI514	–	2016.389	R	20	1.339	0.007	87.2*	0.3				
12556+5706	MLR553	–	2016.296	R	20	0.476	0.006	187.5	1.3				
12560+5305	TDS8595	–	2016.302	R	20	0.624	0.006	225.1*	0.4				
12563+4300	A2000	8709	2016.296	R	20	1.018	0.005	48.8	1.8				
12575+2457	COU397	–	2016.296	R	20	0.708	0.006	60.3	1.7	Elongated			
12587+2728	STF1699	8721	2016.291	R	20	1.704	0.009	8.9	0.3				
12595+3004	A1852	8726	2016.411	R	20	0.977	0.012	310.9	0.3				
13007+5622	BU1082	8739	2016.266	R	20	0.816	0.005	123.6	0.3		Sca2012c	−0.01	2.9
13007+5622	BU1082	8739	2016.378	R	20	0.820	0.006	124.4*	0.3		Sca2012c	−0.00	3.2
13041+5227	MLR704	–	2016.340	R	20	0.410	0.004	217.8*	0.4				
13042+5615	MLR554	–	2016.266	R	20	0.606	0.015	144.7*	0.9				
13069+5200	A1605	8785	2016.340	R	20	1.087	0.005	349.7	0.4				
13081+2657	STT260	8791	2016.326	R	20	0.311	0.004	220.6	0.4	Elongated	Zir2008	−0.04	−36.5^Q
13091+2127	HU572	8799	2016.321	R	20	0.511	0.004	334.4	0.6		Fmr2012b	−0.02	1.0
13097+4418	COU1909	–	2016.321	R	20	0.649	0.008	252.1	0.7				
13101+3830	BU608BC	8805	2016.291	R	20	1.254	0.006	268.9*	0.3				
13121+3655	STF1730	–	2016.414	R	20	1.871	0.009	338.7	0.4				
13128+4030	A1606	8820	2016.291	R	20	1.296	0.006	15.7	0.3				
13134+5252	A1607	8825	2016.321	R	20	0.477	0.004	9.1	0.3				
13157+5424	HDS1858	–	2016.340	R	20	0.530	0.008	172.2	0.9				
13177+5845	A1360	8851	2016.326	R	20	0.784	0.004	142.0*	0.3				
13198+4747	HU644AB	8862	2016.269	R	20	0.587	0.006	83.0*	0.7		Msn2012a	0.02	0.3
13221+2755	MLB646	–	2016.337	R	20	2.522	0.013	163.1	0.3				
13222+2710	A565	8875	2016.337	R	20	0.785	0.004	196.0*	0.8				
13223+2631	A566	8876	2016.337	R	20	1.966	0.010	245.5*	0.3	Elongated			
13232+4029	POP119	–	2016.326	R	20	0.750	0.006	4.8	0.5				
13237−0043	A2489	8884	2016.321	R	20	0.986	0.005	190.7	0.6		WSI2004a	0.02	−0.8
13252+1518	J749	8894	2016.419	R	20	2.653	0.013	286.7	0.3				
13258+4430	A1609AB	8901	2016.291	R	20	0.361	0.006	57.8	1.1		Hei1991	0.01	−1.3
13258+4430	A1609AC	8901	2016.291	R	20	2.500	0.012	39.7	0.3				
13258+4430	A1609BC	8901	2016.291	R	20	2.849	0.014	41.9	0.3				
13262+0345	HEI773	–	2016.302	R	20	0.883	0.007	72.0*	0.3				
13268+5043	COU2190	–	2016.302	R	20	0.435	0.004	37.9*	0.4				
13280+3235	A1856	8911	2016.334	R	20	1.072	0.007	344.4*	0.3				
13283+0214	A2490	8913	2016.302	R	20	1.177	0.006	91.4*	0.3				
13305+3430	A1857	8927	2016.296	R	20	0.440	0.007	341.6*	0.6				
13315+5725	MLR555	–	2016.302	R	20	0.554	0.004	169.0*	0.4				
13328+1649	VYS6	–	2016.288	R	20	2.686	0.013	54.2*	0.9		Hei1990d	−0.05	0.8

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ (″)	σ_ρ (″)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) (″)	$\Delta\theta$(O-C) (°)
13328+2421	A567	8937	2016.340	R	20	1.453	0.008	255.6*	0.3	Faint			
13331+4316	COU1754	–	2016.402	R	10	–	–	–	–	Unres.			
13333+4526	A1610	8942	2016.334	R	20	0.907	0.005	267.4	0.4	Elongated			
13336+2944	A1095	8943	2016.296	R	20	0.339	0.007	288.0	0.8		Ole2002a	0.01	−1.0
13340+0847	A1792	8946	2016.288	R	20	0.722	0.017	308.2*	0.9				
13368+0650	A1611	8968	2016.288	R	20	0.882	0.022	121.7	0.8				
13377+5028	BU934	8978	2016.378	R	20	1.264	0.006	263.5	0.3				
13377+5043	STF1770	8979	2016.378	R	20	1.713	0.009	122.5*	0.3				
13400+3759	HU897AB	8988	2016.326	R	20	0.353	0.004	57.9*	0.6		Zir2015a	−0.01	1.6
13442+5921	HU1261	9009	2016.378	R	20	1.073	0.007	101.3*	0.3				
13453+4559	COU1915	–	2016.326	R	20	1.632	0.008	76.1*	0.3				
13478+0120	A2492	9026	2016.378	R	20	0.948	0.005	199.4	0.8	Elongated			
13485−0052	RST4991	–	2016.378	R	20	1.333	0.007	290.3	0.3				
13532−0333	RST5530	–	2016.430	R	20	0.891	0.007	20.5	0.3	Diffuse			
13577+5200	A1614	9071	2016.384	R	20	1.425	0.007	299.7	0.3		RAO2015	0.03	0.1
14009+0912	HEI777	–	2016.326	R	20	1.763	0.009	215.3	0.3	Faint			
14012+2522	A569	9084	2016.389	R	20	0.589	0.005	149.2	0.4				
14020+5713	A1097AB	9089	2016.296	R	20	0.405	0.011	259.4*	1.6		Sca2000a	−0.02	3.4
14028+1417	HEI65	–	2016.397	R	20	0.310	0.004	94.1	0.4				
14034+1740	A2064	9093	2016.397	R	20	1.060	0.006	176.9	0.3				
14037+0829	BU1270	9094	2016.430	R	10	0.222	0.002	4.6	0.8		USN2006b	−0.01	−1.2
14065−0249	RST4523	–	2016.389	R	20	0.379	0.004	81.2	0.4				
14078+2443	A346	9116	2016.397	R	20	0.967	0.008	308.7	0.3				
14082+3645	STT276AB	9121	2016.321	R	20	0.425	0.004	209.0	0.5				
14110+0525	TDS9122	–	2016.389	R	20	–	–	–	–	Unres.			
14122+2722	J1125	9154	2016.386	R	20	0.682	0.005	96.3	0.3	Elongated			
14122+4411	STT278	9159	2016.340	R	10	0.368	0.004	93.5*	0.6		Hrt2009	−0.02	−0.5^{Q}
14131+5520	STF1820	9167	2016.329	R	20	2.765	0.014	123.0	0.3		Kiy1998 (orb.1)	0.09	−0.3
14135+1234	BU224	9165	2016.329	R	20	0.632	0.009	100.6*	0.3		Lin1985c	−0.02	1.4
14139+2906	STF1816	9174	2016.291	R	20	0.400	0.006	98.9*	0.4		Zir2014a	0.02	0.4
14141+1056	HEI530	–	2016.386	R	20	0.538	0.008	353.3	0.3				
14145−0459	A2588	9176	2016.386	R	20	0.952	0.005	220.2	0.5				
14148+0015	RST5383	–	2016.329	R	20	0.548	0.004	44.2	0.7	Elongated			
14151−0125	RST4997	–	2016.329	R	20	0.282	0.008	250.4	0.7	Elongated			
14153+0308	STF1819AB	9182	2016.266	R	20	0.893	0.011	165.9	0.3		Sca2012b	0.01	0.8
14153+0308	STF1819AB	9182	2016.387	R	20	0.899	0.012	165.6	0.3	Elongated	Sca2012b	0.01	0.8
14160+5247	A1616	9194	2016.266	R	20	1.644	0.008	84.4*	0.4				
14171+4529	A1617	9205	2016.430	R	20	0.458	0.004	281.4	0.8				
14171+5100	A147	9206	2016.296	R	20	0.618	0.012	106.8*	1.2				
14171+5100	A147	9206	2016.340	R	20	0.607	0.006	106.7*	0.3				
14175+1722	A2067	9204	2016.386	R	10	–	–	–	–	Unres.			
14184+3412	HU901	9214	2016.288	R	20	0.632	0.005	35.7	1.7				
14185+4755	BU1273	9217	2016.430	R	20	1.328	0.014	176.7	0.3	Diffuse			
14188+5934	HU1267	9221	2016.302	R	20	0.753	0.004	185.8*	0.3				
14188+5934	HU1267	9221	2016.337	R	20	0.752	0.004	6.0*	0.3				
14205+2634	DAN1	–	2016.403	R	10	–	–	–	–	Unres.			
14213+3050	COU482	–	2016.397	R	20	0.629	0.005	121.1	0.3	Elongated			
14220+5107	A148	9238	2016.403	R	20	0.501	0.005	190.3	0.4				
14234+4736	A149AB	9249	2016.291	R	20	0.784	0.007	123.3	0.3				
14241+4331	COU1916	–	2016.430	R	20	0.745	0.006	268.3	0.4				
14303+4709	COU1917	–	2016.337	R	20	0.426	0.004	40.7	0.3				
14333+2725	A688	9308	2016.337	R	20	0.759	0.004	195.4*	0.4				
14339+5514	STF1860	9315	2016.403	R	20	1.047	0.005	112.7	0.3				
14340−0507	A2589	9309	2016.386	R	20	1.026	0.008	202.7	0.9	Elongated			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
14369+4813	A347	9324	2016.329	R	20	0.551	0.004	236.4*	1.1	Elongated	Doc2017k	−0.00	−0.3
14380+5135	STF1863	9329	2016.329	R	20	0.668	0.004	59.9*	0.7		Zir2013a	0.02	−0.0
14380+5135	STF1863	9329	2016.403	R	20	0.665	0.004	59.8	0.4		Zir2013a	0.02	−0.1
14407+3117	STF1867	9340	2016.329	R	20	0.668	0.004	353.2*	0.4		Zir2013a	0.02	0.0
14407+3117	STF1867	9340	2016.403	R	20	0.666	0.004	353.3	0.3		Zir2013a	0.01	0.1
14416+2747	COU407	–	2016.337	R	20	0.424	0.008	112.6	0.5				
14441+3138	COU607	–	2016.387	R	20	0.723	0.011	314.9	0.5				
14455+4223	STT285	9378	2016.403	R	20	0.499	0.004	79.8*	0.4		Sca2015b	0.00	−0.0
14463−0117	RST5006	–	2016.329	R	20	0.647	0.004	209.9	0.3	Elongated			
14470−0049	RST5007	–	2016.329	R	20	0.506	0.011	333.3*	0.4				
14484+2422	STF1884	9389	2016.376	R	20	2.165	0.011	55.6*	0.3	Elongated			
14515+4456	STT287	9418	2016.403	R	20	0.613	0.004	3.5*	0.3		Hei1997	−0.09	2.0
14534+1542	STT288	9425	2016.504	R	20	1.004	0.008	158.4	0.3	Elongated	Hei1998	0.01	0.6
14558+3939	A1627	9441	2016.403	R	10	0.214	0.003	199.7	0.8		Baz1993a	−0.02	2.3
14590+1732	A2072	9463	2016.389	R	20	0.703	0.004	233.6*	1.2				
14595+1753	COU188	–	2016.419	R	20	0.258	0.005	229.2	0.7				
15009+5745	MLR602	–	2016.302	R	10	0.130	0.003	213.8	0.7				
15018−0008	BU348AB	9480	2016.515	R	20	0.478	0.006	107.6	0.5	Elongated			
15045+1950	HU745	9495	2016.493	R	20	0.558	0.008	18.7	0.6				
15054+1338	HEI378	–	2016.419	R	20	1.596	0.008	350.5	0.3				
15058+5841	A1114	9503	2016.493	R	20	1.215	0.008	285.2	0.5				
15075+5516	HU143Aa,Ab	9511	2016.493	R	20	0.430	0.006	316.9*	0.3				
15077+1158	STF1911	9508	2016.419	R	20	1.948	0.010	291.8	0.3				
15078+3956	COU1271	–	2016.378	R	20	0.404	0.006	193.0*	0.8	Elongated	Cou1999b	0.02	−33.6
15092+2809	A690	9526	2016.337	R	10	–	–	–	–				
15100+2807	TDS768	–	2016.337	R	20	0.893	0.006	192.3*	0.3	Elongated			
15126+2041	COU190	–	2016.378	R	20	1.350	0.007	272.1	0.3	Elongated			
15143+1959	COU27AB	–	2016.419	R	20	–	–	–	–	Unres.			
15149+3818	STF1926	9553	2016.378	R	20	0.318	0.004	221.7*	0.5				
15183+2650	STF1932AB	9578	2016.504	R	20	1.605	0.008	265.8	0.3		Sca2015b	−0.02	0.0
15192+4329	A1630	9589	2016.326	R	20	0.787	0.004	244.4*	0.3				
15200+2338	COU103	–	2016.378	R	20	0.556	0.010	283.1	0.7				
15202+5824	MLR533	–	2016.302	R	20	0.286	0.004	311.3	0.3				
15204+5309	HU147	9602	2016.302	R	20	0.572	0.004	287.0*	0.3				
15206+1523	HU1160	9595	2016.337	R	20	0.474	0.006	175.1	0.8		Hrt2009	0.01	4.8
15208+3459	HO62	9599	2016.504	R	20	1.494	0.019	103.6	0.4				
15210+2104	HU146	9600	2016.520	R	20	0.701	0.004	124.6	0.5		Zir2015a	−0.02	1.2
15225+5516	HU148	9618	2016.430	R	20	1.507	0.008	206.8	0.3				
15232+3017	STF1937AB	9617	2016.512	R	20	0.567	0.004	219.0	1.3	Elongated	Wsi2006b	−0.00	−1.7
15241+2814	TDS9506	–	2016.378	R	20	0.424	0.010	30.5	0.7	Uncertain			
15245+3723	STF1938Ba,Bb	9626	2016.387	R	20	2.262	0.011	3.7*	0.3		Sca2013a	0.05	0.4
15257+2638	STF1941	9630	2016.520	R	20	1.382	0.007	211.9	0.3				
15271+2355	A82	9641	2016.378	R	20	0.840	0.013	353.6	0.8	Elongated			
15272+4133	COU1443	–	2016.493	R	20	0.446	0.017	170.5	0.3				
15272+4133	COU1443	–	2016.493	R	20	0.446	0.017	170.5	0.3				
15277+0606	STF1944	9647	2016.501	R	20	0.636	0.010	294.7	0.3		Zir2015a	0.01	0.4
15328+1945	HU577	9692	2016.501	R	20	0.347	0.005	25.1	1.8		Cou1984b	0.01	0.9
15329+3122	COU610	–	2016.520	R	20	0.844	0.004	197.8	0.4	Elongated			
15360+3948	STT298AB	9716	2016.515	R	20	1.199	0.006	186.1	0.3	Elongated	Sod1999	−0.01	0.7
15361+4849	HU652	9718	2016.512	R	20	1.156	0.006	185.6	0.3				
15361+5531	A1124	9720	2016.531	R	20	1.454	0.007	142.7	0.3				
15368−0438	RST4545	–	2016.340	R	20	0.526	0.008	105.3*	0.4				
15382+3615	HU1167AB	9731	2016.520	R	20	1.363	0.009	79.9	0.3		Dru1995	0.11	−0.8
15382+3615	STF1964CD	9731	2016.520	R	20	1.563	0.008	20.3	0.3		Dru1995	0.06	0.7
15390+2545	COU612	–	2016.501	V	20	0.285	0.006	341.7	0.5		Doc2011h	0.01	1.3^{Q}

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
15404+2123	HU579	9741	2016.326	R	20	0.712	0.004	136.4*	0.3				
15405+1840	A2076	9742	2016.526	R	20	0.722	0.005	185.9	1.0	Elongated	Zir2014a	−0.01	0.3
15413+5959	STF1969	9756	2016.526	R	20	1.069	0.006	29.6	0.3		RAO2015	0.00	0.5
15428+0509	A1125	9755	2016.326	R	20	1.278	0.006	278.4*	0.3	Elongated			
15440+2220	COU106	–	2016.526	R	20	0.331	0.012	276.8	1.0				
15468+1905	A2077	9783	2016.419	R	20	0.536	0.008	224.4	0.6				
15474+5929	A1127	9794	2016.302	R	20	0.351	0.006	296.2*	0.6				
15476+5523	BU946	9793	2016.531	R	20	2.324	0.012	128.5	0.3				
15485+2600	COU616	–	2016.542	R	20	0.787	0.005	162.9	0.8				
15498+4431	BU621	9802	2016.414	R	20	0.681	0.005	25.4	0.5				
15498+4431	BU621	9802	2016.528	R	20	0.672	0.004	21.7	1.0	Diffuse			
15509+1911	A2078	9809	2016.528	R	20	1.082	0.014	165.4	0.3				
15510+4228	BU810	9814	2016.493	R	20	1.615	0.010	84.2	0.3				
15521+0528	A1128	9818	2016.542	R	20	1.530	0.009	350.1	0.3				
15530−0218	RST5035	–	2016.417	R	20	0.486	0.007	113.3	0.5				
15532−0116	RST5036	–	2016.329	R	10	0.260	0.002	22.6	0.6				
15532−0116	RST5036	–	2016.329	R	20	0.257	0.004	19.4	1.6				
15542+1659	A2080	9831	2016.417	R	20	0.384	0.004	103.6	0.4		Hrt2008	0.00	−3.0
15559+1555	ALD12	9845	2016.419	R	20	1.888	0.009	47.7	0.3				
15574+1527	ALD3	9857	2016.419	R	20	1.673	0.008	30.2	0.3				
16009+1316	STT303AB	9880	2016.515	R	20	1.601	0.008	173.8	0.3	Elongated	Zir2015a	0.00	0.1
16013+4529	A1640	9898	2016.509	R	20	0.659	0.011	345.2	0.7				
16027+1257	HEI240	–	2016.340	R	20	1.262	0.008	116.8	0.3				
16059+1041	HDS2273Aa,Ab	–	2016.515	R	20	0.324	0.007	71.4	2.5		Zir2008	−0.04	−1.0
16071+1654	BU812	9925	2016.528	R	20	0.709	0.004	97.5	0.5				
16115+1507	A1799	9952	2016.529	R	20	0.803	0.006	116.3	0.3		Zir2014a	0.01	1.1
16118+3424	STT306	9961	2016.501	R	10	0.222	0.004	2.0	1.3				
16128+3922	STF2028	9970	2016.417	R	20	0.491	0.009	146.5	0.3		Hrt2014b	0.01	0.2
16137+4638	A1642	9975	2016.504	R	20	0.824	0.004	181.0	0.3		Hrt2001b	0.04	0.9
16139+0123	RST5407	–	2016.417	R	20	0.955	0.006	221.7	0.3				
16148+1600	A2083	9977	2016.498	R	20	1.188	0.006	155.6	0.3				
16161+2936	A348	9986	2016.378	R	20	1.072	0.008	151.9*	0.3	Elongated			
16169+0113	A2181	9989	2016.417	R	20	0.517	0.004	85.9	0.5	Elongated	Hei1996	0.07	2.7
16169+1948	COU107	–	2016.417	R	20	0.611	0.004	113.9	0.4	Elongated			
16178+4918	HU661	9994	2016.509	R	20	0.771	0.004	39.3	0.6				
16186+1247	HEI241	–	2016.378	R	20	0.751	0.004	58.0	0.3				
16188+1724	STF2037	9997	2016.414	R	20	1.169	0.006	255.4	0.3				
16192+4140	STT309	10006	2016.515	R	20	0.270	0.012	316.8	1.1	Confused	USN2002	−0.01	2.9
16192+5736	A1137	10011	2016.376	R	20	0.573	0.004	203.2	0.8				
16216+3631	COU982	–	2016.509	R	20	0.360	0.008	247.4	0.5				
16233+3251	COU619	–	2016.376	R	20	0.490	0.004	190.7*	0.9				
16235+3321	BU951AB,C	10036	2016.501	R	20	1.032	0.005	29.6	0.5	Elongated			
16237+0710	TDS810	–	2016.542	R	20	1.181	0.012	76.0	0.3				
16280+2632	BU813	10071	2016.414	R	20	1.194	0.006	176.8	0.3				
16289+1825	STF2052AB	10075	2016.417	R	20	2.391	0.012	118.9	0.3	Elongated	PRU2017	−0.01	0.1
16296+1635	A2084	10078	2016.379	R	20	0.431	0.008	132.0	0.5	Elongated			
16301+3353	HU1173	10085	2016.509	R	20	0.244	0.006	66.3	2.9	Elongated	Hei1997	−0.02	−0.3
16309+0159	STF2055AB	10087	2016.417	R	20	1.402	0.007	41.9	0.3		Hei1993b	−0.02	−0.4
16309+3804	STF2059	10093	2016.403	R	20	0.265	0.004	179.2	0.3				
16312+5725	WOR32	–	2016.376	R	20	0.992	0.006	180.4*	0.3				
16313+5557	MLR636	–	2016.379	R	20	0.569	0.008	271.6	0.3	Elongated			
16317+1919	STF2058AB	10099	2016.509	R	20	2.045	0.010	352.5*	0.3				
16326+2314	BU817	10107	2016.523	R	20	0.929	0.005	328.4	0.4	Elongated			
16326+4007	STT313	10111	2016.523	R	20	0.921	0.005	129.9	0.3	Elongated			
16366+0844	TDT3	–	2016.417	R	20	–	–	–	–	Unres.			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
16368+2632	COU489	–	2016.376	R	20	0.732	0.008	332.0*	0.4				
16384+3514	COU985	–	2016.504	R	20	0.334	0.005	81.3	1.9		Doc2012g	−0.03	0.4
16395+2244	HU486	10145	2016.379	R	20	1.315	0.015	165.1	0.4				
16421+2151	HU487	10165	2016.419	V	10	0.205	0.004	95.8	0.3				
16439+4329	D15	10188	2016.387	R	20	0.567	0.004	336.0	0.3		Alz2007	0.02	0.8
16440+1236	HEI544	–	2016.387	R	20	2.923	0.030	140.2	0.3				
16468+0821	A2784AB	10206	2016.389	R	20	0.388	0.004	168.5	0.5				
16497+5816	MLR430	–	2016.389	R	10	–	–	–	–	Unres.			
16497+5816	MLR430	–	2016.389	V	10	0.131	0.002	159.0*	0.3		Lin2019	0.00	−0.2
16509+4259	A575	10233	2016.419	R	20	0.699	0.014	150.4	2.0				
16511+0924	STF2106AB	10229	2016.523	R	20	0.764	0.006	172.2	0.3	Elongated	Sca2001g	−0.04	1.2
16518+2840	STF2107AB	10235	2016.490	R	20	1.443	0.007	104.2	0.3	Elongated	Sca2003c	0.05	−1.5
16518+3151	BU821	10236	2016.523	R	20	1.269	0.009	324.4	0.3	Faint			
16522+1535	HU1278	10237	2016.493	R	20	1.395	0.008	359.4	0.3	Elongated			
16539+2547	COU492	–	2016.542	R	20	0.515	0.006	92.1	0.6				
16540+2906	A350	10253	2016.600	R	20	0.600	0.012	148.4	0.3				
16564+3755	COU1287	–	2016.389	V	20	0.706	0.004	163.4	0.3				
16566+5711	A1143AB	10276	2016.389	R	20	0.289	0.004	219.0	0.5		Hrt2000c	−0.00	0.7
16576+4935	COU1772	–	2016.512	R	20	0.273	0.014	77.2	1.8	Elongated			
16578+4344	A1872	10281	2016.542	R	20	1.094	0.009	119.4	0.3				
16594+1419	STT321	10294	2016.529	R	20	0.580	0.008	14.5	0.6				
16595+0942	BU1298AB	10295	2016.512	R	20	0.415	0.008	132.0	0.3				
16598+3655	STT322	10302	2016.526	R	20	1.445	0.013	204.3	0.9	Faint			
17007+3951	COU1290	–	2016.542	R	20	0.711	0.004	28.5	0.4				
17020+0827	STF2114	10312	2016.490	R	20	1.350	0.013	196.9	0.3				
17053+5428	STF2130AB	10345	2016.529	R	20	2.528	0.013	1.6	0.6		Pru2012	0.00	0.1
17063+2631	A228	10346	2016.512	R	20	0.575	0.006	7.6	0.6				
17102−0046	BU124	10376	2016.529	R	20	0.907	0.005	260.7	0.3				
17116+3916	HU1178AB	10391	2016.499	R	20	0.335	0.004	8.1	0.4				
17121+4540	KUI79AB	–	2016.526	R	20	0.270	0.020	146.4	3.3		Hrt1996a	−0.04	1.1
17130+0745	STT325	10398	2016.526	R	20	0.404	0.009	300.6	1.3		Fmr2012h	0.05	2.1
17141+5608	STT327	10425	2016.512	R	20	0.448	0.004	337.3	0.4		Msn2011c	0.01	1.7
17171+4034	COU1295	–	2016.499	R	20	0.260	0.008	56.4	1.2				
17174+1113	HU172	10441	2016.542	R	20	1.159	0.010	345.1	0.4				
17183+5338	SWI3	10469	2016.512	R	20	0.491	0.004	179.8	0.9				
17184+3240	BU628	10459	2016.512	R	20	0.551	0.004	261.9	0.7		Fmr2012a	−0.01	−1.1
17212+2542	A232	10495	2016.523	R	20	0.418	0.025	129.8	2.6				
17234+4209	STF2163	10523	2016.602	R	20	1.407	0.010	76.4	0.3	Elongated			
17239+3627	STF2162	10527	2016.611	R	20	1.346	0.007	284.8	0.3				
17240+3835	HU1179	10531	2016.602	R	10	0.293	0.005	271.7	0.5	Elongated	Hrt2000b	0.03	2.5
17251+0716	A1149	10533	2016.387	R	20	1.022	0.011	125.3	0.5	Elongated			
17268+2625	COU1455AB	–	2016.501	R	20	0.274	0.008	358.3*	2.0	Elongated			
17276+2624	COU498	–	2016.501	R	20	0.457	0.005	39.8	1.0				
17291+1727	DAL14AB	–	2016.529	R	20	–	–	–	–	Unres.			
17293+2924	A351AB	10585	2016.510	R	20	0.479	0.005	57.6	0.6		Hei1993d	0.02	−1.1
17304−0104	STF2173AB	10598	2016.616	R	20	0.643	0.007	142.5	0.6	Elongated	Hei1994a	0.00	0.0
17309−0538	A30AB	10600	2016.616	R	20	0.462	0.007	65.8	1.1				
17320+0249	STT331AB	10614	2016.611	R	20	1.013	0.006	352.6	0.3	Elongated			
17327+5924	MLR355	–	2016.616	R	20	0.672	0.009	208.7	0.3				
17344+4913	HU923	10646	2016.540	R	20	1.015	0.008	107.3	0.4				
17345+3935	COU1298	–	2016.510	R	20	0.281	0.004	248.7	1.5				
17354+1322	A1879	10648	2016.616	R	20	0.520	0.004	112.6	0.7				
17374+1233	BU1121	10669	2016.523	R	20	0.483	0.005	192.1	1.4				
17399+0748	HDS2499	–	2016.611	R	20	0.695	0.007	242.6	0.8	Elongated			
17400−0038	BU631	10696	2016.611	R	10	0.281	0.003	79.9	0.9		Hei1996a	−0.03	1.2

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
17412+4139	STF2203	10722	2016.630	R	20	0.744	0.007	292.4	0.3				
17420+1557	BU1251AB	10723	2016.630	RL	20	1.426	0.012	101.7	0.4	Faint	Baz1991a	0.03	3.4
17420+1557	BU1251AB	10723	2016.630	R	20	1.448	0.008	101.4	0.3		Baz1991a	0.05	3.1
17430+1215	HU1283	10733	2016.616	R	20	0.497	0.009	186.8	0.5				
17434+3357	HO560AB	10742	2016.632	R	20	1.372	0.007	263.5	0.3				
17436+1257	HU1284	10740	2016.616	R	20	1.034	0.005	70.6	0.3				
17436+2237	HU1285	10743	2016.632	R	20	0.526	0.004	210.8	0.8		USN2002	0.04	−0.6
17449+5003	TDT485	–	2016.523	R	20	–	–	–	–	Unres.			
17457+1650	A2092	10770	2016.643	R	32	0.874	0.019	338.0	0.4		Cve2008a	−0.07	0.5
17457+1743	STF2205	10769	2016.633	R	20	0.902	0.006	11.1	0.4	Elongated			
17467+1249	ROE141	10785	2016.643	W	32	2.399	0.012	179.9	0.3				
17469+0630	A1162AB	10787	2016.643	R	32	1.825	0.017	163.5	0.3				
17471+1742	STF2215	10795	2016.641	R	20	0.473	0.004	248.3	0.9	Elongated	Cve2006e	0.03	1.4
17471+4215	A697	10800	2016.633	R	20	0.422	0.006	127.9	0.3				
17472+1502	HU1288	10796	2016.602	R	20	0.421	0.009	163.0	0.4		Zir2015a	−0.02	2.4
17472+1502	HU1288	10796	2016.641	R	20	0.435	0.006	162.9	0.8		Zir2015a	−0.00	2.3
17479+4047	TDT509	–	2016.641	W	20	–	–	–	–	Unres.			
17501+0214	A2187	10822	2016.643	R	20	0.505	0.009	322.7	0.4	Elongated			
17506+0714	STT337	10828	2016.654	R	20	0.585	0.004	164.9	0.4		Doc2015f	0.00	0.7
17516+4555	A1883	10855	2016.657	R	20	0.538	0.004	43.6	0.7				
17519+0724	A1164AB	10846	2016.602	R	20	0.431	0.012	41.6	1.0				
17520+1520	STT338AB	10850	2016.654	R	20	0.829	0.004	163.7	0.3		Pru2012	−0.00	0.0
17531+4212	COU1599	–	2016.654	R	20	0.552	0.006	134.5	0.4				
17536+4234	COU1600	–	2016.657	R	20	0.669	0.008	250.8	0.8				
17554+1352	HEI553	–	2016.657	W	20	0.626	0.005	207.4	0.8				
17555+4108	COU1601Aa,Ab	10901	2016.657	R	20	0.533	0.004	62.9	0.9				
18054+1624	A2093	11050	2016.493	R	20	0.645	0.008	229.8	0.3				
18058+2127	STT341AB	11060	2016.515	R	10	0.237	0.004	92.7	1.1	Diffuse	Hei1982b	−0.01	−2.6
18058+4054	TDT677	–	2016.646	W	20	–	–	–	–	Unres.			
18075+1940	STT524	11080	2016.493	R	20	0.478	0.005	206.5	1.1		Hrt2000c	0.00	0.2
18086+1838	HU314	11098	2016.515	R	20	0.271	0.006	70.9	2.2	Elongated	Zir2015a	−0.02	−1.0
18092+3129	COU812	–	2016.646	W	20	0.652	0.005	264.7	0.4	Elongated	Cou1999	−0.03	−22.6
18094+3144	A237AB	11114	2016.646	R	32	2.330	0.012	103.2	0.3				
18101+1629	STF2289	11123	2016.597	R	20	1.216	0.013	214.9	1.7	Diffuse	Hop1964	−0.03	−0.7
18114+2519	A238	11144	2016.493	R	20	0.619	0.004	67.8	0.7	Elongated			
18121+2739	STF2292	11155	2016.532	R	20	0.834	0.005	275.5	0.3				
18124+0415	A353	11153	2016.526	R	20	1.649	0.010	17.2	0.4				
18126+3836	BU1091	11170	2016.540	R	20	0.745	0.006	319.0	0.3		Zir2012b	−0.02	0.3
18127+5446	MLR585	–	2016.515	R	20	0.415	0.006	335.1	1.0				
18133−0324	RST4583	–	2016.526	R	20	0.392	0.028	85.6	2.3				
18133+5242	A1376	11188	2016.515	R	20	0.324	0.004	22.0	1.3				
18145+3249	HU927	11207	2016.526	R	20	0.372	0.006	100.9	1.3				
18146+0011	STF2294	11186	2016.540	R	20	1.364	0.007	92.9	0.3		Sca2015b	0.04	−0.4
18146+2335	HU318AB	11194	2016.649	R	20	0.689	0.008	156.6	0.3				
18146+2335	GII110CD	–	2016.649	R	32	0.884	0.012	301.0*	0.3				
18146+2335	GII110CD	–	2016.649	W	32	0.905	0.020	301.4*	0.4				
18146+2335	GII110CD	–	2016.649	R	32	0.898	0.015	301.0*	0.9				
18146+2335	GII110CD	–	2016.652	R	32	0.849	0.022	301.7*	0.5				
18146+2335	GII110CD	–	2016.652	W	32	0.897	0.009	300.9*	0.3				
18146+2335	GII110CE	–	2016.652	W	32	3.498	0.017	209.8*	0.3				
18146+2335	GII110CE	–	2016.652	R	32	3.486	0.017	210.6*	0.4				
18160+1158	TDT765	–	2016.493	R	20	1.001	0.009	172.4	0.3				
18171+3453	COU12	–	2016.646	W	32	2.061	0.016	210.5	0.3				
18172+2640	A241	11234	2016.660	W	20	0.668	0.008	287.7	0.5				
18173+4355	A577	11239	2016.652	R	20	0.671	0.007	306.1	0.6				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ (″)	σ_ρ (″)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) (″)	$\Delta\theta$(O-C) (°)
18191+2935	A242	11258	2016.652	R	20	1.321	0.007	305.2	0.3				
18197+1016	HU197	11260	2016.501	R	20	0.487	0.005	55.0	1.1	Elongated	Hrt2010a	−0.02	−2.6
18209+3220	ES347	11276	2016.660	W	20	1.771	0.009	64.7	0.4	Elongated			
18217+5740	MLR536	–	2016.660	W	20	0.812	0.005	193.4	0.3	Elongated			
18224+0957	HU238	11294	2016.540	R	20	0.885	0.007	161.9	0.3				
18229+1458	HU581	11300	2016.611	R	20	0.365	0.007	122.3	1.2		AST1991	0.05	−0.4
18233+2731	HO83	11313	2016.502	R	20	0.838	0.010	114.8	0.3				
18252+5659	MLR537	–	2016.502	R	20	0.563	0.008	55.8	1.0				
18253+4846	HU66AB	11344	2016.600	R	10	0.203	0.002	197.3	0.7		USN2002	0.08	5.9
18253+4846	HU66AB	11344	2016.600	R	10	0.202	0.002	196.2	0.4		USN2002	0.08	4.8
18253+4846	HU66BC	11344	2016.600	R	10	0.982	0.005	25.1*	0.3	Outer peaks	Nov2008b	0.09	−0.5
18253+4846	HU66BC	11344	2016.600	R	10	0.980	0.005	25.6*	0.3	Outer peaks	Nov2008b	0.09	0.0
18253+4846	STT351AC	11344	2016.600	R	10	0.786	0.004	26.9*	0.3	Inner peaks			
18253+4846	STT351AC	11344	2016.600	R	10	0.785	0.004	27.0*	0.3	Inner peaks			
18276+4926	COU2278	–	2016.611	R	32	1.421	0.012	14.9	1.0				
18291+0408	A581AB	11387	2016.600	R	20	0.377	0.005	140.0	0.3				
18325+0036	RST5450	–	2016.523	R	20	0.706	0.009	253.4	0.5				
18338+1400	HEI395	–	2016.510	R	20	0.374	0.008	271.6	1.2	Elongated			
18361+2452	A249	11493	2016.510	R	20	1.015	0.005	278.4	0.3				
18370+1016	HU247	11502	2016.523	R	20	0.502	0.037	182.1	1.3				
18380+0800	A356	11518	2016.600	R	20	1.027	0.007	221.6	0.4				
18383+5353	A1378AB	11549	2016.510	R	20	0.373	0.006	119.1	0.5				
18385+3503	COU1308	–	2016.499	R	20	0.407	0.004	25.5	0.7	Elongated			
18386+1632	HO87AB	11530	2016.499	R	20	0.455	0.014	94.1	1.1	Elongated	Hrt2000c	0.05	0.9
18390+5559	A1380AB	11562	2016.613	R	20	0.968	0.006	20.0	0.3				
18406+2636	COU641	–	2016.499	R	20	0.548	0.009	53.1	0.8				
18408+2142	HU324	11571	2016.499	R	20	0.886	0.004	113.3	0.5				
18413+3018	STF2367AB	–	2016.630	R	20	0.418	0.006	72.1	1.3	Elongated	Pbx2000b	−0.01	−0.7
18425+0518	TDT1014	–	2016.543	R	20	0.731	0.006	338.6	0.5				
18436+0444	A357	11610	2016.529	R	20	0.543	0.004	69.7	0.4				
18437+3141	A253	11623	2016.523	R	20	0.690	0.004	132.4	0.4		Baz1987d	0.08	−4.1
18439+0237	STF2369	11617	2016.529	R	20	0.279	0.008	24.8	1.4	Elongated			
18448+5201	HU755	11659	2016.543	R	20	0.569	0.006	124.1	0.3				
18461+1328	TDT1042	–	2016.521	R	20	0.666	0.006	270.8	0.3				
18462+1001	HEI804	–	2016.613	R	32	1.807	0.013	128.0	0.5				
18475+4926	BU971AB	11698	2016.512	R	20	0.491	0.005	34.6	0.9				
18477+0916	HU252	11687	2016.529	R	20	–	–	–	–	Unres.			
18499+5516	MLR574	–	2016.641	W	20	1.052	0.005	52.8	0.5				
18526+4901	A1384	11801	2016.641	W	20	0.693	0.004	60.7	0.6				
18549+4437	COU1932	–	2016.496	R	20	0.868	0.007	297.2	0.4				
18550+3053	A258	11837	2016.513	R	20	0.298	0.004	235.8	0.9		Hrt2013c	−0.04	−3.2
18554+1331	BU647AB	11839	2016.641	W	20	1.307	0.008	6.7	0.3	Elongated			
18554+2324	COU511Aa,Ab	–	2016.496	R	20	0.731	0.006	189.8	0.5	Elongated			
18560+4414	STF3130AB,C	–	2016.419	R	20	2.609	0.013	257.3*	0.3	Elongated			
18560+4414	STT365AB	11863	2016.419	V	10	0.168	0.002	358.5	1.4	Doubtful			
18562−0034	BU972AB	11851	2016.654	R	20	1.091	0.005	2.2	0.3				
18564+2944	COU1014	–	2016.420	R	20	0.246	0.004	45.9	1.8				
18567+2123	HDS2684	–	2016.513	R	20	0.597	0.008	349.6	0.8	Faint			
18569+1546	L42	11865	2016.654	R	32	–	–	–	–	Unres.			
18571+3451	HDS2685	–	2016.603	R	20	0.510	0.004	198.7	0.3				
18575+5814	STF2438	11897	2016.521	R	20	0.861	0.007	357.8*	0.4	Elongated	Hrt2001a	0.04	0.9
18587+1936	HU330	11896	2016.655	W	20	0.697	0.005	32.9	0.6	Elongated			
18591+1810	HU331	11904	2016.543	R	20	0.557	0.005	207.6	0.3				
18591+2230	HU332	11906	2016.603	R	20	0.526	0.005	266.9	0.8				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
19006+3951	COU1933	–	2016.603	R	20	0.580	0.011	194.7	0.4				
19019+1910	STF2437	11956	2016.521	R	20	0.567	0.004	4.4	0.5		Sca2008c	0.01	−0.1
19021+1426	HO93AB	11958	2016.499	R	20	1.133	0.006	328.0	0.4				
19025+5142	TDT1193	–	2016.605	R	20	–	–	–	–	Unres.			
19027−0043	STF2434BC	11971	2016.655	R	20	0.720	0.005	263.6*	0.3	Elongated	Mdz2017	−0.02	−2.2
19030−0423	RST4615	–	2016.655	W	20	0.716	0.004	189.0	0.4				
19030+4233	A589	11990	2016.543	R	20	0.714	0.008	5.7	0.3				
19034+0718	A360	11981	2016.655	W	20	0.675	0.008	285.2	0.5	Elongated			
19061+3549	COU1614	–	2016.496	R	20	0.585	0.009	121.0	0.3				
19064+3144	HO97AB	12043	2016.543	R	20	0.733	0.007	16.0	0.3				
19066+2646	COU722	–	2016.605	R	20	1.011	0.006	334.9	0.5	Faint			
19072+4451	A703	12065	2016.521	R	20	0.560	0.008	189.2	0.6	Faint			
19078+3040	STF2465	12068	2016.605	R	20	1.244	0.006	248.6	0.3				
19081+3031	HO99	12078	2016.499	R	20	0.372	0.004	164.9	0.5				
19089+1914	HO636	–	2016.603	R	20	–	–	–	–	Unres.			
19092+1152	STF2464	12095	2016.603	R	20	1.167	0.006	28.1	0.3				
19092+2656	HO444	12102	2016.605	R	20	1.302	0.007	66.5	0.3				
19134+4443	COU2519Aa,Ab	–	2016.605	R	20	0.255	0.004	76.4	1.0				
19161+4407	COU2520	–	2016.633	R	32	0.904	0.009	233.9	0.7				
19167+2417	A156	12257	2016.611	R	20	0.239	0.012	43.7	1.7				
19178+0317	A2268	12275	2016.611	R	20	0.540	0.005	187.4	0.7				
19182+3910	SEI588	12297	2016.633	W	32	2.211	0.020	78.5	0.3				
19216+5223	BU1129	12366	2016.543	R	10	0.281	0.002	343.7	0.6		Baz1984a	−0.04	3.3
19224+4205	A592	12374	2016.499	R	20	0.608	0.006	250.3	0.6				
19232+1320	HEI269	–	2016.611	R	20	0.725	0.004	10.5	0.3	Elongated			
19233+0911	J2547	–	2016.633	W	32	1.965	0.015	275.6	0.3				
19240+1507	J2964	–	2016.502	R	20	1.237	0.008	292.7	0.3				
19241+4626	STT373	12412	2016.633	R	20	1.819	0.009	232.1	0.3				
19247+5924	MLR220	–	2016.660	W	20	0.756	0.007	337.0	0.6				
19255+4631	A709	12439	2016.502	R	20	0.563	0.004	65.7*	0.5				
19264+3305	COU1317	–	2016.660	R	20	0.443	0.006	290.7	0.8				
19264+3529	TDT1460	–	2016.660	W	20	–	–	–	–	Unres.			
19267+4926	COU2628	–	2016.660	R	20	1.119	0.006	98.1	0.4				
19268+3457	POP33	–	2016.660	W	20	0.856	0.004	232.0	0.6	Elongated			
19270+1606	A1648	12459	2016.502	R	20	0.818	0.007	181.2	0.6				
19276+5025	TDS994	–	2016.660	W	20	1.038	0.006	161.6	0.5	Elongated			
19284+1829	HU340	12496	2016.613	R	20	0.912	0.005	119.5	0.3				
19286+3711	HU1303AB	12504	2016.613	R	20	0.806	0.008	303.7	0.3				
19301+5715	TDT1502	–	2016.657	W	20	–	–	–	–	Unres.			
19303+4932	ES1097	12541	2016.616	R	20	1.107	0.007	244.1	0.6				
19305+2714	A269	12532	2016.614	R	20	0.622	0.007	208.4	0.9				
19309+3815	COU2203BC	–	2016.616	W	20	1.028	0.005	300.8	0.5	Elongated			
19309+5402	A1398	12566	2016.510	R	20	1.498	0.007	48.1	0.3				
19312+3147	TDT1517	–	2016.616	R	20	0.609	0.004	325.5	0.7				
19312+4338	A595	12560	2016.657	R	20	1.066	0.005	85.8	0.3				
19320+3849	A1397AB	12578	2016.616	R	20	1.980	0.010	98.1	0.5				
19326+1203	HEI574	–	2016.526	R	20	0.439	0.004	150.4	0.4				
19326+4603	A714AB	12592	2016.526	R	20	1.515	0.008	359.8*	0.3				
19330+0546	A367	12584	2016.540	R	20	1.010	0.005	305.4	0.3				
19333+2629	COU1028Aa,Ab	–	2016.657	R	20	0.304	0.007	74.1	0.8				
19353+4112	TDT1561	–	2016.616	R	20	–	–	–	–	Unres.			
19371+0819	STF2544AB	12679	2016.515	R	20	1.026	0.005	181.3	0.3				
19371+4108	COU2406	–	2016.630	R	20	0.861	0.004	3.3	0.4				
19379+2248	A164	12704	2016.515	R	10	0.228	0.005	252.5	1.0	Elongated			
19387+2517	J1139AB	12734	2016.630	W	20	1.278	0.006	216.1	0.4	Elongated			
19394+2215	STF2556	12752	2016.611	R	20	0.373	0.005	343.5	0.4		Ari1999	0.00	1.2

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ (°)	σ_θ (°)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) (°)
19401+3943	COU2407	–	2016.630	R	20	–	–	–	–	Unres.			
19414+4058	ES1669	12795	2016.646	R	32	1.886	0.018	155.2	0.3				
19415+2319	A2789	12791	2016.630	R	20	0.741	0.006	279.4	0.7				
19417+3103	A371	12797	2016.646	R	32	1.845	0.009	19.4	0.3				
19418+3056	TDT1645	–	2016.646	W	20	1.103	0.008	207.3	0.4	Elongated			
19419+2723	STT382	12798	2016.515	R	10	0.276	0.006	322.1	0.3	Diffused			
19429+2803	A273	12822	2016.644	R	32	1.738	0.009	153.1	0.3				
19432+1736	COU323	–	2016.646	R	32	1.162	0.009	301.4	0.3				
19432+2701	BU1132	12829	2016.644	R	20	0.558	0.005	212.2	1.5	Elongated			
19439−0034	RST5142	–	2016.647	R	32	1.455	0.009	76.8	0.5				
19450+4508	STF2579AB	12880	2016.540	R	20	2.723	0.014	216.3	0.3		Sca2012c	−0.02	−0.5
19453+3048	AG237	12881	2016.540	R	20	2.414	0.012	140.6	0.3				
19453+3656	POP121	–	2016.644	R	32	1.589	0.009	324.3	0.3				
19458+4033	STT385	12904	2016.715	R	20	1.215	0.006	50.5	0.3	Elongated			
19462+2608	TDT1722	–	2016.644	W	20	0.533	0.004	201.8	1.6				
19462+2917	TDT1721	–	2016.644	W	20	0.728	0.010	194.6	1.2	Elongated			
19470+3926	MLB979	–	2016.647	W	32	3.312	0.020	24.2	0.4				
19476+3557	ES2182	12945	2016.652	R	32	1.887	0.013	43.9	0.4				
19483+3710	STT386	12965	2016.600	R	20	0.918	0.008	69.6	0.3				
19487+3519	STT387	12972	2016.715	R	20	0.477	0.006	107.4	0.7	Elongated	WSI2006b	0.00	0.1
19489+0545	BU829	12966	2016.524	R	20	0.764	0.006	314.0	0.3				
19495+3127	TDT1780	–	2016.652	R	20	–	–	–	–	Unres.			
19504+2409	COU1034	–	2016.524	R	20	0.267	0.011	208.6	0.6				
19535+2405	DJU4	–	2016.717	R	20	1.425	0.007	245.6	0.3	Elongated	Cve2008d	0.06	−1.1
19541+2657	TDT1834	–	2016.652	R	20	0.646	0.006	345.7	0.4				
19545+5727	MLR587	–	2016.717	R	20	1.016	0.008	348.4	0.6	Elongated			
19556+4723	BU831	13144	2016.717	R	20	0.959	0.005	127.9	0.3				
19561+3845	A1407	13146	2016.510	R	20	0.991	0.006	146.9	0.4				
19569+3706	COU2409	–	2016.717	R	20	1.210	0.010	319.9	0.3				
19575+2018	BU425AB	13165	2016.715	R	20	1.355	0.007	239.5	0.3				
19576+5250	A1410	13189	2016.717	R	20	1.449	0.007	198.4	0.3				
19579+2715	AC16AB	13176	2016.720	R	20	0.370	0.004	232.1	0.9	Elongated			
19580+0456	A606	13169	2016.720	R	20	0.577	0.008	164.6*	0.6		Sca2016c	0.03	1.1
19580+0456	A606	13169	2016.731	R	20	0.575	0.008	164.2*	0.6		Sca2016c	0.03	0.7
19581+2003	TDS1027	–	2016.720	R	20	1.043	0.008	77.7	0.5				
19583+3333	HO582AB	13192	2016.720	R	20	0.581	0.009	314.0	0.4				
20020+2456	STT395	13277	2016.597	R	20	0.742	0.004	127.7	0.3		Zir2013a	−0.11	0.9
20034+3815	A1412	13311	2016.605	R	20	0.768	0.007	227.5	0.3	Faint			
20102+4357	STT400	13461	2016.857	R	20	0.661	0.008	329.4*	0.5		Hei1997	0.01	0.8
20113+3550	BU430AB	13486	2016.649	R	20	1.158	0.006	22.7	0.3				
20114+2217	COU217AB	–	2016.649	W	20	1.489	0.009	342.7	0.3	Elongated			
20133+1047	A1202	13533	2016.649	W	20	0.789	0.006	124.5	0.3				
20153+2536	BU983AB	13589	2016.638	R	20	0.433	0.008	190.1	1.2				
20191+3645	BU1206	13693	2016.676	R	32	2.228	0.011	354.8*	0.5				
20196+1925	BRT2525	–	2016.677	R	32	1.871	0.011	59.9*	0.3				
20210+4437	A725	13744	2016.677	R	20	0.817	0.004	25.4	0.3	Elongated	Hrt2009	0.04	−0.6
20216+2346	STF2672	–	2016.857	R	20	0.648	0.009	350.1	0.6	Elongated			
20225+4613	A726	13776	2016.499	R	20	0.497	0.011	276.3	0.4				
20237+2710	TDS1067	–	2016.641	R	32	1.812	0.013	203.5	0.8				
20238+4146	COU2641	–	2016.641	R	20	0.956	0.011	98.6*	0.4				
20240+4457	ES1331	13817	2016.641	R	32	1.263	0.011	77.6	0.3				
20243+4800	TDT2240	–	2016.641	R	20	–	–	–	–	Unres.			
20244+1213	WOR33Aa,Ab	13809	2016.731	R	20	0.594	0.004	131.2	0.4	Elongated			
20244+1213	A1209AB	13809	2016.731	R	20	1.876	0.009	324.2	0.3	Elongated			
20244+1213	A1209Ab,B	13809	2016.731	R	20	2.473	0.012	321.1	0.3	Elongated			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
20248+2254	BRT2839AB	–	2016.677	W	32	1.512	0.022	140.3	0.6				
20248+2254	BRT2839AB	–	2016.717	W	32	1.521	0.020	140.4	0.4				
20248+2254	SCA175BC	–	2016.677	W	32	1.137	0.017	118.2*	0.4				
20248+2254	SCA175BC	–	2016.717	W	32	1.121	0.014	118.8*	0.6				
20248+2254	SCA175AC	–	2016.677	W	32	2.602	0.015	130.8*	0.3				
20248+2254	SCA175AC	–	2016.717	W	32	2.596	0.033	131.2*	0.3				
20249+3404	A290	13834	2016.731	R	20	0.497	0.007	312.4	0.3				
20251+3408	COU1951	–	2016.731	R	20	1.345	0.010	179.2	0.4				
20256+2504	A392	13840	2016.731	R	20	0.899	0.006	292.2	0.4				
20312+1116	CHR99Aa,Ab	13946	2016.540	R	10	0.385	0.003	141.5	0.3	Diffuse			
20312+1116	DA1BC	13946	2016.540	R	10	0.297	0.002	183.7	0.6		Hrt2014b	−0.04	−4.5
20396+0458	KUI99Aa,B	–	2016.655	R	10	0.350	0.003	324.2	0.3				
20402+2039	SCA173	–	2016.655	W	32	1.521	0.009	169.7	0.3	New pair			
20402+2039	SCA173	–	2016.657	W	32	1.500	0.009	169.7	0.3	New pair			
20421+4125	COU2420	–	2016.600	R	20	0.509	0.011	89.6	0.6				
20437+4733	A749	14222	2016.600	R	20	0.476	0.004	306.0	0.8				
20445+3409	HU690	14232	2016.600	R	20	0.486	0.006	280.5	0.4				
20485+0143	RST5471	–	2016.600	R	20	0.645	0.008	13.9	0.5				
20489−0214	HO142AB	14320	2016.600	R	20	0.999	0.005	9.9	0.3				
20519+0544	A613	14368	2016.600	R	20	0.640	0.006	318.8	0.3		USN2002	0.03	0.3
20521+1014	A1212	14374	2016.600	R	20	0.527	0.004	11.8	0.8				
20560+3546	COU2134	–	2016.540	R	20	0.557	0.011	263.6	1.1	Faint			
20582+1038	A1215AB	14481	2016.611	R	20	0.432	0.008	208.1	0.9	Elongated			
20582+1942	TDT2663	–	2016.657	R	20	0.852	0.004	35.7	0.4				
21009+5929	MLR241	–	2016.616	R	20	0.935	0.006	174.1	0.4				
21012+5953	TDT2696	–	2016.616	R	20	0.526	0.004	246.3	0.5				
21021+1423	A1687	14553	2016.660	W	20	0.780	0.008	190.3	0.5	Elongated			
21037+3857	TDT2720	–	2016.660	W	20	–	–	–	–	Unres.			
21039+4322	TDT2722	–	2016.660	W	20	–	–	–	–	Unres.			
21051−0510	A177	14608	2016.603	R	20	1.234	0.007	336.5	0.3				
21055+5340	BU680AB	14626	2016.862	R	20	0.613	0.007	282.6	0.7				
21061+2801	COU525	–	2016.633	R	32	1.066	0.016	167.7	0.4				
21065+4823	BU836AB	14647	2016.605	R	20	0.796	0.004	172.8	0.3				
21069+4314	TDT2759	–	2016.633	W	20	0.511	0.008	118.7	0.5				
21072+1434	HEI79AB	–	2016.660	R	32	1.731	0.024	294.1*	0.3				
21072+1434	HEI79AB	–	2016.717	R	32	1.714	0.009	294.6*	0.3				
21072+1434	SCA174AC	–	2016.717	R	32	1.868	0.009	285.8*	0.3	New pair			
21072+1434	SCA174BC	–	2016.717	R	32	0.315	0.009	229.4*	1.1	New pair			
21080+0509	STT527	14666	2016.603	R	20	0.416	0.011	113.9	1.4		Pop1995d	0.01	7.4
21081+2615	J1328	14671	2016.658	R	20	1.021	0.005	147.8	0.3				
21092+4737	TDT2786	–	2016.633	R	20	–	–	–	–	Unres.			
21092+5220	COU2694	–	2016.617	R	20	1.128	0.011	246.9	0.3				
21097+3856	COU1967	–	2016.603	R	20	0.841	0.016	192.0	0.8	Faint			
21097+4820	COU2545	–	2016.633	W	20	0.654	0.005	71.8	0.7				
21100+4745	A761	14704	2016.617	R	20	0.381	0.006	56.2	0.3				
21118+4417	TDT2812	–	2016.633	W	20	–	–	–	–				
21121+1946	TDT2820	–	2016.617	R	20	–	–	–	–	Unres.			
21127+4900	COU2652	–	2016.606	R	20	0.682	0.010	339.4	0.3	Faint			
21133+4655	A884	14766	2016.606	R	20	0.438	0.004	110.9	1.4				
21139+3830	COU1817	–	2016.630	R	20	0.557	0.004	110.2	0.4				
21139+4400	COU2299	–	2016.606	R	20	0.389	0.007	33.2	0.5				
21143+4109	STT432	14778	2016.854	R	20	1.338	0.007	115.0*	0.3				

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
21153+4017	A1440	14794	2016.630	R	20	1.161	0.006	211.0	0.4	Elongated			
21161+1606	BU1261	14799	2016.658	R	32	1.740	0.029	149.5	0.3				
21161+4101	COU2229	–	2016.873	R	20	0.770	0.004	277.8	0.4				
21167+2955	TDT2878	–	2016.630	R	20	0.552	0.008	10.2	0.4				
21182+4956	HU692	14840	2016.658	R	20	0.378	0.006	259.3	0.6				
21186+3430	HU769	14842	2016.603	R	20	0.893	0.014	177.9	0.7				
21196+1421	HU962	14855	2016.611	R	20	0.618	0.006	60.8	0.4				
21197+5455	A1694	14873	2016.630	R	20	0.821	0.005	92.9	0.5				
21199+5319	A1695	14876	2016.658	R	20	0.462	0.004	193.2	1.3				
21206+4215	LDS2511AB	–	2016.873	R	32	–	–	–	–	Unres.			
21210+0022	RST5162	–	2016.611	R	20	0.409	0.004	21.9	1.0				
21218+4309	STT438	14907	2016.873	R	32	2.230	0.013	357.1*	0.4				
21222+5453	A1696	14923	2016.611	R	32	1.323	0.012	48.7	0.3				
21223+2906	COU532	–	2016.614	R	20	0.387	0.006	45.0	1.5				
21223+5734	A764AB	14926	2016.614	R	20	1.258	0.006	19.4	0.3		Hei1995	0.28	−5.8
21227+1533	J851AB	14919	2016.649	R	32	1.405	0.009	140.9	0.4				
21245+3015	A1219	14950	2016.614	R	32	1.477	0.016	312.4	0.4				
21252+1828	COU430AB	–	2016.638	R	20	0.552	0.004	234.3	0.6				
21256+4138	A618	14967	2016.614	R	20	0.525	0.011	276.8	1.2				
21264+3909	A1442	14979	2016.638	R	32	1.249	0.012	273.9	0.7				
21264+4911	ES822	14984	2016.614	R	20	1.435	0.010	23.5	0.4				
21277+1431	HEI285	–	2016.649	W	20	0.903	0.007	98.4	0.5	Elongated			
21280+4305	HO160	15000	2015.942	R	20	2.030	0.015	182.0*	0.3	Elongated			
21289+1105	STF2799AB	15007	2015.942	R	20	1.877	0.015	258.6	0.3	Elongated	Hrt2011a	0.00	0.2
21305+4620	A768	15047	2016.630	R	20	0.645	0.012	334.2	0.3				
21307+2258	COU134	–	2016.630	R	20	–	–	–	–	Unres.			
21324+2434	MCT12	–	2016.647	W	32	1.598	0.022	239.5	0.4	Elongated			
21362+3003	BU167	15126	2016.647	R	20	1.693	0.008	88.8	0.3				
21362+4253	HO463	15131	2016.647	R	20	0.508	0.009	180.2	0.5	Elongated			
21392+4411	BU1331	15181	2016.647	R	20	0.928	0.005	339.3	0.3				
21393+2043	STT445	15177	2016.726	R	20	1.020	0.006	120.6	0.3	Elongated			
21398+3749	A1444	15193	2016.647	R	20	1.124	0.006	82.5	0.3				
21420+1856	LBU2Aa,Ab	–	2016.647	R	20	0.561	0.004	22.1	0.9	Faint			
21431+3149	A1222	15255	2016.720	R	20	0.683	0.007	351.6	0.3				
21435+2721	A299AB	15260	2016.726	R	20	1.127	0.006	64.5	0.5	Elongated			
21448+0300	BU689	15278	2016.726	R	20	1.771	0.009	243.6	0.3	Faint			
21521+2748	HO171	15401	2015.939	R	20	0.742	0.015	340.0	0.5				
21521+2748	HO171	15401	2015.939	R	20	0.745	0.015	340.1	0.3				
21555+5232	STT456AB	15460	2015.939	R	20	1.615	0.015	216.3*	0.5	Elongated			
21559+1536	BAT1AB	15455	2016.718	R	20	1.071	0.007	152.1	0.3	Elongated			
21565+1940	HU382	15472	2016.718	R	20	0.309	0.007	220.9	1.1				
21576+4938	HU772	15497	2016.718	R	20	0.346	0.006	333.2	1.0				
21583+5616	A1898	15505	2016.718	R	20	1.244	0.006	223.4	0.3				
22013+4515	A780AB	15556	2016.677	R	20	1.522	0.008	148.3	0.3				
22013+4515	A780CD	15556	2016.677	W	20	1.087	0.005	110.4	0.3				
22020+2651	HO610AB	15564	2016.677	R	20	0.621	0.008	241.3	0.4				
22025+2612	A307	15569	2016.677	R	20	0.401	0.004	125.3	0.8				
22028−0045	RST5166AB	–	2016.726	R	20	0.587	0.006	11.9	0.8	Elongated			
22029+4439	BU694AB	15578	2016.939	R	20	1.017	0.006	6.5*	0.3	Elongated			
22038−0248	HO469AB	15586	2016.726	R	20	0.437	0.004	51.2	1.2				
22050+4010	ES1695	15608	2016.677	W	20	1.204	0.006	37.2	0.4				
22053+4308	COU1826	–	2016.677	R	20	0.944	0.005	176.8	0.3				
22054+3858	A1453	15613	2016.939	R	20	0.543	0.007	329.8*	0.3	Elongated			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
22057+3521	PRU2	–	2016.939	R	20	–	–	–	–	Unres.			
22059+4522	A183	15633	2016.644	R	20	0.728	0.004	245.5	0.3				
22061+2034	BRT2840	–	2016.726	R	32	2.389	0.016	316.5	0.4				
22061+4159	A407AB	15636	2016.644	R	20	0.650	0.004	22.2	0.4				
22070+3605	STT462AB	15645	2015.942	R	20	1.054	0.015	314.8*	0.3	Elongated			
22100+2308	COU136	–	2015.942	R	20	0.439	0.015	18.6	0.5		Doc2016h	−0.02	−0.9
22155+5549	MLR611	–	2016.600	R	20	0.382	0.004	140.3	0.5				
22173+5049	HU595	15813	2016.600	R	20	0.570	0.004	221.7	0.8				
22186+5434	MLR612	–	2016.600	R	20	0.346	0.011	165.2	0.7				
22202+2931	BU1216	15843	2015.939	R	20	0.934	0.015	275.4*	0.3		Lin2012a	0.05	−1.8
22206+5349	BU379	15856	2015.939	R	20	1.125	0.015	333.1*	0.3				
22234+1733	HO182	15894	2016.720	R	20	1.454	0.007	309.4	0.3				
22239+1637	HEI83	–	2016.720	R	20	0.759	0.005	109.1	0.4				
22247+1914	HU493	15899	2016.641	W	20	0.807	0.009	171.6	0.4	Elongated			
22265+1925	HU596	15936	2016.720	R	20	1.139	0.006	197.2	0.3				
22281+1215	BU701AB	15962	2016.720	R	20	0.975	0.013	178.6	0.4		Cve2005	−0.01	0.9
22303+1810	COU331	–	2016.655	W	20	0.418	0.005	176.3	1.2	Elongated			
22313+1304	BRT1361	–	2016.720	W	32	3.352	0.020	134.8	0.3	Elongated			
22314+1332	TDT3567	–	2016.655	W	20	–	–	–	–	Unres.			
22325+3500	POP39	–	2016.652	R	20	0.626	0.006	95.1*	0.3				
22333+1203	HEI411	–	2016.649	W	20	1.511	0.013	301.6	0.3	Elongated			
22340+4051	ES1697	16063	2016.655	W	32	2.923	0.015	338.1	0.3				
22344+2514	COU141	–	2016.649	W	20	1.513	0.008	205.6	0.3	Elongated			
22344+2623	COU540	–	2016.649	R	20	0.340	0.006	328.0	1.0		Mnt2004a	0.00	5.9
22359+4515	GII55	–	2016.655	W	32	5.214	0.026	311.0	0.3				
22359+4515	GII55	–	2016.658	W	32	5.215	0.026	310.9	0.3				
22360+4515	COU2242	–	2016.655	W	20	0.823	0.004	275.5	0.3	Elongated			
22373+5420	MLR614	–	2016.614	R	20	0.567	0.008	307.0	0.7				
22390+1850	HU392AB	16139	2016.652	R	20	0.496	0.004	346.9	0.6				
22392+2014	HU393	16142	2016.652	R	20	0.897	0.006	224.9	0.5				
22393+4000	MLB906	–	2016.652	W	32	2.582	0.013	156.0	0.3				
22397+5441	A1473	16161	2016.614	R	20	1.449	0.007	288.6	0.4				
22402+3732	HO188	16164	2016.715	R	20	0.368	0.004	229.1	1.4		USN2006b	0.08	−4.0
22414+0443	BU480	16180	2016.652	R	20	1.065	0.005	60.4	0.3				
22426+2943	BU710	16199	2016.614	R	20	0.494	0.005	246.4	0.7				
22443+3442	ES2203	16230	2016.715	R	32	2.105	0.021	96.8	0.3				
22451−0240	A2696BC	16235	2016.652	R	20	0.607	0.004	75.2	0.6	Elongated	Hrt2014b	−0.01	−1.3
22451+5458	A1474	16244	2016.633	R	20	0.491	0.008	7.4	0.7				
22451+5527	TDT3689	–	2016.633	R	20	0.724	0.004	98.5	0.5				
22497+5007	COU2663	–	2016.633	W	20	0.631	0.008	113.0	0.7				
22508+2404	TDT3747	–	2016.715	R	20	–	–	–	–	Unres.			
22513+2438	TDT3751	–	2016.715	R	20	–	–	–	–	Unres.			
22541+0246	HO483	16344	2016.652	W	32	1.705	0.022	350.4	0.3				
22557+1547	HU987	16373	2016.944	R	20	1.211	0.006	75.4*	0.3	Elongated	USN2007a	0.06	−1.1
22564+2257	COU240	–	2016.944	R	20	0.793	0.004	294.3*	0.4				
22574+1958	COU334	–	2016.652	R	20	1.126	0.007	256.1	0.4	Faint			
22579+5439	A1477	16409	2015.939	R	20	0.497	0.015	352.3*	0.3				
22579+5439	A1477	16409	2016.857	R	20	0.487	0.007	353.4*	0.6				
22590+4617	A192	16430	2016.633	R	20	0.332	0.006	230.7	0.5				
22592+1144	STT483	16428	2016.660	R	20	0.457	0.004	19.7	0.9		Alz2007	0.02	−4.7
22597+4149	HLD56	16435	2015.939	R	20	1.188	0.015	91.3*	0.3				
23042+1518	TDT3871	–	2016.660	R	20	–	–	–	–	Unres.			

Table 2 Table of speckle measurements and O-C residuals with published orbits (cont.)

WDS	Name	ADS	Epoch	Fil.	Eyep. (mm)	ρ ($''$)	σ_ρ ($''$)	θ ($^\circ$)	σ_θ ($^\circ$)	Notes	Orbit	$\Delta\rho$(O-C) ($''$)	$\Delta\theta$(O-C) ($^\circ$)
23055+4643	A196	16505	2016.718	R	20	0.455	0.008	313.5	0.6				
23078+1240	BU1025AB	16524	2016.726	R	20	0.795	0.008	330.6	0.3	Elongated			
23096−0358	A311	16551	2016.726	R	20	1.388	0.007	145.0	0.3	Elongated			
23099+4447	COU1844	–	2016.718	R	20	0.504	0.007	167.0	0.5				
23099+4452	COU2341	–	2016.718	R	20	0.895	0.004	23.0	0.4				
23101+5158	HU1322	16559	2016.660	R	20	0.490	0.004	123.2	0.4				
23102+5727	STT490AB	16560	2016.854	R	20	1.185	0.006	297.6*	0.3				
23110+0637	HEI829AB	–	2016.652	W	20	1.060	0.007	86.7	0.3	Elongated			
23117+3730	A1480	16578	2016.857	R	20	0.759	0.004	222.7	0.5	Elongated			
23147+4116	A200	16621	2016.854	R	20	0.601	0.004	76.8*	0.8				
23156+5829	MLR365	–	2016.726	R	32	2.093	0.010	192.7	0.3				
23195+4225	COU1645	–	2016.660	W	20	0.733	0.006	76.2	0.7	Diffuse			
23210+4926	COU2700	–	2016.854	R	20	1.032	0.005	238.1	0.4				
23237+3739	A1483	16726	2016.603	R	20	0.541	0.005	326.6	0.6				
23241+5732	STT495	16731	2016.603	R	20	0.393	0.006	123.5	1.2		Alz2006	0.00	1.4
23253+5321	MLR619	–	2016.660	W	20	0.894	0.005	21.2	0.5				
23260+2742	HO489AB	16748	2016.944	R	20	0.512	0.007	219.0*	1.4	Elongated			
23267+4103	COU1845	–	2016.658	R	20	0.947	0.008	0.5	0.6	Elongated			
23268+5434	A1485	16760	2016.854	R	20	0.579	0.006	208.5	0.8				
23292+4042	A1487	16785	2016.950	R	20	1.112	0.011	157.0*	0.4	Elongated			
23302+1359	HU999	16797	2016.720	R	20	1.573	0.011	141.9	0.3	Elongated			
23312+5604	TDT4080	–	2016.644	W	20	–	–	–	–	Unres.			
23318+2148	COU243	–	2016.720	R	20	0.897	0.009	343.5	0.4	Elongated			
23334+3215	TDT4096	–	2016.677	W	20	0.421	0.011	104.3	0.6	Elongated			
23339+2342	COU144	–	2016.944	R	20	0.332	0.004	44.9	0.9				
23368+2346	HU498	16867	2016.677	W	20	0.686	0.007	295.8	0.4	Elongated			
23377+4457	COU2249	–	2016.647	R	20	0.488	0.004	31.5	0.5	Elongated			
23379+5806	A642	16881	2016.644	R	20	0.918	0.005	24.1	0.3				
23380+1253	A1241AB	16882	2016.677	R	20	0.652	0.004	11.2	0.4				
23386+1151	TDT4136	–	2016.677	W	20	–	–	–	–	Unres.			
23401+1258	HU1325	16914	2016.647	R	20	0.887	0.006	35.9	0.3		Sca2003a	0.01	4.1
23409+0759	BU724	16924	2016.950	R	20	0.620	0.007	100.4*	0.5	Elongated			
23425+5436	A1495	16941	2016.647	R	20	0.484	0.004	188.6	0.4				
23432+4313	POP172	–	2016.647	R	32	1.314	0.009	346.2	0.3				
23440+2922	AGC14	16957	2016.644	R	20	0.837	0.008	283.9	0.3		Pop1997f	−0.06	0.5
23447+1146	TDT4172	–	2016.720	R	20	0.615	0.005	75.1	1.3				
23472+5755	TDT4191	–	2016.726	R	20	0.254	0.004	171.7	0.6				
23492+5838	A645	17026	2016.718	R	20	0.887	0.004	97.3	0.3				
23495+5628	MLR623	–	2016.718	R	20	0.774	0.006	116.2	0.3				
23500+4755	TDT4226	–	2016.726	R	20	–	–	–	–	Unres.			
23504+2620	COU545	–	2016.731	R	20	0.722	0.007	315.9	0.5	Diffuse			
23505+4703	A792	17036	2016.734	R	20	0.655	0.009	268.4	0.4				
23512+4847	A795	17046	2016.732	R	20	1.225	0.006	318.5	0.3				
23514+4745	A796	17047	2016.734	R	20	0.708	0.006	8.7	0.6				
23515+5913	MLR367	–	2016.734	R	20	–	–	–	–	Unres.			
23536+3316	TDT4258	–	2016.734	W	20	–	–	–	–	Unres.			
23561+2520	A426	17105	2016.649	R	20	0.377	0.004	283.8	0.3		Hrt2001b	−0.02	−5.0
23579+5723	STF3047AB	–	2016.865	R	20	1.160	0.008	71.3	0.4				
23595+5441	A1498	17151	2016.650	R	20	0.375	0.006	89.5	0.9				

Note: In column 9, the exponent * indicates that the position angle θ could be determined without the 180° ambiguity.

