Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

Wilfried R.A. Knapp
Vienna, Austria
wilfried.knapp@gmail.com

John Nanson
Star Splitters Double Star Blog
Manzanita, Oregon
jnanson@nehalemtel.net

Abstract: If any double star discoverer is in urgent need of photometry then it is Jonckheere. There are over 3000 Jonckheere objects listed in the WDS catalog and a good part of them with magnitudes obviously far too bright. This report covers the Jonckheere objects in the constellations Lep and Vul. At least one image per object was taken with V-filter to allow for visual magnitude measurement by differential photometry. All objects were additionally checked for common proper motion. Five qualify indeed as most probably CPM pairs with an additional five as potential CPM pairs.

Introduction

As follow up to the reports on J-objects photometry beginning with Knapp/Nanson 2016 we selected this time the J-objects in Lepus & Vulpecula. Some objects were too close to be resolved with the equipment available to us but we kept these objects in the lists as we thought also about the combined magnitude of interest.

Results of photometry and catalog checking

For all selected J-objects one single image was taken with iTelescope iT24/iT27 with V-filter and 3s exposure time. The single image random effects seem less significant for the measured magnitudes as a magnitude error of ~0.1 or even a bit larger seems negligible in comparison with those for the Jonckheere objects, which often have given magnitude errors in the range of up to 2 magnitudes. Several objects were too faint to be resolved with a 3s exposure time – additional images with longer exposure time were taken for these and stacked with AAVSO VPhot. The images were then plate solved with Astrometrica using the URAT1 catalog (iT27 images with GAIA DR1 for astrometry and UCAC4 for photometry) with reference stars in the Vmag range of 8.5 to 14.5 giving not only RA/Dec coordinates but also photometry results for all reference stars used including an average dVmag error. The J-objects were then located in the center of the image and astrometry/photometry was then done by the rather comfortable Astrometrica procedure with point and click at the components delivering RA/Dec coordinates and Vmag measurements based on all reference stars used for plate solving. The weather conditions during imaging did not allow for perfect image quality so several sessions were necessary to get images of overall acceptable quality – for this reason the astrometry results have to be taken with caution.

The measurement results are given in table 1 below with the following structure:

- First row gives the WDS data as of August 2017:
- J# gives the number of the J-object
- RA/Dec gives the position in the HH:MM:SS/ DD:MM:SS format for the primary
- Sep, PA, M1, M1, pmRA and pmDec give the WDS catalog data for this object
- Date gives the year of the last observation
- Source/Notes gives additional references to the WDS catalog

Data rows give data from other checked catalogs like especially GAIA DR1:

- RA/Dec gives the position in degrees for the primary
- Sep gives separation in arcseconds in the data lines calculated as

$$Sep = \sqrt{\left[\left(RA_1 - RA_2\right)\cos\left(Dec_1\right)\right]^2 + \left(Dec_2 - Dec_1\right)^2}$$

  in radians if coordinates for both components are available
- PA gives position angle in degrees in the data lines calculated as

$$PA = \arctan\left[\frac{\left(RA_1 - RA_2\right)\cos\left(Dec_1\right)}{Dec_2 - Dec_1}\right]$$

  in radians depending on quadrant radians if coordinates for both components are available
- M1 and M2 if visual magnitudes are given in the used catalog
- Proper motion data if available in the used catalogs or in some cases calculated from position comparison between catalog positions
- Ap and Me give aperture and used observation method
- CPM Rat gives the common proper motion rating based on the available PM data according to the description in Appendix A
- CPM % gives an estimated probability for being a physical pair (see Appendix A)
- Source/Notes refers to the used catalogs with additional comments if necessary

Measurement row gives the results from processing of own images:

- RA/Dec gives the position in degrees for the primary
- Sep gives separation in arcseconds in the data lines calculated as described above.
- PA gives position angle in degrees in the data lines calculated as described above.
- M1 and M1 give Vmags for both components measured by differential photometry
- Date gives the Julian observation epoch
- Notes indicate the telescope used, number of images with exposure time and additional comments if considered necessary.

Explanations regarding the content of the Notes column:

- "Touching star disks" indicates that the rims of the star disks are touching and that the measurement results might be a bit less precise than with clearly separated star disks
- "Touching/Overlapping star disks" indicates that the star disks overlap to the degree of an elongation and that the measurement results is probably less precise than with clearly separated star disks
- "SNR <20" indicates that the measurement result might be a bit less precise than desired due to a low SNR value but this is already included in the calculation of the magnitude error range estimation
- "SNR <10" indicates that the measurement result is probably a bit less precise than desired due to a very low SNR value but this is already included in the calculation of the magnitude error range estimation
- "Image quality questionable" or similar indicates rather large average errors for the reference stars used for plate solving for different reasons (mostly atmospheric influences). But this is at least to some degree already included in the calculation of the error range estimation

J 1074 Misidentification

The J 1074 image just showed a single star at the given WDS position 20:45:38.31 +25:52:16.8 which seemed with the given parameters for separation and magnitudes rather curious. A counter-check of the 2MASS images gave the same result – single star without a hint of an elongation. A look at the original Jonckheere catalog provided a reference to BD +25 4365 being nearby with a distance of ~2 arcmin to J 1074 but the given WDS position was rather identicle with the BD object mentioned indicating a mis-match. By chance we found then an object nearby with parameters too close to the original Jonckheere data to be a random hit. The tables above provide the data for this object assuming this to be a correct match with the original Jonckheere object.

After sending this information to USNO the WDS catalog entry for J 1074 was accordingly changed.

A rather curious side result of this riddle is the realization of a gap in the GAIA DR1 catalog in this area of the size of a rectangle with a size of about 8x4 arcmins and another one half this size nearby.

J 2305 Misidentification

J 2305 is listed in WDS with an X-code for bogus and our image confirmed this status by obviously showing a single star at the given position. However we noticed the WDS records showed a total of two observations for J 2305, the second one having taken place in

(Text continues on page 465)

Table 1. Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 1460 AB	06 08 46.781	-14 57 43.9	3.1	132	10.27	10.37	-39	26		8	-37				2003			WDS 06087-1458, WDS data as of August 2017.
	92.194898	-14.962228	3.197	131.726	10.11	10.51	-8.20	-4.50	1.56	-9.40	-5.60	3.11	0.96	Hg	2015.000	ACCB	**31**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	92.194933	-14.962209	3.200	131.280									0.20	Eu	1999.890			UCAC5.
	92.194904	-14.962228	3.143	131.678	10.34	10.75							0.70	C	2015.962			iT27 1x3s. Touching star disks
J 1470 AB	05 59 03.740	-18 37 11.7	9.9	97	11.79	15.4	-8	-7							2005			WDS 05591-1836, WDS data as of August 2017.
	89.765544	-18.619943	7.718	85.326	11.58	15.21	-6.10	-6.10	1.56	12.20	3.20	3.68	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	89.765571	-18.619917	7.430	86.227									0.20	Eu	1999.845			UCAC5.
	89.765513	-18.619906	7.773	86.829	11.86	15.90							0.70	C	2015.962			iT27 1x3s. SNR B <10
J 24 AB	19 35 55.222	+20 49 21.6	3.0	260	10.00	12.00	6	-4							2000			WDS 19360+2049, WDS data as of end of August 2017.
	293.980141	20.822653			9.88		2.25	-6.38	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identified.
	293.980134	20.822671					1.70	-4.70	1.70				0.20	Eu	2001.623			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	293.980175	20.822714	2.885	259.010	10.02	11.11							0.61	C	2015.807			iT24 1x3s. Touching/overlapping star disks
																		Note: Secondary also not identified in URAT1 and 2MASS.
J 196 AB	21 20 04.829	+28 07 29.8	3.5	254	9.50	13.50	22	2							1956			WDS 21201+2809, WDS data as of end of August 2017.
	320.018980	28.124699				12.96							0.96	Hg	2015.000			GAIA DR1. Odd situation in which the primary is not identified in GAIA, but the secondary is. Thus the coordinates shown here are for the secondary and M2 is the GAIA DR1 Gmag, no PM data listed in GAIA.
	320.018941	28.124714				12.96				9.80	-4.40	8.56	0.20	Eu	2002.458			UCAC5. Primary also not identified by UCAC5, but the secondary is. Thus the coordinates shown here are for the secondary, the magnitude is the UCAC5 Gmag value, and the PM data is UCAC5 PM data for the secondary (with high error rates relative to the motion (6.1 for RA, 6.0 for Dec).
	320.020096	28.124936	3.421	253.529	10.86	12.91							0.61	C	2015.805			iT24 1x3s. Touching star disks
																		Note: URAT1 and 2MASS identify the primary but not the secondary. Rather odd situation for the four catalogs.
J 490 OL	19 43 08.873	+23 18 08.2	5.4	119	10.40	12.90	-7	-6							2008			WDS 19432+2318, WDS data as of end of August 2017.
	295.786952	23.302253	5.419	119.084	10.19	12.71	-1.50	-4.90	1.70	-4.40	-7.20	3.68	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rate high relative to proper motion numbers.
	295.786958	23.302271	5.436	118.598									0.20	Eu	2001.676			UCAC5.
	295.786908	23.302219	5.653	121.459	10.66	13.31							0.61	C	2015.805			iT24 1x3s. SNR L <10
J 490 ON	19 43 08.873	+23 18 08.2	4.3	52	10.40	12.20	-7	-6							2013			WDS 19432+2318, WDS data as of end of Oct. 2017.
	295.786952	23.302253	5.391	48.295	10.19	12.92	-1.35	-9.19	6.26	-3.08	-5.21	6.26	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 is GAIA DR1 Gmag. PM data from position comparison with 2MASS. Error rate high relative to proper motion numbers.
	295.786958	23.302271					-1.50	-4.90					0.20	Eu	2001.676			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	295.786908	23.302219	5.968	46.074	10.66	13.73							0.61	C	2015.805			iT24 1x3s. SNR N<10

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 491 AB	19 45 01.009	+23 59 03.7	4.3	74	11.02	13.00	-1	1							2008			WDS 19450+2400, WDS data as of beginning of August 2017.
	296.254242	23.984375	4.352	73.519	10.80	12.17	2.80	1.60	1.41	-3.00	-1.30	1.56	0.96	Hg	2015.000	CACC	**15**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	296.254231	23.984369	4.438	73.316									0.20	Eu	2001.692			UCAC5.
	296.254300	23.984400	3.968	71.788	10.85	12.42							0.61	C	2015.805			iT24 1x3s
																		Note: Unlikely CPM candidate with such little motion. GAIA DR1 shows a parallax for the primary of 1.73 (1885.336 LY), but none for the secondary.
J 492 AB	19 45 06.393	+23 58 34.6	4.8	296	10.79	11.52	0	-4		-2	-3				2008			WDS 19451+2359, WDS data as of beinning of August 2017.
	296.276668	23.976242	4.904	296.468	10.18	10.96	-1.90	-5.20	1.70	0.20	-3.39	3.94	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	296.276675	23.976262	4.917	296.043									0.20	Eu	2001.691			UCAC5.
	296.276650	23.976247	4.812	298.688	10.43	11.27							0.61	C	2015.805			iT24 1x3s
																		Note: GAIA DR1 provides parallax data for both components: A is shown with a parallax of 0.24 (13,590 LY), B is shown with a parallax of 2.06 (1583.316 LY). Given parallax data, there is no possibilty of shared motion.
J 492 AC	19 45 06.393	+23 58 34.6	15.0	281	10.79	16.50	0	-3							2008			WDS 19451+2359, WDS data as of beinning of August 2017.
	296.276668	23.976242	15.024	281.355	10.18	13.65	-1.90	-5.20	1.70	-2.30	-4.90	2.26	0.96	Hg	2015.000	BACC	**61**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	296.276675	23.976262	15.019	281.342									0.20	Eu	2001.688			UCAC5.
	296.276650	23.976247	15.059	281.414	10.43	13.90							0.61	C	2015.805			iT24 1x3s. SNR C<10
																		Note: UCAC5 errors a bit high relative to small amount of motion. Given GAIA parallax for A (0.24, 13,590 LY - see above), shared motion would be difficult to measure. No GAIA DR1 parallax available for the C component.
J 496 AB	19 49 45.377	+23 24 32.5	5.0	264	9.40	10.20	10	-5		-52	-26				2012			WDS 19498+2324, WDS data as of beginning of August 2017.
	297.439134	23.409037	5.047	264.532	10.61	12.44	2.19	-3.43	6.87	4.14	-4.30	6.72	0.96	Hg	2013.856	CCCC	**6**	URAT1. M1 is URAT1 Vmag, M2 is visual estimate from URAT1 J and K bands (URAT1 f.mag for the secondary is 11.852). PM data from position comparison with 2MASS.
	297.439138	23.409047											0.20	Eu	2001.677			UCAC5. Secondary not identified by UCAC5.
	297.439100	23.409067	4.724	265.264	11.00	12.85							0.61	C	2015.805			iT24 1x3s. SNR B<20
																		Note: Minimal motion with large error rates relative to the motion. GAIA shows a parallax for the primary of 1.52 (2145.810 LY). The secondary is not identified in GAIA DR1.
J 496 AC	19 49 45.377	+23 24 32.5	27.6	293	9.40	12.40	10	-5		-21	10				2012			WDS 19498+2324, WDS data as of beginning of August 2017.
	297.439131	23.409029	27.516	293.428	10.68	13.40	-1.80	-4.80	1.70	-1.40	-4.10	1.98	0.96	Hg	2015.000	ACCC	**30**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.439138	23.409047	27.517	293.406									0.20	Eu	2001.677			UCAC5.
	297.439100	23.409067	26.993	293.956	11.00	14.20							0.61	C	2015.805			iT24 1x3s. SNR C<10
																		Note: Minimal motion with large error rates relative to the motion. GAIA shows a parallax for the primary of 1.52 (2145.810 LY), but no parallax for the secondary.

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 498 AB	19 53 54.787	+19 59 01.8	2.3	90	10.04	11.35	-14	-2		3	-3				2001			WDS 19539+1958, WDS data as of beginning of August 2017.
	298.478250	19.983837	2.259	89.087	9.83	10.80	-23.40	-4.80	1.41	-9.30	-5.10	2.69	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	298.478343	19.983855	2.069	88.913									0.20	Eu	2001.610			UCAC5.
	298.478154	19.983725	2.366	81.493	10.16	10.77							0.61	C	2015.807			iT24 1x3s. Heavily overlapping star disks
																		Note: GAIA DR1 provides parallax data for both components: A is shown with a parallax of 8.32 (392.023 LY), B is shown with a parallax of 7.53 (433.152 LY), which suggest shared motion is unlikely.
J 500 AB	19 56 58.712	+24 38 02.4	4.1	298	12.18	12.98	8	-28		-8	-19				2006			WDS 19570+2438, WDS data as of beginning of August 2017.
	299.244462	24.633370	4.159	295.696	11.41	12.30	-7.30	-20.70	1.56	-8.90	-21.10	1.70	0.96	Hg	2015.000	BABB	**74**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	299.244492	24.633446	4.142	295.865									0.20	Eu	2001.710			UCAC5.
	299.244375	24.633411	3.797	296.598	11.62	12.46							0.61	C	2015.805			iT24 1x3s
																		Note: Likely CPM candidate. GAIA DR1 shows a parallax of 2.04 (1598.839 LY) for the primary, none listed for the secondary.
J 509 AB	20 25 23.138	+27 26 58.0	4.1	268	11.50	13.10	12	13		-33	-17				2013			WDS 20254+2727, WDS data as of beginning of August 2017.
	306.346516	27.449536	4.128	265.990	11.89	13.20	19.87	18.82	4.93	6.15	8.54	4.93	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
										6.30	10.00		0.20	Eu	2002.438			UCAC5. Primary not identified in UCAC5, but secondary is; PM data from UCAC5 catalog.
	306.346500	27.449492	3.956	261.570	11.62	13.28							0.61	C	2015.805			iT24 1x3s. SNR B<20
J 511 AB	20 40 18.091	+25 20 28.4	1.8	8	12.60	12.70	1	-12							2013			WDS 20403+2520, WDS data as of beginning of August 2017.
	310.075359	25.341185	1.963	7.927	11.53	12.20	-1.27	-11.62	1.92				0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identifed in 2MASS or in URAT1.
	310.075368	25.341321					-2.20	-38.00	1.56				0.20	Eu	2002.105			UCAC5. PM data from UCAC5 catalog, secondary not identified in UCAC5.
	310.075338	25.341244			11.41								0.61	C	2015.805			iT24 1x3s. No resolution of B. Combined magnitude suggests with 0.1 delta 12.2/12.3mag
J 512 AB	20 41 26.481	+25 01 22.7	2.4	88	12.00	12.30	-8	-2							2011			WDS 20414+2500, WDS data as of beginning of August 2017.
	310.360312	25.022983	2.371	88.607	11.23	12.61	-5.89	-2.33	1.92				0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identifed in 2MASS or in URAT1.
	310.360367	25.022994					-13.70	-3.10	1.41				0.20	Eu	2001.956			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	310.360333	25.022933	2.205	101.508	11.13	11.88							0.61	C	2015.805			iT24 1x3s. Touching/overlapping star disks
J 513 AB	20 42 56.431	+27 33 01.5	4.0	163	10.27	12.90	-7	3							2000			WDS 20429+2732, WDS data as of beginning of August 2017.
	310.735152	27.550371	4.048	162.627	10.24	12.83	0.50	-8.60	6.31	4.37	-12.60	6.31	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
	310.735162	27.550390					-2.50	-5.50	1.70				0.20	Eu	2002.461			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	310.735150	27.550389	3.490	162.024	10.21	12.45							0.61	C	2015.805			iT24 1x3s. Touching star disks

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 514 AB	20 46 01.201	+22 23 24.7	2.5	329	9.60	9.70	0	-23							2015			WDS 20461+2222, WDS data as of beginning of August 2017.
	311.504962	22.390111			11.63								0.96	Hg	2015.000			GAIA DR1. M1 is from GAIA DR1 Gmag. Secondary not identifed in GAIA DR1.
	311.504990	22.390174					-6.90	-16.90	1.70				0.20	Eu	2001.636			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	311.505042	22.389925	2.045	331.659	11.67	11.80							0.61	C	2015.783			iT24 1x3s. Touching/overlapping star disks
																		Note: Secondary also not identified in URAT1 and 2MASS.
J 538 AB	19 15 10.430	+22 45 25.4	3.9	51	9.50	9.50	-18	-21							2011			WDS 19151+2244, WDS data as of beginning of August 2017.
	288.793033	22.756705	3.954	51.159	11.79	11.85	-0.90	-5.60	1.56	0.10	-7.40	1.56	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	288.793036	22.756726	3.959	50.774									0.20	Eu	2001.664			UCAC5.
	288.793067	22.756672	4.047	53.103	12.14	12.14							0.61	C	2015.783			iT24 1x3s
J 542 AB	19 53 02.767	+24 40 27.4	3.8	190	9.50	11.50	7	-3		7	-12				2001			WDS 19530+2441, WDS data as of beginning of August 2017.
	298.261612	24.674248	4.054	189.680	11.05	12.86	6.70	-3.90	1.56	4.50	2.50	4.67	0.96	Hg	2015.000	ACCB	**31**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rate high relative to proper motion numbers, particularly in secondary.
	298.261584	24.674263	4.133	189.072									0.20	Eu	2001.710			UCAC5.
	298.261667	24.674264	4.006	191.183	11.00	12.96							0.61	C	2015.783			iT24 1x3s
J 557 AB	20 23 57.128	+25 05 28.3	2.8	243	11.18	11.23	3	8		3	8				2013			WDS 20240+2505, WDS data as of beginning of August 2017.
	305.988019	25.091227	2.791	243.104	10.76	10.56				-109.27	-43.72	0.00	0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data is from GAIA DR1 catalog. Primary is not identified in 2MASS, not clear as to what the 2MASS marker to southwest of GAIA DR1 secondary is, but not likely to be the secondary since magnitude data doesn't match well.
										-81.60	-40.90		0.20	Eu	2002.193			UCAC5. Primary not identified in UCAC5, but secondary is. PM data is from UCAC5 catalog.
	305.987975	25.091169	2.521	244.132	10.66	10.87							0.61	C	2015.783			iT24 1x3s. Touching star disks
																		Note: GAIA DR1 lists a parallax of 18.11 (180.101 LY) for the secondary, no parallax listed for the primary. URAT1 only identifies one of the components, which appears to be the secondary. Note that GAIA DR1 shows the secondary to be brighter than the primary.
J 558 AB	20 24 54.827	+26 20 01.0	5.6	189	11.83	12.83	0	3		-3	-10				2002			WDS 20249+2618, WDS data as of beginning of August 2017.
	306.228495	26.333678	5.660	188.714	10.87	12.67	-2.35	-3.44	5.79	-5.90	-13.08	5.74	0.2	Eu	2013.765	CCCB	**6**	URAT1. M1 is URAT1 Vmag, M2 is visual estimate from URAT1 J and K bands (URAT1 f.mag for the secondary is 12.223). PM data from position comparison with 2MASS.
	306.228493	26.333683			10.71		-0.77	0.97	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identified.
	306.228497	26.333681					-0.90	0.60	1.41				0.20	Eu	2002.423			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	306.228475	26.333672	5.658	188.196	10.96	12.76							0.61	C	2015.783			iT24 1x3s

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 564 AB	20 31 12.572	+22 26 31.0	2.5	309	9.70	12.40	20	0							2005			WDS 20312+2227, WDS data as of beginning of August 2017.
	307.802485	22.441984			9.78		17.87	1.57	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is DR1 Gmag. PM data from GAIA DR1 catalog, secondary not identified.
	307.802412	22.441978					18.30	1.50	2.40				0.20	Eu	2001.639			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	307.802521	22.441897	2.127	309.737	9.73	11.30							0.61	C	2015.783			iT24 1x3s. Overlapping star disks. SNR B <20
																		Note: The secondary is not recognized by URAT1 and 2MASS.
J 565 AB	20 34 36.258	+29 14 18.3	6.5	48	10.40	10.37	-76	-89		-1	-30				2015			WDS 20346+2914, WDS data as of beginning of August 2017.
	308.650809	29.238112	6.445	48.476	10.03	11.82	-55.60	-74.80	1.70	3.40	-5.90	2.19	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	308.651031	29.238372	5.322	50.164									0.20	Eu	2002.477			UCAC5.
	308.650783	29.238108	6.779	48.183	10.13	12.00							0.61	C	2015.783			iT24 1x3s
																		Note: No parallax data for the A, B, and C components in GAIA DR1.
J 565 AC	20 34 36.258	+29 14 18.3	16.2	88	10.40	13.90	-76	-89		-1	-11				2015			WDS 20346+2914, WDS data as of beginning of August 2017.
	308.650809	29.238112	16.124	88.391	10.03	13.93	-55.60	-74.80	1.70	-6.40	-10.00	2.12	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	308.651031	29.238372	15.506	91.326									0.20	Eu	2002.476			UCAC5.
	308.650783	29.238108			10.13								0.61	C	2015.783			iT24 1x3s. No resolution of B. Has to be fainter than 13.9mag
J 570 AB	20 39 03.542	+26 23 29.7	4.8	86	10.80	13.50	-31	-23							2002			WDS 20391+2624, WDS data as of beginning of August 2017.
	309.764679	26.391485	4.805	82.969	10.87	13.38	-12.50	-24.70	1.98	-15.60	-5.40	3.61	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	309.764728	26.391571	4.821	85.885									0.20	Eu	2002.433			UCAC5.
	309.764675	26.391475	4.876	81.627	10.81	13.69							0.61	C	2015.783			iT24 1x3s
J 574 AB	21 08 28.358	+20 24 17.4	3.1	47	11.15	11.77	73	1							2014			WDS 21085+2025, WDS data as of beginning of August 2017.
	317.118691	20.404848	3.122	46.477	10.53	11.40	71.20	-0.60	2.12	71.90	1.80	4.67	0.96	Hg	2015.000	AABA	**95**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	317.118408	20.404850	3.093	46.769									0.20	Eu	2001.604			UCAC5.
	317.118704	20.404872	2.947	46.470	10.69	11.52							0.61	C	2015.783			iT24 1x3s
																		Note: Solid CPM candidate. No parallax data available in GAIA DR1 for either component.
J 575 AB	21 09 16.739	+20 30 20.5	10.8	181	11.50	12.00	24	15		16	-49				2011			WDS 21093+2029, WDS data as of beginning of August 2017.
	317.319841	20.505739	10.927	181.273	11.18	11.71	18.80	7.10	1.56	14.90	-49.00	1.56	0.96	Hg	2015.000	CCBB	**7**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	317.319766	20.505713	10.174	181.075									0.20	Eu	2001.605			UCAC5.
	317.319825	20.505739	10.944	181.471	11.27	12.00							0.61	C	2015.783			iT24 1x3s
J 606 AB	20 55 50.322	+20 25 02.9	2.7	182	9.90	10.00	4	1		3	-15				2010			WDS 20558+2027, WDS data as of beginning of August 2017.
	313.959680	20.417748	2.633	184.733	12.31	12.54	-0.50	-4.50	1.77	-0.20	-6.70	1.84	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	313.959682	20.417764	2.604	184.875									0.20	Eu	2001.605			UCAC5.
	313.959675	20.417769	2.691	181.497	12.85	12.85							0.61	C	2015.783			iT24 1x3s. SNR A und B <20
																		Note: Some possibility of CPM here, but the motion is rather minimal and error rates are high relative to the motion. No parallax data in GAIA DR1 for either component.

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 773 AB	19 36 57.240	+19 54 16.4	3.1	23	11.70	12.90	5	-20							2006			WDS 19370+1954, WDS data as of beginning of August 2017.
	294.238536	19.904508	3.160	22.407	11.37	12.35	8.40	-13.30	1.70	7.70	-10.90	1.70	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	294.238503	19.904558	3.133	22.773									0.20	Eu	2001.609			UCAC5.
	294.238579	19.904550	2.777	21.138	11.51	12.37							0.61	C	2015.783			iT24 1x3s. Touching star disks
																		Note: GAIA DR1 lists a parallax of 4.31 (756.759 LY) for the primary, no parallax listed for the secondary.
J 794 AB	20 57 09.691	+29 21 26.3	3.2	135	11.71	12.12	-4	15		17	-5				2002			WDS 20572+2921, WDS data as of beginning of August 2017.
	314.290429	29.357282	3.198	134.425	11.62	11.82	8.90	2.00	1.70	10.10	1.30	1.70	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	314.290393	29.357275	3.183	134.488									0.20	Eu	2002.480			UCAC5.
	314.290438	29.357258	3.118	134.877	11.75	11.84							0.61	C	2015.783			iT24 1x3s
J 814 AB	19 13 39.841	+24 22 58.8	1.8	226	12.11	12.68	-4	-4		-4	-4				1991			WDS 19137+2422, WDS data as of beginning of August 2017.
	288.416105	24.382948	1.942	238.151	11.54	12.28	5.48	2.59	4.05				0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS. Secondary not identifed in 2MASS (or URAT1). GAIA DR1 does not show PM data for either component.
	288.415969	24.382872					33.60	20.40	1.98				0.20	Eu	2001.697			UCAC5. Secondary not identified by UCAC5. PM data from UCAC5 catalog. Significant discrepancy with 2MASS-GAIA DR1 comparison with respect to the primary.
	288.415879	24.382769			11.41								0.61	C	2015.783			iT24 1x3s. No resolution of B. Combined magnitude rather confirms current WDS mags
J 816 AB	19 43 45.080	+21 10 59.7	3.0	331	10.20	12.30	-10	-25							1912			WDS 19437+2111, WDS data as of beginning of August 2017.
	295.937780	21.183158			9.76		-6.70	-22.72	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR1, secondary not identified.
	295.937836	21.183242					-14.10	-22.50	1.70				0.20	Eu	2001.625			UCAC5. Secondary not identified by UCAC5. PM data from UCAC5 catalog.
	295.937792	21.183164			10.59								0.61	C	2015.783			iT24 1x3s. No resolution of B. Combined magnitude does not match very well with current WDS mags - either much fainter or bogus
J 817 AB	19 45 17.228	+20 22 48.2	2.7	113	10.70	12.40	8	-10							2002			WDS 19453+2023, WDS data as of beginning of August 2017.
	296.321802	20.380044			9.80								0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. No PM data available in GAIA DR1, secondary not identified.
	296.321815	20.380043					3.30	0.20	1.70				0.20	Eu	2001.610			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	296.321792	20.380031	2.595	112.905	10.48	11.43							0.61	C	2015.783			iT24 1x3s. Touching star disks
J 820 AB	20 24 34.427	+24 29 19.7	3.1	327	9.60	10.00	5	-40							2008			WDS 20246+2429, WDS data as of beginning of August 2017.
	306.143536	24.488577	3.220	326.511	11.48	13.04	-5.86	-9.28	4.93				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from position comparison with 2MASS. Secondary not identified in 2MASS (also not identified in URAT1).
	306.143547	24.488598					-2.70	-5.70	1.56				0.20	Eu	2001.708			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	306.143529	24.488597	3.135	327.025	11.80	13.11							0.61	C	2015.783			iT24 1x3s. Touching star disks

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 834 AB	20 13 39.113	+21 44 47.0	2.6	274	11.00	11.70	12	-5							2008			WDS 20136+2145, WDS data as of beginning of August 2017.
	303.412986	21.746374	2.662	279.000	11.15	12.52	2.52	-5.10	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identified in 2MASS (also not identified in URAT1).
	303.412951	21.746390					8.70	-4.20	1.84				0.20	Eu	2001.639			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	303.412983	21.746369	2.315	276.699	11.18	11.94							0.61	C	2015.783			iT24 1x3s. Overlapping star disks
J 1074 AB	20 45 38.308	+25 52 16.8	2.6	307	10.40	10.80	-3	-8							1994			WDS 20456+2553, WDS data as of August 2017.
	311.409618	25.871311			9.89		-3.95	-9.83	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identified in GAIA DR1.
	311.409634	25.871346					-4.30	-10.10	1.56				0.20	Eu	2002.429			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	311.409638	25.871289			10.25								0.61	C	2015.783			iT23 1x3s. No resolution of B, no hint of an elongation. Bogus?
1074?	311.383975	25.916750	2.099	297.519	12.98	13.12							0.61	C	2015.783			iT23 1x3s. Object with similar Sep and PA nearby
																		Note: Secondary also not identified in URAT1 and 2MASS.
J 1118 AB	19 07 38.789	+22 14 13.2	5.4	94	11.14	13.00	8	-19							2001			WDS 19084+2214, WDS data as of August 2017.
	286.911507	22.236881	5.353	94.652	10.87	12.88	-25.90	-21.50	1.70	-27.10	-21.70	2.05	0.96	Hg	2015.000	AABB	**92**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	286.911611	22.236961	5.368	94.616									0.20	Eu	2001.640			UCAC5.
	286.911533	22.236858	5.225	94.830	11.05	13.52							0.61	C	2015.783			iT24 1x3s. SNR B<20
																		Note: Solid CPM candidate. No parallax data available in GAIA DR1 for either component.
J 1139 AB	19 38 42.091	+25 17 16.9	1.3	217	10.91	10.99	-3	-8		-3	-8				2013			WDS 19387+2517, WDS data as of August 2017.
	294.675479	25.288120	1.251	217.144	10.73	10.87	16.46	19.33	4.91				0.96	Hg	2015.000			GAIA DR1. M1 is from GAIA DR1 Gmag. PM data from position comparison with 2MASS. Secondary not identified in 2MASS (or URAT1).
													0.20	Eu				UCAC5. Neither component identified in UCAC5.
	294.675463	25.288033	1.283	220.171	10.26	10.65							0.61	C	2015.783			iT24 1x3s. Heavily overlapping star disks
J 1139 AC	19 38 42.091	+25 17 16.9	34.0	103	10.91	11.45	-4	-8		12	1				2010			WDS 19387+2517, WDS data as of August 2017.
	294.675479	25.288120	33.852	103.468	10.73	11.22	16.46	19.33	4.91	12.30	-1.72	4.91	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
										13.20	-0.20		0.20	Eu	2002.012			UCAC5. Primary not identified in UCAC5. PM data for secondary is from UCAC5.
	294.675463	25.288033	33.984	103.148	10.26	11.33							0.61	C	2015.783			iT24 1x3s
J 1154 AB	21 15 08.267	+28 08 16.7	1.8	106	9.78	11.69	-13	-22		-13	-22				2009			WDS 21151+2808, WDS data as of August 2017.
	318.784391	28.137912			9.45		-48.66	-10.63	6.78				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data for primary from position comparison with 2MASS. Secondary not identified in GAIA DR1, 2MASS, or in URAT1.
	318.784485	28.137953					-23.70	-11.70					0.20	Eu	2002.469			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	318.784396	28.137897	1.605	107.031	9.62	10.49							0.61	C	2015.783			iT24 1x3s. Overlapping star disks

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 1156 AB	19 55 27.093	+24 48 45.8	3.3	227	10.90	11.00	13	1		-1	-12				2006			WDS 19554+2449, WDS data as of August 2017.
	298.862893	24.812726	3.273	225.951	11.15	11.63	0.20	-6.90	1.41	-2.40	-9.50	1.56	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	298.862892	24.812752	3.224	225.969									0.20	Eu	2201.706			UCAC5.
	298.862979	24.812708	3.169	228.011	11.19	11.59							0.61	C	2015.783			iT24 1x3s
J 1156 AC	19 55 27.093	+24 48 45.8	18.0	305	10.90	13.80	13	1		-11	-4				2006			WDS 19554+2449, WDS data as of August 2017.
	298.862893	24.812726	18.037	305.188	11.15	12.92	0.20	-6.90	1.41	-3.50	-3.50	1.56	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	298.862892	24.812752	17.970	305.163									0.20	Eu	2001.707			UCAC5.
	298.862979	24.812708	18.044	305.119	11.19	13.25							0.61	C	2015.783			iT24 1x3s. SNR C<20
J 1165 AB	20 14 32.122	+24 53 23.9	1.2	119	10.75	12.40	1	2							2009			WDS 20146+2453, WDS data as of August 2017.
	303.633880	24.889954			10.79		7.06	-3.65	5.60				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data for primary from position comparison with 2MASS. Secondary not identified in GAIA DR1, 2MASS, or in URAT1.
	303.633925	24.889911					-11.30	11.60	1.84				0.20	Eu	2001.784			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	303.633917	24.889942	1.699	123.595	11.00	11.72							0.61	C	2015.772			iT24 1x3s. Overlapping star disks
J 1178 AB	20 36 26.197	+22 12 31.1	4.2	330	10.10	11.90	17	9							2002			WDS 20364+2213, WDS data as of August 2017.
	309.108592	22.209714	4.211	149.509	11.77	10.42	5.40	11.00	2.83	11.60	8.50	1.70	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	309.108570	22.209674	4.142	150.268									0.20	Eu	2001.638			UCAC5.
	309.109279	22.208747	3.905	148.240	11.93	10.55							0.61	C	2015.772			iT24 1x3s
J 1179 AB	20 44 53.367	+20 38 56.8	4.2	142	12.37	12.00	3	-2		7	-7				2010			WDS 20449+2041, WDS data as of August 2017.
	311.222383	20.649121	4.169	143.790	11.99	12.77	6.70	-1.30	1.84	7.90	-4.10	2.12	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	311.222356	20.649126	4.130	143.663									0.20	Eu	2001.610			UCAC5.
	311.222404	20.649064	3.959	143.192	12.38	13.30							0.61	C	2015.772			iT24 1x3s
J 1180 AB	21 04 32.358	+27 29 37.8	4.0	276	11.00	12.40	-5	-8							2016			WDS 21045+2730, WDS data as of August 2017.
	316.134813	27.493803	4.012	276.440	10.67	12.28	-7.00	-7.80	1.56	-8.70	-5.40	1.84	0.96	Hg	2015.000	CACB	**16**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rates somewhat high relative to minor amount of proper motion.
	316.134840	27.493830	3.986	276.034									0.20	Eu	2002.457			UCAC5.
	316.134838	27.493769	3.926	276.729	10.98	12.76							0.61	C	2015.772			iT24 1x3s
																		Note: GAIA DR1 lists a parallax of 4.93 (661.588 LY) for the primary, no parallax listed for the secondary.
J 1193 AB	19 45 18.313	+24 00 59.8	4.8	271	12.50	12.60	5	-6		-5	-5				2008			WDS 19453+2402, WDS data as of August 2017.
	296.326259	24.016435	4.834	271.267	11.80	12.07	-2.90	-3.70	1.56	-2.70	-4.60	1.56	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog.
	296.326271	24.016448	4.837	271.424									0.20	Eu	2001.697			UCAC5.
	296.326292	24.016458	4.754	270.241	12.22	12.50							0.61	C	2015.772			iT24 1x3s
POU 4049 AC	20 13 08.482	+21 46 12.0	14.7	313	12.50	14.10	5	-6							2008			WDS 20132+2145, WDS data as of August 2017. This is the AC component of J 1193.
	296.326259	24.016435	14.774	313.261	11.80	14.56	-2.90	-3.70	1.56	-3.80	0.20	3.18	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	296.326271	24.016448	14.729	313.148									0.20	Eu	2001.700			UCAC5.
	296.326292	24.016458	15.303	312.762	12.22	15.68							0.61	C	2015.772			iT24 1x3s. SNR C<5

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 1194 AB	20 13 08.482	+21 46 12.0	5.9	117	10.40	12.80	2	-4		-1	-4				2010			WDS 20132+2145, WDS data as of August 2017.
	303.285371	21.770014	6.141	116.866	10.33	12.80	0.70	-1.50	1.70	-0.80	-3.30	2.12	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	303.285368	21.770020	6.149	116.576									0.20	Eu	2001.639			UCAC5.
	303.285333	21.769975	6.263	115.437	10.45	13.18							0.61	C	2015.772			iT24 1x3s. SNR B<20
J 1195 AB	20 20 15.699	+25 01 31.7	4.4	106	10.01	14.50	-7	-7							2009			WDS 20203+2501, WDS data as of August 2017.
	305.065414	25.025448	4.655	104.471	9.96	12.26	-2.50	-8.00	1.56	11.40	-14.50	2.69	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	305.065423	25.025476	4.465	104.037									0.20	Eu	2002.359			UCAC5.
	305.065550	25.025358	4.460	104.279	9.85	12.19							0.61	C	2015.772			iT24 1x3s
J 1221 AB	19 29 36.812	+22 38 13.2	2.7	204	12.27	12.94	-2	-21							1940			WDS 19297+2238, WDS data as of August 2017.
	292.403381	22.636916	2.925	205.017	10.55	12.52	-4.18	-24.03	1.92				0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identifed in 2MASS or in URAT1.
	292.403403	22.636996					-5.50	-21.50	1.70				0.20	Eu	2001.658			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	292.403379	22.636875	2.117	198.295	10.70	11.71							0.61	C	2015.772			iT24 1x3s. SNR B<20
J 1222 AB	20 03 26.138	+22 42 40.8	2.0	71	11.23	11.39	-12	-11							2003			WDS S20034+2243, WDS data as of August 2017.
	300.858941	22.711321	1.951	71.396	11.45	11.49				-7.71	-6.59	1.92	0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from GAIA DR1 catalog. Secondary not identifed in 2MASS or in URAT1.
													0.20	Eu				UCAC5. Neither component identified in UCAC5.
	300.859346	22.711258			10.97								0.61	C	2015.772			iT24 1x3s. No resolution of B. Combined magnitude suggests both components 0.4mag fainter than currently listed
																		Both 2MASS and URAT1 display a single marker midway between the two components - not possible to tell which component it is because of the virtual identical magnitude of the two components.
J 1223 AB	21 02 36.349	+27 11 06.5	4.8	296	9.40	11.20	19	-14		-64	29				2010			WDS 21029+2711, WDS data as of August 2017.
	315.651381	27.185146	4.818	296.251	10.55	12.70	-0.70	-6.00	1.70	-0.30	-5.00	1.98	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	315.651383	27.185167	4.816	296.079									0.20	Eu	2002.450			UCAC5.
	315.651404	27.185128	4.698	294.657	11.28	13.06							0.61	C	2015.772			iT24 1x3s. SNR B<20
J 1223 AC	21 02 36.349	+27 11 06.5	21.9	134	9.40	14.50	19	-14		7	-7				2002			WDS 21029+2711, WDS data as of August 2017.
	315.651381	27.185146	21.657	133.695	10.55	14.50	-14.88	0.43	5.22	-5.65	19.49	6.15	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
	315.651383	27.185167					-0.70	-6.00	1.70				0.20	Eu				UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	315.651404	27.185128	22.095	134.258	11.28	14.94							0.61	C	2015.772			iT24 1x3s. SNR C<10
																		Note: UCAC5 and the GAIA-2MASS comparison show significant differences in the PM for the primary.
J 1227 AB	19 51 49.131	+27 32 32.9	5.1	355	10.01	13.00	2	-4							2002			
	297.954747	27.542514	5.140	355.323	9.90	12.16	1.40	-1.10	1.41	2.50	0.20	3.61	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.954741	27.542518	5.124	355.155									0.20	Eu	2002.442			UCAC5.
	297.954729	27.542519	5.128	355.239	9.89	12.28							0.61	C	2015.772			iT24 1x3s

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 1239 AB	19 34 53.170	+25 19 22.0	4.3	248	9.40	12.80	7	0							2000			WDS 19348+2517, WDS data as of August 2017.
	293.721589	25.322786	4.299	247.363	10.82	12.95	1.34	-3.09	5.27	0.85	-5.24	5.27	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
	293.721572	25.322794					4.20	-2.20	1.41				0.20	Eu	2002.182			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	293.721583	25.322764	4.069	245.924	10.99	13.27							0.61	C	2015.772			iT24 1x3s. SNR B<20
J 1264 AB	19 28 22.407	+23 05 15.0	4.8	264	13.40	15.70	5	-7							2001			WDS 19284+2305, WDS data as of August 2017.
	292.093409	23.087448	4.906	263.964	13.23	15.40	-0.90	-3.60	1.56	-7.20	-6.60	7.57	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	292.093413	23.087462	4.818	264.327									0.20	Eu	2001.681			UCAC5.
	292.093425	23.087428	4.408	273.121	13.57	15.42							0.61	C	2015.772			iT24 1x3s. SNR B<10
J 1264 AC	19 28 22.407	+23 05 15.0	5.9	69	13.40	16.00	5	-7							2001			WDS 19284+2305, WDS data as of August 2017.
	292.093409	23.087448	6.064	67.832	13.23	15.61	-0.90	-3.60	1.56	9.00	14.00	7.78	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	292.093413	23.087462	5.855	69.477									0.20	Eu	2001.681			UCAC5.
	292.093425	23.087428			13.57								0.61	C	2015.772			iT24 1x3s. No resolution of C
J 1280 AB	19 01 00.473	+22 05 34.5	3.9	108	11.70	12.00	7	-11		19	3				2011			WDS 19011+2204, WDS data as of August 2017.
	285.251987	22.092937	3.887	108.278	11.32	11.72	0.70	1.80	1.70	0.80	1.40	1.70	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Very minimal motion in both components.
	285.251984	22.092930	3.885	108.207									0.20	Eu	2001.640			UCAC5.
	285.251988	22.092950	3.860	108.110	12.02	12.02							0.61	C	2015.772			iT24 1x3s
J 1307 CD	19 29 18.547	+19 49 57.7	3.8	154	10.30	11.80	-5	-9							2003			WDS 19294+1950, WDS data as of August 2017.
	292.327320	19.832614	3.864	154.208	10.43	11.88	5.50	-19.80	1.56	7.10	-22.30	4.81	0.96	Hg	2015.000	ACCB	**31**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	292.327298	19.832688	3.824	154.291									0.20	Eu	2001.602			UCAC5.
	292.327283	19.832628	4.062	151.807	10.63	11.94							0.61	C	2016.569			iT24 1x3s. C is ident with C of LBU 18
																		Note: GAIA DR1 lists a parallax of 3.77 (865.144 LY) for the primary, no parallax listed for the secondary.
J 1308 AB	19 30 06.647	+19 46 46.6	2.4	198	12.49	12.55	11	24		1	-2				2001			WDS 19301+1945, WDS data as of August 2017.
	292.527682	19.779664	2.491	197.363	11.88	12.28	3.10	7.10	2.12	1.80	-1.70	4.60	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	292.527670	19.779638	2.373	197.823									0.20	Eu	2001.602			UCAC5.
	292.527667	19.779608	2.188	198.042	11.96	12.15							0.61	C	2015.772			iT24 1x3s. Touching star disks
J 1309 AB	19 31 15.057	+19 50 21.2	2.7	234	11.00	13.80	5	-2							2000			WDS 19312+1951, WDS data as of August 2017.
	292.812813	19.839269	2.714	233.863	12.39	14.02	-1.46	-3.43	1.92				0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from GAIA DR catalog. Secondary not identified in 2MASS and URAT1.
	292.812807	19.839271					1.50	-0.70	1.70				0.20	Eu	2001.602			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	292.812804	19.839272	2.606	233.777	12.62	14.13							0.61	C	2015.772			iT24 1x3s. Touching star disks, SNR B <20
J 1310 AB	19 32 15.228	+19 48 48.3	3.3	214	9.65	13.50	-16	-9							2000			WDS 19323+1949, WDS data as of August 2017.
	293.063458	19.813414			9.17		-3.42	-4.59	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is from GAIA DR1 Gmag. PM data is from GAIA DR1. Secondary not identified by GAIA DR1, 2MASS, and URAT1.
	293.063474	19.813429					-4.20	-4.10	2.40				0.20	Eu	2001.602			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	293.063438	19.813431	2.171	216.272	9.44	11.22							0.61	C	2015.772			iT24 1x3s. Touching star disks

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 1327 AB	20 52 06.860	+22 18 15.8	2.7	59	12.50	12.50	12	-2							2016			WDS 20522+2218, WDS data as of August 2017.
	313.028332	22.304226	2.694	57.942	11.99	12.35	10.00	0.60	2.12	15.10	3.70	2.34	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	313.028291	22.304224	2.615	57.925									0.20	Eu	2001.634			UCAC5.
	313.028367	22.304236	2.394	59.084	12.25	12.38							0.61	C	2015.772			iT24 1x3s. Touching star disks
J 1328 AB	21 08 03.543	+26 15 19.1	1.0	148	10.54	10.66	22	2		22	2				2016			WDS 21081+2615, WDS data as of August 2017.
	317.014776	26.255422	1.027	147.680	10.12	10.81	4.78	32.44	5.22				0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS, secondary not identified by 2MASS (or URAT1).
													0.20	Eu				UCAC5. Neither component identified in UCAC5.
	317.014871	26.255317			9.89								0.61	C	2015.772			iT24 1x3s. No resolution of B. Combined magnitude confirms WDS values
J 1786 AB	21 21 34.883	+26 08 59.4	6.3	221	10.80	11.70	-1	-10		-11	0				2004			WDS 21214+2610, WDS data as of August 2017.
	320.395289	26.149789	6.176	221.453	10.02	11.98	-5.90	-7.40	2.48	-4.40	-4.70	1.98	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rate high relative to minimal proper motion numbers. No parallax data for either component in GAIA DR1.
	320.395313	26.149816	6.216	221.376									0.20	Eu	2001.788			UCAC5.
	320.395308	26.149789	6.149	221.570	10.78	12.58							0.61	C	2015.769			iT24 1x3s
J 1865 AB	19 48 29.770	+19 57 38.1	6.1	22	10.05	10.93	0	-9		-1	-7				2016			WDS 19485+1958, WDS data as of August 2017.
	297.124059	19.960554	6.057	21.971	10.13	10.96	-0.80	-5.70	1.70	-0.70	-8.00	3.25	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rate high relative to minimal proper motion numbers.
	297.124062	19.960576	6.085	21.845									0.20	Eu	2001.601			UCAC5.
	297.124058	19.960547	6.061	21.994	10.18	11.01							0.61	C	2015.769			iT24 1x3s
																		Note: GAIA DR1 lists parallaxes for both components. A is shown with a parallax of 0.82 (3977.6 LY) and B is shown with a parallax of 0.51 (6395.4 LY). Given those parallaxes, there would be no possibility of CPM.
J 1882 AB	20 29 22.798	+25 54 09.2	9.7	115	9.50	11.00	1	-4		16	-23				2010			WDS 20298+2556, WDS data as of August 2017.
	307.344983	25.902501	9.977	114.782	10.92	12.41	-0.10	-5.90	1.70	6.60	-29.20	1.84	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	307.344984	25.902521	9.781	113.423									0.20	Eu	2002.415			UCAC5.
	307.344950	25.902483	10.050	114.828	11.08	12.68							0.61	C	2015.769			iT24 1x3s
J 1892 AB	20 57 45.239	+22 14 14.4	10.0	42	11.80	13.00	-19	-36		38	22				2001			WDS 20578+2214, WDS data as of August 2017.
	314.438411	22.237191	10.478	41.116	11.15	12.37	-19.70	-36.10	2.19	0.00	-5.80	1.77	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	314.438490	22.237325	10.001	41.508									0.20	Eu	2001.638			UCAC5.
	314.438404	22.237183	10.545	41.072	11.49	12.93							0.61	C	2015.769			iT24 1x3s
HJ 1598 AC	20 57 50.128	+22 56 29.8	9.4	135	11.80	12.00	-19	-36		-18	-38				2001			WDS 20578+2214, WDS data as of August 2017. This is the AC component of J 1892.
	314.438411	22.237191	9.344	134.896	11.15	11.32	-19.70	-36.10	2.19	-20.20	-35.10	2.12	0.96	Hg	2015.000	AABB	**92**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog.
	314.438490	22.237325	9.358	134.921									0.20	Eu	2001.638			UCAC5.
	314.438404	22.237183	9.481	134.625	11.49	11.71							0.61	C	2015.769			iT24 1x3s
																		Note: Solid CPM candidate. No parallax data available in GAIA DR1 for either component.

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 1893 AB	20 57 50.128	+22 56 29.8	6.8	23	13.60	14.80	-2	-3							2010			WDS 20581+2251, WDS data as of August 2017.
	314.458925	22.941620	6.908	23.976	13.49	14.74	2.50	-1.80	2.12	5.70	-2.90	3.32	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	314.458915	22.941627	6.903	23.595									0.20	Eu	2001.641			UCAC5.
	314.458954	22.941639	6.748	22.379	13.79	14.88							0.61	C	2015.769			iT24 1x3s. SNR B<20
J 1894 AB	20 58 08.853	+22 48 34.7	4.8	104	11.10	12.00	-38	-15							2010			WDS 20582+2249, WDS data as of August 2017.
	314.536874	22.809566	4.833	103.681	10.76	11.78	-17.90	-19.70	1.70	-17.60	-20.20	1.77	0.96	Hg	2015.000	AABB	**92**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	314.536947	22.809639	4.826	103.638									0.20	Eu	2001.642			UCAC5.
	314.536888	22.809567	4.797	103.747	11.07	12.17							0.61	C	2015.769			iT24 1x3s
																		Note: Solid CPM candidate. GAIA DR1 shows a parallax for the primary of 3.18 (1025.670 LY), but no parallax for the secondary.
J 2283 AB	19 48 58.548	+19 56 09.6	10.6	351	14.13	14.69	-2	-2		-14	-11				2001			WDS 19490+1956, WDS data as of August 2017.
	297.243968	19.935973	10.703	350.301	13.12	14.06	-4.60	-10.50	1.91	-5.30	-5.30	2.12	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.243986	19.936012	10.633	350.294									0.20	Eu	2001.606			UCAC5.
	297.243996	19.936019	10.419	350.968	14.21	14.90							0.61	C	2017.929			iT24 5x60s
J 2284 AB	19 48 59.777	+19 55 34.7	5.8	61	10.50	11.36	-36	-31		0	-7				2015			WDS 19490+1955, WDS data as of August 2017.
	297.249086	19.926310	5.917	63.469	11.83	13.12	-2.50	-3.30	1.70	-3.60	-6.60	1.70	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.249096	19.926322	5.948	63.158									0.20	Eu	2001.602			UCAC5.
	297.249083	19.926303	5.837	64.313	13.13	13.30							0.61	C	2015.769			iT24 1x3s
J 2285 AB	19 49 01.452	+19 56 56.9	7.9	35	13.76	13.45	-86	-48		0	75				2001			WDS 19491+1956, WDS data as of August 2017.
	297.256063	19.949147	8.111	35.107	12.87	13.70	-3.20	-2.80	1.70	2.90	6.50	1.84	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.256076	19.949158	7.960	35.137									0.20	Eu	2001.605			UCAC5.
	297.256063	19.949114	8.410	35.223	13.86	14.05							0.61	C	2017.929			iT24 5x60s
FYM 262 AC	19 49 01.452	+19 56 56.9	12.0	145	13.76	15.80	-86	-48		5	6				2016			WDS 19491+1956, WDS data as of August 2017. This is the AC component of J 2285.
	297.256063	19.949147	12.428	142.397	12.87	15.37	-3.20	-2.80	1.70	-6.20	-10.50	4.46	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.256076	19.949158	12.371	141.959									0.20	Eu	2001.606			UCAC5.
	297.256063	19.949114	12.550	142.001	13.86	15.84							0.61	C	2017.929			iT24 5x60s
J 2305 AB	20 12 56.253	+22 36 38.3	2.3	178	9.70	10.20	1	4							2008			WDS 20129+2238, WDS data as of August 2017. There's some question as to whether the object identified by the WDS is the J 2305 recorded by Jonckheere. The last line below is a measure of the object that was measured in 2010, which is only the second observation recorded in the WDS. See the discussion on J 2305 in this paper.
	303.234371	22.610673			10.91		-5.11	3.32	1.92				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR catalog. Secondary not identified in GAIA DR1 or in 2MASS and URAT1.
	303.234388	22.610662					-4.10	3.20	1.41				0.20	Eu	2001.681			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	303.234367	22.610664			11.37								0.61	C	2015.769			iT24 1x3s. No resolution of B. Bad match of combined mag with WDS mags - bogus
J 2305?	303.193138	22.642561	1.734	175.881	13.63	14.18							0.61	C	2017.951			iT24 5x30s. Overlapping star disks

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 2310 AB	20 25 33.643	+27 22 09.1	33.5	323	9.86	12.10	-7	-10		5	-4				2002			WDS 20256+2723, WDS data as of August 2017.
	306.390126	27.369158	33.479	322.946	10.04	12.00	-6.70	-7.50	1.84	1.70	-1.30	1.98	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	306.390153	27.369184	33.481	322.724									0.20	Eu	2002.438			UCAC5.
	306.390125	27.369172	33.453	322.838	9.67	12.15							0.61	C	2015.807			iT24 1x3s
J 2310 BC	20 25 32.119	+27 22 35.7	5.3	357	12.10	13.80	5	-4		-1	22				2002			WDS 20256+2723, WDS data as of August 2017.
	306.383816	27.376580	5.317	357.674	12.00	13.59	1.70	-1.30	1.98	4.40	-1.90	2.69	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	306.383810	27.376585	5.326	357.317									0.20	Eu	2002.437			UCAC5.
	306.383804	27.376578	5.289	356.679	12.15	13.77							0.61	C	2015.807			iT24 1x3s
J 2327 AB	20 53 39.633	+21 15 43.2	68.5	48	8.29	13.50	-9	-42		2	19				2015			WDS 20537+2116, WDS data as of August 2017.
	313.415086	21.261829	68.391	47.836	8.14	13.05	-9.60	-40.90	3.82	5.50	6.00	1.91	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	313.415124	21.261981	67.821	48.114									0.20	Eu	2001.617			UCAC5.
	313.415092	21.261819	68.387	47.921	8.14	13.33							0.61	C	2015.794			iT24 1x3s
J 2327 BC	20 53 43.238	+21 16 28.4	4.4	177	13.50	14.00	2	19		-3	-7				2015			WDS 20537+2116, WDS data as of August 2017.
	313.430196	21.274581	4.456	176.958	13.05	13.50	5.60	6.00	1.91	4.00	3.90	1.91	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rates high relative to minimal motion of components.
	313.430174	21.274559	4.430	176.684									0.20	Eu	2001.617			UCAC5.
	313.430221	21.274550	4.374	175.418	13.33	13.83							0.61	C	2015.794			iT24 1x3s. SNR C<20
J 2327 AD*	20 53 39.633	+21 15 43.2			8.29		-9	-42		2	19				2015			* The D object referred to here is not included as a component of J 2327 (WDS 20537+2116), but is added here since its location makes it an obvious addition. The GAIA DR1 coordinates for this star are RA 313.4165978 and Dec +21.2708778. The URAT1 identification is 557-586141.
	313.415086	21.261829	32.840	8.841	8.14	13.53	-9.60	-40.90	3.82	-1.90	-9.40	1.91	0.96	Hg	2015.000	ACCC	**30**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	313.415124	21.261981	32.408	8.777									0.20	Eu	2001.617			UCAC5.
	313.415092	21.261819	32.894	8.652	8.14	13.84							0.61	C	2015.794			iT24 1x3s. SNR D<20
J 2342 AB	21 22 20.002	+28 13 31.1	6.1	213	11.60	12.30	5	5		-4	-1				2015			WDS 21226+2814, WDS data as of August 2017.
	320.583368	28.225324	6.116	214.129	12.59	13.28	2.00	4.20	1.98	10.40	-0.90	2.19	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	320.583361	28.225309	6.125	215.294									0.20	Eu	2002.465			UCAC5.
	320.583388	28.225325	6.128	213.664	12.81	13.56							0.61	C	2016.569			iT24 1x3s
J 2933 AB	19 00 17.489	+24 33 07.1	5.2	127	13.00	13.00	-6	-3							2010			WDS 19002+2433, WDS data as of August 2017.
	285.072875	24.551966	5.196	128.847	13.69	14.05	1.10	-9.10	1.70	0.40	-5.40	2.05	0.96	Hg	2015.000	ACCB	**31**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Error rates high relative to minimal motion of components.
	285.072871	24.551998	5.232	129.189									0.20	Eu	2002.311			UCAC5.
	285.072858	24.551939	5.013	128.637	14.10	14.56							0.61	C	2016.569			iT24 1x3s. SNR B<20

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 2937 AB	19 03 26.921	+23 43 29.3	3.0	56	11.50	12.10	-80	-24							1994			WDS 19034+2343, WDS data as of August 2017.
	285.862140	23.724883	2.489	61.784	12.01	12.99	6.20	30.60	1.98	-9.10	-2.50	2.69	0.96	Hg	2015.000	CCCB	6	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	285.862140	23.724883	2.489	61.788	12.01		-11.78	15.69	4.83				0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from position comparison with 2MASS. Secondary not identified in 2MASS and URAT1.
	285.862115	23.724769	2.892	55.998									0.20	Eu	2001.675			UCAC5.
	285.862179	23.724903	2.107	57.237	12.69	13.80							0.61	C	2016.569			iT24 1x3s. SNR B<20. Overlapping star disks
																		Note: Major discrepancies in PM data for the primary among the WDS data, UCAC5 data, and the GAIA-2MASS comparison. No separate PM data is available in GAIA DR1, nor is parallax data available. GAIA DR1-2MASS comparison added here to see how it aligned with the WDS and UCAC5 data.
J 2944 AB	19 07 41.989	+23 53 15.2	2.3	336	11.50	11.50	9	16							1999			WDS 19075+2352, WDS data as of August 2017.
	286.925205	23.887259	2.262	335.445	11.52	11.32							0.96	Hg	2015.000			GAIA DR1. M1 and M2 GAIA DR1 Gmag. GAIA DR1 coordinates in GAIA DR1 catalog are slightly different than those shown in UCAC5. Both 2MASS and URAT1 show a single marker at the same location, which is located midway between the GAIA markers for the primary and secondary, so no way of knowing which of the two stars it is given the similar magnitudes of the pair.
	286.924986	23.887571					-16.30	70.20	2.12				0.20	Eu	2001.683			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	286.925242	23.887278	2.261	333.323	11.56	11.48							0.61	C	2015.777			iT24 1x3s. Touching star disks
J 2973 AB	19 29 52.131	+25 20 22.5	5.9	187	14.40	14.10	-14	-41							2006			WDS 19299+2520, WDS data as of August 2017.
	292.467194	25.339586	6.256	203.491	13.94	14.10	-4.00	-3.50	2.97	-39.10	-47.70	2.12	0.96	Hg	2015.000	CCCB	6	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	292.467210	25.339598	5.561	201.573									0.20	Eu	2002.062			UCAC5.
	292.467163	25.339556	5.976	204.673	14.88	15.29							0.61	C	2015.777			iT24 1x3s. SNR A<20 and B<10
																		Note difference in WDS PA versus GAIA DR1 and UCAC5.
J 2977 AB	19 33 24.428	+24 02 32.0	7.0	251	11.40	13.50	3	2		34	3				2008			WDS 19334+2403, WDS data as of August 2017.
(Changed to	293.351799	24.042221	7.009	252.437	11.73	11.63	2.60	2.00	1.41	-3.60	-5.40	1.56	0.96	Hg	2015.000	CCCC	6	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
POU 3907)	293.351789	24.042214	6.900	253.003									0.20	Eu	2001.694			UCAC5.
	293.351813	24.042192	7.042	252.394	11.88	12.58							0.61	C	2015.777			iT24 1x3s. Meanwhile renamed to POU 3907
																		NOTE: As J 2977, the WDS ID was 19335+2401.
J 2982 AB	19 34 56.803	+25 25 18.6	5.5	174	12.40	13.80	0	-3		9	-17				2013			WDS 19349+2525, WDS data as of August 2017.
	293.736699	25.421832	5.412	172.713	12.40	13.69	6.30	0.10	1.56	0.90	-3.50	1.84	0.96	Hg	2015.000	CCCC	6	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	293.736674	25.421832	5.374	171.925									0.20	Eu	2002.195			UCAC5.
	293.736675	25.421839	5.046	172.285	12.60	14.12							0.61	C	2015.777			iT24 1x3s. SNR B<20

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 2983 AB	19 35 06.999	+25 25 44.2	5.8	25	11.30	13.00	-60	-134		6	11				2013			WDS 19351+2526, WDS data as of August 2017. WDS PA appears to be in error (off 180 degrees) with respect to the magnitudes shown. The Obs1 data in the WDS (which is Jonckheere's observation) shows a PA of 205 degrees, which is in accordance with the northernmost of the two stars being the brightest. The GAIA DR1 and UCAC5 data, as well as our own observations, are thus based on measuring from the northernmost (brightest) of the two stars.
	293.779977	25.430423	5.992	205.927	12.97	13.17	5.50	3.10	1.56	-1.60	-4.20	1.70	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	293.779977	25.430423	5.993	205.924	12.97	13.17	1.38	0.71	4.91	-3.48	-8.06	4.91	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
	293.779956	25.430412	5.868	205.529									0.20	Eu	2002.185			UCAC5.
	293.779971	25.430417	5.911	207.135	13.38	14.06							0.61	C	2015.777			iT24 1x3s
																		Note: 2MASS-GAIA DR1 comparison included to see how it compared with the UCAC5 PM data due to the major discrepancy with the WDS PM data for the primary.
J 3002 AB	19 45 31.908	+28 50 26.1	8.2	222	12.00	12.40	24	2		-8	-15				2002			WDS 19464+2852, WDS data as of August 2017.
	296.383073	28.840634	8.501	223.613	12.80	14.02	22.30	4.30	1.84	0.00	-3.50	2.26	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	296.382984	28.840619	8.238	222.674									0.20	Eu	2002.455			UCAC5.
	296.383083	28.840606	8.477	223.489	13.01	14.09							0.61	C	2015.777			iT24 1x3s
J 3003 AB	19 45 40.958	+28 49 11.1	8.2	197	12.00	12.10	12	-11		-54	-95				2002			WDS 19465+2851, WDS data as of August 2017.
	296.420709	28.819766	8.276	197.205	13.33	13.71	0.80	-3.30	3.39	-10.10	-10.70	6.79	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	296.420706	28.819777	8.147	196.478									0.20	Eu	2002.456			UCAC5.
	296.420683	28.819775	8.327	198.210	13.73	14.43							0.61	C	2015.777			iT24 1x3s. SNR B<20
																		Note significant discrepancy between WDS and UCAC5 PM numbers. UCAC5 error for secondary is notably higher than normal.
J 3008 AB	19 48 33.808	+20 31 36.4	5.5	7	12.58	12.60	-3	-8							2010			WDS 19484+2031, WDS data as of August 2017.
	297.140938	20.526736	5.671	7.007	12.67	13.24	9.40	-12.70	1.70	0.70	3.10	1.84	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.140901	20.526784	5.477	8.485									0.20	Eu	2001.616			UCAC5.
	297.140946	20.526714	5.707	6.502	13.23	13.68							0.61	C	2015.777			iT24 1x3s
J 3016 AB	19 50 05.132	+21 39 35.5	5.9	354	11.82	12.30	1	-10		1	-10				2009			WDS 19500+2140, WDS data as of August 2017.
	297.521426	21.659848	5.882	354.451	11.67	12.20	0.50	-5.00	1.70	1.80	-7.40	1.70	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.521424	21.659866	5.917	354.311									0.20	Eu	2001.635			UCAC5.
	297.521433	21.659847	5.828	354.372	11.95	12.57							0.61	C	2015.777			iT24 1x3s

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3018 AB	19 50 11.538	+20 29 30.3	6.9	165	10.60	10.80	-3	-3		-2	-12				2016			WDS 19505+2030, WDS data as of August 2017.
	297.548076	20.491736	6.758	163.790	11.93	12.70	-5.90	-4.30	1.56	-5.20	-13.40	1.56	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.548099	20.491752	6.638	163.569									0.20	Eu	2001.614			UCAC5.
	297.548071	20.491725	6.836	164.258	12.27	13.04							0.61	C	2015.777			iT24 1x3s
J 3021 AB	19 51 28.703	+28 10 52.5	5.3	180	9.70	11.00	9	3		8	20				2007			WDS 19516+2810, WDS data as of August 2017.
	297.869644	28.181251	5.336	180.827	11.65	12.63	8.80	-3.50	1.70	-7.90	-22.50	1.70	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	297.869610	28.181264	5.129	178.532									0.20	Eu	2002.446			UCAC5.
													0.61	C				iT24 1x60s V-filter
Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3027 AB	19 53 31.393	+19 47 34.0	5.3	0	12.60	13.10	-3	-8		-9	34				2001			WDS 19538+1948, WDS data as of August 2017.
	298.380814	19.792753	5.336	359.022	12.50	12.96	0.30	-5.50	1.41	-1.50	-1.80	1.41	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	298.380813	19.792774	5.285	359.266									0.20	Eu	2001.607			UCAC5.
	298.380825	19.792767	5.424	357.763	12.77	13.30							0.61	C	2015.777			iT24 1x3s
Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3033 AB	19 54 46.711	+19 40 38.6	4.3	309	13.00	13.80	74	-104		-9	8				2001			WDS 19548+1941, WDS data as of August 2017.
	298.694670	19.677324			12.47								0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. Secondary not identified in GAIA DR1.
	298.694676	19.677333	4.534	309.402	12.63	13.21	10.59	-15.74	11.63	0.59	-1.92	11.68	0.20	Eu	2013.648	CCCC	**6**	URAT1. M1 is URAT1 Vmag, M2 is URAT1 f.mag. PM data from position comparison with 2MASS.
	298.694645	19.677390					6.30	-17.60	1.41				0.20	Eu	2001.607			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	298.694692	19.677319	4.834	307.912	13.14	14.12							0.61	C	2015.777			iT24 1x3s. SNR B<20
J 3045 AB	20 02 23.049	+28 37 22.7	5.0	264	12.09	12.45	18	-9							2006			WDS20025+2836, WDS data as of August 2017.
	300.596641	28.622690	5.232	263.481	11.42	11.86	16.20	-6.40	1.84	16.10	-6.50	1.98	0.96	Hg	2015.000	AACB	**78**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	300.596576	28.622712	5.231	264.504									0.20	Eu	2002.456			UCAC5.
	300.596638	28.622694	5.225	263.185	11.62	12.10							0.61	C	2015.777			iT24 1x3s
																		Solid CPM candidate. GAIA DR1 lists a parallax of 3.81 (856.071 LY) for the primary, but none for the secondary.
J 3051 AB	20 06 04.609	+27 55 17.5	3.4	351	12.00	12.50	12	-83							2007			WDS 20062+2755, WDS data as of August 2017.
	301.519218	27.921568	3.182	349.650	12.19	13.39	1.29	5.64	4.92	-3.46	-29.13	4.92	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from position comparison with 2MASS.
	301.519207	27.921569					2.80	-0.40	2.40				0.20	Eu	2002.440			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	301.519229	27.921583	3.116	348.218	12.72	13.65							0.61	C	2015.777			iT24 1x3s
J 3057 AB	20 12 31.719	+22 15 15.3	6.7	104	11.40	12.20	-15	-7		-2	-16				2016			WDS 20123+2215, WDS data as of August 2017.
	303.132187	22.254246	6.710	104.085	12.00	12.64	-2.90	-1.30	1.56	-5.00	-4.60	1.56	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	303.132199	22.254251	6.726	103.665									0.20	Eu	2001.643			UCAC5.
	303.132175	22.254208	6.727	103.584	12.25	13.19							0.61	C	2015.777			iT24 1x3s

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3061 AB	20 13 19.111	+22 14 45.7	5.0	269	10.00	13.00	4	1		-35	-12				2010			WDS 20134+2214, WDS data as of August 2017.
	303.329672	22.246058			12.15		-1.50	4.06					0.96	Hg	2015.000			GAIA DR1. M1 is GAIA DR1 Gmag. PM data from GAIA DR catalog. Secondary not identified in GAIA DR1.
	303.329669	22.246046	5.328	267.185	12.19	12.03	0.90	-0.60	6.39	-1.41	-18.72	6.40	0.20	Eu	2013.572	CCCB	**6**	URAT1. M1 and M2 are URAT1 Vmags. PM data from position comparison with 2MASS.
	303.329673	22.246038					-0.40	5.30	1.70				0.20	Eu	2001.659			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	303.329688	22.246033	5.381	266.804	12.38	14.11							0.61	C	2015.777			iT24 1x3s
J 3073 AB	20 18 41.107	+28 48 20.5	4.5	16	11.60	11.90	2	-12		27	12				2002			WDS 20188+2849, WDS data as of August 2017.
	304.671322	28.805700	4.480	16.104	12.82	13.44	3.80	2.00	1.84	4.60	3.20	1.98	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog.
	304.671307	28.805693	4.463	16.032									0.20	Eu	2002.463			UCAC5.
	304.671317	28.805722	4.450	16.824	13.07	13.74							0.61	C	2015.777			iT24 1x3s
J 3077 AB	20 22 07.931	+26 49 59.8	4.5	312	11.00	11.50	50	-26		-5	-22				2002			WDS 20220+2651, WDS data as of August 2017.
	305.533145	26.833302	4.445	312.202	12.29	13.32	18.70	9.10	1.84	19.30	8.30	2.26	0.96	Hg	2015.000	AACB	**78**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	305.533071	26.833270	4.456	312.227									0.20	Eu	2002.426			UCAC5.
	305.533129	26.833319	4.285	312.236	12.55	13.66							0.61	C	2015.777			iT24 1x3s
																		Solid CPM candidate. No parallax data for either component avaiable in GAIA DR1.
J 3078 AB	20 22 17.963	+26 07 08.3	7.3	24	10.20	10.20	-5	-10		-1	24				2010			WDS 20222+2606, WDS data as of August 2017.
	305.574837	26.118962	6.862	22.782	12.11	12.60	1.60	-3.80	1.70	-8.30	15.90	1.70	0.96	Hg	2015.000	BCCB	**25**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog. Not a CPM candidate.
	305.574831	26.118975	6.684	24.593									0.20	Eu	2002.418			UCAC5.
	305.574829	26.118939	6.962	22.762	12.78	12.80							0.61	C	2015.777			iT24 1x3s
J 3083 AB	20 23 06.042	+23 26 32.0	5.3	114	12.00	12.50	17	0		65	-30				2010			WDS 20230+2328, WDS data as of August 2017.
	305.775243	23.442264	5.320	114.284	12.95	13.68	11.00	5.00	1.41	-1.70	-4.10	1.56	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	305.775198	23.442246	5.429	112.382									0.20	Eu	2001.683			UCAC5.
	305.775308	23.442189	5.200	112.142	13.27	14.01							0.61	C	2015.791			iT24 1x3s. SNR A <20 and B <10
J 3086 AB	20 26 50.520	+26 57 11.4	3.6	17	11.00	11.00	22	2		7	40				2002			WDS 20268+2657, WDS data as of August 2017.
	306.710493	26.953102	3.659	16.790	12.64	12.23	-3.90	-13.50	1.70	-3.20	-12.50	1.70	0.96	Hg	2015.000	ABCB	**62**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	306.710508	26.953149	3.644	16.714									0.20	Eu	2002.430			UCAC5.
	306.710367	26.953144	2.952	22.363	12.90	12.52							0.61	C	2015.805			iT24 1x3s
																		Possible CPM candidate, error rate somewhat high in relation to rather minimal motion in RA. No parallax data available for either component in GAIA DR1.
J 3097 AB	20 36 37.492	+26 48 49.6	5.8	64	11.00	11.60	-10	-11		10	-2				2010			WDS 20367+2649, WDS data as of August 2017.
	309.156186	26.813749	5.731	64.033	12.54	13.20	-7.80	-4.00	1.98	-5.50	-3.90	2.19	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	309.156217	26.813763	5.704	63.927									0.20	Eu	2002.438			UCAC5.
	309.156192	26.813744	5.719	62.511	12.88	13.47							0.61	C	2015.791			iT24 1x3s

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3105 AB	20 39 49.053	+25 51 41.1	5.5	170	11.80	12.20	1	12		-1	-2				2002			WDS 20399+2549, WDS data as of August 2017.
	309.954428	25.861527	5.785	170.157	13.71	13.67	8.50	12.30	2.12	11.40	-12.10	1.98	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	309.954394	25.861484	5.477	169.980									0.20	Eu	2002.427			UCAC5.
	309.954383	25.861519	5.674	169.583	13.93	13.82							0.61	C	2015.791			iT24 1x3s
J 3106 AB	20 40 53.323	+25 53 23.9	4.9	353	11.00	11.50	-9	-7		-9	27				2010			WDS 20409+2553, WDS data as of August 2017.
	310.222144	25.889890	4.774	355.447	11.86	12.17	-10.30	-10.20	1.70	-2.10	-9.10	1.70	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	310.222184	25.889926	4.769	354.196									0.20	Eu	2002.428			UCAC5.
	310.222146	25.889864	4.801	354.678	12.37	12.89							0.61	C	2015.791			iT24 1x3s
J 3111 AB	20 49 02.798	+25 43 53.3	6.2	139	10.89	12.70	-2	-1		2	-3				2010			WDS 20490+2544, WDS data as of August 2017.
	312.261652	25.731486	6.319	138.161	10.83	12.34	-2.10	-1.00	1.56	-2.80	-1.30	1.70	0.96	Hg	2015.000	ACCC	**30**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	312.261660	25.731490	6.323	138.069									0.20	Eu	2001.959			UCAC5.
	312.261679	25.731514	6.321	138.168	10.91	12.48							0.61	C	2015.791			iT24 1x3s
																		Note: Error rates high in comparison to very minimal motion. GAIA DR1 shows a parallax of 1.3 (2508.947 LY) for the primary, none listed for the secondary.
J 3112 AB	20 49 49.847	+25 35 03.9	5.6	75	10.57	11.28	1	-9		2	-8				2010			WDS 20497+2535, WDS data as of August 2017.
	312.457715	25.584398	5.573	75.355	10.22	11.09	6.51	-4.56	6.67	5.57	-2.57	6.51	0.20	Eu	2013.857	CCCC	**6**	URAT1. M1 is URAT1 Vmag, M2 is visual estimate from URAT1 J and K magnitudes. PM data from position comparison with 2MASS.
													0.20	Eu				UCAC5. Neither component identified in UCAC5 or in GAIA DR1.
	312.457654	25.584389	5.723	75.219	10.67	11.22							0.61	C	2015.791			iT24 1x3s
J 3114 AB	20 50 55.552	+23 06 09.2	4.6	282	13.00	13.40	14	-3		-25	-5				2010			WDS 20508+2305, WDS data as of August 2017.
	312.731502	23.102572	4.915	281.941	13.54	14.13	0.30	-4.80	1.84	-5.30	-10.30	2.12	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	312.731501	23.102590	4.858	282.966									0.20	Eu	2001.662			UCAC5.
	312.731508	23.102569	4.696	280.180	13.91	14.22							0.61	C	2015.807			iT24 1x3s. SNR B<20
J 3120 AB	20 59 37.691	+24 37 55.4	3.5	264	11.28	12.80	-20	-24							2006			WDS 20597+2438, WDS data as of August 2017.
	314.906980	24.632028			11.62		-13.09	-8.01	10.29				0.20	Eu	2013.626			URAT1. M1 is URAT1 Vmag. PM data is from position comparison with 2MASS. Secondary not identified in URAT1, although 2MASS identifies it.
													0.20	Eu				UCAC5. Neither component identified in UCAC5 or in GAIA DR1.
	314.906996	24.632064	3.511	261.978	11.97	12.85							0.61	C	2017.948			iT24 3x30s
J 3121 AB	21 00 15.03	+22 23 56.8	9.9	47	13.00	13.50	-59	-75		13	-4				2010			WDS 20599+2229, WDS data as of August 2017.
	315.062701	22.399094	9.962	46.780	13.42	13.28	5.30	-4.00	1.63	5.70	-4.80	1.70	0.96	Hg	2015.000	BCCC	**24**	GAIA DR1. M1 is from GAIA DR1 Gmag. Secondary not identifed in GAIA DR1.
	315.062680	22.399109	9.966	46.717									0.20	Eu	2001.641			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	315.062679	22.399111	10.138	46.018	13.62	13.64							0.61	C	2015.807			iT24 1x3s

Table 1 continues on next page.

Table 1 (continued). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3122 AB	20 59 45.910	+28 13 25.1	2.3	53	11.30	11.60	6	-16							1983			WDS 20599+2813, WDS data as of August 2017.
	314.940958	28.223444			12.35								0.96	Hg	2015.000			GAIA DR1. M1 is from GAIA DR1 Gmag. Secondary not identifed in GAIA DR1.
	314.941159	28.223556					-51.10	-32.20	2.12				0.20	Eu	2002.471			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	314.941188	28.223442			12.11								0.61	C	2017.948			iT24 5x30s. No resolution of B, has to be fainter than 13.5mag. Combined magnitude bad match with WDS magnitudes. Might be bogus but 2MASS and POSS.I and POSS.II images suggest not only an obvious elongation but also common proper motion
J 3130 AB	21 15 33.652	+25 40 06.9	4.7	305	11.80	11.90	12	-20		-13	10				2015			WDS 21156+2537, WDS data as of August 2017.
	318.890211	25.668629	4.601	304.939	13.79	13.12	-4.80	7.50	2.69	-3.10	7.20	2.12	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog.
	318.890231	25.668601	4.623	304.831									0.20	Eu	2001.726			UCAC5.
	318.890158	25.668694	4.335	300.955	13.82	13.49							0.61	C	2015.805			iT24 1x3s. SNR A <10 and B<20
J 3130 AC	21 15 33.652	+25 40 06.9	6.2	85	11.80	12.00	12	-20		2	7				2015			WDS 21156+2537, WDS data as of August 2017.
	318.890211	25.668629	6.063	84.501	13.79	13.64	-4.80	7.50	2.69	-10.20	0.60	2.55	0.96	Hg	2015.000	CCCB	**6**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	318.890231	25.668601	6.143	83.719									0.20	Eu	2001.722			UCAC5.
	318.890158	25.668694	6.488	86.554	13.82	13.98							0.61	C	2015.805			iT24 1x3s. SNR A and C <10
J 3134 AB	21 18 59.111	+26 33 03.9	5.8	42	11.86	12.00	-26	-60		31	-3				2002			WDS 21179+2630, WDS data as of August 2017.
	319.746259	26.550893	5.791	41.980	11.41	11.93	-7.20	-42.30	1.41	-6.20	-42.90	1.56	0.96	Hg	2015.000	AAAB	**97**	GAIA DR1. M1 and M2 GAIA DR1 Gmag. PM data from UCAC5 catalog
	319.746289	26.551045	5.788	41.823									0.20	Eu	2002.015			UCAC5.
	319.746288	26.550889	5.766	42.079	11.63	12.25							0.61	C	2015.791			iT24 1x3s
																		Solid CPM candidate. GAIA DR1 Does not list a parallax for either component.
J 3241 AB	19 29 25.469	+19 49 32.9	0.6	220	10.43	11.61	16	-31		18	-32				1996			WDS 19294+1950, WDS data as of August 2017.
	292.356224	19.825728	1.336	215.044	9.97	10.64	28.88	-13.52	4.84				0.96	Hg	2015.000			GAIA DR1. M1 and M2 are from GAIA DR1 Gmag. PM data from position comparison with 2MASS. Secondary not identified in 2MASS (or URAT1).
													0.20	Eu				UCAC5. Neither component identified in UCAC5.
	292.356175	19.825639			10.05								0.61	C	2016.569			iT24 1x3s. No resolution of B
LBU 18 AC	19 29 25.469	+19 49 32.9	100.7	284	10.43	10.66	16	-31		-5	-9				2001			WDS 19294+1950, WDS data as of August 2017. This is the C component of J 3241.
	292.356224	19.825728	100.976	284.212	9.97	10.43	28.88	-13.52	4.84	2.11	-16.93	4.84	0.96	Hg	2015.000	CCCC	**6**	GAIA DR1. M1 and M2 are GAIA DR1 Gmag. PM data from position comparison with 2MASS.
										5.50	-19.80	1.56	0.20	Eu	2001.603			UCAC5. Primary not identified in UCAC5, but secondary is; PM data from UCAC5 catalog.
	292.356175	19.825639	101.028	284.421	10.05	10.63							0.61	C	2016.569			iT24 1x3s. C is ident with J 1307

Table 1 concludes on next page.

Table 1 (conclusion). Measurement Results for J Objects in Lepus and Hercules

Name	RA	Dec	Sep "	PA °	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Ap	Me	Date	CPM Rat	CPM %	Source/Notes
J 3242 AB	19 38 01.950	+20 52 30.5	2.5	189	9.70	12.50	-4	-2							1997			WDS 19380+2054, WDS data as of August 2017.
	294.508149	20.875152	3.147	186.970	11.52	13.65	-3.78	-1.67	1.92				0.96	Hg	2015.000			GAIA DR1. M1 and M2 are GAIA DR1 Gmags. PM data from GAIA DR catalog. Secondary not identified in 2MASS and URAT1.
	294.508164	20.875152					-3.60	-0.20	1.56				0.20	Eu	2001.616			UCAC5. PM data from UCAC5 catalog. Secondary not identified.
	294.508154	20.875164	3.069	187.875	11.77	13.84							0.61	C	2015.791			iT24 1x3s. Touching star disks. SNR B <10
J 3243 AB	19 39 22.129	+19 57 42.3	2.7	322	12.50	12.50	10	-14							1996			WDS 19394+1958, WDS data as of August 2017.
	294.842171	19.961690	2.339	318.827	12.27	12.38	-2.90	-4.02	1.92				0.96	Hg	2015.000			GAIA DR1. M1 and M2 are GAIA DR1 Gmags. PM data from GAIA DR catalog. GAIA DR1 coordinates shown here are not those which are listed in the UCAC5 catalog, but come directly from GAIA DR1. Aladin shows a single marker in 2MASS and URAT1 which is located midway between the two components.
	294.841987	19.961919											0.20	Eu	2001.604			UCAC5. Odd situation in Aladin. There are two markers for the two stars, but they're located 280 mas apart. Each marker displays identical GAIA DR1 and UCAC5 coordinates. Each also shows the same date, but clicking on them returns two different PM values: -68.3 and 69.8 for the southernmost of the two markers, 46.6 and -61.7 for the northernmost of the two.
	294.842175	19.961769	1.704	319.192	12.55	12.72							0.61	C	2015.791			iT24 1x3s. Touching star disks

Explanations regarding the content of the Notes column:

- "Touching star disks" indicates that the rims of the star disks are touching and that the measurement results might be a bit less precise than with clearly separated star disks
- "Touching/Overlapping star disks" indicates that the star disks overlap to the degree of an elongation and that the measurement results is probably less precise than with clearly separated star disks
- "SNR <20" indicates that the measurement result might be a bit less precise than desired due to a low SNR value but this is already included in the calculation of the magnitude error range estimation
- "SNR <10" indicates that the measurement result is probably a bit less precise than desired due to a very low SNR value but this is already included in the calculation of the magnitude error range estimation
- "Image quality questionable" or similar indicates rather large average errors for the reference stars used for plate solving for different reasons (mostly atmospheric influences). But this is at least to some degree already included in the calculation of the error range estimation

Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

(Continued from page 444)

2008. We sent an email to Bill Hartkopf at the WDS to request the text file in order to see if it was possible to get some detail on the 2008 observation. The associated reference in the text file for the 2008 observation was a Webb Society Double Star Circular (No.18, 2010) which listed the observation on p. 17 and referenced a note which was found on p. 34. That note included this comment: "AB = GSC 2154 538 (20128+2239!). The images available do not show significant proper motion of nearby stars." We located the GSC-labeled star 3' northwest of the object identified in the WDS as J 2305. (See Figure 1.) Our measures of the GSC object showed a separation of 1.734" and a PA of 175.881 degrees (the 2008 measures are 2.25" and 177.52 degrees) and visual magnitudes of 13.63 and 14.18. Those magnitudes are considerably fainter than the 9.7 and 10.2 recorded by Jonckheere in 1942, but the difference in magnitudes is almost identical. Jonckheere recorded a separation of 4" and a PA of 190 degrees for the pair he measured. All that can be said at this point is that the 2008 measure is clearly not of the object identified in the WDS as J 2305, while the WDS identified object is clearly bogus.

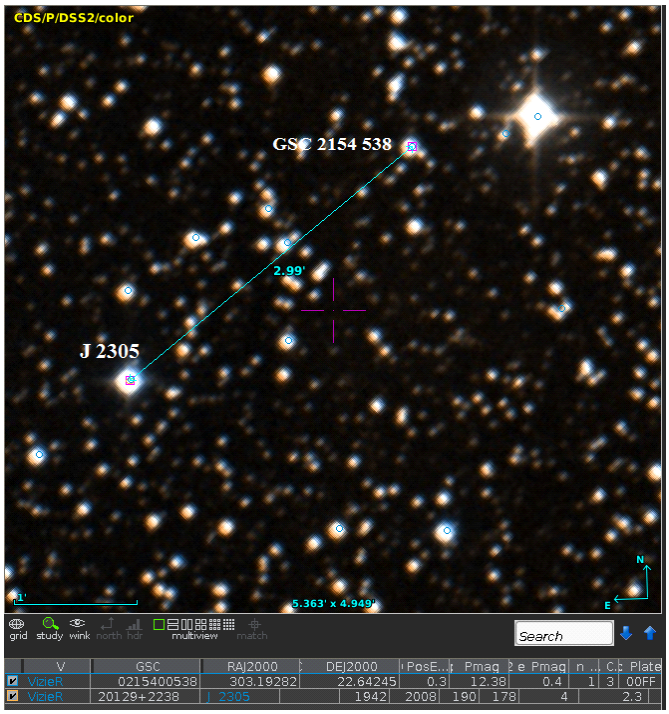

Figure 1. WDS location of J 2305 and GSC 2154 538 compared (Aladin image).

Summary

A good part of the listed J-objects in Lep and Vul show the expected significant magnitude difference compared with the WDS catalog data. Further five objects qualify as most probably and an additional five as potential CPM pairs based on a rating scheme using UCAC5 proper motion data with the caveat that several objects are with at least one component not covered by UCAC5.

References

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- 2MASS catalog
- 2MASS images
- AAVSO VPhot
- Aladin Sky Atlas v9.0
- Astrometrica v4.10.0.427
- AstroPlanner v2.2
- iTelescope
  - ◊ iT24: 610mm CDK with 3962mm focal length. Resolution 0.625 arcsec/pixel. V-filter. No transformation coefficients available. Located in Auberry, California. Elevation 1405m
  - ◊ iT27: 700mm CDK with 4531mm focal length. CCD: FLI PL09000. Resolution 0.53 arcsec/pixel. V-filter. Siding Spring, Australia. Elevation 1122m
- GAIA DR1 catalog
- MaxIm DL6 v6.08
- POSS images
- SIMBAD
- UCAC4 catalog
- UCAC5 catalog
- URAT1 catalog
- VizieR
- Washington Double Star Catalog

Appendix A

CPM rating scheme according to Knapp/Nanson 2017 with extensions:

Four rating factors are used: Proper motion vector direction, proper motion vector length, size of position error in relation to proper motion vector length and relationship separation to average proper motion speed:

- Proper motion vector direction rating: "A" for within the error range identical direction, "B" for similar direction within the double error range and "C" for outside
- Proper motion vector length rating: "A" for within the error range identical length, "B" for similar length within the double error range and C for outside
- Error size rating: "A" for error size of less than 5% of the proper motion vector length, "B" for less than 10% and "C" for a larger error size
- Rating for relation separation to average proper motion speed: "A" for less than 100 years, "B" for 100 to 1000 years and "C" for above.

To compensate for (depending on the selected objects and available catalogs) excessively large position errors resulting an "A" rating despite rather high deviations absolute upper limits are applied regardless of calculated error size:

- Proper motion vector direction: Max. 2.86° difference for an "A" and 5.72° for a "B"
- Proper motion vector length: Max. 5% difference for an "A" and 10% for a "B"

Appendix B

Table 2 is presented with positions for both components, astrometry measurement errors, signal to noise ratio, photometry measurement errors and number of used images.

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	N	Notes
1460	A	06 08 46.777	-14 57 44.02	0.05	0.06	0.078	1.423	0.091	87.57	0.09	2015.962	1	iT27 1x3s. Touching star disks
	B	06 08 46.939	-14 57 46.11					0.091	71.54				
1470	A	05 59 03.723	-18 37 11.66	0.08	0.10	0.128	0.944	0.081	106.08	0.08	2015.962	1	iT27 1x3s. SNR B <10
	B	05 59 04.269	-18 37 11.23					0.155	7.67				
24	A	19 35 55.242	20 49 21.77	0.09	0.07	0.114	2.263	0.063	53.50	0.06	2015.807	1	iT24 1x3s. Touching/ overlapping star disks
	B	19 35 55.040	20 49 21.22					0.065	41.60				
196	A	21 20 04.823	28 07 29.77	0.09	0.11	0.142	2.379	0.081	103.43	0.08	2015.805	1	iT24 1x3s. Touching star disks
	B	21 20 04.575	28 07 28.80					0.090	26.13				
490	O	19 43 08.858	23 18 07.99	0.10	0.10	0.141	1.433	0.151	62.11	0.15	2015.805	1	iT24 1x3s. SNR L <10
	L	19 43 09.208	23 18 05.04					0.232	5.67				
490	O	19 43 08.858	23 18 07.99	0.10	0.10	0.141	1.358	0.151	62.11	0.15	2015.805	1	iT24 1x3s. SNR N<10
	N	19 43 09.170	23 18 12.13					0.254	4.80				
491	A	19 45 01.032	23 59 03.84	0.12	0.12	0.170	2.449	0.082	62.92	0.08	2015.805	1	iT24 1x3s
	B	19 45 01.307	23 59 05.08					0.093	22.57				
492	A	19 45 06.396	23 58 34.49	0.10	0.12	0.156	1.859	0.071	87.40	0.07	2015.805	1	iT24 1x3s
	B	19 45 06.088	23 58 36.80					0.074	43.71				
492	A	19 45 06.396	23 58 34.49	0.10	0.12	0.156	0.594	0.071	87.40	0.07	2015.805	1	iT24 1x3s. SNR C<10
	C	19 45 05.319	23 58 37.47					0.137	8.76				
496	A	19 49 45.384	23 24 32.64	0.11	0.10	0.149	1.803	0.131	61.52	0.13	2015.805	1	iT24 1x3s. SNR B<20
	B	19 49 45.042	23 24 32.25					0.151	13.52				
496	A	19 49 45.384	23 24 32.64	0.11	0.10	0.149	0.316	0.131	61.52	0.13	2015.805	1	iT24 1x3s. SNR C<10
	C	19 49 43.592	23 24 43.60					0.171	9.29				
498	A	19 53 54.757	19 59 01.41	0.09	0.09	0.127	3.079	0.150	101.48	0.15	2015.807	1	iT24 1x3s. Heavily over-lapping star disks
	B	19 53 54.923	19 59 01.76					0.151	65.12				
500	A	19 56 58.650	24 38 00.28	0.13	0.10	0.164	2.473	0.084	42.89	0.08	2015.805	1	iT24 1x3s
	B	19 56 58.401	24 38 01.98					0.090	26.23				
509	A	20 25 23.160	27 26 58.17	0.11	0.12	0.163	2.356	0.092	59.76	0.09	2015.805	1	iT24 1x3s. SNR B<20
	B	20 25 22.866	27 26 57.59					0.112	15.63				
511	A	20 40 18.081	25 20 28.48	0.13	0.12	0.177	-	0.103	44.81	0.10	2015.805	1	iT24 1x3s. No resolution of B. Combined magnitude suggests with 0.1 delta 12.2/12.3mag
	B	-	-					-	-				
512	A	20 41 26.480	25 01 22.56	0.12	0.11	0.163	4.221	0.083	48.75	0.08	2015.805	1	iT24 1x3s. Touching/ overlapping star disks
	B	20 41 26.639	25 01 22.12					0.090	25.81				
513	A	20 42 56.436	27 33 01.40	0.12	0.11	0.163	2.670	0.090	116.49	0.09	2015.805	1	iT24 1x3s. Touching star disks
	B	20 42 56.517	27 32 58.08					0.099	25.50				
514	A	20 46 01.210	22 23 23.73	0.11	0.10	0.149	4.158	0.112	49.79	0.11	2015.783	1	iT24 1x3s. Touching/ overlapping star disks
	B	20 46 01.140	22 23 25.53					0.114	37.43				
538	A	19 15 10.336	22 45 24.02	0.09	0.10	0.135	1.904	0.112	50.11	0.11	2015.783	1	iT24 1x3s
	B	19 15 10.570	22 45 26.45					0.113	41.49				
542	A	19 53 02.800	24 40 27.35	0.08	0.07	0.106	1.520	0.091	100.46	0.09	2015.783	1	iT24 1x3s
	B	19 53 02.743	24 40 23.42					0.096	32.15				
557	A	20 23 57.114	25 05 28.21	0.07	0.07	0.120	2.725	0.091	111.74	0.09	2015.783	1	iT24 1x3s. Touching star disks
	B	20 23 56.947	25 05 27.11					0.091	102.78				
558	A	20 24 54.834	26 20 01.22	0.08	0.08	0.113	1.146	0.090	115.78	0.09	2015.783	1	iT24 1x3s
	B	20 24 54.774	26 19 55.62					0.094	41.78				
564	A	20 31 12.605	22 26 30.83	0.11	0.09	0.142	3.822	0.141	76.95	0.14	2015.783	1	iT24 1x3s. Overlapping star disks. SNR B <20
	B	20 31 12.487	22 26 32.19					0.162	12.67				
565	A	20 34 36.188	29 14 17.19	0.09	0.07	0.114	0.964	0.132	54.26	0.13	2015.783	1	iT24 1x3s
	B	20 34 36.574	29 14 21.71					0.145	16.50				
565	A	20 34 36.188	29 14 17.19	0.09	0.07	0.114	-	0.132	54.26	0.13	2015.783	1	iT24 1x3s. No resolution of B. Has to be fainter than 13.9mag
	C	-	-					-	-				
570	A	20 39 03.522	26 23 29.31	0.08	0.08	0.113	1.329	0.100	114.85	0.10	2015.783	1	iT24 1x3s
	B	20 39 03.881	26 23 30.02					0.112	21.38				

Table 2 continues on next page.

Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

Table 2 (continued).

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	N	Notes
574	A	21 08 28.489	20 24 17.54	0.08	0.07	0.106	2.066	0.081	91.41	0.08	2015.783	1	iT24 1x3s
	B	21 08 28.641	20 24 19.57					0.082	54.03				
575	A	21 09 16.758	20 30 20.66	0.10	0.08	0.128	0.670	0.111	83.60	0.11	2015.783	1	iT24 1x3s
	B	21 09 16.738	20 30 09.72					0.112	59.06				
606	A	20 55 50.322	20 25 03.97	0.05	0.06	0.078	1.663	0.128	13.16	0.10	2015.783	1	iT24 1x3s. SNR A und B <20
	B	20 55 50.317	20 25 01.28					0.128	13.20				
773	A	19 36 57.259	19 54 16.38	0.11	0.09	0.142	2.930	0.102	60.85	0.10	2015.783	1	iT24 1x3s. Touching star disks
	B	19 36 57.330	19 54 18.97					0.103	41.47				
794	A	20 57 09.705	29 21 26.13	0.08	0.07	0.106	1.953	0.082	67.72	0.08	2015.783	1	iT24 1x3s
	B	20 57 09.874	29 21 23.93					0.082	59.10				
814	A	19 13 39.811	24 22 57.97	0.10	0.09	0.135	-	0.103	46.88	0.10	2015.783	1	iT24 1x3s. No resolution of B. Combined magnitude rather confirms current WDS mags
816	A	19 43 45.070	21 10 59.39	0.10	0.08	0.128	-	0.101	107.75	0.10	2015.783	1	iT24 1x3s. No resolution of B. Combined magnitude does not match very well with current WDS mags - either much fainter or bogus
	B	-	-	0.10	0.08	0.128	-	-	-	0.10	2015.783	1	iT24 1x3s. No resolution of B. Combined magnitude does not match very well with current WDS mags - either much fainter or bogus
817	A	19 45 17.230	20 22 48.11	0.08	0.07	0.106	2.346	0.090	125.61	0.09	2015.783	1	iT24 1x3s. Touching star disks
	B	19 45 17.400	20 22 47.10	0.08	0.07	0.106	2.346	0.091	71.44	0.09	2015.783	1	iT24 1x3s. Touching star disks
820	A	20 24 34.447	24 29 18.95	0.08	0.08	0.113	2.067	0.091	70.88	0.09	2015.783	1	iT24 1x3s. Touching star disks
	B	20 24 34.322	24 29 21.58	0.08	0.08	0.113	2.067	0.096	31.66	0.09	2015.783	1	iT24 1x3s. Touching star disks
834	A	20 13 39.116	21 44 46.93	0.08	0.08	0.113	2.798	0.101	105.54	0.10	2015.783	1	iT24 1x3s. Overlapping star disks
	B	20 13 38.951	21 44 47.20	0.08	0.08	0.113	2.798	0.101	68.15	0.10	2015.783	1	iT24 1x3s. Overlapping star disks
1074?	A	20 45 32.154	25 55 00.30	0.08	0.07	0.106	2.899	0.097	29.48	0.09	2015.783	1	iT23 1x3s. Object with similar Sep and PA nearby
	B	20 45 32.016	25 55 01.27	0.08	0.07	0.106	2.899	0.097	29.79	0.09	2015.783	1	iT23 1x3s. Object with similar Sep and PA nearby
1118	A	19 07 38.768	22 14 12.69	0.10	0.08	0.128	1.404	0.091	103.81	0.09	2015.783	1	iT24 1x3s. SNR B<20
	B	19 07 39.143	22 14 12.25	0.10	0.08	0.128	1.404	0.106	19.02	0.09	2015.783	1	iT24 1x3s. SNR B<20
1139	A	19 38 42.111	25 17 16.92	0.10	0.09	0.135	5.988	0.100	111.38	0.10	2015.783	1	iT24 1x3s. Heavily overlapping star disks
	B	19 38 42.050	25 17 15.94	0.10	0.09	0.135	5.988	0.101	85.29	0.10	2015.783	1	iT24 1x3s. Heavily overlapping star disks
1139	A	19 38 42.111	25 17 16.92	0.10	0.09	0.135	0.227	0.100	111.38	0.10	2015.783	1	iT24 1x3s
	C	19 38 44.551	25 17 09.19	0.10	0.09	0.135	0.227	0.101	71.75	0.10	2015.783	1	iT24 1x3s
1154	A	21 15 08.255	28 08 16.43	0.08	0.08	0.113	4.033	0.081	103.44	0.08	2015.783	1	iT24 1x3s. Overlapping star disks
	B	21 15 08.371	28 08 15.96	0.08	0.08	0.113	4.033	0.084	42.63	0.08	2015.783	1	iT24 1x3s. Overlapping star disks
1156	A	19 55 27.115	24 48 45.75	0.09	0.09	0.127	2.300	0.091	68.73	0.09	2015.783	1	iT24 1x3s
	B	19 55 26.942	24 48 43.63	0.09	0.09	0.127	2.300	0.093	47.93	0.09	2015.783	1	iT24 1x3s
1156	A	19 55 27.115	24 48 45.75	0.09	0.09	0.127	0.404	0.091	68.73	0.09	2015.783	1	iT24 1x3s. SNR C<20
	C	19 55 26.031	24 48 56.13	0.09	0.09	0.127	0.404	0.106	18.84	0.09	2015.783	1	iT24 1x3s. SNR C<20
1165	A	20 14 32.140	24 53 23.79	0.08	0.09	0.120	4.054	0.101	63.66	0.10	2015.772	1	iT24 1x3s. Overlapping star disks
	B	20 14 32.244	24 53 22.85	0.08	0.09	0.120	4.054	0.108	26.71	0.10	2015.772	1	iT24 1x3s. Overlapping star disks
1178	A	20 36 26.227	22 12 31.49	0.10	0.10	0.141	2.074	0.100	137.50	0.10	2015.772	1	iT24 1x3s
	B	20 36 26.079	22 12 34.81	0.10	0.10	0.141	2.074	0.102	48.79	0.10	2015.772	1	iT24 1x3s

Table 2 continues on next page.

Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

Table 2 (continued).

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	N	Notes
1179	A	20 44 53.377	20 38 56.63	0.09	0.11	0.142	2.056	0.112	51.30	0.11	2015.772	1	iT24 1x3s
	B	20 44 53.546	20 38 53.46	0.09	0.11	0.142	2.056	0.117	26.13	0.11	2015.772	1	iT24 1x3s
1180	A	21 04 32.361	27 29 37.57	0.09	0.09	0.127	1.857	0.090	115.11	0.09	2015.772	1	iT24 1x3s
	B	21 04 32.068	27 29 38.03	0.09	0.09	0.127	1.857	0.096	32.46	0.09	2015.772	1	iT24 1x3s
1193	A	19 45 18.310	24 00 59.25	0.09	0.09	0.127	1.533	0.020	54.01	-	2015.772	1	iT24 1x3s
	B	19 45 17.963	24 00 59.27	0.09	0.09	0.127	1.533	0.025	42.53	-	2015.772	1	iT24 1x3s
POU 4049	A	19 45 18.310	24 00 59.25	0.09	0.09	0.127	0.477	0.092	54.01	0.09	2015.772	1	iT24 1x3s. SNR C<5
	B	19 45 17.490	24 01 09.64	0.09	0.09	0.127	0.477	0.359	2.65	0.09	2015.772	1	iT24 1x3s. SNR C<5
1194	A	20 13 08.480	21 46 11.91	0.09	0.09	0.127	1.164	0.110	118.44	0.11	2015.772	1	iT24 1x3s. SNR B<20
	B	20 13 08.886	21 46 09.22	0.09	0.09	0.127	1.164	0.125	17.95	0.11	2015.772	1	iT24 1x3s. SNR B<20
1195	A	20 20 15.732	25 01 31.29	0.10	0.09	0.135	1.728	0.120	128.51	0.12	2015.772	1	iT24 1x3s
	B	20 20 16.050	25 01 30.19	0.10	0.09	0.135	1.728	0.125	31.05	0.12	2015.772	1	iT24 1x3s
1221	A	19 29 36.811	22 38 12.75	0.09	0.08	0.120	3.255	0.131	63.18	0.13	2015.772	1	iT24 1x3s. SNR B<20
	B	19 29 36.763	22 38 10.74	0.09	0.08	0.120	3.255	0.160	11.16	0.13	2015.772	1	iT24 1x3s. SNR B<20
1222	A	20 03 26.243	22 42 40.53	0.12	0.08	0.144	-	0.111	65.32	0.11	2015.772	1	iT24 1x3s. No resolution of B. Combined magnitude suggests both components 0.4mag fainter than currently listed
	B	-	-	0.12	0.08	0.144	-	-	-	0.11	2015.772	1	iT24 1x3s. No resolution of B. Combined magnitude suggests both components 0.4mag fainter than currently listed
1223	A	21 02 36.337	27 11 06.46	0.10	0.10	0.141	1.724	0.122	55.32	0.12	2015.772	1	iT24 1x3s. SNR B<20
	B	21 02 36.017	27 11 08.42	0.10	0.10	0.141	1.724	0.140	14.76	0.12	2015.772	1	iT24 1x3s. SNR B<20
1223	A	21 02 36.337	27 11 06.46	0.10	0.10	0.141	0.367	0.122	55.32	0.12	2015.772	1	iT24 1x3s. SNR C<10
	C	21 02 37.523	27 10 51.04	0.10	0.10	0.141	0.367	0.186	7.13	0.12	2015.772	1	iT24 1x3s. SNR C<10
1227	A	19 51 49.135	27 32 33.07	0.08	0.08	0.113	1.264	0.090	197.90	0.09	2015.772	1	iT24 1x3s
	B	19 51 49.103	27 32 38.18	0.08	0.08	0.113	1.264	0.092	54.81	0.09	2015.772	1	iT24 1x3s
1239	A	19 34 53.180	25 19 21.95	0.12	0.08	0.144	2.030	0.111	65.72	0.11	2015.772	0	iT24 1x3s. SNR B<20
	B	19 34 52.906	25 19 20.29	0.12	0.08	0.144	2.030	0.139	12.37	0.11	2015.772	0	iT24 1x3s. SNR B<20
1264	A	19 28 22.422	23 05 14.74	0.09	0.08	0.120	1.565	0.098	27.55	0.09	2015.772	1	iT24 1x3s. SNR B<10
	B	19 28 22.103	23 05 14.98	0.09	0.08	0.120	1.565	0.191	5.94	0.09	2015.772	1	iT24 1x3s. SNR B<10
1264	A	19 28 22.422	23 05 14.74	0.09	0.08	0.120	-	0.098	27.55	0.09	2015.772	1	iT24 1x3s. No resolution of C
	C	-	-	0.09	0.08	0.120	-	-	-	0.09	2015.772	1	iT24 1x3s. No resolution of C
1280	A	19 01 00.477	22 05 34.62	0.08	0.09	0.120	1.787	0.082	65.16	0.08	2015.772	1	iT24 1x3s
	B	19 01 00.741	22 05 33.42	0.08	0.09	0.120	1.787	0.082	68.57	0.08	2015.772	1	iT24 1x3s
1307	C	19 29 18.548	19 49 57.46	0.10	0.12	0.156	2.202	0.071	124.42	0.07	2016.569	1	iT24 1x3s. C is ident with C of LBU 18
	D	19 29 18.684	19 49 53.88	0.10	0.12	0.156	2.202	0.075	38.99	0.07	2016.569	1	iT24 1x3s. C is ident with C of LBU 18
1308	A	19 30 06.640	19 46 46.59	0.08	0.09	0.120	3.151	0.082	67.99	0.08	2015.772	1	iT24 1x3s. Touching star disks
	B	19 30 06.592	19 46 44.51	0.08	0.09	0.120	3.151	0.082	63.39	0.08	2015.772	1	iT24 1x3s. Touching star disks
1309	A	19 31 15.073	19 50 21.38	0.09	0.10	0.135	2.955	0.086	32.79	0.08	2015.772	1	iT24 1x3s. Touching star disks, SNR B <20
	B	19 31 14.924	19 50 19.84	0.09	0.10	0.135	2.955	0.118	11.96	0.08	2015.772	1	iT24 1x3s. Touching star disks, SNR B <20
1310	A	19 32 15.225	19 48 48.35	0.09	0.09	0.127	3.356	0.091	79.91	0.09	2015.772	1	iT24 1x3s. Touching star disks
	B	19 32 15.134	19 48 46.60	0.09	0.09	0.127	3.356	0.105	19.27	0.09	2015.772	1	iT24 1x3s. Touching star disks
1327	A	20 52 06.808	22 18 15.25	0.09	0.08	0.120	2.879	0.082	59.59	0.08	2015.772	1	iT24 1x3s. Touching star disks
	B	20 52 06.956	22 18 16.48	0.09	0.08	0.120	2.879	0.083	53.26	0.08	2015.772	1	iT24 1x3s. Touching star disks

Table 2 continues on next page.

Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

Table 2 (continued).

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	N	Notes
1328	A	21 08 03.569	26 15 19.14	0.07	0.07	0.099	-	0.090	209.09	0.09	2015.772	1	iT24 1x3s. No resolution of B. Combined magnitude confirms WDS values
	B	-	-	0.07	0.07	0.099	-	-	-	0.09	2015.772	1	iT24 1x3s. No resolution of B. Combined magnitude confirms WDS values
1786	A	21 21 34.874	26 08 59.24	0.08	0.07	0.106	0.990	0.090	139.07	0.09	2015.769	1	iT24 1x3s
	B	21 21 34.571	26 08 54.64	0.08	0.07	0.106	0.990	0.093	46.99	0.09	2015.769	1	iT24 1x3s
1882	A	20 29 22.788	25 54 08.94	0.11	0.10	0.149	0.847	0.121	87.76	0.12	2015.769	1	iT24 1x3s
	B	20 29 23.464	25 54 04.72	0.11	0.10	0.149	0.847	0.123	38.82	0.12	2015.769	1	iT24 1x3s
HJ 1598	A	20 57 45.217	22 14 13.86	0.08	0.09	0.120	0.728	0.101	91.15	0.10	2015.769	1	iT24 1x3s
	C	20 57 45.703	22 14 07.20	0.08	0.09	0.120	0.728	0.101	77.86	0.10	2015.769	1	iT24 1x3s
1893	A	20 57 50.149	22 56 29.90	0.07	0.07	0.099	0.840	0.108	26.73	0.10	2015.769	1	iT24 1x3s. SNR B<20
	B	20 57 50.335	22 56 36.14	0.07	0.07	0.099	0.840	0.136	11.32	0.10	2015.769	1	iT24 1x3s. SNR B<20
1894	A	20 58 08.853	22 48 34.44	0.07	0.06	0.092	1.101	0.091	110.43	0.09	2015.769	1	iT24 1x3s
	B	20 58 09.190	22 48 33.30	0.07	0.06	0.092	1.101	0.092	56.29	0.09	2015.769	1	iT24 1x3s
2283	A	19 48 58.559	19 56 09.67	0.12	0.12	0.170	0.933	0.081	69.33	0.08	2017.929	5	iT24 5x60s
	B	19 48 58.443	19 56 19.96	0.12	0.12	0.170	0.933	0.082	57.37	0.08	2017.929	5	iT24 5x60s
2284	A	19 48 59.780	19 55 34.69	0.08	0.08	0.113	1.110	0.125	31.36	0.12	2015.769	1	iT24 1x3s
	B	19 49 00.153	19 55 37.22	0.08	0.08	0.113	1.110	0.126	26.94	0.12	2015.769	1	iT24 1x3s
2285	A	19 49 01.455	19 56 56.81	0.12	0.12	0.170	1.156	0.081	72.88	0.08	2017.929	5	iT24 5x60s
	B	19 49 01.799	19 57 03.68	0.12	0.12	0.170	1.156	0.081	72.62	0.08	2017.929	5	iT24 5x60s
FYM 262	A	19 49 01.455	19 56 56.81	0.12	0.12	0.170	0.775	0.081	72.88	0.08	2017.929	5	iT24 5x60s
	C	19 49 02.003	19 56 46.92	0.12	0.12	0.170	0.775	0.083	47.10	0.08	2017.929	5	iT24 5x60s
2305	A	20 12 56.248	22 36 38.39	0.09	0.03	0.095	-	0.149	21.38	0.14	2015.769	1	iT24 1x3s. No resolution of B. Bad match of combined mag with WDS mags - bogus
	B	-	-	0.09	0.03	0.095	-	-	-	0.14	2015.769	1	iT24 1x3s. No resolution of B. Bad match of combined mag with WDS mags - bogus
2305?	A	20 12 46.353	22 38 33.22	0.10	0.10	0.141	4.661	0.094	38.69	0.09	2017.951	5	iT24 5x30s. Overlapping star disks
	B	20 12 46.362	22 38 31.49	0.10	0.10	0.141	4.661	0.095	33.60	0.09	2017.951	5	iT24 5x30s. Overlapping star disks
2310	A	20 25 33.630	27 22 09.02	0.08	0.09	0.120	0.206	0.090	190.99	0.09	2015.807	1	iT24 1x3s
	B	20 25 32.113	27 22 35.68	0.08	0.09	0.120	0.206	0.092	58.65	0.09	2015.807	1	iT24 1x3s
2310	B	20 25 32.113	27 22 35.68	0.08	0.09	0.120	1.304	0.092	58.65	0.09	2015.807	1	iT24 1x3s
	C	20 25 32.090	27 22 40.96	0.08	0.09	0.120	1.304	0.104	20.64	0.09	2015.807	1	iT24 1x3s
2327	A	20 53 39.622	21 15 42.55	0.09	0.09	0.127	0.107	0.090	240.39	0.09	2015.794	1	iT24 1x3s
	B	20 53 43.253	21 16 28.38	0.09	0.09	0.127	0.107	0.099	25.20	0.09	2015.794	1	iT24 1x3s
2327	B	20 53 43.253	21 16 28.38	0.09	0.09	0.127	1.667	0.099	25.20	0.09	2015.794	0	iT24 1x3s. SNR C<20
	C	20 53 43.278	21 16 24.02	0.09	0.09	0.127	1.667	0.111	16.42	0.09	2015.794	0	iT24 1x3s. SNR C<20
2327	A	20 53 39.622	21 15 42.55	0.09	0.09	0.127	0.222	0.090	240.39	0.09	2015.794	1	iT24 1x3s. SNR D<20. No WDS object but obviously part of this multiple
	D	20 53 39.976	21 16 15.07	0.09	0.09	0.127	0.222	0.108	17.48	0.09	2015.794	1	iT24 1x3s. SNR D<20. No WDS object but obviously part of this multiple
2342	A	21 22 20.013	28 13 31.17	0.10	0.08	0.128	1.197	0.122	45.65	0.12	2016.569	1	iT24 1x3s
	B	21 22 19.756	28 13 26.07	0.10	0.08	0.128	1.197	0.125	32.09	0.12	2016.569	1	iT24 1x3s
2933	A	19 00 17.486	24 33 06.98	0.09	0.10	0.135	1.537	0.099	26.42	0.09	2016.569	1	iT24 1x3s. SNR B<20
	B	19 00 17.773	24 33 03.85	0.09	0.10	0.135	1.537	0.113	15.42	0.09	2016.569	1	iT24 1x3s. SNR B<20
2937	A	19 03 26.923	23 43 29.65	0.10	0.09	0.135	3.654	0.114	37.15	0.11	2016.569	1	iT24 1x3s. SNR B<20. Overlapping star disks
	B	19 03 27.052	23 43 30.79	0.10	0.09	0.135	3.654	0.140	12.07	0.11	2016.569	1	iT24 1x3s. SNR B<20. Overlapping star disks
2944	A	19 07 42.058	23 53 14.20	0.08	0.08	0.113	2.865	0.082	58.40	0.08	2015.777	0	iT24 1x3s. Touching star disks
	B	19 07 41.984	23 53 16.22	0.08	0.08	0.113	2.865	0.082	59.69	0.08	2015.777	0	iT24 1x3s. Touching star disks

Table 2 continues on next page.

Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

Table 2 (continued).

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	N	Notes
2973	A	19 29 52.119	25 20 22.40	0.08	0.11	0.136	1.304	0.117	14.07	0.09	2015.777	1	iT24 1x3s. SNR A<20 and B<10
	B	19 29 51.935	25 20 16.97	0.08	0.11	0.136	1.304	0.165	7.39	0.09	2015.777	1	iT24 1x3s. SNR A<20 and B<10
2977	A	19 33 24.435	24 02 31.89	0.09	0.10	0.135	1.094	0.091	79.56	0.09	2015.777	1	iT24 1x3s. Meanwhile renamed to POU 3907
	B	19 33 23.945	24 02 29.76	0.09	0.10	0.135	1.094	0.092	55.66	0.09	2015.777	1	iT24 1x3s. Meanwhile renamed to POU 3907
2982	A	19 34 56.802	25 25 18.62	0.08	0.10	0.128	1.454	0.083	49.32	0.08	2015.777	1	iT24 1x3s. SNR B<20
	B	19 34 56.852	25 25 13.62	0.08	0.10	0.128	1.454	0.103	16.31	0.08	2015.777	1	iT24 1x3s. SNR B<20
2983	A	19 35 07.193	25 25 49.50	0.09	0.09	0.127	1.234	0.077	32.51	0.07	2015.777	1	iT24 1x3s
	B	19 35 06.994	25 25 44.24	0.09	0.09	0.127	1.234	0.087	20.68	0.07	2015.777	1	iT24 1x3s
3002	A	19 45 31.940	28 50 26.18	0.08	0.09	0.120	0.814	0.103	42.58	0.10	2015.777	1	iT24 1x3s
	B	19 45 31.496	28 50 20.03	0.08	0.09	0.120	0.814	0.111	21.79	0.10	2015.777	1	iT24 1x3s
3003	A	19 45 40.964	28 49 11.19	0.08	0.10	0.128	0.881	0.098	28.20	0.09	2015.777	1	iT24 1x3s. SNR B<20
	B	19 45 40.766	28 49 03.28	0.08	0.10	0.128	0.881	0.112	15.97	0.09	2015.777	1	iT24 1x3s. SNR B<20
3008	A	19 48 33.827	20 31 36.17	0.07	0.08	0.106	1.067	0.095	35.12	0.09	2015.777	1	iT24 1x3s
	B	19 48 33.873	20 31 41.84	0.07	0.08	0.106	1.067	0.098	27.29	0.09	2015.777	1	iT24 1x3s
3016	A	19 50 05.144	21 39 35.45	0.09	0.09	0.127	1.251	0.081	72.60	0.08	2015.777	1	iT24 1x3s
	B	19 50 05.103	21 39 41.25	0.09	0.09	0.127	1.251	0.083	52.57	0.08	2015.777	1	iT24 1x3s
3018	A	19 50 11.537	20 29 30.21	0.08	0.09	0.120	1.009	0.082	62.21	0.08	2015.777	1	iT24 1x3s
	B	19 50 11.669	20 29 23.63	0.08	0.09	0.120	1.009	0.084	41.32	0.08	2015.777	1	iT24 1x3s
3027	A	19 53 31.398	19 47 33.96	0.09	0.09	0.127	1.344	0.095	34.80	0.09	2015.777	1	iT24 1x3s
	B	19 53 31.383	19 47 39.38	0.09	0.09	0.127	1.344	0.097	28.61	0.09	2015.777	1	iT24 1x3s
3033	A	19 54 46.726	19 40 38.35	0.09	0.09	0.127	1.508	0.116	29.25	0.11	2015.777	1	iT24 1x3s. SNR B<20
	B	19 54 46.456	19 40 41.32	0.09	0.09	0.127	1.508	0.130	15.15	0.11	2015.777	1	iT24 1x3s. SNR B<20
3045	A	20 02 23.193	28 37 21.70	0.06	0.06	0.085	0.930	0.061	88.62	0.06	2015.777	1	iT24 1x3s
	B	20 02 22.799	28 37 21.08	0.06	0.06	0.085	0.930	0.062	71.41	0.06	2015.777	1	iT24 1x3s
3051	A	20 06 04.615	27 55 17.70	0.06	0.07	0.092	1.695	0.074	46.10	0.07	2015.777	1	iT24 1x3s
	B	20 06 04.567	27 55 20.75	0.06	0.07	0.092	1.695	0.082	25.44	0.07	2015.777	1	iT24 1x3s
3057	A	20 12 31.722	22 15 15.15	0.07	0.08	0.106	0.905	0.091	66.98	0.09	2015.777	1	iT24 1x3s
	B	20 12 32.193	22 15 13.57	0.07	0.08	0.106	0.905	0.094	37.47	0.09	2015.777	1	iT24 1x3s
3061	A	20 13 19.125	22 14 45.72	0.07	0.08	0.106	1.132	0.101	64.06	0.10	2015.777	0	iT24 1x3s
	B	20 13 18.738	22 14 45.42	0.07	0.08	0.106	1.132	0.110	22.81	0.10	2015.777	0	iT24 1x3s
3073	A	20 18 41.116	28 48 20.60	0.07	0.08	0.106	1.368	0.078	32.06	0.07	2015.777	1	iT24 1x3s
	B	20 18 41.214	28 48 24.86	0.07	0.08	0.106	1.368	0.081	26.13	0.07	2015.777	1	iT24 1x3s
3077	A	20 22 07.951	26 49 59.95	0.07	0.09	0.114	1.524	0.082	54.18	0.08	2015.777	1	iT24 1x3s
	B	20 22 07.714	26 50 02.83	0.07	0.09	0.114	1.524	0.091	24.38	0.08	2015.777	1	iT24 1x3s
3078	A	20 22 17.959	26 07 08.18	0.08	0.09	0.120	0.991	0.083	47.99	0.08	2015.777	1	iT24 1x3s
	B	20 22 18.159	26 07 14.60	0.08	0.09	0.120	0.991	0.083	48.31	0.08	2015.777	1	iT24 1x3s
3083	A	20 23 06.074	23 26 31.88	0.11	0.11	0.156	1.713	0.108	17.94	0.09	2015.791	1	iT24 1x3s. SNR A <20 and B <10
	B	20 23 06.424	23 26 29.92	0.11	0.11	0.156	1.713	0.177	6.65	0.09	2015.791	1	iT24 1x3s. SNR A <20 and B <10
3086	A	20 26 50.488	26 57 11.32	0.12	0.11	0.163	3.156	0.092	22.98	0.08	2015.805	1	iT24 1x3s
	B	20 26 50.572	26 57 14.5	0.12	0.11	0.163	3.156	0.087	31.63	0.08	2015.805	1	iT24 1x3s
3097	A	20 36 37.486	26 48 49.48	0.09	0.09	0.127	1.275	0.085	35.94	0.08	2015.791	1	iT24 1x3s
	B	20 36 37.865	26 48 52.12	0.09	0.09	0.127	1.275	0.090	25.54	0.08	2015.791	1	iT24 1x3s
3105	A	20 39 49.052	25 51 41.47	0.10	0.09	0.135	1.358	0.087	20.32	0.07	2015.791	1	iT24 1x3s
	B	20 39 49.128	25 51 35.89	0.10	0.09	0.135	1.358	0.087	20.80	0.07	2015.791	1	iT24 1x3s
3106	A	20 40 53.315	25 53 23.51	0.10	0.08	0.128	1.528	0.083	51.20	0.08	2015.791	1	iT24 1x3s
	B	20 40 53.282	25 53 28.29	0.10	0.08	0.128	1.528	0.086	34.19	0.08	2015.791	1	iT24 1x3s
3111	A	20 49 02.803	25 43 53.45	0.09	0.09	0.127	1.154	0.091	105.90	0.09	2015.791	1	iT24 1x3s
	B	20 49 03.115	25 43 48.74	0.09	0.09	0.127	1.154	0.094	41.64	0.09	2015.791	1	iT24 1x3s
3112	A	20 49 49.837	25 35 03.80	0.11	0.10	0.149	1.488	0.091	96.90	0.09	2015.791	1	iT24 1x3s
	B	20 49 50.246	25 35 05.26	0.11	0.10	0.149	1.488	0.091	77.48	0.09	2015.791	1	iT24 1x3s

Table 2 concludes on next page.

Jonckheere Double Star Photometry – Part XI: Lepus & Vulpecula

Table 2 (conclusion).

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	N	Notes
3114	A	20 50 55.562	23 06 09.25	0.07	0.08	0.106	1.297	0.094	21.53	0.08	2015.807	1	iT24 1x3s. SNR B<20
	B	20 50 55.227	23 06 10.08	0.07	0.08	0.106	1.297	0.103	16.09	0.08	2015.807	1	iT24 1x3s. SNR B<20
3120	A	20 59 37.679	24 37 55.43	0.10	0.10	0.141	2.306	0.061	95.68	0.06	2017.948	3	iT24 3x30s
	B	20 59 37.424	24 37 54.94	0.10	0.10	0.141	2.306	0.063	52.82	0.06	2017.948	3	iT24 3x30s
3121	A	21 00 15.043	22 23 56.80	0.07	0.09	0.114	0.644	0.108	26.38	0.10	2015.807	1	iT24 1x3s
	B	21 00 15.569	22 24 03.84	0.07	0.09	0.114	0.644	0.108	26.49	0.10	2015.807	1	iT24 1x3s
3122	A	20 59 45.885	28 13 24.39	0.11	0.11	0.156	-	0.070	293.26	0.07	2017.948	5	iT24 5x30s. No resolution of B, has to be fainter than 13.5mag. Combined magnitude bad match with WDS magnitudes. Might be bogus but 2MASS and POSS.I and POSS.II images suggest not only an obvious elongation but also common proper motion
	B	-	-	0.11	0.11	0.156	-	-	-	0.07	2017.948	5	iT24 5x30s. No resolution of B, has to be fainter than 13.5mag. Combined magnitude bad match with WDS magnitudes. Might be bogus but 2MASS and POSS.I and POSS.II images suggest not only an obvious elongation but also common proper motion
3130	A	21 15 33.638	25 40 07.30	0.12	0.11	0.163	2.150	0.147	8.33	0.08	2015.805	1	iT24 1x3s. SNR A <10 and B<20
	B	21 15 33.363	25 40 09.53	0.12	0.11	0.163	2.150	0.099	18.25	0.08	2015.805	1	iT24 1x3s. SNR A <10 and B<20
3130	A	21 15 33.638	25 40 07.30	0.12	0.11	0.163	1.437	0.147	8.33	0.08	2015.805	1	iT24 1x3s. SNR A and C <10
	C	21 15 34.117	25 40 07.69	0.12	0.11	0.163	1.437	0.148	8.25	0.08	2015.805	1	iT24 1x3s. SNR A and C <10
3134	A	21 18 59.109	26 33 03.20	0.09	0.09	0.127	1.264	0.132	49.92	0.13	2015.791	1	iT24 1x3s
	B	21 18 59.397	26 33 07.48	0.09	0.09	0.127	1.264	0.134	33.20	0.13	2015.791	1	iT24 1x3s
3241	A	19 29 25.482	19 49 32.30	0.10	0.12	0.156	-	0.070	163.63	0.07	2016.569	1	iT24 1x3s. No resolution of B
	B	-	-	0.10	0.12	0.156	-	-	-	0.07	2016.569	1	iT24 1x3s. No resolution of B
LBU 18	A	19 29 25.482	19 49 32.30	0.10	0.12	0.156	0.089	0.070	163.63	0.07	2016.569	1	iT24 1x3s. C is ident with J 1307
	C	19 29 18.548	19 49 57.46	0.10	0.12	0.156	0.089	0.071	124.42	0.07	2016.569	1	iT24 1x3s. C is ident with J 1307
3242	A	19 38 01.957	20 52 30.59	0.12	0.11	0.163	3.036	0.095	35.06	0.09	2015.791	1	iT24 1x3s. Touching star disks. SNR B <10
	B	19 38 01.927	20 52 27.55	0.12	0.11	0.163	3.036	0.154	8.16	0.09	2015.791	1	iT24 1x3s. Touching star disks. SNR B <10
3243	A	19 39 22.122	19 57 42.37	0.12	0.11	0.163	5.456	0.093	22.54	0.08	2015.791	1	iT24 1x3s. Touching star disks
	B	19 39 22.043	19 57 43.66	0.12	0.11	0.163	5.456	0.095	20.73	0.08	2015.791	1	iT24 1x3s. Touching star disks

- dRA and dDec = average RA and Dec plate solving errors in arcseconds
- Err_Sep = separation error estimation in arcseconds calculated as SQRT(dRA^2+dDec^2)
- Err_PA = position angle error estimation in degrees calculated as arctan (Err_Sep/Sep) assuming the worst case that Err_Sep points perpendicular to the separation vector
- dmag as average mag plate solving error (Vmag for images with made V-filter and Imag for images made with I-filter)
- Err_Mag = magnitude error estimation calculated as SQRT(dVmag^2+(2.5*LOG10(1+1/SNR))^2)
- SNR as signal to noise ratio for the given object
- Date is Julian observation epoch
- N is number of images used