CPM Pairs from LSPM so far not WDS Listed – Part II

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Abstract: The LSPM catalog (Lepine and Shara 2005) is a rich source for CPM pairs we thought already exhausted – but as we found during research for our report "A new concept for counter-checking of assumed CPM pairs" (Knapp and Nanson 2017) there are still many potential CPM pairs indicated in LSPM which as of the end of 2016 are not listed in the WDS catalog. After our first part on about 40 such objects (Knapp and Nanson 2017) the next report with about 30 additional common proper motion pairs is presented here.

Introduction

Similar to our first report on common proper motion pairs not listed so far in the WDS, the selection from LSPM was done by sorting all LSPM objects by RA and then checking if the next LSPM object is nearer than 30 arc-seconds and so far not included in the WDS catalog. As a second criterion we selected all objects with an altitude suitable for imaging during the time of the research for this report with the intention of taking images with V- and I-filters in order to be able to determine as far as possible not only RA/Dec coordinates, separation, position angle, magnitudes and proper motion values, but also the spectral class range of all components according to the V-I color index.

During the work on this report we found one of the selected LSPM objects had meanwhile been added to the WDS catalog as GWP 2937 – we kept this object in our project for a counter-check.

Since GAIA DR1 coordinates are now available for most of the selected objects, our most important CPM check analysis was done on the basis of comparison of 2MASS to GAIA DR1 positions. Because proper motion data listed directly in GAIA is still scarce and wasn't available for both components on any of our objects, it was necessary to do our own calculations, which allowed a CPM rating according to Knapp/Nanson 2017:

- Three rating factors are used: Proper motion vector direction, proper motion vector length and size of position error in relation to proper motion vector length
- Proper motion vector direction ratings: "A" for within the error range of identical direction, "B" for similar direction within the double error range, and "C" for outside
- Proper motion vector length ratings: "A" for within the error range of identical length, "B" for similar length within the double error range, and C for outside
- Error size ratings: "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

To compensate for excessively large position errors resulting in an "A" rating despite rather high deviations an absolute upper limit is 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"

In some cases we could use SDSS DR9 coordinates instead of 2MASS with much smaller position errors with the consequence that the requirements to get an A

or even B CPM rating were unreasonably hard so we had to modify our process somewhat:

- The position error resulting from the error estimation for proper motion vector direction and length is in this case calculated as root mean square from both position errors (instead of for only the larger 2MASS one).
- If the PM vector direction difference is larger than this calculated "allowed" error but still less than 0.5° then an "A" is given, a "B" is given for larger than 0.5 but less than 1 degree, and a "C" is given if above.
- If the PM vector length difference is larger than this calculated "allowed" error but still less than 0.5% then an "A" is given, a "B" is given for larger than 0.5 but less than 1 percent, and a "C" is given if above.

We also checked as many other sources as possible via Aladin for data for these CPM candidates beginning with visual comparison of POSS I and POSS II images. If the Aladin centroid feature did not work (as was usually the case) we then resorted to visual estimation of the centroids to determine separation, position angle, and proper motion from POSS I to POSS II. We are fully aware that estimated centroids are not a reliable source for calculating these values, yet we got in many cases plausible results. Next came the check of other existing catalog data for the given field of view, especially URAT1, SDSS, WISE, UCAC4, and GSC.

Besides measuring Vmags in our own images we tried also to get the visual magnitudes for each of the components from the various catalogs we used.

When the 2MASS data with J- and K-band values were available, we used a spreadsheet to estimate Vmags with formulas found on the website of Bruce Gary (http://brucegary.net/dummies/method0.html) provided -0.1 < (J-K) < 1.0. In case of components fainter than SDSS 15mag in g-band we estimated Vmag as (gmag+rmag)/2 based on advice from Brian Skiff that this might work rather well.

Spectral class data was scarce in the available catalogs so as already mentioned we had to resort to deriving the spectral class of the objects in question using the B-V color index provided we had these values listed in the same catalog. For this purpose we used a table provided by the Space Telescope Science Institute (http://www.stsci.edu/~inr/intrins.html).

Additionally we took images with I-filter to get Ic-mags to be able to estimate the spectral class of the components on base of own image material again using the above mentioned table.

The image processing followed our usual procedure: stacking with VPhot, plate solving and measuring positions and Vmags with Astrometrica using URAT1 as reference catalog and calculating Sep and PA with the formulas provided by Buchheim 2008. Due to the faintness of some objects we had to use exposure times up to 300 seconds and even then some components were too faint to be resolved. The I-filter images were first also plate solved with URAT1 as reference catalog for the astrometry results and then again plate solved with USNO B1 as reference catalog for Ic-mags for the I-band photometry results. Special thanks to Herbert Raab/Astrometrica for adding this feature to the current beta version of his software.

In total we got in this way an observation history of each object beginning in most cases in the year ~1950 with POSS I and ending in 2016 with our own new images.

Results of our research

In Table 1 we present for the selected objects as much data as we could find in the catalogs available to us including our own measurements based on images taken with remote telescope iT24. Given below is a description of the table content per column:

- LSPM gives the LSPM ID of the selected object in the header line
- RA and Dec give the recent precise coordinates of the A component (if available from GAIA DR1) in the header line in the traditional HH:MM:SS DD:MM:SS format and in the data lines for the sources referred to in the Notes column in decimal degrees format as these values are directly usable for calculating Sep and PA
- Sep gives separation in arcseconds in the data lines calculated as SQRT(((RA2-RA1)*cos(Dec1))^2+(Dec2-Dec1)^2) in radians
- PA gives position angle in degrees in the data lines calculated as arctan((RA2-RA1)*cos(Dec1))/(Dec2-Dec1)) in radians depending on quadrant
- M1 and M2 give measured Vmags in the header line for A and B and if available also in the data lines where we had often to resort to estimated values based on calculation from the J- and K-band values if available
- pmRA1 and pmDE1 with e_pm1 give the proper motion data for A and pmRA2, pmDE2 and e_pm2 for B in the header line as well as in the data lines calculated by comparison of positions between catalogs or directly from the catalogs (specified in the Notes column)
- Spc1 and Spc2 give the spectral class range for A and B usually based on the V-I color index taking into consideration also the error range of the meas-

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Table 1: Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J0011 +2523	00 11 54.932	25 23 31.87			19.6	20.1	94.58	100.14	5.95	93.54	105.30	5.92	>M4	>M4				AAA	Despite the lack of POSS I evidence a solid CPM candidate. Magnitudes estimated - based on non-resolution in the V-filter image (means fainter than 19.5) and delta_m from the I-filter image
	2.97888500	25.3921870	6.528	51.692	18.72										1.2	Pp	1992.705		GSC2.3
	2.97862500	25.3925278	5.721	55.992											1.2	Pp	1995.624		POSS II.N estimates. No resolution of both components in POSS I.O
	2.97903800	25.3924140	5.550	56.496	17.2	18.0									1.3	E2	1997.797		2MASS. M1 and M2 estimated from J- and K-band
	2.97925800	25.3925880	5.524	55.507	20.0	21.1	103.21	90.36	13.30	92.42	99.71	13.30			2.5	Es	2004.729		SDSS DR9. Vmags estimated as mag(g+r)/2. PM calculated from 2MASS to SDSS DR9 positions
	2.97948860	25.3928450	5.593	55.689			94.58	100.14	5.95	93.54	105.30	5.92			0.2	Eu	2013.336	AAA	URAT1. PM data calculated from position comparison with 2MASS
	2.97962500	25.3930000	5.250	56.209	16.29	16.86							>M4	>M4	0.61	C	2016.658		iT24 1x60s I-filter. SNR for both components <20. Estimation Spc based on non-resolution in 180s V-filter image means Vmag fainter than 19.5
																			No GAIA DR1 coordinates available
J0154 +5741	01 54 28.040	57 41 27.92			12.48	13.89	-15.58	-206.17	5.62	-27.27	-206.24	5.62	>M4	M0-M2				BAA	Good CPM candidate with some difference in pm vector direction
	28.61695833	57.6944444	8.414	3.277											1.2	Pp	1951.518		POSS I.O estimates
	28.61716000	57.6929970	6.744	4.762	11.88	14.99									1.2	Pp	1988.852		GSC2.3.2
	28.61658333	57.6923056	8.703	1.584			-16.36	-174.58		-21.81	-167.78				1.2	Pp	1995.624		POSS II.N estimates. PM estimates based on comparison with POSS I.O
	28.61695600	57.6919520	8.683	1.651	10.7	12.7									1.3	E2	1999.910		2MASS. M1 and M2 estimated from J- and K-band
	28.61683380	57.6910878	8.679	0.487	11.30	13.33	-15.58	-206.17	5.62	-27.27	-206.24	5.62			0.96	Hg	2015	BAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	28.6168125	57.6909944	8.587	13.773	12.70	13.89									0.61	C	2016.738		iT24 1x60s V-filter. There has to be an issue with back- or foreground stars with different behavior with different filters. The seemingly completely off PA in the V-filter image was confirmed with several different V-filter images
	28.61679167	57.6909944	8.662	1.326	10.09	12.05							>M4	M0-M2	0.61	C	2016.738		iT24 5x10s I-filter Spc based on V-I color index.

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2011 +2618	20 11 02.740	26 18 34.63			14.13	16.03	28.77	-155.92	4.93	38.94	-160.70	4.93	M2-M4	M3->M4				BAA	Despite some difference in the pm vector direction a good CPM candidate
	302.76050000	26.3123056	4.022	53.361											1.2	Pp	1951.529		POSS I.O estimates
	302.76104167	26.3103611	4.375	50.207			40	-159		43	-150				1.2	Pp	1995.545		POSS II.N estimates. PM estimates based on comparison with POSS I.O
	302.76126200	26.3103660	4.295	57.953	12.6	13.7									1.3	E2	1997.772		2MASS. M1 and M2 estimated from J- and K-band
	302.76137900	26.3099020	4.659	63.769			29.66	-131.23	10.11	72.00	-148.49	24.64			0.4	Hw	2010.5		WISE. PM data calculated from position comparison with 2MASS. Large WISE position error results in large PM error
	302.76141558	26.3096198	4.402	60.074	12.78	14.52	28.77	-155.92	4.93	38.94	-160.70	4.93			0.96	Hg	2015	BAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	302.76143333	26.3095806	4.484	62.941	14.13	16.03									0.61	C	2016.666		iT24 1x60s V-filter.
	302.76141667	26.3095833	4.572	59.507	11.81	13.45							M2-M4	M3->M4	0.61	C	2016.666		iT24 1x60s I-filter. Spc based on V-I color index. Image quality questionable
J2019 +1446	20 19 00.16	14 46 52.0	7.500	60.000	11.10	11.20	-149	-5											Listed as WDS object GWP 2937 since mid data per August 2016 (given here in the header line) seems somewhat suspect - especially the Dec position is about two arcseconds wrong, also mags and pm are rather off. 2MASS-GAIA DR1 and 2MASS-URAT1 comparisons indicates this is a solid CPM candidate, but since this is a WDS object as opposed to an LSPM object the PM data has been left off of this line
	304.74954167	14.7793056	7.655	58.497											1.2	Pp	1953.683		POSS I.O estimates
	304.75016667	14.7807778	7.454	61.119			59	144		59	133				1.2	Pp	1990.472		POSS II.J estimates. PM estimates based on comparison with POSS I.O
	304.75068500	14.7811000	7.505	60.898	13.3	13.4									1.3	E2	1998.735		2MASS. M1 and M2 estimated from J- and K-band
	304.75104700	14.7815660	7.710	61.468			107.11	142.60		125.45	145.35				0.4	Hw	2010.5		WISE. PM data calculated from position comparison with 2MASS. Large WISE position error results in large PM error
	304.75112250	14.7816744	7.479	60.903			102.46	139.12	5.71	101.38	138.83	5.73			0.2	Eu	2013.567	AAA	URAT1. PM data calculated from position comparison with 2MASS
	304.75115854	14.7817185	7.497	60.873	13.50	13.55	101.34	136.91	5.22	100.77	136.82	5.22			0.96	Hg	2015	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are Gmag GAIA
	304.75120833	14.7817889	7.511	61.013	14.66	14.70									0.61	C	2016.669		iT24 1x180s V-filter
													>M4	>M4					iT24 1x60s I-filter too bad in quality to allow useful measurements. Spc estimation based on V-I color index derived from the given G- and Vmags using the GAIA G/V/I-mag formula

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2020 +3345	20 20 51.007	33 45 53.23			12.90	16.95	7.39	-157.20	5.10	12.22	-162.47	5.10	K7-M1	>M4				AAA	Solid CPM candidate
	305.21200000	33.7681389	4.428	186.467											1.2	Pp	1950.603		POSS I.O estimates
	305.21233333	33.7659167	4.317	193.361			22	-178		11	-174				1.2	Pp	1995.474		POSS II.N estimates. PM estimates based on comparison with POSS I.O
	305.21257000	33.7649970	4.802	191.103			20.48	-152.54		18.75	-116.33				0.4	Hw	2010.5		WISE. PM data calculated from position comparison with 2MASS. Large WISE position error results in large PM error
	305.21248700	33.7655110	5.230	189.951	12.5	15.1									1.3	E2	1999.910		2MASS. M1 and M2 estimated from J- and K-band
	305.21251960	33.7648356	5.188	188.884	12.88		6.36	-158.51	5.53	13.20	-158.52	5.59			0.2	Eu	2013.626	AAA	URAT1. PM data calculated from position comparison with 2MASS
	305.21252804	33.7647848	5.304	188.931	12.16	15.51	7.39	-157.20	5.10	12.22	-162.47	5.10			0.96	Hg	2015	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are Gmag GAIA
	305.21252917	33.7647083	4.969	188.806	12.90	16.95									0.61	C	2016.658		iT24 1x60s V-filter. SNR B <20
	305.21252917	33.7647028	5.214	189.638	11.12	14.10							K7-M1	>M4	0.61	C	2016.658		iT24 5x10s I-filter. Spc based on V-I color index
J2022 +3646	20 22 49.675	36 46 45.32			13.19	19.50	104.53	113.35	5.58	107.44	116.17	6.43	K5-M0	>M4				AAA	Solid CPM candidate despite non resolution of the secondary in POSS I images. Vmag B estimated
	305.70604167	36.7788333	8.023	175.706											1.2	Pp	1995.474		POSS II.N values based on Aladin phot tags
	305.70638200	36.7787360	8.399	174.662	13.17	17.39									1.3	E2	1998.470		2MASS. M1 and M2 estimated from J- and K-band
	305.70693860	36.7792253	8.300	174.468	13.17		105.79	116.11	6.08	108.93	125.00	7.13			0.2	Eu	2013.509	AAA	URAT1. PM data calculated from position comparison with 2MASS
	305.70698122	36.7792564	8.357	174.304	12.64	18.26	104.53	113.35	5.58	107.44	116.17	6.43			0.96	Hg	2015	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	305.70712083	36.7792722			13.19	19.50									0.61	C	2016.658		iT24 1x180s V-filter. No resolution of B. Vmag B assumed to be fainter than 19.5
	305.70705833	36.7793167	8.516	175.550	11.69	16.71							K5-M0	>M4	0.61	C	2016.658		iT24 1x60s I-filter. Spc based on V-I color index with B estimated fainter than 19.5Vmag

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2024 +3308	20 24 02.633	33 08 34.57			11.72	15.29	145.46	72.52	5.10	146.34	80.04	5.95	K5-M0	>M4				AAA	Solid CPM candidate
	306.01016800	33.1426010	4.729	14.094	11.6	13.8									1.3	E2	1998.369		2MASS. M1 and M2 estimated from J- and K-band
	306.01089670	33.1429036	4.766	13.441	11.71		144.15	71.49	6.05	143.05	75.61	6.58			0.2	Eu	2013.513	AAA	URAT1. PM data calculated from position comparison with 2MASS
	306.01097055	33.1429360	4.854	13.902	11.11	14.22	145.46	72.52	5.10	146.34	80.04	5.95			0.96	Hg	2015.0	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	306.01105417	33.1429556	4.715	13.242	11.72	15.29									0.61	C	2016.658		iT24 1x60s V-filter
	306.01104583	33.1429556	4.798	13.781	10.08	12.79							K5-M0	>M4	0.61	C	2016.658		iT24 5x10s I-filter. Spc based on V-I color index
																			POSS I.O and POSS II.N images show overlapping star disks giving some elongation and indicate common proper motion but do not allow tagging for data estimates
J2039 +3820	20 39 59.209	38 20 41.20			16.37	17.02	-59.72	-144.77	0.25	-60.72	-144.04	0.25	M2-M4	>M4				AAA	Solid CPM candidate
	309.99762500	38.3474722	2.448	324.784											1.2	Pp	1951.526		POSS I.O estimates
	309.99700000	38.3460000	2.088	329.536			-42	-126		-34	-131				1.2	Pp	1993.478		POSS II.J estimates. PM estimates based on comparison with POSS I.O
	309.99694100	38.3452310	3.081	332.614	16.5	17.1									2.5	Es	2003.719		SDSS DR9
	309.99670238	38.3447773	3.094	332.497	15.07	15.61	-59.72	-144.77	0.25	-60.72	-144.04	0.25			0.96	Hg	2015.0	AAA	GAIA DR1. PM data calculated from position comparison with SDSS DR9. M1 and M2 are GAIA Gmag
	309.99674167	38.3447639	3.004	327.020	16.37	17.02									0.61	C	2016.658		iT24 1x60s V-filter
	309.99657917	38.3446861	3.074	336.546	13.97	14.31							M2-M4	>M4	0.61	C	2016.658		iT24 1x60s I-filter. Spc based on V-I color index
																			No 2MASS and URAT1 object despite clear elongation in the 2MASS image indicating touching star disks
J2041 +1457	20 41 19.386	14 57 36.82			19.03	19.17	130.83	-17.40	5.28	127.85	-16.22	5.28	>M4	>M4				AAA	Solid CPM candidate
	310.32841667	14.9602500	3.871	63.951											1.2	Pp	1953.683		POSS I.E estimates
	310.33000000	14.9606389	4.625	76.241			138	35		164	20				1.2	Pp	1993.530		POSS II.N estimates. PM estimates based on comparison with POSS I.E
	310.33011600	14.9603130	4.605	74.212	16.5	17.0									1.3	E2	1997.526		2MASS. M1 and M2 estimated from J- and K-band
	310.33077333	14.9602285	4.560	73.785	17.23	17.60	130.83	-17.40	5.28	127.85	-16.22	5.28			0.96	Hg	2015.0	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	310.33071667	14.9601361	4.698	69.177	19.03	19.17									0.61	C	2016.669		iT24 1x180s V-filter. SNR A and B <10
	310.33083750	14.9601750	4.647	71.430	15.87	16.45							>M4	>M4	0.61	C	2016.773		iT24 1x180s I-filter. Spc based on V-I color index

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2112 +0644	21 12 34.868	06 44 27.92			14.11	17.93	88.07	-195.70	6.36	85.53	-193.06	6.36	M1-M3	>M4				AAA	Solid CPM candidate
	318.14341667	6.7445833	6.148	67.024											1.2	Pp	1952.629		POSS I.O estimates
	318.14450000	6.7425278	6.502	60.520			111	-211		111	-189				1.2	Pp	1987.641		POSS II.J estimates. PM estimates based on comparison with POSS I.O
	318.14492500	6.7418780	6.518	61.283	13.0	15.5									1.3	E2	2000.502		2MASS. M1 and M2 estimated from J- and K-band
	318.14528215	6.7410899	6.505	60.831	13.01	16.04	88.07	-195.70	6.36	85.53	-193.06	6.36			0.96	Hg	2015.0	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	318.14532917	6.7410333	6.391	63.216	14.11	17.93									0.61	C	2016.669		iT24 1x180s V-filter
	318.14532083	6.7409778	6.702	60.602	11.96	14.83							M1-M3	>M4	0.61	C	2016.800		iT24 1x180s I-filter. Spc based on V-I color index
J2121 +0336	21 21 03.727	03 36 06.37			15.67	20.12	-215.57	-37.46	0.23	-217.08	-39.10	2.71	M2-M4	K0-K3				AAA	Solid CPM candidate. B seems to be a white dwarf
	320.26933333	3.6026667	6.487	71.112											1.2	Pp	1952.643		POSS I.O estimates, B very faint
	320.26695833	3.6023333	7.056	72.686			-244	-34		-227	-34				1.2	Pp	1987.641		POSS II.J estimates. PM estimates based on comparison with POSS I.O
	320.26590400	3.6018340	6.783	71.079	15.7	19.9									2.5	Es	2008.732		SDSS DR9. Vmags estimated from (gmag+rmag)/2
	320.26552790	3.6017688	6.771	71.135	14.56	19.60	-215.57	-37.46	0.53	-217.08	-39.10	2.77			1.0	Hg	2015.000	AAA	GAIA DR1. PM data calculated from position comparison with SDSS DR9. M1 and M2 are GAIA Gmag
	320.26539583	3.6017250	7.177	68.160	13.34	19.25							M2-M4	K0-K3	0.61	C	2016.806		iT24 1x180s I-filter. Spc based on V-I color index. No resolution of B - has to be fainter than 18.5
	320.26538750	3.6017500	7.537	65.463	15.67	20.12									0.61	C	2016.808		iT24 1x360s V-filter. SNR B <20
																			No 2MASS and URAT1 data for B
J2128 +4445	21 28 11.943	44 45 08.99			17.3	19.2	157.91	116.27	8.19	146.16	121.02	8.19	G8-K1	K5-M0				BAA	Good CPM candidate
	322.04795833	44.7517222	3.946	267.095											1.2	Pp	1989.664		POSS II.J estimates
	322.04878100	44.7519840	3.844	267.531	16.6	17.8									1.3	E2	2000.879		2MASS. M1 and M2 estimated from J- and K-band
	322.04975417	44.7525333	3.895	261.883	17.3	19.2									0.61	C	2016.669		iT24 1x180s V-filter. SNR B <10
	322.04976250	44.7524972	4.028	268.720	16.5	17.6	157.91	116.27	8.19	146.16	121.02	8.19	G8-K1	K5-M0	0.61	C	2016.770	BAA	iT24 1x180s I-filter. PM values based on comparison 2MASS to own I-filter image results. Spc based on V-I color index. SNR B <10
																			This object posed a riddle - B very faint in V-band but rather bright in I-band with a very close "C" component rather bright in V-band but faint in I-band. 2MASS has objects for A and B but not C (although to see in the image if very faint) and URAT1 has objects for A and C but not B. GAIA DR1 offers objects similar to URAT1 and SDSS shows nothing here. WISE offers only position for A. POSS II.J shows B clearly but POSS I.O offers no trace of B. What remains: The comparison of 2MASS positions with own measurement of the I-filter image suggests AB being a good CPM candidate while C shows no significant motion

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2143 +0419	21 43 51.543	04 19 24.99			13.27	17.03	-59.23	-171.64	7.87	-55.50	-170.42	7.87	K7-M1	>M4				AAA	Solid CPM candidate
	325.96562500	4.3264444	2.862	335.287											1.2	Pp	1953.781		POSS I.E estimates, no resolution, only elongation
	325.96495833	4.3244722	2.527	335.524			-57	-170		-54	-177				1.2	Pp	1995.493		POSS II.J estimates. PM estimates based on comparison with POSS I.E
	325.96500100	4.3242940	3.984	338.984	13.5										1.3	E2	2000.630		2MASS. M1 estimated from J- and K-band
	325.96487100	4.3238970	3.923	338.528		17.4	-62.26	-167.96	15.69	-52.41	-154.06	15.46			2.5	Es	2008.825		SDSS DR9, Vmags estimated from (gmag+rmag)/2. PM data calculated from position comparison with GAIA DR1
	325.96476390	4.3236089	3.981	339.794	12.85	16.19	-59.23	-171.64	7.87	-55.50	-170.42	7.87			0.96	Hg	2015.0	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	325.96471667	4.3235056	3.926	341.338	13.27	17.03									0.61	C	2016.669		iT24 1x180s V-filter. Overlapping star disks
	325.96471250	4.3234944	3.801	339.498	11.49	14.43							K7-M1	>M4	0.61	C	2016.800		iT24 1x180s I-filter. Touching/overlapping star disks. Spc based on V-I color index
J2213 +6017	22 13 13.177	60 17 23.19			10.75	16.87	193.21	11.22	6.04	201.10	9.42	7.89	K5-M0	>M4				AAA	Solid CPM candidate
	333.30212500	60.2901389	5.360	138.264											1.2	Pp	1992.550		POSS II.N estimates
	333.30309000	60.2897150	5.044	139.229	10.2	15.0									1.3	E2	1998.782		2MASS. M1 and M2 estimated from J- and K-band
	333.30474185	60.2897626	5.143	138.414	10.04	15.65	193.21	11.22	6.04	201.10	9.42	7.89			0.96	Hg	2015.000	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	333.30490417	60.2897750	5.193	139.353	9.11	14.01							K5-M0	>M4	0.61	C	2016.658	AAA	iT24 1x60s I-filter. Spc based on V-I color index
	333.30491667	60.2897889	5.273	140.519	10.75	16.87									0.61	C	2016.669		iT24 1x180s V-filter. Overlapping star disks. SNR B <10
																			No resolution ob B in POSS.I images. No object for B in URAT1, GAIA DR1 and WISE. No SDSS images and data
J2217 +6010	22 17 39.022	60 10 54.52			17.20	18.07	-125.56	-49.57	6.04	-128.75	-49.77	6.04	>M4	>M4				AAA	Solid CPM candidate
	334.41708333	60.1826389	6.367	242.906											1.2	Pp	1952.706		POSS I.O estimates
	334.41504167	60.1820278	6.903	242.381			-92	-55		-103	-63				1.2	Pp	1992.550		POSS II.N estimates. PM estimates based on comparison with POSS I.O
	334.41366300	60.1820220	6.673	241.623	15.3	16.0									1.3	E2	1999.746		2MASS. M1 and M2 estimated from J- and K-band
	334.41271220	60.1818344	6.708	241.812			-125.70	-49.88	6.81	-129.51	-49.96	6.85			0.2	Eu	2013.246	AAB	URAT1. PM data calculated from position comparison with 2MASS
	334.41259309	60.1818120	6.718	241.798	15.69	16.52	-125.56	-49.57	6.04	-128.75	-49.77	6.04			0.96	Hg	2015.0	AAA	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag
	334.41245833	60.1817917	6.675	242.522	14.21	14.91							>M4	>M4	0.61	C	2016.658		iT24 1x60s I-filter. Spc based on V-I color index
	334.41249167	60.1817333	6.813	242.463	17.20	18.07									0.61	C	2016.669		iT24 1x180s V-filter

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2228 +5739	22 28 12.856	+57 39 57.3			15.71														Secondary not seen on any of the images which were looked at. Bogus assumed
	337.050125	57.664472													1.2	Pp	1952.697		POSSI.O. Secondary not visible
	337.052827	57.665523			15.48										1.2	Pp	1990.645		GSC 2.3. M1 is GSC 2.3 Vmag; secondary not identified
	337.052958	57.667722													1.2	Pp	1993.601		POSSII.N. Secondary not visible
	337.053324	57.665821			15.2										1.3	E2	1999.738		2MASS. M1 is from 2MASS J and K magnitudes; secondary not identified
	337.054104	57.666132			14.29		109.5	81.7							0.2	Eu	2013.454		URAT1. M1 is URAT1 f.mag; secondary not identified
	337.054546	57.666300			15.71										0.61	C	2016.669		iT24 1x180s V. No resolution of B, only elongation for 2MASS 22281328+5739591 now much closer due to PM of J2228+5739S. J2228+5739N either bogus or fainter than 19.5mag. As there is no evidence found in all consulted 2MASS and POSS images the former is assumed
																			Notes: Neither component identified in SDSS-DR7 and -DR9; neither component appears to be identified in GAIA DR1; WISE shows the same J and K magnitudes as 2MASS for primary and doesn't identify the secondary
J2229 +1407	22 29 24.990	+14 07 17.1			17.94	20.09	-58.61	-138.81	0.20	-57.46	-139.49	0.79	>M4	M1-M3				AAA	Solid CPM candidate. CPM rating from SDSS DR9 to GAIA comparison since secondary is not identified in 2MASS and URAT1
	337.354750	14.123333	4.538	116.153											1.2	Pp	1953.831		POSSI.O
	337.354167	14.121944	4.583	117.275			-49	-119		-49	-122				1.2	Pp	1992.665		POSSII.J. PM estimates based on comparison with POSSI.O
	337.354282	14.12161	5.098	114.500	17.43										1.2	Pp	1994.122		GSC2.3. Epoch shown is the average for the primary (1995.576) and secondary (1992.667)
	337.354154	14.121459			15.6										1.3	E2	1998.736		2MASS. Secondary not identified in 2MASS. M1 calculated from J and K magnitudes
	337.354134	14.121392	5.243	119.800	17.7	19.7									2.5	Es	2000.740		SDSS DR7. M1 and M2 are averaged g and r magnitudes
	337.354135	14.121389	5.235	118.553	17.7	19.7									2.5	Es	2000.740		SDSS DR9. M1 and M2 are averaged g and r magnitudes
	337.353906	14.120881			15.6		-58.4	-140.5							0.2	Eu	2013.545		URAT1. Secondary not identified in URAT1. M1 calculated from J and K magnitudes
	337.353896	14.120839	5.254	118.560	16.16	19.39	-58.61	-138.81	0.20	-57.46	-139.49	0.79			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with SDSS DR9. M1 and M2 are GAIA Gmag
	337.353879	14.120775			14.32								>M4	M1-M3	0.61	C	2016.658		iT24 1x60s I-filter. Spc according to V-I color index. No resolution of B - has to be fainter than 18mag
	337.354000	14.120786	4.558	123.263	17.94	20.09									0.61	C	2016.669		iT24 1x180s V-filter. SNR B <10

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2232 +6424	22 32 15.28	+64 24 40.8			10.56	15.92	150.23	77.04	5.62	151.82	80.02	5.62	G8-K1	M2-M4				AAA	Solid CPM Candidate based on 2MASS/GAIA data comparison
	338.058625	64.410583	5.555	336.640											1.2	Pp	1952.629		POSSI.O
	338.062500	64.411694	4.969	327.690			144	95		133	74				1.2	Pp	1991.556		POSSII.N. PM estimates based on comparison with POSSI.O. The secondary is blurred in all the POSS images looked at – the two selected were the best, but still difficult to pinpoint the center of the secondary
	338.063723	64.411339	6.303	328.634	10.4	14.3									1.3	E2	1999.746		2MASS. M1 and M2 calculated from J and K magnitudes
	338.064752	64.411544	5.749	314.942	10.4	14.2	148.8	68.6		75.5	-54.2				0.4	Hw	2010.500		WISE. PM position calculated from comparison with 2MASS – error in pmDEC2 data traceable to error in WISE declination data for secondary
	338.065045	64.411629	6.332	329.294	10.51		149.62	75.88	6.18	152.55	80.12	6.16	G8		0.2	Eu	2013.509	AAA	URAT1. M1 is URAT1 Vmag. Spc1 is B-Vmag value. PM data calculated from position comparison with 2MASS
	338.065181	64.411662	6.329	329.033	10.24	14.51	150.23	77.04	5.62	151.82	80.02	5.62			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	338.065346	64.416689	6.144	329.802	10.56	15.92									0.61	C	2016.666		iT24 1x60s V-filter. SNR B <20
	338.065317	64.411725	6.107	329.104	9.79	13.61							G8-K1	M2-M4	0.61	C	2016.666		iT24 1x60s I-filter. Spc according to V-I color index
																			Notes: Secondary not identified in GSC 2.3. Neither component identified in SDSS DR7 and DR9
J2235 +4522	22 35 32.65	+45 22 56.6			18.25	18.52	185.27	23.77	5.68	184.58	22.16	5.68	>M4	>M4				AAA	Solid CPM Candidate
	338.883292	45.382139	4.275	249.461											1.2	Pp	1952.550		POSSI.O
	338.886458	45.382417	4.241	250.726			191	24		191	26				1.2	Pp	1995.810		POSSII.J. PM estimates based on comparison with POSSI.O
	338.886837	45.382332	4.381	248.300	16.7	17.0									1.3	E2	1998.777		2MASS. M1 and M2 calculated from J and K magnitudes
	338.887909	45.382428	4.383	247.419	16.63	16.62	185.48	23.71	6.31	187.85	19.48	6.33			0.2	Eu	2013.368	AAA	URAT1. PM position calculated from comparison with 2MASS. M1 and M2 are URAT1 f.mags
	338.888026	45.382439	4.402	248.040	17.03	17.20	185.27	23.77	5.68	184.58	22.16	5.68			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	338.888196	45.382475	4.465	245.945	15.65	15.62							>M4	>M4	0.61	C	2016.658		iT24 1x60s I-filter. Spc according to V-I color index
	338.888163	45.482450	4.515	248.973	18.25	18.52									0.61	C	2016.669		iT24 1x180s V-filter. SNR for both components <20
																			Notes: Secondary not identified in GSC 2.3 and WISE, neither star identified in SDSS DR7 and DR9
J2236 +5746	22 36 17.030	+57 46 35.3			14.37	15.06	149.57	76.18	5.30	148.24	74.55	5.30	M0-M2	M1-M3				AAA	Solid CPM Candidate based on 2MASS/GAIA data comparison
	339.067042	57.776083	3.294	60.941											1.2	Pp	1953.831		POSSI.O
	339.070208	57.776639	3.450	56.581			145	48		145	55				1.2	Pp	1998.658		POSSII.J. PM estimates based on comparison with POSSI.O. Overlapping of the primary and secondary make it difficult to separate them; picked the best of the POSSI and POSSII images to work with
	339.070833	57.776413	3.654	48.839	13.7	14.2									1.3	E2	1999.001		2MASS. M1 and M2 calculated from J and K magnitudes
	339.072080	57.776752	3.621	48.928	13.45	14.10	149.57	76.18	5.30	148.24	74.55	5.30			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	339.072233	57.776792	3.562	47.634	14.37	15.06									0.61	C	2016.658		iT24 5x10s V-filter
	339.072221	57.776800	3.533	48.735	12.40	12.89							M0-M2	M1-M3	0.61	C	2016.658		iT24 5x10s I-filter. Spc according to V-I color index
																			Notes: Secondary not identified in GSC2.3. Only one of the two stars identified in URAT1, which appears to have captured combined magnitudes of both stars; same situation applies to WISE

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2256 +1607	22 56 19.765	+16 07 21.5			14.09	16.49	1.67	-154.94	6.54	-0.20	-156.15	6.54	>M4	>M4				AAA	Strong CPM candidate based on 2MASS-GAIA comparison
	344.082208	16.124889	4.306	222.007											1.2	Pp	1954.581		POSSI.O
	344.082167	16.122917	4.444	218.035			-3	-169		0	-176				1.2	Pp	1995.774		POSSII.N. PM estimates based on comparison with POSSI.O. A bit difficult to identify centroid of secondary in both POSSI and POSSII images
	344.082320	16.122684	4.686	217.772	13.1	14.5									1.3	E2	1998.750		2MASS. M1 and M2 calculated from J and K magnitudes
	344.082342	16.122199	4.856	217.718			6.92	-158.87	9.67	-2.35	-182.86	10.32			2.5	Es	2009.393	BBB	SDSS DR9. PM position calculated from comparison with 2MASS
	344.082282	16.122251			13.1	14.5									0.4	Hw	2010.500		WISE. Secondary not identified in WISE, but is in ALLWISE. M1 from Wise J and K magnitudes, M2 from ALLWISE J and K magnitudes
	344.082328	16.121985	4.721	217.916	13.00	15.00	1.67	-154.94	6.54	-0.20	-156.15	6.54			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	344.082333	16.121914	4.757	218.168	14.09	16.49									0.61	C	2016.658		iT24 1x180s V-filter
	344.082329	16.121903	4.697	217.627	11.94	13.39							>M4	>M4	0.61	C	2016.658		iT24 5x10s I-filter. Spc according to V-I color index
																			Notes: Secondary not identified in GSC 2.3 and URAT1; neither component identified in SDSS DR7
J2302 +1250	23 02 19.451	+12 50 32.9			15.25	19.27	5.75	-180.52	6.55	4.30	-176.37	6.97	>M4	>M4				AAA	Very solid CPM candidate based on 2MASS to URAT1 and 2MASS to GAIA comparisons
	345.580958	12.845389	5.288	289.900											1.2	Pp	1953.631		POSSI.E
	345.581000	12.843000	5.437	293.867			3	-205		3	-195				1.2	Pp	1995.774		POSSII.N. PM estimates based on comparison with POSSI.E
	345.541058	12.842631	5.253	297.290	13.7	16.1									1.3	E2	1997.728		2MASS. M1 and M2 calculated from J and K magnitudes
	345.581081	12.842083	5.352	297.784			7.27	-177.56	10.18	1.26	-169.79	10.84			2.5	Es	2008.839	AAB	SDSS DR9. PM position calculated from comparison with 2MASS
	345.581105	12.841945	4.64	296.500	12.8	16.1									0.4	Hw	2010.500		WISE. M1 and M2 from Wise J and K magnitudes
	345.581074	12.841860	5.182	297.805	15.23		3.78	-178.89	7.29	9.07	-174.98	7.61	M1		0.2	Eu	2013.399	AAA	URAT1. PM position calculated from comparison with 2MASS. Spc1 is B-V from URAT1 data for the primary; however URAT1 Vmag for the primary is considerably fainter than 2MASS value derived from J and K magnitudes
	345.581086	12.841765	5.307	297.859	13.94	17.08	5.75	-180.52	6.55	4.30	-176.37	6.97			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	345.581092	12.841681	5.221	298.737	12.53	15.65							>M4	>M4	0.61	C	2016.658		iT24 1x60s I-filter. SNR B <20. Spc according to V-I color index
	345.581096	12.841683	5.209	299.818	15.25	19.27									0.61	C	2016.669		iT24 1x180s V-filter. SNR B <10
																			Notes: Secondary not identified in GSC 2.3

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2306 +3648	23 06 06.000	+36 48 55.5			14.04	18.38	167.20	-54.56	5.55	171.99	-59.47	5.55	K7-M1	>M4				AAA	Solid CPM Candidate
	346.521917	36.816556	7.890	146.775											1.2	Pp	1953.752		POSSI.O
	346.524625	36.815778	7.784	152.431			186	-67		169	-74				1.2	Pp	1995.638		POSSII.J PM estimates based on comparison with POSSI.O
	346.524976	36.817500	7.842	159.000	12.50										1.2	Pp	1990.230		GSC2.3. M1 is Vmag.
	346.524817	36.815472	7.452	150.020	13.6	16.1									1.3	E2	1999.699		2MASS. M1 and M2 calculated from J and K magnitudes
	346.525532	36.815366	7.844	152.802	13.6	16.1	190.8	-35.30		178.00	-83.7				0.4	Hw	2010.500		WISE. PM position calculated from comparison with 2MASS. M1 and M2 calculated from J and K magnitudes
	346.525614	36.815273	7.523	149.837	13.70		168.28	-52.45	6.22	172.51	-56.10	6.22	K5		0.2	Eu	2013.347	AAA	URAT1. PM position calculated from comparison with 2MASS. M1 is URAT1 Vmag, Spc1 is from URAT1 B-Vmag data
	346.525705	36.815240	7.553	149.825	13.25	16.50	167.20	-54.56	5.55	171.99	-59.47	5.55			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	346.525817	36.815219	7.537	144.553	14.04	18.38									0.61	C	2016.658		iT24 1x60s V-filter. SNR B <10.
	346.525813	36.815217	7.513	150.510	12.28	15.15							K7-M1	>M4	0.61	C	2016.658		iT24 1x60s I-filter. Spc according to V-I color index
																			Notes: Neither of the pair identified in SDSS DR7 and -DR9
J2309 +5506	23 09 58.034	+55 06 47.4			15.80	15.90	406.92	50.25	5.90	407.34	67.67	5.87	>M4	K0-K3				CAA	Considerable eastward motion in both stars. Comparison of POSS images suggest very definite parallel motion. Probably a better CPM candidate than the CAA 2MASS-URAT1 rating indicates
	347.481958	55.112750	5.748	72.797											1.2	Pp	1953.825		POSSI.O
	347.489292	55.113278	6.054	71.709			360	45		366	50				1.2	Pp	1990.786		POSSII.F. PM estimates based on comparison with POSSI.O
	347.489294	55.113066	6.143	70.600	14.88	15.33									1.2	Pp	1990.790		GSC2.3. M1 and M2 are GSC2.3 f.mags.
	347.490878	55.133129	6.063	72.088	13.2	15.4									1.3	E2	1998.982		2MASS. M1 and M2 calculated from J and K magnitudes
	347.493720	55.113330	6.179	69.934	15.20		406.92	50.25	5.90	407.34	67.67	5.87	K4.5		0.2	Eu	2013.395	CAA	URAT1. PM position calculated from comparison with 2MASS. M1 is URAT1 Vmag. Spc1 is from URAT1 Vmag – URAT1 Bmag, falls midway between K4 and K5
	347.494408	55.113372	6.078	69.587	15.80	15.90									0.61	C	2016.658		iT24 1x60s V-filter
	347.494388	55.113389	6.017	70.484	12.56	15.08							>M4	K0-K3	0.61	C	2016.658		iT24 1x60s I-filter. Spc according to V-I color index
																			Notes: data used here. Primary not identified in WISE; neither star identified in SDSS DR7 and -DR9 or in GAIA
J2316 +6109	23 16 53.990	+61 09 42.0			14.94	19.96	152.57	127.78	6.06	155.12	124.56	6.06	M1-M3	>M4				AAA	Solid CPM Candidate
	349.220833	61.160194	5.255	105.420											1.2	Pp	1954.598		POSSI.O
	349.224423	61.161372			14.61										1.2	Pp	1991.601		GSC2.3
	349.224458	61.161611	5.886	110.902			150.00	122.00		160.00	105.00				1.2	Pp	1997.907		POSSII.J. PM estimates based on comparison with POSSI.O
	349.224865	61.161652	5.842	113.728	13.7	16.3									1.3	E2	1999.787		2MASS. M1 and M2 calculated from J and K magnitudes
	349.226076	61.162145	5.890	113.750	14.92		154.71	130.65	6.78	157.35	128.66	6.76	K7		0.2	Eu	2013.403	AAA	URAT1. PM position calculated from comparison with 2MASS. M1 is URAT1 Vmag. Spc1 is URAT1 Vmag – URAT1 Bmag
	349.226202	61.162192	5.897	114.013	13.73	17.09	152.57	127.78	6.06	155.12	124.56	6.06			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	349.226379	61.162258	5.894	114.030	12.75	15.95							M1-M3	>M4	0.61	C	2016.658		iT24 1x60s I-filter. Spc according to V-I color index
	349.226371	61.162263	5.726	114.010	14.94	19.96									0.61	C	2016.669		iT24 1x180s V-filter. SNR B <10
																			Notes: Neither component identified in SDSS-DR7 nor -DR9, primary only identified in GSC 2.3 and WISE

Table 1 continues on next page.

Table 1 (continued): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2325 +1735S	23 25 48.223	+17 35 37.2			18.31	19.37	182.41	16.34	16.85	182.67	9.75	16.85	>M4	>M4				AAB	Good CPM Candidate
	351.447625	17.593778	5.342	329.435											1.2	Pp	1951.611		POSSI.E
	351.450408	17.593651	5.699	328.400	18.01	18.87									1.2	Pp	1990.757		GSC2.3. Epoch is average of A and B dates (1990.812 for A and 1990.702 for B)
	351.450375	17.593889	5.416	328.132			225	10		222	10				1.2	Pp	1993.719		POSSII.N. PM estimates based on comparison with POSSI.E
	351.450818	17.593658	5.877	324.683	16.8	17.3									1.3	E2	1997.745		2MASS. M1 and M2 calculated from J and K magnitudes
	351.451297	17.593693	5.201	336.100	18.3	20.4									2.5	Es	2006.708		SDSS DR7. M1 and M2 are averaged g and r magnitudes
	351.451408	17.593702	5.847	323.105	18.3	20.4	188.60	20.74	0.48	208.39	21.60	0.48			2.5	Es	2009.461	ACA	SDSS DR9. M1 and M2 are averaged g and r magnitudes. PM Position calculated from comparison with GAIA. No PM data found in GAIA. Note the secondary PM numbers shown here are notably different from the other two comparisons. The 2MASS errors are particularly high for this pair (0.26 and 0.13 for each component)
	351.451631	17.593722	5.759	324.507	16.8	17.3	181.21	14.90	18.89	184.06	7.97	18.82			0.2	Eu	2013.163	AAC	URAT1. M1 and M2 calculated from URAT1 J and K magnitudes. PM position calculated from comparison with 2MASS
	351.451735	17.593736	5.782	324.069	16.82	18.32	182.41	16.34	16.85	182.67	9.75	16.85			0.96	Hg	2015.000	AAB	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	351.451803	17.593731	5.549	326.350	15.53	16.70							>M4	>M4	0.61	C	2016.658		iT24 1x60s I-filter. SNR B <20. Spc according to V-I color index
	351.451796	17.593769	6.376	325.902	18.31	19.37									0.61	C	2016.762		iT24 1x360s V-filter. SNR B <10
																			Notes: The B component is not identified in WISE
J2329 +5625	23 29 46.576	+56 25 05.3			11.31	15.78	-6.21	-233.20	6.02	-2.35	-230.33	6.02	K7-M1	>M4				AAA	Solid CPM Candidate
	352.444292	56.421361	8.117	127.134											1.2	Pp	1952.706		POSSI.O
	352.444070	56.418188	7.925	113.600	11.85										1.2	Pp	1995.395		GSC2.3. M1 is WISE Vmag. Epoch is average of A and B dates (2000 for A and 1990.79 for B, which probably explains the anomalous separation and PA)
	352.444208	56.418528	8.259	125.536			-4	-243		2	-241				1.2	Pp	1995.638		POSSII.F. PM estimates based on comparison with POSSI.O
	352.444028	56.418110	8.949	125.343	11.10	13.90									1.3	E2	2000.899		2MASS. M1 and M2 calculated from J and K magnitudes
	352.443999	56.417301	8.943	124.988	11.31		-4.67	-232.45	6.77	-2.51	-227.56	6.74	K5		0.2	Eu	2013.642	AAA	URAT1. PM position calculated from comparison with 2MASS. M1 is URAT1 Vmag, Spc1 is from URAT1 B-Vmag
	352.443984	56.417197	8.971	124.931	10.70	14.45	-6.21	-233.20	6.02	-2.35	-230.33	6.02			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	352.443988	56.417000	8.892	125.079	11.31	15.78									0.61	C	2016.658		iT24 5x10s V-filter.
	352.443983	56.417103	9.009	124.944	9.57	13.00							K7-M1	>M4	0.61	C	2016.658		iT24 5x10s I-filter. Spc according to V-I color index
																			Neither component identified in SDSS-DR7 nor -DR9, primary only identified in WISE

Table 1 concludes on next page.

Table 1 (conclusion): Research results for potential common proper motion pairs found in the LSPM catalog. Headline object position based on the most precise J2000 coordinates currently available for A (in most cases from the GAIA DR1 catalog)

LSPM	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J2351 +3749	23 51 12.540	+37 49 16.0			16.85	19.62	233.84	-81.75	6.21	235.70	-84.02	8.23	K6-M0	M1-M3				AAA	Solid PM candidate based on 2MASS-URAT1 comparison; PM errors in SDSS DR9 are significantly higher
	357.798208	37.821944	6.450	23.837											1.2	Pp	1951.835		POSSI.E
	357.801375	37.821361	6.359	24.201			215	-50		215	-52				1.2	Pp	1995.810		POSSII.F. PM estimates based on comparison with POSSI.E
	357.801710	37.821275	5.962	25.700	16.42	18.26									1.2	Pp	1995.814		GSC2.3. M1 and M2 are GSC 2.3 Vmags
	357.801997	37.821178	6.161	27.133	15.6	17.2									1.3	E2	1999.76		2MASS. M1 and M2 calculated from J and K magnitudes
	357.802314	37.821073	5.336	27.700											2.5	E2	2003.743		SDSS DR7
	357.802316	37.821076	6.155	27.460			227.73	-92.18	21.3	234.86	-97.60	28.4			2.5	Es	2003.743	AAC	SDSS DR9. PM position calculated from comparison with 2MASS
	357.803120	37.820868	6.148	27.661	16.48		233.84	-81.75	6.21	235.70	-84.02	8.23	K5		0.2	Eu	2013.460	AAA	URAT1. PM position calculated from comparison with 2MASS. M1 is URAT1 Vmag, Spc1 is from URAT1 B-Vmag
	357.803392	37.820811	6.520	25.397	16.85	19.62									0.61	C	2016.669		iT24 1x180s V-filter. SNR B <10
	357.803396	37.820794	6.133	29.645	15.33	17.40							K6-M0	M1-M3	0.61	C	2016.757		iT24 1x180s I-filter. Spc according to V-I color index
																			Notes: Secondary not identified in GAIA (I/337); Secondary not identified by WISE, but is shown in ALLWISE
J2358 +0907	23 58 15.245	+09 07 47.7			15.69	18.56	212.19	140.46	5.94	217.09	144.81	5.94	M2-M4	>M4				AAA	Solid PM candidate based on 2MASS/GAIA data comparison
	359.560542	9.128306	4.360	42.788											1.2	Pp	1955.857		POSSI.E
	359.562965	9.129532	5.333	44.100	15.05										1.2	Pp	1991.697		GSC2.3
	359.562833	9.129694	4.956	43.416			194	119		205	129				1.2	Pp	1991.928		POSSII.J. PM estimates based on comparison with POSSI.E
	359.563519	9.129924	5.056	44.950	14.3	16.0									1.3	E2	2000.721		2MASS. M1 and M2 calculated from J and K magnitudes
	359.564014	9.130231	5.137	45.058			216.81	136.19	10.46	224.70	142.40	10.46			2.5	Es	2008.836	AAA	SDSS DR9. PM position calculated from comparison with 2MASS
	359.564132	9.130318	5.208	42.185			222.80	145.00		215.20	173.80				0.4	Hw	2010.500		WISE. PM position calculated from comparison with 2MASS. PMDec2 anomalous compared with the other three PM's shown
	359.564371	9.130481	5.150	45.013	14.48	16.51	206.100	146.08	0.46	207.08	147.98	0.46			0.96	Hg	2015.000	ACA	GAIA DR1. PM position calculated from comparison with SDSS DR9. M1 and M2 are GAIA Gmag
	359.564371	9.130481	5.150	45.013	14.48	16.51	212.19	140.46	5.94	217.09	144.81	5.94			0.96	Hg	2015.000	AAA	GAIA DR1. PM position calculated from comparison with 2MASS. M1 and M2 are GAIA Gmag
	359.564489	9.130533	4.932	45.614	15.69	18.56									0.61	C	2016.669		iT24 1x180s V-filter. SNR B <20
	359.564475	9.130531	5.256	44.328	13.43	15.33							M2-M4	>M4	0.61	C	2016.757		iT24 1x60s I-filter. SNR B <20
	359.564479	9.130531	5.224	44.442	13.35	15.46							M2-M4	>M4	0.61	C	2016.757		iT24 1x180s I-filter. Spc according to V-I color index
																			Notes: Primary not identified in URAT1; neither component identified in SDSS DR7

CPM Pairs from LSPM so far not WDS Listed – Part II

(Continued from page 448)

ured Imags

- Ap indicates in the data lines the aperture used for the observation listed and Me indicates the WDS code for the used observation method (for GAIA calculated equivalent circular surface diameter)
- Date is the Bessel epoch of the (averaged) observation date given in the data lines
- CPM Rat gives the rating of the CPM assessment based on comparison of positions (in most cases between 2MASS and GAIA DR1 if available) in the header line and the corresponding data line
- Source/Notes finally indicates in the header line the overall assessment for the object in question and in the data lines the source used (images and catalogs) and additional explanations if considered necessary.

Summary

From 29 objects checked for CPM

- 23 objects including counter-checked GWP 2937 received a triple AAA rating based on position comparison, in most cases between 2MASS and GAIA DR1 (according to the method presented in Knapp/Nanson 2017), which means a solid CPM candidate.
- Five objects got a rating between AAB to BAC, which means probably CPM with caveats, but all of them with CPM confirmation by comparison of POSS images.
- One object remained as suspect due to missing evidence for the secondary – bogus assumed.

One object (J2019+1446) was added to the WDS catalog during the research for this report as CPM pair GWP 2937 but we kept this object in the report to provide the additional observations we found in the diverse catalogs or made ourselves.

A special topic is the I-band photometry as there are few sources for reliable I-mags available. We finally settled on the USNO B1 catalog knowing that we have here a rather large average mag error of 0.3mag (according the VizieR description) to consider. We counterchecked for all objects the V- and I-mags gained by photometry with the GAIA DR1 G-mags with the relationship G-V=-0.0257-0.0924*(V-Ic)-0.1623*(V-Ic)^2+0.0090*(V-Ic)^3 given by Jordi et al. 2010 and got an average error in the range of ~-0.1mag indicating that the measured Imags are on average a tad too faint. The calculated standard deviation is ~0.2mag including the average error of 0.05 given for the mentioned formula. This means that this error range has to be added to the error range of the photometry given in Table 1 meaning in consequence that the derived spectral class estimation is to be taken with the caveat of an error range of in total ~0.25mag with some bias to the fainter side.

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The following tools and resources have been used for this research:

- Washington Double Star catalog
- 2MASS All Sky catalog
- iTelescope: Images were taken with iT24: 610mm CDK with 3962mm focal length. CCD: FLI-PL09000. Resolution 0.62 arcsec/pixel. V-filter. Located in Auberry. California. Elevation 1405m
- AAVSO APASS
- GAIA DR1 catalog
- UCAC4 catalog
- URAT1 catalog
- WISE catalog
- SDSS catalog
- IGSL catalog
- LSPM catalog
- Aladin Sky Atlas v9.0
- SIMBAD, VizieR
- AstroPlanner V2.2
- NASA/ IPAC Infrared Science Archive
- Astrometrica 4.10.1.432

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CPM Pairs from LSPM so far not WDS Listed – Part II

Appendix

Table 2 below gives the plate solving errors for the used iT24 images and error information derived from the measurements provided in Table 1 and also the measured positions for both components:

Table 2: Error Estimations for the Measurements Provided in Table 1

- *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*

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
J0011 +2523	A										2016.669	iT24 1x180s V-filter. No resolution for both components - have to be fainter than 19.5mag
	B											
J0011 +2523	A	00 11 55.110	25 23 34.80	0.01	0.01	0.014	0.154	0.174	12.42	0.13	2016.658	iT24 1x60s I-filter. SNR for both components <20
	B	00 11 55.432	25 23 37.72					0.258	9.64			
J0154 +5741	A	01 54 28.035	57 41 27.58	0.04	0.05	0.064	0.427	0.043	74.18	0.04	2016.738	iT24 1x60s V-filter.
	B	01 54 28.290	57 41 35.92					0.048	39.54			
J0154 +5741	A	01 54 28.030	57 41 27.58	0.08	0.08	0.113	0.748	0.066	128.03	0.12	2016.738	iT24 5x10s I-filter
	B	01 54 28.055	57 41 36.24					0.068	57.32			
J2011 +2618	A	20 11 02.744	26 18 34.49	0.13	0.08	0.153	1.950	0.081	88.39	0.08	2016.666	iT24 1x60s V-filter
	B	20 11 03.041	26 18 36.53					0.092	23.34			
J2011 +2618	A	20 11 02.740	26 18 34.50	0.12	0.14	0.184	2.309	0.175	69.55	0.13	2016.666	iT24 1x60s I-filter
	B	20 11 03.033	26 18 36.82					0.176	31.78			
J2019 +1446	A	20 19 00.290	14 46 54.44	0.01	0.01	0.014	0.108	0.041	164.47	0.04	2016.669	iT24 1x180s V-filter
	B	20 19 00.743	14 46 58.08					0.041	162.00			
J2019 +1446	A	20 19 00.294	14 46 54.31	0.17	0.14	0.220	1.675	0.134	11.75	0.10	2016.666	iT24 1x60s I-filter. Very bad image quality. SNR A<20 and B <10
	B	20 19 00.737	14 46 58,24					0.152	8.94			
J2020 +3345	A	20 20 51.007	33 45 52.95	0.02	0.02	0.028	0.326	0.050	203.48	0.05	2016.658	iT24 1x60s V-filter. SNR B <20
	B	20 20 50.946	33 45 48.04					0.087	14.66			
J2020 +3345	A	20 20 51.007	33 45 52.93	0.02	0.02	0.028	0.311	0.149	124.86	0.13	2016.658	iT24 5x10s I-filter
	B	20 20 50.937	33 45 47.79					0.157	25.02			
J2022 +3646	A	20 22 49.709	36 46 45.38	0.12	0.05	0.130		0.110	261.72	0.11	2016.669	iT24 1x180s V-filter. No resolution for B - has to fainter than 19.5Vmag
	B											
J2022 +3646	A	20 22 49.694	36 46 45.54	0.03	0.02	0.036	0.243	0.120	212.95	0.12	2016.658	iT24 1x60s I-filter. SNR B <20
	B	20 22 49.749	36 46 37.05					0.153	11.04			
J2024 +3308	A	20 24 02.652	33 08 34.65	0.06	0.07	0.092	1.134	0.080	147.93	0.08	2016.658	iT24 5x10s V-filter. SNR B <20
	B	20 24 02.741	33 08 39.17					0.098	18.60			
J2024 +3308	A	20 24 02.653	33 08 34.64	0.06	0.07	0.092	1.120	0.070	289.54	0.07	2016.658	iT24 1x60s V-filter
	B	20 24 02.739	33 08 39.23					0.075	40.40			
J2024 +3308	A	20 24 02.651	33 08 34.64	0.06	0.07	0.092	1.101	0.140	189.69	0.14	2016.658	iT24 5x10s I-filter with 1x60s V-filter image
	B	20 24 02.742	33 08 39.30					0.142	50.05			
J2039 +3820	A	20 39 59.218	38 20 41.15	0.07	0.06	0.092	1.758	0.067	35.12	0.06	2016.658	iT24 1x60s V-filter
	B	20 39 59.079	38 20 43.67					0.079	20.62			
J2039 +3820	A	20 39 59.179	38 20 40.87	0.10	0.08	0.128	2.386	0.132	52.79	0.13	2016.658	iT24 1x60s I-filter
	B	20 39 59.075	38 20 43.69					0.132	43.25			
J2041 +1457	A	20 41 19.372	14 57 36.49	0.09	0.11	0.142	1.733	0.139	9.02	0.08	2016.669	iT24 1x180s V-filter. SNR A and B <10
	B	20 41 19.675	14 57 38.16					0.176	6.44			
J2041 +1457	A	20 41 19.401	14 57 36.63	0.09	0.10	0.135	1.658	0.114	35.52	0.11	2016.773	iT24 1x180s I-filter
	B	20 41 19.705	14 57 38.11					0.117	26.73			
J2112 +0644	A	21 12 34.879	06 44 27.72	0.06	0.11	0.125	1.123	0.050	198.22	0.05	2016.669	iT24 1x180s V-filter
	B	21 12 35.262	06 44 30.60					0.071	20.82			
J2112 +0644	A	21 12 34.877	06 44 27.52	0.07	0.08	0.106	0.909	0.090	323.93	0.09	2016.800	iT24 1x180s I-filter
	B	21 12 35.269	06 44 30.81					0.091	99.62			
J2121 +0336	A	21 21 03.693	03 36 06.30	0.09	0.12	0.150	1.140	0.031	182.23	0.03	2016.808	iT24 1x360s V-filter. SNR B <20
	B	21 21 04.151	03 36 09.43					0.099	11.06			
J2121 +0336	A	21 21 03.695	03 36 06.21	0.12	0.08	0.144	1.151	0.080	139.51	0.08	2016.806	iT24 1x180s I-filter. Resolution of B rather shaky - SNR B <5
	B	21 21 04.140	03 36 08.88					0.350	2.71			

Table 2 continues on the next page.

CPM Pairs from LSPM so far not WDS Listed – Part II

Appendix

Table 2 (continued): Error Estimations for the Measurements Provided in Table 1

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
J2128 +4445	A	21 28 11.941	44 45 09.12	0.09	0.07	0.114	1.677	0.117	26.50	0.11	2016.669	iT24 1x180s V-filter. SNR B <10
	B	21 28 11.579	44 45 08.57					0.310	3.27			
J2128 +4445	A	21 28 11.941	44 45 09.12	0.09	0.07	0.114	1.398	0.117	26.50	0.11	2016.669	iT24 1x180s V-filter. SNR C <20
	C	21 28 11.536	44 45 10.91					0.131	14.73			
J2128 +4445	A	21 28 11.943	44 45 08.99	0.07	0.07	0.099	1.408	0.144	30.59	0.14	2016.770	iT24 1x180s I-filter. SNR B <20
	B	21 28 11.565	44 45 08.90					0.160	13.54			
J2128 +4445	A	21 28 11.943	44 45 08.99	0.07	0.07	0.099	1.126	0.144	30.59	0.14	2016.770	iT24 1x180s I-filter. SNR C <20
	C	21 28 11.504	44 45 10.86					0.165	11.81			
J2143 +0419	A	21 43 51.532	04 19 24.62	0.06	0.07	0.092	1.345	0.060	140.56	0.06	2016.669	iT24 1x180s V-filter. Overlapping star disks
	B	21 43 51.448	04 19 28.34					0.075	23.42			
J2143 +0419	A	21 43 51.531	04 19 24.58	0.07	0.06	0.092	1.390	0.140	113.79	0.14	2016.800	iT24 1x180s I-filter. Touching/ overlapping star disks. SNR B<20
	B	21 43 51.442	04 19 28.14					0.162	12.72			
J2213 +6017	A	22 13 13.180	60 17 23.24	0.07	0.07	0.099	1.076	0.060	632.00	0.06	2016.669	iT24 1x180s V-filter. Overlapping star disks. SNR B <10
	B	22 13 13.631	60 17 19.17					0.125	9.40			
J2213 +6017	A	22 13 13.177	60 17 23.19	0.07	0.07	0.099	1.092	0.130	122.34	0.13	2016.658	iT24 1x60s I-filter. Touching/ overlapping star disks. SNR B<20
	B	22 13 13.632	60 17 19.25					0.152	13.38			
J2217 +6010	A	22 17 38.998	60 10 54.24	0.13	0.09	0.158	1.329	0.105	34.63	0.10	2016.669	iT24 1x180s V-filter
	B	22 17 38.188	60 10 51.09					0.112	21.13			
J2217 +6010	A	22 17 38.990	60 10 54.45	0.06	0.07	0.092	0.791	0.121	59.07	0.12	2016.658	iT24 1x60s I-filter
	B	22 17 38.196	60 10 51.37					0.124	35.19			
J2228 +5739	A	22 28 13.091	57 39 58.68	0.09	0.05	0.103		0.071	75.84	0.07	2016.669	iT24 1x180s V. No resolution of B
	B											
J2229 +1407	A	22 29 24.960	14 07 14.83	0.12	0.07	0.139	1.746	0.117	26.79	0.11	2016.669	iT24 1x180s V-filter. SNR B <10
	B	22 29 25.222	14 07 12.33					0.228	4.94			
J2229 +1407	A	22 29 24.931	14 07 14.79	0.08	0.11	0.136		0.122	47.84	0.12	2016.658	iT24 1x60s I-filter. No resolution of B - has to be fainter than 18mag
	B											
J2232 +6424	A	22 32 15.683	64 24 42.08	0.10	0.09	0.135	1.254	0.100	333.44	0.10	2016.666	iT24 1x60s V-filter. SNR B <20
	B	22 32 15.206	64 24 47.39					0.134	11.75			
J2232 +6424	A	22 32 15.676	64 24 42.21	0.11	0.09	0.142	1.333	0.130	161.59	0.13	2016.666	iT24 1x60s I-filter.
	B	22 32 15.192	64 24 47.45					0.138	23.31			
J2235 +4522	A	22 35 33.159	45 22 56.82	0.01	0.01	0.014	0.179	0.069	18.87	0.04	2016.669	iT24 1x180s V-filter. SNR for both components <20
	B	22 35 32.759	45 22 55.20					0.076	16.18			
J2235 +4522	A	22 35 33.167	45 22 56.91	0.01	0.01	0.014	0.181	0.150	19.33	0.14	2016.658	iT24 1x60s I-filter
	B	22 35 32.780	45 22 55.09					0.149	20.71			
J2236 +5746	A	22 36 17.336	57 46 36.45	0.07	0.07	0.099	1.592	0.085	37.79	0.08	2016.658	iT24 5x10s V-filter
	B	22 36 17.665	57 46 38.85					0.090	25.94			
J2236 +5746	A	22 36 17.333	57 46 36.48	0.07	0.07	0.099	1.605	0.141	62.16	0.14	2016.658	iT24 5x10s I-filter
	B	22 36 17.665	57 46 38.81					0.142	49.75			
J2256 +1607	A	22 56 19.760	16 07 18.89	0.05	0.05	0.071	0.852	0.061	117.63	0.06	2016.658	iT24 1x180s V-filter
	B	22 56 19.556	16 07 15.15					0.073	25.26			
J2256 +1607	A	22 56 19.759	16 07 18.85	0.06	0.06	0.085	1.035	0.121	91.45	0.12	2016.658	iT24 5x10s I-filter
	B	22 56 19.560	16 07 15.13					0.125	30.44			
J2302 +1250	A	23 02 19.463	12 50 30.06	0.06	0.05	0.078	0.859	0.061	133.30	0.06	2016.669	iT24 1x180s V-filter. SNR B <10
	B	23 02 19.154	12 50 32.65					0.155	7.11			
J2302 +1250	A	23 02 19.462	12 50 30.05	0.06	0.05	0.078	0.857	0.140	144.02	0.14	2016.658	iT24 1x60s I-filter. SNR B <20.
	B	23 02 19.149	12 50 32.56					0.151	18.55			
J2306 +3648	A	23 06 06.196	36 48 54.79	0.06	0.06	0.085	0.645	0.071	104.25	0.07	2016.658	iT24 1x60s V-filter. SNR B <10
	B	23 06 06.560	36 48 48.65					0.204	5.19			

Table 2 concludes on the next page.

CPM Pairs from LSPM so far not WDS Listed – Part II

Appendix

Table 2 (conclusion): Error Estimations for the Measurements Provided in Table 1

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
J2306 +3648	A	23 06 06.195	36 48 54.78	0.06	0.06	0.085	0.647	0.080	149.79	0.08	2016.658	iT24 1x60s I-filter
	B	23 06 06.503	36 48 48.24					0.085	36.18			
J2309 +5506	A	23 09 58.658	55 06 48.14	0.07	0.07	0.099	0.933	0.083	46.12	0.08	2016.658	iT24 1x60s V-filter
	B	23 09 59.322	55 06 50.26					0.084	44.20			
J2309 +5506	A	23 09 58.653	55 06 48.20	0.08	0.07	0.106	1.012	0.130	144.89	0.13	2016.658	iT24 1x60s I-filter.
	B	23 09 59.314	55 06 50.21					0.134	34.50			
J2316 +6109	A	23 16 54.329	61 09 44.11	0.05	0.06	0.078	0.781	0.050	161.97	0.05	2016.669	iT24 1x180s V-filter. SNR B <10
	B	23 16 55.052	61 09 41.78					0.255	3.86			
J2316 +6109	A	23 16 54.331	61 09 44.13	0.06	0.07	0.092	0.896	0.110	153.93	0.11	2016.658	iT24 1x60s I-filter.
	B	23 16 55.075	61 09 41.73					0.122	19.90			
J2325 +1735	A	23 25 48.431	17 35 37.57	0.06	0.08	0.100	0.899	0.074	19.58	0.05	2016.762	iT24 1x360s V-filter. SNR B <10
	B	23 25 48.181	17 35 42.85					0.309	3.08			
J2325 +1735	A	23 25 48.434	17 35 37.43	0.06	0.06	0.085	0.876	0.144	33.59	0.14	2016.658	iT24 1x60s I-filter. SNR B <20.
	B	23 25 48.219	17 35 42.05					0.155	15.69			
J2329 +5625	A	23 29 46.557	56 25 01.56	0.06	0.06	0.085	0.547	0.070	180.63	0.07	2016.658	iT24 5x10s V-filter
	B	23 29 47.434	56 24 56.45					0.085	21.65			
J2329 +5625	A	23 29 46.556	56 25 01.57	0.06	0.06	0.085	0.540	0.120	226.78	0.12	2016.658	iT24 5x10s I-filter.
	B	23 29 47.446	56 24 56.41					0.122	47.27			
J2351 +3749	A	23 51 12.814	37 49 14.92	0.04	0.03	0.050	0.439	0.063	53.30	0.06	2016.669	iT24 1x180s V-filter. SNR B <10
	B	23 51 13.050	37 49 20.81					0.193	5.42			
J2351 +3749	A	23 51 12.815	37 49 14.86	0.06	0.06	0.085	0.793	0.151	76.66	0.15	2016.757	iT24 1x180s I-filter
	B	23 51 13.071	37 49 20.19					0.158	21.78			
J2358 +0907	A	23 58 15.477	09 07 49.92	0.01	0.03	0.032	0.367	0.051	102.30	0.05	2016.669	iT24 1x180s V-filter. SNR B <20
	B	23 58 15.715	09 07 53.37					0.100	11.98			
J2358 +0907	A	23 58 15.475	09 07 49.91	0.08	0.09	0.120	1.320	0.110	120.56	0.11	2016.757	iT24 1x180s I-filter
	B	23 58 15.722	09 07 53.64					0.113	40.36			
J2358 +0907	A	23 58 15.474	09 07 49.91	0.08	0.12	0.144	1.572	0.081	74.86	0.08	2016.757	iT24 1x60s I-filter. SNR B <20
	B	23 58 15.722	09 07 53.67					0.100	17.63			