Measurements of WDS Objects Found in Images Taken for Detecting CPM Pairs in the LSPM Catalog

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

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

Abstract: During our research for CPM objects in the LSPM catalog so far not included in the WDS catalog part II (Knapp and Nanson 2017) we found by chance a surprisingly large number of WDS objects in the field of view of several images taken for this project. To use the existing image material in the best possible way we decided to take measurements of these objects and to look at other existing catalog data allowing a check for potential common proper motion. This report presents the findings of this research

Introduction

During evaluation of the images taken for our CPM/LSPM-project part II, we found a large number of existing WDS objects included in these images so we decided to make a separate report on these objects (with the exception of Kruger 60 – see Follow Up section at the end of this paper) with our own measurements as well as using data from the GAIA DR1 catalog to check for potential common proper motion.

The CPM check was done similar to the LSPM project on the basis of comparison of 2MASS to GAIA DR1 positions allowing a CPM rating according to Knapp/Nanson 2017.

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. The I-filter images were first plate solved with URAT1 as reference catalog for the astrometry results and then again plate solved with USNO B1 as reference catalog for Icmags for the I-band photometry results.

Results of our Research

In Table 1 below we present the WDS catalog data as of the beginning of 2017 in the header line, the GAIA DR1 data in the second line and in the two following lines our own measurements based on images taken with remote telescope iT24. Given below is a description of the table content per column:

- Name gives the discoverer ID of the selected object in the header line.
- RA and Dec give the recent precise coordinates of the A component from the WDS catalog in the header line in the traditional HH:MM:SS DD:MM:SS format and in the data lines from 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

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

  in radians.
- PA gives position angle in degrees in the data lines calculated as

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

  in radians depending on quadrant.
- M1 and M2 give WDS Vmags in the header line for

A and B and Gmags in the GAIA DR1 line, and the next two lines give the measured V- and Imags from our own images.

- pmRA1 and pmDE1 with e_pm1 give the WDS proper motion data for A and pmRA2, pmDE2 and e_pm2 for B in the header line and in the GAIA DR1 line the values calculated by comparison with 2MASS positions.
- Spc1 and Spc2 give in the header line the WDS spectral class range for A and B if given in the WDS catalog and in the iT24 I-filter image lines the spectral class range based on the V-I color index taking into consideration also the error range of the measured Imags using the table provided by the Space Telescope Science Institute (http://www.stsci.edu/~inr/intrins.html).
- 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 between 2MASS .and GAIA DR1 (see Appendix A).
- And last, Source/Notes indicates the source used (images and catalogs) and additional explanations if considered necessary.

Summary

Of a total of 32 objects only 2 can be considered solid CPM candidates, while 30 objects are most probably optical pairs with 25 objects showing a “solid” CCC CPM rating meaning optical for sure. For a good part of the objects, the current WDS data was confirmed but also a good part of the objects were obviously in need of precise measurements, not only for separation and position angle, but especially also for magnitudes. For SEI 1137 AC, proper motion data for both components was available directly from the GAIA DR1 catalog with slightly different values compared with our calculation 2MASS to GAIA DR1 – but considering the given error range these values correspond reasonably well. The WDS data for the two objects LDS 6010 AB and LDS 5962 AB seem especially suspect to a degree suggesting bogus.

Follow Up

Kruger 60 is another WDS object we found in our images used for this report. KR 60 is a complex multiple with most interesting characteristics deserving a separate report, which we intend to finish soon.

Acknowledgements:

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
- GAIA DR1 catalog
- Aladin Sky Atlas v9.0
- SIMBAD, VizieR
- AstroPlanner V2.2
- NASA/ IPAC Infrared Science Archive
- Astrometrica 4.10.1.432

References

Buchheim, R., 2008, "CCD Double-Star Measurements at Altimira Observatory in 2007", *Journal of Double Star Observations*, **4**, Page 28: Formulas for calculating Separation and Position Angle from the RA/Dec coordinates

Jordi, C.; Gebran, M.; Carrasco, J. M.; de Bruijne J.; Voss, H.; Fabricius, C.; Knude, J.; Vallenar, A.; Kohley, R.; Mora A., 2010, "Gaia broad band photometry", *Astronomy & Astrophysics*, **523**, A48.

Knapp W. and Nanson J., 2017, "A New Concept for Counter-Checking of Assumed CPM Pairs", *JDSO*, **13**, 31-51.

Knapp W. and Nanson J., 2017, "CPM Pairs from LSPM so far not WDS Listed – Part II", *JDSO*, **13**, 447-465.

Table 1: Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
ALI 936 AB	20 29 35.09	+39 01 10.4	10.5	77	11.09	11.46	-1	-5		1	-1						2002		WDS 20296+3901, WDS data as of beginning of 2017
	307.396177	39.019526	10.468	76.860	11.15	11.30	-4.11	-1.89	5.13	-4.35	-1.66	5.13			0.96	Hg	2015.000	BAC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. Weak CPM candidate. PM values too small to be signifi-cant
	307.396183	39.019525	10.465	76.741	11.11	11.96									0.61	C	2016.658		iT24 1x60s V-filter
	307.396167	39.019533	10.469	76.916	11.06	10.51							B9.5-F1	K5-M0	0.61	C	2016.658		iT24 1x60s I-filter. Spc range according to V-I color index
SEI 1137 AC	20 29 35.09	+39 01 10.4	22.1	310	11.09	11.41	-1	-5		2	-18						2002		WDS 20296+3901, WDS data as of beginning of 2017
	307.396177	39.019526	22.024	309.650	11.15	11.31	-4.11	-1.89	5.13	-4.95	-14.15	5.13			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. Parallax data in GAIA: A = 1.68 (1951.45 LY), B = 2.33 (1388.84 LY)
							-3.83	-5.42	2.77	-5.71	-14.68	1.63			0.96	Hg	2015.000	CCC	GAIA DR1. PM data directly from GAIA DR1 catalog. Overlapping Plx error range would with very small probability allow for gravitational relationship
	307.396183	39.019525	22.036	309.645	11.11	11.43									0.61	C	2016.658		iT24 1x60s V-filter
	307.396167	39.019533	22.008	309.605	11.06	10.95							B9.5-F1	F2-K0	0.61	C	2016.658		iT24 1x60s I-filter. Spc range according to V-I color index
DAM 315 AB	20 29 17.60	+39 01 12.2	9.6	283	13.40	13.80	11	-24		-7	-12						2010		WDS 20293+3901, WDS data as of beginning of 2017
	307.323377	39.019958	10.265	280.715	13.41	13.85	6.53	-26.82	5.58	-6.54	-19.17	5.58			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	307.323383	39.019950	10.285	280.759	13.61	14.12									0.61	C	2016.658		iT24 1x60s V-filter
	307.323379	39.019947	10.283	280.705	13.01	13.42							F8-K2	G3-K3	0.61	C	2016.658		iT24 1x60s I-filter. Spc range according to V-I color index
SEI 1134 AB	20 29 10.36	+39 19 14.4	3.9	32	11.38	11.60	-9	-15									2004		WDS 20292+3919, WDS data as of beginning of 2017
	307.293147	39.320590	3.846	31.722	11.39	12.06	3.21	-3.41	5.13	3.40	-3.24	5.58			0.96	Hg	2015.000	BAC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	307.293146	39.320597	3.793	31.336	11.59	12.13									0.61	C	2016.658		iT24 1x60s V-filter
	307.293146	39.320589	3.805	31.634	11.32	11.95							A7-G0	A4-F5	0.61	C	2016.658		iT24 1x60s I-filter. Spc range according to V-I color index
ALI 1144 AB	20 28 56.04	+39 24 10.4	11.1	166	11.80	12.20	-5	2		3	-6						2010		WDS 20290+3924, WDS data as of beginning of 2017
	307.233504	39.403037	11.562	164.782	11.83	12.27	-2.08	3.00	5.58	3.64	-2.24	5.58			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	307.233500	39.403028	11.572	164.846	12.15	12.52									0.61	C	2016.658		iT24 1x60s V-filter
	307.233492	39.403039	11.578	164.736	11.45	11.98							G3-K3	F2-K1	0.61	C	2016.658		iT24 1x60s I-filter. Spc range according to V-I color index

Table 1 continues on next page.

Table 1 (continued). Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
POU 8 AB	00 11 49.18	+25 31 08.3	22.0	278	11.31	13.03	30	6		-7	-8						2010		WDS 00119+2531, WDS data as of beginning of 2017
	2.955073	25.519079	22.198	277.651	11.42	12.82	32.08	8.77	5.36	-5.64	-7.13	5.36			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	2.955100	25.519111	22.255	277.228	11.51	13.02									0.61	C	2016.658		iT24 stack 5x10s V-filter
	2.955088	25.519075	22.258	277.564	10.64	12.06							K0-K4	K1-K5	0.61	C	2016.658		iT24 1x60s I-filter. Spc from V-I color index
ST! 1711 AB	01 54 43.26	+57 29 44.1	8.2	33	12.00	12.20	-5	-4		6	-1						2011		WDS 01547+5730, WDS data as of beginning of 2017
	28.680237	57.495556	8.111	32.711	12.72	11.44	-4.12	-5.74	5.94	8.57	-5.80	5.94			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	28.680242	57.495533	8.150	32.282	12.83	11.98									0.61	C	2016.672		iT24 1x180s V-filter
	28.680229	57.495539	8.200	31.926	12.38	10.69							F2-K0	K4-K7	0.61	C	2016.738		iT24 1x60s I-filter. Spc from V-I color index
CHE 303 AB	20 19 00.11	+14 55 31.7	20.5	260	9.97	11.00	9	-2		-9	-4						2010		WDS 20190+1456, WDS data as of beginning of 2017
	304.750459	14.925449	20.554	259.384	11.68	12.00	0.81	-3.00	5.22	-4.27	-10.05	5.22			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	304.750779	14.925503	21.541	259.650	11.80	11.97							A6-F8	F5-K1	0.61	C	2016.666		iT24 1x60s I-filter. Image quality questionable. SNR B<20. Spc from V-I color index
	304.750463	14.925458	20.561	259.321	12.03	12.56									0.61	C	2016.669		iT24 1x180s V-filter
CHE 300 AB	20 18 48.25	+14 42 31.0	40.1	320	9.39	9.93	12	-21		-1	-1		G0				2013		WDS 20188+1442, WDS data as of beginning of 2017
	304.701090	14.708525	40.267	319.023	10.70	12.44	4.48	-23.45	5.22	-1.39	-6.70	5.22			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	304.701479	14.708689	39.554	320.612	11.02	12.82							B8-A9	B3-A6	0.61	C	2016.666		iT24 1x60s I-filter. Image quality questionable. SNR A and B <20. Spc from V-I color index
	304.701125	14.708567	40.233	318.817	10.99	12.66									0.61	C	2016.669		iT24 1x180s V-filter
CHE 296 AB	20 18 38.20	+14 45 20.8	29.6	24	12.93	13.13	-30	-4		9	0						2010		WDS 20186+1444, WDS data as of beginning of 2017
	304.659151	14.755749	29.634	23.819	12.70	12.91	-10.72	-11.70	5.22	-0.91	-4.49	5.22			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	304.657375	14.755792	30.256	25.227	13.11	13.11							B3.5-A3	B8-A9	0.61	C	2016.666		iT24 1x60s I-filter. Image quality questionable. SNR A and B <20. Spc from V-I color index
	304.659158	14.755767	29.603	23.875	12.86	13.06									0.61	C	2016.669		iT24 1x180s V-filter

Table 1 continues on next page.

Table 1 (continued). Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
ES 2506 AB	20 22 32.24	+36 55 54.8	6.0	149	11.90	12.90	4	2									2006		WDS 20226+3656, WDS data as of beginning of 2017. NOTE: WDS coordinates are incorrect and are for UCAC4 635-095467 (Vmag 10.602), also identified as HD 229142 (Mag. 10.76). ES 2506 A is located 55" north of that star at a position angle of 354 degrees. The GAIA coordinates shown on the next line correctly identify the location of ES 2506 A.
	305.632450	36.947132	5.746	150.306	11.62	12.30	-0.77	-10.07	5.58	1.73	-3.02	5.58			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	305.632454	36.947139	5.733	150.295	11.83	12.70									0.61	C	2016.658		iT24 1x60s V-filter
	305.632454	36.947139	5.733	150.295	10.87	11.40							K1-K5	K5-K7	0.61	C	2016.658		iT24 1x60s I-filter. Spc from V-I color index
BRT 2190 AB	21 12 24.47	+06 55 23.5	3.7	13	12.70	12.80	-41	-160		3	11						2000		WDS 21124+0656, WDS data as of beginning of 2017
	318.101913	6.923110	3.686	13.089	12.45	12.85	-6.72	-22.78	5.92	-10.56	-19.16	5.92			0.96	Hg	2015.000	CBC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	318.101917	6.923083	3.777	12.988	12.60	13.03									0.61	C	2016.669		iT24 1x60s V-filter
	318.101879	6.923056	3.741	15.229	11.94	12.30							G0-K2	G5-K3	0.61	C	2016.800		iT24 1x180s I-filter. Spc from V-I color index
STI 2799 AB	22 29 15.11	+57 42 44.0	13.6	338	11.50	12.10	30	-9		-8	-3						2010		WDS 22292+5743, WDS data as of beginning of 2017
	337.313175	57.712179	14.109	336.785	11.66	13.01	26.05	-8.44	5.56	-10.24	0.69	5.56			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	337.313204	57.712192	14.122	336.492	11.99	13.20									0.61	C	2016.658		iT24 1x60s V-filter
	337.313208	57.712192	14.125	336.568	10.60	12.10							K5-M0	K3-K5	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
STI 2798 AB	22 29 09.86	+57 43 51.3	12.8	40	12.09	13.10	-2	-3		0	1						2010		WDS 22291+5744, WDS data as of beginning of 2017
	337.291304	57.731048	12.755	41.729	11.44	12.49	-12.63	-6.41	5.56	-4.17	2.60	5.56			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	337.291308	57.731067	12.744	41.669	12.28	12.74									0.61	C	2016.658		iT24 1x60s V-filter
	337.291308	57.713053	12.788	41.687	10.06	11.48							M2-M4	K4-K7	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
BAR 60 AB	22 29 24.91	+57 45 42.7	5.1	224	12.70	13.70	52	44		-12	-22						2009		WDS 22293+5746, WDS data as of beginning of 2017
	337.354057	57.761960	5.474	224.492	12.72	13.52	35.01	22.67	5.56	-3.56	-2.72	5.56			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	337.354083	57.761981	5.523	224.639	13.11	13.78									0.61	C	2016.658		iT24 1x60s V-filter
	337.354088	57.761975	5.518	224.580	11.69	12.51							K5-M0	K4-K7	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index

Table 1 continues on next page.

Table 1 (continued). Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
BKO 912 AB	22 29 26.89	+57 43 51.4	7.8	220	13.96	15.14	7	0									2009		WDS 22295+5743, WDS data as of beginning of 2017
	337.362078	57.730940	7.809	220.961	13.89	15.10	0.00	0.54	5.56	1.69	2.86	5.56			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	337.362079	57.730964	7.848	220.698	14.18	15.42									0.61	C	2016.658		iT24 1x60s V-filter
	337.362075	57.730953	7.860	220.467	12.89	14.07							K4-K7	K5-K7	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
BKO 910 AB	22 28 25.32	+57 37 12.2	8.8	81	13.57	14.63	-8	-4		-3	-9						2009		WDS 22284+5737, WDS data as of beginning of 2017
	337.105481	57.620060	9.079	80.273	13.45	14.51	-10.82	6.48	6.04	-11.37	4.38	6.04			0.96	Hg	2015.000	CAC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	337.105475	57.620050	9.074	80.484	13.68	14.88									0.61	C	2016.658		iT24 1x60s V-filter
	337.105471	57.620056	9.099	80.447	12.50	13.33							K4-K7	K5-M1	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
BKO 911 AB	22 28 27.08	+57 38 33.9	6.2	288	13.13	13.80	13	-5		-7	28						2009		WDS 22285+5739, WDS data as of beginning of 2017
	337.112797	57.642753	6.183	287.455	13.49	15.06	-6.29	5.21	6.04	-7.98	5.25	6.04			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	337.112800	57.642758	6.140	286.852	14.31	15.58									0.61	C	2016.658		iT24 1x60s V-filter
	337.112783	57.642753	6.121	287.297	12.14	13.97						M2-M4	K7-M1		0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
STI 2788 AB	22 27 56.74	+57 37 16.4	10.7	252	10.81	12.30	2	-5		-7	-7						2009		WDS 22279+5738, WDS data as of beginning of 2017
	336.986421	57.621207	10.904	252.224	10.82	13.32	-0.95	-22.87	7.89	-5.77	-23.99	7.89			0.96	Hg	2015.000	CBC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	336.986429	57.621197	10.915	252.236	10.91	13.49									0.61	C	2016.658		iT24 1x60s V-filter
	336.986425	57.621200	10.932	252.375	10.03	12.42							K0-K4	K2-K5	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
BKO 909 AC	22 27 56.74	+57 37 16.4	4.7	63	10.81	13.80	1	-4									2009		WDS 22279+5738, WDS data as of beginning of 2017; confirmed PMRA1 and PMDEC1 listed in WDS for the primary in the AC component designation is not the same as the numbers listed for the primary in the AB designation.
	336.986421	57.621207	4.530	61.854	10.82	14.40	-0.95	-22.87	7.89	-2.72	-15.89	7.89			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	336.986429	57.621197	4.341	62.418	10.91	14.34									0.61	C	2016.658		iT24 1x60s V-filter. SNR C<20
	336.986425	57.621200	4.223	62.654	10.03	13.27							K0-K4	K2-K5	0.61	C	2016.658		iT24 5x10s I-filter. SNR C<20. Spc from V-I color index

Table 1 continues on next page.

Table 1 (continued). Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
HJ 1771 AB	22 27 40.96	+57 29 09.6	13.9	210	10.87	12.70	-4	-4		-8	-3		B1				2010		WDS 22276+5730, WDS data as of beginning of 2017
	336.920615	57.486029	14.267	210.035	10.51	12.23	9.40	-22.05	7.41	1.35	-29.58	7.41			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	336.920629	57.486017	14.246	209.982	10.68	12.40									0.61	C	2016.658		iT24 1x60s V-filter
	336.920650	57.486031	14.238	210.002	9.53	11.18							K4-K7	K4-K7	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
STI 2780 AB	22 26 49.38	+57 39 50.9	13.4	146	11.76	12.68	-5	-8		-3	-4						2010		WDS 22268+5740, WDS data as of beginning of 2017
	336.705683	57.664108	13.000	146.330	11.16	12.33	-4.29	-15.32	8.39	-2.67	-8.07	8.39			0.96	Hg	2015.000	ACC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. Not a particularly good CPM candidate.
	336.705683	57.664106	13.008	146.282	11.30	12.62									0.61	C	2016.658		iT24 1x60s V-filter
	336.705692	57.664100	12.995	146.287	10.23	11.24							K3-K5	K5-M0	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
BKO 907 AB	22 27 05.80	+57 42 04.2	6.5	158	13.89	14.48	-6	-4		30	-99						2010		WDS 22271+5742, WDS data as of beginning of 2017
	336.774163	57.701165	6.351	159.306	13.83	14.33	5.04	-10.72	8.91	6.51	-3.24	8.91			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	336.774158	57.701156	6.302	158.906	14.14	15.11									0.61	C	2016.658		iT24 1x60s V-filter
	336.774146	57.701161	6.341	158.498	12.75	12.92							K5-M0	M2-M4	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index
BKO 908 AB	22 27 09.51	+57 41 50.7	5.7	6	13.57	15.61	-6	-15		-3	29						2009		WDS 22272+5742, WDS data as of beginning 2017
	336.789617	57.697420	5.411	6.600	13.79	16.14	4.14	-4.94	8.91	-3.52	-9.17	9.31			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	336.789629	57.697417	5.448	7.610	14.55	16.56									0.61	C	2016.658		iT24 1x60s V-filter
	336.789608	57.697414	5.459	9.125	12.43	15.27							M1-M3	K4-K7	0.61	C	2016.658		iT24 5x10s I-filter. SNR B<20. Spc from V-I color index
DOB 9003 AB	22 27 14.27	+57 49 39.8	45.0	224	9.66	10.76	-3	-4		-4	-4		B8V				2012		WDS 22272+5750, WDS data as of beginning of 2017
	336.809630	57.827706	45.036	223.992	9.65	10.60	4.56	8.21	8.91	-3.24	8.86	8.91			0.96	Hg	2015.000	CAC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. Parallax data in GAIA: A = 0.94 (3469.82 LY), B = 1.81 (1802.01 LY)
							-2.13	-1.80	1.14	-5.40	-1.53	2.53			0.96	Hg	2015.000	CCC	GAIA DR1. PM data directly from GAIA DR1 catalog. GAIA PM numbers at variance with 2MASS-GAIA DR comparison, however URAT1 PM data is similar to 2MASS-GAIA DR1 comparison. Parallax comparison indicates the distances are well outside range of any possible gravitational relationship
	336.809588	57.827278	45.059	223.803	9.73	10.67									0.61	C	2016.658		iT24 1x60s V-filter
	336.809633	57.827708	45.015	223.984	8.91	9.77							G8-K4	K0-K5	0.61	C	2016.658		iT24 5x10s I-filter. Spc from V-I color index

Table 1 continues on next page.

Table 1 (continued). Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
J 3175 AB	22 34 53.63	+45 26 07.6	4.4	138	13.50	13.60	-19	4		2	-1						2006		WDS 22350+4527, WDS data as of beginning of 2017
	338.723437	45.435442	4.521	137.792	13.34	13.47	-0.94	-2.18	5.23	-1.03	-3.56	5.23			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	338.723479	45.435425	4.482	138.171	13.49	13.66									0.61	C	2016.658		iT24 stack 5x10s V-filter
	338.723446	45.435439	4.503	137.872	12.58	12.63							K0-K5	K2-K5	0.61	C	2016.658		iT24 stack 1x60s I-filter. Spc from V-I color index
J 3175 AC	22 34 53.63	+45 26 07.6	9.2	20	13.50	13.50	-19	4		-5	1						2006		WDS 22350+4527, WDS data as of beginning of 2017
	338.723437	45.435442	9.172	20.298	13.34	13.42	-0.94	-2.18	5.23	-2.10	-3.39	5.23			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	338.723479	45.435425	9.166	19.872	13.49	13.58									0.61	C	2016.658		iT24 stack 5x10s V-filter
	338.723446	45.435439	9.169	20.285	12.58	12.43							K0-K5	K4-K6	0.61	C	2016.658		iT24 stack 1x60s I-filter. Spc from V-I color index
LDS 5962 AB	22 36 13.59	+57 46 39.8	3.9	40	15.20	17.50	55	35									1999		WDS 22363+5746, WDS data as of beginning of 2017
	339.056649	57.777696	3.850	37.967	17.15	16.42	2.09	-7.46	6.19	-5.01	-4.08	5.76			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	339.056771	57.777644	4.238	40.342	17.91	17.39									0.61	C	2016.658		iT24 1x60s V-filter. SNR A<10 and SNR B<20. B brighter than A. WDS indicates some proper motion, comparison 2MASS to GAIA DR1 results in little to no PM. Looks to some degree like a mismatch with J2236+5746 nearby but the parameters do not match up well, although separation (3.657) and PA (48.9) are similar.
	339.056650	57.777697	3.910	39.202	16.30	15.48						K7-M1	M0-M2		0.61	C	2016.658		iT24 stack 1x60s I-filter. SNR A<20. Spc from V-I color index
LDS 6010 AB			5.0	258													1960		WDS 23099+5513. Data shown is here from OBS1 (there are only two WDS observations shown for this object)

Table 1 concludes on next page.

Table 1 (conclusion). Measurements for WDS objects found in the existing CPM LSPM II images. Headline data from the WDS catalog per beginning of 2017

Name	RA	Dec	Sep"	PA°	M1	M2	pmRA1	pmDec1	e_pm1	pmRA2	pmDec2	e_pm2	Spc1	Spc2	Ap	Me	Date	CPM Rat	Source/Notes
LDS 6010 AB	23 09 56.39	+55 12 50.7	5.1	280	16.30	16.40	302	16									1998		WDS 23099+5513, WDS data as of beginning of 2017. This is the OBS2 data.
	347.484956	55.214101	5.224	277.375	18.17	17.22	1.10	5.32	17.27	-10.75	-6.08	9.71			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. This line uses the components identified in WDS OBS2 dated 1998. Note: 2MASS position errors rather high for both components.
	347.482433	55.214287	9.381	259.313	17.22	17.82	-10.85	-6.08	9.71	-2.59	-9.06	5.30			0.96	Hg	2015.000	CCC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. This line uses as the primary the WDS B component and the component referred to below in the I-filter line, , resulting in a PA similar to that in WDS OBS1 dated 1960.
															0.61	C	2016.658		iT24 1x60s V-filter. No resolution of both components - have to be fainter than 18Vmag
	347.482604	55.214344	9.489	259.434	16.00	16.66									0.61	C	2016.658		iT24 1x60s I-filter. No resolution of A - has to be fainter than 17 Imag. Taking component B as primary we get a potential substitute with a PA matching the first observation but not the separation. Given WDS mags might be in best case Imags. Also given PM obviously wrong. Very suspect object
LDS 5088 AB	23 26 33.32	+17 35 23.6	218.3	251	15.70	17.97	126	-58		106	-36						1997		WDS 23265+1736, WDS data as of beginning of 2017
	351.639408	17.589606	218.528	251.006	14.86	17.13	133.24	-60.65	8.05	106.93	-34.59	7.88			0.96	Hg	2015.000	CCB	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data.
	351.639475	17.589572	218.627	251.047	13.71	15.89							M2-M4	M3->M4	0.61	C	2016.658		iT24 stack 1x60s I-filter. Spc from V-I color index
	351.639483	17.589564	218.438	250.971	15.89	18.33									0.61	C	2016.669		iT24 1x180s V-filter
GWP 3300 AB	23 26 35.81	+17 35 26.2	111.4	320	13.50	17.10	-28	-72		-30	-72						1997		WDS 23266+1735, WDS data as of beginning of 2017
	351.649139	17.590277	111.441	319.767	13.74	16.41	-18.45	-77.16	8.05	-20.01	-77.49	8.56			0.96	Hg	2015.000	AAC	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. Solid CPM candidate
	351.649129	17.590236	111.407	319.743	12.88	15.13							K5-M0	M3-M4	0.61	C	2016.658		iT24 stack 1x60s I-filter. Spc from V-I color index
	351.649129	17.590219	111.422	319.797	14.34	17.55									0.61	C	2016.669		iT24 1x180s V-filter
STF 3042 AB	23 51 52.40	+37 53 28.4	5.7	86	7.62	7.75	-72	-74		-72	-74		F5				2015.000		WDS 23519+3753, WDS data as of beginning of 2017
	357.967935	37.890921	5.728	86.316	7.52	7.63	-63.99	-76.01	6.56	-58.37	-75.25	6.56			0.96	Hg	2015.000	AAB	GAIA DR1. PM data calculated from position comparison with 2MASS. M1 and M2 are GAIA Gmag data. Solid CPM candidate
	357.967871	37.890897	5.937	87.297	7.73	7.82									0.61	C	2016.658		iT24 5x10s V-filter
	357.967867	37.890883	5.741	86.405	7.71	7.82							B9-F0	B9-F0	0.61	C	2016.658		iT24 stack 1x60s I-filter. Spc from V-I color index

Appendix A

Explanation of the CPM rating scheme according to Knapp and 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”

Measurements of WDS Objects Found in Images Taken for Detecting CPM Pairs in the LSPM Catalog

Appendix B

The following Table 2 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:

- 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 $\sqrt{[dVmag^2 + (2.5*Log_{10}(1+1/SNR))^2]}$
- SNR as signal to noise ratio for the given object

Table 2. Error estimations for Table 1 provided measurements for the given objects:

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
ALI 936	A	20 29 35.084	39 01 10.29	0.05	0.06	0.078	0.428	0.070	381.42	0.07	2016.658	iT24 1x60s V-filter
	B	20 29 35.958	39 01 12.69					0.070	302.23			
	A	20 29 35.080	39 01 10.32	0.05	0.06	0.078	0.427	0.130	286.98	0.13	2016.658	iT24 1x60s I-filter. Spc range according to V-I color index
	B	20 29 35.955	39 01 12.69					0.130	302.88			
SEI 1137	A	20 29 35.084	39 01 10.29	0.05	0.06	0.078	0.203	0.070	381.42	0.07	2016.658	iT24 1x60s V-filter
	C	20 29 33.628	39 01 24.35					0.070	337.68			
	A	20 29 35.080	39 01 10.32	0.05	0.06	0.078	0.203	0.130	286.98	0.13	2016.658	iT24 1x60s I-filter. Spc range according to V-I color index
	B	20 29 33.625	39 01 24.35					0.130	339.25			
DAM 315	A	20 29 17.612	39 01 11.82	0.05	0.06	0.078	0.435	0.070	150.07	0.07	2016.658	iT24 1x60s V-filter
	B	20 29 16.745	39 01 13.74					0.071	116.41			
	A	20 29 17.611	39 01 11.81	0.05	0.06	0.078	0.435	0.130	133.97	0.13	2016.658	iT24 1x60s I-filter. Spc range according to V-I color index
	B	20 29 16.744	39 01 13.72					0.130	112.75			
SEI 1134	A	20 29 10.355	39 19 14.15	0.05	0.06	0.078	1.180	0.070	270.63	0.07	2016.658	iT24 1x60s V-filter
	B	20 29 10.525	39 19 17.39					0.071	108.98			
	A	20 29 10.355	39 19 14.12	0.05	0.06	0.078	1.176	0.130	158.68	0.13	2016.658	iT24 1x60s I-filter. Spc range according to V-I color index
	B	20 29 10.527	39 19 17.36					0.130	114.07			
ALI 1144	A	20 28 56.040	39 24 10.90	0.05	0.06	0.078	0.387	0.070	200.96	0.07	2016.658	iT24 1x60s V-filter
	B	20 28 56.301	39 23 59.73					0.070	201.35			
	A	20 28 56.038	39 24 10.94	0.05	0.06	0.078	0.386	0.130	206.93	0.13	2016.658	iT24 1x60s I-filter. Spc range according to V-I color index
	B	20 28 56.301	39 23 59.77					0.130	189.64			
POU 8	A	00 11 49.224	25 31 08.80	0.02	0.03	0.036	0.093	0.041	165.75	0.04	2016.658	iT24 stack 5x10s V-filter
	B	00 11 47.593	25 31 11.60					0.042	84.69			
POU 8	A	00 11 49.221	25 31 08.67	0.06	0.06	0.085	0.218	0.130	320.30	0.13	2016.658	iT24 1x60s I-filter. Spc from V-I color index
	B	00 11 47.591	25 31 11.60					0.130	171.59			
STI 1711	A	01 54 43.258	57 29 43.92	0.08	0.08	0.113	0.795	0.070	152.69	0.07	2016.672	iT24 1x180s V-filter
	B	01 54 43.798	57 29 50.81					0.070	230.33			
	A	01 54 43.255	57 29 43.94	0.09	0.11	0.142	0.993	0.130	100.29	0.13	2016.738	iT24 1x60s I-filter. Spc from V-I color index
	B	01 54 43.793	57 29 50.90					0.130	188.11			

Table 2 continues on next page.

Measurements of WDS Objects Found in Images Taken for Detecting CPM Pairs in the LSPM Catalog

Table 2 (continued). Error estimations for Table 1 provided measurements for the given objects:

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
	A	01 54 43.255	57 29 43.94	0.09	0.11	0.142	0.993	0.130	100.29	0.13	2016.738	iT24 1x60s I-filter. Spc from V-I color index
	B	01 54 43.793	57 29 50.90					0.130	188.11			
CHE 303	A	20 19 00.111	14 55 31.65	0.05	0.06	0.078	0.218	0.070	362.79	0.07	2016.669	iT24 1x180s V-filter
	B	20 18 58.717	14 55 27.84					0.070	356.96			
	A	20 19 00.187	14 55 31.81	0.12	0.12	0.170	0.451	0.159	19.95	0.15	2016.666	iT24 1x60s I-filter. Image quality questionable. SNR B<20. Spc from V-I color index
	B	20 18 58.725	14 55 27.94					0.163	16.33			
CHE 300	A	20 18 48.270	14 42 30.84	0.05	0.06	0.078	0.111	0.070	390.43	0.07	2016.669	iT24 1x180s V-filter
	B	20 18 46.444	14 43 01.12					0.070	349.20			
	A	20 18 48.355	14 42 31.28	0.12	0.12	0.170	0.246	0.160	18.63	0.15	2016.666	iT24 1x60s I-filter. Image quality questionable. SNR A and B <20. Spc from V-I color index
	B	20 18 46.625	14 43 01.85					0.171	12.90			
CHE 296	A	20 18 38.198	14 45 20.76	0.05	0.06	0.078	0.151	0.070	301.12	0.07	2016.669	iT24 1x180s V-filter
	B	20 18 39.024	14 45 47.83					0.070	302.79			
	A	20 18 38.250	14 45 20.85	0.12	0.12	0.170	0.321	0.176	11.41	0.15	2016.666	iT24 1x60s I-filter. Image quality questionable. SNR A and B <20. Spc from V-I color index
	B	20 18 39.139	14 45 48.22					0.181	10.29			
ES 2506	A	20 22 31.789	36 56 49.70	0.06	0.05	0.078	0.780	0.050	241.35	0.05	2016.658	iT24 1x60s V-filter
	B	20 22 32.026	36 56 44.72					0.051	143.50			
	A	20 22 31.789	36 56 49.70	0.06	0.06	0.085	0.848	0.120	242.51	0.12	2016.658	iT24 1x60s I-filter. Spc from V-I color index
	B	20 22 32.026	36 56 44.72					0.120	168.71			
BRT 2190	A	21 12 24.460	06 55 23.10	0.06	0.11	0.125	1.900	0.050	169.45	0.05	2016.669	iT24 1x60s V-filter
	B	21 12 24.517	06 55 26.78					0.050	183.23			
	A	21 12 24.451	06 55 23.00	0.07	0.08	0.106	1.627	0.150	265.06	0.15	2016.800	iT24 1x180s I-filter. Spc from V-I color index
	B	21 12 24.517	06 55 26.61					0.150	123.63			
STI 2799	A	22 29 15.169	57 42 43.89	0.06	0.07	0.092	0.374	0.070	261.95	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 14.466	57 42 56.84					0.070	158.88			
	A	22 29 15.170	57 42 43.89	0.07	0.07	0.099	0.402	0.130	130.72	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 14.469	57 42 56.85					0.131	67.67			
STI 2798	A	22 29 09.914	57 43 51.84	0.06	0.07	0.092	0.414	0.070	230.81	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 10.972	57 44 01.36					0.070	200.75			
	A	22 29 09.914	57 43 51.79	0.07	0.07	0.099	0.444	0.130	166.10	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 10.976	57 44 01.34					0.131	91.14			
BAR 60	A	22 29 24.980	57 45 43.13	0.06	0.07	0.092	0.956	0.071	126.76	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 24.495	57 45 39.20					0.071	115.94			
	A	22 29 24.981	57 45 43.11	0.07	0.07	0.099	1.028	0.131	76.95	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 24.497	57 45 39.18					0.132	51.53			
BKO 912	A	22 29 26.899	57 43 51.47	0.06	0.07	0.092	0.673	0.071	106.82	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 26.260	57 43 45.52					0.072	61.28			
	A	22 29 26.898	57 43 51.43	0.07	0.07	0.099	0.722	0.132	45.64	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 26.261	57 43 45.45					0.138	23.70			
BKO 910	A	22 28 25.314	57 37 12.18	0.06	0.07	0.092	0.582	0.070	139.20	0.07	2016.658	iT24 1x60s V-filter
	B	22 28 26.428	57 37 13.68					0.072	73.38			
	A	22 28 25.313	57 37 12.20	0.07	0.07	0.099	0.623	0.131	56.93	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 28 26.430	57 37 13.71					0.133	37.56			

Table 2 continues on next page.

Measurements of WDS Objects Found in Images Taken for Detecting CPM Pairs in the LSPM Catalog

Table 2 (continued). Error estimations for Table 1 provided measurements for the given objects:

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
CHE 303	A	20 19 00.111	14 55 31.65	0.05	0.06	0.078	0.218	0.070	362.79	0.07	2016.669	iT24 1x180s V-filter
	B	20 18 58.717	14 55 27.84					0.070	356.96			
	A	20 19 00.187	14 55 31.81	0.12	0.12	0.170	0.451	0.159	19.95	0.15	2016.666	iT24 1x60s I-filter. Image quality questionable. SNR B<20. Spc from V-I color index
	B	20 18 58.725	14 55 27.94					0.163	16.33			
CHE 300	A	20 18 48.270	14 42 30.84	0.05	0.06	0.078	0.111	0.070	390.43	0.07	2016.669	iT24 1x180s V-filter
	B	20 18 46.444	14 43 01.12					0.070	349.20			
	A	20 18 48.355	14 42 31.28	0.12	0.12	0.170	0.246	0.160	18.63	0.15	2016.666	iT24 1x60s I-filter. Image quality questionable. SNR A and B <20. Spc from V-I color index
	B	20 18 46.625	14 43 01.85					0.171	12.90			
CHE 296	A	20 18 38.198	14 45 20.76	0.05	0.06	0.078	0.151	0.070	301.12	0.07	2016.669	iT24 1x180s V-filter
	B	20 18 39.024	14 45 47.83					0.070	302.79			
	A	20 18 38.250	14 45 20.85	0.12	0.12	0.170	0.321	0.176	11.41	0.15	2016.666	iT24 1x60s I-filter. Image quality questionable. SNR A and B <20. Spc from V-I color index
	B	20 18 39.139	14 45 48.22					0.181	10.29			
ES 2506	A	20 22 31.789	36 56 49.70	0.06	0.05	0.078	0.780	0.050	241.35	0.05	2016.658	iT24 1x60s V-filter
	B	20 22 32.026	36 56 44.72					0.051	143.50			
	A	20 22 31.789	36 56 49.70	0.06	0.06	0.085	0.848	0.120	242.51	0.12	2016.658	iT24 1x60s I-filter. Spc from V-I color index
	B	20 22 32.026	36 56 44.72					0.120	168.71			
BRT 2190	A	21 12 24.460	06 55 23.10	0.06	0.11	0.125	1.900	0.050	169.45	0.05	2016.669	iT24 1x60s V-filter
	B	21 12 24.517	06 55 26.78					0.050	183.23			
	A	21 12 24.451	06 55 23.00	0.07	0.08	0.106	1.627	0.150	265.06	0.15	2016.800	iT24 1x180s I-filter. Spc from V-I color index
	B	21 12 24.517	06 55 26.61					0.150	123.63			
STI 2799	A	22 29 15.169	57 42 43.89	0.06	0.07	0.092	0.374	0.070	261.95	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 14.466	57 42 56.84					0.070	158.88			
	A	22 29 15.170	57 42 43.89	0.07	0.07	0.099	0.402	0.130	130.72	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 14.469	57 42 56.85					0.131	67.67			
STI 2798	A	22 29 09.914	57 43 51.84	0.06	0.07	0.092	0.414	0.070	230.81	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 10.972	57 44 01.36					0.070	200.75			
	A	22 29 09.914	57 43 51.79	0.07	0.07	0.099	0.444	0.130	166.10	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 10.976	57 44 01.34					0.131	91.14			
BAR 60	A	22 29 24.980	57 45 43.13	0.06	0.07	0.092	0.956	0.071	126.76	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 24.495	57 45 39.20					0.071	115.94			
	A	22 29 24.981	57 45 43.11	0.07	0.07	0.099	1.028	0.131	76.95	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 24.497	57 45 39.18					0.132	51.53			
BKO 912	A	22 29 26.899	57 43 51.47	0.06	0.07	0.092	0.673	0.071	106.82	0.07	2016.658	iT24 1x60s V-filter
	B	22 29 26.260	57 43 45.52					0.072	61.28			
	A	22 29 26.898	57 43 51.43	0.07	0.07	0.099	0.722	0.132	45.64	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 29 26.261	57 43 45.45					0.138	23.70			
BKO 910	A	22 28 25.314	57 37 12.18	0.06	0.07	0.092	0.582	0.070	139.20	0.07	2016.658	iT24 1x60s V-filter
	B	22 28 26.428	57 37 13.68					0.072	73.38			
	A	22 28 25.313	57 37 12.20	0.07	0.07	0.099	0.623	0.131	56.93	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 28 26.430	57 37 13.71					0.133	37.56			

Table 2 continues on next page.

Measurements of WDS Objects Found in Images Taken for Detecting CPM Pairs in the LSPM Catalog

Table 2 (continued). Error estimations for Table 1 provided measurements for the given objects:

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
BKO 911	A	22 28 27.072	57 38 33.93	0.06	0.07	0.092	0.860	0.071	99.27	0.07	2016.658	iT24 1x60s V-filter
	B	22 28 26.340	57 38 35.71					0.073	48.36			
	A	22 28 27.068	57 38 33.91	0.07	0.07	0.099	0.927	0.131	68.34	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 28 26.340	57 38 35.73					0.136	25.86			
STI 2788	A	22 27 56.743	57 37 16.31	0.06	0.07	0.092	0.484	0.070	268.47	0.07	2016.658	iT24 1x60s V-filter
	B	22 27 55.449	57 37 12.98					0.070	146.59			
	A	22 27 56.742	57 37 16.32	0.07	0.07	0.099	0.519	0.130	163.51	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 27 55.445	57 37 13.01					0.131	60.05			
BKO 909	A	22 27 56.743	57 37 16.31	0.06	0.07	0.092	1.217	0.070	268.47	0.07	2016.658	iT24 1x60s V-filter. SNR C<20
	C	22 27 57.222	57 37 18.32					0.093	17.05			
	A	22 27 56.742	57 37 16.32	0.07	0.07	0.099	1.343	0.130	163.51	0.13	2016.658	iT24 5x10s I-filter. SNR C<20. Spc from V-I color index
	C	22 27 57.209	57 37 18.26					0.148	14.84			
HJ 1771	A	22 27 40.951	57 29 09.66	0.06	0.07	0.092	0.371	0.070	304.95	0.07	2016.658	iT24 1x60s V-filter
	B	22 27 40.068	57 28 57.32					0.070	197.57			
	A	22 27 40.956	57 29 09.71	0.07	0.07	0.099	0.398	0.130	209.22	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 27 40.073	57 28 57.38					0.130	101.69			
STI 2780	A	22 26 49.364	57 39 50.78	0.06	0.07	0.092	0.406	0.070	315.53	0.07	2016.658	iT24 1x60s V-filter
	B	22 26 50.264	57 39 39.96					0.070	212.87			
	A	22 26 49.366	57 39 50.76	0.07	0.07	0.099	0.436	0.130	159.06	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 26 50.265	57 39 39.95					0.130	104.05			
BKO 907	A	22 27 05.798	57 42 04.16	0.06	0.07	0.092	0.838	0.071	110.27	0.07	2016.658	iT24 1x60s V-filter
	B	22 27 06.081	57 41 58.28					0.072	62.90			
	A	22 27 05.795	57 42 04.18	0.07	0.07	0.099	0.894	0.132	50.42	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 27 06.085	57 41 58.28					0.132	47.01			
BKO 908	A	22 27 09.511	57 41 50.70	0.06	0.07	0.092	0.970	0.071	87.62	0.07	2016.658	iT24 1x60s V-filter
	B	22 27 09.601	57 41 56.10					0.080	26.94			
	A	22 27 09.506	57 41 50.69	0.07	0.07	0.099	1.039	0.131	59.94	0.13	2016.658	iT24 5x10s I-filter. SNR B<20. Spc from V-I color index
	B	22 27 09.614	57 41 56.08					0.163	10.54			
DOB 9003	A	22 27 14.301	57 49 39.82	0.06	0.07	0.092	0.117	0.070	384.79	0.07	2016.658	iT24 1x60s V-filter
	B	22 27 10.396	57 49 07.30					0.070	346.90			
	A	22 27 14.312	57 49 39.75	0.07	0.07	0.099	0.126	0.130	158.01	0.13	2016.658	iT24 5x10s I-filter. Spc from V-I color index
	B	22 27 10.398	57 49 07.36					0.130	182.92			
J 3175	A	22 34 53.635	45 26 07.53	0.04	0.04	0.057	0.723	0.054	55.17	0.05	2016.658	iT24 stack 5x10s V-filter
	B	22 34 53.919	45 26 04.19					0.055	48.91			
J 3175	A	22 34 53.627	45 26 07.58	0.06	0.06	0.085	1.079	0.141	84.44	0.14	2016.658	iT24 stack 1x60s I-filter. Spc from V-I color index
	B	22 34 53.914	45 26 04.24					0.140	112.81			
J 3175	A	22 34 53.635	45 26 07.53	0.04	0.04	0.057	0.354	0.054	55.17	0.05	2016.658	iT24 stack 5x10s V-filter
	C	22 34 53.931	45 26 16.15					0.053	57.09			

Table 2 concludes on next page.

Measurements of WDS Objects Found in Images Taken for Detecting CPM Pairs in the LSPM Catalog

Table 2 (conclusion). Error estimations for Table 1 provided measurements for the given objects:

Name		RA	Dec	dRA	dDec	Err Sep	Err PA	Err Mag	SNR	dmag	Date	Notes
J 3175	A	22 34 53.627	45 26 07.58	0.06	0.06	0.085	0.530	0.141	84.44	0.14	2016.658	iT24 stack 1x60s I-filter. Spc from V-I color index
	C	22 34 53.929	45 26 16.18					0.140	141.22			
LDS 5962	A	22 36 13.625	57 46 39.52	0.07	0.07	0.099	1.338	0.121	10.45	0.07	2016.658	iT24 1x60s V-filter. SNR A<10 and SNR B<20. B brighter than A. WDS indicates some proper motion, comparison 2MASS to GAIA DR1 results in little to no PM. Looks to some degree like a mis-match with J2236+5746 nearby but the parameters do not match really good
	B	22 36 13.968	57 46 42.75					0.096	15.87			
	A	22 36 13.596	57 46 39.71	0.06	0.07	0.092	1.351	0.159	14.07	0.14	2016.658	iT24 stack 1x60s I-filter. SNR A<20. Spc from V-I color index
	B	22 36 13.905	57 46 42.74					0.146	26.46			
LDS 6010	A					-					2016.658	iT24 1x60s V-filter. No resolution of both components - have to be fainer than 18Vmag
	B											
	A	23 09 55.825	55 12 51.64	0.08	0.07	0.106	0.642	0.139	21.10	0.13	2016.658	iT24 1x60s I-filter. No resolution of A - has to be fainter than 17Imag. Taking component B as primary we get a potential substitute with a PA matching the first observation but not the separation. Given WDS mags might be in best case Imags. Also given PM obviously wrong. Very suspect object
	B	23 09 54.735	55 12 49.90					0.157	11.84			
LDS 5088	A	23 26 33.476	17 35 22.43	0.05	0.05	0.071	0.019	0.061	89.75	0.06	2016.669	iT24 1x180s V-filter
	B	23 26 19.034	17 34 11.21					0.080	20.14			
	A	23 26 33.474	17 35 22.46	0.06	0.06	0.085	0.022	0.141	90.23	0.14	2016.658	iT24 stack 1x60s I-filter. Spc from V-I color index
	B	23 26 19.013	17 34 11.45					0.145	27.86			
GWP 3300	A	23 26 35.791	17 35 24.79	0.05	0.05	0.071	0.036	0.060	173.49	0.06	2016.669	iT24 1x180s V-filter
	B	23 26 30.761	17 36 49.89					0.070	28.93			
	A	23 26 35.791	17 35 24.85	0.06	0.06	0.085	0.044	0.140	137.18	0.14	2016.658	iT24 stack 1x60s I-filter. Spc from V-I color index
	B	23 26 30.756	17 36 49.87					0.142	43.60			
STF 3042	A	23 51 52.289	37 53 27.23	0.06	0.06	0.085	0.819	0.070	333.37	0.07	2016.658	iT24 5x10s V-filter
	B	23 51 52.790	37 53 27.51					0.070	257.37			
	A	23 51 52.288	37 53 27.18	0.07	0.07	0.099	0.988	0.160	211.61	0.16	2016.658	iT24 stack 1x60s I-filter. Spc from V-I color index
	B	23 51 52.772	37 53 27.54					0.160	208.06			