2126 Common Proper Motion Pairs so far not WDS Listed

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

Abstract: This report covers 2126 common proper motion pairs so far (per April 2018) not WDS listed. The pairs come with a separation between 5 and 25 arcseconds and are considered to be probably physical based on identical proper motion speed and direction within the given error range. For each pair an observation history covering 2MASS, UCAC4, UCAC5 and GAIA DR1 is given. Several other catalogs like for example USNO A2, SDSS1, PS1 etc. were also checked and provide an observation history if only for a part of the listed objects. Estimated visual magnitudes are calculated for each object using GAIA DR1 G-band and 2MASS J/H/K-band magnitude data

1. Introduction

The surprisingly large number of CPM pairs found with less than 5 arcseconds separation (based on UCAC5 proper motion data, see Knapp 2018) was the motivation to have a closer look at the separation range of 5 to 25 arcseconds with the expectation to find even more such objects. The number of UCAC5 stars with up to 25 arcseconds distance to stars nearby is far beyond 100 million because virtually any UCAC5 star meets this condition and many even more often than once. As it is rather difficult to handle a list with such a number of objects in a first step, all stars with a proper motion speed of less than 30 mas/yr and a proper motion error larger than 2 mas/yr were eliminated. This reduced the number of stars by a factor 100 to slightly above one million with then only about 5,500 pairs with a separation between 5 and 25 arcseconds. Using the extended common proper motion assessment scheme presented in Knapp 2018 on this data reduced the number of pairs being potentially physical to about 3,300.

2. Object list

Next a multi-step drill down process was applied:

- After cross-matching with 2MASS, all objects with a photometry quality flag less than "AAA" were deleted
- After cross-matching with WDS and WDSS, all objects already listed as double stars were eliminated
- All objects with a CPM score of less than 74% were eliminated to concentrate on the most promising pairs.

The number of pairs fulfilling these criteria was 2,126.

Finally, other catalogs were checked for matches to expand the observation history of the reported objects.

The availability of GAIA DR1 Gmags and 2MASS J/H/K-mags for all objects made it possible to calculate an estimated visual magnitude for all objects.

The statistics for successful cross-matches are the following:

- GAIA DR1, UCAC5, 2MASS and UCAC4: 2,126 objects or 100%
- WISE: 1,826 objects or 86%
- GSC 2.3.2: 1,646 objects or 77%
- PS1: 1,316 objects or 62%
- USNO B1: 1,076 objects or 51%
- URAT1: 1,042 objects or 49%
- USNO A2: 986 objects or 46%
- SDSS9: 571 objects or 27%
- Tycho-2: 42 objects or 2%.

The data for the first 20 objects are given in Table 1. The complete data set with 2,126 objects is available for download from the JDSO web site as "2126_CPM_Report".

Table 2 gives for the first 20 objects the rating re-

(Text continues on page 593)

Table 1: First 20 Objects of 2,126 CPM Pairs so far not WDS Listed

KPP n+	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Ap	Me	Date	N	Source/Notes
1	54.3115553	-65.7500769	5.013	220.349	11.846	13.530	4.6	37.2	1.56	2.4	38	1.98	74	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Probably physical
	54.3115042	-65.7502450	5.000	219.917	11.599	13.543	4.6	37.2	1.56	2.4	38	1.98	74	0.20	Eu	1998.706		UCAC5. M1 and M2 are fmag values
	54.3114380	-65.7502290	4.979	219.966	11.785	13.554								1.30	E2	2000.018		2MASS. M1 and M2 estimated from J- and K-band
	54.3114963	-65.7502509	5.040	219.492	11.519		13.9	47.1	2.82			70.71		0.20	Eu	1992.425		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	54.3115553	-65.7500768	5.013	220.348	11.351	13.255	5.22	37.75	0.92					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
2	126.1804856	52.1383086	5.019	58.291	10.968	12.798	-20.7	-41.7	1.84	-19.8	-39.1	1.98	78	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most probably physical
	126.1805967	52.1384461	4.994	58.519	10.726	12.470	-20.7	-41.7	1.84	-19.8	-39.1	1.98	78	0.20	Eu	2003.125		UCAC5. M1 and M2 are fmag values
	126.1805220	52.1385370	5.115	61.635	14.444	14.564								2.50	Es	2000.263		SDSS9. M1 and M2 are SDSS9 gmags
	126.1806200	52.1385190	4.983	58.946	11.002	12.630								1.30	E2	1999.817		2MASS. M1 and M2 estimated from J- and K-band
	126.1806195	52.1384881	4.779	58.402	10.749		-25.7	-36.5	8.28	36.1	-3.3	3.26		0.20	Eu	1997.563		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	126.1806185	52.1385164	4.982	58.937	10.739		-18.4	-49.1	5.80	-22.9	-46.6	5.80		0.20	Eu	2013.854		URAT1. M1 and M2 are Vmags
	126.1804397	52.1384009	4.956	62.122	12.854	13.119								1.80	C	2011.201		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	126.1804856	52.1383087	5.019	58.291	10.678	12.269	-21.5	-39.8	1.16					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
3	6.3392964	-41.2207564	5.038	217.846	12.275	14.710	11.3	-67.5	1.27	11.4	-68.9	2.33	100	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most certainly physical
	6.3392289	-41.2204517	5.022	218.026	12.046	14.561	11.3	-67.5	1.27	11.4	-68.9	2.33	100	0.20	Eu	1998.757		UCAC5. M1 and M2 are fmag values
	6.3392630	-41.2206590	4.810	219.167	10.031	11.006								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	6.3392380	-41.2205010	4.984	217.721	12.196	14.280								1.30	E2	1999.580		2MASS. M1 and M2 estimated from J- and K-band
	6.3392524	-41.2204681	5.042	218.770	12.099		30.5	-38.3	10.64					0.20	Eu	1997.668		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	6.3392964	-41.2207563	5.038	217.844	11.846	13.928	11.35	-67.4	0.88					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
4	24.9130719	65.9194442	5.066	195.217	10.953	12.264	38.5	-15	1.70	37.6	-17.2	1.84	78	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most probably physical
	24.9127764	65.9194914	5.040	195.178	10.695	12.010	38.5	-15	1.70	37.6	-17.2	1.84	78	0.20	Eu	2003.719		UCAC5. M1 and M2 are fmag values
	24.9129070	65.9194740	4.852	196.227	9.127	9.998								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	24.9126670	65.9195180	4.998	194.675	10.846	12.046								1.30	E2	1999.810		2MASS. M1 and M2 estimated from J- and K-band
	24.9126506	65.9194767	4.930	195.677	10.604		38.1	22.1	38.45	41.3	-13.6	12.95		0.20	Eu	2002.945		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	24.9126719	65.9195165	4.996	194.683	10.583		37.7	-19.9	5.90	33	-20.8	5.80		0.20	Eu	2013.543		URAT1. M1 and M2 are Vmags
	24.9130719	65.9194443	5.066	195.217	10.617	11.843	37.93	-16.1	1.80					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
5	166.7862200	-31.9055053	5.091	248.751	11.144	13.355	-50.2	10.7	1.41	-48.7	10.8	1.98	97	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	166.7864806	-31.9055522	5.115	248.829	10.808	13.069	-50.2	10.7	1.41	-48.7	10.8	1.98	97	0.20	Eu	1999.159		UCAC5. M1 and M2 are fmag values
	166.7863550	-31.9055500	4.956	252.543	9.193	10.558								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	166.7865000	-31.9055610	5.087	249.279	10.936	13.115								1.30	E2	1999.197		2MASS. M1 and M2 estimated from J- and K-band
	166.7864799	-31.9055439	5.185	249.165	10.918		-37	19.1	3.48	-111	25.1	2.55		0.20	Eu	1991.560		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	166.7862201	-31.9055052	5.091	248.754	10.775	12.803	-50.2	11.68	1.03					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags

Table 1 continues on the next page.

Table 1 (continued): First 20 Objects of 2,126 CPM Pairs so far not WDS Listed

KPP n+	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Ap	Me	Date	N	Source/Notes
6	210.2326747	-17.2925067	5.102	328.891	10.412	13.222	33.6	-21.9	1.56	31.5	-22.3	2.69	92	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	210.2325228	-17.2924122	5.092	329.232	10.207	13.010	33.6	-21.9	1.56	31.5	-22.3	2.69	92	0.20	Eu	1999.439		UCAC5. M1 and M2 are fmag values
	210.2326650	-17.2924860	5.024	331.472	8.862	10.416								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	210.2325250	-17.2924100	5.103	328.846	10.133	13.156								1.30	E2	1999.167		2MASS. M1 and M2 estimated from J- and K-band
	210.2325315	-17.2924231	5.111	329.210	10.257		38.9	-29.2	3.70			70.71		0.20	Eu	1993.685		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	210.2326748	-17.2925067	5.102	328.886	10.123	12.700	31.57	-21.9	0.99					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
7	316.0311447	18.6125975	5.113	61.381	11.519	12.881	3.2	-32.1	1.84	2.2	-31.8	1.84	92	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	316.0311319	18.6127172	5.123	61.491	11.450	12.818	3.2	-32.1	1.84	2.2	-31.8	1.84	92	0.20	Eu	2001.566		UCAC5. M1 and M2 are fmag values
	316.0311830	18.6126340	5.058	60.164	10.140	11.023								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	316.0311550	18.6127340	5.085	61.269	11.545	12.758								1.30	E2	2000.356		2MASS. M1 and M2 estimated from J- and K-band
	316.0311359	18.6127259	5.095	61.361	11.320		5.6	-33.2	2.62	15.3	-30.9	8.30		0.20	Eu	1997.890		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	316.0311550	18.6127371	5.085	61.284	11.306		-0.8	-30.7	6.20	-0.4	-30.7	6.20		0.20	Eu	2013.489		URAT1. M1 and M2 are Vmags
	316.0311448	18.6125979	5.226	60.888	11.678	13.102								1.80	C	2010.438		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	316.0311446	18.6125975	5.113	61.381	11.319	12.564	-0.58	-34	4.09					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
8	221.5637636	-12.6785533	5.152	74.375	11.805	13.914	-31.8	8.2	1.56	-33.4	8.5	2.12	92	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	221.5639930	-12.6785050	5.359	71.513	11.840									1.20	Pp	1996.120		GSC 2.3.2. M1 and M2 are Vmags
	221.5639008	-12.6785878	5.177	74.503	11.695	13.805	-31.8	8.2	1.56	-33.4	8.5	2.12	92	0.20	Eu	1999.807		UCAC5. M1 and M2 are fmag values
	221.5638480	-12.6785770	5.265	73.473	10.076	10.795								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	221.5639280	-12.6785520	5.168	74.525	11.644	13.692								1.30	E2	2001.114		2MASS. M1 and M2 estimated from J- and K-band
	221.5639122	-12.6785817	5.184	74.620	11.621		-34.4	6	3.72	134.8	53.9	1.98		0.20	Eu	1989.295		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	221.5637637	-12.6785533	5.137	74.205	13.744	14.330								1.80	C	2011.951		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	221.5637637	-12.6785533	5.152	74.373	11.500	13.288	-31.5	9.654	0.97					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
9	129.2552858	5.1260622	5.157	284.833	12.770	14.738	-19.6	29.5	1.70	-20.5	30.3	2.55	92	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	129.2553667	5.1259408	5.140	284.744	12.702	14.588	-19.6	29.5	1.70	-20.5	30.3	2.55	92	0.20	Eu	2000.196		UCAC5. M1 and M2 are fmag values
	129.2552700	5.1260250	5.356	283.726	10.887	11.939								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	129.2553470	5.1259590	5.146	284.751	13.126	15.248	4	24	4.24					2.50	Es	2002.120		SDSS9. M1 and M2 are SDSS9 gmags
	129.2553540	5.1259390	5.137	285.113	12.700	14.647								1.30	E2	2000.136		2MASS. M1 and M2 estimated from J- and K-band
	129.2553616	5.1259462	5.121	284.667	12.565		-16	28	4.25					0.20	Eu	1998.065		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	129.2553544	5.1259377	5.136	285.111	12.565		-17.6	33.6	5.90	-18.7	30.7	6.00		0.20	Eu	2013.745		URAT1. M1 and M2 are Vmags
	129.2553064	5.1260465	5.225	285.107	12.812	15.157								1.80	C	2012.129		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	129.2552858	5.1260623	5.156	284.829	12.467	14.178								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags

Table 1 continues on the next page.

Table 1 (continued): First 20 Objects of 2,126 CPM Pairs so far not WDS Listed

KPP n+	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Ap	Me	Date	N	Source/Notes
10	0.8907633	19.5741111	5.174	331.158	11.028	13.222	50.5	-27.8	1.56	49	-27.6	1.84	100	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most certainly physical
	0.8905536	19.5742200	5.162	331.334	10.854	13.046	50.5	-27.8	1.56	49	-27.6	1.84	100	0.20	Eu	2000.906		UCAC5. M1 and M2 are fmag values
	0.8906290	19.5741910	5.524	332.498	9.415	11.077								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	0.8906320	19.5741570	5.187	331.739	13.536	13.481								2.50	Es	2009.057		SDSS9. M1 and M2 are SDSS9 gmags
	0.8904900	19.5742530	5.203	331.664	11.120	13.028								1.30	E2	1998.882		2MASS. M1 and M2 estimated from J- and K-band
	0.8905374	19.5742339	5.084	331.266	10.835		57.1	-45.7	16.33	14.3	35.4	5.87		0.20	Eu	1997.955		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	0.8905087	19.5742436	5.201	331.644	10.850		57.2	-29.2	5.50	56.8	-33	5.60		0.20	Eu	2013.680		URAT1. M1 and M2 are Vmags
	0.8907198	19.5739705	5.562	334.876	11.545	13.364								1.80	C	2012.779		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	0.8907635	19.5741112	5.174	331.145	10.772	12.806	48.8	-27.6	2.32					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
11	118.2314992	36.5296644	5.174	249.002	13.056	13.751	-32.2	-17.1	1.56	-30.6	-18.9	1.84	74	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Probably physical
	118.2316439	36.5297261	5.185	249.322	12.845	13.645	-32.2	-17.1	1.56	-30.6	-18.9	1.84	74	0.20	Eu	2002.017		UCAC5. M1 and M2 are fmag values
	118.2315430	36.5296790	5.077	250.273	10.407	11.368								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	118.2316500	36.5297420	5.172	248.993	15.609	14.504								2.50	Es	2000.905		SDSS9. M1 and M2 are SDSS9 gmags
	118.2317050	36.5297430	5.212	249.164	12.718	13.547								1.30	E2	1998.274		2MASS. M1 and M2 estimated from J- and K-band
	118.2316622	36.5297323	5.122	249.388	12.553		-24.4	-15.6	6.58	-48.1	-24.7	6.63		0.20	Eu	2001.100		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	118.2316828	36.5297343	5.203	249.154	12.553		-37.6	-17.5	5.20	-31.5	-15.9	5.20		0.20	Eu	2013.851		URAT1. M1 and M2 are Vmags
	118.2315271	36.5296836	5.265	248.662	13.472	14.008								1.80	C	2012.695		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	118.2314993	36.5296645	5.174	249.003	12.509	13.308								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
12	91.4534211	-35.9047958	5.188	196.416	12.416	12.852	-6.6	31.5	1.56	-8.3	33.7	1.56	78	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most probably physical
	91.4534572	-35.9049356	5.214	196.023	12.262	12.690	-6.6	31.5	1.56	-8.3	33.7	1.56	78	0.20	Eu	1999.022		UCAC5. M1 and M2 are fmag values
	91.4534360	-35.9047960	5.030	195.569	10.569	10.407								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	91.4534400	-35.9049110	5.189	196.083	12.350	12.742								1.30	E2	1999.751		2MASS. M1 and M2 estimated from J- and K-band
	91.4534529	-35.9049109	5.354	195.960	11.761	11.761	11.8	89.3	1.98	-33.1	-66.3	19.51		0.20	Eu	1995.180		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	91.4534212	-35.9047959	5.187	196.424	12.072	12.405								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
13	61.4343900	-44.7184294	5.191	55.654	11.420	13.703	17.9	39.1	1.56	14.8	39.2	1.98	78	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most probably physical
	61.4342769	-44.7186047	5.233	55.989	11.396	13.920	17.9	39.1	1.56	14.8	39.2	1.98	78	0.20	Eu	1998.871		UCAC5. M1 and M2 are fmag values
	61.4343090	-44.7185750	5.202	56.148	11.383	13.508								1.30	E2	1999.649		2MASS. M1 and M2 estimated from J- and K-band
	61.4342706	-44.7185992	5.252	56.170	11.276		-19.6	18	10.56					0.20	Eu	1997.623		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	61.4343899	-44.7184295	5.192	55.655	11.211	13.423	15.82	40.34	1.32					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags

Table 1 continues on the next page.

Table 1 (continued): First 20 Objects of 2,126 CPM Pairs so far not WDS Listed

KPP n+	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Ap	Me	Date	N	Source/Notes
14	135.1290572	-61.2580233	5.216	238.732	12.117	14.480	-61.5	37.5	1.27	-61.1	37.5	2.33	100	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most certainly physical
	135.1296519	-61.2581978	5.221	238.770	11.964	14.412	-61.5	37.5	1.27	-61.1	37.5	2.33	100	0.20	Eu	1998.252		UCAC5. M1 and M2 are fmag values
	135.1295920	-61.2581830	5.222	238.312	11.966	14.095								1.30	E2	2000.010		2MASS. M1 and M2 estimated from J- and K-band
	135.1296242	-61.2581867	5.182	237.593	11.951		-51.7	41.2	2.40					0.20	Eu	1997.273		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	135.1290572	-61.2580233	5.216	238.725	11.748	13.877								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
15	63.9120500	1.4864542	5.227	92.459	13.333	14.172	32.1	-8.9	1.70	32.3	-9.2	1.91	92	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	63.9119169	1.4864911	5.224	92.413	13.398	14.180	32.1	-8.9	1.70	32.3	-9.2	1.91	92	0.20	Eu	2000.069		UCAC5. M1 and M2 are fmag values
	63.9119910	1.4864500	5.212	90.910	11.476	12.036								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	63.9119250	1.4864750	5.172	92.194	13.257	14.187								1.30	E2	2000.062		2MASS. M1 and M2 estimated from J- and K-band
	63.9118977	1.4864828	5.212	92.518	12.901		9.8	-9.5	3.06	38.7	-6	8.07		0.20	Eu	1998.233		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	63.9119242	1.4864752	5.171	92.202	12.901		30.8	-7.1	6.10	31.8	-8.1	6.00		0.20	Eu	2013.409		URAT1. M1 and M2 are Vmags
	63.9120274	1.4864582	5.273	92.209	12.979	14.413								1.80	C	2012.558		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	63.9120500	1.4864541	5.227	92.459	13.018	13.802								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
16	99.8280081	47.1633603	5.235	69.680	12.408	14.260	8.9	-34.2	1.70	7.7	-33.4	2.40	92	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Almost certainly physical
	99.8279644	47.1634750	5.245	69.814	12.324	14.173	8.9	-34.2	1.70	7.7	-33.4	2.40	92	0.20	Eu	2002.909		UCAC5. M1 and M2 are fmag values
	99.8279200	47.1635020	5.228	69.904	12.195	13.961								1.30	E2	1999.786		2MASS. M1 and M2 estimated from J- and K-band
	99.8279665	47.1634978	5.272	72.045			0.2	-31.8	2.69	-27.7	32	4.31		0.20	Eu	2001.455		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	99.8279212	47.1635000	5.227	69.906			14.6	-34.1	5.80	10.9	-33.3	5.80		0.20	Eu	2013.688		URAT1. M1 and M2 are Vmags
	99.8280083	47.1633583	5.233	69.579	12.470	14.491								1.80	C	2012.067		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	99.8280082	47.1633604	5.235	69.679	12.144	13.854								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
17	146.6397911	70.7890761	5.237	23.069	10.574	12.927	-62.7	-44.5	1.63	-62.2	-41.6	2.26	100	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most certainly physical
	146.6403719	70.7892119	5.206	23.156	10.275	12.586	-62.7	-44.5	1.63	-62.2	-41.6	2.26	100	0.20	Eu	2004.025		UCAC5. M1 and M2 are fmag values
	146.6402700	70.7891970	5.243	21.942	8.786	9.927								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. observation date
	146.6405920	70.7892840	5.172	23.244	10.584	12.570								1.30	E2	1999.167		2MASS. M1 and M2 estimated from J- and K-band
	146.6405915	70.7892695	4.859	23.476	10.305		-64.6	-45.1	13.38	-38.2	35.7	22.49		0.20	Eu	2002.125		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	146.6405503	70.7892734	5.171	23.227	10.365		-58.8	-45.5	5.50	-60.9	-45.1	5.50		0.20	Eu	2013.867		URAT1. M1 and M2 are Vmags
	146.6401048	70.7890228	5.327	18.934	10.902	13.433								1.80	C	2012.213		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	146.6397910	70.7890762	5.237	23.071	10.273	12.272	-61.4	-42.7	1.51					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags

Table 1 concludes on the next page.

Table 1 (conclusion): First 20 Objects of 2,126 CPM Pairs so far not WDS Listed

KPP n+	RA	Dec	Sep	PA	M1	M2	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Ap	Me	Date	N	Source/Notes
18	335.4758044	-15.8297022	5.237	88.787	12.024	13.174	40.5	36.6	2.33	40.6	37.4	2.48	100	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most certainly physical
	335.4756258	-15.8298575	5.236	88.917	12.140	13.254	40.5	36.6	2.33	40.6	37.4	2.48	100	0.20	Eu	1999.736		UCAC5. M1 and M2 are fmag values
	335.4757720	-15.8296930	5.312	88.330	10.143	10.838								0.40	Hw	2010.500		WISE. M1 and M2 are 3.35um mid-infrared band magnitudes. Date is approx. obser-vation date
	335.4756460	-15.8298840	5.162	88.681	11.910	13.032								1.30	E2	1998.480		2MASS. M1 and M2 estimated from J- and K-band
	335.4756018	-15.8298478	5.262	88.902	11.664		-16.1	33.2	12.89					0.20	Eu	1997.360		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	335.4758513	-15.8296889	5.087	89.287	12.263	13.460								1.80	C	2011.814		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	335.4758044	-15.8297023	5.237	88.784	11.693	12.710	46.26	49.77	7.88					0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
19	279.7073742	45.6652436	5.247	98.339	13.802	14.903	-39.3	-29.3	1.98	-36	-28.1	2.69	74	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Probably physical
	279.7084900	45.6653240	3.711	97.301	12.570									1.20	Pp	1992.007		GSC 2.3.2. M1 and M2 are Vmags
	279.7075547	45.6653375	5.212	98.541	13.646	14.677	-39.3	-29.3	1.98	-36	-28.1	2.69	74	0.20	Eu	2003.440		UCAC5. M1 and M2 are fmag values
	279.7075910	45.6653370	5.243	98.887	13.679	14.628								1.30	E2	2000.279		2MASS. M1 and M2 estimated from J- and K-band
	279.7076108	45.6653642	5.071	99.765	13.411		-45.9	-24.9	6.16					0.20	Eu	2003.315		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	279.7075950	45.6653385	5.245	98.892	13.411		-38.9	-21.9	6.10	-39.4	-18.7	6.00		0.20	Eu	2013.616		URAT1. M1 and M2 are Vmags
	279.7073775	45.6652478	5.250	98.252	14.079	15.342								1.80	C	2012.497		Pan-STARRS release 1 (PS1) Survey. M1 and M2 are PS1 gmags
	279.7073741	45.6652436	5.248	98.335	13.368	14.294								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags
20	231.9063294	-69.8212378	5.258	286.464	12.973	14.163	-48.7	-31.1	1.41	-49.1	-32.5	1.84	100	0.96	Hg	2015.000	V	GAIA DR1/UCAC5. M1 and M2 estimated from G/J/H/K-mag. PM data from UCAC5. Most certainly physical
	231.9069878	-69.8210928	5.258	286.713	12.933	14.078	-48.7	-31.1	1.41	-49.1	-32.5	1.84	100	0.20	Eu	1998.224		UCAC5. M1 and M2 are fmag values
	231.9069500	-69.8211140	5.348	286.744	12.827	13.967								1.30	E2	2000.219		2MASS. M1 and M2 estimated from J- and K-band
	231.9070048	-69.8211203	5.293	287.784	12.643		3.4	-54	4.10					0.20	Eu	1997.755		UCAC4. Given magnitudes are Vmags. Central epochs averaged
	231.9063295	-69.8212378	5.258	286.458	12.595	13.618								0.96	Hg	2015.000		GAIA DR1. M1 and M2 are Gmags

Content Description

The header line lists the data suggested for the WDS catalog entry, the other lines give the data from catalogs as indicated in the Source/Notes column. Given magnitudes in the header line are estimated Vmags according to Knapp and Nanson 2018 and given magnitudes in the 2MASS lines are estimated Vmags according to Caldwell et al. 1993.

KPPn+ Discoverer ID + running number
RA RA in degrees
Dec Dec in degrees
Sep Sep in arcseconds
PA PA in degrees
M1 Magnitude for the primary
M2 Magnitude for the secondary
pmRA1 RA proper motion in mas/yr for the primary
pmDec1 Dec proper motion in mas/yr for the primary
e_pm1 Proper motion error vector in mas/yr for the primary
pmRA2 RA proper motion in mas/yr for the secondary
pmDec2 Dec proper motion in mas/yr for the secondary
e_pm2 Proper motion error vector in mas/yr for the secondary
CPM score Estimated probability for being physical
Ap Aperture
Me Observation method

2126 Common Proper Motion Pairs so far not WDS Listed

(Continued from page 587)

sults according to the Knapp 2018 CPM assessment scheme, the complete data set with 2,126 objects is available for download at the JDSO web site as "2126_CPM_Rating".

3. GPS1

Finally a look at the GPS1 catalog with proper motion data for 345,274,875 objects based on comparison of PS1 to GAIA DR1 positions – this number of objects seems impressive, but is curiously small compared to the total number of PS1 and GAIA DR1 objects. As currently (mid-April 2018) the CDS X-Match tool does not work with GPS1, it was necessary to resort to manually match the objects of this report with the GPS1 catalog. The match of the 2,160 report objects with PS1 yielded 1,316 pairs, so the expectation is a similar number for GPS1, but only about 140 matches were found with most of them confirming the CPM assessment, but about 25% did not. As this result is to some degree not fully convincing, the GPS1 data was not included in Table 1, but given separately in Appendix B. A few of the "missing" objects were then manually counter-checked – in all cases the primary showed several PS1 objects making it hard to select the correct match, so this might be an explanation for this disappointing small number of GPS1 matches.

To visualize the cases with PS1 ghost stars and different proper motion data between UCAC5 and GPS1 examples are given in Figures 1 and 2.

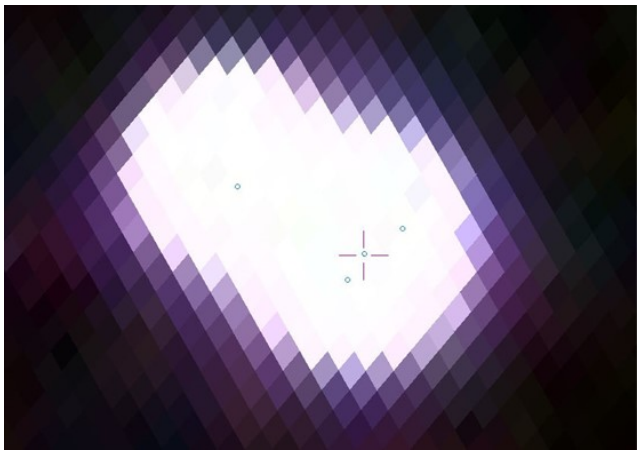

Figure 1. Three PS1 objects for the primary of KPP n+6.

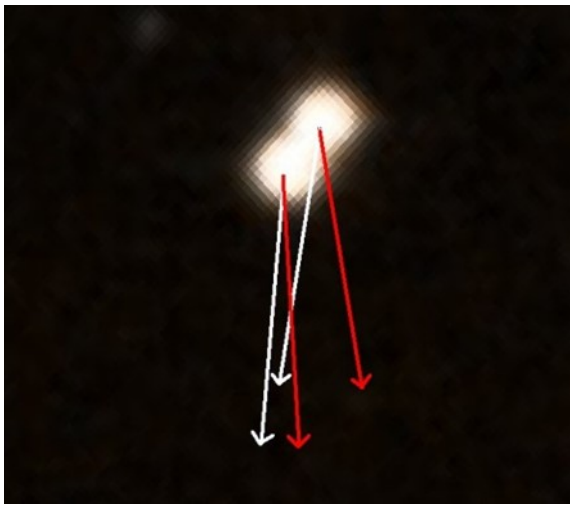

Figure 2. Different PM vectors for KPP n+361 (white UCAC5, red GPS1).

4. Summary

Compared with the 495 CPM objects reported with a separation of 2 to 5 arc seconds (Knapp 2018), the number of 2,126 CPM objects with a separation of 5 to 25 arc seconds seems surprisingly large, because the relationship of such objects in the WDS catalog would suggest only half this number.

A potential follow up to this report might be to take CCD images of these objects to provide one's own astrometry and photometry measurements and to counter-check these objects with the coming second data release of the GAIA catalog providing, hopefully, not only proper motion, but also parallax data for at least a good part of the objects.

5. Acknowledgements

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

- Washington Double Star catalog
- 2MASS All Sky catalog
- GAIA DR1 catalog
- UCAC5 catalog
- PS1 catalog
- GPS1 catalog
- URAT1 catalog
- UCAC4 catalog
- USNO A2 catalog
- USNO B1 catalog
- Tycho-2 catalog
- WISE catalog
- SDSS9 catalog
- CDS X-Match
- CDS VizieR
- Aladin Sky Atlas v9/10

(Text continues on page 595)

2126 Common Proper Motion Pairs so far not WDS Listed

Table 2: CPM Rating of the Listed Objects

KPP n+	PMVD A	PMVD B	PMVL A	PMVL B	CPM Rat	CPM Score	Verbal
1	7.05	3.61	37.48	38.08	BABB	74	Probably physical
2	206.40	206.86	46.56	43.83	ABAB	78	Most probably physical
3	170.50	170.61	68.44	69.84	AAAA	100	Most certainly physical
4	111.29	114.58	41.32	41.35	BAAB	78	Most probably physical
5	282.03	282.50	51.33	49.88	AAAB	97	Almost certainly physical
6	123.10	125.30	40.11	38.59	AABB	92	Almost certainly physical
7	174.31	176.04	32.26	31.88	AABB	92	Almost certainly physical
8	284.46	284.28	32.84	34.46	AABB	92	Almost certainly physical
9	326.40	325.92	35.42	36.58	AABB	92	Almost certainly physical
10	118.83	119.39	57.65	56.24	AAAA	100	Most certainly physical
11	242.03	238.30	36.46	35.97	BABB	74	Probably physical
12	348.17	346.16	32.18	34.71	ABAB	78	Most probably physical
13	24.60	20.68	43.00	41.90	BAAB	78	Most probably physical
14	301.37	301.54	72.03	71.69	AAAA	100	Most certainly physical
15	105.50	105.90	33.31	33.58	AABB	92	Almost certainly physical
16	165.41	167.02	35.34	34.28	AABB	92	Almost certainly physical
17	234.64	236.22	76.89	74.83	AAAA	100	Most certainly physical
18	47.90	47.35	54.59	55.20	AAAA	100	Most certainly physical
19	233.29	232.03	49.02	45.67	ABBB	74	Probably physical
20	237.44	236.50	57.78	58.88	AAAA	100	Most certainly physical

Content Description

KPP n+	Discoverer ID + running number
PMVD° A	Proper motion vector direction primary
PMVD° B	Proper motion vector direction secondary
PMVL A	Proper motion vector length primary in mas/yr
PMVL B	Proper motion vector length secondary in mas/yr
CPM Rat	Overall common proper motion rating for direction, speed, error range, and angular separation in relation to speed (see Appendix A)
CPM Score	Estimated probability for being physical in percent
Verbal	Verbal estimated probability for being physical

(Continued from page 593)

6. References

Caldwell, John A.R., Cousins, A.W.J., Ahlers, C.C., van Wamelen, P. and Maritz, E.J., 1993, "Statistical Relationships Between the Photometric Colours of Common Types of Stars in the UBV(RI)c, JHK and uvby Systems", *South African Astronomical Observatory Circulars,* No. 15.

Knapp, Wilfried R. A. and Nanson, John, 2017, "A New Concept for Counter-Checking of Assumed CPM Pairs", *Journal of Double Star Observations*, **13** (1), 31-51.

Knapp, Wilfried R.A. and Bryant, Tom, 2018, "Reliability of UCAC5 Proper Motion Data for Common Proper Motion Assessment of Double Stars", *JDSO*, **14** (3), 578-587. (this issue)

Knapp, Wilfried R.A. and Nanson, John, 2018, "Estimating Visual Magnitudes for Wide Double Stars", *JDSO*, **14** (3), 496-502. (this issue)

Knapp, Wilfried R.A., 2018, "A New Concept for Counter-Checking of Assumed Binaries, *JDSO*, **14** (3), 487-486. (this issue)

Knapp, Wilfried R.A., 2018, "495 Common Proper Motion Pairs so far not WDS Listed", *JDSO*, **14** (3), 546-551. (this issue)

Appendix A

Description of the CPM Assessment Scheme According to Knapp/Nanson 2017 with Extensions

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

- Proper motion vector direction ratings: "A" for within the error range of identical direction, "B" for similar direction within the double error range, "C" for direction within the triple error range and "D" 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, "C" for length within the triple error range and "D" for outside
- Error size ratings: "A" for error size of less than 5% of the proper motion vector length, "B" for less than 10%, "C" for less than 15% and "D" for a larger error size
- Relationship PM speed to angular separation: "A" for less than 100 years, "B" for less than 1,000 years, "C" for less than 10,000 and "D" for above.

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"
- Proper motion vector length: Max. 5% difference for an "A".

The letter based rating result is then transformed into an estimated probability for being physical given in the column CPM Score (Knapp 2018).

Appendix B

Results of the Match of the Reported 2,126 CPM Pairs with GPS1

KPP n+	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Source/Notes
108	-52.096	-40.167	1.869	-52.327	-40.144	1.722	100	GPS1. Most certainly physical
126	-20.072	-37.937	3.090	-21.732	-37.469	2.309	92	GPS1. Almost certainly physical
127	-27.092	-22.959	1.758	-25.549	-23.621	2.152	92	GPS1. Almost certainly physical
143	-31.409	13.981	2.775	-30.219	13.865	1.890	92	GPS1. Almost certainly physical
146	-27.525	-44.642	4.066	-27.099	-46.500	2.512	92	GPS1. Almost certainly physical
169	-13.044	-26.993	1.396	-14.763	-25.283	1.398	78	GPS1. Most probably physical
187	27.511	-29.762	2.302	26.100	-27.014	2.312	74	GPS1. Probably physical
196	-45.098	2.650	3.265	-48.289	3.896	1.844	74	GPS1. Probably physical
197	12.856	-29.415	1.758	13.673	-30.238	1.720	92	GPS1. Almost certainly physical
203	-49.002	-1.908	4.211	-54.270	2.007	2.484	29	GPS1. Probably optical
233	-10.905	-40.163	2.560	-13.531	-37.998	2.352	74	GPS1. Probably physical
299	-25.206	23.229	2.110	-28.007	22.331	1.930	74	GPS1. Probably physical
310	13.404	-24.569	2.926	17.188	-28.960	1.767	4	GPS1. Almost certainly optical
339	7.253	-32.916	2.595	5.505	-32.471	1.326	92	GPS1. Almost certainly physical
342	-31.569	-3.231	1.543	-33.343	-3.407	1.776	74	GPS1. Probably physical
361	-2.154	-34.226	3.618	-5.619	-32.752	3.311	16	GPS1. Most probably optical
363	-32.294	-15.535	2.709	-33.853	-16.252	1.974	92	GPS1. Almost certainly physical
370	-51.675	-7.431	3.377	-48.955	-5.838	2.591	74	GPS1. Probably physical
373	-1.038	-37.136	2.936	-1.857	-40.494	2.837	74	GPS1. Probably physical
380	40.195	-20.432	1.587	39.967	-21.283	1.256	97	GPS1. Almost certainly physical
397	-44.295	33.127	2.127	-43.472	25.110	1.767	16	GPS1. Most probably optical
400	41.330	-14.360	3.914	42.220	-12.443	2.794	92	GPS1. Almost certainly physical
419	-21.596	-40.390	1.499	-26.676	-27.018	3.783	0	GPS1. Almost certainly optical
454	-59.111	-10.259	3.775	-61.046	-4.491	2.523	74	GPS1. Probably physical
458	48.911	-85.006	2.698	51.299	-80.825	2.879	80	GPS1. Most probably physical
467	5.512	-32.860	2.328	1.305	-37.944	2.064	7	GPS1. Almost certainly optical
470	-31.309	25.730	1.750	-30.128	25.127	1.630	97	GPS1. Almost certainly physical
475	-35.621	0.953	2.145	-37.354	0.205	1.707	92	GPS1. Almost certainly physical
493	-1.179	-37.046	3.395	-1.362	-38.205	2.012	92	GPS1. Almost certainly physical
495	6.714	-46.335	2.587	6.632	-44.639	2.782	92	GPS1. Almost certainly physical
498	-24.303	-21.011	1.987	-24.121	-20.676	1.828	92	GPS1. Almost certainly physical
503	-14.016	44.464	3.673	-14.159	44.858	3.691	92	GPS1. Almost certainly physical
539	-39.021	-14.519	5.512	-38.538	-7.572	3.574	1	GPS1. Almost certainly optical
606	-41.292	-5.801	2.224	-41.845	-6.719	2.006	92	GPS1. Almost certainly physical
631	-6.765	-49.607	2.765	-7.817	-50.356	2.296	92	GPS1. Almost certainly physical
642	37.528	7.417	5.732	39.366	10.876	3.159	50	GPS1. Undecideable
647	-27.759	18.301	1.637	-26.280	18.913	1.501	97	GPS1. Almost certainly physical
657	92.873	21.601	1.966	90.973	20.642	2.087	100	GPS1. Most certainly physical
658	-42.481	-4.559	4.314	-45.532	-6.251	2.026	74	GPS1. Probably physical
664	33.369	-28.690	1.340	31.300	-32.181	1.507	78	GPS1. Most probably physical

Table continues on the next page.

2126 Common Proper Motion Pairs so far not WDS Listed

KPP n+	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Source/Notes
667	-44.206	-28.020	2.800	-41.477	-29.753	2.172	74	GPS1. Probably physical
685	29.332	-18.550	4.187	29.495	-14.176	2.546	12	GPS1. Most probably optical
691	33.498	2.222	2.545	33.451	1.484	2.784	92	GPS1. Almost certainly physical
699	-12.833	-30.111	2.261	-12.315	-29.653	2.105	92	GPS1. Almost certainly physical
704	-17.129	-51.045	1.736	-17.638	-48.711	1.651	97	GPS1. Almost certainly physical
714	-48.576	-27.561	4.131	-48.105	-27.195	2.767	92	GPS1. Almost certainly physical
750	-19.365	-20.511	2.405	-14.787	-18.616	1.820	4	GPS1. Almost certainly optical
763	-12.144	-20.686	2.912	-15.028	-27.044	3.161	4	GPS1. Almost certainly optical
770	8.320	-42.856	2.488	2.191	-28.607	2.183	1	GPS1. Almost certainly optical
807	-37.284	0.642	2.343	-37.430	3.139	1.698	74	GPS1. Probably physical
836	-32.980	-31.625	2.176	-32.489	-32.651	2.180	97	GPS1. Almost certainly physical
853	34.781	-4.130	1.706	36.726	-5.245	2.018	74	GPS1. Probably physical
856	-44.340	-7.566	2.275	-43.877	-6.482	2.472	92	GPS1. Almost certainly physical
889	31.849	-33.394	1.991	32.574	-31.114	2.754	92	GPS1. Almost certainly physical
902	19.772	-8.840	2.372	30.160	-16.260	2.178	3	GPS1. Almost certainly optical
907	21.193	-32.726	2.251	20.030	-30.916	1.419	74	GPS1. Probably physical
917	40.951	-2.131	3.859	43.557	-0.254	2.321	74	GPS1. Probably physical
921	6.428	-35.837	2.732	3.417	-35.754	2.511	74	GPS1. Probably physical
932	-44.027	23.986	2.497	-45.920	21.295	2.212	78	GPS1. Most probably physical
962	22.859	-32.743	2.534	17.621	-29.015	1.910	4	GPS1. Almost certainly optical
967	9.822	-44.052	1.832	9.976	-41.328	2.182	74	GPS1. Probably physical
988	33.688	-4.833	3.476	31.081	-5.549	3.117	62	GPS1. Probably physical
1001	-29.201	-73.726	2.152	-30.310	-74.914	2.136	97	GPS1. Almost certainly physical
1015	-46.665	19.350	1.894	-44.313	20.435	1.960	97	GPS1. Almost certainly physical
1029	55.124	-61.060	2.325	55.718	-58.242	1.831	97	GPS1. Almost certainly physical
1035	-29.412	-46.535	2.725	-29.970	-49.298	2.051	97	GPS1. Almost certainly physical
1054	-10.263	-42.888	1.821	-12.575	-43.509	2.806	92	GPS1. Almost certainly physical
1076	37.396	1.642	3.027	35.481	-1.921	3.029	59	GPS1. Probably physical
1091	17.015	-36.197	6.806	17.341	-43.865	3.722	3	GPS1. Almost certainly optical
1092	-52.220	-4.271	2.864	-53.173	-7.313	2.945	74	GPS1. Probably physical
1123	6.131	27.415	2.922	6.743	27.198	2.913	78	GPS1. Most probably physical
1126	-38.041	-18.850	2.223	-37.129	-17.638	1.979	92	GPS1. Almost certainly physical
1129	-19.977	-34.398	2.720	-21.741	-31.156	2.151	74	GPS1. Probably physical
1142	37.597	24.384	1.714	37.643	25.388	1.834	97	GPS1. Almost certainly physical
1143	-0.829	-46.927	1.833	-3.369	-48.226	2.089	78	GPS1. Most probably physical
1160	-42.571	19.494	1.888	-41.876	22.013	1.823	78	GPS1. Most probably physical
1165	43.853	-3.724	2.680	43.633	-1.945	2.960	92	GPS1. Almost certainly physical
1167	4.995	-37.282	2.102	4.058	-33.377	2.073	37	GPS1. Probably optical
1186	-30.196	-17.632	2.103	-30.747	-15.345	2.104	74	GPS1. Probably physical
1247	4.586	-39.407	2.386	4.473	-37.815	2.139	92	GPS1. Almost certainly physical
1255	18.715	24.695	2.981	19.787	29.180	3.337	29	GPS1. Probably optical

Table concludes on the next page.

2126 Common Proper Motion Pairs so far not WDS Listed

KPP n+	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Source/Notes
1271	-34.427	-8.575	1.783	-32.186	-6.572	1.817	74	GPS1. Probably physical
1286	41.676	-19.387	2.039	39.480	-17.862	1.677	78	GPS1. Most probably physical
1307	-35.219	-3.422	1.892	-39.224	-5.160	2.014	37	GPS1. Probably optical
1317	25.444	-22.618	3.496	22.665	-22.292	1.975	50	GPS1. Undecideable
1330	-28.524	15.137	3.268	-29.234	18.692	2.461	50	GPS1. Undecideable
1357	-22.751	-36.781	1.618	-23.164	-35.403	1.524	97	GPS1. Almost certainly physical
1365	-38.412	-0.263	2.914	-40.816	3.744	1.986	59	GPS1. Probably physical
1367	-14.170	29.714	1.766	-13.616	28.682	1.738	92	GPS1. Almost certainly physical
1398	-22.588	-27.488	2.114	-20.803	-27.732	1.994	92	GPS1. Almost certainly physical
1422	-0.258	-37.772	2.602	0.102	-37.609	2.524	92	GPS1. Almost certainly physical
1431	41.159	-9.459	2.833	37.508	-9.263	2.360	74	GPS1. Probably physical
1435	-19.348	-44.539	2.232	-24.359	-44.984	3.810	59	GPS1. Probably physical
1438	-21.778	-30.514	2.266	-22.910	-25.410	1.916	15	GPS1. Most probably optical
1443	17.804	-38.181	3.944	17.997	-29.769	2.156	1	GPS1. Almost certainly optical
1447	48.122	-63.938	2.775	48.829	-67.481	2.670	97	GPS1. Almost certainly physical
1452	-41.873	-27.197	2.538	-42.954	-26.430	2.634	92	GPS1. Almost certainly physical
1476	-35.483	-7.593	2.246	-35.321	-9.231	1.618	92	GPS1. Almost certainly physical
1481	-36.998	38.051	3.065	-36.099	32.556	2.812	59	GPS1. Probably physical
1499	-11.893	-36.832	2.541	-18.749	-39.025	1.666	7	GPS1. Almost certainly optical
1501	-32.386	-2.569	1.690	-29.763	0.723	1.347	15	GPS1. Most probably optical
1517	10.163	38.523	3.192	13.378	37.468	2.711	74	GPS1. Probably physical
1536	-3.692	-33.631	3.037	-9.587	-35.405	3.000	1	GPS1. Almost certainly optical
1537	-26.987	-16.733	2.884	-25.248	-11.396	1.851	7	GPS1. Almost certainly optical
1612	-54.511	-7.851	2.160	-52.012	-6.773	2.249	97	GPS1. Almost certainly physical
1663	47.262	-6.299	2.229	46.790	-4.685	1.748	97	GPS1. Almost certainly physical
1685	35.554	0.810	2.221	37.039	0.728	2.606	92	GPS1. Almost certainly physical
1719	-29.849	9.823	1.841	-32.341	12.297	1.997	74	GPS1. Probably physical
1729	-33.635	-7.790	2.060	-34.586	-6.179	2.127	74	GPS1. Probably physical
1760	-35.011	-9.585	2.806	-34.277	-9.966	2.318	92	GPS1. Almost certainly physical
1762	45.193	-12.318	2.552	48.717	-8.365	2.709	59	GPS1. Probably physical
1771	-29.597	2.163	2.806	-34.677	1.883	1.691	5	GPS1. Almost certainly optical
1772	23.670	-40.621	2.451	24.402	-41.233	1.874	92	GPS1. Almost certainly physical
1790	34.745	-3.851	2.168	32.226	-0.470	2.484	59	GPS1. Probably physical
1794	-6.829	-36.986	1.656	-8.521	-37.912	1.619	97	GPS1. Almost certainly physical
1798	41.356	10.443	3.193	35.663	6.027	3.297	4	GPS1. Almost certainly optical
1829	33.932	4.170	2.324	35.297	3.792	2.278	92	GPS1. Almost certainly physical
1836	9.161	-38.329	2.123	8.332	-40.111	1.914	92	GPS1. Almost certainly physical
1848	-22.939	31.260	2.207	-21.802	30.125	2.023	92	GPS1. Almost certainly physical
1850	-42.705	-6.589	3.138	-41.012	-13.151	3.116	1	GPS1. Almost certainly optical
1874	26.238	-18.267	3.272	27.103	-24.325	2.994	6	GPS1. Almost certainly optical
1877	24.101	-21.908	2.096	24.834	-19.019	1.751	74	GPS1. Probably physical

2126 Common Proper Motion Pairs so far not WDS Listed

KPP n+	pmRA1	pmDE1	e_pm1	pmRA2	pmDE2	e_pm2	CPM Score	Source/Notes
1882	45.510	10.117	2.190	44.630	7.661	2.267	92	GPS1. Almost certainly physical
1885	17.022	44.864	3.379	18.596	41.270	2.348	59	GPS1. Probably physical
1886	29.189	12.382	1.835	28.470	10.621	1.881	92	GPS1. Almost certainly physical
1895	-50.924	20.428	2.083	-52.173	17.480	1.922	78	GPS1. Most probably physical
1926	28.671	-35.043	1.805	26.316	-37.373	2.466	74	GPS1. Probably physical
1944	40.380	-8.504	2.631	37.337	-9.314	2.464	74	GPS1. Probably physical
1951	-51.578	41.405	2.847	-46.009	38.056	1.607	39	GPS1. Probably optical
1965	-27.708	-1.928	3.466	-30.202	-2.569	2.315	62	GPS1. Probably physical
1977	-14.470	35.045	2.624	-20.500	31.263	1.638	1	GPS1. Almost certainly optical
1995	-15.801	-23.302	1.645	-16.334	-20.600	1.407	59	GPS1. Probably physical
1997	-34.657	-15.039	2.738	-35.893	-16.511	2.871	92	GPS1. Almost certainly physical
2002	-1.881	-40.579	1.623	-1.805	-39.219	1.916	97	GPS1. Almost certainly physical
2027	-24.647	-38.164	2.188	-25.520	-41.711	2.617	74	GPS1. Probably physical
2033	40.192	-15.444	1.981	39.453	-14.071	2.143	92	GPS1. Almost certainly physical
2041	33.912	-30.741	2.219	31.675	-33.447	2.078	78	GPS1. Most probably physical
2049	-5.876	-12.960	3.458	12.259	-24.651	2.771	0	GPS1. Almost certainly optical
2060	11.841	-38.991	4.251	2.036	-36.110	3.126	0	GPS1. Almost certainly optical
2071	-38.785	23.965	3.436	-37.398	32.942	3.511	1	GPS1. Almost certainly optical
2079	15.888	-35.163	1.528	15.120	-36.518	1.666	97	GPS1. Almost certainly physical

Content Description

The basic data for positions, separation and position angle etc. are ident with PS1 and for this reason not given again.

KPPn+ Discoverer ID + running number
pmRA1 RA proper motion in mas/yr for the primary
pmDec1 Dec proper motion in mas/yr for the primary
e_pm1 Proper motion error vector in mas/yr for the primary
pmRA2 RA proper motion in mas/yr for the secondary
pmDec2 Dec proper motion in mas/yr for the secondary
e_pm2 Proper motion error vector in mas/yr for the secondary
CPM score Estimated probability for being physical
Source/Notes Used source plus comments as required