CCD Measurements of 141 Proper Motion Stars: The Autumn 2015 Observing Program at the Brilliant Sky Observatory, Part 3

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Abstract: The use of a Skyris 618C camera on a Celestron C-11 SCT proved to be a reliable means of obtaining accurate data for double star astrometry. 141 systems were examined, with all but one result plotting within the scattered data from the historical measurements.

The Observing Program

From October 23 to December 1, 2015, a vigorous program of measuring double stars with a Skyris 618C CCD camera was done at Brilliant Sky Observatory (Cave Creek, Arizona). Over 18 different nights, over 220 double stars were imaged and their FITS cubes reduced using Plate Solve 3.47B. This report focuses on 141 pairs that share some degree of proper motion.

Equipment Used

The equipment used for this project is described in Harshaw 2016.

Procedure

See Harshaw 2016 for a complete description of the procedure used for these observations.

Results: 141 Pairs That Are Proper Motion Related

This set of measurements deals with stars that share proper motion to some degree. I list three types of proper motion classes, based on the relative differences in the proper motions.

The proper motion of a star can be depicted as a vector. When the resultant of the two vectors is divided by the largest vector, the result will either be zero (or very near it) if the proper motions are identical, somewhere between 20% and 60% of the resultant of the vectors, or over 60% of the resultant. Pairs in the first category are classed as Common Proper Motion pairs, or CPM. Pairs in the second category are classed as Similar Proper Motion pairs (SPM), and those in the third category are classed as Different Proper Motion pairs (DPM).

Some examples might help illustrate the classification scheme.

Case 1 has two stars in which the proper motion (PM) vectors of the stars are +027 +018 for the primary and +026 +018 for the companion. The resultant is found by:

$$R = \sqrt{(27-26)^2 + (18-18)^2}$$

$$R = 1 \text{ mas}$$

The largest vector is that of the primary, for which the value is

$$V = \sqrt{26^2 + 18^2}$$

$$V = 31.6 \text{ mas}$$

The ratio of the resultant to the largest vector is thus 1/31.6 = 3.2%. This is a CPM case.

Case 2 has a pair with PM of -026 +005 for the primary and -018 +009 for the companion. The resultant is 8.94 mas while the largest vector has a scalar value of 26.48 mas. The resultant is 33.7% of the scalar, so this is a SPM pair.

For Case 3, the primary has PM of +038 -076 with a companion of -010 +037. The resultant is 122.7 mas while the scalar for the largest vector is 85.0 mas. The ratio is 69.2%, so this would be a DPM case.

Common proper motion stars are a challenge for double star astrometry. First, they appear to be moving across the sky at the same angular rate. If they are at nearly the same distance (established by accurate parallaxes, which are not always available for both stars of a double), they are probably physically related. If close enough to be gravitationally bound, they are probably a true binary (albeit one with an extremely long period). If too far for gravitational binding (and such binding would depend on the total system mass relative to the orbital velocity of the pair, as noted by Rica [2011]), then the pair probably shares a common origin— perhaps being ejected together from an open star cluster or stellar association.

It might also be the case that stars that show no significant displacement over two or three centuries could be in highly eccentric orbits whose plane is nearly on our line of sight and whose major axis is oriented more or less along our line of sight, and that we are viewing the motion of the companion along one of the longer sides of the orbit as it approaches (or recedes from) earth. In such cases, a star may show no significant angular displacement for thousands of years.

Finally, the two stars may not be related to each other at all. They just happen to share angular motion across the sky. If they are at greatly different distances, this implies that the more remote star has a higher absolute motion through space than the nearer star, but other than that, we cannot make any conclusions about the nature of the system, unless accurate parallaxes for both stars are known and the parallaxes place the stars at significantly different distances (too far apart for gravitational binding).

Discussion

All but one of 141 measurements plotted inside the region of all the historical measurement plots. Only one measurement plotted on the outer edge of the historical grouping (WDS 00142+4612).

The capabilities of the Skyris 618 and an 11-inch SCT to do accurate double star astrometry are well-established.

Recommended Future Observations

Four pairs appear to be physical and warrant extra attention: WDS 00528+5638, WDS 01057+2128, WDS 02053+6740 and WDS 02370+2439.

Three pairs show an optical nature and could use extra observations in the next few decades: WDS 00028+8017, WDS 00352+3650 and WDS 21543+1943.

Four pairs are starting to show what may be a linear trend. These are WDS 00029+7122, WDS 00052+3020, WDS 01420+5547 and WDS 01513+6451.

Acknowledgments

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory. Use was also made of the VizieR service of the Centre de Données astronomiques de Strasbourg and the Hipparcos 2 Output Catalog.

References

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Table 1. Measurements on 141 Proper Motion Pairs

WDS No.	Disc	Comp	Date	Last θ	Last ρ	Last Year	Meas. Made	Meas θ	Meas ρ	Resid θ	Resid ρ	Type	Note
00004+6026	STI1248		2015.855	48.2	12.37	2011	2	48.021	12.254	0.179	0.114	CPM	
00005+6713	HJ 1924		2015.858	225.1	8.20	2010	2	224.761	8.087	0.339	0.113	CPM	
00020+2347	TVB 2		2015.849	292.2	28.07	2010	6	292.166	27.925	0.034	0.145	CPM	
00026+6606	STF3053	AB	2015.833	70.0	14.30	2014	10	70.586	15.159	-0.586	-0.859	SPM	
00027+5958	ARG 47		2015.833	290.0	9.90	2010	6	287.620	9.876	2.380	0.024	DPM	
00028+8017	STF3051		2015.836	23.6	16.69	2010	6	22.827	16.768	0.773	-0.078	CPM	1
00029+7122	STF3052		2015.836	8.7	34.72	2010	6	8.294	34.649	0.406	0.071	SPM	2
00031+0816	STF3054		2015.836	180.0	34.70	2014	6	181.296	33.597	-1.296	1.103	CPM	
00039+2759	HJ 1929	AB, C	2015.904	287.3	5.43	2011	6	288.115	5.138	-0.815	0.292	SPM	
00040+6050	HJ 1930		2015.858	346.4	10.95	2011	2	346.404	10.810	-0.004	0.140	CPM	
00042+2701	SMA 1		2015.852	161.3	13.12	2010	2	161.356	13.382	-0.056	-0.262	CPM	
00043+4235	HJ 1932	AB	2015.882	306.5	7.11	2011	6	307.037	7.155	-0.537	-0.045	CPM	
00052+3020	STF3058		2015.836	52.2	12.60	2012	6	51.267	12.616	0.933	-0.016	CPM	3
00068+5430	ES 611		2015.849	291.0	9.88	2003	2	289.970	10.367	1.030	-0.487	CPM	
00078+5723	HJ 3241		2015.849	8.1	15.04	2014	4	7.976	14.974	0.124	0.066	CPM	
00089+3713	STF 1		2015.836	286.7	9.65	2014	4	286.216	9.855	0.484	-0.205	SPM	
00096+4758	ES 1126		2015.910	318.3	6.36	2008	6	317.634	6.056	0.666	0.304	SPM	
00099+0827	STF 4		2015.904	276.1	5.20	2009	6	276.109	5.243	-0.009	-0.043	CPM	
00099+3014	MLB 552		2015.882	190.0	8.20	2012	8	190.027	8.042	-0.027	0.158	DPM	
00112+4419	ES 1406	AB	2015.890	331.5	9.35	2011	8	333.136	9.686	-1.636	-0.336	SPM	
00114+5205	HJ 1004	AC	2015.890	314.8	25.10	2014	8	315.279	25.207	-0.479	-0.107	DPM	4
00115+2949	MLB 441	AB	2015.852	358.7	14.14	2012	2	358.670	14.138	0.030	0.002	CPM	5
00116-0305	STF 8		2015.836	291.8	7.99	2012	6	291.325	7.621	0.475	0.369	CPM	
00129+6150	ES 1865	AB	2015.858	121.6	23.60	2012	3	123.289	23.712	-1.689	-0.112	DPM	
00137+4934	STF 9		2015.849	164.5	20.19	2003	4	165.411	19.935	-0.911	0.255	CPM	
00138+3612	BU 1341	AB	2015.910	319.0	20.51	2014	8	319.330	20.295	-0.330	0.215	CPM	
00142+4612	ES 1195		2015.910	14.6	6.68	2002	6	12.856	6.788	1.744	-0.104	CPM	6
00148+6250	STF 10	AB	2015.849	176.0	17.60	2012	4	175.664	17.503	0.336	0.097		
00150+0849	STF 12		2015.836	145.0	11.60	2014	8	147.190	11.527	-2.190	0.073	SPM	
00152+7801	STF 11		2015.858	191.8	7.97	2010	6	191.522	8.220	0.278	-0.250	CPM	
00160+4835	HJ 1009	AB	2015.852	27.9	16.79	2003	2	28.287	16.199	-0.387	0.591	SPM	
00160+4835	HJ 1009	AC	2015.852	138.4	36.46	2002	2	137.085	36.108	1.315	0.352	SPM	
00161+6006	HJ 1010		2015.858	117.8	20.40	2008	2	118.246	20.471	-0.446	-0.071	SPM	
00162+2918	STF 17	AB	2015.849	30.0	26.90	2012	4	28.986	26.696	1.014	0.204	SPM	7
00167+5439	STF 16		2015.901	39.1	5.82	2003	6	40.618	5.869	-1.518	-0.049	SPM	
00174+1631	STF 20		2015.849	233.4	11.88	2009	4	233.425	11.913	-0.025	-0.029	CPM	
00174+3550	WEI 1		2015.904	286.6	5.28	2009	6	285.884	5.386	0.716	-0.106	CPM	
00185+2608	STF 24		2015.904	247.0	5.10	2013	6	247.429	4.950	-0.429	0.150	SPM	
00203+5412	HDS 44		2015.852	32.1	12.34	2009	4	37.636	12.312	-5.536	0.028	DPM	
00214+6700	STF 26	AB, C	2015.858	114.4	13.33	2010	4	113.627	13.753	0.773	-0.424	CPM	
00216+5543	STI1334		2015.910	235.4	6.61	2011	6	235.867	6.600	-0.467	0.010	SPM	
00220+4213	HJ 1021		2015.910	246.2	6.15	2002	6	247.127	6.016	-0.927	0.135	SPM	
00239+2930	STF 28	AB	2015.849	224.2	32.80	2013	6	223.919	32.786	0.281	0.014	CPM	
00260+6647	HJ 1026		2015.863	192.1	12.35	2012	2	192.393	12.466	-0.293	-0.116	CPM	
00261+3448	HJ 622		2015.852	130.9	19.86	2014	2	130.924	19.794	-0.024	0.066	CPM	

Table 1 continues on next page.

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Table 1 (cointinued). Measurements on 141 Proper Motion Pairs

WDS No.	Disc	Comp	Date	Last θ	Last ρ	Last Year	Meas. Made	Meas θ	Meas ρ	Resid θ	Resid ρ	Type	Note
00270+6430	**MLB 277**		**2015.877**	**72.6**	**6.34**	**2011**	6	**73.272**	**6.709**	**-0.672**	**-0.369**	**???**	
00271+6112	FOX 108		2015.863	26.8	7.58	2012	2	26.919	7.369	-0.119	0.211	SPM	
00287+5700	STI1358		2015.852	302.6	14.32	2011	2	302.691	14.247	-0.091	0.074	SPM	
00310+5539	ES 116		2015.882	256.0	7.41	2003	10	257.762	7.409	-1.762	0.001	DPM	
00327+7807	STF 34		2015.863	339.4	5.79	2006	6	339.111	5.609	0.289	0.181	CPM	
00329+3007	FOX 111		2015.852	26.5	23.22	2010	2	26.771	23.081	-0.271	0.139	SPM	
00333+3731	ALI 249		2015.852	287.3	13.33	2005	2	287.398	13.023	-0.098	0.307	CPM	8
00350+5636	ES 3		2015.849	158.6	8.10	2012	4	158.769	7.921	-0.169	0.179	CPM	
00352+3650	STF 40	AB	2015.849	312.1	11.64	2014	6	311.628	12.015	0.472	-0.375	SPM	9
00355+5841	STF 38		2015.852	144.4	16.89	2012	4	144.265	16.900	0.135	-0.010	SPM	
00369+3343	H 5 17	AB	2015.890	173.5	35.60	2014	10	173.969	35.702	-0.469	-0.102	SPM	
00400+5549	ES 936		2015.901	269.0	6.03	2011	6	270.994	7.886	-1.994	-1.856	CPM	
00403+2403	STF 47	AB	2015.852	205.7	16.40	2011	2	205.464	16.560	0.236	-0.160	CPM	
00403+4343	HJ 1044		2015.890	138.9	21.73	2005	8	139.389	21.560	-0.489	0.170	CPM	
00430+4405	ES 1408		2015.901	262.5	7.90	2005	6	265.106	7.558	-2.606	0.342	CPM	
00474+7239	STF 57		2015.863	197.9	6.29	2010	2	15.271	6.151	182.629	0.139	???	
00475+4214	ES 1488		2015.890	280.9	6.91	2004	8	282.638	6.810	-1.738	0.100	CPM	
00495+5534	STI1437		2015.910	298.6	11.27	2011	2	298.641	11.093	-0.041	0.176	SPM	
00503+3548	STF 62		2015.855	303.0	11.81	2012	2	303.010	11.757	-0.010	0.053	CPM	
00514+7010	HJ 1999		2015.863	16.2	25.60	2010	2	16.153	25.312	0.047	0.288	CPM	
00528+5638	BU 1	AD	2015.890	194.8	8.96	2012	6	196.763	8.896	-1.963	0.064	SPM	
00528+5638	BU 1	CD	2015.890	133.0	3.10	2013	6	134.536	3.718	-1.536	-0.618	???	10
00536+6835	AG 8		2015.855	35.2	17.41	2010	2	34.923	17.387	0.277	0.023	CPM	
00543+6903	AG 9		2015.863	70.6	6.49	2003	2	71.112	6.419	-0.512	0.070	SPM	
00573+6020	ARG 3		2015.855	200.2	20.69	2014	2	199.991	20.677	0.209	0.013	CPM	
00581+2655	STF 77		2015.855	118.0	10.37	2005	2	119.324	10.300	-1.324	0.070	CPM	
00583+5659	STI1492		2015.882	315.9	14.55	2010	8	316.312	14.380	-0.412	0.172	DPM	
01003+6717	HJ 1061		2015.877	103.6	13.17	2010	4	102.748	13.125	0.852	0.045	CPM	
01027+4742	HJ 2010		2015.833	270.7	9.88	2011	8	270.428	9.899	0.272	-0.019	CPM	
01032+6032	MLB 43		2015.858	297.7	7.53	2012	2	294.973	7.089	2.727	0.441	SPM	
01057+2128	STF 88	AB	2015.833	159.0	29.69	2014	10	158.917	29.556	0.083	0.134	CPM	11
01058+0455	STF 90	AB	2015.833	83.4	32.88	2014	8	83.452	32.887	-0.052	-0.007	CPM	12
01101+5145	STT 23	AB	2015.852	190.9	14.32	2011	4	191.201	14.503	-0.301	-0.183	SPM	
01103+1636	STF 94	AC	2015.852	280.8	20.24	2005	2	281.175	20.279	-0.375	-0.039	CPM	
01107+6515	STI 194		2015.858	21.9	10.21	2011	2	20.387	10.636	1.513	-0.426	CPM	
01129+3205	STF 98	AB	2015.833	248.0	20.00	2014	8	248.457	19.502	-0.457	0.498	CPM	
01133+4426	HJ 2027	AB	2015.893	161.2	18.76	2003	6	160.789	18.203	0.411	0.557	CPM	
01137+0735	STF 100	AB	2015.833	63.2	22.80	2012	10	62.971	22.752	0.229	0.048	CPM	
01146+4102	AG 300		2015.882	44.8	6.58	2008	8	45.119	6.599	-0.319	-0.019	SPM	
01147+4255	ARG 49	AB	2015.893	106.8	36.26	2003	6	105.753	35.328	1.047	0.932	DPM	
01170+3828	STF 104		2015.852	321.6	13.33	2010	2	323.037	13.423	-1.437	-0.093	SPM	
01172+6810	HJ 1075		2015.877	104.5	7.78	2010	6	103.365	7.797	1.135	-0.017	DPM	
01178+4901	STF 102	AB, C	2015.882	223.8	10.08	2012	14	224.002	10.060	-0.202	0.020	CPM	
01192+5821	STI1560		2015.893	324.4	13.90	2005	6	324.862	13.782	-0.462	0.118	CPM	
01200+6355	STF 109	AB	2015.877	11.4	7.20	2012	4	8.911	7.254	2.489	-0.054	CPM	

Table 1 continues on next page.

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Table 1 (continued). Measurements on 141 Proper Motion Pairs

WDS No.	Disc	Comp	Date	Last θ	Last ρ	Last Year	Meas. Made	Meas θ	Meas ρ	Resid θ	Resid ρ	Type	Note
01283+5329	**STF 123**	**AB**	2015.852	**162.1**	**16.30**	2007	**2**	**162.121**	**16.335**	**-0.021**	**-0.035**	CPM	
01326+5445	ES 2584		2015.890	196.3	15.70	2008	8	196.536	15.649	-0.236	0.051	CPM	
01330+5340	HJ 2051		2015.910	75.3	23.15	2002	6	76.064	22.812	-0.764	0.342	DPM	13
01331+5416	ES 2585		2015.893	29.0	15.05	2006	6	29.782	15.037	-0.782	0.013	CPM	
01332+6041	STF 131	AB	2015.877	147.7	13.35	2012	10	142.878	13.920	4.822	-0.570	CPM	
01340+4559	ARG 5		2015.882	319.2	9.93	2006	8	319.825	9.930	-0.625	0.000	CPM	
01348+5209	ES 759		2015.910	90.9	10.37	2008	6	92.037	10.260	-1.137	0.110	CPM	
01348+6954	STF 130		2015.877	187.7	7.69	2003	10	187.098	7.608	0.602	0.081	CPM	
01373+6714	HJ 1084		2015.877	358.3	15.56	2010	8	358.904	15.584	-0.604	-0.024	SPM	
01409+4952	HU 531	AB, C	2015.890	280.2	6.11	2011	6	279.762	6.092	0.438	0.018	CPM	
01420+5547	HJ 2066		2015.910	71.7	20.74	2005	6	72.016	20.677	-0.316	0.063	DPM	14
01431+3426	COU 668	AB	2015.910	41.0	25.36	2011	6	41.290	24.932	-0.290	0.428	SPM	
01447+5607	ES 1772	AB	2015.915	107.5	24.67	2011	4	106.801	23.919	0.699	0.751	DPM	
01460+6113	STF 151		2015.863	38.1	7.25	2011	2	38.015	6.814	0.085	0.436	CPM	
01461+6114	STF 152		2015.863	106.3	9.28	2012	4	105.898	9.422	0.402	-0.142	SPM	
01466+6116	STF 153		2015.863	69.1	7.84	2012	4	69.062	7.710	0.038	0.130	CPM	
01467+3856	STF 157	AC	2015.890	115.6	12.50	2011	8	115.620	12.475	-0.020	0.025	SPM	
01487+6150	HJ 1091		2015.863	151.9	28.28	2011	4	151.481	28.106	0.419	0.174	CPM	
01487+7528	HJ 2075	AB	2015.863	230.8	30.73	2003	4	230.844	30.514	-0.044	0.219	CPM	15
01492+3404	STF 164		2015.890	95.4	9.81	2011	8	95.847	9.825	-0.447	-0.015	CPM	16
01493+6135	ES 1951		2015.863	158.6	6.41	2011	4	160.639	6.122	-2.039	0.288	SPM	
01513+6451	STF 163	AB	2015.863	37.2	34.75	2012	4	37.073	34.167	0.127	0.583	CPM	17
01514+4329	HJ 2089		2015.890	306.1	29.07	2011	6	306.464	29.031	-0.364	0.039	CPM	
01517+4549	ARG 51		2015.890	170.9	15.87	2011	6	171.825	15.839	-0.925	0.031	CPM	
01527+5717	ARG 6	AB	2015.882	136.4	14.81	2003	8	136.135	14.913	0.265	-0.103	SPM	
01545+5954	HDS 259		2015.893	211.8	16.79	2008	6	211.734	16.499	0.066	0.291	SPM	
01561+3745	HJ 1097		2015.915	39.9	14.82	2011	3	39.796	14.645	0.104	0.175	CPM	
01561+6035	AG 301		2015.863	262.3	8.60	2011	2	262.186	8.564	0.114	0.036	CPM	
01567+3505	ES 2144		2015.915	143.4	6.33	2011	4	144.010	6.407	-0.610	-0.077	CPM	
01595+6254	STF 188		2015.863	238.1	31.88	2011	4	237.860	31.827	0.240	0.053	SPM	18
02039+4220	STF 205	A, BC	2015.855	63.2	9.39	2013	10	61.952	9.708	1.248	-0.318	CPM	
02042+5257	HJ 2104		2015.855	169.8	30.61	2003	2	168.411	30.161	1.389	0.449	SPM	
02053+6740	STF 199		2015.863	22.2	35.80	2012	4	22.089	35.562	0.111	0.238	CPM	19
02078+5525	SMA 30		2015.915	327.8	11.13	2003	4	329.072	11.141	-1.272	-0.012	SPM	
02091+4048	STF 215		2015.893	59.5	19.71	2011	6	60.031	19.584	-0.531	0.126	CPM	
02091+4051	AG 32	AB	2015.915	99.8	21.40	2011	4	99.094	21.164	0.706	0.236	CPM	20
02094+4254	FOX 122		2015.915	5.0	17.38	2008	4	6.581	17.351	-1.581	0.029	SPM	
02103+3322	STF 219		2015.855	184.6	11.40	2011	8	185.638	11.662	-1.038	-0.262	CPM	21
02109+3902	STF 222		2015.893	35.8	16.68	2013	10	36.515	16.603	-0.715	0.077	SPM	
02124+3018	STF 227		2015.855	69.0	3.80	2012	10	67.422	3.871	1.578	-0.071	CPM	
02149+5829	STF 230		2015.901	258.8	24.19	2011	6	259.189	23.788	-0.389	0.402	CPM	
02172+3729	STF 238	AC	2015.915	355.8	10.93	2012	6	356.464	10.845	-0.664	0.085	DPM	22
02216+7212	HJ 2122		2015.904	140.1	31.51	2011	6	139.466	31.269	0.634	0.241	CPM	23
02236+7406	STF 241		2015.904	286.0	20.13	2011	6	285.018	19.989	0.982	0.141	DPM	
02370+2439	STFA 5	AB	2015.849	275.0	38.00	2012	6	274.593	37.747	0.407	0.253	CPM	24

Table 1 concludes on next page.

Table 1 (conclusion). Measurements on 141 Proper Motion Pairs

WDS No.	Disc	Comp	Date	Last θ	Last ρ	Last Year	Meas. Made	Meas θ	Meas ρ	Resid θ	Resid ρ	Type	Note
20585+1626	**STF2738**	**AB**	2015.816	**254.0**	**14.80**	2013	**10**	**254.108**	**14.929**	**-0.108**	**-0.129**	SPM	
21105+2227	STF2769	AB	2015.816	299.2	18.14	2014	10	299.310	18.067	-0.110	0.073	CPM	
21359+2622	HJ 1661		2015.816	84.6	11.93	2011	8	85.207	11.932	-0.607	-0.002	CPM	
21390+5729	STF2816	AD	2015.808	338.4	19.80	2012	10	337.671	19.865	0.729	-0.065	CPM	
21543+1943	STF2841	A, BC	2015.808	109.8	22.20	2014	10	108.235	22.200	1.565	0.000	CPM	25
22086+5917	STF2872	A, BC	2015.808	315.6	21.61	2014	10	314.825	21.528	0.775	0.082	CPM	

Notes:

1. The parallax of the primary is 6.72 mas ± 0.80, implying a distance of 148 pc and minimum separation of 1,241 AU. But the parallax for the companion is given as 11.46 mas ± 3.56, which is 31% of the parallax and hence not reliable as a true distance indicator. However, assuming this parallax is close to the real one, the companion would appear to be about 87 pc distant, or some 61 pc closer to earth than the companion. Probably an optical system based on this.
2. Both stars have parallax values but the error estimates are too large to make them reliable as true distance indicators. However, a linear trend does appear to be forming in the data plot.
3. This pair may be starting to show a linear trend. The parallax for each star is known, but the error estimates are so large as to make the values unreliable as true distance indicators.
4. HJ 1828.0 should be given very little weight during analysis.
5. Both BAZ 1935.05 and WFC 1958.32 appear to have quadrant reversals.
6. I am not completely at ease with my measurement.
7. HJ 1828.1 should be discounted heavily during analysis.
8. High velocity pair.
9. Parallaxes of both stars are known, but only the primary is reliable. It is given as 3.85 mas ±0.86, implying a distance of 260 pc. If both stars are at this distance, the minimum separation between the two is 1,600 AU. The parallax of the companion has an uncertainty of 70% of the parallax itself, so is not a reliable indicator. If the companion really is at the distance implied by its parallax (1.61 mas), it is some 260 pc farther away than the primary and thus the system would clearly be optical.
10. Although the pair is shown as CPM, the parallaxes are nearly identical, being 11.86 mas ± 0.68 for the primary and 11.64 mas ± 0.68 for the companion. Using the mean of 11.73 mas, the system is thus 85 pc away and the stars are 512 AU apart. This system is most likely physical.
11. Like STF 88, this pair has nearly identical parallaxes (24.61 mas ± 0.76 and 23.28 mas ± 0.60). Using the mean of 23.95 mas, the pair is then about 42 pc away with the stars 686 AU apart at minimum. This pair is most likely physical.
12. Only the primary has a usable parallax (18.76 mas ± 2.76), which places it 53 pc away. If the pair is physical (and given the companion parallax of 10.64 mas ± 10.93, this is not likely), the minimum separation would be 606 AU.
13. HJ 1831.88 should be assigned a minimal weight during analysis.
14. Starting to show a linear trend?
15. HJ 1831.84 should be given minimal weight during analysis.
16. Both Mad 1834.36 and WFD 1916.20 should be given very low weights during analysis.
17. A linear trend appears to be emerging. The parallax of the primary is given as 0.17 mas ± 0.063, a value which is on the verge of being unreliable. But assuming it is accurate, the distance to the primary is at least 5,880 pc away which would make the minimum separation of the two stars over 100,000 AU. This pair is probably optical.
18. HJ 1828 should be given minimal weight during analysis.
19. HJ 1828 should be given minimal weight during analysis. The parallax of both stars is known with good accuracy and is almost identical. Using the mean of 7.41 mas, the distance to the system works out to 135 pc, making the stars at least 2,348 AU apart. The system is most probably physical.
20. Dob 1912.96 should be assigned a low weight during analysis.
21. The parallaxes of both stars are similar enough to suggest a physical system, but the uncertainty in the companion's motion makes use of its parallax unreliable. Assuming the system to be at the distance suggested by the primary's parallax, the pair is 160 pc with a minimum separation of 934 AU. But the uncertainty in the parallax of the primary means this analysis should be held with a healthy degree of skepticism.
22. HJ 1828 should be given minimal weight during analysis.
23. CLL 1980.8 appears to be a case of quadrant reversal.
24. This is a high proper motion pair, and given that the parallaxes are virtually identical (the mean being 24.24 mas), the distance to the system works out to 41 pc with the stars being at least 778 AU apart. Most likely a physical system.
25. Both stars have a parallax, but only the primary's is reliable. Its value puts the primary at 103 pc with the pair being 1,143 AU apart. The parallax for the companion would imply a distance of 37 pc, so it is possible that this is an optical pair.