Double Star Measurements Using a Webcam and CCD Camera, Annual Report of 2016

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Abstract: This report shows the results on 223 double star measurements from 2016; minimum separation is 1.23 a.s. (STF1024AB), maximum separation is 371 a.s. (STF1424AD). The mean value of all measurements is 18.7 a.s.

In 2016 a total of 223 double stars were measured. In the first half of 2016, the measurements were done at the primary focus of a 12-inch Newtonian telescope with a standard webcam (Schlimmer, 2013). Its reproduction scale is about 0.77 a.s. per pixel. In the second half of 2016 the measurements were done with a CMOS QHY5L II Color camera with reproduction scale of about 0.52 a.s. per pixel. Because of longer exposure times fainter double stars could be selected. Double stars with unequal magnitudes were of particular interest. With this reproduction scale, it was found that double stars with differences of 3 magnitudes could be separated with at least 3 a.s. separation; double stars with 4 magnitude differences could be separated with at least 4 a.s. separation and so on. Figure 1 shows the 223 measurements sorted by separation. The majority of the measured doubles are closer than 7.5 as.

Figure 2 shows the differences in magnitudes of the measured double stars. In 116 cases the difference is more than 2 magnitudes.

Special Notes on Some Stars

ES 944, WDS01195+5816 was discovered in 1910 by Espin and only observed in 1999 and 2015 for a second and third time (Mason, 2017). Magnitudes are 9.79 and 13.1, separation is about 5 as. A further measurement could be done in 2016 by the author.

ES 528, WDS22025+4714 was also discovered by Espin in 1907 and observed for a second time in 2011 (Mason, 2017). Its magnitudes are 10.10 and 12.7 but although my telescope had high precision positioning, I couldn't find ES 528 and I can't validate these past measurements. Close to the position of ES 528 another double star A 781 was easy to observe. Its brightness is 9.54 and 11.24 magnitudes.

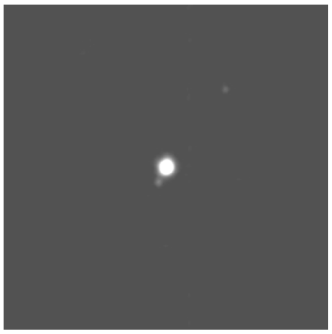

Figure 3: ES 944

Figure 4: ES 1179

Also for ES 1179, WDS22187+5122 there are only 2 measurements from 1912 and 1999 in the WDS catalog (Mason, 2017). Brightness is 9.63 and 13.4. ES 1179 could be easy observed.

Table 1 shows the measurements of separation and

(Text continues on page 29)

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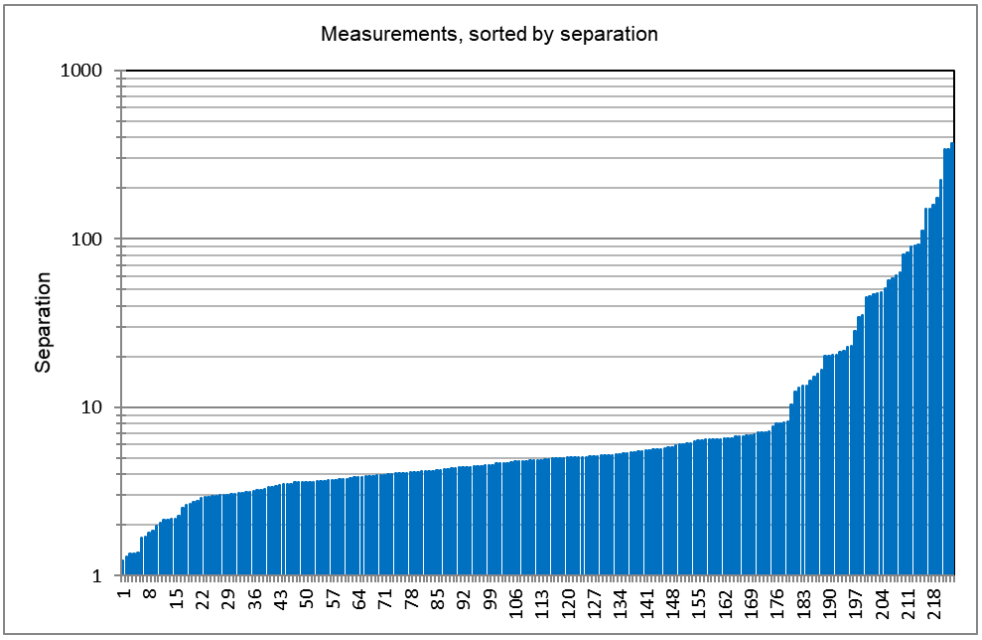

Figure 1. Separation of the 223 measurements, sorted by separation

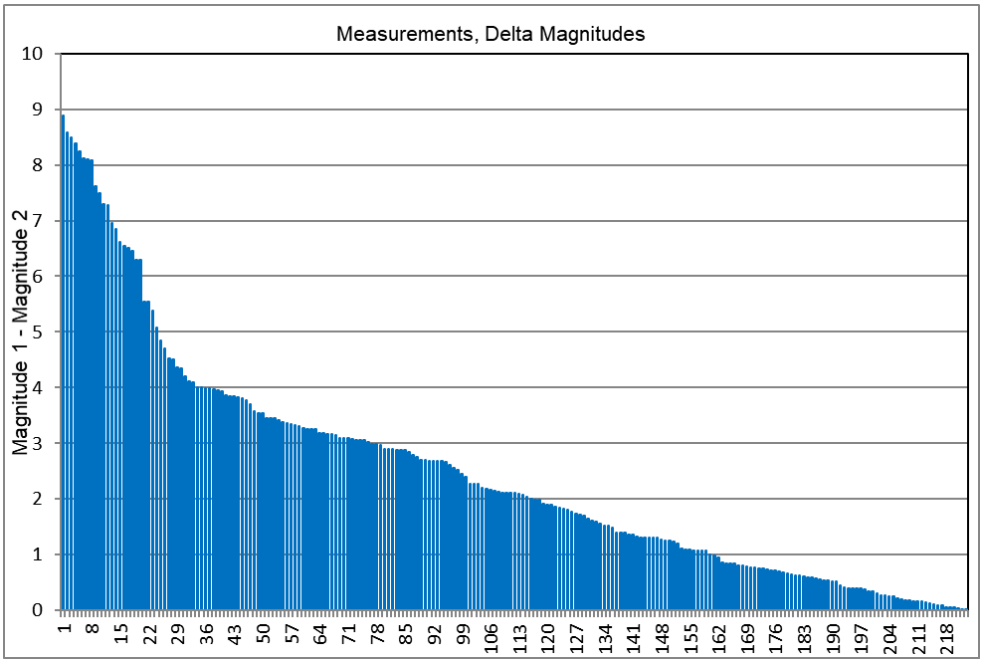

Figure 2: Differences in magnitudes, sorted by delta magnitudes

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Table 1. Measurements of 223 Double Stars from 2016

Name	RA+Dec	Mags	PA	Sep	Date	N	Notes
H 5 32AB	00084+2905	2.22 - 11.11	285.3	91.22	2016.924	1	C
STT 547AB	00057+4549	8.98 - 9.15	189.7	6.01	2016.924	1	C
A 1255	00144+4351	8.37 - 10.49	349.8	4.25	2016.924	1	C
STT 5	00187+4347	6.08 - 10.07	239.7	6.07	2016.924	1	C
ES 1197	00205+4911	8.43 - 11.4	107.6	5.28	2016.927	1	C
BU 489AB	00261+4411	8.59 - 12.30	136.8	4.65	2016.927	1	C
ES 445	00381+4527	10.1 - 11.1	349.7	3.60	2016.927	1	C
BU 498AB	00528+0948	8.62 - 12.03	151.4	4.06	2016.927	1	C
A 1809	00585+4142	9.66 - 13.5	95.5	4.50	2016.927	1	C
BU 236	01121+4700	9.10 - 9.20	112.9	5.32	2016.927	1	C
A 2103	01163+1015	9.14 - 12.4	184.6	4.36	2016.971	1	C
ES 944	01175+5459	9.79 - 13.1	336.9	5.07	2016.971	1	C
ES 408AB	01195+5816	10.20 - 12.3	162.4	3.04	2016.971	1	C
ES 408CD	01195+5816	10.02 - 11.5	89.5	3.81	2016.971	1	C
ES 1808AB	01196+5820	10.35 - 13.9	334.6	6.83	2016.971	1	C
STI1564	01196+5818	11.8 - 11.9	178.6	8.06	2016.971	1	C
A 947	01441+3057	9.33 - 12.5	6.3	4.88	2016.971	1	C
BU 872AB	02015+3319	8.74 - 12.2	261.3	4.13	2016.971	1	C
BRF 1AB	02180+5616	11.07 - 11.16	131.8	4.50	2016.971	1	C
A 1273	02180+5614	8.91 - 11.6	337.0	3.68	2016.971	1	C
ES 456	02277+5029	9.82 - 12.1	279.8	3.95	2016.971	1	C
ES 2083AB	02473+3835	9.79 - 11.9	334.5	6.45	2016.971	1	C
A 2339	02516+0224	9.1 - 12.0	342.4	3.46	2016.971	1	C
A 1531AB	03067+4332	8.81 - 11.7	246.0	3.64	2016.526	2	W - C
KUI 12AC	03067+4332	8.81 - 10.95	177.3	47.20	2016.056	1	W
A 1702AB	03072+4306	9.48 - 10.01	230.4	4.45	2016.056	1	W
AG 63AB	03138+3733	9.83 - 10.25	130.4	5.21	2016.067	1	W
STF 371	03187+4702	8.50 - 10.55	88.9	3.21	2016.996	1	C
AG 66	03208+2139	9.7 - 11.0	284.8	3.95	2016.067	1	W
STF 382AB	03245+3332	5.80 - 9.25	151.2	4.56	2016.996	1	C
STF 384AB	03285+5954	8.13 - 8.85	268.3	1.84	2016.996	1	C
HLM 2AB	03297+5955	9.22 - 11.3	51.0	5.29	2016.996	1	C
BU 787AB	03342+4837	7.38 - 11.9	293.1	5.17	2016.100	1	W
BU 787AD	03342+4837	7.38 - 11.75	181.0	34.47	2016.100	1	W
STF 410	03350+3201	6.6 - 10.6	213.2	5.08	2016.548	2	W - C
STF 420	03365+2355	8.72 - 11.0	113.4	6.69	2016.996	1	C
ES 1958	03411+6103	8.5 - 11.4	202.5	3.69	2016.100	1	W
A 989AB	03435+2935	9.85 - 10.39	353.4	2.91	2016.100	1	W
A 989AC	03435+2935	9.86 - 10.93	93.2	58.75	2016.100	1	W
STF 444AB	03458+2309	6.91 - 10.09	338.8	3.22	2016.996	1	C

Table 1 continues on next page.

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Table 1 (continued). Measurements of 223 Double Stars from 2016

Name	RA+Dec	Mags	PA	Sep	Date	N	Notes
STF 443AB	03470+4126	8.20 - 8.82	56.1	6.90	2016.100	1	W
STF 448	03479+3336	6.68 - 9.36	13.1	3.49	2016.548	2	W - C
STF 449	03474+2440	8.78 - 11.3	330.3	6.75	2016.548	2	W - C
STF 450AB	03474+2355	7.29 - 9.4	262.9	6.29	2016.548	2	W - C
A 1542	03530+4112	9.5 - 12.2	288.3	4.64	2016.996	1	C
HLD 10	04025+4824	9.44 - 10.80	90.1	4.14	2016.158	1	W
ES 466AB	04041+4949	9.46 - 12.48	53.8	4.32	2016.996	1	C
ES 466AC	04041+4949	9.46 - 13.0	120.2	15.84	2016.996	1	C
WAK 11CD	04041+4949	13.0 - 13.8	68.9	7.14	2016.996	1	C
BU 309	04083+1944	7.77 - 11.03	280.4	5.67	2016.996	1	C
STF 494	04089+2306	7.53 - 7.65	187.9	5.12	2016.100	1	W
BU 86AB	04158+2331	9.63 - 10.23	50.0	4.43	2016.158	1	W
STF 541AB	04254+2218	4.22 - 5.29	173.9	339.44	2016.158	1	W
STF 541CD	04254+2218	10.6 - 10.0	329.6	5.34	2016.158	1	W
STF 529AB	04229+2824	8.58 - 10.4	14.4	4.17	2016.100	1	W
BU 1386	04460+2116	9.6 - 11.5	115.3	5.20	2016.100	1	W
A 2426	04527+2000	9.56 - 11.54	193.0	3.89	2016.100	1	W
BU 751AB	05098+4240	8.22 - 10.2	244.5	4.50	2016.100	1	W
BU 751AC	05098+4240	8.22 - 11.5	103.4	13.12	2016.100	1	W
STF 666	05172+3320	7.85 - 7.89	74.9	2.96	2016.100	2	W
STF 716AB	05293+2509	5.83 - 6.68	209.5	4.70	2016.158	1	W
STF 719AB	05301+2933	7.50 - 8.76	335.7	1.36	2016.210	1	W
STF 719AC	05301+2933	7.50 - 9.39	352.8	15.15	2016.210	1	W
STF 724	05303+1101	9.30 - 10.6	251.8	6.85	2016.158	1	W
STF 742	05364+2200	7.09 - 7.47	274.8	4.20	2016.100	1	W
STF 769AB	05455+5320	8.19 - 10.00	179.5	3.61	2016.158	1	W
STF 786AB	05460+2015	8.24 - 11.3	335.5	6.50	2016.158	1	W
BU 1053	05535+3720	6.91 - 8.83	0.0	1.71	2016.201	1	W
STF 811	05542+3029	7.97 - 9.3	234.2	5.01	2016.158	1	W
A 1318	06120+5611	9.23 - 11.0	44.9	3.12	2016.158	1	W
ES 1236	06235+4717	9.53 - 11.4	270.8	6.14	2016.158	1	W
STF 905AB	06289+4007	8.21 - 9.95	129.5	1.68	2016.158	1	W
ARG 14	06319+4542	9.55 - 10.13	242.6	6.28	2016.158	1	W
STF 928AB	06347+3832	7.93 - 8.61	131.9	3.53	2016.180	2	W
STF 929	06353+3743	7.35 - 8.44	23.5	6.50	2016.158	1	W
AG 116	06370+3813	9.81 - 10.59	31.1	2.18	2016.158	1	W
STF 940	06373+3826	8.76 - 10.29	294.5	10.36	2016.180	2	W
J 1964	06381+1648	9.21 - 11.6	326.3	6.40	2016.158	1	W
STF 944AB	06408+4815	8.45 - 10.17	57.5	5.45	2016.158	1	W
ES 1237	06469+4825	9.32 - 11.5	358.4	5.11	2016.158	1	W

Table 1 continues on next page.

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Table 1 (continued). Measurements of 223 Double Stars from 2016

Name	RA+Dec	Mags	PA	Sep	Date	N	Notes
STF 966	06502+3957	8.21 - 10.96	112.1	5.53	2016.158	1	W
STF 984	06563+3227	8.67 - 10.8	150.5	3.26	2016.158	1	W
H 2 71AC	06483+4105	8.99 - 10.6	46.4	8.03	2016.201	1	W
STF1008	07016+2634	8.70 - 9.96	272.3	2.28	2016.278	1	W
STF1013	07059+3603	9.9 - 10.6	47.0	3.62	2016.201	1	W
STF1024AB	07102+3808	8.97 - 9.16	322.9	1.23	2016.201	1	W
STF1033AB	07148+5233	7.81 - 8.44	277.0	1.38	2016.278	1	W
AG 335	07310+2510	9.77 - 10.63	299.0	4.04	2016.201	1	W
STF1177	08056+2732	6.69 - 7.41	348.0	3.25	2016.201	1	W
STT 189	08148+4302	6.87 - 10.73	296.6	4.97	2016.267	1	W
A 3061AB	08310+1001	9.3 - 10.8	318.1	4.66	2016.201	1	W
S 571AC	08399+1933	7.31 - 7.47	156.6	45.20	2016.158	1	W
S 571AD	08399+1933	7.31 - 6.67	241.9	92.45	2016.158	1	W
STF1244	08377+4148	9.02 - 10.32	1.3	3.73	2016.267	1	W
BKO 34DE	08399+1933	6.67 - 11.75	2.7	35.23	2016.158	1	W
STF1254AB	08404+1940	6.44 - 10.37	53.3	20.61	2016.158	1	W
STF1254AC	08404+1940	6.52 - 7.61	342.7	63.38	2016.158	1	W
STF1254AD	08404+1940	6.52 - 9.20	43.8	82.69	2016.158	1	W
STF1262	08420+2348	8.54 - 10.09	203.3	6.57	2016.201	1	W
STF1272	08483+3436	8.07 - 10.19	343.4	20.29	2016.267	1	W
STF1282AB	08508+3504	7.59 - 7.76	280.1	3.60	2016.267	1	W
STF1297AB	09005+2244	8.88 - 9.96	160.2	4.98	2016.267	1	W
STF1300AB	09013+1516	9.47 - 9.73	179.9	5.07	2016.213	1	W
STF1298AB	09014+3215	5.95 - 8.56	136.6	4.51	2016.267	1	W
AG 160	09051+3931	9.97 - 9.83	58.9	3.91	2016.267	1	W
AG 162	09071+3037	9.78 - 10.09	106.9	4.20	2016.267	1	W
STF1312	09103+5223	8.35 - 8.80	148.9	4.82	2016.267	1	W
STT 571AB	09213+3426	3.29 - 8.83	42.5	223.33	2016.201	1	W
STT 199AB	09207+5116	6.19 - 10.0	139.6	5.67	2016.201	1	W
STF1342BC	09213+3426	8.83 - 11.1	313.3	16.68	2016.201	1	W
STT 209	09533+5037	7.41 - 10.31	310.4	4.88	2016.267	1	W
A 2141	10019+4248	9.1 - 10.5	175.6	4.94	2016.278	1	W
STFB 6AB	10084+1158	1.40 - 8.24	308.0	175.49	2016.201	1	W, Regulus
STT 215	10163+1744	7.25 - 7.46	178.8	1.30	2016.344	1	W
STT 523	10172+2306	5.8 - 11.3	298.8	7.72	2016.349	1	W
STF1424AB	10200+1950	2.37 - 3.64	126.3	4.78	2016.201	1	W, γ Leo
STF1424AC	10200+1950	2.37 - 9.64	288.4	341.18	2016.201	1	W
STF1424AD	10200+1950	2.37 - 10.62	302.2	371.29	2016.201	1	W
STF1424CD	10200+1950	9.64 - 10.62	6.1	90.68	2016.201	1	W
STF1425	10216+4609	9.89 - 10.74	358.4	4.77	2016.278	1	W

Table 1 continues on next page.

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Table 1 (continued). Measurements of 223 Double Stars from 2016

Name	RA+Dec	Mags	PA	Sep	Date	N	Notes
STF1439	10301+2048	8.32 - 8.87	68.3	1.35	2016.344	1	W
A 2153	10303+3125	9.9 - 11.8	193.0	3.12	2016.349	1	W
STF1446	10336+1513	9.29 - 10.03	250.5	5.48	2016.349	1	W
STF1447	10338+2321	7.52 - 8.88	125.0	4.44	2016.349	1	W
STT 225AC	10401+1914	8.53 - 10.38	356.4	6.42	2016.349	1	W
STF1460	10406+4209	8.72 - 8.90	162.9	3.77	2016.349	1	W
STF1521	11154+2734	7.66 - 8.06	98.2	3.69	2016.347	2	W
STF1534	11218+1811	8.08 - 11.14	313.9	5.19	2016.349	1	W
STF1537	11245+2037	8.23 - 9.07	0.1	2.07	2016.344	1	W
STT 237AB	11390+4109	8.11 - 9.32	242.0	1.97	2016.344	1	W
STF1576	11529+3050	9.11 - 9.45	239.7	5.15	2016.478	1	W
STF1672	12427+3349	8.92 - 10.22	309.9	4.32	2016.478	1	W
BU 925	12566+4333	6.98 - 11.1	209.3	6.53	2016.478	1	W
KR 41	13026+5625	9.7 - 10.1	331.3	3.67	2016.478	1	W
STF1744AB	13239+5456	2.23 - 3.88	152.9	14.38	2016.478	1	W
STF1772AB	13407+1957	5.76 - 9.60	137.5	4.87	2016.478	1	W
STF1809	14089+4608	9.42 - 11.98	200.1	3.84	2016.478	1	W
STF1826AB	14152+4658	8.94 - 9.69	309.3	4.19	2016.478	1	W
STF1871	14416+5124	8.02 - 8.07	312.9	1.80	2016.477	1	W
STF1919	15127+1917	6.71 - 7.38	10.7	23.21	2016.477	1	W
STT 301	15462+4228	7.50 - 10.38	29.9	3.87	2016.571	1	C
ES 1554	15498+4349	11.0 - 11.2	2.6	4.92	2016.571	1	C
A 1129	15523+0842	9.3 - 10.1	122.6	4.08	2016.571	1	C
STF1992AB-C	16003+1140	9.46 - 9.72	325.9	5.94	2016.571	1	C
AG 200	16011+3936	10.62 - 10.94	215.8	2.75	2016.571	1	C
J 739	17017+3458	9.1 - 10.5	159.0	2.77	2016.582	1	C
A 2086	17094+1901	9.99 - 11.39	203.6	3.08	2016.582	1	C
STT 324	17080+3112	6.0 - 10.7	221.6	3.58	2016.582	1	C
STF2142AB	17117+4945	6.18 - 9.35	111.9	4.86	2016.582	1	C
STF2160	17246+1536	6.40 - 9.28	65.9	3.85	2016.582	1	C
STF2188	17362+0637	9.22 - 9.98	204.2	5.55	2016.666	1	C
A 233	17432+2447	8.02 - 11.37	237.4	2.92	2016.666	1	C
HEI 551	17433+1018	9.9 - 10.3	71.8	3.16	2016.666	1	C
STF2310	18206+2248	6.83 - 9.98	238.9	4.79	2016.680	1	C
STF2349AB	18366+3328	5.39 - 9.4	203.9	7.15	2016.673	2	C
STF2374AB	18435+2743	9.64 - 10.43	39.6	13.37	2016.666	1	C
STF2374AC	18435+2743	9.64 - 9.36	357.7	150.60	2016.666	1	C
STF2382AB	18443+3940	5.15 - 6.10	346.7	2.16	2016.683	1	C, ε Lyr
STF2383CD	18443+3940	5.25 - 5.38	76.4	2.17	2016.683	1	C, ε Lyr
A 255	18484+2544	9.2 - 12.9	77.4	4.43	2016.680	1	C

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Table 1 (continued). Measurements of 223 Double Stars from 2016

Name	RA+Dec	Mags	PA	Sep	Date	N	Notes
STF2406	18499+2626	7.12 - 11.21	5.9	4.55	2016.683	1	C
STFA 39AB	18501+3322	3.63 - 6.69	77.4	4.43	2016.680	1	C
A 261	18591+2730	9.07 - 12.9	193.5	3.37	2016.683	1	C
AG 370	19015+2724	9.71 - 10.49	341.0	3.94	2016.675	2	C
STF2461AB	19074+3230	5.26 - 9.1	286.1	3.15	2016.683	1	C
A 264AB	19127+2435	8.2 - 11.9	285.5	3.59	2016.683	1	C
STF2487AB	19138+3909	4.38 - 8.58	80.2	28.25	2016.730	1	C
HJ 2871AB	19255+1948	5.16 - 10.0	87.3	13.50	2016.730	1	C
HJ 2871AC	19255+1948	5.16 - 11.7	211.6	50.87	2016.730	1	C
ES 2180	19365+3638	8.50 - 11.86	138.6	8.09	2016.683	1	C
STF2579AB	19450+4508	2.89 - 6.27	216.7	2.68	2016.683	1	C
STF2585AB-C	19490+1909	5.04 - 9.01	310.9	8.26	2016.730	1	C
J 124AB	19510+1025	5.11 - 13.5	253.6	20.48	2016.688	1	C
J 124AC	19510+1025	5.11 - 13.7	220.1	21.50	2016.688	1	C
POP1228AD	19510+1025	5.11 - 13.2	121.5	48.27	2016.688	1	C
POP1228AE	19510+1025	5.19 - 12.14	148.7	80.53	2016.688	1	C
ES 1673	19555+4049	9.00 - 12.1	200.6	5.02	2016.683	1	C
BU 980AB	19563+3505	3.89 - 12.0	206.0	7.21	2016.730	1	C
HJ 1455AC	19563+3505	3.89 - 10.5	332.8	45.89	2016.730	1	C
HJ 1455AD	19563+3505	3.89 - 10.4	163.0	47.50	2016.730	1	C
BU 980AE	19563+3505	3.89 - 11.5	247.4	56.54	2016.730	1	C
BU 981AB	19579+2032	8.32 - 11.40	106.9	3.04	2016.683	1	C
SMR 7	20000+1736	10.1 - 11.4	263.5	4.09	2016.683	1	C
STF2613AB	20014+1045	7.48 - 8.02	355.7	3.50	2016.688	1	C
A 277	20018+2716	9.15 - 13.1	340.0	4.26	2016.688	1	C
STF2616	20028+1435	6.85 - 9.64	267.8	3.35	2016.688	1	C
A 1413	20046+3641	9.97 - 10.60	136.6	2.16	2016.714	2	C
A 2996	20072+2611	8.42 - 11.74	256.5	3.00	2016.714	2	C
A 721	20085+4622	8.42 - 11.52	43.2	3.99	2016.730	1	C
AG 400	20104+2532	9.72 - 11.24	12.4	5.45	2016.730	1	C
HJ 1491	20111+4131	9.56 - 9.62	298.4	4.67	2016.730	1	C
A 1418	20116+3853	7.72 - 9.89	329.5	2.96	2016.730	1	C
STF2653	20137+2414	6.72 - 9.18	279.0	2.65	2016.724	1	C
STF2655AB	20141+2213	7.89 - 7.95	3.2	6.16	2016.724	1	C
STF2655AC	20141+2213	7.89 - 10.09	154.2	60.52	2016.724	1	C
A 387AB	20151+4118	7.90 - 11.48	151.0	5.08	2016.724	1	C
A 387AC	20151+4118	7.90 - 10.75	222.2	21.62	2016.724	1	C
BU 442AP	20165+3739	9.72 - 10.8	155.7	4.13	2016.724	1	C
BU 442BS	20165+3739	8.04 - 14.5	124.2	3.67	2016.724	1	C
BU 442BT	20165+3739	8.04 - 11.5	163.8	6.72	2016.724	1	C

Table 1 concludes on next page.

Double Star Measurements Using a Webcam and CCD Camera, Annual Report of 2016

Table 1 (conclusion). Measurements of 223 Double Stars from 2016

Name	RA+Dec	Mags	PA	Sep	Date	N	Notes
BU 442CU	20165+3739	8.82 - 11.5	109.7	12.42	2016.724	1	C
BU 442CV	20165+3739	8.82 - 12.0	116.4	20.24	2016.724	1	C
A 1423AB	20170+3725	8.11 - 12.1	128.1	4.35	2016.724	1	C
STF2758AH	21069+3845	5.35 - 10.89	269.9	112.23	2016.683	1	C
SMR 1AI	21069+3845	5.35 - 10.74	240.0	22.74	2016.683	1	C
SMR 40AO	21069+3845	5.35 - 12.65	282.0	158.60	2016.683	1	C
SMR 40AP	21069+3845	5.35 - 12.84	291.4	151.72	2016.683	1	C
ES 528	22025+4714	10.10 - 12.7	-	-	-	1	C, see text
A 781	22029+4717	9.54 - 11.24	196.4	2.53	2016.931	1	C
HJ 1748	22166+5831	10.86 - 11.25	311.6	5.06	2016.931	1	C
ES 1179	22187+5122	9.63 - 13.4	107.4	5.09	2016.931	1	C
ES 1281	22245+4720	9.36 - 10.6	170.3	5.67	2016.931	1	C
A 309AB	22300+2556	8.48 - 11.14	77.8	5.49	2016.931	1	C
ES 1116	22323+5156	9.29 - 10.40	133.6	7.09	2016.931	1	C
HLD 52	22372+5117	8.32 - 11.58	278.5	5.73	2016.931	1	C
ES 1028	22424+5414	7.58 - 10.57	243.3	5.79	2016.931	1	C
ES 1030	22476+5249	9.30 - 11.3	0.4	5.80	2016.931	1	C
ES 1119	22570+5209	10.8 - 11.2	101.2	3.05	2016.931	1	C
BU 452AB	22574+4301	6.66 - 11.0	255.6	6.45	2016.931	1	C
STF2987	23104+4901	7.42 - 10.41	154.1	3.39	2016.931	1	C
STF3002AB	23208+0227	7.85 - 10.55	-	3.76	2016.924	1	C
HJ 3203	23352+1133	10.23 - 10.2	210.7	6.54	2016.924	1	C
STF3026	23363+2854	9.42 - 9.94	274.1	2.94	2016.924	1	C
ES 1291	23520+4702	10.4 - 12.0	147.0	3.93	2016.924	1	C

Notes:

W: A webcam was used for imaging (until 2016.477)

C: A CCD was used for imaging (from 2016.571)

(Continued from page 22)

position angle of 223 components from 2016. Brightness and coordinates are from Washington Double Star catalog (Mason, 2016).

Acknowledgements

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