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Abstract: This report contains theta/rho measurements from 101 different double star systems. The time period spans from 2005.479 to 2005.679. All measurements were obtained using a 20-cm Schmidt-Cassegrain telescope and an illuminated reticle micrometer. This report represents a portion of the work that is currently being conducted in double star astronomy at Divinus Lux Observatory in Flagstaff, Arizona.

Over the past 5 years, a primary part of the double star research, which has been conducted, has consisted of measuring double stars from the WDS CATALOG. During the time that this project has been in process, it was noticed that almost all of the double stars, which were labeled with the "WFC" prefix, have had no recent measurements. Many of these systems have only one published measurement, with several of them dating back to the 1890s. It was also noted that a number of these pairs were brighter than the magnitude listings in the WDS catalog, since several of these "WFC" systems could be measured that should have been out of the range of a 20-cm telescope.

As a consequence of making these discoveries, I asked Dr. Brian Mason if he would be able to supply me with the entire list of double stars having the "WFC" prefix, so that I would not have to search the entire catalog line by line. He promptly helped me with my request, and I wish to publicly thank him for his assistance. Several more of the neglected "WFC" double stars have now been measured during the past several months.

The reason for mentioning this is because the researcher can employ this type of approach to further enhance a double star measuring program. There are likely neglected doubles with other prefixes, which are listed in the catalog, that need additional study besides the particular one that came to my attention. By focusing upon such pairs, or by providing additional measurements of the "WFC" doubles that have appeared in this series of reports, one can make valuable contributions to astrometry. In addition, the vast majority of the "WFC" doubles are common proper motion pairs that are separated by less than 20 arc seconds, so measuring such pairs could provide information for eventually calculating orbits if such double stars are also binaries.

As has been done in previous articles, the selected double star systems, which appear in this report, have been taken from the 2001.0 version of the Washington Double Star Catalog, with published measurements that are no more recent than ten years ago. There are also some noteworthy items that are discussed pertaining to the following table.

As has been pointed out in prior reports, this one includes listings of some double stars that have displayed significant theta/rho shifts because of proper motion. To begin with, J 2324 AB has displayed an 11% increase in the rho value, since 1953, as a result of proper motion by the "A" component. Proper motion by the "B" component, in BU 1290 AB, is responsible for an increase of over 4 degrees in the theta value since 1997. In regards to ES 390, proper motion by both components has brought about an increase of 3 degrees in the theta value and a decrease of 10.5% in the rho value, since 1957.

Proper motion by both component stars has been the cause for a 7% increase in the rho value, for HJ 5548 AC, since 1983. Similarly, proper motion by both component stars, in HJ 3211, has resulted in an increase of almost 5% in the rho value since 1991. Proper motion in opposite directions, by both components of STI 1358, is the reason that a 6 % increase in the rho value has occurred in this system since 1984. In regards to STF 2975 Aa-B, proper motion by the "Aa" components has been responsible for a 3 degrees

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increase in the theta value and a 4.5% increase in the rho value, since 1991. In addition, proper motion by the "A" component, in HJ 1109 AB, has caused the theta value to increase by over 3 degrees since 1984.

STT 17 is an optical multiple star system that has shown significant theta/rho shifts, since 1996, because of large proper motions by the "C" and "D" components. As a result, the "AC" part of this system has shown a 12 degrees increase in the theta value. In addition, the "CD" portion of STT 17 has displayed a 3 degrees decrease in the theta value and an increase of almost 4% in the rho value.

As has been mentioned in the opening paragraphs of this report, there are still a fair number of double stars, which haven't had published measurements for many decades, that should be at the top of the list for anyone who is focussing upon neglected pairs. HJ 3243 is one such double star, which has listed measurements in the following table. According to the 2001.0 version of the U.S. Naval Observatory double star CD, this double star has not been measured since 1831. This pair is not difficult to measure, with component magnitudes of +10.4 and +10.5, and a rho value of over 28 arc seconds. Because only one set of measurements was listed in 1831, the ones in this report depart from this earlier set by 6 degrees and 13.5 arc seconds. More measurements, by others, are obviously needed

In addition to HJ3243, a combination of several decades having passed since the last published measurements, and proper motion, is the cause for a 4.5 degrees decrease in the theta value for ES 532 since 1907. Likewise, the same two factors are the cause of a 9 degrees increase in the theta value and a 7.5% decrease in the rho value, since 1918, for ES 2709.

A possible error might exist in the WDS Catalog in reference to KU 59 AB. While the 1892 rho value in the Catalog, in the Hipparcos/Tycho data, and in this report display a separation range from 31.6 to 32.8 seconds, the 1991 Catalog value is listed at 28.5 seconds. It appears that the 1991 rho measurements for "AB" may have been made to the "C" component, since a separation of 28.5 seconds more closely matches the rho value for "AC."

NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
HJ 1469	20038+1436	10.0 10.2	214.9	17.78	2005.504	1n	1
STF2622 AB	20041+1700	8.7 9.4	193.0	5.43	2005.504	1n	2
ES 132 AB	20099+5657	9.4 9.8	82.5	5.43	2005.479	1n	3
ES 132 AC	20099+5657	9.4 9 6	63.1	33.58	2005.479	1n	3
SEI1047	20158+3447	10.5 10.7	162.7	20.74	2005.479	1n	4
ES 660 AB	20173+5201	10.2 10.2	305.0	29.63	2005.479	1n	5
ES 660 BC	20173+5201	10.2 10.3	290.5	9.88	2005.479	1n	5
HJ 912 AC	20183+2002	10.5 9.0#	170.2	88.38	2005.501	1n	6
SEI1089 AC	20204+3840	10.5 10.6	196.8	28.14	2005.482	1n	7
SEI1120	20252+3522	10.2 10.4	216.5	27.16	2005.482	1n	8
ARG 92	20256+4155	9.7 10.5	309.6	41.48	2005.482	1n	9
KU 59 AB	20286+2404	10.0 10.0	142.0	32.09	2005.501	1n	10
SEI1142	20305+3540	10.4 9.6#	78.1	21.73	2005.482	1n	11
STF2690 Aa-BC	20312+1116	7.1 7.4	254.8	17.78	2005.504	1n	12

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NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
SEI1164	20331+3932	9.9 10.7	214.4	17.78	2005.482	1n	13
SMA 118	20370+0452	10.4 10.5	125.1	18.76	2005.504	1n	14
STT 211	20493+5845	6.9 7.8	267.8	95.79	2005.504	1n	15
J 2324 AB	20508-1135	10.0 9.8#	186.3	25.18	2005.501	1n	16
J 2326	20531-0651	10.3 10.4	67.2	7.41	2005.501	1n	17
STF2737 AB-C	20591+0418	5.9 7.0	66.7	10.86	2005.504	1n	18
ES 2703	21009+5931	10.4 10.5	230.2	10.37	2005.636	1n	19
BU 1290 AB	21009+4730	10.1 10.6	32.4	8.39	2005.504	1n	20
STT 214 AB	21039+4138	6.3 8.6	184.7	57.28	2005.482	1n	21
BAL1583	21126+0149	10.1 10.4	6.1	7.90	2005.523	1n	22
ES 2709	21234+5923	9.9 10.6	274.1	11.85	2005.636	1n	23
POU5414	21344+2443	10.5 10.7	128.5	24.69	2005.504	1n	24
HJ 5519	21417-0816	10.2 10.4	51.5	18.76	2005.523	1n	25
HJ 3053	21436+0700	9.9 10.4	192.0	24.69	2005.504	1n	26
STT 222	21441+0709	7.4 8.4	257.5	87.40	2005.504	1n	27
BU1305 A-BC	21460+1053	9.7 10.8	91.0	88.88	2005.526	1n	28
HJ 3063	21494+5830	10.1 10.5	64.7	11.36	2005.542	1n	29
HO 174 AB	21558+3716	10.3 10.7	333.3	7.41	2005.523	1n	30
STT 225	21575+0409	7.0 8.5	287.4	74.56	2005.504	1n	31
HJ 1712	21599+4843	10.5 10.7	189.4	11.36	2005.523	1n	32
STF2852	22006+5411	9.9 10.2	172.7	7.90	2005.526	1n	33
SCA 113	22007-0448	10.6 10.6	279.8	16.29	2005.526	1n	34
KU 134	22028+0345	10.2 10.7	261.1	55.30	2005.526	1n	35
HJ 3086	22059-1806	10.1 10.1	194.3	13.83	2005.542	1n	36
ES 532	22064+4716	10.3 10.7	241.6	9.88	2005.526	1n	37
HJ 1751 AC	22191+5607	10.2 10.4	113.4	11.36	2005.526	1n	38
ES 2718	22211+5428	9.4 9.7	83.6	20.24	2005.542	1n	39
ES 390	22226+3328	9.5 10.3	267.8	8.89	2005.542	1n	40

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NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
STT 231	22226+0956	8.0 8.9	113.2	90.85	2005.616	1n	41
KU 64 AB	22227+2849	10.1 10.6	160.1	35.55	2005.542	1n	42
HDO 319 AC	22290+0118	10.1 10.2	185.6	89.86	2005.542	1n	43
HDO 319 AD	22290+0118	10.1 9.8#	304.7	149.11	2005.542	1n	43
BU 478 AC	22294-0720	10.1 10.1	238.7	28.64	2005.542	1n	44
AG 285	22401+3242	10.1 10.7	309.9	37.53	2005.542	1n	45
HJ 1813	22486+4136	9.9 10.0	61.3	9.38	2005.575	1n	46
STF2946	22497+4031	8.1 8.2	261.2	5.43	2005.575	1n	47
HJ 1816	22499+4620	10.5 10.6	133.1	6.91	2005.575	1n	48
HJ 5548 AC	22506+5306	10.4 10.6	228.1	27.65	2005.616	1n	49
ES 542 AC	22533+5009	10.0 10.2	84.0	62.21	2005.616	1n	50
ES 1701	22540+4000	10.7 10.7	65.9	8.39	2005.616	1n	51
BU 712 AC	22548+5914	10.1 10.3	111.4	45.43	2005.638	1n	52
STF2956 AC	22559+0121	10.0 10.6	278.4	69.13	2005.616	1n	53
ES 1120	22582+5133	10.5 10.4#	207.3	8.89	2005.616	1n	54
STF2975 Aa-B	23067+3302	10.4 10.4	314.2	36.54	2005.619	1n	55
KU 137	23112+2919	9.9 10.3	88.8	33.58	2005.619	1n	56
HJ 5398	23254-1717	10.2 10.4	3.0	28.64	2005.619	1n	57
HJ 1894 AB	23359+5132	10.1 10.4	213.6	24.69	2005.619	1n	58
FOX 274 AD	23359+5132	10.1 9.5#	185.4	84.93	2005.619	1n	58
HJ 315	23376+1236	10.3 10.4	247.1	20.24	2005.619	1n	59
ES 2732	23413+4954	10.2 10.7	249.6	10.86	2005.619	1n	60
HJ 3211	23450+0346	10.3 10.6	77.5	72.09	2005.619	1n	61
STT 255	00054+1620	8.6 8.8	338.5	88.88	2005.638	1n	62
HJ 1000	00065+0155	10.3 10.7	205.9	7.41	2005.638	1n	63
STT 256 AB	00080+3123	7.1 7.3	113.3	109.61	2005.636	1n	64
AG 298	00087-0451	10.1 10.3	12.1	15.80	2005.638	1n	65
MLB 441 AB	00115+2949	10.1 10.4	358.8	14.32	2005.638	1n	66

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NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
BU 1341 AC	00138+3612	10.3 8.2#	228.4	180.71	2005.638	1n	67
STF 24	00185+2608	7.8 8.4	250.0	4.94	2005.636	1n	68
STI1358	00287+5700	10.4 10.7	302.2	14.32	2005.638	1n	69
HJ 5451	00314+3335	5.9 9.3	84.9	55.30	2005.636	1n	70
ALI 249	00333+3731	10.3 10.4	287.3	13.33	2005.638	1n	71
J 922 AC	00363+1701	9.9 10.1	1.0	49.38	2005.638	1n	72
ES 936	00400+5549	10.5 10.7	268.5	8.39	2005.638	1n	73
HJ 1044	00403+4343	10.0 10.0	138.9	21.73	2005.638	1n	74
ES 2581	00429+4722	10.3 10.6	70.7	10.86	2005.638	1n	75
ES 1408	00430+4405	10.1 10.3	262.5	7.90	2005.655	1n	76
KU 70	00512+2211	10.2 10.2	124.9	54.31	2005.658	1n	77
HJ 9	00534+1159	10.6 10.7	99.8	12.34	2005.658	1n	78
KU 71	00552+3814	9.9 10.0	247.8	22.71	2005.655	1n	79
STF 77	00581+2655	10.3 10.4	118.0	10.37	2005.655	1n	80
HJ 2003	00584+5426	10.6 10.7	332.6	16.79	2005.655	1n	81
ES 317	01004+3228	9.2 9.4	194.3	6.91	2005.658	1n	82
HJ 1067	01052+2614	10.4 10.7	239.1	15.80	2005.658	1n	83
H 66 AB	01072+5330	6.3 10.1	74.7	20.74	2005.658	1n	84
STF 94 AC	01103+1636	10.0 10.0	280.8	20.24	2005.679	1n	85
GAL 308	01241-1244	10.3 10.7	16.4	24.69	2005.679	1n	86
STT 17 AB	01245+3902	7.9 9.7	101.4	35.55	2005.658	1n	87
STT 17 AC	01245+3902	7.9 8.4	347.8	137.26	2005.658	1n	87
STT 17 CD	01245+3902	8.4 9.7	279.3	67.15	2005.658	1n	87
ES 2585	01331+5416	10.0 10.0	29.2	14.81	2005.658	1n	88
HJ 2047	01344+5553	10.6 10.7	55.4	13.33	2005.658	1n	89
PLQ 19	01376+0709	9.7 9.7	76.5	40.49	2005.679	1n	90
SEI 19	01395+3216	10.1 10.7	347.2	18.76	2005.658	1n	91
HJ 2066	01420+5547	10.5 10.7	71.7	20.74	2005.679	1n	92

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NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
HJ 3455	01433-1736	9.9 10.0	73.9	23.70	2005.679	1n	93
AG 23	01459+1500	10.3 10.3	46.0	29.63	2005.679	1n	94
STF 172	01500+2706	10.2 10.3	194.1	17.78	2005.679	1n	95
HJ 3243	01572+2618	10.4 10.5	68.2	28.64	2005.679	1n	96
SMA 25	01588+5517	10.0 10.7	103.5	26.66	2005.679	1n	97
AG 302	01594+5036	10.0 10.3	1.6	14.81	2005.679	1n	98
HJ 1109 AB	02104+3911	10.2 10.7	184.2	24.19	2005.679	1n	99
STF 222	02109+3902	6.1 6.7	35.9	16.79	2005.679	1n	100
ES 1613	02505+4118	9.4 10.4	17.0	6.91	2005.679	1n	101

The companion star is the brighter component.

Notes

1. In Aquila. Relatively fixed. Spect. G0, G0.
2. In Sagitta. Relatively fixed. Spect. G5, G5.
3. In Cygnus. AB = cpm; relfix. AC = sep. decreasing. Spect. F8, F8, G5.
4. In Cygnus. Separation and position angle decreasing.
5. In Cygnus. AB & BC = relatively fixed. Spect. A0, A2, A0.
6. In Sagitta. Sep. & p.a. increasing. Spect. F8.
7. In Cygnus. Separation increasing. Position angle decreasing.
8. In Cygnus. Separation and position angle increasing.
9. In Cygnus. Position angle decreasing. Spect. A5.
10. In Vulpecula. Position angle increasing. Spect. A0, F0.
11. In Cygnus. Position angle slightly increasing.
12. In Delphinus. Separation increasing. Spect. B8V, A0.
13. In Cygnus. Relatively fixed. Common proper motion.
14. In Delphinus. Position angle increasing.
15. In Cepheus. Sep. decreasing; p.a. increasing. Spect. B9, K0.
16. In Aquarius. Sep. & p.a. increasing. Spect. G5.
17. In Aquarius. Position angle increasing. Spect. G0.
18. Epsilon or 1 Equulei. Common proper motion; p.a. decreas. Spect. F6IV, F5.
19. In Cepheus. Sep. & p.a. increasing.
20. In Cygnus. Sep. & p.a. increasing.
21. In Cygnus. Relatively fixed. Common proper motion. Spect. F3IV.
22. In Aquarius. Common proper motion. Separation decreasing. Spect. F8.
23. In Cepheus. Sep. decreasing; p.a. increasing.
24. In Pegasus. Position angle increasing.
25. In Aquarius. Position angle slightly increasing.
26. In Pegasus. Separation decreasing. Spect. M0.
27. In Pegasus. Relatively fixed. Common proper motion. Spect. F2V, F5.
28. In Pegasus. Relatively fixed. Common proper motion. Spect. K0, G.
29. In Cepheus. Separation slightly decreasing. Spect. A5, A5.

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30. In Cygnus. Position angle decreasing. Spect. F2.
31. In Pegasus. Relatively fixed. Common proper motion. Spect. F5, F5.
32. In Cygnus. Sep. & p.a. increasing.
33. In Cygnus. Relatively fixed. Common proper motion. Spect. G0.
34. In Aquarius. Sep. decreasing; p.a. increasing.
35. In Pegasus. Separation decreasing. Spect. K0.
36. In Aquarius. Sep. & p.a. decreasing. Spect. G0.
37. In Lacerta. Sep. increasing; p.a. decreasing.
38. In Cepheus. Position angle slightly decreasing. Spect. O8V.
39. In Lacerta. Separation slightly decreasing. Spect. A2, A2.
40. In Pegasus. Sep. decreasing; p.a. increasing. Spect. K.
41. In Pegasus. Position angle increasing. Spect. F0, G0.
42. In Pegasus. Separation slightly increasing. Spect. M5.
43. In Aquarius. AC = sep. dec. AD = sep. & p.a. inc Spect. AD = G0, K2.
44. In Aquarius. Relatively fixed. Spect. F5.
45. In Pegasus. Sep. & p.a. slightly decreasing. Spect. F5.
46. In Lacerta. Sep. increasing; p.a. decreasing. Spect. A2, A5.
47. In Lacerta. Common proper motion; p.a. increasing. Spect. F8, F8.
48. In Lacerta. Position angle decreasing. Spect. K0.
49. In Lacerta. Separation increasing.
50. In Lacerta. Separation increasing. Spect. A2, F2.
51. In Lacerta. Common proper motion. Separation increasing.
52. In Cepheus. Separation decreasing. Spect. A0.
53. In Pisces. Separation slightly increasing. Spect. K2, K.
54. In Andromeda. Separation and position angle increasing.
55. In Pegasus. Sep. & p.a. increasing. Spect. K0, A2.
56. In Pegasus. Sep. increasing; p.a. decreasing. Spect. K2, G5.
57. In Aquarius. Common proper motion. Sep. slightly decr. Spect. F0V, G0.
58. In Cassiopeia. AB = sep. & p.a. inc. AD = sep. & p.a. dec. Spect. F2V.
59. In Pegasus. Common proper motion; sep. decreasing. Spect. K0, K0.
60. In Cassiopeia. Separation decreasing. Position angle increasing.
61. In Pisces. Sep. increasing; p.a. decreasing. Spect. F8.
62. In Pegasus. Relatively fixed. Common proper motion. Spect. G0, G.
63. In Pisces. Sep increasing; p.a. decreasing. Common proper motion.
64. In Andromeda. Sep. increasing; p.a. decreasing. Spect. A5, A3.
65. In Pisces. Common proper motion; p.a. increasing. Spect. G0.
66. In Andromeda. Common proper motion; p.a. decreasing. Spect. G1V, G.
67. In Andromeda. Separation increasing. Spect. F8, G0.
68. In Andromeda. Slight increase in p.a. Spect. A2, A2.
69. In Cassiopeia. Sep. increasing; p.a. decreasing.
70. In Andromeda. Sep. slightly decreasing. Spect. K1III, F8.
71. In Andromeda. Relatively fixed. Common proper motion.
72. In Pisces. Relatively fixed. Common proper motion. Spect. F8.
73. In Cassiopeia. Sep increasing; p.a. decreasing.
74. In Andromeda. Relatively fixed. Common proper motion. Spect. G5, K0.
75. In Cassiopeia. Sep decreasing; p.a. increasing.
76. In Andromeda. Relatively fixed. Common proper motion.
77. In Andromeda. Sep. & p.a. decreasing. Spect. F8, G0.
78. In Pisces. Common proper motion; p.a. decreasing.
79. In Andromeda. Sep. decreasing; p.a. increasing. Spect. F8.
80. In Pisces. Common proper motion; p.a. slightly decreasing. Spect. G, G.
81. In Cassiopeia. Sep. increasing; p.a. decreasing. Spect. A5.
82. In Pisces. Sep. & p.a. increasing.

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83. In Pisces. Common proper motion; sep. decreasing. Spect. F8, F8.
84. In Cassiopeia. Sep. & p.a. decreasing. Spect. K2III.
85. In Pisces. Sep. & p.a. increasing. Spect. K0, K0.
86. In Cetus. Relatively fixed. Common proper motion.
87. In Andromeda. AB & CD = p.a. dec. AC = p.a. inc. Spect. G5, K0, G5, G8.
88. In Perseus. Relatively fixed. Spect. F0.
89. In Cassiopeia. Sep. & p.a. increasing.
90. In Pisces. Relatively fixed. Common proper motion. Spect. K0, K0.
91. In Triangulum. Sep. & p.a. increasing.
92. In Cassiopeia. Sep. & p.a. increasing.
93. In Cetus. Relatively fixed. Common proper motion. Spect. F5, F5.
94. In Pisces. Relatively fixed. Common proper motion. Spect. K0, K0.
95. In Triangulum. Relatively fixed. Common proper motion. Spect. F8.
96. In Triangulum. Sep. & p.a. increasing. Spect. K0.
97. In Perseus. Relatively fixed.
98. In Perseus. Sep. & p.a. increasing. Spect. A2.
99. In Andromeda. Sep. decreasing; p.a. increasing. Spect. F8.
100. 59 Andromedae. Relatively fixed. Spect. B9V, A1V
101. In Perseus. Separation slightly decreasing. Spect. F5.