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Abstract: This report contains theta/rho measurements from 87 different double star systems. The time period spans from 2005.800 to 2006.290. 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.

In a previous article, the rationale was given for focussing upon measuring double stars that challenge the limits of one's equipment, and perhaps, the limits of the researcher as well. One additional element, which was not mentioned, is the fact that many of the double stars that appear in the WDS CATALOG are brighter than the listing would indicate. For example, since I have been giving more attention to 10th magnitude pairs, I have found that a number of doubles, which are listed as 11th magnitude pairs, are actually in the 10th magnitude range, and sometimes, even in the 9th magnitude range.

It must be pointed out that finding such pairs is not a task that can be quickly done. One must be willing to check every potential target that is listed in the CATALOG against an accurate star chart. Since I use a CD-ROM star chart, I am able to switch back and forth between the CATALOG and the star chart so that each pair of interest can have immediate magnitude verification. Of course, it is true that many of the doubles that are listed as 11th magnitude pairs in the CATALOG really have such a value, but I have found enough brighter ones to make the effort worthwhile.

As a result of making such a search, many more neglected double stars can be measured that actually fall within the range of the instrumentation that one is using. In addition, it can be intrinsically rewarding when one realizes that, occasionally, measurements are being made for certain double stars that have had no published measurements for over a century. Recovering this type of double star can almost be as exciting as finding a new pair. Frequently, significant theta/rho shifts will also be found as a consequence of the many decades that have passed since the last measurements were made. Hence, the researcher may wish to consider giving priority to this type of work as a way to enhance a double star measuring program.

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 Washinton 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.

To begin with, several double star systems have displayed significant theta/rho shifts since the last measurements were published. Consistent with the discussion above, it has been noted that STF 892 has been listed in the USNO Double Star CD 2001.0 as not having been measured since 1831, so measurements for this pair appear in the table. Because 174 years have passed since the earlier measurements were obtained, it is being reported that this double star has displayed a 7 degrees decrease in the theta value and a 9.5" increase in the rho value during this span of time. Proper motion by the reference point star appears to be responsible for these shifts.

Proper motion by one or both of the components has caused significant theta/rho shifts in three additional double stars. For ARG 66, proper motion by the

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companion star has caused an 11.5 degrees decrease in the theta value since 1968. Proper motion by both components of ARG 67 is responsible for a 7.8% increase in the rho value since 1961.In a like manner, proper motion by both components of J 2840 has brought about a 7 degrees decrease in the theta value since 1991.

Theta/rho shifts from proper motion are also being reported for STF 1327 AC, HJ 807 AB, and STF 1359 AB & AC. For STF 1327 AC, a large proper motion by the "A" star is responsible for a 3% increase in the rho value since 1996. Regarding HJ 807 AB, proper motion by both component stars has caused a 2.5 degrees increase in the theta value and a 5% increase in the rho value since 1969. For STF 1359 AB & AC, proper motion by the "A" component has brought about a decrease of 2 degrees in the theta value for "AB" since 1991 and, for "AC," proper motion by both components has caused a 2.5" increase in the rho value since 1923.

A large proper motion by the "B" component, for HJ 808 AB, is responsible for a 2.7 degrees decrease in the theta value and a 2.5% increase in the rho value since 1991. Likewise, "B" component proper motion has caused parameter shifts for KU 47 AB. Since 1960, increases of 5 degrees in the theta value and 8.5" in the rho value have occurred. Because almost a century has passed since the 1910 measurements were published for BUP 155 AC, a 2.5 degrees decrease for the theta value and a 50" increase in the rho value are being reported. Also noteworthy is the fact that a large proper motion has caused an increase of almost 5% in the rho value, for STF 1561 AC, since 1991.

Proper motions by both components, in five additional double stars, have caused theta/rho shifts that might be mentioned. The first such system, A 2379 A-BC, has undergone a 2 degrees decrease in the theta value and a 3.7% decrease in the rho value since 1962. Secondly, since 1984, KU 104 has shown an increase of 2.3% in the rho value. Thirdly, a decrease of almost 3 degrees in the theta value, since 1988, has been measured for HJ 217 AB. Next, STF 1961 AB has displayed a 2 degrees decrease in the theta value and a 3.5% increase in the rho value, since 1991. Lastly, proper motions in opposite directions, by the components of STF 1901, have caused a 2 degrees decrease in the theta value, since 1996.

The discussion regarding proper motion shifts concludes by examining two multiple star systems. For the STF 1945 AB/AC system, common proper motions by the "BC" components, relative to the "A" component, have caused theta value increases of 8 degrees and 7 degrees, respectively, for "AB" and "AC" since 1961. The rho values have increased by 3.7" and 2.8" during this same time period. The second multiple star system, which has displayed significant proper motion shifts, is STF 1996 AB/AC. In this case, common proper motions by the "AB" components, relative to the "C" component, have caused the theta value to increase by about 3 degrees, and rho value to increase by 11" for the "AC" measurements, since 1910.

Orbital motion appears to be the cause for a 2 degrees increase in the theta value and a slight increase in the rho value, for STF 1985, since 1996. This visual binary is one of a dozen, or so, that can be regularly monitored even with a small telescope.

In regards to STT 72 AC, a possible increase of 4 degrees in the theta value has been measured, but the obtained value of 326.8 degrees is not consistent with the historical record in the WDS CATALOG or with the data in the Hipparcos/Tycho Catalogs. These other sources suggest a value of around 323 degrees. The reason for this discrepancy is unclear, since STT 72 AC was remeasured with the same results being obtained. The measurements for STT 72 AB were consistent with catalog values, so calibration of the micrometer didn't seem to be a factor in obtaining this discordant theta value. Adding to the mystery is the fact that STT 72 AC is supposedly a relatively fixed, common proper motion system. Additional measurements by others should help to determine which theta value is more accurate.

Also being reported is the listing of a potentially new double star bearing the "ARN" prefix. ARN 86 (07354+0016) appears in the table as a possible common proper motion pair that doesn't seem to have been previously cataloged. This new submission is located near BAL 1108.

Next, it appears as though a quadrant flip may have occurred for HJ 460 AC as it is currently listed in the WDS CATALOG. This conclusion has been reached because the respective positions of the "AB" components should place the "C" component with a theta value of 21 degrees, rather than at 201 degrees. Hence the table gives measurements for HJ 460 (CA), in order to reflect values which more closely relate to those currently in the CATALOG. It might also be mentioned that the rho value for "AC" has decreased by 4.5" since 1991, because of proper motion by the "C" component. Additionally, the "C" component is also part of the double star LDS 6219.

In a like manner, because a quadrant flip occurred

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between 1828 and 1988 for the theta measurements pertaining to STF 1773 AB, the measurements for "AC" and "BC" are also reversed. The WDS CATALOG lists these additional measurements according to the 1828 configuration, while these component measurements, in this report, are consistent with the 1988 listing for "AB."

Lastly, in regards to LDS 968 AB-C, the 1996 rho value that is listed in the WDS CATALOG appears to be incorrect. The rho measurement listed in this report more closely matches the 1936 value of 135" rather than the 1996 value of 121".7. This conclusion has been reached, for the 1996 listing, because this is a relatively fixed, common proper motion pair.

Name	RA DEC	Mags	PA	Sep	Date	N	Notes
STF 871	06116-0046	8.9, 9.4	306.3	7.90	2005.800	1n	1
STF 892	06195+1220	10.4, 10.7	41.2	39.50	2005.800	1n	2
STT 74AB	06206+2511	7.1, 8.9	264.8	56.78	2005.800	1n	3
STT 72AB	06247+5940	7.5, 10.3	304.5	46.41	2005.926	1n	4
STT 72AC	06247+5940	7.5, 7.6	326.8	133.31	2005.926	1n	4
WFC 66	06498+0656	9.9, 10.5	322.0	7.41	2005.800	1n	5
AG 136	07066+3802	10.0, 10.3	216.3	6.91	2005.800	1n	6
ARG 66	07162-0216	9.6, 10.3	301.6	14.32	2005.926	1n	7
ARD 67	07327+0540	9.8, 10.2	140.0	24.69	2005.926	1n	8
ARN 86*	07354+0016	9.8, 9.9	181.1	32.59	2005.926	1n	9
J 2840	07377+1330	10.4, 10.6	281.9	7.90	2005.926	1n	10
SEI 488	08112+3255	10.3, 10.6	314.2	22.71	2005.984	1n	11
STT 91AB	08195+3503	7.2, 8.3	210.2	94.80	2005.984	1n	12
STF1224A-BC	08267+2432	6.9, 7.5	50.6	5.43	2005.984	1n	13
STF1250AB	08402+5147	10.1, 10.4	168.9	21.73	2005.984	1n	14
STF1266	08445+2827	8.7, 9.9	64.1	23.70	2005.984	1n	15
HJ 460AC	08525+2816	5.9, 6.3	200.8	273.54	2005.984	1n	16
STT 97	09084+2732	8.2, 8.2	237.4	51.35	2005.984	1n	17
HJ 807AB	09124-0709	9.6, 10.0	289.6	14.81	2005.984	1n	18
WFC 125	09133+0540	10.2, 10.4	76.3	8.39	2005.984	1n	19
STF1327AC	09155+2755	8.7, 10.4	16.8	28.64	2005.984	1n	20
HJ 808AB	09168+0814	10.3, 10.5	206.3	24.19	2006.060	1n	21
SHJ 107	09320+0943	5.1, 9.2	74.5	37.53	2006.060	1n	22
STF1359AB	09330+5615	9.7, 10.6	54.9	7.41	2005.984	1n	23
STF1359AC	09330+5615	9.7, 10.4	240.0	117.51	2005.984	1n	23
OSV 4AB	10151+3931	10.2, 10.5	40.7	97.76	2006.055	1n	24

\# Companion star is the brighter component.

* Not listed in WDS CATALOG.

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Name	RA DEC	Mags	PA	Sep	Date	N	Notes
STF1427	10220+4354	8.1, 8.5	214.7	9.38	2006.055	1n	25
STF1435	10280+1950	10.3, 10.7	202.0	8.39	2006.060	1n	26
HJ 2532AB	10296+3757	10.3, 10.6	70.1	12.84	2006.060	1n	27
FOX 166AC	10296+3757	10.3, 10.1#	250.8	201.45	2006.060	1n	27
SCA 71	10346-1258	9.4, 10.6	326.6	145.16	2006.156	1n	28
FIL 26	10457-0130	10.0, 10.1	260.6	20.74	2006.055	1n	29
KU 100	10503+2234	10.0, 10.1	103.3	47.89	2006.055	1n	30
STF1497	10586+0908	10.2, 10.7	70.6	16.79	2006.055	1n	31
HJ 172	11022+0945	10.1, 10.2	94.3	13.33	2006.058	1n	32
HJ 494	11131+4011	10.6, 10.7	141.0	31.11	2006.099	1n	33
KU 36	11133+3811	10.7, 10.7	136.7	8.89	2006.058	1n	34
A 2379A-BC	11182+1638	10.1, 10.3	48.0	27.65	2006.156	1n	35
STF1526	11187+0250	10.2, 10.3	180.6	30.12	2006.058	1n	36
STT 111	11301+2958	6.9,, 9.4	33.3	67.15	2006.058	1n	37
STF 1556	11363+1208	10.6, 10.7	51.8	8.89	2006.058	1n	38
STF1553	11366+5608	7.7, 8.1	165.2	5.93	2006.099	1n	39
STF1561AB	11387+4507	6.5, 8.1	248.3	9.38	2006.099	1n	40
STF1561AC	11387+4507	6.5, 9.4	90.2	164.91	2006.099	1n	40
HJ 209	12239-0303	10.6, 10.7	146.5	23.70	2006.079	1n	41
ES 2642	12280+4753	10.1, 10.3	257.2	28.14	2006.079	1n	42
HJ 519	12304+3608	10.2, 10.3	189.2	18.27	2006.079	1n	43
STF1653	12334+3202	9.6, 9.6	347.7	7.90	2006.079	1n	44
HJ 212	12335+1012	10.1, 10.2	264.4	21.73	2006.079	1n	45
STF1657	12351+1823	5.0, 6.3	270.5	20.24	2006.099	1n	46
BAL1162	12432+0000	10.0, 10.7	303.2	14.81	2006.079	1n	47
STF1678	12454+1422	7.2, 7.6	171.5	36.54	2006.099	1n	48
HJ 217AB	12459+1009	10.1, 10.4	25.2	33.08	2006.156	1n	49
HJ 523	12519+3447	10.3, 10.7	183.0	14.32	2006.079	1n	50
STF1689	12555+1130	6.9, 9.1	221.7	29.63	2006.099	1n	51
STF1721	13085+0107	10.1, 10.2	357.7	6.42	2006.101	1n	52
HJ 2649	13184+5420	10.2, 10.5	345.4	21.23	2006.101	1n	53
FOX 177	13217+1542	10.2, 10.4	86.9	17.28	2006.101	1n	54
HJ 1232	13276+0655	10.0, 10.5	306.5	12.84	2006.101	1n	55
ODE 11	13337+4801	9.5, 9.8	134.9	124.43	2006.101	1n	56
STF1765	13379+0221	10.4, 10.6	161.5	38.02	2006.101	1n	57

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Name	RA DEC	Mags	PA	Sep	Date	N	Notes
KU 104	13384+4306	10.1, 10.5	54.1	59.25	2006.156	1n	58
STF1773AB	13416+0736	9.9, 9.9	210.5	30.12	2006.230	1n	59
STF1773AC	13416+0736	9.9, 10.6	102.0	56.29	2006.230	1n	59
STF1773BC	13416+0736	9.9, 10.6	77.9	72.09	2006.230	1n	59
BU 613AB-C	13514+3441	10.3, 10.6	74.8	45.92	2006.156	1n	60
HJ 2678	13520-1955	10.1, 10.4	140.2	15.80	2006.101	1n	61
KU 47AB	13540+3209	10.2, 10.7	149.2	20.74	2006.230	1n	62
HJ 233	13572+1151	10.6, 10.7	133.8	19.75	2006.101	1n	63
BUP 155AC	13594+2515	10.6, 9.7#	91.4	308.10	2006.230	1n	64
STF1835A-BC	14234+0827	5.0, 6.7	193.7	5.93	2006.230	1n	65
STF1850	14286+2817	7.1, 7.6	262.1	25.68	2006.230	1n	66
HJ 554AB	14325+3442	10.3, 10.7	291.8	11.85	2006.137	1n	67
GLP 3	14327-1246	10.5, 10.7	322.3	79.00	2006.137	1n	68
ES 609AC	14375+4743	10.1, 10.2	117.5	79.00	2006.137	1n	69
LDS 968AB-C	14426+1929	9.1, 10.1	309.8	135.29	2006.230	1n	70
KU 48AB	14430+1310	10.4, 10.6	137.4	6.42	2006.137	1n	71
HJ 241	14485+1203	10.2, 10.7	140.8	17.28	2006.137	1n	72
HJ 1261	14539+5734	10.4, 10.5	17.0	8.89	2006.137	1n	73
ABT 9	14540-0945	10.7, 10.5#	336.3	23.21	2006.137	1n	74
AG 196	14547+5038	10.0, 10.7	139.1	27.16	2006.137	1n	75
HJ 4720	14573-0551	10.4, 10.5	212.5	12.84	2006.137	1n	76
STF1901	15010+3123	8.5, 10.5	184.9	19.26	2006.230	1n	77
STF1931AB	15187+1026	7.2, 8.0	166.7	13.33	2006.230	1n	78
STF1945AB	15280+1442	10.0, 10.5	311.2	40.49	2006.290	1n	79
STF1945AC	15280+1442	10.0, 10.5	306.1	48.39	2006.290	1n	79
STF1945BC	15280+1442	10.5, 10.5	280.9	9.38	2006.290	1n	79
HJ 254AB	15303+1543	9.9, 10.4	277.6	17.28	2006.173	1n	80
STF1949	15306+1303	10.1, 10.2	213.4	16.29	2060.173	1n	81
AOT 60	15306-1217	10.1, 10.6	356.6	39.50	2006.173	1n	82
STF1961AB	15346+4331	9.9, 10.1	21.0	28.14	2006.230	1n	83
HJ 4804	15459-0921	10.6, 10.7	283.3	19.26	2006.173	1n	84
STF1985	15559-0210	7.0, 8.6	353.0	6.42	2006.290	1n	85
STF1996AB	15565+5717	10.2, 10.6	108.0	19.26	2006.290	1n	86
STF1996AC	15565+5717	10.2, 10.6	143.9	160.96	2006.290	1n	86
STF2104	16487+3556	7.4, 8.7	21.0	5.93	2006.290	1n	87

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Notes:

1. In Orion. Relatively fixed. Spect. A0, A0.
2. In Orion. Sep. increasing; p.a. decreasing.
3. In Gemini. Separation slightly decreasing. Spect. B9, A0.
4. In Lynx. AB = sep. & p.a. inc. AC = cpm, (relfix?) Spect. AC = K0, A3.
5. In Monoceros. Position angle increasing. Spect. A3, F8.
6. In Auriga. Relatively fixed.
7. In Monoceros. Sep. & p.a. decreasing. Spect. G, G.
8. In Canis Minor. Separation increasing. Spect. K, F0.
9. In Canis Minor. Near BAL 1108. Possible common proper motion. Spect. F0.
10. In Gemini. Position angle decreasing.
11. In Cancer. Sep. decreasing; p.a. increasing. Spect. F8, G.
12. In Lynx. Sep. increasing; p.a. decreasing. Spect. A5, G0.
13. 24 Cancri. Common proper motion; p.a. increasing. Spect. F0V, F7V.
14. In Ursa Major. Relatively fixed. Common proper motion. Spect. G, G.
15. In Cancer. Relatively fixed. Common proper motion. Spect. F8, F8.
16. 53 Cancri. Sep. & p.a. decreasing. Spect. K0, M3.
17. In Cancer. Relatively fixed. Common proper motion. Spect. G0V, G0.
18. In Hydra. Sep. & p.a. increasing. Spect. G, G.
19. In Hydra. Common proper motion; p.a. increasing. Spect. G5.
20. In Cancer. Sep. increasing; p.a. decreasing. Spect. F8, F8.
21. In Cancer. Sep. increasing; p.a. decreasing. Spect. F5, K.
22. 6 Leonis. Slight decrease in p.a. Spect. K3III, F5.
23. In Ursa Major. AB = p.a. dec. AC = sep. inc. Spect. G5.
24. In Leo Minor. Relatively fixed. Common proper motion. Spect. M0.
25. In Ursa Major. Slight increase in p.a. Spect. F5V, F5.
26. In Leo. Relatively fixed. Common proper motion. Spect. G0, G.
27. In Leo Minor. AB = relfix; cpm. AC = sep. & p.a. inc. Spect. F8, G0, F5.
28. In Hydra. Sep. & p.a. slightly increasing. Spect. K5.
29. In Sextans. Decrease in p.a. Spect. G, G.
30. In Leo. Relatively fixed. Common proper motion. Spect. F8.
31. In Leo. Relatively fixed. Spect. F2, F5.
32. In Leo. Relatively fixed. Common proper motion. Spect. K5, M.
33. In Ursa Major. Sep. increasing; p.a. decreasing. Spect. F8, G0.
34. In Ursa Major. Relatively fixed. Spect. G0, G0.
35. In Leo. Sep. & p.a. decreasing.
36. In Leo. Relatively fixed. Common proper motion. Spect. G0, G0.
37. In Ursa Major. Relatively fixed. Common proper motion. Spect. A9, G5.
38. In Leo. Relatively fixed. Common proper motion. Spect. G5, G5.
39. In Ursa Major. Common proper motion; p.a. decreasing. Spect. G5, G5.
40. In Ursa Major. AB = cpm; p.a. dec. AC = sep. inc. Spect. G0V, G0, K0.
41. In Virgo. Common proper motion; sep. slightly decreasing. Spect. K, K.
42. In Canes Venatici. Common proper motion; sep. slightly decreasing.
43. In Canes Venatici. Sep. decreasing; p.a. increasing. Spect. F2.
44. In Canes Venatici. Relfixed. Common proper motion. Spect. F3V, F3V.
45. In Virgo. Relatively fixed. Common proper motion. Spect. G5, K.
46. 24 Comae Berenicis. Common proper motion; p.a. dec. Spect. K2III, A3.
47. In Virgo. Relatively fixed. Common proper motion. Spect. F8, G.
48. In Coma Berenices. Position angle decreasing. Spect. B8V, G5.
49. In Virgo. Position angle decreasing. Spect. G2V, K.
50. In Canes Venatici. Relatively fixed. Common proper motion. Spect. G, G.
51. In Virgo. Position angle increasing. Spect. M4III, F5.
52. In Virgo. Relatively fixed. Spect. F8, F8.

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53. In Ursa Major. Separation decreasing. Spect. K0, K0.
54. In Coma Berenices. Relatively fixed. Common proper motion. Spect. K5, K5.
55. In Virgo. Relatively fixed. Common proper motion. Spect. F8, G.
56. In Canes Venatici. Relatively fixed. Common proper motion. Spect. G0, G0.
57. In Virgo. Sep. & p.a. decreasing.
58. In Canes Venatici. Sep. & p.a. increasing. Spect. F8.
59. In Bootes. AB = sep. inc. AC = p.a. dec. BC = sep. dec. Spect. K2, F8, G5.
60. In Canes Venatici. Sep. & p.a. decreasing. Spect. F8, K0.
61. In Virgo. Position angle increasing. Spect. F5, F0.
62. In Canes Venatici. Sep. & p.a. increasing. Spect. K0, K0.
63. In Bootes. Position angle decreasing. Spect. G0, G0.
64. In Bootes. Sep. increasing; p.a. decreasing. Spect. K4, K0.
65. In Bootes. Common proper motion; p.a. increasing. Spect. A0V, F2V.
66. In Bootes. Relatively fixed. Spect. A1V, A1V.
67. In Bootes. Relatively fixed. Common proper motion. Spect. K0, K0.
68. In Libra. Sep. & p.a. increasing. Spect. G6V.
69. In Bootes. Relatively fixed. Spect. K0, G5.
70. In Bootes. Relatively fixed. Common proper motion. Spect. M0, M0.
71. In Bootes. Common proper motion; p.a. decreasing. Spect. K0, K.
72. In Bootes. Separation decreasing. Spect. K0.
73. In Draco. Common proper motion.
74. In Libra. Common proper motion.
75. In Bootes. Separation increasing. Spect. G5, F8.
76. In Libra. Relatively fixed. Common proper motion.
77. In Bootes. Sep. & p.a. decreasing. Spect. M2, G5.
78. In Serpens. Common proper motion; p.a. decreasing. Spect. F2V, G3V.
79. In Serpens. AB & AC = sep. & p.a. inc. BC = relfix; cpm. Spect. K2, K, K.
80. In Serpens. Common proper motion; p.a. slightly decreasing. Spect. G5.
81. In Serpens. Relatively fixed. Common proper motion. Spect. G0, G0.
82. In Libra. Separation increasing. Spect. G5.
83. In Bootes. Sep. increasing; p.a. decreasing. Spect. K2, F8.
84. In Libra. Relatively fixed. Common proper motion.
85. In Libra. Common proper motion; p.a. increasing. Spect. F8V, G0.
86. In Draco. AB = relfix; cpm. AC = sep. & p.a. inc. Spect. F8.
87. In Hercules. Relatively fixed. Spect. F2, F2.