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Abstract: This report contains theta/rho measurements obtained using a 20-cm Schmidt-Cassegrain telescope and an illuminated reticle micrometer. 105 different double star systems were measured. The time period spans from 2005.696 to 2005.871. This report represents a portion of the work that is currently being conducted in double star astronomy at Divinus Lux Observatory in Flagstaff, Arizona.

The double star measuring program that has been ongoing, at Divinus Lux Observatory, has evolved to the point in which tenth magnitude pairs have been a primary emphasis for the past several months. Admittedly, measuring such pairs with a 20-cm telescope and an illuminated reticle micrometer pushes this type of instrumentation to the limit. In essence, when working at the practical limit of measurability, one tenth of a magnitude can become significantly noticeable. In the present case, companion stars can be measured down to about magnitude +10.7, but it becomes almost impossible to make measurements at about magnitude +10.8, or fainter, with a reasonable degree of accuracy.

One may wonder why such instrumentation should be consistently pushed to the limit when there are so many brighter pairs that would be easier to measure. The principal reason for this attention is because it is these fainter pairs that most frequently show up on the "neglected doubles" list. Because the mission of the observatory is to provide double star measurements that are in great need, the rationale for this emphasis becomes obvious. In addition, since increased expertise naturally evolves when the researcher uses the same instrumentation for several years, the time eventually comes when one should exploit this to the fullest for the benefit of science.

As has been mentioned in a previous article, nights with good seeing and transparency are usually essential when working at the limits of one's equipment, but the satisfaction that can be derived from such a focus is incalculable. Providing double star measurements that are needed the most is certainly one element. Furthermore, I have detected enough errors from sky survey data to state that the visual measuring of double stars has not been rendered obsolete, but rather, such measurements can help to confirm the accuracy of this information. Hence, an appeal is being made, in this report, for others to give greater attention to the visual measuring of neglected double stars.

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.

To begin with, there are several double stars that have displayed significant theta/rho shifts, during the past several years, because of proper motion by one or both of the components. HJ 2153 is one such pair. Since 1912, the year of the last published measurements, the rho value has decreased by about 7.5% as a result of proper motion by the reference point star. Proper motion by the reference point star is also responsible for a 7.2" decrease in the rho value and a 3 degrees increase in the theta value, since 1902, for HJ 3246 AC. BAL 2995 has also displayed significant theta/rho shifts. Since 1991, the theta value has decreased by about 2.5 degrees and the rho value has decreased by 3% because of proper motion by the reference point star.

Two additional double stars that have dated pub-

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lished measurements might be mentioned as well. GAL 375 has had only one previous set of published measurements, and these were done in 1904. Consequently, with such a large passage of time, a 9 degrees increase in the theta value and a 5.7" increase in the rho value are being reported for this system. Proper motion by both component stars is responsible for these shifts. Secondly, AG 88 Aa-B is a neglected system with the last published measurements appearing in 1914. It is noted that the 1914 theta measurements may be anomalous for unknown reasons, since the 1902 measurements and current measurements suggest a value of 286 degrees, rather than the 289 degrees value reported in 1914. What these results suggest is that several of these "neglected" systems need measurement verifications by other researchers.

It is noted in this report that the rho measurements in the table for BAL 2691 AB more closely match those published in 1910, rather than the ones published in 1982. A 3.2% difference exists with the 1982 rho measurements, while only an 0.8% difference exists with the 1910 measurements. Since only 2 sets of measurements were published in 1982, this double star needs additional study in order to determine the rho value more accurately.

Regarding STF 404 AB, one may notice that the companion star is listed as being at magnitude +11.3, which seems to contradict what was mentioned in the opening remarks for this report. However, while magnitude +11.3 is indicated in the Hipparcos/Tycho data for this star, this component was noticeably brighter when measurements for "AB" were done. Excellent seeing conditions were probably not responsible because the "D" component, which is listed with a similar magnitude, was definitely not bright enough for theta/rho measurements to be performed. Since the mission of the observatory emphasizes astrometry instead of photometry, a direct measurement of the magnitude for the "B" component was not made. Nevertheless, a visual estimate of +10.8 has been noted in the records of the observatory. In addition, because the USNO DOUBLE STAR CD 2001.0 indicates that "AB" has not had published measurements since 1911, obtaining measurements for this common proper motion pair was of vital importance.

Two double stars, labeled with the "ARN" prefix, appear in the table because these pairs, which might share a common proper motion, do not appear to have been previously cataloged. Hence, ARN 84 (05262+0048) and ARN 85 (05472+5631) have been included in this report. ARN 85 is located near STI 2108.

Finally, this report notes an error for one of the published measurements in the WDS catalog. Regarding ES 1310AD (03131+4440), the listed measurements for "AD" are actually measurements for the "BD" components. The table below reflects updated measurements for the AD components, which lists a theta value that is 13 degrees less than what appears in the catalog.

Name	RA DEC	Mags	PA	Sep	Date	N	Notes
A 2324 AC	02007+0456	10.2, 10.3	130.1	71.10	2005.696	1n	1
A 2324 DC	02007+0456	10.2, 10.3	20.8	87.89	2005.696	1n	1
GAL 317	02021-1321	10.0, 10.6	59.0	41.48	2005.696	1n	2
GAL 319	02070-1017	10.0, 10.5	85.1	28.14	2005.696	1n	3
ES 1306	02234+4441	10.3, 10.5	274.8	9.38	2005.696	1n	4
KU 76	02235+2623	9.8, 10.4	349.7	32.09	2005.696	1n	5
MLB1061 AC	02324+3905	10.0, 10.7	311.3	24.19	2005.696	1n	6
HJ 2153	02388+1729	10.6, 10.7	350.8	19.26	2005.734	1n	7
BU 1374 AB	02516+6033	9.7, 10.1	195.8	21.23	2005.808	1n	8
HJ 2162 AB	02548+4332	10.5, 10.7	40.2	11.85	2005.696	1n	9
AG 305	03063+5100	10.2, 10.3	99.9	11.36	2005.696	1n	10

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Name	RA DEC	Mags	PA	Sep	Date	N	Notes
ES 1310 AD	03131+4440	10.4, 9.0#	234.8	96.78	2005.696	1n	11
HJ 3246 AC	03207+1736	9.9, 9.9	141.1	172.82	2005.808	1n	12
BAL2995	03212+0523	10.6, 10.7	187.6	11.36	2005.808	1n	13
ES 464	03213+4743	10.1, 10.6	67.3	7.41	2005.696	1n	14
KU 80	03232+2412	10.2, 10.4	181.1	27.65	2005.715	1n	15
STF 404 AB	03314+2148	9.7, 11.3	202.2	28.64	2005.715	1n	16
STF 404 AC	03314+2148	9.7, 8.8#	49.7	120.48	2005.715	1n	16
AG 69	03332+0409	10.0, 10.3	353.6	6.42	2005.808	1n	17
HJ 3583	03377-2028	10.2, 10.5	86.8	11.85	2005.808	1n	18
SMA 38	03348+4408	10.2, 10.7	68.1	21.23	2005.696	1n	19
KU 81	03451+3425	9.9, 10.5	282.6	41.48	2005.715	1n	20
ES 167	03474+3521	10.3, 10.5	314.3	7.41	2005.715	1n	21
ES 770 AB	03494+5214	10.2, 10.4	232.2	70.11	2005.715	1n	22
WFC 33	04077+5258	10.4, 10.5	185.7	8.39	2005.734	1n	23
STF 494	04089+2306	7.5, 7.6	187.3	5.43	2005.734	1n	24
AG 78	04104+3618	10.0, 10.5	198.1	17.78	2005.734	1n	25
STI2036	04105+5717	10.4, 10.7	55.2	8.89	2005.808	1n	26
HJ 673	04170+3048	9.6, 10.4	197.2	20.74	2005.734	1n	27
GAL 371	04283-1400	10.1, 10.5	184.7	20.24	2005.808	1n	28
STF 550 AB	04320+5355	5.8, 6.8	308.4	10.37	2005.734	1n	29
AG 81	04427+0630	10.6, 10.7	279.9	38.51	2005.808	1n	30
A 3006 AC	04441+0205	9.9, 10.0	250.2	52.34	2005.808	1n	31
HJ 27	04455-0512	10.1, 10.1	51.4	39.50	2005.808	1n	32
WHC 1	05036-2029	10.0, 10.7	83.0	8.89	2005.811	1n	33
GAL 375	05047-0925	10.2, 9.9#	257.0	16.79	2005.811	1n	34
AG 88 Aa-B	05049+3054	10.0, 10.2	286.3	12.84	2005.811	1n	35
HJ 3265 AB	05080+3703	10.3, 10.2#	137.3	14.81	2005.811	1n	36
VBS 10 AC	05103+3718	6.8, 10.4	192.2	72.09	2005.827	1n	37
BU 1006 AC	05123-0212	9.3, 10.0	178.4	51.84	2005.811	1n	38

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Name	RA DEC	Mags	PA	Sep	Date	N	Notes
HJ 3270	05127+1629	10.4, 10.6	331.3	13.83	2005.811	1n	39
AG 92 AB	05154+3020	10.1, 10.7	334.9	24.69	2005.811	1n	40
HJ 2260 AB	05177-1041	10.3, 10.5	1.9	31.11	2005.811	1n	41
ES 574 AB	05178+4720	10.1, 10.7	67.0	34.56	2005.811	1n	42
STF 679	05197+2511	10.0, 10.2	317.0	20.24	2005.811	1n	43
SMA 54	05206+3939	9.9, 10.6	268.1	15.80	2005.816	1n	44
HJ 364	05242+2208	10.1, 10.5	143.2	10.86	2005.816	1n	45
HDS 713	05261+2250	9.9, 10.1	129.3	24.19	2005.816	1n	46
ARN 84 ##	05262+0048	8.3, 9.9	275.9	35.55	2005.830	1n	47
STF 705	05266+3524	10.2, 10.7	12.3	18.27	2005.816	1n	48
WEB 4	05290-0442	10.0, 9.8#	52.7	47.89	2005.816	1n	49
STF 748 AB	05353-0523	6.6, 7.5	32.4	8.89	2005.830	1n	50
STF 748 AC	05353-0523	6.6, 5.1#	132.5	12.84	2005.830	1n	50
STF 748 AD	05353-0523	6.6, 6.4#	96.0	21.73	2005.830	1n	50
AG 316	05395+5352	10.0, 10.1	212.3	9.88	2005.816	1n	51
STD 771 AB	05418+1933	10.2, 10.3	54.6	21.73	2005.816	1n	52
STF 777	05434+2213	9.3, 9.8	84.5	4.94	2005.830	1n	53
HJ 5539	05456+1737	10.0, 10.2	281.7	27.16	2005.816	1n	54
STI2108	05461+5623	10.4, 10.7	139.2	10.86	2005.830	1n	55
ARN 85 ##	05472+5631	10.0, 10.5	271.1	75.05	2005.830	1n	56
HJ 2279	05502+5450	10.6, 10.7	21.6	15.80	2005.816	1n	57
SEI 394	05514+3506	10.0, 10.7	325.5	14.32	2005.816	1n	58
SEI 404	05521+3235	10.5, 10.7	167.3	16.79	2005.816	1n	59
SEI 410	05522+3235	10.6, 10.7	121.9	17.28	2005.816	1n	60
SEI 428	05528+3233	10.0, 10.0	334.2	23.21	2005.816	1n	61
SEI 434 AE	05545+3109	10.1, 10.0#	82.4	26.17	2005.816	1n	62
STF 852 AC	06086+0722	9.9, 10.5	30.0	44.93	2005.833	1n	63
SCA 37	06099+2032	10.5, 10.6	94.3	24.69	2005.833	1n	64
AG 106 AC	06110+3302	9.9, 10.1	218.4	27.65	2005.833	1n	65

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Name	RA DEC	Mags	PA	Sep	Date	N	Notes
OPI 8	06119+0051	10.5, 10.7	143.5	34.07	2005.833	1n	66
GAL 225	06192-1151	10.3, 10.4	165.4	7.90	2005.833	1n	67
HJ 2312	06194-0516	10.4, 10.5	197.2	9.38	2005.833	1n	68
ES 2617	06219+5459	10.3, 10.3	26.4	9.88	2005.833	1n	69
J 595 AC	06264+1128	10.7, 10.6#	245.0	43.94	2005.833	1n	70
AG 113	06284+3116	10.0, 10.2	315.4	11.36	2005.833	1n	71
STF 908	06310+5351	10.6, 10.6	359.8	8.89	2005.833	1n	72
BAL2671	06342+0420	10.2, 10.7	213.4	19.26	2005.836	1n	73
GYL 80 AB	06402+3342	10.2, 10.3	117.1	28.64	2005.836	1n	74
BAL2691 AB	06422+0409	9.8, 10.3	63.7	22.71	2005.836	1n	75
ES 2098 AB	06435+3929	10.6, 10.5#	203.2	30.61	2005.836	1n	76
BAL1350	06521+0146	10.4, 10.5	29.7	18.27	2005.836	1n	77
HJ 3902 AB	06574-1821	10.1, 10.2	236.2	14.81	2005.836	1n	78
SEI 479	07269+3054	10.6, 10.7	41.5	15.31	2005.863	1n	79
HJ 2386	07283+0345	10.3, 10.5	249.3	6.91	2005.863	1n	80
D 13 AC	07330-1250	10.3, 10.6	288.1	11.85	2005.863	1n	81
STF1098	07348+5933	10.2, 10.5	289.3	27.16	2005.863	1n	82
KU 93	07414+0149	9.9, 10.7	15.1	49.38	2005.863	1n	83
HJ 2418	07506+2001	10.1, 10.1	217.2	21.73	2005.863	1n	84
STF1153	07526+1201	10.1, 10.3	357.6	19.75	2005.863	1n	85
SEI 483	07530+3138	10.4, 10.6	150.9	22.71	2005.863	1n	86
AG 148	08059-0146	10.2, 10.3	176.6	6.91	2005.866	1n	87
CHE 88	08137+0833	10.2, 10.7	110.5	45.43	2005.866	1n	88
AG 151	08138+3346	10.2, 10.5	148.9	6.42	2005.866	1n	89
BHA 56	08233-1804	9.9, 10.4	271.0	18.76	2005.866	1n	90
HJ 93	08285+1212	10.5, 10.6	99.1	19.26	2005.866	1n	91
HJ 3314	08504-0002	10.2, 10.7	133.4	16.29	2005.866	1n	92
AG 156	08508+3418	10.2, 10.4	249.8	10.86	2005.866	1n	93
STF1288	08527+2827	10.1, 10.1	258.9	7.90	2005.866	1n	94

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Name	RA DEC	Mags	PA	Sep	Date	N	Notes
SCJ 12	09078-0013	10.2, 10.2	260.7	6.42	2005.871	1n	95
POU3029	09082+2353	10.0, 10.3	315.5	7.90	2005.871	1n	96
HJ 122	09137+1109	10.2, 10.4	91.3	9.88	2005.871	1n	97
HJ 2490	09150+1253	10.2, 10.5	68.0	21.73	2005.871	1n	98
HJ 810 AC	09212+2728	10.4, 10.7	26.2	22.22	2005.871	1n	99
HJ 137	09297+0433	10.0, 10.3	354.7	18.76	2005.871	1n	100
KU 98	09404+1936	10.2, 10.4	341.1	56.78	2005.871	1n	101
HJ 820	09434+0858	10.0, 10.2	253.3	12.84	2005.871	1n	102
HJ 2503	09445+4830	10.4, 10.7	158.4	37.03	2005.871	1n	103
HJ 470	09448+1940	10.1, 10.3	211.5	22.22	2005.871	1n	104
KR 34	09578+5815	10.0, 10.6	65.5	33.08	2005.871	1n	105

Companion star is the brighter component.
Not in WDS catalog

Notes

1. In Pisces. AC= sep. increasing. DC = sep. decreasing. Spect. F8, K2, K5.
2. In Cetus. Relatively fixed.
3. In Cetus. Relatively fixed.
4. In Andromeda. Position angle decreasing.
5. In Aries. Sep. & p.a. decreasing. Spect. A5, F5.
6. In Andromeda. Sep. increasing; p.a. decreasing. Spect. G3V.
7. In Aries. Sep. & p.a. decreasing. Spect. A2.
8. In Cassiopeia. Slight p.a. increase. Spect. B1V, B.
9. In Perseus. Separation decreasing. Position angle increasing.
10. In Perseus. Relatively fixed. Common proper motion. Spect. F2, F2.
11. In Perseus. Sep. increasing; p.a. decreasing. Spect. K0.
12. In Aries. Separation decreasing. Position angle increasing.
13. In Cetus. Sep. & p.a. decreasing. Spect. G0, G0.
14. In Perseus. Relatively fixed. Common proper motion.
15. In Aries. Relatively fixed. Common proper motion. Spect. G5, G5.
16. In Taurus. AB = relfix; cpm. AC = sep. dec.; p.a. inc. Spect. AC = K0, F2.
17. In Taurus. Relatively fixed. Common proper motion. Spect. F8.
18. In Eridanus. Common proper motion; p.a. decreasing. Spect. F5.
19. In Perseus. Relatively fixed. Common proper motion.
20. In Perseus. Position angle slightly increasing. Spect. A2.
21. In Perseus. Sep. increasing; p.a. decreasing. Spect. G0.
22. In Perseus. Position angle slightly increasing.
23. In Camelopardus. Relatively fixed. Common proper motion.
24. In Taurus. Common proper motion. Spect. A8IV, A8IV.

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25. In Perseus. Relatively fixed. Spect. A0.
26. In Camelopardus. Sep. & p.a. decreasing.
27. In Taurus. Sep. decreasing; p.a. increasing. Spect. G0.
28. In Eridanus. Sep. decreasing; p.a. increasing. Spect. G0.
29. 1 Camelopardi. Common proper motion. Spect. B0III, B0III.
30. In Taurus. Sep. increasing; p.a. decreasing. Spect. F8, F8.
31. In Orion. Relatively fixed. Spect. F8, F0.
32. In Eridanus. Relatively fixed. Common proper motion.
33. In Lepus. Relatively fixed. Spect. A0.
34. In Eridanus. Sep. & p.a. increasing. Spect. G5.
35. In Auriga. Relatively fixed. Spect. A2.
36. In NGC 1778 (Auriga). Relfixed. Common proper motion. Spect. B8, B8.
37. In Auriga. Part of STF 644 system. Sep. & p.a. decreasing. Spect. B2.
38. In Orion. Relatively fixed. Common proper motion. Spect. F2V.
39. In Taurus. Position angle increasing. Spect. A0.
40. In Auriga. Separation increasing. Spect. G0.
41. In Orion. Relatively fixed. Common proper motion. Spect. B, B.
42. In Auriga. Sep. & p.a. increasing.
43. In Taurus. Relatively fixed. Common proper motion. Spect. G0, G0.
44. In Auriga. Relatively fixed. Spect. B8
45. In Taurus. Relatively fixed. Spect. F2, F5.
46. In Taurus. Relatively fixed. Common proper motion. Spect. G0, F8.
47. In Orion. Possible common proper motion. Spect. B9, A2.
48. In Auriga. Relatively fixed. Spect. F8.
49. In Orion. Sep. & p.a. increasing. Spect. M, M.
50. In Orion. Trapezium. All components relfixed. Spect. O7, B1V, O6, B0.
51. In Auriga. Position angle decreasing. Spect. A0, A2.
52. In Taurus. Separation decreasing. Spect. A0.
53. In Taurus. Relatively fixed. Spect. A0, A0.
54. In Taurus. Relatively fixed. Spect. A0.
55. In Camelopardus. Relatively fixed.
56. In Camelopardus. Near STI 2108. Possible common proper motion. Spect. G5.
57. In Auriga. Relatively fixed. Common proper motion.
58. In Auriga. Relatively fixed.
59. In Auriga. In M37 open cluster. Relatively fixed. Common proper motion.
60. In Auriga. In M37 open cluster. Sep. & p.a. decreasing.
61. In Auriga. In M37 open cluster. Sep. & p.a. increasing. Spect. F5.
62. In Auriga. Separation decreasing. Spect. A0.
63. In Orion. Sep. & p.a. slightly increasing. Spect. F5.
64. In Orion. Sep. & p.a. slightly decreasing. Spect. F0.
65. In Auriga. Position angle increasing. Spect. G0.
66. In Orion. Sep. & p.a. slightly increasing. Spect. G0.
67. In Canis Major. Position angle increasing. Spect. G0.
68. In Monoceros. Relatively fixed.
69. In Lynx. Relatively fixed. Common proper motion. Spect. A, A.
70. In Monoceros. Relatively fixed.
71. In Auriga. Common proper motion. Sep. slightly increasing. Spect. G5, G5.
72. In Auriga. Common proper motion. Slight increase in p.a.
73. In Monoceros. Relatively fixed. Spect. A0, A.
74. In Auriga. Sep. increasing; p.a. decreasing. Spect. G0, G0.
75. In Monoceros. Sep. & p.a. increasing. Spect. A5.

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76. In Auriga. Separation increasing.
77. In Monoceros. Sep. & p.a. slightly decreasing.
78. In Canis Major. Sep. & p.a. increasing. Spect. A2.
79. In Gemini. Sep. increasing; p.a. decreasing.
80. In Canis Minor. Common proper motion. Position angle increasing.
81. In Puppis. Separation slightly increasing.
82. In Lynx. Sep. & p.a. increasing. Spect. K0, F8.
83. In Canis Minor. Relatively fixed. Spect. A2.
84. In Gemini. Relatively fixed. Common proper motion. Spect. A0, F2.
85. In Canis Minor. Relatively fixed. Spect. F8, F5.
86. In Gemini. Sep. & p.a. slightly increasing. Spect. K0.
87. In Monoceros. Sep. & p.a. slightly decreasing. Spect. A5, A5.
88. In Cancer. Sep. & p.a. increasing.
89. In Lynx. Common proper motion; p.a. increasing.
90. In Puppis. Sep. slightly increasing. Spect. F5.
91. In Cancer. Sep. increasing; p.a. decreasing.
92. In Hydra. Relatively fixed. Common proper motion. Spect. F8.
93. In Lynx. Slight decrease in p.a. Spect. G0, G0.
94. In Cancer. Relatively fixed. Common proper motion. Spect. G0.
95. In Hydra. Sep. decreasing; p.a. increasing. Spect. K2, K2.
96. In Cancer. Relatively fixed. Common proper motion. Spect. F5, F5.
97. In Cancer. Separation increasing. Spect. A5, F.
98. In Cancer. Relatively fixed. Common proper motion. Spect. K0, K.
99. In Cancer. Sep. increasing; p.a. decreasing. Spect. K0, F5.
100. In Hydra. Sep. & p.a. decreasing. Spect. G0.
101. In Leo. Separation increasing. Spect. G5, G5.
102. In Leo. Relatively fixed. Common proper motion. Spect. F2, F2.
103. In Ursa Major. Sep. decreasing; p.a. increasing. Spect. K0, F8.
104. In Leo. Relatively fixed. Common proper motion.
105. In Ursa Major. Sep. decreasing; p.a. increasing. Spect. M4.