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Abstract: This report contains theta/rho measurements from 96 different double star systems. The time period spans from 2010.367 to 2010.597. 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.

This article contains a listing of double star measurements that are part of a series, which have been continuously reported at Divinus Lux Observatory, since the spring of 2001. 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 (WDS) Catalog, with published measurements that are no more recent than ten years ago. Several systems are included from the 2006.5 version of the WDS catalog as well. There are also some noteworthy items that are discussed pertaining to the following table.

First of all, several double stars have displayed significant theta/rho shifts, because of proper motion, by one or both of the components. In this regard, BAL 1937 has shown an increase of 4.7 degrees, since 2000, primarily from proper motion by the reference point star. Next, a large proper motion by the "C" component, for STF 2277 AC, has caused a 3.8 degrees increase in the theta value and a 2.6% increase in the rho value since 2000. Significant parameter shifts are also being noted for H 39 AB (Vega). During the past 10 years, the theta value has increased by about 2.7 degrees, while the rho value has increased by 3.6%. A large proper motion value by Vega is primarily responsible. Proper motions in opposite directions, for the components of STF 2390, have created a 5.7% increase in the rho value during the past decade. In a like manner, proper motions in opposite directions, for the components of HWE 46, have created a 6.5% increase in the rho value and a 2 degrees increase in the theta value since 2000. Finally, proper motion by the "A" component, for STF 2455 AB, is responsible for a 4.2% rho value increase in just the past 5 years.

Visual binary 70 Ophiuchi has also displayed some significant theta/rho shifts, during the past 10 years, because of orbital motion. A decrease of approximately 16 degrees for the theta value and an increase of 2 seconds, or 52%, for the rho value is being reported. The current parameters for this pair, which are listed in the table, are almost identical to what would be obtained if the orbital elements were to be used to determine the theta/rho values. This should probably be expected for a calculated orbit which, according to *Sky Catalogue 2000.0, Vol. 2*, (Hershfield and Sinnot, 1999) carries a rating of grade 1. Because the period is only 88 years long, and since this pair has been thoroughly studied for decades, this is one of the most accurately known orbits among visual binary stars.

Visual binary 61 Cygni has also displayed a significant parameter shift in just 5 years. Since

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2005, the theta value appears to have increased by 3 degrees, while the rho value has shown little change during this period. A calculation using the orbital elements indicates that an increase of only one degree should have occurred. However such a disparity might not be totally surprising since the *Sky Catalogue* rating for this orbit is a grade 4. This is certainly one visual binary that is easily measured by even very small instruments, so additional measurements are strongly encouraged, by others, in order to help bring additional accuracy to the orbital elements that have been published.

References

Hirshfield & Sinnott, 19, *Sky Catalogue 2000.0, Volume 2,* p. 190, Sky Publishing Corporation, Cambridge, MA.

NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
STF1943	15276+0522	9.2 9.5	147.8	4.94	2010.367	1
STF2003	16037+1126	7.1 10.4	171.2	14.32	2010.386	2
HDO 308	16323+0012	9.6 9.7	304.0	6.91	2010.367	3
BAL1937	17262+0205	8.5 10.2	204.7	12.34	2010.386	4
STF2220Aa-BC	17465+2743	3.4 9.8	249.3	35.06	2010.386	5
STF2242	17512+4454	8.1 8.2	326.0	3.46	2010.386	6
STF2271AB	18003+5251	8.1 9.2	270.0	3.46	2010.425	7
STF2277AB	18031+4828	6.2 8.8	127.7	26.66	2010.425	8
STF2277AC	18031+4828	6.2 10.1	298.8	99.74	2010.425	8
STF2266AB	18044+0329	7.9 9.5	186.1	8.39	2010.425	9
SLE 106AE	18047+2707	7.2 10.7	42.8	183.68	2010.430	10
STF2272AB	18055+0230	4.1 6.2	130.7	5.93	2010.425	11
STF2276AB	18057+1200	7.1 7.4	257.1	6.91	2010.430	12
STT 165AB	18060+0434	8.4 8.5	141.3	66.66	2010.430	13
POU3427	18330+2420	10.1 10.4	80.7	6.42	2010.430	14
H 39AB	18369+3846	0.1 9.5	184.7	80.98	2010.425	15
STF2364	18401+2442	8.0 10.2	174.7	10.37	2010.430	16
STF2372Aa-B	18421+3445	6.5 7.7	82.1	25.18	2010.430	17
GRV 238	18444+2003	9.5 9.6	345.0	36.54	2010.430	18
STF2390	18458+3431	7.3 8.5	156.0	4.44	2010.425	19
STF2420AB	18512+5923	4.6 8.1	318.1	37.03	2010.430	20
POU3591Aa-B	18554+2324	9.1 10.1	45.5	24.19	2010.430	21
BAL 588	18590-0139	10.7 10.7	316.0	9.88	2010.504	22
ENG 65AB	18596+1504	4.0 10.5	183.9	123.44	2010.430	23
POP1225AD	19054+1352	3.0 10.7	150.7	200.46	2010.507	24
STF2455AB	19069+2210	7.4 9.4	28.5	9.38	2010.504	25
STF2466AC	19079+2948	8.6 10.7	140.9	98.26	2010.507	26
HWE 46	19150-1559	9.5 9.8	162.9	5.43	2010.562	27
STF 497	19200+0535	7.6 8.4	356.6	30.12	2010.507	28
STF2512	19227+3144	8.3 10.6	305.7	22.22	2010.507	29

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NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
STF2526AB	19229+5701	8.1 10.7	84.9	16.79	2010.507	30
STF2534	19277+3632	8.2 8.4	62.8	6.91	2010.507	31
BRT1318	19299+1241	10.4 10.6	84.7	5.93	2010.507	32
H 89	19394+1634	6.4 9.2	301.3	28.64	2010.507	33
GRV 268	19411+2008	8.4 10.4	27.1	31.60	2010.507	34
STF2566	19445+0459	7.5 10.0	232.6	26.66	2010.507	35
GRV 281	19487+1634	8.7 9.0	221.6	35.55	2010.507	36
STF2585AB-C	19490+1909	5.0 9.0	310.8	7.90	2010.504	37
STF2611	19588+4721	8.4 8.4	207.8	5.43	2010.507	38
STF2610AB	19591+3532	8.8 9.2	295.8	3.95	2010.507	39
S 730AB	20001+1737	7.0 8.4	14.3	113.07	2010.542	40
S 730AC	20001+1737	7.0 10.2	337.6	78.51	2010.542	40
S 730AD	20001+1737	7.0 10.7	198.0	40.49	2010.542	40
H 100AB	20001+1731	9.9 10.0	254.1	24.19	2010.504	41
H 100AC	20001+1731	9.9 5.4*	298.6	114.55	2010.504	41
D 21	20030+1528	8.5 10.7	209.9	21.23	2010.507	42
AG 398	20038+1345	9.7 10.6	220.6	26.66	2010.540	43
A 2278AC	20068+0157	10.0 10.7	356.4	23.21	2010.540	44
WEB 12	20078+1950	8.3 8.3	76.9	40.98	2010.540	45
KU 127	20078+1016	9.6 10.7	178.7	19.75	2010.540	46
AC 17AE	20125+5128	6.0 10.7	148.0	130.35	2010.540	47
OPI 23AC	20135+4653	10.1 10.7	330.0	97.27	2010.540	48
STF2654	20152-0330	6.9 8.1	232.9	14.32	2010.542	49
ARY 25	20168+3731	8.5 8.7	293.3	146.64	2010.540	50
GRV 326AC	20172+2415	9.0 10.2	262.3	36.06	2010.540	51
SEI1064	20173+3420	10.1 10.7	254.4	23.70	2010.540	52
HJ 607AC	20176-1230	4.2 9.6	222.9	46.41	2010.504	53
ARY 4	20215+3035	6.8 8.5	286.6	134.79	2010.540	54
AG 256AB	20279+0958	9.4 10.6	351.8	4.94	2010.562	55
AG 406	20291+2700	9.4 10.3	333.1	8.39	2010.540	56
STF2686	20297+1018	9.4 10.7	278.1	25.68	2010.540	57
SHJ 324	20299-1835	5.9 6.7	238.5	21.73	2010.542	58
S 756	20313+4913	5.4 10.2	326.7	60.73	2010.542	59
SCJ 26	20348+0514	8.3 10.0	88.7	25.18	2010.542	60
ES 88	20379+5106	9.5 10.5	126.6	7.90	2010.542	61
POU4811	20396+2345	9.7 10.7	201.6	21.23	2010.542	62
ENG 75	20399+1115	6.4 10.6	6.2	182.19	2010.542	63
STT 409AB	20403+0326	6.9 10.1	84.1	16.79	2010.562	64
STT 409AC	20403+0326	6.9 9.8	332.4	63.20	2010.562	64
S 765Aa-C	20474+3629	4.8 9.5	106.1	82.95	2010.504	65

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NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
AG 267	20484+0426	10.1 10.3	260.4	5.93	2010.542	66
STT 210	20500+0533	6.2 9.0	127.1	78.51	2010.542	67
BAL2548	20537+0336	9.8 10.7	257.5	7.41	2010.542	68
WAL 133AB-D	20593+1534	8.1 10.0	205.7	83.94	2010.542	69
STT 425AE	21001+4841	7.3 10.5	15.8	44.93	2010.584	70
BU 1497	21005+1920	5.7 9.8	336.9	49.87	2010.584	71
STF2758AB	21069+3845	5.2 6.0	154.1	31.11	2010.562	72
ARG 107	21122+5854	8.1 9.2	193.0	36.54	2010.584	73
KU 131	21304+3859	9.6 10.6	11.9	36.54	2010.584	74
STF2804AB	21330+2043	7.6 8.0	356.0	3.46	2010.584	75
ES 2713	21352+3839	9.7 10.7	97.2	17.78	2010.584	76
BU 687AC	21388+5548	7.9 10.7	203.3	54.31	2010.584	77
STT 450	21465+0632	7.8 10.5	254.2	44.44	2010.584	78
HLD 48	21486+5136	9.3 10.5	21.9	4.44	2010.584	79
STF2840AB	21520+5548	5.7 6.4	196.8	17.78	2010.584	80
GRV 517	21532+4324	10.5 10.7	211.7	45.92	2010.584	81
STT 456AC	21555+5232	8.2 10.5	289.8	27.16	2010.584	82
ABH 154AB-G	21555+5232	7.8 9.3	106.8	111.59	2010.584	82
STF2867AB	22100+0757	8.2 9.3	208.6	10.37	2010.597	83
STT 230	22143+4029	7.9 9.6	161.9	47.40	2010.597	84
GRV 557	22170+0108	9.5 10.5	189.9	55.30	2010.597	85
STT 232AB	22235+0351	9.2 9.4	193.0	75.54	2010.597	86
BU 844AB	22296+0538	8.6 10.6	34.7	98.75	2010.597	87
ROE 47AD	22324+3947	5.9 10.0	216.2	103.69	2010.597	88
GRV 587	22338+0352	9.6 9.9	229.3	78.01	2010.597	89
GRV 601AC	22429+3316	9.5 10.0	72.2	43.45	2010.597	90
STT 480	22461+5804	7.6 8.6	116.5	30.61	2010.597	91
HJ 1823AC	22518+4119	7.1 8.1	337.2	81.96	2010.597	92
HJ 1823AE	22518+4119	7.1 8.8	262.7	118.99	2010.597	92
GRV 647	23114+3242	8.7 10.2	323.4	73.08	2010.597	93
ES 2728	23249+5430	9.8 10.0	247.6	10.37	2010.597	94
S 830AB	23269+0115	4.9 9.9	343.2	176.76	2010.597	95
GRV 704	23583+0217	9.5 10.3	58.6	59.74	2010.597	96

* Companion star is the brighter component.

Notes

1. In Serpens. Common proper motion; sep. & p.a. decreasing. Spect. G5.
2. In Serpens. Relatively fixed. Common proper motion. Spect. K3III, K2.
3. In Ophiuchus. Relatively fixed. Spect. F0.
4. In Ophiuchus. Position angle increasing. Spect. G5, G5.
5. Mu or 86 Herculis. Sep. & p.a. increasing. Spect. G5IV.
6. In Hercules. Relatively fixed. Common proper motion. Spect. F0, F0.
7. In Draco. Common proper motion. Sep. & p.a. increasing. Spect.G0, G0.
8. In Hercules. AB = p.a. inc. AC = sep. & p.a. inc. Spect. AB = A1V, K.
9. In Ophiuchus. Relatively fixed. Spect. F5.
10. In Hercules. Sep. & p.a. slightly decreasing. Spect. A7III.
11. 70 Ophiuchi. Common proper motion. Sep. inc.;

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p.a. dec. Spect. K0V, K4V.

12. In Ophiuchus. Sep. & p.a. slightly decreasing. Spect. A7, A7.
13. In Ophiuchus. Relatively fixed. Spect. K0III, A0.
14. In Hercules. Position angle increasing. Spect. F5.
15. Vega or Alpha Lyrae. Sep. & p.a. increasing. Spect. A0V.
16. In Hercules. Separation increasing. Spect. K0, K0.
17. In Lyra. Slight decrease in p.a. Spect. B5V, B8.
18. In Hercules. Relatively fixed. Common proper motion. Spect. G0, F8.
19. In Lyra. Separation increasing. Spect. A7V, A5.
20. Omicron or 47 Draconis. Sep. increasing; p.a. decreasing. Spect. G7III.
21. In Hercules. Relatively fixed. Common proper motion. Spect. G0, G0.
22. In Aquila. Relatively fixed. Spect. G, A5.
23. Epsilon Aquilae. Sep. & p.a. decreasing. Spect. K0.
24. Zeta or 17 Aquilae. Sep. & p.a. decreasing. Spect. A0V.
25. In Vulpecula. Sep. increasing; p.a. decreasing. Spect. F4IV, F0.
26. In Lyra. Slight decrease in p.a. Spect. A0.
27. In Sagittarius. Sep. & p.a. increasing. Spect. B9IV, B9.
28. In Aquila. Relatively fixed. Common proper motion. Spect. G5, G5.
29. In Lyra. Sep. & p.a. decreasing. Spect. A2.
30. In Draco. Relatively fixed. Common proper motion. Spect. K5, K5.
31. In Cygnus. Common proper motion; sep. & p.a. decreasing. Spect. B9III.
32. In Aquila. Common proper motion; sep. & p.a. increasing.
33. In Sagitta. Relatively fixed. Spect. K4I.
34. In Vulpecula. Sep. & p.a. decreasing. Spect. F8.
35. In Aquila. Sep. increasing; p.a. decreasing. Spect. K5.
36. In Sagitta. Relatively fixed. Common proper motion. Spect. F0, F0.
37. Zeta or 8 Sagittae. Sep. decreasing; p.a. increasing. Spect. A2, A3V.
38. In Cygnus. Relatively fixed. Common proper motion. Spect. K0, K0.
39. In Cygnus. Relatively fixed. Spect. B9V, B9.
40. In Sagitta. AB & AC = sep. & p.a. dec. AD = sep. inc. Spect. K0, F5, A2.
41. C component = 13 Sagittae. AB & AC = relatively fixed. Spect. AC = K0, M2.
42. In Aquila. Position angle decreasing. Spect. M1.
43. In Aquila. Separation slightly increasing. Spect. F0, A7.
44. In Aquila. Sep. & p.a. decreasing. Spect. F8.
45. In Sagitta. Relatively fixed. Common proper motion. Spect. F0, F0.
46. In Aquila. Position angle increasing. Spect. F5.
47. In Cygnus. Position angle slightly decreasing. Spect. K2.5III.
48. In Cygnus. Relatively fixed.
49. In Aquila. Relatively fixed. Common proper motion. Spect. F2V, F4V.
50. In Cygnus. Separation increasing. Spect. K2, A3.
51. In Vulpecula. Relatively fixed. Common proper motion. Spect. B8, F8.
52. In Cygnus. Relatively fixed. Spect. A0, A0.
53. Alpha 1 or 5 Capricorni. Separation increasing. Spect. G3I.
54. In Cygnus. Position angle decreasing. Spect. A2, A2.
55. In Delphinus. Sep. & p.a. decreasing. Spect. A2.
56. In Cygnus. Sep. & p.a. increasing. Spect. B9, A0.
57. In Delphinus. Separation decreasing. Spect. A0.
58. Omicron Capricorni. Relfixed. Common proper motion. Spect. A3V, A7V.
59. Omega or 46 Cygni. Sep. & p.a. increasing. Spect. M2III, G.
60. In Delphinus. Sep. & p.a. slightly increasing. Spect. M5, M.
61. In Cygnus. Relatively fixed. Common proper motion. Spect. G5.
62. In Vulpecula. Sep increasing; p.a. decreasing. Spect F5.
63. In Delphinus. Sep. & p.a. decreasing. Spect. F8IV.
64. In Delphinus. AB = relfix.; c.p.m. AC = sep. & p.a. dec. Spect. K0, K0, K0.
65. Lambda or 54 Cygni. Separation decreasing. Spect. B5.
66. In Delphinus. Common proper motion; sep. increasing. Spect. G5, G5.
67. In Delphinus. Sep. decreasing; p.a. increasing. Spect. K0, K0.
68. In Delphinus. Common proper motion; p.a. decreasing. Spect. G5.
69. In Delphinus. Relatively fixed. Spect. A3, A.
70. In Cygnus. Position angle increasing. Spect. B9.
71. In Delphinus. Sep. & p.a. increasing. Spect. M3III.
72. 61 Cygni. Common proper motion. Sep. & p.a. increasing. Spect. K5V, K7V.
73. In Cepheus. Relatively fixed. Spect. B3, A2.
74. In Cygnus. Sep. & p.a. slightly increasing. Spect. A0.

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75. In Pegasus. Common proper motion; sep. & p.a. increasing. Spect. F6IV, F6IV.
76. In Cygnus. Relatively fixed. Common proper motion.
77. In Cepheus. Relatively fixed. Spect. A0.
78. In Pegasus. Sep. & p.a. increasing. Spect. F5.
79. In Cygnus. Relatively fixed. Common proper motion. Spect. F2.
80. In Cepheus. Sep. decreasing; p.a. increasing. Spect. B6IV, A1.
81. In Cygnus. Relatively fixed. Common proper motion. Spect. F8.
82. In Cygnus. AC = p.a. inc.; sep. dec. AB-G = relatively fixed. Spect. F2V.
83. In Pegasus. Relatively fixed. Common proper motion. Spect. G5III, G0.
84. In Lacerta. Sep. & p.a. slightly increasing. Spect. K2, K2.
85. In Aquarius. Relatively fixed. Common proper motion. Spect. G.
86. In Pegasus. Sep. & p.a. increasing. Spect. G5.
87. In Pegasus. Relatively fixed. Spect. K0, A0.
88. In Lacerta. Slight increase in position angle. Spect. A6V.
89. In Pegasus. Relatively fixed. Common proper motion. Spect. G0.
90. In Pegasus. Relatively fixed. Common proper motion. Spect. G0.
91. In Cepheus. Relatively fixed. Common proper motion. Spect. F8, K0.
92. In Lacerta. AC = relfix. AE = sep. slightly increasing. Spect. B8V, A0, A0.
93. In Pegasus. Relatively fixed. Common proper motion. Spect. F5.
94. In Cassiopeia. Sep. & p.a. increasing. Spect. B8.
95. Kappa or 8 Piscium. Separation increasing. Spect. A2.
96. In Pisces. Sep. slightly decreasing. Common proper motion. Spect. G0, G.