Divinus Lux Observatory: Report #15

Dave Arnold

Program Manager for Double Star Research
2728 North Fox Fun Drive
Flagstaff, AZ 86004

E-Mail: dvdarnl@aol.com

Abstract: This report contains theta/rho measurements from 96 different double star systems. The time period spans from 2008.221 to 2008.402. 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.

While in the process of reviewing several papers over the past several months, in conjunction with my own research, it seems that a particular inference may be drawn regarding the neglected doubles list that comprises part of the Washington Double Star (WDS) Catalog data base. It appears that the majority of double stars that I have measured from this list are optical doubles, especially if the last published measurements are at least 50 years old. Perhaps since many of these pairs are widely separated, or have been discovered to have divergent proper motions, such double stars have become ignored because of only having a slight possibility of being physically connected. If these pairs happen to be faint, or have poorly known coordinates, this would also contribute to these double stars appearing on the neglected doubles list.

As a result of my experience with the neglected double star data base, it has occurred to me that it might be useful if a list of double stars could be generated from the WDS catalog that identified all known optical doubles, so that they could be eliminated from further study when one is attempting to conduct a binary star research project. It has since come to my attention that the Washington Multiplicity Catalog (WMC), which is currently being developed by the U. S. Naval Observatory, could fill this need. Not only could known optical systems be identified, but the WMC would combine the WDS catalog data with those of other existing catalogs, in order to formulate a complete listing of all known double and/or multiple stars. This could provide a list of pairs that would show theta/rho shifts that are more likely to be caused by orbital motion, rather than divergent proper motions. The existence of such a catalog could provide greater efficiency in identifying pairs that might merit an orbital motion study.

I simply mention the emergence of the WMC as an upcoming valuable tool for bringing efficiency to binary star research, especially when sifting through known optical pairs becomes burdensome. If more time could be devoted to common proper motion pairs, or pairs that are known to be physically related, it might become more likely that additional visual binaries could be identified in less time. My understanding is that the WMC will, hopefully, be completed in about two years. More information about this upcoming catalog can be obtained by visiting the website of the US Naval Observatory. I would also like to thank Bill Hartkopf for his input as I composed these above paragraphs.

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. 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.

Divinus Lux Observatory: Report #15

As is often the case, proper motion by one or both of the components of a double star has caused some shifts in reported theta/rho values. In regards to STF 2120 AB, proper motion by the "B" component has caused a 3.5% increase in the rho value since 1998. A significant rho value increase is also being noted for AG 214. Since 1998, proper motion by the reference point star has caused a 10% shift to occur. Another rho value increase is being cited for HJ 4923. Since 1998, proper motions by both components have caused an increase of 4%. Additionally, proper motion by the reference point star, for HU 946, has resulted in a 5% increase in the rho value during the past 10 years. However, the most noteworthy rho value increase, which is being highlighted in this article, pertains to LV 20 AB. Since 1998, an increase of 36" has occurred because of a large proper motion by the "A" component.

A possible additional component is being submitted for A 281 (20106+3452). Labeled as ARN 100 AC, this star, with a magnitude of +9.7, appears to share a common proper motion with the (AB) components. This proposed "C" component does not appear to have been previously cataloged.

Regarding double stars that are currently listed in the WDS catalog, it is being noted that SEI 630 (19335+3611) appears to be a duplicate entry for HJ 1414 (19335+3610) because the coordinates and parameters for these two entries are very similar. It has been visually confirmed that only one double star appears in this part of the sky near the coordinates listed above.

NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
STF1779	14048-0633	8.1 9.0	297.5	4.44	2008.279	1
STF1818	14143+3356	8.9 10.2	330.0	5.43	2008.221	2
STF1826AB	14152+4658	8.9 9.6	310.0	3.95	2008.279	3
BU 116	14195-1343	8.0 8.2	275.0	3.95	2008.279	4
STF1858AB	14336+3535	8.0 8.5	38.5	2.96	2008.221	5
SHJ 191	14596+5352	6.8 7.5	341.7	40.49	2008.257	6
LV 20AB	15103-1616	9.1 10.1	10.6	478.94	2008.358	7
BUP 161AC	15103-1616	9.1 9.5	180.3	301.19	2008.358	7
STT 137	15158+5056	6.5 8.8	101.2	67.64	2008.257	8
HDS2150	15177-1712	9.4 10.7	193.6	20.74	2008.221	9
HJ 2779	15206+5520	8.0 10.7	347.2	10.86	2008.257	10
AOT 60	15306-1217	10.1 10.6	356.6	39.37	2008.221	11
STF1961AB	15346+4331	9.9 10.1	20.7	28.14	2008.279	12
STF1963AB	15379+3006	8.5 8.8	298.2	5.43	2008.279	13

Table continued on next page.

Divinus Lux Observatory: Report #15

NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
STF1965	15394+3638	5.0 5.9	305.2	6.42	2008.257	14
STT 300	15402+1203	6.2 10.0	260.7	14.81	2008.257	15
STF1982	15499+4247	9.9 10.1	298.0	4.94	2008.257	16
STT 302AB	15549+3422	7.1 10.4	50.8	29.63	2008.279	17
STF2010AB	16081+1703	5.0 6.1	13.3	27.16	2008.279	18
SHJ 227AB	16219+1909	3.7 9.9	227.2	42.46	2008.358	19
STF2053Aa-B	16284+3108	9.9 10.7	350.9	21.73	2008.265	20
STF2068	16339+4717	8.9 9.0	251.7	4.94	2008.265	21
STF2072	16355+4741	9.7 10.5	179.7	4.94	2008.265	22
STF2087AB	16426+2340	8.8 8.8	287.0	4.94	2008.358	23
STF2101AB	16458+3538	7.5 9.3	48.5	4.44	2008.265	24
KPR 3AC	16458+3538	7.5 10.2	87.5	235.03	2008.265	24
STF2120AB	17048+2805	7.3 9.2	231.0	23.21	2008.298	25
STF2120AC	17048+2805	7.3 10.2	174.2	145.16	2008.298	25
HJ 4923	17091-1815	8.5 10.6	147.8	15.80	2008.358	26
TOB 137	17108+3211	7.3 10.6	260.5	39.99	2008.358	27
POP1234AC	17167+3504	9.5 10.6	320.8	56.78	2008.284	28
STN 34	17167-1709	9.4 10.6	289.0	17.28	2008.284	29
BU 45	17179+3229	9.9 10.5	291.2	4.94	2008.279	30
STF2161Aa-B	17237+3709	4.5 5.4	318.5	3.95	2008.298	31
STF2167	17244+4931	8.1 10.7	209.1	20.74	2008.284	32
STF2180	17290+5052	7.8 7.9	261.0	2.96	2008.298	33
STF2175	17294+3243	8.8 10.6	7.0	13.33	2008.358	34
AG 210	17378+2257	9.9 10.2	187.0	4.44	2008.284	35
B 2413	17424-1924	9.6 10.6	198.1	11.36	2008.284	36
STF2209	17428+4310	8.3 10.5	126.7	29.63	2008.284	37

Table continued on next page.

Divinus Lux Observatory: Report #15

NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
STT 334	17436+3446	7.8 9.8	355.5	15.31	2008.284	38
AG 213	17457+3452	9.1 10.6	175.7	22.22	2008.284	39
STT 336AD	17479+3417	6.6 10.6	163.4	41.48	2008.284	40
AG 214	17495+3436	9.0 9.9	203.5	4.94	2008.298	41
A 698AB	17505+4112	9.6 10.1	256.5	4.44	2008.284	42
STF3129	18011+4521	7.6 10.6	167.8	31.11	2008.342	43
STF2264	18015+2136	4.8 5.1	257.4	6.42	2008.342	44
STF2323AC	18239+5848	5.1 7.9	19.6	88.88	2008.342	45
STF2318	18255+2600	8.4 9.9	249.2	20.74	2008.342	46
STF2352AC	18370+3452	7.9 10.2	160.7	210.34	2008.339	47
SLE 218AD	18381-1400	6.6 10.5	337.9	120.48	2008.339	48
STF2259AC	18386+3046	9.0 9.8	182.5	137.26	2008.339	49
STF2259AE	18386+3046	9.0 10.1	148.0	225.15	2008.339	49
STT 361	18437+0539	8.2 9.4	171.5	22.71	2008.377	50
STF 38AD	18448+3736	4.3 5.6	149.8	43.94	2008.342	51
ES 1425	18467+4303	9.8 10.3	230.5	4.44	2008.339	52
H 40AC	18498+3249	5.9 10.3	120.6	57.28	2008.339	53
SRT 1	18501-1317	8.9 9.4	251.2	29.13	2008.339	54
TAR 3AB	18506+3313	10.5 10.7	305.3	14.81	2008.342	55
STF2436AB	19022+0845	8.5 9.2	314.4	30.12	2008.377	56
STF2436AC	19022+0845	8.5 10.6	300.3	134.30	2008.377	56
STF2453	19051+4008	8.5 10.5	86.0	13.33	2008.374	57
STF2479AB-C	19083+5520	7.5 9.6	29.7	6.42	2008.377	58
MRG 3	19118+2443	10.0 10.3	144.7	5.43	2008.374	59
LDS5873	19151-0428	9.9 10.3	99.9	85.42	2008.374	60
HJ 1395AC	19252+3708	9.5 10.7	13.2	53.82	2008.374	61

Table continued on next page.

Divinus Lux Observatory: Report #15

NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
STF2531AC	19295+0305	8.1 10.1	28.2	31.60	2008.377	62
STF 43Aa-B	19307+2758	3.1 4.7	54.2	34.56	2008.377	63
HU 946	19323+3417	8.1 9.9	215.4	8.39	2008.374	64
HJ 1414	19335+3610	9.3 10.7	32.6	14.32	2008.374	65
A 598AC	19365+4124	9.9 10.7	92.7	47.40	2008.374	66
STF2545AB	19387-1009	6.8 8.5	326.0	3.95	2008.377	67
STT 190AC	19434+4715	7.7 9.7	316.1	67.15	2008.374	68
AG 236	19435+3450	9.8 10.1	148.6	4.44	2008.377	69
STT 384AC	19438+3819	7.6 9.8	296.8	59.25	2008.374	70
STF2605AB	19556+5226	5.0 7.5	178.4	2.96	2008.377	71
GUI 29AC	19585+3317	7.7 9.5	273.7	167.88	2008.377	72
STT 196AB	20019+4052	7.3 9.2	168.8	53.82	2008.402	73
STF2624Aa-C	20035+3601	7.1 9.3	327.4	42.96	2008.402	74
SEI 830	20037+3626	8.2 10.2	359.5	29.63	2008.399	75
HDS2861	20042+4645	9.7 10.7	108.9	16.79	2008.399	76
HJ 1471	20046+3213	5.6 10.4	8.4	32.59	2008.399	77
STF 314AD	20060+3547	6.8 9.5	300.6	11.36	2008.402	78
STF 314AF	20060+3547	6.8 7.3	28.0	36.04	2008.402	78
HJ 1485	20096+3325	8.3 8.9	276.5	4.94	2008.402	79
A 281(AB)	20106+3452	9.0 9.4	172.0	4.44	2008.402	80
ARN 100AC*	20106+3452	9.0 9.7	313.5	63.20	2008.402	80
S 738AB	20106+3338	7.8 8.4	106.4	41.97	2008.402	81
AG 249	20123+3451	7.8 10.7	132.4	33.08	2008.402	82
ES 1674	20181+4122	9.5 10.2	125.8	4.94	2008.399	83
STF2661	20199-0215	7.9 9.2	340.3	24.19	2008.399	84
BU 662AB	20209-1939	8.7 10.7	4.1	124.92	2008.399	85

Table continued on next page.

Divinus Lux Observatory: Report #15

NAME	RA DEC	MAGS	PA	SEP	DATE	NOTES
SEI1103	20215+3950	9.0 10.7	223.0	16.79	2008.399	86
ES 206	20288+3810	9.8 10.5	124.4	3.95	2008.399	87
WEI 35AB	20293+3731	8.2 8.8	215.5	4.44	2008.402	88
WEI 35AC	20293+3731	8.2 9.4	99.9	87.39	2008.402	88
SEI1160AB	20327+3916	8.2 10.3	49.9	14.32	2008.399	89
STF2713	20409+1035	9.8 9.8	63.0	4.94	2008.402	90
HJ 612Aa-B	20410+3905	6.5 10.5	9.4	48.88	2008.399	91
SEI1222	20419+3953	10.4 10.7	77.3	25.18	2008.399	92
AG 265	20457+3647	9.9 9.9	207.5	6.91	2008.399	93
HJ 1582AC	20498+3833	8.2 10.5	326.0	28.64	2008.402	94
SEI1268	20501+3714	10.6 10.7	123.3	27.16	2008.402	95
STF2797	21267+1341	7.4 8.8	218.0	3.46	2008.402	96

* Not listed in the WDS Catalog.

Table Notes

1. In Virgo. Sep. & p.a. increasing. Spect. F0, F0.
2. In Bootes. Common proper motion; sep. increasing. Spect. G2III, G2III.
3. In Bootes. Common proper motion; p.a. decreasing. Spect. F8, F8.
4. In Virgo. Common proper motion; sep. inc; p.a. dec. Spect. F8V, G0.
5. In Bootes. Sep. & p.a. increasing. Spect. G5.
6. In Bootes. Relatively fixed. Common proper motion. Spect. F1V, F1V.
7. In Libra. AB = sep. inc. AC = relfix; common proper motion. Spect. K0.
8. In Bootes. Sep. & p.a. decreasing. Spect. G5, G5.
9. In Libra. Relatively fixed. Common proper motion. Spect. F8, F2.
10. In Draco. Common proper motion; p.a. decreasing. Spect. F5, F5.
11. In Libra. Sep. increasing; p.a. decreasing. Spect. G5.
12. In Bootes. Sep. increasing; p.a. decreasing. Spect. K2, F8.
13. In Corona Borealis. Sep. & p.a. increasing. Spect. F8, F8.
14. Zeta or 7 Coronae Borealis. Cpm; sep. & p.a. inc. Spect. B7V, B9V.
15. In Serpens. Separation slightly increasing. Spect. G2.5III.
16. In Hercules. Common proper motion; p.a. decreasing. Spect. F8, F8.
17. In Corona Borealis. Sep. increasing; p.a. decreasing. Spect. A3V.
18. Kappa or 7 Herculis. Sep. decreasing; p.a. increasing. Spect. G7III, G5.
19. Gamma or 20 Herculis. Position angle decreasing. Spect. A9III.
20. In Hercules. Relatively fixed. Common proper motion. Spect. G0.

Divinus Lux Observatory: Report #15

21. In Hercules. Sep. & p.a. decreasing. Spect. F5, F5.
22. In Hercules. Common proper motion; p.a. decreasing. Spect. G0, G0.
23. In Hercules. Common proper motion; sep. & p.a. dec. Spect. G5IV, G5IV.
24. In Hercules. AB = cpm; p.a. dec. AC = sep. inc. Spect. AB = F6V, G0.
25. In Hercules. AB = sep. increasing. AC = relfixed. Spect. AB = K0III, K1III.
26. In Ophiuchus. Sep. increasing; p.a. decreasing. Spect. A7III.
27. In Hercules. Position angle increasing. Spect. K2.
28. In Hercules. Separation decreasing. Spect. G0, G.
29. In Ophiuchus. Separation slightly increasing. Spect. F5.
30. In Hercules. Common proper motion; p.a. increasing.
31. Rho or 75 Herculis. Common proper motion; p.a. inc. Spect. B9.5III, B9.5III.
32. In Hercules. Common proper motion; p.a. decreasing. Spect. F5, F5.
33. In Draco. Common proper motion; sep. & p.a. decreasing. Spect. A7IV.
34. In Hercules. Common proper motion; p.a. decreasing. Spect. F5.
35. In Hercules. Common proper motion; p.a. increasing. Spect. M0, M0.
36. In Ophiuchus. Relatively fixed. Common proper motion. Spect. F6V.
37. In Hercules. Relatively fixed. Common proper motion. Spect. F0.
38. In Hercules. Position angle slightly increasing. Spect. G5, G5.
39. In Hercules. Sep. increasing; p.a. decreasing. Spect. K0.
40. In Hercules. Separation slightly decreasing. Spect. B3V.
41. In Hercules. Sep. increasing; p.a. decreasing. Spect. F5.
42. In Hercules. Common proper motion; sep. increasing. Spect. F5, F5.
43. In Hercules. Separation increasing. Spect. B9.
44. 95 Herculis. Common proper motion; p.a. decreasing. Spect. A5III, G5.
45. 39 Draconis. Common proper motion; p.a. decreasing. Spect. A1V, F5.
46. In Hercules. Separation increasing. Spect. K2III.
47. In Lyra. Relatively fixed. Spect. K0.
48. In Scutum. Separation slightly decreasing. Spect. B9IV.
49. In Lyra. AC & AE = relatively fixed. Spect. A5.
50. In Serpens. Relatively fixed. Common proper motion. Spect. A2.
51. Zeta or 7 Lyrae. Common proper motion; sep. inc.; p.a. dec. Spect. F0IV, F0IV.
52. In Lyra. Relatively fixed. Common proper motion.
53. 8 Lyrae. Sep. & p.a. slightly decreasing. Spect. B3IV.
54. In Scutum. Relatively fixed. Common proper motion. Spect. G5V, G0.
55. In Lyra near STF 39. Sep. & p.a. increasing.
56. In Aquila. AB = sep. dec.; p.a. inc. AC = sep. inc; p.a. dec. Spect. K0, F8, A0.
57. In Lyra. Sep. & p.a. decreasing. Spect. A2, A2.
58. In Cygnus. Position angle decreasing. Spect. A5IV, A3.
59. In Vulpecula. Separation slightly increasing. Spect. A2.
60. In Aquila. Relatively fixed. Common proper motion.
61. In Lyra. Separation slightly decreasing. Spect. A0.
62. In Aquila. Position angle decreasing. Spect. B5V, A1V.
63. Albireo, Beta, or 6 Cygni. Relatively fixed. Spect. K3II, B8V.
64. In Cygnus. Sep. increasing; p.a. decreasing. Spect. G0.
65. In Cygnus. Sep. decreasing; p.a. increasing.

Divinus Lux Observatory: Report #15

66. In Cygnus. Position angle decreasing. Spect. F5.
67. In Aquila. Sep. & p.a. increasing. Spect. A9III, A5.
68. In Cygnus. Relatively fixed. Spect. B0V, A2.
69. In Cygnus. Sep. & p.a. decreasing. Spect. A0, A0.
70. In Cygnus. Sep. slightly increasing; p.a. slightly decreasing. Spect. B5V.
71. Psi or 24 Cygni. Sep. & p.a. dec. Common proper motion. Spect. A4V, A4V.
72. In Cygnus. Sep. increasing; p.a. decreasing. Spect. F5IV, G0.
73. In Cygnus. Sep. slightly decreasing; p.a. slightly increasing; Spect. A0.
74. In Cygnus. Relatively fixed. Spect. B1III, B2.
75. In Cygnus. Sep. & p.a. slightly increasing. Spect. B5II.
76. In Cygnus. Relatively fixed. Common proper motion. Spect. A, A.
77. In Cygnus. Sep. & p.a. slightly increasing. Spect. B1.5I.
78. In NGC 6871 in Cygnus. AD & AF = relatively fixed. Spect. O9.5I, B2, B.
79. In Cygnus. Position angle slightly decreasing. Spect. A2V, A2V.
80. In Cygnus. (AB) = sep. inc.; common proper motion. AC = cpm. Spect. F7V.
81. In Cygnus. Position angle decreasing. Spect. B9V, B9V.
82. In Cygnus. Separation decreasing. Spect. K2V.
83. In Cygnus. Position angle increasing. Spect. B0, G.
84. In Aquila. Relatively fixed. Common proper motion. Spect. A0.
85. In Capricornus. Separation increasing. Spect. K2III, G.
86. In Cygnus. Relatively fixed. Common proper motion. Spect. B2I, B2I.
87. In Cygnus. Position angle increasing.
88. In Cygnus. AB = sep. & p.a. inc. AC = relatively fixed. Spect. F5, F5, B8.
89. In Cygnus. Common proper motion; p.a. decreasing. Spect. B9, B9.
90. In Delphinus. Relatively fixed. Spect. B9.
91. In Cygnus. Relatively fixed. Spect. B6III.
92. In Cygnus. Sep. increasing; p.a. decreasing.
93. In Cygnus. Common proper motion; sep. slightly increasing.
94. In Cygnus. Separation increasing. Spect. M.
95. In Cygnus. Position angle decreasing.
96. In Pegasus. Position angle increasing. Spect. A2V, A2.