Divinus Lux Observatory Bulletin: Report #10

Dave Arnold

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

Email: dvdarnl@aol.com

Abstract: This report contains theta/rho measurements from 94 different double star systems. The time period spans from 2006.899 to 2007.230. 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, it was mentioned that a number of double stars in the WDS CATALOG, bearing the "WFC" prefix, were brighter than the listed magnitudes. As a consequence, many of these pairs were noted as being within the measuring capabilities of a small telescope that is fitted with a micrometer, and the vast majority of these double stars appear to share a common proper motion as well.

A second series of double stars, bearing the "KU" prefix, has recently come to my attention because, like the "WFC" doubles, many of these pairs are as bright, or brighter, than the magnitude listings in the WDS CATALOG. While a lower percentage of these double stars appear to share a common proper motion, there are a greater number that can be measured with smaller instruments than is the case with the "WFC" series. Hence, the reader may wish to consider giving the "KU" doubles some attention as a way of increasing the number of targets on the measuring list.

Conversely, there are also some double star prefixes than appear to be consistently fainter than the magnitude listings in the WDS CATALOG. Among these types of pairs are prefixes such as BAL, MLB, SEI, and KZA. Unless the doubles with these 4 prefixes have had some recent published measurements, many of them will be out of range to measure with a smaller telescope. If the reader spends some time working with the WDS CATALOG, additional discoveries of this sort will likely be noted besides those that have been listed in 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. There are also some noteworthy items that are discussed pertaining to the following table.

As has been previously noted, this report contains measurements indicative of the fact that large theta/rho shifts have occurred because of proper motion by one or both of the components of a double star. To begin with, ENG 20 has displayed an increase of 5 degrees in the theta value and 30" in the rho value since 1991. This huge shift has been caused by a large proper motion from the reference point star. Proper motion by the companion star, for J 2840, has caused a decrease in the theta value of almost 6 degrees since 1997. A 3.6% increase in the rho value is being noted for STT 564 AC. This has occurred since 1991 because of proper motion by the "A" component. Proper motions by both "A" and "C" have caused dramatic shifts in the theta/rho parameters for OPI 13 Aa-C. Since 1926, the date of the last listed published measurements, the rho value has increased by 25" and the theta value has increased by about 8.5 degrees. Also of note is the fact that BU 1433 Aa-B has undergone a 3 degrees decrease in the theta value, since 1991, resulting from proper motion by the "A" component.

Five double star systems listed in this report, while not displaying significant shifts in theta values,

Divinus Lux Observatory Bulletin: Report #10

are found to have undergone noteworthy rho value shifts as a consequence of the directions of proper motion. STF 926 Aa-B has displayed a 3.3% rho value increase, since 1997, because of proper motion by both "A" and "B." BU 1059 A-BC has shown a 3.1% rho value decrease, since 1990, as a result of a large proper motion by the "A" component. For HO 237, proper motion by the reference point star, and the passage of 120 years since the last published measurements, have combined to give a rho value increase of 40% since 1887. A 3.2% rho value increase is being noted for STF 5 AF (Pollux). This shift has been caused by the "A" component's proper motion since 1991. Likewise, proper motion by the reference point star, for HJ 1181, has resulted in a 3% increase in the rho value since 1997.

The final proper motion shift to be discussed in this report, just like the one mentioned for ENG 20 above, is huge by about any standard one would choose to use. In this case, KUI 51 has displayed a nine degrees decrease in the theta value and an increase of 41%, or 11".0, in the rho value, since 1991. As in many of the systems highlighted in this article, the motion of the reference point star is the cause of this shift.

Orbital motion is primarily responsible for a 3 degrees increase in the theta value, for STF 1321 AB, since 1997. This visual binary star has had its orbital elements calculated, and these can be found in SKY CATALOGUE 2000.0, Volume 2. When calculating the theta/rho values from the listed orbital elements, for 2007.129, I found that these values matched up very well with what I measured on that date. Perhaps the listed orbital elements are more accurately known than the "grade 5" ranking would imply from the catalog.

In regards to LDS 5535, it appears that the rho measurement is in error in the WDS CATALOG. Only one measurement was recorded in 1960, at a value of 253".0, but a value of approximately 180" is a more accurate figure. Proper motion cannot account for such a large shift in 46 years. Additionally, the theta value in the CATALOG is off by 8 degrees, and this discrepancy is in a contrary direction to the proper motion of the reference point star. More measurements of this double star would help to accurately determine the theta/rho parameters.

Several discrepancies appear to exist in the historical record for the STF 1121 multiple star system (M 47). First of all, the measurements for STF 1121 AE, in the WDS CATALOG, appear to more nearly match the parameters for STF 1121 BE. The table lists measurements as being for "BE" because this is how the parameters matched up telescopically when M47 was the subject of study. In addition, it is noted that the various catalogs (WDS CATALOG 2001.0, WDS DOUBLE STAR CD 2001.0, and WDS DOUBLE STAR CD 2006.5) list theta/rho values for the components of this system that vary to some extent. Because the components that appear in the following table are all relatively fixed, such discrepancies should be minimal. Hence, it is being suggested that all of the system components might need measurements from several researchers in order to bring increased accuracy to all published theta/rho values that are listed for M 47.

Another possible error in the WDS CATALOG pertains to listed measurements for ES 2629 in 1991, which have theta/rho values of 297 degrees and 40".1. Measurements in this report match up much more closely with the 1903 values of 289 degrees and 16".3. When one considers such factors as the common proper motions of both components, it is readily apparent that the 1991 rho value could not possibly be so large and, to a lesser extent, that the theta value is also too large.

As in previous articles, the following table contains new submissions for possible common proper motion double stars that don't appear to have been previously cataloged. These submissions are identified as ARN 91 (05500+2258), ARN 92 (05097+2549), ARN 93 (06255+0650), and ARN 94 (07061+5259). The companion star for ARN 91 is supposedly the reference point star for POU 789 (05499+2259), but the companion star for POU 789 was not visible with my instrumentation and did not appear on my star chart. Perhaps researchers with larger telescopes could verify whether or not this apparently missing star has any level of visibility with moderated sized instruments. ARN 92 is located near HDS 680 (05097+2546). ARN 93 appears near GRV 716 (06259+0655). ARN 94 is in the vicinity of STF 1009 (07057+5245).

Divinus Lux Observatory Bulletin: Report #10

Name	RA Dec	Mag 1	Mag 2	PA	Sep	Date	N	Notes
STF 404 AC	03314+2148	9.7	9.8	50.4	121.46	2006.899	1n	1
STF 416 AB	03349+1949	8.7	10.5	67.5	30.12	2006.899	1n	2
STF 458	03496+1817	10.4	10.5	202.0	4.94	2006.899	1n	3
LDS6118	03497+2320	8.1	9.1	322.6	179.73	2006.899	1n	4
GUI 4 AD	04101+2407	10.1	9.1*	205.9	89.37	2006.937	1n	5
LDS5535	04173+2035	4.9	9.5	118.3	179.73	2006.937	1n	6
BUP 52 Aa-B	04184+2135	5.6	10.3	61.1	158.99	2006.937	1n	7
H 101 AC	04255+1756	4.3	10.5	235.5	77.03	2006.937	1n	8
ARN 62 AD	04255+1756	4.3	9.0	39.5	412.78	2006.937	1n	8
STF 559	04335+1801	7.0	7.0	277.0	2.96	2006.937	1n	9
BUP 66 AC	04382+1231	4.3	10.3	309.4	122.45	2006.937	1n	10
STF 589	04448+0517	8.7	8.8	279.3	4.44	2006.937	1n	11
STT 55	04491+0513	8.1	9.2	17.1	37.53	2006.937	1n	12
BUP 70	04514+1850	5.1	10.5	301.8	179.73	2006.937	1n	13
STF 609	04518+0115	8.7	9.6	70.0	2.96	2006.937	1n	14
ARN 92 **	05097+2549	9.9	9.9	135.5	25.68	2006.984	1n	15
STT 62	05120+0650	7.5	7.6	52.5	124.92	2006.984	1n	16
A 212 AC	05158+2928	9.2	10.7	16.8	21.23	2006.997	1n	17
CTT 4 AC	05175+3312	7.7	10.3	282.8	111.59	2006.984	1n	18
STF 679	05197+2511	10.0	10.2	317.0	20.24	2006.956	1n	19
J 144	05222+2008	9.7	10.3	167.4	5.93	2006.956	1n	20
HJ 364	05242+2208	10.1	10.5	143.2	10.86	2006.956	1n	21
STF 716 AB	05293+2509	5.8	6.7	208.0	4.44	2006.984	1n	22
STT 63	05308+3950	6.4	7.6	277.0	76.03	2006.984	1n	23
STF 731 AB	05314-0206	8.6	9.1	327.2	4.94	2006.956	1n	24

Divinus Lux Observatory Bulletin: Report #10

Name	RA Dec	Mag 1	Mag 2	PA	Sep	Date	N	Notes
GUI 8 AC	05314-0206	8.6	9.5	135.3	169.93	2006.956	1n	24
ENG 20	05314-0336	8.0	10.6	318.1	276.50	2006.997	1n	25
STF 738 AB	05351+0956	3.5	5.5	44.0	4.44	2006.984	1n	26
STF 738 AD	05351+0956	3.5	9.6	271.1	78.01	2006.984	1n	26
GUI 9 AE	05351+0956	3.5	9.2	279.4	151.09	2006.984	1n	26
STF 749 AC	05371+2655	6.6	9.6	299.6	179.73	2006.997	1n	27
STF 771 AB	05418+1933	10.2	10.3	54.7	21.73	2006.956	1n	28
STF 773 AB	05428+3322#	9.6	10.7	219.5	27.16	2006.956	1n	29
STF 777	05434+2213	9.3	9.8	84.5	4.94	2006.956	1n	30
POU 768	05437+2504	9.2	10.6	272.4	11.85	2006.956	1n	31
STF 779 AB	05444+2744	7.5	9.8	254.2	8.89	2006.956	1n	32
HJ 5539	05456+1737	10.0	10.2	281.5	27.65	2006.956	1n	33
STT 66	05479+2441	6.8	7.5	167.2	93.81	2006.984	1n	34
ARN 91 **	05500+2258	8.3	8.9	312.2	112.08	2006.984	1n	35
AG 220	05566+1033	9.5	10.0	13.1	22.71	2006.956	1n	36
JRN 23 JI	06085+1358	10.4	10.6	90.0	43.45	2006.962	1n	37
SCA 37	06099+2032	10.5	10.6	94.3	24.69	2006.956	1n	38
STF 845	06116+4843	6.2	6.8	358.5	7.41	2006.997	1n	39
STT 70	06141+2359	7.5	7.9	179.1	114.55	2006.997	1n	40
H 23 AB	06171+1551	7.3	10.5	229.9	43.94	2006.962	1n	41
ARN 39 AC	06171+1551	7.3	10.1	87.5	103.69	2006.962	1n	41
S 513 AB	06212+2108	7.3	8.9	259.2	58.26	2007.071	1n	42
S 513 AD	06212+2108	7.3	7.6	25.2	264.65	2007.071	1n	42
STF 897	06224+2640	8.8	9.0	348.7	18.27	2006.962	1n	43

Divinus Lux Observatory Bulletin: Report #10

Name	RA Dec	Mag 1	Mag 2	PA	Sep	Date	N	Notes
BU 1059 A-BC	06230+2231	2.9	10.5	140.4	107.64	2007.071	1n	44
ARN 93**	06255+0650	9.2	10.3	210.9	23.21	2007.071	1n	45
STF 926 Aa-B	06317+0546	7.2	8.6	290.2	11.36	2007.071	1n	46
STF 929	06353+3743	7.2	8.4	24.1	5.93	2007.071	1n	47
HO 237	06421+0315	7.1	10.6	54.8	168.86	2007.071	1n	48
STF 978 AB	06555+3755	6.7	10.0	86.4	18.76	2006.962	1n	49
STF1009 AB	07057+5245	6.7	7.0	147.7	4.44	2007.074	1n	50
ARN 94**	07061+5259	10.5	10.7	91.5	16.79	2007.074	1n	51
STF1056	07156-0152	7.9	8.8	300.4	3.95	2007.074	1n	52
DUF 2	07160+1644	9.2	9.3	112.8	41.48	2006.989	1n	53
STF1063 AB**	07181+0421	9.1	10.4	289.8	51.35	2006.989	1n	54
GIC 72 AB	07224+0854	9.4	10.5	166.6	302.18	2006.989	1n	55
BID 2	07261+2153	9.3	9.7	320.9	100.23	2006.989	1n	56
STF1089 AB	07262+1450	8.9	8.9	5.9	6.91	2007.074	1n	57
SHJ 368 Aa-C	07277+2127	5.2	10.6	220.8	133.31	2006.989	1n	58
STF1121 AB	07366-1429	6.9	7.3	305.1	7.90	2007.074	1n	59
STF1121 AD	07366-1429	6.9	9.5	102.3	72.09	2007.074	1n	59
STF1121 BE**	07366-1429	7.3	9.9	232.8	69.13	2007.074	1n	59
STF1121 AH	07366-1429	6.9	9.4	269.3	150.10	2007.074	1n	59
J 2840	07377+1330	10.4	10.6	281.3	7.90	2007.074	1n	60
STF 5 AF	07453+2802	1.2	10.5	78.6	309.09	2007.071	1n	61
HJ 2418	07506+2001	10.1	10.1	217.2	21.73	2006.989	1n	62
STF1153	07526+1201	10.1	10.3	357.6	19.75	2006.989	1n	63
BUP 110 AC	08069+2530	9.8	10.4	127.6	254.78	2007.016	1n	64

Divinus Lux Observatory Bulletin: Report #10

Name	RA Dec	Mag 1	Mag 2	PA	Sep	Date	N	Notes
STT 564 AC	08116+3227	6.8	10.7	66.2	289.34	2007.093	1n	65
CHE 88	08137+0833	10.2	10.7	110.5	45.43	2007.016	1n	66
OPI 13 Aa-C	08160+1842	7.6	9.7	78.6	65.18	2007.093	1n	67
ES 2629	08269+5210	9.7	10.1	290.4	15.80	2007.093	1n	68
S 571 AC	08399+1933	7.3	7.4	156.8	45.43	2007.093	1n	69
S 571 AD	08399+1933	7.3	6.6*	241.8	92.83	2007.093	1n	69
STT 569 Aa-C	09123+1500	6.5	10.4	216.7	204.41	2007.167	1n	70
HJ 122	09137+1109	10.2	10.4	91.3	9.88	2007.038	1n	71
STF1321 AB	09144+5241	7.6	7.7	95.1	17.28	2007.129	1n	72
HJ 2490	09150+1253	10.2	10.5	67.9	21.73	2007.038	1n	73
STF1332	09174+2339	7.8	8.1	28.8	5.93	2007.129	1n	74
HJ 2492 AC	09186+5231	10.1	9.1*	129.5	221.69	2007.038	1n	75
STF1401	10002+0615	7.7	9.7	21.2	24.19	2007.167	1n	76
STF1402 AB	10049+5529	7.7	8.9	105.7	32.09	2007.167	1n	77
GIR 2 AC	10049+5529	7.7	9.6	175.4	132.33	2007.167	1n	77
STF1446	10336+1513	9.2	10.0	250.2	5.43	2007.060	1n	78
KUI 51	10365-1214	5.7	10.2	0.2	37.53	2007.205	1n	79
STF1486	10550+5207	8.3	9.6	99.8	31.60	2007.167	1n	80
HJ 1181	11006-1819	8.9	9.9	268.3	63.20	2007.205	1n	81
LDS 342 AB	11154-1807	10.2	10.1*	261.7	18.76	2007.115	1n	82
STF1521	11154+2734	7.6	8.0	98.1	3.46	2007.205	1n	83
STF1547 AB	11317+1422	6.3	9.0	330.2	15.80	2007.205	1n	84
BGH 35	11324+1212	8.4	9.4	106.3	395.00	2007.115	1n	85
STF1552 AB	11347+1648	6.3	7.3	209.0	3.46	2007.205	1n	86

Divinus Lux Observatory Bulletin: Report #10

Name	RA Dec	Mag 1	Mag 2	PA	Sep	Date	N	Notes
STF1552 AC	11347+1648	6.3	9.8	234.9	63.20	2007.205	1n	86
STF1596	12043+2128	6.2	7.4	236.0	3.95	2007.230	1n	87
STF1600	12056+5156	7.5	8.3	92.8	7.90	2007.205	1n	88
BU 1433 Aa-B	12337+4121	4.2	10.6	199.8	264.65	2007.230	1n	89
BGH 40 AB	12396+1956	8.4	8.8	148.1	415.74	2007.115	1n	90
HJ 2617 AB	12406+4017	8.3	9.6	2.5	5.93	2007.230	1n	91
STF1719	13073+0035	7.5	8.1	359.3	6.91	2007.230	1n	92
STF1723	13082+3844	8.6	10.0	11.1	6.42	2007.230	1n	93
HJ 2687	13520-1955	10.1	10.4	140.2	15.80	2007.115	1n	94

* The companion star is the brighter component.
** Not listed in the WDS CATALOG.
# System coordinates appear to be closer to 05435+3317.

Notes

1. In Taurus. Position angle increasing. Spect. K0, F2.
2. In Taurus. Sep. & p.a. increasing. Spect. K5, K5.
3. In Taurus. Common proper motion; p.a. increasing. Spect. F8.
4. In Taurus. Common proper motion; p.a. slightly increasing. Spect. A2, F8.
5. In Taurus. Sep. & p.a. slightly decreasing. Spect. G0, F5.
6. In Taurus. Position angle decreasing. Spect. A3, K5.
7. 51 Tauri. Separation decreasing. Spect. F0V.
8. Delta or 68 Tauri. AC = sep. inc. AD = relfix, cpm. Spect. AD = A2IV, K2V.
9. In Taurus. Slight decrease in p.a. Spect. B9IV, B9IV.
10. 90 Tauri. Separation increasing. Spect. A6V.
11. In Orion. Common proper motion; p.a. decreasing. Spect. G5, G5.
12. In Orion. Relatively fixed. Common proper motion. Spect. K, F.
13. 97 Tauri. Separation increasing. Spect. A7IV, F5.
14. In Orion. Sep. increasing; p.a. decreasing. Spect. F8.
15. In Taurus. Common proper motion. Near HDS 680.
16. In Orion. Sep. & p.a. increasing. Spect. K0, K0.
17. In Auriga. Sep. increasing; p.a. decreasing. Spect. G2V.
18. In Auriga. Position angle slightly increasing. Spect. A2.
19. In Taurus. Relatively fixed. Common proper motion. Spect. G5, G0.
20. In Taurus. Common proper motion; p.a. decreasing. Spect. F.
21. In Taurus. Relatively fixed. Spect. F2, F5.
22. 118 Tauri. Sep. dec; p.a. inc. Common proper motion. Spect. B8.5V, B9V.
23. In Auriga. Position angle increasing. Spect. G9III, K0.
24. In Orion. AB = p.a. decreasing. AC = relatively fixed. Spect. A0, A0, A2.
25. In Orion. Sep. & p.a. increasing. Spect. M1.5V, F8.

Divinus Lux Observatory Bulletin: Report #10

26. 39 Orionis. AB = cpm. AD = relfix. AE = sep. inc. Spect. O8, B.5V, B9, B9.
27. In Taurus. Sep. increasing; p.a. decreasing. Spect. B9IV.
28. In Taurus. Separation decreasing. Spect. A0.
29. In Auriga. Relatively fixed. Spect. K0.
30. In Taurus. Relatively fixed. Spect. A0, A0.
31. In Taurus. Common proper motion; p.a. decreasing. Spect. A2.
32. In Taurus. Relatively fixed. Common proper motion. Spect. A0, A0.
33. In Taurus. Separation increasing. Spect. A0.
34. In Taurus. Relatively fixed. Spect. K2, K2.
35. In Taurus. Common proper motion. Spect. A2, F0.
36. In Orion. Relatively fixed. Common proper motion. Spect. G5.
37. In Orion. Part of STF 848 system. Relatively fixed. Common proper motion.
38. In Orion. Separation slightly decreasing. Spect. F0.
39. 41 Aurigae. Common proper motion; p.a. increasing. Spect. A1V, A6V.
40. In Gemini. Sep. slightly decreasing. Spect. F0.
41. In Orion. AB = sep. slightly dec. AC = p.a. slightly dec. Spect. B8II.
42. In Gemini. AB & AD = relatively fixed. Spect. B9II, A0, A0.
43. In Gemini. Relatively fixed. Spect. A0, A0.
44. Mu Geminorum. Separation decreasing. Spect. M3II.
45. In Monoceros. Common proper motion. Spect. A7, F5.
46. In Monoceros. Sep. & p.a. increasing. Spect. A1, A5.
47. In Auriga. Relatively fixed. Common proper motion. Spect. G5, G5.
48. In Monoceros. Separation increasing. Spect. A2V.
49. In Auriga. Sep. increasing; p.a. decreasing. Spect. K0.
50. In Lynx. Sep. inc; p.a. dec.; common proper motion. Spect. A3V, A3V.
51. In Lynx. Common proper motion.
52. In Monoceros. Position angle increasing. Spect. G0, G0.
53. In Gemini. Position angle increasing. Spect. A5III, F0.
54. In Canis Minor. Sep. inc. WDS listing = A-BC. Spect. F8, A5.
55. In Canis Minor. Relatively fixed. Common proper motion. Spect. F2.
56. In Gemini. Relatively fixed. Spect. R5.
57. In Gemini. Position angle slightly decreasing. Spect. A2, A2.
58. In Gemini. Sep. decreasing; p.a. increasing. Spect. F5V.
59. In Puppis (M 47). All components relatively fixed. Spect. AB = B6V, B6V.
60. In Gemini. Position angle decreasing.
61. Pollux, Beta, or 78 Geminorum. Sep. & p.a. increasing. Spect. K0III.
62. In Gemini. Relatively fixed. Common proper motion. Spect. A0, F2.
63. In Canis Minor. Relatively fixed. Spect. F8, F5.
64. In Cancer. Slight decrease in p.a. Spect. K5.
65. In Cancer. Sep. increasing; p.a. decreasing. Spect. G4V.
66. In Cancer. Sep. & p.a. increasing.
67. In Cancer. Sep. & p.a. increasing. Spect. K0, K0.
68. In Lynx. Sep. dec.; p.a. inc.; common proper motion. Spect. K4.
69. In Cancer. AC & AD = relfixed; common proper motion. Spect. A0, A0, K0.
70. In Cancer. Sep. & p.a. decreasing. Spect. G8V, F0.
71. In Cancer. Common proper motion. Sep. slightly increasing. Spect. F, F.
72. In Ursa Major. Common proper motion; p.a. increasing. Spect. M0V, K2.
73. In Cancer. Common proper motion. Sep. slightly increasing. Spect. K0, K.
74. In Cancer. Common proper motion; p.a. increasing. Spect. F6V, F7V.
75. In Ursa Major. Position angle slightly increasing. Spect. F2.
76. In Sextans. Relatively fixed. Common proper motion. Spect. F5.

Divinus Lux Observatory Bulletin: Report #10

77. In Ursa Major. AB = sep. & p.a. inc. AC = relfix. Spect. K5, K5, G0.
78. In Leo. Relatively fixed. Common proper motion. Spect. G0, G0.
79. In Hydra. Sep. increasing; p.a. decreasing. Spect. F7V.
80. In Ursa Major. Sep. increasing; p.a. decreasing. Spect. K5, F5.
81. In Crater. Separation decreasing. Spect. M7, F2.
82. In Crater. Common proper motion; p.a. slightly increasing. Spect. K7V, K7V.
83. In Leo. Common proper motion; p.a. increasing. Spect. A5, A5.
84. 88 Leonis. Common proper motion; p.a. increasing. Spect. G0IV, G0V.
85. In Leo. Relatively fixed. Common proper motion. Spect. F5, G5.
86. 90 Leonis. AB & AC = separation increasing. Spect. B4V, B3, F5.
87. 2 Comae Berenicis. Relfixed. Common proper motion. Spect. F0IV, F0IV.
88. In Ursa Major. Common proper motion; p.a. decreasing. Spect. G8III, G8III.
89. Beta Canes Venaticorum. Position angle decreasing. Spect. G0, K0.
90. In Coma Berenices. Relatively fixed. Common proper motion. Spect. G5, K0.
91. In Canes Venatici. Common proper motion. Sep. inc.; p.a. dec. Spect. G0, G0.
92. In Virgo. Common proper motion; p.a. decreasing. Spect. F5V, F9V.
93. In Canes Venatici. Common proper motion; p.a. increasing. Spect. G5, G5.
94. In Virgo. Sep. & p.a. increasing. Spect. F0, F0.