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Abstract: This report contains theta/rho measurements from 97 different double star systems. The time period spans from 2004.585 to 2004.697. All 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 this article, I would like to discuss the existence of common proper motion as it applies to double star research. The purpose for doing this is to bring additional clarity to previous articles that I have written on this subject, and also to address some issues that have been expressed from e-mails that I have received.

To begin with, one must be aware that the existence of common proper motion between two double stars is a necessary, but not a sufficient condition, to determine whether a particular double star is also a binary. The fact that common proper motion is a necessary condition is intuitively obvious, since two components that have divergent proper motions are not gravitationally bound.

However, one must also be cognizant of the fact that the existence of common proper motion is not a sufficient condition, by itself, to determine that a given double star is a binary. For example, it is possible that if the double is viewed from a location, which is removed from that of the earth, the double may not show a common proper motion. Additional factors such as the distances, the radial velocities, and the tangential velocities of the components, relative to earth's location, must also be known in order to help establish the existence of a binary star.

Another consideration that one must be aware of is knowing how closely aligned the proper motions of the components are to each other, in order to declare that a common proper motion exists in the first place. In essence, the percentage of similarity in the proper motions should be reasonably high. The value of this percentage of similarity is not necessarily the same among all researchers, although a value above 90% is a standard that is often applied.

Finally, one may want to consult several sources that list proper motions, such as the WDS, TYCHO, and POSITION AND PROPER MOTION CATALOGS. If such sources as these are in fairly close agreement, regarding the values indicative of common proper motion for a particular double star, then the probability that such motion is real is greatly enhanced.

In summary, if it is established that a common proper motion does not exist between two components of a double star, then such pairs can be sorted out as optical doubles. For those doubles that may not be optical pairs, a probability factor can be identified to determine the likelihood of common proper motion. This is, again, only the first step in the process of establishing that a given double star is also a binary. Hopefully, the above discussion will help to bring clarity to a subject that can sometimes create confusion for those that are new to the field of double star astronomy.

As has been done in previous articles, the selected double star systems, which appear in the table below, 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. Various items of significance are discussed in the following paragraphs, such as large theta/rho shifts, possible newly discovered components, and possible discrepancies in the WDS CATALOG.

First of all, this report contains measurements implying that some recent theta/rho values in the

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WDS CATALOG might be anomalous for unknown reasons. Regarding STF 2902 AB, the rho values for 1833, in the Hipparcos Catalog, and my measurements cluster around 6.3 to 6.4 arc seconds, while the 1994 CATALOG measurement lists a value of 6.9 arc seconds. For HJ 975, the theta values for 1875, in the Hipparcos Catalog, and my measurements reveal a value of approximately 243 degrees, while the 1991 CATALOG value lists 245 degrees for this parameter.

In a like manner, the 1994 theta value for STF 2960 AC deviates 5 to 6 degrees from the other 3 source types mentioned above, the 1991 theta value for STF 3134 shows a deviation of 3 degrees, and the 1994 theta value for STF 2861 deviates from 1.5 to 2 degrees. The 1991 theta listing in the CATALOG, for A 414 AC, also shows a 2 to 3 degrees variation from the other three source types mentioned above. In addition, the 1994 theta/rho values, for WEI 38 AB, deviate by approximately 5 degrees and 0.5" from the other previously mentioned sources. Finally, the 1994 CATALOG theta value for STF 3009 varies by 5 degrees from those in the Hipparcos Catalog, from measurements in 1829, and my measurements. Because there is no obvious explanation for these differences, these double stars probably need additional study from other researchers in order to help determine accurate values, and possibly, to verify what has been reported.

Also appearing in this article are some common proper motion pairs, bearing the ARN prefix, that apparently have not been previously cataloged. In this regard, a "C" component has been added to H 31 (22284+5825), being listed in the table as ARN 79 AC. An additional inclusion in the table, listed as ARN 80 (23023-1116), is a widely separated, common proper motion pair that is located near STF2970. A new component is being proposed as an addition to STF 3009, a double star that was referred to in the previous paragraph. Appearing as ARN 81 AC in the table (23243+0343), this very widely separated component shares a common proper motion with both stars comprising the STF 3009 system. Lastly, a possible common proper motion pair, located near the STT 377 star system, has been designated as ARN 82 (19362+3541) in the table below.

A decrease in the position angle value, probably because of orbital motion, is being noted for STF 2925. This common proper motion pair appears to have displayed a p.a. shift of over 2 degrees since 1991. Because this rate of change is greater than what was reported prior to 1991, the companion star might be headed towards periastron.

As in previous articles, significant shifts in theta/rho values, resulting from the proper motion of one or both of the double star components, are reflected in the measurements listed in the table. Noteworthy in this regard is the KR 60 multiple star system. Because of a very large proper motion by the "A" component, AC has shown a 13" increase in separation since 1991. From the same cause, AI has undergone a position angle decrease of over 3 degrees, and a 5.5" separation increase, sine 1991.

Additional systems that have shown theta/rho shifts, because of proper motion, include ABH 168 AD, BU 80 AD, and BU 80 AE. The separation value for ABH 168 AD has increased by 2.5 %, since 1987, as a result of proper motion by the "D" component. Because BU 80 AD and AE have not been measured since the early 1920s, and as a result of a large proper motion by the "A" component, AD has shown theta/rho shifts of 6 degrees and 28 seconds, while AE has shown shifts of 2 degrees and 37 seconds, since that time.

Also in regards to BU 80 AE, a 1916 separation measurement may contain a typographical error in the WDS CATALOG. The CATALOG listing shows a value of 105.5 seconds, but based on proper motion rates for the AE components, this value should probably be 205.5 seconds. A possible second typo in the CATALOG, which is being noted in this report, relates to H 302 AB. In this case, an 1886 separation measurement of 60" should probably be nearly the same as the 1991 value of 80" because the common proper motion vectors for this pair are nearly parallel.

Lastly, a possible correction to the CATALOG may be in order for BU 1149. To begin with, this double star is listed twice in the CATALOG with two completely different sets of parameters. The rho value for one set of the parameters presents a separation that was too small for me to verify with my instrumentation. However, I was able to confirm that the wider double star pair, also identified as BU 1149, shares the same reference point star with SHJ 355 AC, which also appears in the table below. Perhaps this wider BU 1149 pair should be listed as BU 1149 AI, and be included as part of the same multiple star system with SHJ 355 AC.

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NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
ARN 82 #	19362+3541	8.1 8.4	34.1	43.45	2004.683	1n	1
STT 377 AB-C	19363+3540	9.4 10.3	153.9	25.68	2004.683	1n	2
STF 2548	19365+2500	8.5 9.8	100.0	9.38	2004.683	1n	3
BU 144	19377+3022	9.4 9.5	355.5	5.93	2004.683	1n	4
ES 794 AB	19420+5201	9.2 9.9	256.3	44.44	2004.683	1n	5
HJ 1448	19520+3802	9.6 9.7	167.9	11.85	2004.683	1n	6
KU 125	19523+4545	9.5 10.2	265.0	54.31	2004.683	1n	7
ARG 105	19530+5606	8.4 10.0	305.2	57.28	2004.683	1n	8
HJ 1457	19577+3755	9.6 9.8	223.1	11.85	2004.683	1n	9
STF2817 AB	21424+0027	8.8 9.1	154.8	25.68	2004.697	1n	10
CHE 316	21444+0008	9.2 10.3	298.4	37.53	2004.697	1n	11
ARG 43 AB	21448+4931	8.6 9.0	19.3	29.13	2004.697	1n	12
HJ 1694 AB	21462+5748	9.6 10.2	14.0	19.75	2004.697	1n	13
STF2829	21494+3045	8.9 9.6	14.9	16.79	2004.697	1n	14
KU 133	21497+3415	9.3 9.8	181.3	48.39	2004.697	1n	15
SCA 101	21504-0356	9.0 10.0	110.4	106.65	2004.697	1n	16
SCA 102	21510-0352	9.6 10.2	338.4	50.36	2004.697	1n	17
HJ 1714	22013+4621	9.6 9.6	251.9	16.79	2004.639	1n	18
A 780 AC	22013+4515	9.5 10.1	95.1	66.16	2004.639	1n	19
STF2851 AB	22017-1200	8.7 9.0	122.1	18.76	2004.639	1n	20
STF2855 AB	22053-0125	8.3 10.2	304.3	25.68	2004.639	1n	21
STF2861	22060+2048	8.1 8.6	220.6	6.91	2004.585	1n	22
ES 2715	22069+4752	8.6 9.0	278.8	36.54	2004.639	1n	23
HJ 3092	22095-1827	8.9 9.4	342.2	28.64	2004.639	1n	24
ABH 160 AE	22103+4758	9.7 10.0	121.5	67.15	2004.639	1n	25
STF2878 AC	22145+0759	6.9 10.5	119.7	67.15	2004.585	1n	26
STF2886	22147+4921	7.6 10.1	108.2	20.74	2004.585	1n	27
STF2890 AB	22152+4953	9.4 9.7	11.1	9.38	2004.639	1n	28

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STF2890 AC	22152+4953	9.4 9.4	277.3	73.08	2004.639	1n	28
STF2891 AB	22165+4759	8.8 9.8	309.0	12.84	2004.639	1n	29
BOT 5 AC	22165+4759	8.8 10.4	105.2	57.28	2004.639	1n	29
STF2892 AC	22193-1047	8.7 9.8	258.8	38.02	2004.639	1n	30
STF2897	22218+1515	9.5 10.3	97.9	16.79	2004.639	1n	31
STF 2898	22223+1105	9.1 10.3	282.0	12.84	2004.639	1n	32
STF2902 AB	22236+4521	7.5 8.2	88.3	6.42	2004.585	1n	33
WEI 38 AB	22237+4054	9.0 9.7	52.5	6.91	2004.639	1n	34
STF2904	22272-0146	9.6 10.1	310.8	8.40	2004.604	1n	35
KR 60 AC	22280+5742	9.7 10.3	61.9	131.34	2004.604	1n	36
KR 60 AI	22280+5742	9.7 8.3##	120.8	233.05	2004.604	1n	36
H 4 31 (AB)	22284+5825	8.5 10.4	3.9	24.69	2004.585	1n	37
ARN 79 AC #	22284+5825	8.5 9.4	320.1	79.00	2004.585	1n	37
STFA 58 AC	22292+5825	4.1 6.1	191.1	40.49	2004.585	1n	38
HLD 51 AC	22355+0234	9.0 9.9	29.2	132.33	2004.604	1n	39
A 1469 Aa-D	22359+3938	5.7 9.1	144.0	81.96	2004.585	1n	40
STF2925	22379+0554	9.6 10.3	1.8	7.41	2004.658	1n	41
HJ 5355 AC	22386-1404	7.5 9.2	0.3	107.64	2004.604	1n	42
STF2930	22395+0710	9.0 10.3	76.0	21.73	2004.604	1n	43
HDO 171 AB	22398-1942	9.1 10.4	357.3	66.13	2004.658	1n	44
HJ 299	22400+1710	9.2 10.4	314.5	19.26	2004.642	1n	45
STF3134	22407+2959	9.5 10.1	76.2	6.91	2004.585	1n	46
A 414 AC	22426+4401	9.7 10.4	82.0	25.68	2004.604	1n	47
ES 393 AB	22435+3114	8.8 8.9	297.1	80.98	2004.604	1n	48
STF2938A-BC	22451-0240	9.3 9.5	341.9	19.75	2004.642	1n	49
STF2943	22477-1403	5.7 9.0	126.4	21.73	2004.604	1n	50
AG 288	22487+3818	8.8 10.1	185.5	18.76	2004.607	1n	51
HJ 1829	22512+5712	9.6 10.2	44.0	22.71	2004.642	1n	52

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HJ 3150	22519+5304	9.8 9.9	110.6	19.75	2004.642	1n	53
HJ 3149	22532+0440	9.5 9.8	248.4	36.54	2004.642	1n	54
STF2954	22548+1511	9.8 10.3	21.5	40.49	2004.642	1n	55
HJ 975	22557+3621	5.7 9.0	243.6	52.34	2004.585	1n	56
STF2960 AC	22564+4136	5.6 9.3	47.6	62.21	2004.585	1n	57
STF2967	22590+2745	8.6 9.8	5.0	6.91	2004.642	1n	58
ES 2723	23021+5455	8.8 9.6	52.1	30.61	2004.658	1n	59
ARN 80 #	23023-1116	7.8 9.8	270.3	79.00	2004.658	1n	60
STF2970	23024-1119	8.9 9.3	37.5	8.40	2004.658	1n	61
HJ 1841 AB	23029+4610	9.7 10.2	344.1	18.27	2004.607	1n	62
HJ 1841 AC	23029+4610	9.7 10.4	285.9	33.58	2004.607	1n	62
STF2976 AC	23077+0636	9.0 9.4	207.1	20.74	2004.658	1n	63
STF2986	23100+1426	6.5 8.8	269.8	31.60	2004.661	1n	64
HO 197 AB-C	23114+3813	7.9 10.3	320.4	36.54	2004.607	1n	65
HJ 3176	23129+1233	9.9 10.0	344.0	26.66	2004.658	1n	66
SCA 146	23140+0327	9.2 10.2	216.3	71.10	2004.658	1n	67
HJ 983 AB	23144+3147	9.2 10.3	155.7	16.79	2004.607	1n	68
AG 291 AB	23150+3556	8.5 10.3	237.0	20.74	2004.607	1n	69
AG 291 AC	23150+3556	8.5 10.2	235.1	44.44	2004.607	1n	69
ABH 168 AD	23150+3556	8.5 10.2	62.2	80.98	2004.607	1n	69
HJ 3181 AC	23159+5258	9.4 9.8	48.8	156.03	2004.607	1n	70
STF2995	23166-0135	8.1 8.5	33.1	5.43	2004.661	1n	71
HJ 1864	23169+4238	9.7 10.3	205.9	22.71	2004.607	1n	72
STF2997	23170+2125	8.8 9.5	221.9	24.69	2004.658	1n	73
STF2999 AB	23188+0510	8.8 9.1	168.1	77.03	2004.658	1n	74
BU 80 AD	23189+0524	8.1 9.9	324.2	222.19	2004.658	1n	75
BU 80 AE	23189+0524	8.1 10.3	292.8	243.91	2004.658	1n	75
STF2998 Aa-B	23191-1328	5.2 6.9	351.2	12.34	2004.678	1n	76

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ES 697 AB	23204+5530	9.1 9.9	344.3	68.14	2004.656	1n	77
STF 3006 AB	23212+3526	9.1 9.8	151.0	6.91	2004.656	1n	78
STF3009 (AB)	23243+0343	6.7 8.7	230.0	6.91	2004.678	1n	79
ARN 81 AC #	23243+0343	6.7 9.7	265.9	562.88	2004.678	1n	79
STT245 AB-C	23260+2742	7.8 8.5	194.1	62.21	2004.642	1n	80
STF 3012 AC	23276+1638	8.5 9.4	65.4	52.34	2004.656	1n	81
HJ 1884	23279+5011	9.5 10.1	244.8	11.85	2004.656	1n	82
STT 246 AB	23280+2335	7.8 8.8	121.3	79.99	2004.678	1n	83
STF 3016	23290-0638	9.6 10.3	318.5	20.74	2004.656	1n	84
BU 1149 (AI)	23300+5833	4.9 9.8	207.5	229.1	2004.678	1n	85
SHJ 355 AC	23300+5833	4.9 7.2	268.3	76.04	2004.678	1n	86
WEB 10 AB	23386+4441	8.3 8.8	303.5	126.40	2004.678	1n	87
WEB 10 AC	23386+4441	8.3 9.9	247.7	121.46	2004.678	1n	87
WEB 10 BD	23386+4441	8.8 10.2	252.5	104.68	2004.678	1n	87
AG 427	23402+4949	9.5 10.1	244.0	17.28	2004.656	1n	88
H 302 AB	23403+1945	8.8 10.2	28.9	79.99	2004.661	1n	89
KU 140	23420+1523	9.6 10.3	100.0	26.66	2004.661	1n	90
ES 548	23428+4727	9.2 10.2	316.9	14.31	2004.656	1n	91
ES 550	23468+4640	9.8 10.1	168.1	16.79	2004.656	1n	92
STF3043 AB-C	23528+3841	9.5 9.9	250.0	15.80	2004.656	1n	93
ES 1050 AC	23537+5453	9.7 10.4	309.8	39.50	2004.656	1n	94
HJ 3223	23537-0140	8.6 10.4	352.8	49.38	2004.656	1n	95
ES 2735 AB	23553+5144	8.9 10.5	98.1	12.34	2004.656	1n	96
ES 2736	23593+5352	9.1 10.5	106.9	18.76	2004.656	1n	97

Not listed in the WDS CATALOG.

Companion star is the brighter component.

( ) See discussion in main article.

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NOTES

1. In Cygnus. Possible common proper motion. Near STT 377. Spect. A0, B8.
2. In Cygnus. Relatively fixed. Spect. A0, A.
3. In Vulpecula. Relatively fixed. Spect. A1V.
4. In Cygnus. Common proper motion; p.a. increasing. Spect. K0V.
5. In Cygnus. Sep. increasing; p.a. decreasing. Spect. K7, K5.
6. In Cygnus. Relatively fixed. Common proper motion. Spect. K, K.
7. In Cygnus. Separation slightly increasing. Spect. K0, K5.
8. In Cygnus. Separation slightly increasing. Spect. K2, K.
9. In Cygnus. Relatively fixed. Spect. G5III, K.
10. In Aquarius. Relatively fixed. Common proper motion. Spect. F8, F8.
11. In Aquarius. Sep. increasing; p.a. decreasing. Spect. F0, K.
12. In Cygnus. Sep. & p.a. increasing. Spect. A0, A2.
13. In Cepheus. Relatively fixed. Spect. B2.
14. In Cygnus. Relatively fixed. Spect. A0, A2.
15. In Pegasus. Separation increasing. Spect. M2, M2.
16. In Aquarius. Sep. decreasing; p.a. increasing. Spect. F8.
17. In Aquarius. Relatively fixed. Common proper motion. Spect. G0.
18. In Cygnus. Relatively fixed. Common proper motion. Spect. B8, K.
19. In Cygnus. Separation increasing. Spect. A0, F8.
20. In Aquarius. Relatively fixed. Common proper motion. Spect. G6, G5.
21. In Aquarius. Sep. decreasing; p.a. increasing. Spect. F0, G.
22. In Pegasus. Relatively fixed. Spect. A4V, A4V.
23. In Lacerta. Common proper motion; sep. decreasing. Spect. A0, G5.
24. In Aquarius. Relatively fixed. Common proper motion. Spect. A9.
25. In Lacerta. Position angle slightly decreasing. Spect. K3III, A5.
26. In Pegasus. Sep. increasing; p.a. decreasing. Spect. B9IV.
27. In Lacerta. Separation slightly increasing. Spect. F8.
28. In Lacerta. A, B, & C = relatively fixed. Spect. B9V, B8, B8.
29. In Lacerta. AB = relfix; cpm. AC = sep. & p.a. increasing. Spect. A0.
30. In Aquarius. Sep. increasing; p.a. decreasing. Spect. K2.
31. In Pegasus. Common proper motion; p.a. decreasing. Spect. F2V, F0.
32. In Pegasus. Relatively fixed. Common proper motion. Spect. G5, G5.
33. In Lacerta. Common proper motion; p.a. slightly decreasing. Spect. G5, G5.
34. In Lacerta. Relatively fixed. Common proper motion. Spect. K0.
35. In Aquarius. Common proper motion; p.a. decreasing. Spect. F0, F.
36. In Cepheus. AC = sep. & p.a. inc. AI = sep. inc.; p.a. dec. Spect. M2V.
37. In Cepheus. AB = p.a. decreasing. AC = cpm. Spect. AC = A0, A5.
38. Delta Cephei. Relatively fixed. Common proper motion. Spect. B7V, A0.
39. In Aquarius. Relatively fixed. Spect. G0.
40. 8 Lacertae. Relatively fixed. Spect. A0, A0.
41. In Pegasus. Common proper motion; p.a. decreasing. Spect. F5, F5.
42. In Aquarius. Position angle slightly decreasing. Spect. A5II, K.
43. In Pegasus. Relatively fixed. Common proper motion. Spect. F8, F8.
44. In Aquarius. Sep. & p.a. increasing. Spect. K0.
45. In Pegasus. Position angle increasing. Spect. K0, K.
46. In Pegasus. Separation slightly increasing. Spect. F.
47. In Lacerta. Relatively fixed. Common proper motion. Spect. G0.
48. In Pegasus. Separation increasing. Spect. K0, K0.

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49. In Aquarius. Relatively fixed. Common proper motion. Spect. F8, F8.
50. 69 Aquarii. Sep. decreasing; p.a. increasing. Spect. A0V.
51. In Lacerta. Position angle increasing. Spect. K2.
52. In Cepheus. Relatively fixed. Spect. A2, F0.
53. In Lacerta. Sep. & p.a. decreasing. Spect. G5, A0.
54. In Pisces. Sep. & p.a. increasing. Spect. G5, G5.
55. In Pegasus. Sep. increasing; p.a. decreasing. Spect. F8, G5.
56. In Lacerta. Sep. increasing; p.a. slightly increasing. Spect. B7III.
57. 16 Lacertae. Separation slightly decreasing. Spect. B2IV, F5.
58. In Pegasus. Relatively fixed. Spect. F5, F5.
59. In Cassiopeia. Relatively fixed. Spect. K5, A0.
60. In Aquarius. Common proper motion. Near STF 2970. Spect. K0.
61. In Aquarius. Common proper motion; p.a. increasing. Spect. F5, F5.
62. In Andromeda. A, B, & C = relatively fixed. Spect. AB = F5, F5.
63. In Pisces. Sep. & p.a. increasing. Spect. G5, G5.
64. In Pegasus. Common proper motion; p.a. decreasing. Spect. G0V.
65. In Andromeda. Sep. & p.a. decreasing. Spect. F5, F8.
66. In Pegasus. Relatively fixed. Common proper motion. Spect. F5, F5.
67. In Pisces. Sep. & p.a. increasing. Spect. G5, G0.
68. In Pegasus. Sep. increasing; p.a. decreasing. Spect. G0.
69. In Andromeda. AB = relfix; cpm. AC = sep. inc. AD = sep. dec. Spect. F8.
70. In Andromeda. Separation increasing. Spect. F2, A2.
71. In Pisces. Common proper motion; p.a. increasing. Spect. G5, G5.
72. In Andromeda. Relatively fixed. Common proper motion.
73. In Pegasus. Relatively fixed. Common proper motion. Spect. G0, F8.
74. In Pisces. Sep. increasing; p.a. decreasing. Spect. F6V, F8.
75. In Pisces. AD & AE = sep. increasing; p.a. decreasing. Spect. AD = K0, K0.
76. 94 Aquarii. Sep. decreasing; p.a. increasing. Spect. G5IV.
77. In Cassiopeia. Relatively fixed. Spect. A, B8.
78. In Andromeda. Sep. increasing; p.a. decreasing. Spect. K5, K5.
79. In Pisces. AB = relfix;cpm. AC = cpm w/ AB. Spect. K2III, K2III, F5.
80. In Pegasus. Relatively fixed. Common proper motion. Spect. F8, A3.
81. In Pegasus. Relatively fixed. Common proper motion. Spect. G0, G0.
82. In Andromeda. Sep. & p.a. decreasing. Spect. K2, K2.
83. In Pegasus. Sep. decreasing; p.a. increasing. Spect. K1V, G5.
84. In Aquarius. Relatively fixed. Common proper motion. Spect. F8, F8.
85. AR Cassiopeiae. Relfixed. Possible cpm with SHJ 355 AC. Spect. B3IV.
86. AR Cassiopeiae. Relatively fixed. Common proper motion. Spect. B3IV, A0.
87. In Andromeda. AB = p.a. dec; sep. inc. AC = sep. inc. Spect. AB = F5, A0.
88. In Andromeda. Relatively fixed. Spect. G5.
89. In Pegasus. Relatively fixed. Common proper motion. Spect. B8, F2.
90. In Pegasus. Relatively fixed. Common proper motion. Spect. F8, G0.
91. In Andromeda. Relatively fixed. Common proper motion. Spect. A0.
92. In Andromeda. Relatively fixed. Spect. B8.
93. In Andromeda. Relatively fixed. Common proper motion. Spect. F0, F0.
94. In Cassiopeia. Relatively fixed. Spect. A0, A0.
95. In Pisces. Sep. increasing; p.a. decreasing. Spect. K0.
96. In Cassiopeia. Relatively fixed. Spect. A0.
97. In Cassiopeia. Separation slightly increasing. Spect. B9.