

Double Star Measurements Using a Webcam: Annual Report of 2010

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Abstract: I report on the measurements of 144 double stars of 2010 using a standard webcam. For five I recommend companions not yet listed in the WDS catalog.

For my observations I use a small 8 inch Newtonian telescope with a webcam described in my previous reports (Schlimmer 2007a, Schlimmer 2008b). To improve the signal noise ratio the standard webcam was modified.

In an ambient air temperature of 20 °C the CCD processor temperature increases to 40 °C after 10 minutes. The original housing of the webcam is very small so that the processor can't give off its heat to the air. To get better cooling, the original housing was replaced with a bigger one (85 mm x 80 mm x 40 mm) and a cooling fan was mounted on the outside. Additionally, a passive cooling element was added to the processor. With these simple modifications the operating temperature of the webcam is equal to the ambient air temperature. As a result, the brightness of the background in the video frames is less than before. Faint stars can be better detected and analyzed because of the improved signal noise ratio. The modified webcam has been used since August 2010. In my experience, there is a significant reduction in the noise level on summer nights, but in winter the difference in noise level between the standard webcam and the modified webcam is not significant.

Because the webcam case was replaced the reproduction scale of the optical system has changed from 0.7918 to 0.8202 arc seconds / pixel. For analyzing the video records the program REDUC (Version 3.82) is used.

Table 1 shows the position angle (PA), separation

(SEP) and date (DATE) of my measurements of 2010. The values for NAME, RA+DEC, and MAGS are taken from the WDS catalog. Normally each star was observed for only one night in the given year (N=1).

In the following, I give some notes about my observations of the proposed new companions.

WDS 05110+3203, STF 648AB

This pair was first observed in 1825. Bright components AB are often observed. Two further components with brightness of about 13.0 and 13.4 magni-



Figure 1: WDS 05110+3203, STF 648AB, the marked component is not listed in the WDS catalog

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tudes were observed in 1906 for first time. Four observations are listed in WDS catalog. Because the brightness is less than 11.5 magnitudes, these components are too faint for my webcam observations. But at a distance of about 191 arc seconds there is another star with a brightness of about 9 magnitudes which is not yet listed in the WDS catalog (Figure 1).

WDS 05159+3425, ES 170AB, WAL 36AC

Components AB were observed in 1895 for the



Figure 2: WDS 05159+3425, ES 170AB, WAL 36AC, the marked component is not listed in the WDS catalog.

first time. Ten observations are listed in the WDS catalog. Components AC were first observed in 1944. Only 3 observations have been made since its discovery. At a distance of about 90 arc seconds, I found a background star with a brightness of about 11 magnitudes, which is not yet listed in WDS catalog (Figure 2).

STF 954, WDS 06412+0928

STF 954 is the top of the Christmas tree star cluster. Six components are listed in the WDS catalog. In my observations I found 1 further component with a brightness of about 11.5 magnitudes, see Figure 3. This component can also be seen on POSS2 images. On POSS2 image this component occurs as separate double star, see Figure 4.

KU 48AB, WDS 14430+1310

This pair was first observed in 1897. Currently there are 16 observations for AB and only 6 observa-

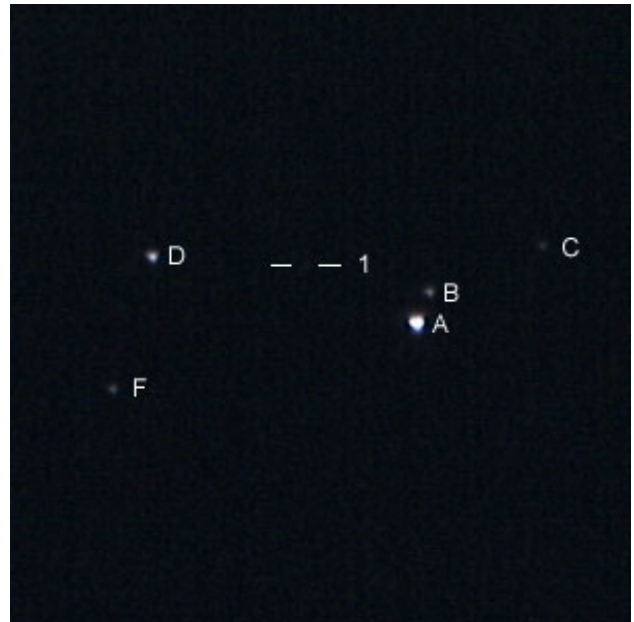


Figure 3: STF 954, the marked component is not listed in the WDS catalog.

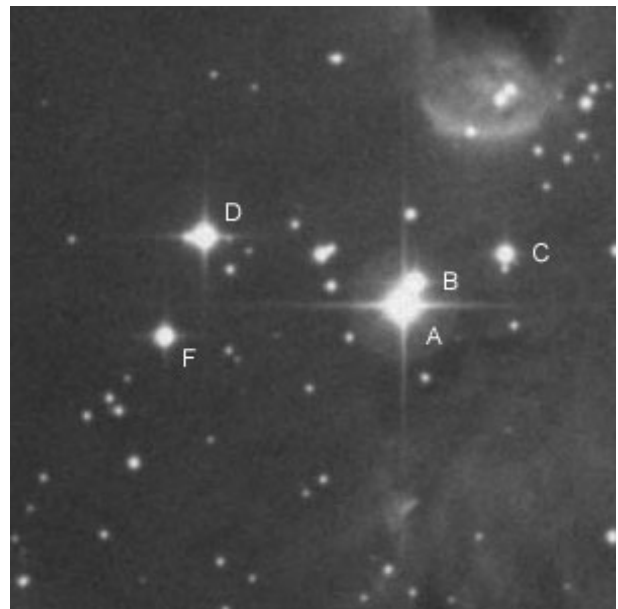


Figure 4: POSS2 image of STF 954 (SIMBAD).

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tions for AC and BC. In my own observations I found a further component at a distance of 72 arc seconds, which is not yet listed in the WDS catalog (see Figure

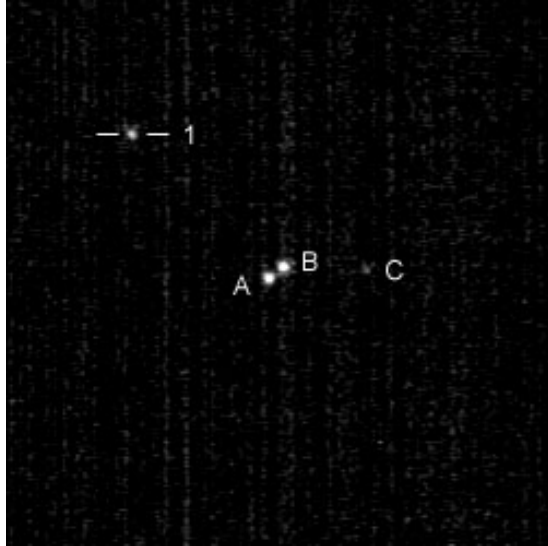


Figure 5: WDS 14430+1310, the marked component is not listed in the WDS catalog.

5). The magnitude of this further component is brighter than the magnitude of component C and so I wonder why it was not observed before. Because I don't use any filter for my observations, the maximum sensitivity of my webcam lies in the near infrared. But, comparing with POSS2 images in red (F), blue (J), and infrared (N) shows no significant variation of these 4 components to each other (SIMBAD).

15 Sge, WDS 20041+1704

This pair is characterized by high proper motion of -393 mas in R.A and -408 mas in declination. A lot of background stars B-H are observed and known as STT 592 and BUP 202. In Figure 6 the components A-F are shown. In my observation of 15 Sge I found a further background star with a distance of 132 as and a position angle of 130 degrees. This is the star in upper right corner of Figure 6.

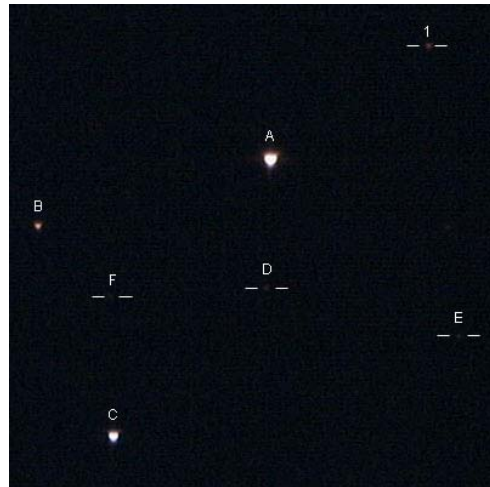


Figure 6: WDS 20041+1704, the marked component (labeled with "1") is not listed in the WDS catalog

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Table 1: Measurements of 2010.

NAME	RA+DEC	MAGS		PA	SEP	DATE	N	NOTES
STF 518A-BC	04153-0739	4.43	9.7	102.5	82.89	2010.129	1	40 Eri
STF 518AD	04153-0739	4.43	12.2	98.4	78.66	2010.129	1	40 Eri
STF 648AB	05110+3203	8.14	8.93	59.4	4.44	2010.129	1	Aur
STF 648A1	05110+3203	8.14		162.0	190.99	2010.129	1	note 1
STF 653AC	05154+3241	5.03	7.33	224.7	14.02	2010.129	1	14 Aur
STF 653AD	05154+3241	5.03	10.75	322.1	179.70	2010.129	1	14 Aur
ES 170AB	05159+3425	7.79	11.1	11.4	23.04	2010.173	1	
WAL 36AC	05159+3425	7.79	12.13	303.4	59.05	2010.173	1	
	05159+3425	7.79		215.5	90.33	2010.173	1	note 2
STF 666	05172+3320	7.85	7.89	77.0	2.98	2010.129	1	Aur
ES 59AB	05187+3331	8.46	9.59	10.1	13.76	2010.129	1	Aur
STF 697AB	05235+1602	7.27	8.10	285.6	25.84	2010.129	1	Ori
WAL 38AC	05235+1602	7.27	10.83	284.2	97.42	2010.129	1	Ori
SMR 3AD	05235+1602	7.3	10.1	284.5	248.16	2010.129	1	Ori

Table 1 continued on next page.

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Table 1 (continued): Measurements of 2010.

NAME	RA+DEC	MAGS	PA	SEP	DATE	N	NOTES
D 7AB	05273+3426	10.01 11.12	329.2	21.12	2010.129	1	
D 7AC	05273+3426	10.01 9.77	283.7	169.45	2010.129	1	
D 7AD	05273+3426	10.01 11.4	292.3	153.61	2010.129	1	
D 7CD	05273+3426	9.77 11.4	51.3	28.79	2010.129	1	
BUP 79AC	05276+3429	5.22 10.87	70.5	62.76	2010.129	1	Phi Aur
BLL 15AD	05276+3429	5.22 8.07	14.9	210.50	2010.129	1	Phi Aur
STF 707AE	05281+3425	9.40 10.80	132.7	18.16	2010.129	1	
STF 950AC	06410+0954	4.66 9.9	14.7	17.11	2010.173	1	S Mon
STF 950AD	06410+0954	4.66 9.7	309.6	41.17	2010.173	1	S Mon
STF 950AE	06410+0954	4.66 8.86	139.9	73.15	2010.173	1	S Mon
STF 950AF	06410+0954	4.66 9.0	222.6	154.18	2010.173	1	S Mon
STF 950AG	06410+0954	4.66 10.01	230.5	186.08	2010.173	1	S Mon
STF 950AH	06410+0954	4.66 9.81	166.9	88.03	2010.173	1	S Mon
STF 950AK	06410+0954	4.66 8.2	55.9	105.34	2010.173	1	S Mon
STF 950AM	06410+0954	4.66 9.75	104.0	177.22	2010.173	1	S Mon
STF 950AO	06410+0954	4.66 9.7	261.4	135.00	2010.173	1	S Mon
D 11EP	06410+0954	8.86 10.4	45.0	3.95	2010.173	1	S Mon
STF 952MN	06410+0954	9.75 10.05	115.4	13.98	2010.173	1	S Mon
SMR 9AQ	06410+0954	9.75 11.5	6.3	95.67	2010.173	1	
SMR 9AR	06410+0954	9.75 11.5	143.8	141.35	2010.173	1	
SMR 9AS	06410+0954	9.75 11.5	155.3	123.31	2010.173	1	
SMR 9RS	06410+0954	11.5 11.5	274.6	32.43	2010.173	1	
STF 954AB	06412+0928	7.18 10.23	152.7	12.77	2010.173	1	
SLE 558AC	06412+0928	7.15 10.93	117.0	56.36	2010.173	1	
ARN 40AD	06412+0928	7.18 9.09	251.4	104.04	2010.173	1	
SMR 10AF	06412+0928	7.18	277.7	119.02	2010.173	1	
A1	06412+0928	7.18	239.1	48.06	2010.173	1	note 3
STF 953	06412+0859	7.10 7.66	330.9	7.25	2010.173	1	note 4
STF1110AB	07346+3153	1.93 2.97	56.9	4.60	2010.173	1	Castor
STF1110AB-C	07346+3153	1.93 9.83	164.8	70.01	2010.173	1	Castor
STF1110AB-D	07346+3153	1.93 10.07	221.7	181.35	2010.173	1	Castor
STF1196AB	08122+1739	5.30 6.25	35.3	1.04	2010.260	1	Zet Cnc
STF1196AB-C	08122+1739	5.30 6.20	68.0	6.29	2010.260	1	Zet Cnc
STF1196AB-D	08122+1739	5.31 8.89	107.0	274.18	2010.260	1	Zet Cnc
STF1245AB	08358+0637	5.98 7.16	26.7	10.05	2010.293	1	BSC3395
STF1245AC	08358+0637	5.98 10.70	112.0	97.41	2010.293	1	
STF1245AD	08358+0637	5.98 12.0	292.7	109.72	2010.293	1	
STF1245AE	08358+0637	5.98 9.60	207.8	113.78	2010.293	1	
STF1336	09175+0033	7.0 10.2	180.6	39.98	2010.293	1	

Table 1 continued on next page.

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Table 1 (continued): Measurements of 2010.

NAME	RA+DEC	MAGS	PA	SEP	DATE	N	NOTES
HJ 1167	09291-0246	4.64 7.28	4.5	65.84	2010.293	1	
STT 204AB	09388+1047	6.70 11.6	98.6	8.11	2010.293	1	
WAL 56AC	09388+1047	6.70 10.65	81.5	85.21	2010.293	1	
H 6 76AB	09412+0954	3.56 10.83	47.8	95.91	2010.293	1	
HJ 820	09434+0858	10.02 10.28	253.3	12.99	2010.293	1	
STF1379	09453+0853	7.16 10.75	176.1	9.54	2010.293	1	
STFB 6AB	10084+1158	1.40 8.24	307.9	175.10	2010.263	1	Regulus
STF1424AB	10200+1950	2.37 3.64	126.1	4.57	2010.260	1	Algieba
STF1424AC	10200+1950	2.37 9.64	288.6	334.92	2010.260	1	AD Leo
STF1424AD	10200+1950	2.60 10.0	302.2	367.75	2010.260	1	
STF1431	10256+0847	7.76 9.07	70.1	3.75	2010.263	1	
STT 573AB	11141+2031	2.56 8.6	341.9	204.78	2010.263	1	δ Leo
STF1523AB	11182+3132	4.33 4.80	209.2	1.58	2010.263	1	ξ UMa
STF1670AB	12417-0127	3.48 3.53	22.9	1.47	2010.309	2	note 5
STF1670AE	12417-0127	3.48 8.94	168.0	259.53	2010.263	1	γ Vir
SHJ 162AB	13149-1122	7.11 8.18	45.2	109.98	2010.307	1	note 6
STF1744AB	13239+5456	2.23 3.88	153.5	14.48	2010.315	1	Mizar
SMR 4AD	13239+5456	2.23 7.6	101.8	490.71	2010.315	1	note 7
STF1825	14165+2007	6.47 8.42	151.2	3.72	2010.422	1	
KU 48AB	14430+1310	10.43 10.66	136.7	6.45	2010.427	1	
KU 48AC	14430+1310	10.43 11.60	104.3	35.65	2010.427	1	
KU 48BC	14430+1310	10.66 11.61	97.8	30.04	2010.427	1	
KU 48A1	14430+1310	10.43	232.3	72.14	2010.427	1	note 8
KU 48B1	14430+1310	10.66	237.4	73.05	2010.427	1	
STF1888AB	14514+1906	4.76 6.95	308.8	5.97	2010.422	1	ξ Boo
HLD 120AB	14527+0746	8.05 10.84	214.8	16.04	2010.424	1	
HJ 1260	14557+4116	10.25 11.65	177.3	19.93	2010.427	1	
STF1895	14575+4010	8.27 8.88	42.4	12.40	2010.427	1	
A 1628	14583+4106	8.56 11.63	96.6	4.97	2010.427	1	
STFA 33AB	17037+1336	5.91 6.17	116.5	304.28	2010.518	1	
STFA 33AD	17037+1336	5.91 10.43	137.6	176.71	2010.518	1	
STFA 33AE	17037+1336	5.91 10.95	161.4	228.98	2010.518	1	
STFA 33DE	17037+1336	10.43 10.95	208.00	98.2	2010.518	1	
H 5 133	17054+1244	4.91 10.9	306.9	60.43	2010.518	1	60 Her
STF2159	17249+1320	8.53 9.44	326.7	26.38	2010.518	1	note 9
STF2184AB	17344+1310	6.7 11.6	65.7	22.72	2010.518	1	note 10
STF2272AB	18055+0230	4.20 6.20	131.8	5.86	2010.518	1	70 Oph
	18055+0230	4.20	274.9	143.93	2010.518	1	70 Oph
STTA171AB	18329+3850	7.02 8.12	328.1	149.24	2010.578	1	

Table 1 continued on next page.

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Table 1 (continued): Measurements of 2010.

NAME	RA+DEC	MAGS	PA	SEP	DATE	N	NOTES
STTA171AG	18329+3850	7.02 11.1	134.5	80.26	2010.578	1	
H 5 39AB	18369+3846	0.02 9.5	183.6	79.89	2010.578	1	Vega
STFB 9AE	18369+3846	0.02 9.5	38.6	87.78	2010.578	1	Vega
STFA 37AB-CD	18443+3940	5.15 5.25	172.8	208.14	2010.578	1	
STFA 37AB-I	18443+3940	6.10 10.43	138.1	149.06	2010.578	1	
BLL 35	18433+3918	6.64 10.35	192.4	60.42	2010.578	1	
HO 89	18534+3728	8.89 12.9	169.6	5.19	2010.696	1	
ES 2028AB	18545+3654	4.30 11.2	349.0	87.94	2010.578	1	δ Lyr2
SMR 13AD	18545+3654	4.30 8.8	210.3	191.35	2010.578	1	
SMR 13AE	18545+3654	4.30 10.3	238.4	398.20	2010.578	1	
SMR 13AF	18545+3654	4.30 8.7	245.5	367.25	2010.578	1	
SMR 13AG	18545+3654	4.30 9.8	261.5	334.03	2010.578	1	
SMR 13AH	18545+3654	4.30 8.7	284.8	228.53	2010.578	1	
SMR 13AJ	18545+3654	4.30 12.0	249.8	277.09	2010.578	1	
SMR 13AK	18545+3654	4.30 12.0	237.0	302.87	2010.578	1	
SMR 13HI	18545+3654	4.30 12.9	251.8	26.18	2010.578	1	
SMR 13JK	18545+3654	12.0 12.0	175.0	69.68	2010.578	1	
STF2427AB	18581+3813	9.61 9.93	59.2	54.96	2010.696	1	
STF2427AC	18581+3813	9.61 10.20	61.4	61.57	2010.696	1	
CTT 11AD	18581+3813	9.61 11.8	289.8	56.58	2010.696	1	
SP 2AE	18581+3813	9.61 5.87	350.0	160.14	2010.696	1	
STF2427BC	18581+3813	9.93 10.20	78.4	6.97	2010.696	1	
SMR 14EF	18581+3813	5.87 11.2	332.8	83.18	2010.696	1	
STF2470	19088+3446	7.03 8.44	268.7	13.76	2010.696	1	
SHJ 289	19135+3902	8.01 8.71	55.3	39.13	2010.696	1	
STF2487AB	19138+3909	4.38 8.58	78.9	28.48	2010.696	1	v Lyr
STF2487AC	19138+3909	4.38 11.42	150.1	161.15	2010.696	1	v Lyr
SHJ 292AB	19164+3808	4.48 10.14	69.9	99.05	2010.696	1	θ Lyr
SHJ 292AC	19164+3808	4.48 11.1	128.3	99.80	2010.696	1	θ Lyr
STFB 10AB	19508+0852	0.95 9.82	286.1	193.99	2010.674	1	Altair
STFB 10AC	19508+0852	0.77 10.1	108.0	188.04	2010.674	1	Altair
SMR 5AE	19508+0852	0.77 11.0	354.8	153.54	2010.674	1	Altair
SMR 7	20000+1736	10.1 11.4	262.4	3.86	2010.674	1	
H 4 100AB	20001+1731	9.96 10.12	255.7	24.18	2010.674	1	13 Sge
H 4 100AC	20001+1731	9.96 5.57	296.2	112.87	2010.674	1	13 Sge
H 4 100AC	20001+1731	9.96 5.57	296.2	112.87	2010.674	1	13 Sge
S 730AB	20001+1737	7.16 8.45	14.7	112.91	2010.674	1	
S 730AC	20001+1737	7.16 10.21	338.2	78.66	2010.674	1	
S 730AD	20001+1737	7.16 9.9	198.7	40.83	2010.674	1	

Table 1 continued on next page.

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Table 1 (conclusion): Measurements of 2010.

NAME	RA+DEC	MAGS	PA	SEP	DATE	N	NOTES
STF2622AB	20041+1700	8.74 9.46	194.2	5.83	2010.674	1	
STF2622AC	20041+1700	8.74 11.70	303.4	16.79	2010.674	1	
STT 592AB	20041+1704	5.86 9.50	290.1	163.04	2010.674	1	15 Sge
STT 592AC	20041+1704	5.86 6.92	334.7	214.79	2010.674	1	15 Sge
BUP 202AD	20041+1704	5.86 11.34	2.0	86.80	2010.674	1	15 Sge
BUP 202AE	20041+1704	5.86 11.77	50.7	174.53	2010.674	1	15 Sge
BUP 202AF	20041+1704	5.86 11.6	314.4	142.86	2010.674	1	15 Sge
A1	20041+1704	5.86	129.6	131.50	2010.674	1	15 Sge
STF2727	20467+1607	4.36 5.03	266.7	9.13	2010.674	1	g Del
STF2758AB	21069+3845	5.35 6.10	151.8	31.22	2010.635	1	61 Cyg
STF2758AH	21069+3845	5.35 10.89	281.9	89.00	2010.635	1	61 Cyg
SMR 1AI	21069+3845	5.35	34.0	9.25	2010.518	1	61 Cyg
SMR 1AI	21069+3845	5.35	32.1	8.82	2010.635	1	61 Cyg

Notes:

1. Not yet listed in wds catalog, brightness about 9 mag
2. Not yet listed in wds catalog, brightness about 11 mag
3. Not yet listed in wds catalog
4. Located south of the top of the Christmas tree star cluster
5. γ Virginis, observed two times, values are weighted depending on number of analyzed frames
6. SHJ 162AB = Mayer 36 (Schlimmer 2007b), observed for two times, values are weighted depending on number of analyzed frames
7. Background star between Mizar and Alcor
8. Not yet listed in wds catalog, brighter than component C, brightness is about 11 mag
9. Between α Oph and α Her
10. in north of α Ophiuchi

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Acknowledgements

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory.

References

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