

# Double Star Measurements Using a Webcam, Annual Report of 2009

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**Abstract:** I report on the measurements of 166 double stars of 2009 using a standard webcam. For STF 478, STF 950, STF 954, HJ 2452, ES 2028 and STF2427 I recommend companions not yet listed in the WDS catalog.

I report on the measurements of 166 double stars of 2009 using a standard webcam. For STF 478, STF 950, STF 954, HJ 2452, ES 2028 and STF2427 I recommend companions not yet listed in the WDS catalog.

For my observations I use a small 8 inch Newtonian telescope with a standard webcam described in my previous reports (Schlimmer 2007a, Schlimmer 2008b). No changes in the optical system were made. For analyzing the records the program REDUC (Version 3.82) is used.

## WDS 03598+1133, STF 478

STF 478 is about 1.5 degrees south of lambda Tauri. The components, with magnitudes of 9.9 and 8.8, can be easily separated. At a distance of 155 a.s. there is a further component which is not yet listed in the WDS catalog (Figure 1). Because of its distance and low brightness, it could be a background star.

## WDS 06410+0954, STF 950

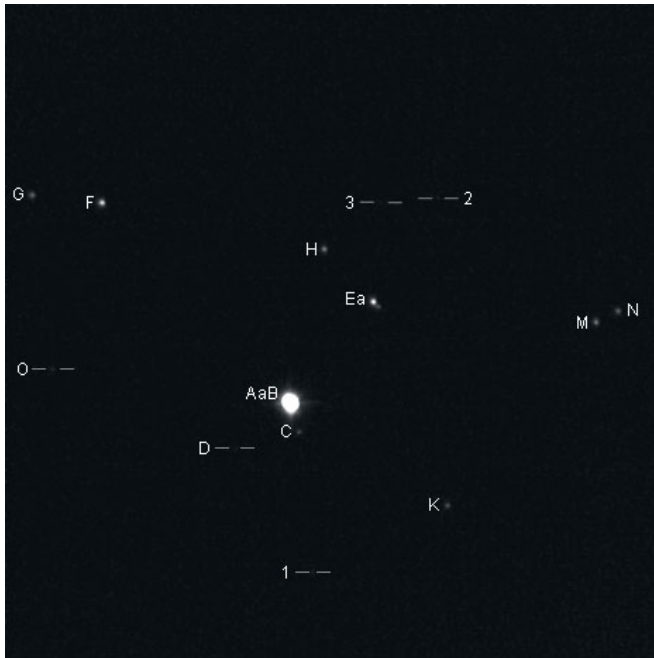
The Christmas Tree star cluster was discovered in 1784 by William Herschel. This cluster is of interest to astronomers, because it is an area of star birth. STF 950 is the brightest star in the Christmas tree cluster and is also known as 15 Monocerotis. Many components of STF 950 are described in the WDS catalog. I



**Figure 1:** Stacked image of 50 frames of STF 478. The component which is marked with lines is not yet listed in WDS catalog.

found 3 further components near STF 950 which are not yet included in WDS catalog (Figure 2). These

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**Figure 2:** Webcam image of STF950, 16 frames were stacked for analyzing. The numbered components are not yet listed in WDS catalog.



**Figure 3:** POSS image of the same area (taken from SIMBAD Astronomical Database).

components are also seen on the long time-exposure of the POSS image (Figure 3), which is taken from the SIMBAD Astronomical Database. 1

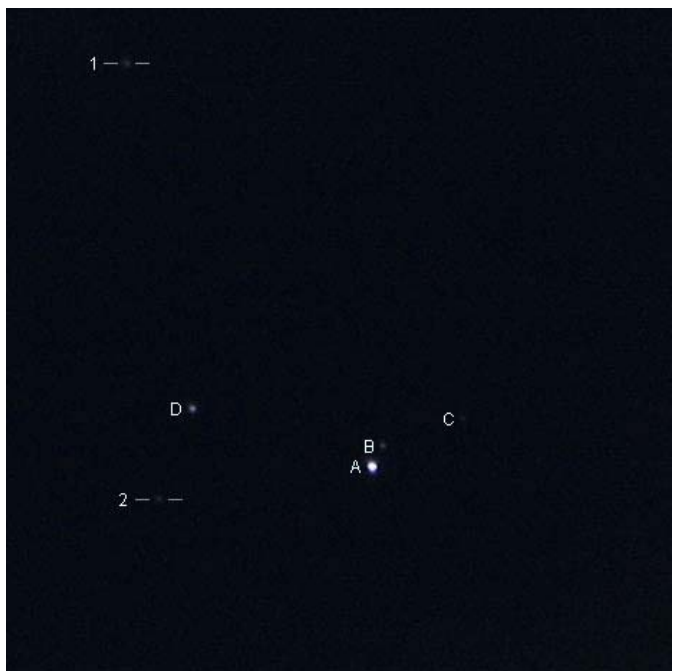
### WDS 06412+0928, STF 954

STF 954 is at the top of the Christmas tree star cluster. Four components are listed in the WDS catalog. In my observations I found 2 further components with a brightness of around 11.5 magnitudes (figure 4). In this image, 50 frames of STF 954 were stacked for analyzing.

### WDS 08316+1806, HJ 2452, $\theta$ Canceri

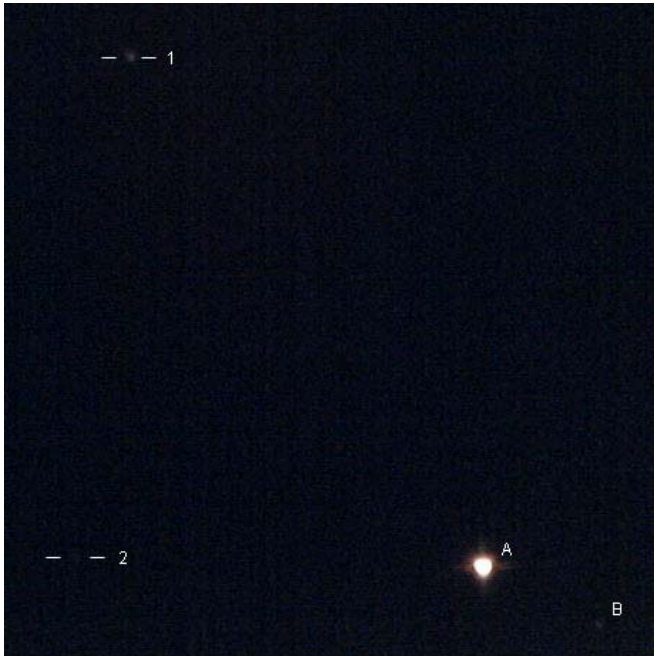
HJ 2452 was first observed in 1831. The brightness of the primary star is 5.35 magnitude and the companion is magnitude 10.0. The distance between both components is 72.22 a.s., the position angle is 63.4 deg. Currently there are 12 measurements in WDS catalog.

At a distance of 345 a.s., I found a background star which is not yet listed in the WDS catalog. The position angle is 214.2 deg. On Figure 5 this star is marked with -1-. A second background star was found at a distance of 226 a.s. with a position angle of 268.3 deg, marked with -2-.



**Figure 4:** Webcam image of STF 954. The marked components are not yet listed in WDS catalog.

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**Figure 5:** Webcam image of HJ 2452, the components which are labeled with -1- and -2- are not yet listed in WDS catalog.



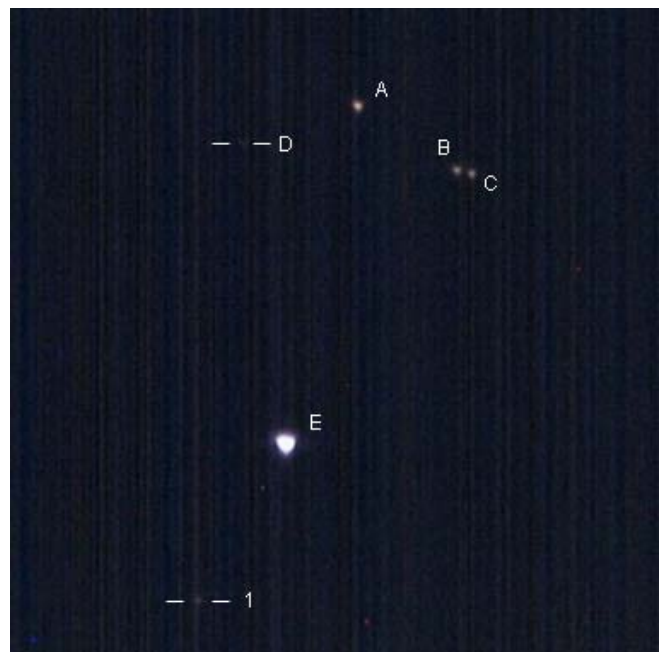
**Figure 6:** Webcam image of WDS 18545+3654. The marked components are not yet listed in WDS catalog, except AB

### WDS 18545+3654, Stephenson 1, $\delta$ Lyrae Cluster

Delta Lyrae is the brightest star of a galactic star cluster which is also known as Stephenson 1. A couple of stars between 8 to 10 magnitudes are located near delta Lyrae (Figure 6). For later research of the relative motion between members of this star cluster, distance and position angle of the brightest stars were analyzed. Those stars haven't been listed yet in the WDS catalog.

### WDS 18581+3813, STF2427, CTT 11, SP 2

In the WDS catalog, 5 components are listed. The components AB and AC are known as STF2427, AD is listed as CTT 11 and AE is listed in the WDS catalog as SP 2. At a distance of about 83 a.s. from the brightest component E, I found a further background star with a brightness of magnitude 11.0 (Figure 7).



**Figure 7:** Webcam image of STF2427, the component labeled "1" is not yet listed in WDS catalog.

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NAME	RA+DEC	MAGS	PA	SEP	DATE	N	Note
H 518AD	00405+5632	2.35 8.98	282.1	70.42	2009.798		$\alpha$ Cas
STF 60AB	00491+5749	3.52 7.36	321.6	13.09	2009.798		$\eta$ Cas
STF 60AE	00491+5749	3.52 10.15	125.0	81.29	2009.798		$\eta$ Cas
SMR 2AI	00491+5749	3.52	74.3	92.66	2009.798		$\eta$ Cas
SMR 2AJ	00491+5749	3.52	261.7	233.82	2009.798		$\eta$ Cas
ARG 3	00573+6020	8.51 9.41	200.3	20.55	2009.798		
STF 478	03598+1133	9.9 10.22	137.9	9.59	2009.069	47	note 1
	03598+1133	9.9	55.1	155.22	2009.069	1	note 2
BUP 74	05078-0505	2.79 10.9	136.8	117.15	2009.080	1	$\beta$ Eri
STF 649AB	05083-0840	5.80 8.97	68.7	21.58	2009.080	39	note 3
STF 649AC	05083-0840	5.80	4.3	85.89	2009.080	1	
A 483AB	05099-0906	9.74 10.08	50.2	2.56	2009.069	1	
OL 202AC	05099-0906	9.74 10.10	156.7	61.67	2009.069	1	
BUP 76	05119-0907	8.13 9.86	257.6	86.84	2009.069	47	
STF 752AB	05354-0555	2.9 7.0	138.3	10.78	2009.080	15	44 Ori
A 499AB	05487-0856	8.27 10.51	215.7	12.60	2009.080	1	
STF 950AC	06410+0954	4.66 9.9	16.1	17.00	2009.135	30	S Mon
STF 950AD	06410+0954	4.66 9.7	309.3	40.04	2009.135	1	S Mon
STF 950AE	06410+0954	4.66 8.86	139.5	73.41	2009.135	42	S Mon
STF 950AF	06410+0954	4.66 9.0	222.3	154.28	2009.135	40	S Mon
STF 950AG	06410+0954	4.66 10.01	230.3	186.10	2009.135	42	S Mon
STF 950AH	06410+0954	4.66 9.81	166.6	88.27	2009.135	35	S Mon
STF 950AK	06410+0954	4.66 8.2	55.9	105.40	2009.135	36	S Mon
STF 950AM	06410+0954	4.66 9.75	103.8	177.45	2009.135	39	S Mon
STF 950AO	06410+0954	4.66 9.7	261.1	135.13	2009.135	1	S Mon
D 11EP	06410+0954	8.86 10.4	44.1	3.84	2009.135	16	S Mon
STF 950FG	06410+0954	9.00 10.01	263.1	39.63	2009.135	1	S Mon
STF 952MN	06410+0954	9.75 10.05	115.1	13.85	2009.135	13	S Mon
A1	06410+0954	9.75 11.5	6.5	96.44	2009.135	1	note 4
A2	06410+0954	9.75 11.5	143.2	141.38	2009.135	1	note 4
A3	06410+0954	9.75 11.5	154.7	122.36	2009.135	1	note 4
A23	06410+0954	11.5 11.5	274.6	32.43	2009.135	1	note 5
STF 954AB	06412+0928	7.18 10.23	153.1	12.88	2009.135	38	note 6
SLE 558AC	06412+0928	7.18 12.2	117.6	56.79	2009.135	1	
ARN 40AD	06412+0928	7.18 9.09	251.8	104.25	2009.135	36	
A1	06412+0928	7.18	211.1	259.84	2009.135	38	note 7
A2	06412+0928	7.18	278.3	118.92	2009.135	32	note 8

*Table continued on next page.*

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NAME	RA+DEC	MAGS	PA	SEP	DATE	N	Note
STF1110AB	07346+3153	1.93 2.97	58.1	4.61	2009.299	74	Castor
STF1110AB-C	07346+3153	1.93 9.83	164.5	69.87	2009.080	42	Castor
STF1110AB-C	07346+3153	1.93 10.07	221.9	181.72	2009.080	26	Castor
STF1110CD	07346+3153	9.83 10.07	244.1	155.55	2009.080	1	
D 29AE	07393+0514	0.38	67.4	467.44	2009.135	37	Prokyon
	07393+0514	0.38	312.5	353.18	2009.135	24	note 9
STF1196AB	08122+1739	5.30 6.25	38.0	1.03	2009.217	43	ζ Cnc
STF1196AC	08122+1739	5.30 5.85	68.8	6.43	2009.217	123	ζ Cnc
STF1196AB-C	08122+1739	5.30 6.20	69.1	6.38	2009.217	40	ζ Cnc
STF1196AB-D	08122+1739	5.31 8.89	107.0	274.42	2009.217	39	ζ Cnc
HJ 2452	08316+1806	5.35 10.0	63.4	72.22	2009.217	1	θ Cnc
	08316+1806	5.35	214.2	344.57	2009.217	1	notes 10
	08316+1806	5.35	268.3	225.89	2009.217	1	notes 10
STF1300	09013+1516	9.47 9.73	180.7	4.91	2009.247	134	
STT 569AC	09123+1500	6.56 10.40	215.0	203.95	2009.247		Pil Cnc
H 6 111AB	09276-0840	1.98 9.7	153.6	282.25	2009.299	1	α Hya
SHJ 107	09320+0943	5.22 9.30	74.6	37.69	2009.299	33	6 Leo
H 676AB	09412+0954	3.56 10.83	47.7	95.80	2009.299	18	o Leo
STFB 6AB	10084+1158	1.40 8.24	308.2	174.33	2009.247	39	Regulus
STF1424AB	10200+1950	2.37 3.64	126.3	4.65	2009.299	66	Algieba
STF1424AC	10200+1950	2.37 9.64	288.2	334.04	2009.217	41	AD Leo
STF1424AD	10200+1950	2.60 10.0	301.8	367.56	2009.217	38	
STF1523AB	11182+3132	4.33 4.80	215.3	1.61	2009.283	46	Xi UMa
STF1561AB	11387+4507	6.53 8.23	248.1	9.11	2009.305	31	
STF1561AC	11387+4507	6.53 9.46	90.7	166.63	2009.305	42	
STF1561AE	11387+4507	6.53 12.08	335.7	64.34	2009.305	1	
STF1570	11455+4536	8.86 9.60	48.9	10.78	2009.305	49	
STT 245	12175+2856	5.7 10.2	281.0	8.30	2009.390	1	
STF1643	12272+2701	9.03 9.45	2.3	2.37	2009.390	25	
STFA 21AB	12289+2555	5.23 6.64	251.2	144.23	2009.390	42	17 Com
SHJ 145	12299-1631	2.95 8.47	215.4	23.36	2009.390	31	δ Crv
STF1651	12317+2701	8.65 10.07	215.2	6.94	2009.390	38	
STF1657	12351+1823	5.11 6.33	270.9	19.85	2009.390	45	24 Com
STF1670AB	12417-0127	3.48 3.53	25.8	1.27	2009.299	50	γ Vir
STF1670AE	12417-0127	3.48 8.94	168.5	259.08	2009.299	51	γ Vir
STF1670AF	12417-0127	3.48 9.53	267.8	423.76	2009.299	48	γ Vir
SHJ 162AB	13149-1122	7.11 8.18	44.8	109.50	2009.305	70	note 11

*Table continued on next page.*

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NAME	RA+DEC	MAGS	PA	SEP	DATE	N	Note
STF1825	14165+2007	6.47 8.42	151.6	4.46	2009.450	39	note 12
STF1864AB	14407+1625	4.88 5.79	111.0	5.58	2009.390	71	Pi Boo
STF1864AC	14407+1625	4.88 10.63	163.3	127.01	2009.390	30	Pi Boo
STF1888AB	14514+1906	4.76 6.95	308.9	6.13	2009.395	66	37 Boo
STT 291	15006+4717	6.33 9.62	156.4	35.42	2009.395	34	BSC5597
STF1909	15038+4739	5.20 6.10	60.7	1.66	2009.395	86	44 Boo
STF1955AB	15339+2643	9.84 10.32	236.4	7.62	2009.430	65	note 13
HLM 6	15499+2547	10.72 11.69	181.1	23.34	2009.409	28	
AGC 7AC	15576+2653	4.2 11.5	173.8	94.92	2009.409	1	eps CrB
STF2031AB	16163-0139	7.18 8.74	229.3	20.74	2009.592	35	note 14
STT 305AB	16117+3321	6.44 10.17	263.7	5.89	2009.409	34	
STF2032AB	16147+3352	5.62 6.49	238.0	7.04	2009.409	42	17 CrB
STF2032AD	16147+3352	5.62 10.78	82.2	91.24	2009.409	13	17 CrB
STFA 31AB	16406+0413	5.76 6.92	230.3	69.31	2009.584	75	36 Her
ENG 58AB	16469+0215	6.75 8.83	216.8	148.51	2009.584	40	note 15
STF2096AB	16472+0204	6.09 9.68	87.3	23.98	2009.584	41	19 Oph
STF2241AB	17419+7209	4.60 5.59	16.4	30.04	2009.691	69	Psi 31 Dra
STF2216	17470+0542	8.01 10.09	26.6	26.81	2009.573	38	note 16
BU 633AE	17566+5129	2.23 11.9	234.2	94.39	2009.691	1	$\gamma$ Dra
BU 633AF	17566+5129	2.23 11.2	113.9	124.27	2009.691	1	$\gamma$ Dra
BU 633AG	17566+5129	2.23 11.9	26.9	141.68	2009.691	1	$\gamma$ Dra
STF2272AB	18055+0230	4.20 6.20	133.2	5.69	2009.579	120	70 Oph
H 539AB	18369+3846	0.02 9.5	183.3	80.25	2009.581	43	Vega
STFB 9AE	18369+3846	0.02 9.5	38.8	88.66	2009.581	1	Vega
STFA 37AB-CD	18443+3940	5.15 5.25	172.3	208.17	2009.706	101	note 17
STFA 37AI	18443+3940	6.10 10.43	137.6	149.60	2009.716	55	note 17
STFA 38AD	18448+3736	4.34 5.62	150.4	43.47	2009.641	44	6,7 Lyr
H 540AB	18498+3249	5.93 10.89	75.6	34.09	2009.581	1	$\nu$ 1 Lyrae
H 540AC	18498+3249	5.93 10.3	119.7	57.52	2009.581	23	$\nu$ 1 Lyrae
STFA 39AB	18501+3322	3.63 6.69	147.6	45.37	2009.581	17	$\beta$ Lyrae
BU 293AE	18501+3322	3.63 10.14	317.8	66.76	2009.581	17	$\beta$ Lyrae
BU 293AF	18501+3322	3.63 10.62	18.5	86.33	2009.581	15	$\beta$ Lyrae
H 6 3	18537+3658	5.55 9.93	19.7	175.24	2009.641	34	$\delta$ Lyr1
ES 2028AB	18545+3654	4.30 11.2	351.0	86.55	2009.644		$\delta$ Lyr2
A1	18545+3654	4.30	210.1	191.74	2009.644	39	
A2	18545+3654	4.30	238.2	398.43	2009.644	37	
A3	18545+3654	4.30	245.3	367.42	2009.644	41	

*Table continued on next page.*

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A4	18545+3654	4.30	261.2	334.11	2009.644	43	
A5	18545+3654	4.30	284.5	228.46	2009.644	38	
5a	18545+3654	4.30	251.6	26.21	2009.644	1	
A6	18545+3654	4.30	249.6	277.52	2009.644	1	
A7	18545+3654	4.30	236.5	302.16	2009.644	1	
STF2427AB	18581+3813	9.61 9.93	59.5	54.77	2009.641	43	
STF2427AC	18581+3813	9.61 10.20	61.7	61.58	2009.641	41	
CTT 11AD	18581+3813	9.61 11.8	290.7	55.42	2009.641	1	
SP 2AE	18581+3813	9.61 5.87	350.4	159.94	2009.641	38	
STF2427BC	18581+3813	9.93 10.20	79.8	6.91	2009.641		
EF	18581+3813	5.87	332.7	83.41	2009.641	1	note 18
SHJ 289	19135+3902	8.01 8.71	56.6	38.95	2009.737	43	
STF2487AB	19138+3909	4.38 8.58	80.4	28.55	2009.737	34	$\eta$ Lyr
STF2487AC	19138+3909	4.38 11.42	151.1	160.89	2009.737	30	$\eta$ Lyr
SHJ 292AB	19164+3808	4.48 10.14	70.0	99.03	2009.737	37	$\theta$ Lyr
SHJ 292AC	19164+3808	4.48 11.1	128.3	100.56	2009.737	1	$\theta$ Lyr
J 121AB	19401+1801	4.37 13.2	178.2	29.87	2009.522	1	$\alpha$ Sge
WAL 118AD	19401+1801	4.37 11.21	147.8	82.53	2009.622	38	$\alpha$ Sge
STF2585AB-C	19490+1909	5.04 9.01	311.2	8.19	2009.622	76	$\zeta$ Sge
STFB 10AB	19508+0852	0.95 9.82	285.8	191.98	2009.798	39	Altair
STFB 10AC	19508+0852	0.77 10.1	107.4	188.25	2009.798	24	Altair
SMR 5AE	19508+0852	0.77 11.0	354.9	153.10	2009.798	1	
SMR 5AF	19508+0852	0.77	47.0	296.26	2009.798	1	
H 4 100AB	20001+1731	9.96 10.12	255.6	23.92	2009.633	41	13 Sge
H 4 100AC	20001+1731	9.96 5.57	296.1	112.68	2009.633	41	13 Sge
S 730AB	20001+1737	7.16 8.45	14.5	112.94	2009.633	30	
S 730AC	20001+1737	7.16 10.21	338.0	78.54	2009.633	37	
S 730AD	20001+1737	7.16 9.9	198.0	40.44	2009.633	37	
STF2622AB	20041+1700	8.74 9.46	194.2	5.83	2009.633	37	note 19
STF2622AC	20041+1700	8.74 11.70	303.4	16.79	2009.633	1	
STT 592AB	20041+1704	5.86 9.50	290.1	163.04	2009.633	25	15 Sge
STT 592AC	20041+1704	5.86 6.92	334.7	214.79	2009.633	25	15 Sge
BUP 202AD	20041+1704	5.86 11.34	2.3	86.79	2009.633	1	15 Sge
STF2637AB	20099+2055	6.56 8.85	331.6	11.54	2009.641	62	17 Sge
STF2637AC	20099+2055	6.56 7.52	221.5	89.92	2009.641	85	17 Sge
S 737	20099+2100	7.93 9.26	128.1	100.27	2006.641	83	
LAU 4	20309+1126	10.0 11.26	270.0	27.43	2009.740	1	

*Table concludes on next page.*

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NAME	RA+DEC	MAGS	PA	SEP	DATE	N	Note
STF2690Aa-BC	20312+1116	7.12 7.39	255.1	17.32	2009.740	62	note 20
STF2703AB	20368+1444	8.35 8.42	290.2	25.03	2009.740	34	
STF2703AC	20368+1444	8.35 8.76	233.8	77.12	2009.740	14	
STF2703BC	20368+1444	8.42 8.76	215.6	66.46	2009.740	35	
STF2704AB-D	20375+1436	3.68 11.4	319.0	46.73	2009.740	1	$\beta$ Del
STF2715	20418+1231	7.80 10.22	3.3	12.26	2009.740	35	
STF2718AB	20426+1244	8.28 8.39	87.4	8.26	2009.740	31	
STF2718AC	20426+1244	8.28 9.02	165.4	166.57	2009.740	51	
STF2718BC	20426+1244	8.39 9.02	162.7	168.42	2009.740	39	
STF2727	20467+1607	4.36 5.03	266.1	9.02	2009.740	73	$\gamma$ Del
STF2758AB	21069+3845	5.35 6.10	151.5	31.10	2009.798	39	61 Cyg
STF2758AE	21069+3845	5.35 9.63	270.1	309.90	2009.798	29	61 Cyg
STF2758AF	21069+3845	5.35 11.32	240.7	333.84	2009.798	1	61 Cyg
STF2758AG	21069+3845	5.35 10.84	236.3	223.49	2009.798	1	61 Cyg
STF2758AH	21069+3845	5.35 10.89	284.7	85.31	2009.798	1	61 Cyg
SMR 1AI	21069+3845	5.35	39.3	14.49	2009.798	1	61 Cyg
BU 1516AC	22415+1050	3.40 11.0	9.1	175.76	2009.800	1	42 Peg
SMR 6AD	22415+1050	3.40	165.0	146.90	2009.800	1	
BU 1144Aa-BC	22430+3013	3.02 9.87	338.4	93.34	2009.800	42	$\eta$ Peg

#### Notes:

- 1.5 degree south from lambda Tauri
- not yet in WDS
- BSC1671 in constellation Eridanus
- not yet in WDS
- not yet in WDS, pa and distance between A1 and A2
- STF 954AB is the head of the Christmas Tree star cluster
- not yet in WDS, I estimate a brightness of about 11.5 mag
- not yet in WDS, I estimate a brightness of about 11.5 mag
- not yet in WDS
- not yet in WDS
- Mayer 36 (Schlimmer, 2007b)
- Ca. 1° north of Arcturus
- 11 arc minutes in western of alpha CrB
- About 2° north of delta Ophiuchi
- Next to 19 Oph
- Double star in star cluster IC4665
- Epsilon Lyrae was observed on September, the 9th and 26<sup>th</sup>. Separation, angle and date was linear weighted against the number of analyzed single frames from videos
- not yet in WDS
- 250 as from 15 Sge
- STF2690Aa-BC = Mayer 65 (Schlimmer, 2007b)



## Double Star Measurements Using a Webcam, Annual Report of 2009

### Acknowledgements

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

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