CD Double Star Measures, Jack Jones Memorial Observatory: Report #5

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Abstract: This report submits 100 CCD measurements of 90 multiple star systems for inclusion in the WDS. Observations were made during the calendar year 2011. Selected results are discussed.

This paper reports on double star observations and measurements made at the Jack Jones Memorial Observatory during Calendar year 2011.

Some observations were made using a Celestron 11-inch (28 cm) f/10 SCT with a Meade f/6.3 focal reducer/field flattener. This combination yields a pixel scale of approximately 0.95 arcsec/pixel.

Most observations were made using a Celestron 14-inch (35 cm) f/10 Classic SCT with an OpTec 0.5X telecompressor. This combination yields a pixel scale of approximately 0.87 arcsec/pixel.

All observation utilized an SBIG-ST8XME camera with a KAF-1603ME Kodak NAB sensor.

Multiple images of each target were solved using "Astrometrica". Position Angle and Separation and their associated standard deviations were computed from the RA and Dec of the primary and secondary using software written by the author. The precision of each observation was quantified and reported by calculating the standard deviation of the image set.

The UCAC2 catalog was used in most cases for image solution. Where UCAC2 was unavailable or didn't provide adequate reference stars, USNO-B1.0 or UCAC3 was used.

Results and Discussion

Position Angle (θ) and Separation (ρ) measurements are reported in columns θ and ρ respectively in Table 1. The precision of θ and ρ is reported in columns σ(ρ) and σ(θ) and refers to the standard deviation of θ and ρ for the image set. Column N indicates the number of nights that contributed to the measurement. NAME, RA DEC, and MAGS columns are taken from the WDS. The telescope used is indicated in the Notes column of Table 1.

ALI 1021 01550+4012

(Rho = 8.9, Theta = 316, mags = 12.5, 12.8) This double was discovered by A. Ali in 1928 and not observed since it's discovery.

The author measured this pair as Rho = 3.65, Theta = 296.9 which is a large change from the 1928 measurement.

The J2000 coordinates of this pair are 015458.499+401157.28 and 015458.145+401159.54 (UCAC2). Both of these stars have significant proper motion with the A component pmRA = 71.8 and pmDEC = -94.5 and the B component pmRA = -106.6 and pmDEC = 17.8 . The UCAC2 coordinates, yield a J2000 position of Rho = 4.64, Theta = 299.13. YB6 catalog (derived from NOMAD) provide Vmags of 11.090 and 11.380.

It appears that the large and opposite proper motion of these two stars accounts for the large change in Rho and Theta between 1928.88 and 200.914.

POU 3483 18415+2349

(Rho = 11.4, Theta = 182, mags = 12.9, 13.9) This double was discovered in 1905 by M. A. Pourteau (Rho = 8.0, Theta = 186.0).

Gellera measured this pair from prints of the Polomar Observatory Sky Survey plates (1952.526, Rho = 12.51, Theta = 182)(Gallera, 1984), (Gallera,

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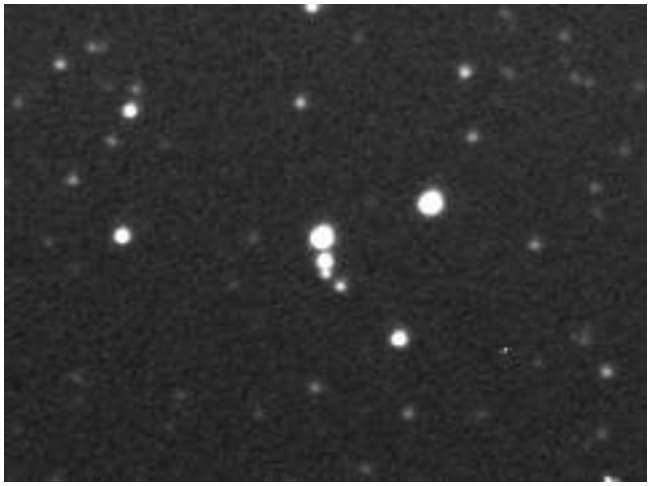

Figure 1. Cropped mage of Pou 3483 showing the three stars in question.

1990).

It was measured again from 2 MASS catalog (1997.44, Rho = 11.37, Theta = 182.4)

This pair is part of a three star chain of stars oriented from north to south (Figure 1). Gallera (Gallera, 1984) notes that "B is double, a noticeable mpg 16 attached to B in PA 220". This can clearly be seen in Figure 1. The northern star is located at coordinate 184127.041+234825.46. The center star at 184127.003+234817.96 and the southern star at 184127.007+234814.10. Coordinates are from 2MASS.

It appears clear that the 1997 2MASS measurement is based on the northern star and the southern star. Calculations using the 2MASS northern star and center star yield Rho = 7.52 and Theta = 184 which is in closer agreement with Pourteau's original measurement.

The author used the northern star and the center star for his measurements and so reported in Table 1 (Rho = 7.49, Theta = 183.4)

LDS 2446 19528+6732

(Theta=265, Rho=29.0, mag 16.0, 16.2) LDS 2446 was discovered by P. M. Luyten in 1953 and not observed since. The author measured the unfiltered magnitudes of the two stars to be approximately 14.2. At first glance the stated magnitudes in WDS appear to be too dim.

However the magnitudes given in the LDS catalog, and repeated in the WDS, are blue photographic magnitudes. Using the conversion methodology of Warner (2007), the V magnitudes of the pair converted from the 2MASS J-K magnitudes are 14.79 and 14.50. B-V values converted from the same source are 1.32 and 1.30 using the same methodology. Both stars are quite red which accounts for the difference between observed unfiltered magnitudes and WDS magnitudes.

SEI 937 20097+3510

(Theta=67, Rho=25.3, mag 11.73, 12.4) SEI 937 was discovered by J. Scheiner in 1896 and observed twice since its discovery. The WDS Precise Coordinate is listed as 200942.37+351101.5. There is a star of approximately 11.7 unfiltered magnitude at that coordinate but no secondary. It appears that the coordinate of the pair reported as SEI 937 is 200942.846+350857.79 (UCAC2). It should be noted that CCDM locates the primary of SEI 937 at 200942.9+350858

POP 185AD 20060+3821

(Theta=62, Rho=128.8, pri mag 10.29) POP 185AD is part of a six star system that was discovered by G.M Popovic in 1896 and observed 5 times since its discovery.

The entry for POP 185AD in the WDS does not include a magnitude for the D component. Using the conversion formula of Dymock and Miles (2009) yielded a V magnitude of 12.19 +/- 0.06 from CMC14.

POP 185AG 20060+3821

(Theta=293, Rho=18.9, pri mag 10.29) The WDS entry for POP 185AG does not include a magnitude for the secondary. Conversion from CMC14 yielded a V magnitude of 13.54 +/- 0.05.

Acknowledgements

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory and the VizieR catalogue access tool, CDS, Strasbourg, France.

References

Warner, Brian D., 2007 Minor Planet Bulletin, 34, 113-119

Dymock, Rodger and Miles, Richard, 2009, Journal of the British Astronomical Association, 119,3, 149-156

Gellera, Lodi, 1984, Webb Soc., Double Star Circ. 3, part 1, 3-28

Gellera, Lodi, 1990, Astronomische Nachrichten 311, 117-121

CD Double Star Measures, Jack Jones Memorial Observatory: Report #5

NAME	RA DEC	MAGS	θ	σ(θ)	ρ	σ(ρ)	DATE	N	NOTES
POP 178AC	01260+4326	11.4 11.0	247.7	0.04	20.61	0.02	2011.914	1	1
ES 2586	01340+4416	9.53 9.67	98.6	0.009	44.51	0.01	2011.914	1	1
ALI1187	01434+4031	11.50 12.11	40.6	0.03	13.05	0.01	2011.914	1	1
LDS3321	01529+3201	11.23 13.9	150.5	0.01	63.70	0.007	2009.922	1	1
ALI1021	01550+4012	12.5 12.8	296.9	0.7	3.65	0.09	2011.914	1	1, 3
LDS3324AB	01554+4047	12.9 13.8	299.9	0.009	117.82	0.01	2011.914	1	1
LDS3324AC	01554+4047	12.9 18.9	70.0	0.10	113.43	0.10	2011.914	1	1
STF 187AB	01576+3134	9.68 11.90	190.3	0.12	11.04	0.003	2011.922	1	1
BAR 21BC	01576+3134	11.90 15.9	243.6	na	19.76	na	2011.922	1	1, 5
ALI1023	02067+4015	11.58 11.76	244.2	0.10	11.95	0.009	2011.914	1	1
ALI1024	02085+3944	11.4 12.3	355.4	0.06	9.36	0.005	2011.914	1	1
ALI 750	02164+3839	13.3 13.4	224.6	0.11	13.97	0.03	2011.914	1	1
ES 164	02180+4052	9.33 13.6	331.5	0.08	9.61	0.02	2011.922	1	1
ES 1502AB	02241+4137	10.90 11.7	168.6	0.06	6.64	0.03	2011.922	1	1
ES 1502AC	02241+4137	10.90 11.19	24.7	0.09	15.17	0.009	2011.922	1	1
ES 49AB	02249+4704	8.75 11.63	150.5	0.04	37.33	0.01	2011.922	1	1
ES 1503	02276+4206	11.35 13.0	55.0	0.24	4.93	0.07	2011.922	1	1
FOX 126AB	02284+4248	9.11 12.26	214.4	0.02	15.83	0.008	2011.922	1	1
LMP 29AC	02284+4248	9.11 13.96	291.3	0.01	53.11	0.02	2011.622	1	1
ES 2408	02355+3322	10.8 12.3	16.5	0.09	9.35	0.02	2011.922	1	1
ES 2409	02384+3308	10.09 14.6	77.5	0.10	11.81	0.03	2011.922	1	1
SEI 25	02382+3251	11.20 12.22	268.3	0.02	24.04	0.01	2011.922	1	1
LDS 880	02448+2852	13.5 13.6	207.5	0.04	35.48	0.02	2011.922	1	1
HJ 329	02539+3142	8.2 13.7	108.1	0.02	35.38	0.03	2011.922	1	1
POU 690	05303+2327	13.6 14.4	314.5	0.17	15.81	0.08	2011.092	1	2
POU 689	05303+2347	13.3 13.9	63.2	0.04	16.69	0.08	2011.092	1	2
POU 695	05313+2323	13.2 13.3	119.3	0.12	18.65	0.06	2011.092	1	2
POU 696	05314+2313	13.6 14.4	90.7	0.08	18.32	0.09	2011.092	1	2
POU 697	05315+2320	13.4 13.5	127.9	0.08	11.36	0.01	2011.092	1	2
POU 698	05315+2318	11.9 14.6	122.2	0.07	10.88	0.03	2011.092	1	2
POU 705	05318+2321	13.2 14.1	28.6	0.10	17.01	0.03	2011.092	1	2
POU 710	05322+2321	13.6 14.5	12.4	0.07	10.69	0.02	2011.092	1	2
POU 716	05329+2434	13.8 14.4	153.1	0.14	13.80	0.04	2011.092	1	2
POU2851	07386+2309	12.8 12.9	48.8	0.04	13.58	0.04	2011.092	1	2
POU2861	07406+2332	12.9 13.2	226.0	0.11	13.27	0.02	2011.092	1	2
POU2894	07483+2328	11.01 14.0	97.4	0.05	12.34	0.04	2011.092	1	2
POU2904	07535+2410	11.3 11.8	69.6	0.03	13.53	0.01	2011.092	1	2
POU2908	07559+2449	11.43 12.59	269.4	0.10	11.86	0.02	2011.092	1	2

Table continues on next page.

CD Double Star Measures, Jack Jones Memorial Observatory: Report #5

NAME	RA DEC	MAGS		θ	σ(θ)	ρ	σ(ρ)	DATE	N	NOTES
ALI 377	18299+3633	12.5	12.7	273.6	0.06	7.43	0.007	2011.933	1	1
SLE 188	18319+2253	12.58	13.9	99.3	0.06	17.70	0.08	2011.582	1	1
SLE 212	18354+2243	12.27	13.4	255.1	0.06	14.29	0.01	2011.577	1	1
POP 17	18390+3501	13.27	13.31	15.8	0.05	8.63	0.003	2011.633	1	1
POU3460	18400+2324	10.33	14.2	121.3	0.02	11.61	0.007	2011.608	2	1
POU3464	18402+2328	12.9	13.6	332.3	0.06	9.60	0.01	2011.608	2	1
POU3475	18410+2346	11.09	13.2	22.0	0.009	13.72	0.005	2011.608	2	1
POU3481	18414+2350	13.13	13.13	8.3	0.09	6.98	0.004	2011.608	2	1
POU3483	18415+2349	12.9	13.9	183.4	0.05	7.49	0.008	2011.608	2	1,3
POU3486	18416+2331	12.41	12.5	348.6	0.04	21.06	0.02	2011.608	2	1
POU3669	19030+2358	12.6	13.4	18.0	0.08	12.76	0.01	2011.933	1	1
POU3675	19035+2331	11.81	13.4	227.7	0.02	15.87	0.02	2011.933	1	1
MLB 290AB	19348+6748	8.8	11.8	78.3	0.13	19.23	0.07	2011.640	1	1
MLB1083	19361+6755	10.58	10.63	162.0	0.10	8.72	0.04	2011.640	1	1
LDS2446	19528+6732	16.0	16.2	264.8	0.04	29.17	0.13	2011.640	1	1,3
SEI 710	19528+3644	11.0	11.0	19.7	0.06	25.32	0.01	2011.538	1	1
SEI 712	19531+3633	11.25	11.91	60.7	0.01	14.64	0.005	2011.538	1	1
SEI 714	19534+3640	11.0	11.0	56.1	0.05	11.02	0.007	2001.538	1	1
SEI 769	19596+3321	12.04	12.5	228.2	0.007	23.66	0.008	2011.610	2	1
BEW 4	19596+3318	11.7	13.2	202.9	0.03	17.90	0.006	2011.610	2	1
SEI 784	20008+3337	12.50	12.74	158.8	0.03	23.45	0.008	2011.610	2	1
SEI 785	20010+3346	11.45	11.4	137.0	0.01	29.04	0.007	2011.615	1	1
SEI 789	20013+3346	10.69	12.7	347.4	0.02	16.88	0.008	2001.615	1	1
SEI 803	20024+3320	10.35	13.4	271.9	0.009	22.59	0.007	2011.609	2	1
SEI 841	20048+3359	12.27	12.66	307.1	0.02	26.68	0.005	2001.615	1	1
POU4208	20053+2349	14.02	13.07	169.2	0.06	19.22	0.02	2011.597	2	1
SEI 844	20053+3343	10.43	12.9	5.7	0.01	22.46	0.007	2011.612	1	1
POU5058	20549+2434	13.4	13.6	357.2	0.04	11.49	0.02	2011.626	1	1
POU4214	20059+2353	12.15	14.6	79.0	0.02	9.78	0.006	2001.612	1	1
POP 185AB	20060+3821	10.29	11.28	124.5	0.02	43.42	0.03	2011.604	1	1
POP 185AC	20060+3821	10.29	12.55	185.3	0.09	64.69	0.07	2011.604	1	1
POP 185AD	20060+3821	10.29	.	61.9	0.06	128.53	0.06	2011.604	1	1,3
POP 185AE	20060+3821	10.29	12.5	101.1	na	119.09	na	2011.604	1	1,4
POP 185AG	20060+3821	10.29	.	293.0	0.08	19.00	0.05	2011.604	1	1,3
SEI 929	20096+3459	10.87	11.60	31.2	0.13	20.81	0.07	2011.615	1	1
SEI 937	20097+3510	11.73	12.4	67.3	0.007	25.27	0.007	2011.618	1	1,3
BKO 99	20099+3509	11.5	12.5	65.7	0.04	8.95	0.005	2011.618	1	1
SEI 941	20103+3511	10.76	11.59	156.3	0.01	27.49	0.006	2011.618	1	1

Table concludes on next page.

CD Double Star Measures, Jack Jones Memorial Observatory: Report #5

NAME	RA DEC	MAGS	θ	σ(θ)	ρ	σ(ρ)	DATE	N	NOTES
SEI 977	20117+3458	11.84 11.89	38.6	0.04	15.18	0.02	2011.618	1	1
SEI 987	20120+3454	11.40 12.4	336.2	0.03	23.20	0.005	2011.618	1	1
SEI1027	20139+3439	10.15 12.1	10.0	0.01	28.62	0.005	2011.618	1	1
POU4957	20455+2522	10.37 13.6	293.9	0.11	19.97	0.09	2011.618	1	1
POU4959	20455+2509	14.3 14.5	137.7	0.06	13.88	0.06	2011.622	2	1
POU4923	20436+2518	12.42 13.5	308.4	0.02	15.51	0.02	2011.618	1	1
POU4972	20462+2513	13.7 14.1	279.3	0.05	13.76	0.02	2011.622	2	1
POU4974	20462+2526	12.8 14.3	106.2	0.03	17.26	0.03	2011.618	1	1
POU4980AB	20465+2506	14.1 14.3	144.4	0.15	7.56	0.03	2011.618	1	1
POU4980AC	20465+2506	14.1 14.3	104.6	0.06	13.10	0.04	2011.618	1	1
POU5045	20513+2511	12.48 13.7	313.8	0.05	13.65	0.01	2011.626	1	1
POU5050	20518+2509	12.2 12.4	325.7	0.04	18.49	0.03	2011.626	1	1
POU5052	20525+2522	13.21 13.73	323.3	0.03	15.85	0.01	2011.626	1	1
POU5053	20529+2453	13.0 14.2	184.5	0.07	14.33	0.01	2011.626	1	1
POU5054	20532+2508	12.7 14.0	314.8	0.03	10.47	0.02	2011.626	1	1
POU5055	20543+2441	12.1 13.2	201.8	0.07	9.16	0.007	2011.262	1	1
POU5056AB	20543+2405	10.40 12.02	184.1	0.03	21.45	0.01	2011.262	1	1
POU5057AC	20543+2405	10.40 13.8	231.2	0.03	23.59	0.01	2011.262	1	1
STI2562	21165+5727	12.0 12.6	77.1	0.02	11.17	0.009	2011.640	1	1
STI2566	21202+5809	11.87 12.34	125.1	0.04	13.12	0.007	2011.640	1	1
POU5395	21314+2451	10.96 13.1	127.0	0.02	17.38	0.02	2011.933	1	1
STI2615	22057+5531	12.30 12.9	248.7	0.06	10.16	0.01	2011.640	1	1
STI2714	22210+5502	12.5 13.1	159.2	0.10	9.52	0.04	2011.640	1	1
HJ 1767	22264+5534	11.01 11.65	212.1	0.01	11.97	0.006	2011.639	2	1

Table Notes

1. 14” C14 Classic SCT
2. 11” C11 SCT
3. See discussion.
4. The presence of the F component just 2.1” west ot the E component makes the measurement of POP 185AE very difficult. While the observation in Table 1 is consistient with the observation made, I am very reluctant to quote an error.
5. Observation based on 2 images.