

Observation Report for the Year 2010, Humacao University Observatory

R. J. Muller, J.C. Cersosimo, R.Rodriguez, E. Franco, M. Rosario,
M. Diaz, Y. Nieves, and B.S. Torres

Humacao University Observatory
Department of Physics and Electronics
The University of Puerto Rico at Humacao
College Station, Humacao, Puerto Rico 00791

E-mail: rjmullerporrata@gmail.com

Abstract: This is a report on observations of binary stars using Lowell Observatory's 31 inch telescope in June and September in the year 2010. The data was gathered in the form of images using the NASACAM CCD at the prime focus of the 31 inch. The data was downloaded to the Humacao University Observatory computers for analysis by the undergraduate student authors.

Introduction

In this paper we continue reporting measurements of position angle and separation of binary stars gathered from CCD images. The observations reported in this paper are the result of the analysis of data gathered during the year 2010. A team of undergraduates from the Department of Physics and Electronics of the Humacao Campus of the University of Puerto Rico traveled to Flagstaff, Arizona twice during that year to gather the data. They observed during June 1, 2, and 3 and, again, in September 10, 11, and 12. They used the 31 inch NURO telescope located at the Anderson Mesa facilities of Lowell Observatory, east of Flagstaff, at an altitude of 7200 feet. The Cassegrain telescope has, at its prime focus, a 2Kx2K CCD with 15 micron pixels. Its field of view is 16 arcminutes. There is an optical reducer in the optical path of the telescope.

Four students went to observe in June and two in September. The students operated the telescope, recorded the data, and brought it to our campus for further analysis.

We use the pixelization of the images and also a

software application to obtain and check for the separation measurements. We described this procedure in an article of the Double Star Observer (Muller et al. 2003). To obtain the position angle from the images, we use a property of fork and German equatorial mounts (Muller et al. 2006). The measurement of the position angle introduces a systematic error that we call the offset and its correction is included in the values presented in this report (Muller et al, 2006).

Data

We include our 73 June observations in Table 1 and 107 September observations in Table 2. We must state that sometimes more than one image is obtained of a binary in a particular night or in various nights. However, in the analysis and calculations of position angle and separation, only one image is used for each case; this image is duplicated and assigned to various students to average their results. On both tables, UPRH ρ stands for our measurement of separation and UPRH Θ stands for position angle.

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Table 1. Observations Made in June 2010

NAME	R.A.	Declination	Mag1	Mag2	UPRH ρ	UPRH Θ	Date
HDO 122	09 16 41.99	-09 41 02.3	10.94	11.3	9.6	88.46	2010.4192
HJ 2491	09 16 43.52	+34 31 06.9	11.41	11.5	15.3	199	2010.4192
HJ 2492AB	09 18 35.41	+52 30 50.0	9.8	12.3	17	119	2010.4192
HJ 129	09 19 27.7	+06 06 13.5	12.2	12.9	12.7	241	2010.4192
BAL2833	09 20 14.28	+03 51 40.5	10.1	11.2	13.2	173	2010.4192
HJ 462	09 23 07.94	+30 07 41.7	10.78	11.37	18	9	2010.4192
HJ 818AB	09 36 11.79	-07 25 12.3	10.9	11.5	8.8	39.5	2010.4192
GRV 795	09 41 18.2	+26 50 56.3	11.6	13.8	23.4	234	2010.4192
POU3057	09 46 44.5	+23 22 47	11.7	12.2	6.28	26.2	2010.4192
STI2236	09 48 34.3	+55 37 21	11.8	13.3	5.85	58.5	2010.4192
STI 695	09 49 25.47	+58 39 26.4	11.1	12.9	12.1	126	2010.4192
HJ 828	10 06 23.97	+27 02 51.6	10.9	11.4	12.3	309	2010.4192
WEI 22	10 06 30.40	+43 33 06.8	9.87	10.57	11.8	296	2010.4192
ARA 668	10 22 21.88	-19 34 56.4	11.42	12.2	12.3	87	2010.4219
ES 2222	10 24 33.4	+32 57 53	10.15	11.4	8.2	290	2010.4192
BAL2841	10 29 04.9	+03 42 28	10.16	10.93	3.94	359	2010.4192
SEI 520	10 30 07.4	+30 50 53	12.0	12.0	8	2.5	2010.4192
STI 707	10 32 30.2	+59 00 47	10.8	11.8	6.75	213	2010.4192
BVD 82	10 34 00.56	-13 54 14.1	10.69	11.39	17.4	211	2010.4219
STF1452A,BC	10 35 48.16	+02 33 16.9	9.59	9.81	9.3	325	2010.4192
LDS1248	10 36 05.34	+29 06 18.0	16.0	16.3	14.5	275	2010.4219
STF1456	10 38 17.33	+01 14 38.4	8.24	9.75	15.2	49	2010.4192
ES 603	10 42 41.50	+48 10 33.0	9.95	12.3	12.7	101	2010.4192
STI2256	10 48 22.62	+55 32 47.8	10.8	11.2	12.3	134	2010.4192
GRV 821	10 51 12.34	+10 26 58.7	11.8	13.2	14.7	82.5	2010.4219
STF1482	10 52 10.61	+07 27 39.4	8.25	9.20	13.1	295	2010.4192
ES 722	11 00 31.3	+52 37 07	9.95	11.4	7.0	103	2010.4219
HJ 2553	11 02 11.1	+07 25 00	10.66	12.78	16.6	264	2010.4219
BAL1443	11 08 30.9	+01 17 44	10.8	11.0	9.6	183	2010.4219
POU3097	11 14 09.37	+22 58 37.6	11.94	13.6	12.0	326	2010.4219
STF1520	11 16 04.03	+52 46 23.4	6.54	7.81	13.4	341	2010.4219
STF1535	11 22 54.19	+00 55 38.9	9.39	12.0	15.1	60	2010.4219
HJ 1205	12 02 45.94	+04 21 34.4	11.94	12.1	15.6	30	2010.4219
STF1636	12 22 32.1	+05 18 20	6.53	9.31	23.7	343	2010.4219
STF1657	12 35 07.7	+18 22 37	5.11	6.33	21.4	263.6	2010.4219
HO 54BD	12 41 56.32	+09 52 45.6	11.8	14.8	20.2	89	2010.4219
B 2740	13 00 12.59	-19 29 02.7	8.16	11.4	10.4	120.7	2010.4219

Table 1 concludes on next page

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Table 1 (conclusion). Observations Made in June 2010

NAME	R.A.	Declination	Mag1	Mag2	UPRH ρ	UPRH Θ	Date
STF1707	13 01 14.16	+15 51 45.2	9.70	11.5	10.3	46	2010.4219
STF1718AB-C	13 05 30.27	+50 59 11.0	9.84	10.7	15.5	273	2010.4219
POU3134	13 14 27.47	+23 58 03.7	12.9	14.3	14	59	2010.4219
BAL 224	13 21 52.68	-02 39 17.3	10.92	11.24	12.3	70	2010.4219
HJ 231	13 46 19.3	+11 37 21.5	11.02	12	11.0	81	2010.4219
COU 59AB	14 00 42.1	+17 53 55	10.55	13.8	9.74	172.5	2010.4192
ARA 74	14 01 26.4	-16 36 00	13.3	13.3	13.8	10	2010.4192
HJ 2699BC	14 03 04.6	+11 54 18	13.0	13.4	14.8	304	2010.4192
ARA 695	14 03 29.2	-19 32 20	12.6	12.9	7.3	58	2010.4192
HJ 542	14 12 21.2	+36 46 12	12	12	12.2	247	2010.4192
LDS 953	14 13 29.8	+21 37 39	13.7	15.2	11.0	187	2010.4192
STFA 26AB	14 16 10.0	+51 22 01	4.76	7.39	38.6	30	2010.4192
GRV 888	14 30 53.35	+28 06 52.2	10.92	11.64	12.9	48	2010.4192
POU3176	14 52 43.4	+23 53 47	12.39	14.0	5.0	3	2010.4192
HJ 560	14 55 36.9	+34 57 23	9.82	11.2	39.0	298	2010.4192
HJ 1264	14 58 21.7	+40 16 15.8	10.22	12.83	19.4	320	2010.4192
BAL1175	15 00 23.7	+00 06 44	10.8	11.2	17.0	196	2010.4192
HJ 2758	15 00 40.2	-17 30 34	11.76	13.8	18.6	343	2010.4192
KZA 80	15 20 42.0	+31 33 15	12.13	12.82	25.3	53	2010.4192
HJ 2777	15 22 25.3	+25 37 27	7.5	10.4	42.31	343.5	2010.4192
KZA 87	15 24 48.6	+29 34 28	12.0	12.5	11.8	1.5	2010.4192
KZA 90	15 27 25.4	+31 01 41	12.5	13.0	19.7	294	2010.4192
GIC 131	15 32 30.2	+08 32 08	13.57	14.68	14.6	310	2010.4192
POU3193	15 35 22	+24 08 18	13.2	13.7	9.5	300	2010.4192
HDS2205	15 38 16.34	-09 34 27.5	9.89	12.39	10.1	45.5	2010.4192
STT 300	15 40 10.35	+12 03 10.6	6.32	10.07	15.1	261	2010.4192
STF1981	15 51 16.00	+25 08 39.2	9.37	10.86	13.7	3	2010.4192
STF1983	15 51 57.93	+35 27 39.0	10.19	11.74	13.5	65	2010.4192
HJ 580	16 02 50.6	+37 05 27	9.20	12.2	41.0	8	2010.4192
ARA 433	16 06 35	-18 19 11	11.6	14.1	9.5	50	2010.4219
POU3214	16 07 48	+23 05 29	11.1	13.3	13.3	88	2010.4219
HJ 1288	16 12 40	-16 45 18	11.0	12.3	17.2	123	2010.4219
ES 627	16 18 35.7	+51 19 51	9.88	10.98	12.2	285	2010.4219
BAL2429	16 54 51.2	+03 18 41	11.77	12.8	11.4	51	2010.4219
POU3252	16 56 22.97	+24 01 14.3	11.4	13.4	13.4	11	2010.4219
ARA 434	16 57 40.02	-18 10 55.5	9.82	13.0	12.7	156.5	2010.4219

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Table 2. Observations Made in September 2010

NAME	R.A.	Declination	Mag1	Mag2	UPRH ρ	UPRH Θ	Date
ARA 243	16 01 04.07	-17 40 59.3	11.84	12.0	13.4	297	2010.6932
AG 349	16 01 04.36	+28 06 42.4	9.59	10.86	11.8	288	2010.6932
AG 200	16 01 09.14	+39 36 11.8	10.62	10.94	3.3	215	2010.6932
HJ 580	16 02 50.56	+37 05 26.8	9.20	12.2	40.9	6.80	2010.6932
BEM 21	16 02 58.26	+51 11 40.4	10.54	11.02	18.9	105	2010.6932
VKI 25	16 03 10.46	+42 13 01.1	11.4	13.4	6.6	162.5	2010.6932
BAL1911	16 03 20.00	+02 31 26.8	12.19	12.7	16.9	235	2010.6932
STF1999AB	16 04 25.9	-11 26 57	7.52	8.05	13.6	102	2010.6932
ARA 433	16 06 35.8	-18 19 11	11.6	14.1	9.9	56	2010.6932
ALI 370	16 07 26.8	+35 48 29	12.06	12.5	12.9	146.8	2010.6932
POU3214	16 07 48.8	+23 05 29	11.1	13.3	12.1	82	2010.6932
HJ 1289	16 10 38.01	+39 28 38.2	11.39	12.3	11.2	239	2010.6932
GRV 924	16 11 43.26	+35 07 29.1	8.8	12.1	10.8	304	2010.6932
HJ 1288	16 12 40.8	-16 45 18	11.0	12.3	18.3	122	2010.6932
ES 627	16 18 35.71	+51 19 51.5	9.88	10.98	11.5	287	2010.6932
BAL2418	16 35 09.74	+02 54 20.0	11.06	11.25	11.9	189.3	2010.6932
STF2098AB	16 45 43.47	+30 00 17.2	8.77	9.61	14	144.5	2010.6932
BAL2429	16 54 51.2	+03 18 41	11.77	12.8	11.4	52.7	2010.6932
BAL1486	17 05 55.9	+00 55 57	10.86	12.4	7.4	12	2010.6932
BAL1931	17 06 09.8	+02 06 05	11.4	11.5	16.9	187	2010.6932
COU 109	17 06 27.9	+22 07 57	10.01	13.1	8.26	141	2010.6932
SLE 78BC	17 06 49.8	+33 56 00	11.27	12.15	14.3	202.5	2010.6932
STF2123	17 06 57.50	+06 48 03	9.82	9.98	18.6	216.5	2010.6932
AG 353	17 07 01.4	+12 13 22	9.83	11.7	9.8	248.5	2010.6932
STF2127	17 07 04.42	+31 05 35.1	8.70	12.30	15.1	281	2010.6932
SLE 9	17 07 06.29	+20 29 21.7	10.49	11.94	19.8	173	2010.6932
GRV 946	17 07 14.12	+25 44 34.5	10.54	11.71	20.5	42.5	2010.6932
STN 34	17 16 42.44	-17 09 11.5	9.57	10.58	17.4	290.2	2010.6932
HDS2441	17 15 56.29	-13 29 39.0	9.63	11.74	12.5	233	2010.6932
BAL1934	17 17 45.85	+02 07 05.9	10.85	11.8	12.9	234	2010.6932
SLE 13	17 18 17.06	+19 12 14.0	10.14	11.7	11.2	308	2010.6932
BAL2454	17 51 08.47	+03 11 18.9	11.78	11.66	13.2	92.5	2010.6932
STI2366	18 00 33.71	+58 40 56.1	10.65	12.1	9	296.5	2010.6932
ES 640	18 00 42.85	+54 52 38.1	9.51	10.1	8.4	80	2010.6932
ES 1558	18 00 50.53	+41 45 12.5	10.22	13.7	6.2	297.8	2010.6932
SLE 107	18 01 49.80	+26 31 23.4	12.45	12.6	12.9	206.5	2010.6932
HJ 1314	18 07 05.32	+32 22 54.6	10.33	11.09	17.9	155.3	2010.6932
SLE 110	18 07 14.5	+27 16 04	10.56	13.3	10.9	111.5	2010.6932

Table 2 continues on next page.

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Table 2 (continued). Observations Made in September 2010

NAME	R.A.	Declination	Mag1	Mag2	UPRH ρ	UPRH Θ	Date
STF2280AB	18 07 49.5	+26 06 04	5.81	5.84	14.25	183	2010.6932
BAL2474	18 08 03.4	+03 43 12	10.0	11.0	15.6	282	2010.6932
POU3351	18 08 08.8	+23 27 12	12.05	12.05	10.4	157.5	2010.6932
SLE 111	18 08 53.9	+27 24 56	10.8	12.5	14.6	309.5	2010.6932
POU3353	18 08 55.1	+23 19 00	12.26	12.4	15.7	345	2010.6932
HJ1315	18 09 53.5	+29 41 16	11.85	13.1	8.8	128.8	2010.6932
STF2293	18 09 53.83	+48 24 05.7	8.08	10.34	12.2	80	2010.6932
ARA 267	18 09 54	-17 09 38	11.22	12.4	14.4	349	2010.6932
SEI 559	18 10 27.8	+33 55 55	11.0	11.0	11.5	170.5	2010.6932
BAL2481	18 10 37.2	+03 27 23	11.3	11.3	10.8	110	2010.6932
AG 217	18 11 05.89	+53 29 37.8	10.77	11.85	14.37	240.8	2010.6932
ALI 140	18 11 25.14	+35 06 45.5	10.97	11.79	14.3	249	2010.6932
BAL2483	18 14 41.6	+03 42 05	12.00	12.7	12.7	196	2010.6932
SLE 145	18 14 58.3	+03 03 43	11.2	11.9	11.6	27.8	2010.6932
WLY 10AC	18 30 31.14	+08 51 54.4	10.6	11.3	11.3	82	2010.6932
POU3419	18 32 02.77	+25 04 01.7	7.7	12.1	9.86	234	2010.6959
J 1745	18 32 49.40	-13 03 35.4	9.47	12.8	9.0	52.8	2010.6959
STF2459	19 07 22.01	+25 58 23.9	9.12	10.07	14.1	230.5	2010.6959
POU3718	19 08 00.6	+24 58 09	10.69	13.7	14.1	272	2010.6959
HJ 877	19 10 04.2	+19 33 15	10.8	11.1	12	293	2010.6959
POU3745	19 12 00.7	+23 46 18	12.47	13.7	11	23	2010.6959
HJ 1375	19 12 34	+28 14 47	11.0	13.6	11.1	86.5	2010.6959
HLM 18	19 13 15.0	+39 08 57	10.94	11.33	12.2	331.8	2010.6959
ARA1175	19 15 30.0	-19 55 19	11.60	12.5	12.5	12.5	2010.6959
HJ 2861	19 16 30.4	+07 12 10	10.84	13.8	12.0	54	2010.6959
BAL1516	19 17 00.2	+01 45 03	11.5	11.6	10.5	271.5	2010.6959
HJ 2868	19 17 56.9	+58 07 58	11.9	11.9	11.3	103.3	2010.6959
POU3940	19 35 12.15	+25 01 29.6	10.6	10.7	9.6	29	2010.6959
HJ 1421	19 36 21.95	+35 35 51.5	9.37	11.72	14.9	232	2010.6959
ALI 892	19 37 20.68	+39 04 19.2	10.74	12.6	10.8	67	2010.6959
ES 2297AB	19 37 28.79	+33 32 31.2	9.14	9.4	7.2	189	2010.6959
HJ 1429	19 37 57.45	+56 14 05.9	10.6	11.0	7.1	238.5	2010.6959
SMA 101	19 50 51.42	+44 44 38.6	11.40	11.9	9.6	49	2010.6959
POU4178	20 00 12.25	+24 20 45.5	11.30	12.3	11.5	6	2010.6959
CHE 235	20 14 36.6	+14 52 35.2	12.3	13.6	13.8	31	2010.6959
POU4392	20 21 09.47	+25 07 24.0	10.98	11.9	9.9	334.3	2010.6959
ES 362AB	20 23 05.60	+30 35 49.6	10.18	12.5	11.5	233.5	2010.6959

Table 2 concludes on next page.

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Table 2 (conclusion). Observations Made in September 2010

NAME	R.A.	Declination	Mag1	Mag2	UPRH ρ	UPRH θ	Date
POU4500	20 26 52.84	+23 40 16.1	11.99	12.1	8.5	278	2010.6959
A 1674AC	20 27 31.64	+14 53 33.6	9.72	12.5	7.7	288.5	2010.6959
SEI1483	21 16 06.47	+35 47 58.0	11.0	11.0	10.1	25.5	2010.6959
POP 186AB	21 16 57.43	+41 39 52.6	10.3	11.1	10.2	294	2010.6959
MLB 489AC	21 17 38.12	+28 40 46.1	10.32	12.0	10.9	286	2010.6959
WSI 23AC	21 24 42.86	+36 30 30.1	11.0	12.2	9.2	79	2010.6959
POU5363	21 25 07.59	+24 01 10.1	10.4	11.9	7.9	281.3	2010.6959
BAL1230	21 27 50.46	+01 04 48.4	11.4	11.5	12.0	273	2010.6986
STF2800	21 28 43.09	+49 52 06.6	9.50	10.41	9	249	2010.6986
J 1896	21 29 11.79	+23 10 49.4	10.88	13.7	6.9	110.5	2010.6986
STI2586	21 42 40.45	+56 14 56.9	10.71	11.72	12.6	3	2010.6986
STI2720	22 21 30.0	+58 36 48	12.1	12.1	14.2	161	2010.6986
STI2722	22 21 59.1	+56 19 52	10.67	13.1	14.8	71	2010.6986
BU 174	22 29 18.56	-09 39 45.8	8.83	11.74	8.53	288	2010.6986
ES 837AC	22 31 45.72	+50 04 24.4	9.64	12.9	11.2	234.5	2010.6986
HO 475AC	22 32 45.49	+26 24 32.8	9.34	11.3	8.5	223	2010.6986
POU5723	22 35 11.58	+23 41 55.6	12.3	12.7	10.9	183	2010.6986
CHE 347	22 40 37.34	+30 19 50.5	13.1	13.6	8.2	47.5	2010.6986
CHE 396	22 43 18.39	+33 14 38.8	8.93	12.0	10.6	168	2010.6986
STI2872	22 50 16.7	+57 36 20	11.85	11.9	11.4	56.5	2010.6986
STF2999AD	23 18 46.4	+05 11 18	8.90	11.9	27.4	21	2010.6986
HJ 1876	23 25 56.79	+36 50 32.5	11.1	11.6	9.4	210	2010.6986
HJ 986	23 27 07.33	+35 20 28.2	11.23	12.2	9.5	296	2010.6986
STF3019	23 30 40.76	+05 14 58.0	7.77	8.37	11.6	184.5	2010.6986
BRT 602	23 32 07.02	-14 31 33.3	10.8	11.0	4.7	139	2010.6986
STI3012	23 38 24.5	+58 00 27	12.6	12.6	8.0	102.3	2010.6986
MLB 506	23 38 28.67	+28 44 56.2	11.1	11.6	8.6	239	2010.6986
STI3007	23 36 42.8	+58 19 49	13.2	13.2	8	120	2010.6986
BAL1249	23 41 02.7	+00 43 07	10.36	12.4	13.6	340	2010.6986
ES 269AB	23 49 03.25	+41 19 26.2	9.93	12.1	10.5	224.5	2010.6986
STF 23AB	00 17 28.7	+00 19 15	7.88	10.28	9.5	218	2010.6986
BAL1611	00 43 18.50	+02 51 01.2	11.4	11.5	20.1	179.5	2010.6986

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Acknowledgements

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