

# Observation Report 2007, Humacao University Observatory

R. J. Muller, J.C. Cersosimo, V. Miranda, D. Centeno, L. Rivera-Rivera, E. Franco, K. Ramos, K. Morales, V. Maldonado

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:** We report the measurement of position angle and separation of 157 binary pairs. The data was obtained using the NURO Telescope at the Anderson Mesa location of Lowell Observatory near Flagstaff, Arizona, on May and September 2007. We gathered the data using the 2K x 2K CCD camera - NASACAM - at the prime focus of the 31 inch telescope. The data was transferred and analyzed at the Humacao University Observatory by undergraduate students undertaking research projects. We request more observations on some binaries with ambiguous results.

## Introduction

We report on data acquired during the year 2007. We obtained observing time at the 31 inch NURO telescope, located at the Lowell Observatory site at Anderson Mesa, some 20 miles east of Flagstaff, Arizona. The observing time was split 3 nights in May and 3 nights in September, as per our request. We gathered data for 63 binaries in May and for 94 pairs in September. Four students traveled to the telescope in May, two went in September. The students operated the telescope, gathered the data and brought it to the Humacao Campus Observatory of the University of Puerto Rico for analysis.

The separation measurements were done by pixelizing the images, as we described in an article of the *Double Star Observer* (Muller, et al. 2003). The position angle was simply extracted from the images, using a property of German equatorial and fork mounts (Muller, et al. 2006). Since the telescope now has a reducer in the optical path, north is not up or down in the images this year, it lies to the right this time. The measurement of the position angle introduces a systematic error which we call the offset and correct statistically. There is a different offset for the data in May and in September. The offset for May was -0.33

and the offset for September was 0.1 degree

The Cassegrain telescope has a 2K x 2K CCD camera at its prime focus. This CCD has 15 micron pixels and a field of view of 16 arc minutes. The optical reducer was changed in the last months preceding our observing run, and it changed our plate scale, so we had to recalculate the plate scale again for this report as we did before (Muller, et al. 2008). The plate scale obtained was .47 arc seconds /pixel, and is the value used for this report.

## Data

Tables 1 and 2 present the results for the 157 binaries; Table 1 yields values for our May observing run and Table 2 for the September run.

Some entries in the tables are presented in bold-face and those entries represent values we believe are ambiguous. The first one is HJ 2699BC. We found a big difference between the last value for position angle posted at the Washington Double Star Catalog (WDS) (our own previous measurement in 2004) and the value presented here, but there is agreement in the value of the separation. We requested information on this binary using the WDS request form (Mason, Brian, 2006) and discovered that there was an observation in 2006 not yet posted in the WDS and reported

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in the JDSO (Wiley, E.O., 2007) that yielded close agreement on position angle with our 2007 measurement. Further observations of this binary are urgently needed. The fact that this binary seems to be part of a triple system suggests that observers might be looking at different components of the system at different times, obtaining different values.

HJ 580 is the next troublesome binary in our report. This binary was observed both in May and in September, and our results differ by much in both position angle and separation with the last value entered in the WDS in 2007 and reported at the JDSO (Spangler, Morgan, 2007). Further observations of this pair are needed to correct this ambiguity.

The last troublesome binary is SLE959AB. This is part of a multiple system, so anything is possible. The main problem is that it has been observed only once before, so we are in need of additional observations of this system to correct any ambiguity regarding its position angle and separation.

### Acknowledgements

We want to acknowledge extensive use of the Washington Double Star Catalog of the U.S. Naval Observatory. We also want to thank Ed Anderson, the NURO telescope technician, for his effort during our

observations. We also want to thank Puerto Rico's NASA Space Grant Consortium for its continuous support of this project.

### References:

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**Table 1:** Measures made in May 2007

Name	R.A	DEC	MAGS	$\rho$	$\theta$	DATE
SLE 387	07 00 03.6	+19 52 40	11.9 12.2	8.2	117.3	2007.402
STF 996AB	07 00 13.7	+42 59 04	8.88 10.7	10.0	167.6	2007.402
SLE 783	07 00 12.23	+37 16 29	12.0 12.6	10.0	186.8	2007.402
HJ 74	08 00 23.9	+11 37 41	10.3 10.8	9.6	292.6	2007.402
SLE 316	08 00 24.6	+12 40 25	10.3 12.1	18.8	90.3	2007.402
ES 1387	08 00 25.4	+42 42 32	10.7 11.4	5.5	147.3	2007.402
BAL 844	08 00 47.34	-01 00 51.6	11.02 11.21	14.6	88.3	2007.402
BAL1419	08 00 55.9	+01 10 30	10.8 11.6	15.6	329.3	2007.402
SLE 317	08 01 02.91	+12 02 41.6	11.5 11.5	13.0	110.8	2007.402
HJ 129	09 19 27.7	+06 06 14	12.2 12.9	10.5	245.3	2007.402
GRV 795	09 41 18.27	+26 50 56.3	11.6 13.8	24.3	230.3	2007.402
HJ 469	09 44 30	+18 51 58	6.50 12.6	30.3	262.3	2007.402

Table 1 continues on next page.

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**Table 1:** Measures made in May 2007, continued from previous page

Name	R. A	DEC	MAGS	$\rho$	$\theta$	DATE
POU3057	09 46 44.5	+23 22 47	11.7 12.2	5.2	13.3	2007.402
STI2236	09 48 34.3	+55 37 21	11.8 13.3	5.8	64.3	2007.402
FOX 163	09 51 03	+08 04 50	8.86 12.4	6.0	278.3	2007.402
LDS3979	10 20 17	+15 42 48	17.1 18.4	10.2	352.3	2007.397
ES 2222	10 24 33.4	+32 57 53	10.15 11.4	7.4	293.3	2007.397
POU3080	10 25 29.1	+23 21 39	9.74 10.9	6.5	98.8	2007.397
BAL1876	10 27 19.8	+02 21 26	10.6 11.5	7.6	49.3	2007.397
BAL2841	10 29 04.92	+03 42 28.1	10.16 10.9	4.6	355.3	2007.397
SEI 520	10 30 07.4	+30 50 53	12.0 12.0	7.8	4.3	2007.397
STI 707	10 32 30.2	+59 00 47	10.8 11.8	4.7	213.3	2007.397
BAL2842	10 35 29	+04 06 13	10.8 11.5	7.4	245.3	2007.397
ES 303	10 58 46.1	+30 38 32	10.36 12.4	7.8	201.3	2007.397
ES 722	11 00 31.3	+52 37 07	9.95 11.4	8.6	105.3	2007.397
HJ 2553	11 02 11.13	+07 25 00	10.66 12.78	16.6	264.3	2007.397
BAL1443	11 08 30.9	+01 17 44	10.8 11.0	6.5	176.3	2007.397
STI 738	12 03 17.7	+59 24 05	12.24 13.1	6.8	36.3	2007.397
STF1636	12 22 32.1	+05 18 20	6.53 9.31	21.4	340.3	2007.397
STF1657	12 35 07.76	+18 22 37.4	5.11 6.33	20.6	271.7	2007.397
COU 59 AB	14 00 42.18	+17 53 55.2	10.55 13.8	8.7	169.8	2007.397
ARA 74	14 01 26.4	-16 36 00	13.3 13.3	13.6	15.8	2007.397
LDS1402	14 02 27.1	+15 20 33	15.1 15.5	6.9	311.8	2007.397
<b>HJ 2699 BC</b>	<b>14 03 04.6</b>	<b>+11 54 18</b>	<b>13.3 13.3</b>	<b>14.5</b>	<b>298.3</b>	2007.397
ARA 695	14 03 29.2	-19 32 20	12.6 12.9	7.7	58.3	2007.397
BAL1169	14 08 19.3	-00 11 19	10.9 11.3	14.1	298.8	2007.397
HJ 542	14 12 21.2	+36 46 12	12.0 12.0	12.6	244.8	2007.397
LDS 953	14 13 29.8	+21 37 39	13.7 15.2	10.6	170.3	2007.400
STFA 26 AB	14 16 10.0	+51 22 01	4.76 7.39	40.4	33.8	2007.400
POU3176	14 52 43.4	+23 53 47	12.39 14.0	7.2	.3	2007.400
HJ 560	14 55 36.9	+34 57 23	9.82 11.2	40.2	298.3	2007.400
HJ 1264	14 58 21.70	+40 16 15.8	10.22 12.8	19.4	321.6	2007.400
BAL1175	15 00 23.7	+00 06 44	10.8 11.2	14.7	197.3	2007.400
HJ 2758	15 00 40.2	-17 30 34	11.76 13.8	19.6	343.3	2007.400
KZA 80	15 20 42.0	+31 33 15	12.41 12.9	26.7	55.1	2007.400
HJ 2777	15 22 25.3	+25 37 27	7.5 10.4	43.5	344.3	2007.400

*Table 1 continues on next page.*

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**Table 1:** Measures made in May 2007, continued from previous page

Name	R. A	DEC	MAGS	$\rho$	$\theta$	DATE
KZA 87	15 24 48.6	+29 34 28	12.0 12.5	11.9	360.3	2007.400
KZA 90	15 27 25.4	+31 01 41	12.5 13.0	19.9	298.6	2007.400
GIC 131	15 32 30.27	+08 32 08.3	13.57 14.68	15.0	311.8	2007.400
POU3193	15 35 22	+24 08 18	13.2 13.7	7.4	297.1	2007.400
HJ 1284	16 00 36	-00 30 00	10.0 14.0	23.2	183.6	2007.400
<b>HJ 580</b>	<b>16 02 50.6</b>	<b>+37 05 27</b>	<b>9.20 12.2</b>	<b>41.4</b>	<b>9.1</b>	2007.400
STF1999AB	16 04 25.9	-11 26 57	7.52 8.05	12.2	99.3	2007.400
ARA 433	16 06 35.8	-18 19 11	11.6 14.1	10.1	55.8	2007.400
ALI 370	16 07 26.8	+35 48 29	12.06 12.5	13.4	147.3	2007.400
HJ 259	16 07 42	+35 49 00	12.0 13.0	36.3	155.3	2007.400
POU3214	16 07 48.8	+23 05 29	11.1 13.3	12.6	82.3	2007.400
STF2010AB	16 08 04.5	+17 02 49	5.10 6.21	27.6	13.3	2007.400
H 56AC	16 11 59.7	-19 27 38	4.21 6.60	41.2	338.8	2007.400
HJ 1288	16 12 40.8	-16 45 18	11.0 12.3	18.8	122	2007.400
ES 627	16 18 35.71	+51 19 51.5	9.88 10.98	12.1	287.3	2007.400
GRV 940	16 51 36.98	+00 28 41.9	9.29 10.69	46.5	341.3	2007.400
BAL2429	16 54 51.2	+03 18 41	11.77 12.8	11.8	53.8	2007.400

**Table 2:** Measures made in September 2007

Name	R. A	DEC	MAGS	$\rho$	$\theta$	DATE
LDS4521	15 00 47.5	+23 06 26	16.3 17.3	26.4	338.9	2007.7150
STF1901	15 00 57.70	+31 22 38.2	8.71 10.55	20.1	184.9	2007.7150
KZA 80	15 20 42.0	+31 33 15	12.41 12.9	26.0	53.9	2007.7150
HJ 2777	15 22 25.3	+25 37 27	7.5 10.4	43.9	342.9	2007.7150
KZA 90	15 27 25.4	+31 01 41	12.5 13.0	20.3	298.4	2007.7150
POU3193	15 35 22	+24 08 18	13.2 13.7	7.8	299.9	2007.7150
AG 348	16 00 11.9	+14 11 12	8.99 9.5	41.6	171.9	2007.7123
KU 109	16 02 21.66	+09 36 32.5	10.09 10.25	38.5	119.9	2007.7123
<b>HJ 580</b>	<b>16 02 50.6</b>	<b>+37 05 27</b>	<b>9.20 12.2</b>	<b>41.7</b>	<b>6.9</b>	2007.7123
BEM 21	16 02 58.26	+51 11 40.4	10.54 11.02	19.2	104.9	2007.7123
OSO 67	16 03 13.2	+42 14 46.	9.85 15.9	25.5	311.9	2007.7123
HJ 582	16 07 06	+35 07 00	9.7 12.0	22.3	231.9	2007.7123
ALI 370	16 07 26.8	+35 48 29	12.06 12.5	13.2	146.9	2007.7123

*Table 2 continues on next page.*

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**Table 2:** Measures made in September 2007, continued from previous page

Name	R. A	DEC	MAGS	$\rho$	$\theta$	DATE
HJ 259	16 07 42	+35 49 00	12. 13.	36.1	154.9	2007.7123
POU3214	16 07 48.8	+23 05 29	11.1 13.3	12.3	82.9	2007.7123
ES 627	16 18 35.71	+51 19 51.5	9.88 10.98	11.4	283.9	2007.7123
GRV 940	16 51 36.98	+00 28 41.9	9.29 10.69	45.7	342.9	2007.7150
BAL1486	17 05 56	+00 55 57	10.86 12.4	8	7.9	2007.7150
WFC 186	17 06 05.5	+43 28 56	10.81 12.11	18.1	14.9	2007.7123
BAL1931	17 06 09.8	+02 06 05	11.4 11.5	18.1	185.9	2007.7123
SLE 77	17 06 38.8	+32 14 56	10.54 5.5	20.7	267.9	2007.7123
SLE 78BC	17 06 49.8	+33 56 00	11.27 12.15	14.6	201.9	2007.7123
STF2122	17 06 53.0	-01 39 22	6.38 9.73	20.9	277.9	2007.7150
STF2123	17 06 57.50	+06 48 03	9.82 9.98	19.0	217.9	2007.7150
AG 353	17 07 01.4	+12 13 22	9.83 11.7	9.9	246.4	2007.7150
STF2127	17 07 04.4	+31 05 35.1	8.70 12.30	15.5	279.9	2007.7123
SLE 9	17 07 06.3	+20 29 21.7	10.49 11.94	20.6	171.9	2007.7150
GRV 946	17 07 14.1	+25 44 34.5	10.54 11.7	20.7	41.9	2007.7150
LDS 988	17 06 56.8	+06 47 48.2	12.2 12.4	18.9	35.9	2007.7150
SLE 110	18 07 14.5	+27 16 04	10.56 13.3	11.2	113.9	2007.7123
SLE 85	18 07 33.1	+03 13 53	11.2 12.5	11.5	177.9	2007.7178
BAL1952	18 07 34.4	+02 24 08	11.52 12.8	15.5	152.9	2007.7150
POU3350	18 07 59.9	+24 06 00	11.8 12.0	9.6	67.9	2007.7123
BAL2474	18 08 03.4	+03 43 12	10.0 11.0	16.3	280.9	2007.7150
POU3351	18 08 08.8	+23 27 12	12.05 13.9	10.4	158.9	2007.7123
SLE 111	18 08 53.9	+27 24 56	10.8 12.5	14.7	314.9	2007.7123
POU3353	18 08 55.1	+23 19 00	12.26 12.4	15.6	350.9	2007.7123
BAL2478	18 09 42.9	+03 54 26	10.34 11.3	12.0	109.4	2007.7150
STF2293	18 09 53.8	+48 24 05.7	8.08 10.34	13.1	82.9	2007.7123
HJ1 315	18 09 53.5	+29 41 16	11.85 13.1	9.4	126.9	2007.7123
SEI 559	18 10 27.8	+33 55 55	11.0 11.0	11.2	171.9	2007.7123
BAL2481	18 10 37.2	+03 27 23	11.3 11.3	10.9	107.9	2007.7150
AG 217	18 11 05.8	+53 29 37.8	10.77 11.85	14.9	237.9	2007.7123
ALI 140	18 11 25.1	+35 06 45.5	10.97 11.79	14.5	249.4	2007.7123
BAL2483	18 14 41.6	+03 42 05	12.00 12.7	13.2	196.9	2007.7150
SLE 145	18 14 58.3	+03 03 43	11.2 11.9	11.8	25.9	2007.7150
STF2459	19 07 22.0	+25 58 23.9	9.12 10.07	14.0	231.9	2007.7123

*Table 2 continues on next page.*

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**Table 2:** Measures made in September 2007, continued from previous page

Name	R.A	DEC	MAGS	$\rho$	$\theta$	DATE
POU3718	19 08 00.6	+24 58 09	10.69 13.7	15.0	272.4	2007.7123
HJ 877	19 10 04.2	+19 33 15	10.8 11.1	12.8	293.9	2007.7123
SLE 931	19 10 20.3	+02 49 58.7	9.9 12.0	10.9	76.4	2007.7150
ALI 617	19 11 47.9	+37 21 23	11.59 12.6	13.2	78.9	2007.7123
POU3745	19 12 00.7	+23 46 18	12.47 13.7	11.8	22.9	2007.7123
HJ 1375	19 12 34.	+28 14 47	11.02 13.64	11.5	96.9	2007.7123
SLE 935	19 14 26.7	+02 12 06.2	11.0 11.0	9.6	214.9	2007.7150
SEI 585	19 14 48.6	+38 20 01	8.91 11.7	14.6	122.9	2007.7123
HJ 2861	19 16 30.4	+07 12 10	10.84 13.8	11.9	54.4	2007.7123
BAL1516	19 17 00.2	+01 45 03	11.03 11.1	11.5	271.9	2007.7150
HJ 2868	19 17 56.9	+58 07 58	11.9 11.9	11.3	99.4	2007.7123
ALI 620	19 19 03.7	+37 45 01	11.56 12.0	13.6	3.9	2007.7123
POU3769	19 20 22.	+25 11 42	12.82 12.70	12.3	264.9	2007.7123
ALI 657	20 11 17.7	+37 30 50	11.21 11.34	10.9	280.9	2007.7123
<b>SLE 959AB</b>	<b>20 11 50.1</b>	<b>+37 26 06.8</b>	<b>11.8 12.6</b>	<b>14.9</b>	<b>48.9</b>	<b>2007.7123</b>
STI 953	20 12 39.1	+59 23 39	11.4 12.4	20.2	13.9	2007.7123
SEI1012	20 13 02.3	+34 50 28	11.0 11.0	14.9	48.9	2007.7150
J 1295	20 14 06.1	+08 15 44.2	11.57 11.68	3.78	97.9	2007.7150
CHE 235	20 14 36.2	+14 52 35.2	10.00 11.5	14.1	28.9	2007.7150
STI2586	21 42 40.4	+56 14 56.9	10.71 11.72	12.5	2.9	2007.7178
POU5478	21 44 59.1	+24 30 56	11.8 13.1	16.5	329.4	2007.7150
POU5490	21 45 40.	+25 02 18	12.20 14.38	14.7	54.9	2007.7150
AG 420	21 47 24.4	+28 54 55	11.1 11.9	7.8	142.9	2007.7150
HJ 1726	22 06 51.5	+15 05 01.	11.0 11.5	19.3	23.9	2007.7150
STI2706	22 19 58.4	+56 03 39.	12.50 13.1	13.6	80.9	2007.7150
STI2720	22 21 30.0	+58 36 48.	12.1 12.1	14.0	159.9	2007.7150
STI2722	22 21 59.1	+56 19 52.	10.67 13.1	14.6	69.9	2007.7150
STI2728	22 22 23.0	+55 16 42.	12.5 13.1	14.8	37.9	2007.7150
AG 423	22 36 15.6	+29 44 43.	8.32 9.7	23.7	153.9	2007.7150
STI2866	22 49 42.3	+58 04 13.4	10.58 11.28	15.6	183.9	2007.7150
STI2872	22 50 16.7	+57 36 20	11.85 11.9	11.4	53.9	2007.7150
STI2876	22 51 26.3	+56 19 32	11.20 11.2	12.8	57.9	2007.7150
HJ 1839	23 00 23.9	+41 07 29	8.78 10.5	14.9	295.9	2007.7150
STI2957	23 13 39.4	+56 47 48	11.9 12.5	13.6	154.4	2007.7150

*Table 2 continues on next page.*

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**Table 2:** Measures made in September 2007, continued from previous page

Name	R. A	DEC	MAGS	$\rho$	$\theta$	DATE
STF2999AD	23 18 46.4	+05 11 18	8.90 11.9	27.7	19.9	2007.7150
HJ 307	23 19 20.7	+13 26 48	10.22 12.0	25.3	311.9	2007.7150
HJ 987	23 29 40.5	+32 12 40	9.22 12.1	13.6	278.9	2007.7150
STI3007	23 36 42.8	+58 19 49	13.2 13.2	9.0	123.9	2007.7150
STI3012	23 38 24.5	+58 00 27	12.6 12.6	7.9	98.4	2007.7150
HJ 1899	23 40 35.4	+55 12 40	8.68 10.5	14.1	247.9	2007.7150
BAL1249	23 41 02.7	+00 43 07	10.36 12.4	14.6	335.9	2007.7150
HJ 5435AC	23 57 23.1	-16 05 44	9.52 12.5	25.4	52.9	2007.7150
ES 1051AC	23 57 42.3	+53 45 27.5	10.4 12.7	9.7	181.9	2007.7150
STI3089	00 03 52.3	+55 17 57.	12.6 13.2	16.9	124.4	2007.7150
BU 9001AC	00 05 10	+45 13 44	6.69 10.58	21.9	237.9	2007.7150
STF3064	00 07 37.9	+40 08 52.6	6.84 10.50	25.0	9.9	2007.7150
STF 23AB	00 17 28.7	+00 19 15	7.88 10.28	9.3	219.9	2007.7150

