

Photometry on Some Wide and Faint Double Stars

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Abstract: Some doubles with suspect magnitude data for the secondary were found during session planning. For several of them, images were made with remote telescopes and used for photometry to get precise measurements.

Introduction

During planning for visual observation sessions at the end of 2014, I found several objects with suspect WDS data I included in my plans. Weather allowed only for a part of these plans effective sessions, but with the help of remote telescopes I could at least make images for several objects with the intention to use these images for photometry. The WDS entries for these objects are given in Table 1.

In most cases the fact of a single digit precision in the magnitude of the secondary was the first hint that this might be an estimation or a measurement with low precision.

Further Research

As weather did not allow for enough visual observation session, I concluded that the best approach would be to obtain images suitable for photometry from remote telescopes from locations with better conditions. I uploaded these images to AAVSO VPhot and did photometry for the companion using nearby UCAC4 objects with Vmag values given for comparison and check stars, with the results given in Table 2.

Specifications of the remote telescopes that were used are:

- iT9: RC 320mm f/9.3, 0.8 arcsec resolution per pixel, V-filter. Siding Spring, Australia
- iT11: CDK 510mm f/4.5, 0.81 arcsec resolution per

pixel, V-filter. Mayhill, New Mexico

- iT18: CDK 318mm f/7.9, 0.73 arcsec resolution per pixel, V-filter. Nerpio, Spain
- iT24: CDK 610mm f/6.5, 0.62 arcsec resolution per pixel. Auberry, California

The VPhot M2 photometry results in Table 2 are in most cases substantially different from the corresponding WDS values. In a few especially suspect cases, I did photometry for the primary as well with several substantial different values also for M1 (see the Notes column). The reported results have meanwhile been submitted to USNO for making the changes considered necessary in the WDS catalog.

Acknowledgements

The following tools and resources have been used for this research:

- Washington Double Star Catalog
- iTelescope
- AAVSO VPhot
- AAVSO APASS
- UCAC4 catalog via the University of Heidelberg website
- Aladin Sky Atlas CDS, SIMBAD, VizieR
- 2MASS All Sky Catalog
- AstroPlanner

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Table 1: WDS 2014/12 values for suspect pairs sorted by WDS ID with Sep = separation, PA = position angle, M1 = magnitude of the primary and M2 = magnitude of the companion

Name	WDS ID	RA	Dec	Sep	PA	M1	M2
ES 6	02011+5331	02:01:08.570	+53:31:24.100	5.5	203	7.99	10.10
COU 258	02262+2105	02:26:09.660	+21:04:37.302	2.3	122	9.60	9.60
J 588	02307+2013	02:30:43.500	+20:12:25.999	5.1	151	9.30	9.40
SLE 267	02316+1550	02:31:37.670	+15:49:54.701	20.0	225	11.40	12.50
ES 620	02355+5341	02:35:30.180	+53:41:16.401	6.3	216	8.60	12.10
J 649	02456+4952	02:45:39.440	+49:51:47.607	5.2	126	9.40	9.80
J 884	02519+4810	02:51:52.720	+48:09:33.500	3.6	217	9.20	10.00
ES 1217	02557+4746	02:55:43.500	+47:46:48.806	2.1	269	9.40	9.50
J 886	02583+4740	02:58:13.540	+47:41:43.400	2.6	185	9.30	9.80
ES 874	03055+5134	03:05:29.550	+51:33:49.395	10.0	83	9.69	12.70
HJ 2175	03141+5445	03:14:03.290	+54:44:57.597	12.4	25	9.20	10.20
MLB 558	04122+2805	04:12:11.540	+28:04:40.199	8.9	358	9.50	9.70
HU 1220	04577+3320	04:57:42.750	+33:19:52.703	4.4	13	9.50	12.50
J 652	05207+3349	05:20:43.390	+33:50:22.806	3.7	355	9.40	9.50
BU 887	05228+3325	05:22:46.529	+33:25:11.197	9.7	115	9.82	14.30
BRT1182	05302+1421	05:30:12.550	+14:20:35.601	4.4	150	10.60	10.90
J 244	05311+1145	05:31:08.889	+11:41:10.702	3.9	150	9.70	9.70
J 1902	05339+1817	05:33:57.341	+18:16:47.501	4.8	142	10.90	11.20
J 654	05342+1248	05:34:17.770	+12:48:32.400	4.4	254	11.07	11.89
BRT1183	05413+1435	05:41:16.030	+14:34:36.601	4.6	43	11.46	11.60
HJ 2280	05490-0319	05:49:00.230	-03:18:41.000	17.9	21	9.91	12.45
SEI 414	05523+3233	05:52:17.680	+32:34:36.801	15.0	7	10.81	12.00
J 952	05545+3331	05:54:31.150	+33:32:29.606	3.7	232	9.40	9.60
SEI 453	06012+3132	06:01:14.729	+31:32:28.103	19.5	214	8.07	9.10
J 1362	06026+0014	06:02:38.359	+00:13:14.900	5.4	255	10.00	10.00
J 961	06063+2849	06:06:26.080	+28:49:12.699	4.0	149	9.40	9.70
J 963	06069+3336	06:06:59.091	+33:37:31.607	5.9	351	9.50	10.50
J 907	06078+3532	06:07:47.970	+35:30:50.606	2.4	236	9.40	9.40
HJ 720	06121+1022	06:12:03.779	+10:18:18.499	30.1	62	11.24	11.16
J 992	06482+1652	06:48:08.719	+16:53:16.603	3.8	99	9.50	10.00
J 2035	07049+1538	07:04:54.040	+15:37:31.500	5.8	92	9.30	9.40

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Table 2: Results based on iTelescope image used with AAVSO VPhot with WDS M2 = magnitude of the companion according to the WDS catalog per end of 2014, VPhot M2 = result of photometry, VPhot Err = reported error for the measurement calculated based on the standard deviation for the comparison stars and on the Error based on SNR and Date = Bessel epoch for the imaging session

Name	WDS ID	WDS M2	VPhot M2	VPhot Err	Date	Notes
ES 6	02011+5331	10.10	11.321	0.023	2015.025	iT18 single shot image, 5s exp. Time
COU 258	02262+2105	9.60	10.297	0.013	2015.015	iT11 single shot image, 5s exp. Time. VPhot Mag for A 10.195 with same Err
J 588	02307+2013	9.40	11.695	0.021	2014.973	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.437 with Err 0.018
SLE 267	02316+1550	12.50	14.316	0.081	2014.976	iT18 single shot image, 15s exp. Time
ES 620	02355+5341	12.10	12.605	0.059	2015.025	iT18 single shot image, 5s exp. Time
J 649	02456+4952	9.80	12.566	0.076	2015.022	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.310 with Err 0.060
J 884	02519+4810	10.00	11.895	0.033	2015.025	iT18 single shot image, 5s exp. Time. VPhot Mag for A 10.907 with Err 0.021
ES 1217	02557+4746	9.50	10.025	0.013	2015.022	iT18 single shot image, 5s exp. Time
J 886	02583+4740	9.80	10.984	0.022	2015.020	iT18 single shot image, 5s exp. Time
ES 874	03055+5134	12.70	13.836	0.148	2015.025	iT18 single shot image, 5s exp. Time
HJ 2175	03141+5445	10.20	10.635	0.015	2015.011	iT18 single shot image, 5s exp. Time
MLB 558	04122+2805	9.70	11.867	0.033	2014.976	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.014 with Err 0.019
HU 1220	04577+3320	12.50	12.120	0.030	2015.028	iT18 single shot image, 5s exp. Time
J 652	05207+3349	9.50	12.543	0.047	2015.017	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.966 with Err 0.027
BU 887	05228+3325	14.30	13.100	0.042	2015.017	iT18 single shot image, 15s exp. Time
BRT1182	05302+1421	10.90	12.142	0.079	2015.036	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.513 with Err 0.070
J 244	05311+1145	9.70	13.087	0.095	2015.036	iT18 single shot image, 5s exp. Time. VPhot Mag for A 12.316 with Err 0.052
J 1902	05339+1817	11.20	12.917	0.023	2015.039	iT18 single shot image, 20s exp. Time. VPhot Mag for A 12.516 with Err 0.019
J 654	05342+1248	11.89	11.684	0.016	2015.039	iT18 single shot image, 10s exp. Time. VPhot Mag for A 11.272 with Err 0.013
BRT1183	05413+1435	11.60	12.753	0.058	2015.036	iT18 single shot image, 10s exp. Time. VPhot Mag for A 12.238 with Err 0.052
HJ 2280	05490-0319	12.45	11.797	0.080	2015.012	iT18 single shot image, 5s exp. Time. VPhot Mag for A 9.772 with Err 0.076
SEI 414	05523+3233	12.00	11.836	0.038	2015.025	iT18 single shot image, 5s exp. Time. VPhot Mag for A 10.674 with Err 0.028
J 952	05545+3331	9.60	11.785	0.030	2015.023	iT18 single shot image, 5s exp. Time, VPhot Mag for A 11.651 with Err 0.029
SEI 453	06012+3132	9.10	11.828	0.032	2015.025	iT18 single shot image, 5s exp. Time
J 1362	06026+0014	10.00	11.498	0.112	2014.967	iT9 single shot image, 5s exp. Time. VPhot Mag for A 11.369 with Err 0.112
J 961	06063+2849	9.70	12.371	0.051	2015.025	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.538 with Err 0.039
J 963	06069+3336	10.50	12.709	0.043	2015.025	iT18 single shot image, 5s exp. Time. VPhot Mag for A 11.840 with Err 0.026
J 907	06078+3532	9.40	11.289	0.018	2015.023	iT18 single shot image, 5s exp. Time
HJ 720	06121+1022	11.16	11.181	0.008	2014.971	iT18 single shot image, 15s exp. Time, VPhot Mag for A 11.270 with Err 0.008
J 992	06482+1652	10.00	12.284	0.087	2014.991	iT24 single shot image, 3s exp. Time. VPhot Mag for A 11.536 with Err 0.084
J 2035	07049+1538	9.40	11.361	0.026	2014.991	iT24 single shot image, 3s exp. Time, VPhot Mag for A 11.334 with Err 0.025