Yankee Tank Creek Observatory Report No. 1: Forty-One Measures from 2012

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Abstract: This report contains 41 measures of mostly STF pairs taken in 2012 and comprises those pairs not reported in other papers. All measures were taken with a 0.2M Dall-Kirkham and a DMK21 video camera working at F22.5. Both stacking and pixel correlation techniques were used to obtain measures using REDUC.

Introduction

Herein I report a number of measures taken during 2012 and not incorporated in Wiley (2013) or Wiley (in review). Most of these pairs were picked because they are of possible astrophysical interest, displaying movement in theta and rho and having relative high proper motions. A few of the measures are check measures of rectilinear pairs based on other calibration pairs used to establish camera angle and plate scale.

Methods

All measures were taken with a 0.2 meter Dall-Kirkham telescope with a native focal ratio of *f*/22.5. Images were acquired with an Image Source DMK21-618. Integration times varied between 1 second/frame and 33 milliseconds/frame while the number of frames varied between 200 and 3000, depending on integration time. The video sequences were converted to bitmap images via VirtualDub and dark-frame subtraction was used to calibrate each frame in REDUC (Losse, 2013). REDUC was used for all reductions. For each night camera angle and plate scale were determined by visualizing calibration pairs from the Catalogue of Rectilinear Elements (Hartkopf and Mason, 2011) and camera angle was checked by capturing star trails. Two kinds of data reduction were used within REDUC. Images from relatively wide pairs were grouped into four subsets. For each set the 10-25% of best images were aligned and stacked. The resulting image was measured with the normal (non-interferometric) functions of REDUC. Relatively close pairs were analyzed by grouping the video into four subsets 500-1000 images and analyzed using the interferometric algorithm in REDUC. "Relatively wide" is a function of seeing; on nights of good to excellent seeing pairs as close as 2.5" may be analyzed using non-interferometric methods, while on nights of average seeing this may not be possible and interferometric techniques are used. These techniques follow Wiley (2013, in press). For pairs with rectilinear (Hartkopf and Mason, 2011) or orbital (Hartkopf et al. 2001-2013) solutions an O-C value is computed using either formulae in the Rectilinear Catalog or an updated version of the Workman spreadsheet (Workman, 2013).

Results

Measures and their errors are shown in Table 1. For pairs having either orbital or rectilinear solutions an O-C value is reported with an abbreviated reference which is linked to the full reference below.

Acknowledgements

This research has made use of the Washington Double Star Catalog, the Catalog of Rectilinear Elements, and the Sixth Catalog of Orbits of Visual Binary Stars, all maintained at the U.S. Naval Observatory as well as the Brian Workman Star Calculator.

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Table 1. Measures reported. Abbreviations: WDS (WDS catalog), Disc (discover code), epoch (epoch of observation), PA (position angle in degrees) Sep (separation in arcseconds), N (nights-number of images measured, e.g., 1-4 = one night and four images measures for error), errPA (error among N images in degrees), errSep (error among N images in arcseconds), method (reduction method; C is ccd reduction of N images by stacking subimages, I is autocorrelation of all images), O-C (observed vs. computed values), Ref (abbreviated reference linked to full reference in References).

WDS	Disc	epoch	PA	Sep	N	errPA	errSep	method	O-C	Ref
00063+5826	STF3062	2012.7894	352.6	1.50	3	1.15	0.004	I	+0°57/+0"10	Sod 1999
00116-0305	STF 8	2012.889	291.8	7.99	4	0.18	0.067	C	*	
00272+4959	STF 30AB	2012.9192	314.6	13.39	4	0.17	0.04	C	+0°40/-0"08	Hrt2011c
00324+1539	STF 37	2012.889	246.7	5.84	4	0.93	0.035	C	*	
00384+4059	STF 44	2012.864	273.9	12.72	3	0.06	0.013	C	+0°09/+0"10	Hrt2011c
00499+2743	STF 61	2012.889	115.2	4.29	4	0.24	0.016	C	*	
00503+3548	STF 62	2012.889	303.0	11.81	4	0.11	0.035	C	*	
00551+1333	STF 75	2012.889	273.0	5.23	4	0.27	0.017	C	*	
01001+4443	STF 79	2012.8575	193.9	7.86	5	0.26	0.016	C	*	
01001+4443	STF 79	2012.864	193.9	7.82	4	0.03	0.008	C	*	
01072-0144	STF 91	2012.9192	314.2	4.30	4	0.19	0.026	C	*	
01105-0458	STF 95	2012.9192	310.1	13.95	4	0.12	0.03	C	*	
01137+0735	STF 100A-BC	2012.889	63.2	22.80	4	0.01	0.018	C	*	
01175+2105	STF 107	2012.889	68.2	21.13	4	0.03	0.027	C	*	
01178+4901	STF 102AB-C	2012.8575	223.8	10.08	5	0.25	0.045	C	*	
01178-1220	STF 110	2012.9192	352.8	7.54	4	0.12	0.032	C	*	
01180-0420	STF 111	2012.9192	328.7	20.78	4	0.11	0.032	C	*	
01390+4104	STF 140AB	2012.864	173.9	3.43	2	0.01	0.001	I	*	
01401+3858	STF 141	2012.889	303.9	1.68	4	0.56	0.011	C	*	
01443+0929	STF 155AB	2012.889	324.6	4.95	4	0.22	0.019	I	*	
01479-0320	STF 166	2012.9192	0.2	7.78	4	0.19	0.006	C	*	
01485+6027	STF 156	2012.9192	100.9	5.87	4	0.11	0.03	C	*	
01510+2107	STF 175AB	2012.889	359.4	28.01	4	0.07	0.016	C	+0°20/+0"10	Hrt2011c
01510+2107	STF 175AB	2012.9192	359.2	27.92	4	0.03	Jan-00	C	+0°03/+0"01	Hrt2011c
01535+1918	STF 180AB	2012.864	359.9	7.45	5	0.13	0.062	I	*	
02016+2405	STF 200	2012.864	123.4	8.11	4	0.15	0.019	C	*	
02031-0725	STF 209	2012.9192	135.9	39.80	4	0.04	0.025	C	*	
02370+2439	STFA 5	2012.864	274.7	37.91	4	0.08	0.019	C	*	
02390+1452	STF 287	2012.864	73.1	6.78	4	0.1	0.056	C	*	
02563+7253	STF 312AB	2012.9192	45.2	1.79	4	0.85	0.013	I	0°32/0"02	Cve 2006e
02581+6912	STF 317	2012.9192	84.0	4.07	3	0.53	0.011	C	*	
03242+6728	STF 374	2012.9192	296.6	11.19	4	0.08	0.023	C	*	
03242+6728	STF 389AB	2012.9192	71.1	2.67	4	0.26	0.034	I	*	
04105+6009	STF 490	2012.9192	58.5	4.63	4	0.24	0.041	C	*	
18301+0404	STF2822AB	2012.7906	315.9	1.76	4	0.23	0.032	I	*	
18443+3940	STF2382AB	2012.7901	345.1	2.35	4	0.39	0.02	I	-1°69/+0"05	
19418+5032	STFA 46AB	2012.7894	132.8	39.65	5	0.05	0.033	C	-0°48/-0"07	Mrc 1999
20035+3601	STF2624AB	2012.7906	172.0	1.91	4	0.45	0.031	C	*	
23595+3343	STF3050AB	2012.7894	337.8	2.32	4	0.52	0.014	I	-0°33/0"01	Hrt 2011a
23595+3343	STF3050AB	2012.8575	338.3	2.33	5	0.12	0.038	I	-0°15/0"01	Hrt 2011a

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References

Losse, F. 2013. REDUC V4.7. Available at: http://www.astrosurf.com/hfosaf/.

Hartkopf, W.I. & Mason, B.D. 2011. AJ **142**, 56 (10 pp.). (Hrt 2011a)

Hartkopf, W.I. & Mason, B.D. 2011. *Catalog of Rectilinear Elements*. (Hrt 2011c)

Soderhjelm, S. 1999. A&A 341. 121-140. (Sod1999)

Wiley, E. O. 2013. JDSO 9(2):142-152.

Wiley, E. O. (in review). Autocorrelation Techniques with Small Telescopes, with comments on Lucky Imaging. Proceeding of the Maui Double Star Conference. Collins Foundation Press.

Workman, B., 2013, The Binary Star Calculator. Available at: http://www.saguaroastro.org/content/downloads.htm.

Ed Wiley recently retired from his professorial position in ecology and evolutionary biology at the University of Kansas and still maintains his research program in the evolution of fishes as part of the Euteleost Tree of Life initiative (http://www.fishtree.org/).