

# Double Star Measurements for 2009

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**Abstract:** I report the measurement of 19 WDS binary systems in 2009. The observations were conducted with the AREO2 robotic telescope located at the GRAS Observatory, Mayhill, NM, USA. Discussion includes remarks on several John Herschel “neglected” doubles. Information about instrumentation and methodology and results is included.

## Introduction and Instrumentation

I have been imaging “neglected” double stars for several years using the equipment at Global Rent-a-Scope (<http://www.global-rent-a-scope.com/>). These measures are my first reported results using this facility.

The program of measuring the visual doubles used the AREO2 telescope at the GRAS Observatory. The instrument is a Takahashi Mewlon 300 Dall-Kirkham Cassegrainian reflector. The telescope is f9.1 with an approximate focal length of 2730mm. The imaging camera is ST8E NAB CCD with 9 micron pixels. Field of view is 11.5 x 17.3 arcminutes and the resolution is approximately 0.6 arcseconds/pixel. The OTA is mounted on a Bisque Paramount 1100 German equatorial mount of excellent pointing accuracy.

The mount is capable of quickly and accurately slewing to a selected double star. The system takes about one minute to take an exposure and save the resulting image in a FITS format. To maximize telescope time, the FITS images are stored on the RAS server and are retrieved later to be analyzed by suitable software. The relatively short focal length of this system restricts measurements of doubles to pairs > 5 arcseconds in most cases.

## Methods

Imaging was conducted by entering the coordinates of the double into the robotic telescope’s web interface. A test exposure was taken and checked for centering and proper exposure. If all was well, an

exposure run of 5 to 7 images through a clear filter was run for each pair. Exposures typically ran about 10-12 seconds for 10-13 magnitude doubles.

Each image in the exposure sequence was examined and any trailed or sub-par images were discarded. MOP Canopus was used to reduce the images (Warner 2006). Any image that the software could not reach a plate solution was also discarded. Canopus produces an astronomic solution to the image based on the UCAC3 catalog (Zacharias et al. 2010) The software measures double stars using a subroutine built into Canopus. It also produces a great amount of information about the astrometric solution. All images were copied to archival CD-ROM material and are available by request from the author. The starting and ending images were blinked—just in case.

## Results

Table 1 shows the results for the 16 doubles measured.

## Discussion

### *HJ1536*

This John Herschel double was observed once in 1828 and had a measured PA of 113 and a SEP of 6.00 arcseconds. The reported magnitudes were 11.60 and 12.60. I imaged the starfield centered on the reported position of HJ1536 on 2009.524. The CCD image reveals 11.71 magnitude single star 3UCAC 234-240864 right at Herschel's position of 20:33:43 +26:58:52.6, but no double. In addition to the CCD image field, I also checked a 13.03' x 12.95'

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Aladin DSS2.F.POSSII field for possible candidates. After considering both my image and the Aladin field, I see only two likely candidates for HJ1536.

Just east of the reported position of HJ1536 is a striking triple star. This triple is marked "Candidate #1" in Figure 1 in this article. The 9.11 magnitude "A" star is 3UCAC 234-240912 located at 20:33:50 + 26:58:04. The "B" and "C" stars are 12.88 mag 3UCAC 234-240921 and 13.44 mag 3UCAC 234-240920 respectively. The B-C stars have a PA of 213.1 and a SEP 7.19. The separation is a fairly close match with the original measure, but both magnitudes are about one magnitude fainter than the original report. In Table 1 the measures of this triple are marked HJ1536-1?.

Still further to the east is a double star marked "Candidate #2" in Figure 1. The "A" star in this double is 10.93 mag 3UCAC 234-241193 located at 20:34:18.26 +26:58:37.3. The "B" star is 12.82 mag 3UCAC 234-241210. This pair has a PA of 80.0 and a SEP 15.48. The separation of this pair is more than twice the original measure, but the PA of the double and DEC of the primary agree pretty well with Herschel's measure. There is a very good agreement in magnitudes with the original report. This double is marked HJ1536-2? in Table #1.

Trying to chase down John Herschel doubles is always an adventure. It will be interesting to see if the WDS wizards deem either -- or neither -- of these doubles to be the second measure of HJ1536.

### HJ2855

The search for this Herschel double began when I CCD imaged the listed position of 19:08:00+22:40:00 on 2009.495 and found no double within the area of the FITS image. HJ 2855 has one measure from 1911 with a SEP of 10.00 and a PA of 200. I reported my findings in Post #1958 on Yahoo "binary-stars-uncensored" discussion group. In the post I mentioned nearby STF2457 had almost identical PA and SEP to

HJ2855 and thus the two might be the same double.

In post #1958 in the same discussion group, Dr. William I. Hartkopf of the USNO reported that he had researched both doubles. He reported that STF 2457 was not HJ2855. Dr. Hartkopf also precessed Herschel's original coordinates to epoch-2000 and searched Aladin for nearby doubles that came close to Herschel's original measure. He noticed a likely pair at 19:08:55.5 +22:34:04. The "A" and "B" stars are 3UCAC 226-174791 and 3UCAC 226-174799 respectively. This double has the correct RA and the DEC is off by almost exactly 6 arcminutes. On epoch 2009.524 I took a series of CCD images of that pair. The results are reported in Table 1. The WDS authorities will need to make a decision if this is indeed the second measure of HJ2855. If it is deemed a new pair, I recommend that it be credited to Dr. Hartkopf as he did all the work in finding it.

### Acknowledgments

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### References

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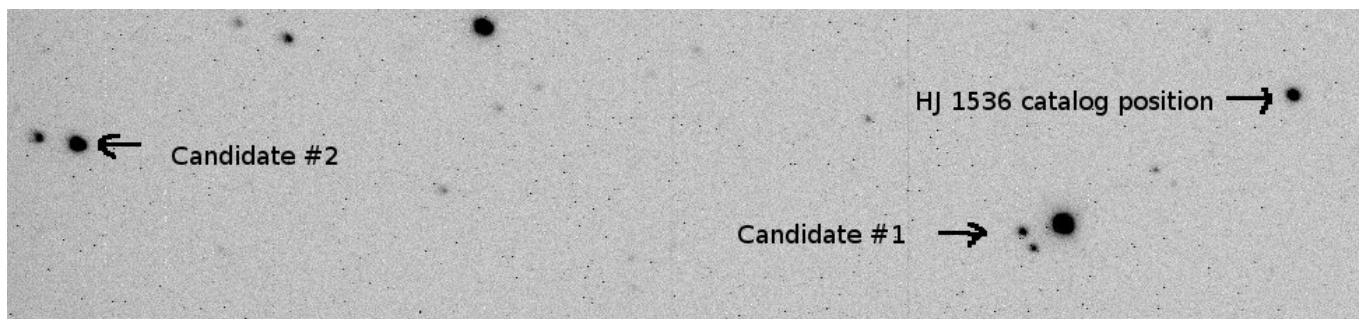


Figure 1: Possibilities for HJ1536

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**Table 1:** Summary data for measures for 2009 are reported. WDS ID and Discovr. are Washington Double Star Catalog identifiers and discoverer codes. Discoverer codes marked with "?" indicate the identity of the pair is uncertain. PAsd and SEPsd refer to the standard deviations of the position angle (PA) and separation (SEP) based on the number (No.) of CCD images measured, followed by the date of the last measure, total number of measures and the number of an associated note, if any.

WDS ID	Discovr.		PA	SEP	Epoch	No.	PAsd	SEPsd	Last	Prev.	Notes
20337+2659	HJ 1536-1?	AB	100.3	15.83	2009.524	8	0.25	0.104	1826	1	1,4
20337+2659	HJ 1536-1?	AC	127.6	14.62	2009.524	8	0.26	0.039	1826	1	1,4
20337+2659	HJ 1536-1?	BC	213.1	7.19	2009.524	7	0.85	0.089	1826	1	1,4
20347+2701	HJ 1536-2?		80.0	15.48	2009.524	8	0.16	0.079	1826	1	1,4
20292+2731	HJ 1519		234.4	15.82	2009.524	7	0.25	0.048	1909	3	
19455+1931	HJ 2894		318.9	10.08	2009.524	7	0.27	0.062	1913	6	
19139+2252	HJ 2859	AC	9.3	134.96	2009.524	7	0.01	0.073	2002	8	
19139+2252	HJ 2859	AB	35.9	9.48	2009.524	7	0.34	0.068	1901	2	2
19139+2250	HJ 2858		255.3	17.94	2009.524	7	0.17	0.045	1997	3	
19104+2438	POU3735		109.7	16.23	2009.524	7	0.22	0.051	2000	2	
19101+2443	TDT1269	AC	288.5	4.81	2009.524	7	1.21	0.289		new	3
19100+2441	HJ 1372		102.3	12.06	2009.524	7	0.24	0.065	1913	3	
19089+2240	HJ 2855?		132.6	12.15	2009.524	7	0.14	0.040	1911	1	4
18579+2409	POU3618		90.7	13.83	2009.399	3	0.04	0.014	1950	3	
18576+2425	POU3616		48.0	14.19	2009.399	7	0.38	0.104	1950	3	
18574+2425	POU3614		242.3	8.30	2009.399	7	0.56	0.145	2000		
18573+2502	POU3612		174.2	8.13	2009.399	6	1.36	0.086	1950	3	
18572+2457	POU3605		118.8	11.19	2009.399	7	0.27	0.066	2006	4	
18571+2456	HDS2686		275.4	8.20	2009.399	7	0.16	0.055	2006	4	
04125+3538	HJ 341		333.4	13.66	2008.917	8	0.52	0.067	2007	7	
01192+5821	STI1560		324.3	13.75	2009.790	2	0.04	0.165	2008	11	
01057+5432	STI1530		177.2	14.90	2009.790	7	0.14	0.057	1913	1	

#### Notes:

1. The discoverer code for this star is marked with "?" as its identity is not certain.
2. HJ2859AC is measured from the primary of HJ2859 to the primary of HJ2858!
3. The "A" and "B" components of TDT1269 at 0.50 arcseconds are not separated at this focal length. I report a new 12.95 magnitude companion (Raw instrumental magnitude w/clear filter). See Illustration #2. I could not find a catalog number for this star. TDT1269 is in the same CCD field as HJ1372 and POU3735.
4. See "Discussion" section of this article.

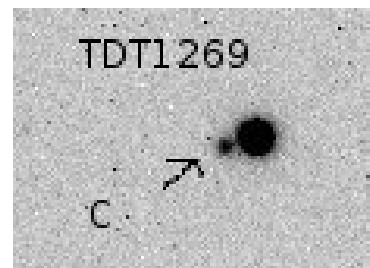


Figure 2: TDT 1269A-B too close to split. Arrow indicates new companion "C"