Astrometric Measurements of WDS 17366-4825 TDT 431

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Abstract

The double star WDS 17366-4825 TDT 431 was observed using a Las Cumbres Observatory Global Telescope (LCOGT) 0.4-m telescope on July 11th, 2021, and July 14th, 2021. The position angle was 289.07° and the separation was 5.33″. Historical data was used as a comparison for the observed data and was accessed from the Washington Double Star catalog.

Introduction

The objective of our research was to develop and expand upon already existing data to determine whether or not WDS 17366-4825 TDT 431 is a binary star system. Located at right ascension 17h 36m 33.30s and declination at 48° 25' 09.9" (*Stelle Doppie - Double STAR DATABASE*, n.d), in the Southern Hemisphere constellation Ara, this system has been documented and recorded in the Washington Double Star catalog, with a total of 6 observations. The first observation occurred in 1902 and the most recent, save for our research, was in 2015. The position angle has changed a total of 9 degrees and the separation has decreased by 0.4 arc seconds. The spectral class for both stars is A2V, placing them both on the main sequence (*Stelle Doppie - Double STAR DATABASE*, n.d.).

Equipment and Procedures

Our team chose to study WDS 17366-4825 for a variety of reasons. First, it was visible in July (the 11th and 14th, 2021), with
the LCOGT 0.4-meter telescopes. Secondly, it had a separation of around 5 arcseconds which is close to the resolution limit of the telescope and camera system being used for observations. Magnitude limits were chosen to allow for reasonable exposure times on the LCOGT telescopes and finally we chose a system that had not been observed since 2015. Using the telescope network's SBIG 6303 camera and no filter, exposure times ranged from one to five seconds.

Measurements of WDS 17366-4825 TDT 431 were analyzed using AstroImageJ (Collins et al., 2017). The brightness and aperture sizes were individually adjusted to ensure the best measurements were taken. Each image was measured the same way, as shown in Figure 1.

Historical data on WDS 17366-4825 TDT 431 was requested from Dr. Brian Mason at the US Naval Observatory and analyzed using Harshaw's Plot Tool (2020).

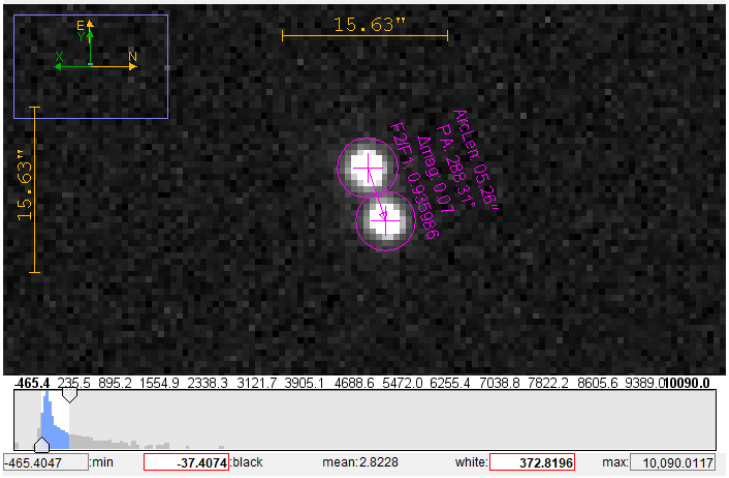

Figure 1: An image of WDS 17366-4825, taken July 11, 2021, showing the AstroImageJ measurement. (Collins et al., 2017)

Data

Table 1 contains information from the observations of WDS 17366-4825 TDT 431 taken on July 11th and 14th at the Cerro Telolo Inter-American Observatory node of the LCOGT network. The separation is measured in arc seconds and the position angle is measured in degrees. The mean, standard of deviation, and the standard error of the mean for each are recorded at the bottom of the table.

	Separation (Rho) (arcseconds)	Position Angle (Theta) (degrees)
Image 1	5.26	288.31
Image 2	5.62	288.95
Image 3	5.28	289.68
Image 4	5.27	289.54
Image 5	5.11	288.22
Image 6	5.23	288.45
Image 7	5.36	288.68
Image 8	5.41	288.06
Image 9	5.34	290.60
Image 10	5.44	288.21

Image 11	5.23	290.11
Image 12	5.24	288.95
Image 13	5.45	289.39
Image 14	5.40	290.30
Image 15	5.31	289.80
Image 16	5.31	287.88
Mean	5.33	289.07
Standard of Deviation	0.12	0.86
Standard Error of Mean	0.03	0.22

Table 1: Measurements and average values of images of the stars, taken on AstroImageJ

Discussion

The separation and position angle of WDS 17366-4825 TDT 431 were last measured on July 11th and 14th, 2021. The separation is 5.33″ and the position angle is 289.07°. The historical data was plotted using Richard Harshaw's Plot Tool (2020).

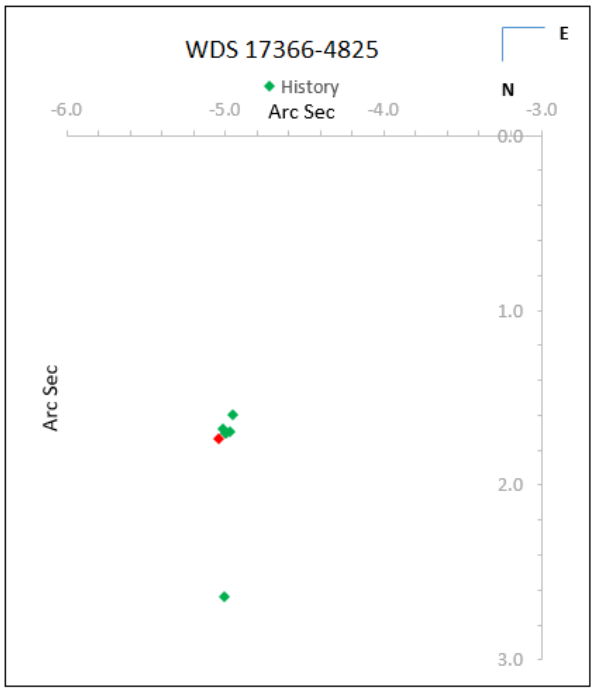

Figure 2: Data from all recorded observations of WDS 17366-4825 TDT 431. Historical observations are shown in green and the 2021 observation is shown in red. (Harshaw, 2020)

The data points are indicative of some change in the movement of the stars. However, it is uncertain whether or not these changes are attributed to noise in the data. Moreover, the data point in the bottom left represents the first measurement of this system from 1902 and appears to be an outlier.

WDS 17366-4825 was looked up in the Gaia DR2 catalog and the parallax and proper motion values of the primary and secondary stars are shown in Table 2.

	Parallax (mas)	RA Proper Motion (mas/ yr)	DEC Proper Motion (mas/ yr)
Primary Star	3.5913	-3.379	-18.373
Secondary Star	3.6039	-4.557	-18.030

Table 2: Gaia parallaxes and proper motions (Gaia Collaboration, 2018)

Very similar parallaxes indicate that the stars are at the same distance from earth. Together with their similar proper motions in right ascension and in declination it is likely that this pair is at least a common proper motion pair. Longer term studies could help determine if this is an orbiting binary system.

Conclusion

After investigating and analyzing both our data and the data provided by Dr. Brian Mason, it appears WDS 17366-4825 TDT 431 is a physical star system. The data implies that the star system is possibly a binary, but there is currently not enough data to definitively state that they are orbiting each other.

Acknowledgements

Our team would like to thank Dr. Brian Mason for providing the historical data to us. As well as the Las Cumbres observatory for allowing us to use their telescopes. We would also like to thank Richard Harshaw for the utilization of his Plot Tool to graph historical data and data from our research. Finally, we must thank the authors of the *Small Telescope Astronomical Research Handbook* (Genet et al., 2018) for helping us learn how to successfully complete this research project.

References

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Stelle Doppie - Double STAR DATABASE, www.stelledoppie.it/index2.php.