

Astrometry of Double Star WDS 18026-5234

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Abstract

Using the Las Cumbres Observatory global telescope network, we investigated potential double star WDS 18026-5234. We focused on taking new position angle and separation measurements and then examined our measurements alongside historical data. On October 21, 2023, we measured the separation at 7.685 arcseconds and the position angle at 226.659 degrees, with standard deviations of 0.2085 and 1.44584, respectively. We then calculated the separation between the two stars in the system to be approximately 4920 astronomical units, making it unlikely that the two stars are gravitationally bound.

1. Introduction

When choosing a star system to study, we used the Stelle Doppie database. Our parameters included double stars that had not been observed since 2015, had a right ascension that put them over the skies of Chile during our observation time, and had a separation between 5 and 10 arcseconds. The magnitude of the primary star was set to be between 9 and 11, and the delta magnitude between the primary and secondary star was set to less than 4. Additionally, we looked for star systems whose natures were either physical or uncertain.

From the double stars that fulfilled these parameters, we chose the double star WDS 18026-5234. This system is located in the constellation Ara. The primary star's right ascension and declination are 18h 02m 36.26s and $-52^{\circ} 33' 50.3''$. The magnitude of the primary star is 9.13, and the magnitude of the secondary star is 12.00. This star system's entry in Stelle Doppie has a first observation in 1974 and a most recent observation in 1998. Those are the only previously existing observations of this star system in Stelle Doppie.

2. Instruments

We used Las Cumbres Observatory (LCO) Global Telescope network's 0.4 meter diameter telescopes to capture our images. Our data was captured from the Cerro Tololo Inter-American Observatory in the Coquimbo region of Northern Chile. The images were taken on SBIG STL6303 cameras, which have a 29.2" x 19.5" field of view and a pixel size of 0.571"/pixel.

3. Procedure

We focused on the likely double star WDS 18026-5234 and measured the current position angle and separation of the two stars using 10 images obtained from the LCO Global Telescope Network with a 3 second exposure time. The images were captured on October 21, 2023 from 23:51:39 to 23:55:04 UTC. We used Afterglow Access (Reichert et al., 2023) to take these measurements (shown in Fig. 1).

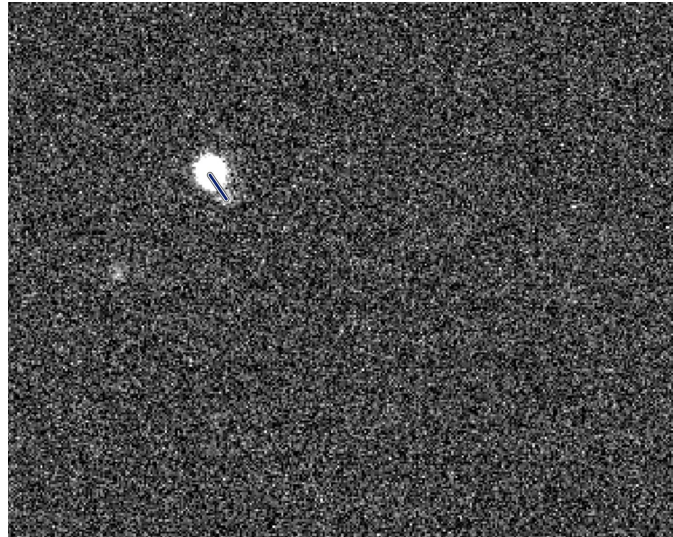


Figure 1: This image shows the star system, WDS

4. Results

The individual measurements are shown in Table 1 b average position angle was 226.569°.

Average	7.685	226.659
Standard deviation	0.2085	1.44584
Standard error of the mean	0.06594	0.457214

We then compared our data with historical data obtained from the U.S. Naval Observatory, shown in Table 2.

Table 2: Historical and new measurements of WDS 18026-5234.

Year Observed	Position Angle (degrees)	Separation (arcseconds)
1974	231	7.6
1998.591	227.8	7.467
2023.8	226.659	7.685

The bold values are our measurements; the top two are from the USNO.

We graphed the system's position angle over time (Figure 2) and separation over time (Figure 3) using the historical data. We then converted the position angle and separation measurements into Cartesian coordinates and graphed the position of the secondary relative to the primary (Figure. 4).

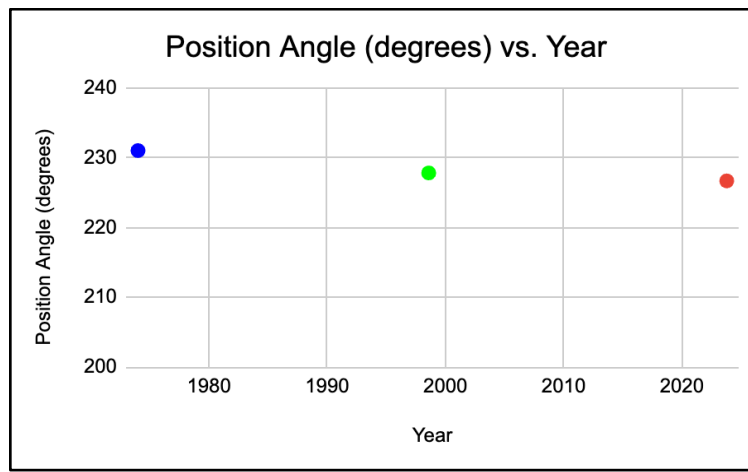


Figure 2: This graph shows the position angle in degrees of WDS 18026-5234, with the 1974 measurement in blue, the 1998 measurement in green, and our measured value in red.

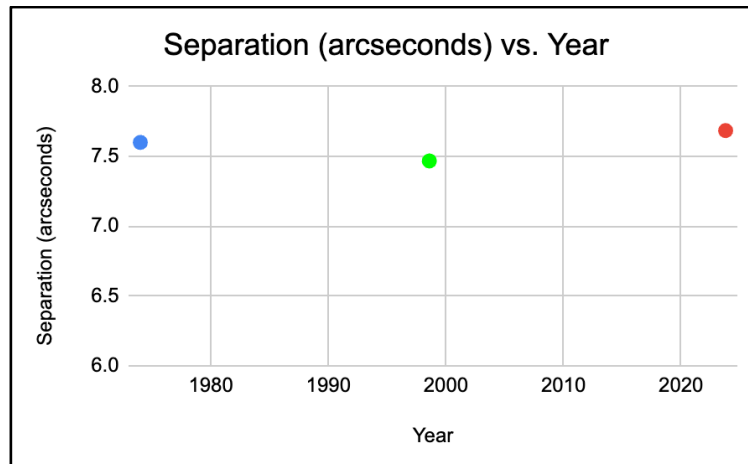


Figure 3: This graph shows the separation in arcseconds over time of WDS 18026-5234 with the 1974 measurement in blue, the 1998 measurement in green, and our measured value in red.

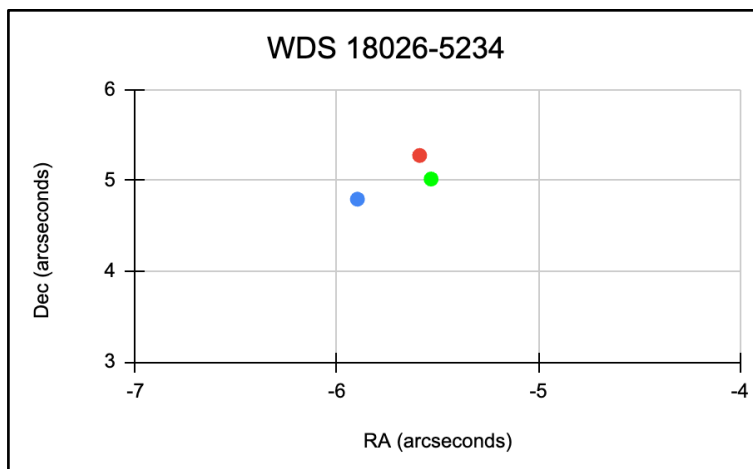


Figure 4: This graph shows the position of the secondary star relative to the primary, with the primary star being at the origin. The 1974 measurement is in blue, the 1998 measurement in green, and our measured value in red.

5. Discussion

By using Afterglow Access to analyze the ten images collected by the LCO telescopes, and then taking the average of these measurements, we found that the current position angle of the double star, WDS 18026-5234 is 226.659 degrees, and the separation of the two stars is 7.685 arcseconds. It is difficult to make a confident conclusion about trends because we only have three data points. According to Gaia Data Release 2, the primary star in our system has a parallax of 1.5622 milliarcseconds, giving it a distance of 640 parsecs, or 132 million astronomical units. If we assume both the primary and the secondary are at this distance, then the small angle formula, using the separation angle of 7.685 arcseconds, yields a separation of 4920 astronomical units. As Harshaw notes that “very few known binaries have separations that exceed 3,000 AU, and most are closer than 1,000 AU,” it is unlikely that WDS 18026-5234 is a binary system (Harshaw, 736). Rather, it is likely an optical double.

Acknowledgments

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