

Visual Double Stars With More Than One WDS Number

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Abstract: WDS catalog is one of the most important reference for double star observers and we must consider it as something that is ours and so we must maintain it, for example, detecting and communicating errors to the database administrator. In this work the author presents two double stars that had two entries in WDS catalog. The doubles were studied, their nature determined and the errors corrected in WDS

Introduction

Those amateurs that are observing and investigating visual double stars for a long time, know that the WDS catalog is one of the main reference which allows us to investigate, design our observational programs and include our measures and new double stars. For these and other reasons it is not strange that double star observers consider the WDS catalog as something that is ours, which we must care for and love. That is why there exists an interesting, enjoyable and important task to try to improve all the information included in the WDS such as detecting errors of those visual double stars that have more than one WDS number. If you detect one of these double stars, please inform Dr. Brian Mason, project manager of the double star program at the United States Naval Observatory.

In this article I include two cases of double stars included in the 2001 Observational Program of LIADA's Double Star Section: B 509 AC = TDT 2618 and OL224 = MLB 435. The OL 224 case was discovered by LIADA and the case of B 509 AC was pointed out to me by Brian Mason.

B 509 AC = TDT 2618

After sending our Circular #1 in English to the United Stated Naval Observatory (USNO), Brian Mason sent me a private communication where he wrote to me that B 509 and TDT 2618 are confusing and he had the suspicion that B 509 AC and TDT 2618 could be the same object but he had no confirmation of this. In this work a confirmation is obtained. I obtained the followed data from WDS catalog:

20542-2730	B	509	AB	1927	108°	3.9"	9m8	14m3
20542-2730	B	509	AC	1927	359°	4.4"	9m8	9m9
20542-2730	TDT2618			1991	57°	2.5"	10m72	11m21

In Tycho-2 catalog:

TDT2618 A = TYC 6930 863-1; V=10.65; B-V=0.69
TDT2618 B = TYC 6930 863-2; V=11.16; B-V=0.45

Consulting Astrographics Catalog 2000, I deduced THETA and RHO from AR and DEC (epoch 1913.571) of two stars of blue magnitudes 11.5 and 11.7 that seems to be B 509 AC. The value of THETA= 348.0° and RHO= 6.09" was obtained. The three possible

EPOCH	THETA	RHO	MG_A	MG_B	Note
1913.571	348.0	6"09	11m5	11m7	AC2000; blue magnitudes
1927	359	4"4	9m8	9m9	WDS (for B 509 AC)
1991	57	2"5	10m72	11m21	WDS (for TDT2618)

measures of B 509 AC are:

If these three measures are represented as X-Y, X-t and Y-t plots it can be seen that they make a perfect linear fit (Figure 1). I have calculated the followed data:

- Relative proper motion of the system: +0.041 a.s./year and -0.056 a.s./year in AR and DEC.
- Photometric Spectral type: G5 and F5.5 (if they belong to the main sequence).

According to the large difference in proper motion of the components we can deduce that this pair is an optical double star. In addition this I have studied the nature of this pair using several professional criterion

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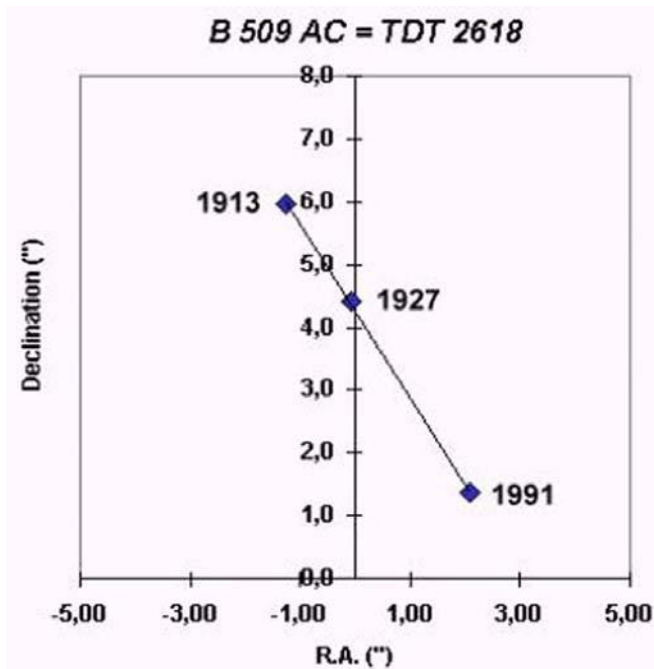


Figure 1: Measures of TDT 2618 with a linear fit

that confirmed the optical nature.

OL 224 = MLB435 (=ADS 16458)

This double star was measured in the LIADA's 2002 observational program and our study concluded that OL 224 and MLB 435 are the same object. LIADA informed Brian Mason who updated the WDS catalog, rejected MLB 435, and updated the web page of USNO.

OL 224 is composed of two stars of 9.34 and 11.19 magnitudes (from Tycho-2) separated by 6.9" in direction 47°. LIADA analysed all official measures, 11 in total, three of which were LIADA's measures. Since 1895 θ has increased nearly 3" and ρ has not changed.

Proper motions. Tycho-2 annual proper motion of main component are $\mu(\alpha) = +0.026''$ and $\mu(\delta) = +0.012''$; for secondary: $\mu(\alpha) = +0.022''$ and $\mu(\delta) = +0.014''$. We have plotted the 11 historical measures in a X-t and Y-t plots obtaining a annual relative proper motion of $\mu(\alpha) = +0.003''$ and $\mu(\delta) = -0.003''$ in excellent agreement with Tycho-2 proper motions (a difference of 0"001 was observed).



Figure 2: CCD image of double star OL 224, in J infrared band taken with the 2 meters Hopkins telescope.

Nature. LIADA has used seven professional criteria to investigate the OL 224 nature, among them the Aitken and Hablwachs criterions. I modified the Hablwachs criterion and we now consider the probabilities to be common proper motion using a Gaussian distribution. According to the modified Hablwachs' criterion OL 224 has an 87 % probability of being a physical pair.

Other criterion: a 20° x 20° sky area from Tycho-2 was analysed to use the study of probability theory made by E. Grocheva and A. Kiselev (1998). Among the 32,031 stars located in the 20° x 20° area, 173 stars have proper motion similar to those of components. According to the probability theory OL 224 has $P_\mu = 0.005$. In this criterion, physical pairs are considered when $P_\mu < 0.01$, so OL 224 is a physical pair.

According to the JHK infrared and BV optical photometry the spectral types are F7V: and G0V. The kinematical data are consistent also with an early-F normal giant in agreement with the professional spectral type in the literature, F2. The study of the photometric and astrometric data showed that OL 224 is a strong candidate to be a physical pair with a possible orbital period of about 40,000 years.

The author has been a scientific computer programmer for 7 years and has been studying double stars for 11 years. He has been a member of the Astronomical Society of Merida (Spain) since 1993 and is also the coordinator of LIADA's Double Star Section in Argentina.