

BD +46°664 – a "New" Double Star

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Abstract: The pair of stars BD+46°664p and BD+46°664s was found as a visual double star. Using modern astrometrical and astrophysical catalogs it is not ruled out that this is a physical pair with small but similar proper motion, spectral type and spectroscopic parallax.

The first evening of northern spring March 20, 2014 found me starhopping in Perseus with an 8-inch Newtonian at 160x magnification. I chanced upon a nice white pair of nearly equal stars of 9th magnitude, well separated and approximately N-S oriented. After sketching the field, I continued to my other visual deep-sky targets.

Looking up the object in Simbad [1] and Vizier [2] showed that this nice pair has no double star designation but a double Bonner Durchmusterung designation of BD+46°664p and BD+46°664s. The pair already has many known astrometric and astrophysical measures. These measures from Tycho 2, PPMX, and UCAC4 are given in Figures 1 through 6. Interestingly, the two stars have a very small but similar proper motion, perhaps similar spectral type, and even an estimated distance which could be the same within error margins. So it is not ruled out that this is a physical pair.

Position and magnitude of this pair from the UCAC4 catalog [3] are given in Table 1. Calculated PA and separation are given in Table 2. Figure 7 is an image of the pair from DSS.

There are various statistical criteria for probable physical pairs. BD+46°664 just barely fails the Aitken criterion [5] which gives, for the combined magnitude

Table 1. Position and magnitude of the double star from UCAC 4.

Star	Mag V	RA 2000.0	Pm mas/year	Dec 2000.0	Pm mas/year
BD+46 664p	9.567	02 58 00.526	3.0	+46 49 39.38	-5.1
BD+46 664s	9.644	02 58 00.617	2.3	+46 49 27.72	-4.3

Table 2. Position angle and separation of the double star derived from UCAC4 and AC 2002.2.

Source	Epoch	Distance (arcsec)	Position Angle (deg)
UCAC4 [3]	1991	11.70	175.4
AC 2000.2 [4]	1899	11.83	174.6

of 8.8, a maximum distance of 11.0 arc seconds. Of course there are more sophisticated statistical studies which give the probability of a pair being physical. Hopefully we will know if BD+46°664 is a physical pair when GAIA astrometry satellite measures its parallax to high precision.

Acknowledgments

This research made use of the Washington Double

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I/259/tyc2 [The Tycho-2 Catalogue \(Hog+ 2000\)](#)
*The Tycho-2 main catalogue (2539913 rows) (Note)

Full	r	RAJ2000	DEJ2000	TYC1	TYC2	TYC3	pmRA	pmDE	BTmag	VTmag
arcsec	"h:m:s"	"d:m:s"	mas/yr	mas/yr	mag	mag	mag	mag	mag	
1	0.492	02 58 00.528	+46 49 39.37	3297	1272	1	4.6	-5.8	9.676	9.567
2	11.325	02 58 00.616	+46 49 27.68	3297	1272	2	2.9	-6.8	9.875	9.644

Figure 1. Position, proper motion, and magnitude information of the pair from Tycho 2.

I/312/sample [PPMX Catalog of positions and proper motions \(Roesser+ 2008\)](#)
The PPMX Catalog (Position and Proper Motions eXtended) (18088919 rows)

Full	r	RAJ2000	DEJ2000	PPMX	RAJ2000	DEJ2000	pmRA	pmDE	Cmag
arcsec	"h:m:s"	"d:m:s"	deg	deg	mas/yr	mas/yr	mag	mag	mag
1	0.473	02 58 00.528	+46 49 39.37	025800.5+464939	044.502201	+46.827604	4.60	-5.80	9.567
2	11.385	02 58 00.616	+46 49 27.68	025800.6+464927	044.502568	+46.824355	2.90	-6.80	9.644

Figure 2. Position, proper motion, and magnitude information of the pair from PPMX.

I/322A/out [UCAC4 Catalogue \(Zacharias+, 2012\)](#)
Fourth U.S. Naval Observatory CCD Astrograph Catalog (113780093 rows)

Full	r	RAJ2000	DEJ2000	UCAC4	RAJ2000	DEJ2000	ePos	f.mag	of	db	pmRA	pmDE	Jmag	Kmag	Bmag	Vmag
arcsec	"h:m:s"	"d:m:s"	deg	deg	mas	mag	mag	mag	mag	mag	mas/yr	mas/yr	mag	mag	mag	mag
1	0.463	02 58 00.526	+46 49 39.38	685-018255	044.5021927	+46.8276045	15	9.689	0	36	3.0	-5.1	9.325	9.243	9.676	9.567
2	11.341	02 58 00.617	+46 49 27.72	685-018256	044.5025724	+46.8243675	18	9.781	0	36	2.3	-4.3	9.377	9.336	9.875	9.644

Figure 3. Position, proper motion, and magnitude information of the pair from UCAC4 [3].

III/231/catalog [The Tycho-2 Spectral Type Catalog \(Wright+, 2003\)](#)
Main Catalog (351863 rows)

Full	r	RAJ2000	DEJ2000	TYC1	TYC2	TYC3	RAJ2000	DEJ2000	VTmag	BTmag	r	SpType	Dist	Teff	SpType
arcsec	"h:m:s"	"d:m:s"	deg	deg	deg	deg	deg	deg	mag	mag	mag	mag	arcsec	K	mag
1	0.473	02 58 00.528	+46 49 39.37	3297	1272	1	044.50220120	+46.82760375	9.567	9.676	ppN	0.193	9520	A0	
2	11.382	02 58 00.616	+46 49 27.68	3297	1272	2	044.50256793	+46.82435569	9.644	9.875	ppN	0.607	9520	A0	

Figure 4. Spectral type information of the pair from Wright+, 2003 (The Tycho-2 Spectral Type Catalog, Vizier catalog III/231) [8].

VI/135/table15 [All-sky spectrally matched Tycho2 stars \(Pickles+, 2010\)](#) 2010PASP.122.1437F
[Tycho2Fit.dat] Tycho2 catalog fit (2429446 rows)

Full	r	RAJ2000	DEJ2000	RAJ2000	DEJ2000	BTmag	VTmag	J2mag	H2mag	K2mag	Qual	Type	Ufmag	Bfmag	Vfmag	Rfmag	Dist	Tyc2
arcsec	"h:m:s"	"d:m:s"	deg	deg	mag	mag	mag	mag	mag	mag	mag	mag	mag	mag	mag	mag	pc	pc
1	0.46	02 58 00.53	+46 49 39.4	044.50220	+46.82760	9.676	9.567	9.325	9.287	9.243	AAA	A47IV	9.73	9.68	9.613	9.56	504	Tyc2
2	11.37	02 58 00.62	+46 49 27.7	044.50257	+46.82436	9.875	9.644	9.377	9.340	9.336	AAA	A5V	9.87	9.83	9.681	9.61	395	Tyc2

Figure 5. Color magnitude data of the pair from Pickles+, 2010 (All-sky spectrally matched Tycho2 stars, Vizier catalog VI/135) [9].

V/136/tycall [Teff and metallicities for Tycho-2 stars \(Ammons+, 2006\)](#)
Photometry and derived parameters for all Tycho 2 stars, including giants (2399792 rows)

Full	r	RAJ2000	DEJ2000	Tycho	d	pmRA	pmDE	Bmag	Vmag	Jmag	Hmag	Ksmag	Teff	Dist
arcsec	"h:m:s"	"d:m:s"	mag	mag	mag	mag	mag	mag	mag	mag	mag	mag	K	pc
1	0.468	02 58 00.528	+46 49 39.37	3297-01272-1	4.6	-5.8	9.676	9.567	9.325	9.287	9.243	8628	147	
2	11.381	02 58 00.616	+46 49 27.68	3297-01272-2	2.9	-6.8	9.875	9.644	9.377	9.340	9.336	8798	113	

Figure 6. Temperature and metallicities of the pair from Ammons+, 2006 (Teff and metallicities for Tycho-2 stars, Vizier catalog V/136/tycall) [10].

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Star Catalog maintained at the U.S. Naval Observatory.

I wish to thank all astronomers compiling and creating the great catalogs of astrometric and astrophysical data available here.

This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France.

This research has made use of the VizieR catalogue access tool, CDS, Strasbourg, France.

References:

- [1] Simbad Astronomical Database: <http://simbad.u-strasbg.fr/simbad/>
- [2] VizieR Service: <http://vizier.u-strasbg.fr/viz-bin/VizieR>
- [3] Vizie catalog I/322A: UCAC4 Catalogue (Zacharias+, 2012)
- [4] Vizie catalog I/275/ac2002: The AC 2000.2 Catalogue (Urban+ 2001)
- [5] Francisco Rica Romero, "R.G.Aitken's criterion to detect physical pairs", *JDSO*, **2**, 36-41, 2006.
- [6] Hog+ 2000: The Tycho-2 catalogue (Vizie catalog I/259)
- [7] Roeser+ 2008: PPMX Catalog of positions and proper motions (Vizie catalog I/312)
- [8] Wright+, 2003: The Tycho-2 Spectral Type Catalog (Vizie catalog III/231)
- [9] Pickles+, 2010: All-sky spectrally matched Tycho2 stars (Vizie catalog VI/135)
- [10] Ammons+, 2006: Teff and metallicities for Tycho-2 stars (Vizie catalog V/136/tycall)

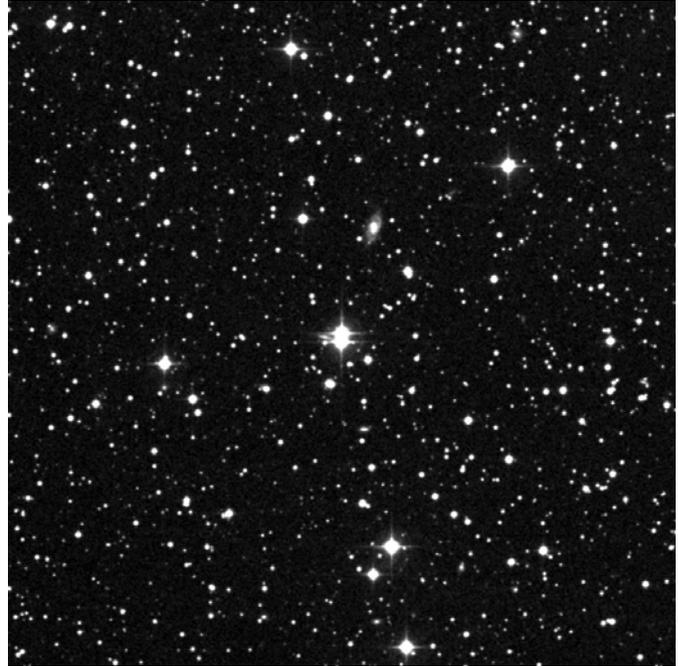


Figure 7. DSS image of the pair (located in the dead center of the image).

