# The Strange Case of STF2417 = Theta Ser

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**Abstract:** For many years the system STF2417 has been surrounded with mistakes of all kinds including misprints, confusion in the historical measurements, and lost references. In the year 2001, the British amateur Tomas Teague investigated the case and contributed new information, but problems, nevertheless, remained unresolved. In this article the final conclusions are offered after measuring the system and investigating historic documents.

## Introduction

Dave Arnold (2001) was not able to identify the C component of the system STF2417, and he requested the help of other observers to clarify the case. I decided to lend a hand to the work being interested by the peculiarity of the matter. A first glance at the data in the WDS for this triple system, makes one think that there is a clear error in some of the measurements (AB, AC or BC). Figure 1 shows the WDS entry for the system. Figure 2 is a 2MASS image of STF2417.

## The Problem

It is obvious that if the AB pair is correct (it is a well studied, bright pair, and has no less than 172 official measurements as listed in the appendix), the measurements of one or both of the other two pairs is mistaken. The coexistence of the three measures is geometrically impossible because the direction (PA) is, judging from its WDS entry, practically invariable.

Since this is a widely separated system with no large difference in magnitude, I decided to measure it visually using a Meade MA 12 mm eyepiece on a telescope at the Camino de Palomares Astronomical Observatory, (OACP), in Valladolid, Spain. This observatory is located at latitude 41° 39 ' 59.53296 N; and Longitude 4° 41 ' 42.15818 W; Altitude: 694.651 m.

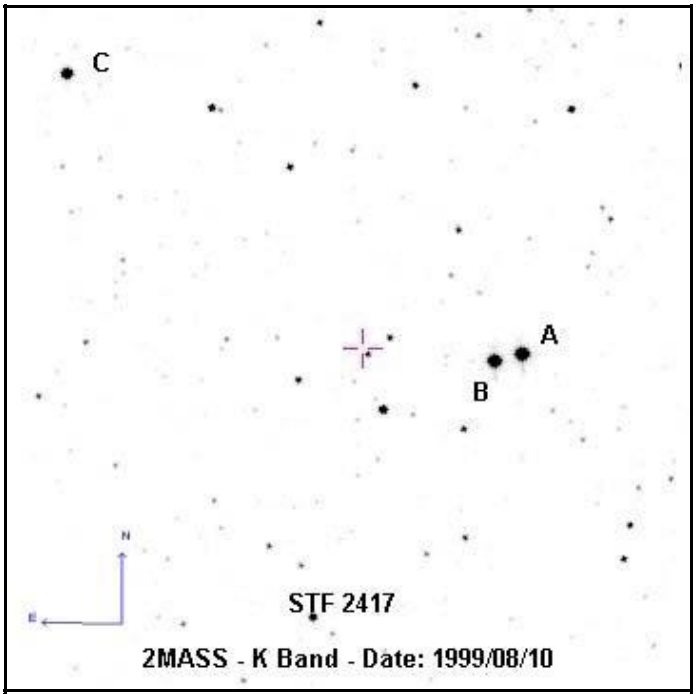


Figure 2: Image of STF2417

I used a Newtonian telescope with a 200 mm objective, focal length = 1000 mm and no Barlow. The scale constant for this optical configuration is 24.82 ±

| N° WDS | Doble | Año1 | Año2 | N | θ1 | θ2 | ρ1 | ρ2 | mgA | mgB | Sp | μ(A) | μ(B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18562+0412 | STF2417 AB | 1819 | 2002 | 99 | 104 | 104 | 22.0 | 22.5 | 4.59 | 4.93 | A5V A5Vn | +047 +030 | +042 +013 |
| 18562+0412 | STF2417 AC | 1954 | 1954 | 1 | 58 | 58 | 26.0 | 26.0 | 4.59 | 7.9 | | +047 +030 | |
| 18562+0412 | STF2417 BC | 1927 | 2001 | 3 | 56 | 56 | 414.1 | 405.9 | 4.98 | 7.9 | A5Vn | +056 +028 | |

Figure 1: Entry in the WDS for the STF2417 system.

0.04 as/division on the linear scale of the astrometric eyepiece, a convenient value for measuring a distance around 22" for the AB pair.

There was no doubt about the AB pair, formed by two almost identical stars. I then tried to locate the C component to measure the AC pair. According to the WDS it should be at a distance of 26 as, at a position angle of 58° and possess a magnitude 7.9. Result: no star of these characteristics was swept up. Nor did I find a dimmer star in the correct position as might have been possible if there was an error in the photometry. Subsequently, I tried to place the BC pair and I found a star, which after their measurements, was in agreement with the catalogue data. So, without a doubt, the error was in the AC subsystem. The results of the measurements that I carried out are shown in Table One.

## The Solution

| Date | Star | θ | ρ | Nights |
|---|---|---|---|---|
| 2004.627 | STF2417 AB | 104° | 22.338" | 2 |
| | STF 2417 AC | 58° | 421.94" | 2 |
| | STF2417 BC | 56.96° | 407.048" | 2 |

Table 1: Measurements of STF 2417 made by the author.

I requested the historical archive of measures for the system from Brian Mason (manager of WDS). There was, as indicated earlier, 172 measures for AB, one for the AC pair and four more for BC pair. One of the most recent of this last quartet of measurements was by Hipparcos (1991.25), which, given the total reliability of Hipparcos guarantees the accuracy of the BC measurements. One more point in favor of the hypothesis that the error lies in AC.

The only official measurement of AC is shown below in Table 2. The author, Karl W. Kamper (1941-1998), affiliated with the David Dunlap Observatory, Ontario, Canada, measured it in 1954. In WDS references it is said that the source of this measurement is unknown:

KPR9999 KAMPER, K.W.
Unpublished, manuscript or reference not found.

The code for this observer is Kpr9999, the four digits indicating that the origin of the measurement data is ignored. The following step, logically, was to discover something about Kamper. I began to look on the Internet ADS site (Astrophysics Data System, http://adswww.harvard.edu), which is an enormous database maintained by NASA, containing, in electronic form, mountains of astrophysical works. I aimed the search toward Kamper and potential publications on double stars. This search returned 60 references, and among them two were lists of photographic measurements of double stars. Could it be that in those pages the hidden C component of STF2417 system would be included? The answer to this question took only a bit of patience and a page for page review of the scanned writings. And there it was! In the Astronomical Journal (Kamper, 1992) were four measurements for the AB pair on plates that had been taken in the years 1949, 1951, 1954 and 1958, with the 36 inch telescope at the Lick Observatory, they were all in agreement with the historical measures. As you probably guess the observer code WDS assigns to these measurements is indeed Kpr9999. But, there was another entry, and it was exactly the one that I was looking for. In the photographic plate numbered 1820 taken in 1954.41 I found AC measurement, our discord couple: θ = 58°10" and ρ = 425".994 !

Mr. Kamper had measured correctly, and the error, without a doubt, occurred when transcribing the data to the WDS. The shift operator had simply omitted the "4".

How did this happen? I contacted Francisco Manuel Rica Romero, coordinator of LIADA Double Stars Section and sent him the results of my study. Rica has a great deal of experience in this field, and it took him only a couple of days to come up with an explanation. Before the current version of the WDS, the catalog had undergone gradual changes and cosmetic retouches, designed to organize the data more efficiently. In its first version, 1984, the angular distances of the very open pairs, those of more than a hundred arc seconds, were not written entirely in the column corresponding to rho. At that time the measurement was truncated to the tens digit and a new column was added where a figure was located that

| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 1954.41 | 58.10 | 25.994 | . | . | 1 | Kpr9999 | 36 | H | |

Table 2: Measurements of the AC pair of STF2417 by K. Kemper

would reveal the hundreds number that would be necessary to add to obtain the correct rho value. In this way, the WDS entry for a certain pair that had an angular separation of 230".43, would have a value of 30".43 and, in the auxiliary hundreds-column, would be stored a 2, to indicate that it would be necessary to add 200 to the initial value.

Following this hypothesis, Rica wanted to confirm his suspicions and he consulted the entry of STF2417 BC (yes, that's right, the BC pair and later on we will see the reason) in the WDS 1984. It checked that in the rho column was the value 25".994 and in column number 79 - containing the hundreds - appeared a 4, as expected. Surely the error was made during the format change from the 1984 version to that of 1996.

There is one more piece of the puzzle that must be inserted. It is that in the notes corresponding to the system STF2417 in the current version of the WDS, that we read that in the year 2001, Tom Teague (distinguished British amateur double star observer) carried out a study on the nature of the errors in the system. The results of this work were published in *Double Star Observer* (Teague, 2001). In this article he shows that one of the historical measures for the BC pair really corresponded the AC pair.

After Teague's report, that, by the way, repaired the omission of the hundreds digit, the WDS was updated transferring the measure from BC to AC. However, the error was not corrected completely, because the rho value continued being 25".994. The confusion, then, remained in the measurements of this problematic system.

One last point. If in the current version of the WDS there is only the single measurement for AC (Kpr9999) and this came from BC, once it was corrected after the correction of Teague, it seems logical to think that previously there would exist no measurement of AC. I wanted to check it and I consulted the 1996 version of the WDS. My suspicions were confirmed, I didn't find any measurement of AC. This entry is shown in Table 3.

I also got another small surprise. It can be seen that the true historical measure for BC (56°, 414"1) also appears truncated (14.1). This corroborates what we pointed out above; that is to say that the sequence of lamentable misprints that we have been describing had its origin in the WDS form-changes process. Also, it is observed that Kamper's measurement of the AC pair is incorrectly included with the BC measurements.

## Conclusions

The conflicting C component is completely identified and their measures should be corrected in WDS. New value: 425"994.

The lost reference on the author (Kpr9999) has been found and it would be convenient to update the historical file of measures of WDS catalogue. New value: Kpr1992 and its bibliographical reference.

Three new measures are contributed for the whole system (AB, AC and BC) that could be included in WDS.

Finally, and after so many eventualities, the case of STF2417 can be closed.

***Note:*** *This system was included in the Third Observational Program (July / September 2004) of LIADA's Double Stars Section.*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18562+0412 | STF2417 AB | 1822 | 1984 | 99 | 104 | | 21.6 | 22.3 | 4.62 | 4.98 | A5V A5Vn |
| 18562+0412 | STF2417 BC | 1927 | 1954 | 2 | 56 | 58 | 14.1 | 26.0 | 4.98 | 7.9 | A5Vn |

Table 3: Entry for STF2417 in 1996 issue of the WDS.

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## Appendix: Historical data for STF2417 in WDS catalogue.

WDS Star No. 18562+0412

| RA & DEC (2000) | Disc. Number | Comp | No. Obs. | Magnitudes A | B | Spec. Type | PM/1000 yr RA | DEC | DM No. |
|---|---|---|---|---|---|---|---|---|---|
| 18562+0412 | STF2417 | AB | >99 | 4.59 | 4.93 | A5V A5Vn | +047 | +030 | +04 3916 |

Precise Position of Primary of System or Subsystem (when available)
RA = 18 56 13.1 Dec = +04 12 12

Proper Motion (PM/1000 yr) of Secondary of Subsystem (when available)
RA = +042 Dec = +013

Note? = yes Orbit? = no DM? = yes

| | Date Observed | Position Angle | Separation |
|---|---|---|---|
| First | 1755 | 106 | 22.1 |
| Last | 2003 | 104 | 22.1 |

Observations

| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 1755.00 | 105.8 | 22.05 | . | . | 1 | Bdy1906A | 04 | A | |
| 1819.63 | 104.1 | 22.0 | . | . | 2 | StF1837 | 04 | A | |
| 1822.72 | 104.0 | 21.59 | 5. | 5. | 1 | StF1837 | 04 | A | |
| 1830.05 | 103.8 | 21.65 | 4.0 | 4.2 | 8 | StF1837 | 10 | A | |
| 1830.62 | 103.6 | 25. | . | 0.0 | 1 | HJ_1833c | 18 | B | |
| 1830.75 | 103.7 | 21.71 | . | . | 6 | Bes1833a | 06 | D | |
| 1833.52 | 104.0 | 22.08 | 5. | 5.6 | 1 | Da_1835 | 04 | A | |
| 1834.78 | 103.2 | 21.76 | . | . | 2 | Wh_1849 | 06 | D | |
| 1836.51 | 104.6 | 22.46 | . | . | 1 | Gll1840 | 10 | A | |
| 1836.99 | 103.8 | 22.19 | . | . | 2 | Enc1840 | 10 | A | |
| 1838.58 | 103.4 | 22.04 | . | . | 4 | Gll1840 | 10 | A | |
| 1841.48 | 103.9 | 21.48 | . | . | 4 | Mad1842a | 10 | A | |
| 1842.74 | 103.9 | 21.62 | . | . | 2 | Mad1843 | 10 | A | |
| 1842.77 | 103.8 | 21.91 | . | . | 10 | Wh_1849 | 06 | D | |
| 1843.44 | 104.7 | 21.08 | . | . | 1 | Mad1844 | 10 | A | |
| 1849.18 | 104.2 | 21.80 | . | . | 2 | Mad1856 | 10 | A | |
| 1850.512 | 103.7 | 21.391 | . | . | 1 | JMJ1850 | 08 | D | |
| 1851.90 | 103.4 | 21.39 | . | . | 2 | Stt1878 | 15 | A | |
| 1852.72 | 103.9 | 21.04 | . | . | 2 | Mad1856 | 10 | A | 7 |
| 1855.42 | 104.3 | 20.20 | . | . | 1 | Lut1857 | | D | |
| 1855.43 | 104.9 | 20.74 | . | . | 1 | Lut1857 | | D | |
| 1856.67 | 104.6 | 21.76 | . | . | 1 | Se_1860b | 10 | A | |
| 1857.20 | 104.25 | 20.73 | . | . | 2 | Kon1865 | 06 | D | |
| 1857.81 | 104.0 | 21.68 | 4.3 | 4.5 | 1 | D__1883 | 05 | A | |
| 1860.28 | 104.1 | 21.79 | . | . | 12 | Mad1906A | 10 | A | |
| 1861.42 | 103.88 | 21.776 | . | . | 7 | Auw1862 | 06 | A | |
| 1861.47 | 104.02 | 20.88 | 4.5 | 4.7 | 1 | Mai1861 | 08 | D | |
| 1863.56 | 108.5 | 21.85 | . | . | 2 | Rom1865 | 10 | A | |
| 1863.652 | 103.7 | 21.98 | . | . | 2 | Hl_1877a | 10 | A | |
| 1863.73 | 103.4 | 21.61 | . | . | 5 | Eng1865 | 05 | A | |
| 1865.71 | 104.0 | 21.78 | 4.0 | 4.4 | 4 | D__1884 | 07 | A | |
| 1865.84 | 103.7 | 22.01 | 4.5 | 5. | 1 | Knt1877 | 07 | A | |
| 1866.47 | 103.9 | 22.14 | . | . | 1 | Tal1868 | 10 | A | |
| 1866.71 | 103.9 | 21.94 | . | . | 6 | Kai1872 | 07 | C | |
| 1866.71 | 103.7 | 21.70 | . | . | 6 | Kai1872 | 07 | A | |
| 1868.76 | 103.6 | 21.56 | 4.0 | 4.4 | 5 | Du_1876 | 10 | A | |
| 1869.61 | 102.82 | 21.89 | 5.5 | 6.0 | 1 | Mai1869 | 08 | D | |
| 1877.37 | 103.6 | 21.67 | . | . | 3 | Je_1881b | 06 | A | |
| 1880.61 | 104.8 | 21.40 | . | 0.0 | 3 | Sne1880 | 08 | D | |

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| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 1884.58 | 103.7 | 21.93 | 3.8 | 4.1 | 3 | Per1887 | 15 | A | |
| 1885.63 | 103.6 | 21.69 | . | . | 1 | And1899 | 09 | A | |
| 1886.54 | 103.7 | 21.97 | . | . | 5 | Per1906A | 15 | A | |
| 1887.55 | 103.4 | 21.95 | . | . | 2 | Mon1899 | 09 | A | |
| 1888.57 | 103.8 | 22.01 | . | . | 2 | SBc1899 | 09 | A | |
| 1889.09 | 103.7 | 22.08 | . | . | 2 | Kin1928 | 13 | H | |
| 1889.58 | 103.6 | 22.01 | . | . | 5 | Gia1891 | 05 | A | |
| 1889.69 | 103.4 | 21.90 | . | . | 10 | Amb1919 | | D | |
| 1890.48 | 102.5 | 21.09 | . | . | 2 | Glp1892f | 06 | A | |
| 1892.06 | 103.7 | 21.88 | . | . | 7 | Sp_1909 | 19 | A | |
| 1892.94 | 283.8 | 21.82 | . | . | 5 | Coh1894 | | D | |
| 1893.66 | 103.1 | 22.01 | 4.0 | 4.3 | 2 | Glp1895 | 09 | A | |
| 1894.55 | 105.1 | 22.45 | . | . | 1 | Rsd1899 | 09 | A | |
| 1896.67 | 104.3 | 22.06 | . | . | 2 | Col1896 | 08 | A | |
| 1897.15 | 103.7 | 22.08 | . | . | 5 | Ser1916 | 15 | A | |
| 1899.66 | 103.8 | 22.06 | . | . | 1 | Coh1911 | 13 | A | |
| 1902.48 | 104.3 | 22.18 | . | . | 3 | Hu_1911 | 12 | A | |
| 1905.50 | 103.6 | 21.93 | 3.9 | 4.2 | 2 | Lau1906a | 10 | A | |
| 1907.61 | 104.5 | 22.01 | . | . | 1 | Lau1908b | 10 | H | |
| 1908.55 | 104.3 | 22.01 | . | . | 3 | Dob1927 | 06 | A | |
| 1908.58 | 106.0 | 26.415 | . | . | 1 | WFC1998 | 13 | G | |
| 1908.75 | 102.8 | 21.900 | . | . | 5 | WFD1914 | 06 | M | |
| 1909.54 | 103.9 | 22.04 | . | . | 1 | Dob1927 | 06 | A | |
| 1909.58 | 103.8 | 21.91 | . | . | 1 | Gui1912 | 06 | A | |
| 1909.6 | 107.1 | 21.397 | . | . | 2 | WFD1928d | 08 | M | |
| 1909.61 | 104.3 | 22.09 | . | . | 1 | Gui1912 | 13 | A | |
| 1909.61 | 104.2 | 21.94 | 4.7 | 5.0 | 2 | Jan1909b | 10 | A | |
| 1909.65 | 103.2 | 22.29 | . | . | 2 | Roe1910c | 06 | A | |
| 1910.73 | 99.3 | 24.332 | . | . | 1 | WFC1998 | 13 | G | |
| 1910.73 | 102.1 | 22.522 | . | . | 1 | WFC1998 | 13 | G | |
| 1911.64 | 103.3 | 21.84 | . | . | 4 | Vou1922 | 10 | A | |
| 1912.6 | 103.8 | 22.247 | . | . | 1 | WFD1931 | 08 | M | |
| 1914.72 | 103.0 | 22.17 | . | . | 2 | Frk1915 | 06 | A | |
| 1916.46 | 104.6 | 22.09 | . | . | 1 | Gui1931 | 06 | A | |
| 1917.46 | 103.9 | 22.33 | . | . | 3 | Hrc1926 | | A | |
| 1918.387 | 103.71 | 22.054 | . | . | 2 | Hzg1920 | 20 | H | |
| 1920.57 | 104.3 | 22.38 | . | . | 1 | Nie1921 | 10 | A | |
| 1920.57 | 103.7 | 22.04 | . | . | 2 | Jan1921a | 10 | A | |
| 1920.84 | 103.8 | 22.03 | . | . | 1 | Haa1921a | 10 | A | |
| 1920.84 | 103.5 | 21.95 | . | . | 1 | Jan1921a | 10 | A | Z |
| 1921.50 | 103.4 | 21.41 | . | . | 1 | Haa1921b | 10 | A | |
| 1921.50 | 103.7 | 21.58 | . | . | 1 | Fjl1921b | 10 | A | |
| 1921.52 | 103.8 | 22.24 | . | . | 2 | Dob1927 | 06 | A | |
| 1921.78 | 103.3 | 22.21 | . | . | 2 | Gau1924 | 16 | A | |
| 1922.11 | 103.8 | 22.54 | . | . | 2 | Blo1931 | 06 | A | |
| 1922.51 | 102.7 | 22.43 | . | . | 4 | Gbb1924b | 19 | A | |
| 1922.98 | 103.6 | 21.93 | . | . | 2 | Scl1923 | 07 | A | |
| 1925.597 | 104.0 | 22.31 | . | . | 1 | Baz1928 | 04 | A | |
| 1926.70 | 103.8 | 22.21 | . | . | 2 | Kom1929 | 15 | A | |
| 1927.18 | 103.9 | 21.99 | . | . | 3 | Sil1931 | 12 | A | |
| 1927.27 | 103.73 | 22.11 | 4.5 | 5.5 | 1 | Ald1936a | 26 | H | |
| 1927.51 | 103.77 | 22.131 | 4.0 | 4.2 | 1 | Lbz1929 | 13 | H | Z |
| 1927.51 | 103.85 | 22.056 | . | . | 1 | Lbz1929 | 13 | H | Z |
| 1927.57 | 104.03 | 22.123 | . | . | 1 | Prz1926 | 13 | H | Z |
| 1927.59 | 104.3 | 22.07 | . | . | 3 | Kom1935a | 15 | A | |
| 1927.59 | 103.78 | 22.149 | . | . | 1 | Lbz1929 | 13 | H | Z |
| 1927.62 | 103.7 | 22.24 | . | . | 5 | Buc1929 | 08 | A | |
| 1929.64 | 103.7 | 21.91 | . | . | 5 | All1930 | 05 | A | |
| 1929.88 | 103.8 | 22.02 | . | . | 2 | Dob1930 | 09 | A | |
| 1930.50 | 102.7 | 21.25 | . | . | 3 | Arm1934 | 05 | A | |
| 1930.67 | 103.2 | 22.21 | . | . | 4 | Baz1933a | 05 | A | |
| 1931.76 | 103.7 | 21.43 | . | . | 1 | All1932 | 05 | A | |
| 1933.65 | 103.5 | 22.09 | . | . | 3 | Urb1938 | 12 | H | X |
| 1934.60 | 103.5 | 22.451 | . | . | 7 | WFD1969 | 08 | M | |

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| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 1936.47 | 102.6 | 21.989 | . | . | 1 | WFC1949 | 05 | G | |
| 1936.66 | 105.5 | 22.05 | . | . | 5 | Sch1937 | 10 | A | |
| 1937.69 | 103.76 | 22.11 | . | . | 1 | Hzg1940 | 36 | H | |
| 1938.52 | 103.06 | 21.94 | 4.0 | 4.2 | 5 | Sch1939 | 08 | A | |
| 1941.43 | 103.3 | 22.61 | . | . | 3 | Kor1948 | 15 | A | |
| 1942.58 | 103.71 | 22.18 | . | . | 6 | Ahn1957 | 05 | A | |
| 1949.44 | 103.72 | 22.158 | . | . | 1 | Kpr9999 | 36 | H | |
| 1949.453 | 103.76 | 22.166 | . | . | 1 | LO_1978 | 36 | H | |
| 1949.68 | 103.80 | 22.24 | 4.0 | 4.2 | 1 | Kra1951 | 20 | H | |
| 1951.54 | 103.78 | 22.151 | . | . | 1 | Kpr9999 | 36 | H | |
| 1952.69 | 102.8 | 22.15 | . | . | 1 | Fer1960 | 05 | A | |
| 1952.71 | 103.8 | 22.34 | . | . | 3 | All1960 | 05 | A | |
| 1953.497 | 103.75 | 22.215 | . | . | 1 | DeO1957 | 18 | H | |
| 1953.514 | 103.78 | 22.224 | . | . | 1 | DeO1957 | 18 | H | |
| 1953.522 | 103.74 | 22.171 | . | . | 1 | DeO1957 | 18 | H | |
| 1954.41 | 103.74 | 22.169 | . | . | 1 | Kpr9999 | 36 | H | |
| 1955.410 | 103.77 | 22.182 | . | . | 1 | Gzl1962 | 20 | H | |
| 1955.553 | 103.53 | 22.238 | . | . | 1 | Gzl1962 | 20 | H | |
| 1955.64 | 103.27 | 22.205 | . | . | 2 | Bot1958 | 05 | H | |
| 1956.55 | 103.67 | 22.219 | 4.5 | 4.9 | 1 | Bot1962 | 08 | H | |
| 1958.58 | 103.4 | 22.24 | 5.1 | 5.5 | 1 | Hop1964a | 27 | A | |
| 1958.59 | 103.70 | 22.195 | . | . | 1 | Kpr9999 | 36 | H | |
| 1958.76 | 104.5 | 21.65 | . | . | 1 | All1960 | 05 | A | |
| 1958.76 | 101.1 | 21.74 | . | . | 1 | Cta1960 | 05 | A | |
| 1962.518 | 103.89 | 22.254 | . | . | 1 | Bot1965 | 20 | H | |
| 1962.562 | 103.67 | 22.239 | . | . | 1 | Bot1965 | 20 | H | |
| 1962.652 | 103.73 | 22.241 | . | . | 1 | Bot1965 | 20 | H | |
| 1973.000 | 104.0 | 22.00 | 4.0 | 4.2 | 3 | Cll2003 | 03 | A | |
| 1973.355 | 103.76 | 22.259 | . | . | 1 | USN1978 | 26 | H | |
| 1973.355 | 103.74 | 22.264 | . | . | 1 | USN1978 | 26 | H | |
| 1973.546 | 103.75 | 22.267 | . | . | 1 | USN1978 | 26 | H | |
| 1973.546 | 103.74 | 22.272 | . | . | 1 | USN1978 | 26 | H | |
| 1976.767 | 102.0 | 22.30 | . | . | 1 | Tob2003 | 02 | A | |
| 1980.000 | 104.0 | 22.00 | 4.2 | 4.5 | 3 | Cll2003 | 04 | A | |
| 1982.117 | 103.9 | 21.15 | . | . | 2 | Lef1982 | 10 | B | |
| 1983.734 | 104.0 | 22.30 | 4.2 | 4.5 | 1 | Tob2003 | 02 | A | |
| 1983.775 | 102.2 | 22.24 | . | . | 1 | Doc1984a | 05 | A | |
| 1983.775 | 102.5 | 22.00 | . | . | 1 | Csa1984 | 05 | A | |
| 1983.775 | 102.8 | 22.55 | . | . | 1 | Lin1984a | 05 | A | |
| 1984.48 | 103.3 | 22.61 | . | . | 6 | Gel1989 | 04 | A | |
| 1984.771 | 102.7 | 22.26 | . | . | 3 | Lin1985b | 05 | A | |
| 1984.776 | 102.3 | 22.55 | . | . | 4 | Doc1985b | 05 | A | |
| 1987.50 | 103.6 | 21.72 | . | . | 1 | Gir1992 | 10 | M | |
| 1988.619 | 103.8 | 22.42 | . | . | 1 | Jny2003 | 08 | Z | |
| 1988.657 | 286.0 | 22.50 | 4.4 | 4.3 | 1 | Scn2003 | 09 | B | |
| 1990.482 | 283.5 | 22.40 | . | . | 1 | Tob2003 | 04 | A | |
| 1991.25 | 103.7 | 22.37 | 4.69 | 5.06 | 1 | HIP1997a | 54 | T | |
| 1991.72 | 103.6 | 22.365 | 4.59 | 4.93 | 1 | TYC2000b | 07 | T | |
| 1992.545 | 104.1 | 22.46 | . | . | 1 | Tob2003 | 04 | A | |
| 1992.556 | 105.5 | 22.38 | . | . | 1 | Tob2003 | 04 | A | |
| 1992.583 | 284.0 | 22.54 | . | . | 1 | Tob2003 | 04 | A | |
| 1992.73 | 103.6 | 22.30 | . | . | 5 | Kzn1994 | 10 | M | |
| 1993.66 | 103.1 | 22.58 | . | . | 3 | Ctt1995 | 08 | I | |
| 1993.695 | 103.5 | 22.33 | . | . | 1 | Tob2003 | 04 | A | |
| 1993.805 | 104.0 | 22.80 | . | . | 1 | Roj2003 | 04 | A | |
| 1994.495 | 103.0 | 22.70 | . | . | 1 | Roj2003 | 04 | A | |
| 1994.506 | 103.3 | 22.44 | . | . | 1 | Tob2003 | 04 | A | |
| 1994.684 | 104.0 | 22.80 | . | . | 1 | Roj2003 | 04 | A | |
| 1995.468 | 103.0 | 22.70 | . | . | 1 | Roj2003 | 04 | A | |
| 1995.575 | 103.0 | 22.90 | . | . | 1 | Roj2003 | 04 | A | |
| 1996.485 | 104.9 | 22.51 | . | . | 1 | Tob2003 | 04 | A | |
| 1997.693 | 104.3 | 23.05 | . | . | 1 | Lfb1997 | 05 | B | |
| 1997.693 | 104.3 | 23.05 | . | . | 1 | Lfb2003 | 05 | A | |
| 1999.61 | 103.3 | 22.35 | . | . | 1 | TMA2003 | 51 | F | |
| 2001.33 | 104.3 | 22.3 | . | . | 1 | UPR2004 | 31 | F | |

(Continued on page 17)

## The Strange Case of STF2417 = Theta Ser

| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 2001.712 | 104.1 | 22.63 | . | . | 1 | Dal2002a | 09 | F | |
| 2002.482 | 104.59 | 22.58 | 4.59 | 4.93 | 1 | Ni_2003a | 12 | F | 6 |
| 2002.731 | 104.0 | 22.48 | . | . | 1 | Dal2003a | 09 | F | |
| 2003.580 | 103.6 | 22.09 | . | . | 6 | WSI2004b | 26 | S | |

| RA & DEC (2000) | Disc. Number | Comp | No. Obs. | Magnitudes A | B | Spec. Type | PM/1000 yr RA | DEC | DM No. |
|---|---|---|---|---|---|---|---|---|---|
| 18562+0412 | STF2417 AC | | 1 | 4.59 | 7.9 | | +047 | +030 | |

Precise Position of Primary of System or Subsystem (when available)
RA = 18 56 13.1 Dec = +04 12 12

Proper Motion (PM/1000 yr) of Secondary of Subsystem (when available)
RA = Dec =

Note? = no Orbit? = no DM? = no

| | Date Observed | Position Angle | Separation |
|---|---|---|---|
| First | 1954 | 58 | 26.0 |
| Last | 1954 | 58 | 26.0 |

Observations

| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 1954.41 | 58.10 | 25.994 | . | . | 1 | Kpr9999 | 36 | H | |

| RA & DEC (2000) | Disc. Number | Comp | No. Obs. | Magnitudes A | B | Spec. Type | PM/1000 yr RA | DEC | DM No. |
|---|---|---|---|---|---|---|---|---|---|
| 18562+0412 | STF2417 BC | | 4 | 5.06 | 6.84 | A5Vn | +056 | +028 | +04 3917 |

Precise Position of Primary of System or Subsystem (when available)
RA = 18 56 14.7 Dec = +04 12 07

Proper Motion (PM/1000 yr) of Secondary of Subsystem (when available)
RA = Dec =

Note? = yes Orbit? = no DM? = no

| | Date Observed | Position Angle | Separation |
|---|---|---|---|
| First | 1927 | 56 | 414.1 |
| Last | 2001 | 56 | 405.9 |

Observations

| Date | P.A. | Sep. | Mag-a | Mag-b | # | RefCode | Aperture | Method | Codes |
|---|---|---|---|---|---|---|---|---|---|
| 1927.55 | 55.82 | 414.136 | 4.2 | 7.3 | 1 | Lbz1929 | 13 | H | |
| 1927.55 | 55.8 | 414.14 | 4.2 | 7.3 | 2 | Prz1926 | 13 | H | |
| 1991.25 | 56.0 | 407.188 | 5.06 | 6.84 | 1 | HIP1997b | 54 | T | |
| 2000.501 | . | . | . | . | 1 | Dal2001b | 11 | A | S |
| 2001.66 | 56.1 | 405.9 | . | . | 2 | Tea2001 | 09 | A | |

WDS Index Catalog Notes

AB: Theta (1) Ser. B is BD+04@3917, Theta (2) Ser.
BC: This system analyzed in detail by Teague (TEA01) who determined the source of the errors in all three historical measures (LBZ56, PRZ02, and KPR99 which actually belongs with the AC pair) of this system.

(Continued on page 18)

**The Strange Case of STF2417 = Theta Ser**

## Acknowledgements

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory.

## References

Arnold, David, "Double Star Measurements Made with a Reticle Micrometer and an 8-Inch Schmidt Casssegrain", *Double Star Observer*, **7**, 6-9, 2001

Kamper, K.W., "Photographic measures of double stars from Lick Observatory plates", *Astronomical Journal*, **104**, 231-240, 1992.

Teague, E.T.H., "Σ 2417 BC: An Investigation", *Double Star Observer*, **7**, 11-12, 2001.

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