

Double star discovery during an occultation by the minor planet (48590) 1994 TY2

Sven Andersson

Mueggelheim Observatory A37, IOTA-ES, Berlin, Germany; sandersson@astw.de

Abstract

On 25 October 2021, while observing a stellar occultation of TYC 2416-141-1 by minor planet (48590) 1994 TY2, it was discovered that TYC 2416-141-1 is a double star. A stellar component separation of $1.4 \text{ mas} \pm 0.1$ was measured.

1. Observation

The occultation path ran exactly over the Müggelheim observatory. The Schmidt-Cassegrain reflector telescope with an aperture of 355 mm was used for observation. The focal length of 3920 mm was shortened with a 0.7x focal reducer to 2744 mm. The camera used was a QHY174GPS with active cooling. The exposure time was set to 20 ms. The star TYC 2416-141-1 has an apparent magnitude of $M_v 9.6^m$, the minor planet had an apparent magnitude of $M_v 16.9^m$.

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48590 1994 TY2 occults TYC 2416-00141-1 on 2021 Oct 25 from 22h 54m to 23h 15m UT
Star: (Dia < 0.1 mas)           Max Duration = 1.40 secs           Asteroid:
Mv 9.6; Mb 9.8; Mr 9.5         Mag Drop = 7.3 (7.0z)             Mag = 16.9
RA = 5 36 35.809 (astrometric)  Sun : Dist = 127°                 Dia = 11.41km, 14 mas
Dec = 36 3 17.918              Moon: Dist = 12°                  Parallax = 8.383"
[of Date: 5 37 31, 36 4 2]      : illum = 76 %                   Hourly dRA = 1.641s
Prediction of 2021 Oct 9.0      Error 53.0x24.0 mas in PA 85°     dDec = 31.13"
Reliable not available

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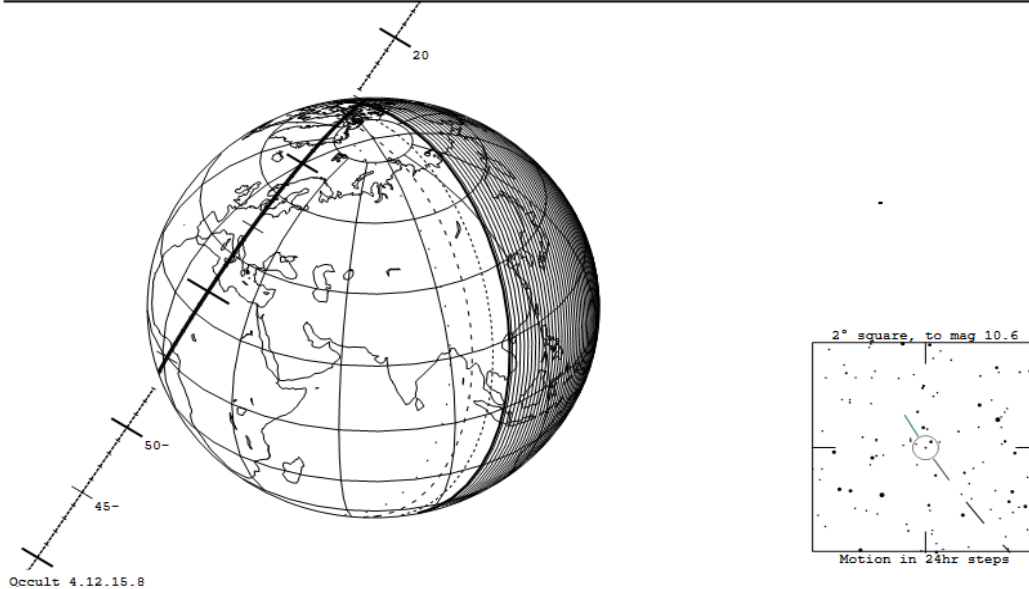


Figure 1: Prediction of the occultation of TYC 2416-141-1 by (48590) 1994 TY2

2. Analysis

The evaluation of the light curve showed that the star TYC 2416-141-1 is a double star (Figures 2 and 3). The evaluation was done with the programs PyMovie and PyOTE. The measured separation distance is $1.4 \text{ mas} \pm 0.1$. The brightness of the star's components could be reduced to 10^m and 11^m . There are no other observations of this occultation due to the weather conditions at that time. The program Occult 4 provides further solutions of the distance and alignment of the two stellar components (Table 1). Further observations are necessary to improve the data. No other observations of an occultation of TYC 2416-141-1 could be found in the data archive of the Occult 4 program. No evidence was found in the data archives that TYC 2416-141-1 is a double star.

Table 1.

Solutions from Occult 4

Solution	Separation (mas)	P.A. (°)
1	1.4	212.3 ± 0
2	8.4	130,5
3	1,4	$209,6 \pm 0,3$
4	8,4	291,4

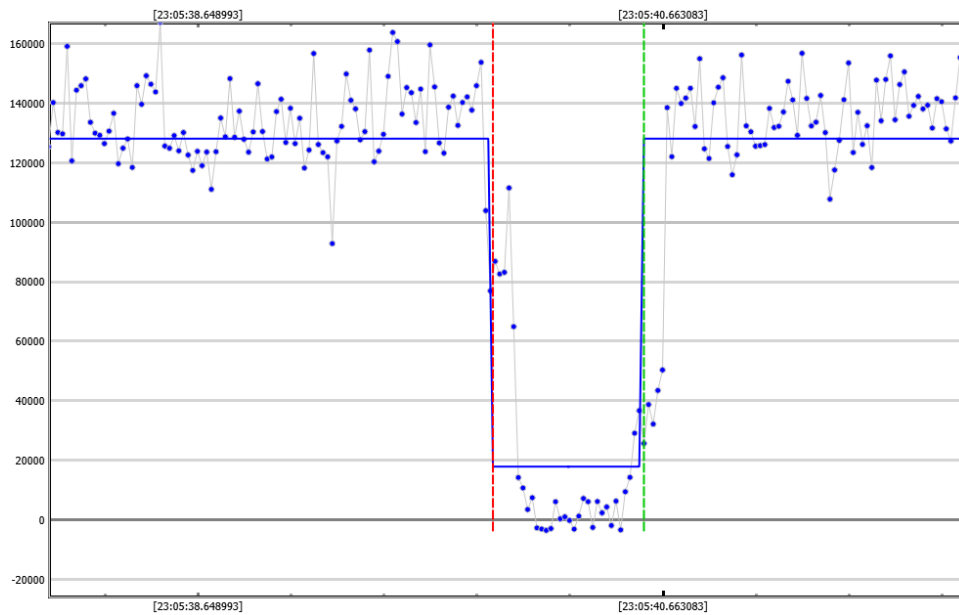


Figure 2: TYC 2416-141-1_A analysed using PyOTE

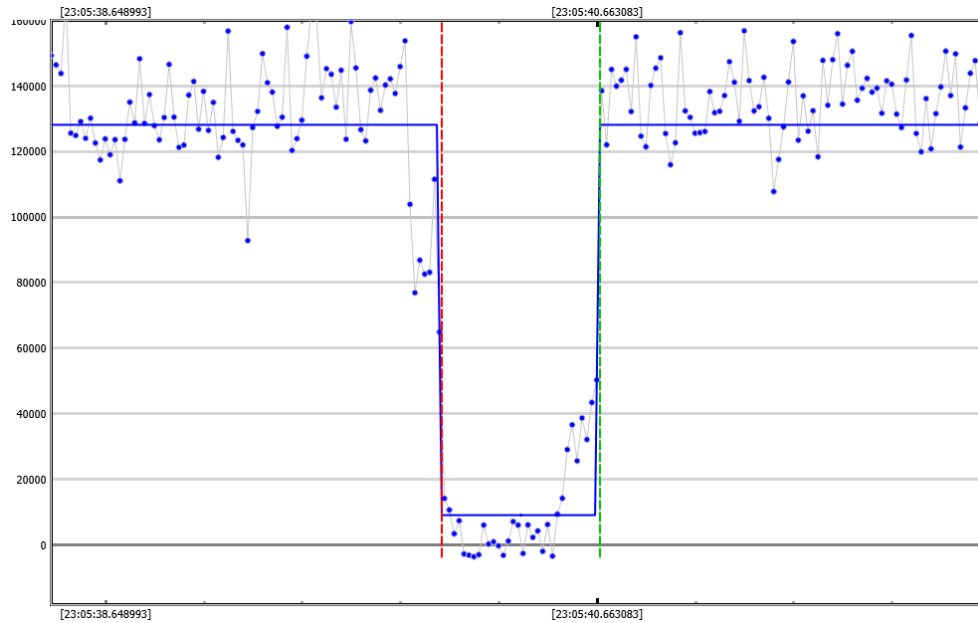


Figure 3: TYC 2416-141-1_B analysed using PyOTE

References

Herald, D., Occult4 - <http://www.lunar-occultations.com/iota/occult4.htm>

Anderson, B., PyMovie – Stellar occultation aperture photometry program,
<https://occultations.org/observing/software/pymovie/>

Anderson, B., PyOTE – Occultation Time Extractor, <https://occultations.org/observing/software/ote/>