HIP 36603 - Discovery of a New Double Star by Lunar Occultation Observation

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Abstract

An extended step event just above the noise level was recorded on 2021 Feb 23 during a lunar occultation of HIP 36603 (SAO 79470, XZ 11232). Analysis of the recording shows two components with Mv magnitudes of 7.7 and 10.5 respectively, with a separation of 0.17 arcseconds. More observations of this star are needed for accurate values of its separation and position angle.

The Observation

On 2021 Feb 23 I recorded several total lunar occultations of stars with my 10“ LX200 Classic SCT, a QHY174M-GPS camera and SharpCap at a frame rate of 60 fps with 12 bits in FITS file format. The region of interest (ROI) was set to 640x480 pixels (Fig. 1). Sky conditions were not perfect, haze and the illumination of the Moon of 86% made the observations not easy.

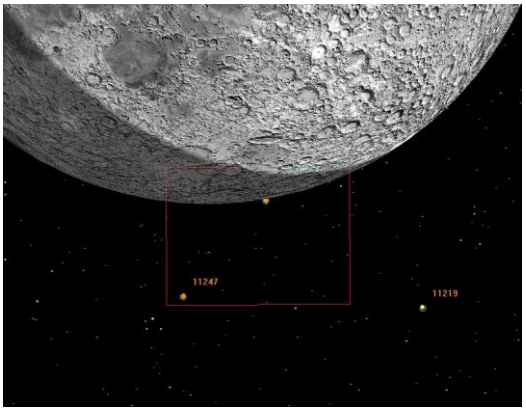

Figure 1: The red square demonstrates the region of interest set for the recording of the lunar occultation of HIP 36603. The star identifier are from the XZ80Q Zodiacal Catalogue by Dave Herald. Screenshot of simulation in GUIDE 9.1

While watching the recording live on the notebook screen, I noticed a faint step event at the disappearance of K0-star HIP 36603 at a cusp angle of 26° south, with the Moon’s shadow velocity of 729.5 m/s and an altitude of the Moon of 60° above the horizon.

Analysis with Tangra and Limovie

A first analysis of the recording with Tangra confirmed this very faint, but extended step event just above the noise level. After converting the FITS files into an AVI file with the software Siril, I opened the file in Limovie because this software has advanced features for analysing total lunar occultation of double stars. The Mv magnitude of HIP 36603 is 7.64 and the analysis of the video gave magnitude estimates of 7.7 for the brighter component (which disappeared first) and 10.5 for the fainter one. The duration in time of the step was 1.4 s (Fig. 2).

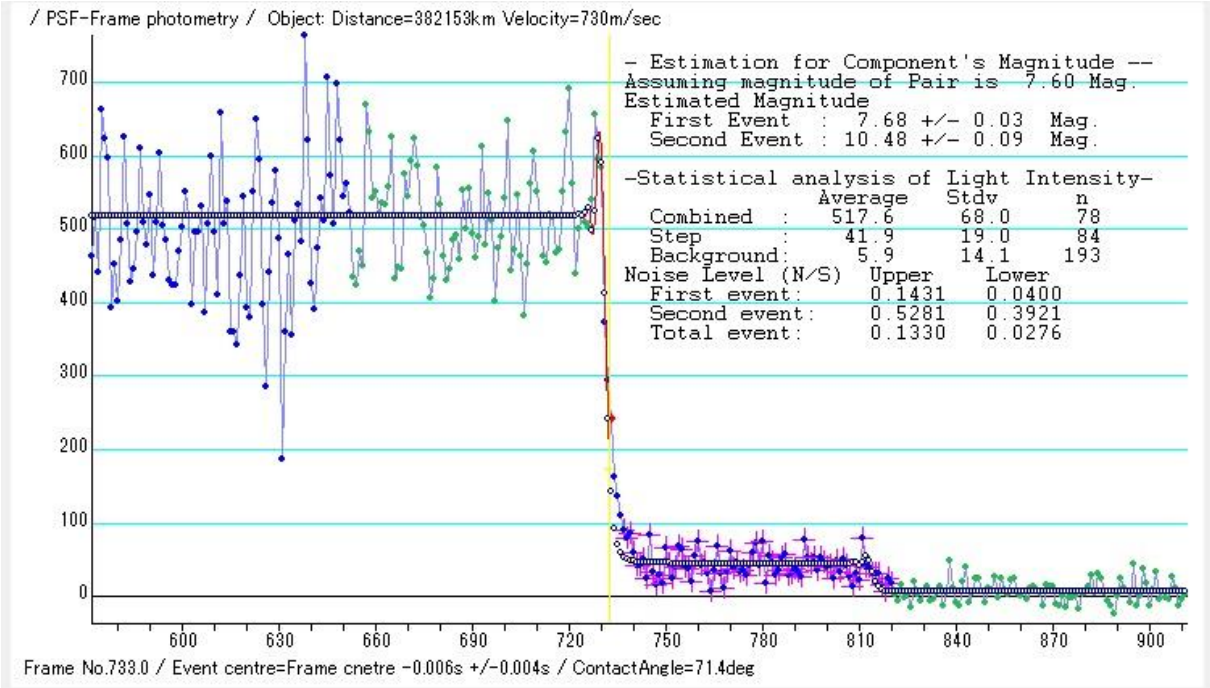

Figure 2. Plot of the observation with Limovie. The step event is marked in purple.

Position Angle and Separation

A determination of PA and separation is not possible with a single observation of a total lunar occultation of a double star. With the radial velocity of the Moon of 0.12"/s at the point of ingress of the star and a duration of the step event of 1.4 s the separation of the two components is at least 0.17". The position angle at the ingress of the star into the Moon's limb was predicted to 165°. Therefore, the value for the position angle of the double star system should be between 75° and 255°.

The Double Star

HIP 36603 = SAO 79470 = XZ 11232
7.7 mag +/- 0.03 mag
10.5 mag +/- 0.09 mag
Sep > 0.17"
PA >75° <255°

Checking the Catalogues

The star was not listed as a double star in Occult, the software which was used to make the predictions. A check of available catalogues in the Vizier database revealed no double star flags for this star. The Fourth Catalog of Interferometic Measurements of Binary Stars flagged the star as "Hipparcos suspected non-single". In the Gaia EDR3 the star was not marked as double.

Confirmation

More observations of this star are needed for the accurate determination of PA and separation. The next total lunar occultation of this star will not happen before late 2026.

Conclusion

Discovery of double stars are still possible in the age of automated sky surveys. A step event just above the noise level during a total lunar occultation can be recorded with high frame rates, a dynamic range of > 8 bit and an amateur telescope.

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