

A New Double Star from an Asteroidal Occultation: UCAC2 41168613

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Abstract: An occultation of UCAC2 41168613 by the asteroid (675) Ludmilla on 2010 October 20 showed this star to be a double star. Only one component of the double star was occulted as seen by one observer and both components were occulted as seen by the other observer. The separation of the two components is 0.0283 ± 0.002 arc seconds at a position angle of 205.1 ± 3.5 degrees. The magnitude of the primary component is estimated to be 12.13(r). The magnitude of the secondary component is estimated to be 12.33(r).

Observation

On 2010 October 20 Coughlin and Fleishman observed the asteroid (675) Ludmilla occult the star UCAC2 41168613 from two locations near Santa Rita, B.C.S., Mexico (Figure 4). The observations were made with 25 cm (Coughlin) and 25 cm (Fleishman) telescopes, using video with GPS-based time insertion to record the event. Coughlin's two step-event observations are shown in Figures 1A and 1B. Fleishman's event is shown in Figure 2. The star is of magnitude 11.47 (R). The expected magnitude drop at occultation was 0.97 magnitudes. Coughlin observed a 0.391 and 0.472 magnitude drop in each of the two events – a combined magnitude drop of 0.863 which is very close to the predicted 0.97. Fleishman observed a 0.348 magnitude drop, very close to the 0.391 observed by Coughlin in the first step of the two step event.

The star is not listed in the Fourth Interferometric Catalog, nor is it listed in the Washington Double Star catalog.

The observations were analyzed in the standard manner described by IOTA. The error analysis was performed by David Dunham: "Three observed chords are insufficient to determine the elliptical outline of Ludmilla, the separation and position angle (PA) of the stellar components, and the center of the ellipse relative to the primary star. A unique solution has been obtained by assuming that the asteroid is circular, but that just determines the parameters without allowing a formal estimate of errors of the determination. However, the fact that Fleishman's chord (labeled #1 in Fig. 3) for the secondary and Coughlin's chord (#4) for the primary are close to each other on the northern side of the asteroid allows

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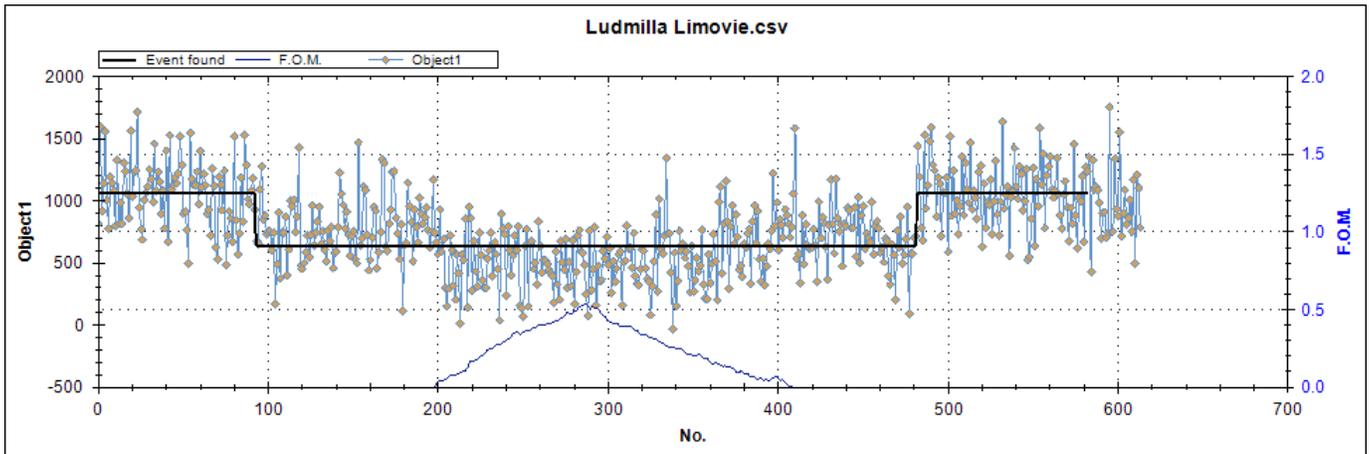


Figure 1A: Coughlin primary event – note secondary occultation in bottom of event.

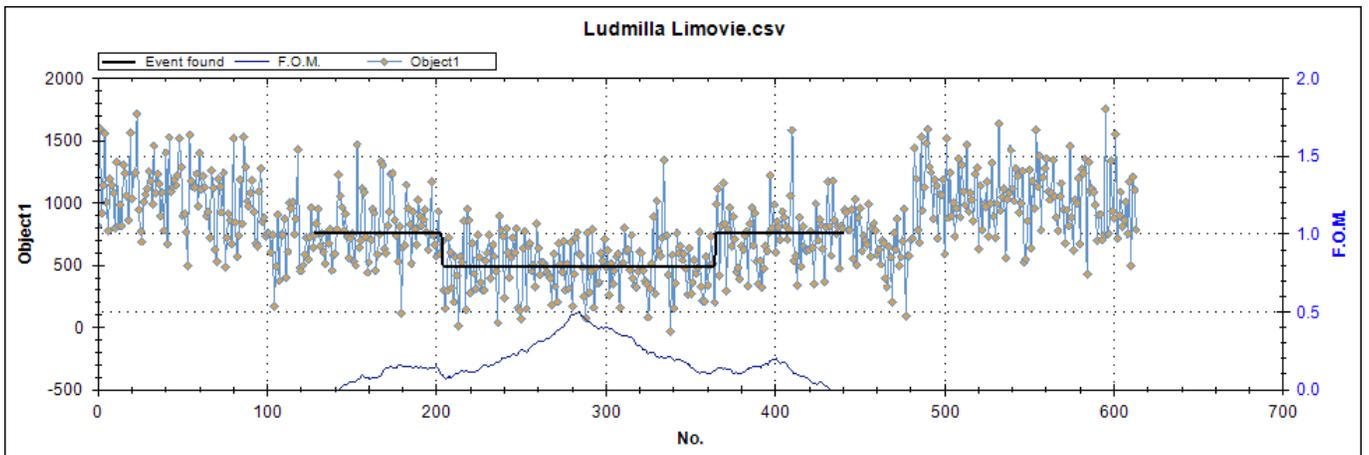


Figure 1B: Coughlin secondary event

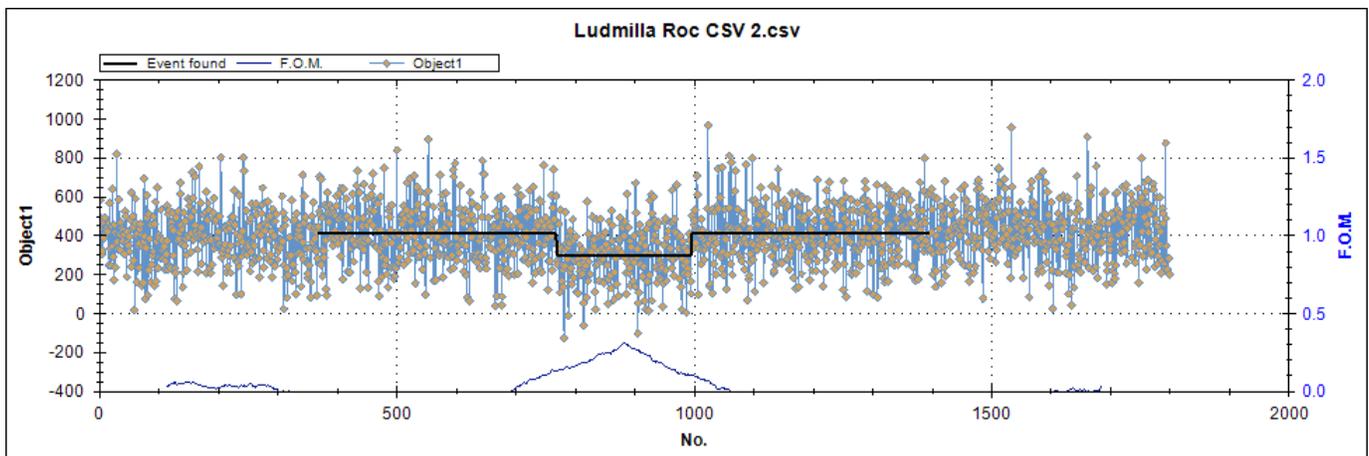


Figure 2: Fleishman event

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(675) Ludmilla 2010 Oct 20 86.0±1.1 x 86.0 km. PA 0.0
 Geocentric X -5177.7±0.1 Y 1089.0±0.5 km
 Double: Sep 0.0283". PA 205.1"

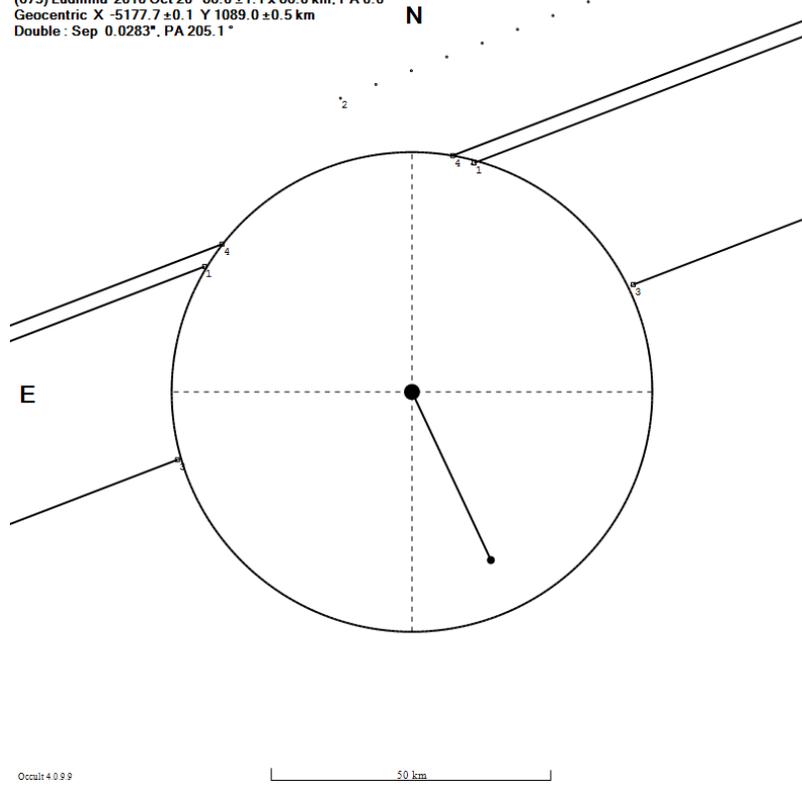


Figure 3: Occultation (675) Ludmilla occultation of UCAC2 41168613 plot

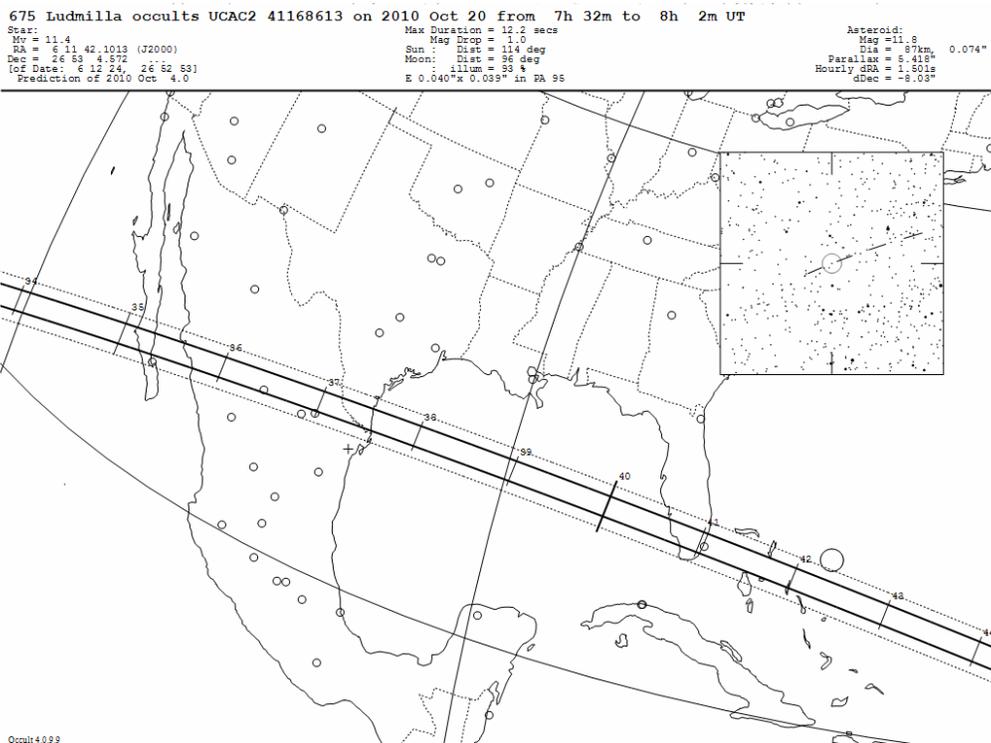


Figure 4: Occultation Path

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us to estimate the maximum error of the double star parameters. These errors are half the distance between the disappearance points of chords 1 and 4 on the sky plane, that distance being nine kilometers." Based on the Dunham analysis, the separation error is $\pm 0.002''$ and the Position Angle (PA) error is ± 3.5 degrees.

Magnitude estimates for each component were made using the brightness measurements derived by Occular 4.0, the Magnitude calculator routine in Occult4 (Method 3 – Magnitudes from light curve values), and the M(r) combined magnitude from PPMX catalog.

Based on the data presented in this report, the double star characteristics as shown in Figure 3 are:

Star UCAC2 41168613
 3UC 234-056430
 NOMAD 1168-0112907
 PPMX 061142.0+265304 (RMag 11.473)
 spectral type not known to authors

Coordinates (J2000)
 RA 06 11 42.098
 Dec +26 53 04.63 (Vizier PPMX)

Mag A 12.13 ± 0.1 (PPMX)

Mag B 12.33 ± 0.1 (PPMX)

Separation 0.0283 ± 0.002 arcseconds

Position Angle 205.1 ± 3.5 degrees

Acknowledgements

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