

HC-007

Stefano Sposetti, 28.11.2025

Event data

OW Cloud, url:

<https://cloud.occultwatcher.net/event/1445-937-96858-649243-U034016>

Prediction

Last Updated: 18/Oct/24, 23:25 UT
Data Sources: Horizons/GaiaEDR3
Error (path widths): 0.031
Err. Ellipse: [0.0012" x 0.0003"](#)
Err. Basis: Known errors
Computed By: OWC
Orbit Date: 10 Oct 2024 (**JPL#61**)
Error in time: 0.1 sec
Err. Ellipse PA: 97°
OWC Id: 2005653

Event

From: 20:33:30 UT
To: 20:47:38 UT
Combined Mag: 12.37
Mag Drop (V): 2.65
Shadow Width: 14.5 km
Solar Elong.: 163°
Max Duration: 1.0 sec
Mag Drop (R): 2.14
Moon Phase: 97% sunlit
Moon Elong.: 9°

Target Star

Name: [UCAC4 550-034016](#)
Constellation: Gemini
Diameter: ()
RUWE: [1.00](#)
Gaia SourceId: [3365760776596906752](#)
RA [ICRS]: 06^h 49^m 34^s.8963
Dec [ICRS]: +19° 48' 49".814
V mag: 12.90
R mag: 12.53
B mag: 13.12
Flags:
Gaia Flags:
RA [aprt]: 06^h 51^m 04^s.7673
Dec [aprt]: +19° 47' 07".709

Object

Name: [\(937\) Bethgea](#)
Diameter: 12 ± 0.8 km (Occult)
Distance: 1.5883 au
Motion RA: -38.98 "/hr
Moons: 0
Detections: 1(1+)
Class: Main-belt Asteroid
Diameter (augm): 10.43 mas
Mag: 15.4

Motion Dec: $-0.44''/\text{hr}$
Rings: 0



Image: Screenshot from OWC, Target star field, FOV 10 arcmin

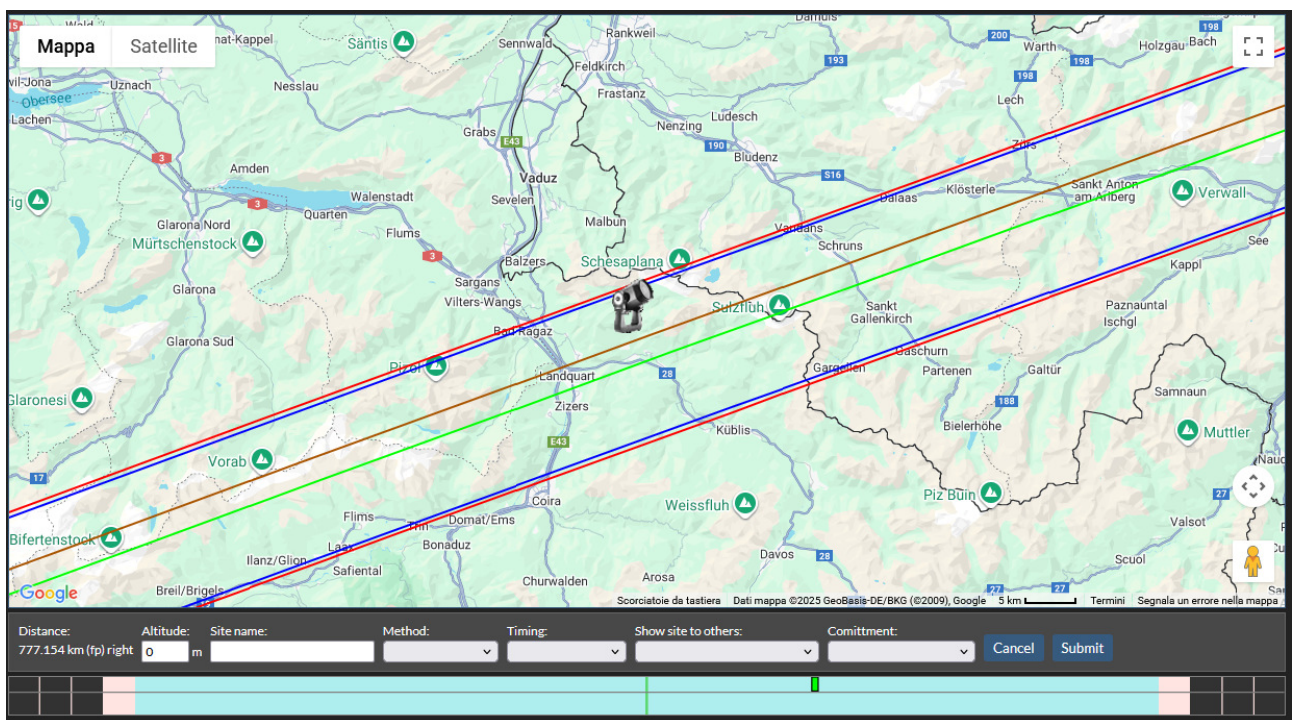


Image: Screenshot from OW Cloud, Earth map

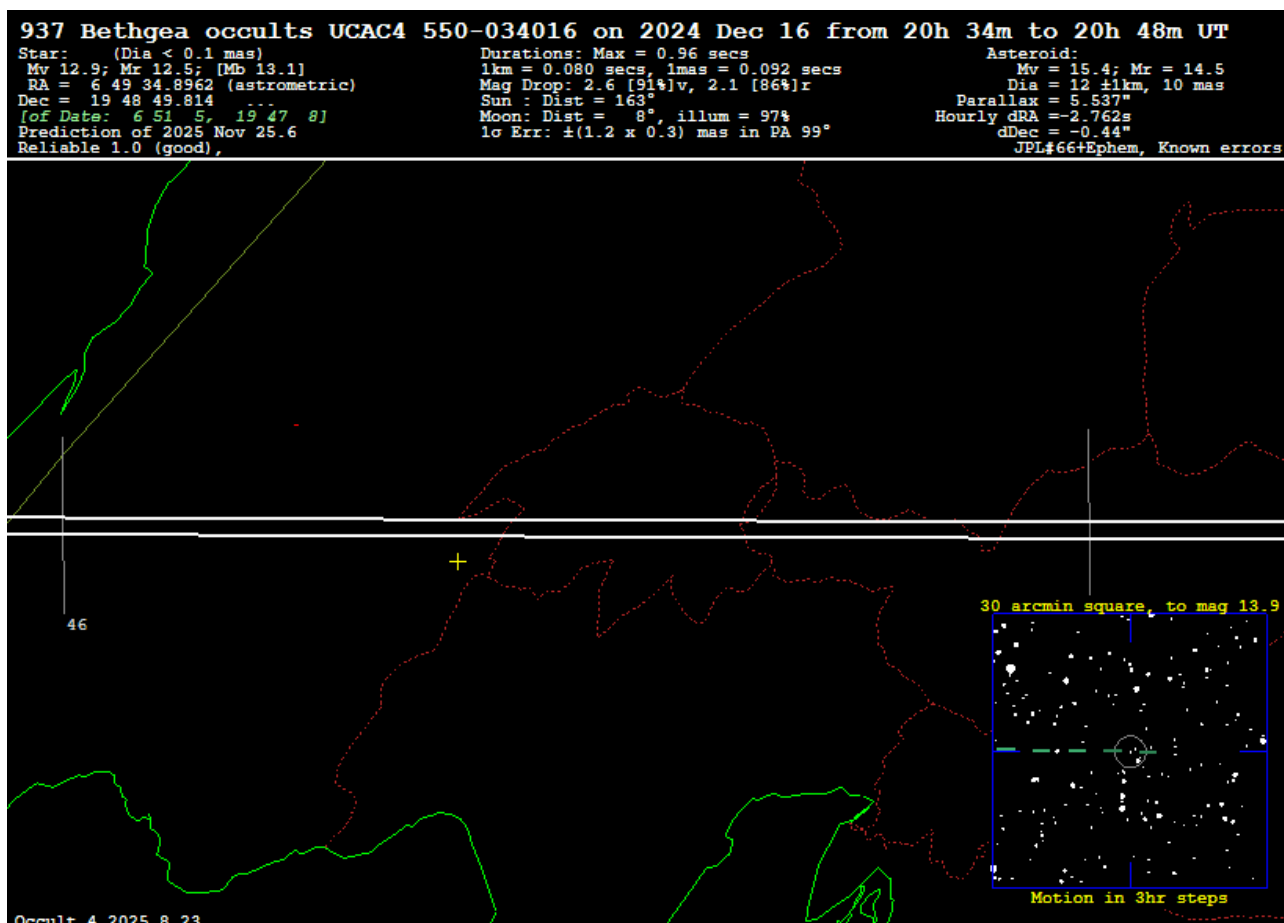


Image: Screenshot of the predicted path from Occult4

Observational data

Name	Country	Geogr. Coordinates WGS84	Telescope	Camera	Integr. time	Timing
C. Ziolek	CH	E Long: 9d 38m 24.3s N Lat: 46d 59m 33.0s Alt: 970 m	SCT, 36 cm	DVTI+CAM, serial #43	100 ms	GPS

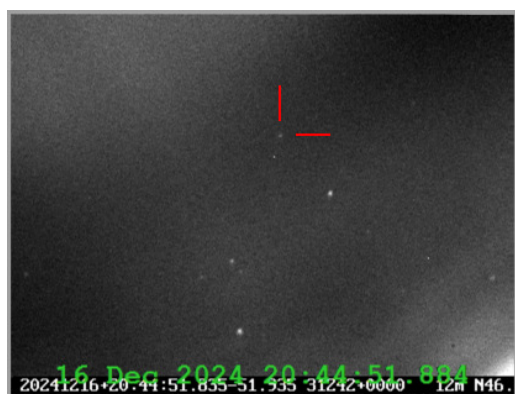


Image: In red the target star in the FOV

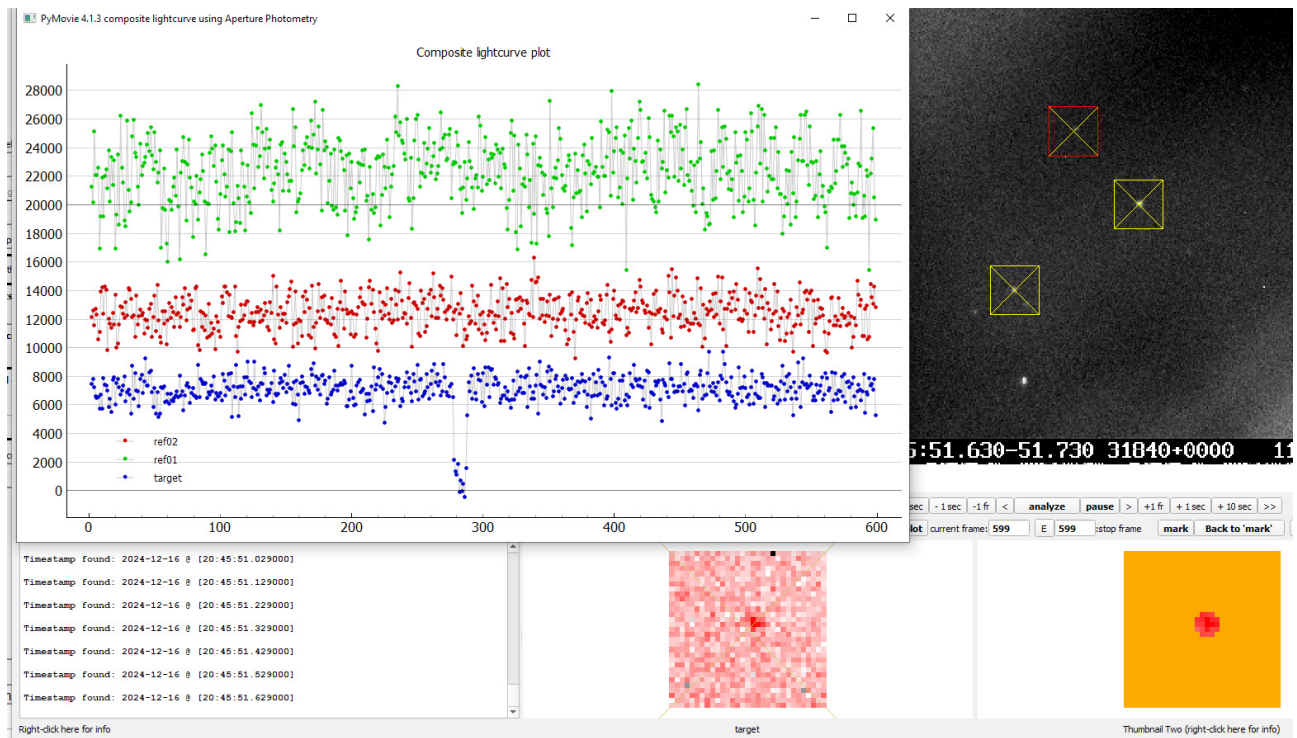


Image: Lightcurve from the observer

Observational conditions

StarAlt, deg: 37
 StarAz, deg: 100
 Transparency: 1
 Stability: 1
 Moon lit, %: 97
 Moon distance, deg: 9

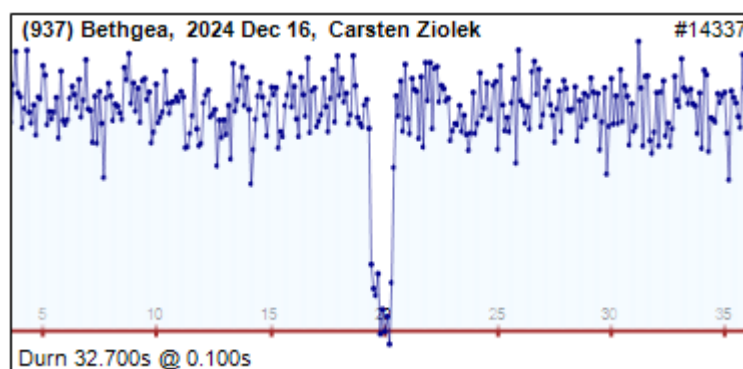


Image: Plot of the lightcurve from the DAT file hinting for a double star case

Data reduction of the ADV file and analysis of the lightcurve

I used PYMOVIE with:

aperture: 31 x 31 pixels
 mask: 12 circular masks

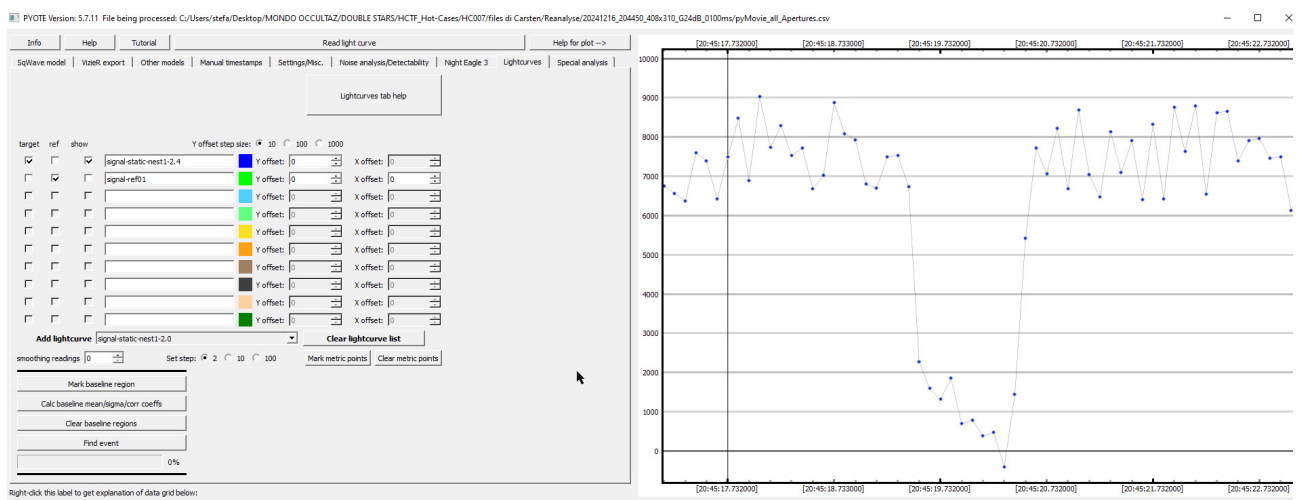


Image: Lightcurve with circular nest 2.4 gave the best results

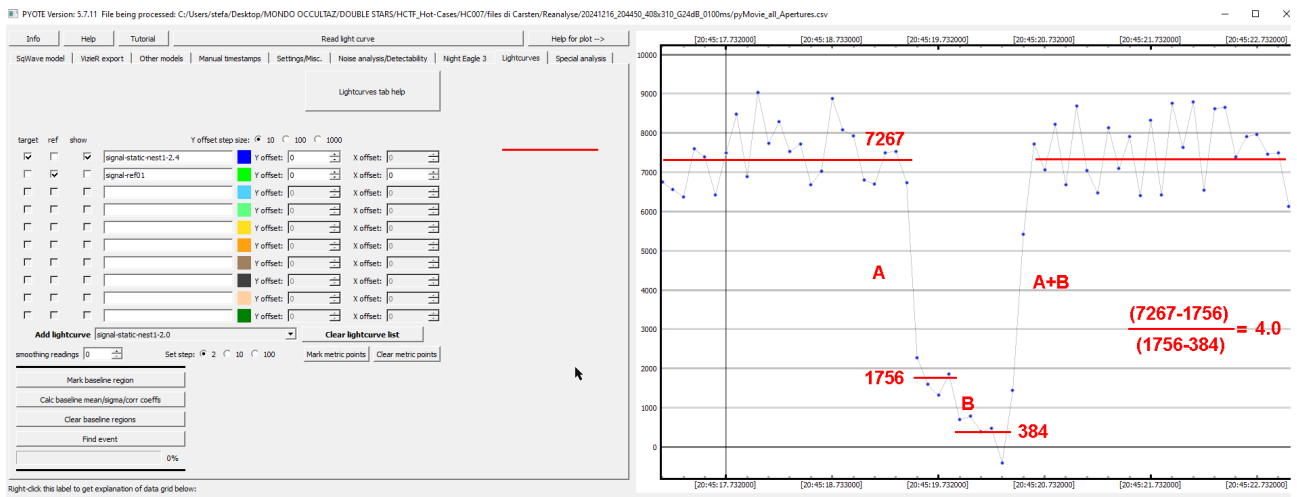


Image: light intensities

Evaluation of the light intensity:

light of A+B+asteroid: 7267 ADU
light of B+asteroid: 1756 ADU
light of asteroid: 384 ADU

$$A/B = (7267 - 1756) / (1756 - 384) = 4.02$$

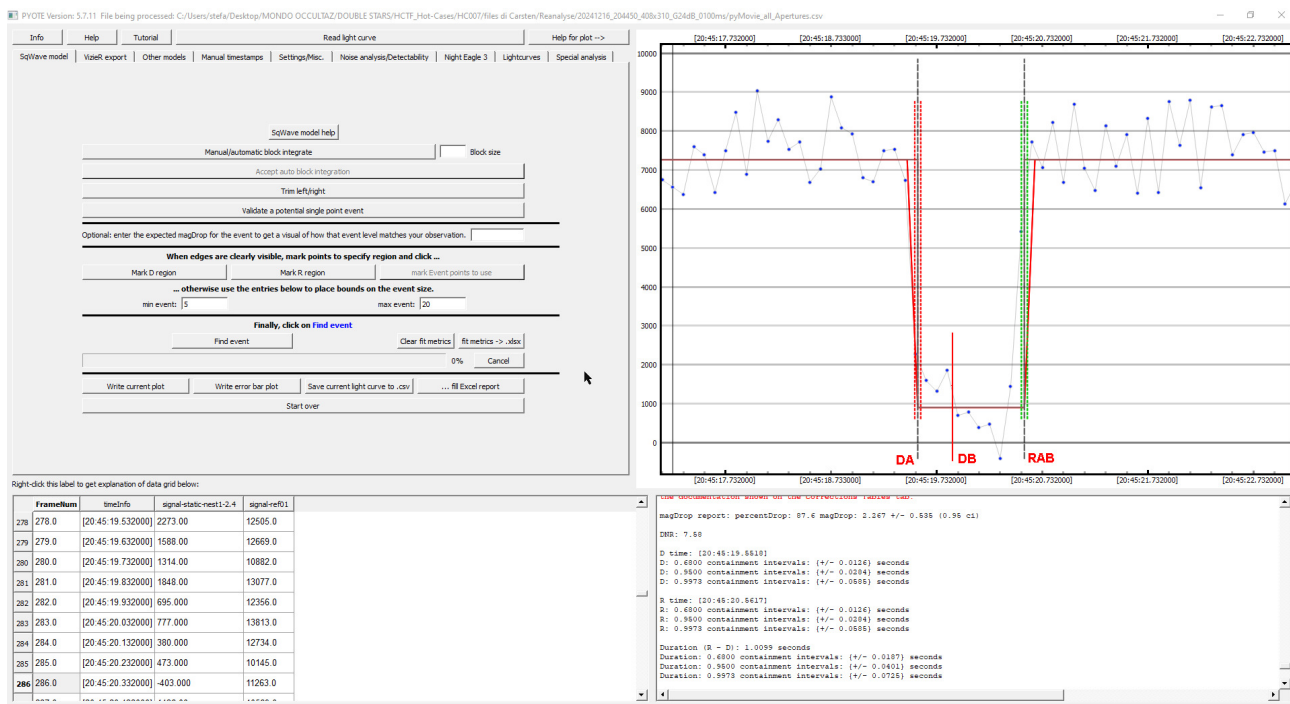


Image: Evaluation of DA, DB and RAB times with PyOTE

Measured DA, DB and RAB times:

DA: 20:45:19.552 $\pm$ 0.03

DB: 20:45:19.932 $\pm$ 0.05

RAB: 20:45:20.562 $\pm$ 0.03

DA and RAB times were calculated from PyOTE

The DB transition occurs between frame number 281 and 282.

The DB time was extracted from the average times of the frame numbers 281 and 282.

MANUAL analysis

I assume a circular asteroid.

The durations of the two occultations were:

occ. duration of the A star: 20.562 - 19.552 = 1.10 s $\pm$ 0.06 s

occ. duration of the B star: 20.562 - 19.932 = 0.63 s $\pm$ 0.08 s

Because the duration of the A star matches the predicted maximal duration (1.0 s), I assume a central occultation of the A star. The asteroid occulted the B star marginally. Only two solutions are possible.

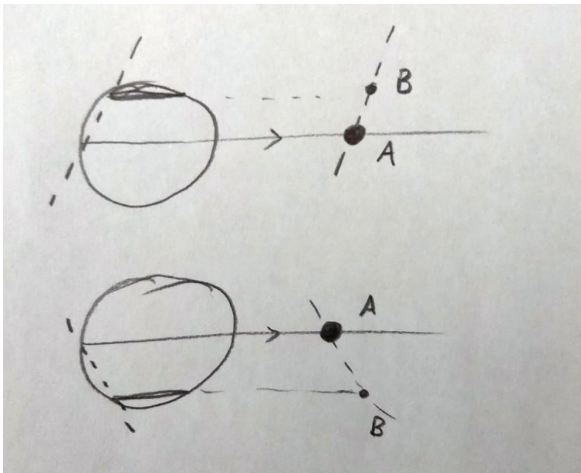


Image: manual drawing of the occultation

OCCULT4 analysis

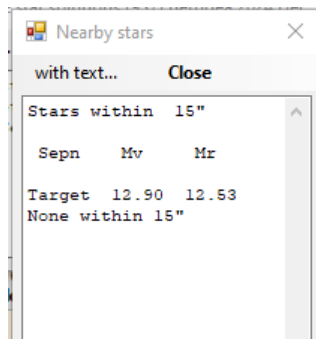


Image: Nearby stars

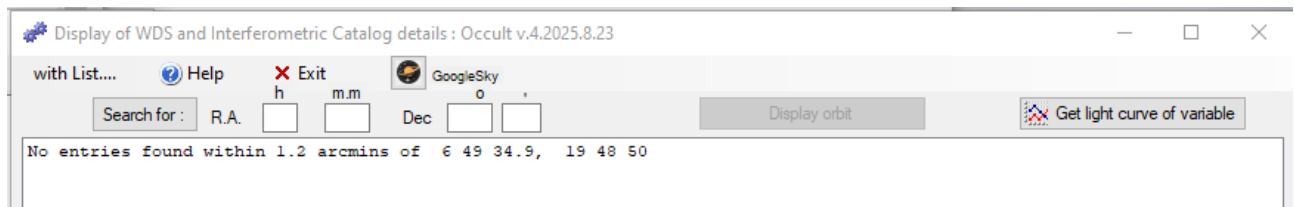


Image: Display of WDS Catalog

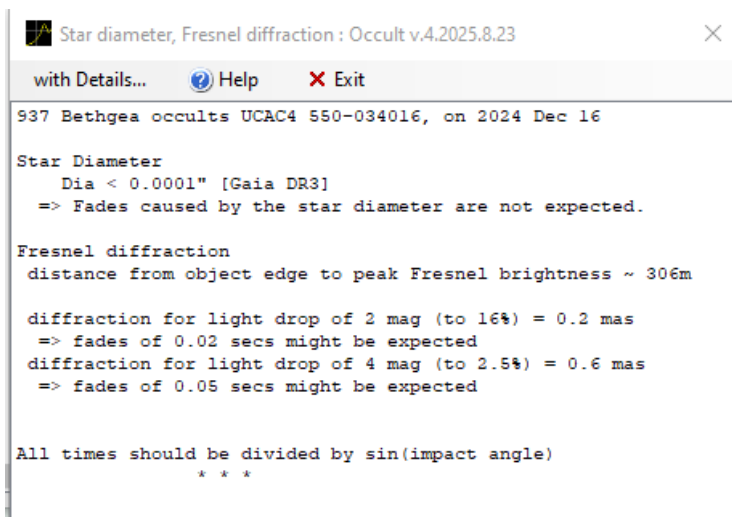


Image: Fresnel diffraction

DAMIT: no model available

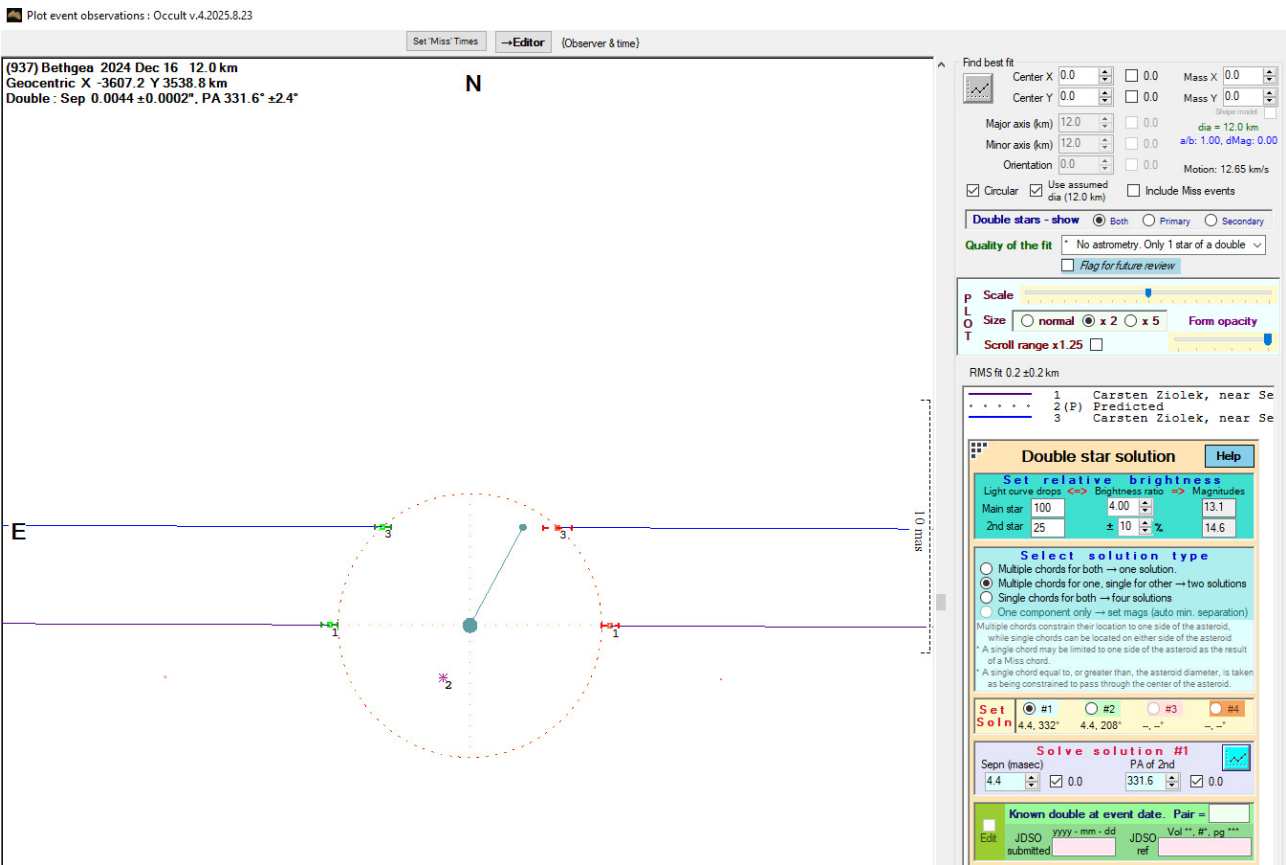


Image: Solution 1

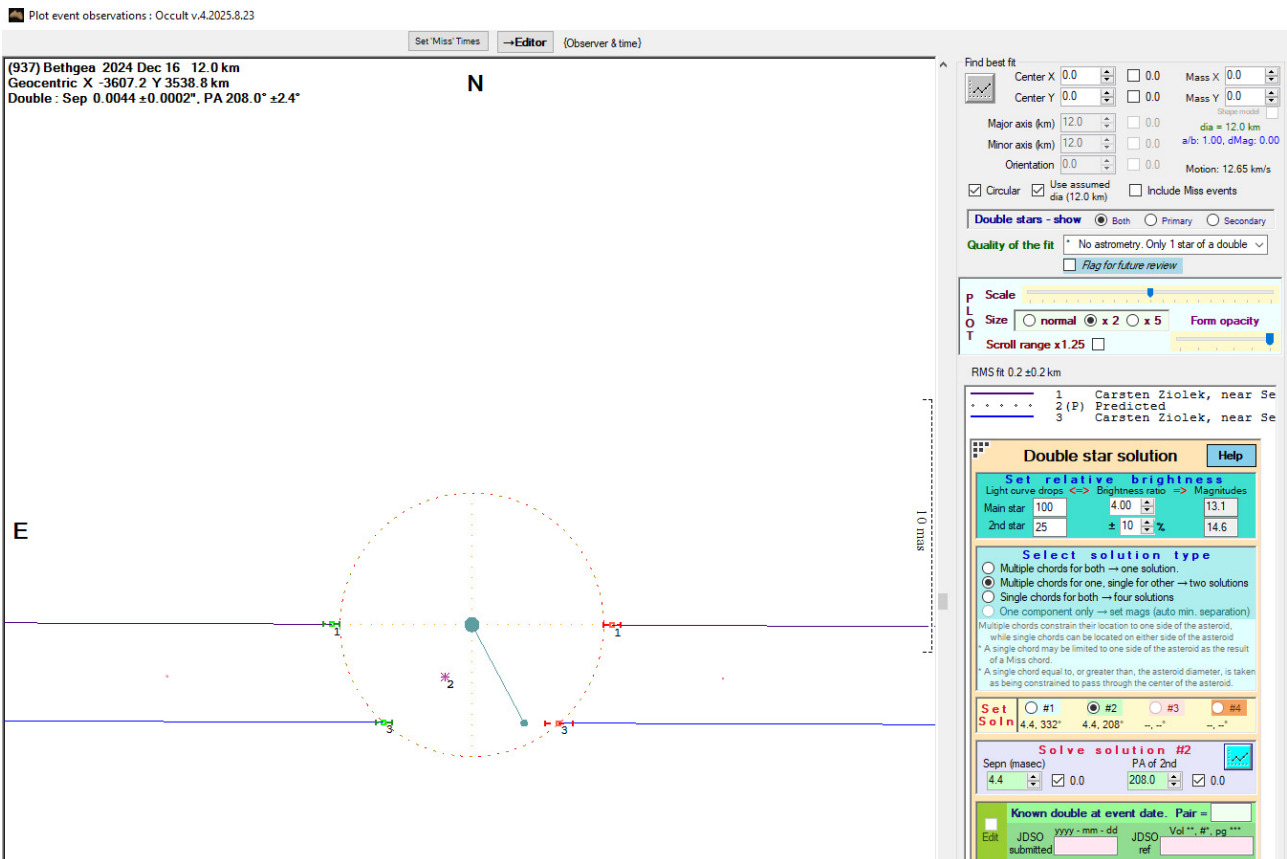


Image: Solution 2

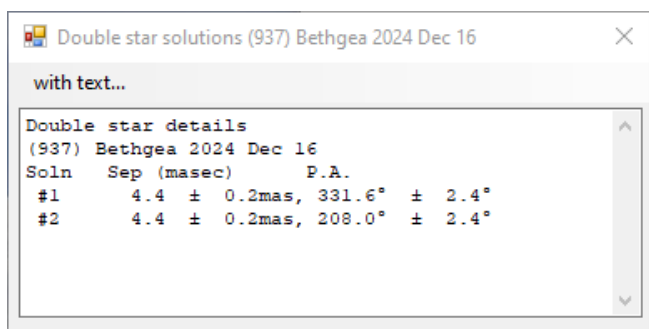


Image: Double star solution

Light intensity results:

A star: 13.1 mag

B star: 14.6 mag

A + B star: 12.9 mag

The resulting xml file:

```
<AsteroidOccultations>
<FileVersion>2.15</FileVersion>
<Event>
<Date>2024|12|16|20.7</Date>
<Details>
<Star>UCAC4|550-034016|3|3365760776596906752|6.8263600723|19.813837280|0.16|0.13|0.00|0|6.85132426|19.7854748|13.12|12.90|12.53|0</Star>
<StarIssues>1.00|0|0|0|4.00|10|0.42|0.00|0.04|0.78|</StarIssues>
<Asteroid>937|Bethgea|-7.04202890|-0.07859116|-0.0016461|0.0004478|0.0000013|-0.0000001|5.53677|0.00031|12.0|0.8|15.43</Asteroid>
<EventFits>
<SolveFlags>0|0|0|0|1|0|1|1</SolveFlags>
<EllipticFit>0.0|0.0|12.0|12.0|0.0|6|1|0|0.0|0.0</EllipticFit>
<EllipseUncertainty>||||</EllipseUncertainty>
<DoubleStar>
<JDSO>|</JDSO>
<Solution>331.6|4.4|2.4|0.2|0|0|0|1</Solution>
<Solution>208.0|4.4|2.4|0.2|0|0|0|2</Solution>
</DoubleStar>
</EventFits>
<Astrometry>
<ReferenceTime>2024|12|16|20.7556008|0.030|0.00</ReferenceTime>
<MainBody>937|-3607.2|3538.8|-3.1393|3.0641|0.0042|0.0042|0|2|0|4|-5.4|-1.2|0.00|0.00|9.00|-9.00</MainBody>
<MainAtConjunction>937|-40.0|3578.6|2024|12|16.8615075|0.0000006|0.5|3.1069|4.2|359.210|0</MainAtConjunction>
<MPC>|</MPC>
</Astrometry>
</Details>
<Observations>
<Observer>
<ID>1|Carsten Ziolk||0|Seewis Dorf|CH|+ 9 38 24.3|+46 59 33.0|970| |36|3|a|a</ID>
<Conditions>1|1|7.8|</Conditions>
<D>20 45 19.55|D|0.03||| </D>
<R>20 45 20.56|R|0.03||| </R>
</Observer>
<Prediction>2|+ 10 0 0. |+47 3 36. |20 45 18.53|JPL#66+Ephem</Prediction>
<Observer>
<ID>3|Carsten Ziolk||0|Seewis Dorf|CH|+ 9 38 24.3|+46 59 33.0|970| |36|3|a|a</ID>
<Conditions>1|1|7.8|</Conditions>
<D>20 45 19.93|d|0.05||| </D>
<R>20 45 20.56|r|0.03||| </R>
</Observer>
</Observations>
<Added>2025|11|24</Added>
<LastEdited>2025|11|24</LastEdited>
</Event>
</AsteroidOccultations>
```