

## Obserwacje zakryć z Poznania i okolic

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seminarium SOPiZ online  
12 września 2020

# Zakrycie gwiazdy 3UC 245-025166 przez planetoidę (54) Alexandra

Hello to Poznan,

I need a contact to observer in your region. I send my mail to some addresses in your department. Maybe you can help.

Thank you for any support

Dr. Eberhard Bredner

International Occultation Timing Association / European Section ( IOTA/ES )

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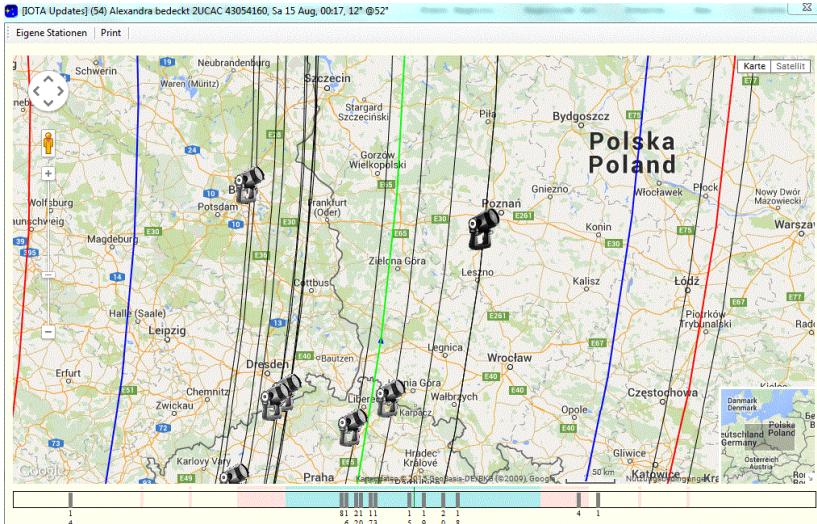
the occultation by 54 Alexandra in Poland on/near the European Road E 30 between Swiebodzin and Poznan.

The occultation is on August 14 at 22:15 UT or August 15 at 00:15 CEST.

Is there any amateur observer in this region who wants to join me?

He / she only has to bring with the telescope ( 20 cm would be OK ), all the electronic will be supported by me.

# (54) Alexandra, przewidywane parametry zakrycia. 14 sierpnia 2015





## (54) Alexandra, wyniki

← → ⓘ | www.euraster.net/results/2015/index.html#0814-54

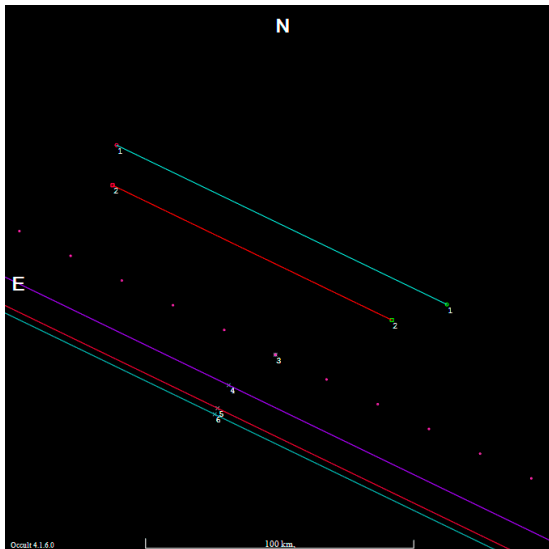
**2015/08/14 | 54 | Alexandra | 2UCAC 43054160**  
 asteroid measurement: at least 137 km  
[chords](#)

P+	prediction	22:17:33	22:17:33				E 13 25 02	N 46 23 44	0	WS	;
0+	Johan Warell	22:17:45	22:18:45	M250	CCD	SE	E 13 30 38.5	N 55 26 09.4	38	WS	
	6.46	22:18:08.82	0.19	22:18:15.28	0.19	NTP					;
0+	Zdenek Moravec	22:16:58	22:18:31	M432	VID	CZ	E 13 50 48.3	N 50 38 18.0	275	WS	
	5.46	22:17:47.01	0.30	22:17:52.47	0.48	GPS++					;
0-	Gerhard Dangl	22:15:57	22:19:40	M254	VID	AT	E 15 14 08.3	N 48 47 13.5	600	WW	
<i>Previously reported as positive but modified as negative at the observer request due to bad signal and incompatibility with the other results.;</i>											
0-	Bernd Gaehrken	22:16:00	22:19:00	M150	VID	AT	E 15 22 02.2	N 48 13 27.4	261	WS	
	1.28s integration.;										
0-	E. Bredner et al	22:00:00	22:30:00	M356	VID	PL	E 16 39 30.0	N 52 05 41.0	135	WS	
<i>Observation with A. Marciniak/M. Malicak.;</i>											

W Kościanie obserwacja negatywna.

Tylko 2 pozytywne obserwacje: ze Szwecji i z Czech.

# (54) Alexandra, cięciwy okultacyjne



Best fit

Center X 0.0  0.0  
Center Y 0.0  0.0

Major axis (km) 160.0  0.0 a/p=1.00  
Minor axis (km) 160.0  0.0 d/M=0.00  
Orientation 0.0  0.0 Motion  
19.07km/s, X

Double star or double asteroid

Seprn (masec) 0.0  0.0  
PA of 2nd 0.0  0.0

Show:  Both  Primary  Secondary

A= 10.0  B= 10.0  PA= 0.0

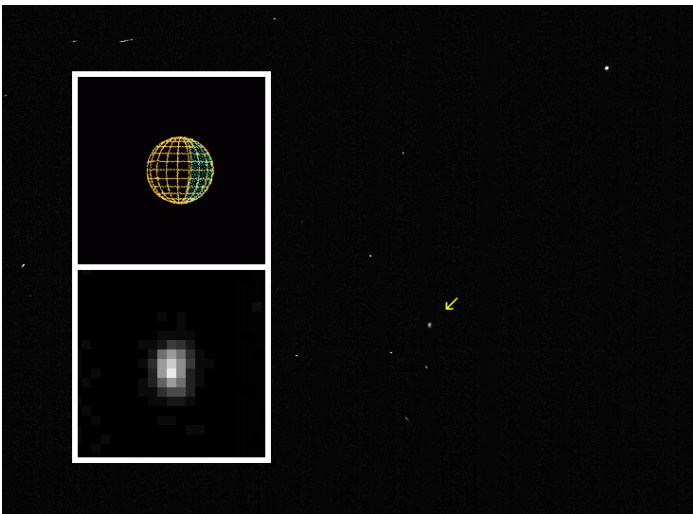
Circular  Include Miss events

Plot scale  Quality Not fitted ▾

RMS fit -15.5 ± 12.7 km

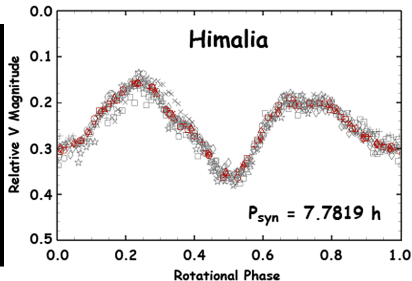
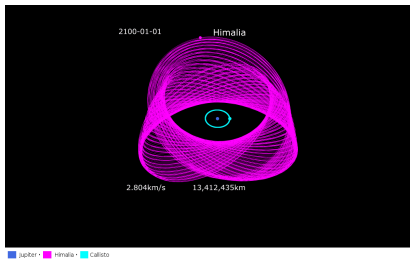
1	Johan Warell, SE
2	Zdenek Moravec, CZ
3 (P)	Prediction
4 (M)	Gerhard Dangl, AT
5 (M)	Bernd Gaehrken, AT
6 (M)	E Bredner/A Marciniak/M Me

# Zakrycie gwiazdy TYC 6168860 przez VI księżyc Jowisza, Himalię



Piąty co do wielkości księżyc Jowisza ( $140 \pm 20$  km x  $120 \pm 20$  km).  
Typ taksonomiczny C. Gęstość od 1.63 do 3.33 g/cm<sup>3</sup>.

# Zakrycie gwiazdy TYC 6168860 przez VI księżyc Jowisza, Himalię



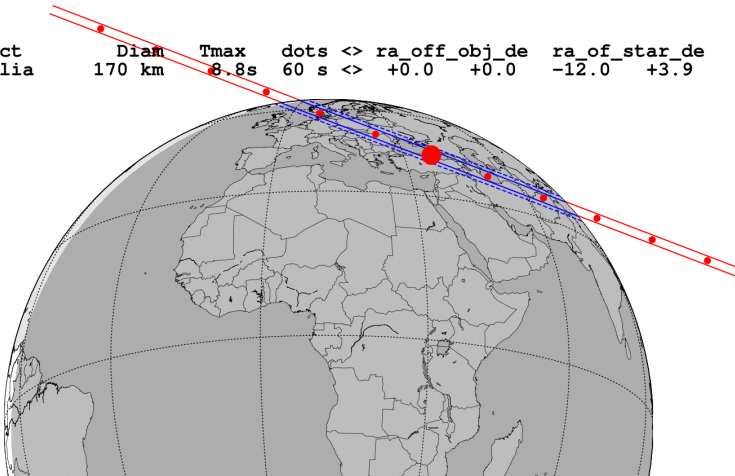
Orbita Himalii wokół Jowisza i jej krzywa zmian blasku.

JPL Horizons; Pilcher et al. 2012



# Himalia, przewidywane parametry zakrycia. 20/21 maja 2018

Object	Diam	Tmax	dots <>	ra_off_obj_de	ra_of_star_de
Himalia	170 km	8.8s	60 s <>	+0.0 +0.0	-12.0 +3.9



F. Braga-Ribas





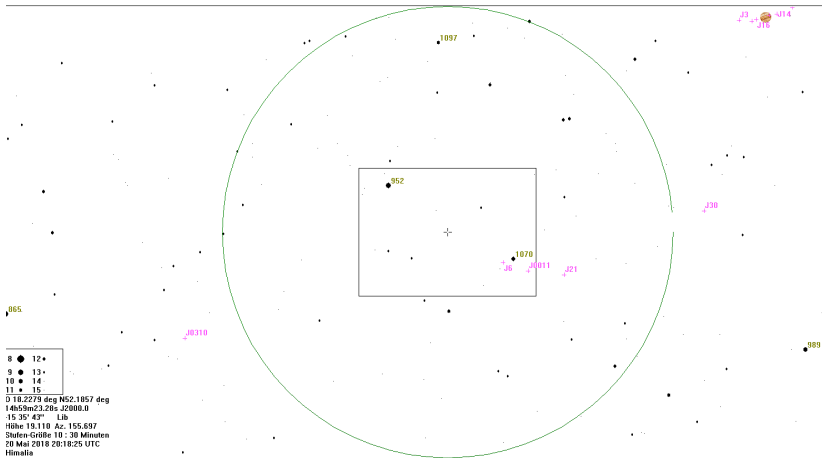
# Himalia. Sprzęt do obserwacji



# Himalia. Sprzęt do obserwacji

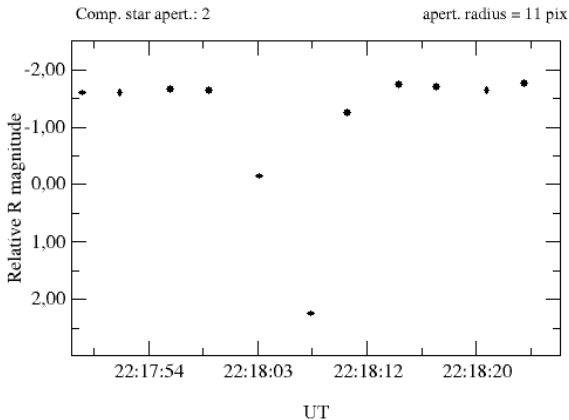


# Himalia. Pole gwiazdowe





# Himalia zakrywa gwiazdę 10.7 mag. Krzywa zmian blasku z Borowca



Teleskop fotometryczny, 40-cm Newton. Kamera SBIG ST7.  
Czas naświetlania: 2 sekundy. Czas odczytu: 1.4 sekundy.



## Himalia, czasy zajścia zjawiska

Station Poznan ( Anna Marciniak )  
disappearance 22:18:04.023 +/- 0.16 s  
reappearance 22:18:11.063 +/- 0.16 s  
duration of occultation 7.040 s

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station Konin ( Eberhard Bredner )  
D 22:17:59.290 +/- 0.08 s  
R 22:18:06.650 +/- 0.08 s  
duration of occultation 7.360 s.  
Data reductions by Gerhard Dangl.

=====  
Station Borowiec ( Roman Hirsch ):  
D 22:18:03 +/- 1 s  
R 22:18:09 +/- 1 s  
duration of occultation: 6.0 s  
Initial data reductions by Anna Marciniak.

## Himalia, wyniki

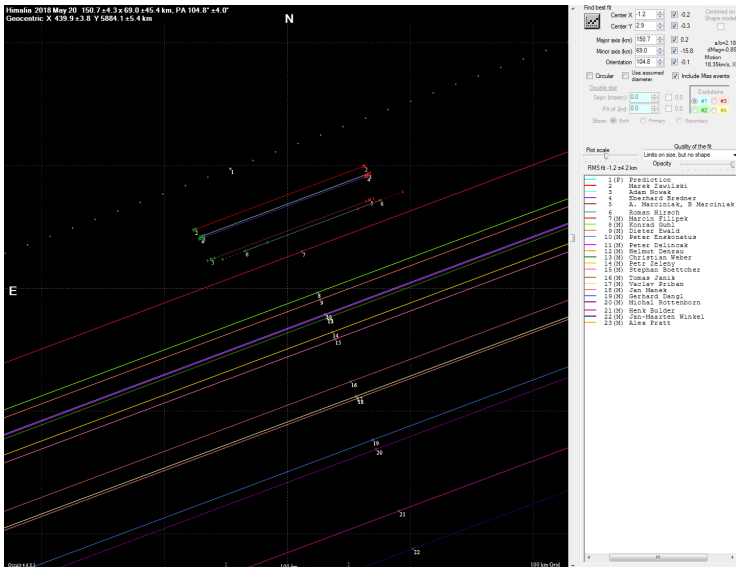
2018/05/20 | P5H06 | Himalia | TYC 6168-00860-1

chords

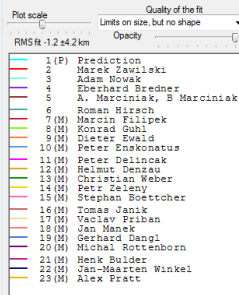
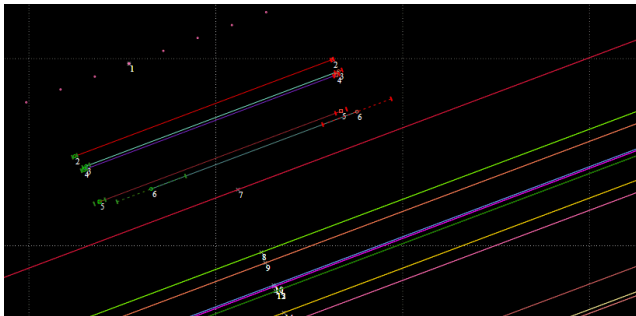
P+	prediction	22:18:03	22:18:03			E 18 59 10	N 53 00 00	0	WS	;
0-	Alex Pratt	22:18:04	22:20:04	M279	VID	UK	W 01 36 28.0	N 53 50 15.4	114	WS ;
0-	Jan-Maarten Winkel	22:15:35	22:21:35	M310	VID	NL	E 06 15 36.9	N 51 54 13.6	66	WS ;
0-	Henk Bulder	22:15:00	22:17:30	M305	VIS	NL	E 06 17 35.5	N 52 40 15.9	4	WS ;
0-	Stephan Boettcher	22:13:30	22:20:00	M300	VIS	DE	E 09 52 08.1	N 54 16 23.4	68	WS ;
0-	Helmut Denzau	22:12:00	22:22:00	M356	VID	DE	E 10 33 06	N 54 20 34	40	WS ;
0-	Konrad Guhl	22:15:00	22:22:00	M180	VID	DE	E 13 11 24	N 53 15 57	74	WS ;
0-	Michal Rottenborn	22:16:18	22:20:18	M303	VID	CZ	E 13 19 55.8	N 49 42 26.4	326	WS ;
0-	Christian Weber	22:15:24	22:20:19	L102	CCD	DE	E 13 25 41.6	N 52 30 58.5	40	WS ;
0-	Dieter Ewald	22:13:01	22:21:30	L127	VIS	DE	E 13 42 05.4	N 52 46 40.0	63	WS ;
0-	Peter Enskonatus	22:17:00	22:20:00	M200	CCD	DE	E 13 43 04	N 52 25 42	38	WS ;
0-	Tomas Janik	22:15:56	22:20:17	M254	VID	CZ	E 14 00 09.3	N 50 44 00.5	460	WS ;
0-	Vaclav Priban	22:11:16	22:21:03	M300	VID	CZ	E 14 28 35.8	N 50 08 27.0	325	WS ;
0-	Jan Manek	22:16:14	22:20:14	M205	CCD	CZ	E 14 46 51.7	N 49 54 33.2	530	WS ;
0-	Gerhard Dangl	22:16:37	22:20:20	M254	VID	AT	E 15 14 08.5	N 48 47 13.0	539	WS ;
0+	A. Marciniak et al	22:17:50	22:18:39	M150	VID	PL	E 16 56 40.0	N 52 26 57.8	85	WS ;
7.04	22:18:04.02	0.16	22:18:11.06	0.16	GPS++					
Observation with B. Marciniak/P. Krzenciessa.;										
0+	Roman Hirsch	22:00:20	22:29:44	M400	CCD	PL	E 17 04 30.8	N 52 16 36.8	123	WS ;
6	22:18:03	1	22:18:09	1	NTP					
0-	Petr Zeleny	22:15:50	22:20:20	M252	VID	CZ	E 17 58 24.5	N 49 27 47.9	338	WS ;
0+	Eberhard Bredner	22:10:00	22:20:00	M200	VID	PL	E 18 13 37.3	N 52 11 10.1	100	WS ;
7.36	22:17:59.29	0.08	22:18:06.65	0.08	GPS++					
0-	Peter Delincak	22:17:51	22:18:26	M400	CCD	SK	E 18 42 09.5	N 49 24 15.2	680	WS ;
0+	Marek Zawilski	22:16:00	22:20:00	M203	CCD	PL	E 19 03 22.4	N 51 54 48.3	140	WS ;
7.51	22:17:56.18		22:18:03.69	0.07	NTP					
0-	Marcin Filipek	22:11:00	22:21:00	M250	VIS	PL	E 19 44 58.6	N 50 12 46.1	430	WS ;
0+	Adam Nowak	22:16:54	22:19:05	M200	CCD	PL	E 20 36 23.9	N 50 47 05.3	258	WS ;
7.36	22:17:49.44	0.1	22:17:56.80	0.1	NTP					
Unreliable time source.;										

5 pozytywnych obserwacji, wszystkie z Polski.

# Himalia, cięciwy okultacyjne



# Himalia, cięciwy okultacyjne



[euraster.net/results](http://euraster.net/results)

# Himalia, prezentacja wyników. EPSC-DPS 2019, Genewa

EPSC Abstracts  
Vol. 13, EPSC-DPS2019-1909-1, 2019  
EPSC-DPS Joint Meeting 2019  
© Author(s) 2019. CC Attribution 4.0 license.



## The first stellar occultations by irregular satellites

**Altair R. Gomes-Júnior** (1,2), Marcelo Assafin (2,3), Felipe Braga-Ribas (4,5,6), Gustavo Benedetti-Rossi (4,6), Júlio I. B. Camargo (2,4), Bruno E. Morgado (4), Rodrigo Bouffeur (2,4) and Roberto Vieira-Martins (2,3,4)  
(1) UNESP - São Paulo State University, Grupo de Dinâmica Orbital e Planetologia, Guaratinguetá, SP, Brazil (altair.gomes@unesp.br) , (2) Laboratório Interinstitucional de e-Astronomia - LInEA, Rio de Janeiro-RJ, Brazil, (3) Observatório do Valongo/UFRJ, Brazil, (4) Observatório Nacional/MCTIC, Brazil, (5) Federal University of Technology Paraná (UTFPR-Curitiba), Brazil, (6) Observatoire de Paris – Meudon/LESIA, France;

### Abstract

#### 1. Introduction

The irregular satellites are objects that orbit the Giant Planets from great distances, with highly inclined, eccentric orbits and mostly retrograde. It is believed that these satellites were captured by their host planets during the Solar System evolution. Thus, studying them may give us hints about their region of origin.

In order to estimate their dimensions with great

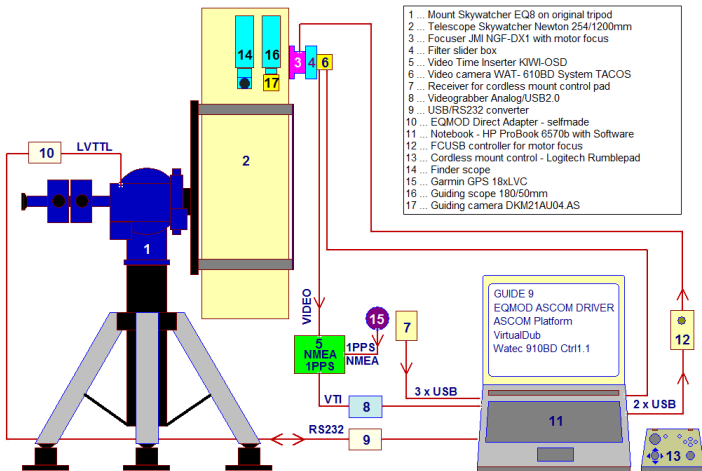
metre accuracy can be used to constrain the shape of Phoebe in the regions that were not observed by Cassini.

Since Phoebe already has a known shape from Cassini observations, we used the 3D shape model of [2]<sup>1</sup> to fit our chords. This is important because Phoebe is highly cratered so it is likely that the chords may have passed through topographical features.

#### 2.1. New rotational period for Phoebe



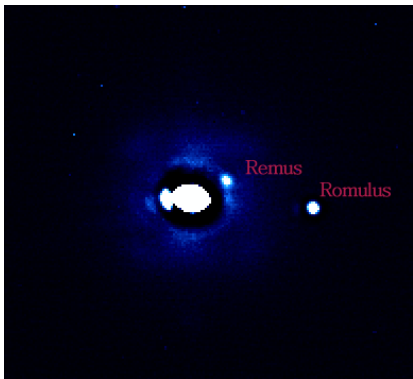
# Dygresja na temat kamery







# (87) Sylvia. Potrójna planetoida



Main body:  
385 x 265 x 230 ± 10 km  
1.2 ± 0.1 g/cm<sup>3</sup>

Romulus:  
diameter: 10.8 ± 5.6 km  
*ds/dp*: 0.038 ± 0.02

Remus:  
diameter: 10.6 ± 1.6 km  
*ds/dp*: 0.037 ± 0.006

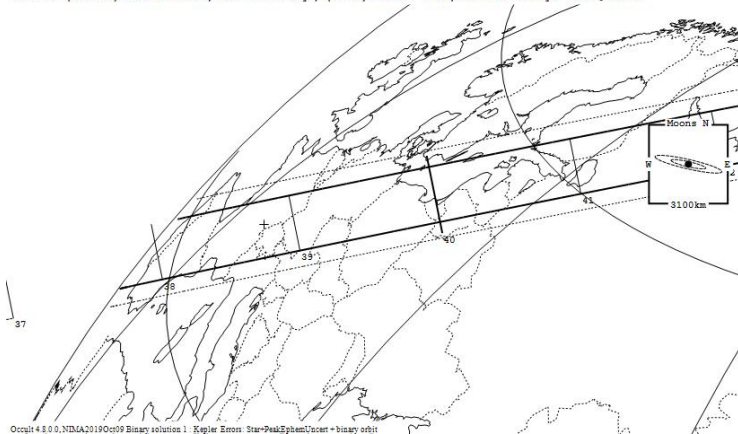
Marchis i in. 2005

# Zakrycie gwiazdy TYC 1932-00469-1 przez potrójną planetoidę (87) Sylvia

87 Sylvia #1 occults TYC 1932-00469-1 on 2019 Oct 29 from 23h 38m to 23h 49m UT

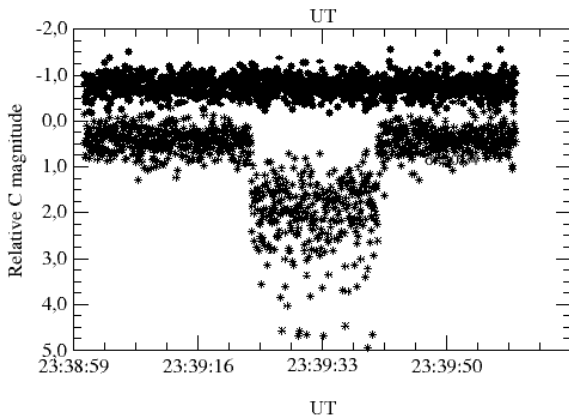
Star:	Max Duration = 23.0 secs	Asteroid: (in ISAM)
Mag V = 10.1	Mag Drop = 3.3 (0.0r)	Mag = 13.3
RA = 8 21 1.7489 (BCRS)	Sun : Dist = 95°	Dia = 286km, 0.114"
Dec = 25 57 43.125	Moon: Dist = 119°	Parallax = 2.544"
[cf Date: 8 22 12, 25 53 53]	: illum = 5 %	Hourly dRA = 1.296s
Prediction of 2019 Oct 11.0	E 0.032"x 0.032" in PA 90	dDec = 3.53"

2 moons. {Romulus} 11km at 1351km, Period 3.654days, {Remus} 11km at 702km, Period 1.373days Orbit@Miriade



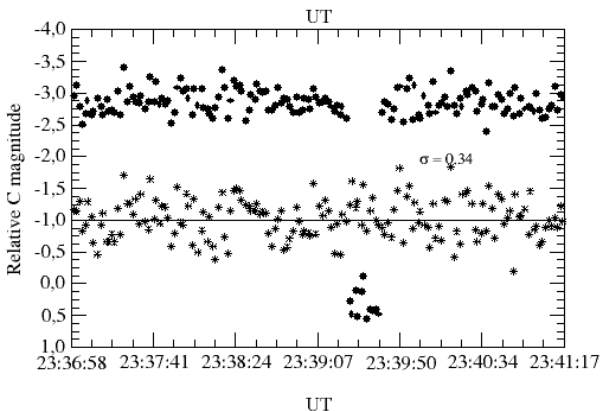
Occult 4 8.0.0.NIMA2019Oct09 Binary solution 1: Kepler Error: Star=PeakEphemUncert+binary orbit

# (87) Sylvia zakrywa gwiazdę 10.1 mag. Krzywa zmian blasku z IOA



Telescop: NexStar 8, Schmidt-Cassegrain, f/1.0, D=203 mm. Kamera: QHY174 CCD.  
Czas naświetlania: 0.05 s, Czas odczytu: 0.0004s.

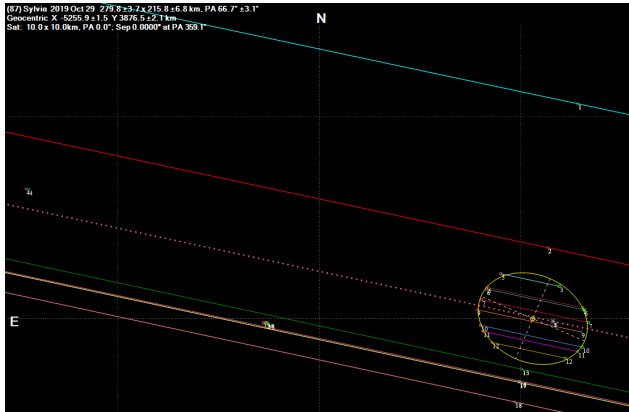
# (87) Sylvia zakrywa gwiazdę 10.1 mag. Krzywa zmian blasku z Borowca



Teleskop fotometryczny, 40-cm Newton. Kamera SBIG ST7.  
Czas naświetlania: 0.3 sekundy. Czas odczytu: 1.2 sekundy.

## (87) Sylvia, wstępne wyniki

(87) Sylvia 2019 Oct 29 2:08 B=3.7x215.8±6.8 km, PA 66.7°±3.1°  
 Geocentric X: -5255.9±1.5 Y: 3876.5±2.1 km  
 Sat: 10.0 x 10.0 km, PA 0.0°, Sep 0.0000" at PA 359.1°



Find best fit

Center X: 0.4  0.0  Centered on Shape model  
 Center Y: 6.7  0.0

Major axis (km): 279.8  0.0  a/b=1.30  
 Minor axis (km): 215.8  0.0  a/bage=0.28  
 Orientation: 66.7  0.0  Motion: 12.14 km/s, X

Circular  Use assumed diameter  Include Max events

Double asteroid  3σ Plot range

Seprn (masses): 0.0  0.0  Satellite fit quality  
 PA of 2nd: 359.9  0.0  None

Show:  Both  Primary  Secondary

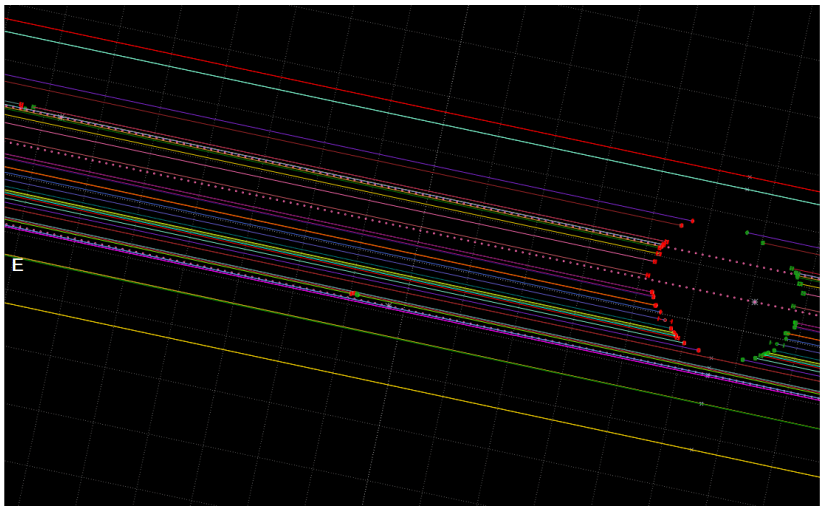
A= 10.0  B= 10.0  PA= 0.0

Plot scale: Reliable size. Can fit to shape mode   
 RMS fit: 0.6 ± 4.9 km Opacity: \_\_\_\_\_

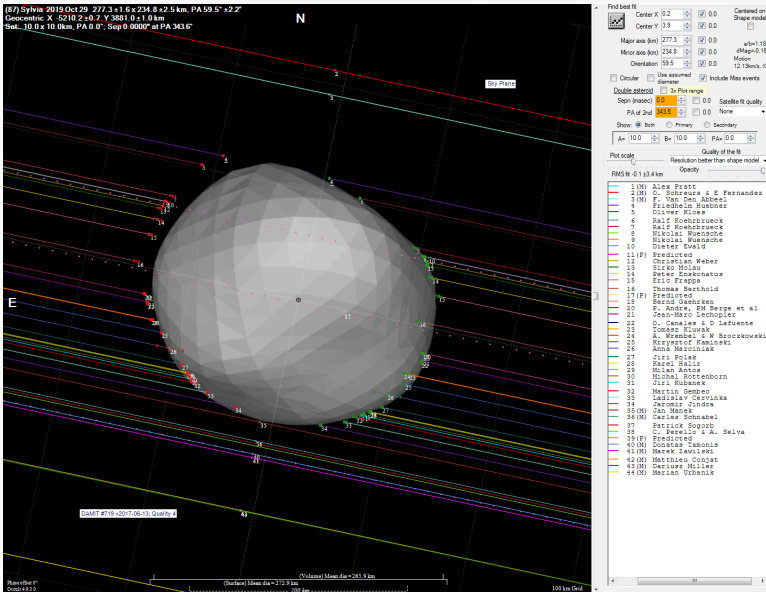
1 (H)	Alex Pratt
2 (H)	F. Van Den Abbeel
3	Oliver Riles
4	Nikolai Wuensche
5	Nikolai Wuensche
6	Christian Weber
7	Eric Frappa
8 (P)	Predicted
9	Thomas Berthold
10	O. Canales & D Lafuente
11	Tomáš Klouček
12	Anna Marciniak
13 (H)	Jan Hankeš
14	Patrick Sogorb
15	C. Perello & A. Selva
16 (H)	Donatas Tamoniš
17 (H)	Marek Zawiślak
18 (H)	Matthieu Conjat

euraster.net/results

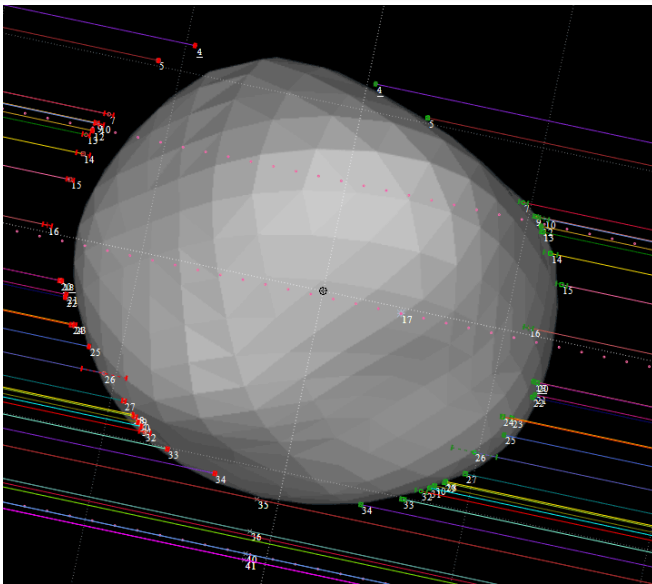
# (87) Sylvia, ostateczne wyniki



## (87) Sylvia, cięciwy okultacyjne + model z algorytmu ADAM

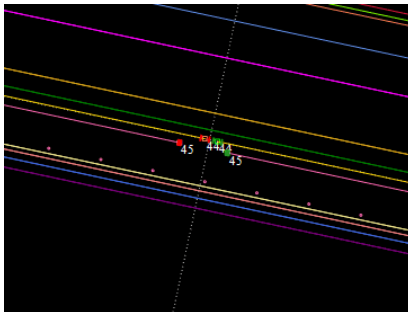


# (87) Sylvia, cięciwy okultacyjne + model z algorytmu ADAM





# Remus



„Two positive chords of the occultation observed by (87) Sylvia II = Remus, lasting 0.92 and 0.24 s (...) have also been reported.”

„A preliminary analysis suggests that Remus is slightly elongated (7.2 +/- 0.2 by 5.0 +/- 0.1 km)”

[euraster.net/results](http://euraster.net/results); CBET 4703, 2019



## (87) Sylvia, telegram CBET

Electronic Telegram No. 4703

Central Bureau for Astronomical Telegrams

Mailing address: Hoffman Lab 209; Harvard University;

20 Oxford St.; Cambridge, MA 02138; U.S.A.

e-mail: [cbatiau@eps.harvard.edu](mailto:cbatiau@eps.harvard.edu) <<mailto:cbatiau@eps.harvard.edu>> (alternate [cbat@iau.org](mailto:cbat@iau.org)  
<<mailto:cbat@iau.org>>)

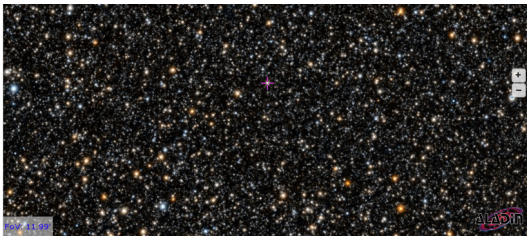
URL <http://www.cbat.eps.harvard.edu/index.html> <<http://www.cbat.eps.harvard.edu/index.html>>

Prepared using the Tamkin Foundation Computer Network

STELLAR OCCULTATION BY (87) SYLVIA on 2019 OCTOBER 29

F. Vachier and J. Berthier Observatoire de Paris; B. Carry, Observatoire de la Cote d'Azur; J. Desmars, D. Souami, J. Lecacheux, F. Braga Ribas, and B. Sicardy, Observatoire de Paris; and dozens of other observers (including E. Frappa, J. Manek, O. Kloes, A. Pratt, O. Canales, D. Lafuente, P. Andre, P. M. Berge, J. C. Lachurie, F. Pailler, C. Schnabel, C. Perello, A. Selva, J. M. Lechopier, F. Van Den Abbeel, O. Schreurs, E. Fernandez, A. Wuensche, M. Bretton, P. Sogorb, M. Conjat, F. Huebner, J. Ohlert, M. Letz, T. Schaefer, M. Koch, B. Gaehrken, T. Berthold, R. Koehrbrueck, J. Polak, L. Smid, C. Weber, S. Molau, K. Halir, D. Ewald, P. Enskonatus, J. Kubanek, J. Lev, M. Rottenborn, J. Zahajsky, J. Jindra, S. Holy, L. Cervinka, M. Gembec, M. Antos, T. Kluwak, K. Kaminski, A. Marciniak, A. Wrembel, W. Broczkowski, M. Urbanik, M. Zawilski, D. Miller, D. Tamonis, N. Morales, J. L. Ortiz, P. Santos-Sanz, A. Malvache, E. Vanhoutte, F. Marchis, A. Martin, E. Arbouch, and C. Harder), on behalf of the International Occultation Timing Association (IOTA), report the successful observation of the occultation of the 10th-magnitude Tycho Catalogue star TYC 1932-00469-1 by the triple-minor-planet system (87) Sylvia on 2019 Oct. 29.9885 UTC. This is the first time that occultations by all the components of a triple system were simultaneously recorded. Among 44 reports (cf. website URL <http://www.euraster.net/results/2019/index.html#1029-87> <<http://www.euraster.net/results/2019/index.html#1029-87>>), 28 positive chords of the occultation by the primary, lasting between 6.5 and 21.76 s, have been reported. They confirm the validity of the non-convex model of (87) that was determined by Hanus et al. (2017, A.Ap. 601, 114),

# Zakrycie gwiazdy 14.6 mag przez TNO 2002 KX14



[link to sky-map](#)

For declination above  $-25^\circ$ , Pan-STARRS survey is displayed by default whereas below  $-25^\circ$ , DSS is displayed.

## Interactive Map

top



# 2002 KX14 zakrywa gwiazdę 14.6 mag. Ramki z momentu zjawiska

Zakrywając gwiazdę wskazuje strzałka.

The screenshot displays the Starlink GAIA software interface, showing four frames of a star field during an occultation event. The frames are arranged in a 2x2 grid. The top row shows the event at different stages, and the bottom row shows the event with a white arrow pointing to the occulted star. The software interface includes various control panels and a data table on the right.

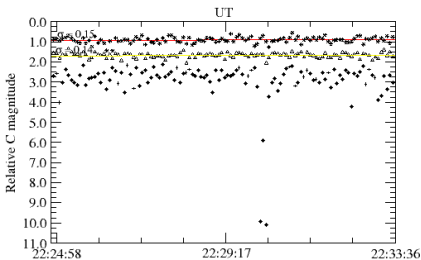
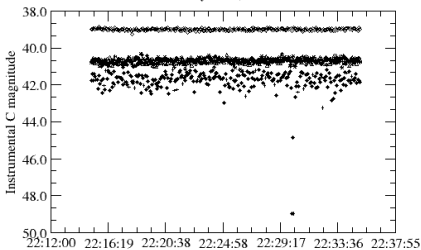
Control panels for each frame show parameters such as X, Y, Value, Equinox, Min, Max, Low, High, and Scale. The bottom-right panel shows a data table with columns for magnitude and position.

Mag	RA	Dec
4.16	283.3	4.12
4.19	283.3	4.12
4.22	283.3	4.12
4.25	283.3	4.12
4.28	283.3	4.12
4.31	283.3	4.12
4.34	283.3	4.12
4.37	283.3	4.12
4.40	283.3	4.12
4.43	283.3	4.12
4.46	283.3	4.12
4.49	283.3	4.12
4.52	283.3	4.12
4.55	283.3	4.12
4.58	283.3	4.12
4.61	283.3	4.12
4.64	283.3	4.12
4.67	283.3	4.12
4.70	283.3	4.12
4.73	283.3	4.12
4.76	283.3	4.12
4.79	283.3	4.12
4.82	283.3	4.12
4.85	283.3	4.12
4.88	283.3	4.12
4.91	283.3	4.12
4.94	283.3	4.12
4.97	283.3	4.12
5.00	283.3	4.12
5.03	283.3	4.12
5.06	283.3	4.12
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5.24	283.3	4.12
5.27	283.3	4.12
5.30	283.3	4.12
5.33	283.3	4.12
5.36	283.3	4.12
5.39	283.3	4.12
5.42	283.3	4.12
5.45	283.3	4.12
5.48	283.3	4.12
5.51	283.3	4.12
5.54	283.3	4.12
5.57	283.3	4.12
5.60	283.3	4.12
5.63	283.3	4.12
5.66	283.3	4.12
5.69	283.3	4.12
5.72	283.3	4.12
5.75	283.3	4.12
5.78	283.3	4.12
5.81	283.3	4.12
5.84	283.3	4.12
5.87	283.3	4.12
5.90	283.3	4.12
5.93	283.3	4.12
5.96	283.3	4.12
5.99	283.3	4.12
6.02	283.3	4.12
6.05	283.3	4.12
6.08	283.3	4.12
6.11	283.3	4.12
6.14	283.3	4.12
6.17	283.3	4.12
6.20	283.3	4.12
6.23	283.3	4.12
6.26	283.3	4.12
6.29	283.3	4.12
6.32	283.3	4.12
6.35	283.3	4.12
6.38	283.3	4.12
6.41	283.3	4.12
6.44	283.3	4.12
6.47	283.3	4.12
6.50	283.3	4.12
6.53	283.3	4.12
6.56	283.3	4.12
6.59	283.3	4.12
6.62	283.3	4.12
6.65	283.3	4.12
6.68	283.3	4.12
6.71	283.3	4.12
6.74	283.3	4.12
6.77	283.3	4.12
6.80	283.3	4.12
6.83	283.3	4.12
6.86	283.3	4.12
6.89	283.3	4.12
6.92	283.3	4.12
6.95	283.3	4.12
6.98	283.3	4.12
7.01	283.3	4.12
7.04	283.3	4.12
7.07	283.3	4.12
7.10	283.3	4.12
7.13	283.3	4.12
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14.48	283.3	4.12
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14.66	283.3	4.12
14.69	283.3	4.12
14.72		

# 2002 KX14 zakrywa gwiazdę 14.6 mag. Krzywa zmian blasku

## Occultation by 2002KX14

26/27 May 2020, Borowiec



## Podsumowanie obserwacji zakryciowych

Obserwacje zakryć z udziałem AM i in.:

- 2015-08-14 (54) Alexandra (negatywne), Kościan, Wieża Ciśnień, EB, AM, MM
- 2017-05-19 2002 GZ32, TNO (negatywne), Borowiec, JH.  
*Santos-Sanz i in., praca wysłana do MNRAS*
- 2018-04-02 Bienor, TNO (negatywne), Borowiec, AM  
*Rommel i in., praca wysłana do Astronomy & Astrophysics*
- 2018-05-20 Himalia, Jupiter VI (pozytywne) Poznań, AM + Borowiec, RH  
(pozytywne). *Gomes-Júnior i in. 2019, EPSC 2019*
- 2019-03-31 (259) Aletheia (negatywne), Borowiec, AM
- 2019-10-29 (87) Sylvia, Poznań OA, KK (pozytywne) + Borowiec, AM (pozytywne).  
*Souami i in. praca w przygotowaniu*
- 2020-05-26 TNO 2002 KX14 (pozytywne), Borowiec, AM  
*Santos-Sanz i in. praca w przygotowaniu*
- 2020-08-08 TNO 2002 MS4 (negatywne), Borowiec, AM  
*Braga-Ribas i in. praca w przygotowaniu* „We have almost 60 positive observations and 110 reports by now!”

W sumie: 3 pozytywne zjawiska na 7 obserwowanych = 43%