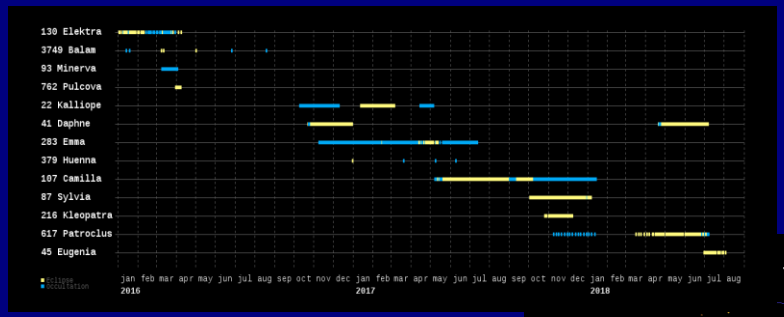
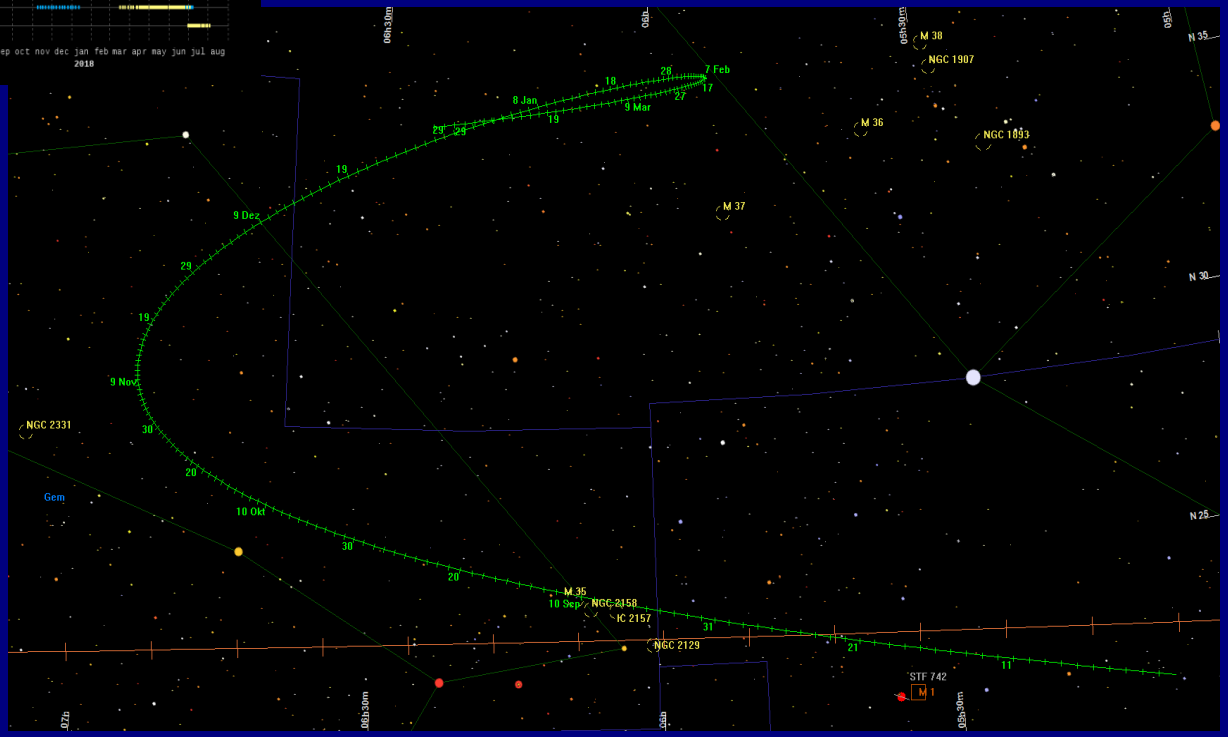
Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017





Oliver Klös, IOTA-ES

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Some facts about (22) Kalliope:

Discovered by J.R. Hind, London, 1852

Main-Belt Type MDiameter: ~ 166 km
Orbital period: 4.97 y Synodic rotation period: 4.1483 h

2001: Satellite discovered
(Margot, J.L., Brown, M.E., 2001. IAU Circ. 7703)
2003: Satellite named „Linus“

Orbital period: 3.59 d Synodic rotation period: ?
Diameter ~ 28 km Semi-major axis ~ 1100 km

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

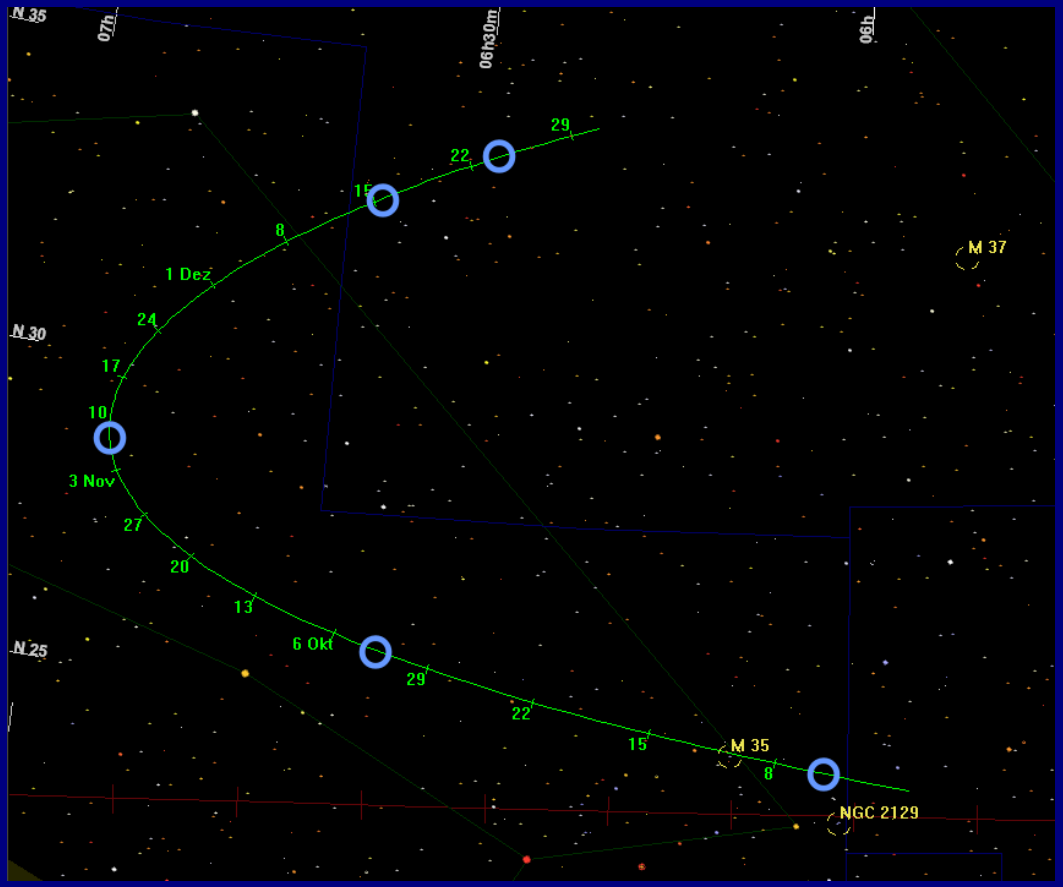
Occultations by (22) Kalliope for Europe

2016	2017 (Jan - Jun)
Sep 05	Mar 14
(Sep 22)	
Nov 03	
Nov 08	
Dec 16	
Dec 24	

Predictions at: *http://asteroidoccultation.com/*

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

The Path of (22) Kalliope 2016 Sep 01 - Dec 31



O. Klös
Guide 9.1

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Conditions for mutual events:
- Asteroidal system at annual equinoxe
- The orbital plane of Linus is close to the Sun‘s line of sight.

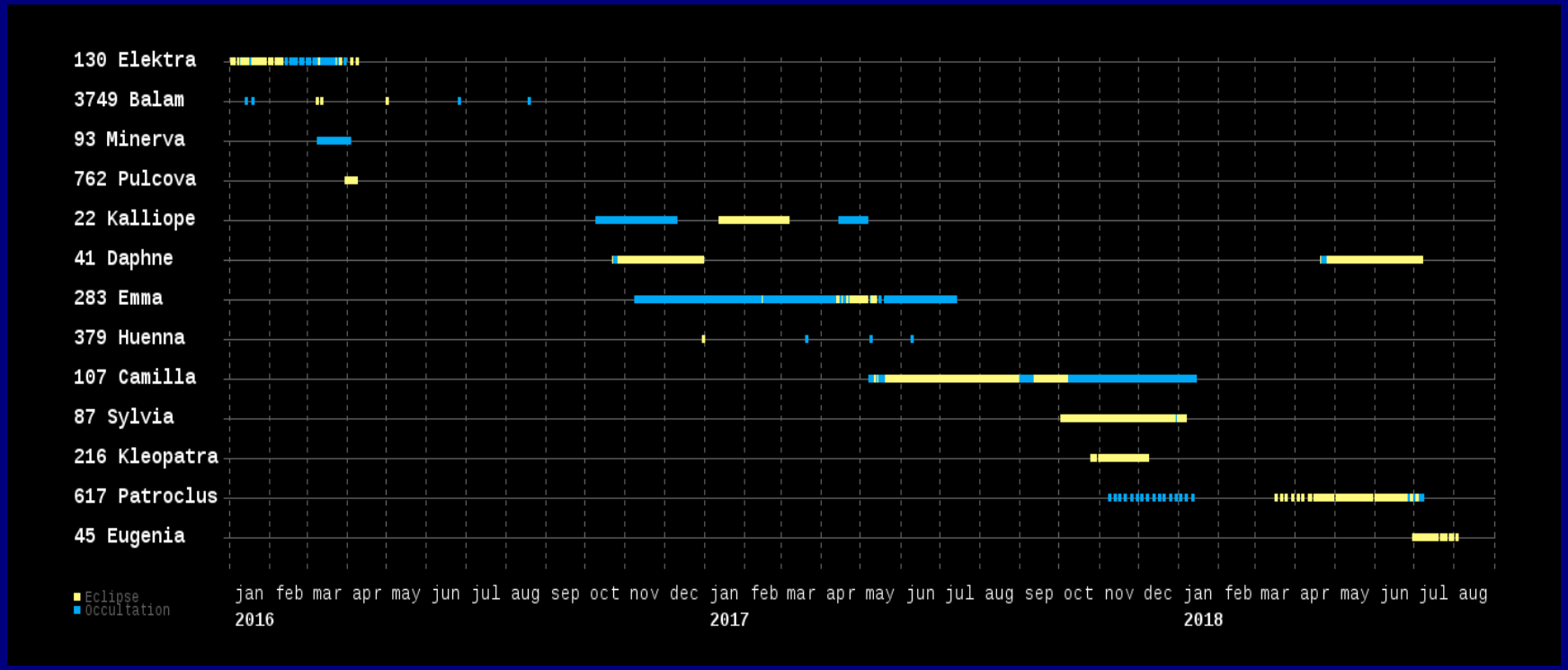
Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Conditions for mutual events:
- Asteroidal system at annual equinoxe
- The orbital plane of Linus is close to the Sun‘s line of sight.

What can be observed:
- Eclipses and occultations by the two bodies itself

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

- Mutual Events of Binary Asteroids 2016 - 2018



Frédérick Vachier, IMCCE

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Some data about the mutual events of (22) Kalliope

- Observable from Oct 2016 to May 2017

- Duration: 33 min up to 3 hours!

- Mag drop: 0.028 up to 0.132 mag

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Some data about the mutual events of (22) Kalliope

- Observable from Oct 2016 to May 2017

- Duration: 33 min up to 3 hours!

- Mag drop: 0.028 up to 0.132 mag

Bad news:
Very, very large uncertainties!!

60 to 90 min in time and a factor of 2 for mag drop, more or less
(F. Vachier, personal e-mail, April 2016)

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Top 7 mutual events for Europe ~10.5 mag

(calculated by F. Vachier, IMCCE)

(sorted by mag drop)

Date	*Time (UT)*	*Dur*	*Event*	*Drop*
2016-12-10	05:15 - 05:57	00:42	S1 occ K	0.132
2017-01-15	04:15 - 05:41	01:26	S1 ecl K	0.121
2016-12-04	19:25 - 21:06	01:41	K occ S1	0.118
2017-01-16	23:10 - 00:56	01:45	K ecl S1	0.117
2016-12-03	00:17 - 02:09	01:51	S1 occ K	0.115
2017-01-18	18:14 - 20:14	02:00	S1 ecl K	0.113
2016-12-01	05:03 - 07:05	02:02	K occ S1	0.111

Opposition of (22) Kalliope: 2016 Dec 28

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

- Hints for observation:

- The mutual events are slow:

  - Start recording at least 90 min before predicted start of event
  - Long running observation, use 1 frame per second or less
  - Digital cameras are preferred to analogue cameras (8 bit)
  - Use a high bit rate with digital cameras (10 - 16 bit)
  - Don’t forget darks and flats

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

- Hints for observation:

- The mutual events are slow:

  - Start recording at least 90 min before predicted start of event
  - Long running observation, use 1 frame per second or less
  - Digital cameras are preferred to analogue cameras (8 bit)
  - Use a high bit rate with digital cameras (10 - 16 bit)
  - Don’t forget darks and flats
  - No sub-second accuracy necessary
  - Check the time stamps of your recording device before and after recording (NTP, GPS)
  - Don’t stop recording just after predicted end of event

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

- Hints for observation:

- The mutual events are slow:

  - Start recording at least 90 min before predicted start of event
  - Long running observation, use 1 frame per second or less
  - Digital cameras are preferred to analogue cameras (8 bit)
  - Use a high bit rate with digital cameras (10 - 16 bit)
  - Don’t forget darks and flats
  - No sub-second accuracy necessary
  - Check the time stamps of your recording device before and after recording (NTP, GPS)
  - Don’t stop recording just after predicted end of event

  - These are events for observers with high patience!!

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Many thanks to

Frédérick Vachier, IMCCE

for calulating the mutual events and answering my questions.

Link to F. Vachier's web page with predictions of stellar occultations by binary asteroids, mutual events and more:

http://fredvachier.free.fr/