

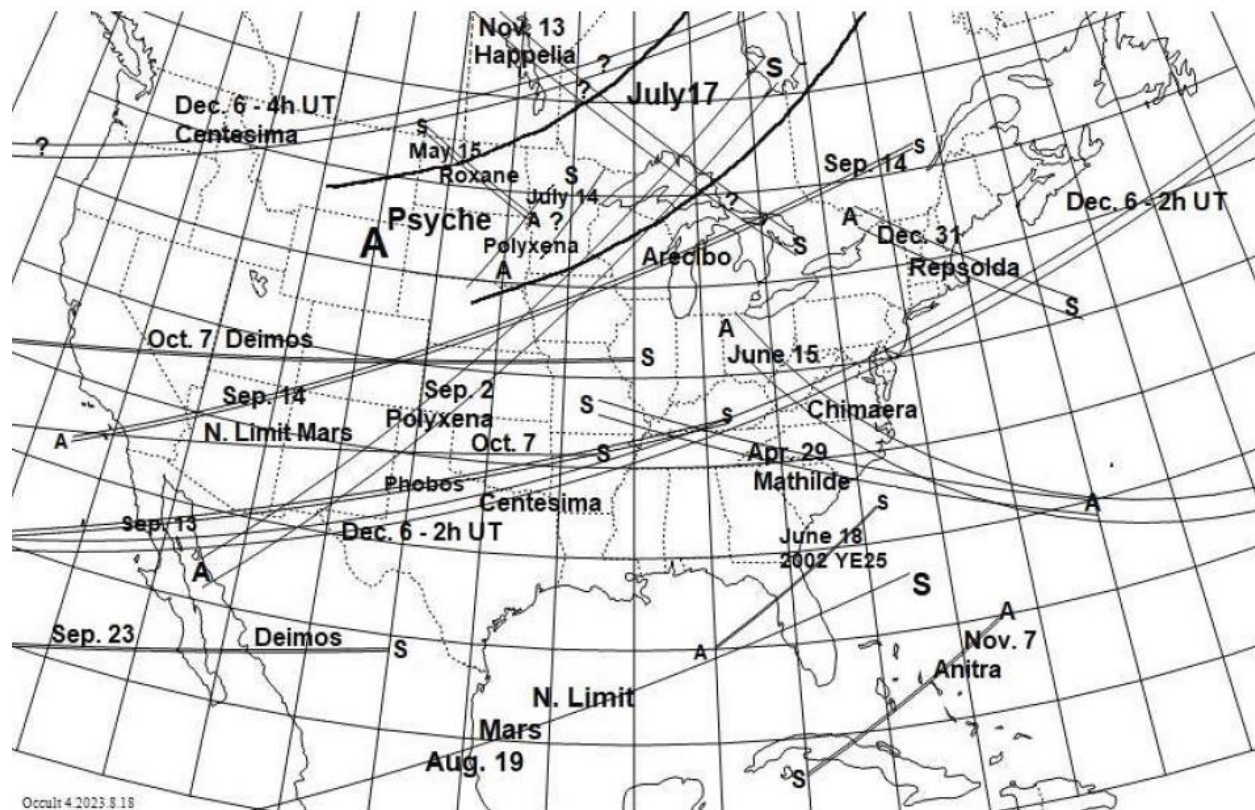
## 2024 Occultations by Special Main-Belt Asteroids

The map, and the corresponding table, similar to those of the pages for other 2024 asteroidal occultations, shows the paths for occultations of a selected group of Main-Belt asteroids that will be occulted in 2024. These are objects that have unusual shapes, or known or suspected significant moons, for which new observations will be valuable to better characterize them. Most future updates will not be given in this document, but more likely will be on IOTA's special main-belt asteroidal occultations page for 2024 at <https://occultations.org/publications/rasc/2024/nam24MBspecialoccs.htm> .

A good example of a successful campaign for an occultation by an unusual main-belt asteroid was the discovery and confirmation of the large moon of (4337) Arecibo by occultations in 2021 described at <https://occultations.org/publications/rasc/2024/AreciboMoonAccount.pdf>, adopted from an article that was published in the October 2021 issue of *Stardust*, publication of the National Capital Astronomers. We hope to have some further special-object successes in 2024, with the opportunities portrayed below; unfortunately, there are no opportunities with Arecibo in North America in 2022, but there are some chances in other parts of the world.

More about these events is available at the IOTA special Main Belt occultations page at <https://occultations.org/publications/rasc/2024/nam24MBspecialoccs.htm>. With fewer objects than considered in the previous sections, occultations of stars to magnitude 12.0 had to be considered. Two of the stars are brighter than mag. 10.0. Information about the selected objects is given starting at the bottom of the next page.

### The best occultations of stars by Special Main-Belt Asteroids in North America during 2024



## 2024 OCCULTATIONS BY SPECIAL MAIN-BELT ASTEROIDS

Date	UT	Occulting Body	Star	Mag.	RA (2000)			Dec			ΔMag.	Dur. s	Path
					h	m	s	°	'	"			
Apr. 29	01:43	253 Mathilde	EI Tauri	8.9	05	46	56.5	+17	54	31	7.3	1.8	NC-MO
May 15	03:59	317 Roxane	UCAC4 562-032446	11.7	06	37	28.7	+22	20	04	3.4	0.5	SK-ND
Jun. 15	05:15	623 Chimaera	TYC 7404-03568-1	11.7	18	16	13.8	-37	24	58	3.0	3.5	NC-OH
Jun. 18	08:56	172376 2002 YE25	UCAC4 580-006816	12.0	02	59	29.9	+25	58	44	8.8	0.1	FL
Jul. 14	09:21	595 Polyxena	TYC 2413-00257-1	10.1	05	49	14.7	+35	15	53	4.3	2.5	NE-MN
Jul. 17	05:37	16 Psyche	UCAC4 381-166238	11.3	21	18	39.7	-13	54	58	0.3	29.1	QC-WY
Sep. 2	09:21	595 Polyxena	UCAC4 635-039699	11.0	07	04	54.3	+36	59	43	3.4	3.3	Mex-ON
Sep. 13	10:27	Phobos	UCAC4 568-026971	11.7	06	20	48.5	+23	29	40	1.8	1.0	Baja-KY
Sep. 14	09:14	4337 Arecibo	TYC 1895-00394-1	10.8	07	00	15.7	+24	13	20	8.1	0.8	CA-QC
Sep. 23	11:48	Deimos	TYC 1893-01034-1	11.0	07	17	36.4	+22	55	57	3.4	0.6	Baja-Mex
Oct. 7	11:17	Deimos	TYC 1909-00533-1	9.8	07	17	36.4	+22	55	57	4.4	0.6	CA-IL
Nov. 7	23:38	1016 Anitra	UCAC4 309-164338	11.9	18	05	35.6	-28	12	43	5.2	0.3	Cuba-BS
Nov. 13	11:06	578 Hapelia	UCAC4 599-026750	11.9	05	58	11.2	+29	44	42	2.7	7.1	ON-MB
Dec. 6	02:53	513 Centesima	UCAC4 476-004159	11.9	02	47	26.8	+05	00	10	2.1	6.3	NJ-Baja
Dec. 6	04:32	513 Centesima	TYC 0053-01328-1	11.9	02	47	24.8	+05	00	02	2.1	6.3	ON-OR
Dec. 31	10:30	906 Reapsolda	TYC 6192-00868-1	12.0	15	31	28.8	-19	22	47	3.4	1.8	QC-MA

The map, and the corresponding table, similar to those for main-belt and other types of occultations published in the *RASC Observer's Handbook for 2024*, and for bright main-belt occultations described in <https://occultations.org/publications/rasc/2024/nam24MBoccs.pdf>, shows the paths for occultations of some of the better distant-object occultations during 2024. The successive columns in the table list: (1) the date and central time of the event; (2) the name of the occulting body; (3) the catalogue and number of the occulted star; (4) the star's apparent visual magnitude; (5) the star's right ascension and (6) declination; (7) the expected magnitude change from the combined brightness; (8) the predicted maximum duration of the occultation in seconds; and, (9) the path location specified by the lands crossed by the eastern and western ends of the path shown on the map. The two-letter abbreviations for the US States and Canadian Provinces are given, with the order indicating the direction of motion of the shadow. "Baja" is Baja California, either Norte or Sur, while "Mex" denotes the rest of Mexico. Note that the times are for the geocentric time of closest approach; for any specific location in North America, the event time can be several minutes earlier or later. They are shown if occultations by them of stars brighter than magnitude 12.1 will occur in North America during 2024. Note that the table in the printed handbook has two errors (corrected in our table above): The Deimos occultation listed on Sept. 23 will actually be on Oct. 7, and the Anitra occultation given as Oct. 7 will actually be on Nov. 7. Also, the 4 tables in the Planetary Occultations section of the printed USA edition have no column headings; pages to correct that error are on the RASC 2024 corrections Web page at <https://rasc.ca/2024-edition-updates>.

For 2024, we selected the 29 asteroids described below for our special MB asteroids; in the descriptions below, an "-x" follows the object's name, if no occultations by it of stars brighter than mag. 12.1 will occur in North America during 2024. For those asteroids, occultations by fainter stars, yet observable by many, may occur, and relatively bright events will occur in other parts of the world. Now, in May, we have added many more special asteroids, including 3 new binary asteroids discovered during occultations early this year, and many more from the GAIAMOONS project publicized by Raphael Lallemand at Paris Observatory, asteroids suspected of being binary from astrometric Gaia observations. All of the special asteroids are

listed below, with the new ones indicated with **red font** or **green font** in the list below. The GAIAMOONS project has a Web site with worldwide predictions, at <https://gaiamoons.imcce.fr/> - it is similar to Lucky Star's prediction page for occultations by TNOs, Centaurs, and Trojan asteroids. Any observations by the GAIAMOONS objects, whether positive or negative, should be reported to the Lucky Star portal. More about the GAIAMOONS project is at <https://www.oca.eu/fr/gaiamoons> . Many GAIAMOONS events, mainly those in Europe, are now identified on Occult Watcher (OW) cloud, but not yet as a dedicated feed. It seems that the GAIAMOON orbits have all been improved on OW, whether the events are identified as GAIAMOON or not. Below, the GAIAMOONS asteroids are indicated with **red font**, while the other new objects have **green font**.

**(16) Psyche:** The largest M-class (metallic) asteroid and target of a NASA mission. The occultation by it on July 17 will be difficult since Psyche is brighter than the star; defocus slightly or take other steps to avoid saturation of the combined image of the objects to detect the 0.3 mag. change. On the map, the Psyche path is very wide, accentuated with thicker lines to avoid confusion of it with 4 other paths it envelops.

**(90) Antiope-x:** This is a binary asteroid with equal large (~90km) components 171 km apart. Special procedures given at <http://iota.jhuapl.edu/PlottingPathsForAntiopeOccultations.pdf> are needed to show paths of occultations by the separate components, which is crucial for these events; often only a miss by both components will occur at the central line of an uncorrected prediction.

**(121) Hermione-x:** has an 8-km moon 770 km away, discovered by adaptive optics.

**(165) Loreley-x:** May have a moon about 5% of Loreley's size, from a 2020 July 21<sup>st</sup> occultation.

**(216) Kleopatra-x:** This is the "Dog-bone" asteroid, the 2<sup>nd</sup>-largest M-class (metallic) asteroid, and has two small moons. Separate predictions are given for the paths of the larger one, **Alexhelios**.

**(234) Barbara-x:** This may be a contact binary; past occultation observations reveal two lobes.

**(252) Clementina-x:** Probable unusual shape; see JOA 2023\_1, p. 9.

**(253) Mathilde:** NEAR imaged half the asteroid in 1997; occultations could probe the other half. The star, EI Tauri, occulted on Apr. 29, is a Mira variable, spectral type S, with range 10.4 - >15 with a 389d period. Since its maximum is expected on May 15, only 17 days after the occultation, it should be near maximum. Its Gaia # is G054656.5+175431.

**(264) Libussa:** 53 km GAIAMOONS object, with possible 12km satellite about 69 km away.

**(276) Adelheid-x:** May have small moon, with K. Green's obs. of 2022 Aug. 31 event, 9 km ~500 km away.

**(269) Justitia-x:** This very red object may have originated in the Kuiper belt. It is a target of the UAE's Main Belt asteroids mission planned to launch in 2028 and will orbit Justitia and land on it in 2034.

**(317) Roxane:** This has a 5km moon, Olympias, with separation 245 km.

**(319) Leona-x:** We want to improve knowledge of the size and shape of this occultation, to better analyze observations of the 2023 Dec. 12<sup>th</sup> occultation of Betelgeuse by Leona.

**(379) Huena-x:** An 8-km moon 3000 km away was discovered with adaptive optics at Keck in 2003.

**(412) Elisabetha-x:** May have a 4km moon 3 diameters away, based on a 2016 Mar. 17 event in Slovakia.

**(449) Hamburga:** may have a 9 – 62km moon up to about 220 km away -R. GAIAMOONS, 24Feb24.

**(476) Hedwig:** 99km GAIAMOONS object with a 10 – 50km moon up to about 200 km away.

**(513) Centesima:** This asteroid has an unusual shape.

**(516) Amherstia:** 63 km GAIAMOONS object, with possible 12km satellite about 87 km away.

**(532) Herculina:** 191 km GAIAMOONS object, with possible 30km satellite about 254 km away. This is remarkable as there was an early claimed finding of a 45km satellite from a 1978 June 7<sup>th</sup> occultation that had the satellite distance about 900 km away, as given in D. Herald et al's paper on asteroidal occultation results published in MNRAS, Vol. 499, pp. 4570-4590, 2020, <https://doi.org/10.1093/mnras/staa3077> . The observation was controversial at the time, as discussed in issues of *Occultation Newsletter* and briefly in *Sky and Telescope*, and was discounted when HST observations showed no satellite when with those parameters, it should have been easy to image. The GAIAMOONS possible detection has a smaller sep.



(550) **Senta**: 38 km GAIAMOONS object, with possible 6km satellite about 50 km away.

(578) **Happelia**: May have a 3km moon a diameter away, based on a 2017 Feb. 24 in seen in Texas.

(595) **Polyxena**: May have a 23km moon about 3 diameters away, based on a 2008 Feb. 3 occultation.

(605) **Juvisia**: 68 km GAIAMOONS object, with possible 15km satellite about 113 km away.

(623) **Chimaera**: This is a 44km 2nd flyby target of the UAE Main-Belt asteroids mission.

(699) **Hela**: 13 km GAIAMOONS object, with possible 2km satellite about 52 km away.

(705) **Erminia-x**: May have an 8km moon about 400 km away, from a 2014 Dec. 8<sup>th</sup> occultation; see [https://www.occultations.org.nz/planet/2014/results/20141208\\_705\\_Erminia\\_4UC\\_315\\_245088\\_Rep.htm](https://www.occultations.org.nz/planet/2014/results/20141208_705_Erminia_4UC_315_245088_Rep.htm) .

(810) **Atossa**: 8 km GAIAMOONS object, with possible 1km satellite about 27 km away.

(879) **Ricarda**: 16 km GAIAMOONS object, with possible 1.6km satellite about 66 km away.

(957) **Camelia-x**: This asteroid has an unusual shape.

(906) **Repsolda**: This may have a ~10km moon ~240km away, according to a 2023 Jan. 25 event in Calif.; see <https://www.dr-ricknolthenius.com/events/20230124Repsolda/index.html> .

(950) **Ahrensa**: 14 km GAIAMOONS object, with possible 3-13km satellite about 41 km away.

(1016) **Anitra**: May have a 4-km moon, based on rotational light-curve observations.

(1024) **Hale**: 42 km GAIAMOONS object, with possible 6-39km satellite about 106 km away.

(1089) **Tama**: Lightcurves show 11km and 7km objects 21km apart, IAUC 8265 (2004) <https://ui.adsabs.harvard.edu/abs/2004IAUC.8265....2B/abstract>

(1180) **Rita**: Suspicious 2-occ'n event observed 2024 Mar 4 from s. France.

(1509) **Esclangona**: 10 km GAIAMOONS object, with possible 3km satellite about 70 km away.

(1800) **Aguilar**: 7 km GAIAMOONS object, with possible 2km satellite about 15 km away.

(3457) **Arnenordheim**: 13 km GAIAMOONS object, with possible 2km satellite about 52 km away.

(3800) **Karayusuuf**: 1.7 km GAIAMOONS object, moon 0.4-1.6 km, up to 9-14 km away. Many occs in EUR.

(4337) **Arecibo**: Binariness discovered during 2021 occultations and confirmed by Gaia to have a 1.3d period.

(4552) **Nabelek-x**: This was thought to be 6 km across, but a recent paper argues that it is about 20 km.

(5044) **Shestaka**: 6 km GAIAMOONS object, with possible 2km satellite about 17 km away.

(5232) **Jordaens**: Simpson et al, Alberta occ 2024Feb1 binary each 10 km and 47 km apart.

(5457) **Queen's-x**: This has a small moon, discovered on 2023 Sep. 4<sup>th</sup> occ in Switzerland and confirmed during a second occultation 16 days later, observed in Greece, see <https://www.iota-es.de/queen.html> .

(7083) **Kant**: 13 km GAIAMOONS object, with possible 2-12km satellite about 21 km away.

(7165) **Pendleton-x**: Analysis of the rotational lightcurve shows this may be a close binary.

(8632) **Egleston**: 4 km GAIAMOONS object, with possible 0.8km satellite about 9 km away.

(8947) **Mizutani**: This 9-km object may be binary, from recent light curve observations.

(10235) **1998 QR37**: 16 km GAIAMOONS object, with possible 8-10km satellite about 27 km away.

(10424) **Gaillard**: J-F Gout, MS occ 2024Jan14, diams 4 and 3 km, 7 km apart; covered Jan. 30 .htm page.

(10518) **1990 MC**: 7 km object with 2-6 km moon 10-16 km away, GAIAMOONS 24May10.

(12281) **Chaumont**: 16km GAIAMOONS object, moon 2-15 km up to 25 km away.

(12936) **Glennschneider**: 5km MB object; Ron Abileah interested in any occultations.

(15269) **1990 XF**: 11km object with 1-5km moon up to 30 km away, GAIAMOONS 24Apr18.

(16901) **Johnbrooks**: 5 km GAIAMOONS object, with possible 1.4km satellite about 23 km away.

(18434) **Mikesandras**: 5 km GAIAMOONS object, with possible 1.5km satellite about 10 km away.

(20426) **Fridlund**: 2022 Oct. 11, K. Green – need diams, asked Kevin and Norm.

(22150) **2000 WM49**: 7km object with 2-6 km moon 10-16 km away, GAIAMOONS 24MAY10.

(25707) **2000 AQ141**: 8km object with 4-5 km moon 52-66 km away, GAIAMOONS 24 May10.

(31450) **Stevepreston**: Binary (diameters 11.7 & 2.3 km, period 2.228 days, sep. 39 km) from lightcurves.

(33074) **1997 WP21-x**: This object, 18 km across, may have an 8 km moon 66 km apart from occultations recorded in the Czech Republic on 2021 Feb. 14.

(52246) **Donaldjohanson-x**: This is a Lucy-mission 2025 main-belt target on its way to the Jupiter Trojans.

**(85714) 1998 SU49:** 6km object with 1-5km moon up to 60 km away, GAIAMOONS 24Mar8

**(87464) 2000 QV129:** Double occ recorded 2024 June by Antoni Selva; peanut-shape graze or binary.

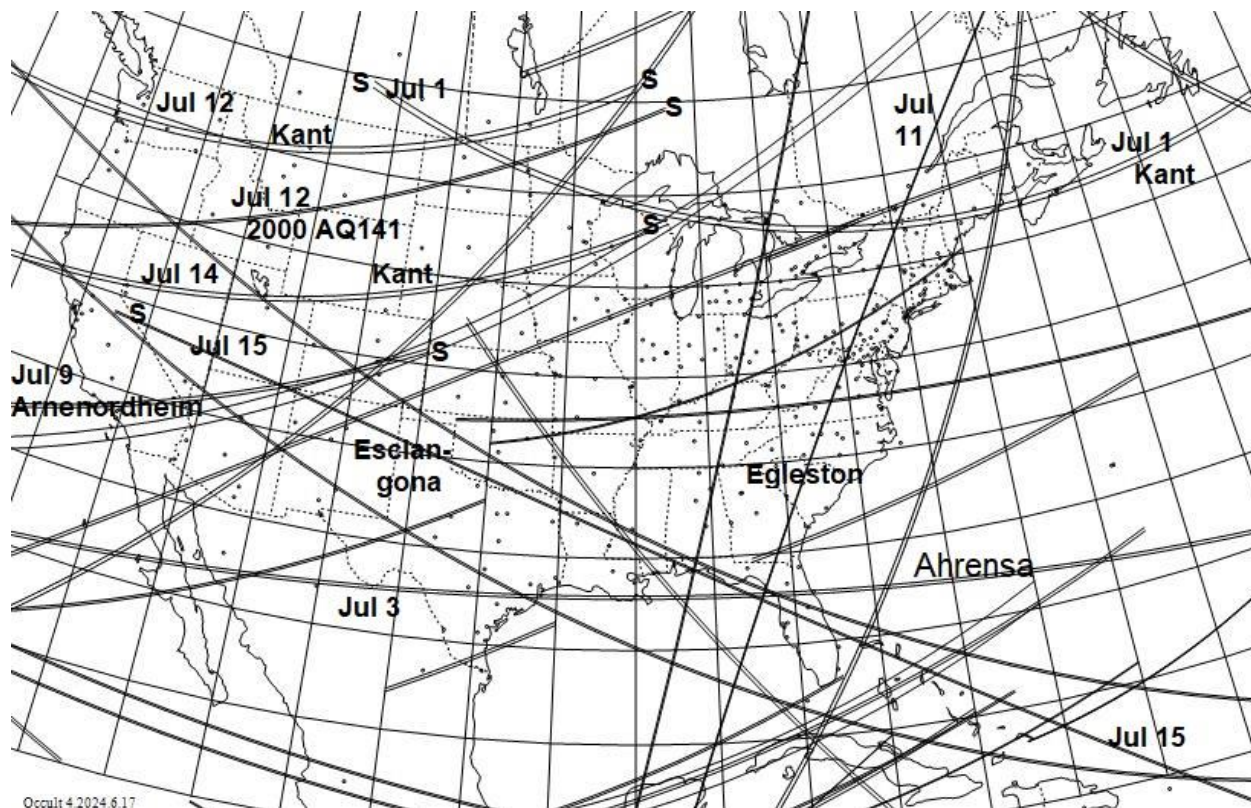
**(100624) 1997 TR28:** 2024 Jan 23 Sat occ 2 in JP, main occ Jiri CZ. Trojan asteroid.

**(172376) 2002 YE25:** This is likely a binary asteroid, a small version of Antiope, from 2022 May observations of an occultation by P. Nosworthy and D. Gault.

Some relatively bright occultations by Phobos and Deimos, the small moons of Mars, as well as the northern limits of two occultations by Mars, are also shown on the map on p. 1, although their Occult input is with the major planet and their moons events for North America for 2024 Web page at <https://occultations.org/publications/rasc/2024/nam24Planetoccs.htm> .

There are so many new objects added (red and green asteroids above) with this update that we have added a North American map for them (to mag. 13.0) for the rest of 2024, and an associated table, similar to those for the main map and list given on pages 1 and 2. But we don't have time to label all 46 of them; we have labelled the first 8 events, through July 15, so you can easily identify their paths. For the later events, by looking at the map, you can tell if any events are near you, and you can get their Occult input file from the updated Web page (link at top of p. 1) and generate a list of them within a specified distance of your location. Of course, if you have a larger scope, you may be able to observe events involving stars fainter than the mag. 13 limit for our map and table, which you can find by using the larger input file for all of the new objects for the rest of 2024, also available from the Web page.

**The best events of stars by New Special Main-Belt Asteroids in N. America during the rest of 2024, to mag. 13.0**



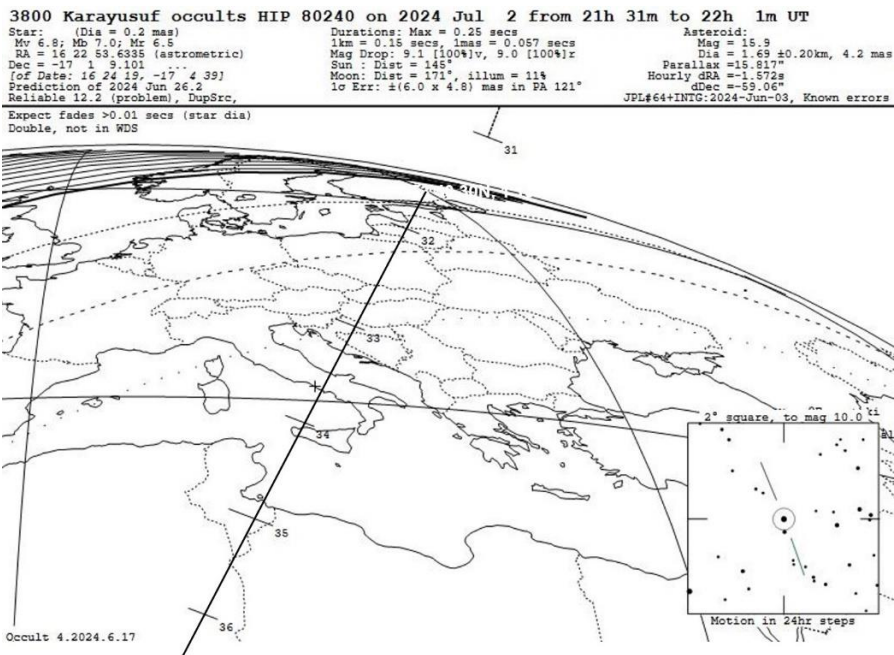
A table for the above paths, similar to that at the top of p. 2, is at the top of the next page.



The Best Occultations of stars by New Special Main-Belt Asteroids in N. America during the rest of 2024, to mag. 13.0

Date	m	d	h	m	U.T.	Path Ast.	Diam "	Durn sec	Star mag	dmag	Elong V	Star Cat.	No.	d RUWE	Planet	Moon Dist	% R.A.	J2000	Dec	
						km								<1.4	No Name	ill				
Jul 1	5	16.5	NS-SK	13.0	0.010	1.02	12.8	4.3	173	UCAC4	365-132569	0.90	7083	Kant	123	25	18	29	1.678	-17 3 32.80
Jul 1	7	52.3	ON-CA	7.8	0.007	0.73	11.5	6.3	162	UCAC4	421-080919	s 0.90	25707	2000 AQ141	123	24	18	23	20.985	-5 57 29.24
Jul 3	8	3.0	FL-Baja	15	0.012	1.73	12.6	3.0	136	UCAC4	519-128962	2.55	950	Ahrensa	108	8	20	32	40.591	13 43 37.77
Jul 9	10	15.7	CA-CO	13.0	0.007	0.65	11.0	6.6	84	UCAC4	480-002204	K 1.25	3457	Arnenordheim	125	12	1	30	3.766	5 51 42.08
Jul 11	3	54.2	QC-FL	3.8	0.004	0.94	12.8	5.3	128	UCAC4	441-062367	0.80	8632	Egleston	71	25	16	6	35.497	-1 48 56.13
Jul 12	8	1.0	ON-CA	13.0	0.010	1.10	11.9	5.3	163	UCAC4	366-123736		7083	Kant	92	35	18	18	55.561	-16 54 16.59
Jul 14	8	17.1	WI-CA	13.0	0.010	1.13	11.7	5.6	161	TYC	6269-00375-1	0.90	7083	Kant	68	54	18	17	12.368	-16 53 4.36
Jul 15	4	33.7	FL-CA	8.0	0.011	0.68	12.7	2.4	145	UCAC4	468-134744	0.95	1509	Esclangona	106	62	21	16	8.383	3 29 25.13
Jul 21	4	35.4		15.0	0.013	1.26	12.8	2.6	147	UCAC4	515-125438	0.90	950	Ahrensa	39	100	20	18	4.687	12 49 37.34
Aug 3	3	46.2		15.0	0.013	1.14	12.9	2.5	149	UCAC4	506-126495	1.05	950	Ahrensa	143	2	20	6	35.074	11 6 55.86
Aug 3	4	16.7		15.0	0.013	1.14	13.0	2.4	149	UCAC4	506-126489	0.95	950	Ahrensa	143	2	20	6	33.933	11 6 44.13
Aug 5	7	50.8		8.0	0.012	0.70	12.5	2.4	155	UCAC4	490-134145	0.85	1509	Esclangona	151	1	20	45	38.292	7 55 51.89
Aug 7	8	29.4		8.0	0.012	0.71	12.0	2.8	155	UCAC4	492-135937	0.85	1509	Esclangona	139	8	20	42	32.227	8 12 30.51
Aug 11	8	6.8		15.0	0.012	1.12	12.6	2.8	147	UCAC4	499-123811	0.90	950	Ahrensa	91	38	20	0	2.618	9 39 35.93
Aug 15	1	29.0		15.0	0.012	1.13	12.7	2.8	146	UCAC4	495-121332	0.90	950	Ahrensa	53	74	19	57	25.243	8 55 29.18
Aug 18	3	4.3		15.0	0.012	1.14	12.4	3.1	144	UCAC4	492-123203	0.85	950	Ahrensa	33	96	19	55	27.583	8 17 44.33
Aug 19	2	26.8		4.4	0.002	0.11	10.9	9.4	32	TYC	0865-00515-1	1.25	16901	Johnbrooks	140	99	12	3	22.680	8 58 43.79
Sep 1	4	14.8		42.0	0.047	14.0	12.4	0.8	127	UCAC4	391-109452	v 0.90	550	Senta	146	4	19	7	34.463	-11 52 29.44
Sep 15	0	23.5		3.3	0.002	0.28	9.6	10.5	95	UCAC4	348-121393	s 0.75	87464	2000 QV129	43	86	17	50	33.394	-20 28 36.44
Sep 17	4	12.4		8.1	0.007	0.41	11.9	4.6	86	UCAC4	345-096815	s 0.85	810	Atossa	81	99	17	19	35.162	-21 11 44.09
Sep 19	2	49.1		13	0.007	0.59	8.7	9.2	83	HIP	84299	s 0.90	10235	1998 QR37	112	98	17	14	5.217	-22 34 38.42
Sep 20	2	51.8		3.23	0.002	0.22	12.2	8.0	92	UCAC4	347-120065	s 0.80	87464	2000 QV129	117	94	17	54	55.985	-20 38 37.79
Sep 29	0	59.1		66	0.003	2.6	11.2	4.5	76	UCAC4	251-112494	s 1.15	605	Juvisia	116	12	17	17	56.144	-39 55 23.02
Oct 1	23	18.1		1.67	0.002	0.09	12.0	6.4	87	UCAC4	276-183809	s 0.80	3800	Karayusuf	95	1	18	25	41.315	-34 58 55.39
Oct 6	2	29.6		6.4	0.007	1.98	12.1	4.5	125	UCAC4	371-182380	0.95	5044	Shestaka	89	10	21	22	41.079	-15 53 23.36
Oct 8	1	6.0		73	0.032	2.6	12.5	3.2	67	UCAC4	331-104368	K 1.00	449	Hamburga	10	23	17	25	26.588	-23 56 12.62
Oct 10	1	12.9		15.0	0.009	1.00	12.1	4.2	104	UCAC4	439-108942	0.85	950	Ahrensa	32	42	19	57	51.077	-2 15 5.42
Oct 13	0	50.9		3.4	0.002	0.14	11.5	8.9	75	UCAC4	345-138470	0.80	87464	2000 QV129	44	74	18	20	49.179	-21 11 2.91
Oct 16	2	20.3		8.0	0.006	0.28	12.5	4.2	71	UCAC4	340-129303	s 0.85	810	Atossa	90	97	18	15	2.423	-22 10 36.87
Oct 20	2	29.6		8.0	0.008	0.71	12.5	3.8	102	UCAC4	488-130102	s 0.85	1509	Esclangona	109	90	20	23	0.212	7 31 32.43
Oct 21	2	29.5		8.0	0.008	0.69	11.5	4.8	101	UCAC4	488-130353	s 1.10	1509	Esclangona	121	82	20	24	2.994	7 30 5.54
Oct 25	1	4.8		195.0	0.081	4.4	12.6	0.25	33	UCAC4	378-076344	V 1.10	532	Herculina	113	43	16	13	50.219	-14 33 26.95
Nov 5	2	33.9		8.1	0.005	0.24	9.3	7.4	61	UCAC4	341-178749	s 0.90	810	Atossa	21	12	18	59	58.457	-21 54 39.14
Nov 15	23	15.0		7.0	0.004	0.17	12.6	5.3	36	UCAC4	384-093551	s 1.10	10518	1990 MC	144	100	17	55	23.179	-13 22 42.06
Nov 18	0	16.2		13	0.006	0.38	11.6	6.9	54	TYC	6297-00248-1	0.90	7083	Kant	153	94	19	21	48.777	-16 44 52.88
Nov 19	0	30.3		8.0	0.006	0.38	12.2	4.5	84	UCAC4	489-133073	1.65	1509	Esclangona	130	87	21	3	22.952	7 40 4.35
Nov 22	23	41.6		66	0.026	1.60	12.7	3.1	41	UCAC4	276-197367	0.95	605	Juvisia	130	51	18	51	12.602	-34 58 15.45
Nov 30	3	0.6		13	0.008	6.3	8.7	8.3	128	TYC	0022-00073-1	s 0.95	3457	Arnenordheim	140	1	1	6	7.936	2 37 57.09
Dec 3	23	54.2		14	0.009	0.30	12.8	2.5	44	UCAC4	400-122626	0.95	699	Hela	19	8	19	40	24.320	-10 11 16.68
Dec 4	0	56.5		13	0.005	0.30	12.2	6.0	37	UCAC4	345-185269	0.95	10235	1998 QR37	7	8	19	19	49.424	-21 9 49.80
Dec 4	22	22.1		73	0.027	1.73	12.2	3.6	29	UCAC4	331-184049	s 1.00	449	Hamburga	15	14	18	52	4.268	-23 56 17.90
Dec 7	0	37.0		7.9	0.004	0.20	11.1	8.2	47	TYC	6332-00500-1	0.90	25707	2000 AQ141	23	32	20	16	12.940	-17 18 2.06
Dec 7	1	43.1		1.7	0.001	0.05	11.3	7.7	60	TYC	6946-00292-1	1.20	3800	Karayusuf	14	33	21	21	56.214	-28 7 20.48
Dec 8	13	24.1		12	0.006	1.23	9.5	8.3	101	UCAC4	467-043889	s 1.10	5232	Jordaens	167	49	10	19	45.491	3 19 2.45
Dec 9	23	28.6		14	0.009	0.30	11.8	3.5	43	UCAC4	403-126185	s 1.05	699	Hela	66	65	19	58	5.592	-9 24 28.59
Dec 29	22	34.2		66	0.025	1.40	9.4	6.2	20	TYC	7440-00498-1	w 0.95	605	Juvisia	29	1	20	0	33.103	-30 28 15.14

Raphael Lallemand earlier today sent a message to Planoccult giving a synthesis of GAIAMOONS events for July, with predictions given on this Web page, for selected GAIAMOON events, with emphasis on European events: <https://gaiamoons.imcce.fr/mainevent> . His second event especially is a great one, involving 6.8-mag. ZC 2352 = HIP 80240 = SAO 159888, spec. type F0V in Scorpius; the Occult map is below and his page for it is <https://gaiamoons.imcce.fr/occ.php?p=20429> . It is the brightest star occulted by ANY of the new asteroids worldwide during the rest of 2024.



15269 1990 XF occults HIP 307696 on 2024 Sep 25 from 21h 56m to 22h 1m UT

Star: (Dia = 0.2 mas)  
Mv 7.1; Md 7.5; Mr 6.5  
RA = 14 27 33.3387 (astrometric)  
Dec = -21 59 30.714  
[of Date: 14 28 56, -22 6 S]  
Prediction of 2024 Jun 26.2  
Reliable 1.1 (good),

Durations: Max = 0.26 secs  
1km = 0.024 secs, 1mas = 0.051 secs  
Mag Drop: 10.3 [100%] v, 10.5 [100%] r  
Sun : Dist = 33°  
Moon: Dist = 115°, illum = 38%  
to Err: ±(1.1 x 0.4) mas in PA 121°

Asteroid: (in DAMIT)  
Mag = 17.4  
Dia = 11 ±1km, 5 mas  
Parallax = 2.965"  
Hourly dRA = 4.913s  
dDec = -16.94"

JPL#S8+INTG:2024-Jun-03, Known errors

810 Atossa occults UCAC4 341-178749 on 2024 Nov 5 from 2h 30m to 2h 35m UT

Star: (Dia = 0.2 mas) Durations: Max = 0.24 secs Asteroid: (in DAMIT)  
Mv 9.3; Md 10.4; Mr 8.2 1km = 0.030 secs, 1mas = 0.044 secs Mag = 16.7  
RA = 18 59 58.4567 (astrometric) Mag Drop: 7.4 [100%]v, 8.0 [100%]r Dia = 8.1 ± 0.8km, 5 mas  
Dec = -21 54 39.143 Sun : Dist = 61° Parallax = 4.179"  
[of Date: 19 1 27, -21 52 39] Moon: Dist = 22°, illum = 12% Hourly dRA = 5.851s  
Prediction of 2024 Jun 26.2 1σ Err: ±(1.5 x 0.3) mas in PA 99° dDec = 5.75"  
Reliable 0.9 (good), JPL#69+INTG:2024-Jun-03, Known errors

The map shows the central United States with state boundaries and city labels. The occultation path is shown as a solid line, and the asteroid's path is shown as a dashed line. The path starts in the northwest, near Albuquerque, and moves southeast towards the Gulf of Mexico. The path is labeled with city names: Albuquerque, Dodge, Topeka, Kansas, Wichita, Peoria, Illinois, Amarillo, Bloomington, Enid, Oklahoma, Springfield, Joplin, Missouri, Oklahoma City, Tulsa, Lubbock, Texas, Hermosillo, Nichita, Evansville, Abilene, Paducah, Kentucky, Hayti, Missouri, San Antonio, Fort Worth, Dallas, Bowling Green, Chihuahua, Texas, Nashville, Tennessee, Waco, Texas, and Marshall.

The above objects (with black font) were the ones we decided upon in August last year when we computed the predictions. But other unusually-shaped asteroids, mostly apparently peanut-shaped objects that produced two occultations for some observers, may be included in the predictions for 2025, including



(398) Admete, (885) Ulrike, (1721) Wells, (14758) 6519 P-L, and (243267) 2008 AM10. These are of interest since we initially thought this was the case for **(5457) Queen's**, but then 16 days later, observation of another occultation by it clearly showed two well-separated objects, rather than just one elongated object. Later, we might add (3825) Nürnberg, (3819) Robinson, and (21976) 1999 XV2, which, like (4552) Nabelek, are expected to be larger than the standard thermal IR models predict, according to "Probabilistic Modeling of Asteroid Diameters from Gaia DR2 Errors" in Research Notes of the AAS, Aug. 2021, DOI: 10.3847/2515-5172/ac205e, by Rafael S. de Souza et al. Let us know of any other asteroids that you think should be added to the Main-Belt special asteroids list.

The **European Section of IOTA** has their own priority events with calls for observations on their Web page at <https://call4obs.iota-es.de/> and especially for slow-rotating asteroids at [https://www.iota-es.de/neglected\\_asteroids.html](https://www.iota-es.de/neglected_asteroids.html) – European observers should consult it, since it includes several events that are not in my lists. I consult it to find some of the asteroids for our selection here.

The maps were produced with IOTA's free *Occult* software; see <http://www.lunar-occultations.com/iota/occult4.htm>. You can download and use this software and use it to compute your own local lists and information about these and many other occultations. The information for doing this is at <http://www.lunar-occultations.com/iota/2024iotapredictions.pdf>. This describes a prediction input file for planetary and asteroidal files called **All2024.xml**. You can use that file to generate local predictions, but you can replace it with the other files listed below to generate predictions for more occultations, mainly of fainter stars than shown on the maps, or for other parts of the world (the files given in **red font** below are in the new group of special asteroids added with this update and given in **red and green font** in the list of our considered special asteroids on pages 3-5:

**Nam24MBspecialFinal.xml** – This is the input for the 16 special main-belt occultations for North America shown on the map at the bottom of the 1<sup>st</sup> page.

**Nam24MBspecialToMag14.xml** – This is the input for 118 occultations across North America by the selected special main-belt asteroids of stars to mag. 14, "old" objects with black font only.

**2024worldMBspecial.xml** – This is the input for 1907 occultations worldwide by the selected special main-belt asteroids of stars to mag. 14, "old" objects with black font only.

**2024restMBspecialRedAndGreen.xml** – This is the input for 12,948 occultations worldwide by the new (**red** and **green** font, GAIAMOONS and other new) objects only, for the rest of 2024. This and some subsets of it are on the updated IOTA 2024 special objects occultations Web page at <https://occultations.org/publications/rasc/2024/nam24MBspecialoccs.htm>.

With these added events, we apologize that you have to review two maps, and for comprehensive work, make two separate Occult runs, one to generate the occultations from the first group, and another to get the many occultations by the newly-added asteroids (ones with red and green font). Of course, they will be consolidated into one file for next year's predictions, so the inconvenience will be temporary.

For worldwide occultations by major and all types of minor planets (mainly main-belt) worldwide for the whole year, fairly comprehensive only to about mag. 12.5, use the **All2024.xml** file noted above, but even more occultations can be found with Occult Watcher (it is limited to the next two months); it is a free download from <http://www.occultwatcher.net/>.

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