

LIGHTCURVES AND ROTATION PERIODS OF 47 AGLAJA, 504 CORA, 527 EURYANTHE, 593 TITANIA, AND 594 MIREILLE

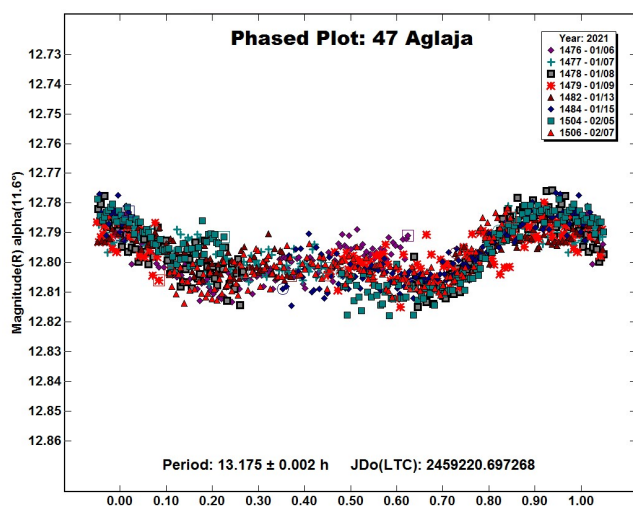
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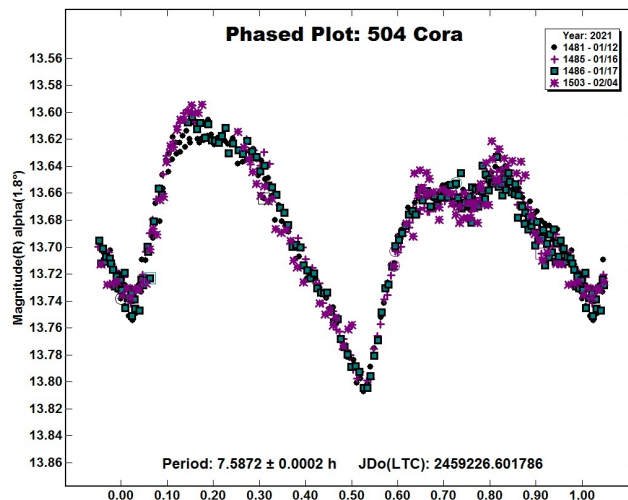
Synodic rotation periods and amplitudes are found for
47 Aglaja: 13.175 ± 0.002 h, 0.02 mag;
504 Cora: 7.5872 ± 0.0002 h, 0.18 ± 0.01 mag;
527 Euryanthe: 42.75 ± 0.01 hours, 0.14 ± 0.01 mag;
593 Titania: 9.899 ± 0.001 h, 0.26 ± 0.02 mag;
594 Mireille: 4.9685 ± 0.0002 hours, 0.32 ± 0.02 mag.

Observations to produce the results reported in this paper were made at the Organ Mesa Observatory with a Meade 35 cm LX200 GPS Schmidt-Cassegrain, SBIG STL-1001E CCD, unguided. Exposure times were 60 seconds with R filter for 593 Titania and clear filter for all other targets. Image photometric measurement and lightcurve construction were done by *MPO Canopus* software. To reduce the number of data points on the lightcurves and make them easier to read, data points have been binned in sets of 3 with maximum time difference 5 minutes.

47 Aglaja. The Lightcurve Data Base (Warner et al. 2009, updated 2020 October) lists 11 previously published rotation periods for 47 Aglaja, nine of which are close to the preferred value of 13.178 hours, and with amplitudes ranging from 0.02 to 0.21 magnitudes. Pal et al. (2020) report a period twice as great, 26.4112 hours. New observations on 8 nights 2021 Jan. 6 - Feb. 7 can be fit to an asymmetric lightcurve with period 13.175 ± 0.002 h, amplitude 0.02 magnitudes. The period is consistent with many previously published periods except for Pal et al. (2020). The very small amplitude compared with the largest found shows that its rotational pole is close, probably within 10 degrees, to its location in the sky on the dates of observation near celestial longitude 142° , latitude 4° .



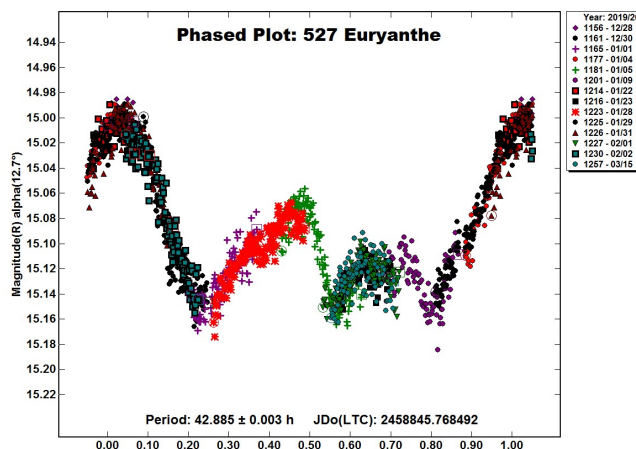
504 Cora. The Lightcurve Data Base (Warner et al. 2009, updated 2020 October) lists 9 previously published rotation periods for 504 Cora, eight of which are within 0.01 hours of the preferred period of 7.587 hours. New observations on 4 nights 2021 Jan. 12 - Feb. 4 provide an excellent fit to a lightcurve with period 7.5872 ± 0.0002 hours, amplitude 0.18 ± 0.01 magnitudes. This period is in excellent agreement with previously published periods.



527 Euryanthe. Previously published rotation periods are by Brinsfield (2010), 26.06 h; Polakis and Skiff (2019), 42.986 h; Polakis (2020), 43.40 h; this author (Pilcher, 2020), 42.93 h.

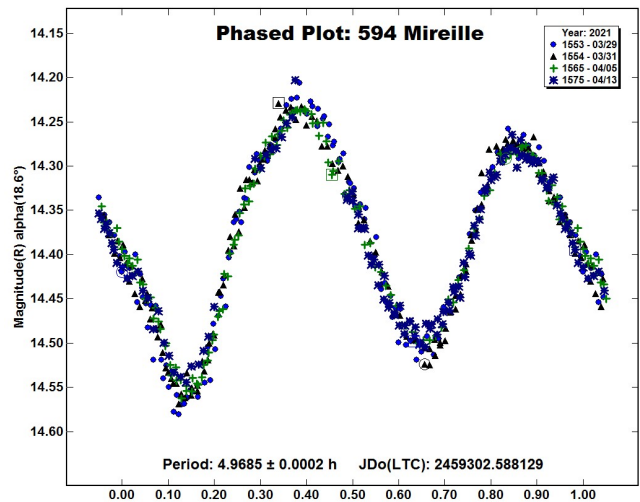
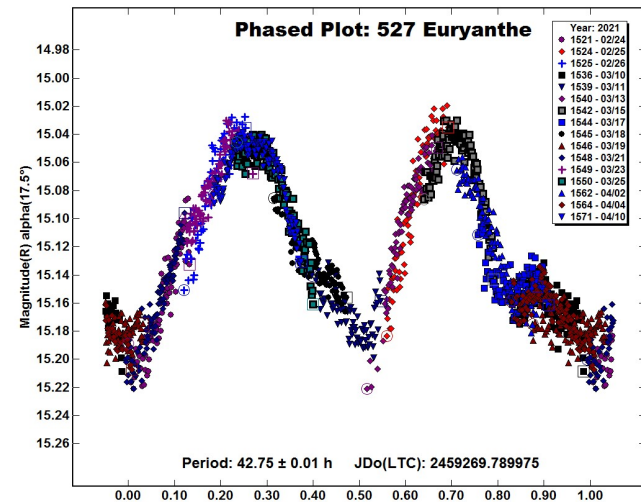
This author thanks Brian Warner (private communication) for independently analyzing the data from Pilcher (2020). Following Warner's suggestion, this author made several small adjustments to the zero points of individual session lightcurves and found that 42.885 ± 0.003 hours, amplitude 0.14 ± 0.01 magnitudes is a better fit with lower rms deviation from the order ten Fourier series best representing the data. The 42.93-hour period is retracted and the lightcurve phased to 42.885 hours is presented in this paper.

Sixteen new sessions obtained 2021 Feb. 24 - Apr. 10 provide an excellent fit to a lightcurve with period 42.75 ± 0.01 hours, amplitude 0.14 ± 0.01 magnitudes. This period is within 0.3% of this author's revised year 2020 period of 42.885 hours and farther removed from all other period determinations.

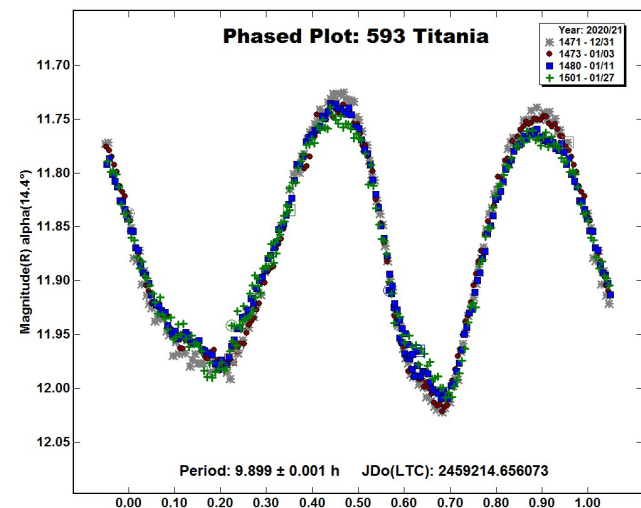


Number	Name	yyyy/mm/dd	Phase		LPAB	BPAB	Period(h)	P.E	Amp	A.E.
47	Aglaja	2021/01/06–2021/02/07	11.6	1.8	142	4	13.175	0.002	0.02	0.01
504	Cora	2021/01/12–2021/02/04	* 1.8,	8.0	115	3	7.5872	0.0002	0.18	0.01
527	Euryanthe	2019/12/28–2020/03/15	*12.7,	15.6	133	3	42.885	0.003	0.14	0.01
527	Euryanthe	2021/02/24–2021/04/10	17.5	6.6	210	12	42.75	0.01	0.14	0.01
593	Titania	2020/12/31–2021/01/27	14.4,	10.8	122	16	9.899	0.001	0.26	0.02
594	Mireille	2021/03/29–2021/04/13	18.6,	25.8	165	17	4.9685	0.0002	0.32	0.02

Table I. Observing circumstances and results. Pts is the number of data points. The phase angle is given for the first and last date, unless a minimum (second value) was reached. LPAB and BPAB are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris *et al.*, 1984).



593 Titania. The Lightcurve Data Base (Warner et al. 2009, updated 2020 October) lists 4 previously published rotation periods for 593 Titania, all within 0.04 hours of the preferred value of 9.8968 hours. New observations on 4 nights 2020 Dec. 31 - 2021 Jan. 27 provide an excellent fit to a lightcurve with period 9.899 ± 0.001 hours, amplitude 0.26 ± 0.02 magnitudes. This period is in excellent agreement with previously published periods.



594 Mireille. Previously published rotation periods are by Wisniewski (1991), 4.966 h; Polakis and Skiff (2017), 4.9671 h; and Benishek (2018), 4.9688 h. New observations on 4 nights 2021 Mar. 29 - Apr. 13 provide an excellent fit to a lightcurve with period 4.9685 ± 0.0002 hours, amplitude 0.32 ± 0.02 magnitudes. This period is in excellent agreement with previously published periods.

References

- Benishek, V. (2018). "Lightcurve and rotation period determinations for 29 asteroids." *Minor Planet Bull.* **45**, 82-91.
- Brinsfield, J.W. (2010). "Asteroid lightcurve analysis at the Via Capote Observatory: 4th quarter." *Minor Planet Bull.* **37**, 50-53.
- Harris, A.W.; Young, J.W.; Scaltriti, F.; Zappala, V. (1984). "Lightcurves and phase relations of the asteroids 82 Alkmene and 444 Geytis." *Icarus* **57**, 251-258.
- Pal, A.; Szakáts, R.; Kiss, C.; Bódi, A.; Bognár, Z.; Kalup, C.; Kiss, L.L.; Marton, G.; Molnár, L.; Plachy, E.; Sármeczky, K.; Szabó, G.M.; Szabó, R. (2020). "Solar System Objects Observed with TESS - First Data Release: Bright Main-belt and Trojan Asteroids from the Southern Survey." *Ap. J. Supl. Ser.* **247**, 26-34.
- Pilcher, F. (2020). "Lightcurves and rotation periods of 83 Beatrix, 86 Semele, 118 Peitho, 153 Hilda, 527 Euryanthe, and 549 Jessonda." *Minor Planet Bull.* **47**, 192-195.
- Polakis, T.; Skiff, B. (2017). "Lightcurve analysis for 341 California, 594 Mireille, 1115 Sabauda, 1504 Lappeenranta, and 1926 Demidelaer." *Minor Planet Bull.* **44**, 299-302.
- Polakis, T.; Skiff, B. (2019). "Lightcurves of eleven main-belt minor planets." *Minor Planet Bull.* **46**, 152-157.
- Polakis, T. (2020). "Photometric observations of thirty minor planets." *Minor Planet Bull.* **47**, 177-186.
- Warner, B.D.; Harris, A.W.; Pravec, P. (2009). "The Asteroid Lightcurve Database." *Icarus* **202**, 134-146. Updated 2020 October. <http://www.minorplanet.info/lightcurvedatabase.html>
- Wisniewski, W.Z. (1991). "Physical studies of small asteroids I. Lightcurves and taxonomy of ten asteroids." *Icarus* **90**, 117-122.