

**LIGHTCURVE RESULTS FOR
EIGHT MAIN-BELT ASTEROIDS**

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Photometric observations for eight main-belt asteroids allowed us to derive the following rotational synodic periods: 2663 Miltiades, 3.95796 ± 0.00007 h; 3539 Weimar, 8.7059 ± 0.0007 h; 9014 Svyatorichter, 3.7635 ± 0.0008 h; 13441 Janmerlin, 23.0840 ± 0.0007 h; (14488) 1994 TF15, 2.8761 ± 0.0001 h; (15138) 2000 EQ93, 16.4228 ± 0.0023 h; (18489) 1996 BV2, 2.9317 ± 0.0014 h; (18513) 1996 TS5, 9.7437 ± 0.0028 h.

We report on the photometric analysis for eight-belt asteroids by Asociación Valenciana de Astronomía (AVA). The data were obtained during the last quarter of 2024 and first months of 2025. We present graphic results of data analysis, mainly lightcurves, with the plot phased to a given period. We managed to obtain several accurate and complete lightcurves and calculating as accurately as possible their rotation periods.

Observatory	Telescope (meters)	CCD
C.A.A.T. J57	17" DK	QHY- 600
C.A.A.T. J57	10" NW	ZWO ASI 1600
Z93	SC 8"	SBIG ST8300
J67	SC 10"	SBIG ST7
Y78	SC 8"	ZWO ASI 294 MM PRO
Y76	SC 9..25"	ATIK 314L+

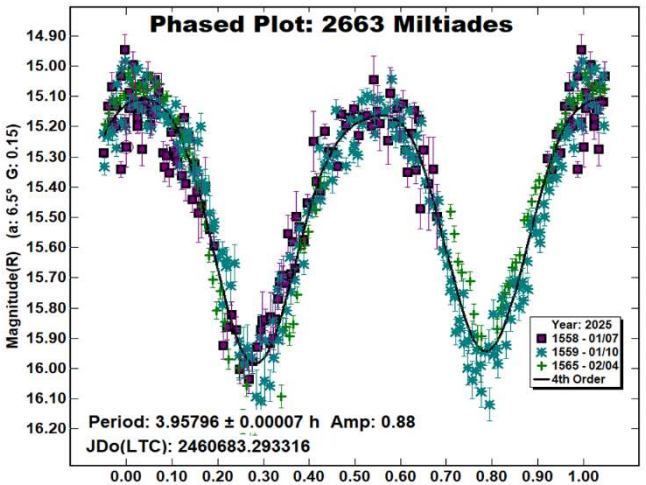
Table I. List of instruments used for the observations.

We focused on asteroids with no reported period and those where the reported period was poorly established and needed confirmation. The targets were selected from the Collaborative Asteroid Lightcurve (CALL) website

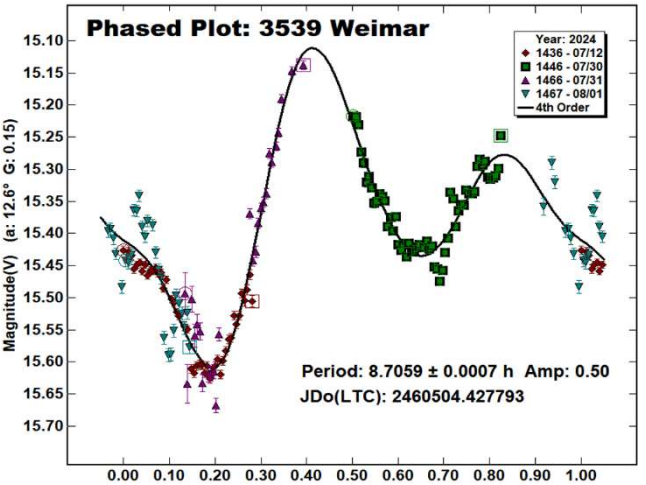
(<http://www.minorplanet.info/call.html>), the Minor Planet Center (<http://www.minorplanet.net>) and Brian D. Warner et at. (2024). The Asteroid Lightcurve Database (LCDB; Warner et al., 2009) was consulted to locate previously published results.

Images were measured using *MPO Canopus* (Bdw. Publishing) with a differential photometry technique. The comparison stars were restricted to near solar-color to minimize color dependencies, especially at larger air masses. The lightcurves show the synodic rotation period. The amplitude (peak-to-peak) that is shown is that for the Fourier model curve and not necessarily the true amplitude.

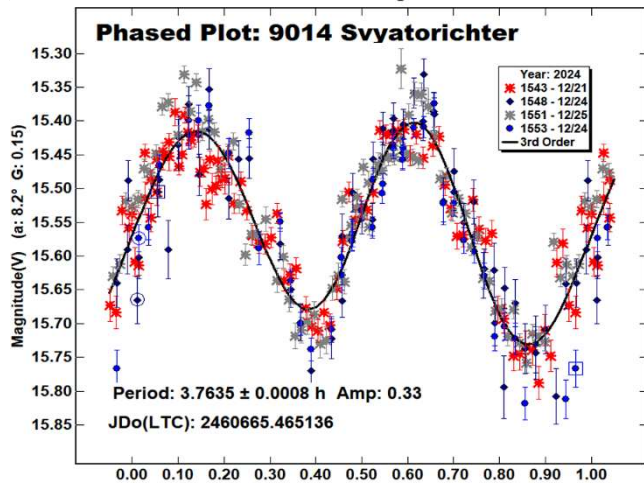
2663 Miltiades. This inner main-belt asteroid was discovered on 1960 Sep 24 at Palomar by PLS. We made observations on 2025 Jan 7 to Feb 4. From our data we derive a synodic rotation period of 3.95796 ± 0.00007 h and an amplitude of 0.88 mag. Durech et al. (2018) found a sidereal period of 3.957489 h and Martikainen et al. (2021) found a sidereal period of 3.957490 h. All of them are consistent with our calculation.



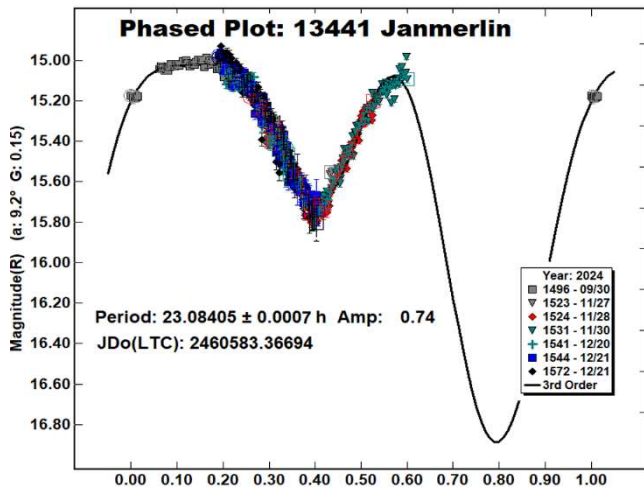
3539 Weimar. This outer main-belt asteroid of the Eunea family was discovered on 1967 Apr 11 at Thuringia State Observatory Tautenburg by F. Börngen. We made observations on 2024 Jul 7 to Aug 1. From our data we derive a synodic rotation period of 8.7059 ± 0.0007 h and an amplitude of 0.50 mag. Garlitz (2011 web) got a period of 7.29 h.



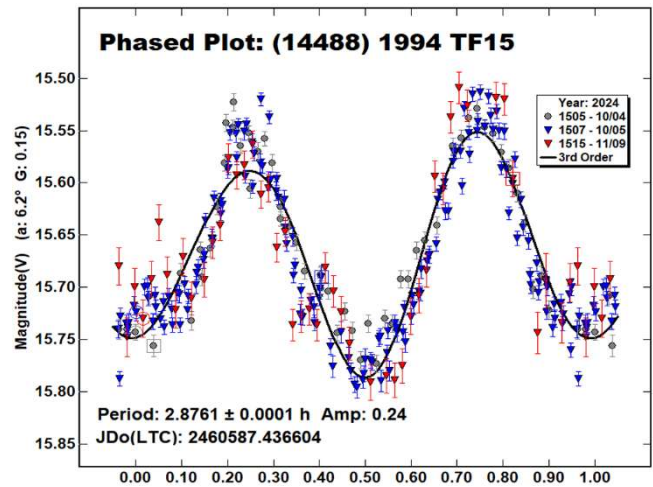
9014 Svyatorichter. This inner main-belt asteroid was discovered on 1985 Oct. 22 at Nauchnij by L.V. Zhuravleva. We made observations on 2024 Dec 21 - 25. From our data we derive a synodic rotation period of 3.7635 ± 0.0008 h and an amplitude of 0.33 mag. We have no previous information about its rotation period.



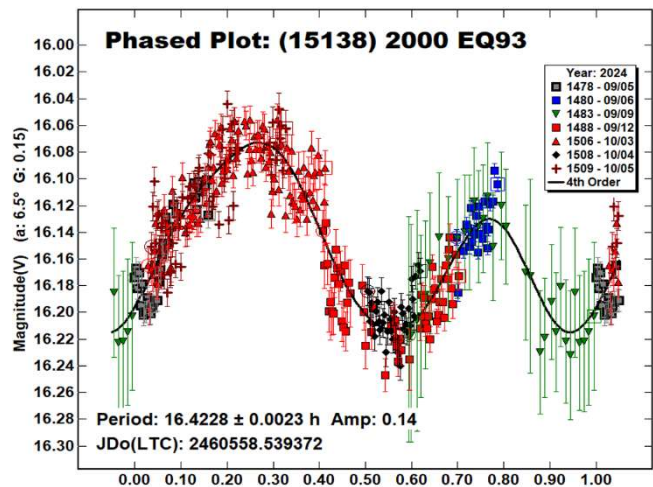
13441 Janmerlin. This middle main-belt asteroid was discovered on 1960 Sep. 24 at Palomar by PLS. We made observations on 2024 Sep 30 to Dec 21. From our data we derive a synodic rotation period of 23.0840 ± 0.0007 h and an amplitude of 0.74 mag. The period is close to 24 hours and we have not obtained the complete lightcurve but only one of the halves. In any case, the result of the period calculation is accurate enough. Our results match with Marchini and Papini (2025) who got a period of 23.087 h.



(14488) 1994 TF15. This inner main-belt asteroid was discovered on 1994 Oct 13 at Kiyosato Observatory by S. Otomo. We made observations on 2024 Oct 4 to Nov 9. From our data we derive a synodic rotation period of 2.8761 ± 0.0001 h and an amplitude of 0.24 mag. We have no previous information about its rotation period.



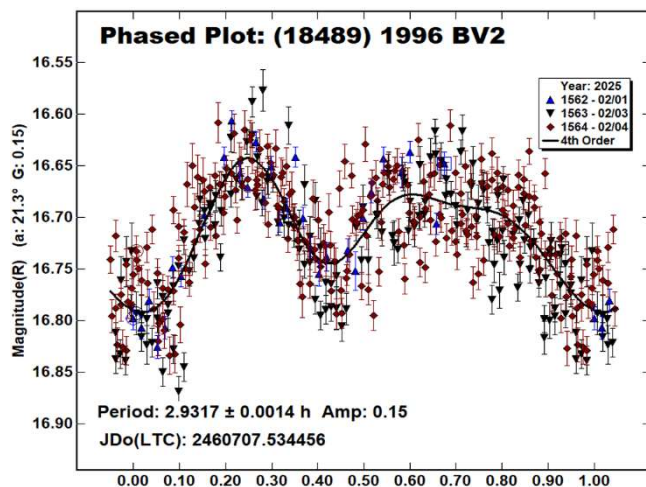
(15138) 2000 EQ93. This middle main-belt asteroid was discovered on 2000 March 9 at SOCORRO by LINEAR. We made observations on 2024 Sep 5 to Oct 5. From our data we derive a synodic rotation period of 16.4228 ± 0.0023 h and an amplitude of 0.14 mag. We have no previous information about its rotation period.



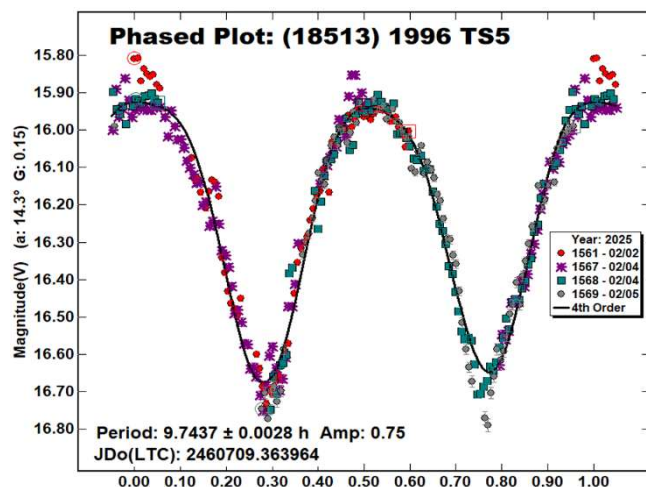
Number	Name	yyyy mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
2663	Miltiades	2025 01/07-02/04	6.4, 18.6	105.5	9.0	3.95796	0.00007	0.88	0.05	MB-I
3539	Weimar	2024 07/12-08/01	5.7, 10.6	290.9	8.9	8.7059	0.0007	0.5	0.05	MB-O
9014	Svyatorichter	2024 12/21-12/24	8.7, 10.5	76.1	1.8	3.7635	0.0008	0.33	0.05	MB-I
13441	Janmerlin	2024 09/30-12/21	8.6, 25.6	26.1	-4.5	23.0840	0.0007	0.74	0.05	MB-M
14488	1994 TF15	2024 10/04 11/09	6.1, 15.7	20.4	3.4	2.8761	0.0001	0.24	0.05	MB-I
15138	2000 EQ93	2024 09/05-10/05	6.5, 13.8	350.3	9.8	16.4228	0.0023	0.14	0.03	MB-M
18489	1996 BV2	2025 02/01-02/04	7.1, 6.1	142.7	9.0	2.9317	0.0014	0.15	0.03	MB-M
18513	1996 TS5	2025 02/02-02/05	14.3, 16.0	111.8	-1.3	9.7437	0.0028	0.75	0.05	MB-I

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).

(18489) 1996 BV₂. This middle main-belt asteroid was discovered on 1996 Jan 26 at Kashiwara by F. Uto. We made observations on 2025 Feb 1 to 4. From our data we derive a synodic rotation period of 2.9317 ± 0.0014 h and an amplitude of 0.15 mag. We have not previous information about its rotation period.



(18513) 1996 TS₅. This inner main-belt asteroid of the Phocaea family was discovered on 1996 Oct 7 at Catalina Station by T.B. Spahr. We made observations on 2025 Feb 1 to 4. From our data we derive a synodic rotation period of 9.7437 ± 0.0028 h and an amplitude of 0.75 mag. We have no previous information about its rotation period.



References

- Durech, J.; Hanus, J.; Ali-Lagoa, V. (2018). "Asteroid models reconstructed from the Lowell Photometric Database and WISE data." *Astron. Astrophys.* **617**, A57.
- Garlitz (2011web). (unknown link).
- Harris, A.W.; Young, J.W.; Scaltriti, F.; Zappala, V. (1984). "Lightcurves and phase relations of the asteroids 82 Alkmene and 444 Gytis." *Icarus* **57**, 251-258.
- Marchini, A; Papini, R. (2025). "13441 Janmerlin, an Asteroid with an Earth Commensurate Rotation Period." *Minor Planet Bull.* **52**, 7-8.
- Martikainen, J.; Muinonen, K.; Penttilä, A.; Cellino, A.; Wang, X.-B. (2021). "Asteroid absolute magnitudes and phase curve parameters from Gaia photometry." *Astron. Astrophys.* **649**, A98.
- Warner, B.D.; Harris, A.W.; Pravec, P. (2009). "The Asteroid Lightcurve Database." *Icarus* **202**, 134-146. Updated 2016 Sep. <http://www.minorplanet.info/lightcurvedatabase.html>
- Warner, B.D.; Harris, A.W.; Durech J.; Lance A.M. (2024). "Lightcurve Photometry Opportunities: 2024 July - September." *Minor Planet Bull.* **51**, 293-296.