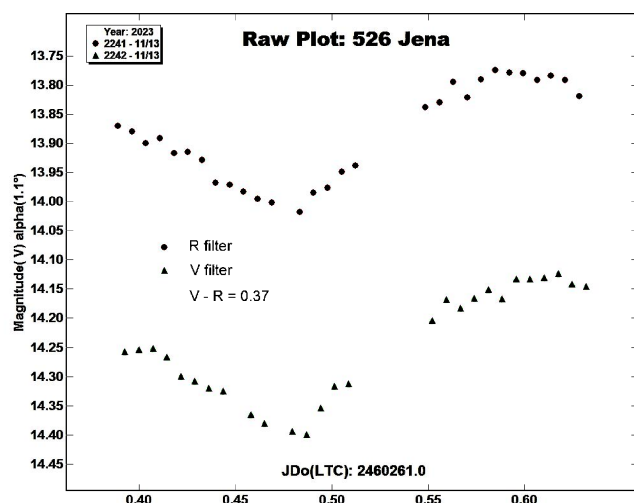
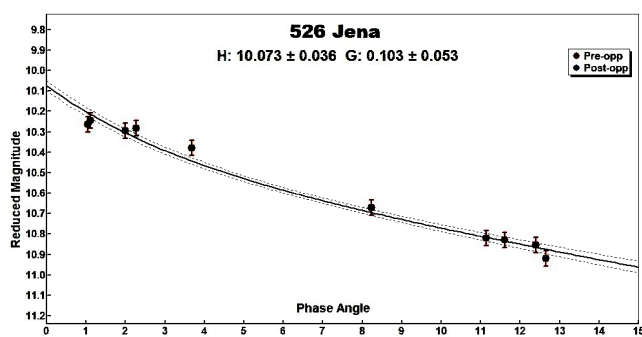




We also present an $H - G$ plot in the V magnitude system for phase angles from 12.7° down to 1.1° . We find $H = 10.07 \pm 0.04$ and $G = 0.10 \pm 0.05$. For this plot the R band magnitudes were converted to V band, adding the color index $V - R$ and evaluating, for each lightcurve, the half peak-to-peak magnitudes.



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LIGHTCURVES AND ROTATION PERIODS OF 738 ALAGASTA AND 1011 LAODAMIA, AND A NOTE ON 991 MCDONALDA

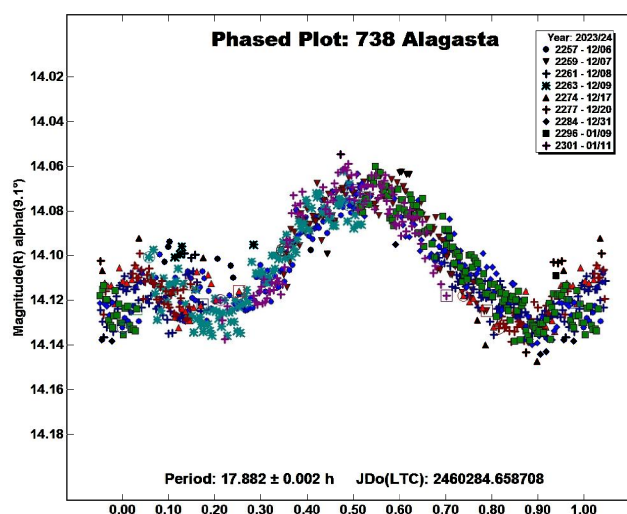
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Synodic rotation periods and amplitudes are found for 738 Alagasta 17.882 ± 0.002 hours, 0.06 ± 0.01 magnitudes; 1011 Laodamia 5.1722 ± 0.0001 hours, 0.43 ± 0.02 magnitudes. The period of 991 McDonaldia was not found and may be long.

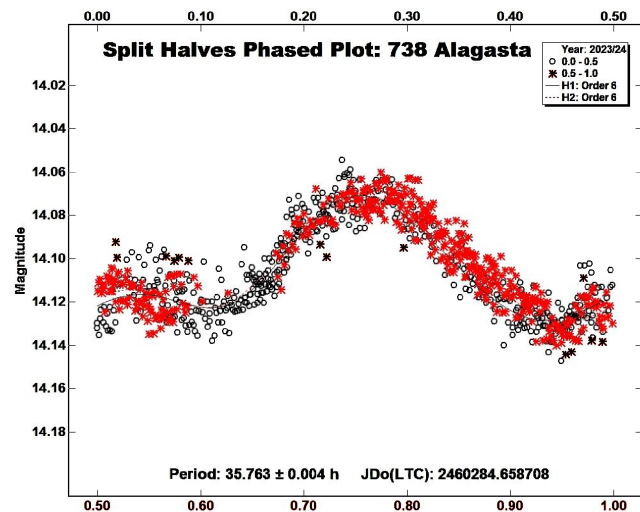
The new observations to produce the results reported in this paper were made at the Organ Mesa Observatory with a Meade 35 cm LX200 GPS Schmidt-Cassegrain, SBIG STL-1001E CCD, 60 to 120 second exposures, unguided, clear filter. Image measurement and lightcurve construction were with *MPO Canopus* software with calibration star magnitudes for solar colored stars from the CMC15 catalog reduced to the Cousins R band. Zero-point adjustments of a few $\times 0.01$ magnitude were made for best fit. 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.

738 Alagasta. Previously published rotation periods for 738 Alagasta are by Sada et al. (2005), 17.83 hours; Behrend (2009web), >12 hours; Garcerán et al. (2016), 18.86 hours; Polakis (2020), 17.89 hours. New observations on 9 nights 2023 Dec. 6 to 2024 Jan. 11 provide a good fit to an irregular lightcurve with period 17.882 ± 0.002 hours, amplitude 0.06 ± 0.01 magnitudes. The split halves plot of the double period 35.763 hours shows close overlap of both halves of the plot and rules out the double period. The period found by this study is consistent with Sada et al. (2005) and Polakis. (2020), but not with Garcerán et al. (2016).

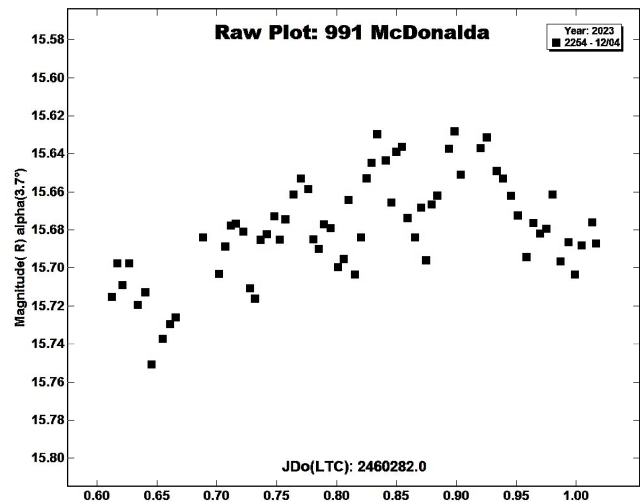


Number	Name	yyyy/mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E	Amp	A.E.
738	Alagasta	2023/12/06-2024/01/11	* 9.1 - 4.9	98	- 2	17.882	0.002	0.06	0.01
991	McDonalda	2023/12/04	3.7	82	1	-----	-----	>0.06	-----
1011	Laodamia	2023/12/11-2024/01/10	6.0 - 20.0	82	- 6	5.1722	0.0001	0.43	0.02

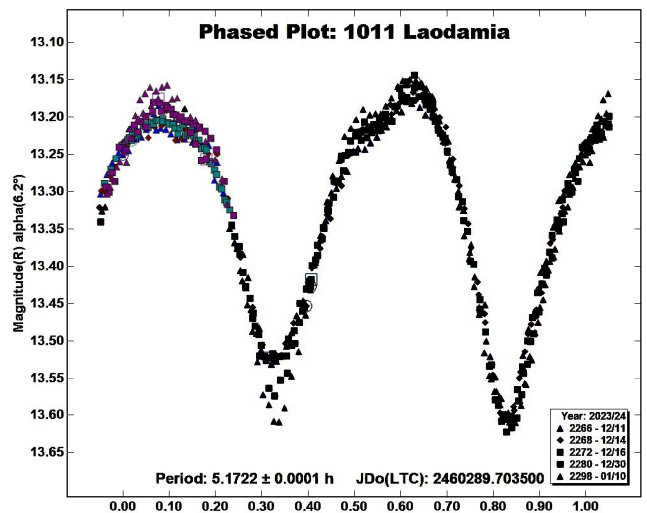
Table I. Observing circumstances and results. The phase angle is given for the first and last date, unless a minimum (second value) was reached. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris et al., 1984).



991 McDonalda. The Asteroid Lightcurve Data Base (Warner et al., 2009) lists no published rotation period for 991 McDonalda, probably because this object is very faint. At magnitude 16, the equipment of the Organ Mesa Observatory could have found a reliable rotation period only if the amplitude was fairly large, certainly >0.1 magnitudes, and the period was fairly short. A single ten-hour session on 2023 Dec. 4 showed that this was not the case. From JD 2460282.60 until near JD 2460282.9 the magnitude brightened by 0.06 magnitudes, then faded by 0.03 magnitudes when the session ended at JD 2460283.03. The period is unlikely to be longer than 2 to 4 days. But it was evident after the first session that a very large amount of telescope time would be needed to find a solution that might not be accurate and reliable, and that this telescope time would be more productive if assigned to other targets.



1011 Laodamia. Previously published rotation periods for 1011 Laodamia are by Behrend (2002web), 5.17247 hours; Ivanova et al. (2002), 5.17 hours; Apostolovska (2011), 5.175 hours. New observations on 5 nights 2023 Dec 11 to 2024 Jan 10 provide an excellent fit to a lightcurve with period 5.1722 ± 0.0001 hours, amplitude 0.43 ± 0.02 magnitudes. This result is compatible with other published values.



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LIGHTCURVE ANALYSIS FOR EIGHT MAIN-BELT ASTEROIDS AND ONE MARS CROSSER

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Photometric observations of eight main-belt asteroids and one Mars-crosser were obtained from 2023 April 15 to December 30. We derived the following synodic rotational periods: 222 Lucia, 7.8370 ± 0.006 h; 862 Franzia, 7.5235 ± 0.0004 h; 1259 Ogyalla, 17.3000 ± 0.0013 h; 1305 Pongola, 8.0648 ± 0.0015 h; 1308 Halleria, 6.0313 ± 0.0005 h; 1412 Lagrula, 5.9165 ± 0.0008 h; 6025 Naotosato, 27.017 ± 0.004 h; 14835 Holdridge, 16.6717 ± 0.0013 h; and (16591) 1992 SY17, 2.73715 ± 0.00009 h. We also obtained the sidereal rotation period for: 222 Lucia, 7.836690 ± 0.000014 h; 862 Franzia, 7.521938 ± 0.000013 h; 1305 Pongola, 8.063733 ± 0.000015 h; and 6025 Naotosato, 27.02452 ± 0.00019 h.

We report on the photometric analysis result for eight main-belt and one Mars-crossing asteroids. This work was done from Observatorio Polop MPC Z93 (Alicante) operated by members of the Valencian Astronomy Association (AVA) (<http://www.astroava.org>). This database shows graphic results of the data (lightcurves), with the plot phased to a given period.

Observatory	Telescope	CCD
Polop Z93	SC 8"	ASI 2600 MM

Table I. List of instruments used for the observations.

We concentrated on asteroids with no reported period and those where the reported period was poorly established and needed confirmation. We also prioritized those asteroids for which we had dense data collected by our team in previous years in order to attempt finding sidereal periods using *MPO LCInvert* (Bdw Publishing, 2023). All the targets were selected from the Collaborative Asteroid Lightcurve (CALL, 2023) and Minor Planet Center (MPC, 2023) websites. The Asteroid Lightcurve Database

(LCDB; Warner et al., 2009) was consulted to locate previously published results.

Images were calibrated in *MaximDL* (Diffraction, 2023) and measured using *MPO Canopus* (Bdw Publishing, 2023) with a differential photometry technique. The comparison stars were restricted to near-solar color to reduce the effects of color dependencies, especially at larger air masses. The lightcurves give 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.

If we found enough data in ALCDEF to add to our ours, we tried finding the sidereal period using *MPO LCInvert* (Bdw Publishing, 2023), which uses the inversion method described by Kaasalainen and Torppa (2001a). This software uses the C code for a routine called “Period Scan” that was written by Ďurech based on the original FORTRAN code written by Kaasalainen (2001). The advantage of this method is that it allows combining *dense* data, such as ours and those in the ALCDEF database (ALCDEF, 2023), with *sparse* data such as those produced by all-sky surveys, e.g., Catalina, USNO, ATLAS, Palomar, etc.

This is an iterative method that starts with an initial estimate based on a known synodic period and scans a range of possible sidereal periods to find a *global* minimum of χ^2 . The procedure starts with six initial poles for each trial period and selects the period that gives the lowest χ^2 . If there is a clear minimum in χ^2 when plotted as a function of the period, the associated period is very likely the correct solution. Getting a clear solution is not always certain. Here, we reference only those asteroids with an apparently valid result.

When using *MPO LCInvert*, we assign weighting coefficients to consider the different densities and quality of the data. A value of 1.0 is assigned to *dense* data and 0.3 to *sparse* data, which is generally appropriate for higher-quality *sparse* data.

Error estimates for inversion method are not obvious. The smallest separation, ΔP , of the *global* minimum (Kaasalainen et al., 2001b), in the period parameter space is roughly given by

$$\Delta P \approx 0.5 * P^2 / \Delta t$$

where Δt is the full epoch range of the data set expressed in the same units as the period. This derives from the fact that the maxima and minima of a double sinusoidal lightcurve for periods P and $P \pm \Delta P$ are at the same epochs after Δt time.

Quoting from Kaasalainen et al. (2001b), “The period error is mostly governed by the epochs of the lightcurves. If the best local χ^2 minimum of the period spectrum is clearly lower than the others, one can obtain an error estimate of, say, a hundredth part of the smallest minimum width ΔP since the edge of a local minimum ravine always lies much higher than its bottom.”