LIGHTCURVES OF FOUR ASTEROIDS

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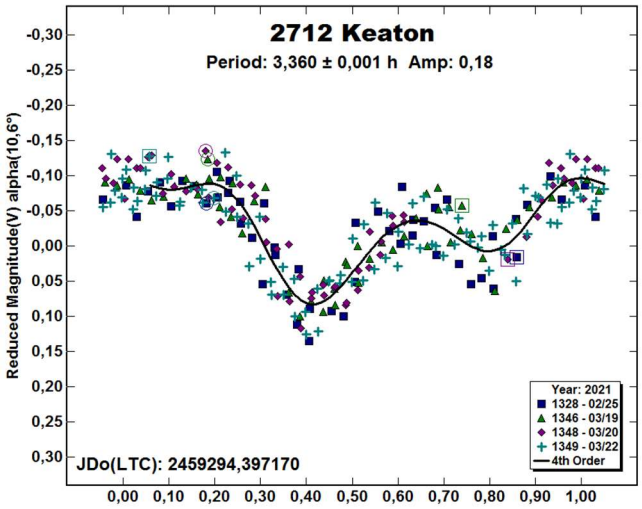
In this paper we present the lightcurves of four main-belt asteroids: 2712 Keaton, P = 3.360 ± 0.001 h, A = 0.18 mag; 4422 Jarre, P = 7.013 ± 0.001 h, A = 0.11 mag; (5343) 1999 RA44, P =590.48 ± 0.46 h, A = 0.57 mag; (49548) 1999 CP83, P = 2.758 ± 0.001 h, A = 0.11 mag.

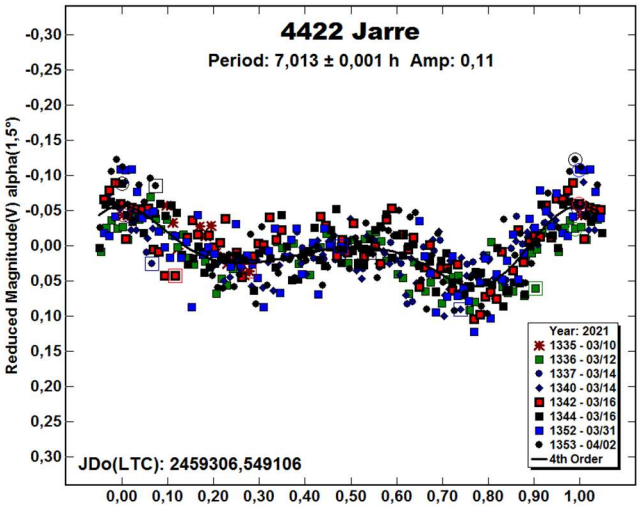
During the first four months of 2021, the Bigmuskie Observatory focused on finding the rotational period of four main-belt asteroids. All targets were found on the CALL website ephemeris generator (Warner, 2021) and choosen because of am uncertain or no reported period.

Because of the very low brightness of all the targets, well beyond 16 mag and even near 18 mag, observations for (25343) 1999 RA44, were made without a filter in order to achive as good as possible signal-to-noise ratio. The telescope was a Marcon 0.30-m *f*/8 Ritchey-Chretién telescope coupled with a Moravian G3 01000 camera with a KAF-1001E CCD. The pixel array 1024×1024×24 microns provided a scale of exactly 2 arcsec/pixel and a field of view of 36×36 arcmin. Telescope and camera were controlled by *Maxim DL* (Diffraction Limited, 2020) and *The Sky 6 Pro* (Bisque, 2020). *Voyager* (Starkeeper, 2020) controlled the entire observatory. Photometric reductions were done with *MPO Canopus* v 10.7.12.9.(Warner, 2018), which permits obtaining fast results and precise night-to-night zero-point calibration using the Comparison Star Selector utility.

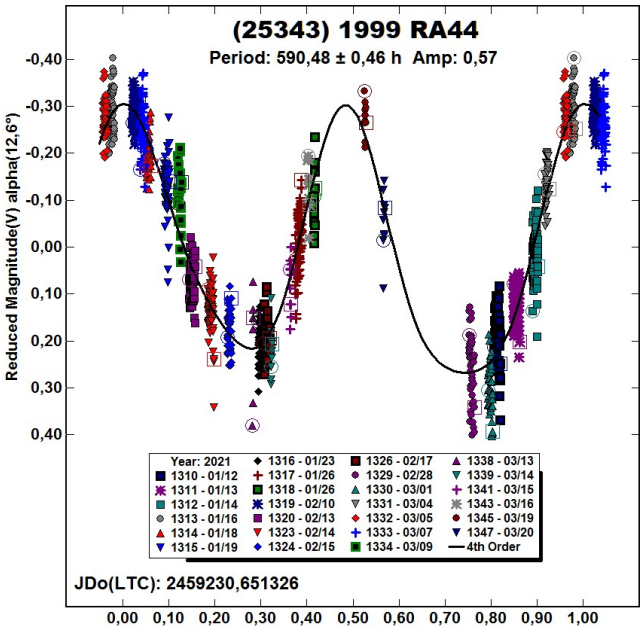
2712 Keaton. A previous period of 5.87 ± 0.04 h measured by Chang et al. (2019) is reported in the LCDB Database. Four observations over a period of about a month starting from February 25 to March 22 led now to a different period of $P = 3.360 \pm 0.001$ h with an amplitude of $A = 0.11$ mag. An attempt to fit the sessions to the previously reported period produced no result.



4422 Jarre. Two periods were reported for this target, a shorter one of 5.428 ± 0.004 h measured by Behrend (2002) and a longer one of 7.002 ± 0.011 h by Polakis (2020). After eight sessions, this target leads to a period very close to the one reported by Polakis: $P = 7.013 \pm 0.001$ h, $A = 0.11$ mag.



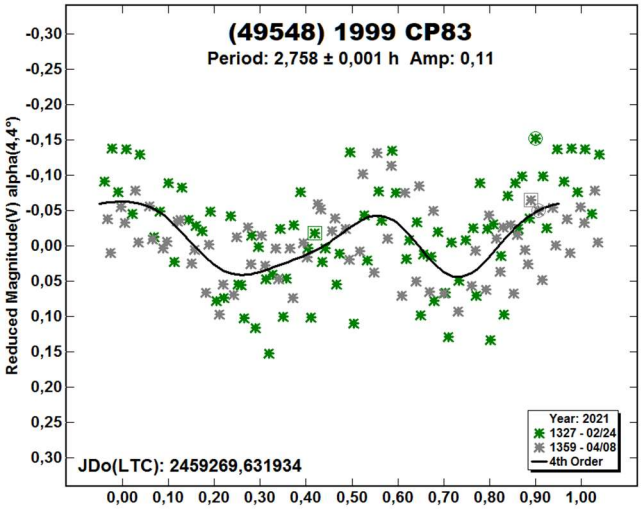
(25343) 1999 RA44. No previous period for this target is reported on the LCDB. It required about three months of work to reach a result. As more sessions were added, many periods appeared, and only in the end *MPO Canopus* pointed in the direction of the period reported in this paper. The final period is $P = 590{,}48 \pm 0.46$ h, $A = 0.57$ mag. Unfortunately, bad weather together with a full moon made it almost impossible to measure the target during rotation phase 0.40 - 0.70. After the last session of March 20, it was too faint, close to 19 mag. Any new measurements showed an uncertainty larger than the amplitude of the curve and so they were useless.



Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
2712	Keaton	2021 02/25-03/22	10.6,4.0	174	0	3.360	0.001	0.18	0.05	MB-I
4422	Jarre	2021 03/10-04/02	1.2,11.1	167	2	7.013	0.001	0.11	0.05	FLOR
25343	1999 RA44	2021 01/12-03/20	12.6,24	131	10	590.48	0.46	0.57	0.05	FLOR
49548	1999 CP83	2021 02/24-04/08	4.4,20.1	161	6	2.758	0.001	0.11	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).

(49548) 1999 CP83. No previous period was reported for this target in the LCDB. The author found a very short period, evident since the first session, of P = 12.981 ± 0.002 h and A = 0.10 mag.



References

Behrend, R. (2020). Observatoire de Geneve web site. *http://obswww.unige.ch/~behrend/page_cou.html*

Bisque (2020). Software Bisque. *The Sky Pro 6*. *http://www.bisque.com*

Chang, C.-K; Lin, H.-W.; Ip, W.-H.; Chen, W.-P.; Yeh, T.-S.; Chambers, K.C.; Magnier, E.A.; Huber, M.E.; Flewelling, H.A.; Waters, C.Z.; Wainscoat, R.J.; Schultz, A.S.B. (2019). "Searching for Super-fast Rotators Using the Pan-STARRS 1." *Ap. J. Supl. Ser.* **241**:6.

Diffraction Limited (2020). *Maxim DL* software. *http://diffractionlimited.com/product/maxim-dl/*

Harris, A.W.; Young, J.W.; Scaltriti, F.; Zappala, V. (1984). "Lightcurves and phase relations of the asteroids 82 Alkmene and 444 Gyptis." *Icarus* **57**, 251-258.

Polakis, T. (2020). "Photometric Observations of Twenty-Three Minor Planets" *Minor Planet Bulletin* **47**, 94-101.

Starkeeper (2020). Voyager Observatory control software. *http://software.starkeeper.it*

Warner, B.D.; Harris, A.W.; Pravec, P. (2009). "The Asteroid Lightcurve Database." *Icarus* **202**, 134-146. Updated 2021 04 13. *http://www.minorplanet.info/lightcurvedatabase.html*

Warner, B.D. (2018). *MPO Canopus* software. *http://bdwpublishing.com*

Warner, B.D. (2021). CALL website ephemeris generator. *http://www.minorplanet.info/PHP/call_OppLCDBQuery.php*