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ROTATIONAL PERIODS OF THREE MAIN-BELT ASTEROIDS

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Here are reported the result of photometric work on three asteroids: 3222 Liller, $P = 12.576 \pm 0.001$ h, $A = 0.31$ mag; (8278) 1991 JJ, $P = 75.028 \pm 0.007$ h, $A = 1.50$ mag; and 10111 Fresnel, $P = 7.421 \pm 0.001$ h, $A = 0.20$ mag;

From 2020 April through June, Bigmuskie Observatory observed three main-belt asteroids to determinate their rotational periods. All three were reported on the CALL website (http://www.minorplanet.info/PHP/call_OppLCDBQuery.php), with no previous observations.

The setup at the Bigmuskie Observatory includes a Marcon 0.30-m $f/8$ Ritchey-Chretien telescope coupled with a Moravian G3 01000 equipped with a KAF-1001E CCD with a pixel array of $1024 \times 1024 \times 24$ microns. This gives a pixel scale of 2 arcsec/pix and a field of view of 36×36 arcmin. Images were unguided and taken through a Topotec R filter. Camera and telescope control were with *Maxim DL* (<http://diffractionlimited.com/product/maxim-dl/>) and *The Sky 6 Pro* (<http://www.bisque.com>). These were controlled by *Voyager* (<http://software.starkeeper.it>) to automate the entire observatory. All photometric reductions were done with *MPO Canopus* v10.7.12.9 (<http://bdwpublishing.com>), which permits obtaining fast results and precise night-to-night zero-point calibration using the Comparison Star Selector utility.

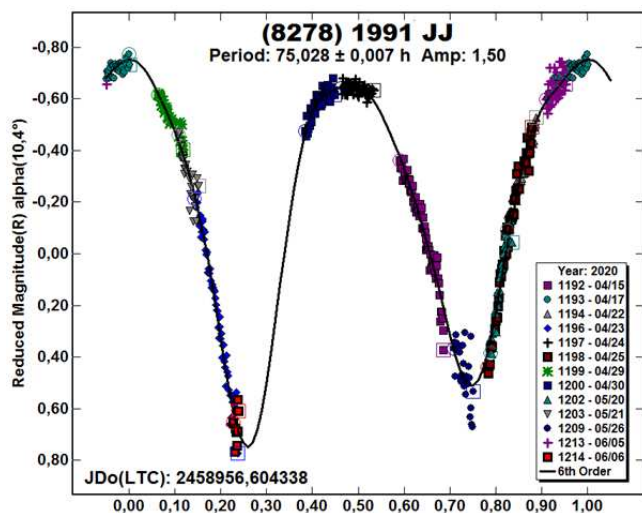
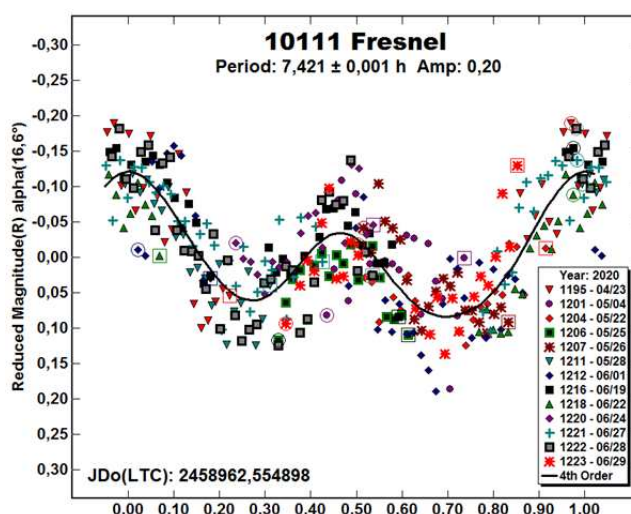
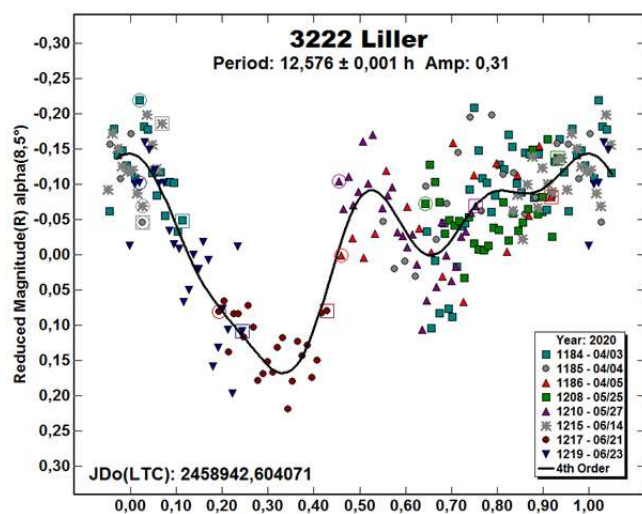
3222 Liller. Due to its period being very close to an Earth day, it took many sessions to reach the final result, which was found thanks to sessions 1217 and 1219 that aligned together into the deepest minimum of the curve. This provided a sort of “stationary landmark” and helped to find the right lightcurve. The period is $P = 12.576 \pm 0.001$ h with an amplitude of $A = 0.31$ mag.

(8278) 1991 JJ. This target showed a very large amplitude which helped to remove any uncertainty due to some low-quality sessions. The final period is $P = 75.028 \pm 0.007$ h, $A = 1.5$ mag.

10111 Fresnel. This was the most difficult target due to the low amplitude and its faint magnitude. Many periods appeared as more sessions were added, but in the end, after some shifting of zero points, the result seems to be reliable. The period is $P = 7.421 \pm 0.001$ h and $A = 0.20$ mag.

Number	Name	yyyy mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
3222	Liller	2020 04/03-06/23	8.5, 18.8	208	17	12.576	0.001	0.31	0.05	MB
8278	1991 JJ	2020 04/15-06/06	10.1, 24.5	194	11	75.028	0.007	1.50	0.05	MB
10111	Fresnel	2020 04/23-06/29	16.6, 14.9	248	18	7.421	0.001	0.20	0.05	MB

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).



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