

PERIOD OF THE FLAT-TOPPED LIGHTCURVE OF 1510 CHARLOIS

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(Received: 2024 October 15 Revised: 2024 November 2)

There are three quite different period determinations listed in the latest lightcurve database for 1510 Charlois. One lightcurve shows intriguing broad flat maxima. The author has observed Charlois and derived $P = 5.867 \pm 0.005$ h as the reliable period, which matches one of those previously reported.

1510 Charlois has an orbital period of 4.36 y, a semimajor axis of 2.670 AU, an eccentricity of 0.149, and an orbital inclination of 11.8° . Three incongruous lightcurve periods have been published for this object. Antonini and Roy (2013) report a period of 5.866 h, Bennefeld et al. (2009) report 6.653 h, and Durech et al. report 15.9844 h. All three periods were assigned $Q = 2$ in the asteroid lightcurve database (Warner et al., 2009).

The author became intrigued by the lightcurve presented by Antonini and Roy (2013), which shows fairly broad flat maxima. A separated close binary asteroid might be expected to show flat maxima as both objects might be fully visible for a length of time at maximum light. In September/October 2024, the author obtained photometry of Charlois on five nights using the 0.43-m T21 iTelescope at the Utah Desert Remote Observatory (IAU code U94). Two-minute exposures through a luminance filter were obtained spanning 17.7 hours in total. Observations of standard stars in the Landolt system (Clem and Landolt, 2013) provided an excellent transformation between the luminance and V system. The lightcurve below presents absolute V mags, $H(V)$, derived assuming $G=0.15$ (Bowell et al., 1989). The 402 points were fit with a smooth spline curve. The standard deviation scatter around the fit is 0.014 mag.

The observations yield a very reliable period of 5.867 h, which matches that of Antonini and Roy (2013). One of the minima was observed on three nights, the other on two nights, so phasing the observations to various periods resulted in a very narrow window of possible periods around 5.867 h.

The shape of the lightcurve here is significantly different from that presented by Antonini and Roy (2013). The amplitude is little more than half that of the 2013 lightcurve. This is likely due to a significant difference between 2013 and 2024 in the angle between the Earth-object direction and the object rotational axis orientation. As usual, more lightcurves at different orbital positions are needed to determine the rotational axis direction of the object. At its next opposition in January 2026, Charlois will be near the position where the higher amplitude lightcurve was found by Antonini and Roy (2013). In January 2026 Charlois should have a V mag as bright as 14.5 at a declination of $+30^\circ$, providing an excellent observing opportunity for northern hemisphere observers with small telescopes. Multiple lightcurves at the time of maximum amplitude

could help investigate the possible binary nature of the object using the minima timing idea (Romanishin, 2024).

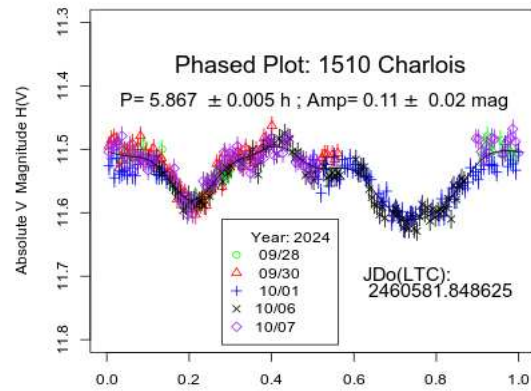


Figure 1. Phased absolute magnitude plot. The observed V mags average around 15.6.

Acknowledgements

This research has made use of data and/or services provided by the Jet Propulsion Laboratory HORIZONS system and the Minor Planet Center of the International Astronomical Union.

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Number	Name	yyyy mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1510	Charlois	2024 09/28-10/07	3.6-6.3	1	8	5.867	0.005	0.11	0.02	MB-M

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).