

**LIGHTCURVE ANALYSIS AND
ROTATION PERIOD FOR NEA 2006 WB**

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Analysis of lightcurve observations of NEA 2006 WB during its closest approach to Earth in 2024 yields a synodic rotation period solution of 8.53 ± 0.29 h. Even though this period is compatible with the value found by the Arecibo telescope in 2006, the data set allowed for many other periods with similar RMS values in the Fourier analysis. Thus the 8.53 h period solution must be considered ambiguous and inconclusive.

2006 WB is a very small near-Earth asteroid. NASA JPL analysis determined that it presents no imminent threat and so is not listed as a potentially hazardous asteroid (PHA). It orbits the sun every 286 days (0.78 years), reaching a minimum perihelion distance of about 0.70 au and aphelion distance of 1.0 au (JPL, 2024). Based on its absolute magnitude of $H = 22.8$ and depending on the assumed albedo, the diameter of 2006 WB is probably between 0.048 to 0.214 km.

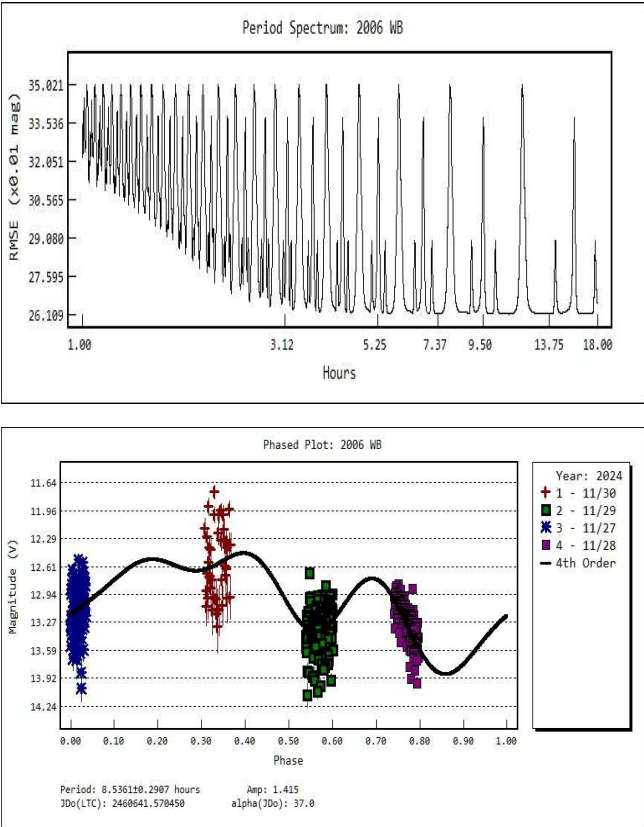
2006 WB was discovered by the Catalina Sky Survey in 2006 November, when it passed about 0.018 au (2.7 million km) from Earth. Radar observations at Arecibo a month later suggested a rotation period of approximately 8 h.

The NEA was observed during its last approach in 2024 November at the OARU Observatory (X33) in Manaus, Brazil. Observations were carried out with a 0.2 m/f/5 reflecting telescope equipped with an ASI 294 MC Pro camera. No photometric filters were used and exposure times varied from 10 to 30 seconds. On the last night of observations, the asteroid was $V > 16$ and so the photometric data became more dispersed.

Tycho Tracker Pro (Parrott, 2024) was used to measure the images and do a period search using Fourier analysis. The resulting lightcurve suggests a rotation period of 8.53 ± 0.29 hours with a peak-to-peak amplitude of about 1.41 mag; this would imply a significantly elongated shape or albedo variations on the asteroid’s surface. The former is the more likely cause.

While the period found here is close to that found by the Arecibo, it cannot be considered conclusive. In fact, it is highly ambiguous. A look at the period spectrum generated by the Fourier analysis shows numerous other solutions with essentially the same RMS fit, which are likely *rotational aliases*, i.e., periods that are the result of one or more integral half-rotations of the one attributed to the dominant period.

More studies will be necessary to complement and accurately determine the rotation period of this asteroid, whose next closest approach to Earth will not occur until 2039 November.



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References

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Number	Name	yyyy mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
2006	WB	2024 11/27-11/30	*37.0, 80.5	38	7	8.53	0.29	1.41	0.26	NEA

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).