

ROTATION PERIOD DETERMINATION FOR ASTEROID 2024 MK

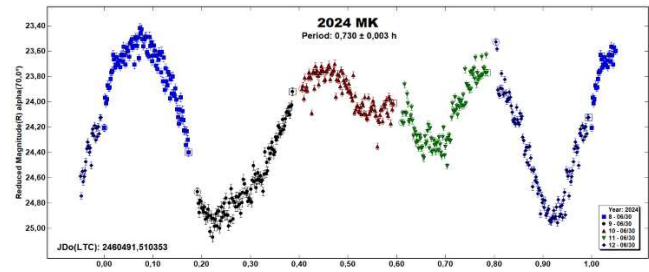
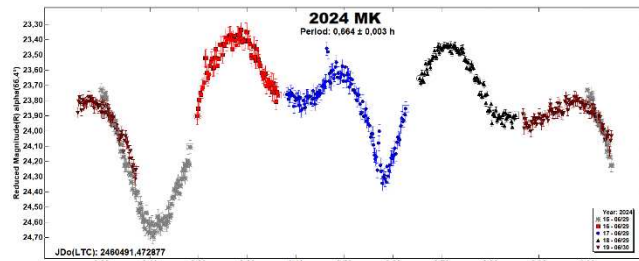
Nick Sioulas
NOAK Observatory (L02)
Stavraki Ioannina, GREECE
nsioulas@hotmail.com

(Received: 2024 July 21 Revised: 2024 August 8)

Photometric observations of the near-Earth asteroid 2024 MK were conducted from the NOAK Observatory, in Greece to determine its rotation period. Multiple tumbling periods are found: $P = 0.730 \pm 0.003$ h, $A = 1.48$ mag and $P = 0.664 \pm 0.003$ h, $A = 1.38 \pm 0.02$ mag.

All observations of 2024 MK were performed at the NOAK Observatory, Ioannina Greece (MPC-International Astronomical Union code L02), using a 0.25-m Newtonian Skywatcher optical tube operating at f/4.7. The optical tube is mounted on NEQ6 Skywatcher robotic mount and equipped with ATIK 460exm CCD camera. It is a high Quantum Efficiency CCD. No filters used for better signal to noise. Exposure time for all the images was two seconds. The camera was binned at 2×2 . The image scale after 2×2 binning was 1.57 arcsec/pixel and the field of view $35.9' \times 28.7'$. In these fields, the asteroid and five comparison stars were measured for differential photometry.

All images were reduced in the standard manner using nightly flatfield files as well as dark-current and bias images. Photometric measurements and lightcurve analysis were performed using *MPO Canopus* (version 10.8.1.1; Warner, 2019). The *Cartes Du Ciel* was used as the planetarium software with the most recent ephemerides downloaded from the Minor Planet Center and *Artemis Capture* was used for image capture.



2024 MK (54448601) was discovered by ATLAS South Africa, Sutherland on 2024-06-16. It has an estimated diameter of 141m and passed within 294,000 km of Earth's surface – roughly 77% of the distance between Earth and the Moon. The recording time from the observatory was 2 hours. Within this observation period it was found that the asteroid has 2 rotation periods. This leads to the result that it is a non-principal axis rotator asteroid, a result that agrees with the preliminary analysis performed by the Goldstone Solar System Radar. The first period analysis shows a solution for the rotational period $P = 0.730 \pm 0.003$ h with an amplitude $A = 1.48 \pm 0.02$ mag and the second analysis a rotational period $P = 0.664 \pm 0.003$ h with an amplitude $A = 1.38 \pm 0.02$ mag. It is a Potentially Hazardous Asteroid with a semi-major axis of 2.201AU, eccentricity 0.542, inclination 8.401deg, and an orbital period of 3.266 years. Its absolute magnitude is $H = 22.052$ (JPL, 2024).

References

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Number	Name	yyyy mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
2024 MK		2024 06/29	+33.40	264.9	-11.8	0.664	0.003	1.48	0.02	APOLLO [NEO]
2024 MK		2024 06/30	+70.30	308.6	19.4	0.730	0.003	1.38	0.02	APOLLO [NEO]

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).