

# ROTATIONAL PERIOD AND LIGHTCURVE DETERMINATION OF TWO ASTEROIDS

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Photometric observations were conducted of two main-belt asteroids. The results of lightcurve analysis gave sidereal rotation periods and amplitudes shown in the table below.

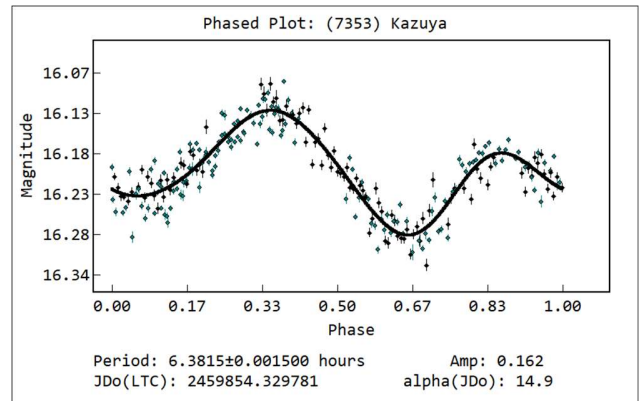
Reported here are lightcurve and period of rotation solutions for asteroids studied with Marina Sky Observatory 17-inch robotic telescope (Marina Sky Observatory, 2022). All images were taken with a Planewave CDK 0.432-m f/6.8 telescope and Finger Lake Instruments Proline 16803 CCD camera using Sloan r filter. The images were binned at 2×2 yielding an image scale of 1.278 arcsec/pixel and the field of view 43 × 43 arcmin. The exposure time of each image was 150 seconds. To remove Residual Bulk Image (RBI), the NRI pre-flash was applied before each exposure. Images were calibrated with bias, dark for -20°C and sky flat frames.

Astrometric plate solving of acquired images was achieved using *PinPoint* (DC3 Dreams, 2022) with star positions from ATLAS catalogue (Tonry et al., 2018). In photometry analysis, a couple dozen of carefully selected comparison stars sourced from ATLAS catalogue were used having Sloan r magnitudes in range 12 - 16, B-V color index in range 0.45 - 0.9 and SNR usually between 50 and 450.

*Tycho Tracker* software (Parrot, 2022) was used for data processing and photometric analysis. *The Top 50 Asteroids* website and associated database (Kluwak, 2022) was used as asteroid ephemeris generator during planning and observing.

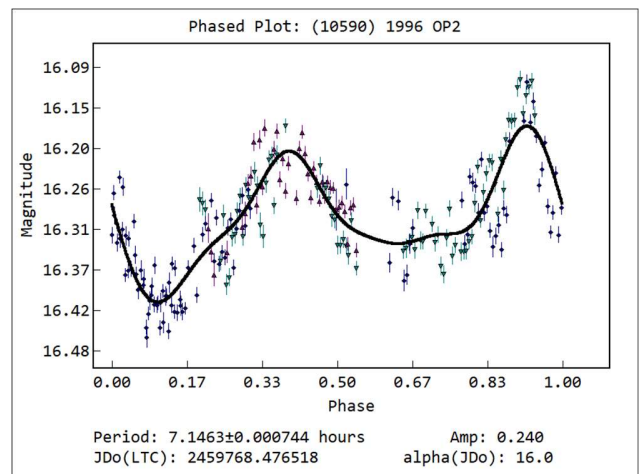
(7353) Kazuya 1995 AC1. This main-belt (LCDB orbital group 521) asteroid was discovered at Nyukasa on 1995 January 06 by M. Hirasawa and S. Suzuki. The determined orbit (MPC Objects, 2022) has a semi-major axis of 2.5695868 au, eccentricity of 0.1751155, and inclination of 14.32936 degrees. According to JPL Small-Body Database (JPL, 2022) the diameter is 10.998 km, absolute magnitude  $H = 12.47$ , and geometric albedo 0.192.

The rotational period for this body has not been found in previously published data (Warner et al., 2009). Data were obtained during observations on 2022 October 01 and 04. The number of images used in the analysis for the two nights were 161 and 105 respectively. The sky motion during imaging was 0.52 - 0.55 arcsec/minute. The two full observational nights allowed establishing a period of rotation of  $6.3815 \pm 0.0015$  h and Sloan r magnitude range 16.13 - 16.29.



(10590) 1996 OP2. This inner main-belt (LCDB orbital group 9104), orbit type Phocaea asteroid was discovered at Campo Imperatore on 1996 July 24 by A. Boattini and A. Di Paola. The determined orbit (MPC Objects, 2022) has a semi-major axis of 2.4013510 au, eccentricity of 0.2429032, and inclination of 13.54323 degrees. According to JPL Small-Body Database (JPL, 2022) the diameter is 3.951 km, absolute magnitude  $H = 14.37$ , and geometric albedo 0.284.

The rotational period for this body has not been found in previously published data (Warner et al., 2009). Data were obtained on 2022 July 7-10. The number of images used in the analysis for the four nights were 23, 85, 88 and 55 respectively. The sky motion during imaging was 0.39 - 0.43 arcsec/minute. The four observational nights allowed establishing a bi-modal period of rotation of  $7.1463 \pm 0.0007$  h and Sloan r magnitude range 16.18 - 16.42.



| Number | Name     | yyyy mm/dd       | Phase      | L <sub>PAB</sub> | B <sub>PAB</sub> | Period(h) | P.E.   | Amp  | A.E. | Grp  |
|--------|----------|------------------|------------|------------------|------------------|-----------|--------|------|------|------|
| 7353   | Kazuya   | 2022 10/01-10/04 | 14.9, 13.9 | 30               | 18               | 6.3815    | 0.0015 | 0.16 | 0.02 | 521  |
| 10590  | 1996 OP2 | 2022 07/07-07/10 | 15.7, 16.0 | 300              | 18               | 7.1463    | 0.0007 | 0.24 | 0.04 | 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<sub>PAB</sub> and B<sub>PAB</sub> 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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## LIGHTCURVE ANALYSIS OF THREE ASTEROIDS

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Photometric observations were made of three main-belt asteroids in 2021 March at the Las Campanas Remote Observatory. The rotational period and amplitude of each asteroid were determined.

Photometric observations of three main-belt asteroids were taken on four nights over the span of five days in 2021 March using the Las Campanas Remote Observatory. The observatory uses a 0.3 m f8 Astro Physics Maksutov Cassegrain telescope. It uses a FLI Proline 16803 CCD Camera with FLI focuser and Filter wheel. The field of view is 52'×52' with a plate scale of 0.76" per pixel. Exposures were 300 seconds.

Data processing and analysis was done through *Tycho* v9.2 software (Parrott, 2022) to produce lightcurves. Comparison stars were used from the ATLAS catalog (Tonry et al., 2018). Previous data and measurements were found through the asteroid lightcurve database (LCDB, Warner et al., 2009).

**4133 Heureka.** This main-belt asteroid was discovered by L. Oterma at Turku in 1942. 38 images were taken on four nights producing a rotational period of  $3.725 \pm 0.001$  h with an amplitude of  $0.20 \pm 0.03$  mag. There were no previous LCDB measurements found for the period of this asteroid.

