# Obtaining Data about the Rotation Period of an Asteroid by Analysis of the Light Curve

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**Abstract.** This paper presents the results of studying the light curves asteroids obtained at the Kourovka Astronomical Observatory. Observational data were obtained from MASTER-URAL telescopes (400mm) and SBG (500mm). The studied objects were asteroids two categories—the main belt and approaching the Earth. The last group is most important for tracking period change rotation. The importance of observing changes in the periods of these objects due to the YORP effect and the possibility of a materially negative orbit change scenario. The work presents the found periods for asteroids and the synthesis of the light curve along initial data. Synthesis is necessary in order to verify how algorithms for searching the asteroid period, and for testing hypotheses about the shape of the object.

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## 1 Determination of the Rotation Period

### 1.1 Problem Statement

To correctly account for the YORP effect, you need to know the change period with acceptable accuracy (notice the change in the period for weekly observations). To do this, first of all, it is necessary to obtain accurate changes in the period once every three days, or better - every day.

### 1.2 Period Determination Method

In work as the main method of determining period is the Lomb-Scargle periodogram. This algorithm was selected based on the initial data of the target - low signal noise, different temporal resolution and large windows. In work differential algorithms were also tested, but they did not give a significant result according to the data that needed to be processed.

### 1.3 Intermediate Results

Under average observation conditions:

1. exposure 240 seconds,
2. observations no more than 8 hours per day,
3. signal to noise 100 - 50.

the following periods were received:

1. 1930 YE Datura - $3.358 \pm 0.001$ h.
2. 1982 TB2 Yurlov - $4.11 \pm 0.06$ h.
3. 1983 VM7 SIMBAD - $2.733 \pm 0.004$ h.
4. 1998 XM74 - $2.8 \pm 0.1$ h.
5. 1979 BA Kozai $4.516 \pm 0.001$ h.

But it turned out to be impossible to determine a meaningful estimate of the asteroid's rotation period according to daily observations for almost all asteroids. It was necessary to find out the reasons for this result.

### 1.4 Synthetic Curve

To test the performance of the algorithms for finding the rotation period, a light curve synthesis algorithm is implemented Samec et al. (1989). As the main model the rotation of the cube is assumed, where different faces have different albedos and cube rotates like common asteroid - 3-4 hours (Takato 2008). In this way a very detailed (Ferrais 2018) light curve is obtained.

### 1.5 Results

Light curve modeling has shown the importance of high temporary resolution. For example, with a signal-to-noise ratio of 40 and a time resolution of 120 seconds, 2, 3 and 4 hour periods can be enabled with precisions up to the first sign per day of observations. It was confirmed Warner (2006) that 40 S/N is the minimum for this task.

## Bibliography

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