DOUBLY SYNCHRONOUS BINARY CANDIDATES FROM CNEOST ASTEROID LIGHTCURVE SURVEY. Bin Li[1,2,3], Haibin Zhao[1,3], Hao Lu[1,3], Getu Zhaori[1,3], Renquan Hong[1,3], Longfei Hu[1,3], Xin Wang[1,3], Ditteon Richard[4], Xianming L. Han[5]. [1]Purple Mountain Observetory, No.10 Yuanhua Road, Qixia District, Nanjing 210033, China, libin@pmo.ac.cn. [2]University of Science and Technology of China, Heifei,China. [3]CAS Key Laboratory of Planetary Sciences, Nanjing, China. [4]Rose-Hulman Institute of Technology, USA. [5]Butler University, USA.

Introduction: Only 16 doubly synchronous binary asteroids in the LCDB[1]. (69230) Hermes was determined with the fastest rotation period 13.894 hr [2], and (4951) Iwamoto was determined with the lowest rotation period 118.0 hr [3]. Doubly synchronous binary is stuck in a special equilibrium between NYORP and BYORP[4]. What is the range of rotation period when the equilibrium can be achieved? The lightcurve of doubly synchronous binary asteroids has distinct characteristics, then, we can easily find these lightvurves in a larger amount of survey data. We present the results of asteroid lightcurve survey of 5346 asteroids conducted to determine doubly synchronous binary candidates.

Observation: We surveyed approximatel 1000 deg2 of ecliptic for 108 nights across four years with 1.04/1.2 m Chinese near earth Object Survey telescope (CNEOST). The telescope is located at Xuyi Observations Station of Purple Mountain Observatory (PMO). 10K Wide Field Camera (WFC) is located at the F/1.8 CNEOST prime focus, consisting of WFC with 10560×10560 $15\mu m$ pixels each, resulting in a scale of 1.029″/pixel and $3° \times 3°$ field of view.

8 asteroids were found to have doubly synchronous binary characteristics. A deep minimum was showed in their lightcurves. They are (33399) Emilyan, (2280) Kunikov[5], (79323) 1996 PM7, (12546) 1998 QJ21, (167417) 2003WP139, (13314) 1998RH71, (103290) 2000 AN43, (65905) 1998 EH2.

The light curve characteristics of (2280) Kunikov was very obvious (as show Figure 1), and this asteroid has been observed at 2016 [6]. We used these lightcurve data and applied the mothed in [7] to derive their spin stauts and parameter of binary system.

Results: For (2280) Kunikov we get some rough results. Use the data form 2016 and 2018, we deduced that sideral rotation period was 21.4606 h, the primary diameter D_1=6.6 km, D_2=6.1 km, a=13.2 km by assuming an albedo pv=0.35. However, the values H is the source of Sloan-i filter. At present, no color index (i-V) has been determined. So the diameter is overestimated. In 2019, we will observe the asteroid again, and the diameters will be updated. We assume a three-axis ellipsoid model to fitting the primary and second shapes (as show Figure 2), and get the $b_p/a_p = c_p/a_p = b_s/a_s = c_s/a_s = 0.689$, with bulk density $\rho = 1.77$ g/cm^3.

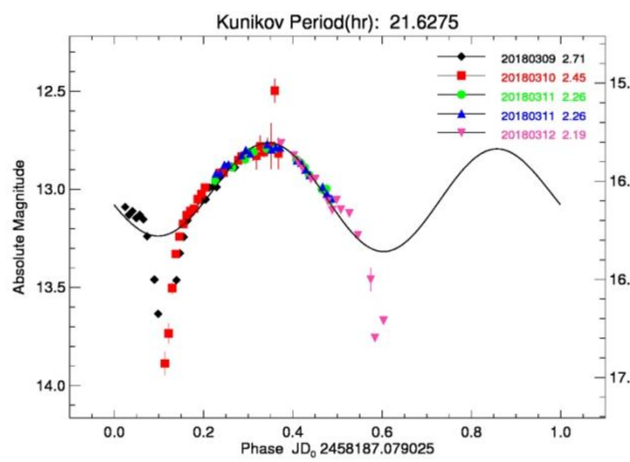

Figure 1. The lightcurve of (2280) Kunikov folded with the rotational period 21.6275 h from CNOST-ALC survey.

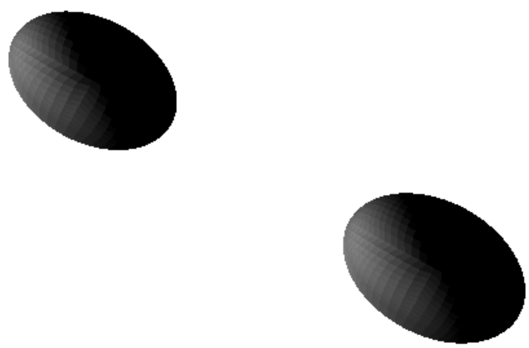

Figure 2. Three-axis ellipsoid model of Kunikov.

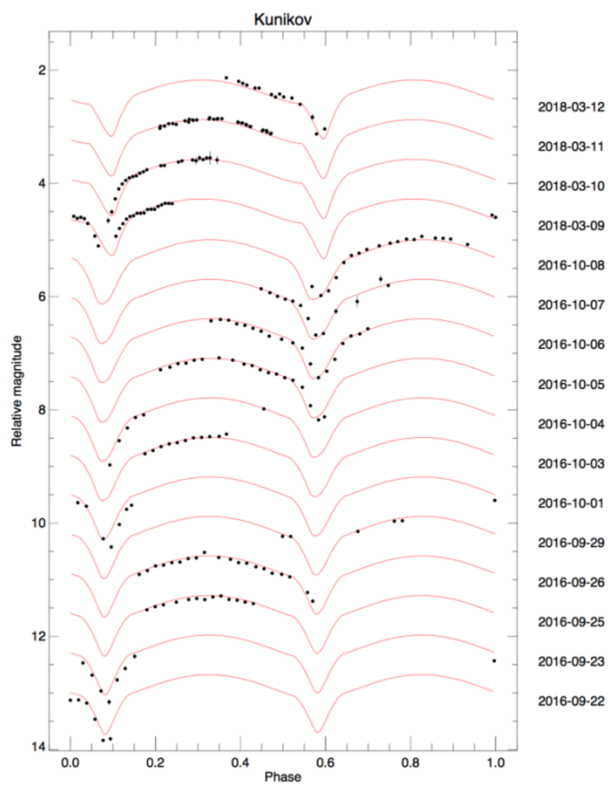

Figure 3. The observed lightcurves are fitted with the model. The observational data (points) are plotted together with the synthetic lightcurve for the best-fit solution (curve).

Future Work: We will continue to observe the asteroid Kunilov in 2019, (79323) 1996 PM7 and (65905) 1998 EH2 are planned to observing in the Autumn of 2019. On the other hand, the results of fitting of the model need be improved.

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References:

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