LONG-PERIOD LIGHTCURVE FOR ASTEROID 15552 SANDASHOUNKAN

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Photometric observations of the main-belt asteroid 15552 Sandashounkan were made from 2014 September to December. We find the data are best fit by a period of 33.62 ± 0.02 h, with an amplitude of 1.44 mag., although further observations are necessary before this result may be considered secure.

We are members of the astronomy club of Sanda Shounkan Senior High School in Japan. We participated in Asteroids Comets Meteors (ACM) 2012. 15552 Sandashounkan (2000FO26) is a main-belt asteroid that was named after our attending the ACM 2012 conference (MPC 2012). A search of the asteroid lightcurve database (LCDB; Warner *et al.*, 2009) did not find any previously reported results for 15552 Sandashounkan.

Observations of 15552 Sandashounkan were made from 2014 September 20 through December 14. We started observations on September 20 using a 0.6-m Schmidt-Cassegrain with an SBIG STL-1001E CCD Camera at Nishi-Harima Astronomical Observatory (NHAO). In order to get date for a prolonged period, we continued observations with remote internet telescopes: the University of Western Australia (UWA), SPIRIT telescope and iTelescope.net (T11, T17, T21). The details of the telescopes and cameras are shown in Table I and the observation details are given in Table II.

Name	D(m)	fl(mm)	Camera	Location
T11	0.51	2280	FLI PL11002	NewMexico(US)
T17	0.43	2912	FLI-PLI4710	SidingSpring(AU)
T21	0.43	1940	FLI-PLI6303E	NewMexico(US)
UWA	0.35	4124	Apogee-AltaU6	Perth(AU)
NHAO	0.60	7200	SBIG-STL1001E	Sayo(JPN)

Table I. Observation equipment list

UT Date	Time	Telescope	Ph	Points	Filter
Sep 20	11:36-19:43	NHAO	6.5°	112	R
Sep 24	14:13-20:16	UWA	5.1°	142	R
Oct 15	05:45-07:39	T11	3.2°	24	C
Oct 16	02:51-04:55	T21	3.5°	30	R
Oct 16	07:42-09:09	T21	3.6°	19	R
Oct 16	11:21-12:39	T17	3.7°	18	R
Oct 16	14:16-16:27	T17	3.7°	19	R
Oct 17	03:24-06:23	T21	3.9°	15	R
Oct 22	09:16-12:25	T17	5.9°	33	R
Oct 23	02:09-08:58	T21	6.1°	58	R
Dec 14	01:54-05:20	T21	18.7°	34	R

Table II. Observations List

The combined data set consists of 504 data points. Most images were unbinned with Johnson-Cousins R-band filter. Measurements were made using *MPO Canopus* (Warner, 2011), which employs differential aperture photometry to produce the raw data. Period analysis was also done using *MPO Canopus*, which incorporates the Fourier analysis algorithm (FALC) developed by Harris (Harris *et al.*, 1989). Though it is suggested that period spectrum shows that other solutions exists, we found possible fits at 33.62 h periods. On September 20 we could make observations for the about seven hours which was the longest period, at NHAO. The longest this lightcurve runs from a minimum to a maximum. We can consider that the seven hours lightcurve showed to be about quarter of the full period, i.e., the full period is four times longer than about seven hours. Furthermore, another period analysis software, cyclocode, calculates that the period is 30.6 h from our data. Therefore, we regard that the most suitable period is 33.2 h, though the period that we have found is tentative.

The spacecraft WISE observed 15552 Sandashounkan (Masiero *et.al.,* 2011). WISE derived the optical albedo 0.3738 and absolute magnitude 12.3 mag of 15552 Sandashounkan. The diameter of 15552 Sandashounkan is estimated at 7.64 km. The rotation period of most 10 km-sized asteroids is about 10 ± 5 h. 15552 Sandashounkan has a very long rotational period for its diameter.

Fully resolving the correct lightcurve period will become possible when longer observing runs can be obtained. We note the next opportunity is when 15552 Sandashounkan reaches opposition again in 2016 January.

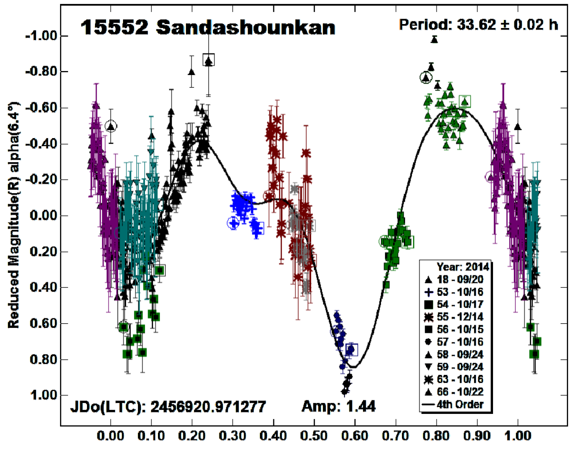

Figure 1. Our observations phased to a rotational period of 33.62h

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ASTEROID PHOTOMETRY FROM THE PRESTON GOTT OBSERVATORY

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Asteroid period and amplitude results obtained at the Preston Gott Observatory during the second half of 2014 are presented.

The Preston Gott Observatory is the main astronomical facility of the Texas Tech University. Located about 20km north of Lubbock, the main instrument is a 0.5-m *f*/6.8 Dall-Kirkam Cassegrain. An SBIG STL-1001E CCD was used with this telescope. Other telescopes used were 0.3-m Schmidt-Cassegrains with SBIG ST9XE CCD cameras. All images were unfiltered and were reduced with dark frames and sky flats.

Image analysis was accomplished using differential aperture photometry with *MPO Canopus*. Period analysis was also done in *MPO Canopus*, which implements the algorithm developed by Alan Harris (Harris *et al.*, 1989). Differential magnitudes were calculated using reference stars from the USNO-A 2.0 catalog and the UCAC3 catalog.

Results are summarized in Table I and the lightcurve plots are presented at the end of the paper. The data and curves are presented without additional comment except were circumstances warrant.

1708 Polit. This asteroid was observed on five nights as part of an ongoing study to model the shape of the asteroid. The derived period almost exactly matches those derived from earlier observations (Clark, 2011). However the lightcurve is noticeably different. The secondary minimum is not as deep and there appears to be a slight rise just prior to this minimum.

2036 Sheragul. This asteroid was observed on five nights as part of an ongoing study to model the shape of the asteroid. The derived period is very slightly greater than that derived previously (Clark, 2004; 2011).

3131 Mason-Dixon. Observations of this asteroid were made on two nights before clouds and work prevented further observations. The data obtained could be fitted into a single-maximum period of 10.2 hours, so a possible bimodal period would be around 20 hours.

4340 Dence. Observations of this asteroid were made on three nights. The derived period closely matches that obtained by Pravec *et al*. (2008)

8077 Hoyle. This asteroid was observed on three nights as part of an ongoing study to model the shape of the asteroid. The derived period very closely matches that previously obtained (Clark 2013; Klinglesmith *et al.*, 2012).

(9928) 1981 WE9. This asteroid was previously observed in 2007 (Clark, 2008). From those observations, a period of 5.547 hours was derived. The current observations cannot be harmonized with this result, with the new data indicating a much longer period of 18.398 hours. A re-measurement of the 2007 data does not result in a reasonable fit to an 18+ hour period. However a reasonable fit can be made to a 9.14 hour period. In view of the crowded field in 2007 and the associated difficulty in measuring the asteroid, I am inclined to rule out a 9+ hour period and put more faith in the 18.398 hour period measured most recently. However more observations are required to substantiate this result.

(12920) 1998 VM15. Observations made in 2013 (Clark, 2014) indicated a period of 12.885 hours. The current observations cannot be harmonized with such a period. The best match to the most recent observations indicates a period of 9.124 hours. A re-analysis of the 2013 data shows a fit at 9.0511 hours, which is a close match to the 2014 data. It is likely, therefore, that the earlier result was in error. However both sets of data are noisy and further observations are required. Plots of both sets of 2013 data are included here for comparison.

#	Name	Date Range	Nights	Per (h)	Error (h)	Amplitude	Error
1708	Polit	Nov 24 - Dec 25 2014	5	7.5080	0.0002	0.46	0.03
2036	Sheragul	Nov 27 - Dec 15 2014	4	5.42026	0.00015	0.90	0.05
3131	Mason-Dixon	Aug 31 - Sept 1, 2014	2	20?		0.76	0.1
4340	Dence	Nov 27 - Nov 30, 2014	3	7.546	0.005	0.58	0.1
4535	Adamcarolla	July 27 - Aug 24, 2014	4	10.211	0.001	0.35	0.05
8077	Hoyle	Dec 15 - Dec 25, 2014	3	2.7296	0.0004	0.23	0.1
8400	Tomizo	Dec 15, 2014 - Feb 9, 2015	5	3.04983	0.00007	0.14	0.05
9347	1991 RY21	Nov 27 - Nov 30, 2014	3	4.028	0.002	0.45	0.1
9732	Juchnovski	Aug 19 - Sept 1, 2014	3	7.572	0.003	0.14	0.03
9928	1981 WE9	Nov 27 - Dec 25 2014	6	18.3980	0.0034	0.41	0.1
12920	1998 VM15	Nov 27 - Dec 25 2014	6	9.1240	0.0012	0.20	0.05
41327	1999 XD217	Aug 31 2014	1	5.104	0.043	0.37	0.05

Table I. Dates of observation, number of nights, and derived periods/amplitudes.