LIGHTCURVE AND ROTATION PERIOD DETERMINATION FOR 2578 SAINT-EXUPERY, 4297 EICHHORN, 10132 LUMMELUNDA AND (21766) 1999 RW208

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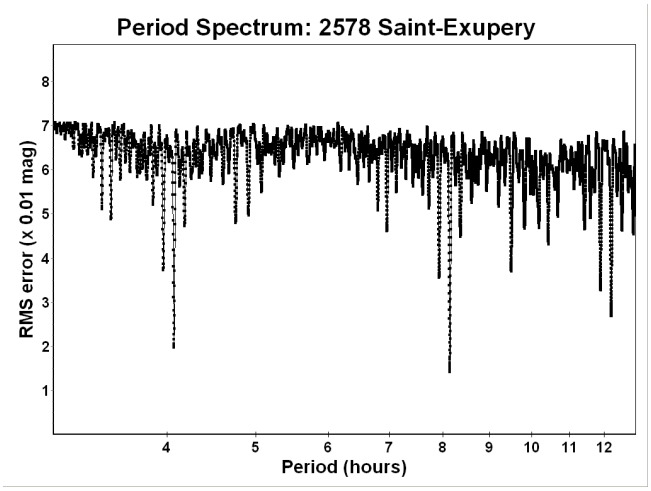
Photometric observations of the main-belt asteroids 2578 Saint-Exupery, 4297 Eichhorn, 10132 Lummelunda and (21766) 1999 RW208 performed by the authors from June to December 2017, revealed the bimodal light curves phased to 8.146 ± 0.001 h for 2578 Saint-Exupery, 4.105 ± 0.003 h for 4297 Eichhorn, 2.51 ± 0.03 h for 10132 Lummellunda and 5.841 ± 0.001 h for (21766) 1999 RW208 as the most likely solutions representing the synodic rotation periods for these asteroids.

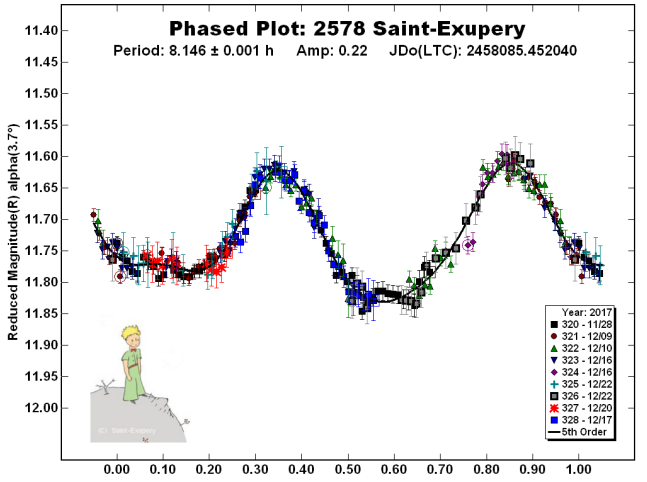
Lightcurve analysis was performed using images taken at the Astronomical Observatory of the University of Siena (Italy) and at the Wild Boar Remote Observatory (K49).

At the Astronomical Observatory of the University of Siena, a facility of the Department of Physical Sciences, Earth and Environment (DSFTA, 2017), data were obtained with 0.30-m f/5.6 Maksutov-Cassegrain telescope, SBIG STL-6303E NABG CCD camera and clear filter; the pixel scale was 2.26 arcsec in binning 2x2. Exposures were set to 300 seconds. At the Wild Boar Remote Observatory (K49) data were obtained with a 0.235-m f/10 (SCT) telescope, SBIG ST8-XME NABG CCD camera, unfiltered; the pixel scale was 1.6 arcsec in binning 2x2. Exposure were set to 300 seconds.

A search through the asteroid lightcurve database (LCDB; Warner *et al.*, 2009) indicates that our results may be the first reported lightcurve observations and results for these objects. MPO Canopus (Warner, 2017) was used to measure the images, do Fourier analysis, and produce the lightcurves. Table I lists the asteroids that were observed as well as the period associated with the analysis and the number of data points in the analysis. Orbital data and discovery circumstances were taken from the JPL Small Bodies Node (JPL, 2017).

2578 Saint-Exupery (1975 VW3) is a main-belt asteroid discovered on November, 02 1975 by Smirnova T. at Nauchnyj. It's named in memory of the French writer Antoine de Saint-Exupery (1900-1944). It's a typical main-belt asteroid in an orbit with a semi-major axis of about 3.00 AU, eccentricity 0.097, and orbital period of about 5.19 years. We observed this asteroid in 2017 from November, 28 to December, 23. The collaborative observations resulted in 7 sessions with a total of 249 data points. The result for the synodic period for 2578 Saint-Exupery is associated with the established trimodal lightcurve phased to 8.146 ± 0.001 h with an amplitude of 0.22 ± 0.02 mag.



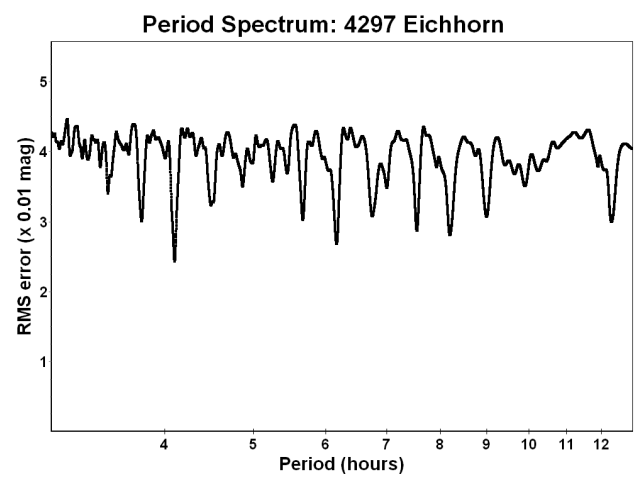


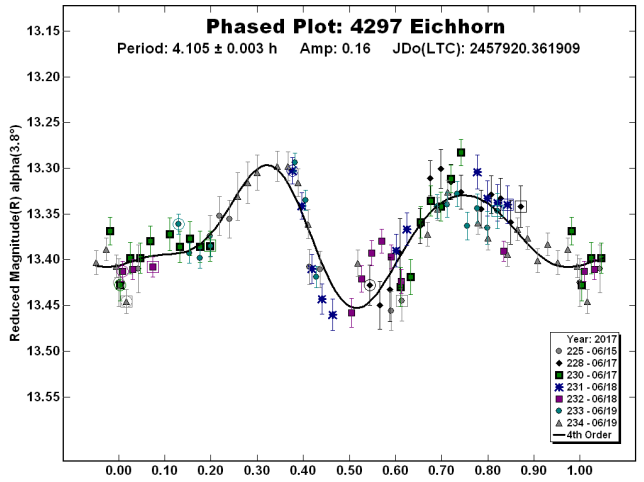
4297 Eichhorn (1938 HE) is a main-belt asteroid discovered on April, 19 1938 by Dieckvoss W. at Bergedorf. It's a typical main-belt asteroid in an orbit with a semi-major axis of about 2.34 AU, eccentricity 0.192, and orbital period of about 3.57 years. We observed this asteroid in June, 15 to 19, 2017. The collaborative

Number	Name	2017 mm/dd	Pts	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.
2578	Saint-Exupery	11/28-12/23	249	3.8,7.6	74	5	8.146	0.001	0.22	0.02
4297	Eichhorn	06/15-06/19	97	3.8,3.8,4.3	265	5	4.105	0.003	0.16	0.03
10132	Lummelunda	08/27	49	10.5	347	5	2.510	0.001	0.17	0.02
21766	1999 RW208	10/13-10/20	290	12.2,8.7	40	3	5.841	0.001	0.63	0.01

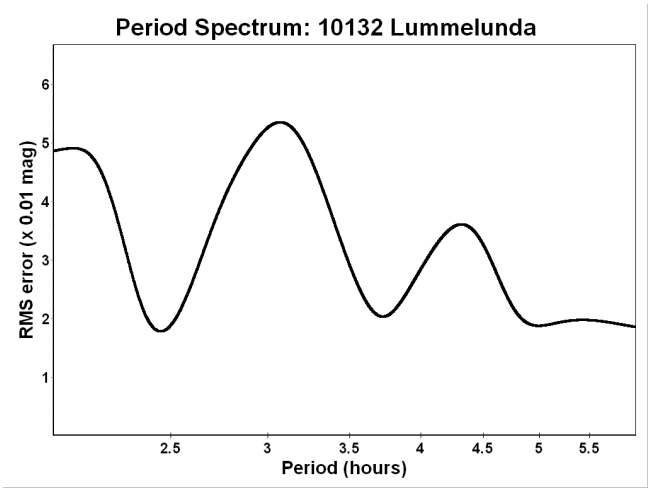
Table I. Observing circumstances and results. Pts is the number of data points. The phase angle is given for the first and last date. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris *et al.*, 1984).

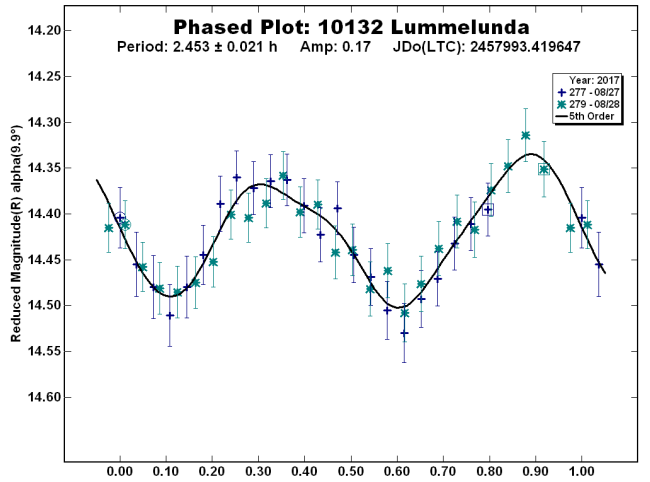
observations resulted in 4 sessions with a total of 97 data points. The result for the synodic period for 4297 Eichhorn is associated with the established bimodal lightcurve phased to 4.105 ± 0.003 h with an amplitude of 0.16 ± 0.03 mag.



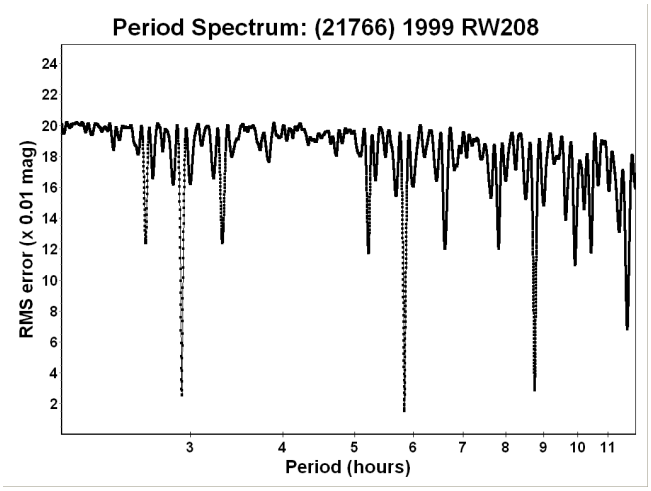


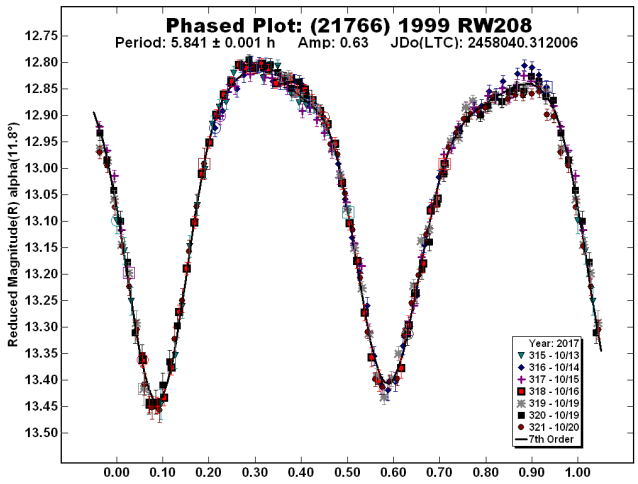
10132 Lummelunda (1993 FL84) is a main-belt asteroid discovered on March, 20 1993 at ESO. It's a typical main-belt asteroid in an orbit with a semi-major axis of about 2.22 AU, eccentricity 0.165, and orbital period of about 3.30 years. We observed this asteroid on 2017 August, 27. The collaborative observations resulted in one sessions with a total of 49 data points. The result for the synodic period for 10132 Lummelunda is associated with the established bimodal lightcurve phased to 2.510 ± 0.001 h with an amplitude of 0.17 ± 0.02 mag. This minor planet was revealed as a binary through the CBET 4440 (Benishek *et al.*, 2017) with a primary period of 2.5099 ± 0.0001 h, perfectly comparable with our result.





(21766) 1999 RW208 is a main-belt asteroid discovered on September, 08 1999 by LINEAR. It's a typical main-belt asteroid in an orbit with a semi-major axis of about 2.71 AU, eccentricity 0.219, and orbital period of about 4.46 years. We observed this asteroid in October 2017, from 13 to 20. The collaborative observations resulted in one sessions with a total of 290 data points. The result for the synodic period for (21766) 1999 RW208 is associated with the established bimodal lightcurve phased to 5.841 ± 0.001 h with an amplitude of 0.63 ± 0.01 mag.





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Note from producer: Editor Binzel inserted a little cartoon in the lightcurve plot of 2578 Saint-Exupery. We could publish it that way if you approve.