

COLLABORATIVE ASTEROID PHOTOMETRY FROM UAI: 2019 MAY-JUNE

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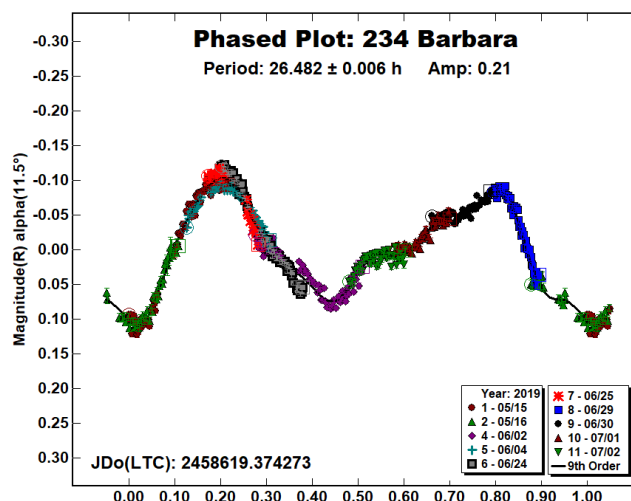
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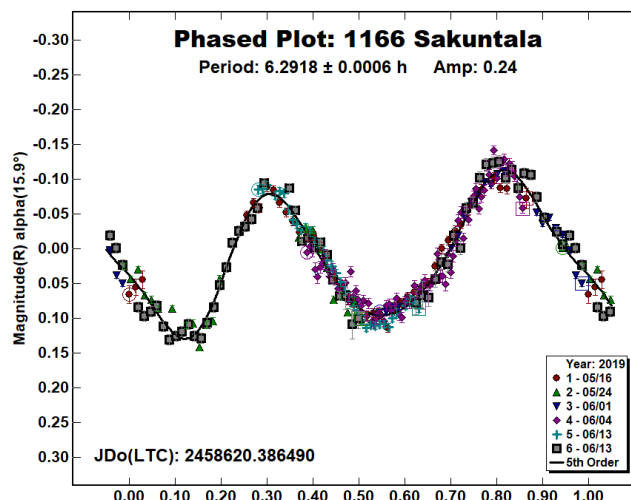
Photometric observations of four main-belt and one near-Earth asteroids were made in order to acquire lightcurves for shape/spin axis models. The synodic period and lightcurve amplitude were found for: 234 Barbara: 26.482 ± 0.006 h, 0.21 mag; 1166 Sakuntala: 6.2918 ± 0.0006 h, 0.24 mag.; 1914 Hartbeespoortdam: 6.3398 ± 0.0006 h, 0.10 mag; 2433 Sootiyo: 7.235 ± 0.005 h, 0.35 mag; (66391) 1999 KW4: 2.7644 ± 0.0002 h, 0.15 mag. We also confirmed the binary nature of the asteroid (66391) 1999 KW4.

Collaborative asteroid photometry was made inside the UAI (Italian Amateur Astronomers Union) group. The targets were selected in order to acquire lightcurves for shape/spin axis models. The CCD observations were made in 2019 May-June using the instrumentation described in Table I. Lightcurve analysis was performed at the Balzaretto Observatory with *MPO Canopus* (BDW Publishing, 2016). All the images were calibrated with dark and flat frames and converted to R magnitudes using solar colored field stars from CMC15 catalogue, distributed with *MPO Canopus*. Table II shows the observing circumstances and results.

234 Barbara is an Ld-type (Bus & Binzel, 2002) inner main-belt asteroid discovered on 1883 August 12 by Peters, C. H. F. at Clinton. Collaborative observations were made over ten nights. We found a synodic period of $P = 26.482 \pm 0.006$ h with an amplitude $A = 0.21 \pm 0.02$ mag. The period is close to the previously published results in the asteroid lightcurve database (LCDB; Warner et al., 2009).



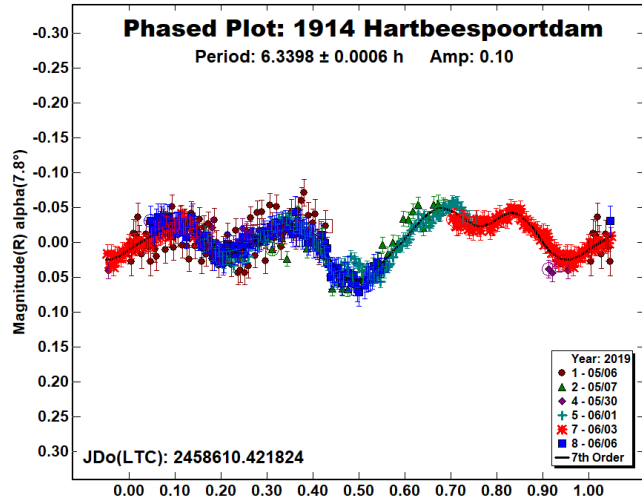
1166 Sakuntala is an inner main-belt asteroid, discovered on 1930 June 27 by Parchomenko, P. at Simeis. Collaborative observations were made over six nights. We found a synodic period of $P = 6.2918 \pm 0.0006$ h with an amplitude $A = 0.24 \pm 0.02$ mag. The period is close to the previously published results in the asteroid lightcurve database (LCDB; Warner et al., 2009).



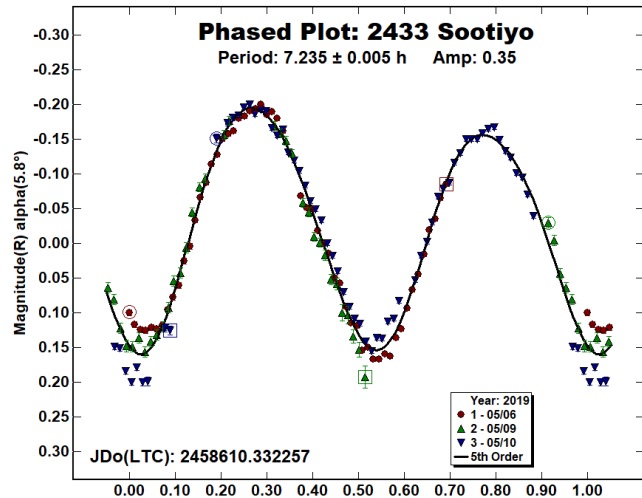
Observatory (MPC code)	Telescope	CCD	Filter	Observed Asteroids
DSFTA Observatory (K54)	0.30-m MCT f/5.6	SBIG STL-6303e (bin 2x2)	Rc,C	234,1166,2433,66391
M57 (K38)	0.30-m RCT f/5.5	SBIG STT-1603	C	1914,66391
WBRO (K49)	0.235-m SCT f/10	SBIG ST8-XME	Rc,C	234,1166,2433
GAMP(104)	0.60-m NRT f/4	Apogee Alta	C	1914,66391
GiaGa Observatory (203)	0.36-m SCT f/5.8	Moravian G2-3200	C	66391
Filzi School Observatory	0.35-m RCT f/8	QHY9 (KAF8300)	Rc	1166,1914
Santa Maria a Monte (A29)	0.40-m NRT f/5	DTA Discovery plus Kaf 260	C	66391

Table I. Observing Instrumentations. MCT: Maksutov-Cassegrain, RCT: Ritchey-Chretien, SCT: Schmidt-Cassegrain, NRT: Newtonian Reflector, SCT: Schmidt-Cassegrain.

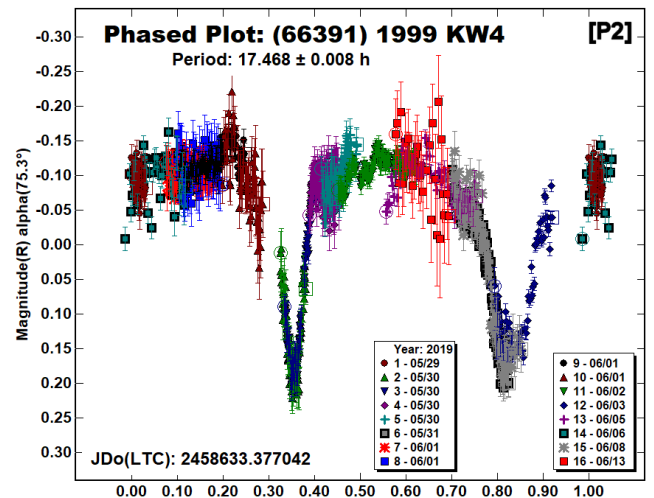
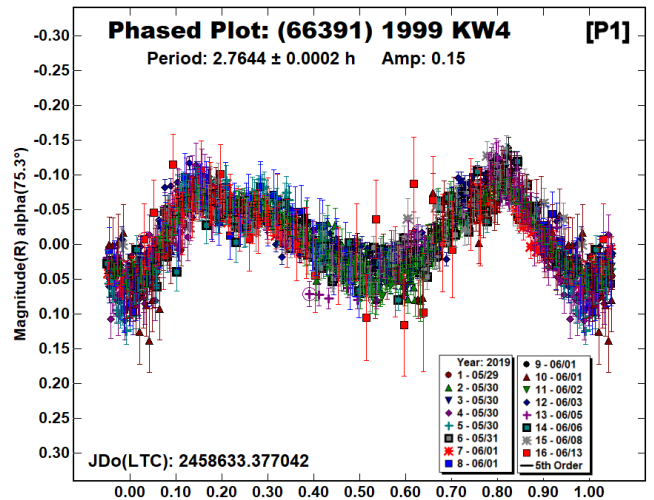
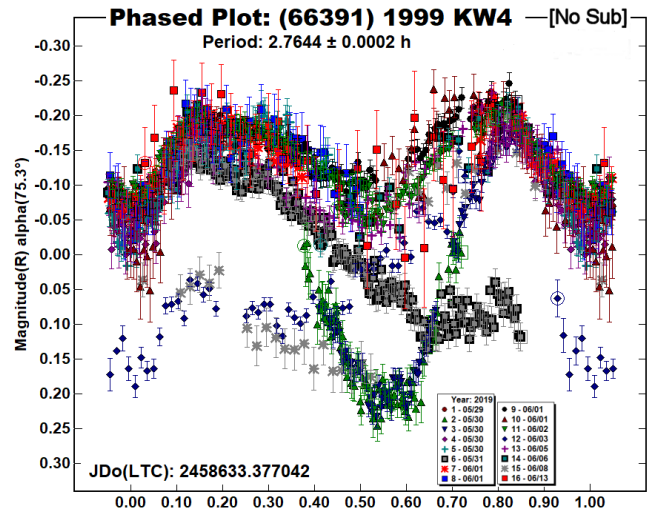
1914 Hartbeespoortdam is an inner main-belt asteroid, member of the Vestoid group, discovered on 1930 September 28 by Van Gent, H. at Johannesburg. Collaborative observations were made over six nights. We found a quadrimodal lightcurve with a synodic period of $P = 6.3398 \pm 0.0006$ h and an amplitude $A = 0.10 \pm 0.02$ mag. The period is close to the solution published by Pravec et al. (2015; 6.331 ± 0.003 h).

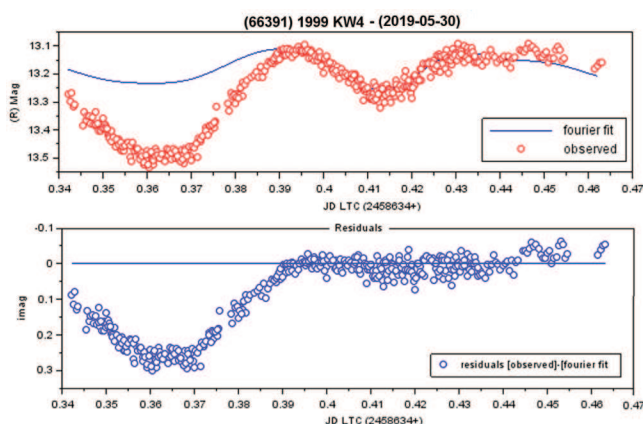


2433 Sootiyo is a middle main-belt asteroid discovered on 1981 April 05 by Bowell, E. at Flagstaff. Collaborative observations were made over three nights. We found a synodic period of $P = 7.235 \pm 0.005$ h with an amplitude $A = 0.35 \pm 0.03$ mag. The period is close to the solution published by Behrend (2007; 7.2298 ± 0.0002 h).



(66391) 1999 KW4 is an S-type Aten near-Earth asteroid, discovered on 1999 May 20 by LINEAR at Socorro. This asteroid is a binary system as reported by Benner et al. (2001) and Pravec et al. (2001). Collaborative observations were made over ten nights. The analysis was done using the dual period search function implemented in *MPO Canopus*. We found a primary synodic rotational period of $P_1 = 2.7644 \pm 0.0002$ h with an amplitude $A_1 = 0.15 \pm 0.04$ mag; orbital period $P_2 = 17.468 \pm 0.008$ h with a maximum attenuation for the deeper event of 0.27 ± 0.03 mag, observed on May 30, 2019. Those periods are consistent with the previously published results in the asteroid lightcurve database (LCDB; Warner et al., 2009).





Top: data points observed on May 30, 2019 superimposed to the 2nd order Fourier model curve. Bottom: residuals after the Fourier model curve has been subtracted to the observed data.

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Number	Name	2019 mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
234	Barbara	05/15-07/02	11.5, 21.4	240	21	26.482	0.006	0.21	0.02	MB-I
1166	Sakuntala	05/16-06/13	16.2, 8.1	259	14	6.2918	0.0006	0.24	0.02	MB-I
1914	Hartbeespoortdam	05/06-06/06	8.2, 11.1	237	7	6.3398	0.0006	0.10	0.02	V
2433	Sootiyo	05/06-05/10	5.7, 6.4	225	9	7.235	0.005	0.35	0.03	MB-M
66391	1999 KW4	05/29-06/13	77.7, 69.2	213	11	2.7644 17.468	0.0002 0.008	0.15 0.27	0.04 0.03	NEA

Table II. Observing circumstances and results. The first line gives the results for the primary of a binary system. The second line gives the orbital period of the satellite and the maximum attenuation. 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_{PAB} and B_{PAB} 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).