

## COLLABORATIVE ASTEROID PHOTOMETRY FROM UAI: 2023 APRIL-JUNE

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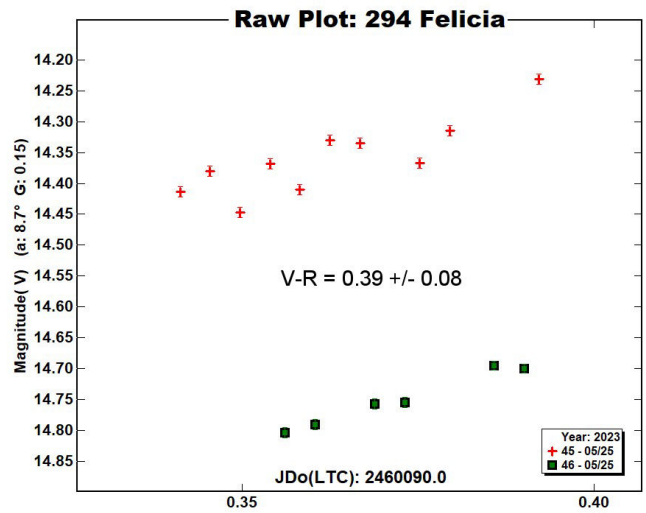
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Photometric observations of five asteroids were made in order to acquire lightcurves for shape/spin axis modeling. Synodic periods and lightcurve amplitudes were found for 1166 Sakuntala, 1929 Kollaa, 3443 Leetsungdao, and 2020 DB5. We also found color indices for 294 Felicia, 1166 Sakuntala, and 2020 DB5.

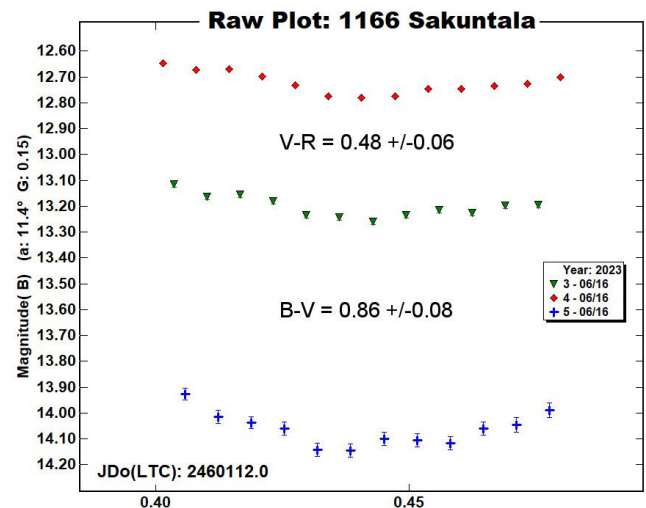
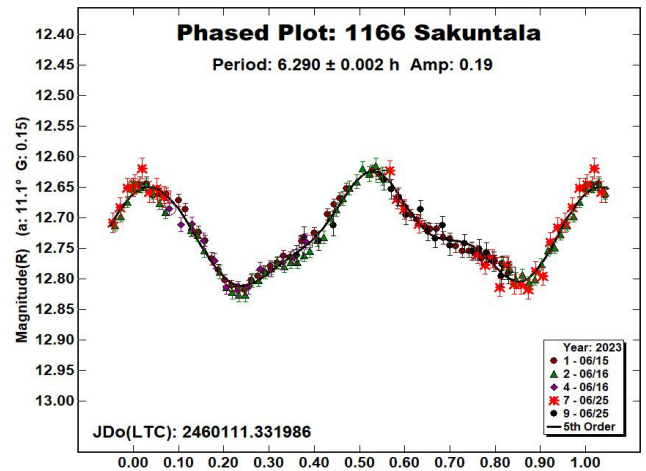
Collaborative asteroid photometry was done inside the Italian Amateur Astronomers Union (UAI; 2023) group. The targets were selected mainly in order to acquire lightcurves for shape/spin axis modeling. Table I shows the observing circumstances and results.

The CCD observations of five asteroids were made in 2023 April-June using the instrumentation described in the Table II. Lightcurve analysis was performed at the Balzaretto Observatory with *MPO Canopus* (Warner, 2021). All the images were calibrated with dark and flat frames and converted to standard magnitudes using solar-colored field stars from CMC15 and ATLAS catalogues, distributed with *MPO Canopus*. For brevity, the following citations to the asteroid lightcurve database (LCDB; Warner et al., 2009) will be summarized only as “LCDB”.

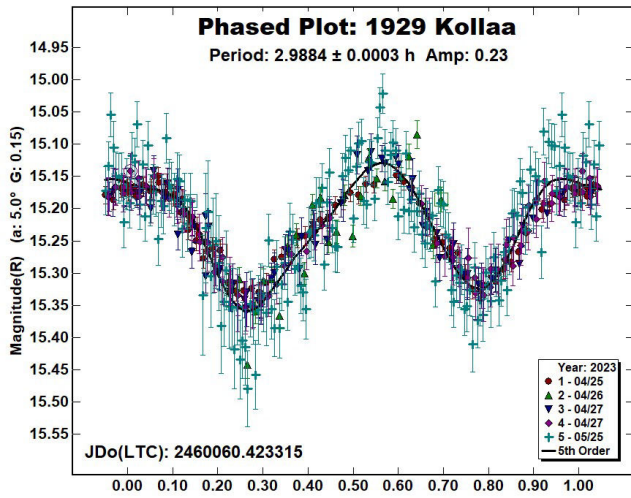
294 Felicia is a low-albedo outer main-belt asteroid. Multiband photometry was made by P. Fini and G. Betti (L73) on 2023 May 25. We found  $V-R = 0.39 \pm 0.08$ , which is close to a C-type asteroid (Shevchenko and Lupishko, 1998).



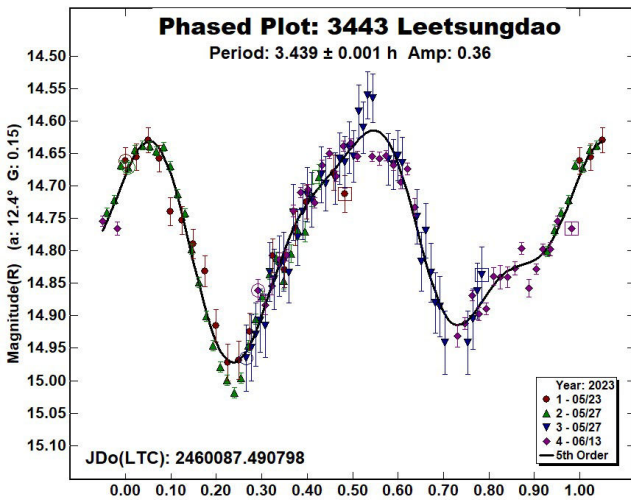
1166 Sakuntala is a medium-albedo middle main-belt asteroid. Collaborative observations were made over four nights. The period analysis shows a synodic period of  $P = 6.290 \pm 0.002$  h with an amplitude  $A = 0.19 \pm 0.01$  mag. The period is close to the previously published results in the LCDB. Multiband photometry was made by N. Montigiani and M. Mannucci (A57) on 2023 June 16. We found  $B-V = 0.86 \pm 0.08$  and  $V-R = 0.48 \pm 0.06$ , which are consistent with a S-type asteroid (Shevchenko and Lupishko, 1998).



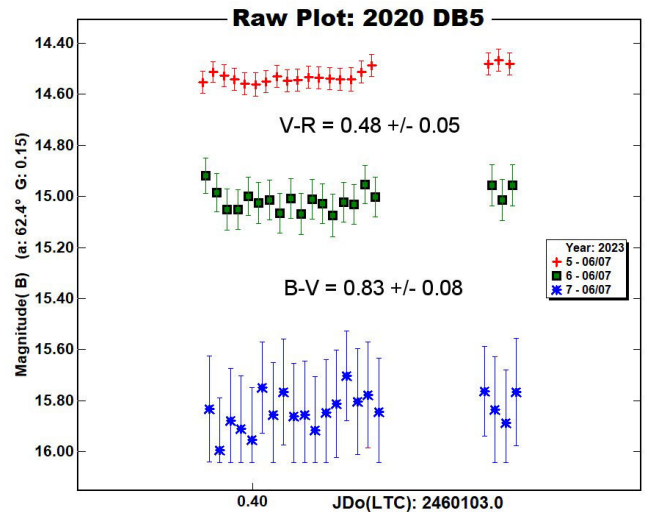
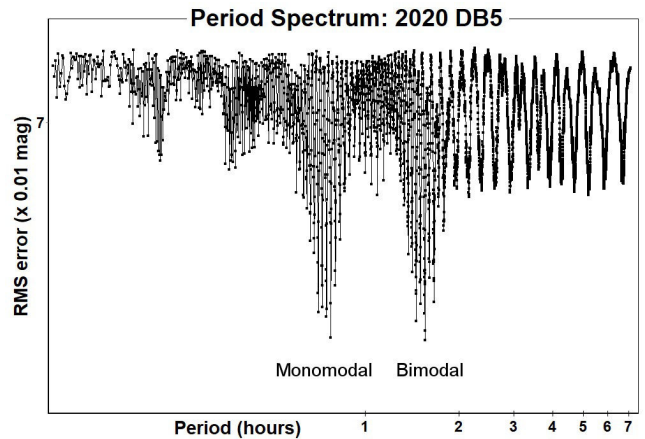
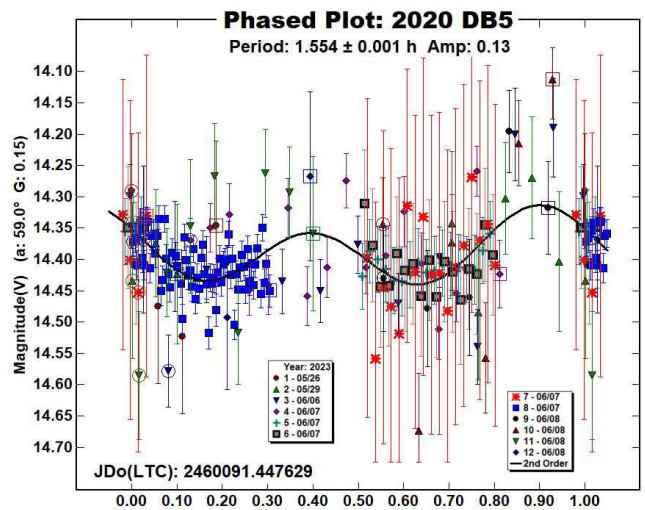
1929 Kollaa is a V-type (Bus and Binzel, 2002) inner main-belt asteroid. Collaborative observations were made over four nights. The period analysis shows a synodic period of  $P = 2.9884 \pm 0.0003$  h with an amplitude  $A = 0.23 \pm 0.07$  mag. The period is close to the previously published results in the LCDB.



3443 Leetsungdao is a T-type (Bus and Binzel, 2002) inner main-belt asteroid. Collaborative observations were made over three nights. The period analysis shows a synodic period of  $P = 3.439 \pm 0.001$  h with an amplitude  $A = 0.36 \pm 0.05$  mag. The period is close to the previously published results in the LCDB.



2020 DB5 is an Amor Near-Earth asteroid. Collaborative observations were made over four nights, before its close approach to the Earth. We found a bimodal solution with a synodic period of  $P = 1.554 \pm 0.001$  h and an amplitude  $A = 0.13 \pm 0.10$  mag. For this asteroid no periods were found in the LCDB. Multiband photometry was done by P. Bacci and M. Maestriperi (104) on 2023 June 7. We found color indices of  $B-V = 0.83 \pm 0.08$  and  $V-R = 0.48 \pm 0.05$ , which are close to a medium-albedo S-type asteroid (Shevchenko and Lupishko, 1998).



Number	Name	2023 mm/dd	Phase	L <sub>PAB</sub>	B <sub>PAB</sub>	Period(h)	P.E.	Amp	A.E.	Grp
294	Felicia	05/25	8.7	223	8					MB-O
1166	Sakuntala	06/15-06/25	11.0, 14.3	253	13	6.290	0.002	0.19	0.01	MB-M
1929	Kollaa	04/25-05/25	4.9, 17.1	209	5	2.9884	0.0003	0.23	0.07	MB-I
3443	Leetsungdao	05/23-06/13	12.7, 21.7	235	16	3.439	0.001	0.36	0.05	MB-I
	2020 DB5	05/26-06/08	58.9, 62.0	221	18	1.554	0.001	0.13	0.10	NEA

Table I. 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<sub>PAB</sub> and B<sub>PAB</sub> 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).

Observatory (MPC code)	Telescope	CCD	Filter	Observed Asteroids (#Sessions)
HOB Astronomical Observatory (L63)	0.20-m SCT f/6.0	ATIK 383L+	C, V, Rc	3443 (1), 2020 DB5 (6)
Osservatorio Astronomico Nastro Verde (C82)	0.35-m SCT f/6.3	SBIG ST10XME (bin 2x2)	C	1929 (1), 3443 (2), 2020 DB5 (1)
GAMP (104)	0.60-m NRT f/4.0	Apogee Alta	C, B, V, Rc	1929 (2), 2020 DB5 (1)
Astronomical Observatory, University of Siena (K54)	0.30-m MCT f/5.6	SBIG STL-6303e (bin 2x2)	Rc	1166 (2), 1929 (1)
M57 (K38)	0.35-m RCT f/5.5	SBIG STT1603ME	V, Rc	1166 (2)
Osservatorio Serafino Zani (130)	0.40-m RCT f/5.8	SBIG ST8 XME (bin 2x2)	C	1929 (1)
Blessed Hermann Observatory (L73)	0.30-m SCT f/6.0	QHY 174MGPS (bin 2x2)	V, Rc	294 (2)
Iota Scorpis (K78)	0.40-m RCT f/8.0	SBIG STXL-6303e (bin 2x2)	Rc	3443 (1)
Osservatorio Astronomico Margherita Hack (A57)	0.35-m SCT f/8.3	SBIG ST10XME (bin 2x2)	B, V, Rc	1166 (1)

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

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