

COLLABORATIVE ASTEROID PHOTOMETRY FROM UAI: 2020 JULY-SEPTEMBER

Lorenzo Franco
Balzaretto Observatory (A81), Rome, ITALY
lor_franco@libero.it

Giulio Scarfi
Iota Scorpis Observatory (K78), La Spezia, ITALY

Alessandro Marchini
Astronomical Observatory, DSFTA - University of Siena (K54)
Via Roma 56, 53100 - Siena, ITALY

Pietro Aceti, Massimo Banfi
Seveso Observatory (C24) & Felizzano Observatory
Seveso, ITALY

Riccardo Papini, Fabio Salvaggio
Wild Boar Remote Observatory (K49)
San Casciano in Val di Pesa (FI), ITALY

Ernesto Guido, Antonio Catapano
AstroCampania Associazione - Osservatorio Astronomico
Salvatore di Giacomo (L07), Agerola, ITALY

Adriano Valvasori, Ernesto Guido
ALMO Observatory (G18), Padulle (BO), ITALY

Massimiliano Mannucci, Nico Montigiani
Osservatorio Astronomico Margherita Hack (A57)
Florence, ITALY

Antonio De Pieri, Antonino Brosio
Parco Astronomico Lilio (K96), Savelli (KR), ITALY

Luciano Tinelli
GAV (Gruppo Astrofilo Villasanta), Villasanta, ITALY

Alessio Ciarnella
GrAG (Gruppo Astrofilo Galileo Galilei), Viterbo, ITALY

Ernesto Guido, Marco Rocchetto
Telescope Live (X02), El Sauce, CHILE

(Received: 2020 October 4)

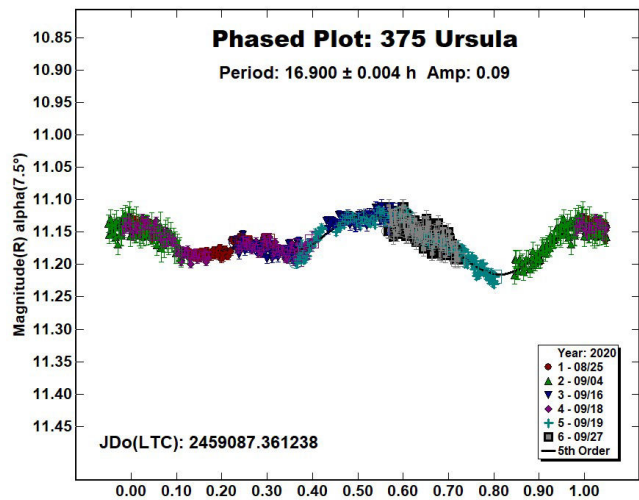
Photometric observations of six main-belt and one near-Earth asteroids were made in order to acquire lightcurves for shape/spin axis modeling. The synodic period and lightcurve amplitude were found for
375 Ursula: 16.900 ± 0.004 h, 0.09 mag;
444 Gytis: 6.2136 ± 0.0006 h, 0.09 mag;
737 Arequipa: 7.024 ± 0.001 h, 0.14 mag;
1146 Biarmia: 5.4697 ± 0.0007 h, 0.17 mag;
1346 Gotha: 2.6366 ± 0.0006 h, 0.11 mag;
1656 Suomi: 2.5892 ± 0.0006 h, 0.11 mag;
2020 PL2: 0.3606 ± 0.0001 h, 1.5 mag.

Collaborative asteroid photometry was done inside the Italian Amateur Astronomers Union (UAI; 2020) group. The targets were selected mainly in order to acquire lightcurves for shape/spin axis modeling. Table I shows the observing circumstances and results.

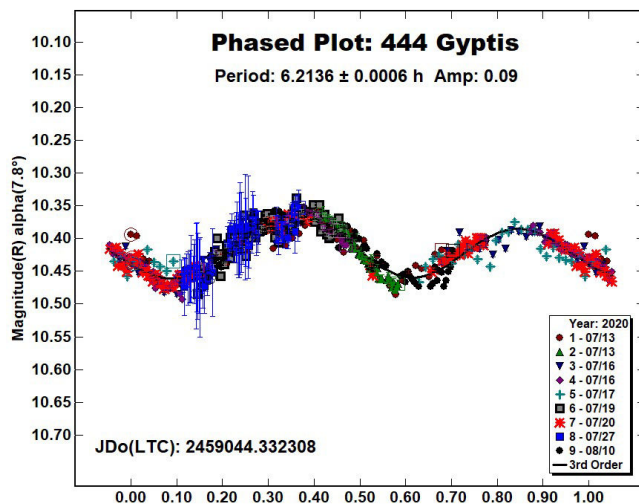
The CCD observations were made in 2020 July-September using the instrumentation described in the Table II. Lightcurve analysis was performed at the Balzaretto Observatory with *MPO Canopus* (Warner, 2019). All the images were calibrated with dark and flat frames and converted to R magnitudes using solar colored field stars from the CMC15 catalogue distributed with *MPO Canopus*.

In the following, we frequently reference the asteroid lightcurve database (LCDB; Warner et al., 2009), which will be cited with only “LCDB” from here on.

375 Ursula is an Xc-type (Bus and Binzel, 2002) outer main-belt asteroid discovered on 1893 September 18 by A. Charlois at Nice. Collaborative observations were made over six nights. The period analysis shows a synodic period of $P = 16.900 \pm 0.004$ h with an amplitude $A = 0.09 \pm 0.02$ mag. The period is close to the previously published results in the LCDB.



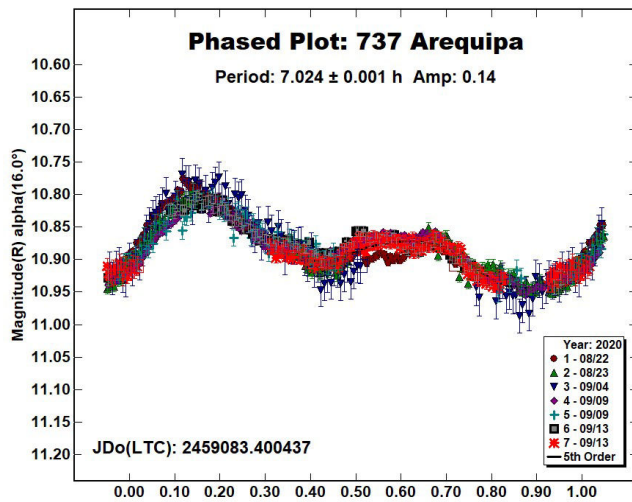
444 Gytis is a C-type (Bus and Binzel, 2002) middle main-belt asteroid discovered on 1899 March 31 by J. Coggia at Marseille. Collaborative observations were made over six nights. The period analysis shows a synodic period of $P = 6.2136 \pm 0.0006$ h with an amplitude $A = 0.09 \pm 0.03$ mag. The period is close to the previously published results in the LCDB.



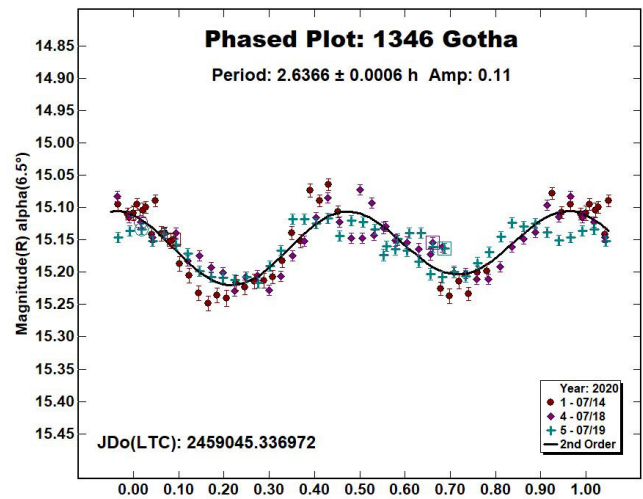
Number	Name	2020 mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
375	Ursula	08/25-09/27	*7.5, 6.6	350	5	16.900	0.004	0.09	0.02	MB-O
444	Gyptis	07/13-08/10	*7.8, 11.7	299	13	6.2136	0.0006	0.09	0.03	MB-M
737	Arequipa	08/22-09/13	15.5, 3.6	355	5	7.024	0.001	0.14	0.02	MB-M
1146	Biarmia	07/18-08/06	15.1, 11.8	317	23	5.4697	0.0007	0.17	0.02	MB-O
1346	Gotha	07/14-07/19	6.4, 7.1	289	15	2.6366	0.0006	0.11	0.04	MB-M
1656	Suomi	08/09-08/19	13.8, 12.6	324	21	2.5892	0.0006	0.11	0.05	H
	2020 PL2	08/14-08/15	26.3, 30.9	323	15	0.3606	0.0001	1.5	0.2	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 extremum 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).

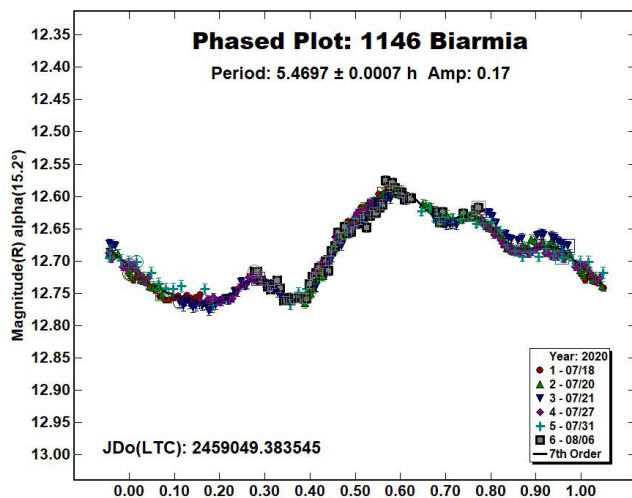
737 Arequipa is an S-type (Bus and Binzel, 2002) middle main-belt asteroid discovered on 1912 December 7 by J.H. Metcalf at Winchester. Collaborative observations were made over six nights. We found a synodic period of $P = 7.024 \pm 0.001$ h with an amplitude $A = 0.14 \pm 0.02$ mag. The period is close to the previously published results in the LCDB.



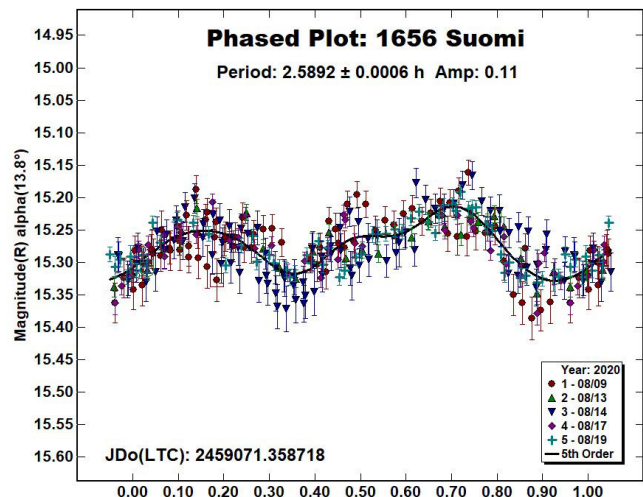
1346 Gotha is a medium-albedo middle main-belt asteroid discovered on 1929 February 5 by K. Reinmuth at Heidelberg. Collaborative observations were made over three nights. We found a synodic period of $P = 2.6366 \pm 0.0006$ h with an amplitude $A = 0.11 \pm 0.04$ mag. The period is close to the previously published results in the LCDB.



1146 Biarmia is an X-type (Tholen, 1984) outer main-belt asteroid discovered on 1929 May 7 by G. Neujmin at Simeis. Collaborative observations were made over six nights. We found a synodic period of $P = 5.4697 \pm 0.0007$ h with a moderate amplitude $A = 0.17 \pm 0.02$ mag. The period is close to previously published results in the LCDB.



1656 Suomi is a S-type (Sanchez, 2013) member of the Hungaria group; it was discovered on 1942 March 11 by Y. Vaisala at Turku. Collaborative observations were made over five nights. The period analysis shows a synodic period of $P = 2.5892 \pm 0.0006$ h with an amplitude $A = 0.11 \pm 0.05$ mag. The period is close to the previously published results in the LCDB.

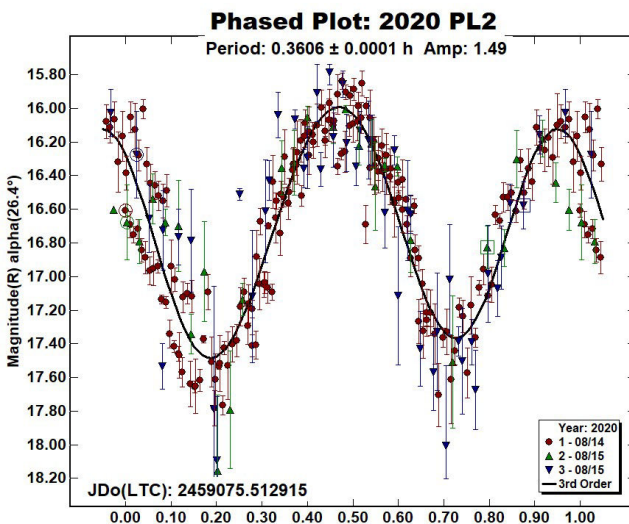
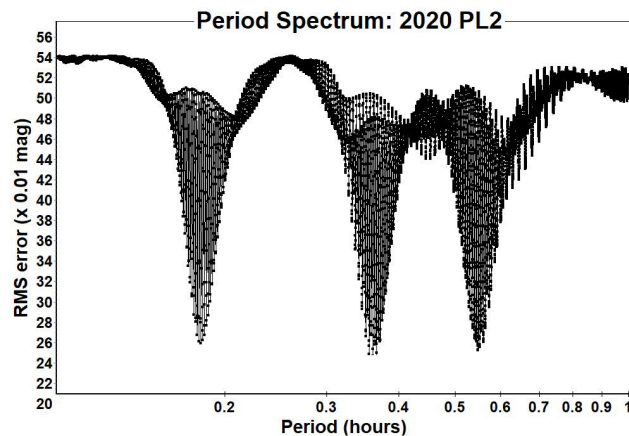


Observatory (MPC code)	Telescope	CCD	Filter	Observed Asteroids (#Sess)
Iota Scorpiae (K78)	0.40-m RCT f/8.0	SBIG STXL-6303e (bin 2×2)	Rc	375 (3), 444 (2), 737 (4), 1146 (4), 1656 (2)
Astronomical Observatory of the University of Siena (K54)	0.30-m MCT f/5.6	SBIG STL-6303e (bin 2×2)	Rc	375 (1), 444 (1), 1146 (1), 1656 (2)
Seveso Observatory (C24)	0.30-m SCT f/6.3	SBIG ST9	Rc	375 (2), 737 (2)
WBRO (K49)	0.235-m SCT f/10	SBIG ST8-XME	C	444 (3), 737 (1)
Salvatore di Giacomo (L07)	0.50-m RCT f/8.0	FLI PL4240	C	2020 PL2 (2)
ALMO Observatory (G18)	0.235-m SCT f/5.1	Atik 4000	Rc	444 (1), 1146 (1)
Osservatorio Astronomico Margherita Hack (A57)	0.35-m SCT f/8.3	SBIG ST10XME (bin 2×2)	Rc	1346 (2)
Parco Astronomico Lillio (K96)	0.50-m RCT f/8.0	FLI PL1001	r'	1346 (1)
GAV	0.20-m SCT f/6.3	SXV-H9	Rc	444 (1)
GrAG	0.25-m NRT f/4.8	SBIG ST8-XME	C	1656 (1)
Telescope Live, El Sauce (X02)	0.60-m NRT f/3.8	FLI PL 16803	R	444 (1)

Table II. Listing of participating observing stations, equipment, filter, and the asteroids observed. The number in parentheses indicates the

2020 PL2 is an Aten near-Earth asteroid first detected on 2020 August 13 by ATLAS Haleakala. Astrometric and photometric observations were in the following hours by Ernesto Guido and Antonio Catapano at the Salvatore di Giacomo Observatory (L07).

The period spectrum shows many possible solutions. We prefer the one featuring bimodal lightcurve, synodic period $P = 0.3606 \pm 0.0001$ h (~ 21.6 min), and amplitude $A = 1.5 \pm 0.2$ mag. Given the rotation period and large amplitude, this is likely a strength-bound, elongated asteroid.



References

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