Tel. ID	Dia. (m)	CCD camera	FOV (′)	Bin	Scale ("/pix)
UCO	0.51	SBIG SXTL-11002	30×20	2×2	0.93
WAO-2	0.36	FLI ML1001	22×22	1×1	1.26
WAO-3	0.36	FLI ML1001	20×20	1×1	1.18
WAO-4	0.36	SBIG STL-1001	21×21	1×1	1.25
WAO-PW	0.61	FLI PL16803	32×32	1×1	0.46

Table II: Telescopes and cameras information. Columns are: telescope ID (UCO, OGS RC20; WAO-2, shed pier #2 Celestron C14; WAO-3, shed pier #3 Celestron C14; WAO-4, shed pier #4 Celestron C14; WAO-PW, Elliot PlaneWave 24-in CDK), telescope diameter, CCD camera, detector field of view, image binning used, and binned image scale.

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References

Brines, P.; Lozano, J.; Rodrigo, O.; Fornas, A.; Herrero, D.; Mas, V.; Fornas, G.; Carreño, A.; Arce, E. (2017). "Sixteen Asteroids Lightcurves at Asteroids Observers (OBAS) - MPPD: 2016 June - November." *Minor Planet Bull.* **44**, 145-149.

Chang, C.; Ip, W.; Lin, H.; Cheng, Y.; Ngeow, C.; Yang, T.; Waszczak, A.; Kulkarni, S.; Levitan, D.; Sesar, B.; Laher, R.; Surace, J.; Prince, T.A. (2015). "Asteroid Spin-rate Study Using the Intermediate Palomar Transient Factory." *Astrophys. J. Suppl. Ser.* **219**, A27.

Erasmus, N.; Navarro-Meza, S.; McNeill, A.; Trilling, D.E.; Sickafoose, A.A.; Denneau, L.; Flewelling, H.; Heinze, A.; Tonry, J.L. (2020). "Investigating Taxonomic Diversity within Asteroid Families through ATLAS Dual-band Photometry." *Astrophys. J. Suppl. Ser.* **247**, A13.

Howell, S.B. (1989). "Two-dimensional Aperture Photometry: Signal-to-noise Ratio of Point-source Observations and Optimal Data-extraction Techniques." *PASP* **101**, 616-622.

Slivan, S.M.; Binzel, R.P.; Boroumand, S.C.; Pan, M.W.; Simpson, C.M.; Tanabe, J.T.; Villastrigo, R.M.; Yen, L.L.; Ditteon, R.P.; Pray, D.P.; Stephens, R.D. (2008). "Rotation Rates in the Koronis Family, Complete to $H \approx 11.2$." *Icarus* **195**, 226-276.

Waszczak, A.; Chang, C.; Ofek, E.O.; Laher, R.; Masci, F.; Levitan, D.; Surace, J.; Cheng, Y.; Ip, W.; Kinoshita, D.; Helou, G.; Prince, T.A.; Kulkarni, S. (2015). "Asteroid Light Curves from the Palomar Transient Factory Survey: Rotation Periods and Phase Functions from Sparse Photometry." *Astron. J.* **150**, A75.

LIGHTCURVE ANALYSIS OF TWO NEAR-EARTH ASTEROIDS

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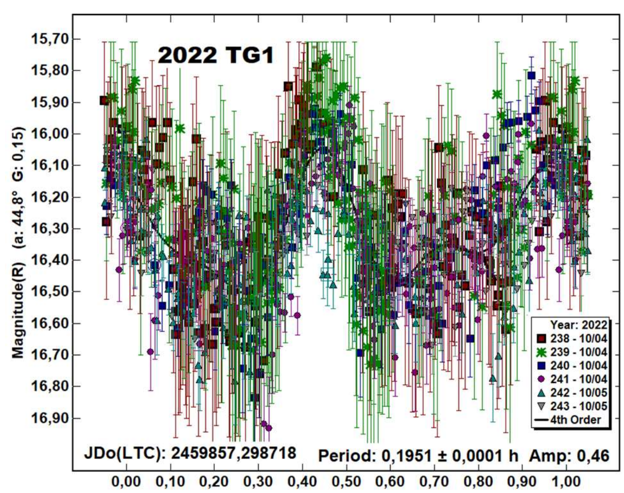
We report photometric analysis of two near-Earth asteroids observed during close approaches in 2022 October. For 2022 TG1 we found P = 0.1951 ± 0.0001 h, A = 0.46 mag; and for 2022 UR4 P = 0.0282 ± 0.0001 h, A = 1.08 mag.

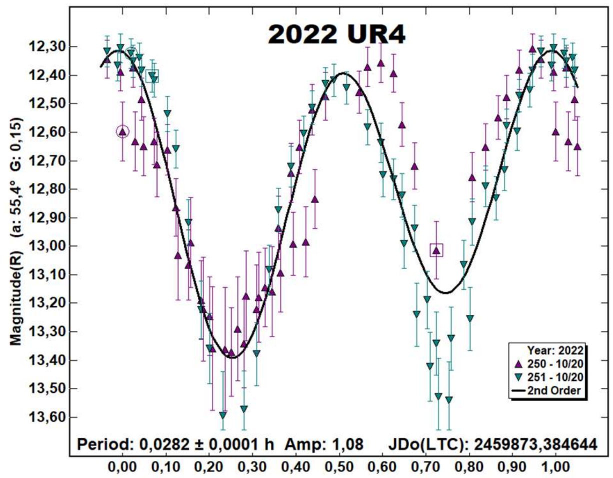
CCD observations of two near-Earth asteroids were made in 2022 October using the instrumentation described in Table I. Lightcurve analysis was performed with *MPO Canopus* (Warner, 2022). All the images were calibrated with dark and flat frames and converted to R magnitudes using solar-colored field stars from CMC15 catalogue distributed with *MPO Canopus*. Table II shows the observing circumstances and results.

No previously reported results were found in the Asteroid Lightcurve Database (LCDB; Warner et al., 2009), The size estimates are calculated using *H* values from the Small-Body Database Lookup (JPL, 2022). Both asteroids are small in size and have a rotation period above the spin-barrier, they are probably monolithic objects.

2022 TG1 is an NEA Apollo; it was discovered by ATLAS-MLO, Mauna Loa, on 2022 October 4 (Bacci et al., 2022a). *H* =25.62 and the Minimum Orbit Intersection Distance (MOID) from Earth of 0.0011 au. Observations were made while the object was still on the NEOCP page of the Minor Planet Center, at V ~ 16.8. It was observed for 46 minutes starting at 2022 October 4, 19:10 UT, and for 55 minutes starting at 2022 October 5, 19:10 UT. We found a synodic period of P = 0.1951 ± 0.0001 h with amplitude A = 0.46 ± 0.10 mag. and ratio a/b = 1.5 ± 0.1 based on the amplitude and an assumed triaxial ellipsoid viewed equatorially (Zappala et al., 1990).



2022 UR4 is an NEA Apollo that was discovered on 2022 October 20 by ATLAS-MLO, Mauna Loa (Bacci et al., 2022b). *H* = 28.90 and the Minimum Orbit Intersection Distance (MOID) from Earth is 0.00053 au. Observations were made while the object was still on the NEOCP page of the Minor Planet Center, on 2022 October 10 at mag 13.9 V. It was observed for 13 minutes starting at 2022 October 20, 21:19 UT. We found a synodic period of *P* = 0.0282 ± 0.0001 h with amplitude *A* = 1.08 ± 0.10 mag and ratio a/b = 2.7 ± 0.1 based on the amplitude and an assumed triaxial ellipsoid viewed equatorially (Zappala et al., 1990).



GAMP (104)			
2022 TG1			
2022 UR4	0.60-m NRT f/4.0	Apogee Alta	C
G. Pascoli (K63)			
2022 TG1	0.40-m NRT f/3.2	QHY22 C1318	C

Table I. Observing Instrumentations. The first column gives the asteroid while the second through fourth columns give, respectively, the telescope, CCD camera, and filter. NRT: Newtonian Reflector. C is Clear filter.

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References

Bacci, P.; Maestripieri, M.; Tesi, L.; Fagioli; and 36 colleagues (2022a). "2022 TG1" *MPEC* **2022-T73**. *https://www.minorplanetcenter.net/mpec/K22/K22T73.html*

Bacci, P.; Maestripieri, M.; Tesi, L.; Fagioli, G.; and 34 colleagues (2022b). "2022 UR4" *MPEC* **2022-U145**. *https://www.minorplanetcenter.net/mpec/K22/K22UE5.html*

JPL (2022). Small-Body Database Lookup. *https://ssd.jpl.nasa.gov/tools/sbdb_lookup.html*

NEOCP The NEO Confirmation Page Minor Planet Center. *https://www.minorplanetcenter.net/iau/NEO/toconfirm_tabular.html*

Warner, B.D.; Harris, A.W.; Pravec, P. (2009). "The Asteroid Lightcurve Database." *Icarus* **202**, 134-146. Updated 2016 Sep. *http://www.minorplanet.info/lightcurvedatabase.html*

Warner, B.D. (2022). MPO Software, *MPO Canopus* v10.8.6.9. Bdw Publishing, Eaton, CO. *http://minorplanetobserver.com*

Zappala, V.; Cellini, A.; Barucci, A.M.; Fulchignoni, M.; Lupishko, D.E. (1990). "An analysis of the amplitude-phase relationship among asteroids." *Astron. Astrophys.* **231**, 548-560.

Number	Name	2022 mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	H
	2022 TG1	10/04	44.8,44.3	356	17	0.1954	0.0002	0.46	0.1	25.62
		10/05	28.0,27.6	7	13					
	2022 UR4	10/10	55.4	26	11	0.0282	0.0001	1.04	0.1	28.90

Table II. Observing circumstances and results. 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). H is the absolute magnitude at 1 au from Sun and Earth taken from the Small-Body Database Lookup (JPL, 2022).