2013

PHOTOMETRIC OBSERVATION OF 3024 HAINAN, 3920 AUBIGNAN, AND 5951 ALICEMONET

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asteroid, it was observed before closest approach at a magnitude of 16.7 and sky velocity of 0.3 arcsec/s using 15-s exposures.

The observations took place on 2012 October 10, from 16:30-19:30 UT, 36 hours before closest approach at a geocentric distance of ~850,000 km (~134 Earth-radii) and phase angle of 28 degrees. 235 images were recorded. Observations were performed using the 0.46-m Centurion telescope (Brosch *et al.*, 2008) of the Wise Observatory (MPC 097). The telescope was used with an SBIG STL-6303E CCD at the *f*/2.8 prime focus. This CCD covers a wide field of view of 75x50 arcmin with 3072x2048 pixels, with each pixel subtending 1.47 arcsec, unbinned. Observations were performed in "white light", i.e., with no filters (clear). The asteroid was observed while crossing a single field, thus the same comparison stars were used to calibrate the images.

The images were reduced in a standard way. IRAF's *phot* function was used for the photometric measurements. After measuring, the photometric values were calibrated to a differential magnitude level using ~200 local comparison stars. The brightness of these stars remained constant to ± 0.02 mag. Analysis for the lightcurve period and amplitude was done by Fourier series analysis (Harris and Lupishko, 1989). See Polishook and Brosch (2009) for complete description about reduction, measurements, calibration and analysis.

The periodic variation of 2012 TC4 is easily visible in its lightcurve. A rotation period of 12.24 ± 0.06 min (Fig. 1) best matches the variations (with 1-sigma of uncertainty). Since 2012 TC4 was observed during 3 hours, ~14.5 cycles are visible on the lightcurve (Fig. 2). The amplitude is 0.9 ± 0.1 mag. Under the assumption of a triaxial shape ($a \geq b \geq c$), the lightcurve amplitude corresponds to minimal a/b axial ratios of 2.3 ± 0.2, or an elongated shape.

Assuming an albedo of 0.15 and the absolute magnitude provided by the MPC website (26.7), the effective diameter of 2012 TC4 is 15 meters. Choosing conservative values for the boundaries of these parameters (albedo: 0.05 to 0.4; absolute magnitude: ± 0.5 mag) in order to estimate the uncertainty of the diameter, the effective diameter of 2012 TC4 is 7 to 34 meters. This small diameter, in addition to the elongated shape and fast rotation of the body, supports the notion that 2012 TC4 is not a "rubble pile" asteroid but rather it has a monolithic structure; otherwise it would have been disintegrated (Richardson *et al.* 1998).

Reference

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Three minor planets were measured photometrically between 2012 September 4 and 21 using the SARA (Southeastern Association for Research in Astronomy) South telescope, located in Cerro Tololo Inter-American Observatory. The following synodic periods were found: 3024 Hainan, P = 11.785 ± 0.005 h; 3920 Aubignan, P = 4.4762 ± 0.0005 h; and 5951 Alicemonet, P = 3.8871 ± 0.0005 h.

All observational data reported here were obtained using the remotely-operated 0.61-m SARA South telescope located at the Cerro Tololo Inter-American Observatory in Chile. The telescope has an effective focal ratio of f/13.5. Coupled to a QSI 683s CCD camera, this resulted in a resolution of 0.27 arcsec/pixel (binned 2×2) and field of view (FOV) = 7.51×5.70 arcminutes. An SDSS r filter was used when taking images. The camera temperatures were set at –25°C. Image acquisition was done with *MaxIm DL*. All images were reduced with master bias, dark, and flat frames. All calibration frames were created using *IDL*. Period analysis was performed using *MPO Canopus,* which incorporates the Fourier analysis algorithm (FALC) developed by Harris (Harris *et al.*, 1989). The asteroids were selected from the list of asteroid photometry opportunities published on the Collaborative Asteroid Lightcurve Link (CALL) website (Warner *et al.*, 2008).

3024 Hainan. This asteroid was discovered on 1981 Oct 23 by Purple Mountain Observatory in Nanjing, China. We could find no previously reported period. It was observed from 2012 Sep 8 to 21. We obtained a period P = 11.785 ± 0.005 h and an amplitude A = 0.10 ± 0.03 mag.

3920 Aubignan. Data were collected on the nights of 2012 Sep. 4, 11, 12, and 25. A synodic period of 4.4762 ± 0.0005 h and an amplitude of 1.00 ± 0.01 mag were determined. No previously published results were found.

5951 Alicemonet. Data were collected on the nights of 2012 Sep 5, 11, and 25. A synodic period of P = 3.8871 ± 0.0005 h and an amplitude of 0.46 ± 0.02 mag were determined. No previously published results were found.

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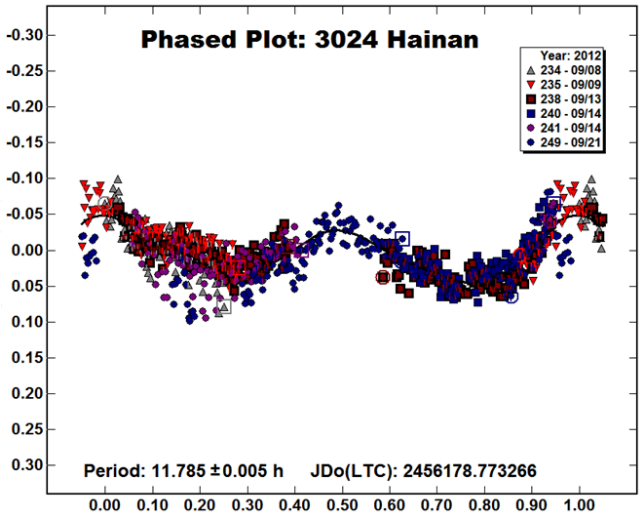

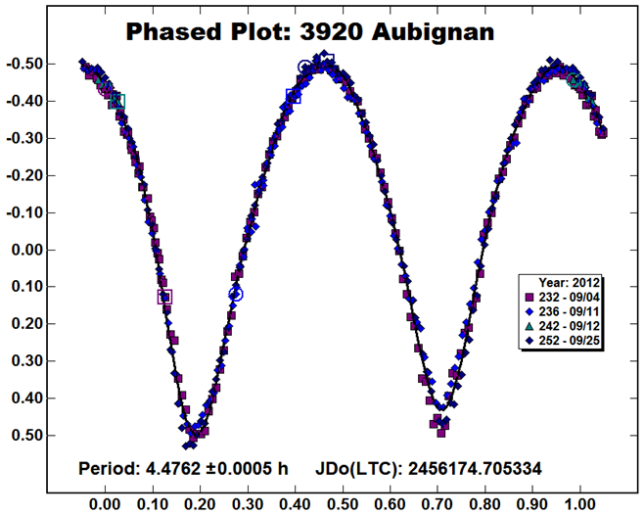

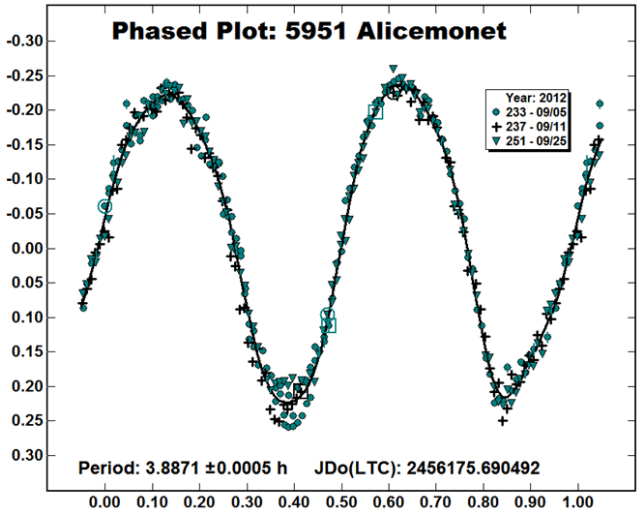

LIGHTCURVE PHOTOMETRY OF NEA 2012 TV

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Photometric observations of near-Earth asteroid 2012 TV were made during the object's close approach to Earth on 2012 October 06. Analysis of the resulting data found a synodic period P = 0.0525 ± 0.0001 h with an amplitude A = 0.57 ± 0.04 mag.

The Apollo near-Earth asteroid (NEA) 2012 TV was discovered by Tenagra II Observatory on 2012 October 05. For this asteroid the JPL Small-Body Database Browser reported an absolute magnitude H = 25.2, with an estimated diameter from 24 to 54 meters, respectively for medium and low albedo object type.

The asteroid was observed remotely from the iTelescope network near Mayhill, NM (MPC Code H06) on 2012, October 06.3 and at Balzaretto Observatory (MPC Code A81) on 2012, October 06.8. Both observing sessions are just one day before its very close approach to Earth on the 2012, October 07. The equipment used for observations is reported in Table I.. A total of 103 unfiltered images were acquired by the two observatories over a time span of 39 minutes, with exposures of 15 and 6 seconds respectively. All images were calibrated with dark and flat-field frames. Differential photometry and period analysis was done using *MPO Canopus* (Warner, 2010) at Balzaretto Observatory. The derived synodic period was P = 0.0525 ± 0.0001 h (Fig. 1, 2), or equivalently 3.15 minutes, with a amplitude of A = 0.57 ± 0.04 mag.

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