AN UPDATED PERIOD DETERMINATION FOR 772 TANETE

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CCD photometric observations of main-belt minor planet 772 Tanete were made during its favorable opposition from 2014 April-June. Analysis of the data found a synodic period of 17.258 ± 0.001 h.

772 Tanete is a main belt asteroid, discovered in 1913 by A. Massinger at Heidelberg and named after the city of Tanete on the southwest coast of Celebes, Indonesia (Schmadel, 2003). The asteroid was selected from Brian Warner's Collaborative Asteroid Lightcurve Link (CALL) site's Lightcurve Targets list (Warner, 2014).

CCD photometric observations of the asteroid were made at the Lenomiya Observatory using a Celestron CPC1100 0.28-m Schmidt-Cassegrain operating at *f*/6.3 using a focal reducer. The camera was an SBIG ST-8XME set to –17° C and binned 2x2. This resulted in an array of 765x510 18-micron pixels and a scale of 1.92 arcsec/pixel. All exposures were unfiltered and guided and ranged from 30 to 50 s based on atmospheric conditions brightness of the asteroid.

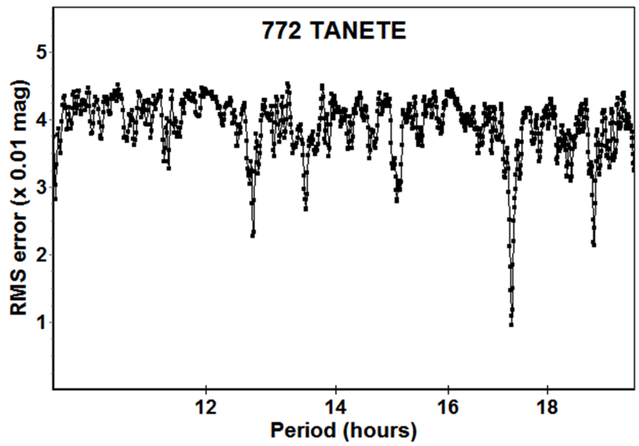
The 3,402 images were dark and flat-field corrected using *CCDSoft* version 5.00.205. Differential photometry using up to five comparison stars of near-solar color was used to obtain the magnitude of the asteroid on each image. The data were light-time corrected prior to period analysis, which was done with *MPO Canopus* version 10.4.4.0 (Warner, 2014), which incorporates the Fourier period analysis algorithm (FALC) developed by Harris (Harris *et al.*, 1989).

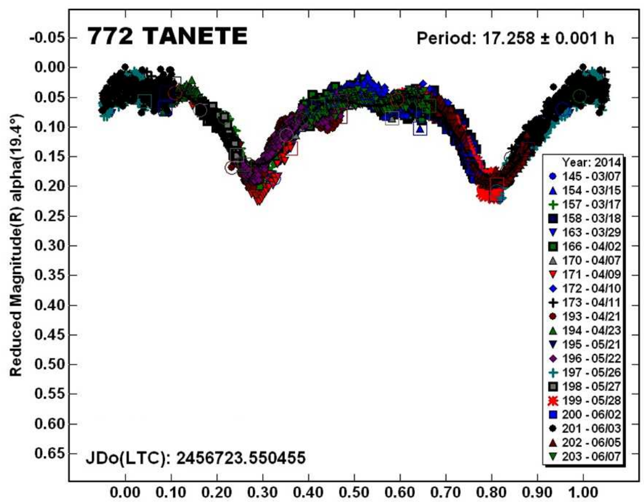
Tanete was independently observed at the Bigmuskie Observatory during 2014 March-April (Ferrero, 2014) where the equipment was a 0.30-m Ritchey-Chretien telescope coupled to an SBIG ST-9 CCD camera. The 512x512x 20-micron pixel array produced a field-of-view of about 15x15 arcmin and a scale of 1.7 arcsec/pixel. Photometric reductions and measurements were done with *MPO Canopus* version 10.4.3.17. The most probable period found after ten sessions was 8.629 ± 0.001 h with an amplitude of 0.18 mag.

Shortly before submitting his results for publication, Martinez was advised by Frederick Pilcher (private communications) that Ferrero had already submitted his results to the *Minor Planet Bulletin* with a different period. This prompted the authors to form a collaboration by merging the two data sets for additional analysis. It soon became evident that the period of 8.629 h was about the semi-period of the true period. Because the period was nearly commensurate with an Earth day, nearly the same part of the lightcurve was observed from a given station on succeeding nights. Merging all the sessions from the two observatories located in opposite hemispheres led to a final solution of 17.258 ± 0.001 h and an amplitude of 0.15 mag.

Observer	Sessions
Martinez	193,194,195,196,197,198,199,200,201, 202,203
Ferrero	145,154,157,158,163,166,170,171,172, 173

Table I. Observing sessions per observer (see lightcurve plot). Observations by Ferrero used an R filter while Martinez used a clear filter.





A search of the Asteroid Lightcurve Database (LCDB; Warner *et al.*, 2009), the NASA Astrophysics Data System (ADS), and other sources revealed an earlier period determination by Behrend (2006) of 11.8 hours and a tentative estimation of 12 hours or longer by L. Bogan (1994). Bogan's estimate was based on only 6 hours of observations. The period spectrum, a plot of the RMS residual values versus the period, shows two possible solutions near 13 hours and 17 hours, with 17 hours being the best fit. Analysis of the data found a bimodal lightcurve with a period of 17.258 ± 0.001 h and amplitude of 0.15 ± 0.01 mag. Individual sessions spanned the complex section of the lightcurve, ruling out any trimodal or monomodal fit.

Acknowledgments

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ROTATION PERIODS AND LIGHTCURVES FOR SIX NEAR-EARTH ASTEROIDS

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The lightcurves and synodic rotation periods for six near-Earth asteroids observed in the period 2013 October to 2014 June are presented.

Photometric observations of six near-Earth asteroids were carried out in the period 2013 October through 2014 June using an SBIG ST-8XME CCD camera mounted on a 0.35-m LX200 GPS Schmidt-Cassegrain (SCT) that operated at focal ratios of *f*/6.3 (2014 observations) and *f*/10 (2013 observations). The exposures were unguided. No filters were used in order to maximize signal-to-noise. To further increase the sensitivity, the camera was operated in a 2x2 binning mode, which produced an image scale of 1.66 arcsec/pixel at *f*/6.3 and 1.04 arcsec/pixel at *f*/10. The exposure times were customized depending on the brightness and apparent motions of the particular targets.

All photometric measurements, lightcurve constructions, and period analyses were performed in *MPO Canopus* software (2012). The Comparison Star Selector (CSS) utility in *MPO Canopus* was employed for differential photometry. This allowed using up to five comparison stars of near solar color. The V-band magnitudes were taken from the hybrid MPOSC3 catalog, where BVRI magnitudes were derived from J and K 2MASS catalog magnitudes by applying formulae developed by Warner (2007). As a result, the magnitude zero-points for individual data sets are generally consistent within a few hundredths of a magnitude. However, in some cases, more significant misfits between the individual data sets on the order of a few tenths of a magnitude have been noticed. Most likely such discrepancies could be a consequence of catalog magnitude errors.

Due to the very rapid movement of the observed targets in a relatively small field of view and consequent changes of surrounding stellar configurations, it was necessary to change comparison star selections for the observations made during a single night, which resulted in a number of individual data sets for that night. Elliptical apertures with the long axis oriented along an object's path were used in these rapid motion cases.

<u>(154275) 2002 SR41</u>. This asteroid was observed from 2014 June 9–11. The observations resulted in 16 individual photometric sessions with a total of 794 data points. Since the asteroid was fairly faint (V ~ 16.4–17.0), a quite noisy lightcurve was obtained, even with a relatively long exposure time of 240 seconds. Period analysis suggests many possible solutions (see the period spectrum). The most likely is the bimodal solution of 2.75 ± 0.01 hours that, while having the lowest RMS residual, only slightly stands out among other solutions. The Fourier fit amplitude of the corresponding lightcurve is 0.16 mag.

<u>(275677) 2000 RS11</u>. The target was observed from 2014 March 19–23. A bimodal period of P = 4.444 ± 0.001 h can be clearly distinguished among all other solutions in the period spectrum. A large amplitude lightcurve was obtained for this solution. The calculated amplitude for the 15th order Fourier fit is 1.15 ± 0.01