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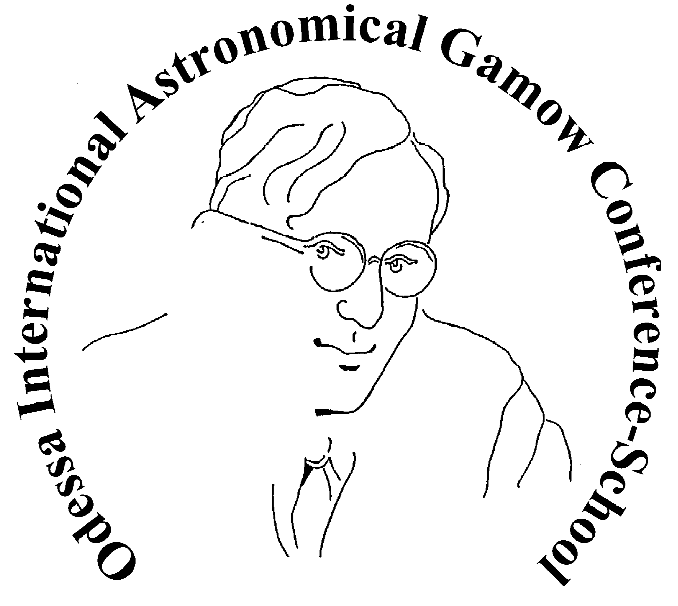
"ASTRONOMY AND BEYOND: ASTROPHYSICS, COSMOLOGY AND GRAVITATION, HIGH ENERGY PHYSICS, ASTROPARTICLE PHYSICS, RADIOASTRONOMY AND ASTROBIOLOGY"



ABSTRACTS

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SOLAR SYSTEM AND SPACE ENVIRONMENT

RESULTS OF CLARIFYING OF ORBITAL ELEMENTS OF LOW-ORBIT SATELLITES BY MODERNIZED DOPPLER STATION OF THE RI "MAO"

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To reduce the error in determining the frequency and time by the Doppler station created in RI "MAO", the standard reference signal of the receiver RTL2832U with a frequency of 28.8 MHz was replaced by a signal generated by a specially designed synthesizer. The synthesizer contains a 28.8 MHz quartz oscillator, the frequency of which is adjusted to the frequency of the 10 MHz signal of the GPS receiver ThunderBolt-E using a phase-locked loop. The 10 MHz signal of the GPS receiver is also used to generate a pilot signal: 1 Hz packages of video pulses with a frequency of 100 kHz, which are fed to the antenna input of the station and synchronized using the pulse-per-second signal of the GPS receiver. Software for determining the frequency and time using the pilot signal was developed and implemented. The internal relative error in determining the frequency has been estimated which did not exceed 10^{-10}. The internal error of time determination did not exceed 30 ms. The report presents results of clarifying the orbit elements of low-orbit satellites obtained by the modernized Doppler station. The results are compared with the data of space-track.org.

ASTROMETRY AND PHOTOMETRY OBSERVATIONS OF THE TROJAN ASTEROID (624)HEKTOR IN LISNYKY

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As NASA plans the Lucy space mission to the Trojan asteroids, comparative ground-based and space-based photometry is important to calibrate further ground-based photometric observations. In September -October 2020 we observed asteroid (624) Hektor with a 0.7-meter (f/4) reflector AZT-8 and FLI PL-4710 CCD camera at the Lisnyky observatory station (Code MPC – 585). During the three nights, 147 images were obtained, of which 123 were selected for astrometric and 93 for photometric measurements.

The orbit of (624) Hektor and the errors (O-C) for both coordinates (RA and Decl.) were determined using *Find Orb*, combining our own observations with those of other observatories from the Minor Planet Center (MPC) database for the past 2 years. For 2020-09-16 (30 obs.) the (O-C) RA residual is −0.650 ±σ 0.312″, the (O-C) Decl. residual is 0.247 ±σ 0.234″; For 2020-10-05 (33 obs.) the (O-C) RA residual is −0.404 ±σ 0.159″, the (O-C) Decl. residual is 0.433 ±σ 0.182″; for 2020-10-14 (60 obs.) the (O-C) RA residual is 0.082 ±σ 0.092″ and the (O-C) Decl. residual is 0.346 ±σ 0.055″. Observations with O-C errors less than 0.5" were selected for inclusion in the MPC database. Astrometric observations are published in M.P.S. 1351729-30.

Based on the photometric observed data, the physical parameters of (624) Hektor were calculated, namely: visible brightness (average value 2020/10/05 – 14.00^m and 2020/10/14 – 13.76^m), absolute brightness (7.92^m). As a result of the asteroid's rotation and its elongated shape, the visible surface decreased in this range – D 220km – 194 ± 28km (2020-10-05), respectively 2020-10-14, the visible surface (phasa) decreased in the range of 241km – 185 ± 28km. The geometric albedo was 0.021 – 2020-10-05 and 0.024 – 2020-10-14 and the surface temperature was 119.7K. Our results of physical parameters are in good agreement with the results of other researchers in the database Asteroids with Satellites Database-Johnston's Archive.

MULTISITE SIMULTANEOUS RSO PHOTOMETRY TO CHARACTERIZE THEIR ROTATION STATE

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The photometry of resident space objects (RSO) makes it possible to determine their state of rotation around the center of mass, orientation of the rotation axis and rotation speed in the most cost-effective manner. However, the methods for determining the attitude parameters from photometric data from a single observation site (OS) require long series of high-quality measurements. We propose a method for determining the orientation parameters of rotating RSO based on simultaneous multi-site photometry with a high temporal resolution. Preconditions for planning and building a local photometric network that can accomplish such a task have been tested via computer simulation. Synchronous network-based photometric observations acquired by three or more OSs enable us to calculate time lags between correlated light-curve segments and promptly determine the direction of rotation, as well as the spatial orientation of a SO's spin axis and its angular spin rate. A local network of several distributed observation sites for synchronous monitoring of the rotation of various SO in LEO will make it possible to determine the rotation parameters of also slowly rotating objects even that do not exhibit glints within their light curves.