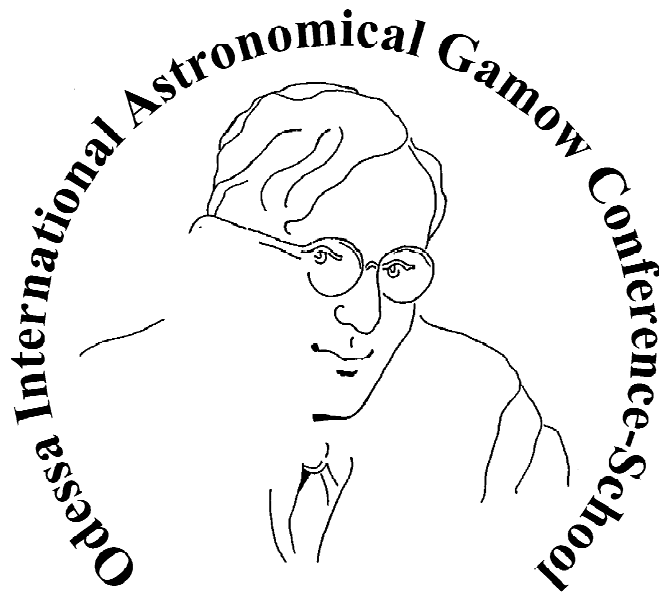# 21-th Gamow International Astronomical Conference-School
"ASTRONOMY AND BEYOND: ASTROPHYSICS, COSMOLOGY AND GRAVITATION, HIGH ENERGY PHYSICS, ASTROPARTICLE PHYSICS, RADIOASTRONOMY AND ASTROBIOLOGY"

ABSTRACTS

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NSFCTC'S SENSORS FOR SPACE SURVEILLANCE – RESULTS OF WORK IN 2020-2021

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The report presents the results of the sensors of the National Space Facilities Control and Tests Center (NSFCTC) of the State Space Agency of Ukraine both in the interests of the national space monitoring and analysis system and international programs. In particular, it represents the Near-Earth Objects observations for Minor Planet Center of International Astronomical Union and space debris observations in the campaigns of the Inter-Agency Space Debris Coordination Committee (IADC). The results of work on the development of ground infrastructure for the monitoring of outer space of the NSFCTC by modernizing existing and creating new sensors are highlighted.

ORBITAL ELEMENTS CATALOG OF GEO SATELLITES BASED ON OBSERVATIONS AT RI MAO IN 2020-2021

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Due to the uniqueness and importance of the geostationary orbit region, it is necessary to continuously track the working spacecraft and known objects of space debris. A regularly updated catalog of orbital elements can significantly help in solving this problem. Optical observations of 149 geostationary satellites (GEO) were carried out using Fast Robotic Telescope (F=1500 mm, D=280 mm, FOV=1.4°×1.4°) in RI "MAO" during 2020-2021. A combined method was used for CCD observations. Catalog of GEO orbital elements in TLE format was generated based on topocentric equatorial coordinates. Orbital elements was calculated by software developed in Astronomical observatory of Odessa National University and FindOrb software. Analysis of observational and orbital data quality was performed. The mean square error of observations of the GEOs in the magnitude range (9–14)^{mag} was ±0.5″ in right ascension and declination. Measured positions and computed orbital elements were compared with precise ILRS data. Obtained Orbital elements in TLE format were represented on Ukrainian Optical Station Network (UMOS) website.

PECULIARITIES OF OBSERVATIONS OF SATELLITES ON MOLNIYA-LIKE ORBITS

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Molniya orbits are typical highly elliptical orbit (HEO) orbit with inclination of about 65°, high eccentricity of about 0.7 and periods of one-half day. Most of the satellites on the HEO orbits are old rocket bodies and other space debris. Objects on as highly elliptical orbit are very danger for LEO satellites and for people in case of a fall because of increasing velocity near the perigee. The situation is complicated by the fact that the NORAD catalog does not contain the orbital elements for many of these objects.

This report is dedicated to observation of space debris on Molniya-like orbits with purpose of their reentry prediction. Six Molniya-like satellites were successfully observed at RI MAO during May-July 2021. The orbital elements for some of these objects are not presented in NORAD catalog. The estimates of the accuracy of the obtained positional observations are given. The mean square errors of position were ±(1.0–3.0)″ in right ascension and declination for the objects in (8–11)^{mag} range. Orbital elements of these satellites were calculated using FindOrb software and software developed in Astronomical observatory of Odessa National University. Orbital elements in TLE format were represented on Ukrainian Optical Station Network (UMOS) website.

PHOTOMETRIC OBSERVATION OF COMET C/2017 K2 (PANSTARRS) WITH THE AZT-8 TELESCOPE AT OBSERVATION STATION LISNYKY

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The comet C/2017 K2 (PANSTARRS) was active at the time of its discovery in May 2017. This comet is an Oort cloud comet with a hyperbolic orbit, discovered at a distance beyond the orbit of Saturn when it was 16 AU from the Sun. C/2017 K2 will approach its perihelion in December 2022. The long-term monitoring data is very valuable and helpful for studying the activity mechanism of C/2017 K2. We observed comet C/2017 K2 (PANSTARS) from September 29, 2017 to July 8, 2021. Photometric observations of the comet were conducted with the V and R broadband filters centred at 5450 Å and 6460 Å, respectively. We obtained over 700 images of the comet while monitoring comet C/2017 K2. The images were obtained during 35 observing runs at the 70 cm AZT8 telescope (observation station Lisnyky of the Astronomical Observatory of Taras Shevchenko National University, Ukraine). The reduction of the raw data included bias