



National Space Facilities Control and Test Center of State Space Agency of Ukraine

Near-Earth Space Observation Activities at Ukraine in 2021

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Observations of spacecraft and space debris for Ukrainian Space Monitoring and Analysis System (SMAS)

Sensors modernization and new sensors development

Software modernization

International Cooperation

NEOs observations



SMAS Facilities



Radar 5N86 "Dnepr", Mukachevo



QOS "Sazhen-S" and OEOS type 1 at CSIRP and NFC, Dunaivtsi



Optical sensors at Odesa Astronomical Observatory



Perspective L-band Radar



Space Observations Center



OEOS type 2 at RD SCP, Novosilky, Kyiv region



Perspective cm-band radar



Optical sensors at Lviv National University



Optical sensors at Uzhhorod National University







Modernized UHF Radar (5N86)



L-band radar with digital antenna array



Perspective centimeter-band radar based on the 25-m Cassegrain antenna



- Detection of SO in the sector 120 degrees at a range: from 250 to 5600 km
 - Replacement of the control and data processing system; Start of implementation and tests of new receiving equipment
- Detection of SO in all directions (support and rotary device) at a range: up to 3000 km
 Modular principle of the construction of receiving and transmitting equipment

The first stage of creation is completed; Undergoing tests

- Ultraprecise measurement of orbit parameters of SO
- Identification of the spacecraft designation

Under development; Research is being carried out to create the radar. Successful test of the C-band receiving channel.



Possible Radar Facilities of SMAS



Modernized Mark-4B antenna (RT-32)





Location: <u>49.856424 N, 24.923862 E</u>

- 32 m diameter; fully steerable;
- C and K band receivers (L and X-band are planned);
- Antenna beam width: C-band: ~7'; K-band: ~1.5'. RT-32 can be used as receiver in beam-park experiments.



Possible Radar Facilities of SMAS







Successful simultaneous reception of the C-band signal from the ARABSAT-5A (COSPAR ID 2010-032B, SSN ID 36745).

Further plans: calibration of receiving channels; creation of an interferometer in the C-band; the ability to create an interferometer for any receiving channels available on two antennas.

Optical Sensors of SMAS









QOS "Sazhen-S", Khmelnitsky region



Two FoV Wide FoV telescope passed calibration for GEO and MEO in ESA

OEOS, type 1, Khmelnitsky region



Operational for MEO, GEO, NEO

OEOS, type 2, Kyiv region



New CMOS camera





Main analytical unit of SMAS is the **Space Observations Center (SOC)**.

Main tasks of the SOC

- Collecting and storing information about the space situation from all possible sources (sensors, Internet, etc.), data processing.
- Analysis of space situation data.
- Sensors tasking.
- Providing information to SMAS users.

Main Activities in 2021

- Daily calculation of ephemeris for optical sensors of SMAS;
- Receiving and processing data from SMAS sensors;

- Weekly prediction of the existence time of RSO and their possible impact areas (12 RSO in 2021);

- 1033 predictions of possible approaches of selected 66 spacecrafts (among them spacecrafts with nuclear power sources on board) with other SO.







- Participation in the work of the IADC including observation and re-entry campaigns ;
- **Cooperation with PoISA and other Polish organizations;**
- Negotiations with other space agencies (India, Greece, Turkey...).



Near Earth Objects



Observations



Total: 14135 observations, 750 NEOs

(https://newton.spacedys.com, 25-Jan-2022)

Objects





PROSPECTS FOR DEVELOPMENT OF SENSORS

Radar sensors



RT-32 L-band receiver



New software for SOC should be tested in 2022







Optical sensors



Twin tube (0.35 m f/2.0 and 0.25 m f/12) telescope with CMOS cameras has been installed in Transcarpathian region. It will be fully operational by the summer of 2022.







Ukraine continues to improve its capabilities for monitoring near-Earth space and expand an international cooperation in this area





THANK YOU FOR YOUR ATTENTION!

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