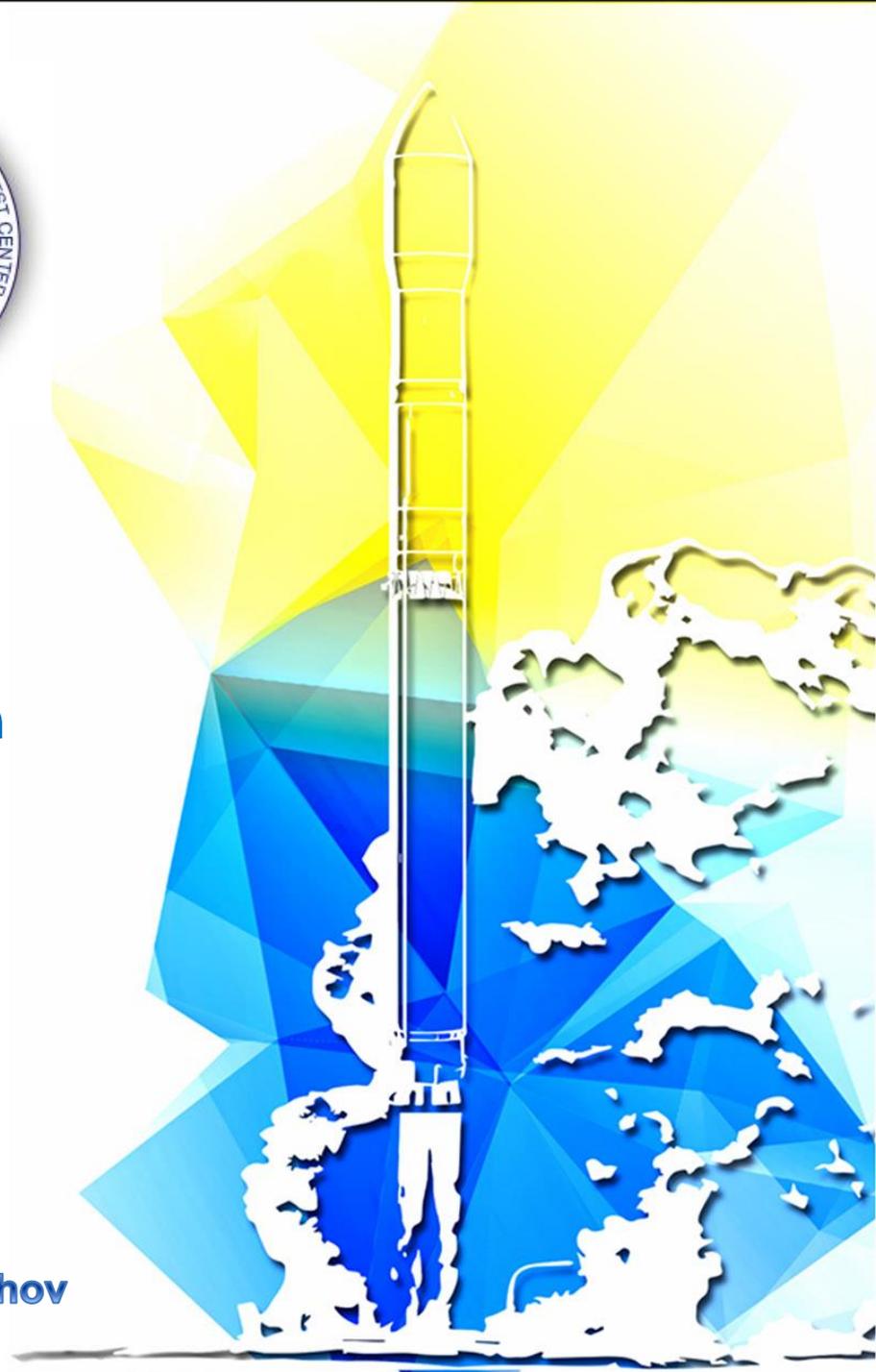




**National Space Facilities
Control and Test Center of
State Space Agency of Ukraine**

**Near-Earth Space Observation
Activities at Ukraine in 2021**

Dr. O.Kozhukhov





Main Activities in 2021



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

Radar 5N86 "Dnepr", Mukachevo



Perspective L-band Radar



Perspective cm-band radar



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



Space Observations Center



Optical sensors at Lviv National University



Optical sensors at Odesa Astronomical Observatory



OEOS type 2 at RD SCP, Novosilky, Kyiv region



Optical sensors at Uzhhorod National University



Modernized UHF Radar (5N86)



- 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

L-band radar with digital antenna array



- 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

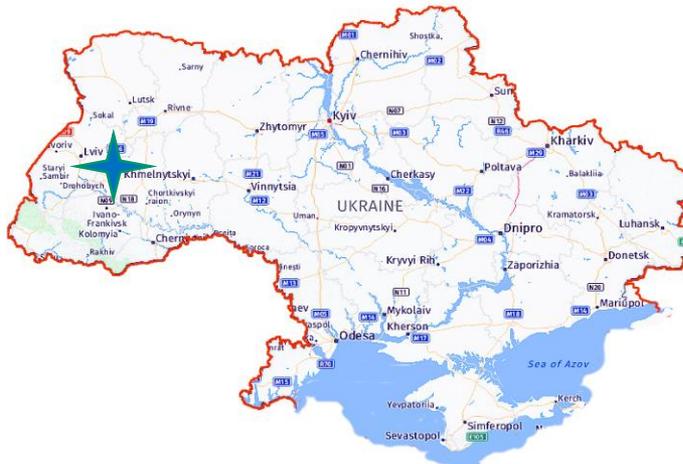
Perspective centimeter-band radar based on the 25-m Cassegrain antenna



- 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.

Modernized Mark-4B antenna (RT-32)



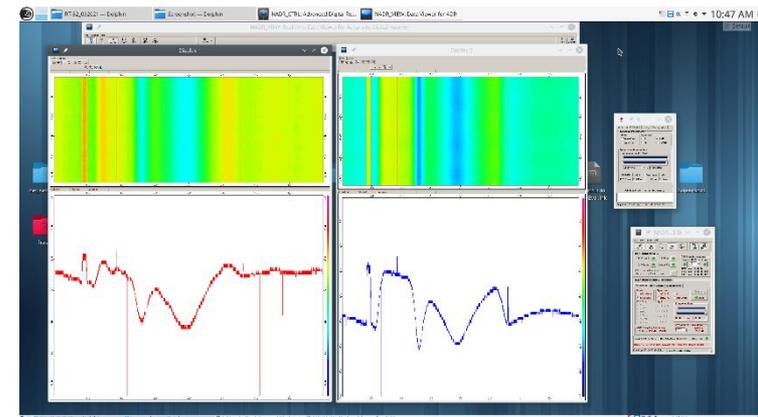
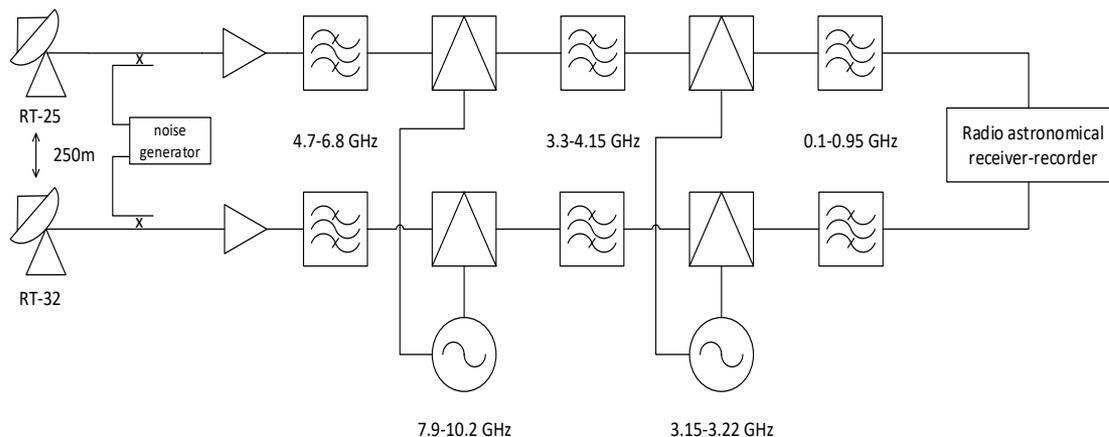
Location: 49.856424 N, 24.923862 E

- **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.



QOS "Sazhen-S", Khmelnytsky region



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

OEOS, type 1, Khmelnytsky 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.



International Cooperation



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...).

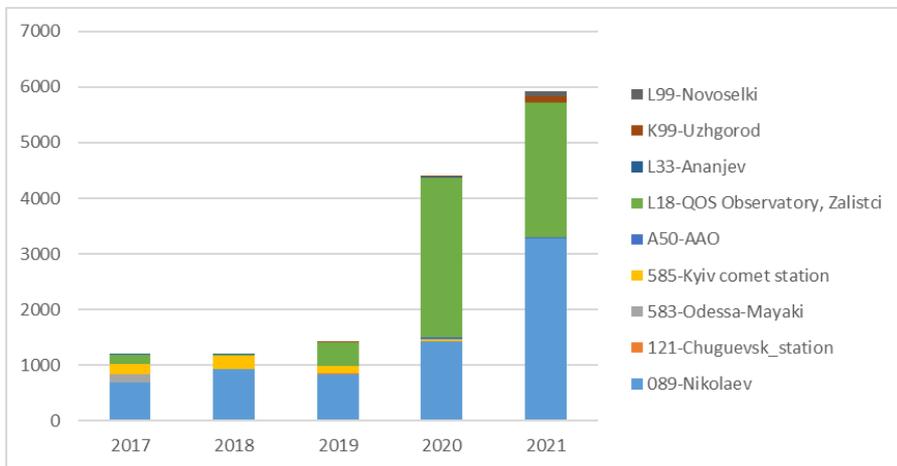


Near Earth Objects



Observation of NEOs by Ukrainian observatories in 2017-2021

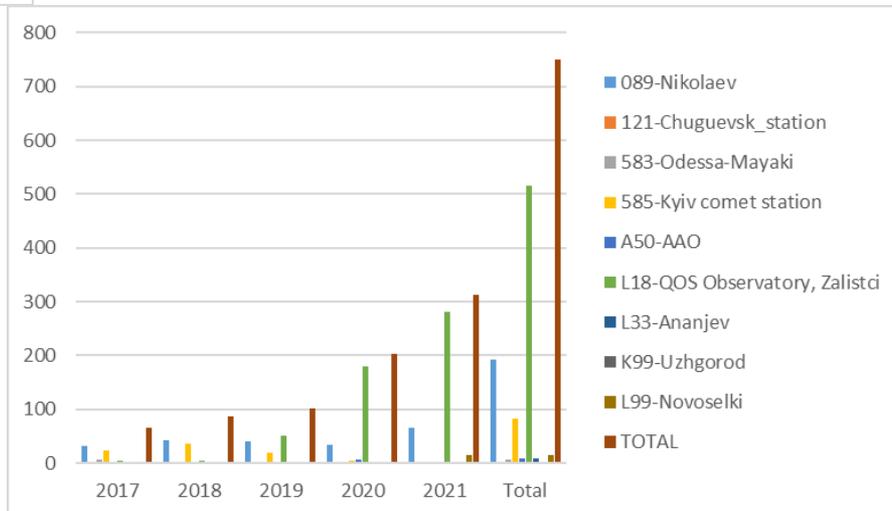
Observations



Total: 14135 observations,
750 NEOs

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

Objects



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.



Conclusion



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



THANK YOU FOR YOUR ATTENTION!

ncuvkz@spacecenter.gov.ua

www.spacecenter.gov.ua

Phone: +38 (044) 253-43-49

Address: 01010, 8 Moskovska Str., Kyiv, Ukraine

