

# Russian Space Science Program

## current status and nearest milestones

ROSCOSMOS

Ministry of Science and Higher Education of Russia  
Russian Academy of Sciences



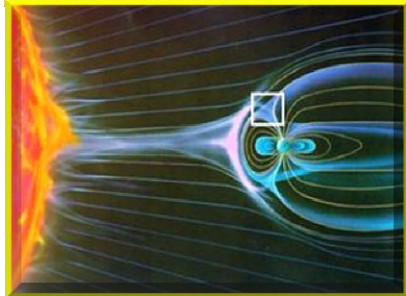
# Science in the Federal space program 2016-2025



moon, planets, minor bodies of the Solar system



space astronomy

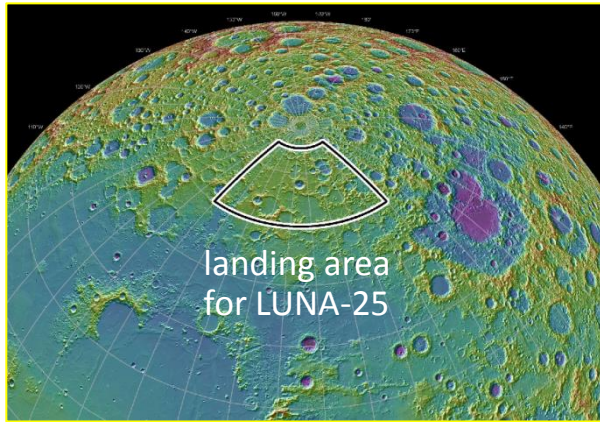


space plasma and solar physics

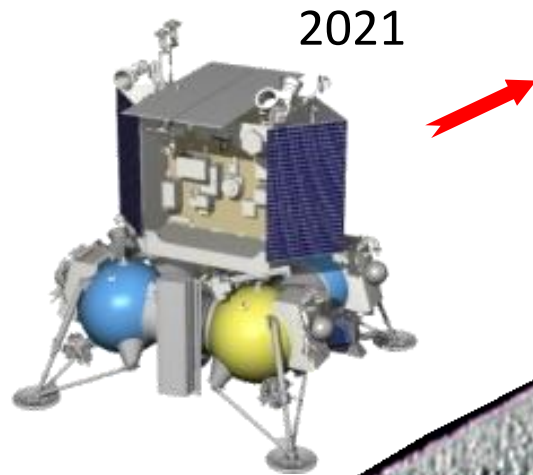


basic problems of space biology and medicine

# Lunar program

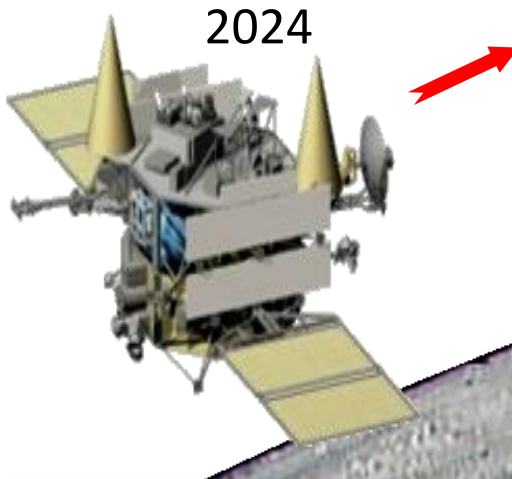


landing area  
for LUNA-25



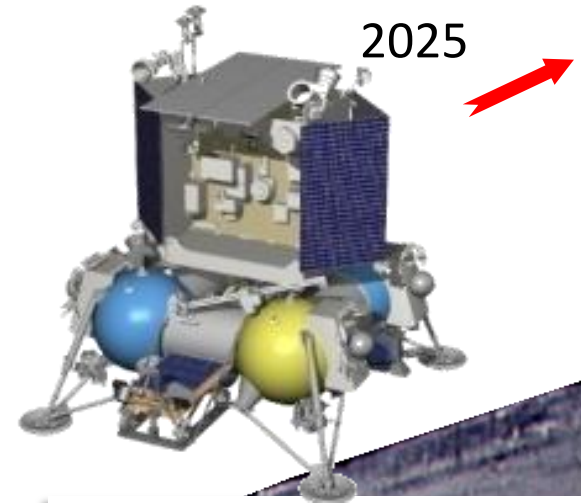
2021

**LUNA-25**  
(old name LUNA-Glob)  
technology of polar soft landing,  
study of lunar south pole region



2024

**LUNA-26**  
(LUNA-Resource-Orbiter)  
global orbital studies of the  
Moon



2025

**LUNA-27**  
(LUNA-Resource-Lander)  
studies of south pole  
regolith and exosphere

# Exomars - 2016

## Goals:

- Search for signs of past and present life on Mars
- Investigate how the water and geochemical environment varies
- Investigate Martian atmospheric trace gases and their source



The 2016 ExoMars Trace Gas Orbiter is the first in a series of Mars missions to be undertaken jointly by the two space agencies, ESA and Roscosmos.

# Exomars - 2020



The 2020 mission of the ExoMars programme will deliver a European rover and a Russian surface platform to the surface of Mars. A Proton rocket will be used to launch (in July 2020) the mission, which will arrive to Mars after a nine-month journey.

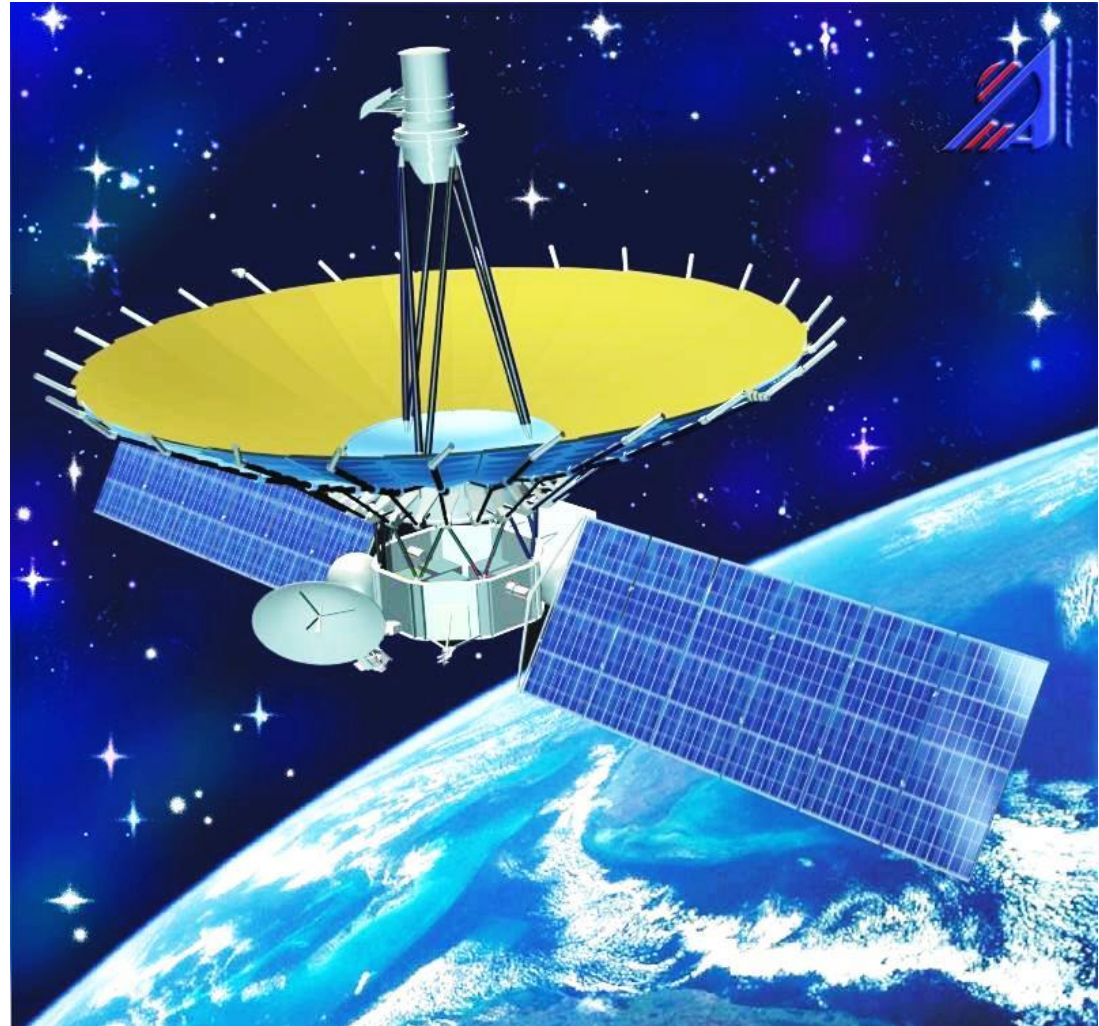
The ExoMars rover will travel across the Martian surface to search for signs of life. It will collect samples with a drill and analyse them with next-generation instruments.

**Roscosmos:** 00:15, Jan 25, 2020

*“Scientific instruments for the Russian-European ExoMars-2020 mission are already ready.”*

# Radio Astron

The world largest interferometer Radio Astron (or “Spektr-R”) which was launched in June 2011 has successfully completed its work in the begin of 2019. A number of important discoveries were made.



Major event in 2019 – successful launch of «Spectrum-Xray-Gamma» (SRG) Observatory and start of observation.

## Principal Science Schedule

- All-sky survey – 4 years
- 2.5 years of pointed observations

## Primary science instruments

- eRosita telescope (Germany)
- ART-XC telescope (Russia)

## Major cooperation

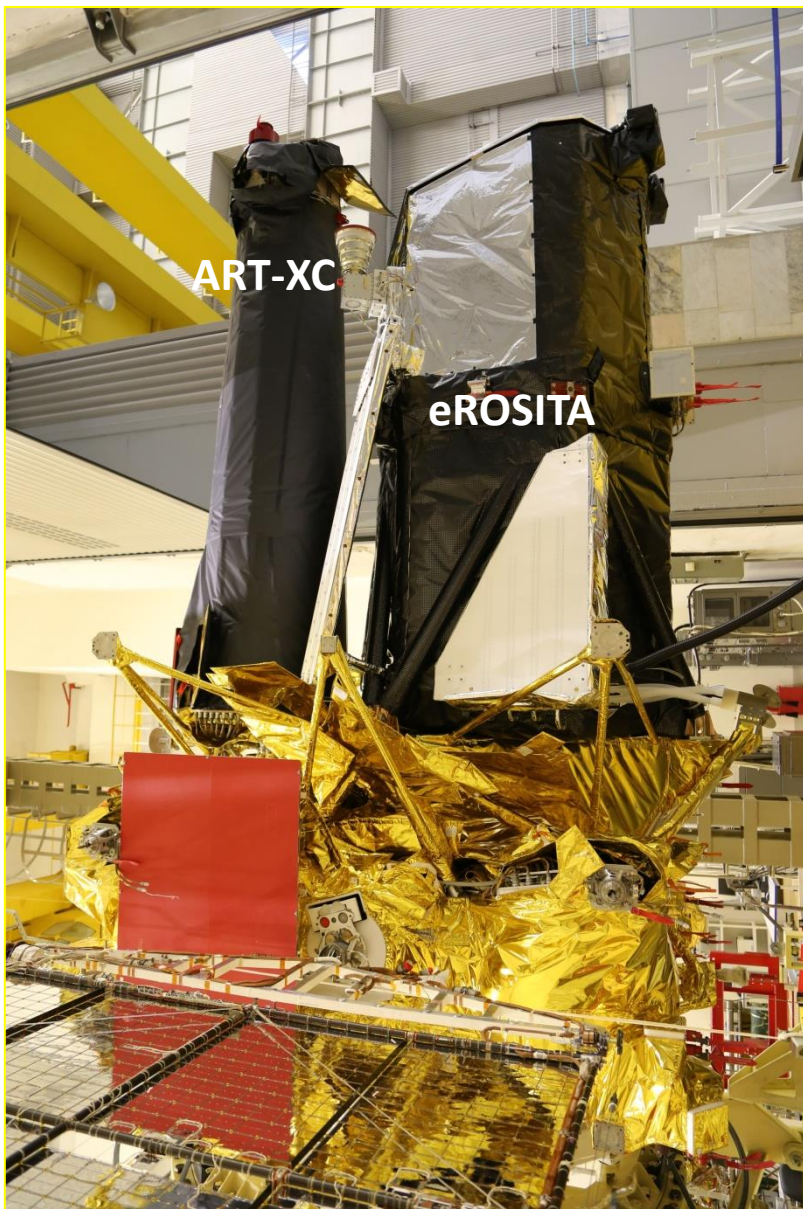
- Roscosmos + DLR
- Scientific head of the mission: acad. Rashid Sunyaev;  
PI of for the ART-XC: Dr. Mikhail Pavlinsky;  
PI of the eROSITA: Dr. Peter Preidel.



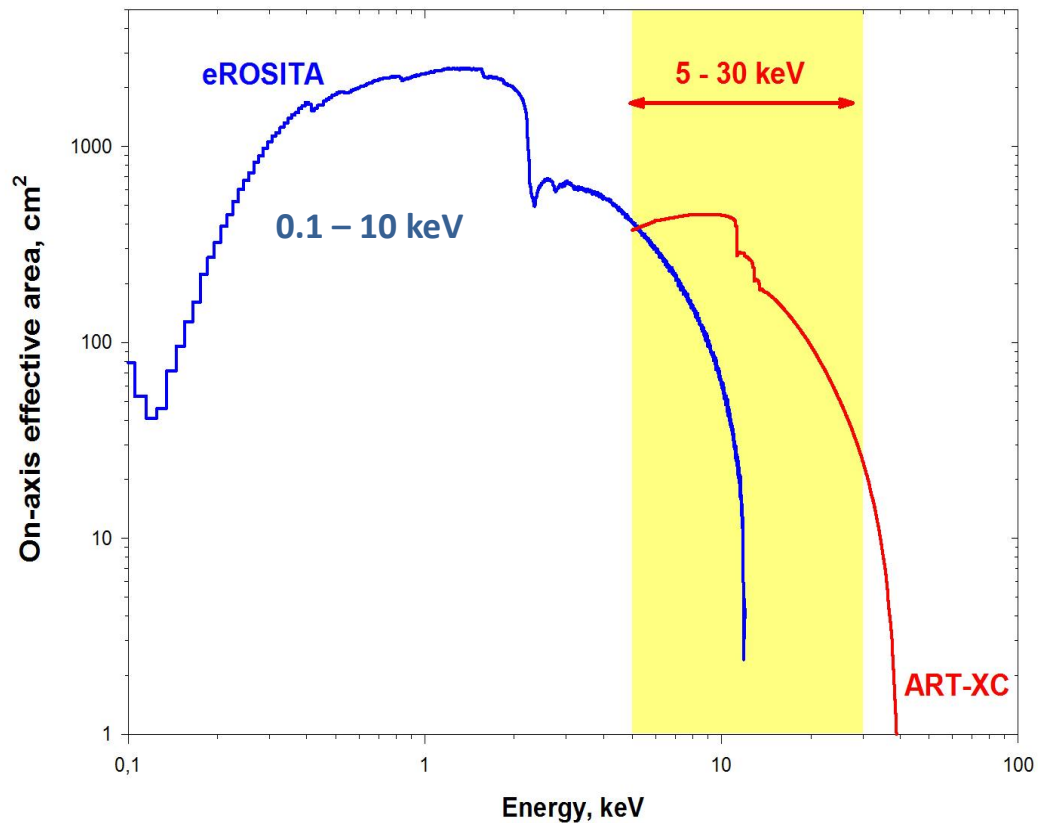
SRG



# eRosita and ART-XC



On-axis effective area of eROSITA and ART-XC



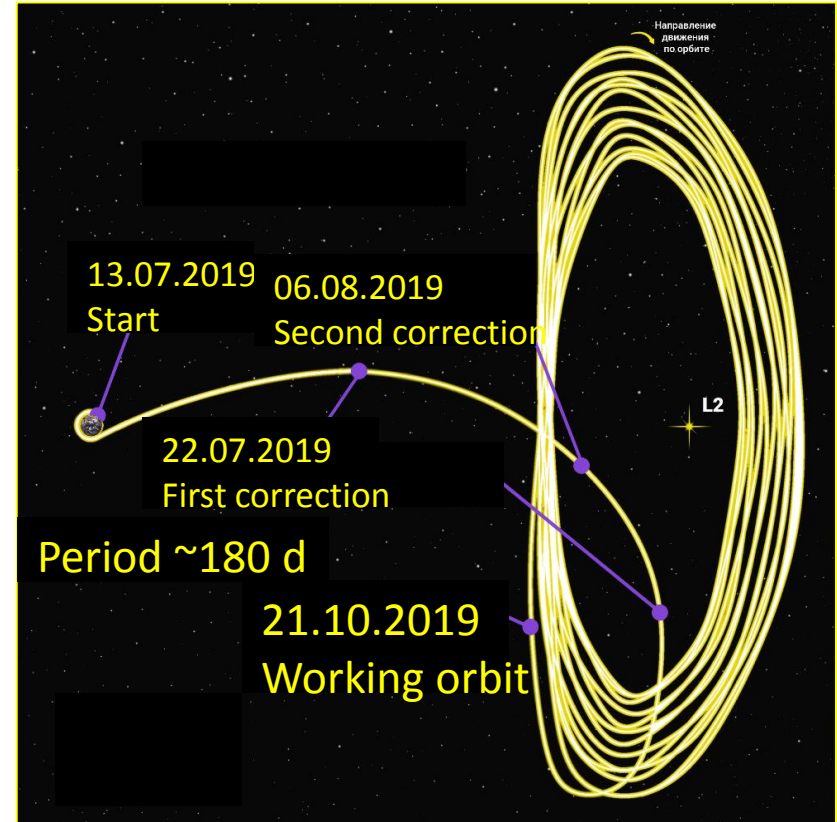


# SRG: launch and orbit

July 13, 2019, launch to the orbit



Flight to L2 point

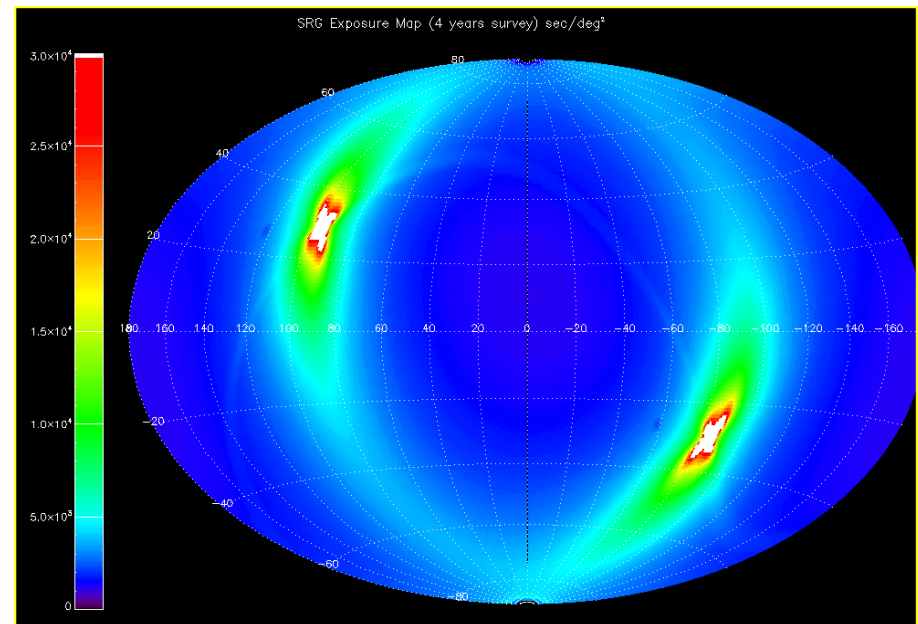


Calibration and verification observations were carried out for few first months. All-sky survey started 08/12/2019. At mid-January 1/6 part of the sky is covered.

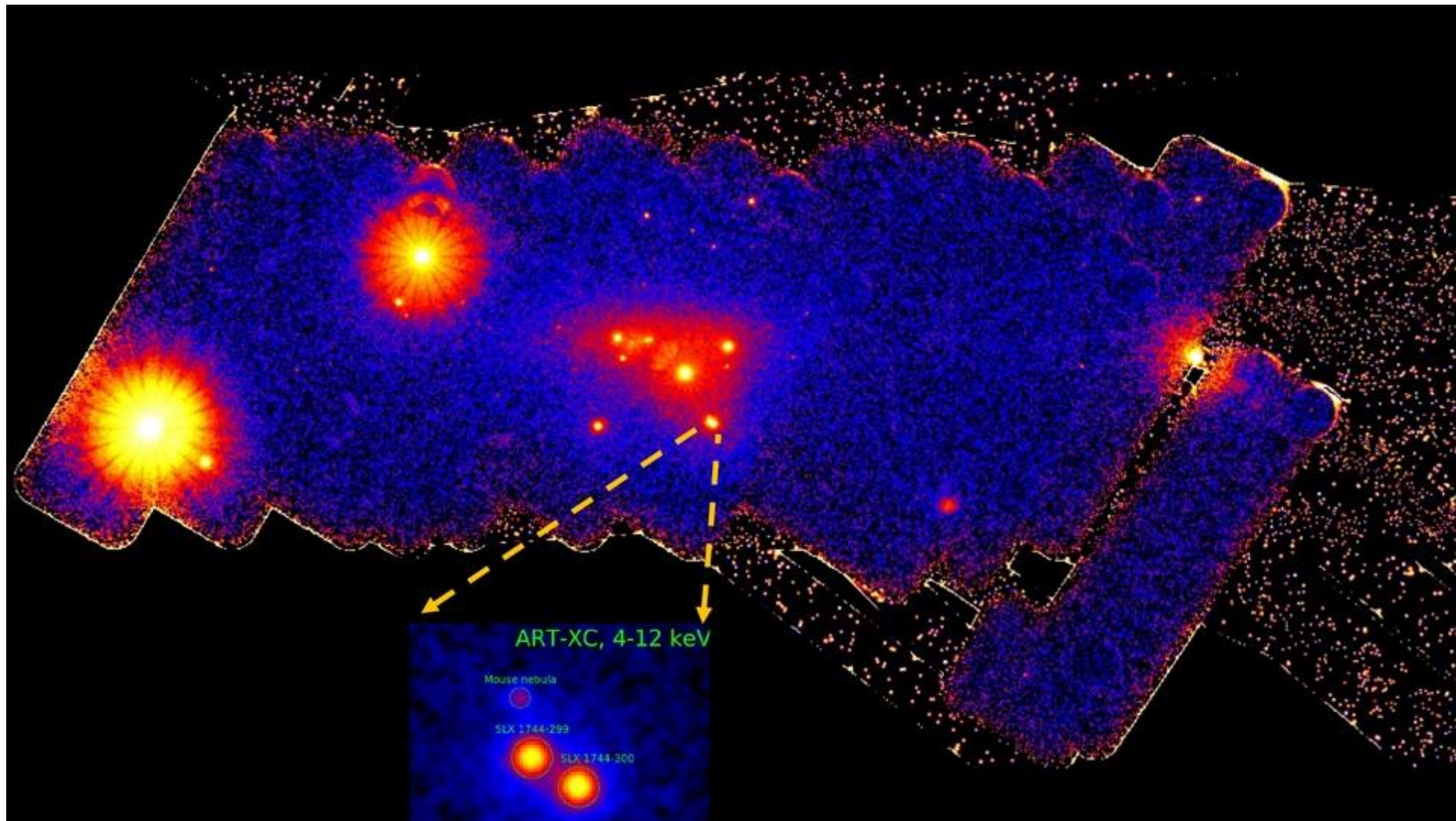
# Principal science goals of the SRG

- Total inventory of clusters of galaxies (up to 100 000) and cosmology
- Supermassive black holes ( $\sim 3\,000\,000$ )
- Complete samples of galactic compact objects ( $\sim 100\,000$ )
- Stars ( $\sim 2\,000\,000$ )
- Diffuse ISM and SNR
- Objects in the Solar system

Combination of the large FoV and effective area will make possible probing record volume of the Universe.

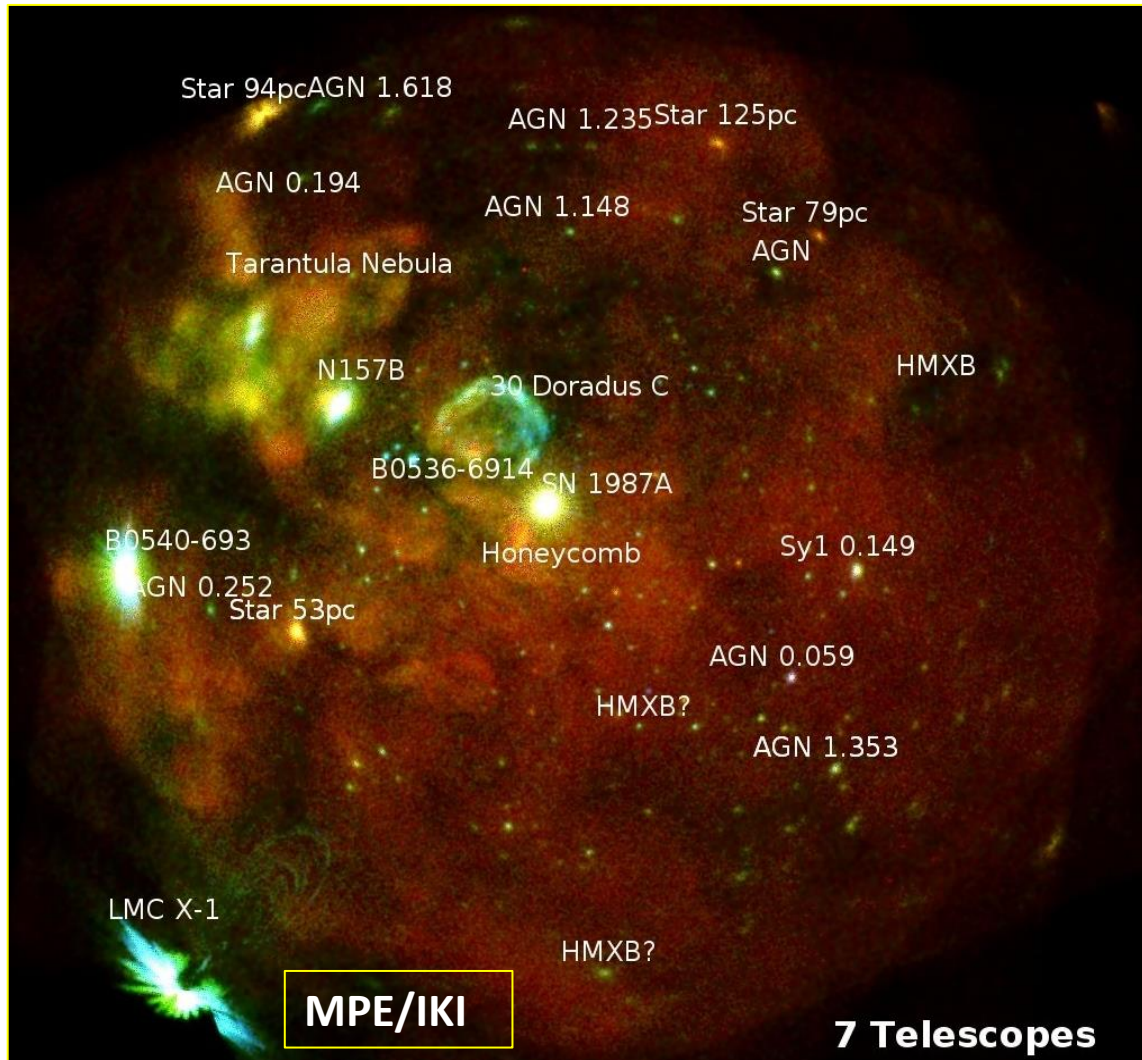


# Observation of Galactic center with ART-XC



More than a hundred of hard X-ray sources observed.

# Large Magellanic Cloud as it is seen by eROSITA



Diffuse emission from the hot gas with temperatures a few million degrees. More compact nebulous structures are mainly supernova remnants. The most prominent one, **SN1987A**, is the bright source close to the centre. Other sources: accreting binary systems, massive young stars, foreground stars from our home Galaxy or distant Active Galactic Nuclei.

# World Space Observatory – Ultraviolet (Spektr – UF)



A Russia led (with participation of Spain) project of a multipurpose space observatory for UV spectral range ( $>115$ - $320$  nm). The WSO-UV is equipped with a 170 cm telescope T-170M and scientific instruments: UV-imagers and 3 spectrographs (resolving power 1000 - 55000). Launch is scheduled for 2025.



Telescope T-170M: working moments at Lavochkin Co.

## Science goals

- The Cosmic Web (history of reionization, search for baryons chemical evolution of Universe)
- Physics of astrophysical engines
- Formation and the evolution of the young planetary systems
- Astrochemistry in UV field and life origin

# The program BION-M continues



The BION-M2 spacecraft is designed for studies of influence of hostile space environment on biological materials and living species in space (flight duration up to 45 days). Bion-M2 is scheduled to launch in 2023 on a Soyuz-2.1a rocket to an altitude of 800 km. The orbiter will carry 75 mice, insects, plants, cell cultures, microorganisms. Studies will focus on how they are affected at molecular level by space radiation.



**Thanks a lot for your  
attention!**

