ISONscope Programme of UNOOSA and the Keldysh Institute under the Access to Space for All Initiative

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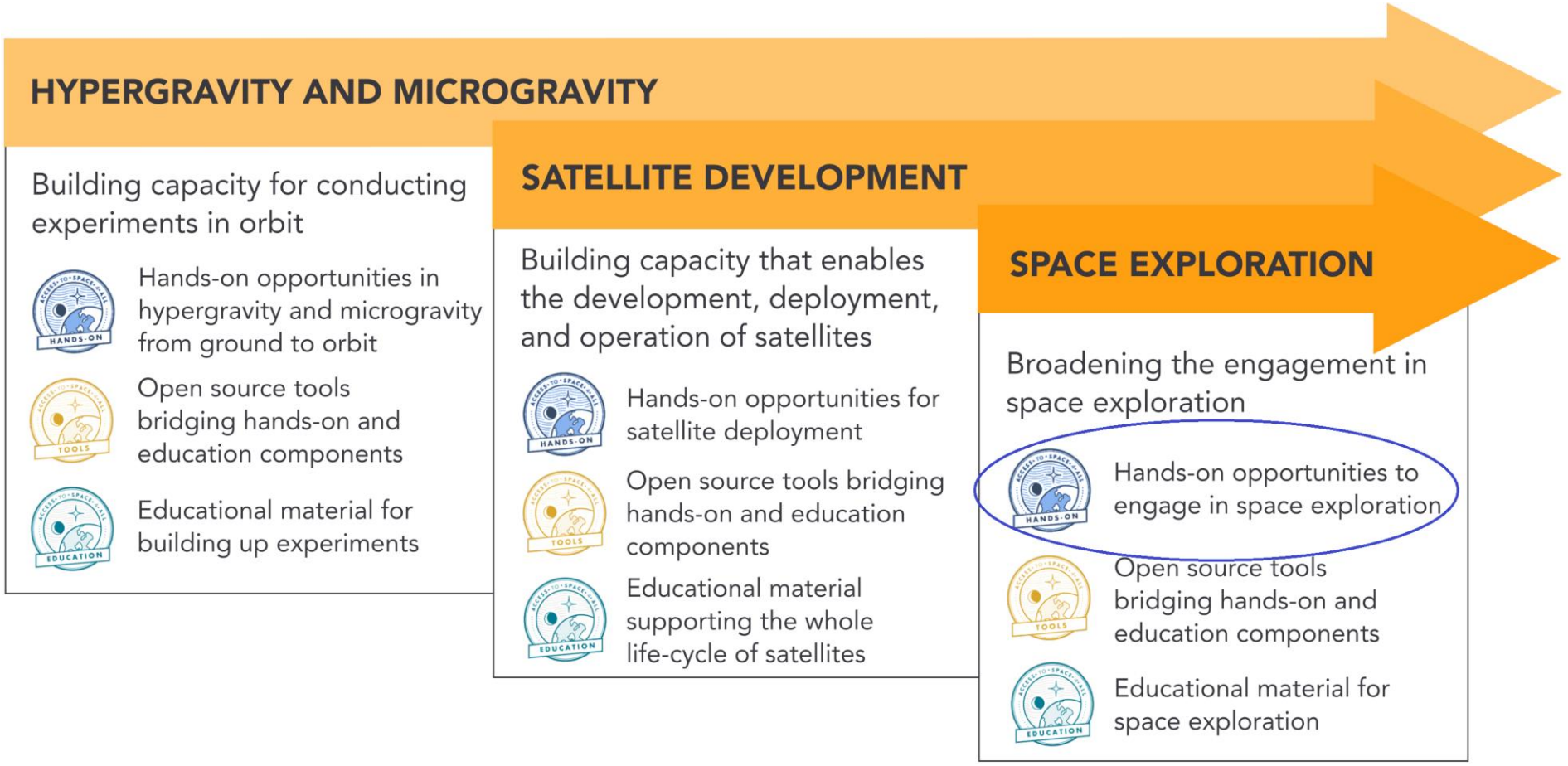
1st Access to Space for All Expert Meeting



ISONscope is a joint program of Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences and the United Nations Office for Outer Space Affairs within the memorandum of understanding signed between the Keldysh Institute and the UN in 2019.

ISONscope is a part of the Space Exploration Track of the Access to Space for All Initiative of UNOOSA. It is envisioned that ISONscope will facilitate optical observations of space objects in the geostationary region and beyond for scientific and educational purposes in winners' developing countries.

Content of ISONscope

Each opportunity includes:

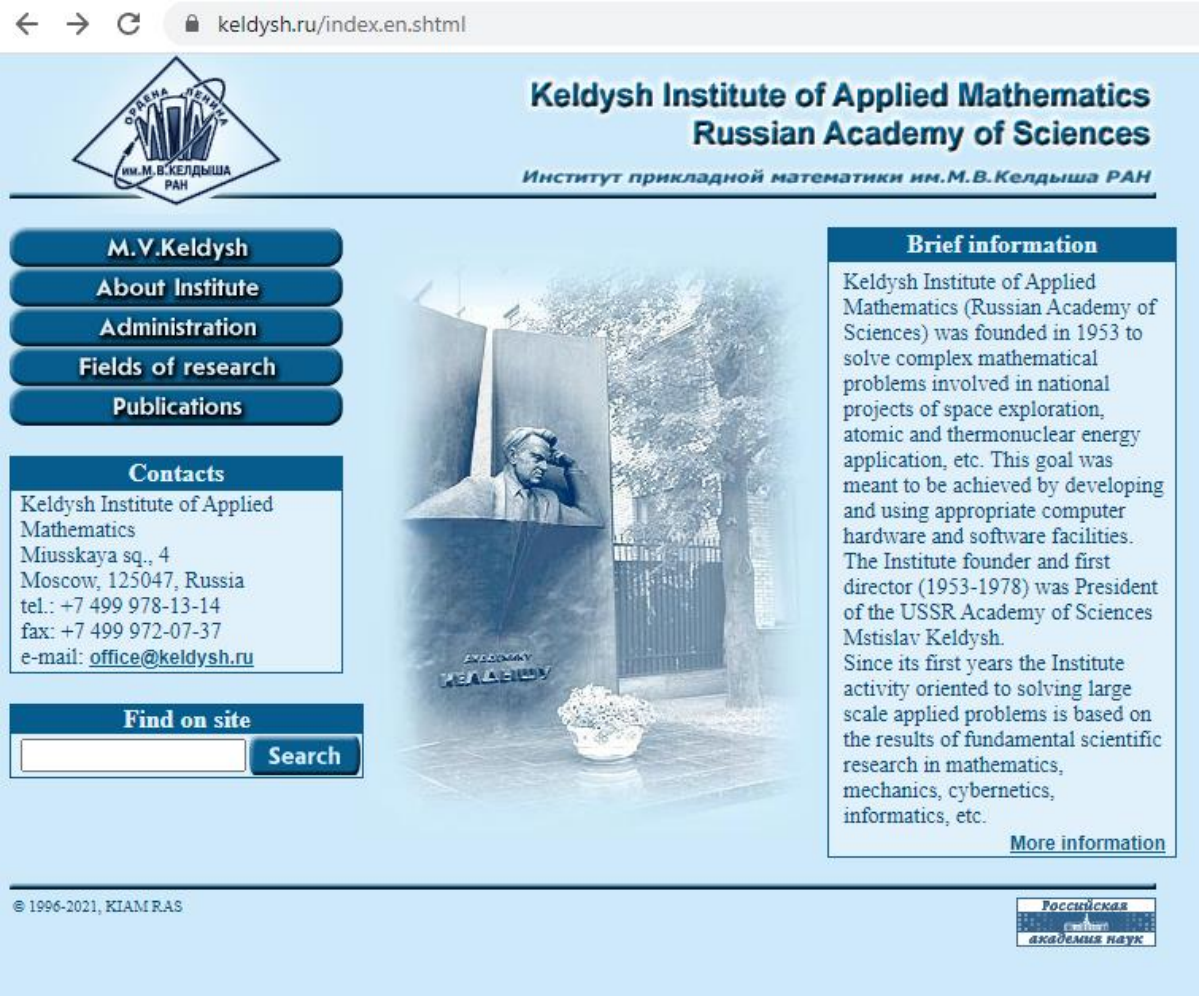
- provision of a small-aperture optical telescope and all related equipment and software;
- onsite training of staff members of a selected organization on the telescope operation and data processing;
- technical support;
- participation in campaigns of the Keldysh Institute on optical observations of anthropogenic space objects and minor planets;
- up to 50 per cent of the telescope observation time for scientific and educational purposes of a selected entity.

Two opportunities were available through the selection process under the first round of ISONscope in 2021.

Specifications of the Equipment to be Provided

- Telescope optical tube: reflector having an aperture in the range from 20 cm to 35 cm and a field of view in the range from 2°x2° to 4°x4° with no significant aberrations in CCD/CMOS images.
- CCD/CMOS camera: monochrome, ASCOM compatible, 50 mm minimum sensor diagonal, 2048 x 2048 pixels minimum sensor size, cooling at least 30°C below ambient, PPS time synchronization, 6 seconds maximum frame read time.
- Telescope mount: equatorial, ASCOM compatible, not less than 100 arcsec/sec maximum supported tracking speed for each axis.
- Single-frequency GPS receiver.
- Motorized focuser: ASCOM compatible.

Observing Campaigns of the Keldysh Institute



- ISON, or International Scientific Optical Network, is an initiative of the Keldysh Institute's research fellows to coordinate international campaigns on optical observations. ISON mainly focuses on anthropogenic space objects orbiting the Earth and near-Earth objects.
- ISON involves wide field of view optical telescopes 20 to 80 cm in diameter at more than 20 sites. Some telescopes are operated by staff members of the Keldysh Institute, and some by staff members of partner organizations.
- Selected entities of ISONscope will become a part of ISON, participate in joint observing campaigns and be able to obtain data and observation time of other telescopes of the network.

Observing Campaigns of the Keldysh Institute

- Optical astrometric observations, cataloguing objects and monitoring events in the geostationary region, medium and high Earth orbits.
- Photometric studies of objects orbiting the Earth in all types of orbits.
- Search for new asteroids and comets.
- Observations of asteroids and comets for studying their physical properties.
- Follow-up observations of newly discovered minor planets.
- Participation in observing campaigns of the International Asteroid Warning Network.

ISONscope Eligibility

Applying organizations from developing countries, if selected, shall ensure the following:

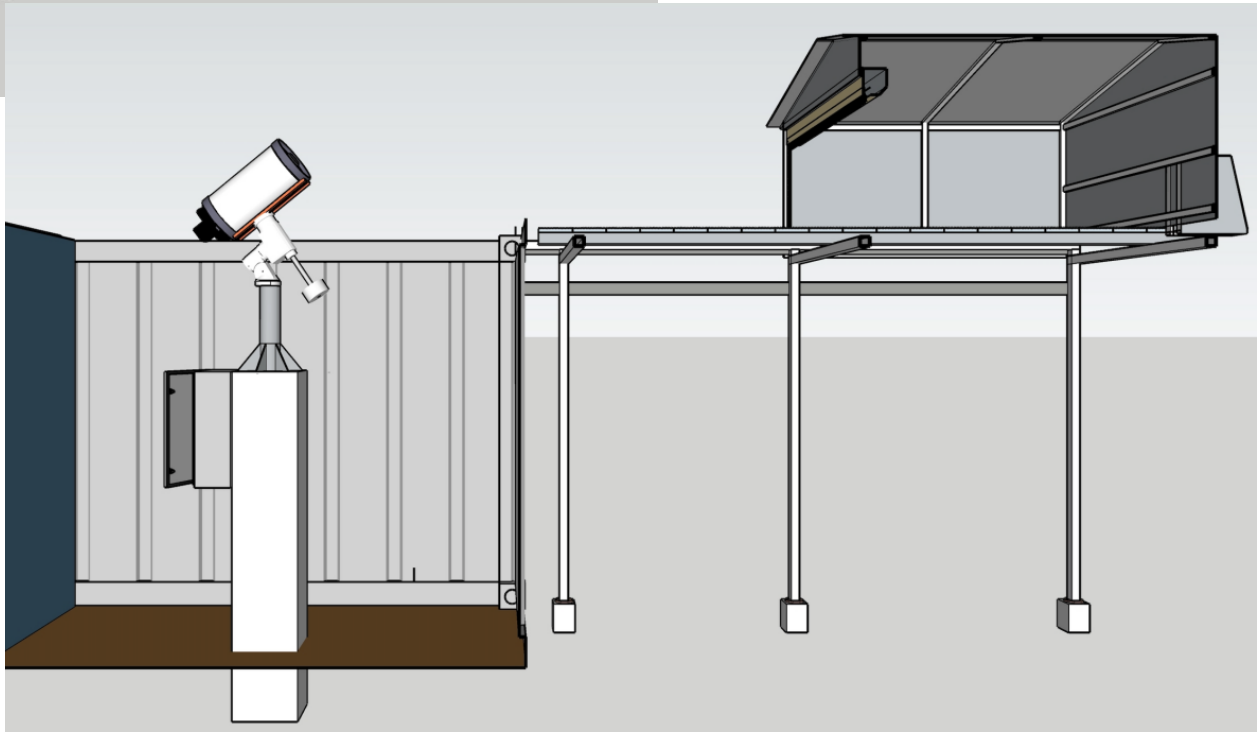
- a site in accordance with data specified in an application form and the minimum requirements for the average number of clear night hours per year and sky brightness;
- a shelter for the telescope, reliable power supply and internet connection;
- its staff for the telescope operation and its feasible technical support.

Winner of the 1st round of ISONscope: the project of Kenya Space Agency and the National Museums of Kenya

The proposed site for
the telescope installation:
the Olorgesailie prehistoric site

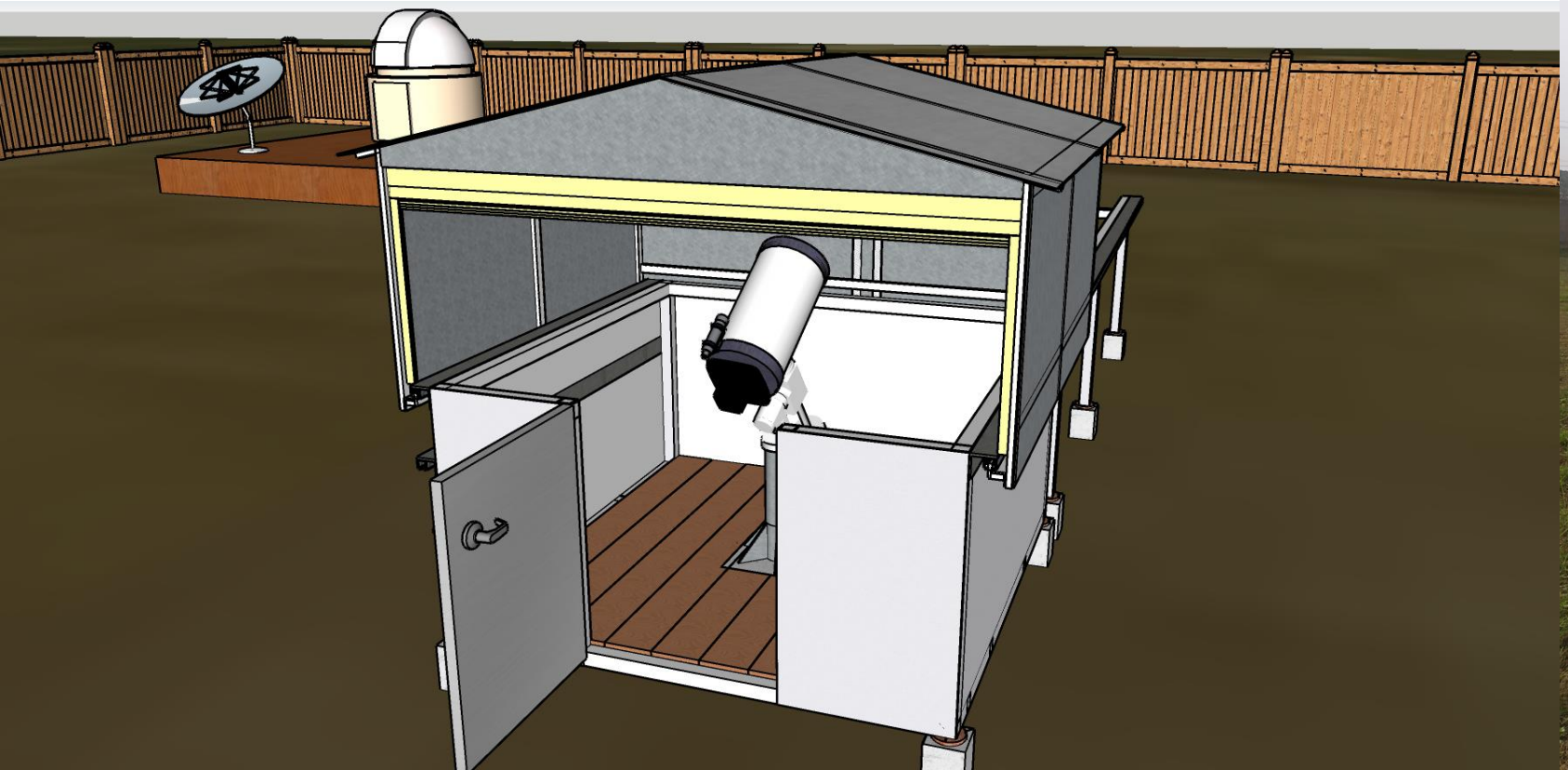
Winner of the 1st round of ISONscope: the project of Kenya Space Agency and the National Museums of Kenya

The telescope pavilion design is now pending the final stages of harmonization



Winner of the 1st round of ISONscope: the project of the Center for Basic Space Science, the National Space Research and Development Agency, the Federal Republic of Nigeria

The proposed site for the telescope installation:
the Center for Basic Space Science's grounds, Nsukka



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The equipment making up the telescope to be provided is prepared for shipment. It was presented to the representatives of the Embassy of the Federal Republic of Nigeria in Moscow in late 2022.

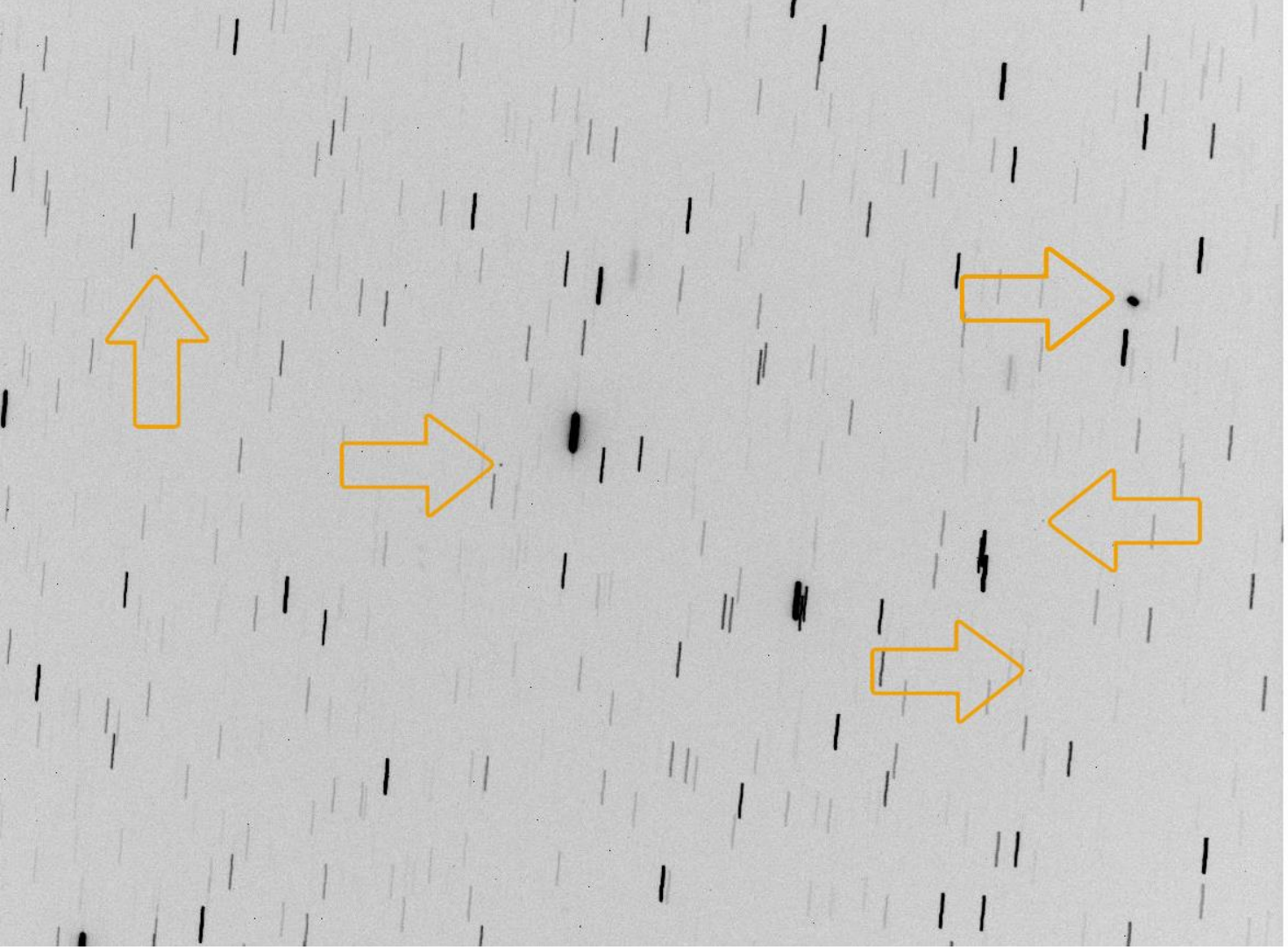
The telescope pavilion construction was completed in the spring of 2023

Challenges Encountered

- A significant amount of time is spent on a telescope pavilion design negotiation and approval.
- A possible need for greater coherence between organizations representing a winning project regarding a telescope pavilion design and its exact location.
- The introduction of the new strict Russian customs regulations in 2022 affected the timelines for transporting the equipment items to the winners' countries.

Ways Forward

- Incorporation of a requirement into the documentation of future ISONscope opportunities of using a standard telescope pavilion design developed by the Keldysh Institute. This design should take into account existing best practices and ensure the use of cost-effective solutions in construction.
- Increased interaction of the Keldysh Institute with public authorities aimed to accelerate obtaining permissions to export Russian equipment while implementing future rounds of ISONscope.



An image taken by one of ISON's telescopes shows several anthropogenic space objects in the geostationary region

The Keldysh Institute intends to ensure the implementation of the second round of ISONscope in 2023.

An announcement of opportunity for applications for the second round is tentatively planned for the third quarter of 2023.

The Keldysh Institute will be able to provide up to five wide field of view small-aperture optical telescopes (sets of equipment, necessary software and training for winning organizations, etc.) under the second round of ISONscope.

Thank you for your time and attention!