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Research in Baldone Observatory.

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Due to the UL consolidation process and the further development of the Baldone observatory infrastructure, the 2025-2035 development strategy of the UL Astronomy Institute and including the Baldone Observatory, was initiated. The first section of the strategy contains an insightful description of the current situation, both in terms of infrastructure and hardware, developed scientific projects, a summary of scientific achievements, a description of personnel, and an insight into the financial field. The following sections examine the development of the institute's scientific projects, the development of the structure due to the inclusion in the Fotonika-LV National Platform, personnel development plans and financial attraction perspectives.



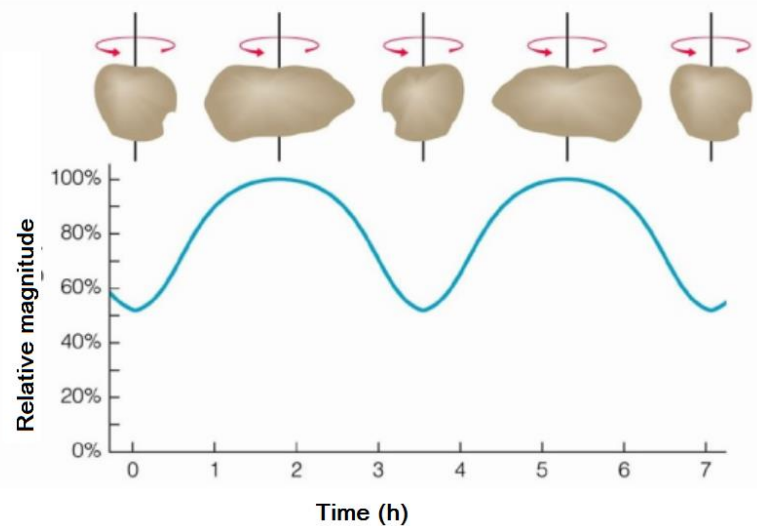
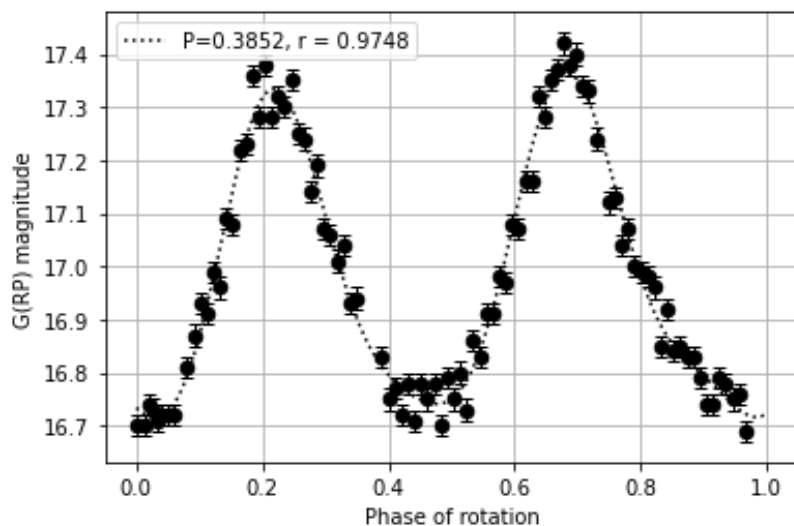
Baldone Observatory operates an 80/120 cm Schmidt telescope with a 120 cm primary mirror and an 80 cm entrance aperture (correction plate). The telescope provides a wide 4.8-degree field of view and reaches a limiting visual magnitude of about 21 mag, making it suitable for large-area sky surveys and faint-object observations.

By placing a four-degree prism in front of the correction plate, the telescope can obtain spectral images with a spectral resolution of about 500 and a limiting magnitude of approximately 14 mag.

In 2017, the telescope was upgraded with two 16.8 Mpix SBIG CCD cameras, each providing a field of view of $54' \times 54'$. The CCD detectors are sensitive in the 4000–9000 Å wavelength range, with a quantum efficiency reaching about 90% in the visual band. The system is equipped with a filter wheel containing standard U, B, V, R, and I photometric filters. The observatory is planning research in three main directions and in some cooperative research :

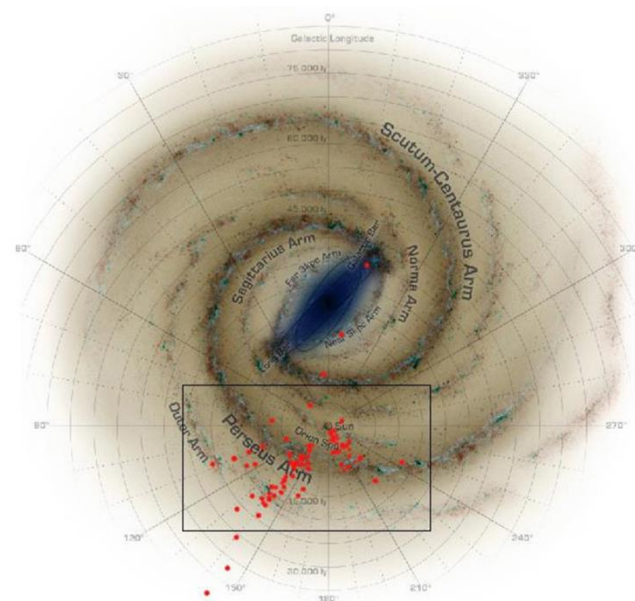
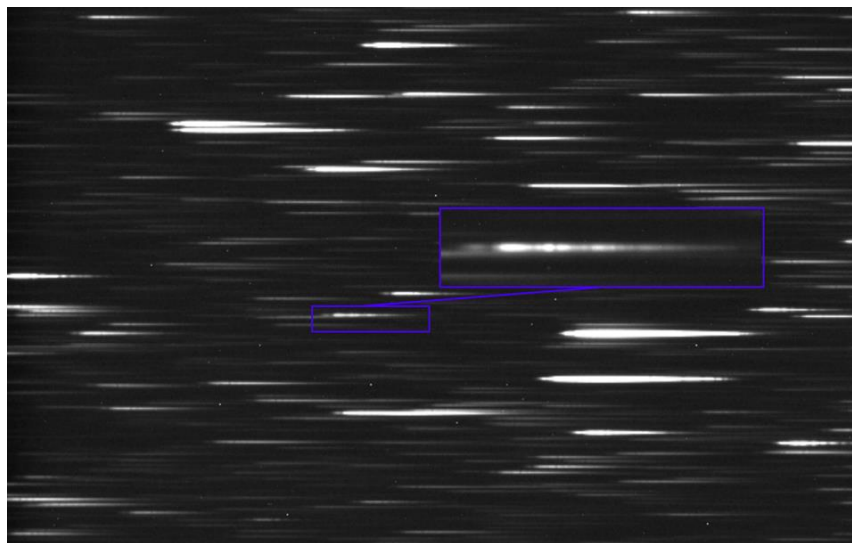
Direction 1. The purpose of the program is to develop the monitoring of small bodies of the Solar System, especially near-Earth (NEO, NEA, Earth Moid) asteroids with a synthetic tracking method, automation methods of data processing, increasing the accuracy of measurements and obtaining the characteristics of these objects, such as the rotation period, absolute magnitude, size and shape, using light curve modeling method.

Achievable result: Will ensure the successful inclusion of Latvian astronomers in the International Asteroid Warning Network (IAWN) and the Space Surveillance and Tracking (SST) network especially to observe small, fast, near-Earth asteroids up to magnitude 21. Submitted project of Latvian Council of Science «Advancing Small-Body Detection and Spectral Classification with Wide-Field Imaging and Synthetic Tracking at Baldone Observatory» (2027-2030).



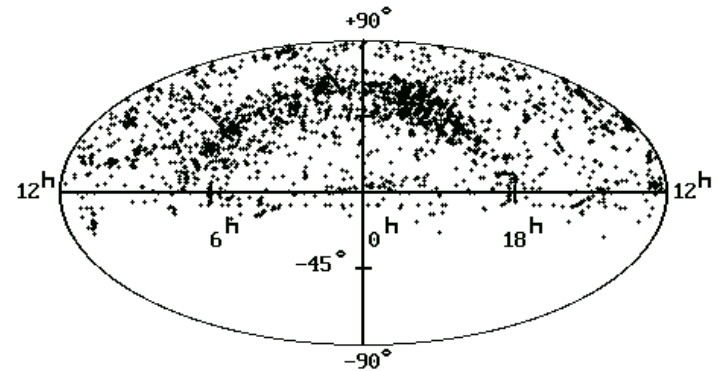
Direction 2. "Improving the catalog of carbon stars". The aim of the program is to develop an in-depth study of carbon stars, the structure of our Galaxy and extrasolar planets, especially in areas rich in carbon, the basic element of life, with Latvia's largest astronomical telescope - the 80/120 cm wide-angle Schmidt system telescope.

Outcome: The structure of our Galactic periphery will be explored. The search for faint carbon stars and their inclusion in a single catalog will create an overall picture of the distribution of carbon - the basic element of life - in our Galaxy.



Direction 3. Program: Digitization of the astrophoto plates archive of the Baldone Schmidt telescope. The goal of the program is to process the digitized 22,000 direct sky photographic images of the Baldone Schmidt Telescope and perform further digital image processing to obtain star position and brightness data in different passbands in the optical range (U, B, V, R, I filters).

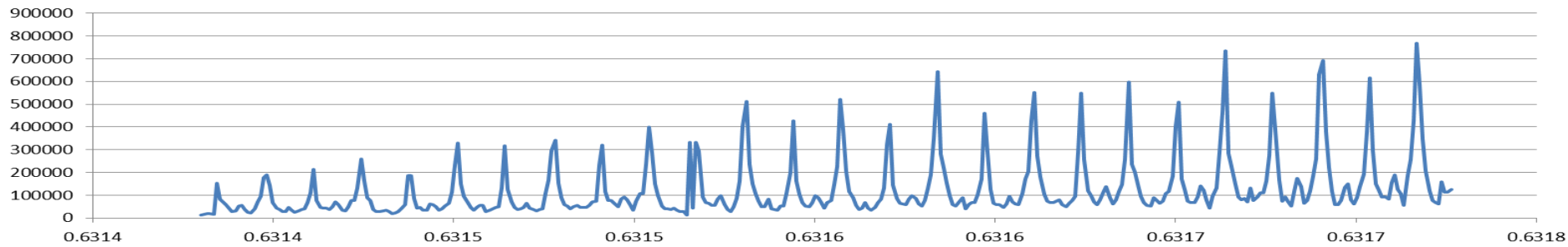
Achievable result: Latvia will fully join the common research space - creating an opportunity for EU and other world scientists to access the observational materials collected by Baldone astronomers, providing data on the position of stars and brightness dynamics over a thirty-year interval in certain regions of our Galaxy.



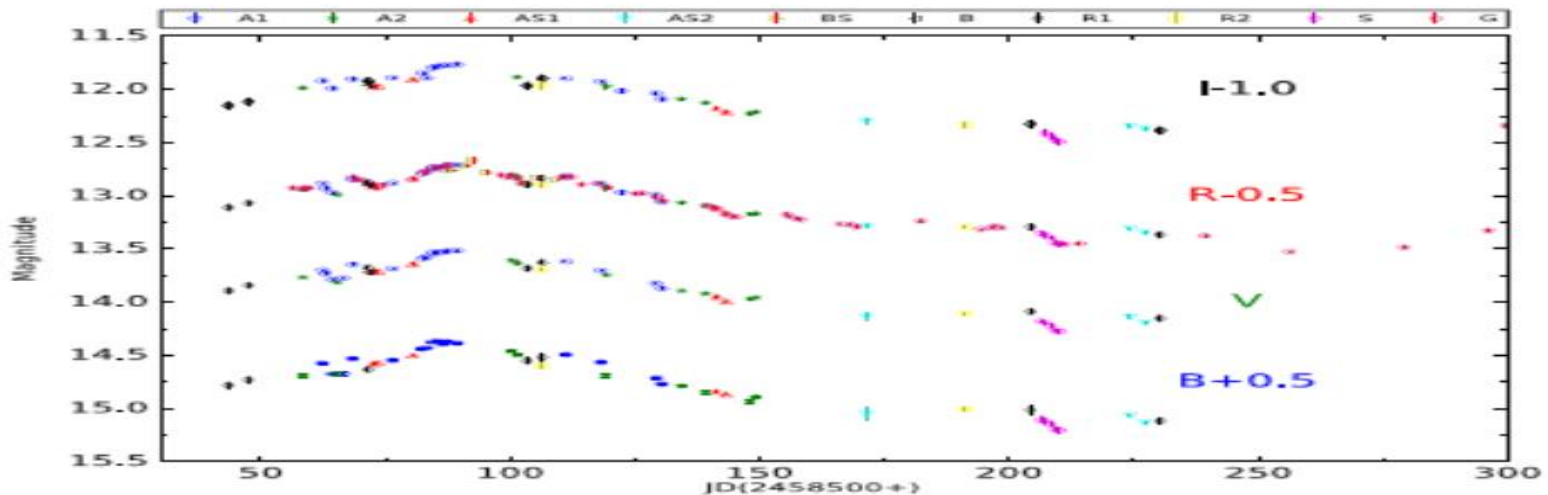
All-sky distribution of the 22000 direct observations

A) Cooperation between the laser ranging group of the Institute of Astronomy will require the development of a methodology for processing cosmic debris observations and data analysis.

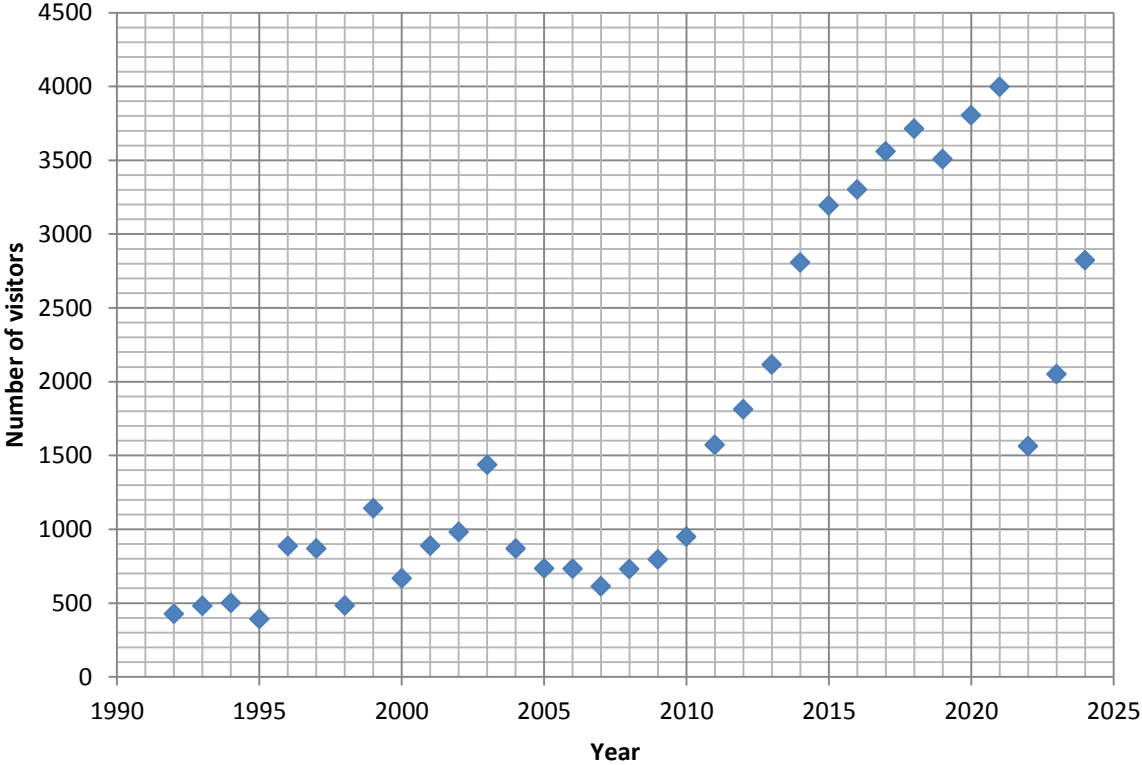
Intensity first serie



B) Cooperation at the international level in the development of multiband observations of relativistic objects together with radio astronomers of Latvia (VIRAC-Ventspils International Radio Astronomy Center), India (ARIES-Aryabhata Research Institute of Observational Sciences) and Ukraine (RI NANU-Institute of Radio Astronomy, National Academy of Sciences of Ukraine).



Since the establishment of the planetarium in 2012 in Baldone Observatory, and through numerous scientific publications and conference presentations, the public visibility of Baldone Observatory has increased significantly over the past decade. Each year, more than 2,500 visitors attend the observatory's popular science lectures and educational events.





Thank You for Your attention

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