L. I. Snezhko. *Large six-meter BTA telescope: status and prospects.* In November 1960 a bold project calling for the construction of the largest alta-azimuth mounted telescope in the world with a six-meter diameter main mirror was approved. The Leningrad Optical-Mechanical Union was assigned the main work of development and construction of the BTA, and the outstanding engineer B. K. Ioannisiani was named as the principal designer of the telescope.

The astronomical side of the project was supported by the Main Astronomical Observatory of the USSR Academy of Sciences. These functions were later transferred to the Special Astrophysical Observatory of the USSR Academy of Sciences, created in 1966. The BTA was put into test operation in January of 1976, and the planned astrophysical observational programs were begun in January of 1977. Programs for the BTA are selected by a commission on projects for the six-meter telescope of the USSR Academy of Sciences (KI61); 70% of the time is devoted to external observational programs (domestic and foreign) while 30% is devoted to scientific and technical programs of the Special Astrophysical Observatory of the USSR Academy of Sciences. Over the years new problems in the field of stellar astrophysics and extragalactic astronomy have been posed and successfully solved based on the observational possibilities of the BTA, enabling the evaluation of both the work flow and the future possibilities of the BTA.

1. Precision characteristics of the telescope. The effectiveness of the telescope is determined by the quality of its construction and alignment of the optical systems, the precision of the siting and tracking of the object, the stability of these characteristics, and also the operating reliability of all systems. In the image created by the main mirror of the BTA 90% of the energy is contained in a circle with a diameter of $d_{0.9} = 0''$, 8. At the prime focus (PF) system with a corrector at the center of the field $d_{0.9} = 0''$, 9 and at a distance of 4′, 5 from the center $d_{0.9} = 1'$,1, which corresponds completely to the computed residual aberrations of the system. At the present time a siting accuracy of $\pm 6''$ has been achieved along both coordinates, and when the new system for controlling the BTA is introduced in 1986 a siting accuracy of $\pm 3''$ will be achieved. Over the last three years virtually no time was lost for technical reasons. Thus the bold, for its time, decision to construct a large telescope on an azimuthal mounting has been completely justified. The successful operation of the azimuthal mounting of the BTA substantially affected the trends in the construction of large telescopes, having significantly increased the maximum diameter of the single-mirror telescope.

2. Astroclimate. Over the last ten years the average yearly number of hours of observation time on the BTA ranged from 1200 to 1800 with an average value of 1300. Thirty percent of the observations were performed with a cloud cover of magnitude $\lesssim 2$ and a turbulent disk of size $\beta \lesssim 2''$, while 70% of the observations were performed with $\beta \lesssim 3''$, 5. The histogram of the distribution of β on the BTA is shifted relative to the histogram for observations outside the tower by $\sim 1''$, 5. This is caused by temperature nonuniformities in the space beneath the dome of the BTA, determined by variations of the outdoor air temperature under the conditions of the large volume and thermal inertia of the subdome space. Over the last 20 years it became clear that in the European part of the USSR, including Transcaucasia, there are no locations with fundamentally better astroclimatic characteristics than the location of the BTA.

3. Observational possibilities of the BTA. The methods of observation, now used in carrying out the planned programs in different parts of the optical range $\lambda\lambda$ 3200–11000 Å are described below. The penetrability of the methods is found from the evaluation of the obtained observational material yielding the scientific results.

Direct photographs: obtained at the PF with a corrector, the UBVR color system, the diameter of the corrected field without vignetting is 10′, and the limiting magnitude $\sim 24^m$,5.

Electrophotometer at the PF: single channel, with offset arrangement, UBVR system, $m_B \lesssim 24^m$.

High-resolution spectroscopy: the principal stellar spectrograph, photographic recording, typical resolution $\delta\lambda = 0.1$, 0.3, 0.8 Å, limiting magnitudes, respectively, ($m_B \lesssim 6^m, 9^m, 5, 11^m$.)

Moderate-resolution spectroscopy: wide-aperture BTA spectrographs: with digital recording with a TV scanner the spectral resolution $\delta\lambda = 1$–5 Å, systematic observations up to $m \sim 20^m$; with photographic recording with an image tube the resolution $\delta\lambda = 0.8$–5 Å, systematic observations up to $m \sim 19^m$.

Low-resolution spectroscopy: multislit spectrograph at the PF, photographic recording with image tube, resolution $\delta\lambda = 35$ Å, observations up to $m \lesssim 23^m$,5.

In addition, the following special observational methods are standard:

Measurement of magnetic fields of stars (Zeeman effect): a photoelectric magnetometer is used here for measuring weak magnetic fields, a photoelectric magnetometer is used for hydrogen lines, and magnetic fields are also recorded photographically.

Program-instrumentational photometric complex: intended for searching for variability of the optical radiation over a time in the range $3 \cdot 10^{-7}$–100 s.

Digital speckle-interferometer: intended for studying the structure of stellar objects with a resolution up to 0″, 02.

Every year 50 to 70 observational programs, including programs in the schedule of KI6I, are performed on the BTA. In 1985–1986 the relative fraction of the photoelectronic observational methods (TV scanner, electrophotometry, speckle interferometry) increased up to 70%, while the photographic methods (OZSP, direct photographs, image tube plus photography) dropped to 30% of the total observational time. Over the last ten years of operation the BTA has in many ways justified the expectations of astronomers, especially in the area of high spectral resolution and in problems of observations of weak and very weak objects.

4. Planned expansion of the possibilities of the BTA. In planning new developments, the Special Astronomical Observatory of the USSR Academy of Sciences starts from the obvious assumption that in the next 15 years the BTA will remain the only domestic source of observational data on extremely weak objects. Here the BTA should remain competitive with other ground-based and space-based telescopes. For this, the following are planned in 1986–1988:

1) Widespread use of digital panoramic methods of recording both with television and with solid-state receivers ("KVANT" system);

2) improvement of the penetrating power of high-resolution spectroscopy (photoelectronic methods of recording, image splitters);

3) use of cross dispersion spectrographs and multiobjective spectrograph;

4) development of a new quartz corrector at the PF with a corrected field of 20′, and,

5) incorporation of polarimetry in the continuous spectrum into the standard observational methods.

All these developments are a continuation of the work of the Special Astronomical Observatory of the USSR Academy of Sciences planned in preceding years. The most important technical problem remains the developmentof a system for modifying the temperature conditions in the subdome space.

Valuable methodological experience in performing astrophysical observations at the limit of technical possibilities has been accumulated together with scientific results over the last ten years at the Special Astronomical Observatory of the USSR Academy of Sciences. It is precisely this experience that gives confidence in the fact that the possibilities of the BTA have by no means been exhausted and the flow of observational data so necessary for astrophysics will only increase.

[1]V. K. Ioannisiani, E. M. Neplokhov, I. M. Kopylov, V. S. Rylov, and L. I. Snezhko, *Instrumentation for Astronomy with Large Optical Telescopes*, R. Reidel, Dordrecht, Holland (1982), p. 3.

[2]V. N. Erokhin and S. P. Plyanskin, Astrofiz. Issled. (Izv. SAO) 17, 40 (1983).