Scientific session of the Division of General Physics and Astronomy and the Division of Nuclear Physics, USSR Academy of Sciences (24–25 March 1976)

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A joint scientific session of the Division of General Physics and Astronomy and the Division of Nuclear Physics of the USSR Academy of Sciences was held on March 24 and 25 at the conference hall of P. N. Lebedev Physics Institute. The following papers were delivered:

1. S. *Ya. Braude*, Certain Results of Experimental Studies in Decameter Radio Astronomy.

2. *V. N. Alfeev*, Properties and Uses of Structures Based on Paraelectrics, Superconductors, and Semiconductors.

3. *V. M. Galitskiĭ*, Anomalous States and Collective Motions of Nuclear Matter.

4. *A. B. Migdal*, π-Condensation and the Possible Existence of Anomalous Nuclei.

We publish below brief contents of three of the papers.

S. Ya. Braude. *Certain Results of Experimental Studies in Decameter Radio Astronomy.* A series of observations has been made in recent years on the UTR-2 radio telescope.[1] Some of the results obtained are reported below.

The flux densities of discrete sources at declinations from 0 to 20° have been measured in the frequency range 10–25 MHz. Approximately 700 sources have been observed, about five percent of them for the first time. It was found that the observed sources include

objects whose spectral indices α reach values of 2–3, whereas known sources usually have $\alpha \approx 0.7$–0.9. More than two-thirds of the observed sources have "linear" logarithmic frequency spectra at frequencies up to 10–12 MHz (Braude, Zhuk, Men', Ryabov, and Sharykin).

The isophots of the Cygnus Arc supernova residue were measured at 25 MHz. Quite satisfactory correspondence was found between the optical and radio emission distributions. Frequency spectra were determined both for the entire Cygnus Arc and for radio details that coincide with optically bright regions. It was found that these spectra are linear (in logarithmic scale) and that their spectral indices are 0.44 and 0.3, respectively (Abranin, Bazelyan).

The coordinates of the sources 3C212 and 4C + 24.11 were determined at frequencies of 25 and 20 MHz, and their one-dimensional brightness distributions were measured by the lunar occultation method. It was found that 3C212 is double. The frequency spectra of its components and the total spectrum were constructed. The spectral indices of the components are 0.77 and 1.07, and that of the entire source 0.82. The source 4C + 24.11 was found to be single-component (Bovkun).

Preliminary interferometric measurements using the UTR-2 and URAN-1 radiotelescopes as a base were begun at 25 MHz. The base length is 42.6 km, which gives a resolution of about $30/\cos\delta$ seconds of arc at a wavelength of 12.5 m. Interference was obtained from a low-frequency source in the Crab Nebula (Babeĭko, Bovkun, Braude, Men').

In a joint project with the Academy of Sciences Physics Institute (FIAN), preliminary measurements of source angular dimensions were made by the flicker method at 25, 86, and 102 MHz. It was found that the flicker index for one source (3C48) decreased much more as the frequency was lowered than would be expected from scattering in the interstellar medium. This may be due to the presence of a rather extensive halo on this source. In the case of another source (3C295), we observe the reverse picture—the flicker index even increased slightly with decreasing frequency. This may be a result of redistribution of the emitting regions in the source itself (Artyukh, Ryabov).

The absorption of the Galactic background in the ionized hydrogen ranges was studied at a number of frequencies: 12.6, 14.7, 16.7, 20, and 25 MHz. Isophots of these regions and their absorption profiles were obtained (Krymkin).

The emission of several pulsars with measures of dispersion not exceeding 20 parsecs $\cdot$ cm^{-3} was observed for the first time in the 10–25 MHz range. Pulsed emission was detected in seven of twelve pulsars observed. In contrast to the situation at higher frequencies, the decameter "emission window," i.e., the part of the period during which emission of the pulsar is observed, is in several cases comparable to the period itself. At the same time, among the approximately 150 pulsars measured at the high frequencies, only five radiated interpulses, and their intensities were low, with the exception of the pulsars 0532 + 21 and 1055 + 52 (about 1–3 percent of the main pulse); strong interpulse emission was observed for all seven pulsars measured at decameter wavelengths. Despite the wide variability of the shape, amplitude, and position of the pulses, certain general relationships were established. For example, the shape was found to be symmetrical about the middle of the period. There is usually a dip at the center with two or four interpulses on its sides. But if an interpulse is observed at the center, it is either a single one or there are three interpulses—one at the center and two symmetrical ones to the right and left of it. The data from the high-frequency and decameter measurements were used to construct main-pulse and interpulse spectra for certain pulsars. For example, the main-pulse spectrum of the pulsar 1919 + 21 has a low frequency inflection with a flux density maximum at 40 MHz, while the interpulse spectrum is linear and its spectral index is 2 (Bruk, Ustimenko).

[1]S. Ya. Braude, Yu. M. Bruk, P. A. Mel'yanovskiĭ, A. V. Men', L. G. Sodin and N. K. Sharykin, Radioteleskop UTR-2 (The UTR-2 Radio Telescope), Preprint, Institute of Radioelectronics, Ukrainian Academy of Sciences, No. 7, Khar'kov, 1971.