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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 Scieinces was held on 24 and 25 June 1981 at the P. N. Lebedev Physics Institute of the USSR Academy of Sciences. The following papers were presented.

June 24

1. *V. I. Kostenko, L. I. Matveenko, and I. G. Moiseev,* Fine structure of objects with active nuclei and superluminal component separation velocities.

2. *L. R. Kogan, L. I. Matveenko, I. G. Moiseev, and R. L. Sorochenko,* Studies of maser sources with the aid of ultralong-baseline radiointerferometry.

3. *L. I. Matveenko, I. G. Moiseev, A. B. Severnyĭ, and R. L. Sorochenko,* Prospects for the development of ultralong-baseline radiointerferometry.

June 25

4. *V. S. Berezinskiĭ,* Superhigh-energy cosmic rays: the astrophysical aspect.

5. *S. I. Nikol'skiĭ,* Absolute flux and nuclear composition of high-energy cosmic rays.

6. *G. B. Khristiansen,* Energy spectrum of superhigh-energy cosmic rays.

Below we present brief contents of the papers.

V. I. Kostenko, L. I. Matveenko, and I. G. Moiseev. *Fine structure of objects with active nuclei and superluminal component separation velocities.* The Institute of Cosmic Research and the Crimean Astrophysical Observatory conduct systematic studies of the nuclear structures of quasars, galaxies, and Lacertids using a global network of radiointerferometers within the framework of a broad international program. The angu-

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lar resolution at 1.35 cm is better than 100 arc microseconds. The structures of several objects have been determined. The high-frequency radiation of the objects and its variability are determined by compact components—by ejections of relativistic particles from the nuclei. Motion with superluminal component velocities has been observed in several objects.

The structure of the nucleus of 3C 84 consists of two systems at a distance of 0.7 pc from one another. Each of them contains a central component and two groups of details disposed symmetrically about it; their brightness temperature is $T_b = 10^{11}-10^{12}$ K. The brightnesses of the components vary, but their relative positions remain unchanged. The observed structure is explained by the distribution of the magnetic field and by variation of the relativistic-particle flux.

The quasar 3C 345 contains a compact nucleus and a chain of compact components that merge into a thin jet of matter 60 pc long. Farther out we observe more extended emission that probably results from activity of the nucleus during an earlier epoch. The outflow direction of the relativistic plasma varies with time as a result of position changes of the axis of rotation of the nucleus.

Superluminal component separation velocities are observed in the objects 3C 273 and 3C 120. This phenomenon can be explained by the finite propagation time of the signal. The time in the system of a source moving at a velocity $v \approx c$ differs from the observer's time by a factor $\gamma = 1/\sqrt{1-(v/c)^2}$ and its velocity in the picture plane is about $v \approx \gamma c$. The radiation becomes directional, and the brightness of the object increases by a factor of γ^3. The high directivity of the radiation limits possibilities for observation and explains the rarity of sources of this type.

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[3]M. H. Cohen, T. J. Pearson, A. C. S. Readhead, G. A. Seielstad, R. S. Simon, and R. C. Walker, *ibid.* **231**, 293 (1979).