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RESULTS OF OBSERVATIONS OF 560 RADIO SOURCES IN THE FREQUENCY OF 86 MEGAHERTZ

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SUMMARY

This note is already an abstract of the results of measurements of flux densities of radio sources from catalogs 3C [1] and 3CR [2] using 560 radio sources in the frequency of 86 mc/s, and carried out from February 1965 to June 1967. The full results of observations will be presented in the forthcoming papers [5, 6].

*
* *

During the period from February 1965 to June 1967 measurements were conducted of flux densities of radiosources from catalogs 3C [1] and 3CR [2] in the frequencies of 86 Mc/s. In all 560 sources were observed against the East-West web the FIAN range-cross-shaped radiotelescope (DKR-1000). The antenna utilized is described in detail in [4].

The results of observations are fully decsribed in [5, 6], where the right ascensions $\alpha_{1950,0}$ the flux densities S, the spectral indices x, and also the root-mean-square errors $\Delta\alpha$ and ΔS for all the sources from catalogs 3C and 3Cr are given. The values of these quantities were obtained, as a rule, by means of no less than 5 readings of each source.

The right ascensions were determined by the sidereal time of source's passage through the radiation pattern maximum of the radiotelescope. At the same time, besides the correction for the precession, a correction was introduced, taking into account the inclination of the horizontal axis, the azimuth and the instrument's collimation error and also the receiver's time constant. These corrections were determined by 35 sources, identified with the optical objects whose coordinates were borrowed from [7]. The precision of determination of $\alpha_{1950,0}$ for most of the sources was no worse than ± 1'.

The measurements of fluxes' densities were relative.

(*) REZUL'TATY NABLYUDENIY 560 RADIOISTOCHNIKOV NA CHASTOTE 86 MGH

Following were the standard sources used: 3C 123, 218, 348, 353, 380, 409. Their fluxes' densities, upon correction for angular dimensions are: $S_{123} = 368$, $S_{218} = 583$, $S_{348} = 684$, $S_{353} = 396$, $S_{380} = 120$, $S_{409} = 182$ (all in units 10^{-26} w/m^2 ·hz). Besides, 30 sources were utilized as secondary standards, so that from 2 to 4 calibrated soucres were available for each registration. For most of the sources the errors in the determination of S did not exceed 10 percent. The integral distribution of sources by flux densities in the frequency of 86 Mc/sec are plotted in Fig.1, b) When plotting this distribution and with the view of eliminating galactic objects, only those sources were utilized, for which the galactic latitude $|b| \geqslant 10°$.

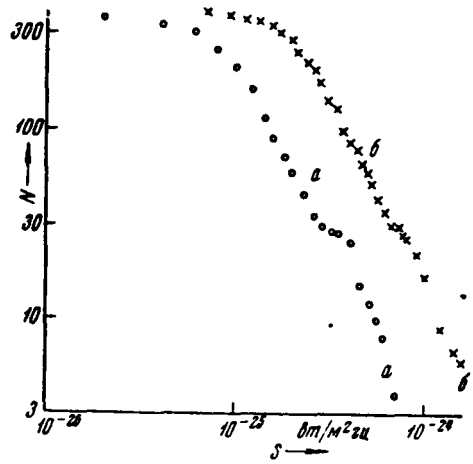

Fig.1. Dependence lgN– lgS.
a) ν = 178 Mc/s (Cat. 3CR);
b) ν = 86 Mc/s (our own measurements)

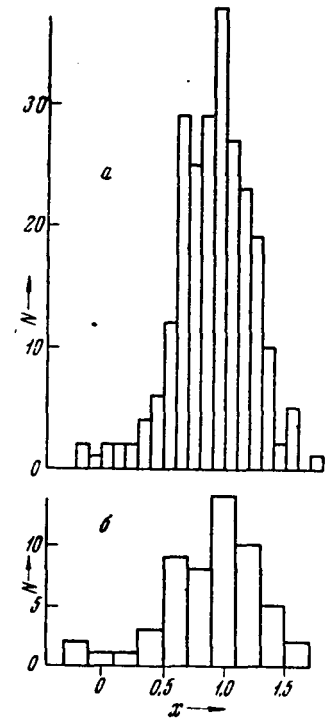

Fig.2. Histogram of spectral indices (in the 178 –86 Mc frequency band. a) for sources of catalog 2CR, having $|b| \geqslant 10°$,; b) for quasars

The inclination of dependence lg N – lg S is n = 1.78 – 0.15. This value practically coincides with the value of n in the 178 Mc frequency (Fig.1, a), which is evidence of the absence of more or less significant variation of the mean spectral index of sources with flux density in the indicated frequency band.

Spectral indices x were obtained on the basis of the measured flux densities in the frequency of 86 Mc/sec and of their values in the frequency of 178 Mc/sec (catalog 3CR). The histogram of spectral indices of sources with galactic latitude $|b| \geqslant 10°$ is shown in Fig.2,a. The mean value $\bar{x} = 0.89 - 0.02$ and the dispersion is $\sigma_x = 0.31$. Inasmuch as the individual values were obtained with an error of ~ 0.20, the corrected value of the dispersion will be $\sigma_x = 0.24$.

An analogous histogram was cosstructed for quasars (Fig.2, b). For them we obtained $\bar{x} = 0.89 - 0.05$, which coincides with x for the remaining sources.

The dispersion for quasars $\sigma_x = 0{,}38$ exceeds somewhat σ_x for all sources. Although the indicated excess in the value of σ_x for quasars is not great, it seems to us that it actually takes plave indeed.

With the view of investigating the dependence of the spectral index on S, we have broken down the sources with $|b| > 10°$ into 5 group by flux densities. The mean values of spectaal indices and their errors for each of these groups are plotted in Fig.3. As may be seen from Fig.3 the mean value of the spectral index remains within the limits of errors, invariable through values of flux densities

$$S = 11 \cdot 10^{-26} \text{ w/m}^2 \cdot \text{hz}$$

and increases for weaker sources. More detailed analysis has shown that the cause of this increase of $\bar{x}$ resides in the systematic underrating of flux densities of weak radio sources in the catalog 3CR by about 5 percent.

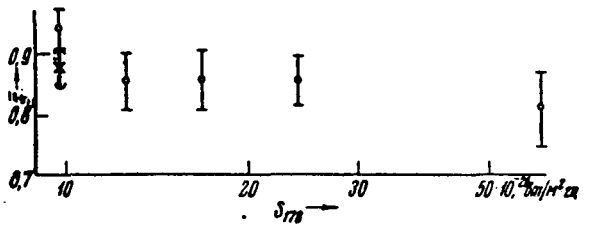

Fig.3. Dependence of the mean spectral index $\bar{x}$ on the density of the flux S. The cross denotes the corrected value of $\bar{x}$ for weak sources

The introduction of the corresponding correction leads to the decrease of the mean spectral index for weak sources to the value x = 0.88, indicated in Fig.3 by the cross. At the same time, the mean spectral index found by all sources entering into the histogram (Fig.2, a), taking into account the indicated correction, decreases to 0.86.

**** T H E E N D ****

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(F.I.A.N.)

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