RADIO SPECTRA PROPERTIES OF A COMPLETE SAMPLE OF SOURCES NEAR THE NORTH CELESTIAL POLE

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The RATAN-600 radio telescope was used to study spectral properties for a complete sample of 504 sources from the NVSS catalogue near the North Celestial Pole. The main task of the work was to determine instantaneous spectra of radio sources with the purpose to select objects with inverted spectra near the 22 GHz frequency for subsequent investigation under the space VLBI Project “RadioAstron”. The high angular resolution of the project “RadioAstron” which is to be achieved 10^{-6} arcsec imposes strict demands to angular dimension of sources. These must be super-compact objects with a high value of the correlated flux. Such objects form a considerable part of objects just with inverse and flat spectra. At present there are no complete high-frequency catalogues of such objects up to low flux density levels (0.2 Jy at 22 GHz). The only available data on the North Celestial Pole are the VLA survey (NVSS) at 1.4 GHz. It is important to obtain spectral characteristics up to the highest frequency of 22 GHz planned in the work of the space interferometer. The following criteria were used in selection of sources from the catalogue NVSS:

1. $00^{\rm h} \leq RA2000 \leq 24^{\rm h}$
2. $+75^o \leq DEC2000 \leq +88^o$
3. Flux density: $S_\nu[1.4\text{GHz}] \geq 200$ mJy from the NVSS catalog

The total number of sources is 504. After data reduction we obtained flux densities of sources and their spectral characteristics. The sources spectral types were determined: 65% – normal, 24% – steep, 7.3% – flat, 2.3% – inverted, and 1.4% – spectra with a maximum at centimeter wavelengths (GPS). Eleven sources with inverted spectra were detected. The statistics of the sources spectra from our sample contrasts with spectral characteristics of the sample of objects with the same initial parameters but carried out at the frequency 20 GHz by Sadler et al. (2006). We obtained that there is a 25% deficit of sources with the inverted spectra in our sample. This can be explained by the spectral properties of the “subliminal” sources, which did not fall into the initial sample at the frequency of 1.4 GHz.

References

Sadler E.M., Ricci R., Ekers R. D., Ekers J. A., Hancock P.J., Jackson C. A., Kesteven M.J., Murphy T., Phillips Ch., Reinfrank R. F., Staveley-Smith L., Subrahmanyan R., Walker M. A., Wilson W.E., de Zotti, G.: *MNRAS*, **371**, 898.