THE POSSIBILITY OF QUICK PROCESS RESEARCHES ON THE SUN IN QUASITRACKING REGIME WITH RADIO TELESCOPE RATAN-600

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First of all the radio telescope RATAN-600 was designed as a transit telescope. This regime of RATAN-600 is main one now (D. Korolkov and Y. Pariiskii, 1979). The "relay" and "zoned relay" methods of the observations allow to track the cosmic radio emission sources for a long time up to 15 hr (O. Golubchina, 1986; O. Golubchina, 1995). In this paper we discuss the results of the first observations of the solar radio emission at wavelength L = 8.01 cm with RATAN-600 by "zoned relay" using the conical secondary reflector (the Type-6). This work was carried out by using the new automatic control system, the narrow band-width (BW (f)) 32-channel radiometer, the modern data acquisition and data processing systems and the new program of the antenna-setting calculation.

The position of the secondary reflector is given in correspondence with the necessary parameters: a geometric area of the antenna, a horizontal angular resolution , a permissible and-width of the radiometer.

Tracking of a radio source in the "relay with zoning" technique is realized by successive utilization of separate sections of reflecting elements of the primary mirror of the antenna as a working part of the antenna. The surface of the working part of the antenna is zoned in oder to enlarge this surface and to raise the horizontal angular rezolution of the antenna. The special conical secondary reflector (the Type-6) was situated at the center of the turntable or near of it.

The observations of the solar radio emission with RATAN -600 at L = 8.01 cm (f =3741 MHz) on 20 October, 1999 were carried out by means of the "zoned relay" method. These observations were every 9 min for 6.5 hr (5:28 UT-12 UT).

Scanning the Sun by the knife-edge antenna pattern was in the parallactic-angle sector 2q = 135 deg. That supplies rather high filling of the U-V plane necessary for the construction of the two-dimensional maps of the Sun.

The horizontal angular resolution was equal to (1.33- 1.79) arc.min. The vertical angular resolution was 19.7 arc.min. The geometric area of the antenna was approximately (493-862) m^2 .

The maximal number of complete periods of the electro- magnetic wave in the zoned surface was equal to Kmax = 52. According to the formula BW(f) = f/8*Kmax (O. Golubchina, 1986). The permissible radiometer band width (BW) is equal to 9 MHz (f= 3741 MHz). The band-width of one channel of the 32-channel radiometer used by us was equal 1 MHz. Thus the condition of the space-time coherence preservation were made. The noise temperature of radiometer was equal to 80K.

The program of the antenna-setting calculation was realized in the C++ language under UNIX.The system of data acquisition and the system of data processing were developed in Group of Solar Researches on RATAN-600. The observations were processed by Work Scan Program. The program Work Scan was realized in the C++ language under OS Win 32.

The measurement of the antenna temperatures of the "quiet" Sun and its change with the azimuth shows the complicated distribution in energy along the aperture by the observations with the conical secondary. That is caused by the pylon "shadow" and by the "shadow" from the secondary refelectors (Nos.1,2,5) which were situated in front of the conical secondary reflector for the observation. The antenna temperature of the Sun was decreased up to 65reference to the base cosmic radio sources is necessary to determine the solar radio fluxes of local solar sources (LSs) according to the LSs antenna temperatures obtained from the observations. We have no such reference procedure now. Therefore the reference to the total solar flux at f= 3750 MHz (NBYM) was made. It allowed to obtain some preliminary quantitative estimations of physical parameters of the LSs at L = 8.01 cm on 20 October,1999. The change of (LSs) flux with the time can be caused by following: 1. "Confusion" effect. 2. No mutual reference of the separate groups data processing. 3. The active processes of the LSs . The "confusion" effect is caused by the simulteneous entry of some LSs in the knife edge beam. The "confusion" effect can be eliminated by the progressive turn of the antenna pattern as a result of the 24-hourly rotation of the celestial sphere. The mutual reference of the solar scans of the different groups of processing results in the reduction the flux jump of the LSs. The obligatory elimination of the causes 1 and 2 will permit to register the real flux change connected with the active solar processes. The obtained fluxes were equal to (2.5-55) s.u.; the angular sizes r = (3 - 5.5) arc. min; the bright temperatures Tb = $(10^4 - 10^6)$ K. These do not contradict to the generally accepted magnitudes. The first observations of the solar radio emission at L = 8.01 cm with RATAN-600 by "zoned relay" using the conical secondary reflector (the Type-6) confirmed the reasonableness of the "zoned relay" method.

References

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