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TWO-CHANNEL ANTENNA OF THE SCANNING RADIOMETER OF 20-CENTIMETER RANGE

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A flat antenna was developed in the form of a nonequidistant array of horns located on a disk 4.5 wavelengths in diameter. The main maximum of the directivity diagram is oriented at the angle of 45° to the array. The antenna operates on two orthogonal (vertical and horizontal) linear polarizations and is designed for the use in the scanning aerospace two-channel radiometer of the decimeter wavelength range.

Narrow-beam reflector antennas having the circular electromechanical scanning of the directional pattern (DP) have been practiced on a wide scale in panoramic aerospace radioelectronics systems for Earth remote sounding (ERS). The necessity of using large volumes for placing the antennas, which makes difficult the building of large space vehicles is considered as their drawback. The use of the narrow-bean antenna arrays is an alternative version.

The present article presents the results of developing and research of a flat 9-element non-equidistant array of horn radiators with circular electromechanical scanning making it possible to ensure high spatial resolution and a wide scanning band of the underlying surface . A narrow-beam flat antenna array of small thickness was built whose DP main maximum is oriented at the angle of $\theta_m = 45\angle$ to the normal direction to the array plane operating in the 20-cm wavelength on two orthogonal (vertical and horizontal) linear polarizations.

High requirements in terms of direction, weight and dimension, and design characteristics are placed on antenna systems of airborne radiometers used for the remote sounding of the underlying surface. One of the main requirements for electrodynamic characteristics that is ensuring high amplification and small width of the DP main lobe given the low level of side lobes, as is known [1], is contradictory. The use of three-parameter amplitude distribution making it possible to optimize the antenna in terms of the maximum of the ratio of the directivity factor to the scattering coefficient [2] leads to the more complex design of the antenna. A small width of the DP main lobe at the prescribed level of the side lobes may be realized by nonequidistant arrangement of the radiators in the array. In this case one may also ensure the antenna minimal weight. Additional possibilities of raising the quality of the directivity characteristics present themselves when using radiators as array elements having high directivity, which inevitably leads to the increase of the antenna thickness. Accordingly, the development of an optimal antenna is related with the tradeoff solution of a multi-parametric problem of analysis and synthesis of the radiators. The following requirements are placed on the radiating elements of the antenna array: design simplicity, small weight and dimensions, lower level of cross-polarization radiation, good matching in the working frequency band, lower level of side and rearward radiation, high cross coupling between orthogonally polarized channels. For streamlining the antenna array design we need a minimal number of radiating elements, which places additional requirements on the characteristics of a radiating element.

Use of weakly-directed radiators requires the use of thickly-filled antenna array having the distance between the elements not in excess of the wavelength half. However, in this case given the prescribed aperture size and assigned DP width one may not attain the lower level of side lobes. The thick-filled antenna array requires a complex and cumbersome circuit of power supply of the elements. In addition, if a dipole is used, which is inclined at the angle of 45° to the screen, its

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