A relatively large number of parameters requires selection of the most optimal values for specific data.

This document contains a comparative analysis of existing methods of automatic detection of moving smoke areas on video sequences. Noted, that the most popular methods of motion detection methods are based on background subtraction. Gaussian mixture model based on the method of background subtraction solves the problem to noise and inaccurate reproduction of moving objects' forms, but it is not adopted to rapid changes in lighting as well as the distribution parameters initialization is rather time-consuming procedure. Thus, refining of the algorithms in predetermined directions is needed to improve the detection of moving areas.

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UDC 621.396.6

MODELING ELLIPTICAL SLOT ANTENNA IN THE PROGRAM HIGH FREQUENCY SYSTEM SIMULATOR

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This article presents the results of modeling an elliptical slot antenna in the software High Frequency System Simulator (HFSS). It was investigated the dependence the characteristics of the antenna on the change in thickness of the substrate. For research as substrate material is selected the dielectric with permittivity $\varepsilon = 3$, thickness of 1.575 mm, 2 mm, 3 mm. The results are presented in the graphs: the standing wave ratio (SWR), polar pattern, input impedance. It shows the structure of the antenna with the description of its parts. The regularities of changes in the characteristics of the elliptic slot antenna according to the variations of dielectric thickness are identified. Recommendations are given for the development of ultra-wideband antennas used in selecting the thickness of the dielectric. The results can be used to construct broadband antennas in telecommunication systems.

Development and creation of antennas which correspond to contemporary market requirements assumes the usage of progressing instruments and methods which permit to carry out engineering calculations for identification of functionality and operating characteristics of the future device. The basic method for this has currently become computer simulation.

Using contemporary software packages any shape of antenna can be drawn easily on your computer and all kind of materials can be prescribed, and after that you will get the needed characteristics. Moreover antenna can be searched and optimized for specific conditions and requirements while changing its operating factors. After all, on the real antenna changing many operating factors is either very difficult or almost impossible.

One of the instruments that is allowed to carry out the designing of antennas, to calculate its performance attributes, to make a computer experiment which models conditions of the real world is the program High Frequency System Simulator (HFSS).The investigation of the dependence of the characteristics of the elliptical slot antenna on the change in thickness of the substrate was conducted in this program.

Antenna construction. The appearance of both side A and B elliptical slot antenna is demonstrated on figure 1 (A and B) correspondingly.

The antenna is accomplished on dielectric baseboard 4, on one side is metal elliptic resonator 1 with connected power line 2, on the other side all along the whole area of dielectric is metal screen 5 with elliptic slot 6. Antenna stimulation originates from discrete port 3 with impedance 50 Ohm.

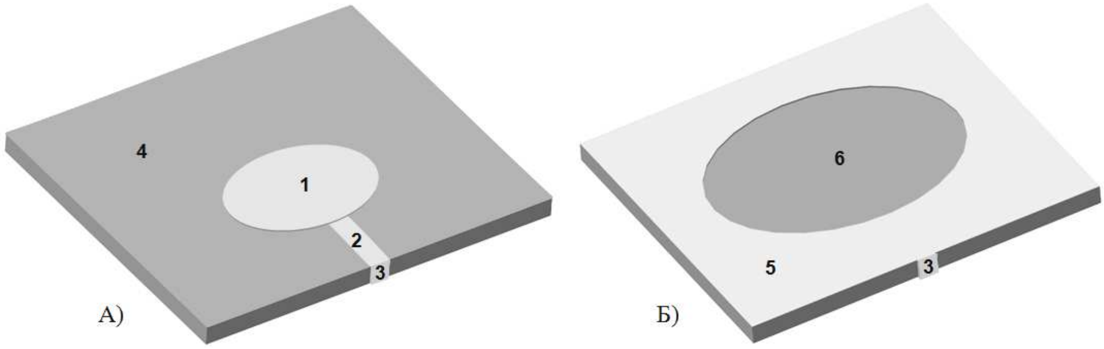

Fig. 1. The appearance of the sides of antenna :
1 – elliptic resonator; 2 – power line; 3 – discrete port; 4 – dielectric baseboard of antenna;
5 – earth surface; 6 – elliptic slot

Resonance wave-length of elliptic resonator can be found from expression:

$$\lambda_{рез} = \alpha\pi\sqrt{s_{эфф}}e / \sqrt{q_{mn}^{s,e}} ,$$

where $e = \sqrt{a^2 - b^2} / a$ – eccentricity of ellipse; $q_{mn}^{s,e}$ – n root even or odd function Mathieu first type order *m* [1].

Elliptic shape resonator has good spectral band qualities and basically is used in nonresonance microstrip antenna [2].

The results of research. The material of dielectric in HFSS was chosen Rogers RO3003 with permittivity ε = 3, thickness of 1.575 mm, 2 mm, 3 mm. As a material of emitting area was chosen copper 0,3 mm thin. The length of antenna is 40 mm, width 35 mm. Researching band is 2,5 GHz – 20 GHz.

During modeling the following characteristics were received: polar pattern, standing wave ratio (*SWR*), reflection coefficient from antenna admission (*S*11). They are shown on the figures 2 – 4 correspondingly.

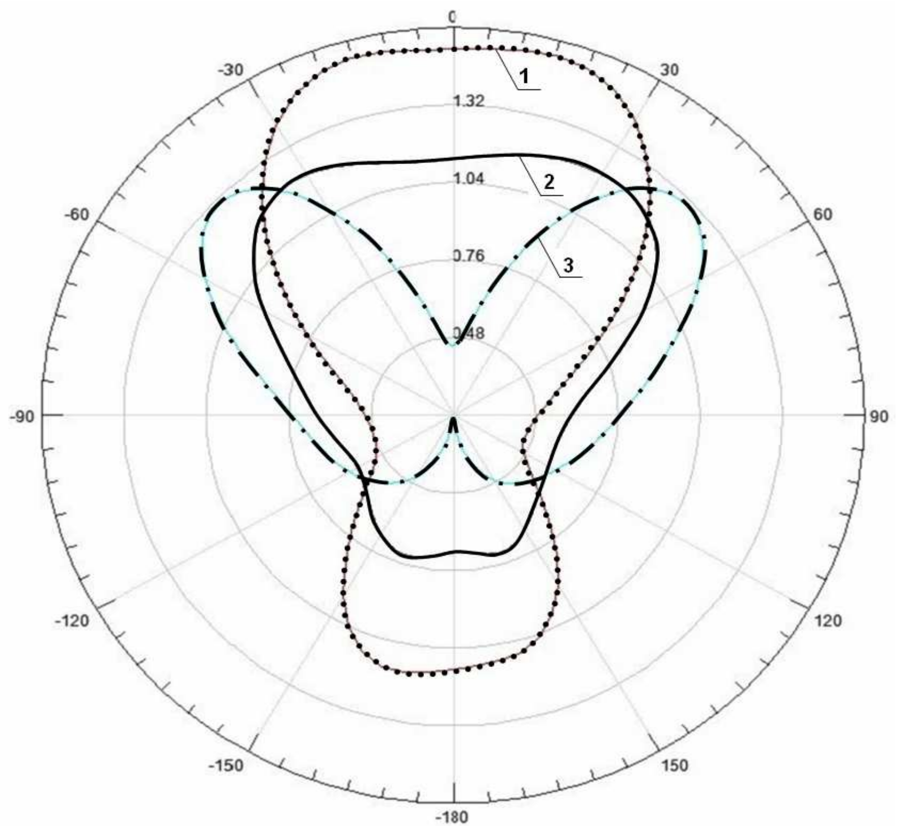

Fig. 2. Antenna polar pattern:
1 – dielectric width 1,575 mm; 2 – dielectric width 2 mm; 3 – dielectric width 3 mm

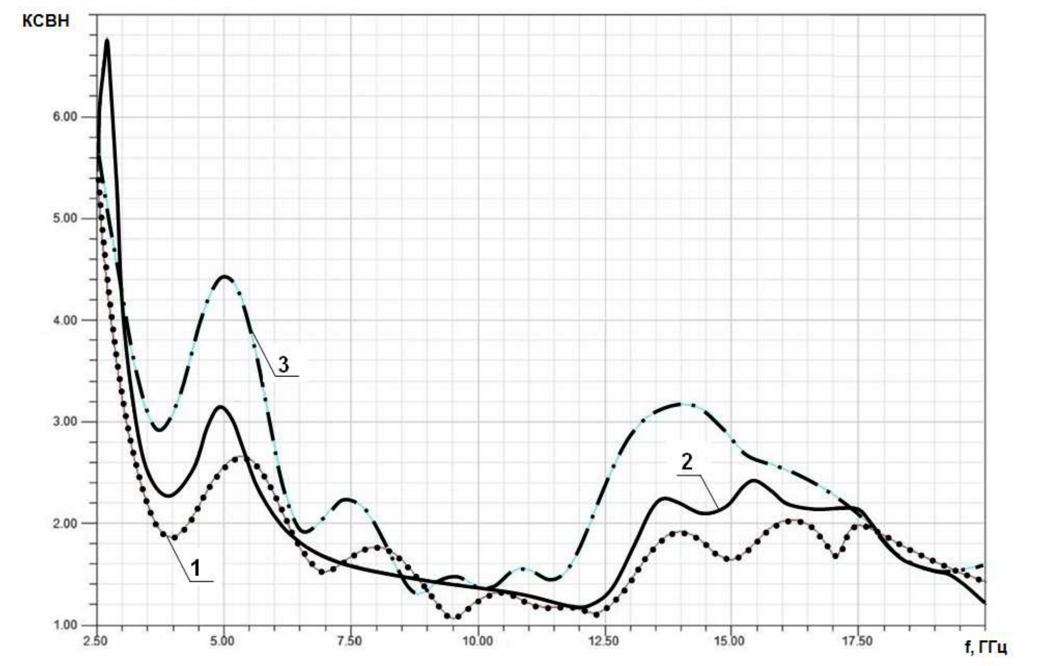

Fig. 3. The standing wave ratio (SWR):
1 – dielectric width 1,575 mm; 2 – dielectric width 2 mm, 3 – dielectric width 3 mm

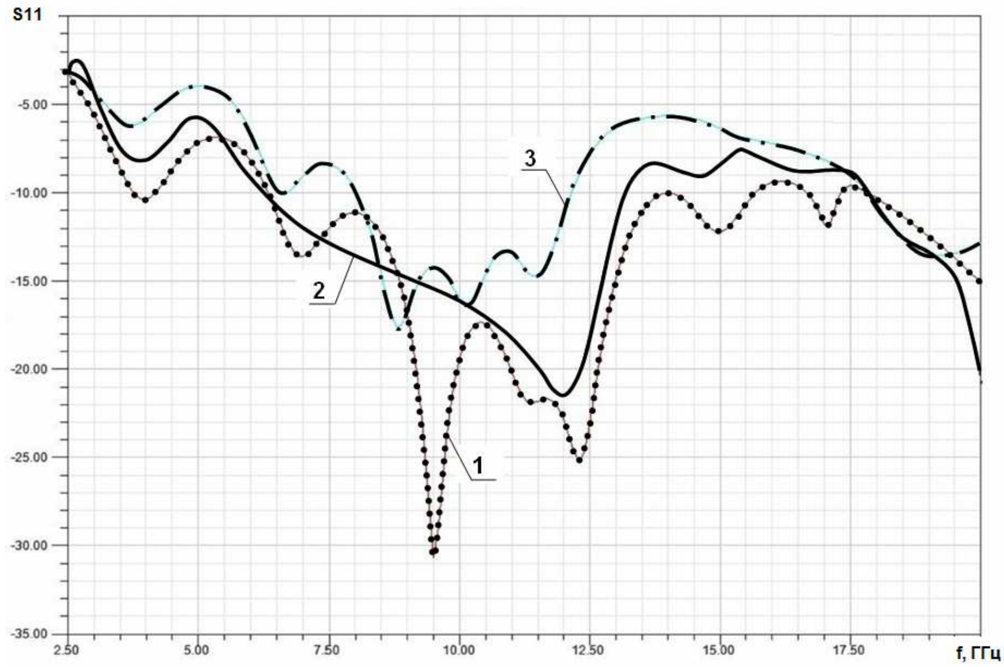

Fig. 4. Reflection coefficient from antenna admission:
1 – dielectric width 1,575 mm; 2 – dielectric width 2 mm; 3 – dielectric width 3 mm

For dielectric with width 1,575 mm antenna directional gain equals 1,44, antenna radiate into straight and reverse directions, the width of polar pattern is 91°.

For dielectric with width 2 mm antenna directional gain equals 1,17, the width of polar pattern is 106° and in direction of 0° is a small crevasse of polar pattern till 1,13 and antenna radiates small amounts into reverse direction .

For dielectric with width 3 mm into direction 0° antenna has crevasse of polar pattern. According to the diagram antenna radiates aside -50° and 50°.

Antenna with the dielectric width 1,575 mm shows good matching qualities on the part of frequency from 6,2 GHz to 20 GHz, but more uniform meaning SWR can be seen on frequency 9,5 – 12,5 GHz.

Antenna with the dielectric width 2 mm shows good matching qualities on the part of frequency from 6 GHz to 13,3 GHz and 17,6 – 20 GHz.

Antenna with the dielectric width 3 mm shows good matching qualities on the part of frequency from 8 GHz to 12,4 GHz and 17,6 – 20 GHz and meaning SWR is changing from 1,3 to 2.

In the antenna with dielectric thickness 1.575 mm, the reflection coefficient decreases from the entrance of -3 dB at 2.5 GHz to -30 dB at 9.5 GHz.

With further increase in the frequency value of S11 rises. The magnitude of the reflection coefficient varies from -31 dB to -10 dB. at a frequency of 9.5 GHz an extreme point (minimum) with the value of *S*11 exists.

In the antenna with the dielectric thickness of 2 mm, the reflectance decreases from the entrance of -2.5 dB at 2.5 GHz and -23 dB at 12 GHz.

With further rise in frequency the value of S11 will increase. The magnitude of the reflection coefficient varies from -23 dB to -15 dB. at 12 GHz. An extreme point (minimum) with the value of S11 exists.

In the antenna with a dielectric thickness of 3 mm, the reflectance decreases from the entrance of -3 dB at 2.5 GHz and 17.5 dB at 8.7 GHz. With further increase in frequency the value of S11 will increase. The magnitude of the reflection coefficient varies from -17.5 dB to -10 dB at a frequency of 8.7 GHz and has the minimum point value S11.

In the course of the simulation it is set that:

– The thickness of the dielectric base elliptical slot antenna affects its band width. When the thickness of the band used tapers, set the optimum thickness of the dielectric in which the antenna has the highest broadband, which is 1,575 mm. The operating frequency band in this case is 6.2 – 20 GHz, i.e. band width is 13,8 GHz.

– The analysis showed that the thickness of the dielectric also affects the directional properties of the antenna. Increasing the thickness of the dielectric leads to the expansion pattern diagram corresponding to the smallest width of the substrate thickness 1,575 mm, when the level 2 equals to 0,707 and 80°. When the substrate thickness of 3 mm is a division of the main lobe and 2 in the direction of the maximum observed failure pattern.

– As a result of the simulation set the thickness of the insulator has an impact on the value of VSWR. By increasing the thickness of the substrate matching properties deteriorate and uneven frequency response SWR increases significantly. Good agreement with the feeder link antenna is observed in the dielectric thickness of 1,575 mm.

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UDC 534.62; 534.6.08

METHOD OF ESTIMATING PROTECTION FROM SPEECH SIGNALS LEAKAGE THROUGH LOW-FREQUENCY TECHNICAL CHANNELS OF INFORMATION LEAKAGE BASED ON THE CORRELATION FUNCTION

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There have been studied the parameters of a measuring broadband chirped signal in bands of equal intelligibility and offered the estimation of protection of informatization object from speech information leakage through low-frequency technical channels of leakage by a broadband chirped signal based on the correlation function in the bands of equal intelligibility. Source data for implementation of the method of estimating the parameters of a broadband chirped signal on new principles in terms of influencing factors have been obtained.