localization in each waveguide channel from the output facet. The image shown in Fig. 1, *b* confirmed that several light beams can propagate in the separate waveguide channels of the induced system. In this case we can insert the information into each light beam and transmit it to the desired addressee.

Conclusion. Thus, we can say that the channel waveguide-based system induced in the surface layer of a lithium niobate sample may be used as a complicated optical element of the integrated optical circuit of optoelectronic or photonic devices.

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UDC 621.317.2

ANALYSIS OF THE COMPLEXITY OF THE ALGORITHM FOR CALCULATING THE ELECTROMAGNETIC FIELD DISTRIBUTION IN A REVERBERATION CHAMBER

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The article presents the results of evaluating the complexity of the algorithm based on representing the electromagnetic field as a superposition of the excited modes for calculating the *E*-field distribution in a reverberation chamber. The estimation of the time spent on executing the algorithm for different values of the fre-

quency sweep step was performed. Based on the analysis of the obtained results, recommendations on the use of the developed algorithm are given.

Keywords: electromagnetic compatibility, reverberation chamber, algorithm, time costs.

Ensuring electromagnetic compatibility is an important task in the development of modern radioelectronic equipment. Miniaturization and integration of the electronic component base and an increase in the component density of printed circuit boards lead to a decrease in the level of susceptibility of radioelectronic equipment to the electromagnetic field [1]. Testing electronic components and units for emission and radiated susceptibility is expensive because it requires sophisticated measuring equipment, as well as special anechoic chambers. The need for cheap test sets, while maintaining the adequacy of the results obtained with their help, leads to the search for alternative test devices, e.g. an electromagnetic reverberation chamber (RC) [2]. Previously, we developed an algorithm based on representing the field as a combination of the cavity modes to obtain rough estimates of the electromagnetic field distribution in an RC [3]. In the high frequency range, the excited electromagnetic field inside the RC is characterized by a complex mode structure. This fact can have a significant impact on the calculation time for the developed algorithm.

The aim of this work is to analyze the time spent on calculating the distribution of the electromagnetic field in an RC, using the developed algorithm.

As a test task, an RC was considered with the dimensions of a rectangular case of $2.4 \times 0.9 \times 1.8$ m^3 [4]. The frequency dependence of the number of excited modes in the RC in the range of 600–2000 MHz was calculated. As can be seen from the resulting dependency, it is necessary to calculate the components defined by 62 modes for calculating the E-field strength at the lower border of the considered range and by 592 modes at the upper border (Fig. 1).

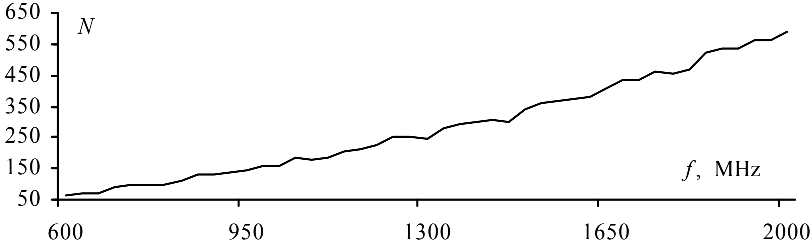

Fig. 1. The frequency dependence of the number of excited modes

In addition to the number of the excited modes, the sweeping step in frequency Δf has a significant impact on the calculation time, which determines the number of frequencies to analyze the structure of the RC. Evaluation of the time spent on an executing the algorithm was performed for $\Delta f = 100$, 10 and 1 MHz by means of calculating the *E*-field strength at 8 points, which determine the working volume of RC at various boundary conditions of electromagnetic wave propagation. Changing the boundary conditions was carried out by moving the source of exposure. In the test task, 10 positions of an isotropic radiator moving along the linear trajectory were considered. Figure 2 shows the calculated frequency dependences of the *E*-field strength at one observation point for different Δf. Time costs corresponding to these calculations are summarized in Table.

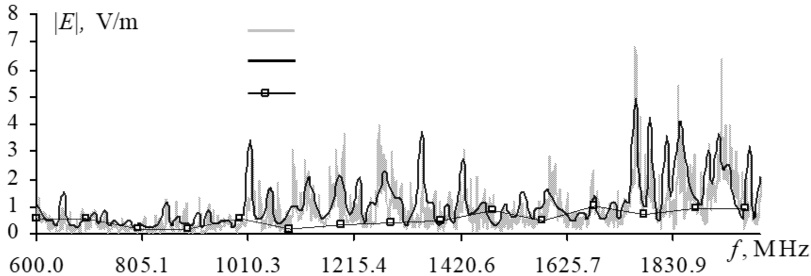

Fig. 2. The frequency dependences of the *E*-field strength $|E(f)|$, calculated for one observation point at $\Delta f = 0.1$ MHz (*a*), 1 MHz (*b*), 10 MHz (*c*) and 100 MHz (*d*)

Time costs (t_c) of calculating the *E*-field distribution in the RC

Δf, MHz	t_c, s
100	6.7
10	10.6
1	92.6
0.1	669.7

As can be observed from the obtained results, there is a non-linear dependence of time costs on the sweep step Δf (Table). For the sweep steps 100 and 10 MHz the time costs are minimal of all the cases considered. However, the incorrect description of the frequency dependence $|E(f)|$ is observed, which is critical for this type of the test device when assessing the statistical properties of the *E*-field distribution (Fig. 2, *c, d*). It can be seen that the high accuracy of the description of $|E(f)|$ is achieved at $\Delta f = 1$ MHz and a further decrease of sweep step for the analyzed structure does not lead to an increase in accuracy (Fig. 2, *a*), while the time costs increase by 7.23 times. It should be noted that the use of the sweep step of less than 1 MHz is appropriate in the case of analyzing the characteristics of the RC in the «understirred» regime, i.e. in the frequency range in which a limited number of modes cannot excite the uniform electromagnetic field.

Thus, estimation of the time spent on calculating the *E*-field distribution in the RC with the help of the developed algorithm was performed. The optimal value of Δf was chosen based on the analysis of the time costs and the calculated frequency dependences of the *E*-field strength, which will be used in the development of the RC prototype.

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POWER SUPPLY SYSTEM OF PLASMA-CHEMICAL REACTOR

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The paper shows the necessity to automate a control system of plasma-chemical reactors. The main goal of the work is to develop an automatic power supply system for the reactor.

Keywords: Plasma reactor, electric arc discharge, automated control system, power supply system