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Research Article

COMPUTER MODEL OF IONIZER

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ABSTRACT

Depending on the field of application and nature of high voltage generation technologies used in various economic sectors, several requirements are imposed, in particular, requirements such as service life, environmental safety, work efficiency and energy efficiency. In this work, a computer model for generating high voltages that are safe for humans using transistors designed to amplify semiconductor electrical signals is described.

KEYWORDS

Electrostatic fields, electrets, photoelectrets, semiconductor material, dielectric maretial, anomalous photovoltage.

INTRODUCTION

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In recent years, high voltage generation technologies used in various economic sectors are subject to several requirements, depending on the field of application and nature, in particular, requirements such as service life, environmental safety, work efficiency and energy efficiency [1-7]. In particular, in biophysical devices with optical radiation, which are used today, the energy source of the means of damaging insects requires voltages higher than ~3000 V, which are safe for humans. In devices of this type, an alternating 220 volt power supply is required to generate high voltage. This not only increases energy consumption, but also causes inconvenience in their use. For example, considering the use of biophysical devices in the field, connecting them to the network requires the use of connecting cables equal to the range of influence. This in turn causes high energy consumption and inconvenience.The creation of transistors designed to amplify semiconductor electrical signals made it possible to solve such problems. Today, such transistors are widely used in the amplification of electrical signals in various fields and are characterized by energy efficiency, low cost, accuracy of operation and other aspects [5-9]. In this work, a computer model for generating high voltages that are safe for humans using transistors designed to amplify semiconductor electrical signals is described.

Literature review

To date, scientists have conducted a lot of research on the creation of transistors for amplifying semiconductor electrical signals, especially the case studies of ionizers based on the combination of semiconductor optoelectronic devices and n-p-n structure transistors for pest control. In particular, [10-13] is dedicated to the study of the physical basis of pest control and elimination using semiconductor optoelectronic devices. In the next work [12-14], the possibility of using the electret effect in the creation of autonomous electric current generators was studied. M.K.Samokhvalov, Energy efficiency, low cost, accuracy of operation and other aspects are studied in the context of optoelectronics and indicator technology.

Methodology

Mathematical model in MATLAB (SPS) system of high voltage generation electrical circuit. Figure 1 shows the mathematical model in MATLAB (SPS) of the electrical circuit for generating high voltages using a semiconductor transistor to amplify electric signals.

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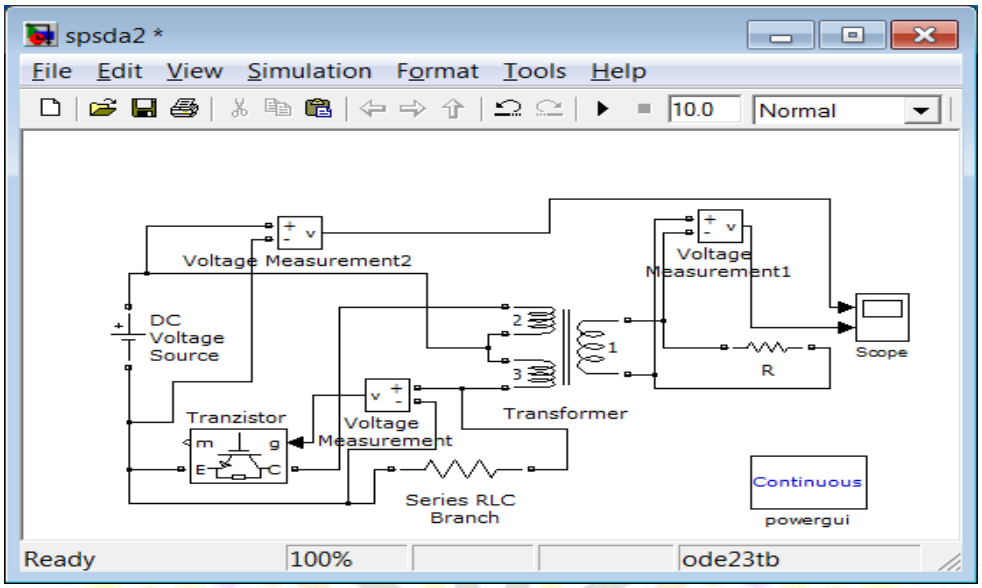

Figure 1. Mathematical model in the MATLAB (SPS) system of the electrical circuit for generating high voltages using a semiconductor transistor to amplify electrical signals.

Figure 2 shows the catalog of the ferrite transformer used in the high voltage generation circuit. We can see that according to the parameters of the transformer, the primary winding is divided into two parts, taken from the windings W11=50 and W12=50, and a constant voltage of 12 V is given. The second winding of the transformer consists of W2=17000 windings and is designed for a voltage of 4000 V. We can see the oscillograms of the voltages generated at the input and output of the ionizer in Figure 3.

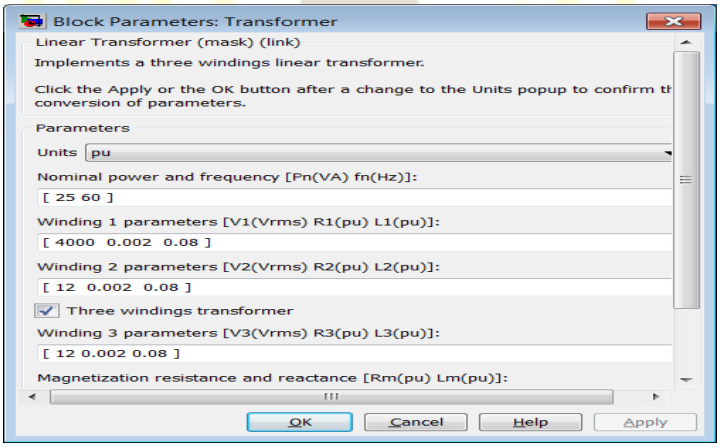

Figure 2. Parameters of the ferrite transformer used in the high voltage generation circuit.

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RESULTS AND DISCUSSION

The presented device consists of the following oscillograms of the voltages generated at the input and output of the ionizer (in the case where the resistance is R=105 Ω) in Figures 3 and 4.

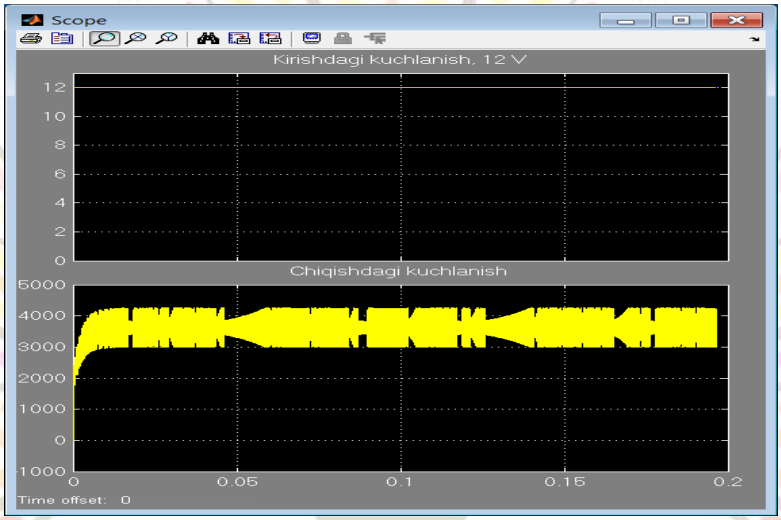

Figure 3. Oscillograms of voltages generated at the input and output of the ionizer

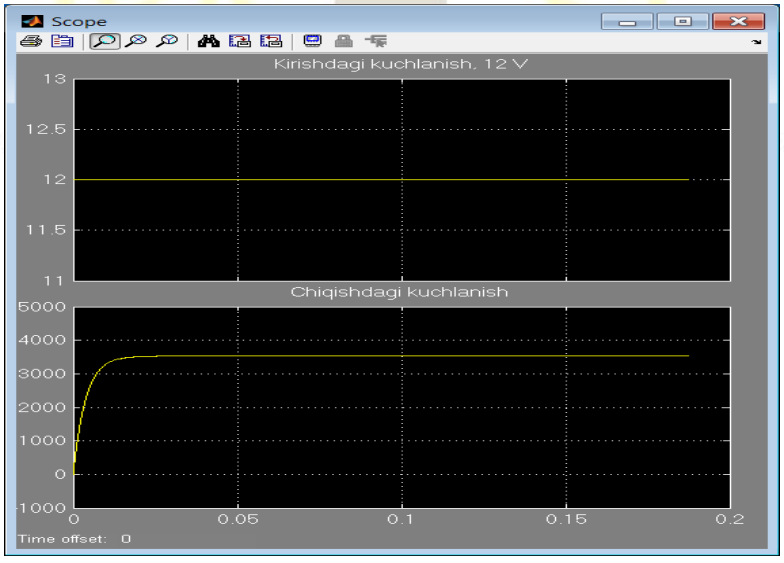

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Figure 4. Oscillograms of the generated voltages at the input and output of the ionizer (R=105 Ω).

We can see the results of this model using the MATLAB Simscape program in Figure 5.

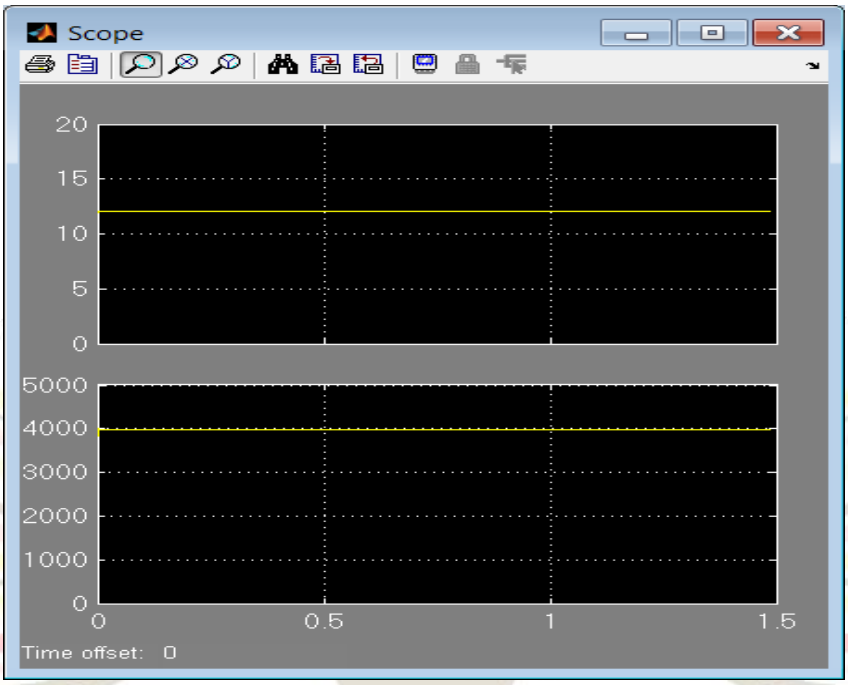

Figure 5. Oscillograms of the generated voltages at the input and output of the ionizer in MATLAB Simscape.

CONCLUSIONS

Based on this computer model, it was determined that transistors with an n-p-n structure in the operating state are p-n junctions in the correct transition mode, and the nature of its temperature coefficient change allows it to be used in generating and amplifying oscillations, as well as in variable circuits. device was proposed, the possibilities of developing a fishing lighting device based on the combination of semiconductor optoelectronic devices and transistors were shown.

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