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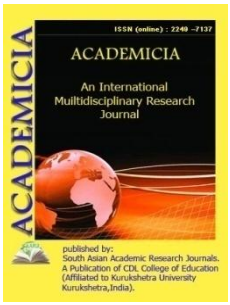

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FACTORS OF ORGANIZING PHYSICAL EXPERIMENTS BASED ON NON-TRADITIONAL TECHNOLOGIES

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ABSTRACT

This article presents the factors of organizing physical experiments based on non-traditional technologies and algorithms for virtual organization and execution of individual experiments in the field of physics of electromagnetic oscillations using electronic resources. Assessing students 'knowledge in non-traditional teaching technology is an important task. Since this technology is mainly focused on independent learning, it is advisable to take into account not only the results of the experiment but also the creative activity and independent working skills of students in the process of assessing students' knowledge.

***KEYWORDS**: Experience, technology, Factors, Electromagnetic oscillations, Alternating current, oscillatory circuit, resonant frequency, voltage, originality.*

INTRODUCTION

Currently, one of the urgent tasks in the education system is to increase the interest of students in obtaining knowledge, as well as the development of creative abilities and the ability of students to apply the obtained theoretical knowledge in practice. In the development of the creative abilities of a schoolchild and a student, it is important to be able to properly organize, conduct physical experiments, and analyze the results [1,2]. This is a guarantee of production efficiency, including the introduction of the achievements of science and technology in various industries.

MATERIALS AND METHODS

An important place in the study of physics was occupied by the organization and conduct of experiments. Factors of organizing physical experiments based on non-traditional technologies:

- The level of physical knowledge will increase;
- The theoretical knowledge gained is strengthened;
- Achieves a deeper understanding and understanding of the basic concepts and laws of physics;
- Form the skills and abilities to solve experimental problems;
- Studies working with physical devices and instruments, measuring instruments;
- Learn to develop and analyze the results of observations and experiments;
- Learns to work on the measurement errors of physical quantities;

Non-traditional (virtual, with computer equipment).

Achievements: students ' skills of working with computer equipment are being formed;

- Direct execution of processes and experiments that are impossible to see or difficult to observe in practice is achieved;
- Saves time when performing your experiments;
- The possibility of dynamic (animated) execution of experiments;
- Direct intervention of the student in it when performing the experiment (temporary stop and continue);
- Achieves repetition of the experience several times within a given time;
- Availability of automatic analysis (evaluation)of the results of the work performed;

Disadvantages: students ' ignorance of the use of computer technology;

- The absence or incorrect structure of the method of performing the experiment;
- The illogical or incomprehensible sequence of the experiment execution;
- The student's work on computer equipment in excess of the established time;
- Incomplete understanding of measurement technology and computing apparatus;

As a result of the analysis mentioned above, the following can be recognized. The difference between non-traditional classes and traditional ones is that these classes create an atmosphere of freedom for students, allowing them to freely express their opinions [2-4]. With traditional methods of teaching the organization and conduct of physical experiments, the devices and devices of the experiment, with sufficient quality, give their effect in this particular case. Also, one of the advanced pedagogical technologies in further improving the effectiveness of training is teaching physical experiences using non-traditional learning technologies. With the above in mind, we present an algorithm for virtual execution of some experimental physics works on electromagnetic oscillations using computer-based learning technology.

1-experience. Method for determining the resonant frequency of the circuit

Purpose of the work: 1. Investigation of the phenomenon of resonance in an alternating current circuit composed of R, L, and K elements connected in series in an experiment.

2. To study the resonant frequency *(ω_{rez})* of the oscillation circuit, the resonant voltage *($U_{m.rez}$)* in the circuit and the determination of the originality and active resistance. Required equipment: an electronic software tool designed to perform virtual laboratory work with auxiliary equipment [3-5]. Brief theoretical information: The phenomenon of a sharp increase in the amplitude of vibrations, when the frequency of harmonic vibrations in an electrical circuit becomes equal to the frequency of the circuit, is called resonance.

The resonance phenomenon in an electric circuit is achieved when the alternating current at a given voltage and at given values of *R*, *L* and *C* reaches its maximum value $R_L = R_C$, $\omega L = \frac{1}{\omega C}$.

When the oscillation contour with a very small active resistance is equal to the frequency of the alternating voltage outside its specific frequency, the amplitude of the forced oscillations of the current increases sharply and a resonance event occurs in the electric oscillation circuit.

The less energy is wasted in the circuit, i.e. the smaller the resistance R in it, the more pronounced the resonance phenomenon. When $R \to 0$ the resonance value of the current increases infinitely: $I_{rez} \to \infty$ is a schematic representation of it in Figure 1. The frequency dependence of the current amplitude when the resistances are different is shown in Figure 1 $R_1 \prec R_2 \prec R_3$. As the current increases during resonance, the voltages in the capacitor and inductor also increase sharply. These voltages are equal in magnitude and several times higher than the external voltage.

As well as: $U_{0_{C.rez}} = i_{0_{rez}} \cdot \frac{1}{\omega_{rez} \cdot C} = i_{0_{rez}} \cdot \sqrt{\frac{L}{C}}$, $U_{0_{L.rez}} = i_{0_{rez}} \cdot \omega_{rez} L = i_{0_{rez}} \cdot \sqrt{\frac{L}{C}}$

The external voltage is related to the resonant current as follows: $U_0 = i_{0_{rez}} \cdot R$

If it is $R \prec\prec \sqrt{\frac{L}{C}}$, it will be $U_{0_{L.rez}} = U_{0_{C.rez}} \succ\succ U_0$.

During resonance, the shift between the external voltage phase and the current-carrying phase in the circuit tends to zero. Permission is obtained from the teacher to perform the measurements. The algorithm and methodology for performing the measurements are as follows: Step 1. The theme "Determination of the resonant frequency of the contour" is activated from the model in the dialogue box (Figure 1).

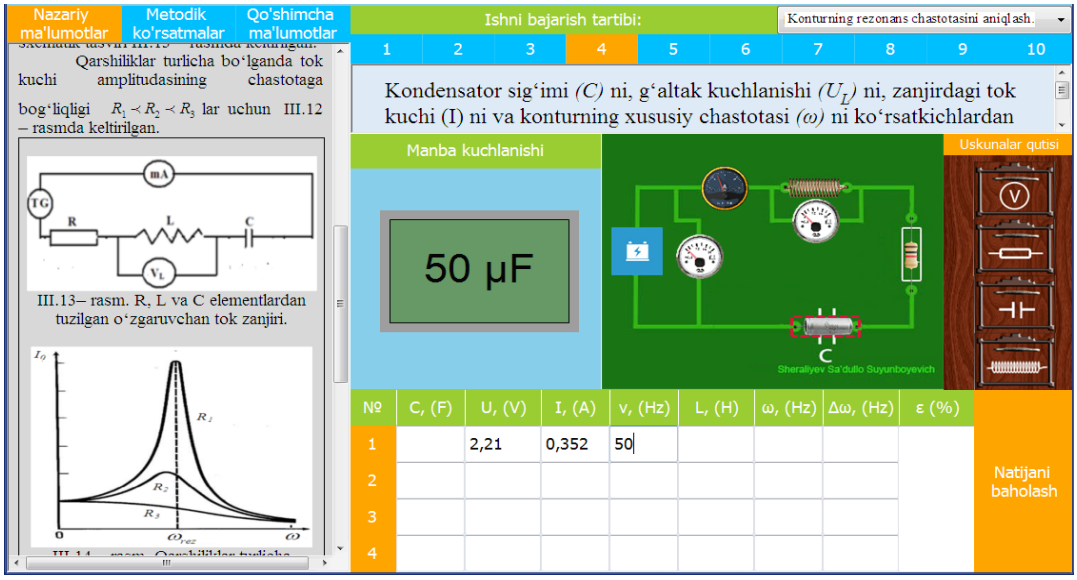

Figure 1: Model for determining the resonant frequency, the voltage of the circuit.

Step 1 A voltmeter, rheostat, capacitor, and coil are used to assemble the circuit in the electrical circuit from the toolbox.

1. Assemble the circuit diagram of the case shown in Figure 1.

2. The output voltage of the sound generator is set to a magnitude of 6B or close.

3. R =- the resistor is removed from the circuit.

4. Capacitor capacitance (*C*), coil voltage (U_L), circuit current (*I*) and circuit-specific frequency *(ω)* are plotted in the table in Figure 1.

5. The values of the coil inductance *L* $L = U_L / \omega I$ are determined and entered in the table.

6. According to the measurement results, the resonant frequency is calculated and summed using the formula $\omega_{рез} = 1/\sqrt{LC}$.

7. After the automatic calculations, the analysis and conclusions on the absolute and relative errors of the experiment are made.

2 - Experience. Methodology for determining the resonant voltage in the circuit;

Theoretical data on the determination of the resonant voltage in the circuit is studied. Permission is obtained from the teacher to perform the measurements. The algorithm and methodology for performing the measurements are as follows: Step 1. The theme "Determination of resonant voltage in the circuit" is activated from the model in the dialogue box (Figure 1).

Step 2A voltmeter, rheostat, capacitor, and coil are used to assemble the circuit in the electrical circuit from the toolbox.

1. The electrical circuit of the work is assembled.

2. The output voltage of the sound generator is set to a magnitude of 8B or close.

3. R - resistor is not connected to the circuit.

4. The capacitance C, the winding voltage U_L, the current I in the circuit and the specific frequency ω of the circuit is entered in the corresponding table.

5. The coil inductance L from $L = U_L / 2\pi\nu I$ is determined and entered in the corresponding table.

6. According to the measurement results, the voltage at the resonance time is calculated and summed using the formula $U_{m.рез} = I_{m.рез}\sqrt{L/C}$.

7. After the automatic calculations, the analysis and conclusions on the absolute and relative errors of the experiment are made. Computer-assisted learning technology is mainly implemented through e-learning resources and its features are:

- It is aimed at developing the student's independent thinking and creative abilities;
- The teacher participates in the educational process as a consultant;
- Active integration of media and resources in the learning process is provided;
- Training motivation is increased;
- Increases the intensity and effectiveness of education;
- The student's skills of independent work and research are formed.

CONCLUSION

Assessing students ’knowledge in non-traditional teaching technology is an important task. Since this technology is mainly focused on independent learning, it is advisable to take into account not only the results of the experiment but also the creative activity and independent working skills of students in the process of assessing students' knowledge.

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