Study of the apparatus for UHF-therapy

PRACTICAL PART

Prepare the device for operation According to the teacher's instructions.

I. **Determine the distribution of the electric field between the electrodes of the device for UHF therapy**.

1. Place an electric dipole (dipole antenna) between the electrodes of the UHF apparatus (Fig. 1) so that it is in the center of the electrodes.

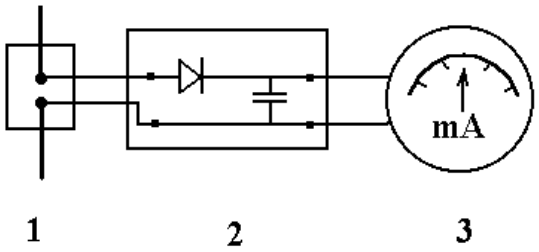


Fig. 1. Block diagram of a dipole antenna
(1- antenna, 2- rectifier, 3- milliammeter).

2. Investigate the distribution of the electric field strength between the electrodes by moving the dipole from the central position in the vertical and horizontal directions and registering the milliammeter current. Enter the data in table 1.

1. Based on the data obtained, plot the distribution of the high-frequency field I = f (L).

Table 1

up		down		to the right		to the left	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0		0		0		0	
2		2		2		2	
4		4		4		4	
6		6		6		6	
8		8		8		8	
10		10		10		10	

II. **Study the dynamics of heating electrolyte and dielectric in the UHF field**.

1. Place electrolyte between the electrodes of the therapy circuit (physiological solution) and dielectric (bone tissue).

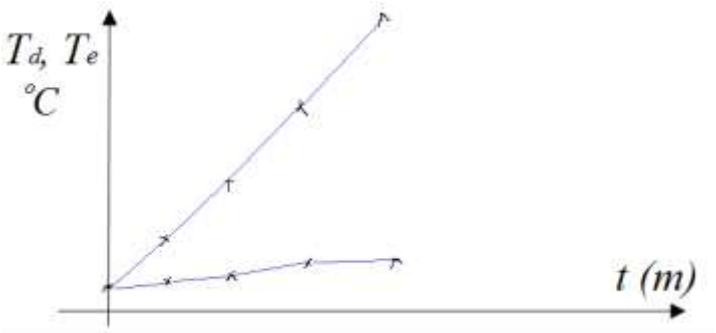
2. Place thermometers in a test tube with electrolyte and in a bone preparation, determine the initial temperature of objects.

3. Turn on the device for UHF-therapy and record the thermometer readings within 5-10 minutes. Enter the data in table 2.

table 2

Substance	T,°C (initial)	Time t, min.	T,°C	ΔT,°C
electrolyte				
dielectric				

4. Based on the data obtained, build graphs of temperature changes over time:



Explain the findings.

TEST QUESTIONS

1. Consider the process of electrical oscillations in the circuit.
2. Explain the principle of operation of a single-cycle generator of electrical oscillations.
3. Draw a diagram and consider the principle of operation of a push-pull generator of electrical oscillations.
4. What is the purpose of the therapeutic circuit in the UHF apparatus? Draw its diagram and indicate the purpose of the elements.
5. What effect does the UHF field have on body tissues?
6. Tell us about the application of high-frequency electrical vibrations in medicine.

SITUATIONAL TASKS

1. Find the frequency of resonant oscillations in the circuit if it is known that the inductance L is 3 μH and the capacitance of the capacitor C is 33 pF.
2. In an oscillating circuit, the ohmic resistance R is 50 Ohms, and the inductance L is 10 mH. Find the damping coefficient β of electrical oscillations.
3. Find the total resistance (impedance) of the oscillating circuit if it is known that the circuit is resonant, and the inductance L is 3 mH, the capacitance of the capacitor C is 33 pF, and the ohmic resistance R is 15 ohms.
4. Find the amount of heat released in 1 s per unit volume of 1 m^3 of dielectric (with relative dielectric constant $\varepsilon = 100$) placed in an electric field of 10^4 V/m, if it is known that the oscillation frequency is 40 MHz, the tangent of the angle dielectrical losses tgδ is equal to 1, and the proportionality coefficient k is equal to ε_0 ($\varepsilon_0=8.85\cdot10^{-12}$ $C^2/(N\cdot m^2)$).
5. Find the amount of heat released in 1 s per unit volume of 1 m^3 of electrolyte placed in an electric field of 10^4 V/m, if it is known that its electrical resistivity is $2\cdot10^3$ Ohm·m (proportionality coefficient k=1).