



ELECTROMAGNETIC ENVIRONMENT IN CITIES AND RESIDENTIAL AREAS

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ABSTRACT: *In this paper presents Electromagnetic Environment in cities. It noted that in the field of living hygiene, the concept of "risk" and safety of life is not sufficiently developed. This situation is preserved to this day, which creates real preconditions for the formation of unfavorable living conditions with damage to the health of the population. It was not until 1996 that the first hygiene standards for EMF levels were used when using consumer goods at home.*

KEY WORDS: *Electromagnetic field, Electromagnetic Environment, RF broadcasting, Induction values, EF Strengths.*

Introduction

Assessing the Electromagnetic Environment in cities, it can be noted that residents are literally "bathed" in Electromagnetic Fields (EMF) generated by many simultaneously operating sources. These EMF differ in structure, intensity, frequency ranges, degree of modulation.

The main sources of EMF include:

- Broadcasting in the Medium Frequency Range;
- RF broadcasting and communications;
- frequency modulated broadcasting in the band 87 MHz - 107 MHz;
- TV in the VHF and UHF band.

In modern telecommunication systems, EMF are transmitted in space by dozens of antennas. It is a widespread practice to deploy the technical means broadcasting in medium and high frequency bands located in the immediate vicinity or on the towers of the technical means for television and radio broadcasting, operating in the VHF and UHF bands.[1]

Exposition

The electromagnetic environment is most unfavorable around the old radio and television transmitting centers with an antenna height of not more than 180 m.

Other sources contributing to the electromagnetic pollution of cities are the basic ones for mobile communication, which are located on the territory of cities and large indoor spaces, and as shopping centers, supermarkets and others.

In residential areas around which airports are located, in addition to the listed EMF, the population may be affected by microwave radiation from radars for various purposes. The EMF emitted by industrial or medical high-frequency installations also has a local impact on the population.

A standard example of the electromagnetic environment in a large city can be given as the sum of the broadcasts of television repeaters, broadcasts of FM radio stations, radio communication and broadcasting in the HF band, broadcasting in the MF band and more than 10 base stations of mobile operators that broadcast around the clock are evenly distributed throughout the city.

Significant contribution to the electromagnetic environment of large cities has EMF created by transmission lines for medium and high voltage, substations, cable routes, rail and urban electric transport. Sources of EMF affecting the population are also handheld radios, radiotelephones, personal computers, microwave ovens and electrical appliances. The impact of the fields occurs against the background of screening of the Earth's geomagnetic field in buildings for various purposes, in the subway and in public transport.

The above sources EMF, which is exemplary and incomplete, shows that the population of large cities and other urban areas is irradiated simultaneously with electric fields, magnetic and electromagnetic fields in different ranges from 0 to hundreds of GHz. At the same time, there are currently no scientifically based criteria for assessing the state of the environment in the complex effects of EMF on humans.

EMI in residential buildings is formed both from external sources, such as power lines, transformers, switchboards and other electrical devices, and from internal sources such as household electrical appliances, lighting, various types of wiring, computer and television equipment. Sources of the field are also TVs and displays of personal computers, but elevated levels are observed only in the immediate vicinity of this equipment.[2]

The fields generated by power lines passing through built-up areas are largely absorbed by buildings, regardless of the material from which they are made. Sources of MF in residential buildings in addition to MF on Earth, can be: currents of electrical cables and household appliances; scattered currents of different frequencies due to the asymmetry of the phase load, currents of power cables, built-in transformer substations, power lines and cable routes.

The sources of external MF are power lines, the fields from the currents of the phases of power lines freely penetrating into the living quarters of nearby buildings. Wandering currents that create an average induction of 0.1-0.3 μT . With the simultaneous action of several sources of MF (phase currents of the power line and scattered currents), the induction can increase to 1 μT , sometimes even higher.

When measuring EMF in residential buildings and houses of different types (panel, brick, etc.), located on the border of the zones of security and sanitary protection by power lines, different levels of intensity of EF and MF have been established. Fluctuations in field values in buildings depend on various reasons that must be taken into account in monitoring. These are the distance from the power line, structures and building materials (non-magnetic, reinforced concrete), dimensions, orientation and number of stores of buildings, location and different variants of overhead and cable lines, voltage class, current value, measurements in vertical and horizontal planes, etc.

Technical progress contributes to the intensive introduction into everyday life of a huge number of electrical devices and equipment, radio and television receivers, electronics, computers and more. These include mobile wireless devices, air conditioners, mixers and toasters, grills and microwaves, etc. The use of this technique leads to a significant increase in electricity consumption. In EU countries, about 25% of energy consumed is for household use only. According to published data for every inhabitant of Europe, electricity consumption per year is: England - 1600 kW/h, Germany - 1370 kW/h, France - 1030 kW/h, in Italy - 640 kW/h, in Russia - 1000 kWh. The increase in electricity consumption by the population is due to an increase in the equipment of homes with electrical appliances, lighting fixtures, television and computer equipment, this is not only a positive indicator of human well-being, but also shows signs of housing change, environment with respect to the electromagnetic factor.[3]

Household appliances small and large, lighting fixtures, wiring and electrical wires are all sources of EMF. The levels of intensity of the electrical component and the values of the induction of the magnetic component of the EMF depend on a number of reasons. For example, near air conditioners, electric heaters, hair dryers, vacuum cleaners, irons, electric mixers, refrigerators, washing machines, air purifiers and other electrical appliances, "high risk areas" are created in terms of electric power levels.

Publications from recent years give approximate values of the intensity of the frequency of electric power (Table 1), created by the sources during operation at different distances.

Table 1

EF power near household electrical appliances, W/m

Device	Distance from the field source in cm.	
	7	51
Laundry	34-420	10-72
Refrigerator	130-460	40-110
Vacuum cleaner	20-640	60-80
Hairdryer	40-420	7-26
Iron	50-540	7-41
Mixer	30-620	6-46

Analyzing the nature and levels of distribution of EF values around the radiation sources, it can be concluded that the field parameters are determined by the mains voltage, material and construction of the device, the distance from the source, mode of operation of the device, grounding and a number of other indicators.

In his early work, R. Kauf (1977) provided data on EF power measurements that create household electrical appliances operating at a frequency of 60 Hz at a distance of 30 cm (Table 2).

Table 2

Strengths of the EF a distance of 30 cm from the appliance

Device	Intensity EF, W/m
Cooker	4
Toaster	40
Electric hob	250
Iron	60
Refrigerator	40
TV	60
Vacuum cleaner	16
Lighting lamp	2

Comparison of the values of the force of EF, given in Table 1 and 2 show that technical progress in recent decades has not led to a reduction in EMF levels. This is determined by the obvious lack of legislation to regulate the impact of adverse environmental factors on humans.

In recent years, results have been obtained that show the development of malignant diseases when exposed to MP with frequencies of 50 - 60 Hz. Some researchers attribute induction in the range of 0.2 to 1.0 μT to increased levels of risk. In this respect, it is of interest to measure the values of the inductions of external MF created by power tools and electrical household appliances (Table 3).

Table 3

Induction values of external MF near electrical appliances

Device	Induction, μT
Soldering iron - 300 W, power cord, hair dryer	1.0- 2.5
Soldering iron 150 W, table lamp, Cooker	0.5 - 1.0
Mixer, TV, dishwasher, iron, washing machine	0.1 – 0.5
Dryer, vacuum cleaner, toaster, refrigerator	0.001 – 0.01

If we focus on the level of induction of MF of 0.2 μT , as an increased level of risk, then the recommended safe distances from the sources of EMF will be: iron - 0.25 m; TV - 1.1 m; electric heating device - 0.3 m; lighting with two bulbs - 0.03 m; cooker - 0.4 m, etc.[4]

Conclusion

It should be noted that in the field of living hygiene, the concept of "risk" and safety of life is not sufficiently developed. As early as the early 80's, Academician Yuri Kundiev pointed out that there is practically no scientifically based system for preventive sanitary supervision in the field of production and operation of electrical household appliances, devices, radio electronic devices. This situation is preserved to this day, which creates real preconditions for the formation of unfavorable living conditions with damage to the health of the population. It was not until 1996 that the first hygiene standards for EMF levels were used when using consumer goods at home.

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