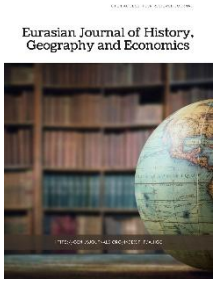

Electromagnetic Radiation And Its Impact On Human Health: Control Methods And Regulatory Approaches

Yusupkhodjaeva Ellenora Narimanovna	Associate Professor at Tashkent State Technical University, Tashkent, Uzbekistan
Nargiza Batirova Utkurovna,	Associate Professor at Tashkent State Technical University, Tashkent, Uzbekistan.
Ruzimukhamedova Shokhodat Bokhodir kizi	Doctoral Student at the Institute of Labor Market Research, Tashkent, Uzbekistan.
Bilalova Dilyafruz Zhamshid kizi	Senior Lecturer at Tashkent State Technical University, Tashkent, Uzbekistan.

ABSTRACT

The article is devoted to the issues of control and regulation of electromagnetic radiation (EMR) in the radio frequency and ultra-high frequency ranges. Domestic and foreign devices for measuring electric and magnetic fields used in sanitary and hygienic practice and in the certification of workplaces are described in detail. Special attention is paid to current sanitary standards, state standards, and international requirements.

Keywords: electromagnetic radiation, sanitary standards, measuring devices, radio frequency range.

Modern society is unthinkable without the active use of electrical and electronic technologies. Household appliances, personal computers, mobile communications, power lines, and radio equipment are sources of electromagnetic radiation (EMR), which has a definite impact on human health. Therefore, the issue of monitoring, measuring, and regulating EMR is a key issue in the fields of occupational health, ecology, and sanitary safety.

The relevance of this research is determined by the steady increase in the number of electromagnetic field sources, as well as the need for their comprehensive assessment in industrial and domestic settings.

The impact of electromagnetic fields on humans was first studied in the mid-20th century, with the rapid development of radio and television broadcasting. The first reports of the health effects of radio waves appeared in the 1950s and 1960s, and in the 1970s, a system of sanitary standards regulating permissible exposure levels was developed. In Eastern European countries, this issue received particular attention due to the rapid development of energy and radio communications. Since the late 20th century, research has become global in scope. The World Health Organization (WHO) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) began developing international standards, enabling the comparison of data from different countries and systematic monitoring.

The main parameters of electromagnetic radiation (EMR) in the radio frequency (RF) and ultra-high frequency (UHF) ranges are characterized by three key parameters:
electric field strength (E),
magnetic field strength (H), and
energy flux density (EFD).

In the range below 300 MHz, radiation intensity is expressed in V/m and A/m, and above 300 MHz, in W/m^2. Magnetic fields are characterized by magnetic flux density (V), measured in teslas (T) or gauss (G).

SAR (Specific Absorption Rate) is used to assess the safety of mobile phones. The lower the SAR, the safer the device. Both domestic and foreign devices are used to monitor electromagnetic fields. Among the most common are:

"Cyclone-04" and "Cyclone-05" – sets of electric and magnetic field meters used in workplace assessment and computer equipment certification.

IPM-101 – a compact EMF strength meter over a wide frequency range.

The EMR-20, EMR-30, EMR-200, and EMR-300 (by Wandel & Goltermann) are devices for measuring radio frequency and microwave emissions.

The Protek-3201 is a field analyzer used in servicing radio communication, television broadcasting, and satellite channels.

The B&Emetr is a compact device for sanitary and hygienic inspection of rooms containing computer equipment.

These devices allow for long-term measurements, recording of results, connection to a PC for data analysis, and generation of protocols.

EMI monitoring is carried out in accordance with state standards (GOST R 50948-96, GOST R 50949-96), sanitary rules and regulations (SanPiN 2.2.2.542-96, SanPiN 2.2.4.723-98, etc.).

According to current requirements:

In industrial settings, measurements are conducted at least once a year.

Repeat measurements are mandatory when introducing new installations or changing source operating modes.

The results are recorded in protocols indicating source parameters, protective equipment used, and EMF characteristics.

International standards (IRPA/INIRC, ANSI, ICNIRP) also establish permissible exposure levels, allowing for comparison of Russian standards with international ones and the implementation of a unified approach.

Modern research shows that long-term exposure to EMF can have both direct and indirect effects on human health:

increased fatigue and decreased performance,

headaches and sleep disturbances,

possible effects on the cardiovascular system,

effects on the nervous and endocrine systems.

Special attention is being paid to the impact of mobile phones and Wi-Fi devices. Despite the lack of definitive evidence of a carcinogenic effect, the WHO classifies radiofrequency fields as "possibly carcinogenic to humans" (2B).

Electromagnetic protection measures. To reduce exposure, the following measures are used:

shielding of workplaces (metal mesh, special coverings),

maintaining distance between the source and the person,

special protective suits and fabrics,

efficient work organization – limiting the time spent working with EMF sources, mandatory breaks, and employee rotation.

Simple measures are recommended for domestic environments: placing the Wi-Fi router outside the bedroom, using a headset during telephone conversations, and minimizing the time spent near high-power electrical appliances.

International Experience and Prospects: Directive 2013/35/EU is in effect in the European Union, establishing requirements for the protection of workers from exposure to electromagnetic fields. In the United States, standards are determined by the Environmental Protection Agency (EPA) and the Federal Communications Commission (FCC).

In Japan and South Korea, EMF monitoring systems are being actively implemented in urban areas, creating electronic maps displaying radiation levels in real time. A promising area is the creation of "electromagnetic maps" of populated areas, which will allow citizens to obtain information about safe zones and choose places to live with minimal exposure to electromagnetic radiation.

Electromagnetic radiation is an important factor in the industrial and domestic environment. Its impact on humans depends on

the frequency range, the power of the sources, and the duration of exposure to the radiation zone.

Modern devices allow for effective monitoring of electromagnetic radiation levels, but improving methods and regulations remains essential to ensure public safety.

Further developments are required:

Reviewing and refining sanitary standards for new types of equipment,

developing methods for assessing the impact of mobile communications,

implementing EMF monitoring systems in cities and industrial zones, and raising public awareness of simple protection methods.

Thus, a comprehensive approach to measuring, standardizing, and monitoring electromagnetic radiation is an important area for ensuring the environmental and sanitary safety of modern society.

References:

1. СанПиН 2.2.4.723-98. Гигиенические требования к допустимым уровням магнитных полей промышленной частоты. – М.: Минздрав РФ, 1998.
2. TCO'92, TCO'95. Swedish Confederation of Professional Employees Standards for Visual Display Units. – Stockholm, 1992, 1995.
3. Мясников В.В., Смирнов И.В. Электромагнитные поля и здоровье человека. – М.: Медицина, 2002.
4. Пономаренко В.А., Киселёв А.Н. Приборы для измерения электромагнитных полей: учебное пособие. – СПб.: Питер, 2010.
5. Yusupkhadjayev E.N., Rozimukhamedova SH.B. The effect of electromagnetic waves on the human body. International Journal. In volume 18 of eurasian research bulletin. 2023.
6. Yusupkhodjaeva E., Botirova N., Axmedova N., Narziev SH. Ruzimukhamedova Sh.B. Negative influence of electromagnetic fields on human health and methods of protection. Республика миқёсидаги илмий конференция. ТошДТУ. 2023.