ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

Results of Evaluation of Protective Equipment to Reduce the Intensity of the Electromagnetic Field in the Workplace of Operators of Video Terminals and Personal Computers

Sulaymanov Sunnatulla, Kamilov Khasan Mirzakhitovich, Ilkhomov Ikromjon Islom o'g'li

Doctor of Technical Sciences, Professor, Tashkent State Transport University, Uzbekistan
Basic doctoral student (PhD), Tashkent State Transport University, Uzbekistan
Student, Tashkent State Transport University, Uzbekistan

ABSTRACT: The article presents the results of evaluation of protective means to reduce the electromagnetic field intensity in the workplace of video terminal operators and personal computers. The developed protective cover and protective shield provide a 2.8-3-fold reduction in the electromagnetic field strength of the uninterruptible power supply in mass production. Their combined use reduces the intensity of the electromagnetic field by 5-6 times. These protective devices have a simple design and do not require significant costs for materials and other resources for their implementation.

KEYWORDS: video terminals, personal computers, train dispatchers, electromagnetic field strength, protective cover, protective screen, serial production uninterruptible power supply.

I. RELEVANCE OF THE ISSUE.

It is known that today in all sectors of the economy, workers, employees and others use personal computers, video terminals, scanners, printers and other electronic devices. Because the electronic technical devices listed above form the technical basis for the creation, development and use of information technology [1].

Personal computers, video terminals, scanners, printers and other electronic devices are widely used in the management of railway transport systems, including information technology used in the work of train dispatchers. The information technologies used in the activities of train dispatchers, on the one hand, ensure the uninterrupted and high-quality operation of the processes of receiving, storing, processing and delivering information to consumers at very high speeds today. On the other hand, personal computers, video terminals, scanners, printers and other electronic devices used in the implementation of information technology are a source of dangerous and harmful factors in the production [1].

Given the dependence of train dispatchers on working conditions, the development and implementation of scientifically based organizational, technical, social measures for the hygienic assessment of working conditions of dispatchers, the authors Elizarov B. B., Podgornaya T G., Tsurkan V. G., Panasovskaya L.S., Dudnik I.N., Nersesyan L.S., Chumak V.I., Karaulovskaya E. A., Rashidov V. A., Buronov I. B., Xudoykulov J.B. and studied by et al. In particular, hygienic assessment of working conditions of dispatchers and harmful production factors affecting their work, harmful factors affecting the voltage of eye analyzers, hygienic measures to improve working conditions of dispatchers and the organization of rest and medical care, as well as rehabilitation programs have been developed [2].

Analysis of the results of hygienic assessment of train dispatchers at the Single Dispatch Center based on the results of certification of working conditions in the workplace showed that their working conditions are classified as 2.0 in terms of actual concentrations of harmful substances in the workplace, noise, infrared, ultrasound, vibration, non-ionizing electromagnetic radiation. microclimate indicators in the cold period of the year, lighting environment of production rooms, class 2.0 on atmospheric pressure, class 3.2 on the weight of the labor process, 3.3 on the impact of the work process load belongs to the class [2].

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

Train dispatchers work conditions attestation results and working conditions belong to class 3.3, dispatchers working in these conditions for a long time use electronic devices of information technology, their cardiovascular, nervous and immune system reflex disorders, diseases of the stomach and pancreas and increases the likelihood of various other diseases [3].

Operators of video terminals and personal computers have developed protective devices designed to reduce the intensity of the electromagnetic field in the workplace. In view of the above, experimental research has been conducted to identify and assess the sources of hazardous and harmful factors in the workplaces of train dispatchers. Based on the results obtained, it was determined that one of the main and highest value sources of electromagnetic field strength in the workplace of dispatchers is a device that serves to provide uninterruptible power supply to electronic devices. Based on the data obtained, experimental models of protection devices to reduce the level of electromagnetic field strength of the device, which continuously supplies all electronic devices with electricity, were developed.

Developed and proposed protective equipment - the device consists of a casing and screen made of insulating foil, the experimental casing is in the form of a metal mesh structure in accordance with the dimensions of the uninterruptible power supply, the surface of the structure is 1 layer with AD1 foil with a thickness of ~ 0.18 mm coated (Fig. 1).

a) **b)**

a- mesh metal construction b- foil-covered construction

Figure 1. An example of an experimental model of kojux

As a protective screen made of foil, the inner surfaces of the sides of the table top used in the work of the train dispatcher are covered in 1 layer with AD1 brand foil with a diameter of ~ 0.18 mm (Fig. 2).

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 1 , January 2021

Figure 2. An example of an experimental model of a protective screen

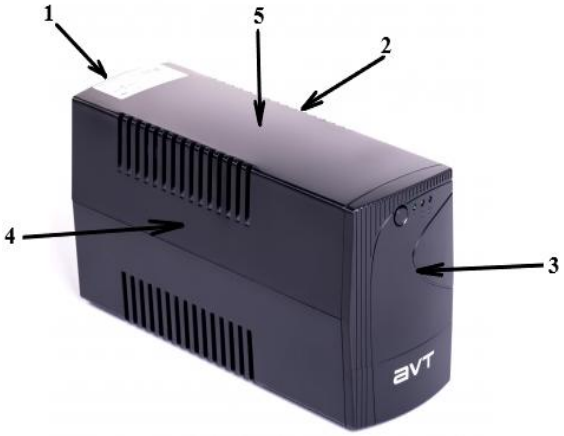
II. EXPERIMENTAL RESEARCH PROGRAM, METHODS AND EQUIPMENT.

The program developed and proposed to evaluate the effectiveness of the sample of the protective casing and the experimental model of the screen consists of:

- preparation of a sample of an experimental model of a protective case (Fig. 1);
- preparation of a sample of the protective screen (Fig. 2);
- selection and commissioning of UPS-Uninterruptible Power Supply;
- creation of a chain of uninterruptible power supply consumers and their preparation for work;
- preparation of the electromagnetic field strength measuring device;
- measure the value of the electromagnetic field strength of the uninterruptible power supply in the series sample at selected points (Fig. 3);
- measure the value of the electromagnetic field strength of the uninterruptible power supply in a series sample covered by a protective coil connected to ground at selected points (Fig. 3);
- measure the value of the electromagnetic field strength of the uninterruptible power supply in a series sample placed on a table top covered with foil, the inner walls of which are connected to the ground at selected points (Fig. 3);
- Measurement of the electromagnetic field strength at the selected points (Fig. 3) of the uninterruptible power supply in a series sample with a protective cover, the inner walls of which are placed on a table top covered with foil;
- processing of experimental results.

The methods used were standardized and the measurement points were made according to the requirements of Sanitary norms, rules and hygienic standards №0224-07 [4]. The electromagnetic field strength propagating from the uninterruptible power supply was re-measured 3 times at selected points according to the measurement scheme (Fig. 3) using the control-measuring instrument NFM1 №03443, which provided the required reliability. The arithmetic mean, standard deviation values for the obtained measurement results were processed using an Excel standard program installed on a personal computer.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 1 , January 2021



1- Rear part, 2- Right part, 3- Front part, 4- Left part, 5- Upper part
Figure 3. Electromagnetic field strength measurement scheme

III. ANALYSIS OF EXPERIMENTAL RESULTS.

According to the program of experimental studies, the results obtained using the methods and equipment described above were processed and then tabulated for analysis (table).

Table
Results of protection assessment

№	Measuring point	Electromagnetic field strength of uninterruptible power supply, V/m			
		uninterruptible power supply in series sample	an uninterruptible power supply in a series sample covered by a protective case	a continuous supply source in a serial sample placed on a table top covered with foil on the surface of the inner walls	an uninterruptible power supply in a serial sample covered by a protective screen and a protective casing
1	1	5,5	1,9	2,1	1,1
2	2	4,7	1,65	1,85	0,94
3	3	4,3	1,4	1,6	0,86
4	4	3,6	1,15	1,35	0,72
5	5	2,8	1	1,1	0,56

Based on the results of the experimental study presented in the table, a histogram (Fig. 4) on the electromagnetic field voltage values was constructed in order to evaluate the technical effectiveness of the developed and proposed protective coil and screen to reduce the electromagnetic field voltage dissipated by the uninterruptible power supply.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 1 , January 2021

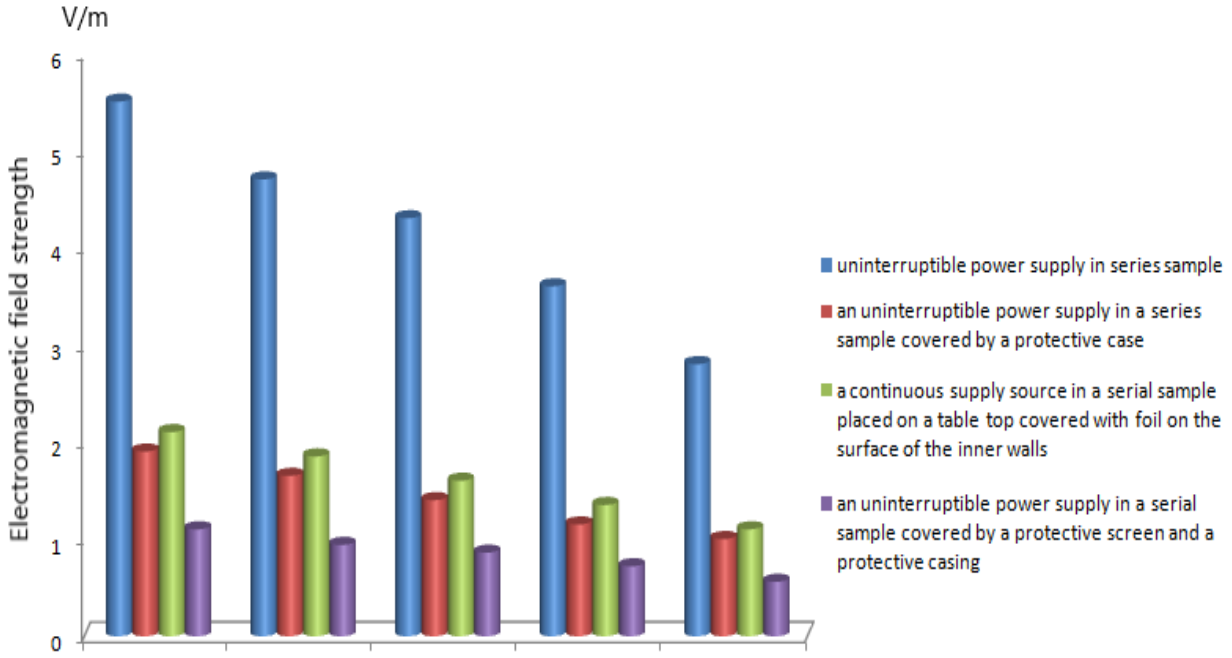


Figure 4. Values of electromagnetic field strength histogram

As can be seen from the histogram, the developed protective casing and protective screen provide a 2,8-3 times reduction in the electromagnetic field strength of the uninterruptible power supply in the serial sample. Using them together reduces the electromagnetic field strength by 5-6 times. These protections have an extremely simple design and do not require significant expenditures on materials and other resources to implement them.

IV. CONCLUSION

The results of experimental studies have been developed and proposed that the use of protective casings and screens ensures that the voltage of the electromagnetic field in the workplaces of train dispatchers is significantly lower than the limit value set in sanitary and hygienic requirements. This, in turn, drastically reduces the likelihood of cardiovascular, nervous and immune system reflex disorders, gastrointestinal and pancreatic diseases due to occupation-related labor activity over several years (over time) and increases the efficiency of train dispatchers during labor provides.

REFERENCES

1. S. Sulaymanov, X.M. Kamilov. Video surveillance results of train dispatcher labor (In example of «Uzbekistan Railways» joint-stock company Single Dispatching Center) // Vestnik TashIIT 2019 year №2, P. 215–220;
2. Sulaymonov S., Kamilov X.M. The Center of the Single Dispatchers Center Results Of Gigienic Assessment Of Work Condition // International Journal of Advanced Research in Science, Engineering and Technology 2019 year Vol. 6, Issue 5 , 9415-9417 page.
3. F.I. Odinaev, Sh.F. Odinaev, Sh. I. Shafiev, S.V. Shutova, Electromagnetic radiation and human health // Bulletin of TSU 2015, Issue 6, pp. 1714-1717;
4. Sanitary norms, rules and hygienic standards when working with personal computers, video display terminals and office equipment, № 0224-07, Republic of Uzbekistan, Toshkent 2007y.

AUTHOR'S BIOGRAPHY

Sulaymanov Sunnatulla - Doctor of Technical Sciences, professor, professor of the Department of Technosphere Safety, Tashkent State Transport University
Kamilov Khasan Mirzakhitovich - basic doctoral student (PhD), Tashkent State Transport University
Ilkhomov Ikromjon Islom o'g'li – student, Tashkent State Transport University