electronic means. *APRN Journal of Engineering and Applied Sciences*. 2019. № 14 (20). Pp. 3566–3571.

3. Iasechko M., Turinskyi O., Burdin M., Larin V., Gnusov Y., Ikaev D., Borysenko V., Manoylo V. Protection of board radioelectronic equipment from the destructive powerful electromagnetic radiation with the use of natural technologies. *IJETER*. 2019. № 7 (11). Pp. 542–548.

4. Iasechko M., Sotnikov O., Syrotenko A., Larin V., Iasechko S., Ochkurenko O., Volkov A. Model of Combined Solid Plasma Material for the Protection of Radio-Electronic Means of Optical and Radio Radiation. *IJATCSE*. 2019. № 8 (4). Pp. 1241–1247.

5. Iasechko M., Sotnikov O., Larin V., Ochkurenko O., Maksiuta D. The model of a medium for creation of electric hermetic screens of the radio electronic means. *IJATCSE*. 2019. 8(2). Pp. 300–304.

6. Iasechko M., Turinskyi O., Larin V., Prokopenko T., Kolmohorov O., Salash O., Tarshyn V. The Investigation of the Impulse Evolution of the Radio-Frequency and Optical Radiation During the Interaction With the Solid-State Plasma Media On Radioisotope and Hexaferrite Inclusions. *IJETER*. 2020. 8(4). Pp. 1333–1337.

DOI https://doi.org/10.30525/978-9934-588-79-2-1.41

RECOMMENDATIONS FOR SUBSTANTIATION OF REQUIREMENTS FOR CONSTRUCTION OF PROTECTION OF RADIOELECTRONIC MEANS FROM THE INFLUENCE OF POWERFUL ELECTROMAGNETIC RADIATION

Iasechko M. M.
Doctor of Technical Sciences,
Associate Professor at the Department
of Air Defense Armaments of the Land Forces
Ivan Kozhedub Kharkiv National Air Force University
Kharkiv, Ukraine

Liashenko V.
Candidate of Technical Sciences,
Senior Research Fellow
State Research Institute of Armament
and Military Equipment Testing and Certification, Ukraine
Chernihiv, Ukraine

Nikitchenko V.
Candidate of Technical Sciences,
Senior Research Fellow
State Research Institute of Armament
and Military Equipment Testing and Certification, Ukraine
Chernihiv, Ukraine

The development of modern radio systems is introduced by the use of electronic and robotic systems, the replacement of hydraulic systems with electromechanical ones. Electronic weapon systems based on microelectronics allow on the one hand to reduce power consumption of systems, reduce the levels of useful signals, increase the speed of processing and transmission of information, and on the other hand – have a relatively low noise immunity. This factor is becoming increasingly important, as the presence of a wide range of electronic means complicates the electromagnetic environment, increases the likelihood of destructive effects on the transmission and processing of information, which can lead to functional safety violations [1-4].

The situation is complicated by the emergence of new technical means of powerful electromagnetic influences that can be used as weapons or means of electromagnetic terrorism.

Therefore, research on the problems of protection of electronic means (REM) from high-power electromagnetic radiation (EMR) is becoming increasingly important. This is due to the fact that in order to counteract the external influence of the EMR, the development of means of protection must go hand in hand with the creation of these weapons and even a few steps ahead.

Improving the methods of generating pulsed EMR in order to increase the radiation power with decreasing pulse duration leads on the one hand to increase the striking effect of EMR, and on the other to the inability to effectively protect REM based on existing methods and tools.

At the same time, there is no systematic data that would determine the ways to protect REM from high-power EMR through the openings of the housings and cable input channels.

One of the possible areas of REM protection is the use of plasma technology [5], which according to preliminary estimates will provide the following requirements:

– independence of the process of functioning of electronic equipment from means of protection;

– the required speed depending on the pulse length of the EMR;

– energy independence and reusability;

– invariability of weight and dimensional characteristics of electronic equipment;

– practical implementation of means of protection of electronic equipment.

Implementation of these requirements in protecting REM from the effects of high-power ultra-short-term EMR through holes and cable input channels is possible by creating conditions for breakdowns in the locations of holes and cable channels for REM input to further dissipate EMR energy.

To do this, it is proposed to use the principle of an out-of-wave waveguide through the use of a waveguide nozzle. But the effectiveness of REM protection depends on the thickness of the nozzle, which leads to an increase in the weight and size characteristics of the housing-screen. Therefore, in order to comply with the requirements for ensuring the weight and size characteristics of the REM screen housings, it is proposed to apply a layer of α-radioactive substance in the form of a thin film on the inner surface of the waveguide nozzle. As a result, in the waveguide nozzle internally or in the space between the inner wall of the nozzle and the cable, a non-equilibrium weakly ionized air environment is formed [6].

This approach to the implementation of the means of protection can significantly reduce the thickness of the waveguide nozzle with strict requirements for weight and size characteristics, increase due to the nonequilibrium state of the electronic absorption subsystem EMR, and in case of powerful EMR to ensure its complete removal by creating a breakdown in pre-ionized air.

Calculations confirming the feasibility and feasibility of using the developed device to protect the openings of the housings and cable input channels from the effects of strong electromagnetic radiation of both terrestrial and onboard REM.

When using a means of complex protection on ground REM, for the breakdown it is necessary to take into account the dependence of the penetration voltage of the electric field on pressure, if necessary, increase the initial electron concentration, which is determined by the activity of α – radioactive film. As a source of ionization, it is advisable to choose pure sources of α – particles, such as Po_{210} or Pu_{208}.

References:

1. Iasechko M., Tymochko O., Shapran Y., Trofymenko I., Maksiuta D., Sytnyk Y. Loss definition of charged particles in the discharge gap of the

opening of the box-screens during the formation of a highly conductive channel. *IJATCSE*. 2019. № 8 (1.3). Pp. 1–9.

2. Iasechko M., Larin V., Maksiuta D., Ochkurenko O., Samsonov Y., Lyashenko H., Zinchenko A. Influence of ionization source onto macroscopic parameters of the air media in the holes in cops-screensof radio electronic means. *APRN Journal of Engineering and Applied Sciences*. 2019. № 14 (20). Pp. 3566–3571.

3. Iasechko M., Turinskyi O., Burdin M., Larin V., Gnusov Y., Ikaev D., Borysenko V., Manoylo V. Protection of board radioelectronic equipment from the destructive powerful electromagnetic radiation with the use of natural technologies. *IJETER*. 2019. № 7 (11). Pp. 542–548.

4. Iasechko M., Sotnikov O., Syrotenko A., Larin V., Iasechko S., Ochkurenko O., Volkov A. Model of Combined Solid Plasma Material for the Protection of Radio-Electronic Means of Optical and Radio Radiation. *IJATCSE*. 2019. № 8 (4). Pp. 1241–1247.

5. Iasechko M., Sotnikov O., Larin V., Ochkurenko O., Maksiuta D. The model of a medium for creation of electric hermetic screens of the radio electronic means. *IJATCSE*. 2019. 8(2). Pp. 300–304.

6. Iasechko M., Turinskyi O., Larin V., Prokopenko T., Kolmohorov O., Salash O., Tarshyn V. The Investigation of the Impulse Evolution of the Radio-Frequency and Optical Radiation During the Interaction With the Solid-State Plasma Media On Radioisotope and Hexaferrite Inclusions. *IJETER*. 2020. 8(4). Pp. 1333–1337.