i.e. the decision that is most suitable for solving the given problem when using the least amount of resources [3].

The implementation of management decisions takes place after the formation of their sequence. It allows defining correctness and optimality of the decision made, monitoring and updating information about adequacy of the road networks.

At the end of planning a management decision, we make the analysis of its effectiveness, which is provided by identifying the reasons for discrepancy between the planned and actual values of indicators, after which, if necessary, the optimized arrangements are formed.

In conclusion, it should be noted that the AIMS for planning management decisions on the example of snow removal in an automated fashion gives a possibility to predict the course of creating management decisions based on the simulation model, and to analyze their effectiveness, considering conditions of the road networks and the existing standards, as well as the rules for cleaning streets.

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ELECTRODYNAMIC SIMULATION OF THE ULTRASHORT PULSE DECOMPOSITION IN THE SEVEN-STAGE MODAL FILTERS LAYOUTS

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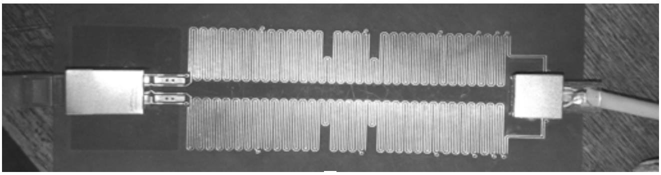
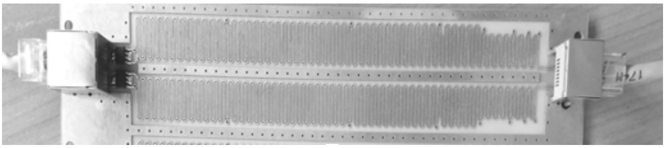
Today, Ethernet 100Base-T (Fast Ethernet) technology is widely used for data transmission in different types of networks. The problem of protection against intentional electromagnetic interference is very important. Therefore, it is urgent to develop devices protecting network equipment from such interference. Surge arresters, varistors, TVS-diodes or galvanic transformer isolation are commonly used to protect equipment from conductive interference. There has also been a proposal to use modal filters (MFs) for this purpose, as they contain no radioelectronic components, and have special structures used to facilitate the decomposition of dangerous high-voltage ultrashort pulses (USPs) and smaller pulses of up to several hundred picoseconds. The MF has a long service life, uses cheap material and is resistant to radiation [1].

The first construction of the seven-stage MF4 was presented in [2]. Later, an improved construction with the aligned width of half-turns was developed [3]. It is necessary to evaluate the effectiveness of protection against USPs for these structures. The purpose of this work is to perform electrodynamic simulation of the response to USPs in the printed circuit boards of the seven-stage MFs.

The investigated structures are shown in Fig. 1. The MF conductors have the following dimensions: width is 0.3 mm, height is 0.105 mm and length is 1300 mm. The passive and reference conductors are interconnected by the openings passing through the dielectric substrate. The conductor material is copper; the substrate is FR-4.



a



b

Fig. 1. MF4 (*a*) and improved MF4 (*b*)

The MF connection diagram is shown in Fig. 2. Resistance values are R_1=R_2=R_3=R_4=50 Ohm. A USP with an amplitude of 10 V and duration of 0.3 ns (Fig. 3) is applied to the input of the active conductor.

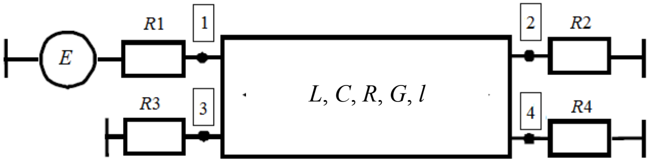


Fig. 2. MF connection diagram

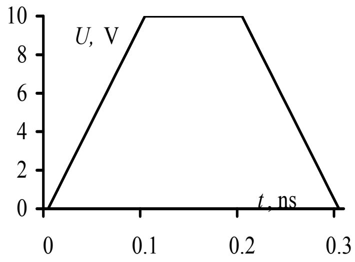
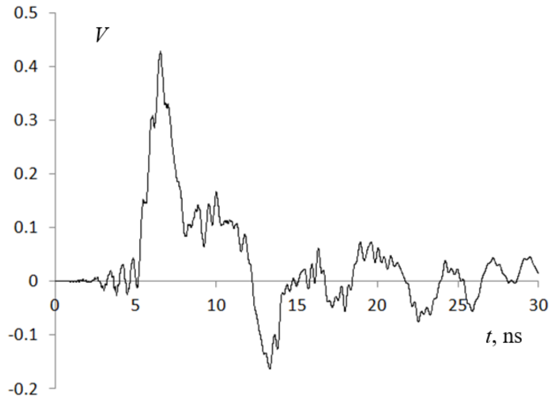
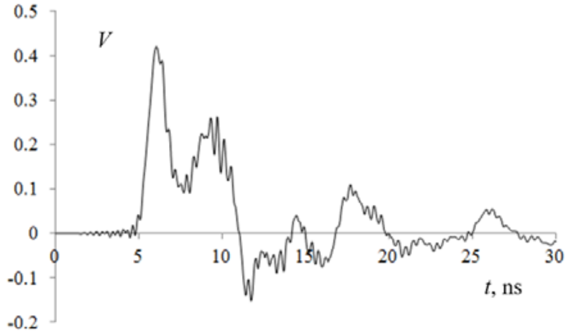


Fig. 3. Input USP

Figure 4 shows the response to the USP at the output of the MFs, which was obtained by electrodynamic simulation.



a



b

Fig .4. Response to USP at the output of MF4 (*a*) and improved MF4 (*b*)

The maximum output voltage of the MF4 is 0.43 V and the voltage at the output of the improved MF4 is 0.42 V. Thus, the presented MFs effectively protect Ethernet equipment from USPs.

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STATIC RECIPROCAL CONVERTER

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The power conditioning unit (PCU) of the spacecraft is one of the essential systems providing the trouble-proof functioning of the satellite in orbit. [1] Connection of onboard primary energy sources (solar and storage batteries) and satellite-borne equipment during ground tests is difficult. The main reasons are the lack of the solar energy equal to the energy in the outer space, the inability to set the required operating point on the current-voltage curve of the solar and storage batteries, as well as the inability to connect the required load of the spacecraft to the PCU [2]/

The Scientific Research Institute of Automatics and Electromechanics (Tomsk, Russia) designs simulating complexes for companies which are engaged in the production of spacecraft. The Institute's developments are a battery simulator, a solar battery simulator, a load simulator, a charge-discharge software and hardware complex, etc. [3] The next step in the development of ground-based test complexes is the design of a universal