ANALYSIS OF THE ACOUSTIC CHANNEL OF VOICE INFORMATION LEAKAGE IN A PROTECTED ROOM

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Protection of speech information in a dedicated room begins with the assessment of acoustic and vibration channels of speech information leakage [1, 2]. The research methodology based on creating acoustic signals in a dedicated room and then measuring the level of acoustic signals outside the room is rather complicated and time-consuming. Therefore, to assess the channels of speech information leakage, it is possible to use the results of the analysis of the acoustic channel of information leakage based on the physical model of the propagation of speech signals in the form of acoustic waves outside the allocated room.

In this work, for the mathematical description of the propagation of speech signals behind structural elements of premises, such as walls, over, ceiling, a rectangular plate was used for the corresponding selected element. The solution of the partial differential equation in the form of a numerical series for transverse vibrations of the enclosing plate is obtained. The equation used the approximation for a plate loosely fixed at the edges (for example, a hinged plate), for which there are no displacement and bending moments at the edges. The frequencies from the first to the tenth for the modes of natural vibrations of the wall made of gypsum blocks 0.09 m thick, 6 m long and 3.2 m high have been determined. The calculation results show that the frequencies of natural vibrations from the first to tenth in terms of wall height, length and their combinations are in the range from 70 to 5000Hz. It is shown that the spectrum of speech signals can be overlapped by a set of a number of natural resonant frequencies for the enclosing elements of the room. As a result, an acoustic wave with speech information is generated, which is excited by the back side of the enclosing structure.

Thus, acoustic vibrations are unevenly distributed throughout the building structure. There are certain areas with maximum values of natural vibrations. Such areas with maximum natural vibrations of structures must be localized by placing vibration sensors that generate an interference signal.

References

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