

THE EXPERIMENTAL SETUP FOR STUDY THE INFLUENCE OF THE NOISE SIGNAL TYPE AT SPEECH INTELLIGIBILITY

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Abstract — Setup for study the influence of the noise signal type on the voice information security by evaluating verbal and phrasal intelligibility of noisy speech signal is described.

1. Introduction

Initial data required for security analysis of acoustic speech signals are sound pressure level signals simulating speech with typical elements of soundproofing enclosures, sound pressure level of background acoustic noise and vibration levels of production of structural elements enclosing space. Obviously, the speech recognition component may be used to assess effectiveness of the closure technology of speech information leakage channels.

Experimental evaluation of speech was carried out in accordance with standard GOST R 50840-2000 STB using articulation table's phrases. For this, brigade of speakers consisting of two men and one woman was formed.

2. Main part

Modern means of active protection of speech information work on the principle of creating masking acoustic and vibration noise reconnaissance now used additive noise pollution useful signal noise or speech-like noise.

Today instrumental calculation methods (based on method Pokrovsky N.B.) for determining intelligibility are widely use [1]. But using of expert method allows identifying the difference in the calculation of speech intelligibility due to the type of interfering signal.

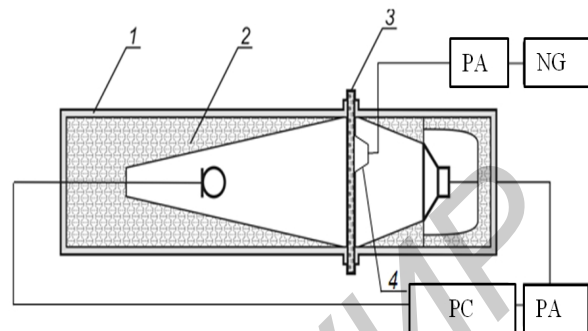
Recording and analysis was performed at various signal/noise. In the study of vibrating channel considered its own insulation value of construction elements which is through the sound.

Optimization of an interfering signal is an actual practical task. Speech intelligibility is the criterion used for optimization.

An experimental test bench setup to study the dependence on the type of speech interference signal and the signal/noise as well as sound insulation enclosing structure and the location of the vibro-acoustic transducers on it was investigated.

Experimental evaluation of speech was carried out in accordance with standard GOST R 50840-2000 STB using articulation table's phrases. For this, brigade of speakers consisting of two men and one woman was formed. Audio recording of acoustic signals representing test phrases from tables [2] was performed using a microphone Oktava MK-319, a sound card ASUS Xonar Essence ST and PC software installed Sound Forge 9.0 in an acoustically anechoic room. Processing of the audio files was conducted in software environments Sound Forge 9.0.

To determine the intelligibility through the walling elements, when exposed to an interfering signal is located between the flanges installation design element on which the movable side of the unit is fixed vibration interference signal emitter connected to the generator through the noise amplifier (Figure 1).



The schematic representation of experimental setup (vibration channel research): 1 is a metal tube; 2 is a sound-proof material; 3 is an element of building construction; 4 is a vibro transducer; NG is a noise generator; PA is a power amplifier; PC is a personal computer

Fig. 1

Furthermore, a signal representing a mixture of the test and the interference signal (white noise, and several types of speech-like Russian speech signal) is recorded on a PC using a microphone installed in the fixed part of the setup and analyzed by auditing group.

3. Conclusion

Studies have shown that the best results (lowest intelligibility) are achieved by using speech-like noise created from pre-formed (or generated in real-time) allophones of speech negotiators.

4. References

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ЭКСПЕРИМЕНТАЛЬНАЯ УСТАНОВКА ДЛЯ ИЗУЧЕНИЯ ВЛИЯНИЯ ТИПА ПОМЕХОВОГО СИГНАЛА НА РАЗБОРЧИВОСТЬ РЕЧИ

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Аннотация — Рассмотрена экспериментальная установка для изучения влияния типа помехи на защищенность речевой информации путем оценки словесной и фразовой разборчивости зашумленного речевого сигнала.