ANALYSIS OF THE ALGORITHM FOR DETECTING COMPUTER NATURAL ELECTROMAGNETIC RADIATION

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Abstract. In this article the analysis of the computer natural electromagnetic radiation is accomplished. It is shown that the correlation processing method is optimum if the noise is gaussian. By the results of experimental researches the method has been establish to process at miss probability no more than 10^{-5} for signal-to-noise ratio down to q =-12 dB.

The personal computer functioning is accompanied by radiation of electromagnetic waves in wide frequency band from units of kilohertz up to units of gigahertz. This electromagnetic radiation is called natural. Each device radiates a particular electromagnetic fluctuation spectrum depending on the data being handled by the device.

The modern science and engineering development level allows using computer natural electromagnetic radiation for illegal access to the information processed by these devices so there is a necessity to create devices for protecting information. Another important question is the personal computer electromagnetic compatibility with other devices, critical to radiation of the devices functioning in the same frequency band. So the purpose of this article is developing and researching the algorithm for detecting computer natural electromagnetic radiation.

For increasing the detection probability and computer natural electromagnetic radiating power estimation accuracy we offer to use the correlation algorithm [1]. The offered algorithm consists of the following parts. The first stage is forming the pulse characteristic of the matched filter by measuring computer natural electromagnetic radiation in a wide band of frequencies at minimally possible distance from the computer. For reducing the noise effect on the matched filter pulse characteristic accuracy averaging signals on set of the measured realizations is carried out. So the average signal inverted on time will be the pulse characteristic of the matched filter.

At the second stage noise level measurements are made at absence of the test signal. It allows to estimate the signal-to-noise ratio on the matched filter output and to set required probability of correct detection. At the following stage the estimation of the test signal detection probability is carried out at various signal-to-noise ratio. For choosing the threshold value of the signal on matched filter output we use Neiman-Pirson's criterion [2]. According to this criterion the threshold value for uniform distributed random noise is defined by the given false alarm probability. Having set a false alarm level and having determined the threshold voltage corresponding to this level, it is possible to estimate detection probability for small signal-to-noise ratio signals.

At the final stage the detection of computer natural electromagnetic radiation is made by estimating matched filter output signal at the certain time moments [3]. Comparing this signal voltage value with the threshold value the decision about signal presence or about its absence is accepted.

For researching the correlation algorithm of computer natural electromagnetic radiation detection we used experimental data of the monitor radiation. The test signal was the sequence of black and white horizontal strips. By the results of the carried out research the correlation method is established to process for chosen monitor test signal at miss probability no more than 10^{-5} for signal-to-noise ratio down to q = – 12 dB.

References

1. Баскаков С.И., Радиотехнические цепи и сигналы. 3-е изд. – М.: «Высшая школа», – 2000, 462 с.
2. Левин Б.Р., Теория случайных процессов и ее применение в радиотехнике. – М.: «Советское радио», 1960.
3. Латышев В.В., Рыжак И.С., Селин В.Я., Современные параметрические методы спектрального оценивания. – М.: Изд-во МАИ, 1996.