ANALYSIS OF EFFICIENCY OF FREQUENCY CHARACTERISTICS CORRECTION SYSTEMS FOR RECEIVING CHANNELS

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This paper considers the general factors affecting the efficiency of compensation for the interference of the auto-compensator, the problem of the non-identity of the characteristics of the main and compensating channels is described in details, and the efficiency of various methods for correcting the frequency characteristics of the receiving channels is analyzed.

Today the actual task of radiolocation is to protect against the effects of interfering radiations. The main way to protect against interfering radiation is to use auto-compensators. One of the factors that significantly affects the auto-compensator's efficiency of compensating the interference is the non-identical characteristics of the receiving channels.

The non-identity of the characteristics of the receiving channels is due to the random nature of the distortion of the characteristics in the receiving and compensating channels. With the same distortions of the channel characteristics, the mutually correlated signal connections at the output of the receiving channels are not violated. If the mutual correlation between signals and interference is maintained, as they pass through the receiving paths, the autocompensators can provide significant suppression of external interference. The interfering radiation undergoes a decorrelating effect on the characteristics of the channels during passage through them. First of all, this refers to the effect on the interfering radiation of the frequency characteristics of the receiving channels.

The influence of the non-identity of the frequency characteristics on the efficiency of compensation of interfering radiations is manifested in the following effects:

- reduction of the coefficient of inter-channel correlation of signals at the output of channels;
- errors in calculating the weight of the auto-compensator w in the compensation channel.

There is tendency to make the frequency characteristics of the compensation channels as close as possible to the frequency characteristics of the main receiving channel when correcting the frequency characteristics of the receiving channels of the autocompensator. At the same time, there is no exact knowledge of the frequency characteristics of the main receiving channel, since the frequency characteristics of the main receiving channel is equally susceptible to random distortions as the frequency characteristics of the compensation channels. Therefore, the problem of synthesizing systems and correction algorithms independent of the exact knowledge of the frequency characteristic of the main receiving channel of the auto-compensator is urgent, i.e. systems and algorithms that are invariant to the frequency characteristics of the main channel. Figure 1 shows the scheme of an adaptive characteristic corrector with the approximation of the frequency characteristic by a power series.

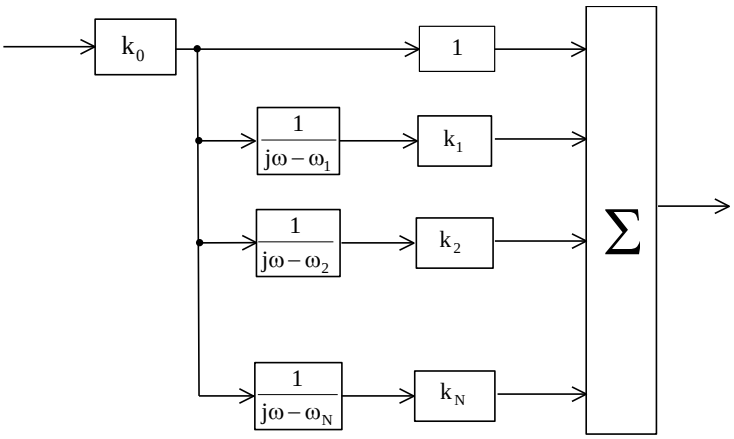

Figure 1. The scheme of the adaptive characteristic corrector with the approximation of the frequency characteristic by a power series

In the given scheme, the multiplier of coefficient k_0 provides a phase shift to compensate the delay of the spread over the antenna opening, and the multipliers by k_l provide equalization of the frequency characteristics of the receiving channels. In this case, a separate equalization of the phase shift due to propagation delay and channel non-identities is carried out.

References:

1. Abramovich Yu.I., Kachur G.V., Struchev V.F. "Methods of digital correction of multichannel location receivers" // Radioengineering and electronics. – 1982;
2. R. A. Monzingo, T.W.Miller, "Introduction to Adaptive Arrays", 2011.