Radioelectronics and Communications Systems
Vol. 47, No. 12, pp. 44–49, 2004

Izvestiya VUZ. Radioelektronika
Vol. 47, No. 12, pp. 61–69, 2004
UDC 621.396.43.833

ADAPTIVE CORRECTION OF SIGNALS IN SYSTEMS WITH QUADRATURE AMPLITUDE MODULATION

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The paper is devoted to the application of adaptive correctors of distortion in the systems with quadrature amplitude modulation in the presence of additive Gaussian interference. Effectiveness of the suggested method of adaptive correction is discussed.

Present-day radio communication channels are noted for the distortion of their amplitude-frequency response and nonlinearity of phase-frequency response. In the main pass-band this results in intersymbol interference (ISI) and, in communication systems with multilevel quadrature modulation (MQAM), which also leads to interchannel distortion (ICD). In addition to distortion in the communication channels, the additive Gaussian interference is also present. To compensate for this distortion, complex adaptive correctors are used. In this connection, it would be interesting to consider the effectiveness of the method of adaptive correction of signals backgrounded by additive Gaussian interference in the channel.

To investigate the method of adaptive correction of signal distortion, it seems expedient to consider the model of a communication system with MQAM and to deduce its main relationships. Such synthesis is possible owing to the linearity of communication systems. The block diagram of the communication system is shown in Fig. 1.

For the communication system under consideration, the signal at the output of the transmitter modulator

$$s(t)=\frac{A_{\max}}{\sqrt{2}\left(\sqrt{M}-1\right)}\left[\sum_{i=-\infty}^{\infty}a_i x(t-iT)\cos(2\pi f_0 t)-\sum_{i=-\infty}^{\infty}b_i x(t-iT)\sin(2\pi f_0 t)\right]$$

where a_i, b_i are the cophasal and quadrature data of the symbols at the ith time instant, taking the values ±1, ±3,..., $\pm(\sqrt{M}-1)$, when the number of positions in the video signal equals $\sqrt{M}$; f_0 is the carrier frequency; $A_{\max}$ is the maximum value of the signal amplitude; and $x(t)$ is the video pulse, whose shape is described as

$$x(t)=\begin{cases}1, & |t|\le T/2;\\ 0, & \text{in other cases,}\end{cases}$$

where T is the repetition period of the signal elements.

The signal $s(t)$ may be represented as the real part of the analytical signal

$$S(t)=s(t)+\mathrm{j}s(t)=\frac{A_{\max}}{\sqrt{2}\left(\sqrt{M}-1\right)}\left[\sum_{i=-\infty}^{\infty}c_i x(t-iT)\exp(\mathrm{j}2\pi f_0 t)\right] \quad (1)$$

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25 March 2003