Технические науки / 12. Автоматизированные системы управления на производстве

Kulyk A.J., Kulyk J.A, Kulyk A.A.

Vinnytsia National Technical University

Impact channel for information transfer process

Impact of interference on digital linear signal generated during transmission, in general form is quite specific requirements leads to it:

- ø linear signal should not contain a permanent component, which reduces the impact of the noise second kind between symbols;
- ø signal energy should be concentrated in narrowest frequency band;
- ø signal structure should be such that that you can select the alarm clock.

Almost to transmit information in real conditions appropriate to form a linear signal, which meets the above requirements.

Spectral analysis, conducted for the process of information transfer shows the mutual influence of harmonics generated by signals of a different character combinations, but calculations show that this can occur only for specific conditions, as in most real systems with wire or fiber lines to transmit information such distances without intermediate amplifiers or regenerators signals is impossible, and the devices themselves perform restructing signals in time. Therefore, it is advisable not to consider a superposition of harmonics of different pulse code combinations in lines, and the impact of individual pulse code combination.

Since the transfer of information at high speeds is in synchronous mode, the transmission of long sequences of zeros and units can lead to loss of synchronism. Given the above requirements, the signal must be like meanders.

The process of transmission of code combinations to reveal the nature of the signal in the channel of communication, described by the expression

$$U_{вых}(t) = \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\left(\frac{a_0}{2}+\frac{a_1}{2}e^{j\tau_{a1}\omega}+\frac{a_1}{2}e^{-j\tau_{a1}\omega}\right)\cdot e^{j(\omega t+\varphi(\omega))}\cdot\left(b_0(\phi)+b_{-1}(\phi)e^{-j\tau_{\phi 1}\omega}+b_1(\phi)e^{j\tau_{\phi 1}\omega}\right)dt =$$

$$= \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_0}{2}\cdot b_0(\phi)\cdot e^{j(\omega t+\varphi(\omega))}dt + \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_0(\phi)\cdot e^{j(\omega t+\varphi(\omega)+\tau_{a1}\omega)}dt +$$

$$+ \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_0(\phi)\cdot e^{j(\omega t+\varphi(\omega)-\tau_{a1}\omega)}dt + \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot e^{j(\omega t+\varphi(\omega)+\tau_{\phi 1}\omega)}dt +$$

$$+ \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_0(\phi)\cdot e^{j(\omega t+\varphi(\omega)-\tau_{\phi 1}(\omega))}dt + \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_1(\phi)\cdot e^{j(\omega t+\varphi(\omega)+\tau_{a1}\omega+\tau_{\phi 1}\omega)}dt +$$

$$+ \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_1(\phi)\cdot e^{j(\omega t+\varphi(\omega)-\tau_{a1}\omega+\tau_{\phi 1}\omega)}dt + \frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot e^{j(\omega t+\varphi(\omega)+\tau_{a1}\omega-\tau_{\phi 1}\omega)}dt +$$

$$+\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot e^{j(\omega t+\varphi(\omega)-\tau_{a1}\omega-\tau_{\phi1}\omega)}dt =$$

$$=\frac{a_0}{2}\cdot b_0(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega t+\varphi(\omega))}dt+\frac{a_1}{2}\cdot b_0(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t+\tau_{a1})+\varphi(\omega))}dt+$$

$$+\frac{a_1}{2}\cdot b_0(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t-\tau_{a1})+\varphi(\omega))}dt+\frac{a_0}{2}\cdot b_{-1}(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t-\tau_{\phi1})+\varphi(\omega))}dt+$$

$$+\frac{a_0}{2}\cdot b_1(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t+\tau_{\phi1})+\varphi(\omega))}dt+\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t-\tau_{\phi1}-\tau_{a1})+\varphi(\omega))}dt+$$

$$+\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t-\tau_{\phi1}+\tau_{a1})+\varphi(\omega))}dt+\frac{a_1}{2}\cdot b_1(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t+\tau_{\phi1}-\tau_{a1})+\varphi(\omega))}dt+$$

$$+\frac{a_1}{2}\cdot b_1(\phi)\cdot\frac{1}{2\pi}\int_{-\infty}^{\infty} S(\omega)\cdot e^{j(\omega(t+\tau_{\phi1}+\tau_{a1})+\varphi(\omega))}dt =$$

$$=\frac{a_0}{2}\cdot b_0(\phi)\cdot U_{ex}(t)+\frac{a_1}{2}\cdot b_0(\phi)\cdot U_{ex}(t+\tau_{a1})+\frac{a_1}{2}\cdot b_0(\phi)\cdot U_{ex}(t-\tau_{a1})+\frac{a_0}{2}\cdot b_{-1}(\phi)\cdot U_{ex}(t-\tau_{\phi1})+$$

$$+\frac{a_0}{2}\cdot b_1(\phi)\cdot U_{ex}(t+\tau_{\phi1})+\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot U_{ex}(t-\tau_{a1}-\tau_{\phi1})+\frac{a_1}{2}\cdot b_{-1}(\phi)\cdot U_{ex}(t+\tau_{a1}-\tau_{\phi1})+$$

$$+\frac{a_1}{2}\cdot b_1(\phi)\cdot U_{ex}(t-\tau_{a1}+\tau_{\phi1})+\frac{a_1}{2}\cdot b_1(\phi)\cdot U_{ex}(t+\tau_{a1}+\tau_{\phi1}) \qquad (1)$$

Expression (1) shows that when transmitting information to real communication channel along with a signal that is transmitted, and ahead to him belatedly formed symmetrical secondary signals. Their formation does not depend on the nature of the communication line, shape and speed of signal transmission. All of the above parameters can only worsen the overall picture. So, for transmission at high speed is not enough to consider only the constant component and first harmonic, according to this increase in the number of secondary signals. Since the rectangular impulse capacity series of harmonics without end, then, even when transmitting low speed, the number of formed secondary signals will be without end.

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