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COMPENSATION OF ADDITIVE FLUCTUATING INTERFERENCE IN THE INFORMATION PROCESSING SYSTEMS

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The paper describes a device for compensation of narrow-band additive fluctuating interference in the information processing systems of various purposes. The functional diagram of the device is considered and its operation is explained.

The additive fluctuating interference caused by the antenna noise and receiver intrinsic noise (of thermal and shot nature), after passing the selective amplifier (IF amplifier, for instance), has the form of a narrow-band random process [1]

$$n(t) = A(t)\cos[\omega_0 t + \varphi(t)]$$

where the envelope $A(t)$ and phase $\varphi(t)$ are slowly changing random functions of time.

In the information processing systems dealing with signals without the angle or quadrature modulation, compensation of such interference is possible. In such systems the signal can be written in the general form — $s(t) = A_s(t)\cos\omega_0 t$. Particularly, in the case of tone amplitude modulation, $A_s(t) = A_0(1 + m\cos\Omega t)$.

The block diagram of the device for compensation of the interference is shown in Fig. 1, where *1* is a selective amplifier; *2*, *3*, *10*, *11* — synchronous detectors (SD); *4*, *5*, *12*, *13* — low-pass filters (LPF); *6*, *7* — modulators; *8*, *9* — band-pass filters with their AFR close to rectangular; *14* — an inverting amplifier with variable gain factor; *15* — adder; *16* — adjustable generator of the reference frequency ω_0; and *17* — phase shifter by 90°. The dashed line in the upper (main) and lower (compensation) channels marks the devices comprising the wide-band low-frequency phase shifters.

To simplify the further consideration, assume that the transfer factors of the synchronous detectors, modulators, and filters are equal to unity, and the outputs of the generator of reference frequency ω_0 and of the 90°-phase shifter yield the unit voltages $\cos\omega_0 t$ and $\sin\omega_0 t$, respectively. Also, assume tentatively that the low-pass filters in the channels are identical, so that the phase shifts introduced may be not taken into account.

The necessary condition for operation of the interference compensation device is usage of the synchronous (coherent) method of radio reception. The principle of the device operation is as follows. The synchronous detector *2* is activated by a signal-interference mixture, and by the voltage $\cos\omega_0 t$ coming from the output of generator *16*. The voltage at the output of SD *2*

$$u_2(t) = \{A(t)\cos[\omega_0 t + \varphi(t)] + A_s(t)\cos\omega_0 t\}\cos\omega_0 t =$$
$$= \frac{1}{2}A(t)\cos\varphi(t) + \frac{1}{2}A(t)\cos[2\omega_0 t + \varphi(t)] + \frac{1}{2}A_s(t) + \frac{1}{2}A_s(t)\cos 2\omega_0 t.$$

After LPF *4*, suppressing the high-frequency components, the voltage

$$u_4(t) = \frac{1}{2}A(t)\cos\varphi(t) + \frac{1}{2}A_s(t).$$

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