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AUTHOR: Georgiyev, V. K.

TITLE: On the comparative characteristics of frequency telegraphy and relative phase telegraphy systems in a channel with fading

PERIODICAL: Elektrosvyaz', no. 12, 1962, 14 - 18

TEXT: This article is a comparative analysis of frequency telegraphy (FT) and relative phase telegraphy (RPT) systems for channels with a constant speed of transmission. The analysis is made taking into account: 1) the fluctuation noises, 2) the interferences distributed on the frequency axis according to the Poisson law. In the first part of the analysis the author reproduces a set of comparison curves showing the noise immunity of binary and multiplex FT and RPT systems in the case of a channel with fadings according to the quasi-Rayleigh law (for the distribution of the envelope of the signal E):

$$W(E) = \frac{E}{\sigma_0^2} \exp\left[-\frac{E^2 + U^2}{2\sigma_0^2}\right] I_0\left(\frac{EU}{\sigma_0^2}\right), \qquad (1)$$

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at $\rho^2 = \frac{U^2}{2\sigma^2} = 0,5$ and 10 respectively, U being the amplitude of the regular component of the signal, σ_0^2 the average statistical value of the power of the scattered components and $I_0(x)$ the imaginary argument first-kind Bessel function; in the RPT noise-immunity calculation, the autocorrelation factor R of the time-spaced quadrature components of the signal was taken equal to 0.995. These comparison curves reveal that the equivalence of the FT and RPT systems occurs at values of error probabilities already ensuring a satisfactory (or nearly satisfactory) quality of communication. The advantages of RPT over FT are considerable, even if only noise immunity as regards fluctuation noises is taken into account in the comparison. These advantages manifest themselves especially when the signal contains a regular component. The development of RPT systems permitting the operation with several values of τ (duration of the sending) removes the main objection to their use in the short-wave range. Examining next the case in which the mutual interferences from operating stations (and not fluctuation noises) play the predominant part and assuming that the stations are distributed chaotically over the frequency range (the probability $p(\ell, F)$ of the existence, in the band F, of interferences from ℓ stations, whose level exceeds E, being found from

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the Poisson distribution), the author reproduces a table showing the advantage of using RPT systems in this case. His other conclusions are: 1) the advantages of FT over RPT begin to manifest themselves, as a rule, only when both systems already ensure a satisfactory quality of reception, the reduction of error probabilities becoming less important; 2) the case of the purely Rayleigh fading with a weak correlation between sendings is the most unfavorable case for RPT. There are 1 figure and 1 table.

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