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ANALYSIS AND CORRECTION OF DYNAMIC CONDITIONS IN LINEAR NETWORKS

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The paper considers the method of dynamic transfer factor for the problems of analysis and correction of transient processes in linear networks. The analytical expressions derived make it possible to simplify calculation of dynamic expressions and to generalize the analysis of dynamics of digital linear filters. A method is developed for control of duration of transient processes in linear filters, and block diagrams of devices, permitting such control, are presented. It is also shown that the transfer function of a filter with controlled duration of transient process is dictated by sections of the two-dimensional function of the dynamic transfer factor.

Because of inertial behavior of the majority of selective systems, in the course of processing of non-stationary signals the dynamic distortion mat occur. The linear networks represent a broad class of radio-engineering devices, so that analysis of transient processes and estimation of dynamic distortions in these devices are invariably pressing problems.

At the present time we know a whole number of methods for determination of network response, which permit to analyze the network dynamics. These are methods based on the Duhamel integral in the time domain [1], the frequency methods of the Laplace and Fourier integral transforms [1], or the frequency-time method of dynamic transfer factor (DTF) [2].

When some analog devices are modeled by digital ones, and the main task consists in retaining the shape of the amplitude-frequency response, transient processes can be taken into account by digital methods. Then in the dynamic analysis based on the Duhamel integral method we use a discrete convolution, while from the Laplace and Fourier integral transforms we pass to discrete transforms [1].

The DTF method is most informative, since it discloses the network dynamics in the frequency-time plane. However, because of a great amount of computations, it did not gain acceptance and has no applications to digital devices.

At the present time the high level of information technologies facilitates the use of DTF method, and its development for analysis of dynamics of digital devices becomes an actual task. Obviously, not only the analysis itself, but development of methods for correction of dynamic distortions of linear filters with the aid of DTF are of importance.

As applied to analog networks, the dynamic transfer factor, as well as the instantaneous spectrum of a signal [3], can be defined via Fourier integral with the variable upper limit:

$$K(\mathrm{j}\omega, t) = \int_0^t h(\tau) \mathrm{e}^{-\mathrm{j}\omega\tau} \, \mathrm{d}\tau \qquad (1)$$

where $h(\tau)$ is the pulse response of the network.

For a current time instant t, in (1) we determine DFT sections yielding the frequency responses of the network in the dynamic mode of operation. At the same time, if we fix the frequency ω, expression (1) gives the complex envelope of the

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