

## **A COMPLEX GENERALIZED MODEL OF AUTOREGRESSION OF NON-GAUSSIAN PROCESSES**

V. A. Tikhonov and K. V. Netrobenko

*Kharkov National University of Radioelectronics, Ukraine*

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**The paper is devoted to the problem of generation of higher-order statistics for complex non-Gaussian random processes. The generalized complex autoregressive models based on the moment functions are set up. A technique is developed for generation of complex non-Gaussian random processes by prescribed parameters of higher-order spectra.**

For the full description of non-Gaussian processes in the time domain, we must use the whole stock of the moment or cumulant functions [1], representing the higher-order statistics. In the literature known to the authors of the present work the problem of generation of higher-order statistics for complex non-Gaussian processes has received little attention [1–4]. The models of complex processes and signals are applied to treatment of many practical problems. Processing of quadrature components of complex signals is used, for example, in detecting legitimate signals against interference background, in correctors of communication channels, for complex demodulation of band-pass signals, etc. The complex signals may represent analytical signals, radio or acoustic waves scattered on inhomogeneities of the atmosphere, or on liquid flows when using noncontact methods for measurement of velocity of a flow and of intensity of rotational fluctuations in it.

Although the most of random processes, described by autoregression (AR) models, are real-valued, the complex AR model based of the second-order statistics permits to describe some classes of random processes in more detail [5]. Based on higher-order statistics of non-Gaussian processes we can set up the generalized model of autoregression (GAR) permitting to consider non-Gaussian properties of actual processes [6]. This GAR model finds application in a number of problems, whose treatment is either difficult or impossible with the aid of second-order statistics [7, 8]. Because of this, construction of the GAR model of non-Gaussian complex processes is an important issue.

The purpose of this work is development of the theory of generation of higher-order statistics of non-Gaussian complex processes and the use of this theory for synthesis of the complex GAR model.

To attain the goal thus formulated, we must resolve the following tasks:

- (a) to find the expressions for the moment and cumulant functions of complex non-Gaussian processes;
- (b) to outline their major properties;
- (c) to develop the theory for constructing the GAR model of complex non-Gaussian processes;
- (d) to suggest the technique for generation of a complex non-Gaussian process with prescribed spectral characteristics;
- (e) to apply the method of statistical simulation to sampling the imitating processes; and
- (f) to assess, with the aid of the deduced expressions, the GAR model parameters and the parametric spectra of the third order.

**Properties of the moment functions.** Let  $\dot{x}[t]$  be a stationary complex non-Gaussian process with the zero mean. Its third-order moment function (MF) will be defined by expression

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