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Initial Phase of Radio Signals when Determining Quadrature Amplitude Modulation

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Abstract. The exponential growth in the volume of transmitted data requires the development of effective methods for processing and analyzing signals especially under conditions of a priori uncertainty. This paper proposes an algorithm for estimating the carrier frequency offset and initial phase of quadrature amplitude modulation (QAM) signals based on fourth-order cumulants. The method is based on the use of the properties of fourth-order cumulants, which are invariant to phase shifts. An algorithm has been developed that makes it possible to accurately determine the values of the carrier frequency and initial phase of QAM signals in the absence of a priori information about the signal parameters. Experimental results demonstrate the high accuracy and efficiency of the proposed algorithm in problems of radio monitoring and radio frequency spectrum analysis.

Goal. Development and analysis of a signal processing algorithm in communication systems under conditions of structural and parametric uncertainty.

Results. A general methodology has been developed for the synthesis of an algorithm for determining the value of the carrier frequency and the initial phase of signals with quadrature amplitude modulation.

Practical significance. The use of the developed algorithm in the design of radio-electronic systems makes it possible to take into account the influence of the carrier frequency and the initial phase of the signals on the quality of radio monitoring of radio signals with QAM.

Keywords: radio signal, quadrature amplitude modulation, phase constellation, cumulant, moment

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