AUTOMATED SYSTEMS FOR TESTING PRODUCTS OF NANOELECTRONICS

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Features of the theory and practice of constructing automated systems of complex tests for the study of nanoelectronics products are related to the specifics of the basic requirements for them, which contradict each other. This achievement of high accuracy in the formation of test actions and in the evaluation of response parameters in a wide frequency band, while ensuring high speed. In this case, the system should be able to generate coherent signals in different channels, and the parameters of the signals should correspond to the objects of research.

Keywords: nanoelectronics, phase, error, metrology

Problem Definition:

When analyzing the tasks of developing such systems, five areas can be distinguished: 1) the functional and elemental base of automated systems; 2) formation of test actions; 3) evaluation of the signal parameters in the system; 4) metrological attestation; 5) architecture and maintenance of the algorithm of work.

The evaluation of the ultra-high-frequency control equipment measuring the time parameters in the subnanosecond region shows that the existing and developing element base will not allow to meet the above requirements [1].

In automated systems of complex tests, two main problems can be identified: the choice of a method for measuring the parameters of signals in a complex that provides the necessary accuracy and reliability, and the problem of the technical implementation of built-in information retrieval devices that ensure a small error due to non-identity and connection of information retrieval devices.

Research:

The analysis of metrological aspects shows that the certification of time parameters should first of all include minimizing the phase separation of the channels, both generator and measuring. Channel delay is a random variable, the characteristics of which depend on the delays of the component channels of the blocks. At the same time, the metrological appraisal subsystem should provide high resolution and accuracy of measurement results. The architecture of the system with a contact set of resources is known, allowing calibration in each channel individually (using a reflectometer), but this solution is partial, cumbersome and does not allow organically to link the certification of automated test systems [2]. There is no universal solution to the problem of metrological attestation, which makes it possible to ensure high reliability of the values of the parameters of the signals being formed and measured.

Thus, in the architecture of a broadband automated test system, the most important aspects are the mutual synchronization of modules. Therefore, the concept of constructing a system architecture based on phase methods is offered, where the possibility of solving the problem of automated metrological certification [3] is laid. When working in the femto-second range of time parameters and a wide range of clock frequencies, the following conditions must be met:

1) the period of the clock signal and the value of the set time parameter must be uniquely and coherently connected;

2) the values and discreteness of the time parameters are close to the existing delays and fluctuations in the switching time of the components of the element base;

3) the values of the temporary instability of the parameters being set are comparable with the values of the parameters themselves;

4) the transfer of correction and calibration methods to the region of ultrahigh frequencies is associated with the problem of obtaining information about the magnitude of the non-identity and adjusting its magnitude with the necessary discretion and accuracy.

Relevance:

The above requirements are satisfied precisely by the phase methods:

1) they have maximum sensitivity and allow to obtain any number of coherent signals in any number of different channels;

2) with increasing clock frequency, the accuracy of specifying the same time shift by the phase method increases, and phase-locked loop systems have the property of suppressing time noise;

3) phase-locked loop is frequency-dependent and can be quasi-static in phase;

4) the phase methods have no restrictions on the frequency range.

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