Implementation of the Real-Time Assessment of Dynamic Allan Deviation and Dynamic Time Deviation

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Dynamic Allan deviation and dynamic time deviation provide more detailed information about analyzed timing signal than commonly used parameters. The characterization of the timing signal using dynamic parameters allows to recognize the variations of the phase noise affecting the analyzed signal[1,2]. The estimates of the parameters are computed for a series of observation intervals using the data segments (non-overlapping or overlapping) of previously measured sequence of time error samples. The results of computation are presented in the form of three-dimensional plot.

The evaluation of the synchronization signal is commonly a two-stage process – calculation of the parameters follows the time error measurement. However, the application of real-time computation of these parameters performed during time error measurement process allows to simplify the evaluation procedure of the timing signal. As a result, the maintenance team of the telecommunication network can track the parameters' values in the real time and immediately perform suitable reactions. The algorithm of the real-time assessment of the dynamic parameters must enable to perform necessary computations for all observation intervals and all data segments within one sampling interval. Therefore it needs specific data arrangement and organization of performed calculations. The computation methods enabling assessment of the dynamic parameters in the real time were proposed and tested[3]. The experimental tests have proved the ability of joint computation of these parameters in the real time for non-overlapping as well as for overlapping data sequences.

In the paper the results of the implementation of the methods enabling real-time assessment of dynamic ADEV and dynamic TDEV during time error measurement are presented. To test these methods in a real measurement process, some special measuring systems, designed and developed in the laboratories of Poznan University of Technology, were used[4]. Several conditions were considered during the implementation: different values and ranges of observation intervals, data segments arrangement, data structures and its organization. Some hardware and software solutions enabling to join the time error measurement and parameters' computation in one effective process are discussed and suggested.

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