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The way to increase GPS synchronization accuracy for distributed geophysical systems.

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The multi-parametric analysis of the natural environment structure is a very important element of today's research. Regularly this includes getting synchronous data of electromagnetic fields variations at more or less big area. To ensure these goals, the synchronous operation of numerous field stations is required. In spite of GPS availability the normally obtained synchronization precision is not enough because of the instability of the GPS synchronization signal, especially for AC fields monitoring. To raise the synchronization accuracy, a new structure of the synchronization device has been developed. A linearized model of the synchronization device was constructed and its computer simulation was carried out. To replace the set of spaced stations, a method for analysing an equivalent virtual reference oscillator with phase instability is proposed. The stochastic model of a set of synchronization devices is developed. The development of this model allowed us to derive the equation of the evolution of cumulants of the random process of clocking. The computational experiments made it possible to identify the parameters of the model, in particular the loop gain, the coefficients of inertia, and the proportionality of the loop filter. The calculated and experimental results obtained have made it possible to improve the quality of synchronization of spaced stations. The verification of the results was carried out in the structure of the broadband magnetotelluric station LEMI-423. The experimental results confirmed significant reduction of the obtained error from the instability of the GPS synchronization signal.