

STABILITY OF REGIONAL POSITIONING IN NAVIGATION FIELDS OF GLOBAL SATELLITE SYSTEMS

E. T. Skorik

UkrKosmos State Enterprise, Kiev, Ukraine

The paper determined the conditions of functioning and composition of technical national facilities if ensuring stability of position finding and navigation by information fields of global satellite radio navigation systems, whose maintenance is provided by owners of the systems outside the regional borders of the area used by civil users as well as the conditions for stable operation of these facilities in the presence of interference, selective access and other limitations in the case of unlicensed use of the open code of standard mode.

Despite the initial military nature of developments of the most known satellite radio navigation systems (SRNS) — GPS NAVSTAR (USA) and GLONASS (Russia), their wide-scale use in civil sectors of national economy and science led to a number of problems. One of them is related to legal and technical conditions of using SRNS that are controlled by two individual countries, for objectives of national and regional navigational support of other countries and international communities [1]. In Ukraine the development of space technologies is regulated by the law “On space activities for the period of 1998–2002” which provides for that in order to implement the civil SRNS, type GNSS, navigational support in the country is based on using SRNS informational fields GPS NAVSTAR and GLONASS whose main parameters are given in Table 1. In terms of technical solutions these SRNS may be referred to queuing information systems equivalent to systems of radio communications with synchronous and inphase (coherent) passive reception of information from at least 3–4 signal sources simultaneously observed located on average-height navigational space vehicles (NSV).

When designing and operating communications systems the main goal is establishing and maintaining the criterion of their quality. To this end the mathematical model of the system is drawn with particular output effects based on the decomposition of the common model. Thus, based on the conditions of cohesion, stationarity, and stability of the communications systems the problems of errors and interferences are solved. The generalized model of the navigation field-system of navigational support-user’s hardware (NF – SNS – UH) system, contains vectors of input effects X ; the output parameters of the system Y , external (including interference) factors Z , internal parameters of the system q from the set Q . The problem of stable performance (robustness) of the system lies in ensuring its guaranteed performance under conditions of the effects of destabilizing factors Z .

Let us consider the problem stability in the small circuit of the regional navigational service in informational fields of global SRNS. Its importance is related to that in 2000 the time specified in the decision of the US Congress elapses, whereby civil communities use without any restrictions whatsoever the open S/A code of standard accuracy. By this term it is planned to identify the structure of the civil SRNE, type GNSS. The first phase designed according to the EGNOS project of the European Space Society ESA was implemented based on navigational supplement to the geostationary communications system INMARSAT-3 in the form of regional solutions: in Europe it is EGNOS proper, in the US it is WAAS, and in the nearest future, in the Far East — MSAS based on the Japanese SV MTSSA.

The operational stability of SRNS will be determined as integral (generalized) factor characterizing the output function of the system with basic components of failure and noise immunity. The operational stability is given much attention to along with accuracy characteristics since SRNS in the future is considered as the main navigational facility. In this case the

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