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Estimation of Throughput Capacity of “Luch” Relay Satellites to Control Low Orbit Spacecraft in S-Band Frequencies

A.I. Zhodzishsky, *Dr. Sci. (Engineering), contact_spacecorp.ru*
Joint Stock Company “Russian Space Systems”, Moscow, Russian Federation

V.V. Kraskov, *postgraduate student, contact_spacecorp.ru*
Joint Stock Company “Russian Space Systems”, Moscow, Russian Federation

M.S. Leonov, *Dr. Sci. (Engineering), contact_spacecorp.ru*
Joint Stock Company “Russian Space Systems”, Moscow, Russian Federation

N.V. Ryabogin, *Cand. Sci. (Engineering), contact_spacecorp.ru*
Joint Stock Company “Russian Space Systems”, Moscow, Russian Federation

Abstract. The paper deals with the application of geostationary “Luch” relay satellites to control low orbit spacecraft (SC) of multisatellite orbital constellations in the multi-station access (MSA) mode in the S-band frequency range. The calculation technique and results of the signal energy ratio to a bit of information to the total spectral power density of noise and interference E_0/N_0 from other SC depending on the n number of simultaneously operating SC-subscribers and the speed of the transmitted data are given.

It is shown that the ratio $e E_0/N_0$ in the radio line SC-subscriber — “Luch” relay system is weak, and in the radio line SC-subscriber — “Luch” relay system is strongly depends on the n number. The existing “Luch” relay systems do not allow providing control of multi-satellite constellations. In order to realize a MSA on a relay system instead of a weakly directional transmitting antenna, it is necessary to install a multibeam active antenna array.

Keywords: multi-satellite constellation, relay satellite, multifunctional relay space system “Luch”, spacecraft control, multi-station access, radio link calculation, S-band frequencies, data transmission rate

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