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ORBITAL SUPERCOMPUTER AS A NEW SOLAR POWER SATELLITE CONSUMER

Abstract

The paper considers a new aspect of space exploration: information generation in space represented as a new type of energo-production cycle referred to as infocommunication cycle. In this cycle, energy is used for receiving, processing, storing and transmitting data and is almost completely converted into heat. According to the UN, the volumes of electricity consumed and heat generated in this cycle have grown significantly in recent years and are already having a significant impact on the Earth's climate change. The peculiarity of the infocommunication cycle is that the it territorial-production complexes can be placed in the near-Earth space areas constantly illuminated by the Sun. The profitability of the space power plant is increased, since the energy received from the Sun is used to produce valuable data, for example, in high-performance computing, and instead of the potentially dangerous wireless energy transmission the tried and tested space communication technology is used. Transferring the data generation into outer space complies with the trend of global warming preventing. The high price of information products allows us to consider creating a new space market segment. The report shows that the placement of data centers and high-performance supercomputers in orbit is an incentive for the development of cost-effective space energy. The main trends and engineering challenges associated with the development of this project are considered. It has been shown that existing startups dealing with space-based data centers have not paid attention to the prospect of combining a data center with a solar power station. The report suggests organizing a closed-loop infocommunication energo-production cycle in the LEO in the form of system consisting of a communications satellite, a supercomputer, a solar power station, and a temperature control system. The selection of design parameters for such a spacecraft is defined. A simple mathematical model of the orbital supercomputing center mass is used as an example. This model shows that for this type of a single-launch LEO satellite there is an optimal operational orbit that can lie below radiation belts. This result is important, since the LEO is convenient both in view of organizing high-speed communications and in view of the orbital maintenance. Increasing the power of the orbital computing center can be achieved either by assembling a complex of several modules, or by creating a grouping of such devices and combining them into a cluster using high-speed laser communication channels.