IAF SPACE POWER SYMPOSIUM (C3)
Solar Power Satellite (1)

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DISTRIBUTED SOLAR POWERED SUPERCOMPUTER SATELLITE

Abstract

Solar Power Satellite (SPS) is one of the most ambitious projects on the industrial use of space, which has not yet been implemented to date for several reasons. Firstly, obtaining significant electric power is associated with the need to create very large-sized solar panels, which raises a lot of problems in the field of structural strength and dynamic. Secondly, wireless power transmission technology is not yet fully ready for industrial application. Third, the need to transfer energy to a stationary ground-based receiver requires the use of a GSO to place the SPS. These problems can be solved if SPS is considered not in isolation, but as part of a new orbital energy-production cycle, which can be called infocommunication cycle. In this cycle, power is consumed for information receiving, processing, storing and transmitting, and is almost completely converted into heat. The space-produced electric power can be used locally to produce valuable information, such as in high performance computing or big data analysis. Additionally instead of the potentially dangerous technology of wireless power transmission, the mature technology of space communication can be used. It is also very important that the transfer of information production into space is consistent with the trend of combating global warming. According to the UN, the amount of electricity consumed and heat generated in infocommunication cycle has been increasing in recent years and is already having a significant impact on the Earth's climate change. The project of distributed Solar Powered Supercomputer Satellite (SPSS) is proposed. Instead of traditionally SPS layout with large-sized solar panels, placed on the GSO a LEO SPSS constellation is considered. The individual SPSS are similar to existing communications satellites and can be built based on proved technology. High-speed inter-satellite communication channels allow creating a high-performance data centers network, which can be used for various commercial applications and have higher profitability than an isolated SPS. Such a distributed SPSS network could be of particular interest for cryptocurrency mining, as it provides additional information security and leaves no carbon footprint. The presented simple mathematical model makes it possible to find a rational number of satellites for a given electrical power capacity. The dependence of the profitability of an information product produced in orbit in comparison with its ground-based analogue, depending on the cost of emission quotas for waste heat and greenhouse gases, is also discussed.