Paper ID: 53864
interactive

IAF SPACE POWER SYMPOSIUM (C3)
Interactive Presentations - IAF SPACE POWER SYMPOSIUM (IP)

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CREATION OF A DEMONSTRATION SPACE SOLAR POWER STATION

Abstract

To problems of design of large space stations, in particular creations of control systems, many scientific articles are devoted. Analysis of the current state of the potential of space solar power stations (SSPS), revealed the main problems of creating SSPS. The proposed way of implementing SSPS through the creation of information-related clusters of satellite power stations is based on existing space platforms and launch vehicles. Conducted preliminary studies allowed determining the appearance of a space platform for collecting and converting solar energy into electrical energy, a ground receiving and converting energy station, a channel for converting energy into laser energy and transmitting it to Earth, as well as studying the potential and state of space infrastructure and space facilities for providing SSPS creation. Of greatest interest is the creation of a demonstration SSPS using laser radiation. The main problem of such a station is the high-precision guidance of the energy transmission channel to the ground receiving point, which includes solving problems: controlling the angular motion of a spacecraft (SC); guidance of the energy transmission channel in the direction of the received pilot beam. The spacecraft control system must provide guidance for photovoltaic sensors on the Sun with an accuracy of +/-2 degrees. Since the system for guiding the beam of energy transfer has the ability to change the direction of the beam in the range of +/-30 degrees, the task of fulfilling the requirement for the guidance of photovoltaics at the Sun for the spacecraft control system becomes decisive. On the basis of the available technologies and the element base in the SC development of the demonstration SSPS, the selection of the executive bodies of the spacecraft angular motion control system was carried out; the task of ensuring the stability of the angular motion of the spacecraft under the conditions of a low frequency of elastic oscillations of the panels of photo-emitting modules has been solved; the choice of orientation modes and the required instrumental composition of the measuring means was made. As a result of the analysis of the tasks of the control system for the demonstration SSPS, the composition of the hardware and the stages of its implementation were established. The results of preliminary studies proved the possibility of achieving the stated accuracy parameters of SSPS.