

SPACE POWER SYMPOSIUM (C3)

Joint Session with IAA Commission 3 (Space Technology & System Development) on "Solar Energy From Space" (1)

Author: Mr. Shoichiro Mihara

Japan Space Systems, Japan, Mihara-Shoichiro@jspacesystems.or.jp

Mr. Takashi Saito

Institute for Unmanned Space Experiment Free Flyer (USEF), Japan, saito@usef.or.jp

Mr. Yutaro Kobayashi

Institute for Unmanned Space Experiment Free Flyer (USEF), Japan, y.kobayashi@usef.or.jp

Dr. Koichi Ijichi

Japan Space Systems, Japan, Ijichi-Koichi@jspacesystems.or.jp

CONSIDERATION OF NEXT LOGICAL STEP FOR WIRELESS POWER TRANSMISSION OF SSPS
BASED ON ACTIVITIES AT USEF

Abstract

Institute for Unmanned Space Experiment Free Flyer (USEF) has been studying wireless power transmission (WPT) under the contract of Ministry of Economy, Trade and Industry (METI). In this study, we have focused on the microwave power transmission as a key technology for the realization of future Space Solar Power System (SSPS). Consideration of next logical step for WPT of SSPS based on activities at USEF is presented in this paper. Because the necessary diameter of transmission antenna is proportional to the square of effective distance for wireless power transmission, the Space Solar Power System with microwave power transmission shall be very large in order to send from the Geostationary orbit, 36000 km above the ground. Proposal of the verification of the SSPS with very large system directly is attractive for realization of commercial base SSPS but that is not easy choice for any government or organization to do by single step. SSPS community has been facing difficulty finding solution to propel the development of the system. Therefore step up demonstration and validation to the feasible system is necessary way to the realization of the system. Current system concept, development plan and previous development are discussed in this paper as follows. (1) Current system concept: The latest concept is a simple, technically feasible and practical configuration SSPS which consists of a power generation/transmission panel suspended by wires from a bus system above the panel. Units of tethered-SSPS are integrated to the commercial plant of 1 GW level (integrated tethered-SSPS with multiple buses). (2) Step up demonstration and validation plan: The integrated tethered-SSPS has huge amounts of power generation/transmission panels, having solar cells on both sides and phased array antenna on one side. The lightest weight and highest performance transmission panel with accurate beam steering is required for the system. Step up demonstration and validation for the transmission panel is very important to reach goal. Validation and demonstration of basic SSPS unit is a goal before the preparation of inexpensive transportation tool to orbit. Near future goal and its development plan is presented. (3) Previous study and demonstration at USEF: A. Microwave transmission to the moving object is one of the spin off fields of SSPS technology. Light weight microwave transmission panel and rectenna for rover has also been developed. B. Microwave beam control system and frequency/phase synchronous system with wireless RF among the transmission antenna modules are studied.