RF TRANSMISSION POWER DISTRIBUTION

BY DISCRETE SPACE SEGMENTS OF SSPS

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Many studies on SSPS (Space Solar Power Station) have been made mainly with a huge and monolithic phased array antenna for RF transmission from the space segment[1, 2]. Assuming 1km aperture antenna, for example, approximately 700 million antenna elements are required at 5.8 GHz frequency. This concept may be read that SSPS should be a far-future application compared with the current technology. In order to make SSPS applicable in the nearer future, a different system concept is proposed in this paper.

The system is to utilize number of space segments, discretely distributed in orbit, with each relatively smaller aperture antenna. This concept should be more feasible from the viewpoints of launch capability and space-structure readiness. On the other hand, this concept should have a disadvantage from the RF transmission viewpoint, that is so-called grating lobe effect to be caused due to existence of regular spacing, between adjacent antennas of space segments, which are much longer than the transmitted wavelength. Given a large grating lobe effect, the RF transmission power will be so widely scattered that the RF energy concentration (spatially integrated RF power) at a receiver on the earth should be hopeless. The authors have made analytical studies to minimize this grating effect and concentrate the transmitted RF energy at the receiver position, assuming 1 GW class SSPS at GEO with discretely located space segments, and compared with the energy distribution by a single-monolithic antenna of the single space segment with the equivalent transmission power.

Fig. 1. Image of the proposed SSPS space segments.

References

[1] “Satellite Power System Concept Development and Evaluation Program : Reference System Report,” *DOE and NASA report*, DOE/ER-0023, Oct. 1978, (Published Jan. 1979).

[2] J. C. Mankins, “A Fresh Look at the Concept of Space Solar Power,” *Proceedings of SPS’97*, Montreal, S7041, 1997.