SPACE POWER SYMPOSIUM (C3)
Wireless Power Transmission Technologies, Experiments and Demonstrations (2)

Author: Mr. Shoichiro Mihara
Japan Space Systems, Japan

Mr. Kazuhiko Maekawa
Japan Space Systems, Japan
Mr. Shuji Nakamura
Japan Space Systems, Japan
Mr. Kenji Sasaki
Japan Space Systems, Japan
Dr. Yukihiro Homma
Mitsubishi Electric Corporation, Japan
Dr. Masatake Hangai
Mitsubishi Electric Corporation, Japan
Mr. Kazuhiro Iyomasa
Mitsubishi Electric Corporation, Japan
Mr. Jun Nishihara
Mitsubishi Electric Corporation, Japan
Mr. Yuichiro Ozawa
IHI Aerospace Co, Ltd., Japan
Mr. Naohiro Tanaka
IHI Aerospace Co, Ltd., Japan
Mr. Kenji Nagano
IHI Aerospace Co, Ltd., Japan
Mr. Kenichi Anma
Mitsubishi Heavy Industries, Ltd., Japan
Prof. Shigeo Kawasaki
JAXA, Japan
Dr. Koji Tanaka
JAXA, Japan

THE CURRENT STATUS OF MICROWAVE POWER TRANSMISSION FOR SSPS AND INDUSTRY APPLICATION

Abstract

Japan Space Systems (J-spacesystems) has been studying wireless power transmission (WPT) from the beginning of 2000. 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). J-spacesystems group have been kept on developing high efficient microwave transmission and receive system. The result of the first stage development was demonstrated as a ground wireless transmission experiment in March 2015. We have conducted the ground WPT experiments project which includes kW level electrical power, under the contract of Ministry of Economy, Trade and Industry (METI) from FY2009 to FY2014. Japan Aerospace Exploration Agency (JAXA) is responsible for the development of this precise beam direction control in

this program. We have developed thin phased array antenna with high power amplifiers by high efficient GaN HEMT and class-F amplifier circuits. More than 70% conversion efficiency at the final high power unit of the transmission system was achieved by the result of the first stage development. Now we are in the second development phase. Though our target figure of the conversion efficiency at the final stage transmitter, Power added efficiency of HPA, has been 80%, we have already achieved 81% on condition fixed output load impedance We are trying to improve total DC-RF conversion efficiency at the transmission section and RF-DC conversion efficiency at the receiving section. We have developed improved RF power capture efficiency 13% better than previous method. Development of thinner transmission panel with lighter weight and higher conversion efficiency is the essential part to realize solar space power system. We have been applying State-of-the-art semiconductor technology for light weight electronical component. We have applied it to the component for Rectenna array and we are developing and evaluating its technology. We are planning future plan for the development as "Technology Road Map for SSPS development. We have been discussing with technology experts of the various fields and make it reliable and feasible plan for the development of SSPS. In order to apply microwave power technology to our daily life before space application, we have started discussion with members from Industry, Academia and Government Agencies. We believe application to the daily life can lead us to the cost effective microwave power transmission technology.