
RECENT RESEARCH ACTIVITIES

Application of Microwave Power Transmission

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Our laboratory started in April 2010 after retirement of Prof. Kozo Hashimoto. In our laboratory, there are three main research topics as follows;

- Research of Space Solar Power Station/Satellite (SPS)
- Research of Microwave Power Transmission (MPT) for Various Applications
- Research of Advanced Microwave Processing for Biomass Refinery and Creation of New Materials

In FY2009, RISH got governmental budget for the research of the SPS, MPT and microwave processing. One is new anechoic chamber with clean room and high power microwave absorbers for experiments of the SPS and MPT, Another is high efficient phased array with GaN amplifiers and MMIC phase shifters for the SPS and MPT. These are under developing (2010). New microwave processing equipments and measurement system of bio materials were introduced in the end of FY2009. The research of advanced microwave processing was elected for 'Flagship collaborative research' in the RISH. We will advance the microwave processing research with the new research equipment.

Research Activities for the SPS

In Japan, 'Basic plan for space policy' was established by Strategic Headquarters for Space Policy in June 2009. This Basic Plan for Space Policy forged this time is based on the Basic Space Law established in May 2008 and is a Japan's first basic policy relating to space activities. In the plan, the SPS was selected on major nine systems. The above research equipments of the anechoic chamber and phased array will be used for the R&D of the Japanese SPS with all Japan researchers. Prof. Shinohara is a chairperson of the METI's SPS R&D committee which collaborates with JAXA. We discuss the short range roadmap to experimental MPT satellite and the long range roadmap to the SPS.

Collaborative Researches of the MPT applications

In FY2009, we have some collaborative researches of the various MPT applications. One is the wireless charging system for an electric vehicle with 2.45GHz. In FY2009, we realized beam collection efficiency of 76% between the transmitting slot antenna and rectenna array. The other is short distance MPT system with 24GHz for FWA (Fixed Wireless Access), which is used for telecommunications network whose interconnections between nodes are implemented without the use of wires. We developed the first 24GHz rectenna with approximately 40% conversion efficiency.

Microwave Pretreatment System for Bioethanol Production from Woody Biomass

We developed prototypes of a continuous-flow-type microwave pretreatment system for bioethanol production from woody biomass. Efficient pretreatment process prior to enzymatic saccharification process is essential for profitable bioethanol production from woody biomass. Microwave pretreatment is expected as an efficient and energy-cost-saving method to enhance enzymatic susceptibility. The objective of the present study is to develop an efficient, high-volume, and continuous microwave pretreatment system toward commercially-based bioethanol production. Prototype experiments and quantitative estimation of energy balance were also conducted. This work is supported by the New Energy and Industrial Technology Development Organization (NEDO) project, "Development of Technology for High-efficiency Conversion of Biomass and Other Energy", whose leader is Prof. Takashi Watanabe of the RISH.