SPACE POWER SYMPOSIUM (C3)
Space Power Experiments Applications and Benefits (4)

Author: Dr. Hiroaki Suzuki
Japan Aerospace Exploration Agency (JAXA), Japan, suzuki.hiroaki2@jaxa.jp

Mr. Tatsuhito Fujita
Japan Aerospace Exploration Agency (JAXA), Japan, fujita.tatsuhito@jaxa.jp
Mr. Katsuto Kisara
Japan Aerospace Exploration Agency (JAXA), Japan, kisara.katsuto@jaxa.jp
Prof. Susumu Sasaki
Japan Aerospace Exploration Agency (JAXA), ISAS, Japan, sasaki.s@apost.plala.or.jp

TECHNOLOGY DEMONSTRATION AND ELEMENTAL TECHNOLOGY DEVELOPMENT OF LASER BASED SPACE SOLAR POWER SYSTEM

Abstract

Japan Aerospace Exploration Agency (JAXA) has studied Space Solar Power Systems (SSPS) using laser and microwave beams. Current SSPS study at JAXA consists of three main subjects, SSPS concepts and architectures study, technology demonstration and elemental technology development.

The technology demonstration on the ground are planed as main subjects in laser based SSPS (L-SSPS) study. For the demonstration, some elemental technologies such as ultralight film mirror, wavelength selective mirror, laser generator based on direct solar pumping solid-state laser, atmospheric transmission property of laser beam and photovoltaic generation converting laser energy to electricity are studied.

In the ground demonstration, transmission distance will be 500m, and laser power will be 1kW. The system of demonstration experiment will consist of laser generator, control system for pointing laser beam, optical equipment for laser transmission and photovoltaic device. Direct solar pumping solid-state laser using Nd/Cr:YAG ceramic medium and condensed sunray will be used as the laser generator.

In the research of laser generation, an active mirror system is chosen as the laser amplification method, and Nd/Cr:YAG ceramic material is chosen as laser medium. Because this ceramic medium can efficiently amplify the laser beam of 1064 nm in solar pumping compared with other laser materials. In the research of laser transmission, we consider wavelength of 1064nm to be the first candidate wavelength for L-SSPS. Because this wavelength has high atmospheric transmission property and various application on the ground such as photovoltaic generation, direct hydrogen generation and heat application. As energy conversion technology on the ground, we have investigated photovoltaic generation converting laser energy to electricity.