

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

Author: Dr. Haitao Liu
Qian Xuesen Laboratory of Space Technology, China, realblue1980@foxmail.com

Dr. Xinbin Hou
CAST, China, houxinbin@cast.cn

Prof. Li Wang
Qian Xuesen Laboratory of Space Technology, China Aerospace Science And Technology Corporation,
China, wangli@cast.cn

Dr. Ming Li
China Academy of Space Technology (CAST), China, liming_cast@sina.cn

THE EXPERIMENTAL PROPOSAL OF THE MICROWAVE POWER TRANSMISSION FROM THE
CHINESE MANNED SPACE STATION

Abstract

The roadmap for Space Based Solar Power (SBSP), which was presented by the International Academy of Astronautics (IAA) in 2011, shows that the SBSP system is a huge and complicated space system. There are many key technologies need to be broken through before the SBSP can be deployed in the space, including the in-orbit assembly, the solar power generation, the power management and distribution, the thermal management and the Microwave Power Transmission (MPT). This paper focuses on the MPT in despite of all other issues listed above and analyze the possibility of taking the MPT experiment in the Chinese manned space station, which was officially initiated on Nov. 27, 2010 and its first laboratory module will be launched before 2020. The orbit of the space station is about 370 km and the foot-print of the MPT beam is no larger than 1km in diameter. The power density is no higher than 1mW/cm² outside of the rectenna fence on the ground. Various antenna structures will be studied on the ground including the truss structure, the tensioned structure and the membrane thin structures. The most suitable one will be tested in the space. Different microwave sources, including the magnetron, Travelling Wave Tubes (TWT) and solid state components, will be examined in advance of the space trial in terms of its life-time, power-mass ratio and efficiency. Since the experiment trial will be carried out in the Low Earth orbit (LEO), the observing window for the ground station is short. The MPT antenna should be able to pointing its beam towards the ground station when the space station is moving in the Leo. Therefore, a feedback link is required to enable the ground based phase error estimated uplink to form a closed-loop.