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IAF SPACE POWER SYMPOSIUM (C3)
Solar Power Satellite (1)

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HIGH POWER ELECTRIC POWER GENERATION, TRANSMISSION AND MANAGEMENT FOR A PILOT MW SPS

Abstract

Space Power Satellite(SPS) is a huge spacecraft to utilize solar energy in space. According to the SPS development roadmaps proposed by IAA, Japan and China, the technology demonstrations in different level, including component level, subsystem level and system level, need to be carried on in space. Based on the proposed SPS roadmap of China in 2015, a pilot MW SPS system should be developed after 2030. In the paper, the primary scheme of a pilot MW SPS system based on Multi-Rotary joints SPS (MR-SPS) concept is presented. It is a very big spacecraft. The length is about 800m and the diameter of antenna is about 150m. The total weight is about 300 tons. The high power electric power generation, transmission and management of the system are introduced. The whole system includes 24 solar sub-arrays. Each solar sub-array is composed of 8 thin-film solar array modules. The output power of each solar sub-array is about 1MW and the output voltage is about 500V. The output electric power is converted to 5000V and is transmitted to the cables installed on the main structure by the MW high voltage rotary joints. The high voltage electric power is transmitted to the antenna by multiple cables and is distributed to different array modules. The key technologies need to be researched and solved include high efficient thin-film GaAs PV cellultra large high voltage (500V) solar sub-array, high power rotary joint, ultra-high voltage(5kV) cables, high power converter, high power switch, etc, and the assembly and maintenance.