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

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WIRELESS POWER TRANSFER TECHNOLOGY FOR MANNED SPACE APPLICATIONS

Abstract

Magnetic resonant coupling wireless power transfer is a novel technology of wireless power transmission that uses high frequency magnetic field coupling between the coils. It has potential application in embedded medicine, human body internal testing, radio frequency identification and mobile equipment. Nowadays, it has been a focus of wireless power transmission. This paper introduces a scenario of wireless power transfer for manned space applications, considering future manned space station in orbit mobile equipment operation and maintenance needs. The system characteristics and features of two-coil systems, four-coil systems, relay resonators systems and domino resonator systems are described. The maximum power transfer principle and the maximum energy efficiency principle are analyzed, and their system power efficiency and transmission distances are explained. Human exposure safety issues and winding resistance reduction approach are also included. Besides, the manned spacecraft wireless power transfer system framework is proposed, demonstrating wireless power transfer system configuration, circuit topology, impedance matching method, hardware and software, and the feasibility of wireless power transfer link. Then, the paper suggests the utility of wireless power transfer for both short-range and mid-range manned spacecraft in orbit applications, providing theory and practice reference for further improvement.