Abstracts

Beamed Microwave Power Transmission and its Application to Space

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The general principles and special components of beamed microwave power transmission systems are outlined and their application to the space program discussed. The beamed system is defined as starting with a dc source of power at the transmitting end, converting it to a microwave beam for transmission through space, and ending with the dc power output at the receiving end. Using this definition, an experimentally measured and certified dc to dc efficiency of 54% has been achieved. The major contribution of beamed power to the development of space is its unique ability to transfer energy across long distances and across large differences in gravitational potential, making possible such developments in space as the Solar Power Satellite system. In that system electric energy obtained from the sun by satellites in geostationary orbit is transmitted to Earth. The application that is discussed in detail is a low-Earth orbit to geostationary orbit (LEO to GEO) transportation system that depends upon vehicles propelled by electric thrusters whose -power is supplied by a microwave beam originating at the Earth's surface. A scenario for such a system is chosen and the performance results presented. The advantages of the all electronic system over a chemically propelled system are enumerated. The principles of space propulsion, particularly as they relate to electric propulsion, are outlined. Key components at the terminals of the system are discussed including the "rectenna" which provides a source of continuous dc power in space with a revolutionary low ratio of mass to dc power output of 1 kg/kW. Environmental considerations are discussed.

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