IAF SPACE POWER SYMPOSIUM (C3)
Wireless Power Transmission Technologies and Application (2)

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HELIOCENTRIC DYSON WEB FOR DISTRESS POWER BEAMING APPLICATIONS

Abstract

Power is a critical requirement for any and all space missions of all time. School students are taught only one percent of solar energy actually reaches Earth. With the advent of missions further away from the Sun, such as Mars, Jupiter and Saturn or beyond, conventional solar panel based power supply is insufficient and creates high and undue pressure to reduce power consumption. Nuclear RTG power options are futuristic but pose contamination and explosive threats. Wireless Power beaming is an alternative being explored by agencies and countries worldwide, beginning as an effort to capture power produced using solar belts and nuclear plants on the Moon and transport to Earth to decrease reliability on fossil fuels, but grew into a potential power source for Lunar missions and satellites orbiting Earth or Near Earth Objects. With advent in Nanosatellite technologies, LASER and MASER based power beaming and energy storage, the TRL for Wireless Power Beaming constellations is higher and the availability of an emerging market spearheaded by organizations such as Shimizu Corporation indicates expansion options in the near future. This project addresses the design and simulation of a Heliocentric 12U Nanosatellite Mega-Constellation designed to operate as a "Dyson Web", much similar to the Dyson Sphere concept for harvesting Solar Energy. The satellite design is based on a previously existing AI powered nanosatellite design for increasing mission TRL with selective upgrades such as sizing, increased number of batteries, upgraded communications and propulsion and active thermal control to name a few. The orbit design is Heliocentric with orbits between each planetary orbit. Spiral Transfers in and out of the designated orbit, flyby missions and body orbiting satellite scenarios were simulated for Earth, Moon, Mars, Venus and Sun on GMAT. Carbon Fiber Microvascular Thermal Control was utilized with heat resistant material selection and TPS for operations close to Sun. The feasible results of this mission design endeavour raises the TRL of Interplanetary Wireless Power Beaming, whose applications in itself culminate to form a new segment of Space-based Power Resupplying Industry which will eliminate the Power Deficiency handicap faced by many missions leading to the end of operations of an otherwise healthy spacecraft and accelerate mankind's progress to the edges of the solar system and beyond.