SPACE POWER SYMPOSIUM (C3)
Space-Based Solar Power Architectures / Space & Energy Concepts (1)

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UNBUNDLING SPACE POWER SYSTEMS TO FOSTER APPLICATIONS OF SPACE-TO-SPACE POWER BEAMING

Abstract

One of many paths forward for hastening the development of viable applications of space based solar power technology is through focused incremental technology development efforts. This will serve to mitigate cost, schedule, and technical risk. This presentation and paper is on one mission – unbundling space power systems (i.e., the separation of power generation, transmission, management, and loads). We have a unique opportunity to foster the development of space-to-space power beaming by leveraging International Space Station (ISS) resources.

This mission will define and implement/prototype a parametric model for unbundled power systems for spacecraft propulsion and/or sustained free-flyer/surface operations. The opportunity to craft viable technology demonstrations will establish the basis for a confluence of interest between real mission users and the technology development effort. This could lead to a range of technology development missions on the ISS and subsequent flight opportunities that can make efficient and effective use of beamed energy for propulsion and/or sustained operations. This has come to pass and there is now a concerted effort to move forward with mission development.

Several potential research opportunities have emerged that could make use of a combination of resources currently available on the ISS using the:

• NASA Space Communications and Navigation (SCaN) testbed (STB) Ka Band 40 watt transmitter and JAXA launched cubesats from the Kibo back porch. This combination of equipment allows for power transmission, far field/near field effect analysis and management, formation flying/alignment, and various propulsion approaches to be tested and used to the benefit of multiple experiments; and,

• STB Ka Band 40 watt transmitter to provide augmented power, communications, and some level of attitude control/positioning services to a co-orbiting free-flyer and/or other elements (e.g., BEAM, HTV, ATV, Dragon, Cygnus, etc.). This combination of equipment could be repurposed as crew-tended free-flyers for some number of extended duration micro-g/production manufacturing cell runs.

Also, commercial space applications include mission enhancements, expansion of operational mission time, and out-bound orbital trajectory insertion propulsion.

Successful demonstration of space-to-space power beaming paves the way for technology for propulsion and free-flyer/surface, lunar/asteroid surface applications by reducing the cost, schedule, and technical risk of those missions. This can materially reduce the perceived cost, schedule, and technical risk associated with the use of space based solar power technology for Space-to-Earth applications.