

SPACE POWER SYMPOSIUM (C3)  
Space Power Experiments Applications and Benefits (4)

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ISS EXPERIMENT DIRECT SPACE-TO-GROUND LASER POWER AND DATA LINK AS AN  
EARLY END-TO-END DEMONSTRATION

**Abstract**

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The solar power from space ISS experiment will be an early precursor for a future space based solar power collection and distribution system. The complete experiment comprises a space and a ground segment. The space part will be located on the Earth nadir pointing External Payload Facility of the COLUMBUS Module. The configuration is based on three functional items which are the in-orbit power and data generation assembly, the space to ground laser link and the on ground power re-conversion of laser power to electricity and the processing and data distribution facility. It will provide an end-to-end demonstration of the key-functionalities and basic technologies and will provide evidence for a safe space-to-earth laser transmission of solar energy collected by the Space Station's Solar Arrays. As a part of the experiment set-up, an additional optical direct data transfer from ISS Columbus Module to a Ground Station is incorporated. The ESTRACK ground stations could serve as possible ground terminals for data reception and transmission and their locations might offer the opportunity to install power terminals for the transmitted laser power. The paper describes the experiments main demonstration drivers based on technology development needs and it screens preparatory laboratory and field tests. Options for the experiment concept, its mission implementation at the Space Station and its key-elements, candidate power transmission lasers and pointing methods are presented. The factors impacting the transmission performance caused by atmospheric interactions are addressed and safety aspects and potential impacts on aircrafts and ground infrastructure systems are identified. Further the benefits, as use of existing space and ground infrastructure, space qualified equipment, also available from previous demonstrations are given. The accessibility to the experiment at the Space Station enables maintenance and up-grade for further utilization of the direct power and data link. The experiments inherent potential for technology enhancements towards larger Solar Power Platforms in space and the perspectives for near term applications and terrestrial niche markets are highlighted. The mission time horizon is planned at the year 2015.