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FIRST YEAR OF OPERATION OF A SANDWICH MODULE SPACE EXPERIMENT

Abstract

For decades, researchers and advocates have proposed concepts for solar power satellites as a means of providing energy for use on Earth. Though many studies have been performed, very little hardware has been developed, and until now, none had been demonstrated in orbit. This paper describes the results from the first year of operation of the Photovoltaic Radiofrequency Antenna Module Flight Experiment (PRAM FX), which represents (to our knowledge) the first instance of hardware specifically for solar power satellites being tested in orbit. The findings underscore the critical importance of efficient power conversion and conscientious thermal design for sunlight-to-microwave sandwich modules, as well as a clear understanding of the illumination conditions. Results from this space experiment will inform future paths forward for evolved sandwich module designs with reduced mass, greater efficiency, and improved thermal performance. Increasing specific power (W/kg) beyond what has been demonstrated by PRAM FX remains a key goal for working towards solar power satellite systems that will be economically competitive with terrestrial energy alternatives.