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THE 16U4SBSP MISSION: A SWARM OF CUBESATS FOR DEMONSTRATING SPACE-BASED SOLAR POWER IN EARTH ORBIT

Abstract

The 16U4SBSP mission concept is based on using a swarm of CubeSats to perform a scaled demonstration of Space-Based Solar Power (SBSP) from Earth orbit. In this demonstration mission, a swarm of 7 identical spacecraft of 16U format is used to provide wireless energy in the 1-kW scale using Radio-Frequency (RF) beaming, and the spacecraft in the swarm are designed to be suitable to both space-to-ground or space-to-space applications. The main objective of the mission is to validate the concept of providing SBSP using a swarm of satellites, as well as some of the involved miniaturized technologies, in view of full-scale missions which could serve users in remote areas with low power requirements or support emergency operations in blackout zones affected by unpredicted hazards. More in general, the mission would represent a low-cost precursor towards larger scale SBSP (in the GW range of larger) to supply clean and affordable energy from space to large areas on the Earth surface. A pre-Phase 0 study of the mission, funded by the European Space Agency through the Sysnova campaign "Innovative Missions Concepts enabled by Swarms of CubeSats", has led to encouraging results on the feasibility of this mission concept.

This paper will summarize the main results of the 16U4SBSP pre-Phase 0 study, including the mission design and the possible way forward to the following steps in mission implementation (Phase A and later). A summary of the spacecraft system design and mission analysis will be presented, as well as a short description of various possible scenarios for the Conops (concept of operations) of the mission. Particular focus will be given to the available options and objectives of the SBSP demonstration, and to the proposed solutions for RF power beaming, formation flying maintenance and end-of-life operations

for compliance to the new European Space Agency regulations on space debris mitigation.