

## IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)

## Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

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POWER CUBE: APPLICATIONS, DESIGN, BREADBOARDING AND ROADMAP OF A 1U  
DEPLOYABLE 100W NANOSAT SOLAR ARRAY

**Abstract**

The need for high-power solar arrays originates from the advent of the NewSpace revolution where hundreds and thousands of shoebox-sized satellites can be launched at relatively low cost. But to achieve their mission, they often need large deployable structures in space to allow high performance applications which demand high power levels. These might include communication constellations or nanosats with electric propulsion. These requirements gave birth to the Power Cube project. It is carried out under an ESA ARTES contract with DcubeD as prime (project management, subsystem development, assembly, testing) in partnerships with 3 other German organisations: the companies German Orbital Systems GmbH (market overview, reference mission requirements, testing) and AZUR Space GmbH (solar cells) and the higher learning institution Technische Hochschule Deggendorf (material and structure RD). The aim is to develop a scalable deployable solar array for nanosatellites, which should be storable within a volume inferior to that of a CubeSat Unit (1U) CubeSat and be capable of generating 100W at EOL (End of Life). The main advantage is that, seeing as the solar array will be stored entirely within the satellite, all sides of the satellite will be free, which offers great flexibility and therefore new mission possibilities. To reach this objective, a state-of-the-art review and the corresponding requirement definition was carried out, ensuring that the 100W array is designed and tested for a market with a clear goal to fly it afterwards. As such, the main system requirements are the following: 1. Minimizing the array's stowed volume 2. Maximize reliability of deployment. 3. Maximize power generation per stowed volume and 4. Demonstrating scalability of the concept

This development together with a parallel activity that DcubeD is pursuing together with the NanoSat powerhouse CalPoly (California Polytechnic State University) located in San Luis Obispo in Central California, a space flight of such a 100W Nanosat solar array is foreseen for the fourth quarter 2022. The project between DcubeD and CalPoly is called PowerSat and has the goal of showing the feasibility of generating and handling large amounts of power on a tiny satellite, here a 3U satellite. DcubeD is taking

care of the payload (the 100W solar array subsystem), while CalPoly is taking care of the development, manufacturing, launch and mission operation of the 3U satellite.