6U Deployable Solar Arrays for Deep Space Missions

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A set of deployable solar panels for 6U solar panels can achieve typically only until 20W of power generation per face when using body mounted solar array solutions. Deep Space missions, some of them with strong requirements coming from electric propulsion, needs of high power generation solutions. This work deals with the technical design, modeling, manufacturing topics and qualification of a Double deployable 6U system with high degree of technical requirements coming launchers and from the Radiation Tolerances to Van Allen belts. The aim of this work is to provide a solution for an 80W BoL system reliable and safe enough.

The chosen folding procedure of the panels allows an easy deployment and retention mechanism with five points of junction with the structure. This way of folding the panels relies on the geometry of the panel and the structure to hold the second panel in place while in stowed position, and it uses the satellite wall to lead the deployment of the second panel. The deployment inertias are compensated with both wings, introducing very little energy to the structure when deployed.

The hinges design is robust and allows a good deployment without damaging neither the panel nor the satellite. This hinges plus the rest of the design gives a strong 6U double deployable with high functionality, in addition to its light weigh, as each wing is less than 600g. Also, the design has successfully passed deployment under different temperature ranges, assuring that the panels will deploy regardless of the conditions when the satellite is launched

In terms of the circuitry for deployment purposes of the solar array, a power driver is used, which drives a power through some resistors, used as thermal knife, and cutting the retaining wire This retaining wire holds the solar panels in stowed position during the launch of the satellite, and allows the deployment with a digital signal from the on-board computer of the satellite. This system is totally tested in thermal vacuum chamber, under cold and hot cases, and vibration tests have been implemented to simulate the launch loads.

As a result, electrical performance and mechanical performance will be shown. Ground support equipment engineered for providing helping in the testing phase of the system is shown. The panels will fly in the ARGOMOON mission to be launched from Mission 1 within the SLS Rocket in Cape Canaveral. Launch is scheduled for the end of 2019