ALFAMA Project: Development of a flexible and laminated space photovoltaic array

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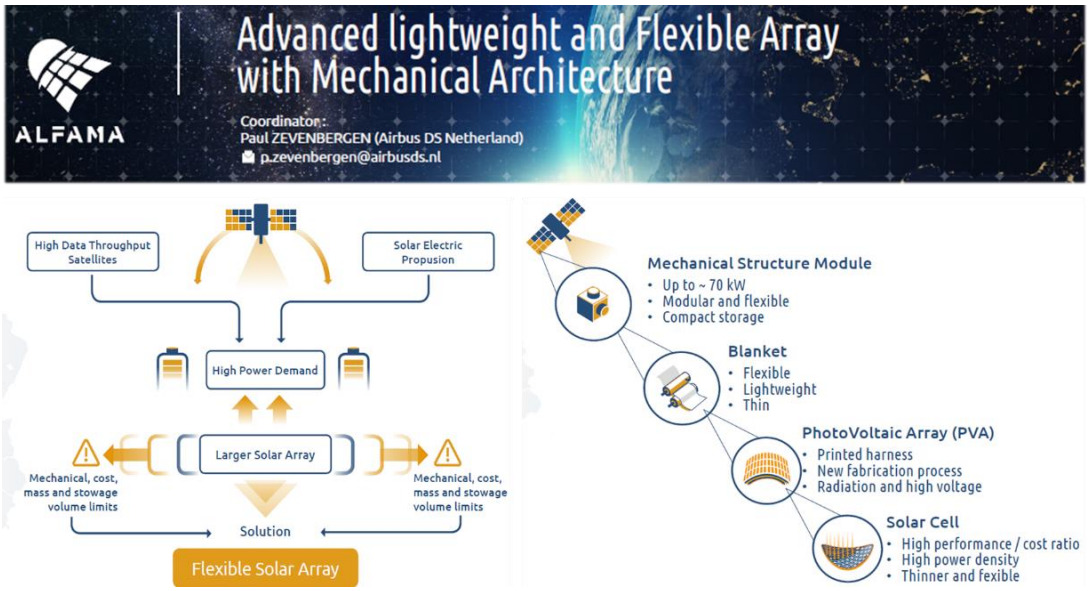
Standard space solar array are usually made with rigid architecture, by using aluminum honeycomb and individual cells glued to rigid substrate protected by front coverglass. More and more space missions require power supply, typically greater than 25 kW, such as solar electrical propulsion and high throughput communications. This leads to increasingly important power targets in watt per kilogram (W/kg), watt per square meter (W/m^2) and watt per cubic meter (W/m^3). However, the restricted volume in the launching spacecraft limits the number and dimension of standard rigid solar arrays. Therefore, the answer for this growing power demand lies neither in stacking more rigid solar arrays, nor by marginal solar cells efficiency improvements, but rather in disruptive photovoltaic solution such as flexible photovoltaic array (PVA). Thirty years ago, European Space Agency (ESA) has developed the first flexible solar arrays for Hubble space telescope [1]. Nowadays, several developments are ongoing in the USA, for instance Ultraflex [2] or Roll-Out Solar Array Experiment tested on International Space Station in 2017 [3].

The EU commission has funded a 3 years H2020 project, ALFAMA – Advanced Lightweight and Flexible Array with Mechanical Architecture, to build an innovative EU solution for this high power challenge. It gathers a consortium of eight European partners from three EU-member states joining their efforts towards the realization of a disruptive space solar array technology. The project addresses the flexible solar generator challenges at every level: solar cells, PVA & mechanical architecture. The progresses and solutions developed within this framework will be presented, with a focus on lamination and interconnection results for flexible PVA.



Schematics of ALFAMA project answer to the high-power system challenge.

Acknowledgments

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References

[1] Gerlach, ESA Bull. Eur. Space Agency (1990).
[2] B. Spence *et al.*, Waikoloa, HI, 2006.
[3] B. R. Spence *et al.*, Waikoloa Village, HI, 2018.