Cable-domes for self-deployable antennas

William Bettini [a], Xavier Maetz [a], Julien Averseng [a], Bernard Maurin [a], Jérôme Quirant [a]

[*a] Laboratoire de Mécanique et Génie Civil – UMR5508
Université de Montpellier, CC048, Place E. Bataillon, 34095 MONTPELLIER
julien.averseng@umontpellier.fr

Abstract

Due to its expertise on the conception of light weight structures, the LMGC team SIGECO designs and realizes innovative structures for space application: their advantage is to deploy automatically by storage of elastic energy in flexible joints [1]. A new concept of space antennas using civil engineering concepts has been recently developed [2].

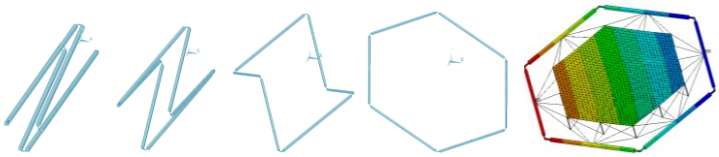

Fig 1: New concept for space antennas designed at LMGC

Antennas are composed of a rigid structure and a parabolic surface for emission or reception of electromagnetic signal. This surface is often maintained with cable network, but we propose a new configuration with cable domes. Well known and appreciated in civil engineering for their low weight, they could be used advantageously for space applications.

Among the existing structures, Fuller and Geiger cable domes are the most widely spreads, but the tensions in elements are not homogenous in the network. So we propose a new kind of geometry, permitting a better distribution of tensions and a good positioning on parabolic surface (possibly non regular). We present form-finding and static calculus for this new configuration.

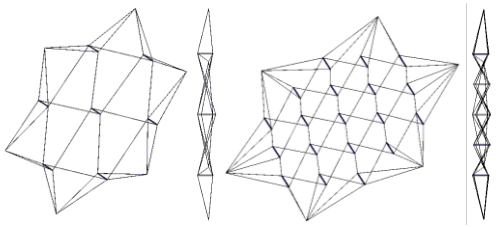

Fig 2: New configuration for cable domes

The applicability of the new concept for space antenna is proposed with a complete solution. The applications could also concern auto-tensioning structures as de-orbit or solar sails and stiff structures for solar panels support.

References

[1] S. Morterolle, B. Maurin, J.-F. Dubé, J. Averseng, J. Quirant, *Modal behavior of a new large reflector conceptual design*, ***Aerospace Science and Technology***, Volume 42, pp.74-79, 2015.

[2] W. Bettini, J. Quirant, J. Averseng, B. Maurin, *Self deployable geometries for space applications*, ***Journal of aerospace engineering***, Volume 32, issue 1, 2019.