MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

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CONCEPTUAL DESIGN OF 30M CLASS MODULAR DEPLOYABLE REFLECTOR

Abstract

JAXA, Japan Aerospace Exploration Agency, is now developing 30m class modular deployable reflector. The concept of the reflector is inherited from Large Deployable Reflector, which is mounted on Engineering Test Satellite VIII, has launched on December 18th 2006, and was successfully deployed in orbit after launching. The reflector is composed of 14 segmented modules. Each module is approximately 9m in diameter and gathers to form 30m reflector.

The challenges for the design of the reflector are the size of each module enlarged to 9m, a structural stability with long boom to connect with satellite systems, the holding mechanism, and its deployment simulations.

In order to enlarge each module to 9m, the reflector is improved in the design of deployment mechanism. Each module is an umbrella like structure. The sliders move along the central cylinder in the modules and change the angle of each rib. For each ribs, the number of sliders is decreased from double to single to reduce moment about sliders induced by the unbalance of ribs. For the same reason, the pulleys attached to the sliders are doubled. The design of the module is currently being confirmed by the deployment simulations.

The boom attached between the reflector and the satellite systems is lengthened to 14m. From the study of the boom design, we employed foldable rods as a boom. This is the most lightweight and stiff among the design candidates.

The holding mechanism is also improved from that of Large Deployable Reflector. In order to stably hold the trunk made from the 14 modules, a caterpillar belt like structure is employed, can strongly tights the reflector up, and is designed to protect the reflector from vibrations in launchers.

For the deployment simulations of the reflector, Origami/ETS, the deployment simulation software developed in JAXA, is used. The software was modified to deal with 30m class deployable reflector and is now smoothly calculating the deployment motion.

JAXA just started to design the hardware of the reflector, the boom, and the holding mechanism in detail. With these designs, JAXA will make a prototype of the reflector.