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DYNAMIC SIMULATION OF WRAP-RIB ANTENNA BY RAILEIGH-RITZ METHOD

Abstract

Wrap-rib antenna is composed of multiple ribs and metallic mesh. Ribs and mesh are tightly stowed around a hub which are then deployed by releasing strain energy once the restraint mechanism is activated. The whole process is highly non-linear but linear analytic simulation is conducted by utilizing classic Raileigh-Riz method. A rib is represented by simple root clamped straight beam with two degrees of freedom of elastic deformation. An additional freedom is added to allow rotation around the clamped end to represent the overall re-wound motion. It will be shown that fundamental frequency and deployment time can be adjusted by the spring constant of the third DoF. The antenna have been launched and are operational in space. Dynamical response of the satellite at the deployment of the antenna is well simulated by the simple model described. The model can be used to verify completeness of the antenna deployment in space.