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Research on Configuration of Large-Scale Linear Array Feeder Truss Parabolic Cylindrical Antenna of Satellite

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Abstract : The large linear array feeding parabolic cylindrical antenna of the satellite has the ability of large-area line focusing, multi-directional beam clusters simultaneously in a certain azimuth plane and elevation plane, corresponding quickly to different orientations and different directions in a wide frequency range, dual aiming of frequency and direction, and combining space power. Therefore, the large-diameter parabolic cylindrical antenna has become one of the new development directions of spaceborne antennas. Limited by the size of the rocked fairing, the large-diameter spaceborne antenna is required to be small mass and have a deployment function. After being orbited, the antenna can be deployed by expanding and be stabilized. However, few types of structures can be used to construct large cylindrical shell structures in existing structures, which greatly limits the development and application of such antennas. Aiming at high structural efficiency, the geometrical characteristics of parabolic cylinders and mechanism topological mapping law to the expandable truss are studied, and the basic configuration of deployable truss with cylindrical shell is structured. Then a modular truss parabolic cylindrical antenna is designed in this paper. The antenna has the characteristics of stable structure, high precision of reflecting surface formation, controllable motion process, high storage rate, and lightweight, etc. On the basis of the overall configuration comprehensive theory and optimization method, the structural stiffness of the modular truss parabolic cylindrical antenna is improved. And the bearing density and impact resistance of support structure are improved based on the internal tension optimal distribution method of reflector forming. Finally, a truss-type cylindrical deployable support structure with high constriction-deployment ratio, high stiffness, controllable deployment, and low mass is successfully developed, laying the foundation for the application of large-diameter parabolic cylindrical antennas in satellite antennas.

Keywords : linear array feed antenna, truss type, parabolic cylindrical antenna, spaceborne antenna
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