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DYNAMIC BEAM CONTROL BASED ON VISION METETROLOGY OF LARGE DEPLYABLE ANTENNA FOR MOBILE SATELLITE COMMUNICATION

Abstract

For next generation satellites for mobile communication service, very large aperture deployable reflector is required for service with small size user terminal in small electric power consumption. Frequency reuse with multi beam architecture are required for large capacity of user as well as for efficient frequency utility. For large deployable antenna, however, change of surface shape in orbit is strong concern for stable service because the structure and mechanism to maintain the shape of reflector is complex and may have a sensitivity to external environment, especially to thermal environment. Deformation of parabola reflector will provide the change of pointing direction and antenna pattern of shaped beam and may cause deterioration of performance of communication service.

We have started a new research and development program to develop a technique with new concept to reduce the influence of the change of the reflector surface shape to the beam property. We propose a method for compensation by dynamic control of amplitude and phase distribution for elements based on dimension measurement results by three dimensional imaging technique operated in orbit. Precise dimensional measurement with vision metrology is widely used technique in precise industrial measurement including large scale structure. The technique is based on photogrammetry. The scope of our research is how to apply the measurement technique onto satellite antenna system overriding many limitation.

In this report, we report results of a base-line consideration and simulation as well as initial experiments to seek a feasible measurement scheme based on “photogrammetry with bundle adjustment with self-calibration method”. We already obtained preliminary measurement network design with accuracy of several millimeters for over twenty meters aperture antenna. We also report a results of feasibility assessment of compensation with the amplitude and phase distribution optimized by measured shape of antenna shape. This program is contract research by Ministry of Internal affairs and Communication to