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ELECTRICAL PERFORMANCE OF LARGE DEPLOYABLE REFLECTOR ANTENNA EQUIPPED ON ENGINEERING TEST SATELLITE (ETS-VIII)

Abstract

Engineering test satellite VIII(ETS-VIII) was launched at December 2006. Many communication technologies are experimented and evaluated the performances. This Satellite is equipped with the large deployable reflector antenna (LDRA) for land mobile communications with the size of 17m x 18 m, which is one of the largest size for communications satellite. This paper describe the electrical performance of that antenna. First, we show the outline of Engineering test satellite and its reflector antenna. Reflector is offset parabola and this is the parameter of antenna. Equivalent aperture diameter is about 13m. Parameters of transmitting and receiving reflectors are same. Tx and Rx feeds constructed by S band phased array system are arranged at defocus points, 900 mm offset to reflector surface direction from focus point, respectively. The reflectors are constructed by the metal mesh surface and the deployable truss structure, and stowed at lunch and deploy on orbit. Next we describe the measurement of radiation patterns of this antenna on orbit, comparing the measurement and calculated results, actual beam positions are little bit shifted and beam shapes are distorted. Antenna patterns are measured by moving the satellite attitude with one dimension (cross scanning), and receiving the CW signal on the earth station from the transmitting antenna. Form pattern measurement results, we recognize measured pattern is distorted and beam position is little bit shifted from calculated results. We think that these results caused by (1) Weight distribution error of array feed (2) Alignment error of reflector (3) Distortion of structure of reflector (4) Thermal distortion of reflector surface Finally, I describe another topics and experiments. One is verification of daily variation of receiving level caused by moving beam position and variation of output power of SSPAs. We think this phenomenon is caused by thermal distortion of reflector. Another is correcting beam position error. We experimented to correct the antenna beam position by predict ion of beam position, and measured the receiving level for verification of receiving level variation.