Abstracts

Microwave Antenna Holography

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Microwave holography, as applied to reflector antennas, is a technique with utilizes the Fourier Transform relation between the complex farfield radiation pattern of an antenna and the complex aperture distribution. Resulting aperture phase and amplitude distribution data are used to precisely characterize various crucial performance parameters, including panel alignment, subreflector position, antenna aperture illumination, directivity at various frequencies, and gravity deformation effects. The holography technique provides a methodology for analysis, evaluation, and RF performance improvement of large reflector and beam waveguide antennas. Strong C W signals obtained from geostationary sources were used as far-field sources. This article describes the application of the holography technique to the newly constructed NASA/JPL Deep Space Network (DSN) 34-m beam-waveguide antenna, resulting in 4. l-dB performance improvement at 32 GHz by reducing the main reflector rms surface error to 0.43 mm. The improved antenna performance was verified by additional holographic measurements and efficiency measurements at X-band (8.45 GHz). Microwave holography has been demonstrated to be a required tool for achieving antenna aperture efficiency of 52% at Ka-band (32 GHz), and is likely required for maintaining an operational DSN Ka-band ground antenna capability.

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