Abstracts

Beam-Waveguide Antenna Performance Predictions with Comparisons to Experimental Results

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This article presents an overview of a NASAIJPL antenna project, with specific focus on the methodology used to predict the microwave performance of a new 34-m-diameter beam-waveguide (BWG) reflector antenna, designated DSS 13. Deep Space Station 13 is the research and development facility serving the NASA/JPL Deep Space Network. Three companion articles in this issue detail the microwave test packages, test results, and microwave holography-based evaluations and alignment. This article provides microwave performance predictions as well as a summary of test results for the antenna, which has Cassegrain and centerline BWG operating modes at X-band (8.450-GHz) and Ku-band (32-GHz) frequencies. Predictions were used to identify critical and poorly understood areas needing further study and diagnostic testing, and assisted in planning, scheduling, and evaluating the final results of a detailed test program. Predictions were assembled for all known losses that contribute to antenna performance degradations, including antenna area efficiencies, corresponding beampeak gains, and noise temperatures. It was found that predictions and experimental results agreed reasonably well for beampeak gain and corresponding efficiency, and for several (but not all) noise temperatures. It is believed that the performance predictions and measurements described herein may be the most detailed and accurate available for a large reflector antenna with two significant operating modes and two frequencies.

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