The Optimum Design of Reflector Antennas and Their Applications

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ABSTRACT

In this paper the theory analysis of the paraboloid reflector antenna and feed source as well as the characteristics of the reflector antenna is used to develop a multibeam shape reflector antenna and computer code. The computer code can analyze antenna patterns, gain, efficiency, beamwidth, and scan angle. Measurement results of the shaping reflector antenna will verify the computer code. The feed source, which is used in the study of the characteristics of the corrugated horn antenna, includes studying differences of depth, aperture shape and aperture angle. For each of these a comparison of simulated and measurement results is done. The corrugate horn antenna will be applied for the VSAT (Very Small Aperture Terminal). Finally, the paraboloid reflector antenna is used for two different applications: the first one uses a 35 cm offset reflector. The feed source is a corner reflector dipole antenna. The frequency range is from 4.5 GHz to 5 GHz, and this design can be used for site survey. The feed source of the first application differs from that of the traditional horn antenna and offers some advantages such as reduced manufacturing costs and a simple manufacturing process. The second application of the paraboloid reflector is a commercially available 160cm DBS (Direct Broadcast Satellite) to design a compact antenna test range without edge treatment and RF anechoic chamber. The DBS antenna is the reflector antenna of CATR (Compact Antenna Test Range), and also is without edge treatment. The combination of the reflector antenna and the ITDAMS (Impulse Time Domain Antenna Measurement System) is used as the CATR, the edge diffraction fields are gated out by the ITDAMS. Three kinds of antenna are chosen to verify the possibility of the new CATR. The results of these verifications are also compared with the near field range, far field range, and proposed CATR results. The verified results are almost similar. The size of the quiet zone is about 55 cm in width, 55 cm in height, and 55 cm in depth. The operating frequency range is up to 26GHz. Key Words: Open waveguide, ITDAMS, Multibeam reflector antenna

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