ABSTRACT

A shaping method for a circularly symmetric three-dimensional dual reflector antenna is proposed in this study. A circularly symmetric three-dimensional dual reflector surface is to be shaped to generate the prescribed aperture distribution with the circularly symmetric feed pattern. Based on the geometrical optics properties of conventional dual reflector antennas, a set of algebraic equations is obtained and solved numerically for the shaped surface points and the caustics

To generate a prescribed aperture distribution for a given primary source, the incident rays to the main reflector have to be different from those for the conventional dual reflector antenna. Since the shaped reflector surfaces are formed by the combination of small surface sections formed by two adjacent points, each surface sections locally must have properties of a conventional dual reflector. Therefore, the caustic is not a fixed point, but moves from the corresponding subreflector surface to redistribute power. This power redistribution explains how this shaping method works.

Physical optics is used to calculate the scattered field for both shaped and unshaped reflector surfaces. The results show the power is redistributed over the aperture plane. Consequently, the shaped reflector produces the increased gain and more focused power in the far zone.