NASA TECH BRIEF

Energy-Storage of a Prescribed Impedance

The best-known reflector antenna is the parabolic type; proper focus requires a point-source feed for illumination of the reflector, so that control of the amplitude of the illumination function is severely limited.

This new reflector-type antenna offers almost complete control of its aperture-illumination function, which is its principal advantage. This control enables the engineer to design for either maximum gain or low side lobes, whichever is required. The feed is either a close approximation to a line source, or some structure that is electrically equivalent to one; thus any desired distribution can be designed into the feed. This distribution is then reflected to the aperture of the cone by the conical surface, altered only predictably by the distance traveled by the wave before it strikes the reflecting surface.

Another advantage is that this antenna's beam width can be changed easily by excitation of various amounts of the line-source feed: wide beams are generated when only a little of the feed, near the apex of the cone, is excited; the beams are progressively narrower as additional sections of the feed, progressively further from the apex, are excited; and the beam is narrowest when the whole feed is excited. The conical reflector collimates a beam when the feed complies with certain geometric constraints. The line-source feed may be either directly broadside or scanned off at an angle; in either case a large cross-polarized component exists if the feed is not specifically designed for its suppression. Tests of a prototype antenna have verified the basic concepts of collimation by the conical reflector, and of cancellation of the cross-polarization by specific design of the feed.

Although designed primarily for use in spacecraft, for which it has many advantages, this antenna may interest manufacturers of antennas for aircraft and other communications systems.

Note:

Documentation is available from:
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Patent status:

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