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High-Efficiency K-Band Tracking Antenna Feed

An antenna feed has been designed and tested which features the high aperture efficiency of a multimode near-field horn and develops tracking signals without the conventional monopulse bridge. The feed is designed for the K_u-band (13.50 to 14.75 GHz), and a square horn fed by an orthomode transducer is used in the configuration. Higher order modes are generated in a step discontinuity in a square waveguide. Error signals are developed by coupling into the higher order modes in the multimode section.

In the basic feed orthogonal linear polarization is utilized. Orthogonal circular polarization is achieved by adding a wire-grid polarizer to the horn aperture.

The feed was assembled and evaluated in a Cassegrain configuration. The error signals were sampled using pin diodes in the waveguide and were added to the receive sum signal to produce single-channel monopulse tracking.

Tests show that the feed is sensitive to cross-polarized energy which couples into the orthogonal error channel. It would therefore not be a candidate for skin-tracking radar applications.

The feed assembly is relatively simple and very compact. Its cost is comparable with those of conventional four-port units and their accompanying monopulse bridge assemblies. It has an added advantage in systems with limited space.

Notes:

1. This design is described in the following report:
   "Design, Fabrication, Test, and Delivery of a K-Band Antenna Breadboard Model"
   Reference: NASA CR-134193 (N74-17931)

   Copies of this report may be obtained at cost from:
   Technology Application Center
   University of New Mexico
   Albuquerque, New Mexico 87131
   Telephone: 505-277-3622
   Reference: B75-10107
2. Specific technical questions may be directed to:
   Technology Utilization Officer
   Johnson Space Center
   Code AT3
   Houston, Texas 77058
   Reference: B75-10107

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:
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