B73-10288

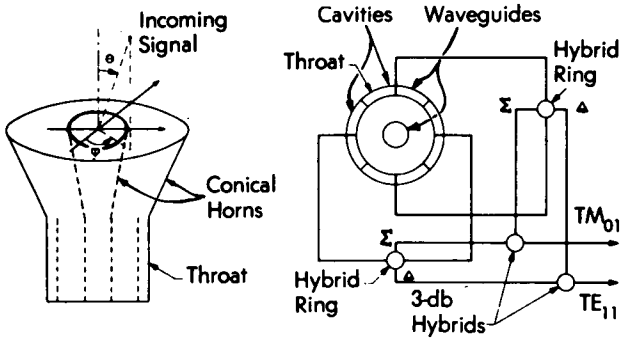
NASA TECH BRIEF

NASA Pasadena Office

Circularly-Polarized Multiband Telemetry Tracking Antenna

The problem:

To provide a high-gain antenna suitable for transmission of telemetry signals at both X- and S-band, while the antenna is tracking an incoming circularly-polarized S-band signal.



The solution:

Utilize a coaxial horn feed to illuminate a reflector; the feed has an inner horn for X-band, and an outer horn for S-band. The feed is designed so that the TM_{01} mode and the TE_{11} mode excited in the feed by the incoming tracking signal are detected. The tracking error signals for servo correction are derived from measurements of the relative phase and relative amplitude between the two modes.

How it's done:

As shown in the diagram, the feed consists of two coaxial conical horns, each fed with a circular waveguide. The inner horn and the space between the outer horn and the inner horn provide down-link telemetry at 8448 MHz and 2295 MHz, respectively. The four quasi-rectangular cavities, formed around the inside wall of the outer waveguide, and the external hybrid circuit provide monopulse tracking capability at 2115 MHz. The tracking function of the feed is accomplished by excitation of the TM_{01} mode and the TE_{11} mode in the feed by the incoming circularly-polarized signal. The TM_{01} mode exists only when the signal is off boresight, and thus provides a null on boresight. The relative phase between the TM_{01} and TE_{11} modes varies through 360 degrees as the signal revolves once around the boresight. Consequently, by comparing the magnitude and phase between the excited TM_{01} and TE_{11} modes, the magnitude Θ and the direction ϕ of the pointing error can be determined. The TM_{01} and TE_{11} modes are sampled for the amplitude and phase comparisons by the four cavities and the hybrid circuit shown in the diagram.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP 73-10288

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,665,481). Inquiries concerning nonexclusive or exclusive license for its commercial devel-

(continued overleaf)

opment should be addressed to:

NASA Patent Counsel
Mail Code 1
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: Kenneth E. Woo of
Caltech/JPL
under contract to
NASA Pasadena Office
(NPO-11264)