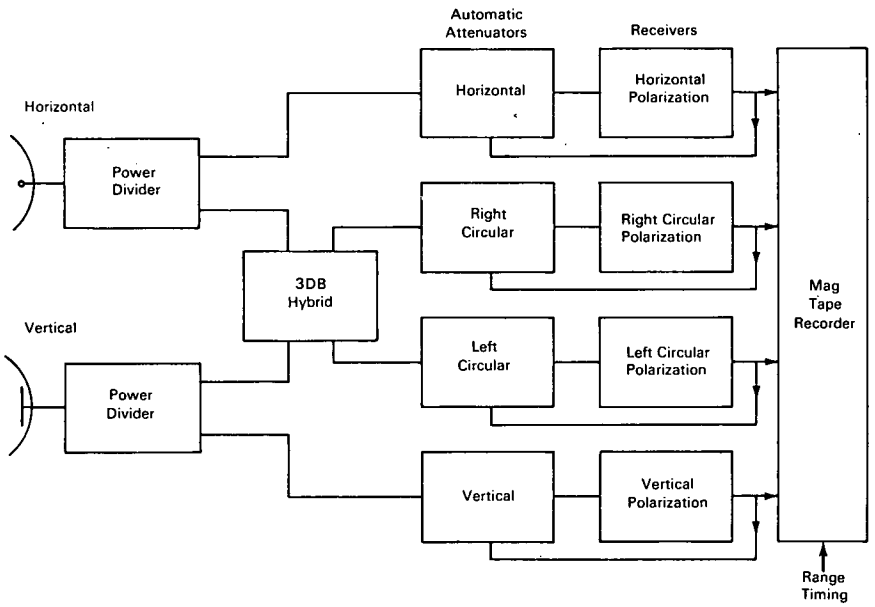
November 1967

Brief 67-10460

NASA TECH BRIEF

Range Recording Technique Enables Four-Way Polarization Measurements



Accurate inflight signal-strength measurements are necessary to verify the design and performance of RF telemetry systems. Such measurements may also be used to analyze the effect of rocket exhaust flames on the phase and amplitude of signals. Other propagation anomalies may be revealed by accurate signal strength information.

Field-strength measurements on RF systems are made by the Atlantic Missile Range, but these measurements are secondary to data recording and are typically ±5 to 6 dB in error and occasionally an order of magnitude in error. This is to be expected, since normally the automatic gain control (AGC) voltage of standard data receivers is used for signal-strength recordings. This AGC voltage is logarithmic; and though it gives a wide dynamic range, it compresses the information, especially at high signal levels.

Other factors that limit the usefulness of the standard range recordings are:

(1) Early in the flights, the vehicle is close to the receiving stations and the receivers are near saturation.

(2) Frequency response is limited to a few cycles, or at best to a few hundred.

(3) Generally only one or two polarizations are recorded; four or more are needed for complete analysis.

A simple straightforward approach was used (block diagram); the best readily available commercial equipment was assembled with a minimum of

(continued overleaf)

modification. A manually tracked antenna, the most critical part of the system, was developed. The system is novel in that it has signal strength recording responses from dc to 20 kHz.

To define the system performance completely requires all senses of polarization simultaneously; i.e., left circular, right circular, vertical, and horizontal polarizations. In addition to steady state or low-frequency-response average signal information, instantaneous information was desirable to determine the noise characteristics imposed on the signal. The data on the signal are neglected and used only for identification. Some of the design goals were to have a recording of all polarizations, linear signal strength, wide frequency response, mobility, and the best obtainable accuracy. Higher frequencies are also needed for particular aspects of studies for which the data are now being used.

Note:

Inquiries concerning these studies may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10460

Patent status:

No patent action is contemplated by NASA.

Source: P. M. Swindall
(MFS-12447)