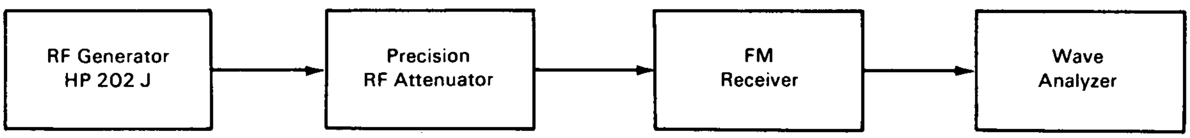
June 1970
Brief 70-10119

NASA TECH BRIEF

Graphical Method to Predict the Dynamic Response of FM Receivers



Equipment Test Setup

A technique has been devised to determine graphically the rms threshold point, saturation point, and operating points for an FM receiver utilizing various modulation indices and degrees of submodulation. The receiver operating points for various signals employing different modulation indices and types of submodulation are normally specified by the signal-to-noise ratio (S/N) for efficient receiver operation.

The S/N of an FM receiver is a function of rf input, noise figure, and bandwidth. Measurements for a generalized noise characteristic graph can be accomplished by connecting an rf signal generator to the FM receiver under test. The FM receiver video output is then measured by a wave analyzer (tunable voltmeter) using a suitable bandpass. Selection of a suitable bandpass requires a close examination of the noise at the particular frequency utilized, to prevent erroneous measures of spectral noise density and eliminate external unrelated sources. The signal generator is set to the carrier frequency and not modulated, since it is desired to measure the noise produced in an FM receiver as a function of rf input level. Measurements of the output carrier-to-noise ratio in db, for various input values in dbm, are obtained and plotted.

With no rf input applied, the noise amplitude at the video output is maximum. When the rf input power to the receiver is slowly increased, video noise magnitude first remains constant and then starts to decrease. When the receiver noise is greater than the rf input, the receiver cannot distinguish rf input from receiver noise. Further increases in rf input to the receiver cause the magnitude of the video noise to decrease rapidly, until a point is reached when the rate of noise decrease slows down. This point is called the threshold point to designate the level where the rf input magnitude is comparable to the receiver noise magnitude, and receiver noise-supression begins.

As the rf input is increased beyond the threshold value, change in video noise in db becomes a linear function of rf input in dbm. This linear relationship continues until saturation is reached. Beyond this point, the output noise shows no further decrease for any additional increase in rf input. This saturation point can be graphically determined as the first increment of rf input for which the output video noise remains constant. When data concerning a specific modulating system is desired, the receiver rms video output of the modulating system is measured within the same bandwidth in which noise is measured, and then plotted.

Note:

Requests for further information may be directed to:
Technology Utilization Officer
Kennedy Space Center
Kennedy Space Center, Florida 32899
Reference: TSP70-10119

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: Karl Merz of
The Boeing Company
under contract to
Kennedy Space Center
(KSC-10111)