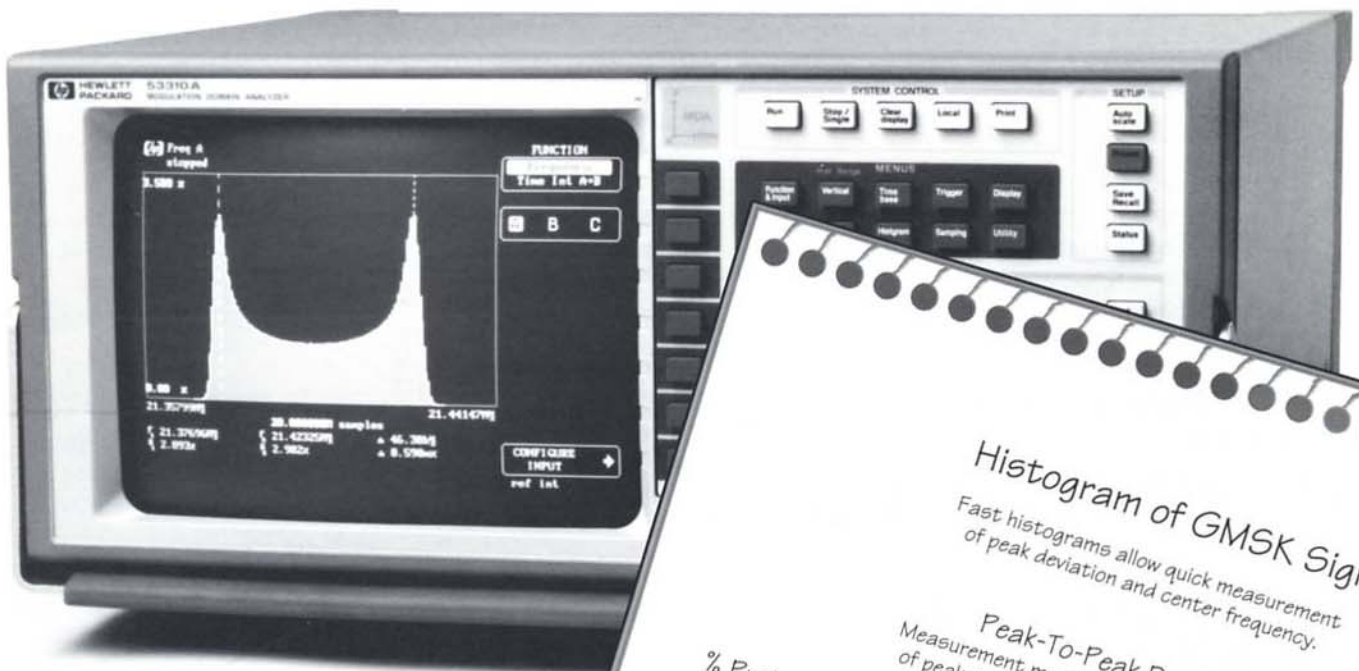# Peak Deviation and Center Frequency Measurements For CT2 and DECT Radios

Application Brief AN 1200-12

HP 53310A Modulation Domain Analyzer

Histogram of GMSK Signal
Fast histograms allow quick measurement of peak deviation and center frequency.

Peak-To-Peak Deviation
Measurement markers allow quick verification of peak-to-peak deviation. Peak deviation is simply one half the peak-to-peak value.

% Probability

Center Frequency
Quickly verify center frequency as half way between the "deviation" peaks.

Frequency

Easy Analysis of GMSK Modulation for CT2 and DECT Radios

Situation

The use of digital modulation in mobile communications systems is growing rapidly. Information in the form of 1's and 0's is often transmitted as two different frequencies. This is known as Minimum Shift Keying (MSK), or Gaussian Minimum Shift Keying (GMSK) if the data is filtered. In most systems Time Division Multiple Access (TDMA) techniques are also used to increase the number of users on each frequency channel. This TDMA, or bursting, means that the transmitter is only on for a few hundred microseconds at a time.

Problem

Measuring the peak deviation and center frequency of such signals is required to meet the regulatory standards. However, measuring the deviation accurately on a bursted signal is difficult or impossible with conventional modulation analyzers. In addition, pulse counters only "average" the frequency within a burst, so the center frequency value will be a function of the particular data sequence transmitted. With wide deviations, discriminator techniques are cumbersome. Complete CT2 or DECT terminal characterization is limited using conventional test techniques.

Solution

The HP 53310A Modulation Domain Analyzer's fast histograms make it easy to to view the modulation on a bursted signal in real time. The frequency markers can be positioned on the two peaks; the delta value will read twice the peak deviation automatically. The center frequency is then simply half way between the peaks.

Note: To obtain optimal frequency resolution, it is necessary to downconvert the RF signal to about 20 MHz. The auxiliary IF output of an HP spectrum analyzer provides a convenient and simple source of downconversion.

The Modulation Domain Gives You a New Way to View Your Complex Signals

Better ways to analyze your complex signals don't come along often. Now Hewlett-Packard brings you the Modulation Domain - a way of looking at frequency or time interval measurements that directly and clearly reveals both intentional and unintentional modulation.

For frequency analysis, it's the missing piece of the puzzle. The Time Domain shows you amplitude (voltage) vs. time. The Frequency Domain gives you amplitude vs. frequency. The Modulation Domain plots frequency vs. time - an intuitive and insightful way of examining your signal's dynamic frequency modulation.
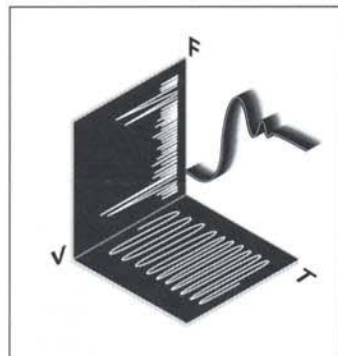
For timing measurements, the Modulation Domain's view of time interval vs. time allows you to both see and quantify timing jitter directly - taking you one step beyond the Time Domain's qualitative view.

Related Applications

- Examining GMSK modulation in GSM and PCN radios
- Examining frequency hopping sequences of hopped cellular radios or secure communication systems
- Examining turn-on time of mobile radios
- Examining channel switching and lock times in mobile radios
- Characterizing VCO and phase-locked loop response

For more information, call your local Hewlett-Packard Test and Measurement Sales Office listed in your telephone directory.