

3.6.: Spectrum Analysis

Spectrum analyzers are generally employed to measure signal characteristics such as carrier level, sidebands, harmonics, and phase noise. They are usually configured as a single-channel receiver without a source. These instruments have a wide range of IF bandwidths available in order to analyze diverse types of signals and are often used with external sources for nonlinear stimulus/response testing. When combined with a tracking generator, spectrum analyzers can be used for scalar component testing to show magnitude versus frequency information but not phase information.

Spectrum analyzers differ in form and function from another tool commonly used to characterize communications systems and components, the network analyzer (Figure 1). Spectrum analyzers measure unknown external signals. In contrast, network analyzers utilize synthesized-frequency sources to provide a known test stimulus that can sweep across a range of frequencies or power levels. Network analyzers also can perform ratioed measurements (including phase), which require multiple receivers. These measurements cannot be performed with a spectrum analyzer, even when it is complemented by a tracking generator.

A spectrum analyzer with a dedicated tracking generator and an external coupler or directional bridge can approximate the operation of a scalar network analyzer by showing amplitude as a function of swept frequency. However, the spectrum analyzer cannot make ratioed measurements or phase measurements. It is also limited to simple normalization in terms of error correction, providing far less measurement accuracy.

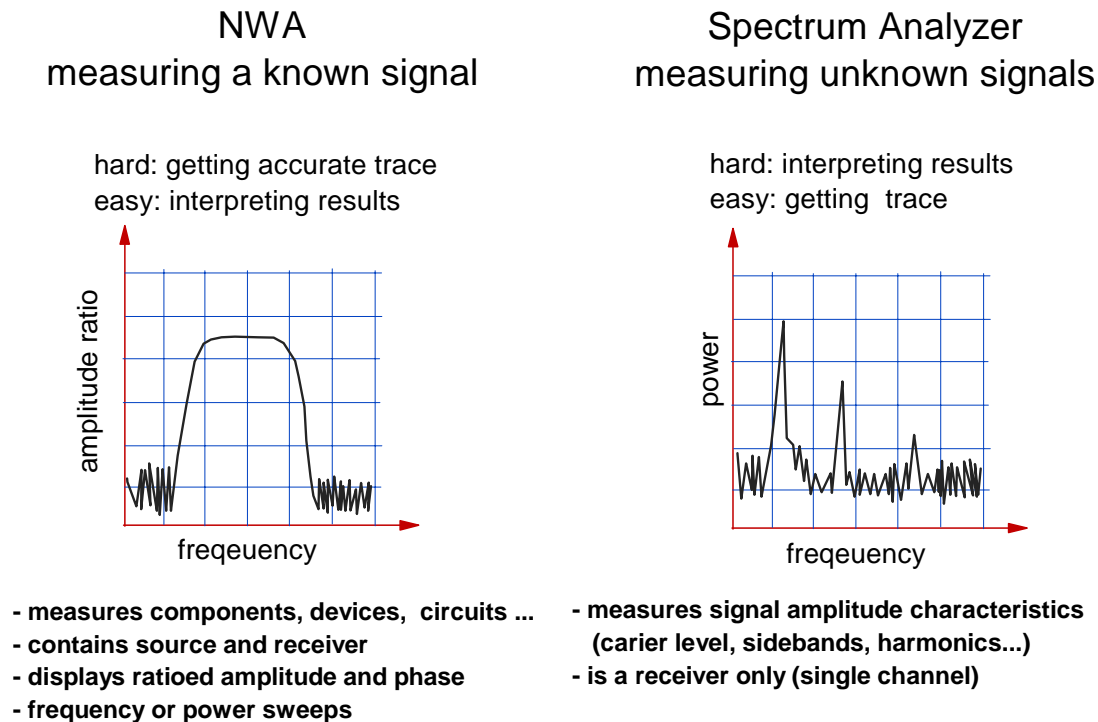
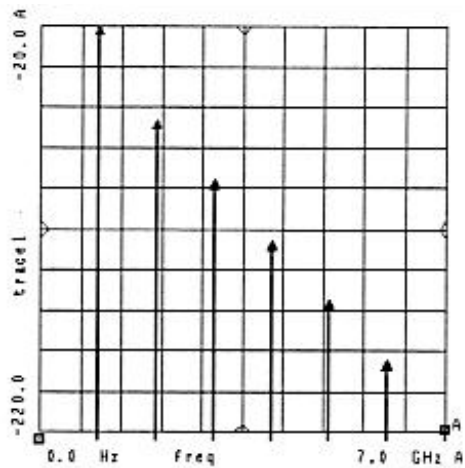


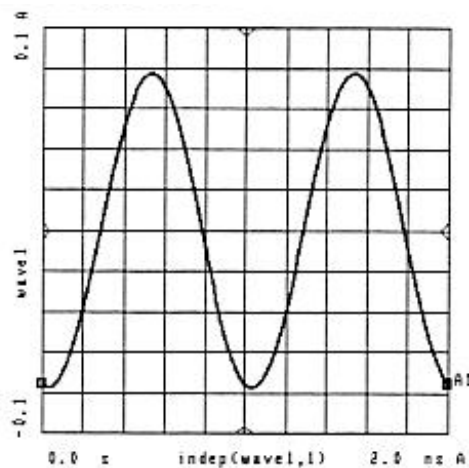
Fig1: Differences between Network and Spectrum Analyzers

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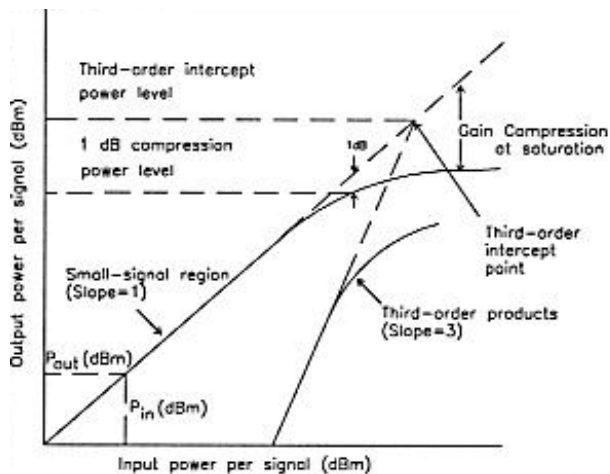
Using a spectrum analyzer allows to model also device properties like spectral distortion. If the trace of the third order harmonics is measured versus input power, important RF characteristics like 3rd order intercept can be modeled. See also the chapter on RF simulators.



spectrum at node "vout"



waveform at node "vout"



Publications:

Hewlett-Packard Application Note 1287-2: Exploring the Architectures of Network Analyzers.

David Ballo, Network Analyzer Basics, Hewlett-Packard 1997 Back to Basics Seminar, HP Microwave Instruments Division, Santa Rosa, California, HP Publication No.: 5956-7917E