

Analyse this

With budgets tightening, purchasing the right piece of communications test equipment can become a strategic decision. By **Chris Shaw**.

When it comes to testing and evaluating the wide range of rf communication signals and technologies, spectrum analysers are often designers' preferred tool of choice.

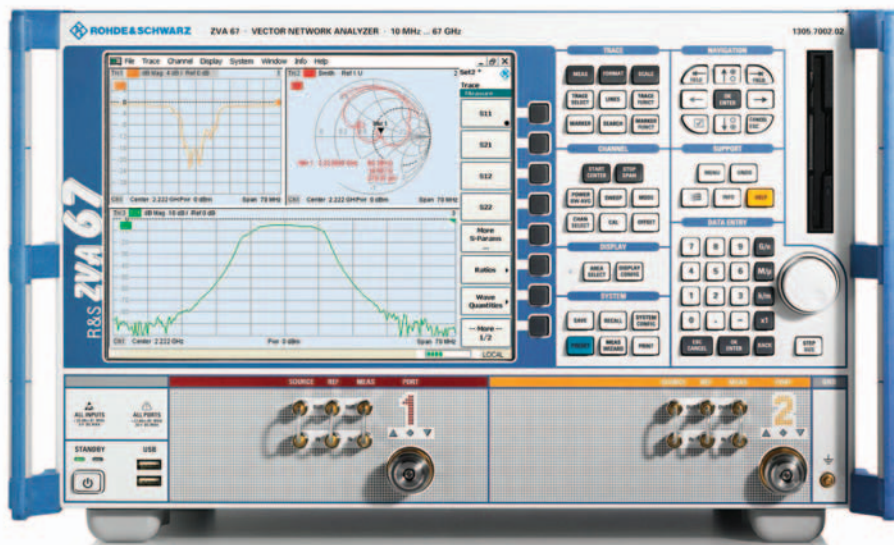
They are particularly valued in the communications industry because of their broad frequency range, which can extend from less than a few Hertz to the gigaHertz range. Spectrum analysers also have a wide amplitude measurement range from close to the limits of random noise up to 30dBm.

As Jeff Hu, Agilent Technologies' product manager for the CXA signal analyser, observes, they are also valued for the ability to separate complex signals into component pieces driven by an extensive selection of digital resolution bandwidth filters from 1Hz to more than 8MHz.

Hu observed: "A large distortion free dynamic range enables measurement of tiny nonlinearities and leakage in the presence of large signals. This compelling performance, combined with diminishing measurement time, has led to the spectrum analyser's popularity among rf engineers."

Meeting the escalating needs of wireless technology to force more data through limited frequency and bandwidth channels means exploiting ever more complex modulation schemes. So signal analysers, such as the Agilent X-series, have increased their measurement sophistication beyond the analysis of power versus frequency and time.

Now, says Hu, powerful analysis tools allow complex modulation schemes and their underlying parameters to be evaluated, while providing application specific displays and metrics. "Built in, single button activated, test routines, advanced measurement algorithms and standards specific software simplify the setup and automation of modulation testing," Hu asserted. "Also, by leveraging its potent rf



Rohde & Schwarz' ZVA67 can address frequencies ranging from 10MHz to 67GHz

hardware performance and computational capabilities, the spectrum analyser can perform the tasks of multiple instruments more economically within a single platform."

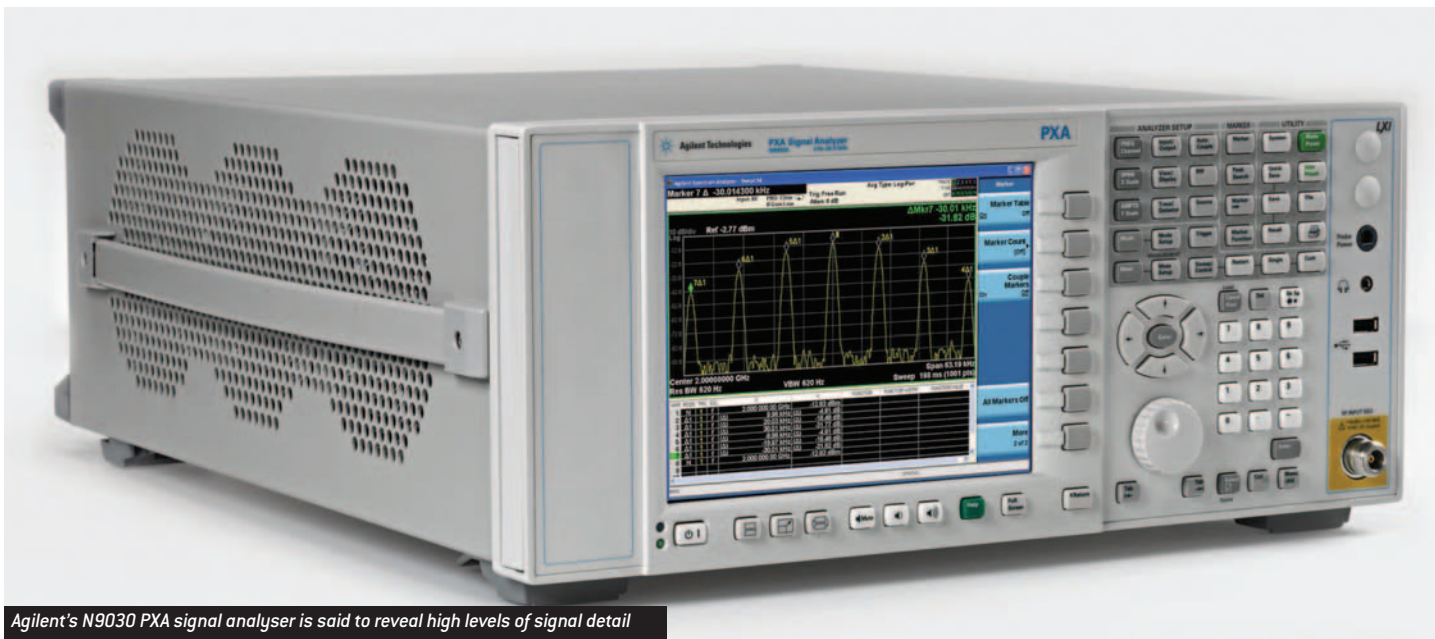
Agilent's X-Series signal analysers have been designed to emulate a noise figure meter, phase noise test set, emc pre-compliance analyser and vector signal analyser. According to Hu, a user interface honed over multiple Agilent analyser generations and modern connectivity like LAN and USB, makes it easier to use these capabilities.

This level of analysis hasn't always been available to lower end R&D, manufacturing and education organisations. Hu noted: "For example, with cost sensitive driven manufacturing test engineers, their biggest challenge is often the relentless cost reduction combined with limited capital equipment budgets. The Agilent CXA signal analyser model, as the most affordable member of the Agilent X-Series signal analysers,

makes possible the first low cost access to these powerful and sophisticated analysis tools."

Analogue demodulation measurements

AM and FM are still a principal form of wireless communications worldwide, ranging from commercial broadcast stations to business radios. Analogue radio manufacturers are challenged to test, evaluate and troubleshoot their products with increasingly more efficient and comprehensive tools. With additional applications, signal analysers can address the matter. For example, Agilent's optional W9063A analogue demodulation measurement application for the CXA has been designed to quickly analyse modulated signals such as AM, FM and PM, providing a quad view showing the rf spectrum, af spectrum, demodulation waveform and fm demodulation metrics simultaneously. By watching the traces in the various domains



Agilent's N9030 PXA signal analyser is said to reveal high levels of signal detail

along with the metrics, engineers can view the signal characteristics precisely and, during troubleshooting, identify the cause of a problem.

Noise figure measurements

A key measurement in the development of devices and systems is the noise figure. The overall noise figure of a system is one of the limiting factors in performance. Making noise figure measurements can also be a tedious manual process.

To address this, Rohde & Schwarz has enhanced its FSV signal and spectrum analyser range to handle measurements up to 40GHz. Typical applications are satellite, radar or military communication systems.

R&S has added options for noise figure and phase noise measurements to its FSV40, for characterising components such as amplifiers and oscillators. For scalar network analysis, it is able to provide an internal tracking generator up to 7GHz, while microwave generators can be connected to attain frequencies up to 40GHz.

To address noise figure, the FSV40 has a low inherent noise of -139dBm (1Hz) at 40GHz combined with a 18dBm third order intercept, which allows measurement of spurious emissions without inherent distortions at high sensitivity even at high signal levels.

It measures a 1GHz span at 1kHz resolution bandwidth in 2.5s, compared with the 1000s required by the company's preceding generation

in this class. And its measurement speed has similarly been enhanced, with the capability of 1000 measurements a second.

R&S' FSV-K30 option for noise figure and gain measurements on receiver front ends, amplifier components and system modules, means that additional noise figure test assembly is not necessary. The FSV-K40 option measures single sideband phase noise on oscillators which means that it's possible to determine the key parameters of an oscillator, output power, frequency and frequency stability with one instrument.

Agilent, too has an additional option for its CXA, designed to make noise figure measurements quicker, easier and with accurate results. The W9069A noise figure application provides a suite of noise figure and gain measurements from 200kHz up to 7.5GHz, depending on which CXA model is chosen. Hu added: "The CXA analysers offer an optional 3 or 7.5GHz preamplifier required to reduce instrument uncertainty so low gain devices can conveniently and accurately be measured. In addition, setup menus help guide engineers through amplifier and mixer measurements. A built in measurement uncertainty calculator makes it easy to qualify a measurement system."

Rohde & Schwarz' ZVA67 is the company's first vector network analyser for the frequency range from 10MHz to 67GHz. According to R&S it

is the fastest vector network analyser in its class with the highest dynamic range.

Designed to measure components for civil or military radar applications or microwave links, it can also measure noise figures on amplifiers.

The ZVA67 has a dynamic range of 110dB a 67GHz with a throughput measurement time of 3.5µs for each test point. With an output power at 67GHz and a power sweep range of of more than 40dB, the ZVA67 is suitable for characterising small and large signal behaviour on active components and can analyse S-parameters, harmonics, compression, intermodulation and noise parameters.

The highest performing member of Agilent's X series is the N9030 PXA signal analyser, which can provide frequency coverage up to 26.5GHz. Its performance is said to reveal high levels of signal detail, starting with up to 75dB spurious free dynamic range at 140MHz analysis bandwidth. Its specifications include 128dBc/Hz phase noise at 10kHz offset (1GHz), 0.19dB absolute amplitude accuracy and sensitivity of -172dBm displayed average noise level at 2GHz.

And, as Hu pointed out, the PXA is the flagship of the Agilent X-series. He explained: "The X-Series is an evolutionary approach to signal analysis that spans instruments, measurements and software. It provides the flexibility to address business and technical requirements across multiple products and programs – now and in the future."