Simplify Spectrum/Signal Analyzer Selection with 5 Key Considerations

Understanding your specific design needs and the functionality required can ease the selection process.

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Spectrum and signal analyzers can be a critical asset in wireless development and manufacturing. Spectrum and vector signal analyzers are perhaps the most fundamental and flexible tools in the wireless engineer's test kit, and can be a critical asset in wireless development and manufacturing.

While the signal analyzer performs many of the same measurement and characterization tasks as the spectrum analyzer, it also performs many more useful digital demodulation functions — a critical asset for the wireless market. To more effectively address the needs of today's digital communications schemes, both analyzers are evolving to include broader ADC and DSP technology, as well as analysis software. Selecting a spectrum/signal analyzer for the wireless market can be difficult given the wide range of options from which to choose. Five key considerations can help simplify that choice.

1. Can a single metric be used to narrow down my choice?

No single metric can dramatically narrow your choice, but the list of major metrics to consider when selecting a spectrum/signal analyzer is fairly short. It includes:

- *Frequency range* — The overall price and performance of the spectrum/signal analyzer is largely influenced by its highest specified frequency. All performance measures, except perhaps speed, decline as measured frequency increases.
- *Dynamic range for W-CDMA adjacent channel power (ACP)* — ACP dynamic range is an excellent metric for swept RF spectrum analyzers because it includes the combined influences of broader performance factors. The W-CDMA figure is attractive because it is a relatively mature technology with many vendors providing built-in W-CDMA ACP measurements along with associated specifications. A good rule of thumb for your selection is as follows: A midrange analyzer (without noise correction) should provide ACP in the low 70 dB range. A high performance analyzer should reach a high 70 dB figure. ACP measurements also offer a rough indication of measurement speed.
- *Amplitude accuracy* — Power measurements are fundamental to RF design and manufacturing. Some analyzers, particularly those with all-digital IF sections, feature amplitude accuracy that nearly matches that of dedicated power meters. The frequency and time speci-

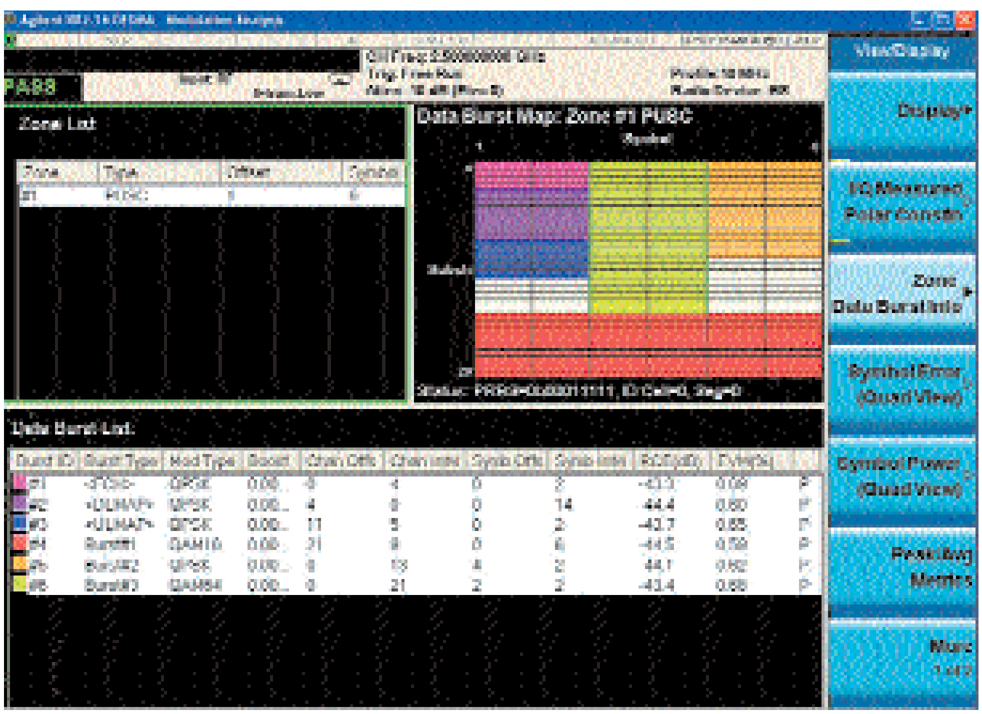

Figure 1. The Agilent N9075A 802.16 OFDMA Measurement Application provides channel power, power versus time, ACP, CCDF, spectrum emission mask, occupied bandwidth, and complete modulation analysis including DL/UL map auto detection and equalizer response. This standard-specific measurement application also allows measurements to be optimized for speed, accuracy and/or dynamic range.

ficity (via time-gated measurements and band power markers) of spectrum analyzer power measurements make them a perfect solution to wireless applications.

2. Which spectrum/signal analyzer will help me achieve faster time-to-market?

Look for an analyzer that features a dedicated measurement set, such as a measurement application or personality, in support of today's major wireless standards. Built-in measurement applications conveniently evaluate a range of parameters (e.g., power, spectral purity and modulation quality), and often include limits testing (see Figure 1). Because they provide a simplified GUI and SCPI command set for automated test, they are well suited for design and development through to production. The benefits of a built-in measurement application include dramatically reduced setup times and chance of setup errors, improved productivity and the ability to quickly make standard sets of measurements.

3. If no commercial measurement application exists to test my device, how do I select a spectrum/signal analyzer?

Seek out analyzers offering "generic" versions of common RF/µW measurements (e.g., channel power, occupied bandwidth, ACPR and harmonic distortion). These general measurement routines can be customized for a particular system, or routines for common standards can be modified, often including measurement limits.

To deal with the complex task of modulation analysis outside of commonly supported standards, use one of any number of flexible demodulation software solutions (see Figure 2). Since the software operates with analog and digital inputs and from baseband through microwave frequencies, these solutions are available for non-standard systems from simulation through manufacturing.

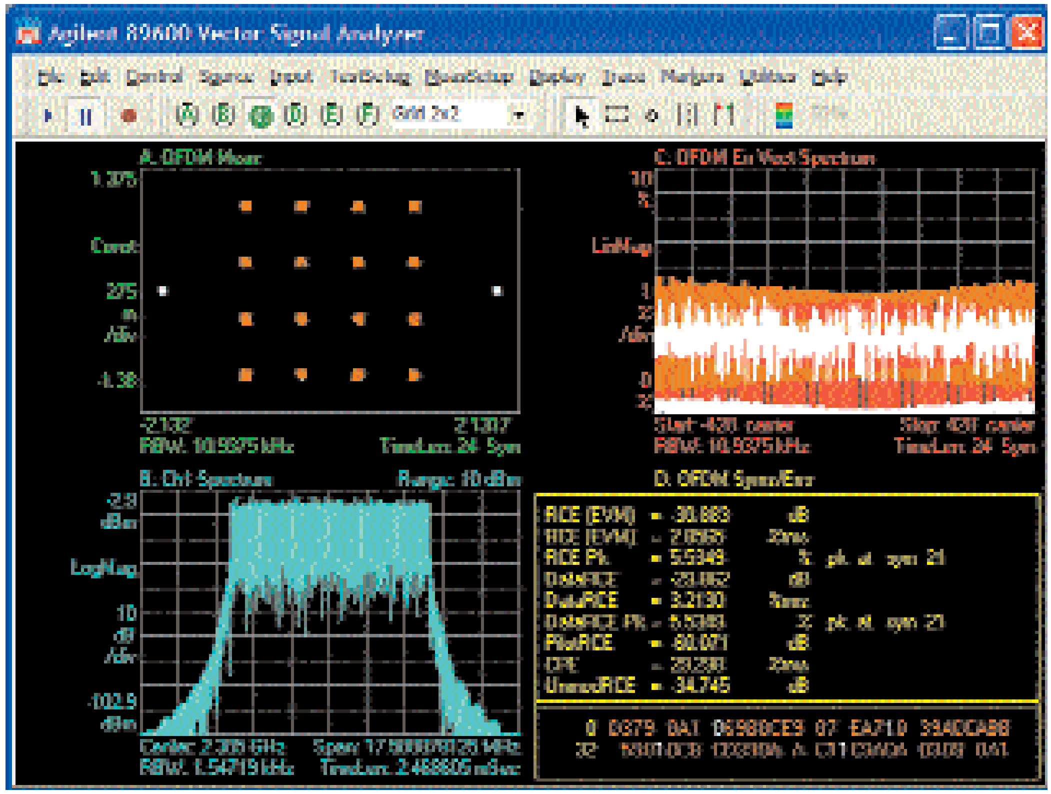

Figure 2. Agilent's 89600 series vector signal analysis software offers many demodulation options and measurement displays. It is available with a flexible GUI or as a dedicated hardkey/softkey solution operating inside Agilent's X Series signal analyzer.

4. Which solution is suitable for manufacturing where improved throughput and yield are critical?

Consider a modern analyzer with built-in measurement applications, as their speed and power make them better choices for manufacturing — especially when RF parametric tests (including demodulation) are sufficient and protocol verification is not required. And, because amplitude accuracy on par with power meters simplifies test systems and improves yield by reducing error margins, consider spectrum/signal analyzers that offer a combination of amplitude accuracy and measurement speed.

Note that some analyzers provide combinations of FFT and fully swept modes, list or discrete sweep features, and coordinated source control as a way to increase measurement speed for both narrowband and wideband measurements. Consequently, in situations where dedicated measurement applications or customizable built-in routines are sufficient, the factors dictating analyzer selection may not change from development to production. Commonality between development and manufacturing is also enhanced when analyzers have a full set of programming/control interfaces such as LAN, GP-IB, and USB, and when LXI support is included.

5. Which analyzer offers the best long-term investment?

Here, the primary specification to look at is frequency range. Ensure that the analyzer you select covers the frequency range of present and likely future carrier frequencies, multiplied by the number of harmonics you may need to cover. For wireless networking with common frequencies extending to about 5 GHz, that means analyzers with frequency ranges of 13 to 26 GHz unless the analyzer will be dedicated to narrowband analysis or demodulation. Also, look for built-in preamplifiers which should cover the widest range possible and are considerably less expensive to purchase initially, rather than to retrofit.

If the analyzer's frequency range and fundamental performance remains sufficient, then consider its flexibility and upgradeability. Can the analyzer handle a wide variety of tasks, be re-deployed as necessary or adapt its hardware or software capabilities to match evolving needs? Is it based on an open Windows operating system with a variety of interfaces? Lastly, has it been fitted with removable processor assemblies or hard disks? If the answer to these questions is yes, then the analyzer likely facilitates upgrades and is therefore ideal for long-term investment.

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About the Authors

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