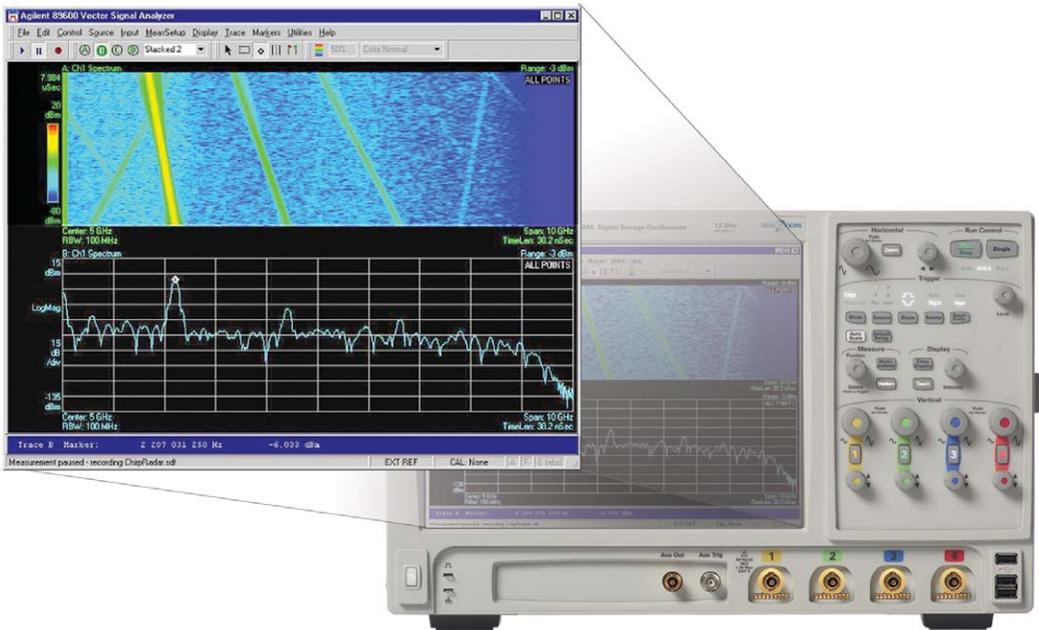


Agilent Infiniium Oscilloscopes and 89601A Vector Signal Analysis Software

Data Sheet



Wideband (up to 13 GHz) vector signal analysis and demodulation tools for applications including radar, satellite communications, UWB and MIMO.

Modulated radar and wideband communications signals require widebandwidth signal analysis that goes beyond the capabilities of traditional spectrum analyzer-based signal acquisition. The team of Agilent's Infiniium real-time oscilloscopes and 89601A Vector Signal Analysis Software is the only solution to deliver

precise, accurate measurement and analysis for signal bandwidths up to 13-GHz. You can now take advantage of Agilent's unparalleled experience and sustained leadership in signal analysis, combined with Agilent's industry-leading high-performance real-time digitizing oscilloscopes.

- Flexible demodulation lets you measure constellation diagrams, carrier offset, and frequency error for QPSK signals, 256-QAM signals and much more.
- Display formats including spectrogram, phase vs time, and frequency vs time provide rapid insight into complex signal behavior.
- Error vector magnitude measurements (89601A Option AYA).
- Dual-channel measurements allow stimulus-response, delay, other transfer function measurements similar to a network analyzer.
- Markers facilitate frequency, amplitude, offset, power, phase, other measurements.
- Time gating allows you to select specific portion of signals for signal analysis.
- Variable frequency resolution.

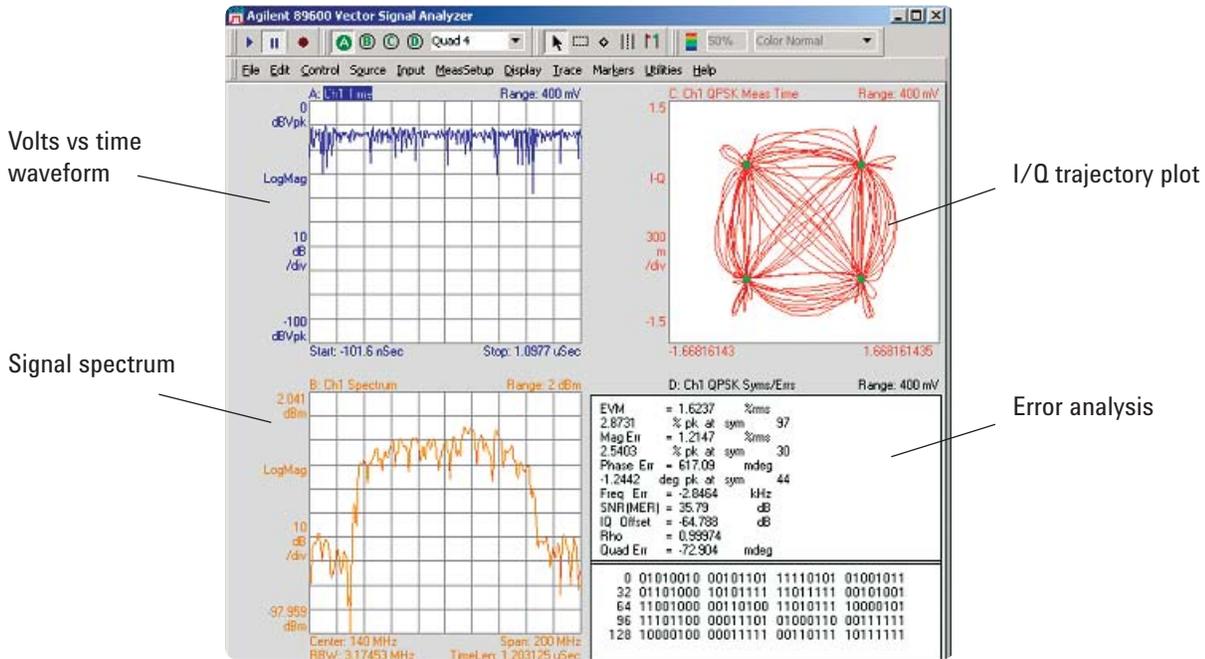


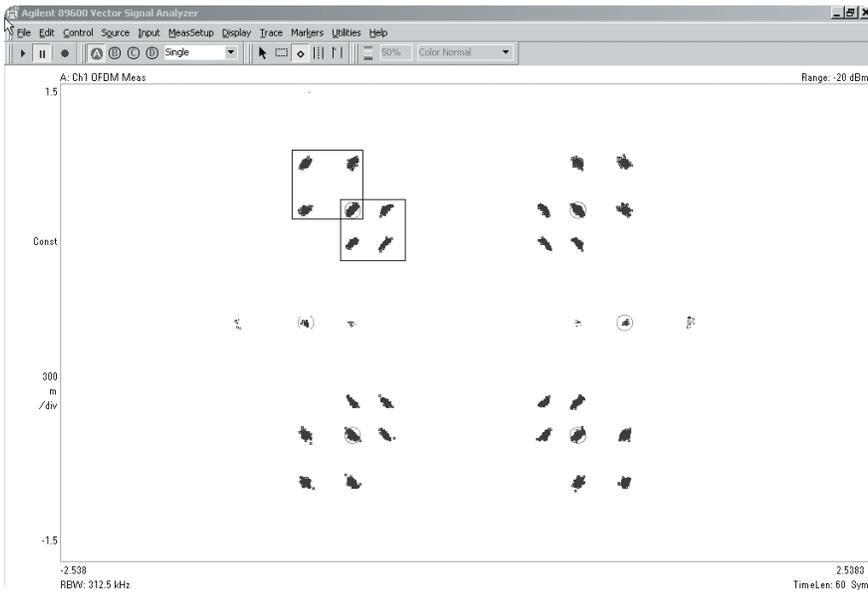
Figure 1. Modulation analysis of a QPSK signal in four different views.

Flexible vector modulation analysis

The 89601A vector signal analyzer (VSA) provides flexible tools for analyzing and demodulating even the most advanced digital modulation formats, including those not defined by an established standard.

The VSA makes measurements on signals in the time and frequency domains using either the BB (baseband) or IF Zoom mode. In BB mode, the analysis frequency range is from 0-Hz to the stop frequency. In IF Zoom mode, the analysis frequency range is defined by center frequency

and span. There is also an I+jQ mode for analyzing two baseband quadrature channels. Results for any mode can be displayed as magnitude or phase, in I/Q and several other formats.



With the optional digital demodulator, Option 89601A-AYA, modulation quality measurements in the form of error vector magnitude (EVM) can be made on digital wireless communications signals with bandwidths of hundreds of MHz. In addition, powerful diagnosis capabilities allow you to determine the exact impairments that cause a digitally modulated signal to fail quality standards.

A choice of 24 digital demodulators, 8 filters, and 25 instrument presets puts all this power at your fingertips.

Figure 2. QPSK Error Vector Magnitude (EVM) constellation diagram showing IQ gain imbalance.

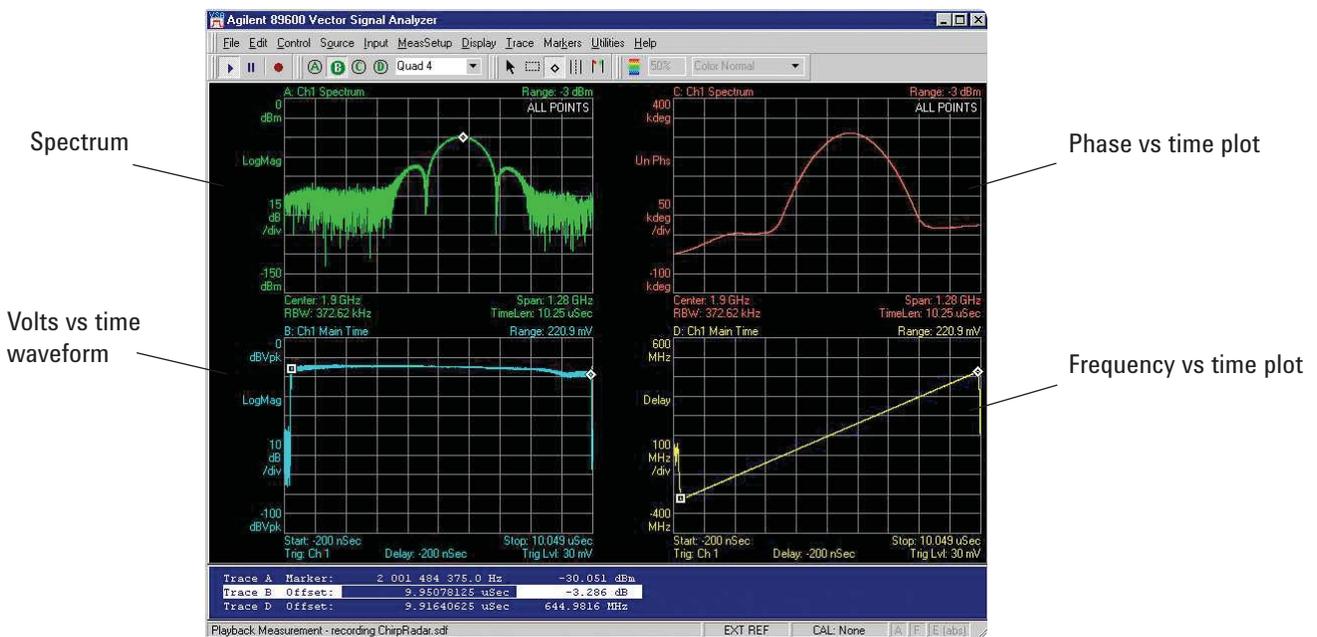


Figure 3. Chirped radar analysis.

Modulated radar analysis

With the wideband Infiniium oscilloscope and 89601A Vector Signal Analyzer, you can measure phase

linearity, frequency linearity, and other parameters of chirped radar signals easily.

Powerful spectrograph display provides insight

The spectrogram display (upper trace in Figure 4) shows the frequency behavior of the radar signal over time. This particular signal has significant 2nd and 3rd order harmonics.

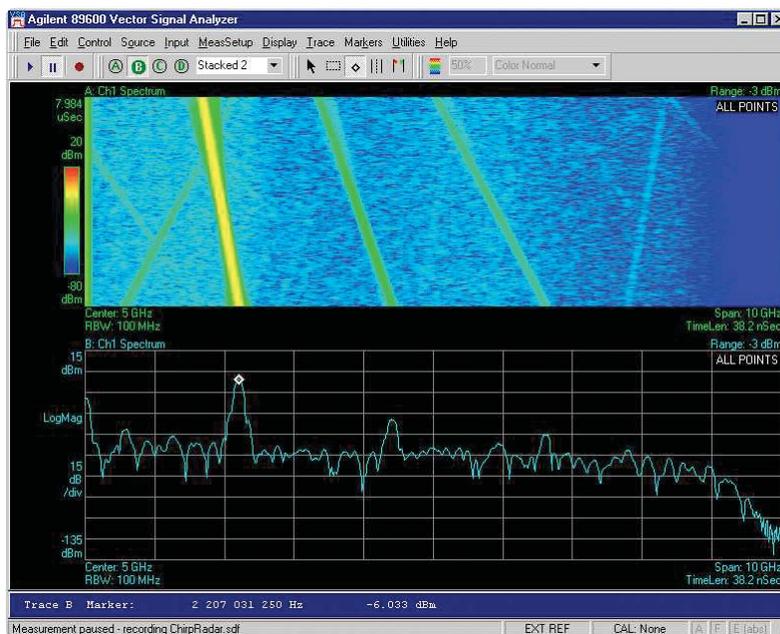


Figure 4. Spectrogram display shows signal dynamic behavior.

Dual-channel measurements

Finding the 1-dB compression point of an amplifier using a GMSK signal

Figure 5 illustrates a measurement of an amplifier's 1-dB compression point. Amplifier designers no longer have to rely exclusively on network analyzers with unmodulated sinusoidal stimulus. The Infiniium oscilloscope/VSA combination allows for this measurement by using an actual complex-modulated signal as stimulus. Use of complex stimulus allows component designers to observe performance characteristics that would otherwise be undetectable when using sinusoidal stimulus.



Real (blue) vs ideal (yellow) response

Figure 5. Finding the 1-dB compression point of an amplifier using real-world signal as stimulus.

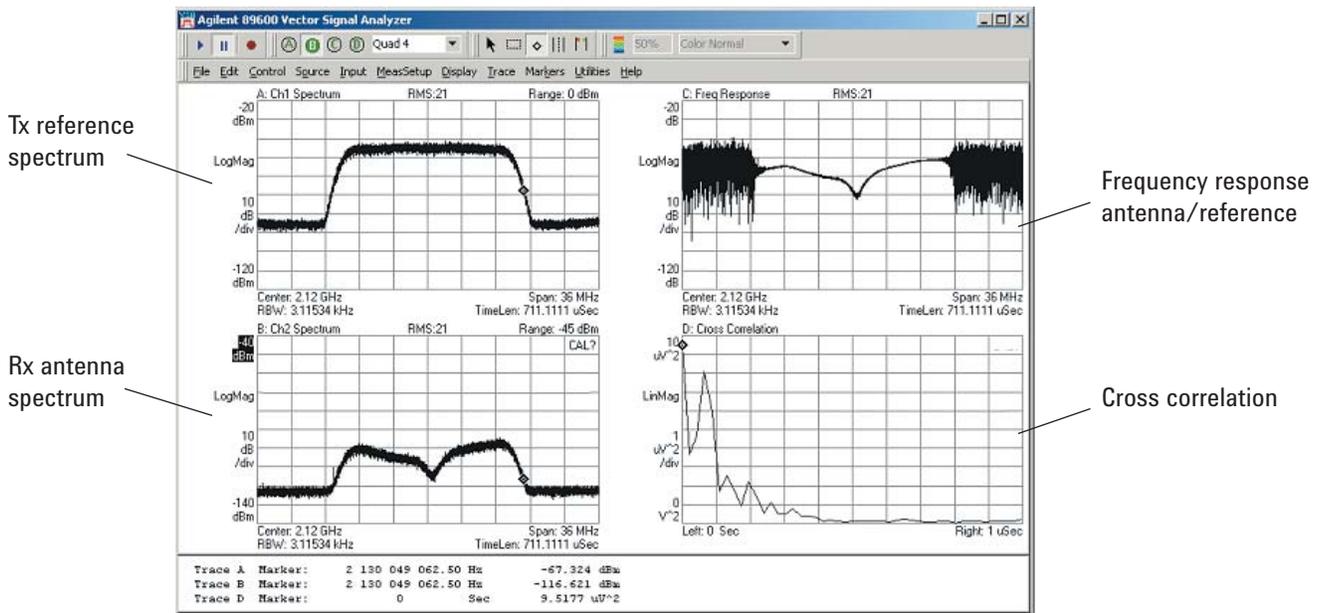


Figure 6. Measuring difference in delay in RF multipath.

Measuring RF path delay spread between a pair of antennas

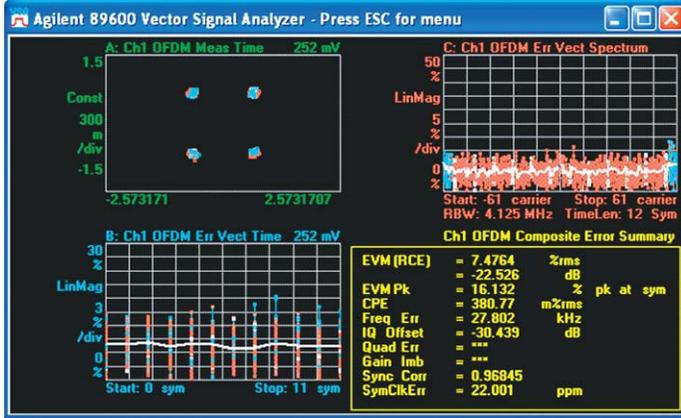
The measurement shown in Figure-6 demonstrates how the Infiniium oscilloscope/VSA software combination can reveal characteristics of the transmit channel. The measurement was created by using a signal generator to provide the same stimulus to both input channels of the Infiniium oscilloscope, with the physical channels being the only difference observed at the receiver end. The output of the signal generator was directed through an RF power splitter to a transmit antenna as well as the channel one input of the

oscilloscope. The generator was set to produce a random noise signal, band limited to 15-MHz. A second receive antenna was connected to the channel two input of the oscilloscope. The antennas were separated by ~2-meters with a large metal object positioned to partially block line-of-site transmission.

The spectrum of the signal coming from the receive antenna clearly shows a spectral notch resulting from multipath in the RF channel. The frequency response result, computed using data from both measurement channels, can be interpreted in this measurement as the channel response.

The frequency response is a complex function and is displayed in the upper right grid in Figure-6 in log-magnitude coordinates. Other coordinates, such as phase or group delay, may also be selected.

In the lower right grid the cross correlation between the time waveforms on each measurement channel shows the impulse response and delay spread of the channel. Time resolution in the cross-correlation result is a function of both the signal bandwidth, and the instrument span selected.



MB-OFDM ultra-wideband modulation analysis (Option BHB)

Troubleshoot your WiMedia-based multi-band OFDM ultra-wideband PHY layer signals, such as those in certified wireless USB, with the industry's most complete set of

easy-to-use measurement tools, providing you with an unparalleled view into your PHY layer signals. Use Option BHB running on the high performance Infiniium oscilloscopes to help you identify the root causes of problems, sooner.

Supporting all Time Frequency Codes (TFC1 through TFC10), including FFI (non-hopped) and TFI (hopped) modes, Option BHB lets you analyze a wide range of formats, including QPSK modulation (utilized for data rates from 53.3 Mb/s to 200 Mb/s), and DCM (at data rates from 200 Mb/s to 480 Mb/s), using burst or standard preamble types. In addition, you can manually turn off/on frequency hopping analysis. In the off mode, the synchronization pattern of the TFC selected will be used, but the software assumes that the signal occupies only one band. This mode of operation is especially useful when bringing up and testing various hopping modes..

Oscilloscope Compatibility

The 89601A Vector Signal Analyzer software is compatible with the Infiniium oscilloscopes listed in Table 1. The Vector Signal Analysis Software will run on a separate PC or can be installed and run on the

oscilloscope's internal Windows XP PC on the DSO90000A Series and the DSO8000 Series. 89601A VSA Software currently provides unofficial support for the 90000 X-Series. Please contact Agilent for a complete list of supported Infiniium models.

Ordering Information

Infiniium oscilloscopes

| Model Number | Bandwidth | Channels | Sample Rate | Standard Memory Depth |
|------------------|------------------|----------|--------------------------------|-----------------------|
| DSO90000A Series | 2.5 GHz- 13 GHz | 4 | 20 or 40 GSa/s on all channels | 10 Mpts to 1 Gpts |
| DSO8000 Series | 600 MHz- 1 GHz | 4 | up to 4 GSa/s | 8 Mpts to 128 Mpts |
| DSO7000 Series | 350 MHz to 1 GHz | 2 or 4 | up to 4 GSa/s | 8 Mpts |

Refer to *Infiniium Series Oscilloscope Probes, Accessories, and Options*, Selection Guide, publication number 5968-7141EN, and *Infiniium 90000A Series Oscilloscopes*, Data Sheet, publication number 5989-7819EN, for probes and other options available.

Vector Signal Analysis Software

| Model Number | Description |
|--------------|---------------------------------|
| 89601A | Vector Signal Analysis Software |

Option available for 89601A

| Option | Description |
|----------------|---------------------------------------|
| 200 (required) | Basic Software |
| 300 | Hardware Connectivity |
| AYA | Flexible Modulation Analysis |
| BHB | MB-OFDM Modulation Analysis |
| B7Z | IEEE 802.16n MIMO Modulation Analysis |

Related Literature

| Publication Title | Publication Type | Publication Number |
|--|--------------------|--------------------|
| <i>Agilent Infiniium DSO/DSA90000A Series Oscilloscopes</i> | Data Sheet | 5989-7819EN |
| <i>Agilent Technologies Infiniium 90000 X-Series Oscilloscopes</i> | Date Sheet | 5990-5271EN |
| <i>Agilent Infiniium 8000 Series Oscilloscopes</i> | Data sheet | 5989-4271EN |
| <i>Agilent InfiniiVision 7000 Series Oscilloscopes</i> | Data sheet | 5989-7736EN |
| <i>Agilent Technologies Solutions for MB-OFDM Ultra-wideband</i> | Application note | 5989-5280EN |
| <i>Agilent 89600 Series Vector Signal Analyzer Software Product Overview</i> | Data Sheet | 5988-3977EN |
| <i>Agilent 89600 Series VSA</i> | Technical Overview | 5989-1679EN |
| <i>Agilent Infiniium Oscilloscopes Performance Guide Using 89601A Vector Signal Analyzer Software</i> | Data Sheet | 5988-4096EN |
| <i>Agilent WLAN and Baseband Transmitter Analysis Using Agilent Infiniium Oscilloscopes and 89600 Software</i> | Data Sheet | 5989-0327EN |

Also see www.agilent.com/find/UWB



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