Agilent
89604A/89604AN
Distortion Test Suite Software

Technical Overview

• Measures complex stimulus signals
• Exports time-aligned stimulus/response data
• Displays AM/AM, AM/PM, “delta” EVM results
• PC-based software
• Works with a variety of Agilent analyzers

The 89604A is discontinued as of 31 March 2012.
The recommended replacement product is the Agilent 89604L.
Distortion Test Suite
Software

Meeting the linearity goals set for today’s advanced multichannel power amplifier (MCPA) designs is a challenge. Measuring the linearity of such a wide bandwidth device is nearly as challenging. Using traditional narrow-band techniques to measure wideband designs can produce inaccurate and even misleading results (Figure 1).

The 89604A distortion test suite works with complex modulated wideband signals to accurately measure AM/AM and AM/PM distortion of MCPAs with up to 80 MHz measurement bandwidth. This wideband measurement technique helps assure that even subtle distortion mechanisms like memory effects and local heating are stimulated and measured.

Powerful measurements

AM/AM and AM/PM measurement results are displayed together with a linear performance line and a curve fit to the results (Figure 2). Use these displays to examine how far from ideal your MCPA behaves as it approaches saturation.

Figure 1: Results vary - AM/PM curves of an 8W class A amplifier derived using single and multiple narrowband signals

Figure 2: AM/AM and AM/PM traces with linear reference lines and polynomial curves fit to the data
For yet more information on your results, call up the gain compression display (Figure 3). Particularly useful with very linear amplifiers, this display scales the AM/AM (gain) curve to emphasize variations in gain. Use the probability distribution function (PDF) and complementary cumulative distribution function (CCDF) curves provided by the distortion suite to monitor the statistical distribution of power in your complex stimulus and response time-waveforms (Figure 4). Examine the PDF to assure the stimulus and response signals have the expected distribution around their means. Use the CCDF to study the headroom available in your design.

Non-linear distortion mechanisms do more than degrade adjacent channel performance. They also degrade the modulation on the signal, that is, they increase the EVM of the signal. Use the distortion test suite to estimate how much your MCPA will increase a signal’s EVM as it passes through. This “delta” EVM is a standard measurement in this software package and works on any signal (Figure 5).
Use the results summary to view the basic parameters of your measurement: gain, delay, stimulus, and response power (Figure 6). The polynomial coefficients provided in this table are the coefficients used by the AM/AM, AM/PM display curve-fitting algorithm and can be used to set up your pre-distortion curve fitter.

**Access sampled waveforms**

Sometimes all you need is the raw data. The distortion test suite provides the digitized stimulus and response waveforms in several file formats so you can process them using proprietary algorithms or curve fitters. These are corrected files. The samples are precisely aligned in time, amplifier induced delay and phase offsets are removed, and the amplitude is scaled and corrected for padding attenuators. A resample algorithm in the distortion test suite lets you select an arbitrary sample rate for the output file to match the requirements of your curve fitting algorithms. The result is time-aligned I/Q data you can use in your MCPA pre-distortion processor.

**Flexible measurement setup**

Make single-channel manual measurements or two-channel automatic measurements with the 89604A distortion test suite software.

For single-channel measurements, you first measure the stimulus signal, then move the test lead to the MCPA output and measure the response signal. A repeatable signal and a synchronizing trigger signal from the signaling source are required to make single-channel measurements.

Two-channel measurements do not require moving test leads, a repeatable signal, or a synchronizing trigger \(^1\). And, the input and output signals can be at different frequencies so you can measure frequency translation devices.

Measurement setup is simple regardless of the number of channels. Enter the center frequency and measurement span, number of measurement channels, input range, size of external attenuators, and trigger delay (if any), then press start. The 89604A software does the rest.

The 89604A software works equally well with real-world signals provided by a base station, test signals provided by a signal generator, or even noiselike signals. Agilent’s ESG, PSG, or MXG Series signal generators offer a wide variety of complex modulation types in a package that provides flexible tuning range, accurate high power out and calibrated performance.

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1. Depending on the measurement hardware used, a trigger signal may still be required to align the measurement with the stimulus signal.
Fit the Hardware to your Measurement Needs

The 89604A distortion test suite software can be linked to more than 30 Agilent instruments, including signal analyzers, spectrum analyzers, oscilloscopes, logic analyzers, and modular VXI systems. The distortion test suite is provided within the signal acquisition capabilities of the platform with which it is working. The 89604 software can run in PC based instruments or on an external PC connecting to instruments via GPIB, FireWire (IEEE 1394), LAN, or USB.

Two channel operation

For faster measurements and to work with non-bursted signal types, the distortion suite supports two channel configurations using the MXA/EXA signal analyzers, the PSA spectrum analyzers (8 MHz analysis bandwidth only), the 89600S VXI-based vector signal analyzers, and multi-channel scopes.

Use your own PC

Load the 89604A distortion test suite on your PC, connect to the measurement hardware and start making measurements. The 89604A runs on any PC running Windows® XP or Vista, or Windows 7 with GPIB, LAN, USB, or IEEE-1394 interface to connect to the hardware.

Additional software when you need to do more

For engineers working with today’s emerging broadband communication systems, Agilent’s 89601A vector signal analysis (VSA) software is an indispensable tool for basic research, product development, manufacturing and field-testing. Working with the same hardware front-ends as the 89604A distortion test suite software, the 89601A VSA software provides high-performance RF and modulation troubleshooting tools to complement the distortion suite. It offers traditional RF spectrum displays, baseband (I/Q) analysis, signal capture and playback, RF and IF triggering, a wide variety of analog and digital demodulators, and an extensive set of time, frequency and modulation analysis tools. These capabilities make the VSA software ideal for evaluating narrowband and broadband digital communication signals.

89604AN floating license for network sharing

Floating license capability allows many users to share licenses. A license installed on the license server is available to any PC that is connected to the network. Install the distortion suite software on as many PCs as you like, and the number of licenses that reside on the network determines the number of users at any moment. When one user exits the software, that license becomes available for another user. Permanent floating licenses facilitate sharing of software so you can:

- Reduce cost by getting more usage from fewer licenses
- Maximize the use of each software license
- Increase productivity with all users operating the software from their own PC
<table>
<thead>
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<tr>
<td><strong>MXA signal analyzer</strong></td>
<td><strong>Model numbers</strong></td>
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<tr>
<td>Residual delta EVM (Center frequency $\leq$ 3.6 GHz)</td>
<td>Analysis bandwidth</td>
</tr>
<tr>
<td>One-channel measurement</td>
<td>Range $\geq –30$ dBm</td>
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<td><strong>ESA-E Series spectrum analyzers</strong></td>
<td><strong>Model numbers</strong></td>
</tr>
<tr>
<td>Residual delta EVM (Center frequency $\leq$ 3.6 GHz, alias protect = on)</td>
<td>Analysis bandwidth</td>
</tr>
<tr>
<td>One-channel measurement</td>
<td>Range $&gt; -20$ dBm</td>
</tr>
<tr>
<td>Two-channel measurement</td>
<td>Range $&gt; -20$ dBm</td>
</tr>
<tr>
<td><strong>PSA Series spectrum analyzers</strong></td>
<td><strong>Model numbers</strong></td>
</tr>
<tr>
<td>Residual delta EVM (Center frequency $\leq$ 3 GHz)</td>
<td>Analysis bandwidth</td>
</tr>
<tr>
<td>One-channel measurement</td>
<td>Range $–44$ to $–24$ dBm</td>
</tr>
<tr>
<td>Range $–24$ dBm</td>
<td>0.3% rms 0.3% rms</td>
</tr>
<tr>
<td>Two-channel measurement</td>
<td>Range $–44$ to $–24$ dBm</td>
</tr>
<tr>
<td>Range $–24$ dBm</td>
<td>0.4% rms 0.5% rms</td>
</tr>
<tr>
<td><strong>VXI analysis hardware</strong> (see 89600 vector signal analyzer configuration guide)</td>
<td><strong>Model numbers</strong></td>
</tr>
<tr>
<td>Residual delta EVM</td>
<td>Analysis bandwidth</td>
</tr>
<tr>
<td>One-channel measurement</td>
<td>Range $\geq –25$ dBm</td>
</tr>
<tr>
<td><strong>Model numbers</strong></td>
<td>Using E1439 ADC and any PSA spectrum analyzer with Option H70</td>
</tr>
<tr>
<td>Residual delta EVM (Center frequency $\leq$ 6.0 GHz)</td>
<td>Analysis bandwidth</td>
</tr>
<tr>
<td>One-channel measurement</td>
<td>Range $–22$ dBm</td>
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<tr>
<td>Two-channel measurement (With 89604A extended calibration)</td>
<td>Range $–22$ dBm</td>
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<tr>
<td><strong>Model numbers</strong></td>
<td>Using E1439 ADC only</td>
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<tr>
<td>Residual delta EVM</td>
<td>Analysis bandwidth</td>
</tr>
<tr>
<td>One-channel measurement</td>
<td>Range $–25$ dBm</td>
</tr>
<tr>
<td>Two-channel measurement (With 89604A extended calibration)</td>
<td>Range $–25$ dBm</td>
</tr>
</tbody>
</table>

1. Stimulus/response signals must be within 6 dB of top of input range. 99.9 percent of signal power must be within the measurement span. Stimulus source must be referenced locked to analyzer for single channel measurements.
General Information

<table>
<thead>
<tr>
<th>Display formats</th>
<th>AM/AM, AM/PM, gain compression, PDF, CCDF, power vs. time, delta EVM, stimulus power, response power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marker results</td>
<td>Gain, phase, stimulus power, response power</td>
</tr>
<tr>
<td>Data scaling</td>
<td>None, peak = 1, mean = 1</td>
</tr>
<tr>
<td>Curve fits</td>
<td>3 to 15 coefficients for AM/AM and AM/PM, user-settable</td>
</tr>
<tr>
<td>Summary results</td>
<td>Gain, delay, stimulus power, response power, result length, number of points, sample rate, gain coefficients, AM/PM coefficients</td>
</tr>
</tbody>
</table>

File

<table>
<thead>
<tr>
<th>Save</th>
<th>Setup, results summary, results data, stimulus data, response data</th>
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</thead>
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<tr>
<td>Recall</td>
<td>Setup, stimulus data, response data</td>
</tr>
<tr>
<td>Formats (save/recall)</td>
<td>csv, .txt, .mat (MAT-file version 4 and later)</td>
</tr>
</tbody>
</table>

Requirements

<table>
<thead>
<tr>
<th>PC (minimum)</th>
<th>&gt; 600 MHz Pentium®, 512 MB RAM, 4 MB video RAM, 500 MB available on hard disk. I/O slot for interface to signal acquisition hardware (if required). CD-ROM drive desirable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>Windows 2000, SP2, or XP Professional (Do not install 89604A on a PC with Agilent vector signal analysis software model 89601A V3.02 or lower already installed. Contact Agilent for information on upgrading your 89601A software.)</td>
</tr>
</tbody>
</table>

Related Literature

89600S Vector Signal Analyzer CD, literature number 5980-1989E

89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12, Technical Overview, literature number 5989-1679EN

89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12, Data Sheet, literature number 5989-1786EN

Hardware Measurement Platforms for the Agilent 89600 Series Vector Signal Analysis Software, Data Sheet, literature number 5989-1753EN

89607A WLAN Test Suite Software, Technical Overview, literature number 5988-9574EN

Web Resources

For more information on the 89604A distortion test suite, please visit: www.agilent.com/find/distortionsuite

For more information on compatible hardware, please visit: www.agilent.com/find/spectrumanalyzers

For more information visit: www.agilent.com/find/89600vsa
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www.agilent.com/find/contactus
Revised: January 6, 2012

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© Agilent Technologies, Inc. 2012
Published in USA, February 10, 2012
5988-7812EN