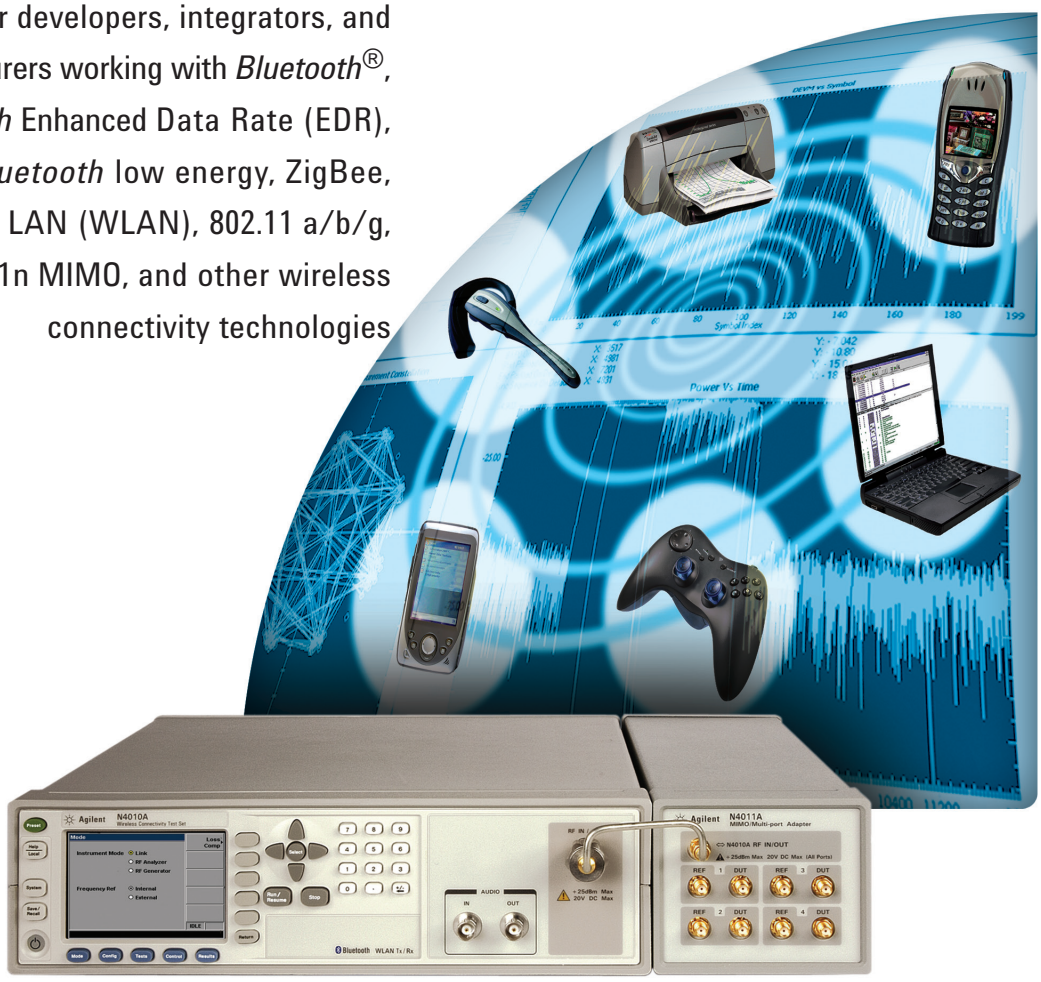
Agilent N4010A Wireless Connectivity Test Set

Achieve efficient and low cost testing of evolving wireless connectivity devices

Flexible verification solutions for developers, integrators, and manufacturers working with *Bluetooth*®, *Bluetooth* Enhanced Data Rate (EDR), *Bluetooth* low energy, ZigBee, Wireless LAN (WLAN), 802.11 a/b/g, 802.11n MIMO, and other wireless connectivity technologies



Anticipate ___Accelerate ___Achieve

Agilent Technologies

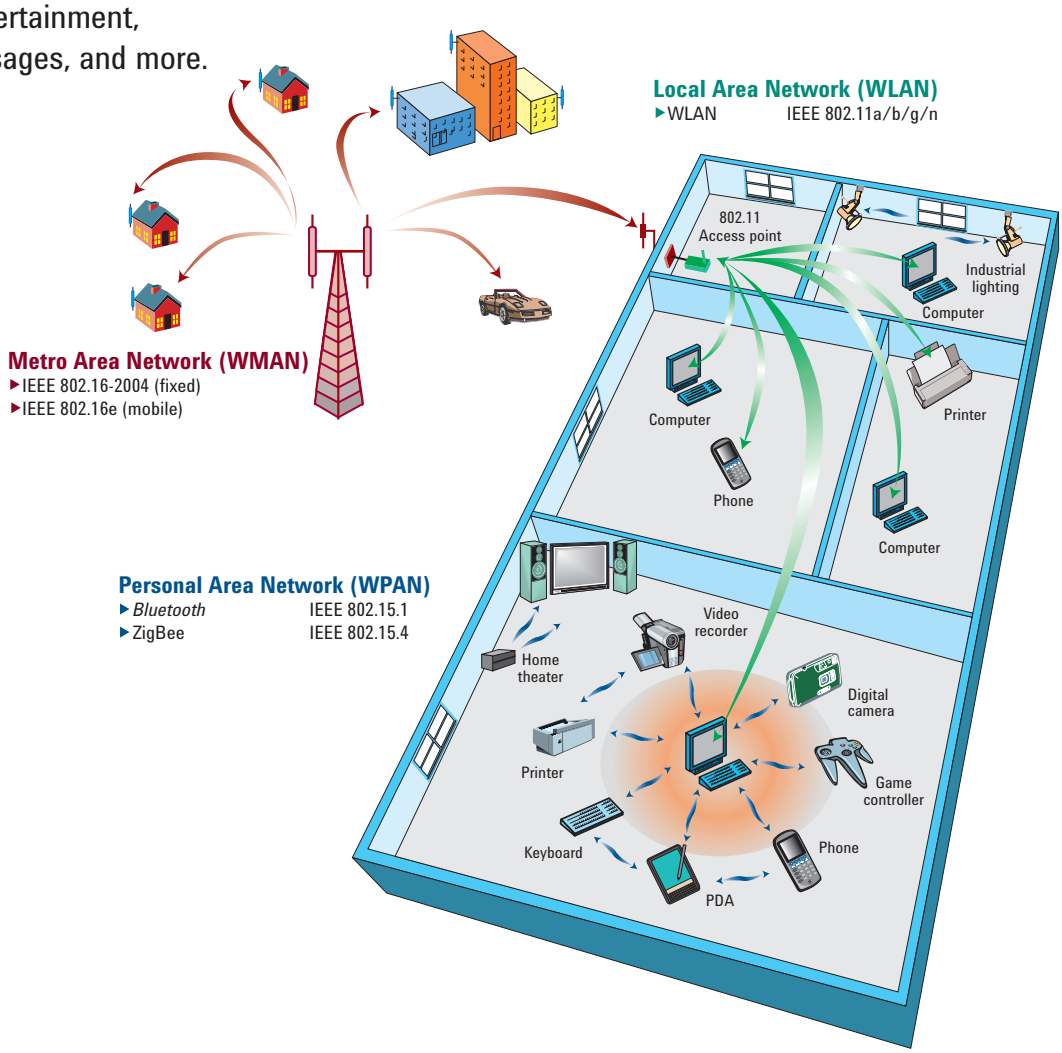
Essential Support for Emerging Communications

Wireless communications are connecting us, our homes, and our businesses in new ways.

Every day we become more reliant on wireless systems—from massive communication satellites to tiny radio frequency identification (RFID) tags; from global cellular networks to the handheld, mobile devices that deliver our news, entertainment, personal messages, and more.

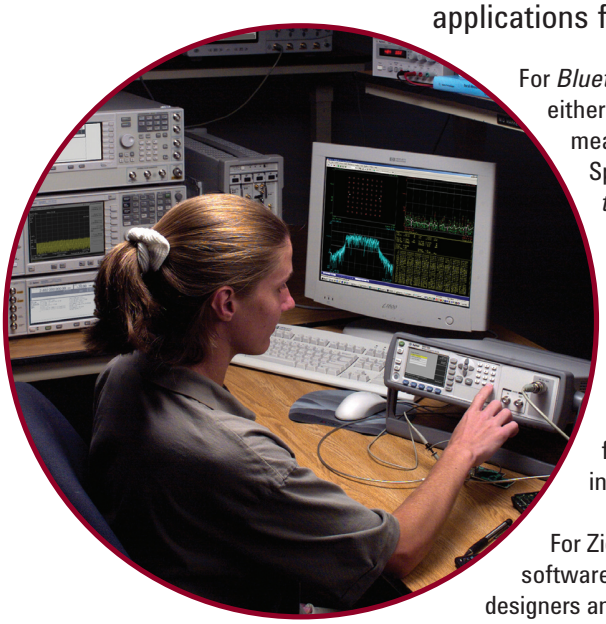
An unplugged world requires absolute confidence in the connections that replace the wires. That's where Agilent comes in. For years Agilent has been focused on designing, integrating, testing, and certifying wireless products. We have the experience it takes to make sure that you get the measurements you need to verify that designs meet wireless functional specifications and that your products work before they ship.

What's more, our design tools, instruments, and systems provide insight into your design and manufacturing processes, which can help reduce the time, complexity, and cost of testing—without sacrificing the essential quality and reliability of your finished product. We know wireless, and we have the tools, technologies, and people to help you guarantee that your products will work as specified with products from other vendors. Agilent tools incorporate the latest industry-required measurements, and our products are found in many certification systems—so you can approach interoperability testing with confidence.



The Flexibility to Test Multiple Technologies

With the N4010A you get a versatile, scalable, multi-format wireless connectivity test solution that can be configured for your particular *Bluetooth*, WLAN, MIMO, and ZigBee applications for development, integration, or manufacturing.



For *Bluetooth*, our solutions provide the ability to connect to devices, in either test mode or normal mode, to make transmitter and receiver measurements as defined in the *Bluetooth* 1.1 and 1.2 RF Test Specification. The capability can be expanded to provide *Bluetooth* 2.0 EDR test mode or non-signaling Tx/Rx test. You can also add the *Bluetooth* low energy Tx/Rx non-signaling test as defined in the *Bluetooth* 4.0 Test Specification.

For WLAN, the N4010A provides a fully-calibrated vector signal generator and a wide bandwidth signal analyzer in a single, compact unit. This is scalable for operation at 2.4 GHz only and can be extended to 5 GHz. With appropriate configuration, it is possible to test to a number WLAN standards, including 802.11a/b/g and 802.11n MIMO.

For ZigBee, the industry standard 89601A vector signal analyzer (VSA) software may be used in combination with the N4010A to provide designers and integrators the capability to test the IEEE 802.15.4 standard.

Designed for *Bluetooth*

With consumer demand for Bluetooth wireless devices on the rise, capitalizing on market opportunities relies on expediting design validation and getting to volume production fast.

The N4010A with Option 101 has eight RF test cases built-in. All tests default to the SIG standard settings and can be modified to match specific test requirements. As your test needs change, simply add the options you need to test your device features.

For testing Bluetooth audio functionality, simply add Option 113 to provide built-in audio generation and analysis, eliminating the need for a separate audio source and analyzer, streamlining test configurations and minimizing the cost of test. With Option 113, the N4010A can generate and transmit an audio tone over a Bluetooth SCO link and anlayze the returned signal for SINAD, frequency, level, and distortion. Audio inputs and outputs to route external analog audio signals over a Bluetooth link are also provided. Option 112 adds Bluetooth headset profile support to simplify Bluetooth audio test of headsets, cell phones, or in-car consoles.

Keep pace with evolving standards and tests. Confidently test Enhanced Data Rate (EDR) devices using Option 107 (*Bluetooth* EDR link plus measurements). *Bluetooth* EDR supports data rates of up to 3 Mbps and remains backward-compatible with the original *Bluetooth* specification. Its two new modulation schemes allow multiple applications to utilize available bandwidth more effectively and achieve higher overall performance. The *Bluetooth* RF Test Specification version 1.2/2.0/2.0 + EDR [vol 2] was developed by the *Bluetooth* SIG in order to provide a set of conformance tests for the air interface, as well as to ensure interoperability among *Bluetooth* devices.

To ensure *Bluetooth* EDR devices adhere to the *Bluetooth* v2.0 + EDR standard, the N4010A test set with Option 107 supports accurate and effective loopback testing of Bluetooth EDR radio transmitters and receivers, with six EDR test cases built-in to the test set. If normal and loopback test modes are not required, *Bluetooth* EDR Tx/Rx analysis is available through a software driver.

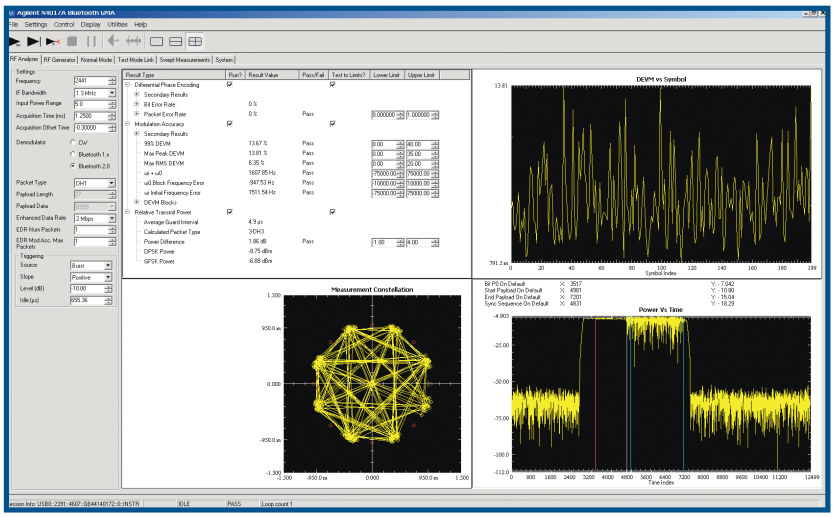
Key EDR transmitter measurements include relative transmit power, carrier frequency stability, modulation accuracy, differential phase encoding, and guard interval. Receiver measurements include EDR sensitivity, EDR BER floor performance, and EDR maximum input level.

For testing *Bluetooth* low energy single-mode and dual-mode devices and modules, a non-signaling PC-based software driver is available for your design and manufacturing needs. *Bluetooth* low energy transmitter measurements include: output power, modulation characteristics, carrier frequency offset, and drift. *Bluetooth* low energy receiver measurements include: receiver sensitivity, maximum input signal level, and PER report integrity.

Consumer demand for wireless devices is on the rise

Designed for development and integration

During the product development cycle, engineers who design or integrate *Bluetooth* wireless technology into chipsets or modules can get products to market faster. The integrated test sequencer enables engineers to quickly and easily create test sequences. The N4010A does more than streamline test development. It ensures design confidence with accurate measurement results that are compliant with the latest *Bluetooth* v2.0 + EDR standard, and speeds the transition from device development to full-scale production.



N4017A GMA in action showing Bluetooth EDR measurements

Use the Agilent N4017A *Bluetooth* graphical measurement application (GMA) to get a graphical user interface and PC-control for the N4010A. Add Option 205 to the N4017A for *Bluetooth* EDR analysis. The ability to fully configure the test set and display detailed numerical results, IQ constellations, and more, makes the N4017A an ideal development tool for R&D engineers. The N4017A is also a well-designed debug tool for integrators and manufacturing test engineers.

Bluetooth test automation software

For automated test sequencing and test cycling, the N4019C Wireless Test Manager for *Bluetooth* and WLAN provides ready-to-use tests and test plans. This software tool allows you to quickly and efficiently create, execute, and repeat test sequences with result logging and measurement report generation (see page 8 for further details).

Designed for manufacturing

In high volume manufacturing, the N4010A one-box test set ensures confidence through excellent measurement accuracy and repeatability. The N4010A speeds time to volume and increases throughput of *Bluetooth* production with short test times and high yields. The test groups feature allows multiple measurements to be made concurrently, which significantly improves test times.

- Measurements in accordance with *Bluetooth* RF Test Specification
- Confidence in test from development through to production with accurate, repeatable results
- Integrated test sequencer for faster test development
- Audio generation, analysis, and headset profile support
- Software tools for graphical analysis, test automation, and report generation
- Qualified by *Bluetooth* SIG

Designed for Wireless LAN including MIMO

Reduce the equipment required in WLAN tet systems

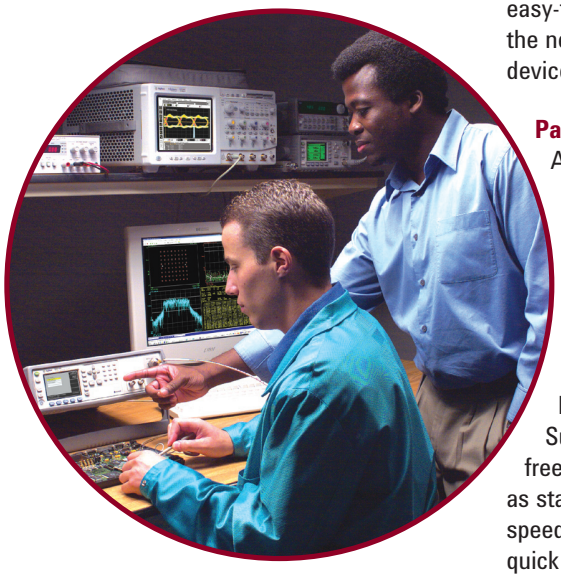
The N4010A, with Options 102, 103, and 108 offers an integrated vector signal generator (transmitter) and a wide bandwidth signal analyzer (receiver) in a single test component—replacing the need for separate spectrum analyzers, power meters, power sensors, and golden radios. The wideband (40 MHz) signal analyzer accurately captures complete WLAN signal bursts to meet demanding WLAN transmitter measurements, such as error vector magnitude (EVM). The vector signal generator emulates 802.11a/b/g/n signals for receiver measurements, so the need for a golden radio can be eliminated.

Agilent's 802.11n MIMO verification solution consists of the N4011A MIMO/ Multi-port adapter and the N4010A wireless connectivity test set, configured with Option 103 for WLAN Tx/Rx analysis and Option 108 for 802.11n MIMO modulation analysis.

The accuracy, fast measurement speed, and reliability of Agilent's test solution make it the ideal choice for manufacturing managers and engineers performing high-volume test on 802.11n devices or modules.

The N4011A connects to the N4010A test set to provide four switchable RF I/O ports for testing devices of all WLAN formats, including 802.11n. Combined, the N4010A Option 108 and N4011A provide fast electronic switching to allow rapid capture and analysis of WLAN bursts on multiple channels, without compromising measurement accuracy. This innovative technique allows independent demodulation of individual MIMO channels, providing greater insight to failure mechanisms such as channel isolation and single- channel, or MIMO EVM. This is achieved without significant impact to test throughput.

Designed for development and integration



WLAN development and integration engineers need instrumentation that is easy-to-use but also has the specifications, features, and software tools to make the necessary 802.11a/b/g/n transmitter and receiver measurements on their devices and modules.

Packed with capability and performance

A high performance, 14-bit, 100 MHz measurement engine drives the N4010A test set so you can capture and accurately measure complex wireless communications formats; plus with up to a 40 MHz bandwidth, the N4010A future-proofs your measurement capability, giving you a solution for testing wide bandwidth signals.

Easy-to-use

For development and integration engineers, the N4010A is easy-to-use, highly accurate, and quickly obtains measurement results. Agilent's IO Libraries Suite, that is shipped with every N4010A, helps you quickly establish an error-free connection to your PC, while LAN, USB2.0, and GPIB interfaces are fitted as standard in every N4010A. This combination eliminates connectivity issues to speed up test development time, provide robust instrument control, and make it quick and simple to integrate the N4010A into a test system environment.

Use the N4010A to help validate wireless LAN module designs

Powerful software tools and options for control and measurement analysis

Agilent provides software tool choices for WLAN development and integration engineers. Combined with the Agilent vector signal analyzer (VSA) software (89601A with Option B7R), the N4010A provides a broad range of measurements for evaluating current and future WLAN formats.

The 89601A VSA software provides flexible tools for making RF and modulation quality measurements on WLAN 802.11a/b/g/n and other communications standards, allowing development engineers evaluate their design against the IEEE standard.

For versatile signal creation, the N4010A Option 204 (Signal Studio license) software is a PC-based application that is used to design 802.11a/ b/g/n signals. These signals can be downloaded directly into an N4010A with Option 104 installed. Option 104 enables flexible arbitrary waveform generation that allows users to download and encrypt waveform files to the N4010A using either Signal Studio or MATLAB.

RF and modulation measurements with the 89601A VSA software and N4010A

Designed for manufacturing

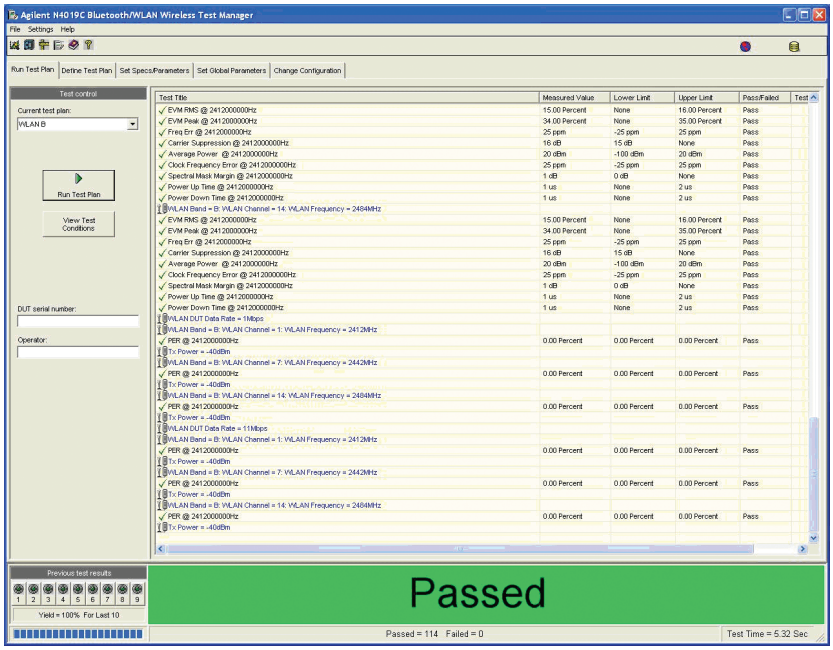
Quickly and confidently test your WLAN devices

The N4010A is the ideal WLAN verification solution, providing efficient and repeatable tests that can result in dramatically improved productivity and throughput for WLAN device manufacturers.

Accuracy and repeatability

Accuracy and repeatability mean having confidence in your measurement test results, which leads to increased manufacturing yields and improved product quality. To provide these benefits, the N4010A offers best-in-class RF performance. With traceable and warranted ±0.5 dB amplitude accuracy in the 2.4 GHz ISM band, and ±0.8 dB amplitude accuracy the 5 GHz WLAN band, the N4010A removes the need for power meters and power sensors that are traditionally used to calibrate power levels. In the 2.4 GHz band, signals can be analyzed with power levels as low as –70 dBm and up to +23 dBm.

EVM measurements provide a great deal of insight into the performance of digitally-modulated signals by identifying the difference between the ideal waveform and the measured waveform. The N4010A vector signal generator provides a low < 2% EVM typical specification for 802.11a/g/n signals, giving manufacturing test engineers the perfect tool to confidently test WLAN receivers.



WLAN and *Bluetooth* test automation software

Designed for use with Agilent's N4010A wireless connectivity test set, Wireless Test Manager software provides ready-to-use tests, test plans, test sequencing, and menu-selectable hardware support for quick and easy automation of *Bluetooth* and WLAN device calibration and test processes. Applicable to manufacturing and integration testing, the test manager makes test development, test execution, and support easier than ever. The test manager includes a test executive, *Bluetooth*- and WLAN-specific tests, easy-to-use interfaces, measurement reports, data graphing, and data export capability. You can run a pre-defined Agilent test plan, customize an existing plan, or create your own test plan. The N4018C is a run-time version, and the N4019C adds development capability, providing you with the source code and ability to further customize the software for your own unique application (requires user-provided Microsoft® Visual Basic® .NET development environment). The test development wizard simplifies this process so you can focus on test.

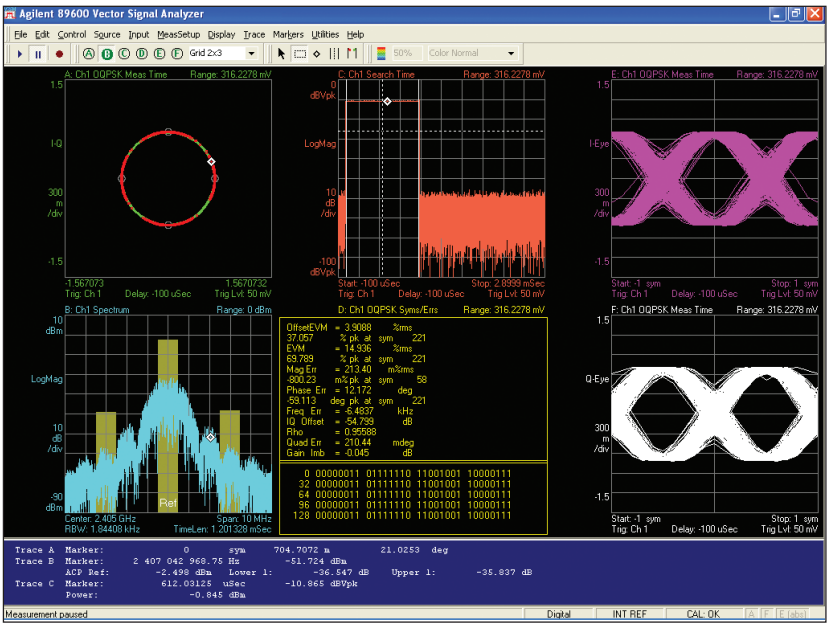
Designed for ZigBee

A market that's set to accelerate rapidly over the next few years is ZigBee, the new global hardware and software standard for wirelessly networking devices used for monitoring, sensing, and control systems.

Agilent has the market expertise to test all major IEEE 802.15.4 chipsets, addressing this requirement with the first one-box test solution based around the N4010A and the industry standard 89601A VSA software.

The N4010A options required for ZigBee operation are already in existence for WLAN. Option 102 provides a fully-calibrated vector signal generator and wideband analyser, which operates with Option 104, the fully-flexible arbitrary waveform generator. Full transmit and receiver tests can be made using the N4010A working with the 89601A VSA software to create a solution for the IEEE 802.15.4 standard.

The N4010A and powerful VSA software combination also provides powerful signal analysis capability beyond the ZigBee RF test specification. This will be of particular interest to emerging wireless connectivity technologies in the 2.4 GHz band.



89601A VSA software and N4010A hardware combined to provide comprehensive ZigBee/IEEE 802.15.4 measurements

Designed for development and integration

Leading edge designers developing ZigBee/IEEE 802.15.4 chipsets, modules, and devices require a solution to quickly ensure standards-compliance design performance. With the N4010A and 89601A VSA software, Agilent provides the first dedicated one-box instrument that delivers accurate and repeatable measurements, including a full range of modulation test results. This solution provides a fast design cycle, allowing products to get to market fast. Agilent is a member of the ZigBee Alliance, and has market experience plus the ZigBee technology that can test all major IEEE 802.15.4 chipsets.

ZigBee Alliance

When it comes to emerging technology, you can depend on Agilent to provide leading-edge solutions. We actively work with trade alliances to understand the test requirements and deliver timely solutions that work. That's why Agilent is the first test and measurement solutions provider to join the ZigBee Alliance.

Systems Solutions

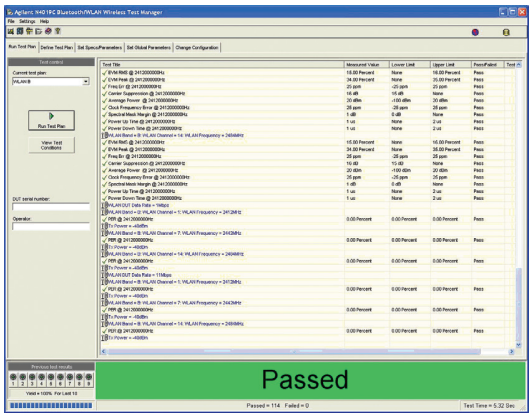
Looking for an integrated functional test system?

The Agilent GS-8300 WLAN manufacturing functional test system puts the instruments, cabling, and system hardware all in a rack that is carefully designed to provide cooling, power, ergonomics, safety, and mechanical stability. Featuring the N4010A test set, several fixturing options, and easy-to-use Wireless Test Manager software, the GS-8300 is ideal for WLAN chipset and reference design manufacturers, and for developers of WLAN modules.

Low cost of test and ownership

The N4010A is a competitively priced, fully integrated platform that replaces numerous pieces of test equipment in the WLAN production line, reducing system complexity and rack-space for the manufacturing engineer.

With Agilent's worldwide service and application engineering support, you have increased product uptime on the production line, the capability to perform hardware and firmware upgrades locally, and unsurpassed expertise to solve your technical problems.



N4019C Bluetooth and wireless LAN Wireless Test Manager

Recommended Configurations

The following tables provide recommended hardware configurations only (no software or graphical measurement applications included). For complete instrument configuration information, refer to the N4010A Configuration Guide, literature number 5989-3486EN.

For *Bluetooth* testing

Development/integration and verification	Manufacturing	Option description/purpose
N4010A-101	N4010A-101	Built-in *Bluetooth* transmitter and receiver test as defined in *Bluetooth* RF Test Specification 1.2
N4010A-107	N4010A-107	Provides Enhanced Data Rate (EDR) loop-back test mode support. Six EDR transmit and receive test cases built-in
N4010A-109	N4010A-109	Provides *Bluetooth* low energy Tx/Rx non-signaling test as defined in *Bluetooth* RF Test Specification 4.0
N4010A-113	N4010A-113	Built-in audio source and analyzer to perform functional audio test over *Bluetooth* SCO link. A-law, μ-law, and CVSD codecs supported
N4010A-112	N4010A-112	*Bluetooth* headset profile
	N4010A-1A7	ISO17025-compliant calibration performed prior to shipment

For WLAN testing

Development/integration and verification	Manufacturing	Option description/purpose
N4011A[1]	N4011A[1]	MIMO/Multi-port adapter
N4010A-103[2]	N4010A-103[2]	2.4 GHz and 5 GHz WLAN transmit and receive analysis
N4010A-108[3]	N4010A-108[3]	Adds 802.11n capability
N4010A-104[4]		N4010A-104: Enables fully flexible arbitrary waveform generation
	N4010A-1A7	N4010A-1A7: ISO17025-compliant calibration performed prior to shipment
N4010A-204	–	N4010A Signal Studio license

For ZigBee (IEEE 802.15.4-2003) testing

Development/integration and verification	Manufacturing	Option description/purpose
N4010A-102	N4010A-102	2.4 GHz WLAN transmit and receive analysis Enables use of N4010A with signal creation or analysis software tools
N4010A-104[4]		N4010A-104: Enables fully flexible arbitrary waveform generation
	N4010A-1A7	N4010A-1A7: ISO17025-compliant calibration performed prior to shipment

For testing multiple wireless technologies (*Bluetooth*, WLAN, MIMO, and ZigBee)

N4011A	N4010A-104	N4010A-112
N4010A-101	N4010A-107	N4010A-113
N4010A-103	N4010A-108	N4010A-204
	N4010A-109	

1. N4011A will only be needed by customers performing MIMO or multi-up testing.
2. If 802.11b/g testing in the 2.4 GHz band only order Option 102 instead of Option 103.
3. Option 108 is only required for 802.11n testing.
4. Option 104 is required for customers who want to create their own waveform files for use with the N4010A.

Related Literature

- Agilent N4010A Wireless Connectivity Test Set, Data Sheet
  Literature number 5989-4035EN
- Agilent N4010A Wireless Connectivity Test Set, Configuration Guide
  Literature number 5989-3486EN
- Agilent N4017A Bluetooth® Graphical Measurement Application, Product Overview
  Literature number 5989-2771EN
- Get Your Bluetooth and WLAN Device to Market Quickly and Reduce Test Cost,
  Literature number 5989-6013EN

For More Information Visit the following Web pages

www.agilent.com/find/n4010a

www.agilent.com/find/n4011a

www.agilent.com/find/n4017a

www.agilent.com/find/n4019c

www.agilent.com/find/89600

www.agilent.com/find/signalstudio

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Revised: January 6, 2012

Product specifications and descriptions in this document subject to change without notice.

Published in USA, March 30, 2012
5989-4150EN

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