Cutting ties to the wired world.

Agilent Solutions for Bluetooth™ Wireless Technology
Bluetooth™ is a limited range RF link technology targeted at voice and data transmission between information appliances in a home or business environment. Bluetooth operates in the 2400-2483.5 MHz Industrial, Scientific and Medical (ISM) band. This band is unlicensed and available globally.

The name Bluetooth comes from Danish King Harald Blåtand (Bluetooth). King Blåtand is credited with the unification of Denmark and Norway in the tenth century. In the spirit of King Blåtand the Bluetooth communication standard represents the unification of telecommunication and computing industries.

Bluetooth makes short range wireless connections among a variety of communication and computing devices possible. Common applications include the creation of personal data networks and wireless voice transmission between a headset and a mobile phone. The Bluetooth standard is quickly gaining acceptance around the world. It is estimated that by 2002 hundreds of millions of electronic devices will be enabled with Bluetooth.

Agilent’s Solutions for Bluetooth

The number of Bluetooth enabled devices in production is on the rise. Applications for this technology are seemingly limitless. The challenge to designers and manufacturers of Bluetooth products is the drive to keep up with evolving Bluetooth standards and the ability to meet the requirement for total interoperability with other Bluetooth devices.

Agilent Technologies, a trusted resource in technological innovation, is a leading provider of Bluetooth test solutions. As an associate member of the Bluetooth Special Interest Group (SIG), Agilent receives the most current insight into the development of the Bluetooth standard. Our solutions offer Bluetooth testing capabilities that address current standards and are designed to measure standards as they evolve to accommodate future technological breakthroughs and innovations.

Agilent is dedicated to providing a broad range of solutions including, equipment, services, and technical support. This brochure outlines Agilent’s comprehensive solutions for developing and manufacturing ICs, modules, and host devices incorporating Bluetooth.
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Bluetooth Solutions Overview

Design and Integration

In order to provide a complete development environment for Bluetooth designers, Agilent Technologies provides simulation tools, as well as characterization and evaluation tools for integrating and optimizing custom Bluetooth designs.
Verification and Pre-Qualification

Bluetooth test specifications offer new challenges to test engineers. Agilent Technologies provides a complete set of test tools that are capable of making high precision and high quality measurements to satisfy the Bluetooth standards.

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ESG-D Signal Generator
- Frequency hopped signal generation with E6432A VXI microwave synthesizer
- Symbol timing error
- Provide loop back test mode for all specified Bluetooth receiver tests

ESA-E Series Spectrum analyzer
- One button Bluetooth measurements
- Spurious emissions testing
- Standard compliant

E1852A Bluetooth Communication Test Set
- Performs suite of functional and parametric test of Bluetooth devices
- Versatile PC-based user interface
- Establishes link using standard Bluetooth protocol
- Functional and parametric measurement of receive and transmit paths
- Versatile PC-based user interface

E66319B/D Dual Output DC Supply
- Fast transient response
- Open sense detection

E4406A VSA
- Fast repetitive Bluetooth manufacturing measurements with high accuracy
- Affordable budget for Bluetooth manufacturers

Manufacturing

Agilent Technologies has multiple solutions for Bluetooth product manufacturers that address the issues of fast test time and automation in order to meet demanding production schedules.

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94000 IC Tester
- Modulation intermodulation characteristics
- Low noise floor
Agilent Technologies provides versatile design tools and instruments for Bluetooth developers. The following Agilent solutions support the evaluation of transmitter and receiver performance during IC design, module development, and integration of Bluetooth into the host device.
The Agilent ADS DesignGuide assists Bluetooth developers with optimization and verification of Bluetooth system designs. The ready-to-use Bluetooth transceiver model with adjustable parameters comes as part of the DesignGuide. It is an indispensable tool in the design and simulation of custom Bluetooth systems.

**Basic system tests**

- Transmit spectrum
- Ideal transmit-receive eye diagram
- Detailed model transmit-receive eye diagram that include phase noise and filters

**Component/subnetwork evaluation**

- Additive White Gaussian Noise (AWGN)
- Oscillator with phase noise
- Exponential multipath model
- Transmit Gaussian FIR filter
- Channel filter impulse response, swept response, and time-domain response

**VCO/Phase Locked Loop (PLL) investigation**

- VCO response to frequency step
- PLL effect on PLL phase noise
- VCO spurious response
- VCO parameter optimization

**Multipath propagation testing**

- Display of multipath impulse response
- FM spectrum and eye diagram with multipath
- Power/Fading statistics
- Display of BER sweep results with multipath and AWGN
- Display of BER/Outage results with Multipath, AWGN, or no channel filter

**System compliance tests with display of time-domain response and BER sweep**

- Receiver sensitivity
- Co-channel interference/blocking
- Adjacent channel interference spectrum/blocking
- Combined Adjacent & Co-channel interference
- Intermodulation compliance test
- Pulsed interference with 2nd order intercept

For more information, contact your local Agilent Sales office to request literature numbers 5988-0701EN and 5966-2870E or visit this web site for general DesignGuide information at:

www.agilent.com/find/bluetooth
Agilent 89600 Series Vector Signal Analyzer

Agilent 89600 Series VSA possesses a wide measurement bandwidth to enable developers to capture and analyze Bluetooth frequency hopped signals. In addition, the VSA contains special capabilities for Bluetooth receiver measurements when used in conjunction with an ESG-D series signal generator.

- Simultaneous visualization of 36 MHz for frequency hopping analysis
- In-band measurements
- Spurious emission measurement
- Adaptive equalization for linear error detection
- Eye diagram
- GFSK demodulation
- Baseband to baseband measurements
- Carrier frequency drift measurement
- Initial carrier frequency tolerance measurement
- Carrier frequency drift slew rate measurement
- Adjacent channel power measurement

For more information, contact your local Agilent Sales office to request literature numbers 5980-0723E and 5980-1258E, or visit our web site at:

http://www.agilent.com/find/bluetooth

Agilent ESG-D Series Signal Generator

Enhancements to the arbitrary waveform generator Bluetooth personality have been made to enrich the design environment. Signal impairments were added to reflect the current Bluetooth RF test specification including symbol timing error, sinusoidal carrier frequency drift and AWGN. Continuous PN9 payload data with Clock and Gate signals are included to offer improved BER test capability. The ESG-D series signal generator is capable of performing the following Bluetooth receiver measurements (some tests may require an additional signal source to provide the interference signal):

- Sensitivity – single slot packets
- Sensitivity – multi-slot packets (user must create the multi-slot packet)
- Carrier to interference performance
- Blocking performance
- Intermodulation performance
- Maximum input level

When performing transmitter measurements the ESG-D series signal generator provides a standard compliant Bluetooth signal to a DUT operating in loopback mode. If frequency hopping is required, the ESG-D can be used in conjunction with the E6432A VXI Microwave Synthesizer.

For more information, contact your local Agilent Sales office to request literature number 5968-4313E or visit our web site at:

http://www.agilent.com/find/bluetooth

Solutions for Design and Integration

Agilent design tools enable the integration of the simulation and measurement environments. Signal files can be created with ADS and downloaded to an ESG Signal Generator to provide the stimulus signal to the Device Under Test (DUT). Data is then acquired by the 89600 VSA and fed back to the ADS software where it can be used to optimize the simulation and design parameters.

Agilent ESG-D Series Signal Generator

Enhancements to the arbitrary waveform generator Bluetooth personality have been made to enrich the design environment. Signal impairments were added to reflect the current Bluetooth RF test specification including symbol timing error, sinusoidal carrier frequency drift and AWGN. Continuous PN9 payload data with Clock and Gate signals are included to offer improved BER test capability. The ESG-D series signal generator is capable of performing the following Bluetooth receiver measurements (some tests may require an additional signal source to provide the interference signal):
**Agilent E6432A VXI Microwave Synthesizer**

For design test applications that require frequency hopping, the E6432A VXI combined with the Agilent ESG-D series signal generator can be used.

Because Bluetooth wireless technology is still evolving, long term Bluetooth test solutions are preferred. The Agilent E6432A VXI can up-convert ESG-D series standard compliant Bluetooth signals to the next generation 5.7 GHz upper ISM band Bluetooth signals. It can even extend up to 20 GHz for other applications. The E6432A VXI can also be used to provide an interference signal to test receiver out of band blocking performance.

For more information, contact your local Agilent Sales office to request literature numbers 5967-6272E and 5968-1242E, or visit our web site at:

www.agilent.com/find/bluetooth

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**ESA-E Spectrum Analyzer**

The Agilent ESA-E series spectrum analyzers provide general-purpose spectrum analysis and one-button standard compliant Bluetooth transmitter measurement capability. The measurement personality options acquire the data you need at the push of a button, so you can concentrate on analysis and troubleshooting.

**Bluetooth one button tests**

- Modulation overview measurement
- Output power
- Carrier frequency drift
- Monitor band/channel
- Initial carrier frequency tolerance
- Modulation characteristics
- 20 dB output spectrum bandwidth

**Additional features**

- Bluetooth channel number tuning
- Bluetooth packet type selection
- p0 timing synchronization
- Level setting

For more information, contact your local Agilent Sales office to request literature numbers 5968-3278E and 5968-7746E, or visit our web site at:

www.agilent.com/find/bluetooth
Solutions for Design and Integration

**Agilent 54620-Series Mixed-Signal Oscilloscopes**

Agilent 54620-series oscilloscopes are optimized for the verification and debug of Bluetooth baseband signals. Combining the detailed signal analysis of a scope with the multi-channel timing measurements of a logic analyzer, you can simultaneously test and monitor the high-speed digital control signals and the slower analog signals in your design.

- Unique 2+16 channel mixed-signal models offer simultaneous scope and logic measurements
- Patented high-definition display works with 2 MB of Megazoom deep memory to uncover more information about your signals
- Powerful triggering with edge, pattern, pulse, sequence, duration, and I2C choices

For more information, contact your local Agilent sales office to request literature numbers 5968-8152EUS and 5980-0943EUS, or visit our web site at:

www.agilent.com/find/bluetooth

**Agilent 89400 Series Vector Signal Analyzer**

Agilent 89400 series vector signal analyzers combine time, frequency and modulation domain analysis to provide measurements and displays to solve the most difficult of Bluetooth design problems. The 89400 series has many unique measurements and features including those outlined below.

- Spectrogram measurement
- Eye diagram
- Adaptive equalization for linear error detection
- Spurious emission measurement
- GFSK demodulation
- Test modulation quality of Bluetooth signal
- Timing tests such as jitter and symbol rate
- PLL settling time
- Capture and replay bursts for later in-depth analysis
- Carrier frequency drift measurement
- Initial carrier frequency tolerance measurement
- Carrier frequency drift slew rate measurement
- Adjacent channel power measurement

For more information, contact your local Agilent Sales office to request literature numbers 5965-8554E and 5964-3630E, or visit our web site at:

www.agilent.com/find/bluetooth
The Agilent 16702B logic analysis system provides comprehensive system-level debugging for multiple processor/bus designs. With on-line processor and bus setup assistant and an intuitive user interface, your Bluetooth design team can finally work together to solve tough hardware/software integration problems. The large flat panel display provides quick and easy access to logic analysis functions and displays, as well as simultaneous views of system activity.

**Measurement modules include:**
- State/timing (Up to 333 MHz state clock speed, Up to 2 GHz timing speed, Up to 32 M samples deep)
- Oscilloscope (Up to 500 MHz Bandwidth)
- High-Speed timing (Up to 4 GHz timing)
- Pattern generator (Up to 300 Mvectors/s, Up to 16 M vectors deep)
- Emulation

Agilent E5900B Emulation Probes and Trace Port Analyzers

Agilent E5900B Emulation Probes and Trace Port Analyzers allow firmware developers to debug software on the embedded System On Chip microprocessors used in handheld appliances. The Agilent E5900B series of products enable:

- Support for the ARM family of processor cores (for other architectures, contact your local Agilent Sales office or see our web site: www.agilent.com/find/bluetooth
- Code download and run control for embedded microprocessors
- Flash memory programming
- Real-time trace of software code flow through a trace port analyzer
- Debug software on SOC cores through commercial software debuggers

For more information, contact your local Agilent Sales office to request literature number 5966-4365E, or visit our web site at:

www.agilent.com/find/bluetooth
Agilent Technologies offers a variety of test tools to assist in the verification and pre-qualification testing of your ICs, modules, and host devices incorporating Bluetooth wireless technology. All Agilent instruments presented in this section are compliant to the test requirements outlined in the Bluetooth standard.
Agilent E6432A VXI Microwave Synthesizer

The Bluetooth standard requires frequency hopping for some transmitter tests to assure the product is Bluetooth compliant. The Agilent E6432A VXI, coupled with the flexible ESG-D series signal generator, can easily generate standard compliant frequency hopped Bluetooth signals at 1600 hops/sec. Additionally, the E6432A VXI may be used to provide an interference signal for receiver testing.

For more information, contact your local Agilent Sales office to request literature numbers 5967-6272E and 5968-1242E, or visit our web site at: www.agilent.com/find/bluetooth

Agilent ESG-D Series Signal Generator

The ESG-D series signal generator provides a flexible solution for verifying that Bluetooth components meet Bluetooth product qualification standards. The arbitrary waveform generator Bluetooth personality generates standard compliant signals for both transmitter and receiver testing. Use the optional internal bit-error-rate analyzer to verify Bluetooth receiver performance. The ESG-D series signal generator is capable of performing the following Bluetooth receiver measurements (some tests may require an additional signal source to provide the interference signal):

• Sensitivity – single slot packets
• Sensitivity – multi-slot packets (user must create the multi-slot packet)
• Carrier to interference
• Performance
• Blocking performance
• Intermodulation performance
• Maximum input level

When performing transmitter measurements the ESG-D series signal generator provides a standard compliant Bluetooth signal to a DUT operating in loopback mode. If frequency hopping is required, the ESG-D can be used in conjunction with the E6432A VXI Microwave Synthesizer.

For more information, contact your local Agilent Sales office to request literature number 5968-4313E or visit our web site at: www.agilent.com/find/bluetooth
Solutions for Verification and Pre-Qualification

Agilent 89400 Series VSA

In addition to being a Bluetooth design tool, the Agilent 89400 Series provides the ability to execute the transmitter test cases required for Bluetooth qualification. Agilent 89400 series exhibits very low phase noise and very high dynamic range making it an excellent tool for your pre-qualification testing.

• Covered test cases
• Modulation overview
• Monitor band/channel
• Output power
• Carrier frequency drift
• Initial carrier frequency tolerance
• Spurious emission tests
• GFSK demodulation
• Adjacent channel power measurement
• Output spectrum – 20dB bandwidth
• Transmit output spectrum
• Power control
• Symbol timing
• PLL settling time

For more information, contact your local Agilent Sales office to request literature numbers 5965-8554E and 5964-3630E, or visit our web site at:

www.agilent.com/find/bluetooth

ESA-E Series Spectrum Analyzer

Pre-qualification testing of your Bluetooth design can be performed with confidence when you use the ESA-E. This tool performs Bluetooth transmitter tests as defined by the standard. Each measurement conforms to the Bluetooth SIG documentation.

Bluetooth one button tests

• Output power
• Carrier frequency drift
• Initial carrier frequency tolerance
• Modulation characteristics
• 20 dB output spectrum bandwidth

Additional features

• Bluetooth channel number tuning
• Bluetooth packet type selection
• p0 timing synchronization
• Level setting
• Monitor band/channel
• Modulation overview

For more information, contact your local Agilent Sales office to request literature numbers 5968-3278E and 5968-7746E, or visit our web site at:

www.agilent.com/find/bluetooth
Agilent E1852A Bluetooth™ Communication Test Set

The Agilent E1852A performs functional and parametric tests of Bluetooth enabled devices.

Features include:

• Establishes link to standard Bluetooth modules.
• Standard Bluetooth protocol
• Frequency hopping
• Versatile PC user interface for manual use
• Test mode and piconet based
• Parametric measurements
• Transmitter tests
• Power over burst
• FM deviation
• Frequency error on specified RF channels
• BER receiver tests on single and multi-slots

For more information, contact your local Agilent Sales office or visit our web site at:

www.agilent.com/find/bluetooth
Low cost-of-test (COT) is a critical consideration when implementing Bluetooth manufacturing test solutions. Agilent provides accurate, cost-effective, comprehensive test solutions to prepare your product for success in the emerging Bluetooth market.

NEW
Agilent E1852A Bluetooth™ Communication Test Set

Designed for manufacturing use:

- SCPI like commands
- Fast measurements
- User interface SW that runs on Windows 98 or NT
- Measurement summary with Pass/Fail
- Data logging
- Remote command debugging window
- Dynamic Link Library with debugging messages for automation development

For more information, contact your local Agilent Sales office or visit our web site at:

www.agilent.com/find/bluetooth
Solutions for Manufacturing

The Agilent 94000 Mixed Signal Test System, configured for Bluetooth applications, provides all the system resources necessary for fast, convenient, Bluetooth IC testing. Utilizing modulated RF sources and a fast frequency-hopping synthesizer, the Agilent 94000 provides the required GFSK stimulus to make receiver BER tests under various interfering and frequency-hopping conditions. All measurement units and digitizers are included with the system to make required transmitter tests.

Agilent 94000 Series Mixed Signal Test System

The following is a summary of 94000 Series Mixed Signal Test System measurement capabilities

- Transmit output power
- Modulation characteristics
- Frequency tolerance
- Spurious emissions
- Frequency-hopping transmitter tests
- Receiver sensitivity (bit error rate - BER)
- Receive interference performance
- Out-of-band blocking
- Intermodulation characteristics
- Frequency-hopping receiver tests

For more information, contact your local Agilent Sales office to request literature number 5966-4005E or visit our web site at:

www.agilent.com/find/bluetooth

Agilent E4406A VSA

Agilent E4406A VSA is a transmitter tester focused on making measurements in the manufacturing environment. It provides an affordable budget with high accuracy and fast repetitive measurements for Bluetooth product manufacturers. Agilent E4406A makes the following Bluetooth measurements:

- Burst rise/fall time measurements
- ACPR measurement with a high dynamic range and high accuracy
- Output power measurements
- Output spectrum

For more information, contact your local Agilent Sales office to request literature numbers 5968-7617E and 5980-2714E, or visit our web site at:

www.agilent.com/find/bluetooth
Agilent 66319B/D and Agilent 66321B/D Mobile Communications DC Source with Battery Emulation

Agilent mobile communications DC source series are fast programmable dynamic DC power sources with battery emulation. These compact fast output response DC power solutions coupled with the DSP based measurement system improves the throughput up to thirty times over general purpose power supplies when testing digital devices. Offering superior output performance and stability when using either short or long load leads ensures accurate regulation at the device under test. The programmable resistance capability allows the device to be tested simulating ‘real world’ battery conditions (internal battery resistance) for more accurate testing.

Fast response power technology
• Can be optimized for a wide range of test configurations
• Superior output stability for both short or long load leads

Programmable output resistance
• Emulate battery characteristics and voltage response

For more information, contact your local Agilent Sales office to request literature numbers 5980-0766E and 5980-0875E or visit our web site at:
www.agilent.com/find/bluetooth

ESA-E Series Spectrum Analyzer

As a manufacturing test tool the ESA allows large amounts of data to be acquired quickly using the remote interface to control the Bluetooth measurement personality. The measurement reliability of the ESA will give you confidence when you ship your product.

Bluetooth one button tests
• Modulation overview measurement
• Output power
• Carrier frequency drift
• Monitor band/channel
• Initial carrier frequency tolerance
• Modulation characteristics
• 20dB output spectrum bandwidth

Additional features
• Bluetooth channel number tuning
• Bluetooth packet type selection
• p0 timing synchronization
• Level setting

For more information, contact your local Agilent Sales office to request literature numbers 5968-3278E and 5968-7746E, or visit our web site at:
www.agilent.com/find/bluetooth
Bluetooth developers require expertise and experience in test technology and methods to achieve faster time to market. Agilent provides worldwide customized integrated test solution services, including, training on custom Bluetooth systems and fixtures, technical support, and consulting assistance.

We offer standard and custom fixture platforms that are completely customizable for Bluetooth devices. These RF-shielded enclosures are manual loaded or auto-engaged, manual or fully automated and have been deployed worldwide for clients in the wireless industry. Our customized Bluetooth fixture systems are modular, flexible, easy to maintain, and modifiable. As with our Bluetooth instrumentation, we guarantee the highest quality and reliability of our fixtures.

Agilent offers Bluetooth developers a completely integrated solution for testing. Worldwide resources provide custom Bluetooth test systems, test executive software and Bluetooth application software to help you achieve faster time-to-market. With our Bluetooth integrated solutions and proven RF-shielded fixtures, your production risk and production time can be reduced significantly. We offer the support that allows you to focus on your core business. Contact your local Agilent Sales office for more information on how Agilent can design and implement a customized Bluetooth test solution.
Agilent Technologies’ Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent’s overall support policy: “Our Promise” and “Your Advantage.”

Our Promise
Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage
Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

For more assistance with your test and measurement needs go to:

www.agilent.com/find/assist

Or contact the test and measurement experts at Agilent Technologies
(During normal business hours)

United States:
(tel) 1 800 452 4844

Canada:
(tel) 1 877 894 4414
(fax) (905) 282 6495

Europe:
(tel) (31 20) 547 2323
(tel) (31 20) 547 2390

Japan:
(tel) (81) 426 56 7832
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(tel) 1 800 629 485
(fax) (61 3) 9210 5947

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