

# MT8852B

Bluetooth Test Set



# The World's Leading Short Range Wireless Technology



By eliminating wires and simplifying connections between everyday appliances, *Bluetooth*<sup>®</sup> wireless technology has become the dominant standard for short-range wireless connectivity. Over 2.5 billion devices are now shipped each year with *Bluetooth* technology embedded. Mobile phones connect seamlessly to headsets and car kits for hands-free speech or to other phones for picture sharing and file transfer. But *Bluetooth* is not confined to the phone— other applications include streaming high quality music from music players to a new generation of stereo headsets and desk speakers plus wireless gaming controllers.

The introduction of the new *Bluetooth* Smart standard opens up a whole new range of applications including sports and fitness monitoring and health and wellbeing sensors.

The future success of the *Bluetooth* standard will depend on users of the technology enjoying reliable, high-quality connections. We will expect to use products “out of the box” to provide immediate connectivity.

Anritsu recognizes the importance of *Bluetooth* link quality to the success of the technology and to the reputation of the products in which it is embedded. We have developed a series of test solutions to help in development and production test of *Bluetooth* modules and *Bluetooth* products – quickly and at low cost.

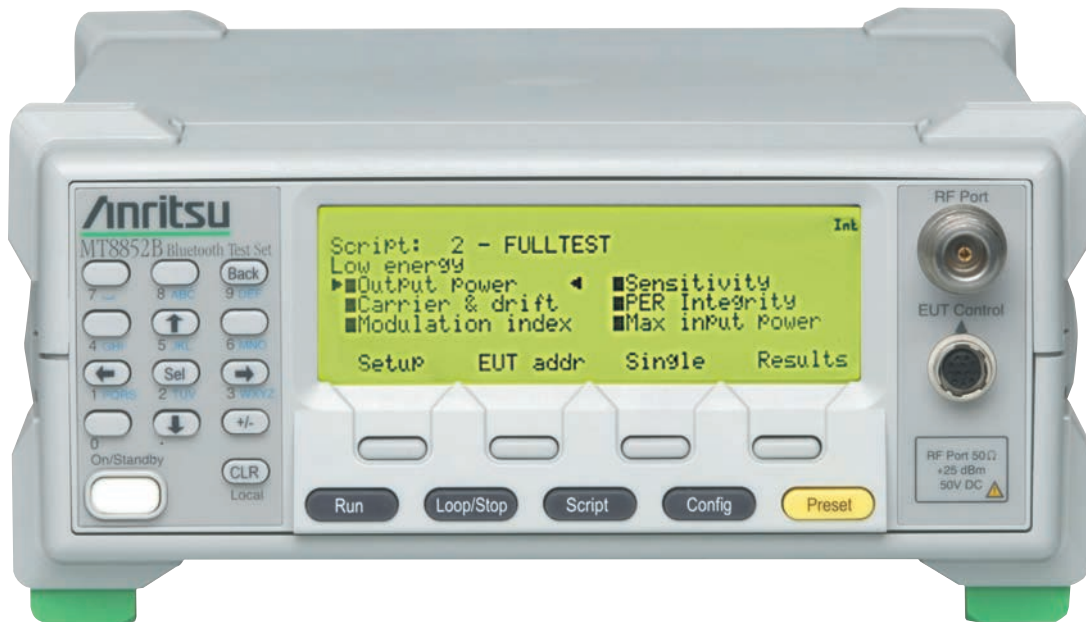
Anritsu is the leading supplier of instruments to test the quality of products manufactured with *Bluetooth* technology embedded. As members of the Bluetooth Special Interest Group (SIG) since 1999, Anritsu has actively participated in the development of the standard from the first Core Specification version 1.0 release through to the current Core Specification version 4.2 release. The MT8852B *Bluetooth* Test Set builds on this experience to offer an optimized radio layer test instrument.

As a manufacturer of *Bluetooth* products, you need above all else to maintain your reputation for quality and reliability. The complex demands of new technologies such as *Bluetooth* will require the adoption of new testing techniques. By bringing our experience to bear on these demanding test requirements, Anritsu can offer you the test capability you need. The MT8852B *Bluetooth* Test Set gives you a one-button test to fully characterize your *Bluetooth* implementation and ensure that your reputation for quality is maintained. Working with RF, especially RF at over 2 GHz, is not easy, but with Anritsu as your test partner you can be certain of having the most up-to-date and relevant testing capabilities for your *Bluetooth* products. Anritsu understand the need to quickly and accurately verify the performance of products in a high volume manufacturing environment, thereby ensuring excellent and reliable performance from new *Bluetooth* products. When tested on the MT8852B, you can ship products to your customers with confidence that they will work perfectly first time, every time.

The *Bluetooth*<sup>®</sup> mark and logos are owned by Bluetooth SIG, Inc. and are used by Anritsu under license.



# Bluetooth Test Set MT8852B

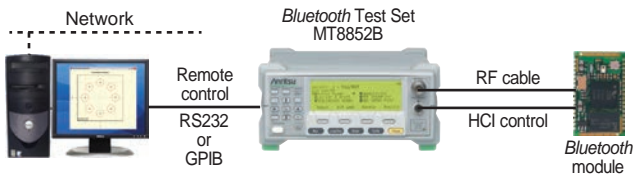


- Qualified by Bluetooth SIG for measurements
- Compliant with *Bluetooth* Core Specification v1.2, 2.0, 2.1, 3.0 + HS, 4.0, 4.1 and 4.2 RF test suite
- Measurements performed in *Bluetooth* test mode – Loopback or Tx mode supported
- Signal generator and transmitter analyzer modes for protocol free applications
- “Quick Test” script validates Basic Rate, EDR and *Bluetooth* low energy test performance in under 15 seconds
- “Full Test” script performs full Bluetooth SIG compliant testing from single key press
- For design proving and production test
- Full implementation of Basic Rate, EDR and *Bluetooth* low energy dirty transmitter for Bluetooth SIG RF test specification compliant measurements
- Audio test capability, 3 SCO channels with CVSD,  $\mu$ -Law and A-Law air interface
- Adaptive Frequency Hopping (AFH) measurements (MT8852B-015)
- BlueSuite Pro3 PC software displays; FSK modulation, power burst profile, PSK constellation diagrams and sensitivity searches graphically
- CombiTest program automates production test software with test script generator and results data base
- Easy operation – one-touch testing with “Run” key
- GPIB and RS232 remote programming interfaces
- Initialization and control of test devices through USB, RS232 and USB-Adaptor HCI control port
- Built-in support for *Bluetooth* low energy 2-Wire control interface
- Small size (half rack) and low weight ( $\leq 3.45$  kg)

# Applications

## Module Testing

Anritsu understands the requirements of the manufacturers of *Bluetooth* modules. Test times must be minimized yet performance must be assured. The MT8852B can establish a link with the module under test and perform a comprehensive set of transceiver measurements in under 10 seconds. If the module address is unknown, MT8852B can read it through the module HCI (RS232, USB or USB-Adaptor), or perform an inquiry. An integrated CW frequency counter can be used for crystal trimming. Module testing requires a test fixture, ideally in a shielded box, to interface the *Bluetooth* module to the MT8852B. The test fixture should provide a direct RF connection plus, if required, connection to the modules HCI interface.



For fault finding and analysis, BlueSuite Pro3 software is a PC based tool kit that tests EUTs systematically on all channels. BlueSuite Pro3 also graphically displays the essential waveforms of power burst profile, modulation deviation and IQ diagrams. In the early stages of development, the signal generator and transmitter analyzer can be used to test the device without forming any protocol connection to the test set.

## Consumer Product Testing

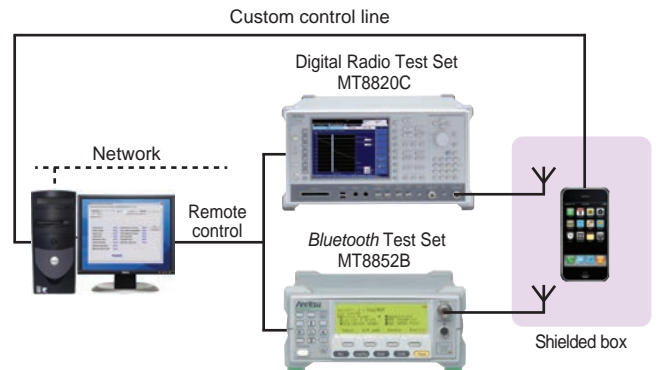
*Bluetooth* interfaces are now standard on many consumer products including; digital music players, notebook PCs, gaming handsets, printers, portable credit card readers and headsets. For many manufacturers, it will be the first time that RF measurements have been made in their production environment.

The MT8852B is a highly targeted instrument that has been designed to offer *Bluetooth* test capability in a compact, economical and easy to operate package. The pre-programmed test scripts provide a fast solution that can quickly be integrated into existing production facilities. By using the CombiTest production test software, the MT8852B can be quickly integrated in to the production flow with automatic archiving of all test results to a database.

## Mobile Phone Testing

Mobile phones are the highest volume product to benefit from *Bluetooth* technology. Manufacturers need to prove the performance of both the *Bluetooth* and mobile phone radios. Test is typically a bottleneck in any mobile phone production line and so testing the *Bluetooth* interface must be performed with no increment to total test time. It is also vital to confirm that both radios can be active simultaneously without any interference between them. These demands result in the need for parallel testing of the *Bluetooth* and mobile phone radios. MT8852B is the ideal instrument used alongside a radio communications analyzer to perform parallel testing.

Should the mobile phone also include an 802.11b/g WLAN radio, the AFH feature of the MT8852B is ideal for validating that both radios can be used simultaneously without mutual interference. For mobile phones without an RF test connector, MT8852B can make all its measurements over the air interface. You simply use your test fixture to position the EUT accurately with respect to the test antenna. Correction values for the path loss at each frequency can be entered into MT8852B path loss table and all results are corrected accordingly.



## Design Proving

Each new revision of a *Bluetooth* chip requires full verification for RF performance. The MT8852B forms the heart of a design and verification test system. With the addition of other Anritsu test instruments including a second MT8852B as the *Bluetooth* modulated interferer, a MG3692C as the CW interferer and a MS2830A spectrum analyzer, all 16 standard rates and 8 EDR test cases can be executed.

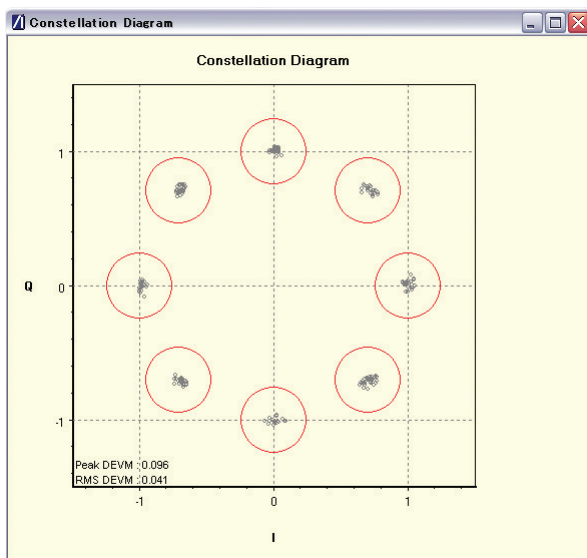
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# Add BlueSuite Pro3 Software for Greater Insight into the Device's Performance

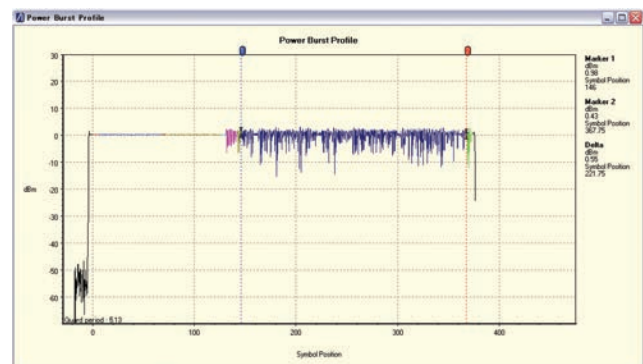


BlueSuite Pro3 is a comprehensive software tool that enables a greater understanding of all aspects of a device's RF characteristics. Running on a standard PC, BlueSuite Pro3 interfaces to the MT8852B through a GPIB interface. With BlueSuite Pro3 you can;

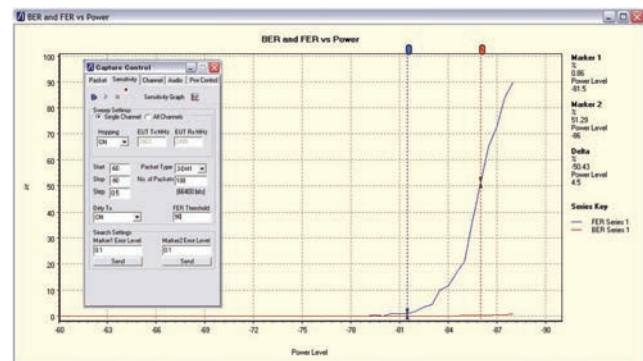
- Monitor the real-time state of the EUT through the display of frequency deviation, power burst, IQ constellation and vector graphs.
- Configure and run sensitivity sweeps and display the results graphically.
- Configure and run measurement sweeps for seven different tests and display the results graphically for each of the 79 Bluetooth channels.
- Configure and run audio tests and display the results graphically.
- Configure and run a power control test and display the results graphically.
- Read and write script and limit settings to and from the MT8852B.
- Edit and run a complete test script and generate a detailed report of the results.
- Step through individual connection and test mode controls to determine the cause of problems otherwise difficult to isolate.



BlueSuite Pro3 displays the IQ constellation pattern for all payload symbols, or any user defined 50 μs block. Limit circles are preset to the core specification requirement for  $\pi/4$ DQPSK or 8DPSK modulation standards.



Power Burst profile display of 3-DH1 packet. Color coding highlights each element of the packet; for example, red - preamble, light blue - access code and dark blue - PSK payload.



Automatic sensitivity search measurements display the FER/BER performance of an EUT with decreasing power into the receiver. Tests can be performed on all supported standard rates and EDR packet types.

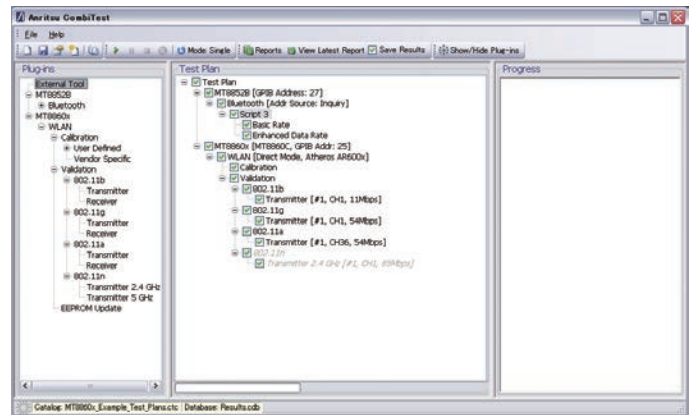
# Introducing CombiTest



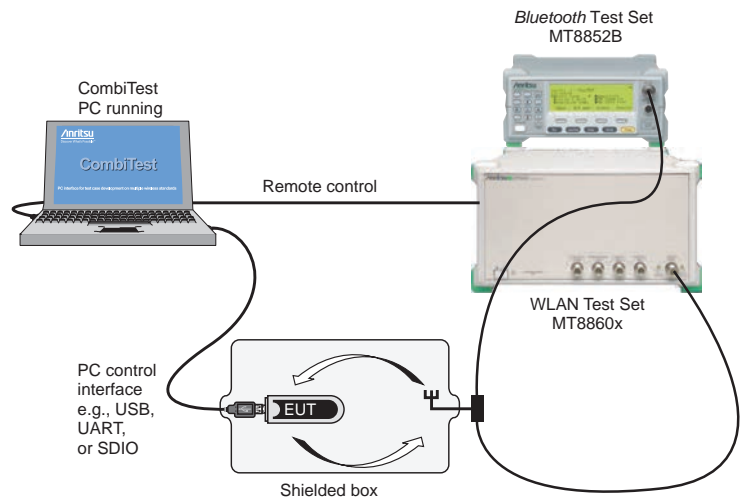
CombiTest is a software application used to remotely control Anritsu WLAN and *Bluetooth* test sets using a user-configured test plan of measurements. It is ideal for creating design-verification or production test plans for the new generation of wireless combo modules including 802.11 and *Bluetooth* radios. CombiTest allows users to install plug-ins as required for each test instrument.

## CombiTest Features

- Plug-ins for MT8852B *Bluetooth* Test Set
- *Bluetooth* test mode measurements
- Rapid creation and execution of test plans
- Calibration, validation, and EEPROM programming of modules
- Run an entire test plan or just the selected components
- Detailed report of test results with database of previous tests
- CombiTest application source code available on request



## Setup



# Test the Interference Rejection Capability of your *Bluetooth* Devices with the AFH Option

When two *Bluetooth* devices connect under normal circumstances, they establish a basic frequency hopping scheme across 79 frequency channels in the 2.4 GHz ISM band, hopping at a rate of 1600 times per second. However, as is becoming increasingly common, interference may be encountered in environments where other wireless technologies, such as 802.11 WLAN or DECT are also active. Blocked channels, caused by interference, result in a deterioration in the performance of the connection, and this in turn results in poor voice quality or reduced data transfer rates. To limit the impact of this interference, an adaptation of frequency hopping, known as Adaptive Frequency Hopping (AFH) was introduced by the Bluetooth SIG in the *Bluetooth* v1.2. AFH aims to restore the performance of a *Bluetooth* connection by identifying channels with high error rates and excluding the use of these channels thereafter.

## MT8852B Implementation of AFH

When *Bluetooth* devices that implement the *Bluetooth* v1.2 are connected, each device can create its own Local Assessment Scheme. This is a channel map that defines which channels the device assesses to be clear and which are experiencing interference. The MT8852B is designed to respond to the EUT assessment of which channels are experiencing interference. The MT8852B, being the Master device, creates an Active Channel Map that is the combination of the EUT's local assessment scheme and any channels that the user has manually masked from the MT8852B user interface.

### With the MT8852B-015 AFH Option You Can:

- Connect to an EUT using the *Bluetooth* v1.2 faster connection and display the connection time in milliseconds.
- Display the EUT *Bluetooth* v1.2 supported features map, including AFH capabilities.
- Create an AFH connection to the EUT.
- Read the EUT Local Assessment Scheme in the presence of an external interfering signal (e.g. WLAN).
- Manually define additional channels to mask in the MT8852B Pseudo Local Assessment Map.
- Display a graph of channel utilization against time to measure the speed with which an EUT masks channels when an interfering source is activated.
- Display a graph of Frame Error Rate (FER) against time to validate that an EUT identifies all "Bad" channels and maintains a zero or low FER.
- Establish an audio SCO link so that the audio quality can be monitored in the presence of interfering signals, and ensure that the AFH functionality maintains a high quality audio path.

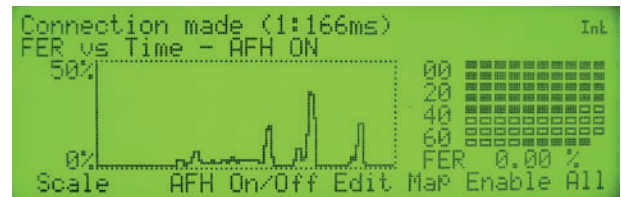
## Channel Utilization Against Time

This screen presents a graph with 1 second resolution of the number of channels masked by the EUT. It can be used to measure the time that the EUT takes to respond to the introduction of an interfering signal source. When the interfering source is removed, the same display shows the time that the EUT takes to re-introduce the now clear channels into the hopping scheme.



## Frame Error Rate (FER) Against Time

This screen presents a graph with 1 second resolution of the FER of the *Bluetooth* link with AFH enabled. When an interfering source such as a 802.11 WLAN access point is activated, the FER can be seen to increase immediately. As the EUT's local assessment scheme identifies the "bad" channels and reports its assessment to the MT8852B, the FER will decrease as the channels are removed from the hopping plan.



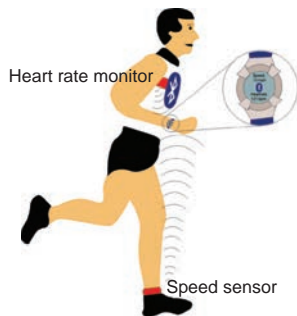
## Audio Measurements with AFH

The MT8852B also supports SCO connections with AFH active. This facilitates analysis of the impact of an interfering source on the quality of an audio signal.



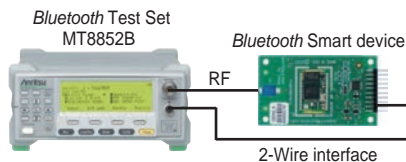
# Add MT8852B-027/034 to Test and Characterise *Bluetooth* Smart and Smart Ready Devices

*Bluetooth* Smart is the latest addition to the *Bluetooth* Core Specification. It is designed specifically for small, button-cell battery powered devices for which low power-consumption and low cost are the primary concerns. *Bluetooth* Smart is designed to work side by side with existing *Bluetooth* devices. It operates in the 2.4 GHz ISM band and offers data rates of 1 Mbps over a range of over 10 meters. Devices ideally suited to *Bluetooth* Smart include wireless health care equipment such as wireless blood sugar monitors, fitness performance equipment such as heart rate monitors, and remote displays (such as a wrist watch display) for displaying data from sensing devices.



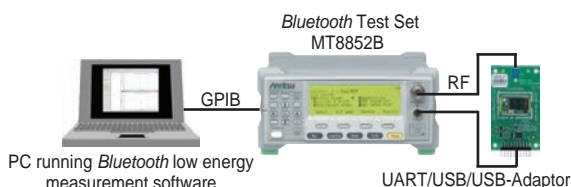
There are two types of *Bluetooth* Smart devices, Smart Ready devices integrate Basic Rate, EDR and *Bluetooth* Smart functionality into a single chip, while *Bluetooth* Smart devices support only the *Bluetooth* Smart standard. Mobile phones and PCs are expected to support *Bluetooth* Smart Ready devices and sensors and peripherals will only support the *Bluetooth* Smart standard.

Unlike the standard for Basic Rate and EDR testing, the *Bluetooth* Smart specification does not define a signalling based test mode connection to the EUT. The EUT must be controlled using defined test control commands sent through the EUT HCI interface. A simple 2-Wire control interface is provided for EUTs that do not have an HCI interface. The MT8852B, with *Bluetooth* low energy measurements option MT8852B-027, sends these test controls to the EUT to deliver fully automated testing. With the use of this integrated interface, the MT8852B can run a single test script that with a single key press can test the Basic Rate, EDR and *Bluetooth* Smart performance of an EUT. With the BLE Data length Extension MT8852B-034 option, the instrument can test *Bluetooth* Smart and Smart Ready devices that support the data length extension defined in *Bluetooth* v4.2.

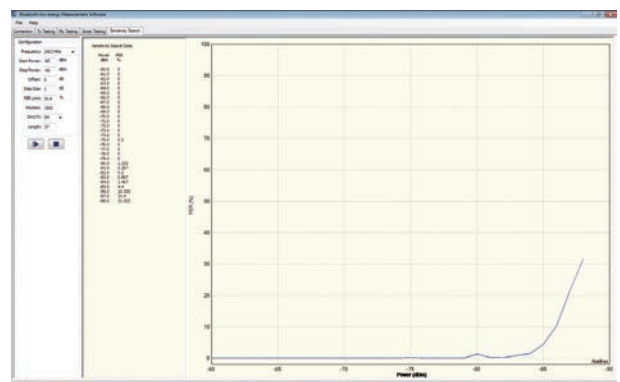
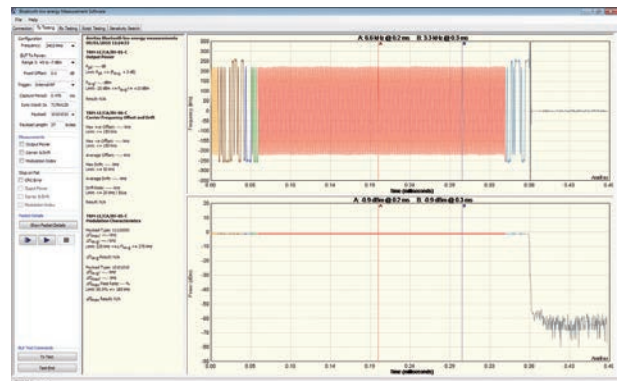


For EUT transmitter tests, test controls sent from the MT8852B configure the *Bluetooth* Smart or Smart Ready device to transmit test reference packets that are captured and analyzed by the MT8852B receiver.

The MT8852B-027/034 options are supplied with a *Bluetooth* low energy measurement application. During the design verification stages this application can be used to display the reference test packets transmitted by the EUT.



The MT8852B *Bluetooth* low energy PC application displays the power burst profile and modulation versus symbol graphs of *Bluetooth* low energy test reference packets. This is an invaluable tool during the design verification process for viewing and fully characterising the performance of a *Bluetooth* Smart radio. The [Tx Testing] tab shown here allows the user to set the conditions under which data is transmitted from the device. Tx measurements are selected and the results displayed numerically and in colour-coded traces. The [Rx Testing] tab allows the user to transmit *Bluetooth* low energy reference packets to the device so that Packet Error Rate (PER) can be calculated. For EUTs that support the UART/USB/USB-Adaptor or 2-Wire interface, the number of received packets can be read by the MT8852B, thus automating receiver sensitivity testing. The application can generate and display a receiver sensitivity curve so that the true sensitivity performance of the EUT can be measured.



## Key Features of MT8852B-027/034

- Fully compliant with *Bluetooth* SIG Core Specification v4.0, 4.1 and 4.2 for *Bluetooth* Smart and Smart Ready
- Test Dual Mode (Basic Rate, EDR and *Bluetooth* Smart) and Single Mode (*Bluetooth* Smart) devices
- Control EUT directly from MT8852B through UART, USB, USB-Adaptor and 2-Wire interfaces
- Configure a single script to run Basic Rate, EDR and *Bluetooth* Smart measurements from one key press

## Includes PC Application

- Configure test reference packets
- View Power Burst Profile and Modulation vs. Symbol
- Automated receiver sensitivity trace
- Numeric display of all test cases with Pass/Fail status



# Supported Measurements

## Basic Rate

Compliant with the following *Bluetooth* Core Specification v1.2, 2.0, 2.1, 3.0 + HS, 4.0, 4.1 and 4.2

TRM/CA/BV-01-C	Output Power
TRM/CA/BV-03-C	Power Control
TRM/CA/BV-07-C	Modulation Characteristics
TRM/CA/BV-08-C	Initial Carrier Frequency Tolerance
TRM/CA/BV-09-C	Carrier Frequency Drift
TRM/CA/BV-14-C	Enhanced Power Control
RCV/CA/BV-01-C	Sensitivity – single slot packets
RCV/CA/BV-02-C	Sensitivity – multi-slot packets
RCV/CA/BV-06-C	Maximum Input Level

## Enhanced Data Rate (EDR)

Compliant with the following *Bluetooth* Core Specification v1.2, 2.0, 2.1, 3.0 + HS, 4.0, 4.1 and 4.2

TRM/CA/BV-10-C	EDR Relative Transmit Power
TRM/CA/BV-11-C	EDR Carrier Frequency Stability and Modulation Accuracy
TRM/CA/BV-12-C	EDR Differential Phase Encoding
RCV/CA/BV-07-C	EDR Sensitivity
RCV/CA/BV-08-C	EDR BER Floor Performance
RCV/CA/BV-10-C	EDR Maximum Input Level

## Bluetooth low energy

Compliant with the following *Bluetooth* Core Specification v4.0, 4.1 and 4.2

TRM-LE/CA/BV-01-C	Output power at NOC
TRM-LE/CA/BV-02-C	Output power at EOC
TRM-LE/CA/BV-05-C	Modulation characteristics
TRM-LE/CA/BV-06-C	Carrier frequency offset and drift at NOC
TRM-LE/CA/BV-07-C	Carrier frequency offset and drift at EOC
RCV-LE/CA/BV-01-C	Receiver sensitivity at NOC
RCV-LE/CA/BV-02-C	Receiver sensitivity at EOC
RCV-LE/CA/BV-06-C	Maximum input signal level
RCV-LE/CA/BV-07-C	PER Report Integrity

NOC: Normal Operating Conditions

EOC: Extreme Operating Conditions

See *Bluetooth* low energy RF PHY Test Specification for details

## Adaptive Frequency Hopping (AFH)

Compliant with the following *Bluetooth* Core Specification v1.2, 2.0, 2.1, 3.0 + HS, 4.0, 4.1 and 4.2

Channel utilisation against time	Display number of active channels as reported by EUT Local Assessment Scheme
Frame error rate against time	Display of link FER with 1 second reporting interval
Active channel map	Display of Active and Masked channels as reported by EUT Local Assessment Scheme

# Ordering Information

Please specify the model/order number, name and quantity when ordering.  
The names listed in the chart below are Order Names.  
The actual name of the item may differ from the Order Name.

Model/Order No	Name
	<b>Main frame</b>
MT8852B	<i>Bluetooth</i> Test Set with EDR and Audio
MT8852B-040	<i>Bluetooth</i> Test Set with no EDR and no Audio
MT8852B-041	<i>Bluetooth</i> Test Set with no EDR and with Audio
MT8852B-042	<i>Bluetooth</i> Test Set with EDR and no Audio
MT8852B-043	<i>Bluetooth</i> Test Set with low energy Measurements only
	<b>Standard accessories</b>
	BlueSuite (Software, Standard version) RS232 HCI Control Interface Lead USB HCI Control Interface Lead RS232 Cable for Firmware Updates Power Cord for Destination Country Certificate of Calibration 3.5 mm Jack Plugs (Qty. 3, Audio Versions Only) BlueTest2 (Software)
	<b>Options and accessories</b>
MT8852B-001	Rack Mount Kit, Single Unit
MT8852B-003	Rack Mount Kit, Side by Side
MT8852B-015	Adaptive Frequency Hopping
MT8852B-017	IQ Data Output
MT8852B-027	<i>Bluetooth</i> low energy Measurements
MT8852B-034*	BLE Data Length Extension
MT8852B-319	Retrofit Audio to MT8852B
MT8852B-325	Retrofit EDR to MT8852B
MT8852B-327	Retrofit <i>Bluetooth</i> low energy Measurements
MT8852B-330	Retrofit Basic Rate Measurements to MT8852B-043
MT8852B-334*	Retrofit BLE Data Length Extension
MT8852B-098	Standard Calibration to ANSI/NCSL Z540
MT8852B-099	Premium Calibration to ANSI/NCSL Z540 (Test report and uncertainty data included)
MX885201B	BlueSuite Pro3 (Application)
2000-1613-R	<i>Bluetooth</i> Antenna and Adaptor
D41310	Soft Carry Bag

\*: MT8852B-034 (334) requires MT8852B-027 (327) or MT8852B-043.

# Bluetooth Audio Test Set MT8855A

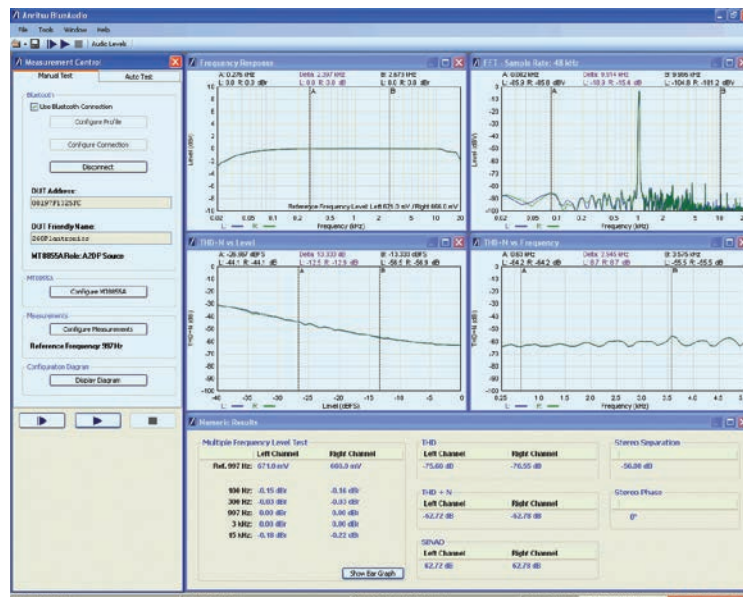


The *Bluetooth* Audio Test Set MT8855A is the world's first test set designed specifically to perform high-quality audio measurements on products using the *Bluetooth* Advanced Audio Distribution Profile (A2DP), the headset profile, or the hands-free profile. The MT8855A is the ideal instrument for both design validation and manufacturing test. Typical *Bluetooth* products that can be tested with the MT8855A include stereo and mono headsets, mobile phones, digital music players, integrated and accessory car kits, and desktop speakers.

### Key Features:

- 20 Hz to 20 kHz frequency coverage
- THD, THD+N, SINAD distortion measurements
- Stereo phase and stereo separation
- Graphical measurements of frequency response, plus THD+N vs. level and frequency
- A2DP profile support for stereo headset testing
- Headset and hands-free profile support for mono headsets
- Audio FFT analyzer aids fault finding
- Direct connection of accessory microphones and speakers
- Under 10 seconds test time for typical headset

The BlueAudio software, supplied with each MT8855A, is installed on a PC that connects to the MT8855A using a standard USB cable. BlueAudio serves as the MT8855A's front panel and is used to configure the instrument and display graphical and numeric measurement results. It communicates with the MT8855A by means of the class library dll file. For full specification and ordering information on MT8855A, go to [www.anritsu.com](http://www.anritsu.com)



BlueAudio screen displays full audio characteristics of a stereo headset

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