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MT8852B
Bluetooth Test Solutions

From Product Design, through Qualification
and into Production Test

The World's Leading Short Range Wireless Technology

By eliminating wires and simplifying connections between everyday appliances, *Bluetooth* wireless technology has become the dominant standard for short-range wireless connectivity. Over 1 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* low energy 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 1.0 core specification release through to the current 4.0 core specification 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 Anritsu MT8852B, you can ship products to your customers with confidence that they will work perfectly first time, every time.

MT8852B *Bluetooth* Test Set

- Qualified by *Bluetooth* SIG for measurements

- Compliant with *Bluetooth* 1.2, 2.0, 2.1, 3.0 + HS and 4.0 core specification 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 Low Energy test performance in under 15 seconds.

- "Full Test" script performs full SIG compliant testing from single key press.

- For design proving and production test.

- Full implementation of Basic Rate, EDR and low energy dirty transmitter for SIG RF test specification compliant measurements.

- Audio test capability, 3 SCO channels with CVSD, μ-Law and A-Law air interface.

- Adaptive Frequency Hopping (AFH) measurements with Option 15.

- BlueSuite Pro3 PC software displays; FSK modulation, power burst profile, PSK constellation diagrams and sensitivity searches graphically.

- BlueTest2 program automates production test software with test script generator and results data base.

- Headset and Hands-free profile support for design verification of integrated *Bluetooth* headsets with option 14.

- Easy operation – one-touch testing with RUN key.

- GPIB and RS-232 remote programming interfaces.

- Initialization and control of test devices through USB and RS 232 HCI control port.

- Built-in support for Bluetooth low energy 2-Wire control interface.

- Small size (half rack) and low weight (3.3 kg).

MT8852B 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 (RS 232 or USB), 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.
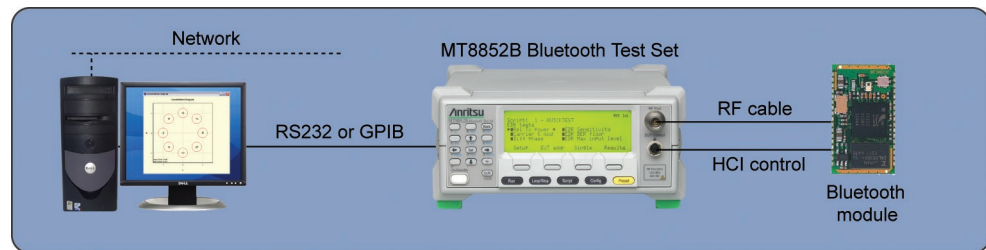
For fault finding and analysis, BlueSuite Pro3 software is a PC based tool kit that tests EUTs systematically on all channels. BlueSuite Pro3 also graphically displays the essential waveforms of power burst profile, modulation deviation and IQ diagrams.

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 BlueTest2 production test software, the MT8852B can be quickly integrated in to the production flow with automatic archiving of all test results to a database.

MT8852B Applications

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 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.
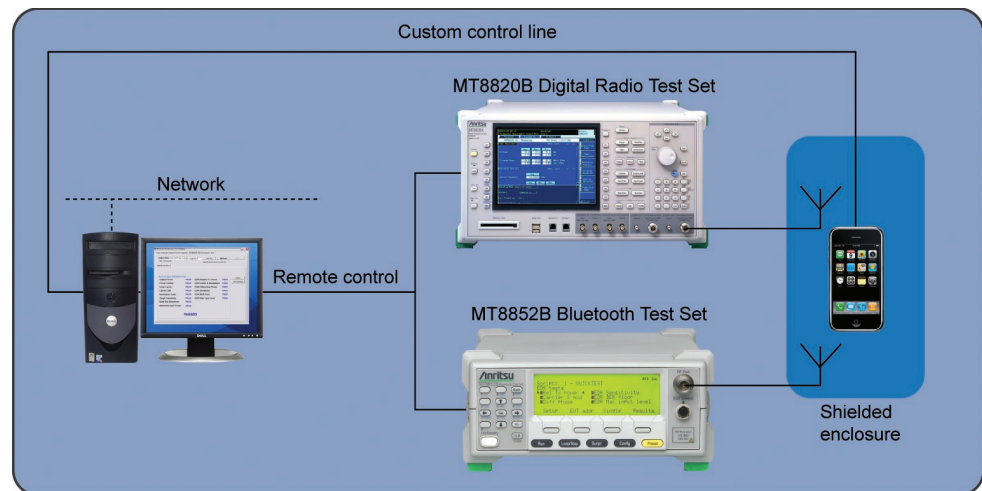
Design Proving.

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 MG3692B as the CW interferer and a MS2681A spectrum analyzer, all 16 standard rate 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 devices 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.
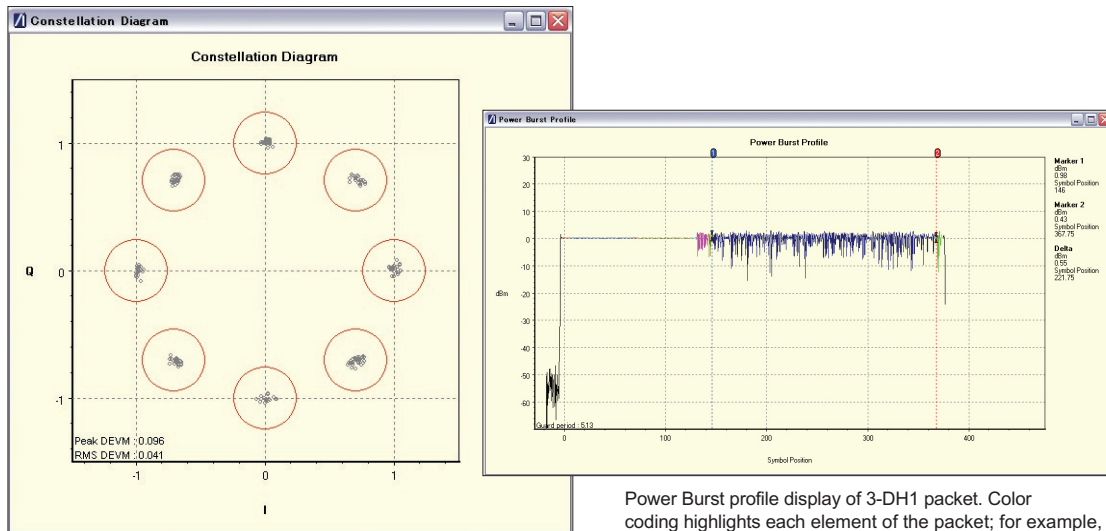
BlueSuite Pro3 displays the IQ constellation pattern for all payload symbols, or any user defined 50 μs block. Limit circles are preset to the core specification requirement for π/4DQPSK or 8DPSK modulation standards.

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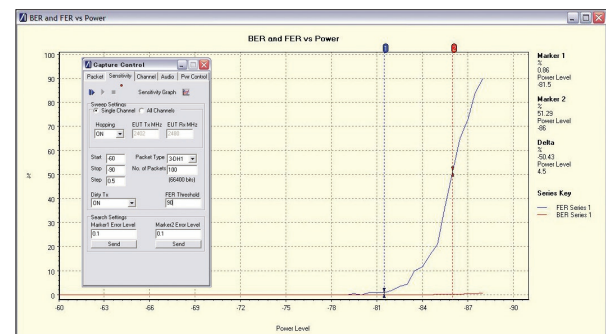
Automatic sensitivity search measurements display the FER/BER performance of an EUT with decreasing power into the receiver. Tests can be performed on all supported standard rate and EDR packet types.

# Start Testing Immediately with BlueTest2 Production Line Software

Anritsu has developed the BlueTest2 software to increase the efficiency of *Bluetooth* testing on the production line. The software provides a remote means to control and run *Bluetooth* tests on up to 16 MT8852B units simultaneously. This simultaneous connection not only means that tests can be performed quickly and easily, but also that script and configuration settings can be copied between the test sets in the line.

BlueTest2 software is supplied as standard with MT8852B in both executable and source code formats (Visual Basic.NET). Users may edit the BlueTest2 source code in order to add functionality to customize it for specific requirements. With BlueTest2 you can;

• Run *Bluetooth* tests remotely using up to 16 MT8852B test sets.

• Copy settings from any of the test sets to BlueTest2.

• Apply settings from BlueTest2 to all of the test sets in the line.

• View and print detailed reports of the tests conducted.

• Write test results to a database on the local drive or to a separate server computer.
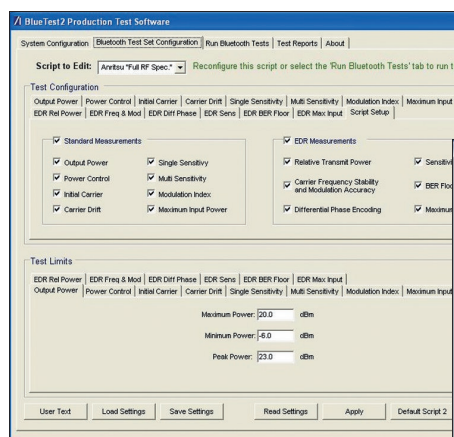
Test scripts are easily defined and written to the MT8852B using the BlueTest2 PC interface.
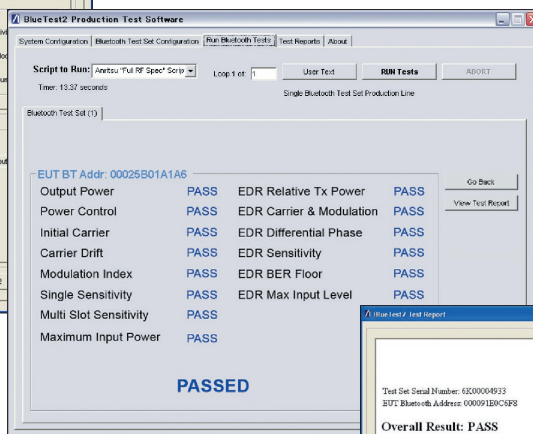
The results of the completed test are read back into the PC and the status of each test clearly displayed.
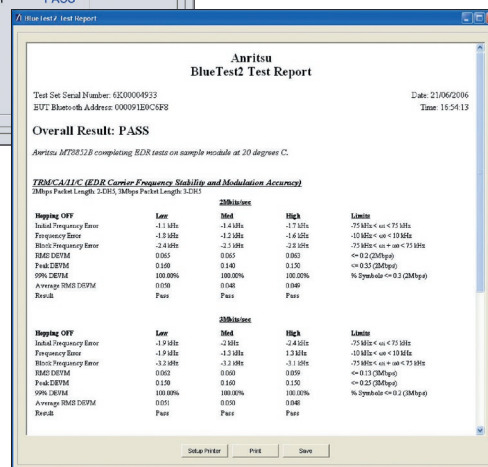
A detailed test report is automatically archived and can be printed in report format with user comments.

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* Special Interest Group in the 1.2 *Bluetooth* specification. 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 1.2 specification 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/15 AFH option you can:

- Connect to an EUT using the *Bluetooth* 1.2 specification Faster Connection and display the connection time in milliseconds.

- Display the EUT *Bluetooth* 1.2 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 against time

This screen presents a graph with one 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.
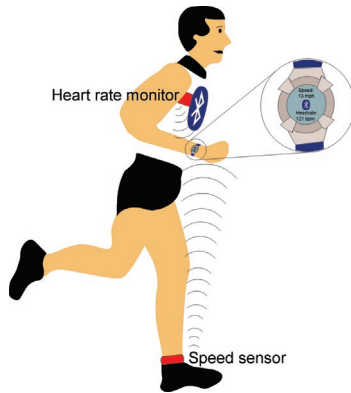

Audio measurements with AFH

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 Option 27 to Test and Characterise
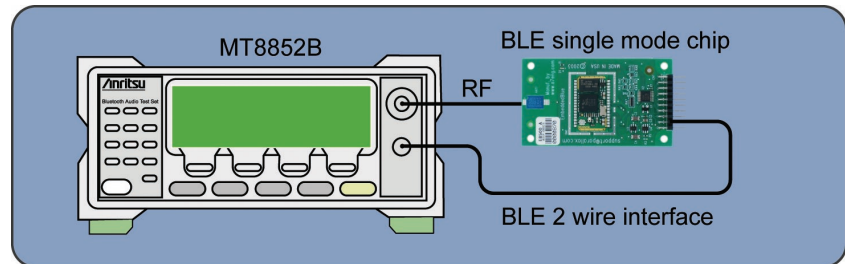# *Bluetooth* Low Energy Devices

Bluetooth low energy wireless technology is the latest addition to the *Bluetooth* 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* low energy 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 Mbit/sec over a range of over 10 meters.

Devices ideally suited to *Bluetooth* low energy include wireless health care equipment such as wireless blood sugar monitors, fitness performance equipment such as heart rate monitors, and for sending data to remote displays such as a wrist watch display.

There are 2 types of *Bluetooth* low energy devices, Dual Mode devices integrate Basic Rate, EDR and low energy functionality into a single chip while Single Mode devices support only the low energy standard. Mobile phones and PCs are expected to support the Dual Mode devices and sensors and peripherals will only support the low energy standard.

Unlike Basic Rate and EDR testing, the low energy specification does not define a signaling based test mode connection to the DUT. The DUT must be controlled using defined test control commands sent through the DUT HCI interface, or if the DUT does not support an HCI interface then a simple 2-Wire control interface has also been defined.

The MT8852B, with Option 27 – *Bluetooth* low energy measurements, sends these test controls to the DUT 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 low energy performance of a DUT.


For DUT transmitter tests, test controls sent from the MT8852B configure the low energy device to transmit test reference packets that are captured and analyzed by the MT8852B receiver.

Option 27 is 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 DUT.
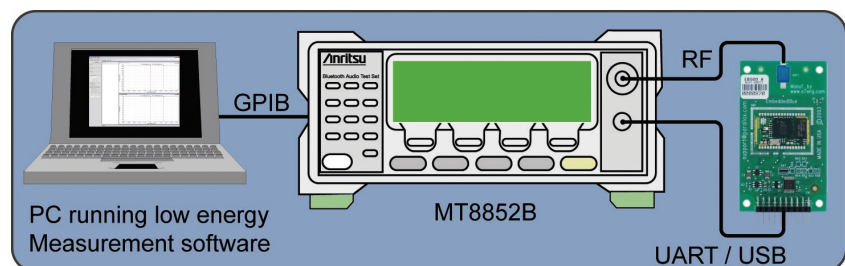
The MT8852B low energy PC application displays the power burst profile and modulation against symbol of low energy test reference packets. This is an invaluable tool during the design verification process for viewing and fully characterising the performance of a BLE radio.

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 low energy reference packets to the device to that PER can then be calculated. For DUTs that support the UART/USB or 2-Wire interface, the number of received packets can be read by the MT8852B, thus automating receiver sensitivity testing.
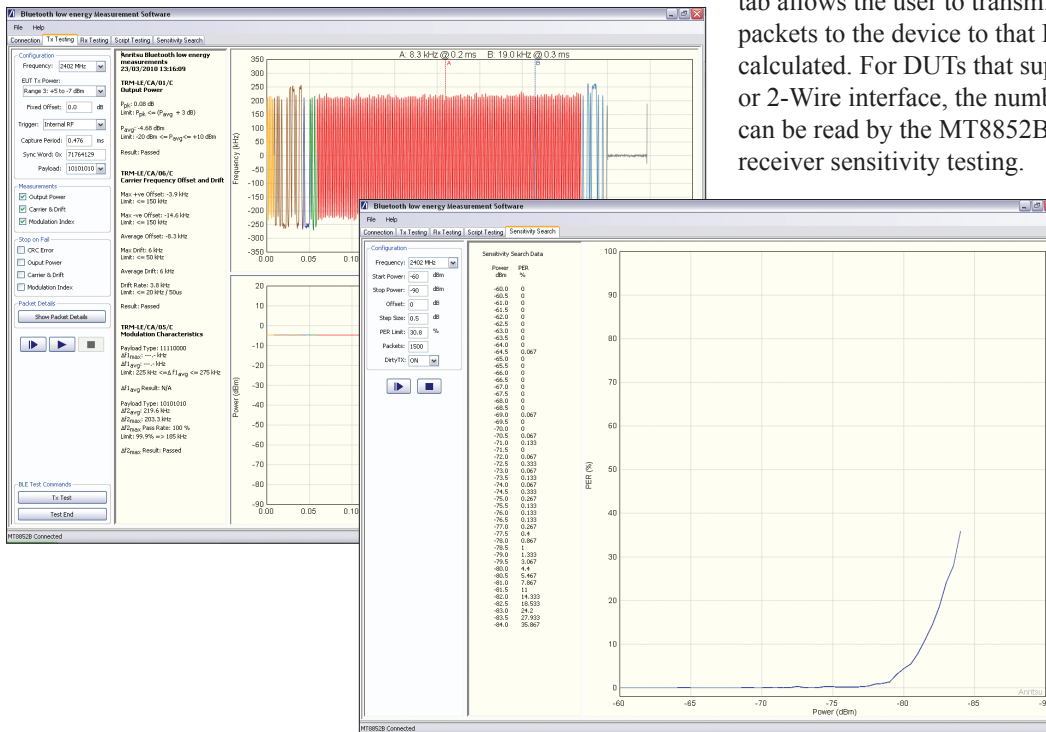
A dedicated tab in the application facilitates the generation of a receiver sensitivity curve so that the true sensitivity performance of the DUT can be displayed.

Key features of MT8852B option 27

- Fully compliant with *Bluetooth* SIG core specification release 4.0 for *Bluetooth* low energy

- Test Dual Mode (BR/EDR and BLE) and Single Mode (BLE only) devices

- Control DUT directly from MT8852B through UART, USB and 2-Wire interfaces

- Configure a single script to run BR, EDR and BLE 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

# Headset and Hands-Free Profile Emulation Software

The *Bluetooth* Headset and Hands-Free Profile Emulator is a software package developed in partnership with AT4wireless (formerly CETECOM), and designed for use with the MT8852B *Bluetooth* Test Set. This PC software package runs the higher layers (above HCI) on the PC including the Headset and Hands-free profiles.

The emulator has been developed to facilitate the testing of integrated headsets in the integration and design proving stages. Typically a fully integrated *Bluetooth* headset requires connections at the profile layer to maintain a connection to another *Bluetooth* device. Use of the emulator enables connection to a headset or audio gateway with the MT8852B and routing of audio signals directly to the microphone and speakers in the headset.

The Emulator allows the user to:

• Perform an EUT inquiry and name discovery.

• Manually enter an EUT address.

• Pair with the selected headset.

• Alert the headset.

• Initiate the MT8852B 1 kHz tone.

• Create and release an ACL or SCO connection between the MT8852B and the headset.

• Perform audio measurements on the headset by establishing an audio path to the headset microphone and speaker.

• View and save activity and host controller interface logs.

• Configure the MT8852B as the headset or audio gateway.

The main control window shows the profile selected for the MT8852B, the discovered devices and the connection status of the protocol stack. An activity log shows messaging, including AT commands, between the test set and the headset in real time. Detailed protocol logs including L2CAP, SDP and RFCOMM are also provided for protocol analysis and debugging.
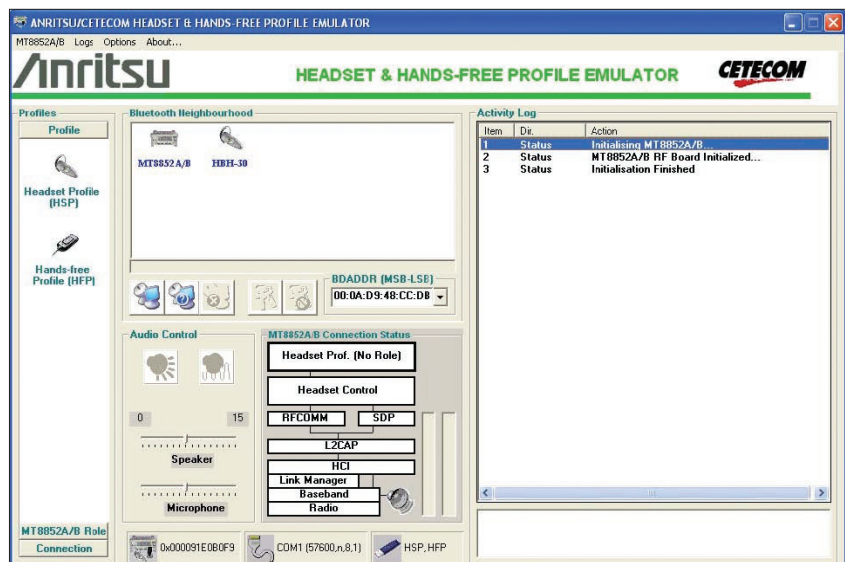
Supported Measurements

Bluetooth - Basic Rate	Compliant with the following *Bluetooth* SIG core specifications 1.2, 2.0, 2.0 + EDR, 2.1, 2.1 + EDR, 3.0, 3.0 + HS, 4.0
TRM/CA/01/C	Output Power
TRM/CA/03/C	Power Control
TRM/CA/07/C	Modulation Characteristics
TRM/CA/08/C	Initial Carrier Frequency Tolerance
TRM/CA/09/C	Carrier Frequency Drift
TRM/CA/14/C	Enhanced Power Control
RCV/CA/01/C	Sensitivity – single slot packets
RCV/CA/02/C	Sensitivity – multi slot packets
RCV/CA/06/C	Maximum Input Level
Bluetooth – Enhanced Data Rate (EDR)	**Compliant with the following *Bluetooth* SIG core specifications 1.2, 2.0, 2.0 + EDR, 2.1, 2.1 + EDR, 3.0, 3.0 + HS, 4.0**
TRM/CA/10/C	EDR Relative Transmit Power
TRM/CA/11/C	EDR Carrier Frequency Stability and Modulation Accuracy
TRM/CA/12/C	EDR Differential Phase Encoding
RCV/CA/07/C	EDR Sensitivity
RCV/CA/08/C	EDR BER Floor Performance
RCV/CA/01/C	EDR Maximum Input Level
Bluetooth – low energy (BLE)	**Compliant with the following *Bluetooth* SIG core specifications 4.0**
TRM-LE/CA/01/C	Output power at NOC
TRM-LE/CA/02/C	Output power at EOC
TRM-LE/CA/05/C	Modulation characteristics
TRM-LE/CA/06/C	Carrier frequency offset and drift at NOC
TRM-LE/CA/07/C	Carrier frequency offset and drift at EOC
RCV-LE/CA/01/C	Receiver sensitivity at NOC
RCV-LE/CA/02/C	Receiver sensitivity at EOC
RCV-LE/CA/06/C	Maximum input signal level
RCV-LE/CA/07/C	PER report integrity
	NOC = Normal Operating Conditions EOC = Extreme Operating Conditions See *Bluetooth* low energy RF PHY test specification for details
Bluetooth – Adaptive Frequency Hopping (AFH)	**Compliant with the following *Bluetooth* SIG core specifications 1.2, 2.0, 2.0 + EDR, 2.1, 2.1 + EDR, 3.0, 3.0 + HS, 4.0**
Channel utilisation against time	Display number of active channels as reported by DUT 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 DUT Local Assessment Scheme

MT8852B Ordering Information

Part number	Description
MT8852B	*Bluetooth* Test Set with EDR and Audio
MT8852B-040	*Bluetooth* Test Set with no EDR and no Audio
MT8852B-041	*Bluetooth* Test Set with no EDR and with Audio
MT8852B-042	*Bluetooth* Test Set with EDR and no Audio
MT8852B-043	*Bluetooth* low energy measurements only
Included accessories	
MT8852B Operation manual	
MT8852B remote programming manual	
BlueSuite software (standard version)	
RS 232 HCI control interface lead	
USB HCI control interface lead	
RS 232 cable for firmware updates	
Power cord for destination country	
Certificate of calibration	
3.5 mm jack plugs (qty 3) Audio versions only	
BlueTest2 software	
Options and accessories	
MT8852B-001	Rack mount kit, single unit
MT8852B-003	Rack mount kit, side by side
MT8852B-014	Headset and Hands-free profile emulator software
MT8852B-015	Adaptive frequency hopping option
MT8852B-017	IQ data output
MT8852B-027	*Bluetooth* low energy measurements
MT8852B-319	Retrofit Audio to MT8852B
MT8852B-325	Retrofit EDR to MT8852B
MT8852B-330	Retrofit Basic Rate measurements to MT8852B-043
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 software application
2000-1613-R	*Bluetooth* antenna and adaptor
D41310	Soft carry bag

MT8855A *Bluetooth* Audio Test Set Overview

The 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 aides 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

BlueAudio screen displays full audio characteristics of a stereo headset

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