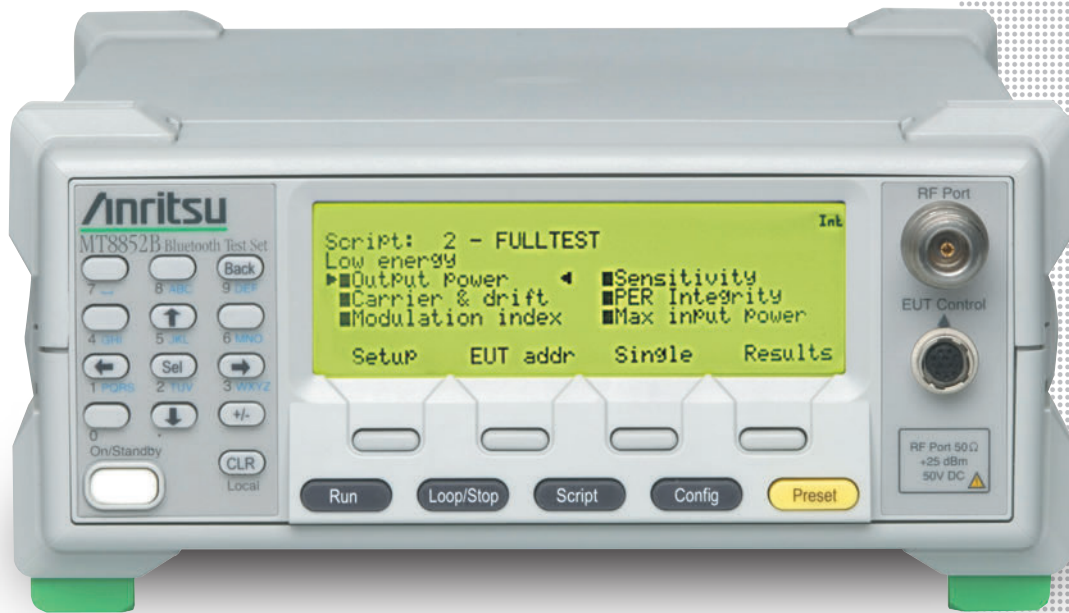


**Anritsu** envision : ensure

# Bluetooth Test Set

## MT8852B





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 3 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 technology 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 Bluetooth low energy to the Bluetooth Standard, opened up a whole range of applications including sports, fitness monitoring, health and wellbeing sensors. Bluetooth Core Specification v5.0 extended this new capability with a higher data and greater operational range.

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.

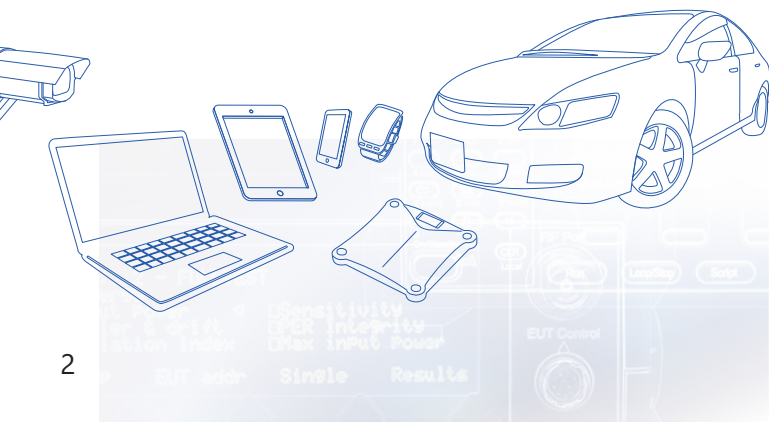
We have developed a series of test solutions to help in development and production test of Bluetooth modules and Bluetooth products – quickly and at low cost.

Anritsu is the leading supplier of instruments to test the quality of products manufactured with embedded Bluetooth technology. 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 5.2 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 technology 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> word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Anritsu is under license.



## Bluetooth Test Set MT8852B



- Qualified by Bluetooth SIG for measurements
- Compliant with Bluetooth Core Specification v.5.2 RF test suite
- Basic Rate and EDR measurement 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)
- Easy operation – one-touch testing with “Run” key
- BlueSuite Pro3 PC software displays; FSK modulation, power burst profile, PSK constellation diagrams and sensitivity searches graphically
- CombiTest software automates tests with test script generator and results data base
- GPIB and RS232 remote programming interfaces
- Initialization and control of test devices through USB, RS232 and USB-Adapter HCI control port
- Built-in support for Bluetooth low energy 2-Wire control interface
- Small size (half rack) and low weight ( $\leq 3.8$  kg)

## 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 15 seconds. If the module address is unknown, MT8852B can read it through the module HCI (RS232, USB, USB to RS232 or USB to BLE 2-Wire Adapter), 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 module's 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 automatic test software, the MT8852B can be quickly integrated into 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. In addition to the cellular system, smartphone manufacturers also need to prove performance of Bluetooth technology. 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 results are corrected accordingly.

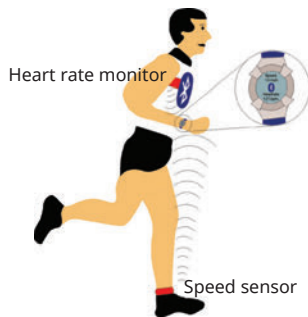
## Design Proving

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, you can run test cases such as blocking performance, intermodulation characteristics, spurious emissions. 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.

## Add MT8852B-027/034/035/036/037 to Test and Characterise Bluetooth Low Energy Devices

Bluetooth Low Energy has been added to the Bluetooth core specification v4.0, and subsequent enhancements have resulted in higher data rates, longer communication ranges, and high accuracy direction finding.

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 125 kbps/500 kbps/1 Mbps/2 Mbps. Bluetooth low energy devices are ideally suited to 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.



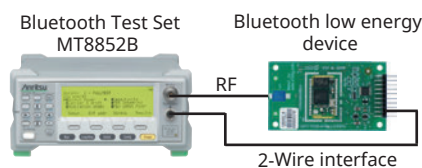
There are two types of Bluetooth Chips. One type integrates Basic Rate, EDR and low energy functionality into a single chip. This type is usually found in smartphones and PCs, which need to be able to connect to any Bluetooth device. The other type of chip supports only Bluetooth low energy, and is increasingly used in sensors and peripherals, where low power consumption is important.

Unlike the standard for Basic Rate and EDR testing, the Bluetooth low energy 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 specification allows low energy devices to be controlled without the complexity of a USB or fully featured UART 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 low energy performance of an EUT.

With the BLE AoA/AoD MT8852B-037 option, the instrument can test Bluetooth low energy devices that support Angle of Arrival (AoA) and Angle of Departure (AoD) defined in Bluetooth Core Specification v5.1.



For EUT transmitter tests, test controls sent from the MT8852B configure the Bluetooth low energy device to transmit test reference packets that are captured and analyzed by the MT8852B receiver. The MT8852B-027/034/035/036 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.

### Key Features of MT8852B-027/034/035/036/037

- Fully compliant with Bluetooth SIG Core Specification v5.2
- Test Dual Mode (Basic Rate, EDR and Bluetooth low energy) and Single Mode (Bluetooth low energy) devices
- Control EUT directly from MT8852B through UART, USB, USB-Adapter and 2-Wire interfaces
- Configure a single script to run Basic Rate, EDR and Bluetooth low energy measurements from one key press
- MT8852B-027 provides the feature to measure Bluetooth Low Energy supported by Bluetooth Core Specification v4.0 or later
- MT8852B-034 provides LE Data Packet Length Extension feature supported by Bluetooth Core Specification v4.2 and later
- MT8852B-035/036 provides the feature to measure LE 2M PHY and LE Coded PHY supported by Bluetooth Core Specification v5.0 or later
- MT8852B-037 provides the feature to measure Angle of Arrival and Angle of Departure by Bluetooth Core Specification v5.1 or later.

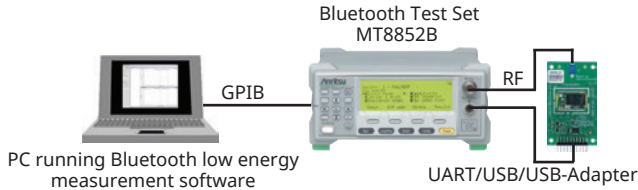
### Includes PC Application

- 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

# Bluetooth Low Energy Testing from the PC

Bluetooth low energy measurements can be performed from a remote PC running the Bluetooth low energy measurement software included with MT8852B-027. The software is installed on a PC and connected to the MT8852B by means of a standard GPIB cable.

An RF cable connects the MT8852B with the device under test. Reference packets transmitted from the EUT can be analyzed and displayed on the PC, or the MT8852B can be configured to transmit reference packets for EUT receiver sensitivity testing.



Use of the Bluetooth low energy software provides the ideal environment for detailed graphical analysis of Bluetooth low energy packets. Devices with an HCI interface can be tested automatically by configuring and running an automated test script from the PC.

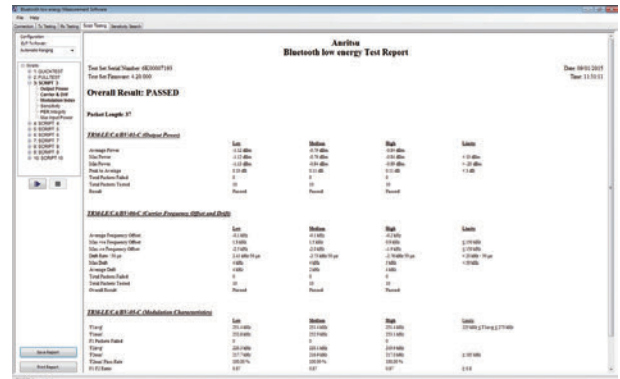
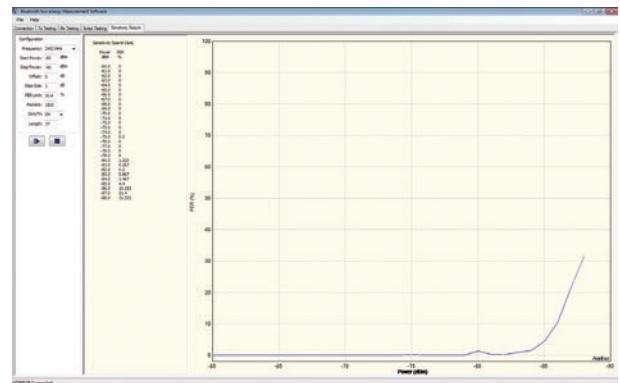
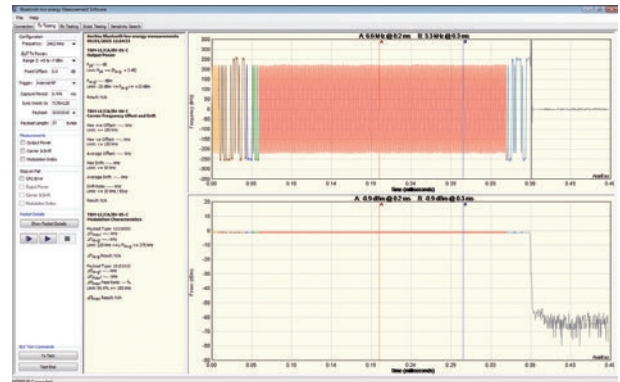
Bluetooth low energy measurements on single mode device that do not have an HCI interface can be performed by controlling the device from the silicon vendor's control software.


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 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-Adapter 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.



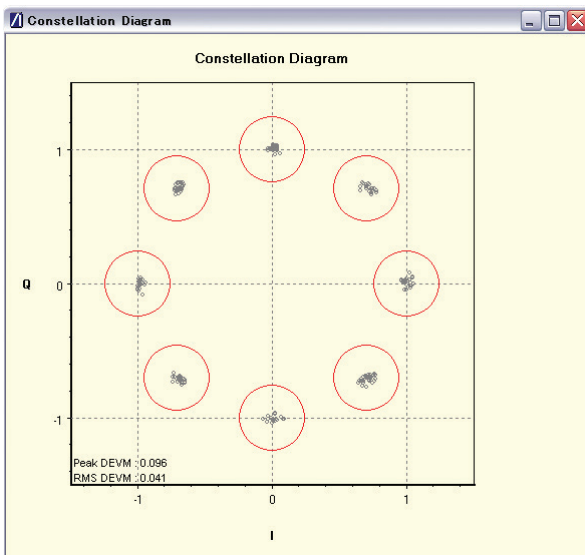
Making Bluetooth low energy measurements on a device with an HCI interface can be fully automated from the [Script Testing] tab. The user simply selects and configures the required test cases and clicks  to execute the script. The test results display in a report that can be printed or saved by the user.

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

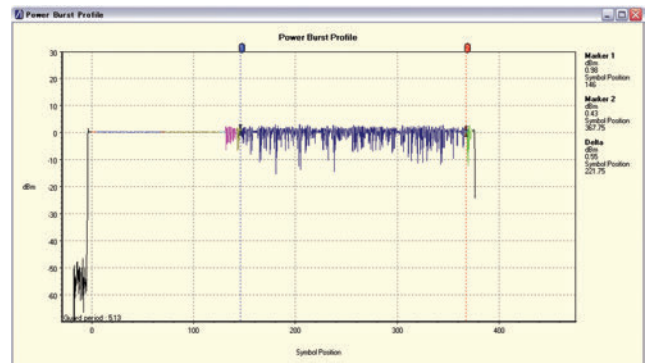


BlueSuite Pro3 is a comprehensive software tool that enables a greater understanding of all aspects of a BR/EDR device's RF characteristics. Running on a standard PC, BlueSuite Pro3 interfaces to the MT8852B through a GPIB interface. With BlueSuite Pro3 you can;

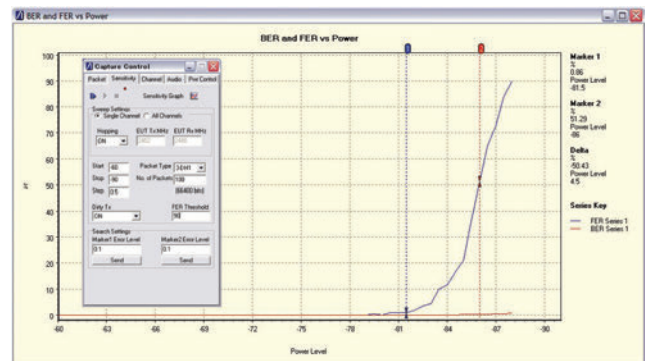
- Monitor the real-time state of the EUT through the display of frequency deviation, power burst, IQ constellation and vector graphs.
- Configure and run sensitivity sweeps and display the results graphically.
- Configure and run measurement sweeps for seven different tests and display the results graphically 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  $\mu$ s 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.

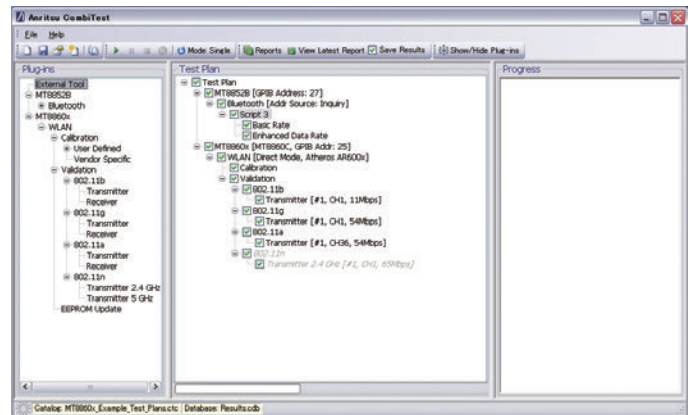
# Introducing CombiTest



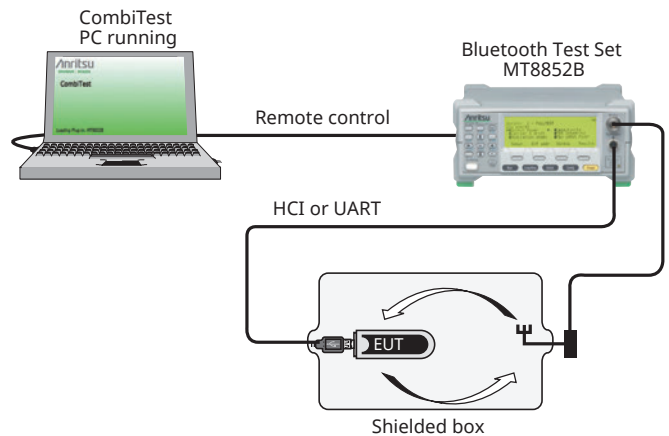
CombiTest is a software application used to remotely control Anritsu Bluetooth test sets using a user-configured test plan of measurements. It is ideal for creating design-verification or production test plans for Bluetooth radios. CombiTest allows users to install plug-ins as required for each test instrument.

## CombiTest Features

- Plug-in for MT8852B Bluetooth Test Set
- Bluetooth test mode measurements
- Rapid creation and execution of test plans
- Run an entire test plan or just the selected test items
- Detailed report of test results with database of previous tests



## Setup





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

When two Bluetooth Classic 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 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 Core Specification v1.2 standard. 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 Core Specification 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.

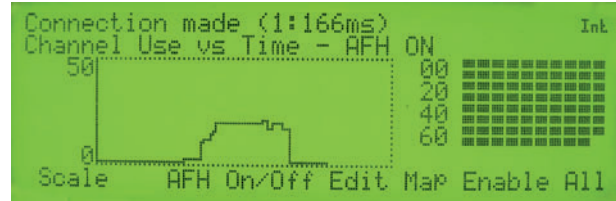
The MT8852B, being the Central device, creates an Active Channel Map that is the combination of the EUT's local assessment scheme and any channels that the user has manually masked from the MT8852B user interface.

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

- Connect to an EUT using the Bluetooth Core Specification v1.2 faster connection and display the connection time in milliseconds.
- Display the EUT Bluetooth Core Specification 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.

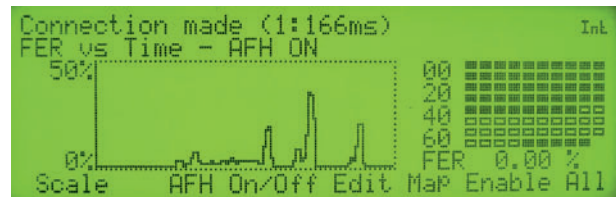
## Channel Utilization Against Time

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.



## Supported Measurements

### Basic Rate

Basic Rate measurements made in compliance with Bluetooth RF Test Specification RF. TS. p30

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

### Enhanced Data Rate (EDR)

Enhanced Data Rate measurements made in compliance with Bluetooth RF Test Specification RF. TS. p30

RF/TRM/CA/BV-10-C	EDR Relative Transmit Power
RF/TRM/CA/BV-11-C	EDR Carrier Frequency Stability and Modulation Accuracy
RF/TRM/CA/BV-12-C	EDR Differential Phase Encoding
RF/TRM/CA/BV-15-C	EDR Guard Time
RF/TRM/CA/BV-16-C	EDR Synchronization Sequence and Trailer
RF/RCV/CA/BV-07-C	EDR Sensitivity
RF/RCV/CA/BV-08-C	EDR BER Floor Performance
RF/RCV/CA/BV-10-C	EDR Maximum Input Level

### Bluetooth Low Energy

Bluetooth low energy measurements made in compliance with Bluetooth RF Test Specification RF-PHY. TS. p15

#### Transmitter Tests

RF-PHY/TRM/BV-01-C	Output power
RF-PHY/TRM/BV-05-C	Modulation Characteristics, uncoded data at 1 Ms/s
RF-PHY/TRM/BV-06-C	Carrier frequency offset and drift, uncoded data at 1 Ms/s
RF-PHY/TRM/BV-10-C	Modulation Characteristics at 2 Ms/s
RF-PHY/TRM/BV-12-C	Carrier frequency offset and drift at 2 Ms/s
RF-PHY/TRM/BV-13-C	Modulation Characteristics, LE Coded (S = 8)
RF-PHY/TRM/BV-14-C	Carrier frequency offset and drift, LE Coded (S = 8)
RF-PHY/TRM/BV-15-C	Output power, With Constant Tone Extension
RF-PHY/TRM/BV-16-C	Carrier frequency offset and drift, uncoded data at 1 Ms/s, Constant Tone Extension
RF-PHY/TRM/BV-17-C	Carrier frequency offset and drift at 2 Ms/s, Constant Tone Extension
RF-PHY/TRM/PS/BV-01-C	Tx Power Stability, AoD Transmitter at 1 Ms/s with 2 $\mu$ s Switching Slot
RF-PHY/TRM/PS/BV-02-C	Tx Power Stability, AoD Transmitter at 1 Ms/s with 1 $\mu$ s Switching Slot
RF-PHY/TRM/PS/BV-03-C	Tx Power Stability, AoD Transmitter at 2 Ms/s with 2 $\mu$ s Switching Slot
RF-PHY/TRM/PS/BV-04-C	Tx Power Stability, AoD Transmitter at 2 Ms/s with 1 $\mu$ s Switching Slot

#### Receiver Tests

Supports low energy signal generator compliant with Bluetooth Core Specification v5.2

RF-PHY/RCV/BV-01-C	Receiver sensitivity, uncoded data at 1 Ms/s
RF-PHY/RCV/BV-06-C	Maximum input signal level, uncoded data at 1 Ms/s
RF-PHY/RCV/BV-07-C	PER Report Integrity, uncoded data at 1 Ms/s
RF-PHY/RCV/BV-08-C	Receiver sensitivity at 2 Ms/s
RF-PHY/RCV/BV-12-C	Maximum input signal level at 2 Ms/s
RF-PHY/RCV/BV-13-C	PER Report Integrity at 2 Ms/s
RF-PHY/RCV/BV-26-C	Receiver sensitivity, LE Coded (S = 2)
RF-PHY/RCV/BV-27-C	Receiver sensitivity, LE Coded (S = 8)
RF-PHY/RCV/BV-30-C	PER Report Integrity, LE Coded (S = 2)
RF-PHY/RCV/BV-31-C	PER Report Integrity, LE Coded (S = 8)

### Adaptive Frequency Hopping (AFH)

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

## Bluetooth Test Set MT8852B 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	Note
MT8852B MT8852B-040 MT8852B-041 MT8852B-042 MT8852B-043	<b>Main Frame</b> Bluetooth Test Set Bluetooth Test Set Bluetooth Test Set Bluetooth Test Set Bluetooth Test Set	With EDR and Audio With no EDR and no Audio With no EDR and with Audio With EDR and no Audio With Low Energy Measurements only
J1783A J1784A J1785A   J1786A	<b>Standard Accessories</b> MT8852B Bluetooth Test Set Operation Manual MT8852B Bluetooth Test Set Operation Manual Remote Control USB HCI control interface lead RS232 HCI Control Interface Lead RS232 Cable for Firmware Updates Power Cord BlueSuite Software Bluetooth Low Energy Measurement Software application MT8852B Bootloader 3.5 mm Jack Plugs (Qty. 3)	Standard version      Audio Version Only
MT8852B-015 MT8852B-017 MT8852B-027 MT8852B-034*1 MT8852B-035*1, *2 MT8852B-036*1, *2, *3 MT8852B-037*1, *2, *3 MT8852B-070	<b>Options and Accessories</b> Adaptive Frequency Hopping option IQ data output Bluetooth low energy measurements BLE Data Length Extension Option BLE 2LE Option BLE BLR Option BLE AoA/AoD Option Platform Enhancement Option	2 Mbps Low Energy Bluetooth Long Range Angle of Arrival/Angle of Departure
MT8852B-315*4 MT8852B-317*4 MT8852B-319*4 MT8852B-325*4 MT8852B-327 MT8852B-330 MT8852B-334*1 MT8852B-335*1, *2 MT8852B-336*1, *2, *3 MT8852B-337*1, *2, *3 MT8852B-170  MT8852B-270  MT8852B-370	Retrofit Adaptive Frequency Hopping option Retrofit IQ data output Retrofit Audio to MT8852B Retrofit EDR to MT8852B Retrofit Bluetooth low energy measurements Retrofit Basic Rate Measurement to MT8852B Retrofit BLE Data Length Extension Option Retrofit BLE 2LE Option BLE BLR Option Retrofit BLE AoA/AoD Option Retrofit Platform Enhancement Option Retrofit  Platform Enhancement Option Retrofit  Platform Enhancement Option Retrofit	For units where the first three characters of the serial number are not "6A6 or 626" For units where the first three characters of the serial number are not "6A6 or 626" (FO) For units where the first three characters of the serial number are "6A6 or 626"
MX885201B MX885201B-301 Z1992A B0748A B0749A J0006 J0007 J0008 J0127A J0127B J0127C	BlueSuite Pro3 software application BlueSuite Pro2 to Pro3 Upgrade 2.4 GHz Antenna and Adapter Soft Carry Bag Rack Mount Kit GP-IB CABLE, 0.5M GPIB CABLE, 1.0M GPIB CABLE, 2.0M COAXIAL CORD, 1.0M COAXIAL CORD, 2.0M COAXIAL CORD, 0.5M	

\*1: MT8852B-034 (334) requires MT8852B-027 (327) or MT8852B-043.

\*2: MT8852B-035 (335), MT8852B-036 (336) and MT8852B-037 (337) requires MT8852B-034 (334).

\*3: MT8852B-036 (336) and MT8852B-037 (337) requires MT8852B-070 (270, 370).

\*4: When installing MT8852B-315/317/319/325 to MT8852B-043, MT8852B-330 is necessary.

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