

# Using the MT8852B to Test a *Bluetooth* Low Energy Device Controlled through an HCI or 2-Wire Interface

## BLE Overview

*Bluetooth* low energy (BLE) wireless technology is designed specifically for small, predominantly button-cell, battery-powered devices for which low power-consumption and low cost are the primary concerns. BLE devices are designed to co-exist with *Bluetooth* BR/EDR devices. They operate in the 2.4 GHz ISM band and offer data rates of 1 Mbit/sec over a range of 10 metres or more.

## Scope of this Application Note

This Application Note explains how to perform *Bluetooth* low energy tests on a device (such a component module) controlled through an HCI or 2-Wire interface.

**Note:** Refer to Anritsu Application Note 13000-00324 for details of how to perform low energy tests on a device (such as a fully assembled *Bluetooth* product) that does not provide access to an HCI or 2-Wire interface.

Three methods of testing are described in this Application Note:

- Running BLE tests directly from the MT8852B.
- Running BLE tests using the MX885203A PC software supplied with option 27 (*Bluetooth* low energy).
- Running BLE tests using the Anritsu CombiTest PC application for test case development on single or multiple wireless standards.

## BLE Testing on the MT8852B

It is important to note that to perform low energy tests using the MT8852B, the EUT must be controlled directly by sending BLE test mode commands over an RS232, USB, or 2-Wire cable connection to the EUT control interface. A *Bluetooth* connection is not established between the MT8852B and the EUT and the EUT *Bluetooth* address is therefore not required.

Testing of BLE devices on the MT8852B, MT8852B-040, MT8852B-041, or MT8852B-042 models requires option 27 and firmware version 4.16 or later. The MT8852B-043 is a dedicated low energy test set and does not require option 27 to perform low energy measurements.

Option 27 enables users to perform three transmitter and three receiver tests in full compliance the *Bluetooth* low energy specification.

### Supported Transmitter Tests

- TRM-LE/CA/01(02)/C (Output Power)
- TRM-LE/CA/05/C (Modulation characteristics)
- TRM-LE/CA/06(07)/C (Carrier frequency offset and drift)

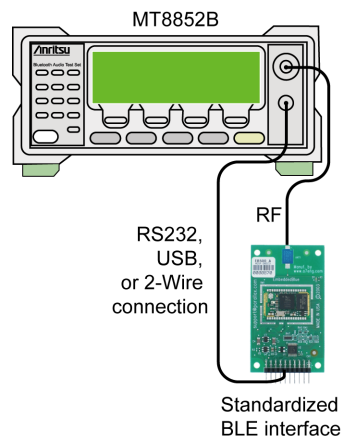
### Supported Receiver Tests

- RCV-LE/CA/01(02)/C (Receiver sensitivity)
- RCV-LE/CA/06/C (Maximum input signal level)
- RCV-LE/CA/07/C (PER Report Integrity)

### Configuration

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## Method 1: Running BLE Tests Directly from the MT8852B



**Figure 1.** Testing Directly from the MT8852B

1. Connect an RF cable between the antenna connector on the EUT and the “RF Port” on the front of the MT8852B.
2. Connect the HCI (RS232, USB) or 2-Wire cable from the “EUT Control” port on the front of the MT8852B to the interface on the EUT.
3. Turn on the MT8852B.

4. Press **Script** > [EUT addr].

5. Press **Sel** to toggle the “Source” setting to the connection interface in use (“RS232”, “USB”, or “BLE2WIRE”).

**Note:** The “INQUIRY” and “MANUAL” settings cannot be used for low energy testing.

6. If using an RS232 or 2-Wire connection, press **Config** > “Equipment Under Test (EUT)” > “EUT RS232 setup”, and enter the Baud rate used during communication. The specified baud rate must match the EUT HCI interface setting.

7. Press **Run** to start testing and display the numerical test results on the MT8852B display.

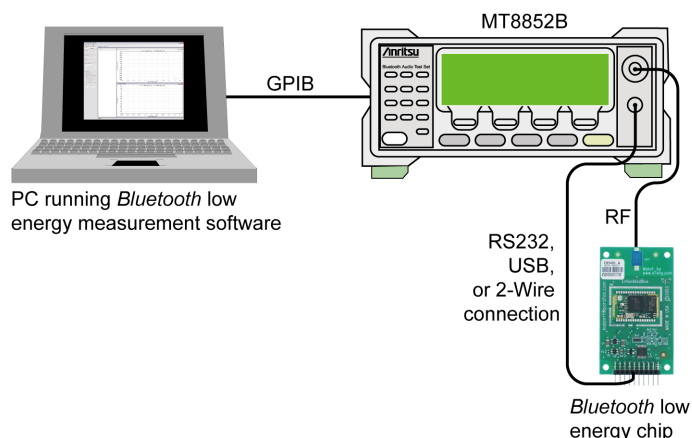
The standard MT8852B display gives numeric results for the test cases selected, along with pass/fail results status.

If more detailed analysis is required, Anritsu recommends the use of the MX885203A PC software supplied with option 27 (*Bluetooth* low energy). The MX885203A software provides both graphical and numerical display of results and allows users to create scripts and run tests in a standard Windows interface. Refer to the explanation below for details.

### Method 2: Running BLE tests using the MX885203A PC software

#### Configuration

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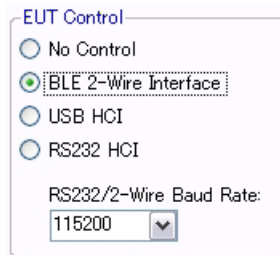


**Figure 2.** Testing using the MT885203A PC Software

1. Connect an RF cable between the antenna connector on the EUT and the "RF Port" on the front of the MT8852B.
2. Connect the GPIB cable from the rear of the MT8852B to the PC.
3. Connect the HCI (RS232, USB) or 2-Wire cable from the "EUT Control" port on the front of the MT8852B to the interface on the EUT.
4. Turn on the MT8852B.
5. Launch the MX885203A *Bluetooth* low energy measurement software to display the main program window. The software is supplied on the CD or can be downloaded from [www.us.anritsu.com](http://www.us.anritsu.com).
6. The program opens displaying the [Connection] tab for GPIB connection. Check that the default GPIB address (27) matches that of the instrument and click [Connect] to establish a remote connection.

Use the buttons in the "EUT Control" field to select the method of communication between the EUT and the MT8852B.

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**Figure 3.** EUT Control Settings

7. If using an RS232 or 2-Wire connection, select the Baud rate used during communication. The selected baud rate must match the EUT HCI interface setting.

**Note:** Selecting "No Control" informs the software that, as an HCI or 2-Wire interface is unavailable, the EUT will be controlled using the vendor's own control software. Refer to Anritsu Application Note 13000-00324 for further details.

### Tx Testing

1. At the "EUT Tx Power" drop-down field, select the power level range at which data will be transmitted from the EUT.
2. At the "Trigger" drop-down entry field, select the trigger mechanism.

**Note:** "Trigger" should be set to "Internal RF" to enable stable packet capture and obtain a numeric display of measurement results.

3. Select the appropriate payload.



**Note:** Payload must be set to PRBS9 to run the output power measurement.

**Note:** Payload must be set to 10101010 to run the initial carrier and drift measurement.

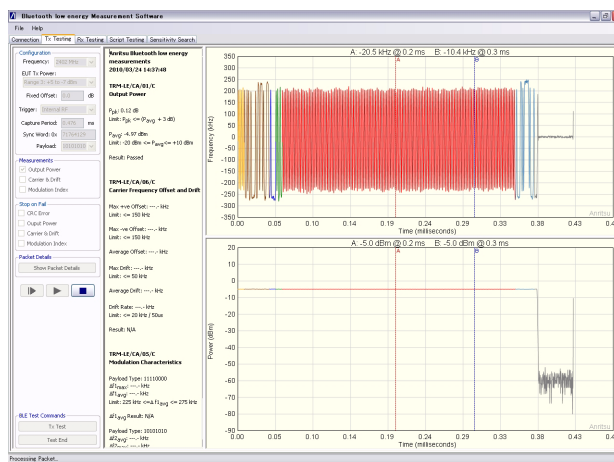
**Note:** Payload must be set to 10101010 or 11110000 to run the modulation index measurement.

4. Select the Tx measurements to be performed by selecting the required check boxes.

5. In the BLE Test Commands frame, click [Tx Test] to send the test control to the EUT to start transmitting packets under the frequency and payload conditions defined.



6. Click  (run once) or  (run continuously) to run tests. Test results display graphically and numerically as shown in the figure below.

If low energy tests are run as part of a script, the results display as a test report that can be saved and printed as required.



**Figure 4.** Tx Testing Results in Low Energy Measurement Software

### Rx Testing

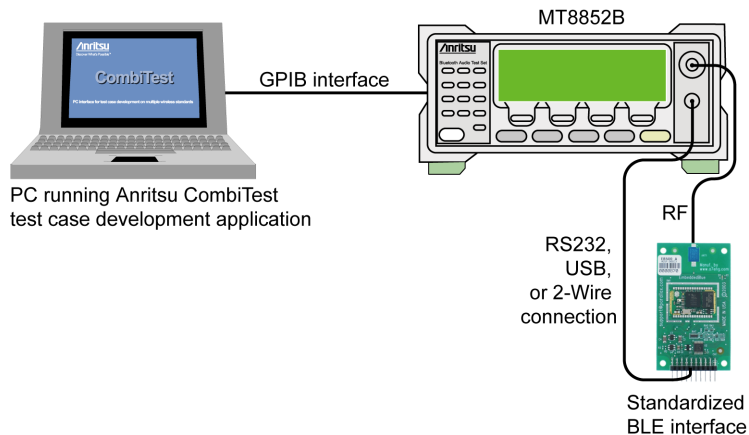
1. At the "Frequency" drop-down field, select the frequency at which data will be transmitted to the EUT.
2. At the "Power Level" drop-down field, select the power level range at which data will be transmitted to the EUT.
3. Select the appropriate payload.
4. Set the Sync word. The defined sync word for a reference packet is 71764129. The sync word should be set to match the requirements of the EUT.
5. Set the spacing. The spacing setting defines the number of microseconds between the start of consecutive packets.
6. Specify the number of packets to be transmitted to the EUT.
7. Click [Rx Test] to configure the EUT to receive low energy packets from the MT8852B.
8. Click  (run once) or  (run continuously) to transmit the selected number of packets.
9. Click [Test End]. The PC application reads the number of correctly received packets from the EUT through the HCI or 2-Wire interface. By comparing the number of packets reported to have been received correctly, with the number of packets sent, the application can calculate the PER directly.

**Note:** Refer to the *MX885203A Operation Manual* (13000-00278) for full details of the option 27 low energy measurement software.

The MX885203A software is ideal for displaying graphical results but does not provide the ability to save test results to a database. If this is required, Anritsu recommends the use of the CombiTest application as described below. CombiTest allows the user to build and run test plans for *Bluetooth* (Basic Rate, EDR, and BLE) and/or WLAN, and to save the test results to a dedicated results database.

### Method 3: Running BLE Tests using the Anritsu CombiTest PC Interface

#### Configuration



**Figure 5.**

1. Connect an RF cable between the antenna connector on the EUT and the “RF Port” on the front of the MT8852B.
2. Connect the remote interface cable from the rear of the MT8852B to the PC.
3. Connect the HCI (RS232, USB) or 2-Wire cable from the “EUT Control” port on the front of the MT8852B to the interface on the EUT.

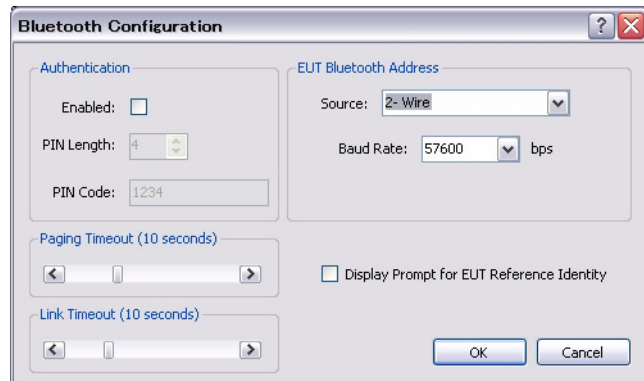
**Note:** CombiTest includes an External Tool plug-in for users needing to control the EUT from the PC over a host control interface.

4. Turn on the MT8852B.
5. Launch the CombiTest software and double-click “MT8852B” in the [Plug-ins] pane. An “MT8852B” branch appears in the [Test Plan] pane.
6. Double-click the “MT8852B” branch in the [Test Plan] to display the [MT8852B Configuration] dialog.
7. Accept or change the GPIB address and click [OK].
8. Double-click the “Bluetooth” branch in the [Plug-ins] pane. A “Bluetooth” branch appears in the [Test Plan] pane.
9. Double-click the “Bluetooth” branch in the test plan to display the [Bluetooth Configuration] dialog.
10. Click the “Source” drop-down and select the method of HCI communication between the EUT and the MT8852B.

**Note:** The “INQUIRY” and “MANUAL” settings cannot be used for low energy testing.

11. If using an RS232 or 2-Wire connection, select the Baud rate used during communication. The selected baud rate must match the EUT HCI interface setting.

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**Figure 6.** [Bluetooth Configuration] Dialog

12. Click [OK] to close the [Bluetooth Configuration] dialog.

13. Build and configure a low energy test plan. Test plans are constructed by double-clicking the required components in the [Plugins] frame. Refer to the *CombiTest Bluetooth (MT8852B) Plug-in Operation Manual* (13000-00307) for a full explanation of how to build a test plan.

14. Click the [Mode] button in the toolbar to display the [Loop Mode] dialog. Select whether the test plan is to be run once (“Single”), in a continuous loop (“Continuous”), or a specified number of times (“Count”).

15. Click  in the CombiTest toolbar to run the tests.

16. When testing is complete click [View Report] in the [Test Plan Finished] dialog to display a report of results.

17. Click [Save Results] in the toolbar to write the test results to a dedicated database.

**Note:** Refer to Anritsu Application Note 13000-00324 for details of how to perform low energy tests on a device (such as a fully assembled *Bluetooth* product) that does not provide access to an HCI or 2-Wire interface.

## Assistance

Support on Anritsu’s range of *Bluetooth* products can be requested by sending an e-mail to [bluetooth.support@anritsu.com](mailto:bluetooth.support@anritsu.com).

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