

For MT8852B Bluetooth Test Set

MT8852B-027

Low Energy Measurements

MT8852B-034

BLE Data Length Extension



What is *Bluetooth Smart* and *Smart Ready*?



Bluetooth® Smart and Smart Ready wireless technology (formerly known as *Bluetooth* low energy technology) is the latest addition to the *Bluetooth* Core Specification. *Bluetooth* Smart is designed specifically for small, predominantly 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 up to 10 metres.

Devices ideally suited to *Bluetooth* Smart include remote displays on wrist watches, health care monitoring equipment, athletic performance monitors, automotive applications to monitor tyre pressure or engine statistics, as well as PC and gaming peripherals for the home and office.

Bluetooth RF testing of *Bluetooth* Smart and Smart Ready devices is enabled by running the latest version of the MT8852B firmware (version 4.20.000) in combination with MT8852B-027 (*Bluetooth* low energy measurement).

Both *Bluetooth* Smart Ready devices (Basic Rate, Enhanced Data Rate (EDR), and *Bluetooth* Smart) and *Bluetooth* Smart devices (*Bluetooth* low energy only) can be tested using MT8852B-027.

With the addition of MT8852B-034, the instrument will test *Bluetooth* Smart and Smart Ready devices incorporating the data length extension defined in the *Bluetooth* Core Specification v4.2.

Bluetooth low energy measurements can be performed in two ways:

- Device with an HCI or 2-Wire interface can be tested at the MT8852B in the same manner as Basic Rate or EDR measurements.
- All devices can be tested from a PC installed with the "Bluetooth low energy measurement software" included with MT8852B-027. The PC software gives users a graphical display of *Bluetooth* low energy packets and a familiar Windows environment in which to work.

The *Bluetooth* low energy measurement software will display and measure data length extension packets only if MT8852B-034 is installed in the instrument.

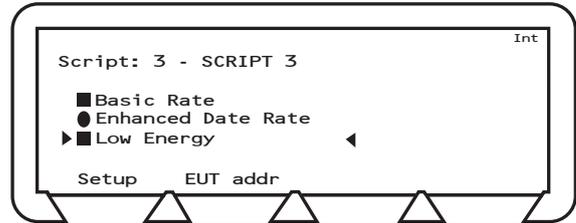
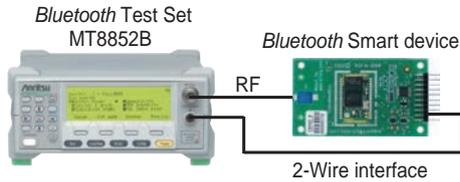
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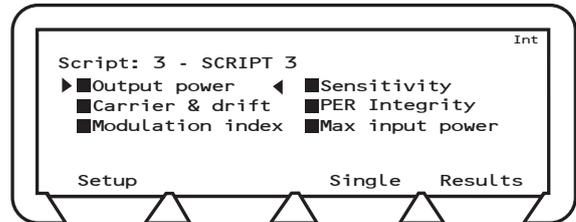
Bluetooth low energy Testing at the MT8852B

Bluetooth low energy measurements can be performed directly at the MT8852B when testing a device with an HCI or 2-Wire interface. The typical configuration for production testing or design verification is shown in the figure below. An RF cable connects the MT8852B with the device under test and in this example the MT8852B sends and receives test control messages to the EUT by means of a HCI or 2-Wire interface.

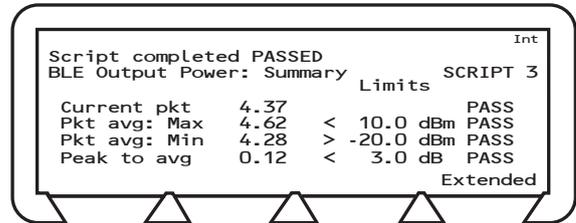
The availability of an HCI or 2-Wire interface allows automated Bluetooth low energy test scripts to be executed from the MT8852B in the same fashion as for Basic Rate/EDR implementation.



When MT8852B-027 is installed and enabled, the “Low Energy” item is added to the script entry screen.



Pressing [Setup] at the entry screen gives the user access to the five Bluetooth low energy tests within the selected script. The test conditions and limits can be specified for each test as required.



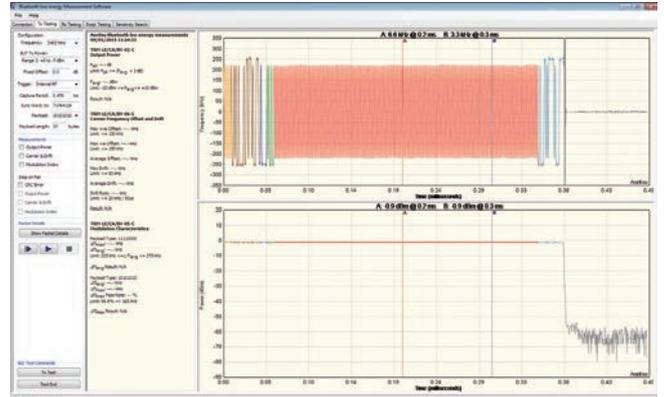
When the script is complete, the measurement results are displayed.

Bluetooth low energy Testing from the PC

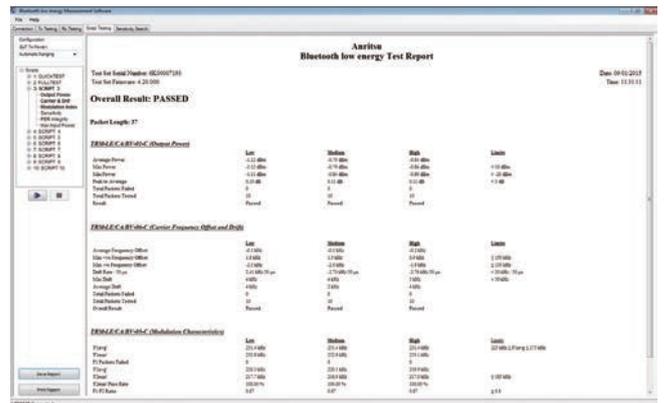
Bluetooth low energy measurements can be performed from a remote PC running the *Bluetooth* low energy measurement software included with MT8852B-027. The software is installed on a PC and connected to the MT8852B by means of a standard GPIB cable. An RF cable connects the MT8852B with the device under 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. Device 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 [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 to that Packet Error Rate (PER) can then be calculated.



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.

Specifications

The following transmitter and receiver tests can be performed in compliance the *Bluetooth* Smart specification.

Transmitter Testing

• TRM-LE/CA/BV-01(02)-C (Output power)

Verifies the average and peak to average power emitted from the EUT.

Display Results	Average power, peak to average power
RF Input Measurement Range	-50 to +22 dBm (average power), +23 dBm (peak power)
Resolution	0.1 dB
Accuracy	±1.0 dB (-35 to +20 dBm) ±1.5 dB (-20 to +22 dBm)

• TRM-LE/CA/BV-05-C (Modulation characteristics)

Verifies that the modulation characteristics of the transmitted signal are correct.

Display Results	Frequency deviation: $\Delta f1_{max}$, $\Delta f2_{max}$, $\Delta f1_{avg}$, $\Delta f2_{avg}$, $\Delta f2_{avg}/\Delta f1_{avg}$ comparison, >185 kHz $\Delta f2_{max}$ ratio (%)
RF Input Measurement Range	-35 to +20 dBm
Deviation Measurement Range	0 Hz to 500 kHz (peak power)
Deviation Resolution	1 kHz
Accuracy	1% for modulation index 0.5

• TRM-LE/CA/BV-06(07)-C (Carrier frequency offset and drift)

Verifies that the carrier frequency offset and carrier drift of the transmitted signal is within specified limits.

Display Results	Carrier frequency error, frequency drift, drift rate
RF Input Measurement Range	-35 to +20 dBm
Frequency Resolution	1 kHz
Accuracy	500 Hz \pm frequency standard

Receiver Testing

• RCV-LE/CA/BV-01(02)-C (Receiver sensitivity)

Verifies that the receiver sensitivity by way of Packet Error Rate (PER) measurement. Refer to table below for specification details.

Amplitude Range	-90 to 0 dBm
Amplitude Accuracy	±1 dBm (-80 to 0 dBm)
Amplitude Resolution	±0.1 dB

• RCV-LE/CA/BV-06-C (Maximum input signal level)

Verifies that the receiver is able to demodulate a wanted signal at high signal input levels. Refer to table below for specification details.

Amplitude Range	-90 to 0 dBm
Amplitude Accuracy	±1 dBm (-80 to 0 dBm)
Amplitude Resolution	±0.1 dB

• RCV-LE/CA/BV-07-C (PER Report Integrity)

Verifies that the EUT PER report mechanism reports the correct number of received packets to the tester.

• EUT Control Interface

When testing *Bluetooth* Smart devices, the EUT control interface provides test controls to the EUT HCI or 2-Wire interface. USB and RS232 cables are supplied with the 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
MT8852B-027	Bluetooth low energy Measurements including "MX885203A Bluetooth low energy measurement software" PC application (Retrofit: MT8852B-327)
MT8852B-034	BLE Data Length Extension (Retrofit: MT8852B-334)

Note:

● **United States**

Anritsu Company

1155 East Collins Blvd., Suite 100, Richardson,
TX 75081, U.S.A.
Toll Free: 1-800-267-4878
Phone: +1-972-644-1777
Fax: +1-972-671-1877

● **Canada**

Anritsu Electronics Ltd.

700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

● **Brazil**

Anritsu Eletrônica Ltda.

Praça Amadeu Amaral, 27 - 1 Andar
01327-010 - Bela Vista - São Paulo - SP - Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

● **Mexico**

Anritsu Company, S.A. de C.V.

Av. Ejército Nacional No. 579 Piso 9, Col. Granada
11520 México, D.F., México
Phone: +52-55-1101-2370
Fax: +52-55-5254-3147

● **United Kingdom**

Anritsu EMEA Ltd.

200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

● **France**

Anritsu S.A.

12 avenue du Québec, Bâtiment Iris 1- Silic 612,
91140 VILLEBON SUR YVETTE, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

● **Germany**

Anritsu GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

● **Italy**

Anritsu S.r.l.

Via Elio Vittorini 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

● **Sweden**

Anritsu AB

Kistagången 20B, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

● **Finland**

Anritsu AB

Teknobulevardi 3-5, FI-01530 VANTAA, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

● **Denmark**

Anritsu A/S

Kay Fiskers Plads 9, 2300 Copenhagen S, Denmark
Phone: +45-7211-2200
Fax: +45-7211-2210

● **Russia**

Anritsu EMEA Ltd.

Representation Office in Russia

Tverskaya str. 16/2, bld. 1, 7th floor.

Russia, 125009, Moscow
Phone: +7-495-363-1694
Fax: +7-495-935-8962

● **United Arab Emirates**

Anritsu EMEA Ltd.

Dubai Liaison Office

P O Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suit 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

● **India**

Anritsu India Private Limited

2nd & 3rd Floor, #837/1, Binnamangla 1st Stage,
Indiranagar, 100ft Road, Bangalore - 560038, India
Phone: +91-80-4058-1300
Fax: +91-80-4058-1301

● **Singapore**

Anritsu Pte. Ltd.

11 Chang Charn Road, #04-01, Shriro House
Singapore 159640
Phone: +65-6282-2400
Fax: +65-6282-2533

● **P.R. China (Shanghai)**

Anritsu (China) Co., Ltd.

Room 2701-2705, Tower A,
New Caohejing International Business Center
No. 391 Gui Ping Road Shanghai, 200233, P.R. China
Phone: +86-21-6237-0898
Fax: +86-21-6237-0899

● **P.R. China (Hong Kong)**

Anritsu Company Ltd.

Unit 1006-7, 10/F., Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong, P.R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

● **Japan**

Anritsu Corporation

8-5, Tamura-cho, Atsugi-shi, Kanagawa, 243-0016 Japan
Phone: +81-46-296-1221
Fax: +81-46-296-1238

● **Korea**

Anritsu Corporation, Ltd.

5FL, 235 Pangyoyeok-ro, Bundang-gu, Seongnam-si,
Gyeonggi-do, 463-400 Korea
Phone: +82-31-696-7750
Fax: +82-31-696-7751

● **Australia**

Anritsu Pty. Ltd.

Unit 21/270 Ferntree Gully Road, Notting Hill,
Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

● **Taiwan**

Anritsu Company Inc.

7F, No. 316, Sec. 1, NeiHu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

Please Contact: