# RTL8762C DTM Application User Manual



**V 1.0.0**

**2019/3/6**

# Revision History

| Date | Version | Comments | Author | Reviewer |
|---|---|---|---|---|
| **2019/02/25** | V1.0.0 | Formal version | Berni | |

# Contents

# Table List

# Figure List

# Glossary

| Terms | Definitions |
|---|---|
| DTM | Direct Test Mode |

# 1 DTM

Direct Test Mode (DTM) is used to control the Device Under Test (DUT) and provides a report back to the Tester. DTM demo application is *DTM Application*.

## 1.1 DTM Application

### 1.1.1 Overview

Direct Test Mode is used to control the DUT and provides a report back to the Tester. Direct Test Mode shall be set up by one of two alternative methods:

- over HCI
- through a 2-wire UART interface

Each DUT shall implement one of the two Direct Test Mode methods in order to test the Low Energy PHY layer. DUT implements the second method, means through a 2-wire UART interface. Figure 1-1 shows the test framework of through 2-wire UART interface.

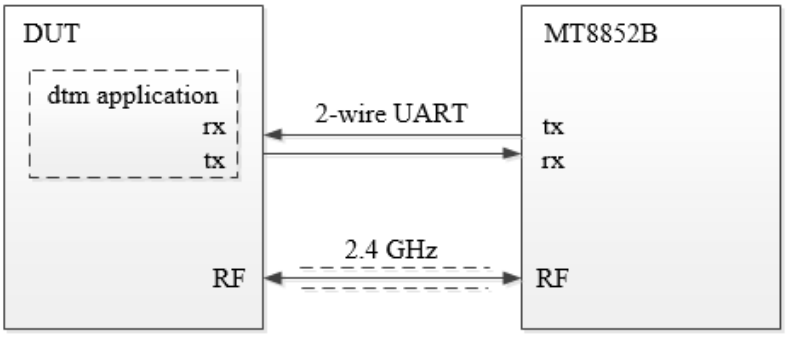


**Figure 1-1 Test Framework through 2-Wire UART Interface**

DUT runs DTM application, and test equipment of MT8852B sends DTM commands to DUT. DTM application analyzes those commands and invokes related API to send packets to MT8852B (transmitter test) or receive packets from MT8852B (receiver test). Afterwards DTM application collects test result and sends to MT8852B by DTM events. MT8852B judges and displays results according to the DTM events.

### 1.1.2 Source Code

Source code can be seen in sdk\ src\sample\dtm folder and project setting can be seen in sdk\board\evb\dtm folder.

The description of each file of the application is shown as below.

**Table 1-1 DTM Application Source Code**

| Source file | Description |
|---|---|
| main.c | Entry of application, initialize parameters and register application message callback. |
| app_task.c | Create message queue and application task. |
| dtm_app.c | Handle commands from 8852B and return with events. |

## 1.1.3 Message Sequence Charts

Lower tester and upper tester are on behalf of MT8852B. Test message sequences are shown in Figure 1-2 and Figure 1-3.

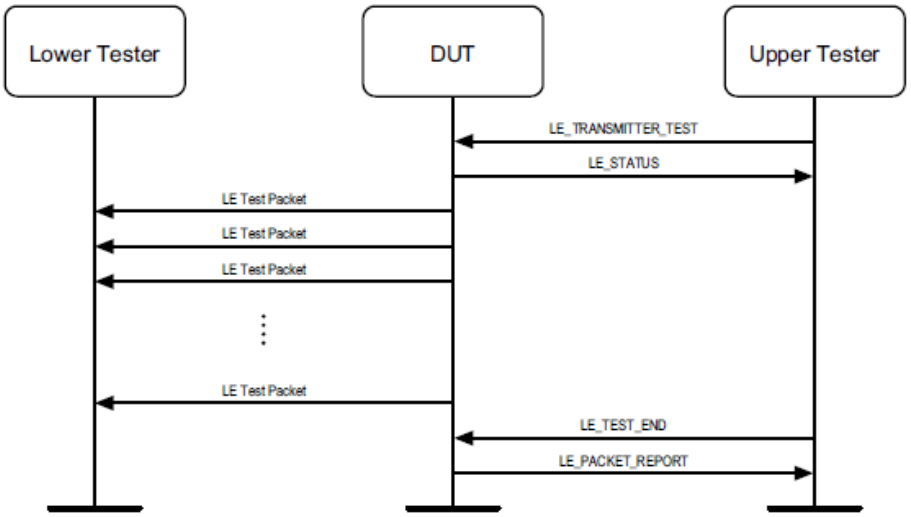


**Figure 1-2 Transmitter Test MSC**

Upper tester sends command to DUT to order it to transmit test packets to lower tester. DUT reports event to upper tester after transmit procedure is terminated.

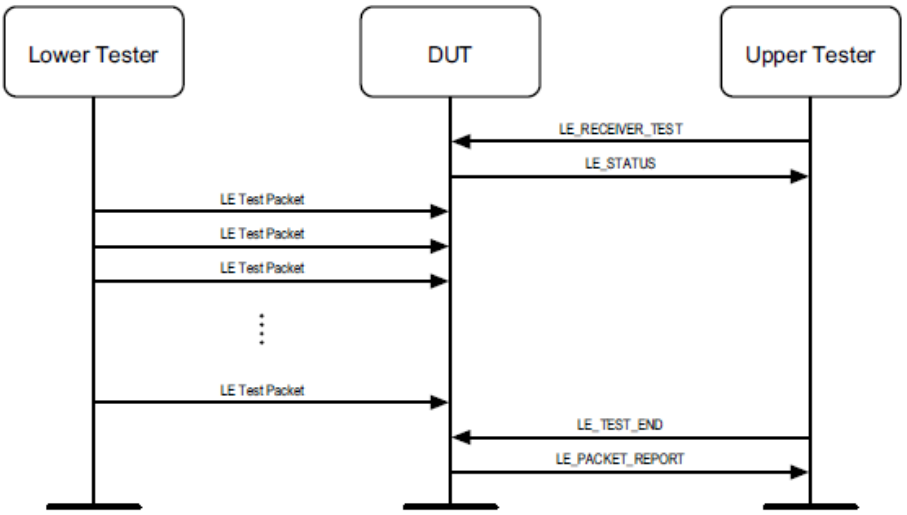


**Figure 1-3 Receiver Test MSC**

Upper tester sends command to DUT to order DUT prepare to receive test packets from lower tester. Lower tester sends test packets to DUT, and DUT reports event to upper tester after receive procedure is terminated.

## 1.1.4 Test Procedure

### 1.1.4.1 Test Case

More details about test case please refer to << MT8852B Test Set >> chapter 7-7 Low energy tests.

### 1.1.4.2 Transmitter test

1. Output power

   The MT8852B transmits a test control message over the RS232, USB, or 2-Wire interface instructing the DUT to transmit reference test packets. The MT8852B measures the average power of the received packets over at least 20% to 80% of the duration of the burst.

2. Carrier & Drift Test

   The carrier drift test performs a frequency drift measurement over the length of the packet received. The carrier frequency offset is measured in the same manner as basic rate initial carrier test, but on the eight preamble bits in the low energy reference packet.

3. Modulation Index Test

   This test measures the modulation characteristics on the DUT output for each of the selected frequency ranges (LOW, MEDIUM and HIGH).

### 1.1.4.3 Receiver test

1. Sensitivity Test

   After sending a test control message to the DUT, the MT8852B sends BLE reference packets to the DUT. The number of packets DUT received is counted and this data is then read by the MT8852B over the 2-Wire connection.

2. PER Integrity

   The MT8852B sends a random even number of BLE reference packets to the DUT at -30 dBm with a PRBS9 payload. The CRC value for the packets is alternated between a valid and invalid value. The DUT counts the number of received packets, and this value is read by the MT8852B over the 2-Wire interface for frame error rate (FER) calculation. The test is repeated three times at the frequency selected.

3. Maximum Input Power Test

   After sending a test control message, the MT8852B sends BLE reference packets to the DUT at -10 dBm. The number of packets received at the DUT is counted, and this value is then read by the MT8852B over the 2-Wire connection[1].

### 1.1.4.4 Test Steps

1. Download DTM application

   DTM Application uses P3_0 as TX pin for Data UART, uses P3_1 as RX pin for Data UART by default. Data UART Pin can be configured according to the hardware environment by modifying board.h file.

```
#define DATA_UART_TX_PIN      P3_0
#define DATA_UART_RX_PIN      P3_1
```

   Please build and download the DTM application to the Evolution Board.

2. Connect the DUT and MT8852B through the 2-wire UART


**Figure 1-4 UART of MT8852B**

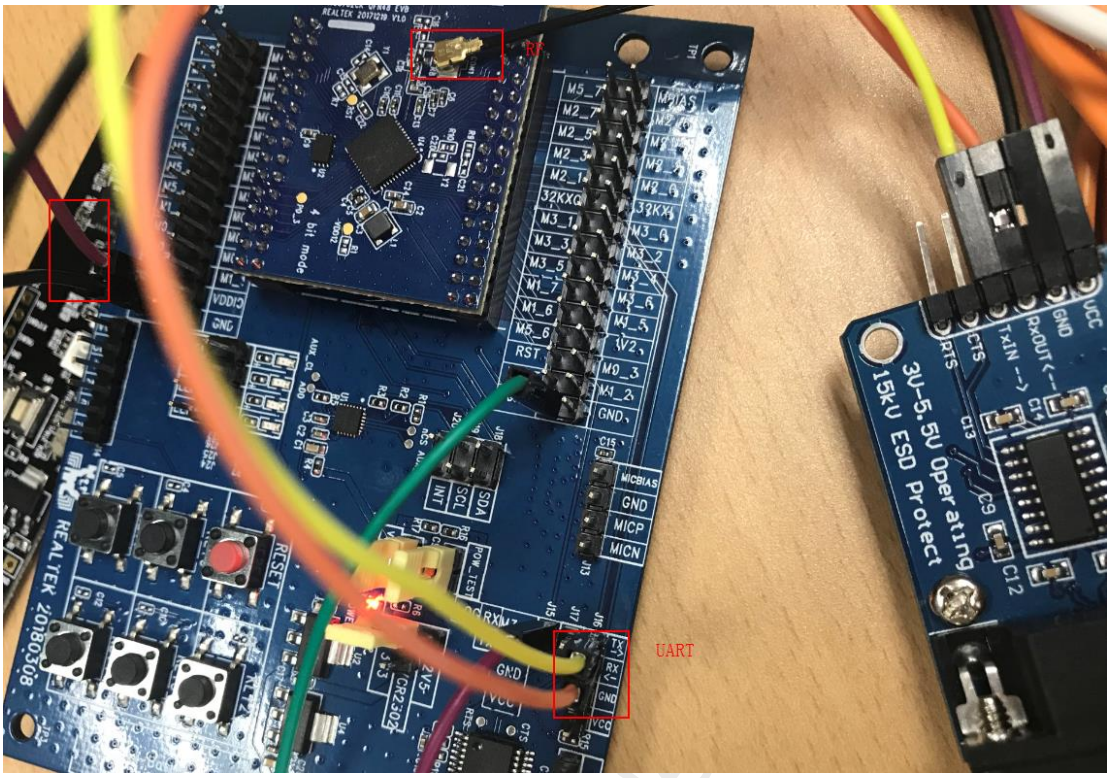


**Figure 1-5 UART of DUT**

3. Reset the DUT and setup MT8852B

   As shown in Figure 1-6, press button On/Standby to start up MT8852B, and then press button EUT addr to modify source of EUT address.

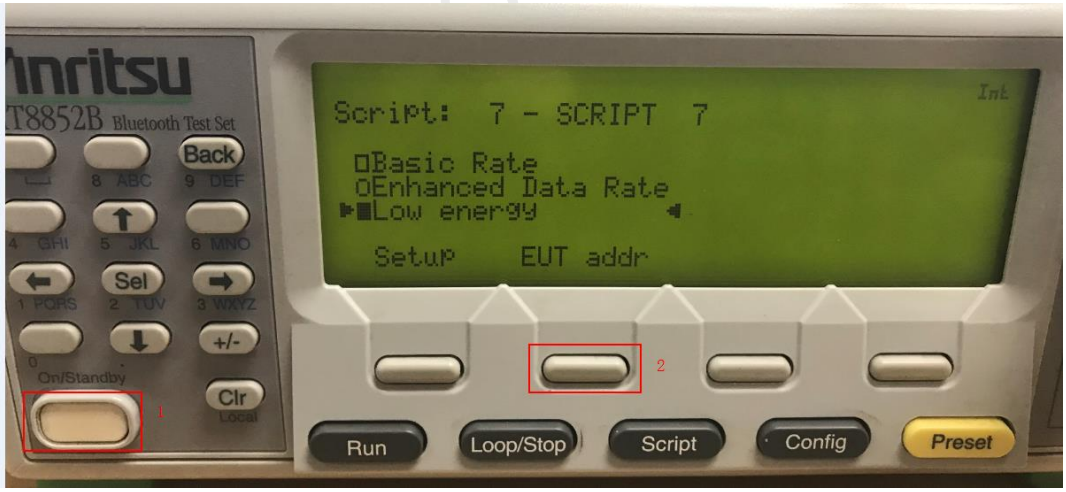


**Figure 1-6 Start up MT8852B**

DUT implements DTM through a 2-wire UART interface, then select BLE2WIRE as Source. RS232 is used to test DTM over HCI.

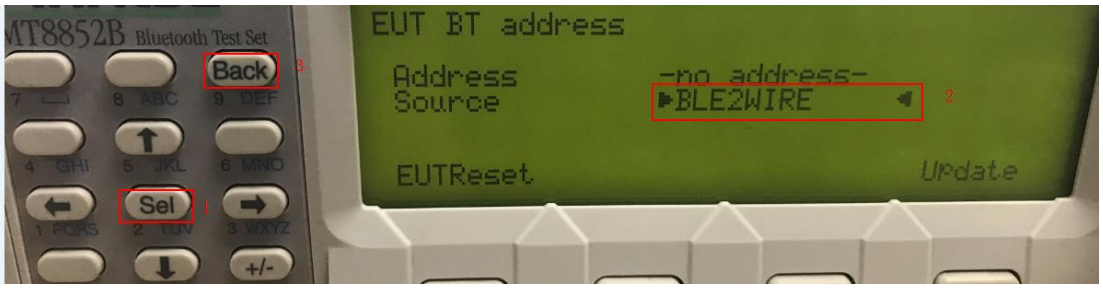


**Figure 1-7 Select source of EUT address**

Press button Setup to set up Low energy script.

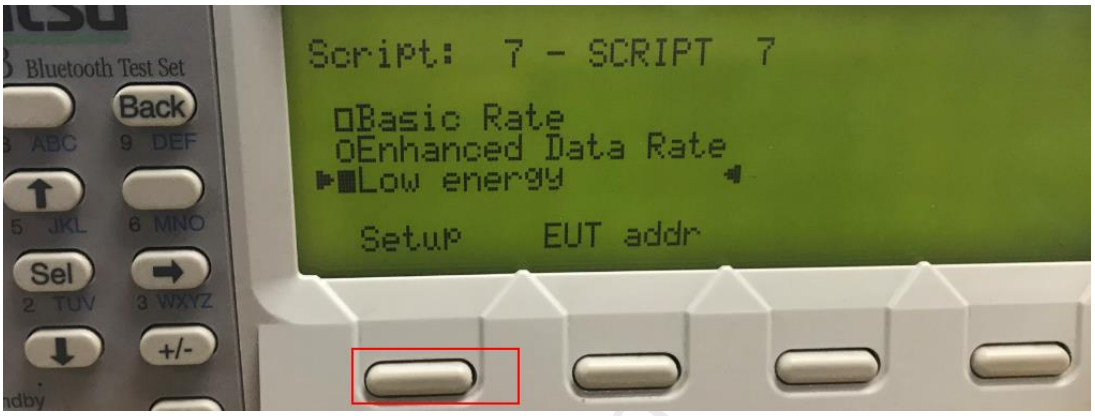


**Figure 1-8 Set up LE energy script**

4. Run MT8852B based on test cases.

   1) Run all test cases

      Press button Run to run all test cases.

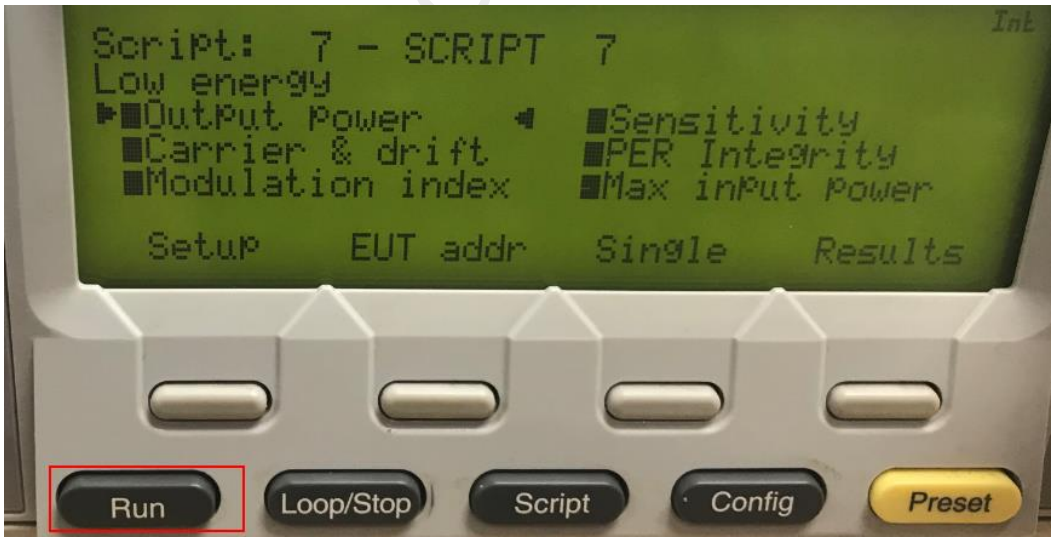


**Figure 1-9 Run all test cases**

   2) Run single test case

      Press button Single and Run to run single test case.

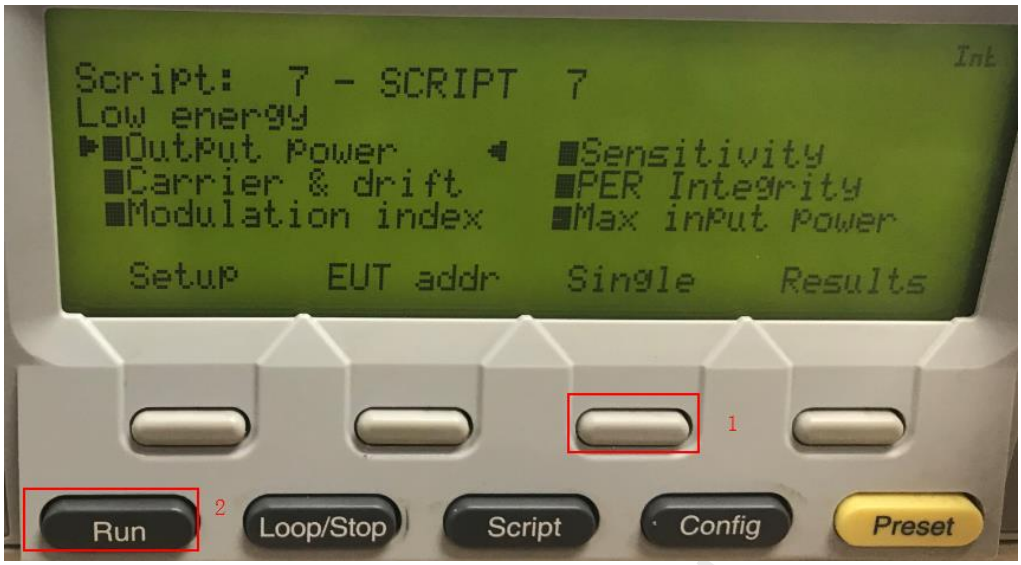


**Figure 1-10 Run single test case**

## 1.1.4.5 Test Result

Test result with passed is shown as below:

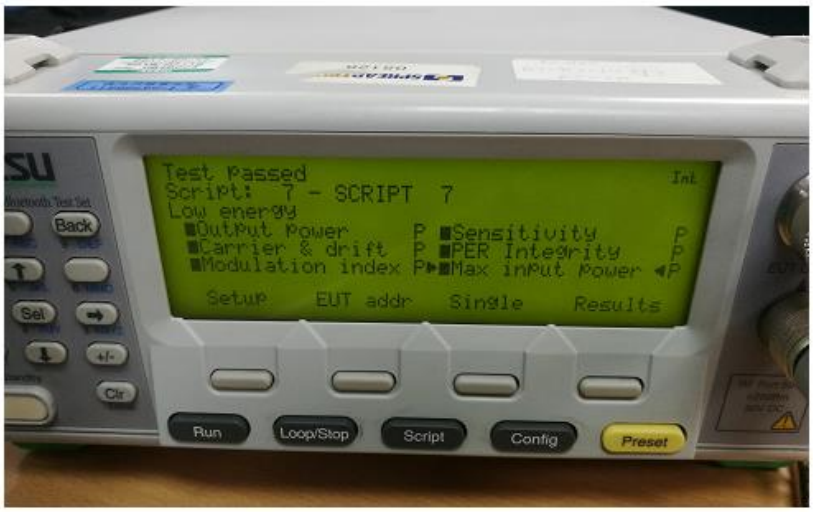


**Figure 1-11 DTM Test Result**

# References

[1] Anritsu Company. MT8852B Test Set [M]. 2012, 102-113.