ESP32-H2

BLE DTM Test Guide

Related Product

ESP32-H2

Version 1.0

Espressif Systems

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Revision History

Date	Version	Release Notes
2023-5-5	V1.0	First version of H2 BLE DTM Test Guide.

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1. Introduction

1.1 Test Introduction

This guide will introduce how to conduct BLE DTM Test based on ESP32-H2 products, by using related software and equipment.

1.2 Product Introduction

Details about product can be found in data sheet.To see more information please enter espressif official website.

2. Test Structure

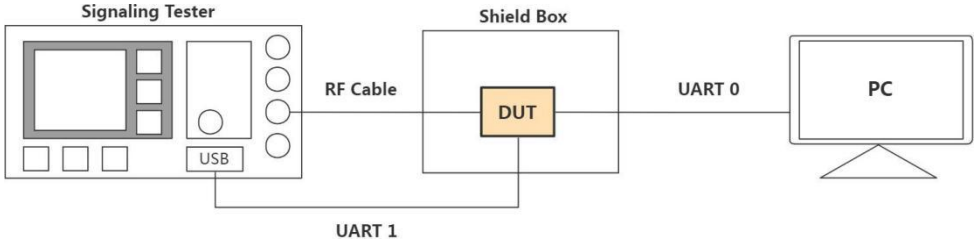


Figure 1. Test Structure

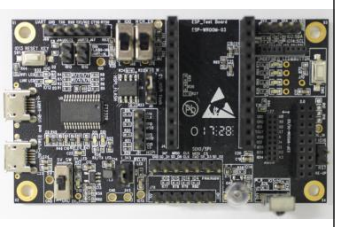
DUT(Device Under test): Products based on ESP32-H2 platform, which will be called as DUT in the rest of the article.

PC: When testing, run serial port tool on PC. PC and DUT communicate through UART, to set configurations for different test purposes.

Signaling Tester: To test performance of DUT,e.g. Rohde&Schwarz CMW500

3. Preparation before Test

3.1 Hardware Preparation

Name	Picture	Number	Introduction
Serial port board		2	Used as USB -to-Serial adapter. DUT communicates with PC through UART, to set test configurations.
Micro USB Cable		2	Used for connection between DUT and PC.
PC	-	1	To run serial tool and *EspTestTool*
Test Instruments （e.g.CMW500）	-	1	Used to test BLE performance parameters.Can be other instruments which can realize same function.
RF Cable	-	1	Used to transmit and receive radio signal between tester and DUT

3.2 Software Preparation

Name	Introduction
ft232r-usb-uart.zip	Driver for USB to Serial Port(will be downloaded automatically when serial port board is plugged)
SecureCRT or other serial port tools	DUT receives commands from PC to set up test configurations.
EspRFTestTool_vX.X_Manual(downloaded from espressif website)	To configure and conduct different test modes

4. DTM Test - HCI

4.1 Hardware Connection

(1) UART 0

This UART is used to communication between PC and DUT. DUT receive commands from PC to set up test configurations and download bin file. Here is the connection details:

- DUT TXD0：Connected to Serial port board TX0.
- DUT RXD0：Connected to Serial port board RX0.
- DUT GND：Connected to Serial port board GND.
- DUT 3V3：Connected to Serial port board 3V3.

(2) UART 1

HCI Serial port, used for connection between DUT and Tester. Here is the connection details:

- DUT pin IO8：Connected to Serial port board TX0.
- DUT pin IO9：Connected to Serial port board RX0.
- DUT GND：Connected to Serial port board GND.

Note: If you are not using ESP serial port board, TX & RX connection may be opposite.

4.2 Test Execution

(1) Connect DUT with PC by UART0, and connect DUT with Tester by UART1.

(2) Open serial port tool, open the serial port of UART0 and set baud rate as 115200. After DUT being powered on (connect RF cable between DUT and tester before electrifying DUT), the following content will be printed on serial port interface.

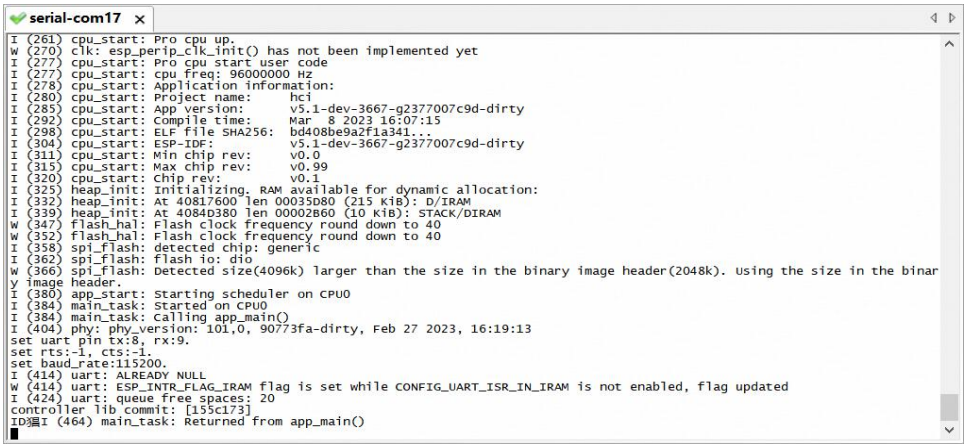


Figure 2. Log of DUT entering BLE DTM mode

(3) Send following commands in sequence in command bar:

- bqb -z set_ble_tx_power -i *[power_level_index]* (See Appendix B)

After sending this command, the log will print: Set BLE TX power to *power_level_index* level.

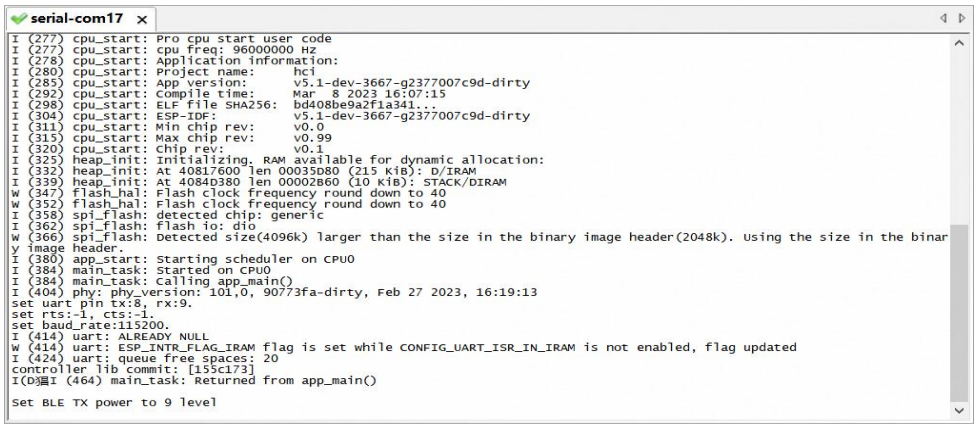


Figure 3. Log of BLE DTM successfully set up

(4) Now, the BLE DTM HCI configuration is finished. You are able to conduct BLE tests by operating the tester.

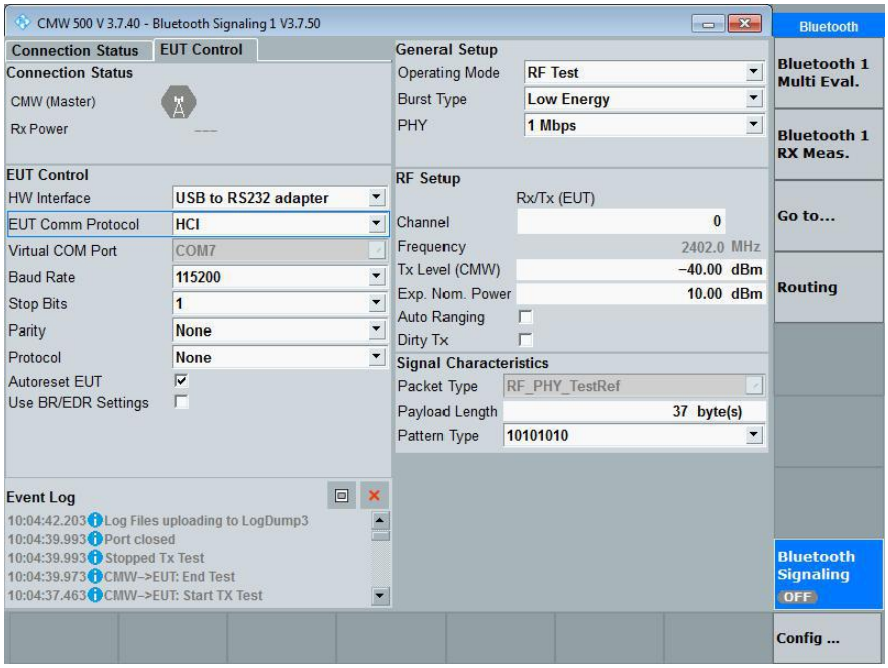


Figure 4. EUT Control Configuration on Tester - HCI

5. DTM Test - 2-wire UART(not supported for now)

5.1 Hardware Connection

When conducting 2-wire DTM, only UART1 is necessary.

(1) UART1

This UART is used to communication between Tester and DUT. Here is the connection details:

- DUT pin IO8：Connected to Serial port board TX0.
- DUT pin IO9：Connected to Serial port board RX0.

Note: Hardware Flow Control is disabled by default.

5.2 Test Execution

The initialization of 2-wire UART DTM function will be initiated automatically after power on.There is no need to input serial commands.
After DUT power on, operate the tester directly.

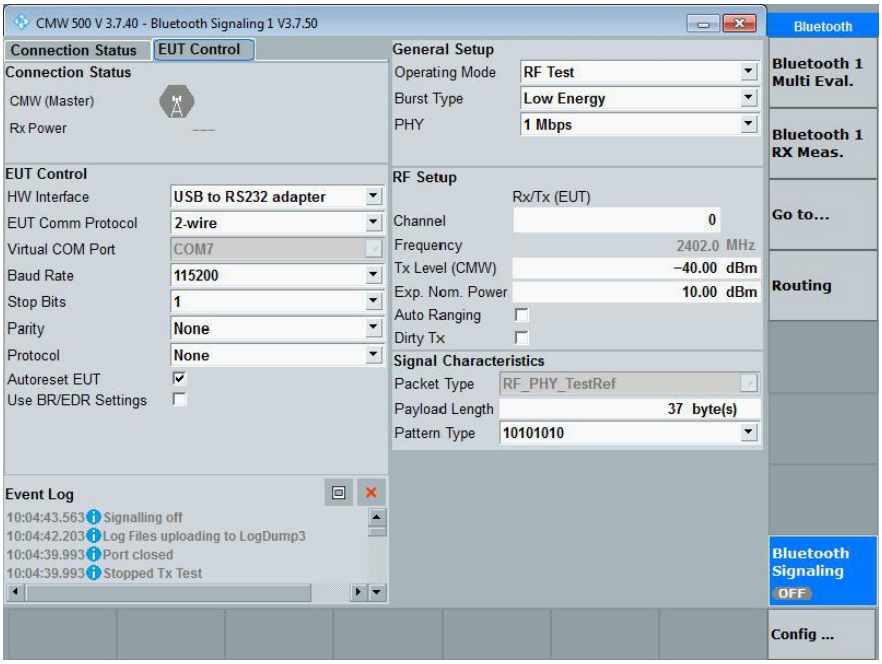


Figure 5. EUT Control Configuration on Tester - 2-wire UART

Appendix A - Bin Download

1. Hardware Set up

Besides connect DUT with PC through UART0 as following, lower IO9 and pull up IO8. Then electrify DUT. In this way , the chip will enter bin download mode.

- DUT TXD0：Connected to Serial port board TX0.
- DUT RXD0：Connected to Serial port board RX0.
- DUT GND：Connected to Serial port board GND.
- DUT 3V3：Connected to Serial port board 3V3.

You may check serial port log to verify that chip has successfully entered bin download mode. If chip enters bin download mode, the log will be like this:

Figure 6.Log of bin download mode

Then, keep IO8&IO9 floating and re-electrify the DUT, chip will enter work mode, in which the chip realizes its functions.

2. Download bin by *EspRFTestTool*

You can use *EspRFTestTool* to download related bin. Here are the operation steps.

(1) Select ***Tool - Download Tool.***

(2) Choose correct ***Chip Type***, ***Com Port*** and ***Baud Rate***. Click ***Open***.

(3) Choose ***Flash***. ***Check*** the checkbox in first row. Click "  " to select bin file.Fill in correct address.

bootloader.bin 0x0

partion-table.bin 0x8000

hci.bin 0x10000

(4) Click ***Start Loading***.

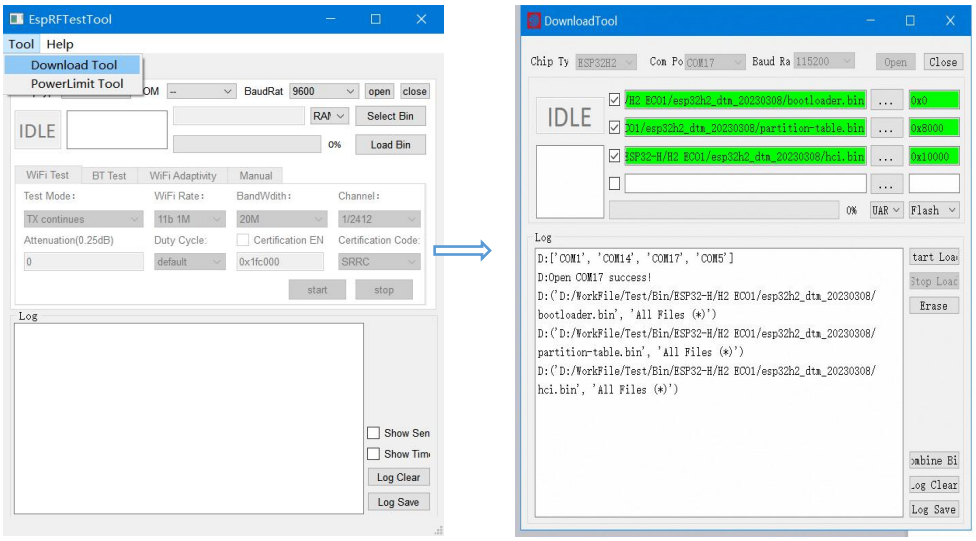


Figure 7.Download bin using *EspRFTestTool (1)*

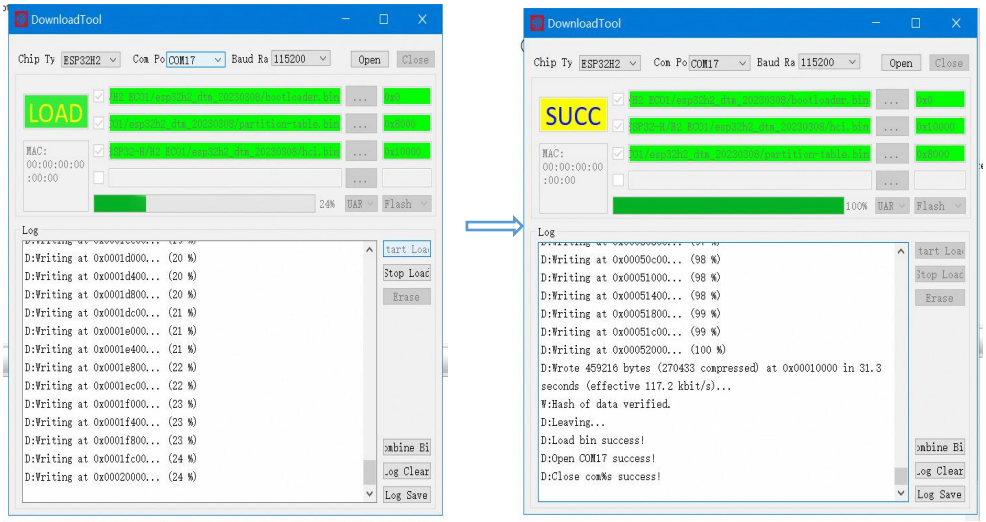


Figure 8.Download bin using *EspRFTestTool (2)*

When "SUCC" with yellow background appears, it means the bin has been successfully downloaded.

Appendix B - UART0 Commands Introduction

1. Set up BLE TX Power

Command: ***bqb -z set_ble_tx_power -i [Power_level_index]***

Introduction: Power level index corresponds to TX power, varies from 0 ~ 15.

Power Level Index	Chip BLE TX Power/dBm
0	-24
1	-21
2	-18
3	-15
4	-12
5	-9
6	-6
7	-3
8	0
9	3
10	6
11	9
12	12
13	15
14	18
15	20

For instance, command *bqb -z set_ble_tx_power -i 9* will set BLE TX power from as 3 dBm .

2. Change pin for UART1

Command: ***bqb -z reconfig_uart1_pin -t [TX_pin] -r [RX_pin]***

Introduction: If GPIO8 and GPIO9 can not be the pins for UART1, you can use this command to configure other GPIO as the pins for UART1.

For instance, command *bqb -z reconfig_uart1_pin -t 4 -r 5* will set GPIO4 as UART1 TX pin, GPIO5 as UART1 RX pin.