

**GigaDevice Semiconductor Inc.**

**GD32VW553 Certification Test Guidelines**

**Application Note**

**AN146**

Revision 1.2

(Jul. 2024)

# Table of Contents

Table of Contents .....	1
List of Figures .....	3
List of Tables .....	4
1. Introduction .....	5
2. Test preparation .....	6
2.1. Hardware configuration .....	6
2.2. Software configuration .....	7
3. Non-signaling test - use RF tool .....	9
3.1. Introduction to the tool .....	9
3.2. Test mode setting .....	10
3.3. WiFi continuous packet sending test .....	10
3.4. WiFi single carrier transmitting test .....	11
3.5. WiFi receiving test .....	12
3.6. BLE continuous packet sending test .....	13
3.7. BLE single carrier transmitting test .....	14
3.8. BLE receiving test .....	15
4. Non-signaling test – use serial port commands .....	16
4.1. Serial port connection .....	16
4.2. Test mode setting .....	17
4.3. WiFi continuous packet sending test .....	17
4.4. WiFi single carrier transmitting test .....	18
4.5. WiFi receiving test .....	18
4.6. BLE continuous packet sending test .....	19
4.7. BLE single carrier transmitting test .....	20
4.8. BLE receiving test .....	20
5. Signaling test .....	22
5.1. Preparations .....	22
5.2. Blocking test .....	23
5.3. Adaptivity test .....	25

---

<b>6.</b>	<b>FAQ.....</b>	<b>27</b>
<b>7.</b>	<b>Revision history .....</b>	<b>28</b>

## List of Figures

Figure 2-1. Reference connection of GD development board .....	7
Figure 2-2. Installation of serial port driver .....	8
Figure 2-3. GDLINK folder .....	8
Figure 3-1. Description of tool functions .....	9
Figure 3-2. Continuous TX Tool setting .....	11
Figure 3-3. LO TX Tool setting .....	12
Figure 3-4. Packet RX Tool setting .....	13
Figure 3-5. BLE Test TX Infinite Tool setting .....	14
Figure 3-6. BLE LO TX TOOL setting.....	14
Figure 3-7. Description of BLE receiving test commands .....	15
Figure 4-1. GD Serial Port Tool .....	16
Figure 4-2. Serial port boot information.....	16
Figure 4-3. RF test mode and country code setting .....	17
Figure 4-4. Description of continuous Tx test commands.....	18
Figure 4-5. Description of LO Tx test commands .....	18
Figure 4-6. Description of packet Rx test commands .....	19
Figure 4-7. Description of commands for BLE continuous packet sending test .....	20
Figure 4-8. Description of commands for BLE LO Tx test .....	20
Figure 4-9. Description of BLE receiving test commands .....	21
Figure 5-1. Connection of the second serial port of DUT .....	23
Figure 5-2. Connecting DUT to AP.....	24
Figure 5-3. Settings of CMW500 DTM.....	25
Figure 5-4. DUT TCP TX .....	26

## List of Tables

Table 4-1. Correspondence between rate and index .....	17
Table 4-2. CMD ble_test_tx parameter description .....	19
Table 4-3. CMD ble_test_rx parameter description .....	20
Table 5-1. Definition of the second serial port of DUT.....	23
Table 7-1. Revision history .....	28

## 1. Introduction

This test guideline is mainly used to give guidance to clients to test RF certification and regulatory performance of chips of GD32VW553 series. The certification regulations mainly refer to FCC, CE, and SRRC. Chapter 2 introduces software and hardware configuration of DUT (device under test). Chapter 3 and 4 introduce methods of testing Tx or Rx (transmitting or receiving) parameters in non-signaling mode in all certifications with RF test tool. Chapter 5 introduces methods of testing "Blocking" and "Adaptivity" parameters in signaling mode in CE certification with serial port command lines. Chapter 6 introduces frequently-asked questions and solutions. Chapter 7 is version history.

## 2. Test preparation

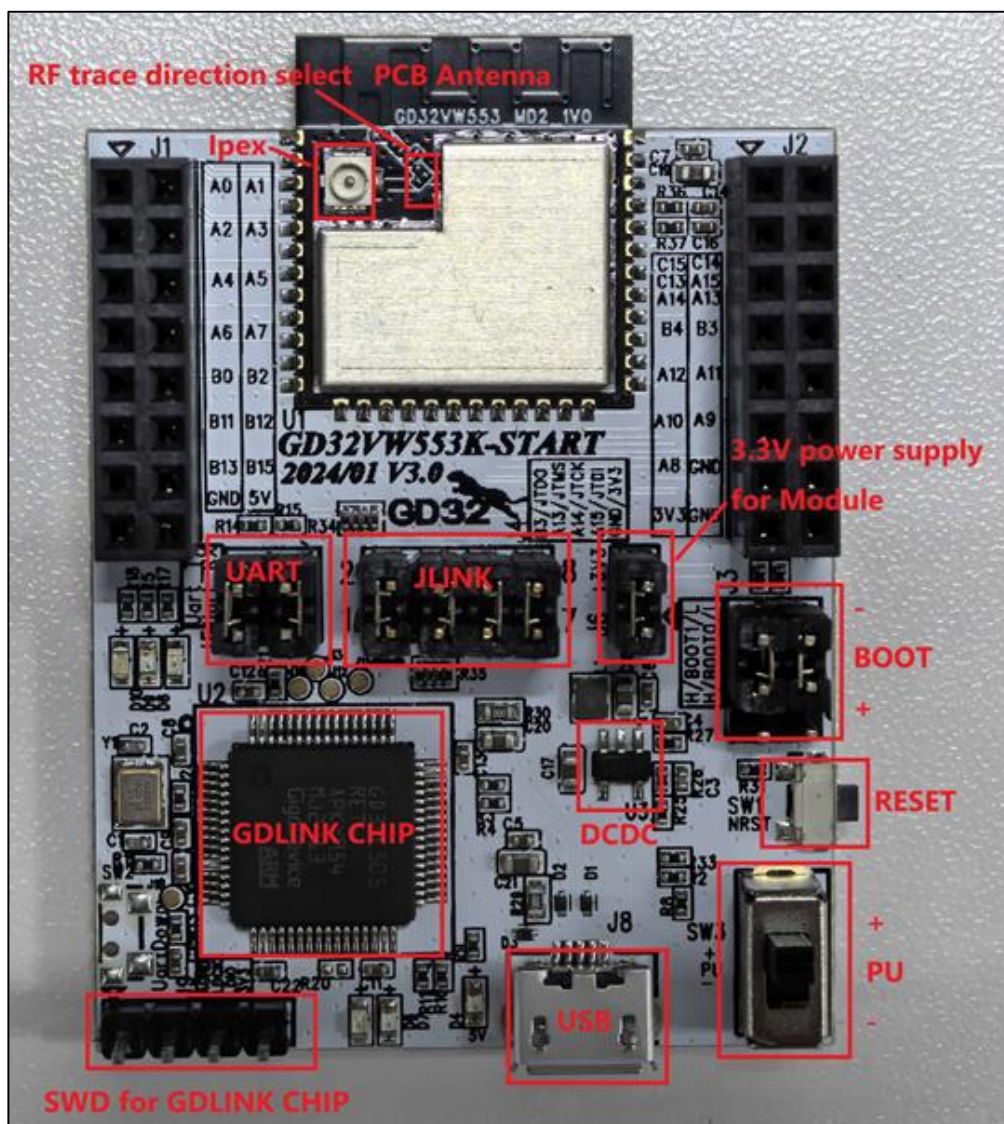
This chapter introduces preparation for certification tests, mainly including the building of DUT software and hardware platforms. DUT should have passed the RF calibration (That is, the RF calibration value, legal value, and other information have been correctly written into the chip Efuse).

### 2.1. Hardware configuration

Use the GD “Start” development board [Figure 2-1. Reference connection of GD development board](#), mother board + module), Version 1.0 Start board use DAPLINK circuit as the communication circuit while Version 3.0 use GDLINK circuit. Below description is mainly based on Version 3.0 Start board.

1. UART&JLINK functions: The communication function of USB to UART and the firmware burning function of USB to JLINK are realized through the DAP chip circuit on the mother board, and PC is connected to the USB port of the mother board using a USB cable;
2. Serial port connection: Connect to the mother board J5.2/4 (main chip UART PIN) and J5.1/3 (GDLINK UART PIN)) using a jumper cap respectively.
3. JLINK connection: Connect to the mother board J4.2/4/6/8 (main chip JLINK PIN) and J4.1/3/5/7 (GDLINK JLINK PIN)) using a jumper cap respectively.
4. Configuration of the main chip mode:
  - “BOOT0” of PIN should be at low level (boot from flash), which is realized by connecting to mother board J3.3 and J3.5.
  - “PU” of PIN should be at high level, which is realized by setting the DIP switch “SW3” on the mother board to the upper position.
5. Module antenna switching:
  - Switch the position of the resistor by welding [Figure 2-1. Reference connection of GD development board](#) to select the RF signal path of DUT: When the left side of the resistor faces upward, the RF path leads to the PCB antenna and can only be used for radiation test; when the left side of the resistor faces downward, the RF path leads to the RF (Ipx) connector and is used for conduction test and external antenna radiation test. This document mainly targets **conduction test**.
  - Connect the RF test socket of DUT and the RF port of the instrument using an Ipx- to-SMA cable.
6. Module power supply: The DC-DC circuit on the bottom board converts the 5 V power input from the USB port into a 3V3 output, and the 3V3 output is connected to the 3V3 pad of the module with the jumper cap “J6”. Disconnect this jumper cap (from external 3V3 output to J6.2) to test the power consumption of the module.

Figure 2-1. Reference connection of GD development board



## 2.2. Software configuration

1. Drive installation: After the development board hardware and the test system are built, connect the two ends of the USB cable to the development board and PC respectively. For GDLINK, no driver is needed for WIN10 system but a corresponding driver should be installed for WIN7 system. For DAPLINK, Firstly install the DAPLINK drive "mbedWinSerial\_16466.rar" on PC: After decompression, double-click the .exe file to start automatic installation. After installation, the serial port device and COM number [Figure 2-2. Installation of serial port driver](#) are displayed in the "Device Manager" on PC. It is recommended to install Windows 10/Windows 7 system on PC.

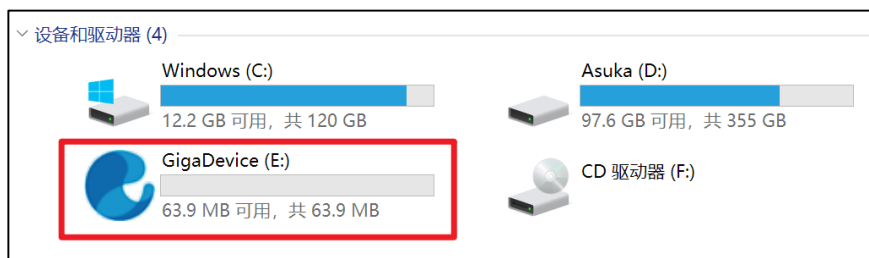


Figure 2-2. Installation of serial port driver



2. Firmware download: After the GDLINK drive is installed, a new diskette named "GigaDevice" [Figure 2-3. GDLINK folder](#) is displayed in the path of PC-"Explorer". For non-signaling test, directly "drag and drop" (or copy and paste) the test firmware named "rf\_test" to this drive letter, wait for a while to achieve firmware burning, and click **Reset** to restart the chip. For signaling test, firmware named "wifi\_signaling\_test" or "ble\_signaling\_test" is used.

Figure 2-3. GDLINK folder



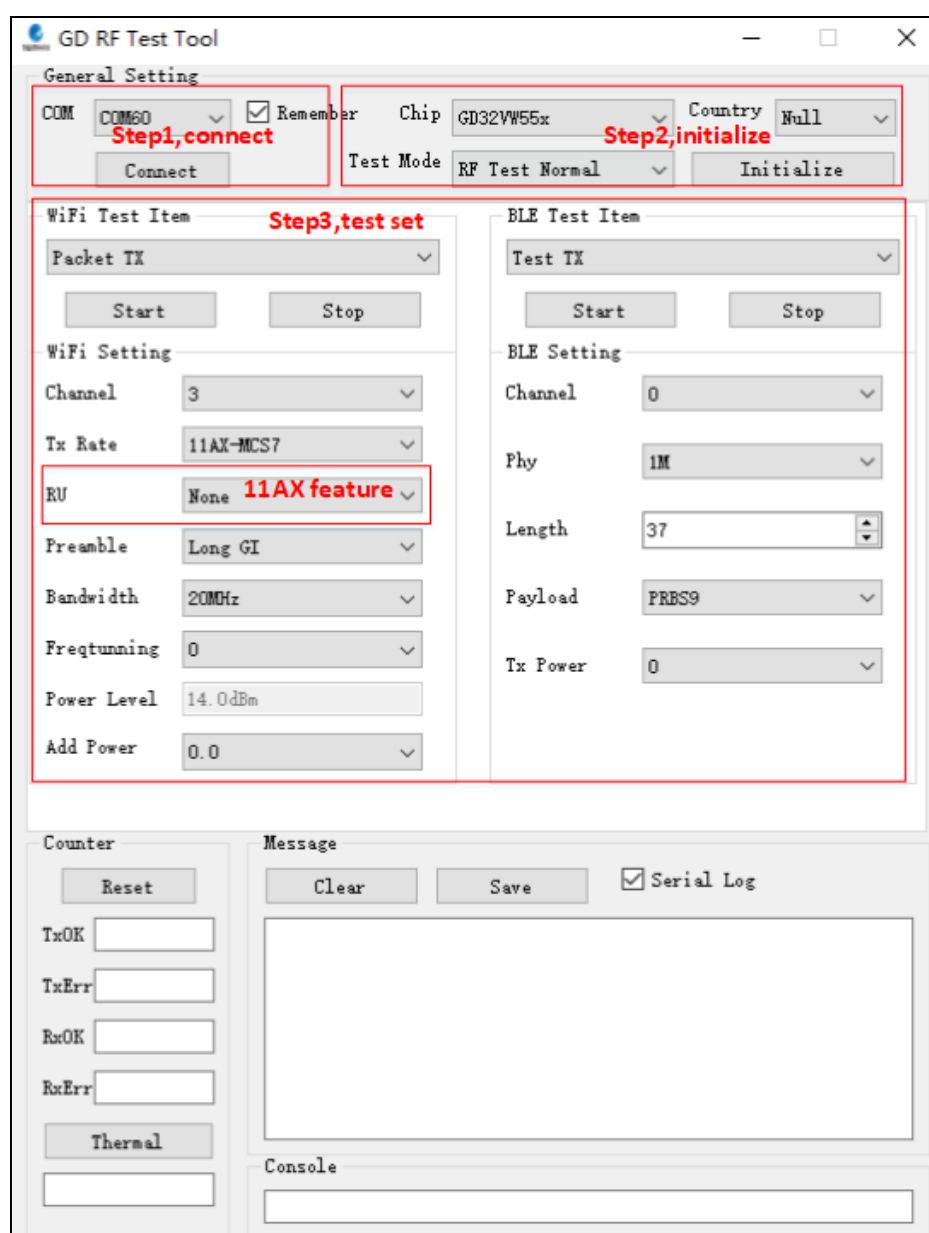
### 3. Non-signaling test - use RF tool

This chapter introduces how to test RF Tx and Rx parameters in non-signaling mode with the GD RF test tool.

#### 3.1. Introduction to the tool

[Figure 3-1. Description of tool functions](#) shows the interface and functions of the first opened RF test tool "GD RF Test Tool" provided by GD (serial port not connected and chip not initialized).

**Figure 3-1. Description of tool functions**



### 3.2. Test mode setting

1. Serial port connection: Select the serial port number of DUT in the drop-down menu of **COM** on the tool interface, click **Connect**, and the text displayed on the button changes to **Disconnect**, which indicates that the serial port is successfully connected, and the **Freqtunning** bar displays the calibrated value. If the serial port connection fails, the log window will report the error.
2. Mode setting: Select "**GD32VW55X**" for "**Chip**". Select "**RF Test Normal**" for "**Test Mode**". Select the corresponding code for "**Country**", like "**FCC**" and "**CE**". Click "**Initialize**" and the button display text will be changed to "**De-initialize**", which indicates entering the test mode.
3. If the development board is restarted or replaced with another development board for test, repeat Steps 1 and 2. If "**Disconnect**" and "**De-initialize**" are displayed, continuously click each buttons twice to connect the serial port and initialize the chip mode again.

### 3.3. WiFi continuous packet sending test

This test item is defined as the modulated signal Tx with 100% duty, which is used to test the transmitted spectrum waveform and harmonic characteristics.

1. DUT setting: Set "**WiFi Test Item**" to "**Continuous TX**" on the tool interface. Set "**Channel**" and "**Rate**". Click "**Start**" and the "**Power Level**" field of the chip will display the default power (absolute dbm), recommended power for current channel and rate to pass certification. Tx TF signal starts.
2. Tx adjustment: To modify the power, first click "**Stop**" to stop Tx, modify the "**Add Power**" value in step units of 0.25 db, and click "**Start**". At this moment, refer to the following formula for the expected power:

$$\text{Expected power} = \text{default power ("power level" dbm value)} + \text{power adjustment value ("Add Power" db value)}$$

3. Click "**Stop**" to end the test

As shown in [Figure 3-2. Continuous TX Tool setting](#), set **Country** to FCC, **Channel** to 1 (2,412 MHz), **Tx Rate** to 11G 6M, and **Power Level** to the default 15 dbm, and start Continuous TX.

Figure 3-2. Continuous TX Tool setting

General Setting	
COM	COM60
<input checked="" type="checkbox"/> Remember	Chip
	GD32VW55x
	Country
	FCC
Disconnect	Test Mode
	RF Test Normal
	De-initialize
WiFi Test Item	BLE Test Item
Continuous TX	Test RX
Start	Start
Stop	Stop
WiFi Setting	BLE Setting
Channel	1
Tx Rate	OFDM6
RU	None
Preamble	Long GI
Bandwidth	20MHz
Freqtunning	-8
Power Level	15.0dBm
Add Power	0.0
	Channel
	39
	Phy
	Coded
	Length
	37
	Payload
	PRBS9
	Tx Power
	5

### 3.4. WiFi single carrier transmitting test

This test item is defined as the single carrier Tx in WiFi mode, which is used to test the frequency offset and other parameters. **WiFi Test Item** needs to be set to **LO TX**, and only **Channel** needs to be set for other parts. The **Power Level** of this test item cannot be adjusted.

As shown in [Figure 3-3. LO TX Tool setting](#), set **Channel** to 7 (2,442 MHz) and start **LO TX**, and the single carrier signal is displayed in the spectrometer.

Figure 3-3. LO TX Tool setting

General Setting

COM: COM60 ☒ Remember Chip: GD32VW55x Country: Null

Disconnect Test Mode: RF Test Normal De-initialize

WiFi Test Item: **LO TX** Start Stop

WiFi Setting

Channel: 7

Tx Rate: 11AX-MCS7

RV: None

Preamble: Long GI

Bandwidth: 20MHz

Frequencing: 0

Power Level:

Add Power: 0.0

BLE Test Item: Test TX Start Stop

BLE Setting

Channel: 0

Phy: 1M

Length: 37

Payload: PRES9

Tx Power: 0

### 3.5. WiFi receiving test

This test item is used to test the received packet error rate (RX PER), receiving sensitivity, and other parameters in a **shielded room environment** without any interference.

1. Set "WiFi Test Item" to "Packet RX" and set "Channel" and "Bandwidth".
2. Click "Start" and "Reset" to reset the counter.
3. At this moment, the instrument has not sent any packet. Observe the numbers shown in RxOK and RxErr at the lower left corner of the user interface for a few seconds to confirm that they are always empty, which indicates that the environment is "clean", and then set the packet sending of the instrument.
4. After the instrument has sent packets, record the result of the counter (number of RxOK packets) on the interface, and calculate PER according to the following formula:  $PER = (\text{number of packets sent by the instrument} - RxOK) / \text{number of packets sent by the instrument}$  (11b rate  $PER \leq 8\%$ , 11g/n rate  $PER \leq 10\%$ , as specified in the Wi-Fi protocol).
5. If retesting is required, repeat Step 2-4.

It is generally recommended that the packet length and number of packets of the waveform of the Rx test instrument should be 1,024 bytes and 1000 respectively.

As shown in [Figure 3-4. Packet RX Tool setting](#), it means that Channel = 1 (2,412 MHz), Packet RX test started.

Figure 3-4. Packet RX Tool setting



### 3.6. BLE continuous packet sending test

This test item is defined as the modulated signal Tx with 100% duty, which is used to test the transmitted spectrum waveform and harmonic characteristics.

1. Set "BLETest Item" to "Test TX Infinite". Set "Channel", "Phy", "Length", and "Payload". Set "Tx Power" to recommended value (FCC is 8, others is 6). Click "Start".
2. TX adjustment: To modify power, click "Stop" to stop Tx and then modify the "Tx Power" value. The field represents absolute dbm, like "5" for 5 dbm.
3. Test result: Click "Stop" to end the test

As shown in [Figure 3-5. BLE Test TX Infinite Tool setting](#), set **Country** to CE, **Channel** to 0 (2,402 MHz), **Phy** to 1M, **Payload** to "PRBS9", and **Tx Power** to 6 dbm, and start Test TX Infinite.

**Figure 3-5. BLE Test TX Infinite Tool setting**

General Setting	
COM	COM60 <input checked="" type="checkbox"/> Remember Chip GD32VW55x Country CE
<div>Disconnect</div> <div>Test Mode RF Test Normal De-initialize</div>	
WiFi Test Item	BLE Test Item
Packet TX	Test TX Infinite
Start Stop	Start Stop
WiFi Setting	BLE Setting
Channel 1	Channel 0
Tx Rate OFDM6	Phy 1M
RU None	Length 37
Preamble Long GI	Payload PRBS9
Bandwidth 20MHz	Tx Power 6
Freqtunning -8	
Power Level 15.0dBm	
Add Power 0.0	

### 3.7. BLE single carrier transmitting test

This test item is defined as the BLE single carrier Tx in BLE mode, which is used to test the frequency offset and other parameters. **BLE Test Item** needs to be set to **Test TX Tone**. **Channel** and **Tx Power** can be adjusted

As shown in [Figure 3-6. BLE LO TX TOOL setting](#), set **Channel** to 0 (2,402 MHz) and start test.

**Figure 3-6. BLE LO TX TOOL setting**

WiFi Test Item		BLE Test Item	
Packet TX		Test TX Tone	
Start Stop		Start Stop	
WiFi Setting		BLE Setting	
Channel 1		Channel 0	
Tx Rate OFDM6		Phy 1M	
RU None		Length 37	
Preamble Long GI		Payload PRBS9	
Bandwidth 20MHz		Tx Power 0	
Freqtunning -8			
Power Level 18.0dBm			
Add Power 0.0			

### 3.8. BLE receiving test

This test item is used to test the received packet error rate (RX PER), receiving sensitivity, and other parameters in a **shielded room environment** without any interference.

1. Set "WiFi Test Item" to "Packet RX" and set "Channel" and "Bandwidth". Click "Start".
2. Set the instrument according to the above-mentioned parameters and send packets.
3. After the instrument ends, click "Stop". At this moment, the "RXOK" field will display the correct number of packets received.

As shown in [Figure 3-7. Description of BLE receiving test commands](#), set **Channel** to 39 (2,480MHz) and **Phy** to "Coded", and start Test RX.

**Figure 3-7. Description of BLE receiving test commands**

WiFi Test Item		BLE Test Item	
Packet RX (PHY OK) ▼		Test RX ▼	
Start Stop		Start Stop	
WiFi Setting		BLE Setting	
Channel	1 ▼	Channel	39 ▼
Tx Rate	11AX-MCS7 ▼	Phy	Coded ▼
RU	None ▼	Length	37 ▼
Preamble	Long GI ▼	Payload	PRBS9 ▼
Bandwidth	20MHz ▼	Tx Power	5 ▼
Freqtunning	0 ▼		
Power Level	14.0dBm		
Add Power	0.0 ▼		



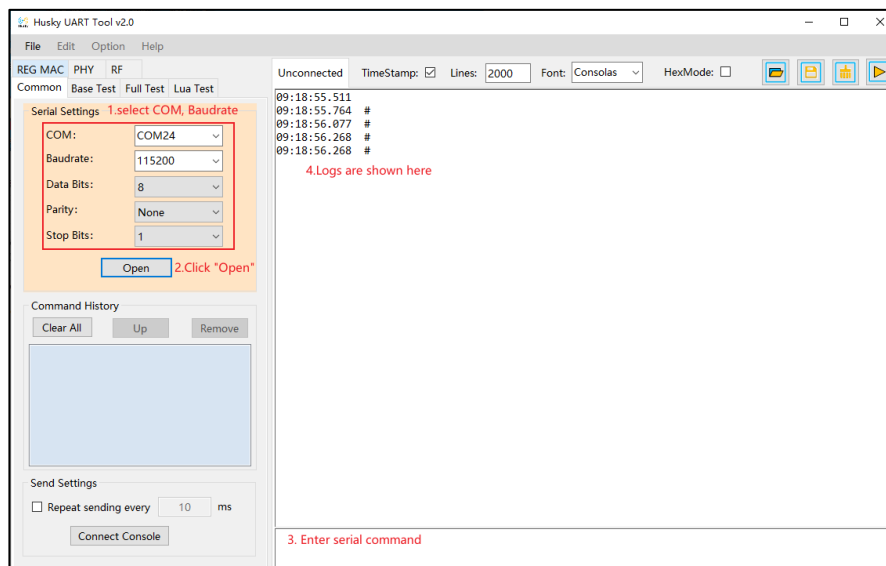
## 4. Non-signaling test – use serial port commands

This chapter introduces how to test RF Tx and Rx parameters in non-signaling mode with the serial port commands.

### 4.1. Serial port connection

1. Open the UART tool on PC (The serial port tool "**Husky Uart Tool**" provided by GD is recommended), click the drop-down menu of "**COM**", select the corresponding COM port of DUT, and the default serial port configuration is as shown in [Figure 4-1. GD Serial Port Tool](#):

Figure 4-1. GD Serial Port Tool



2. Click the button to connect the serial port. Press "**Reset**" at the side of the development board, and the serial port output box displays the log information, as shown in [Figure 4-2. Serial port boot information](#). At this moment, left-click in the serial port input box and press "**Enter**" on the keyboard, and the log displays "**#**":

Figure 4-2. Serial port boot information

```
# ALW: MBL: First print.
ALW: MBL: Boot from Image 0.
ALW: MBL: Validate Image 0 OK.
ALW: MBL: Jump to Main Image (0x0800a000).
Build date: 2024/01/08 17:08:03
This firmware is for WiFi & BLE rf test.
=== RF initialization finished ===
=== WiFi calibration done ===
BLE local addr: 76:BA:ED:21:00:5C, type 0x0
=== BLE Adapter enable complete ===
```

## 4.2. Test mode setting

1. To set the RF Test Normal mode, enter the following command:

**rf\_mp\_mode 2**

2. Set the certification mode:

**rf\_country\_code <code>**

Code=0/1/2/3/4 respectively represents Null/FCC/CE/TELEC/SRRC

An example is as shown in [Figure 4-3. RF test mode and country code setting](#).

Figure 4-3. RF test mode and country code setting

```
#
#
# rf mp mode 2      1. enable RF test normal mode
# rf country code 1 2. set country code = FCC

Set RF country code to 0x1.
#
```

## 4.3. WiFi continuous packet sending test

1. To set the channel, enter the following command:

**wifi\_set\_ch <channel>**

<Channel>: 20M, 1-14 (only the decimal system is supported). This may vary with different certification.

2. To set **Tx Rate** and **Add Power** and start **Tx**, enter the following commands:

**wifi\_tx\_cont <rate> [add power]**

<rate>: Refer to [Table 4-1. Correspondence between rate and index](#).

[add\_power]: -16.0 to 16.0, range = 32 db, step = 0.25 db, for power adjustment

Table 4-1. Correspondence between rate and index

11B Rate	Index	11G Rate	Index	11N Rate	Index	11AX SU Rate	Index
1M	0x0	6M	0x4	MCS0	0x200	MCS0	0x500
2M	0x1	9M	0x5	MCS1	0x201	MCS1	0x501
5.5M	0x2	12M	0x6	MCS2	0x202	MCS2	0x502
11M	0x3	18M	0x7	MCS3	0x203	MCS3	0x503
		24M	0x8	MCS4	0x204	MCS4	0x504
		36M	0x9	MCS5	0x205	MCS5	0x505
		48M	0xa	MCS6	0x206	MCS6	0x506
		54M	0xb	MCS7	0x207	MCS7	0x507
						MCS8	0x508
						MCS9	0x509

3. To stop Tx when the test is completed or power adjustment is required, enter the following command. An example is shown in [Figure 4-4. Description of continuous Tx test commands](#).

wifi\_tx\_stop

Figure 4-4. Description of continuous Tx test commands

```
# wifi_set_ch 1 1. set channel=1(2412MHz)
# wifi_tx_cont 0x200 -0.5 2. set rate=11N MCS0, target power=12.5dbm start tx
rate:0x200, power level: 13.000000dBm, add_pwr: -0.500000dB
wifi_tx_cont: continuous tx started
#
# wifi_tx_stop 3. stop tx when test is done
wifi_stop_tx: tx is to be stopped
#
```

#### 4.4. WiFi single carrier transmitting test

1. To set the channel, enter the same command as that described in [WiFi continuous packet sending test](#).
2. Enter the following command to start Tx.  
wifi\_tx\_lo
3. The instrument receives the signal and obtains the required data.
4. To stop Tx when the test is completed, enter the same command as that described in [WiFi continuous packet sending test](#). An example is as shown in [Figure 4-5. Description of LO Tx test commands](#).

Figure 4-5. Description of LO Tx test commands

```
# wifi_set_ch 3 1. set channel=3(2422MHz)
#
#
# wifi_tx_lo 2. start lo tx
wifi_tx_lo: tx lo started
#
#
# wifi_tx_stop 3. RF Tester analyze signal
wifi_stop_tx: mac bypass single tx is to be stopped
#
#
# 4. stop lo tx
```

#### 4.5. WiFi receiving test

1. Set the channel.
2. Enter the following command to start the receiving test (namely clear the receiving

counter).

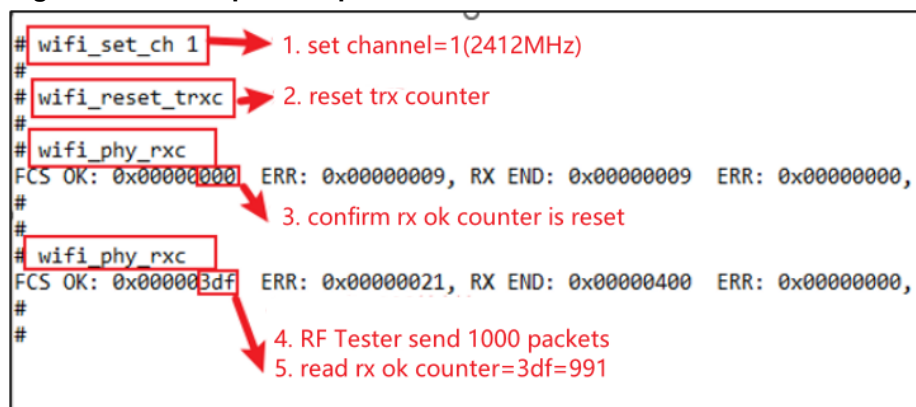
### wifi\_reset\_trxc

- Set the channel through the serial port and start Rx. At this moment, the instrument does not send packets. Determine whether the environment is clean through RxOK and RxErr counters. After the environment is confirmed to be clean, confirm the counters have been reset with the following command before setting the instrument to send packets, like 11G 6M, Power = -94 dbm, packet length = 1,024 bytes, number of packets = 1000.

### wifi\_phy\_rxc

- After the instrument has sent packets, enter the command in Step 3 to obtain the number of packets received by the chip (number of RxOK and RxError packets. The reading is in hexadecimal system and needs to convert to decimal system.) and calculate the PER according to the following formula:  $PER = (\text{number of packets sent by the instrument} - \text{number of RxOK packets}) / \text{number of packets sent by the instrument}$ .
- If retesting is required, repeat Steps 2-4. An example is as shown in [Figure 4-6. Description of packet Rx test commands](#).  $0x3df = 991$ ,  $PER = (1000 - 991)/1000 = 0.9\%$ , which indicates that the test passes.

**Figure 4-6. Description of packet Rx test commands**



## 4.6. BLE continuous packet sending test

- Set parameters according to the following command and start the BLE discontinuous packet sending test

**ble\_test\_tx\_infinite<channel><data length><pkt payload><phy><tx power level>**

Parameter definition is shown in [Table 4-2. CMD ble\\_test\\_tx parameter description](#).

**Table 4-2. CMD ble\_test\_tx parameter description**

Name	Value and Meaning
channel	0X0 to 0x27 represents Channels 0-39
pkt length	0x0 to 0xFF represents 0B-255B
payload type	0X00/01/02/ represents PRBS9/F0F0/AAAA/.
payload type	0X01/02/03/04 represents 1M/2M/1Ms=8/1Ms=2
tx pow level	0x7E/7F represents min/max. 0X05 represents 5dbm/ 0xFF=-1dbm...

2. The instrument starts to receive packets and demodulate.

3. Stop BLE Tx

**ble\_test\_stop**

An example is as shown in [Figure 4-7. Description of commands for BLE continuous packet sending test](#).

**Figure 4-7. Description of commands for BLE continuous packet sending test**

```
# ble_test_tx_infinite 0x0 0x25 0x2 0x0 0x0
ble_test_tx_infinite status:0
#
#
#
# ble_test_stop
#
#
#
```

1. set channel=0, pkt length=37B, payload type=0xAA  
phy type=LE2M, power=0dbm, start continue tx

2. RF Tester analyze signal  
3. stop continue tx

## 4.7. BLE single carrier transmitting test

1. This test item is defined as the BLE single carrier Tx, which is used to test the frequency offset and other parameters.

As shown in [Figure 4-8. Description of commands for BLE LO Tx test](#), set **Channel** to 0 (2,402 MHz) and start test.

**Figure 4-8. Description of commands for BLE LO Tx test**

```
#
# ble_test_tx_tone 0x0 0x0 0x01 0x0
ble_test_tx_tone status:0
#
#
# ble_test_stop
#
```

## 4.8. BLE receiving test

1. Set parameters according to the following command and start the BLE receiving test

**ble\_test\_rx<channel><phy>< modulation idx>**

Usage: ble\_test\_rx<channel><phy><modulation idx>

Parameter definition is shown in [Table 4-3. CMD ble\\_test\\_rx parameter description](#).

**Table 4-3. CMD ble\_test\_rx parameter description**

Name	Value and Meaning
channel	0X0 -27 represents Channels 0-39
phy	0X00/02/03 represents 1M/2M/ 1Mcoded

modulation idx	0X00/01 represents Standard/Stable
----------------	------------------------------------

A specific example is as shown in [Figure 4-9. Description of BLE receiving test commands](#).

**Figure 4-9. Description of BLE receiving test commands**

```
# ble_test_rx 0xc 0x1 0x0
#
#
# ble_test_stop
# le test end, status 0x0, received pkt num: 1316
#
#
#
```

1. set channel=12, rate=LE1M, start rx test

2. RF Tester send 1000 LE1M-PRBS9 packets  
3. get received packet count=1316

## 5. Signaling test

This chapter introduces how to test "**Blocking**" and "**Adaptivity**" parameters in **signaling mode** with the serial port commands for CE certification. For the serial port connection method, Serial port connection see [Serial port connection](#).

Pay attention to the following points:

1. For WiFi, signaling test firmware should be programmed to DUT for connection with AP for test.
2. For BLE, DTM signaling test firmware should be programmed to DUT for communication with the instrument
3. For the above two tests, RF conductive connection is generally adopted for DUT and the instrument.

### 5.1. Preparations

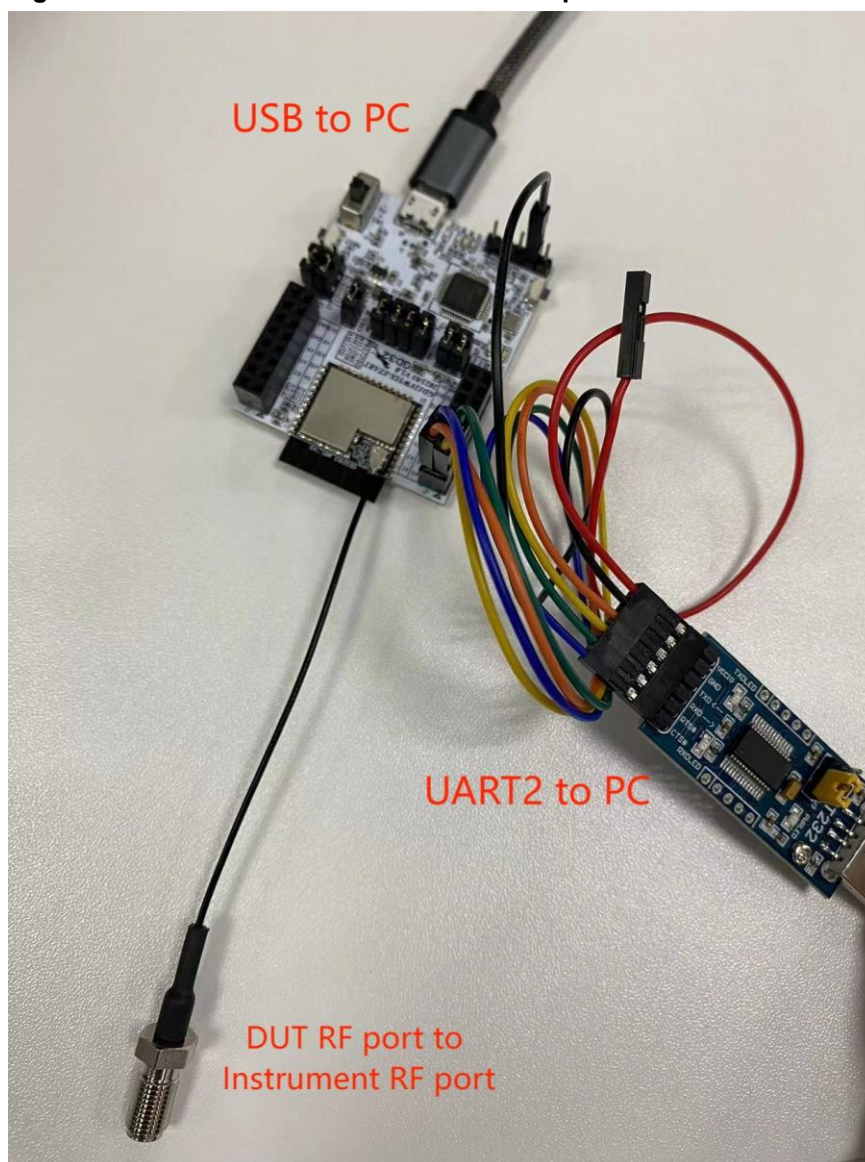
In the "**Blocking**" and "**Adaptivity**" tests of WiFi, DUT is required to be connected to AP with the following serial port commands:

1. Used to reset chips.  
Reboot
2. Used to scan AP in the environment and print information of AP on the serial port tool, like SSID and encryption methods.  
wifi\_scan
3. Used to turn off the power-saving mechanism after connection to AP.  
wifi\_ps 0
4. Used to connect DUT to the corresponding AP. <SSID> in the command is the SSID of the AP. [PASSWORD] is password of the AP. If encryption of the AP is open, [PASSWORD] is not required.  
wifi\_connect<SSID> [PASSWORD]
5. Used to view connection details of DUT, like IP address of DUT.  
wifi\_status
6. Used to set the chip and start TCP TX as described in [Adaptivity test](#). <ipaddr> parameter is IP address of server. <Port> parameter should be the same as the parameter of the command at server. <Interval> parameter is to set the log display interval. <length> is the size of sent packets over TCP in units of bytes. **For TCP test, it is recommended to use 1460.** <Time> is the data transmission time.  
  
iperf3 -c <ipaddr> -l <length> -p <port> -i<interval> -t <time>

For "**Blocking**" test of BLE in DTM mode, the pins of the second serial port should be connected to the instrument through an external UART to USB board. The connection method of the second serial port is shown in [Figure 5-1. Connection of the second serial port of DUT](#).



Figure 5-1. Connection of the second serial port of DUT



The definition of the second serial port of DUT is listed in [Table 5-1. Definition of the second serial port of DUT](#).

Table 5-1. Definition of the second serial port of DUT

Pin of UART to USB board	Pin net name of DUT	Pin of DUT
GND	GND	J9.2
TXD	A1	J1.2
RXD	A0	J1.1
RTS	A2	J1.3
CTS	A3	J1.4

## 5.2. Blocking test

This item is one of CE certification. Certification laboratories usually use signaling tester like



### CMW500.

For “Blocking” test of WiFi, the instrument is set to AP mode. After connecting DUT to the instrument, the instrument can control DUT to conduct RX test. Steps to set DUT is as follows:

1. Reset the chip by entering the command at the serial port: "reboot".
2. Scan AP by entering the command: "wifi\_scan".
3. Turn off the power-saving mechanism by entering the command: "wifi\_ps 0".
4. Connect to the specified AP by entering the command: "wifi\_connect <SSID> [PASSWORD]".
5. Confirm the connection status by entering the command: "wifi\_status". The connection between DUT and AP is as shown in [Figure 5-2. Connecting DUT to AP](#).

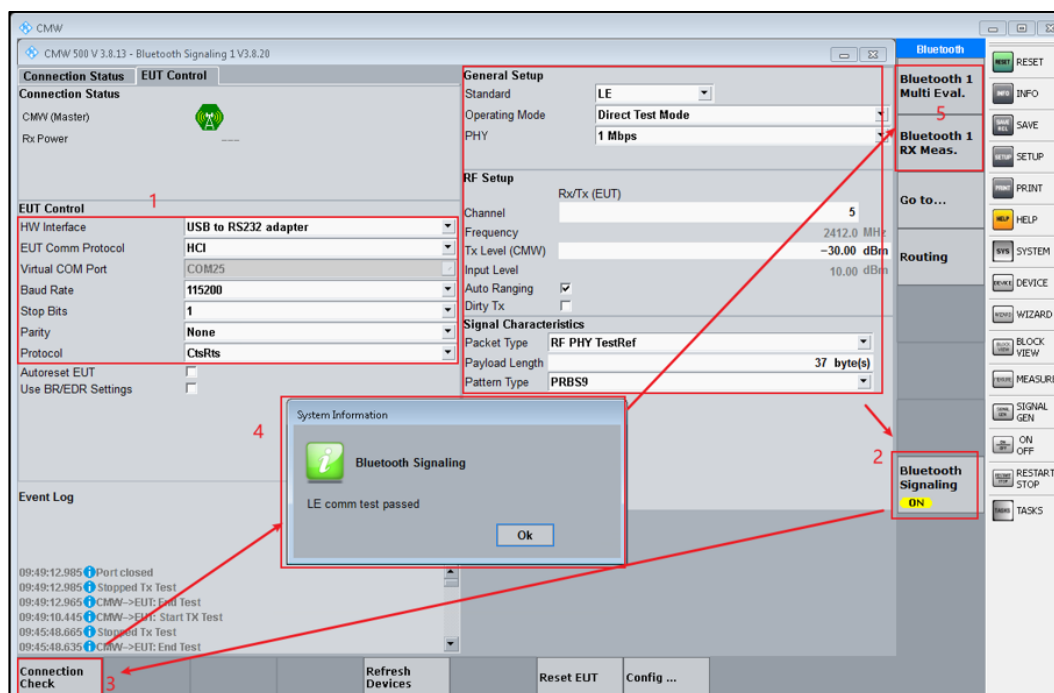
**Figure 5-2. Connecting DUT to AP**

```
wifi_scan
# [Scanned AP list]
-----
SSID:      test
Channel:   7
Security:  Open
Network:   Infrastructure
Rate:      144 Mbps
RSSI:      -18 dbm
BSSID:     c8:3a:35:03:af:11
#
wifi netlink: scan finished. scanned ap number: 1
# wifi_ps 0
wifi_ps: power save disabled!
#
# wifi_connect test 12345678
# STA: Auth Request sent with algm 0x00 and seq 1.
STA: Auth response received with status 0.
STA: Assoc Request sent to c8:3a:35:03:af:11.
STA: Assoc Response received with status 0.
wifi netlink: indicate connect, link_status is 2.
wifi netlink: connected to ap: test
WIFI_MGMT: waiting for DHCP(192)...
WIFI_MGMT: waiting for DHCP(176)...
wifi netlink: Got IP 192.168.12.156
```

For “Blocking” test of BLE, the steps are as follows:

1. Set the instrument with reference to the options in two red boxes in [Figure 5-3. Settings of CMW500 DTM](#).
2. Right-click “**Bluetooth Signaling**” in the lower right corner, and select “**On**”.
3. Click “**Connection Check**” in the lower left corner.
4. If “**LE comm test passed**” is displayed in the dialog box, it means successful connection. If connection failed, check whether the serial port cable of DUT is correctly connected and settings are correct in step 1.
5. Click “**Multi Eval.**” or “**RX Meas.**” in the upper right corner to conduct transmitting or receiving test.

Figure 5-3. Settings of CMW500 DTM



### 5.3. Adaptivity test

This item is one of CE certification, which should be tested by WiFi in general. DUT needs to be connected to the AP of the certification laboratory and needs to conduct TCP TX. Test steps are as follows:

1. Reset the chip at DUT by entering the command at the serial port: "reboot".
2. Connect DUT to the specified AP by following the same steps as those in the previous section.
3. Enter the command at the PC server in the laboratory: `iperf3 -s -p yy -i 1`. "yy" represents the port parameter.
4. Conduct TCP TX at DUT by entering the command at the serial port: `iperf3 -c 192.168.xx.xx -l 1460 -p yy -i 1 -t 1000`. "192.168.xx.xx" represents the server IP address. "yy" represents the port parameter and needs to be the same as that at the server.

DUT starts TCP TX, as shown in [Figure 5-4. DUT TCP TX](#).

**Figure 5-4. DUT TCP TX**

```

16:18:36.097 Iperf3: start iperf3 client!
16:18:36.100 # iperf3 client: Connecting to host 192.168.3.12, port 5002
16:18:36.149 iperf3 client: [ 1] local 192.168.3.11 port 59712 connected to 192.168.3.12 port 5002
16:18:37.335 iperf3 client: [ ID] Interval          Transfer      Bandwidth
16:18:37.340 iperf3 client: [ 1]  0.00-1.00    sec  2.55 MBytes  21.4 Mbits/sec
16:18:38.329 iperf3 client: [ 1]  1.00-2.00    sec  2.75 MBytes  23.0 Mbits/sec
16:18:39.385 iperf3 client: [ 1]  2.00-3.00    sec  2.79 MBytes  23.3 Mbits/sec
16:18:40.381 iperf3 client: [ 1]  3.00-4.00    sec  2.97 MBytes  25.0 Mbits/sec
16:18:41.374 iperf3 client: [ 1]  4.00-5.01    sec  3.29 MBytes  27.4 Mbits/sec
16:18:42.373 iperf3 client: [ 1]  5.01-6.00    sec  2.63 MBytes  22.2 Mbits/sec
16:18:43.367 iperf3 client: [ 1]  6.00-7.00    sec  2.35 MBytes  19.7 Mbits/sec
16:18:44.424 iperf3 client: [ 1]  7.00-8.01    sec  2.85 MBytes  23.7 Mbits/sec
16:18:45.418 iperf3 client: [ 1]  8.01-9.00    sec  3.08 MBytes  25.9 Mbits/sec
16:18:46.416 iperf3 client: [ 1]  9.00-10.00   sec  3.26 MBytes  27.3 Mbits/sec
16:18:47.409 iperf3 client: [ 1] 10.00-11.00   sec  3.31 MBytes  27.9 Mbits/sec

```

## 6. FAQ

1. Q: For non-signaling tests, failure is displayed when the chip is initialized in the RF tool.  
A: Confirm whether the version of the firmware in DUT is the **RF test firmware "image-all-rf-test.bin"**. Use Husky Tool to confirm whether the serial port communication is correct, and whether the commands such as test mode setting are valid.
2. Q: FCC radiated spurious emission parameter fails.  
A: Confirm whether the module shielding case is properly welded.  
Confirm whether the country code values of the chip Efuse complies with the certification requirements. Otherwise, the default power might have a deviation.  
If harmonic fails, confirm whether the RF output matching circuit of the module has been tuned.
3. Q: Low-frequency (< 1 Ghz) radiated spurious emission parameter fails.  
A: Check interference from the test environment.  
Check interference from PC, serial port, power supply base board, USB cable, and other sources.
4. Q: Adaptivity parameter fails.  
A: Confirm whether the power-saving mode has been turned off in the chip.  
Adjust the attenuation added to the AP for test, which can't be too high.

## 7. Revision history

[Table 7-1. Revision history](#) is the version update history of this document.

**Table 7-1. Revision history**

Revision No.	Description	Date
1.0	Initial release	Nov. 17 <sup>th</sup> , 2023
1.1	Modify 2.2	Mar. 1 <sup>st</sup> , 2024
1.2	Add description of carrier tx	Jul. 18 <sup>th</sup> , 2024

## Important Notice

This document is the property of GigaDevice Semiconductor Inc. and its subsidiaries (the "Company"). This document, including any product of the Company described in this document (the "Product"), is owned by the Company under the intellectual property laws and treaties of the People's Republic of China and other jurisdictions worldwide. The Company reserves all rights under such laws and treaties and does not grant any license under its patents, copyrights, trademarks, or other intellectual property rights. The names and brands of third party referred thereto (if any) are the property of their respective owner and referred to for identification purposes only.

The Company makes no warranty of any kind, express or implied, with regard to this document or any Product, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The Company does not assume any liability arising out of the application or use of any Product described in this document. Any information provided in this document is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Except for customized products which have been expressly identified in the applicable agreement, the Products are designed, developed, and/or manufactured for ordinary business, industrial, personal, and/or household applications only. The Products are not designed, intended, or authorized for use as components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, atomic energy control instruments, combustion control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or Product could cause personal injury, death, property or environmental damage ("Unintended Uses"). Customers shall take any and all actions to ensure using and selling the Products in accordance with the applicable laws and regulations. The Company is not liable, in whole or in part, and customers shall and hereby do release the Company as well as its suppliers and/or distributors from any claim, damage, or other liability arising from or related to all Unintended Uses of the Products. Customers shall indemnify and hold the Company as well as its suppliers and/or distributors harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of the Products.

Information in this document is provided solely in connection with the Products. The Company reserves the right to make changes, corrections, modifications or improvements to this document and Products and services described herein at any time, without notice.