

RTL8762C RF Test Flow

Version 0.1

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Revision History

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Table 1-1 Vocabulary

Abbreviation	Implication
BLE	Bluetooth Low Energy
BT	Bluetooth
Single Tone	Single Tone

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1 Overview

This document introduces how to set up the testing environment for RTL8762C RF, including the test mode specified in BT spec and the single tone test mode. It can be used for a whole series of RTL8762C chip.

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2 Download Image

2.1 Download Flow

1. Choose “Download” radio button.
2. Detect the port (UART mode) and select com port;
2. Click “Download” button to download images;

Before downloading, it needs pull P0_3 to low level. RF Test Tool only can download one port at one time. The specific flow diagram is as shown in Diagram 2-1.

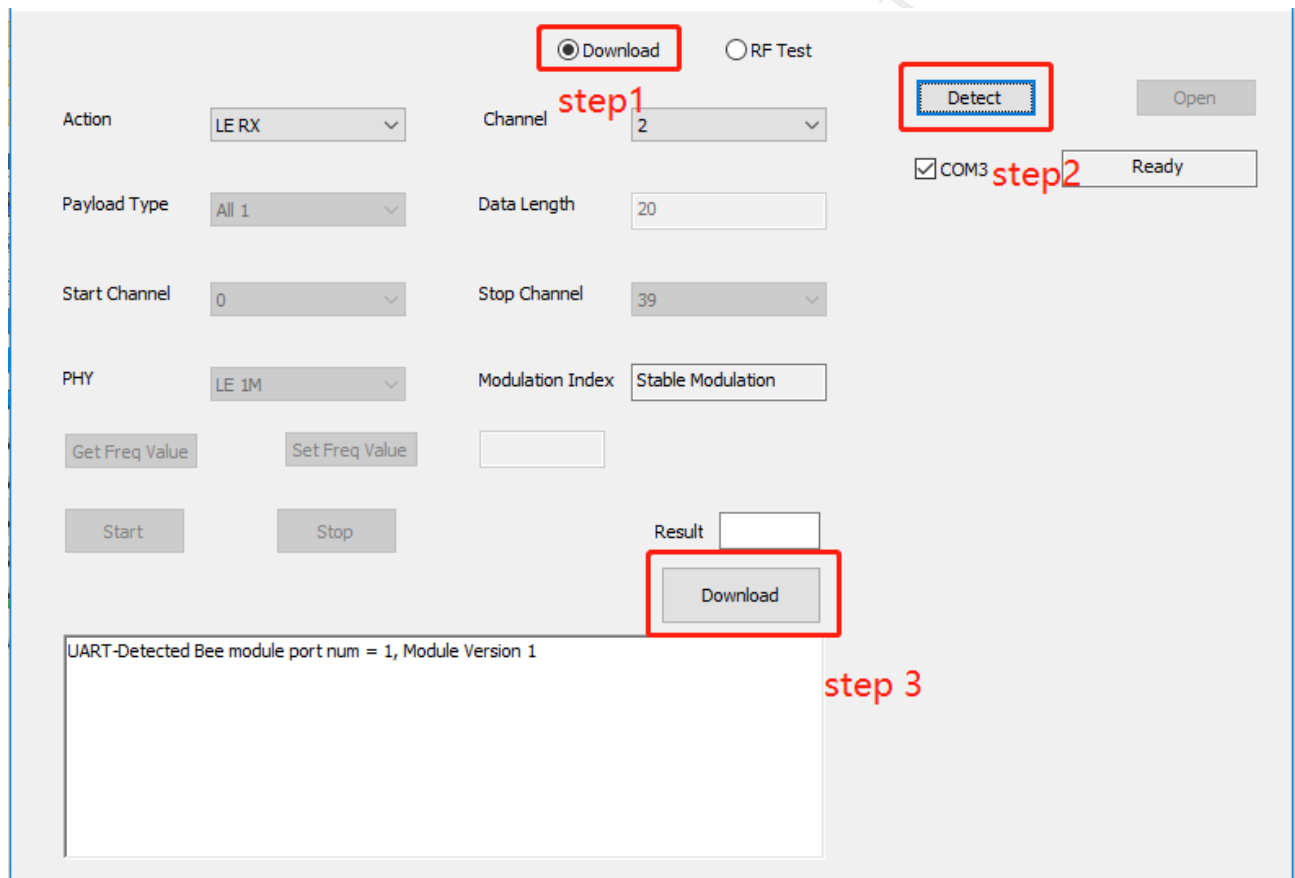


Diagram 2-1 Downloading Flow on RF Test Tool

2.2 Download Status

The downloading status is shown in Diagram 2-2 :

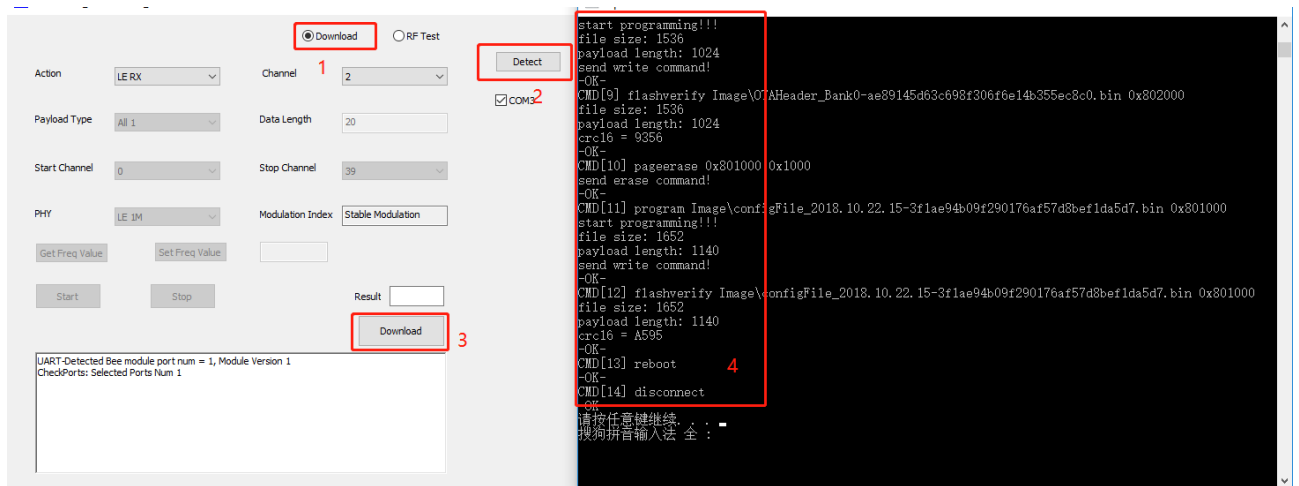


Diagram 2-2 Download status

3 BQB RF Test

3.1 UART Port

RTL8762C supports two types of RF Test interfaces (HCI and 2-wire UART for DTM) specified by BT spec. This document mainly introduces HCI Test Interface. HCI Test interface uses P3_0 (TX_OUTPUT) and P3_1 (RX_INPUT) of the chip as the pin of UART port.

UART interface parameters used by RTL8762C HCI Interface are as below:

Baud rate: 115200
 Data bit: 8
 Stop bit: 1
 Parity bit: No
 Flow control: No

The instrument should use same UART interface settings as chip for communication.

3.2 Instrument Connection

Please refer to Diagram 3-1 for connection between instrument and RTL8762C, the RF port of instrument is connected with RTL8762C RFIO by cable. The UART of instrument is connected with the UART interface of RTL8762C.

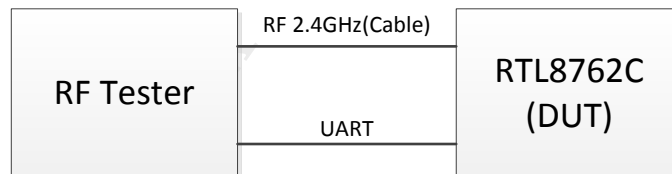


Diagram 3-1 Wiring diagram of RF Tester and RTL8762C

3.3 Enter Test Mode

After downloading corresponding Image, reset RTL8762C and enters the appointed test mode. HCI Test Interface needs to download HCI patch image and OTA Header bin and Config file.

3.4 Precautions

- 1) The chip will automatically perform parameter calibration when it is powered on. Connect with the cable, turn on the instrument, and then power on RTL8762C, so that the chip can detect the correct resistance value. Avoid abnormal RF test results caused by external impedance change;

- 2) Component values of RF matching circuits need readjustment to adapt to the impedance of cable;
- 3) Cable of RF cable needs compensation;
- 4) When using MT8852B for testing, it is required to set the Power range of instrument:
On MT8852B Front panel, select config→MT8852B→RX/TX setting→range, set range as range 2 or range 3;
- 5) The test needs to be done in a shield room to avoid signal interference from other 2.4GH frequency bands such as Wi-Fi.

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4 RF Certification Test

Before doing RF test, Selecting “RF Test” radio button is necessary. It is shown in Diagram 4-1.

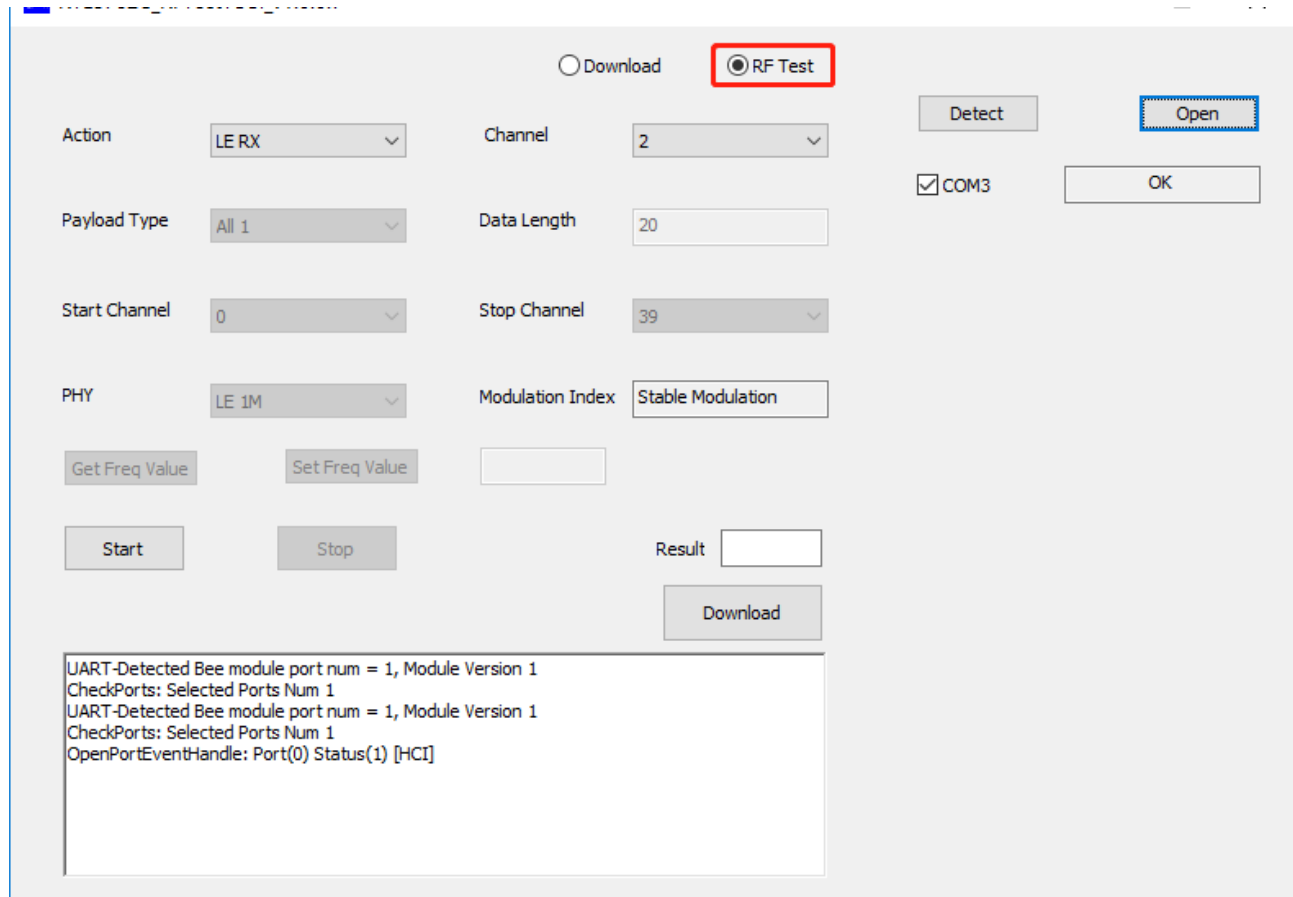


Diagram 4-1 HCI reset

4.1 LE Cont TX Test

It is required to directly make TX measurement for RF test, such as Band Edge verification.

TX test setting is as shown in Diagram 4-2, TX Channel and TX Enable need to be configured for TX test, properly select Channel and set TX Enable to be Enable state before starting TX test.

The step by step :

Step 1): Detect UART com port.

Step 2): Open UART com port.

You can see the message below to check open com port successes.

Step 3): Select TX test item.

Step 4): Choose TX channel.

☐ Download ☒ RF Test

Action: LE Cont TX

Channel: 2

Detect

Open

OK

Payload Type: All 1

Data Length: 20

OK

Start Channel: 0

Stop Channel: 39

PHY: LE 1M

Modulation Index: Stable Modulation

Get Freq Value

Set Freq Value

Start

Stop

Result:

Download

```

UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
OpenPortEventHandle: Port(0) Status(1) [HCI]
        
```

Diagram 4-2 LE Cont TX test setting

Step 5): Click “Start” button and DUT will transmit TX signal. You can check message as Diagram 4-3.

☐ Download ☒ RF Test

Action

Channel

Payload Type

Data Length

Start Channel

Stop Channel

PHY

Modulation Index

Result

☒ COM3

```

UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
OpenPortEventHandler: Port(0) Status(1) [HCT]
LEContTXEventHandler: Port(0) [start] LE Cont TX Test Status(1)
        
```

Diagram 4-3 Start LE Cont TX test

Step 6) Click “Stop” to end test. You can check message as Diagram 4-3.

☐ Download ☒ RF Test

Action: LE Cont TX

Channel: 2

Payload Type: All 1

Data Length: 20

☒ COM3

OK

Start Channel: 0

Stop Channel: 39

PHY: LE 1M

Modulation Index: Stable Modulation

Result:

```

UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
OpenPortEventHandle: Port(0) Status(1) [HCI]
LEContTXEventHandle: Port(0) [start] LE Cont TX Test Status(1)
LEContTXEventHandle: Port(0) [stop] LE Cont TX Test Status(1)
        
```

Diagram 4-5 Start LE TX Test

Step 7) If you want to change TX channel, go to step 4.

You can check the test state diagram of LE TX by the spectrum analyzer. Click “Start” to start TX test, the state is displayed as step 5 in Message box as shown in

☐ Download ☒ RF Test

Action: LE Cont TX

Channel: 2

Detect

Open

Payload Type: All 1

Data Length: 20

☒ COM3

OK

Start Channel: 0

Stop Channel: 39

PHY: LE 1M

Modulation Index: Stable Modulation

Get Freq Value

Set Freq Value

Start

Stop

Result:

Download

```

UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
OpenPortEventHandler: Port(0) Status(1) [HCT]
LEContTXEventHandler: Port(0) [start] LE Cont TX Test Status(1)
    
```

Diagram 4-3, and then waveforms as shown in Diagram 4-4 display on the spectrum analyzer.

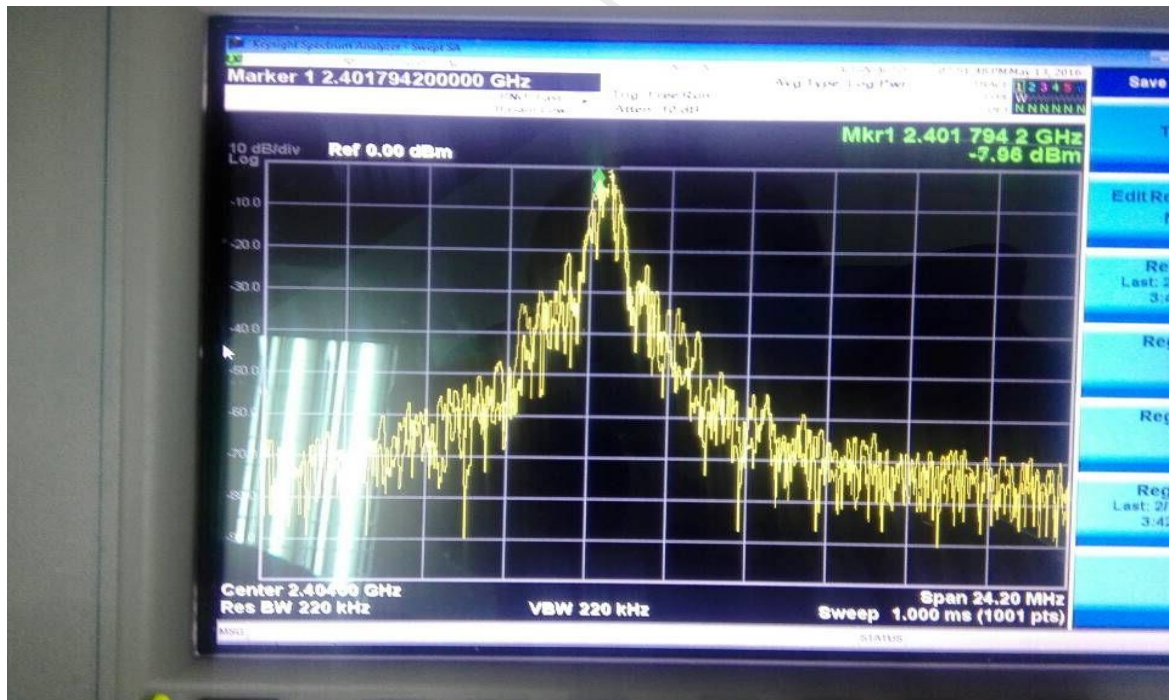


Diagram 4-4 TX Test Waveforms

4.2 LE RX Test

To test whether RX can generate interference, prepare testing environment first, and click “Detect”, and then click “Open” to open the port after UART is detected.

Channel is the only parameter to be set. As shown in Diagram 4-5, select LE RX, click “Start” to start testing, and click “Stop” to stop testing.

Step by step

Step 1): Detect UART com port.

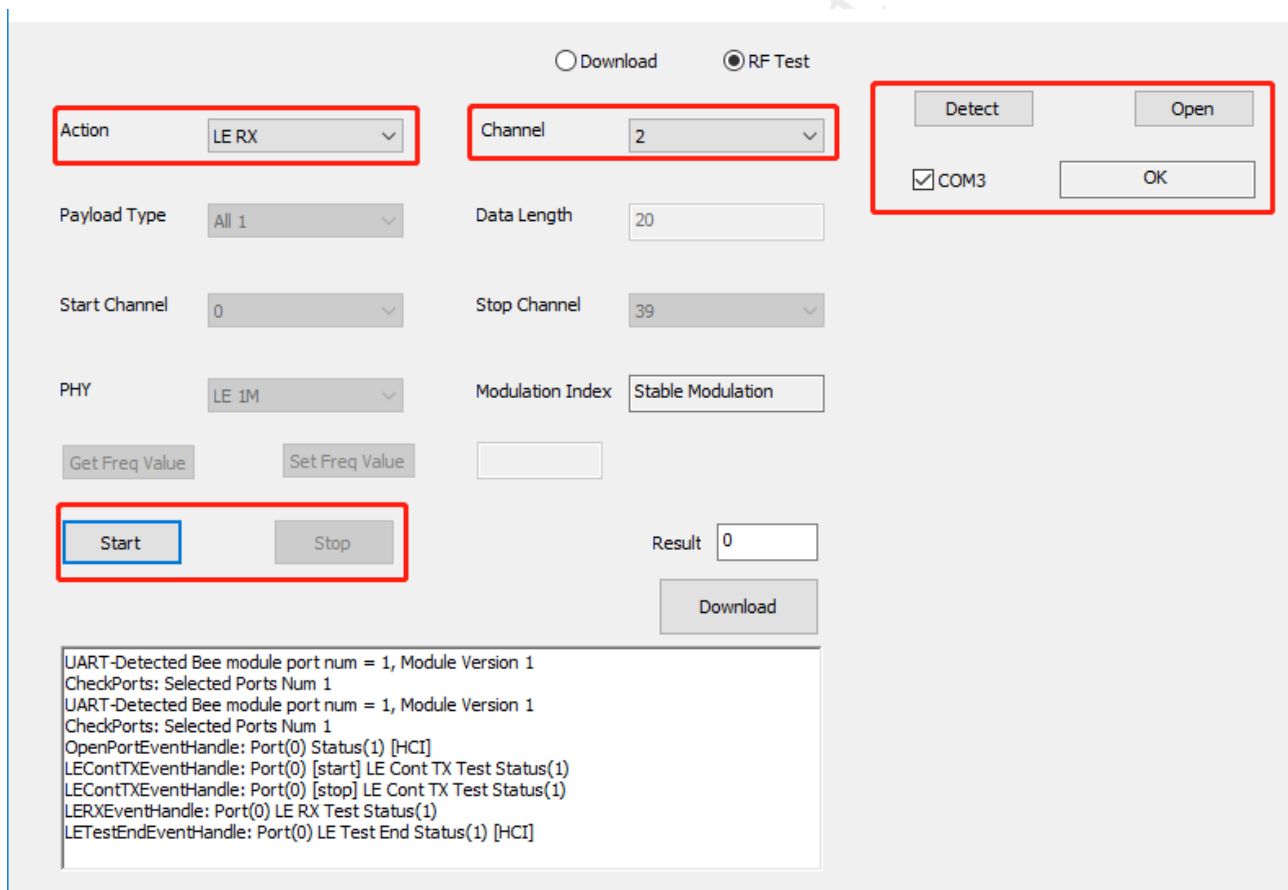
Step 2): Open UART com port.

Step 3): Select RX test item.

Step 4): Choose RX channel .

Step5): Click “Start” to start test.

Step6): Click “Stop” to end test.



The screenshot displays the LE RX Test configuration window. At the top, there are radio buttons for "Download" and "RF Test" (selected). The interface includes several dropdown menus and input fields: "Action" is set to "LE RX", "Channel" is set to "2", "Payload Type" is "All 1", "Data Length" is "20", "Start Channel" is "0", "Stop Channel" is "39", "PHY" is "LE 1M", and "Modulation Index" is "Stable Modulation". There are buttons for "Get Freq Value", "Set Freq Value", "Start", "Stop", "Detect", "Open", and "Download". A checkbox for "COM3" is checked. A "Result" field shows "0". At the bottom, a log window displays the following text:

```

UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
OpenPortEventHandle: Port(0) Status(1) [HCI]
LEContTXEventHandle: Port(0) [start] LE Cont TX Test Status(1)
LEContTXEventHandle: Port(0) [stop] LE Cont TX Test Status(1)
LERXEventHandle: Port(0) LE RX Test Status(1)
LETestEndEventHandle: Port(0) LE Test End Status(1) [HCI]

```

Diagram 4-5 LE RX parameter settings

4.3 LE TX Test

To test LE TX , prepare testing environment first, and click “Detect”, and then click “Open” to open the port after

UART is detected.

Channel is the only parameter to be set. As shown in Diagram 4-5, select LE TX, click “Start” to start testing, and click “Stop” to stop testing.

Step by step

Step 1): Detect UART com port.

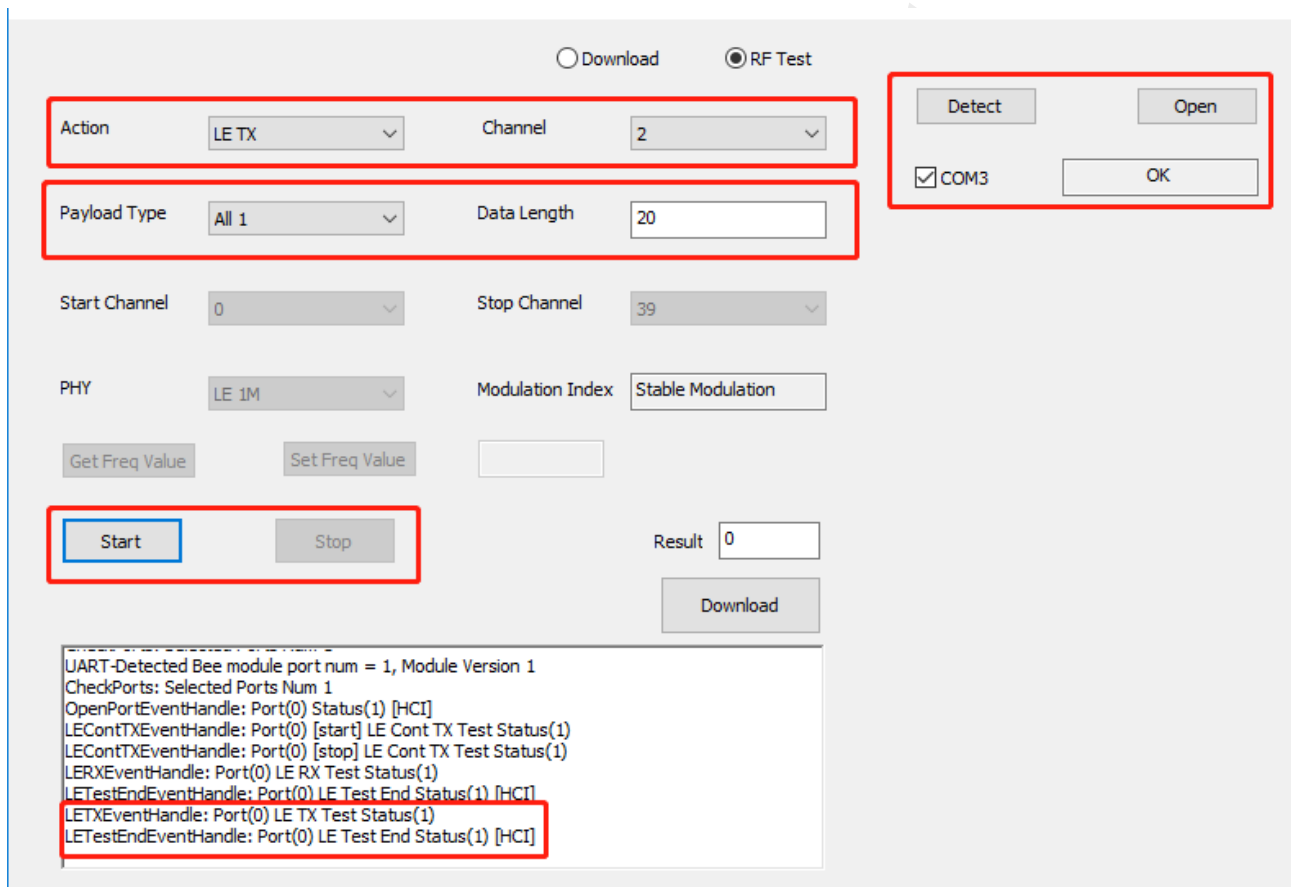
Step 2): Open UART com port.

Step 3): Select LE TX test item.

Step 4): Choose channel and set payload and data length.

Step5): Click “Start” to start test.

Step6): Click “Stop” to end test.



Download RF Test

Action: LE TX Channel: 2

Payload Type: All 1 Data Length: 20

Start Channel: 0 Stop Channel: 39

PHY: LE 1M Modulation Index: Stable Modulation

Get Freq Value Set Freq Value

Start Stop

Result: 0

Download

```

UART-Detected Bee module port num = 1, Module Version 1
CheckPorts: Selected Ports Num 1
OpenPortEventHandle: Port(0) Status(1) [HCI]
LEContTXEventHandle: Port(0) [start] LE Cont TX Test Status(1)
LEContTXEventHandle: Port(0) [stop] LE Cont TX Test Status(1)
LERXEventHandle: Port(0) LE RX Test Status(1)
LETestEndEventHandle: Port(0) LE Test End Status(1) [HCI]
LETXEventHandle: Port(0) LE TX Test Status(1)
LETestEndEventHandle: Port(0) LE Test End Status(1) [HCI]

```

Diagram 4-6 LE TX parameter settings

4.4 LE Enhance TX Test

To test LE Enhance TX, prepare testing environment first, and click “Detect”, and then click “Open” to open the port after UART is detected.

Channel is the only parameter to be set. As shown in Diagram 4-5, select LE Enhance TX, click “Start” to start testing, and click “Stop” to stop testing.

Step by step

Step 1): Detect UART com port.

Step 2): Open UART com port.

Step 3): Select LE Enhance TX test item.

Step 4): Choose channel and PHY first, then set payload and data length.

Step5): Click “Start” to start test.

Step6): Click “Stop” to end test.

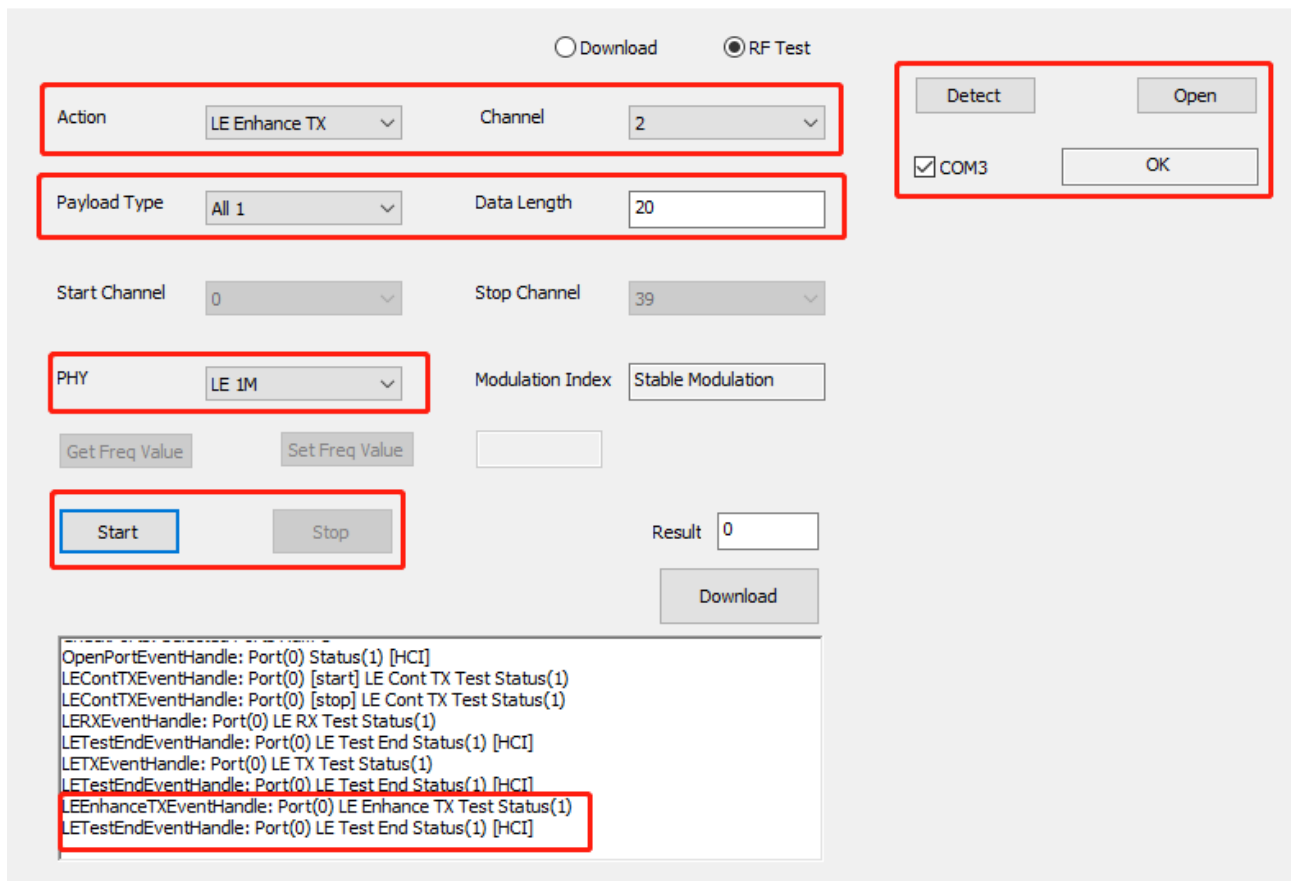


Diagram 4-7 LE Enhance TX parameter settings

4.5 LE Enhance RX Test

To test LE Enhance RX, prepare testing environment first, and click “Detect”, and then click “Open” to open the port after UART is detected.

Channel is the only parameter to be set. As shown in Diagram 4-5, select LE Enhance RX, click “Start” to start testing, and click “Stop” to stop testing.

Step by step

Step 1): Detect UART com port.

Step 2): Open UART com port.

Step 3): Select LE Enhance RX test item.

Step 4): Choose channel and PHY.

Step5): Click “Start” to start test.

Step6): Click “Stop” to end test.

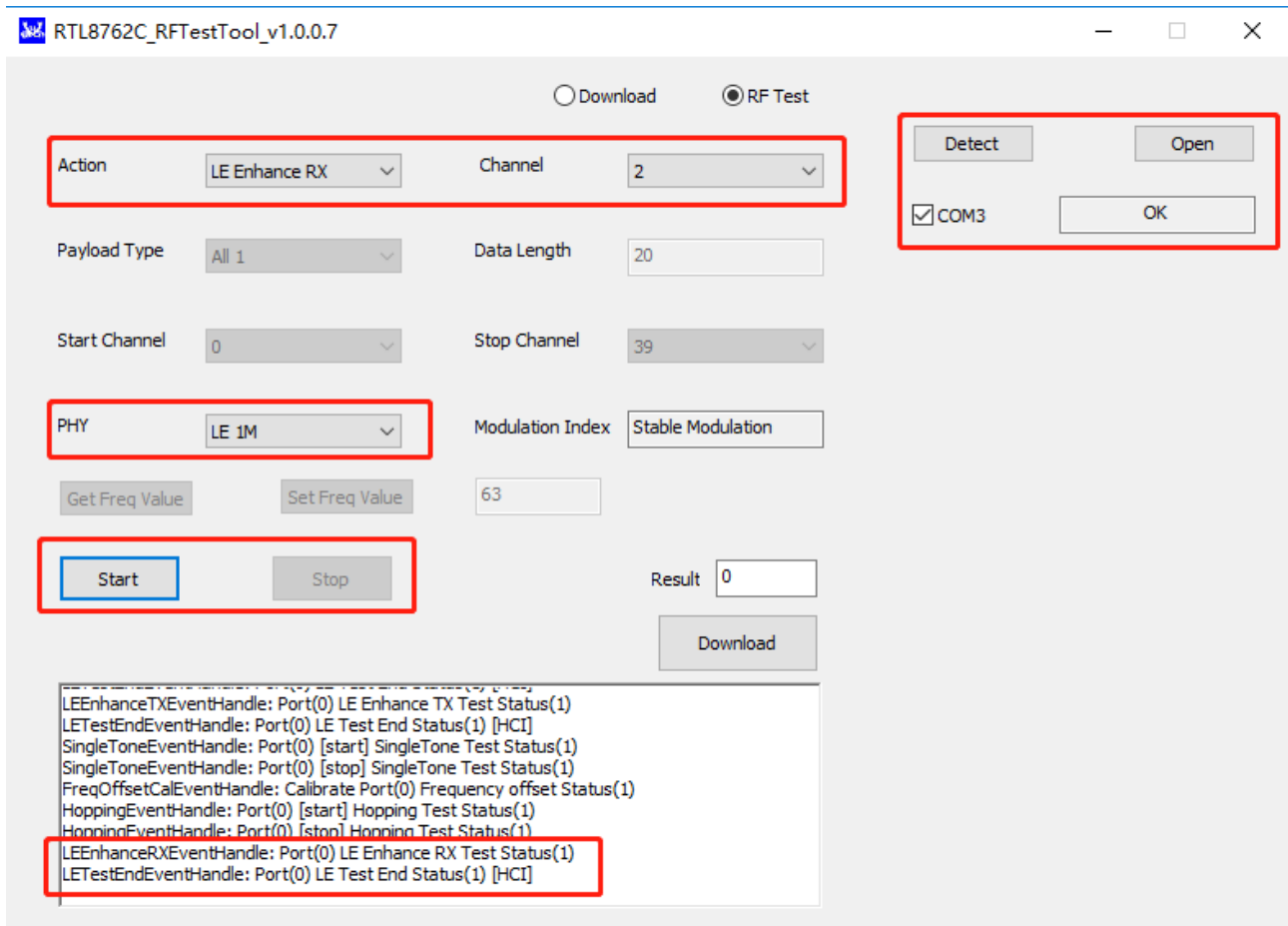


Diagram 4-8 LE Enhance RX parameter setting

4.6 Single Tone TX

To test Single Tone, prepare testing environment first, and click “Detect”, and then click “Open” to open the port after UART is detected.

Channel is the only parameter to be set. As shown in Diagram 4-5, select Single Tone, click “Start” to start testing, and click “Stop” to stop testing.

Step by step

Step 1): Detect UART com port.

Step 2): Open UART com port.

Step 3): Select Single Tone test item.

Step 4): Choose channel.

Step5): Click “Start” to start test.

Step6): Click “Stop” to end test.

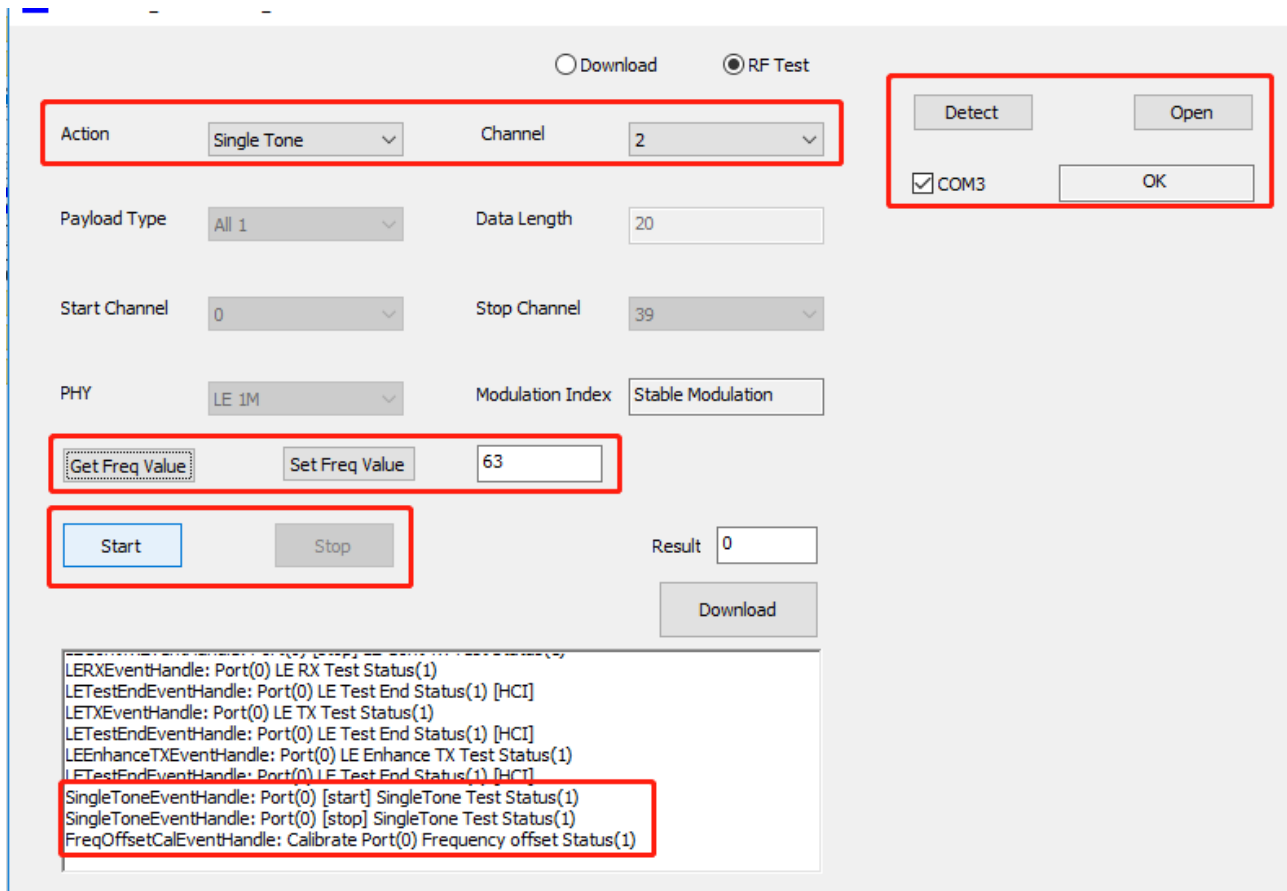


Diagram 4-9 Single Tone test

On Single Tone test, you can get/set frequency offset through “GetFreqValue” and “SetFreqValue” buttons.

4.7 Hopping Test

To test Hopping, prepare testing environment first, and click “Detect”, and then click “Open” to open the port after UART is detected.

Channel is the only parameter to be set. As shown in Diagram 4-5, select Hopping, click “Start” to start testing, and click “Stop” to stop testing.

Step by step

Step 1): Detect UART com port.

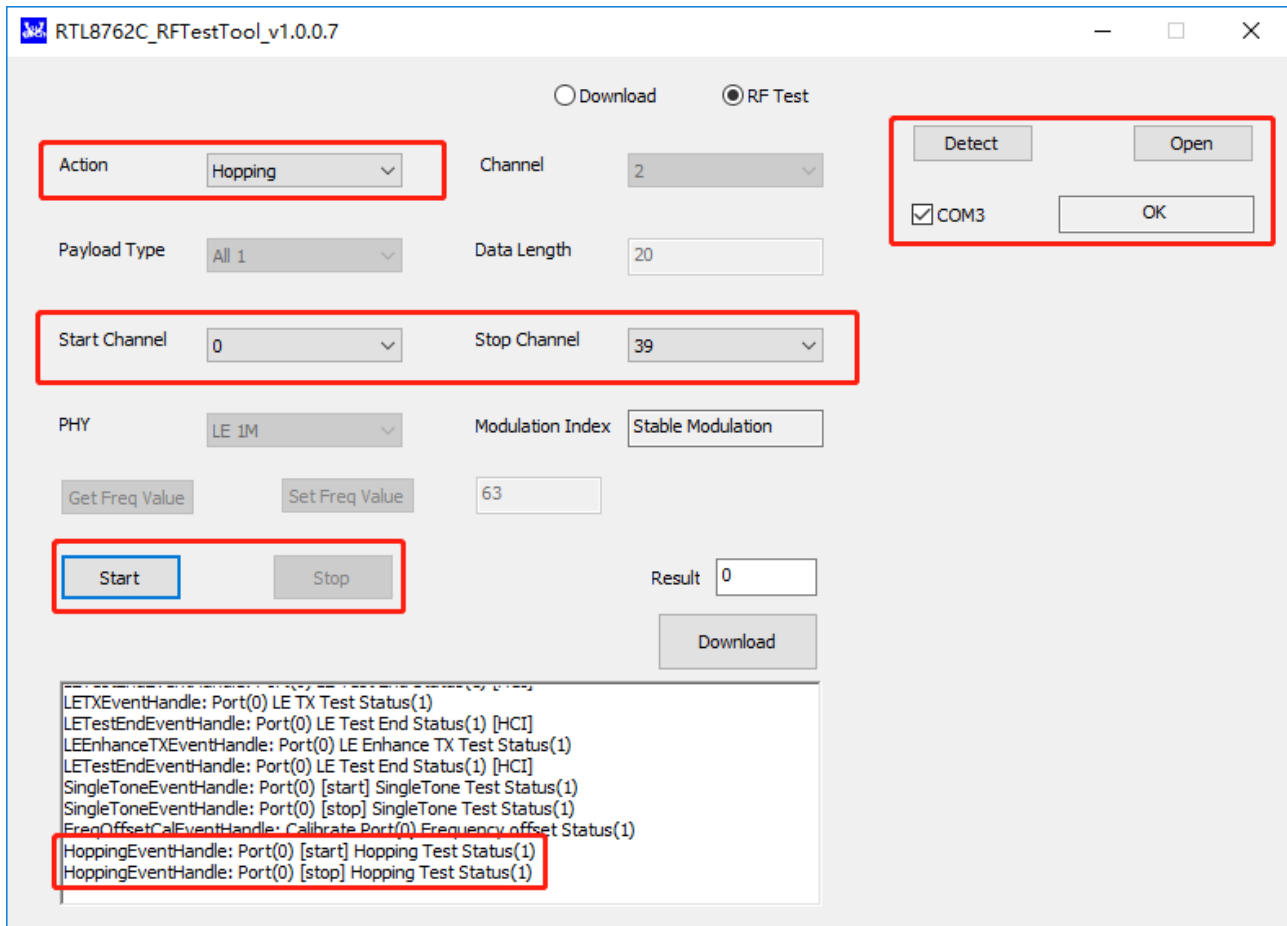
Step 2): Open UART com port.

Step 3): Select Hopping test item.

Step 4): Choose start channel and stop channel.

Step5): Click “Start” to start test.

Step6): Click “Stop” to end test.



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☐ Download ☒ RF Test

Action: Hopping Channel: 2

Payload Type: All 1 Data Length: 20

Start Channel: 0 Stop Channel: 39

PHY: LE 1M Modulation Index: Stable Modulation

Get Freq Value Set Freq Value 63

Start Stop Result: 0 Download

Log Window:

```

LETXEventHandle: Port(0) LE TX Test Status(1)
LETestEndEventHandle: Port(0) LE Test End Status(1) [HCI]
LEEnhanceTXEventHandle: Port(0) LE Enhance TX Test Status(1)
LETestEndEventHandle: Port(0) LE Test End Status(1) [HCI]
SingleToneEventHandle: Port(0) [start] SingleTone Test Status(1)
SingleToneEventHandle: Port(0) [stop] SingleTone Test Status(1)
FreqOffsetCalEventHandle: Calibrate Port(0) Frequency offset Status(1)
HoppingEventHandle: Port(0) [start] Hopping Test Status(1)
HoppingEventHandle: Port(0) [stop] Hopping Test Status(1)
    
```

Diagram 4-10 Hopping Test

You can check the test state diagram of Hopping by spectrum analyzer. Set the center frequency of spectrum analyzer to 2441M, band width >80M, and set it as Max hold mode. Click “Start” to start Hopping test, observe the spectrometer, it is found that the waveforms gradually fill these 40 channels from 2402M to 2480M within 3~5 minutes as shown in Diagram 4-11. Click “Stop” to stop Hopping test.

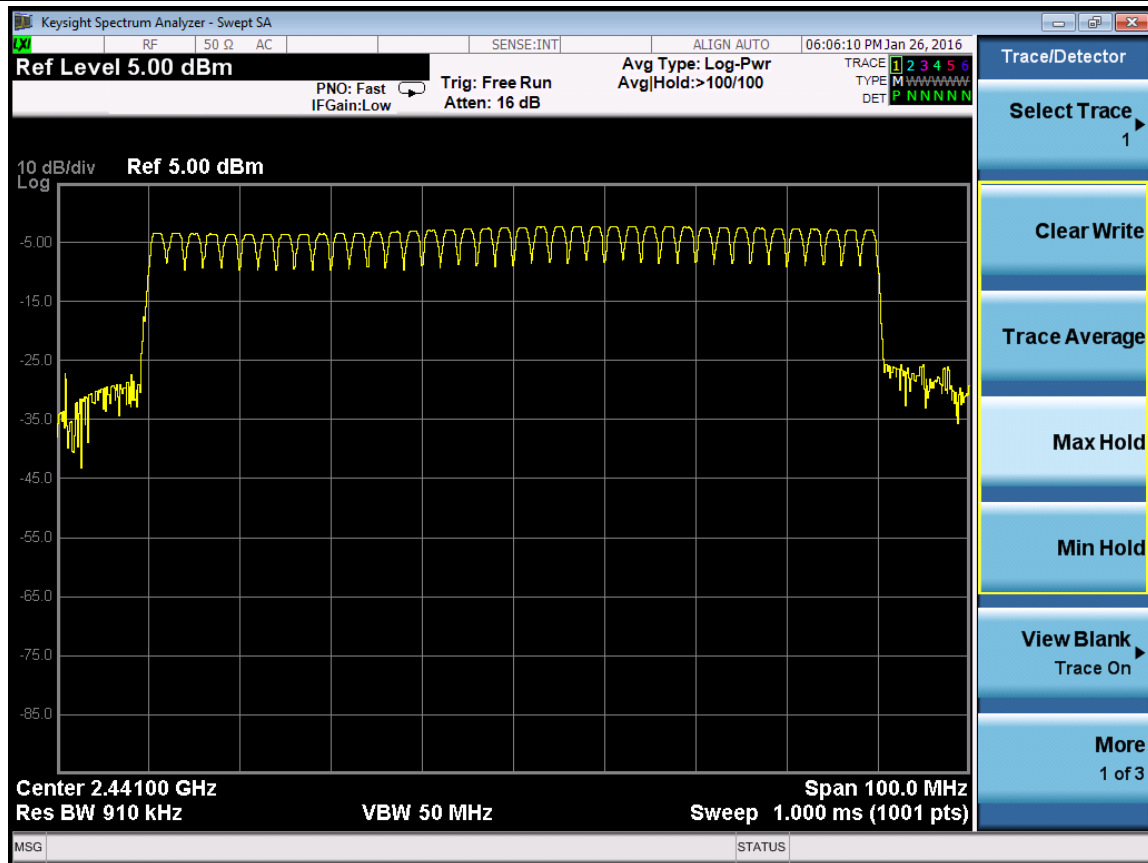


Diagram 4-11 Hopping Test Waveforms

References

- [1] Reference 1
- [2] Reference 2
- [3] Reference 3

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Addendum

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