

# K32W041/K32W061/QN9090(T)/QN9030(T) Bluetooth Low Energy Certification Tool User's Guide



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# Chapter 1

## Introduction

K32W/QN9090/QN9030 is an ultra-low power Bluetooth LE wireless MCU, based on which the product can operate with the frequency within ISM band. Certification is mandatory for these kinds of RF product according to the regulatory of each region. The test is FCC/CE certification in US and EU areas. There are similar certification requirements in other areas.

# Chapter 2

## Test setup

### 2.1 Hardware

- NXP's K32W/QN9090 module + DK6
- Mini USB cable
- Personal computer with a serial port terminal application installed

As shown in [Figure 1](#), connect the USB port of K32W/QN9090 DK with PC USB port through a USB cable.

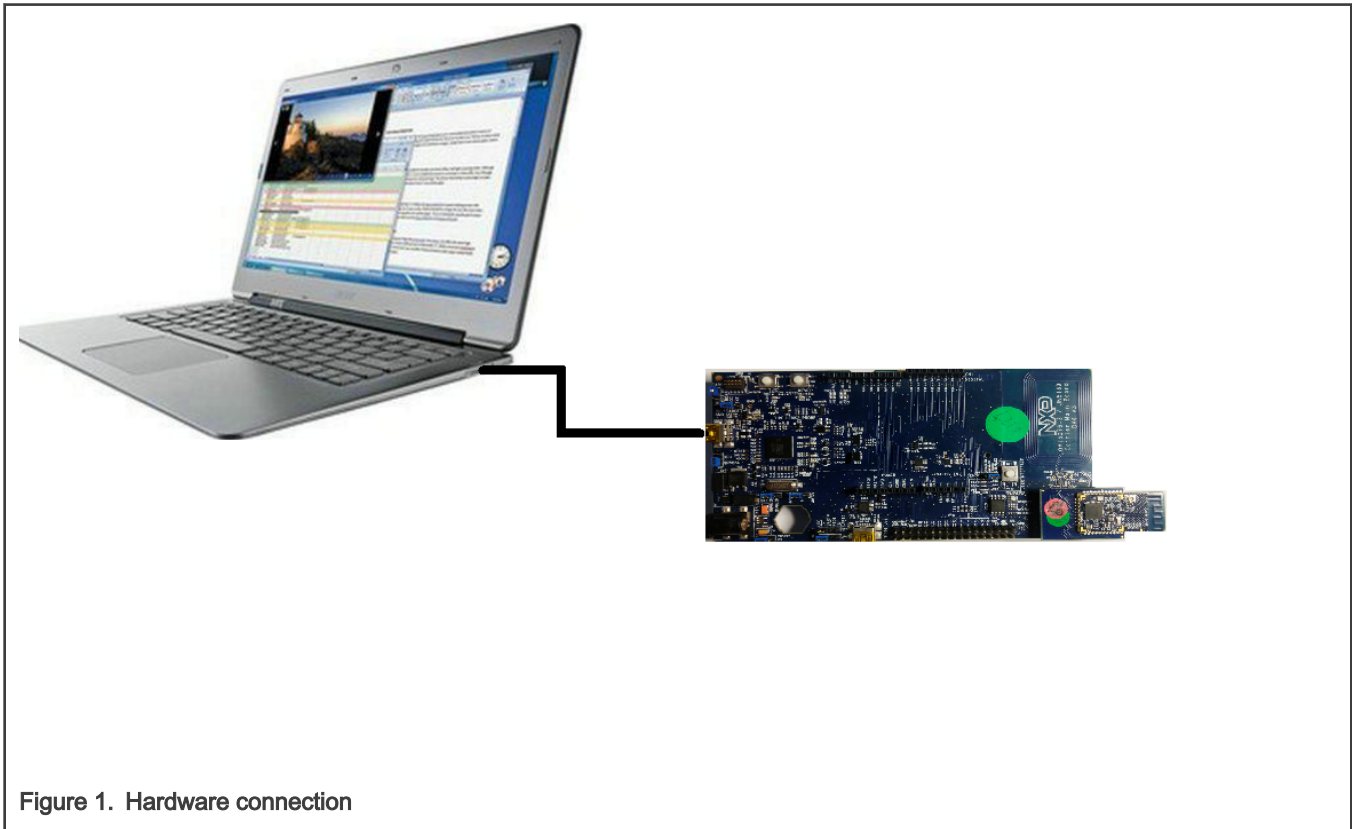


Figure 1. Hardware connection

### 2.2 Software

- Firmware: *K32W\_QN9090\_certi\_test.bin*  
The *bin* file is located in the *K32W\_QN909x\_Certi\_Tools\Debug* folder.
- Test tools: PuTTY or other terminal tool

### 2.3 Test preparations

1. Download the test firmware into the K32W/QN9090.
2. Set the COM port terminal.
  - Open the COM port terminal on your computer.
  - Select the correct setting for the COM port.

Taking PuTTY as an example, COM port settings are as shown in [Figure 2](#).

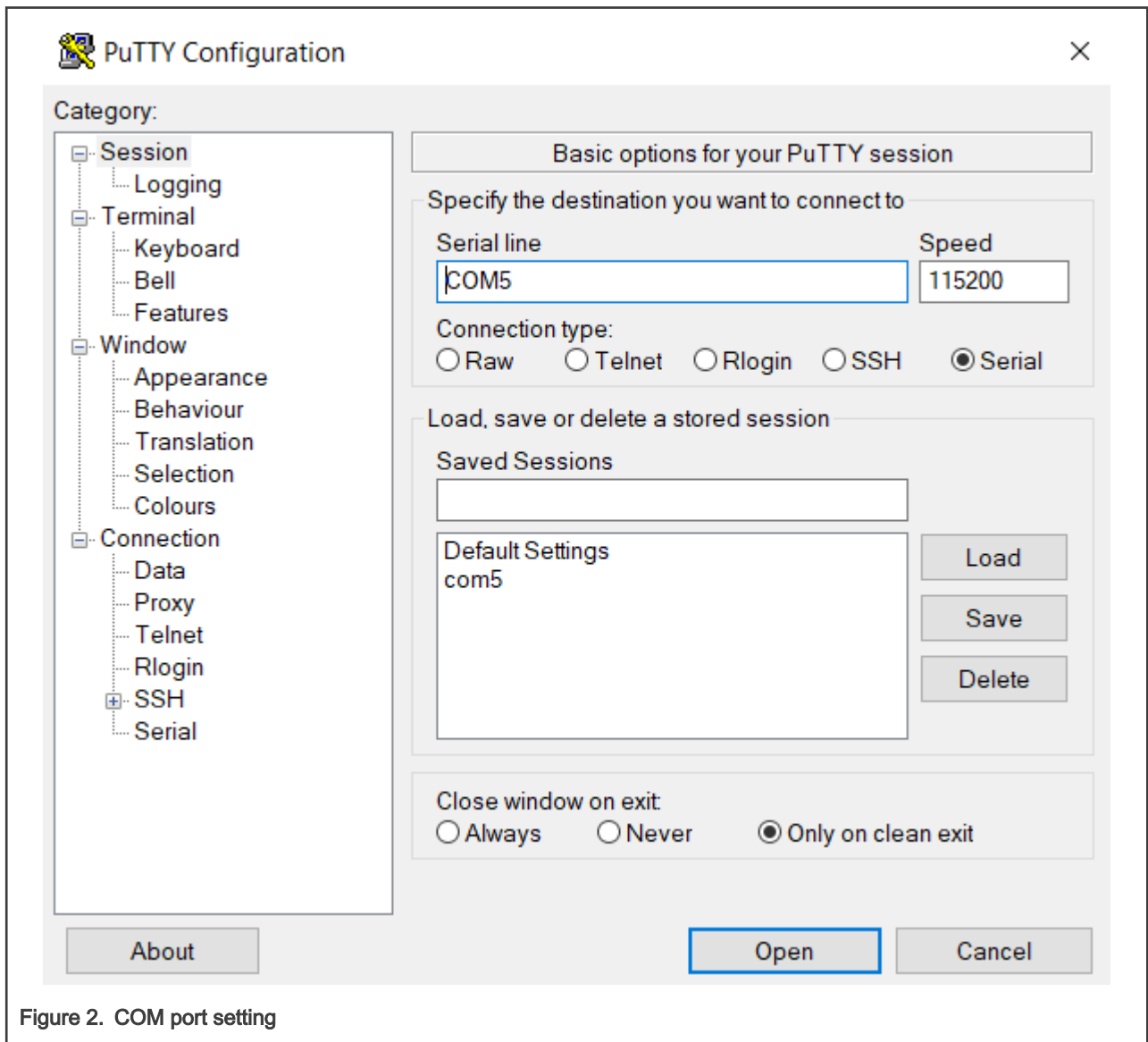


Figure 2. COM port setting

# Chapter 3

## Test items and options

The project uses the COM port terminal as command console to control the operations of K32W/QN9090 DK. After the setup completes successfully, open PuTTY with the correct settings and press the **Reset** button (**SW4**) on the DK6 board. The output is as shown in [Figure 3](#).

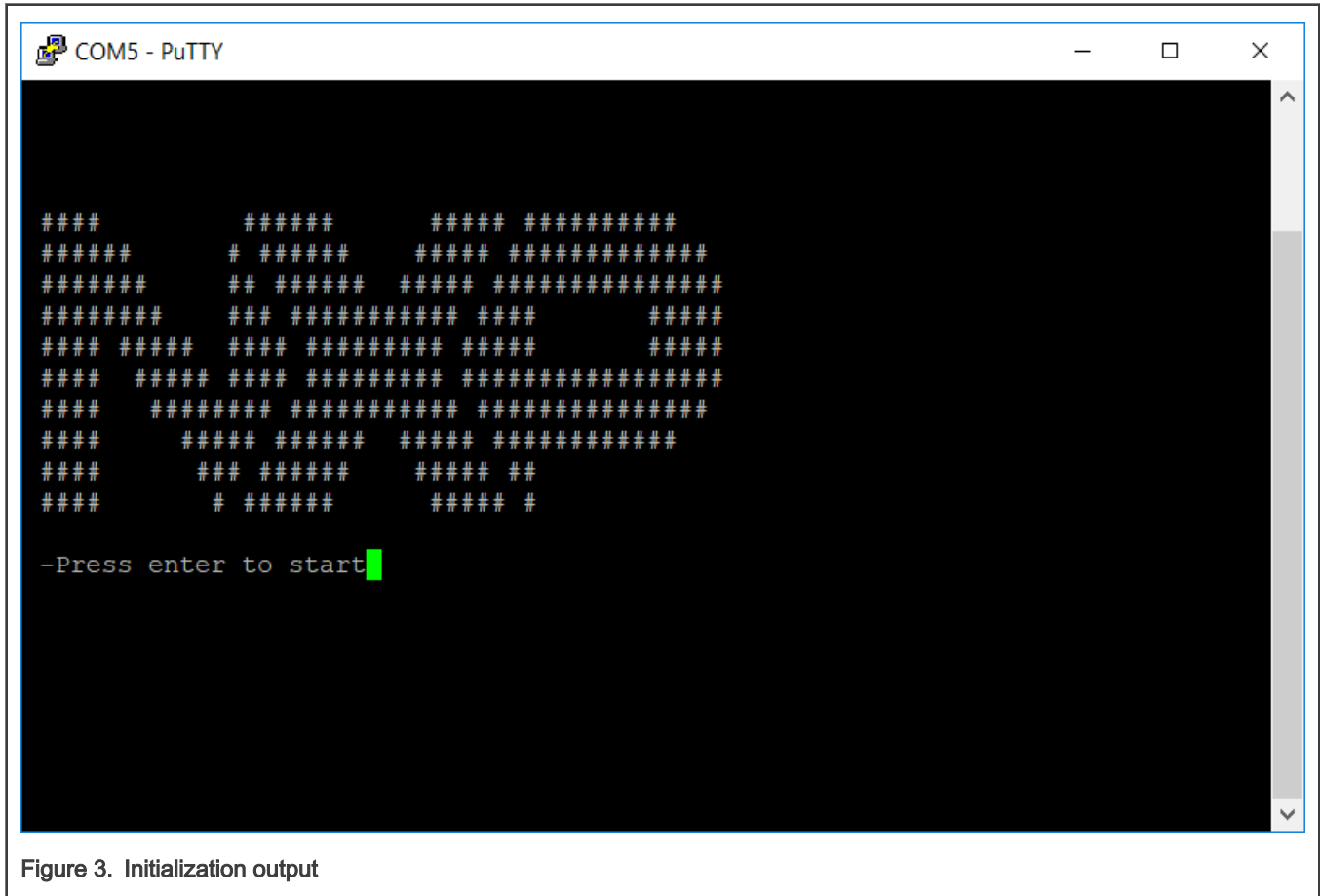


Figure 3. Initialization output

### 3.1 Test items

After pressing the **Reset** button (**SW4**) on the DK6 board, press **Enter**. The main menu is as shown in [Figure 4](#), with all the options and test items.

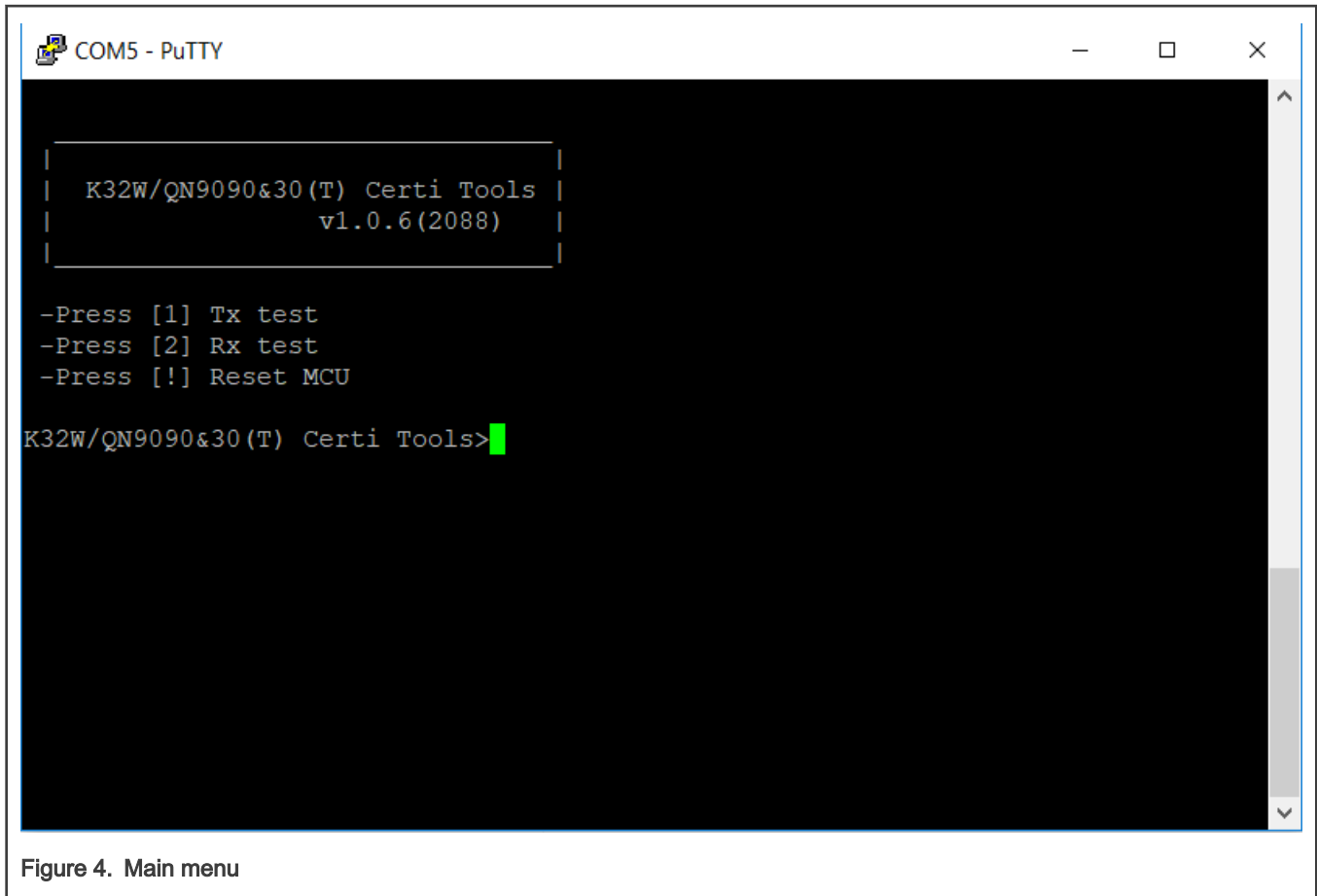


Figure 4. Main menu

### 3.2 Test options

#### 1. PHY 1 Mbps/2 Mbps

- Press [t] for PHY 1 Mbps.
- Press [r] for PHY 2 Mbps.

This option allows you to select the PHY 1 Mbps and PHY 2 Mbps operation for the test. The default mode is 1 Mbps.

#### 2. Channel change

- Press [q] for channel up.
- Press [w] for channel down.

The K32W/QN9090 can be configured to use any channel frequency between 2.402 and 2.480 GHz with each channel frequency interval 2 MHz. This parameter is used to select the channel number from 0 to 39. The default channel is **Channel 1**.

Table 1. Channels

Channel	Frequency(MHz)
0	2402
1	2404
2	2406

Table continues on the next page...

**Table 1. Channels (continued)**

Channel	Frequency(MHz)
.	.
.	.
.	.
19	2440
.	.
.	.
.	.
39	2480

**3. Tx RF power configurations**

- Press **[a]** for power up.
- Press **[s]** for power down.

This parameter specifies the RF Tx power when K32W/QN9090 is in Tx operation. Tx power level range from -30 dBm to 15 dBm. Step 1 dB, max 15 dBm is only for K32W041A/AM and max 10 dBm is for others. The default Tx power is 0 dBm. This parameter will be insignificant when K32W/QN9090 is in Rx operation.

**4. Payload length**

- Press **[n]** to increase the payload.
- Press **[m]** to decrease the payload.

This parameter specifies the payload length when K32W/QN9090 needs to send a packet of data. The default payload length is 37. This parameter will be insignificant when K32W/QN9090 is in the Rx operation.

**3.3 Test cases**

**3.3.1 Tx with random payload packet transmission**

The test case is used when the test requirement for the signal over the air is with random payload packet – PRBS9 transmission, as show in [Figure 5](#).

The Tx with random payload packet can be implemented according to the following steps.

- Press **[1]** to choose Tx tests and enable Tx test menu.
- Press **[2]** transmission using random – payload packets. The test is started.
- Select PHY 1 M/2 M by option **[t]** or **[r]**.
- Select Tx channel by pressing **[q]** or **[w]**.
  - Channel 0 for 2402 MHz
  - Channel 1 for 2402 MHz
  - ...
  - Channel 19 for 2440 MHz
  - ...
  - Channel 39 for 2480 MHz
- Select Tx power by pressing **[a]** or **[s]**. The default Tx power is 0 dBm.



- Select payload length by pressing **[n]** or **[m]**.
- Press **[1]** to stop the emission.
- Press **[p]** to go back to the main menu.

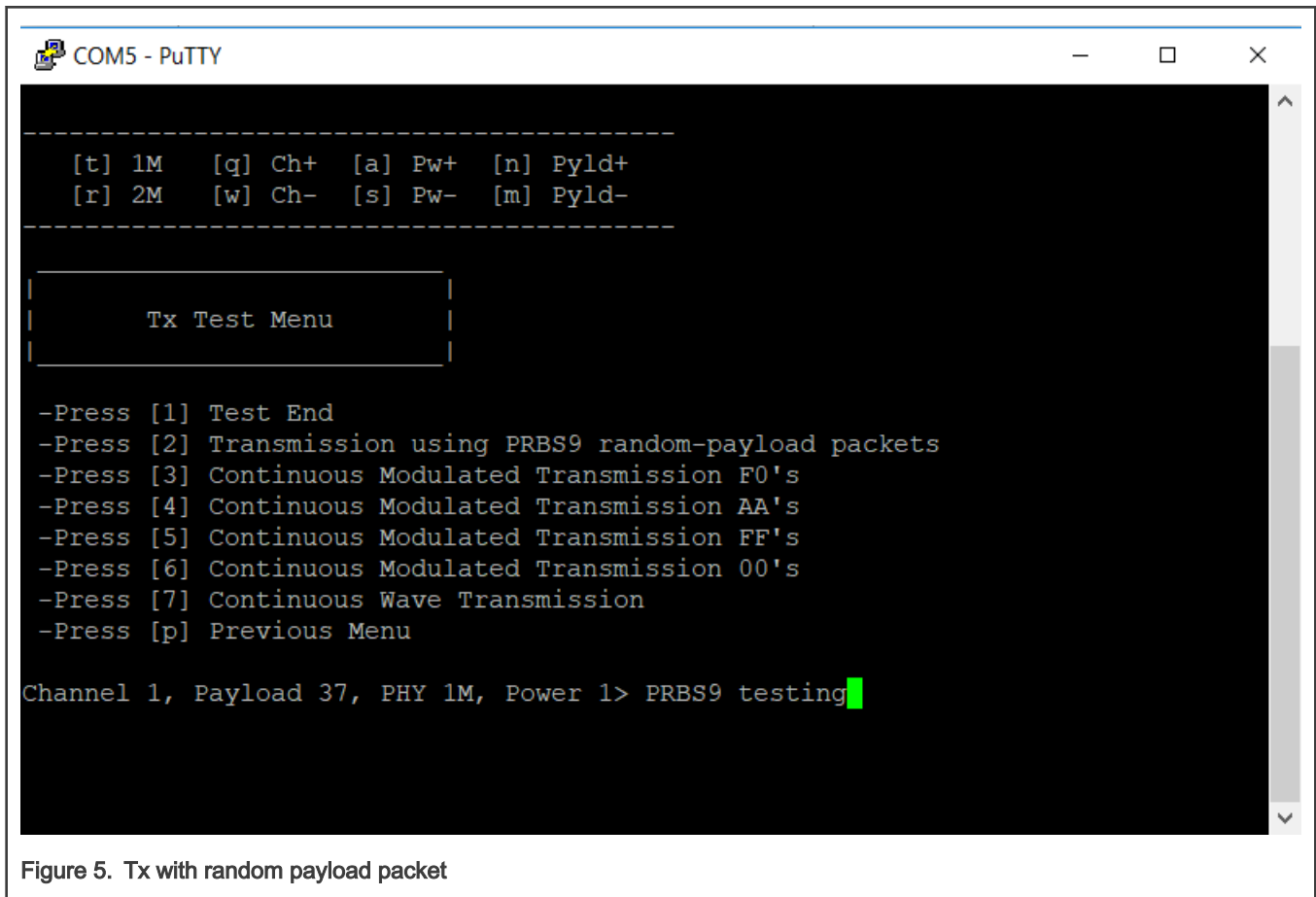


Figure 5. Tx with random payload packet

### 3.3.2 Tx with continuous transmission

The test case is used when the test requirement for the signal over the air is with the continuous transmission.

The Tx with modulation can be implemented according to the following steps. The operation is as shown in [Figure 6](#).

- Press **[1]** to choose Tx tests and enable the Tx test menu.
- Select **[3]** for F0, **[4]** for AA, **[5]** for FF, and **[6]** for 00 payload type continuous transmission. The test is started. These two options, **[5]** and **[6]**, do not give modulated emission but a CW with +/- 250 kHz frequency offset for 1 M and +/-500 kHz for 2 M.
- Select PHY 1 M/2 M by pressing **[t]** or **[r]**.
- Select Tx channel by pressing **[q]** or **[w]**.
  - Channel 0 for 2402 MHz
  - Channel 1 for 2402 MHz
  - ...
  - Channel 19 for 2440 MHz
  - ...
  - Channel 39 for 2480 MHz

- Select Tx power by pressing **[a]** or **[s]**. The default Tx power is 0 dBm.
- Press **[1]** to stop the emission.
- Press **[p]** to go back to the main menu.

**NOTE**

The two cases above illustrate how to choose test items and set options. Generate your test cases with the test items and options per the RF certification requirements.

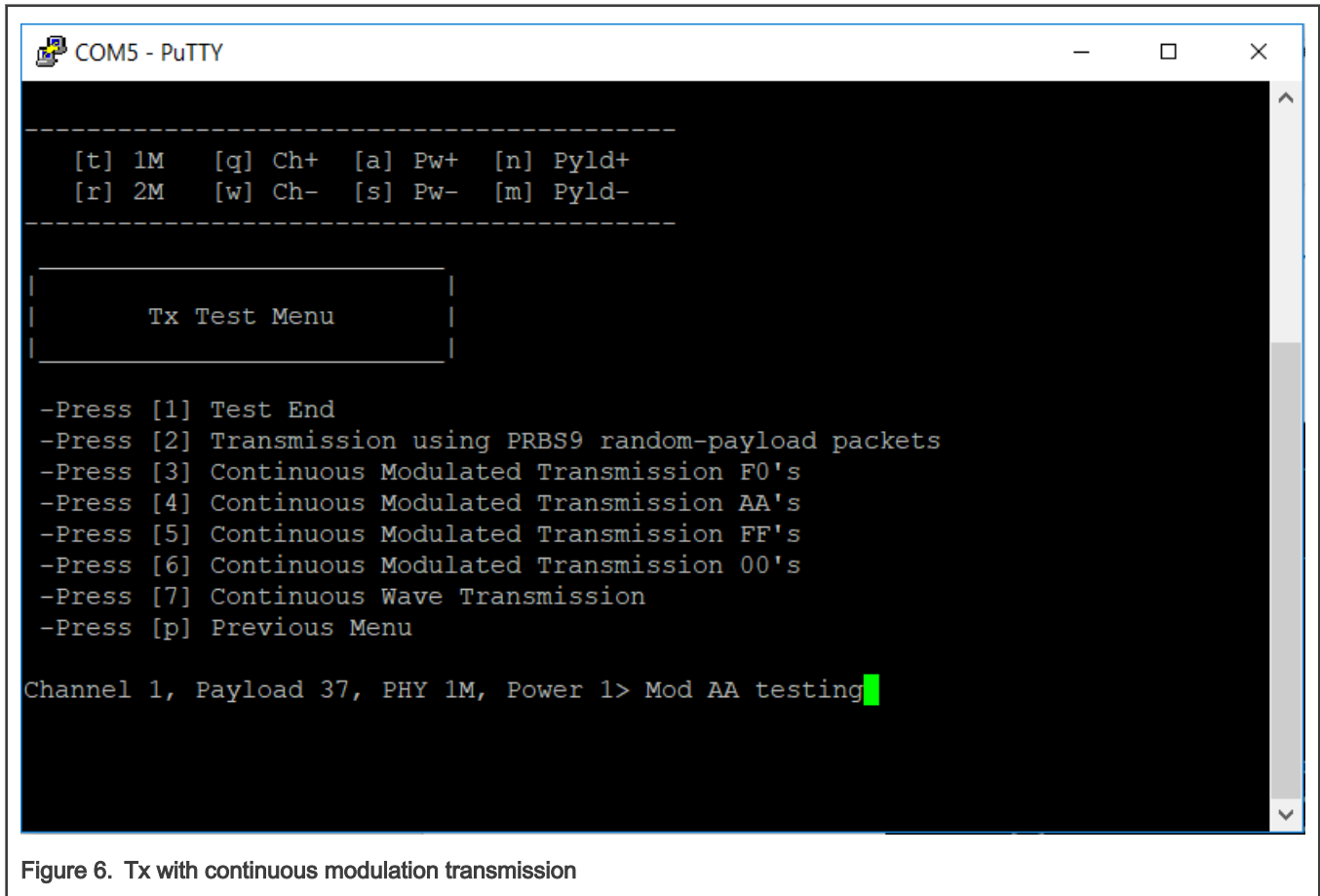


Figure 6. Tx with continuous modulation transmission

### 3.3.3 TX with CW signal transmission

The test case is used when measured the band edge test case of FCC.

The TX with modulation can be implemented according to the following steps, and the operation is as shown in [Figure 7](#).

1. Press **[1]** to choose TX tests and enable the TX Test menu.
2. Select **[7]** for CW signal transmission, and the test is started.
3. Select PHY 1 M/2 M by option **[t]** or **[r]**.
4. Select TX channel by option **[q]** or **[w]**.
  - Channel 0 for 2402 MHz
  - Channel 1 for 2402 MHz
  - ...
  - Channel 19 for 2440 MHz

- ...
  - Channel 39 for 2480 MHz
5. Select TX power by option **[a]** or **[s]**. The default TX power is 0 dBm.
  6. Press **[1]** to stop the emission.
  7. Press **[p]** back to Main menu.

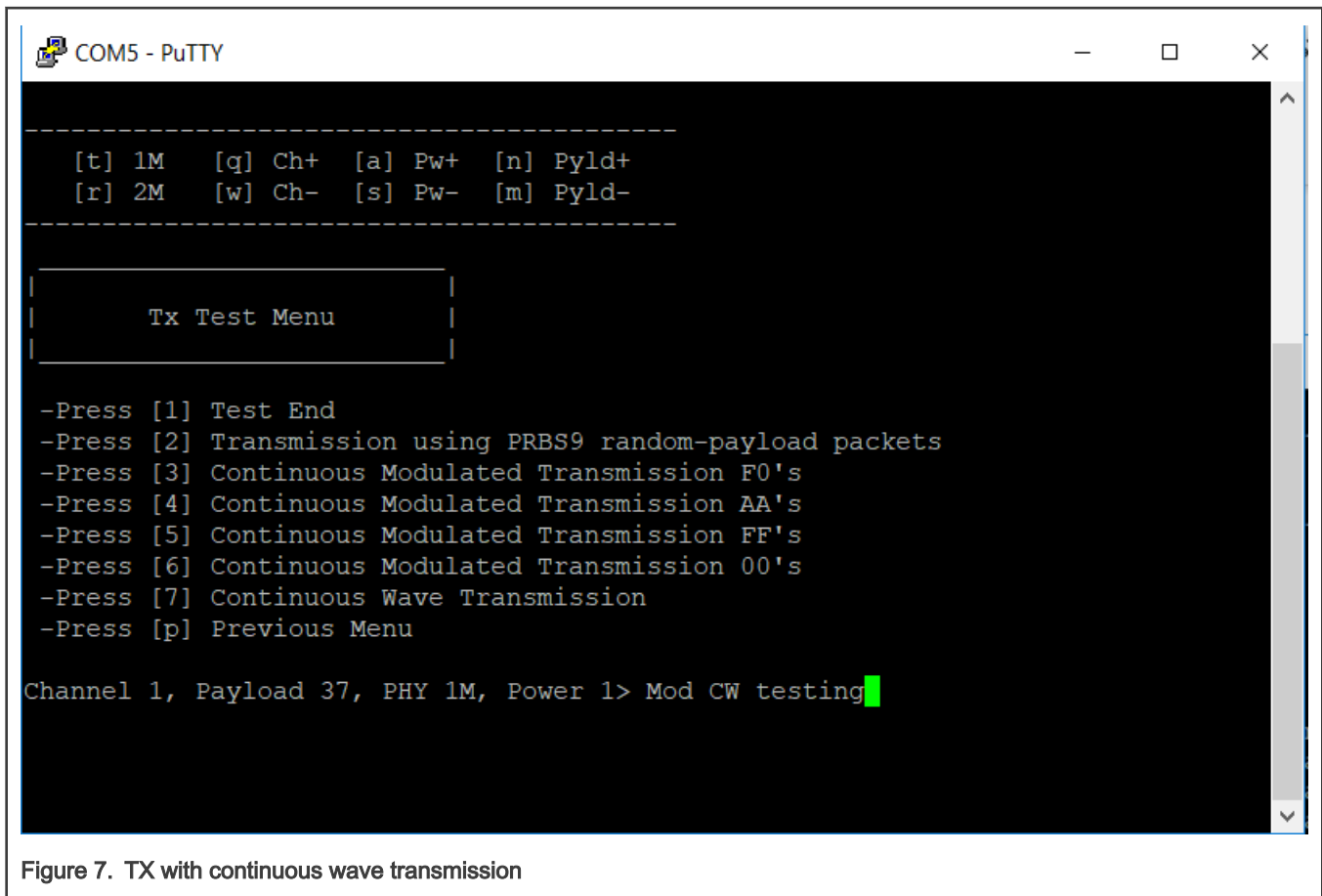


Figure 7. TX with continuous wave transmission

### 3.3.4 Rx trigger mode test

The Rx Trigger mode puts the K32W/QN9090 in the receiving mode on a channel selected by the user. The device counts the number of packets received and displays the number of packets actually received. HW needs to connect the trigger port of signal generator to DIO17 of DK6 board.

On the signal generator, once DIO17 of DK6 board has been connected, it triggers the input to synchronize packet transceiving between the module and the signal generator.

The Rx trigger mode test can be implemented according to the following steps. The operation is as shown in [Figure 8](#).

- Press **[2]** to choose Rx operation and enable the Rx test menu.
- Select PHY 1 M/2 M by pressing **[t]** or **[r]**.
- Select Rx channel by pressing **[q]** or **[w]**.
  - Channel 0 for 2402 MHz
  - Channel 1 for 2402 MHz
  - ...

- Channel 19 for 2440 MHz
- ...
- Channel 39 for 2480 MHz
- Press **[1]** to select RX trigger mode.
- Press **[Enter]** to start RX testing, wait for the test to be done, and then display the number of received packets and also PER.
- Press **[ENTER]** to go back to the Rx test menu.

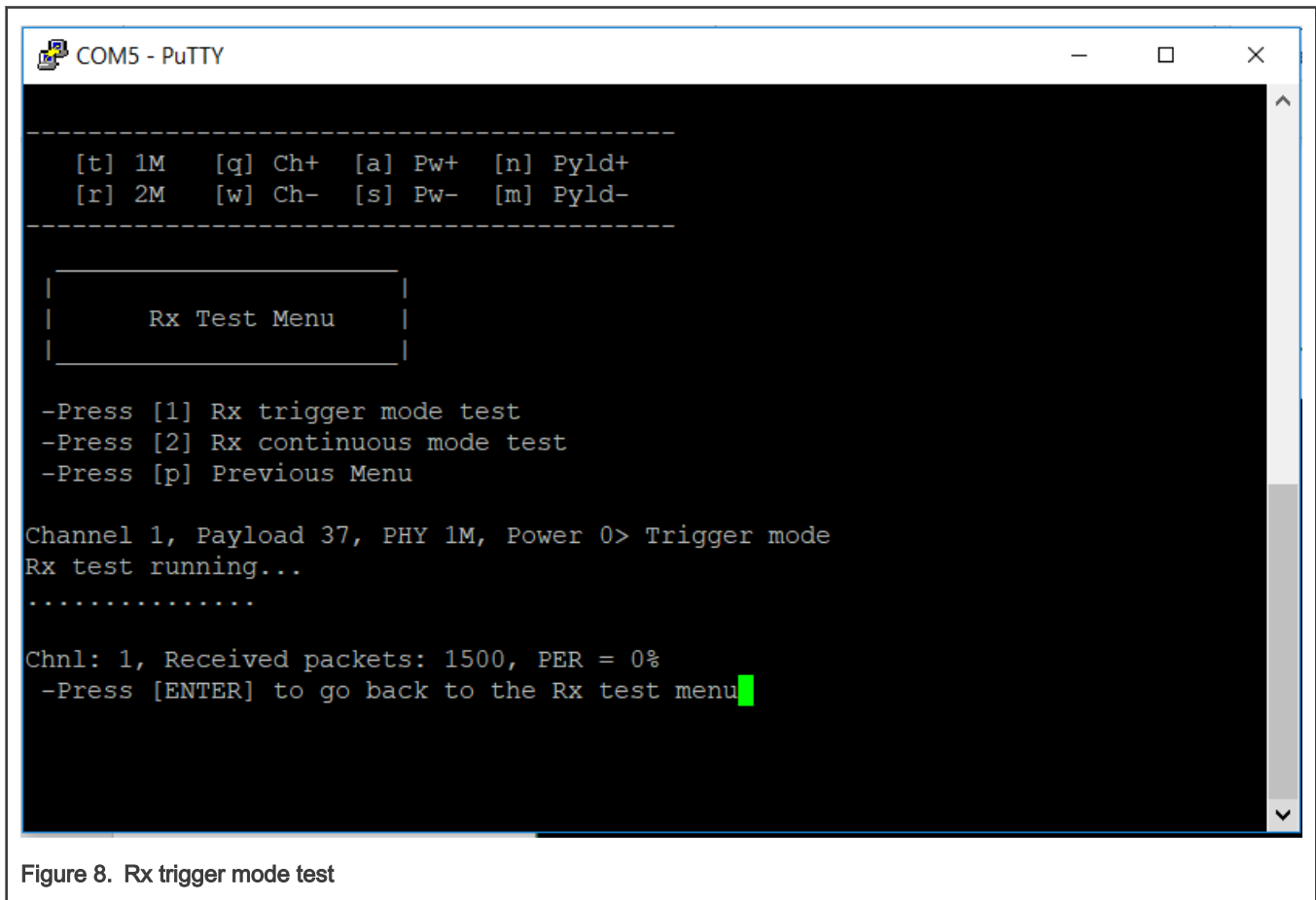


Figure 8. Rx trigger mode test

### 3.3.5 Rx continuous mode test

The Rx continuous mode test puts the K32W/QN9090 in the receiving mode on a channel selected by the user. The device counts the number of packets received and displays the number of packets actually received.

The Rx continuous test can be implemented according to the following steps. The operation is as shown in [Figure 9](#).

- Press **[2]** choose Rx operation and enable the Rx test menu.
- Select PHY 1M/2M by pressing **[t]** or **[r]**.
- Select RX channel by pressing **[q]** or **[w]**.
  - Channel 0 for 2402 MHz
  - Channel 1 for 2402 MHz
  - ...
  - Channel 19 for 2440 MHz

- ...
- Channel 39 for 2480 MHz
- Press **[ENTER]** to start the RX testing.
- Send the Bluetooth LE packets by the signal generator.
- Press **[space bar]** to stop the Rx testing, and then display the number of received packets.
- Press **[ENTER]** to go back to the Rx test menu.

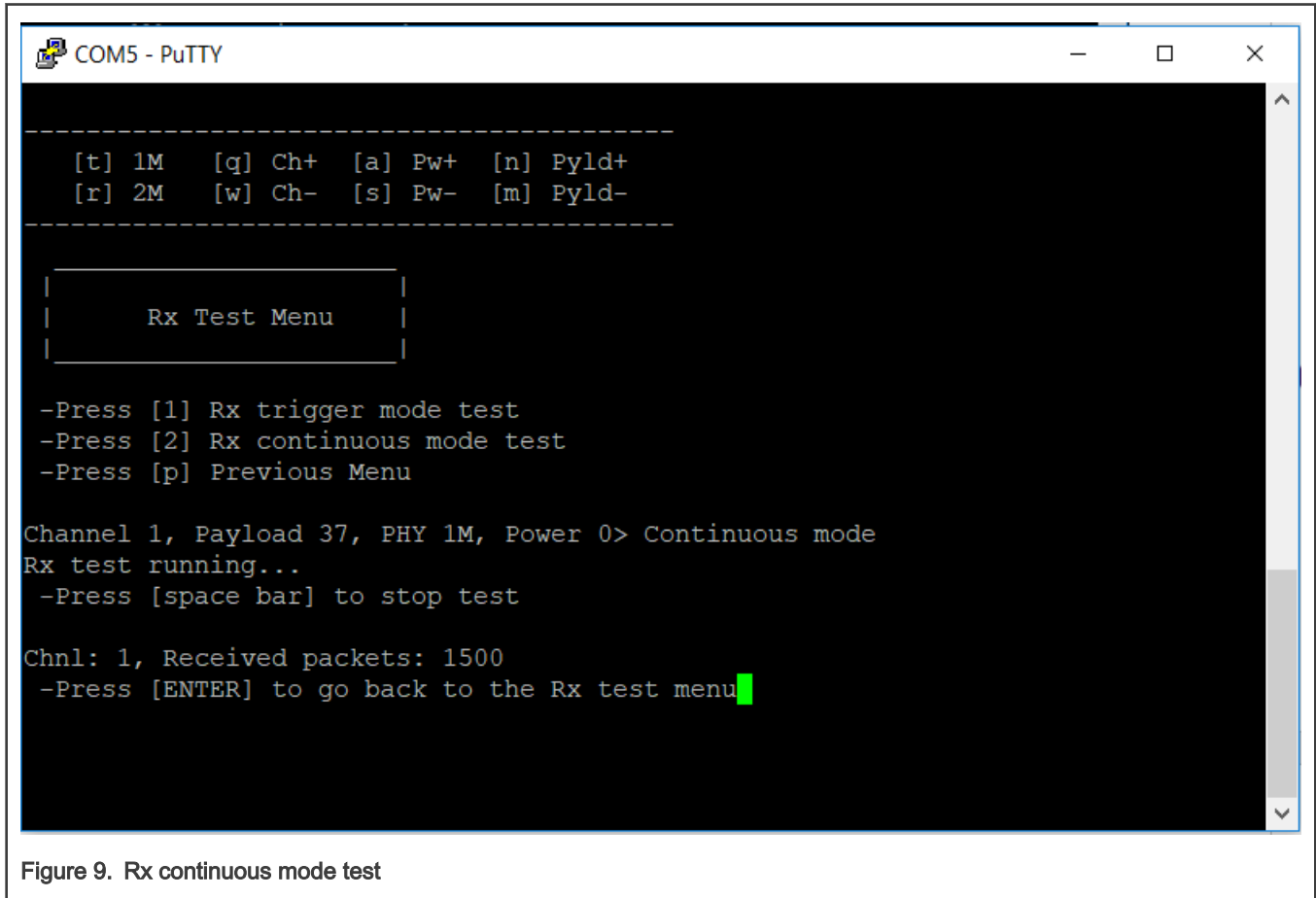


Figure 9. Rx continuous mode test

# Chapter 4

## Revision history

Table 2. Revision history

Rev	Date	Description
0	06/2020	Initial release
1	09/2020	<ul style="list-style-type: none"><li>• Updated <a href="#">Figure 4</a>, <a href="#">Figure 5</a>, and <a href="#">Figure 6</a></li><li>• Added <a href="#">TX with CW signal transmission</a></li></ul>

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