CMOSTEK

AN168

CMT2218B/2219B RF-EB User Guide

Overview

The evaluation platform is designed specifically for users to evaluate the performance of CMOSTEK wireless chips. The evaluation platform is composed of a pair of general purpose wireless evaluation boards (RF-EB) and a wireless receiver chip module (CMT2218B/2219B-EM). By transmitting through the platform and receiving through the wireless receiving module (CMT2218B/2219B-EM), users evaluate the major features of the CMT2218B/2219B such as communication distance in actual environment, signal strength and packet loss rate.

The product models covered in this document are shown in the table below.

Table 1. Product Models Covered in This Document

Product Model	Frequency Range	Modulation Method	Chip Function	Configuration Method	Package
CMT2218B	127 - 1020 MHz	FSK	Receiving	Programming	QFN16
CMT2219B	127 - 1020 MHz	(G)FSK/OOK	Receiving	Register	QFN16

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1 Hardware Platform

1.1 Evaluation Board (RF-EB)

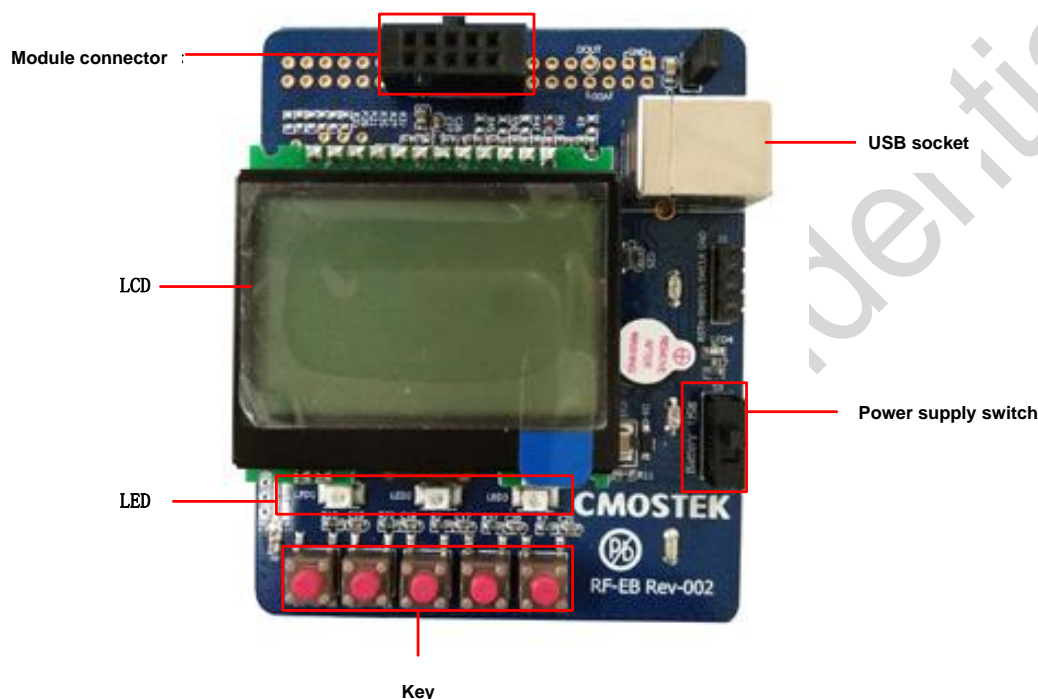The major components of the evaluation board are shown in the below figure.

Figure 1. Evaluation Board

1. Module connector (EM-Connector) – it is a 10-pin and 2.54 mm long female connector used to connect the evaluation board and wireless module.

2. LED - there are 3 LEDs to indicate operating states of the evaluation board.

    LED 1 - flashing once indicates a data frame is transmitted by the RF-EB successfully.

    LED 2 - flashing once indicates a data frame is received by the RF-EB successfully.

    LED 3 - flashing once indicates that a data frame is transmitted or received by the RF-EB with failure.

3. Power supply switch – the power supply switch (S3) controls the power supply source of the RF-EB. When it is turned to *USB* side, the RF-EB is powered through USB socket. When it is turned to the *battery* side, the RF-EB is powered by a battery.

4. USB socket – it connects the RF-EB to a PC providing power supply for the RF-EB.

5. LCD - the RF-EB provides a LCD with a 128x64 pixels resolution for displaying both features and performance demonstration and configuration guidance of the wireless module.

6. Keys - the RF-EB provides 5 keys (K1 - K5), through which users can configure the wireless module following the guidance information displayed on the LCD.

1.2 Wireless Receiving Module (CMT2218B/2219B-EM)

The CMT2218B/CMT2219B-EM is the evaluation module corresponding to wireless receiver chips of CMOSTEK, which is composed of a simple peripheral circuit, a matching network and a CMT2218B/2219B chip. The top and bottom views of the CMT2219B-EM are shown in the below figure. Moreover, the top and bottom views and pin description of 2218B and 2219B are identical.
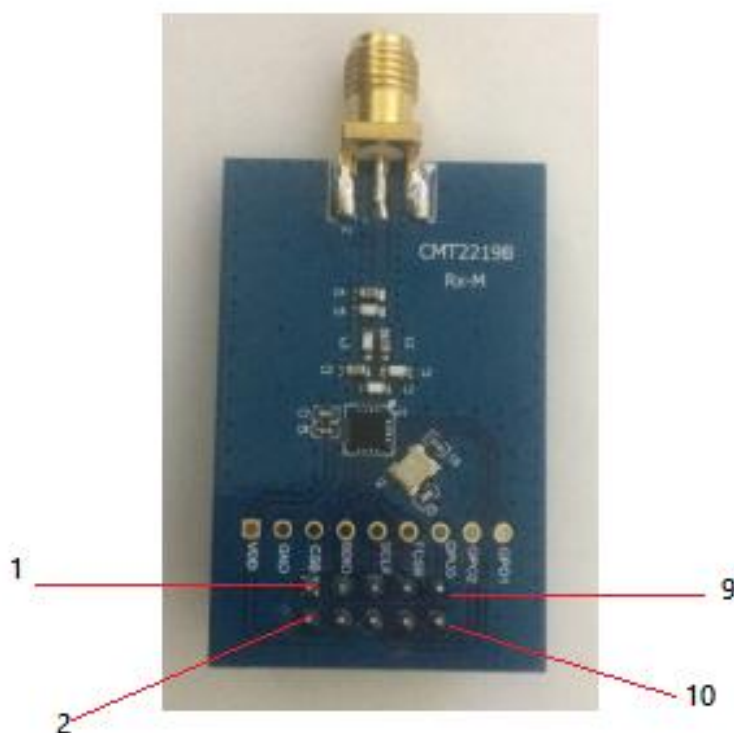

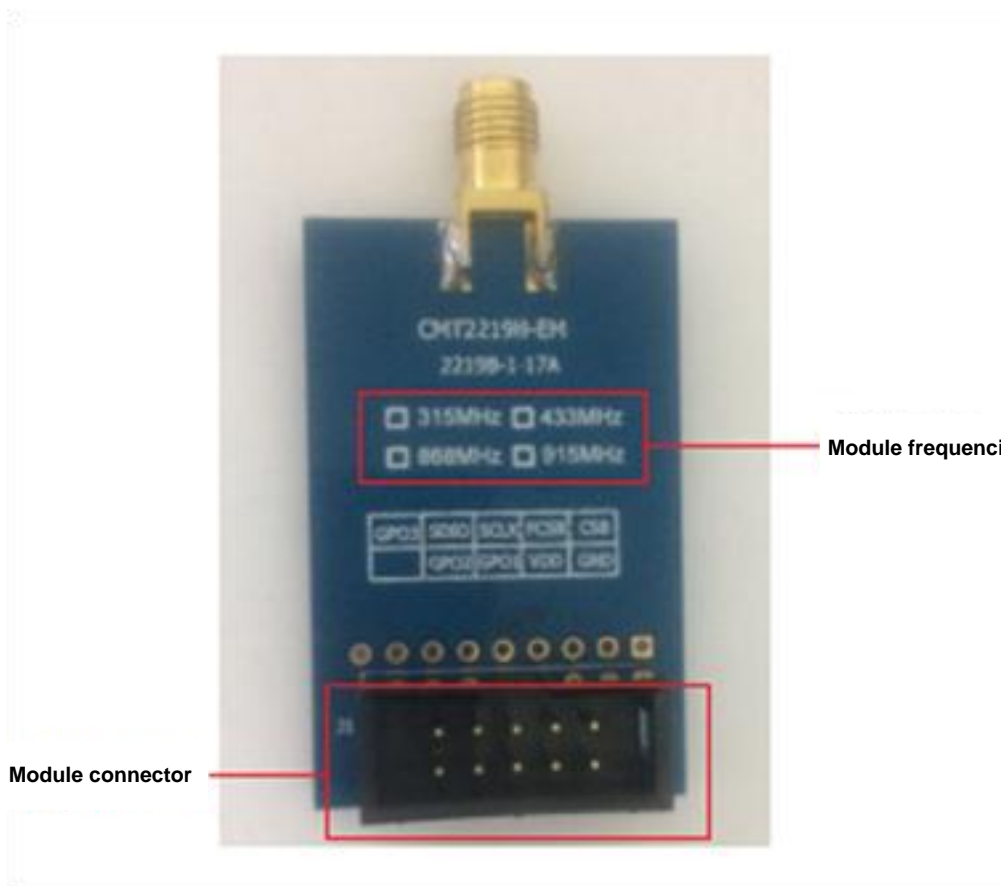**Figure 2. Top View of CMT2219B-EM**

Figure 3. Bottom View of CMT2219B-EM

Table 2. CMT2218B/2219B-EM PIN Description

Pin	Description
1	CSB
2	GND
3	FCSB
4	VDD
5	SCLK
6	GPO1
7	SDIO
8	GPO2
9	GPO3
10	NC

The CMT2218B/2219B-EM supports the frequencies (EM Frequency) of 315 MHz, 433 MHz, 868 MHz and 915 MHz.

2 Evaluation Platform Operation Guide

2.1 Functional Icons in LCD Guidance

The LCD functional icons provide guidance for users to configure the CMT2218B/2219B-EM. The specific functions are shown in the below table.

Table 3. LCD Functional Icon Description

Functional Icon	Description
>	Cursor pointer, which points to the configurable elements only.
↑↓	Move the cursor pointer up and down.
Reset	Back to the initial configuration page for reconfiguration.
<-	Back to the previous configuration page.
->	Skip to the next configuration page.
+	Increase parameter value or select the next option.
-	Decrease parameter value or select the previous option.
OK	Start setting the relevant parameters to the EM and prepare to start Tx/Rx.
TxOn	Start transmitting. It transmits the previously defined data frame repeatedly until the TxOff icon is pressed.
TxOff	Stop transmitting data frames.
RxOn	Start receiving. It receives data frames until the RxOff icon is pressed.
RxOff	Stop receiving data frames.

2.2 Evaluation Platform Operation Flow

The evaluation platform operation flow is as follows.

1. Turn off the power supply of the RF-EB. Insert the wireless module into the slot of the wireless module connector of the RF-EB. Make sure the CMT2218B/2219B-EM is connected properly to the RF-EB.

2. Turn on power supply of the RF-EB. At this time, the information *NextGenRF Production CMOSTEK RF-EB Vxx.xx* is displayed on the LCD screen for about 2 seconds with LED1, LED2 and LED3 flashing once.

3. Follow the LCD guidance, set the parameters to the RF chip step by step, then start transmitting or receiving data frames.

2.3 Introduction to Configuration Parameters

The evaluation platform supports 4 functional UI screens including chip function configuration screen, wireless parameter configuration screen 1, wireless parameter configuration screen 2 and data frame configuration screen. In addition, the platform supports a configuration display screen to show important configuration information.

2.3.1 Chip Function Configuration Screen (Chip Setting)

In this configuration screen, it shows the part no. and chip function as shown in the below figure.
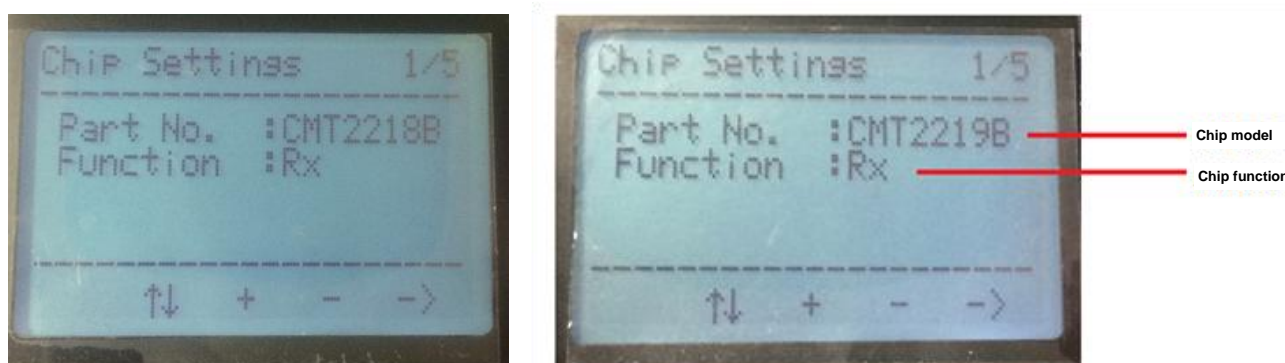
Figure 4. CMT2218B/2219B Chip Function Configuration

Part No. - it is identified automatically during RF-EB startup.

Chip function - the RF-EB evaluation platform provides TX, RX and TRX functions. As the CMT2218B/CMT2219B is a receiving-only module, the chip function is fixed in the configuration screen, no need for user configuration. Please see more details in the below table.

Table 2. RF-EB Chip Function Description

Chip Function	Description
TX	The RF-EB repeats data frame transmitting intermittently and displays the number of transmitted data frames on the LCD.
RX	The RF-EB receives data frames and displays the number of received data frames on the LCD.
TRX	It depends on device type. If device type is *master*, the RF-EB transmits a data frame, then enters receiving mode waiting for the responding data frame from the slave device. If device type is *slave*, the RF-EB receives a data frame, then enters transmitting mode and responds to the master with a data frame.

2.3.2 RF Parameter Configuration Screen 1 (RF Parameters)

In this configuration screen, users can configure the chip's modulation and demodulation, data rate, operating frequency and operating frequency deviation as shown in the below figure.

Figure 5. CMT2219B/2218B RF Parameter Configuration Screen 1

Modulation and demodulation - the CMT2219B RF-EB provides 3 modulation and demodulation modes for user to choose, including OOK, FSK and GFSK, while the CMT2218B RF-EB supports FSK modulation and demodulation only.

Data rate - the RF-EB supports a variety of configurable data rates. The following data rates are available for 2219B/2218B as shown in the below table .

Table 3. CMT2219B Data Rates

Modulation Method	OOK	FSK/GFSK	
Data rate (kbps)	1.2	1.2	30
	2.4	2.4	40
	4.8	2.5	50
	9.6	4.8	100
	19.2	5	150
	30	9.6	200
	40	10	250
		19.6	300
		20	

Table 6. CMT2218B Data Rates

Modulation Methods	FSK	
Data rate (kbps)	1.2	10
	2.4	20
	2.5	30
	4.8	40
	5	50

Operating frequency point (frequency) - the RF-EB provides the following configurable operating frequency points as shown in the below table.

Table 7. CMT2218B/2219B Operating Frequency Point

Operating Frequency Point (Unit：MHz)	
169.00	470.00
315.00	840.90
317.00	868.00
433.92	915.00
436.00	920.00

The operating frequency deviation (deviation) configuration is available only when the FSK or GFSK modulation and demodulation mode is selected. Moreover, operating frequency deviation is subject to data rate configuration. The data rates and its corresponding operating frequency deviations are shown in the below table.

**Table 8. CMT2219B Data Rates and Corresponding Operating Frequency Deviations**

Data Rate (kbps)	Operating Frequency Deviation (kHz)
1.2	1.2, 2.5, 5, 10, 15, 20, 30, 40, 50, 80, 100, 150, 200
2.4, 2.5, 4.8, 5	2.5, 5, 10, 15, 20, 30, 40, 50, 80, 100, 150, 200
9.6, 10	5, 10, 15, 20, 30, 40, 50, 80, 100, 150, 200
19.6, 20	10, 15, 20, 30, 40, 50, 80, 100, 150, 200
30, 40, 50	20, 30, 40, 50, 80, 100, 150, 200
100	50, 80, 100, 150, 200
150, 200, 250, 300	80, 100, 150, 200

Table 9. CMT2218B Data Rates and Corresponding Operating Frequency Deviations

Data Rate (kbps)	Operating Frequency Deviation (kHz)
1.2	1.2, 2.5, 5, 10, 15, 20, 30, 40, 50, 80, 100, 150, 200
2.4, 2.5, 4.8, 5	2.5, 5, 10, 15, 20, 30, 40, 50, 80, 100, 150, 200
10, 20	5, 10, 15, 20, 30, 40, 50, 80, 100, 150, 200
30, 40	10, 20, 30, 40, 50, 80, 100, 150, 200
50	20, 30, 40, 50, 80, 100, 150, 200

2.3.3 RF Parameter Configuration Screen 2 (RF Parameters)

In this configuration screen, users can configure the data mode and transmit power of the chip, as shown in the below figure.
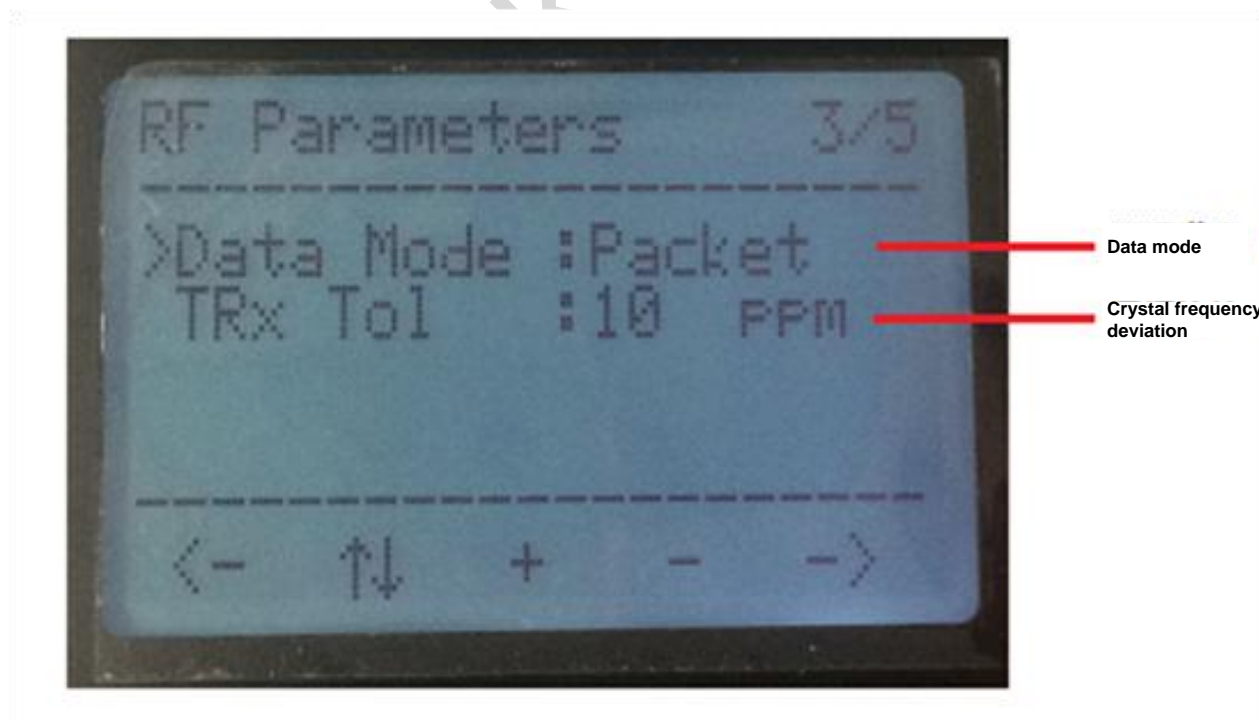
Figure 6. 2218B/2219B RF Parameter Configuration Screen 2

Data mode - the 2219B RF-EB supports 2 data modes, direct mode and packet mode. When a data rate is greater than 100 kbps, only packet mode (packet) is supported. The 2218B supports direct mode (direct) only.

Crystal frequency deviation (TRxTol) - it support users to select one of the crystal deviation values including 5, 10, 20, 40, 60, 80 ppm, with 10 ppm as default.

2.3.4 Data Frame Configuration Screen

In this configuration screen, users can configure information such as preamble, synchronization code, and data frame length, as shown in the below figure.
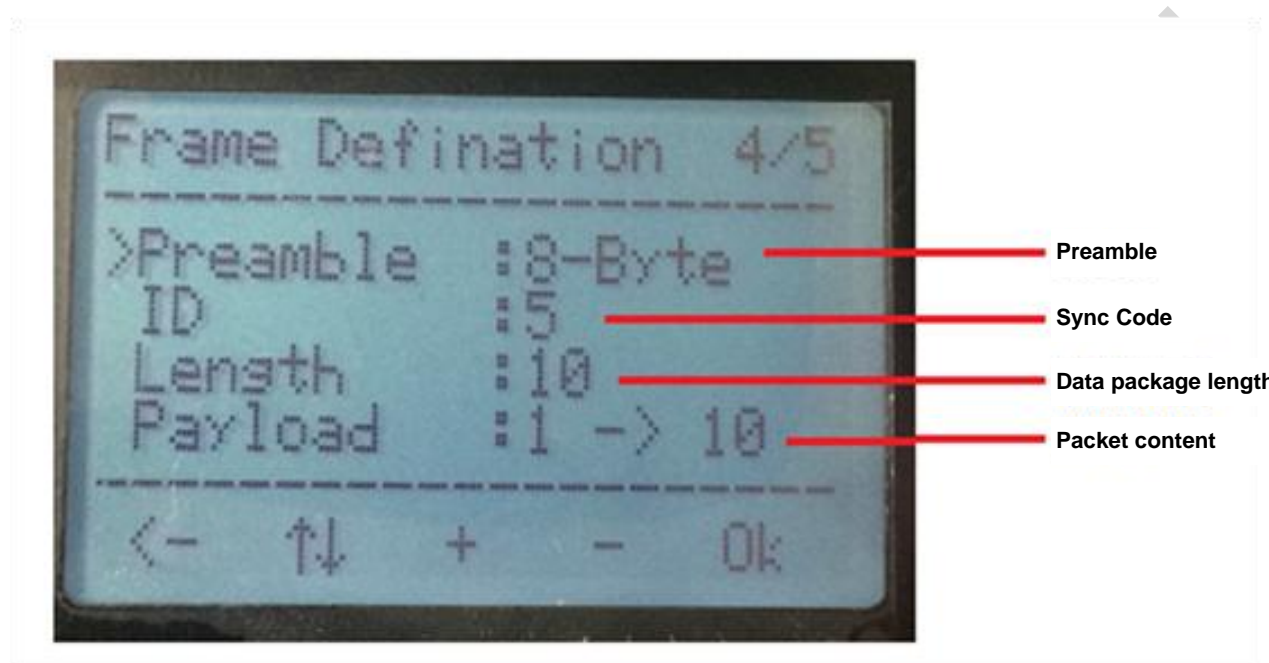
Figure 7. 2218B/2219B Data Frame Configuration Screen

Preamble - it can be configured as 1 - 8 bytes.

Sync Code (ID) - it can be configured as a number between 0 and 9 in the RF-EB screen. The sync code configured to the chip is actually a 4-byte value as 0x(0x55+ID)(0x55+Length)5678.

Data package length (length) - it is the length of the actual transmitted packet content, which can be configured as a value between 1 and 32. This configuration affects the actual sync code and packet content configuration.

Packet content (payload) - it depends on packet length. The packet size is between 1 and the data packet length (length).

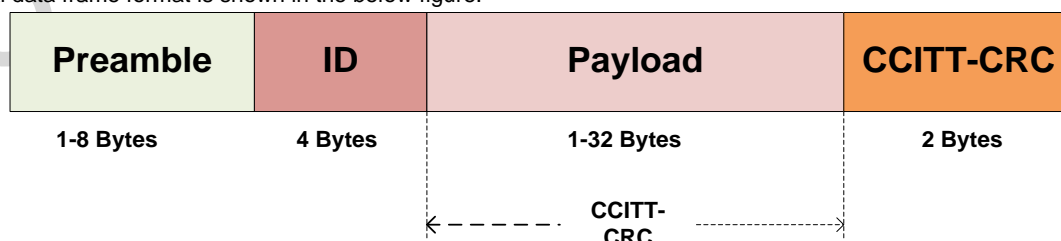The actual data frame format is shown in the below figure.

Figure 2. Data Frame Format

2.3.5 Configuration Information Display Screen

Users can view some configuration information of the chip and the number of received and transmitted data frames, as shown in the below figure.
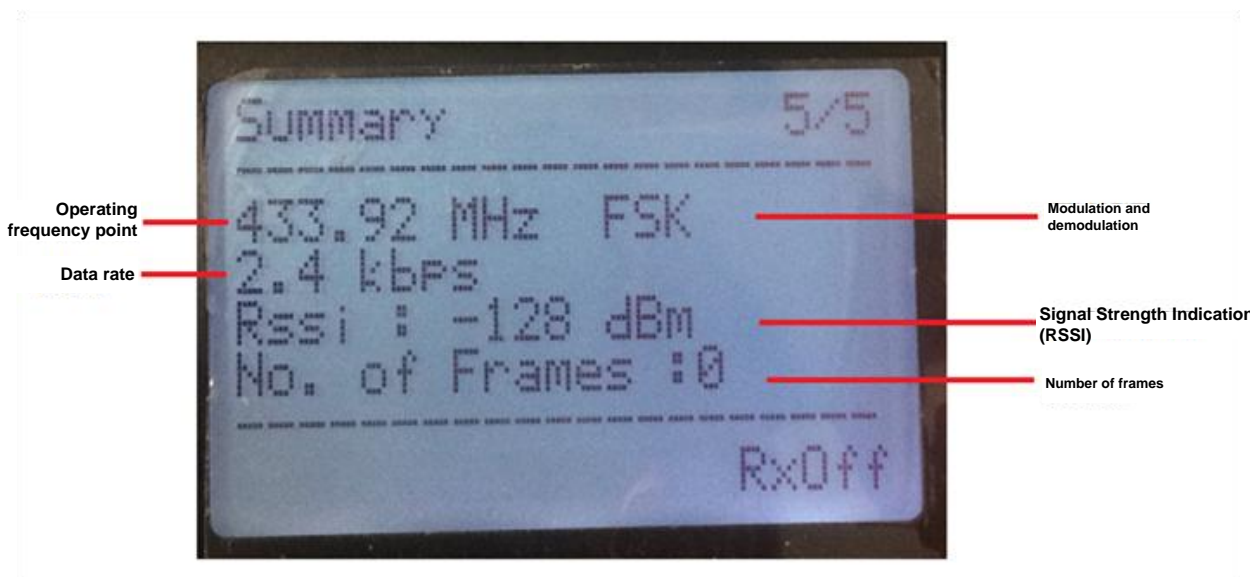

Figure 3. 2218B/2219B Configuration Information Screen

Signal strength indication (RSSI) - it indicates the signal strength of the received data frames. Signal strength indication information display is not supported for the 2218B.

Data frame (frames) - it refers to the number of received or transmitted data frames.

3 Revise History

Table 10. Revise History Records

Version No.	Chapter	Description	Date
0.7	All	Initial version	2018-10-10

4 Contacts

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