

FCC Regulatory Certification (NXP)

Test Guide - Rev. 3.0



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About This Document

This document provides some lab test procedures for Federal Communications Commission (FCC) Part 15C regulatory certification for Murata Wi-Fi/Bluetooth modules based on NXP wireless chipsets. Both NXP and Embedded Artists' i.MX Developer's kits can be used as reference platforms to perform the regulatory testing.

This document does not cover other regulatory certification tests required for FCC such as unintentional radiation or RF exposure test. Details for complete regulatory certification tests are available from regulatory test lab.









Audience & Purpose

This document is targeted towards Regulatory Certification test engineers of NXP i.MX application processor-based solutions, running Linux operating system.

Document Conventions

Table 1 describes the document conventions.

Table 1: Document Conventions

Conventions	Description
	Warning Note Indicates very important note. Users are strongly recommended to review.
	Info Note Intended for informational purposes. Users should review.
	Menu Reference Indicates menu navigation instructions. Example: Insert → Tables → Quick Tables → Save Selection to Gallery 
	External Hyperlink This symbol indicates a hyperlink to an external document or website. Example: Embedded Artists AB  Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. Example: Introduction  Click on the text to open the link.
<pre>Console input/output or code snippet</pre>	Console I/O or Code Snippet This text Style denotes console input/output or a code snippet.
<pre># Console I/O comment // Code snippet comment</pre>	Console I/O or Code Snippet Comment This text Style denotes a console input/output or code snippet comment. <ul style="list-style-type: none"> • Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output. • Code Snippet comment (preceded by "//") may exist in the original code.

1 Murata Certified Wi-Fi[®] and Bluetooth[®] Modules

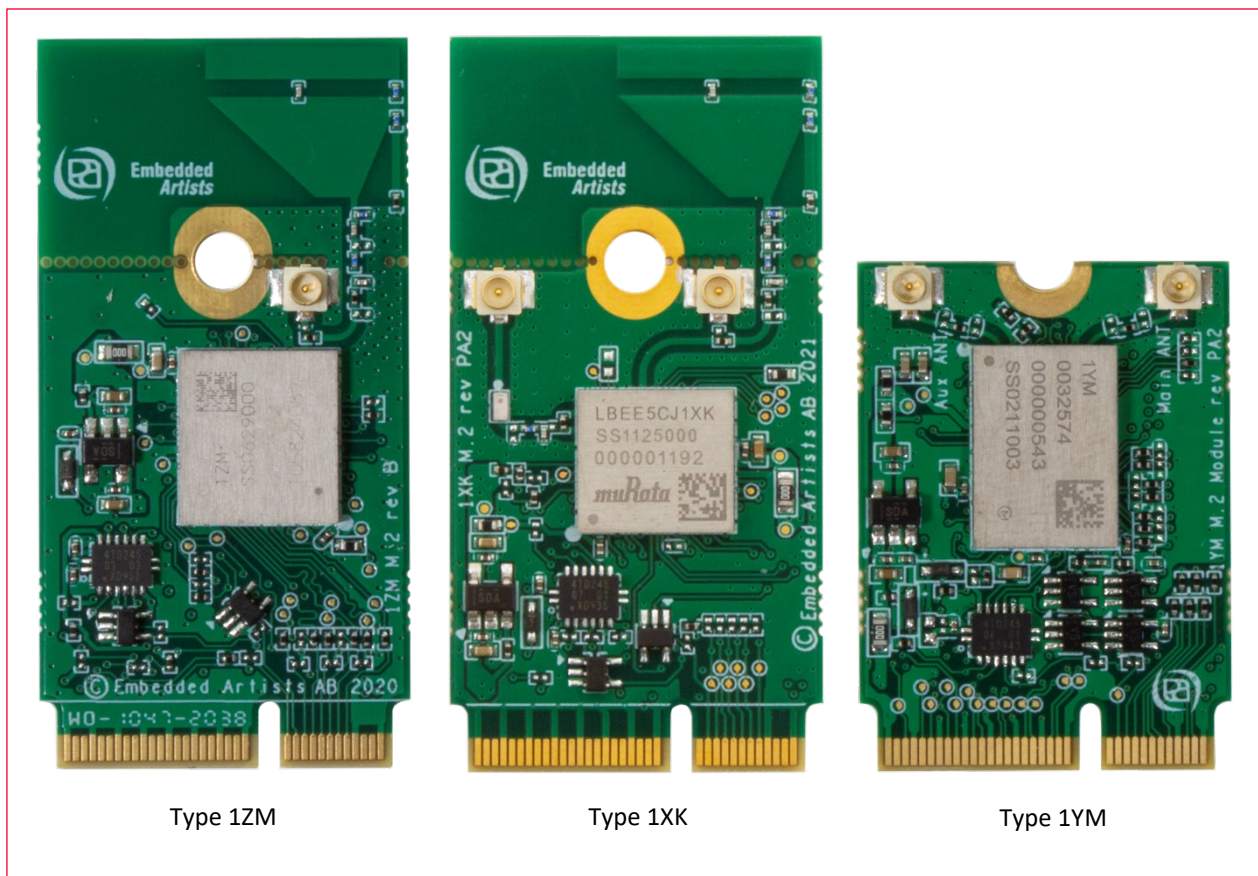
Murata designs and manufactures IEEE 802.11 WLAN and Bluetooth radio modules that can be FCC certified or non-certified. A customer device that installs a non-certified radio module shall go through full FCC certification process to obtain the certified FCC ID.

Most of the Murata modules are reference certified that can significantly reduce the customer FCC certification effort. The following table lists the different NXP chipset-based Murata modules/EVBs and the offered FCC certification types.

Table 2: Murata Modules' Certification Types

Module	Interface	Certification Status	Antenna Options
1ZM ↗	SDIO	Reference certified	PCB trace, u.FL connector
1YM ↗	SDIO, PCIe	Reference certified	u.FL connector
1XK ↗	SDIO	Reference certified	PCB trace, u.FL connector

Figure 1: Murata Certified Wi-Fi and Bluetooth Modules



2 Wi-Fi RF Test

The first step to start the Wi-Fi regulatory testing is to perform rework on the EA's M.2 Evaluation Board (EVB) you are using. All the Murata modules (i.e., 1ZM, 1YM, 1XK) included in this document are based on NXP chipsets.

2.1 Hardware Setup

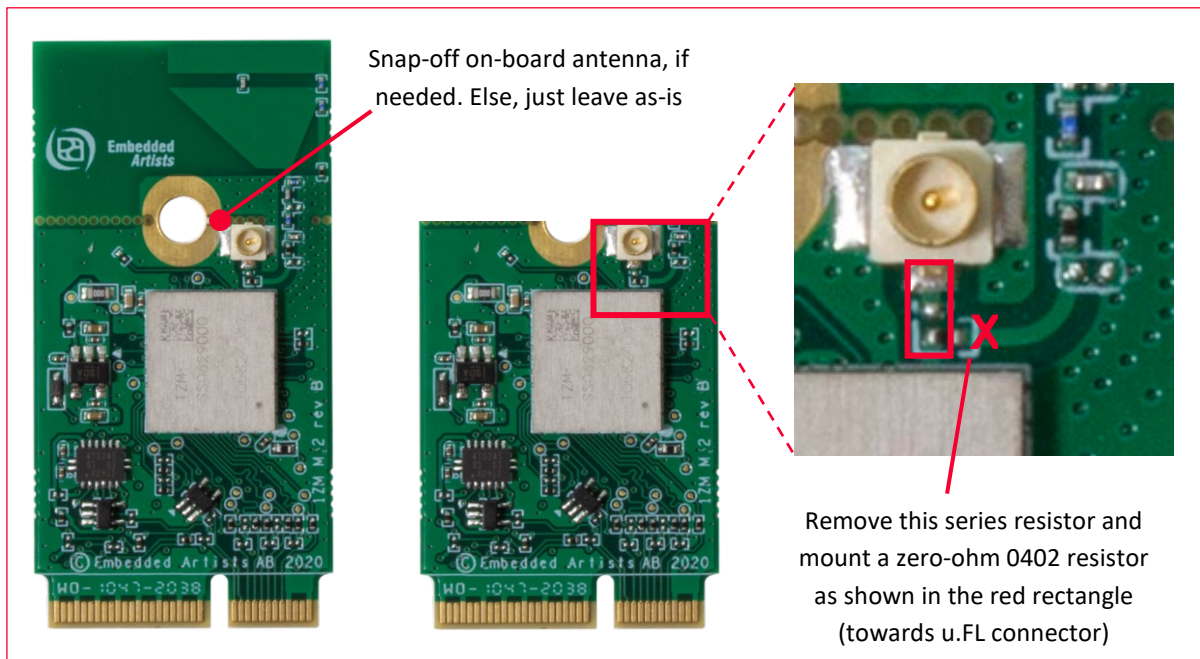
The Embedded Artists' 1ZM and 1XK M.2 EVBs have built in reference antennas. To direct the antenna connection to the u.FL connector, rework must be done. The same rework is needed for both Wi-Fi and BT testing.

2.1.1 Type 1ZM

Type 1ZM is a small and high-performance module based on NXP chipset 88W8987 combo chipset which supports Wi-Fi 802.11a/b/g/n/ac + Bluetooth 5.1 BR/EDR/LE.

The antenna connection from the 1ZM module can be redirected to u.FL connector by just moving one zero-ohm 0402 resistor. It is illustrated in the picture below:

Figure 2: Rework to Connect u.FL Connector for 1ZM



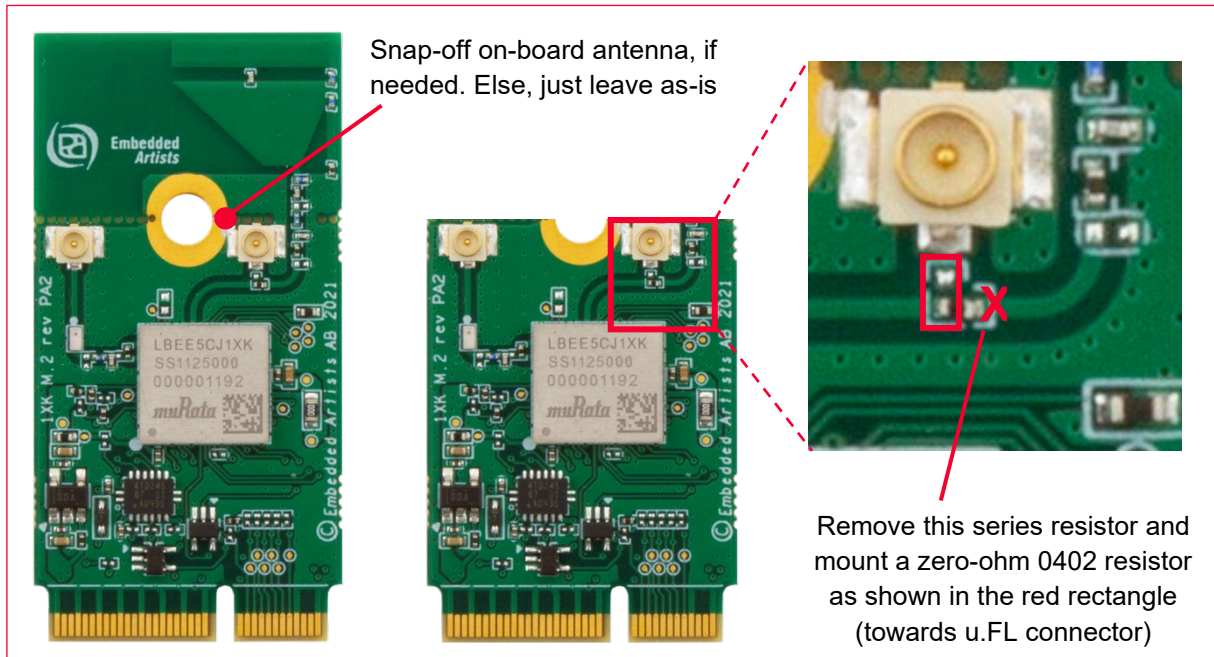
You do not need to snap-off the PCB trace antenna. It is completely optional.

2.1.2 Type 1XK

Type 1XK is a small and high-performance module based on NXP IW416 combo chipset which supports Wi-Fi 802.11a/b/g/n + Bluetooth 5.2 BR/EDR/LE up to 150 Mbps PHY data rate on Wi-Fi and 3 Mbps PHY data rate on Bluetooth.

The antenna connection from the 1XK module can be redirected to u.FL connector by just moving one zero-ohm 0402 resistor. It is illustrated in the picture below:

Figure 3: Rework to Connect u.FL Connector for 1XK

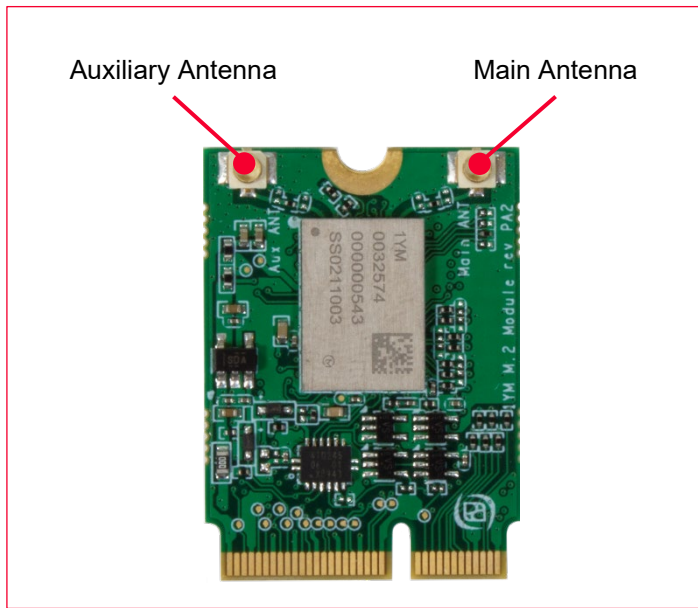


You do not need to snap-off the PCB trace antenna. It is completely optional.

2.1.3 Type 1YM

Type 1YM is a small and very high-performance module based on NXP 88W8997 combo chipset which supports Wi-Fi 802.11a/b/g/n/ac 2x2 MIMO + Bluetooth 5.2 BR/EDR/LE up to 866 Mbps PHY data rate on Wi-Fi and 3 Mbps PHY data rate on Bluetooth. The WLAN section supports PCIe v3.0 Gen 1/Gen 2 rate (2.5/5 Gbps), and SDIO 3.0 interfaces. The Bluetooth section supports high-speed 4-wire UART interface and PCM for audio data.

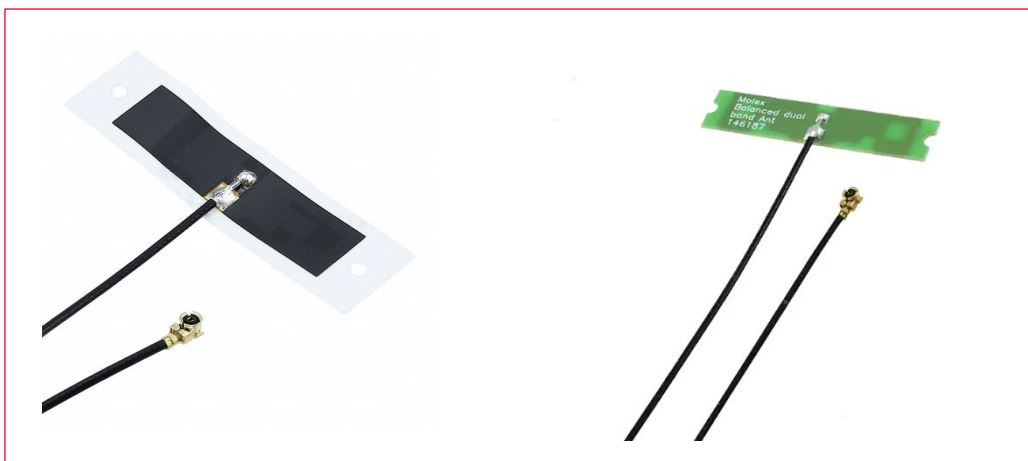
This module does not include a PCB trace antenna, so no hardware rework is necessary. Two external antennas must be connected (to support MIMO). Refer to [Section 2.1.4](#) for details of the antenna.

Figure 4: No Rework Needed to Connect u.FL Connector for 1YM


2.1.4 External Antenna

Murata recommends Molex 146153 (Digi-Key part number [WM12218-ND](#)) or Molex 146187 ([WM16990-ND](#)) module for use as external antenna with its EVBs. The same antenna is used for reference certification of the Type 1XA EVB.

The Molex 146153/146187 is a balanced, dipole-type, high efficiency antenna. It is ground plane independent, dual band antenna that supports the 2400-2500 MHz, 5150-5850 MHz, 5925-7125 MHz frequency bands. The physical size is 40.95 x 9 x 0.7 mm. The antenna cable come in 6 standard length options: 50/100/150/200/250/300 mm (100 mm is used for the reference certification) and the connector is MHF-I, which is a U.FL compatible connector.


Figure 5: Molex 146153 and 146187 Antennas


2.2 Software Setup

The first step to get started with the software set up is to download the latest image from the manufacturer's website.

2.2.1 Linux

First, we need to flash the developer's kit with Embedded Artist image. Download the UUU zip file for the board you are using from [Embedded Artists i.MX Related Resources page](#) .

To flash the i.MX board using UUU tool, please follow the steps mentioned in the Section 6 of Embedded Artist "Getting Started with M.2 modules and i.MX 6/7/8 on Linux v5.10" document. You can download the document from [here](#) .

After flashing the board, you need to load the driver to run the manufacturing tests on the module.

The following command can be used to check whether the driver has loaded correctly, and the firmware version.

```
$ dmesg | grep wlan
[ 36.681211] wlan: Loading MWLAN driver
[ 36.897899] wlan: Enable TX SG mode
[ 36.901413] wlan: Enable RX SG mode
[ 38.365267] wlan: version = SD8987---16.92.10.p208-MXM5X16215.p2-GPL- (FP92)
[ 38.372947] wlan: Driver loaded successfully
```



The version number of firmware should display the text "FP92".

Now you can run RF testing.



Disable all wpa_supplicant / hostapd and background scan operations before performing regulatory tests. To stop wpa_supplicant and hostapd, issue the commands "killall wpa_supplicant" and "killall hostapd".

3 Murata NXP RF Test Script

Murata has simplified the RF testing steps by providing an easy-to-use python script that can be run on the test platform. Steps for downloading and invoking the script are detailed here.

3.1 Dependency

The Murata NXP RF test script requires python to be present in the test machine. Both python 2 and 3 are supported.

3.2 Download Murata NXP RF Test Script File

Download the latest [Murata NXP RF test script](#) .

3.3 Run the script

Murata NXP RF test script performs the following tasks:

- Verifies the driver is loaded. It cannot continue otherwise.
- Verifies the firmware to be the latest one, supporting RF test commands. It cannot continue otherwise.
- Prompts the user to select the Murata Wi-Fi/Bluetooth module being tested.
- Prompts the user to select the RF test to conduct.
- Depending on the selected test, prompts the user to select/enter the relevant parameters:
 - Band
 - Bandwidth
 - Option to include DFS channels
 - Channel
 - Antenna
 - Data rate
 - Transmission power
- Provides the selected configuration for the user to review and accept.
- Starts the test and continues until the user presses 'Enter'.
- Stops the test once the user presses 'Enter'
- For Receive test, shows relevant statistics.

Running the script file is straightforward. Simply invoke the following command from the folder on the test platform where the script is located:

```
python Murata_NXP_RF_Test_Tool.py
```

The script flow logic is shown in below.

For an example input/output sequences, refer to [Appendix A](#) .

3.3.1 Script Flow

The following **Figure 6**, **Figure 7**, and **Figure 8** describe the user interaction flow of the script for modules 1ZM, 1XK and 1YM-PCIe/1YM-SDIO respectively.

Figure 6: Murata NXP RF Test Script Flow for 1ZM

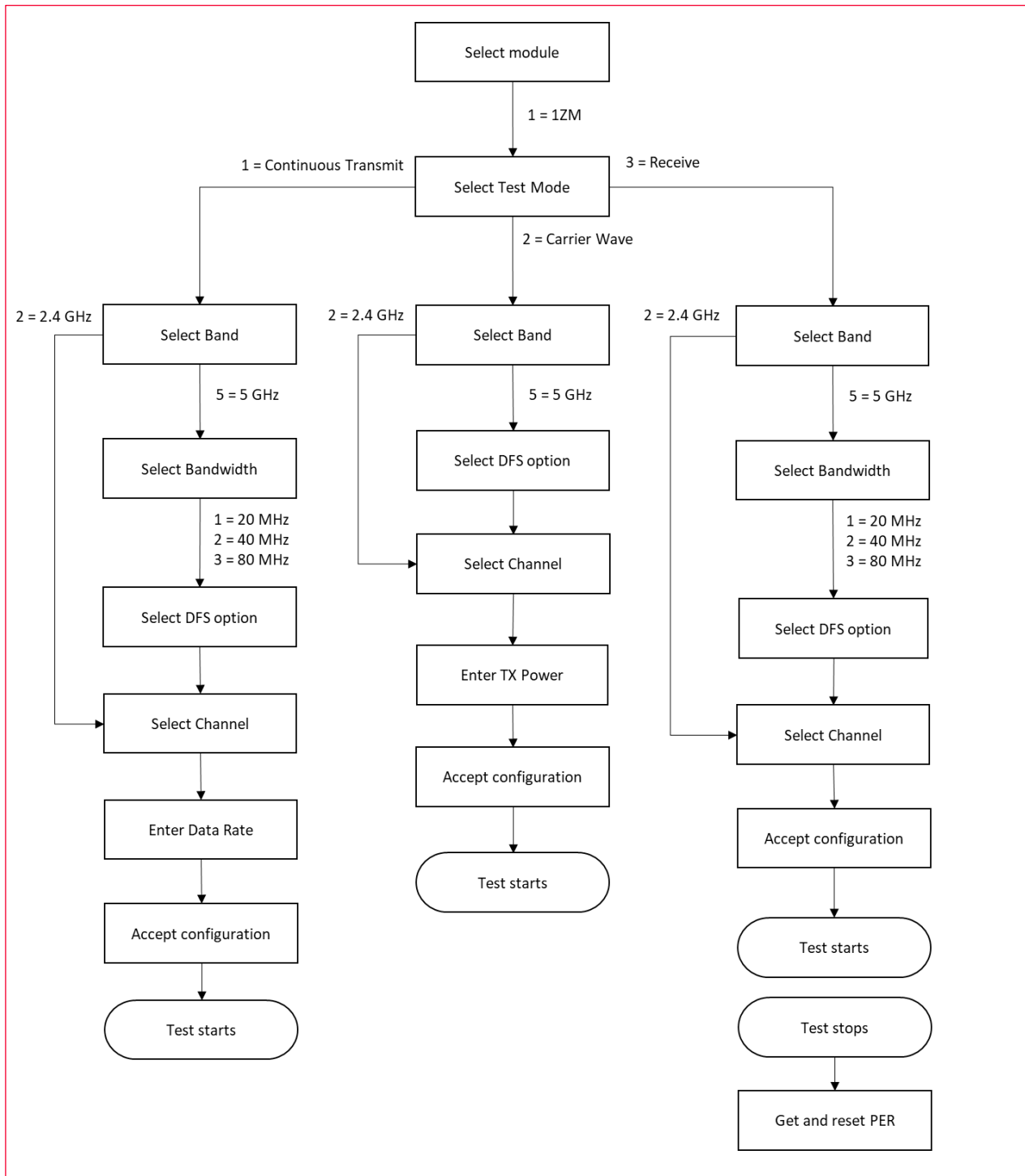


Figure 7: Murata NXP RF Test Script Flow for 1XK

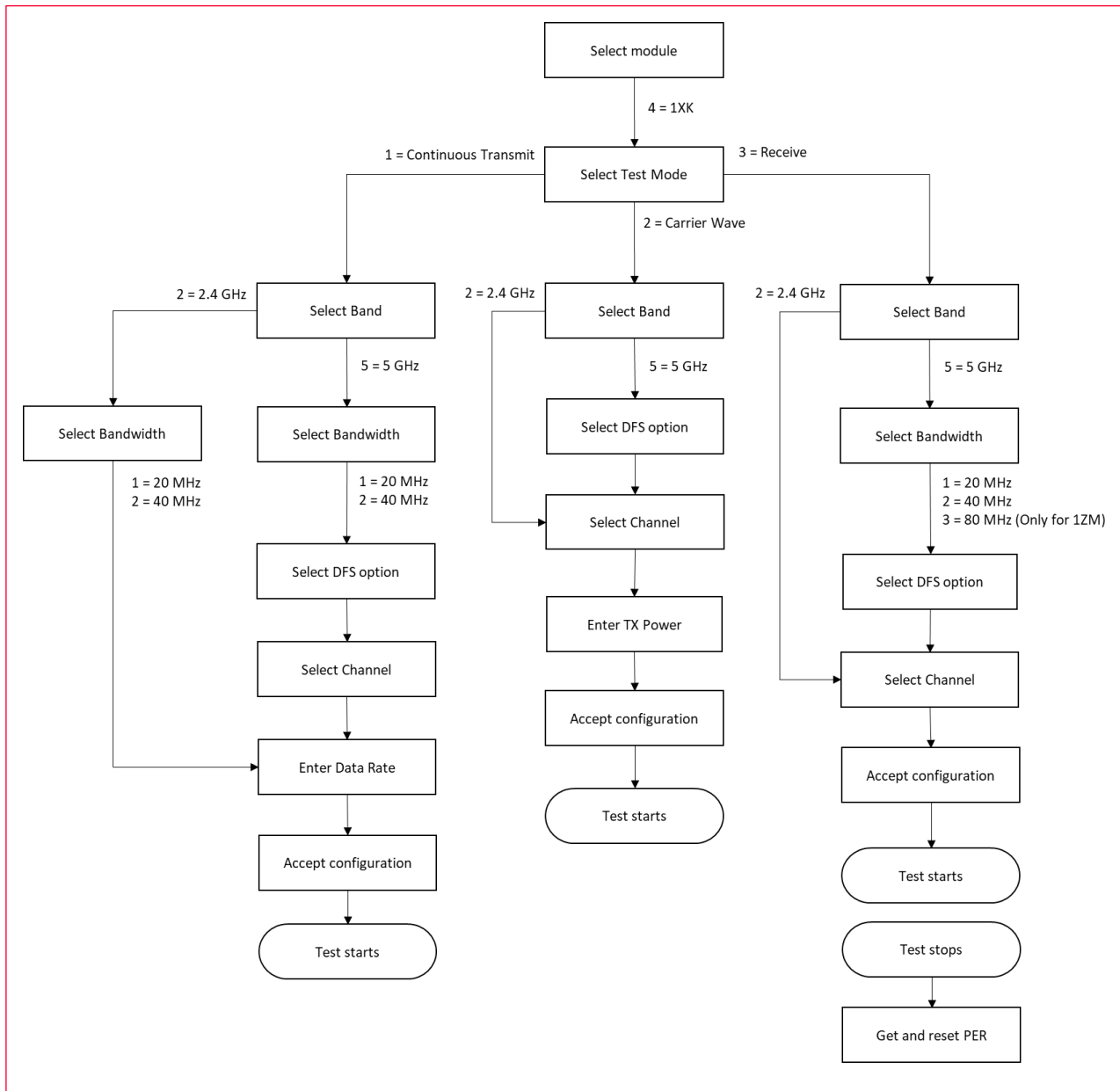
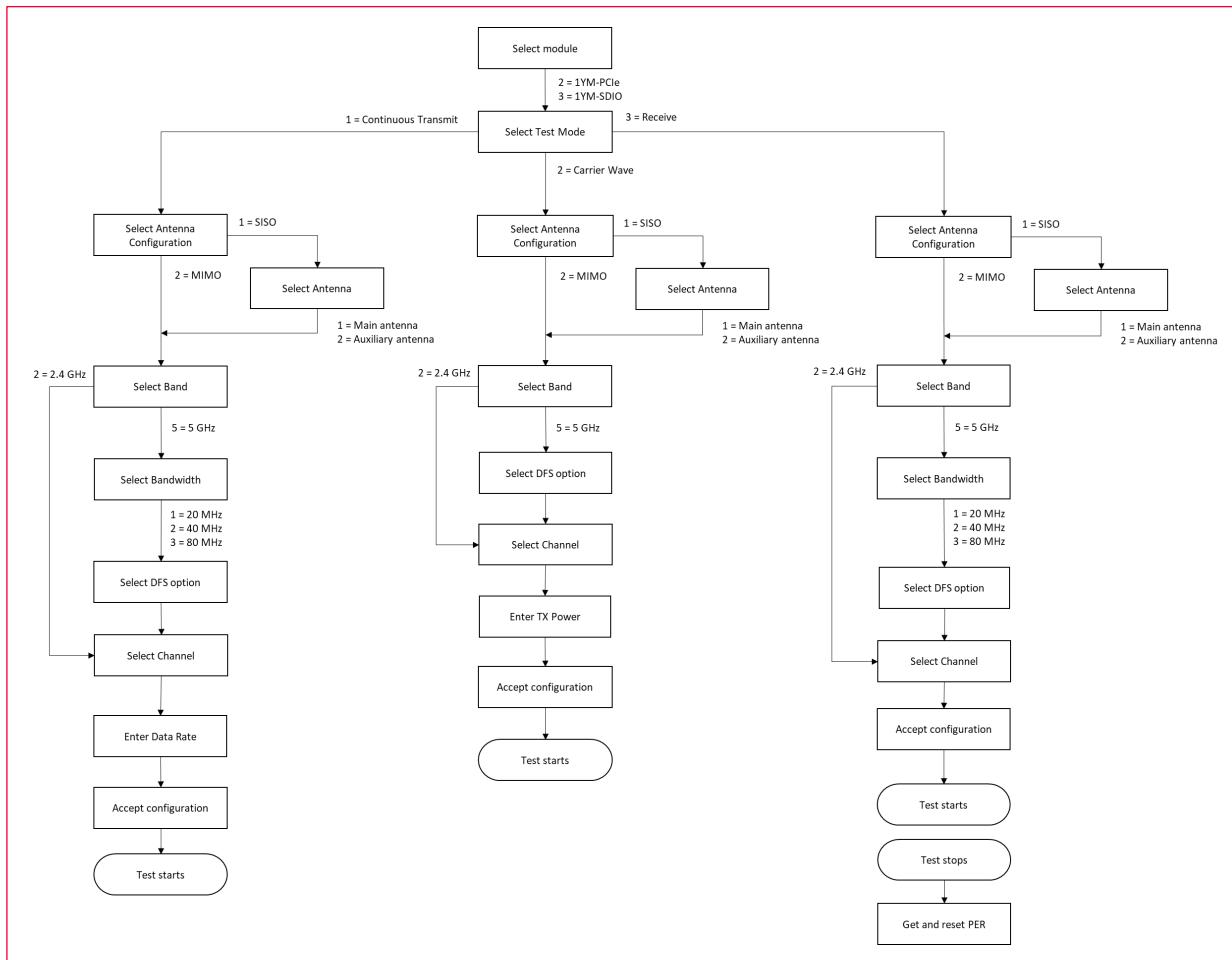


Figure 8: Murata NXP RF Test Script Flow for 1YM



3.3.2 Automation Option in the Script

User can provide a configuration file to the script to automate a test partly or fully. Invoke the script with '-c' switch and provide the config file name.

```
python Murata_NXP_RF_Test_Tool.py -c config.txt
```

The demo config files are given below – the parameters are self-explanatory. Supported values are same as that of the script inputs. In case a required parameter is not provided, or the value provided is not supported, the script will request the user to select/enter the parameter as per normal script operation. This allows the user to automate a test fully (by providing all required parameters), or partly (by providing parameters that will not change between tests). One additional parameter used by the config file is 'TIME' which indicates the time (in seconds) the test should run.

3.3.2.1 Demo Config for Continuous Transmission Test

```
# This config file will execute a Continuous Transmission test on Murata 1ZM  
# module for 5 GHz band (40 MHz bandwidth) on channel 62 and data rate 180  
# Mbps.
```

```
# Module selection option: 1 = 1ZM, 2 = 1YM-PCIe, 3 = 1YM-SDIO, 4 = 1XK  
MODULE=1
```

```
# Test selection option: 1 = Continuous Transmit, 2 = Carrier Wave, 3 = Receive  
TEST=1
```

```
# Band selection option: 2 = 2.4 GHz, 5 = 5GHz  
BAND=5
```

```
# Bandwidth selection option: 1 = 20 MHz, 2 = 40 MHz, 3 = 80 MHz  
BANDWIDTH=2
```

```
# DFS selection option: Y = Include DFS channels, N = Do not include DFS  
channels  
DFS=Y
```

```
# Channel selection option  
CHANNEL=62
```

```
# Data rate selection option  
RATE=180
```

```
# Time to run Continuous Transmit test (in seconds)  
TIME=10
```

3.3.2.2 Demo config for Carrier Wave Test

```
# This config file will execute a Carrier Wave test on Murata 1ZM module  
# for 5 GHz band on channel 100 and transmit power 17 dBm.
```

```
# Module selection option: 1 = 1ZM, 2 = 1YM-PCIe, 3 = 1YM-SDIO, 4 = 1XK  
MODULE=1
```

```
# Test selection option: 1 = Continuous Transmit, 2 = Carrier Wave, 3 = Receive  
TEST=2
```

```
# Band selection option: 2 = 2.4 GHz, 5 = 5GHz  
BAND=5
```

```
# DFS selection option: Y = Include DFS channels, N = Do not include DFS  
channels  
DFS=Y
```

```
# Channel selection option  
CHANNEL=100
```

```
# Transmit Power entry option  
POWER=17
```

```
# Time to run Continuous Transmit test (in seconds)  
TIME=10
```

3.3.2.3 Demo Config for Receive Test

```
# This config file will execute a Receive test on Murata 1ZM module  
# for 5 GHz band (20 MHz bandwidth) on channel 64 and data rate 180  
# Mbps.
```

```
# Module selection option: 1 = 1ZM, 2 = 1YM-PCIe, 3 = 1YM-SDIO, 4 = 1XK  
MODULE=1
```

```
# Test selection option: 1 = Continuous Transmit, 2 = Carrier Wave, 3 = Receive  
TEST=3
```

```
# Band selection option: 2 = 2.4 GHz, 5 = 5GHz  
BAND=5
```

```
# Bandwidth selection option: 1 = 20 MHz, 2 = 40 MHz, 3 = 80 MHz  
BANDWIDTH=1
```

```
# DFS selection option: Y = Include DFS channels, N = Do not include DFS  
channels  
DFS=Y
```

```
# Channel selection option  
CHANNEL=64
```

```
# Time to run Continuous Transmit test (in seconds)  
TIME=10
```





3.3.3 Test Parameters

Please check [Appendix B: Test Parameters](#) for supported test parameters for 1ZM, 1YM and 1XK.

4 Technical Support Contact

Table 3 lists all the support resources available for the Murata Wi-Fi/BT solution.

Table 3: List of Support Resources

Support Site	Notes
Murata Community Forum 	Primary support point for technical queries. This is an open forum for all customers. Registration is required.
Murata i.MX Landing Page 	No login credentials required. Murata documentation covering hardware, software, testing, etc. is provided here.
Murata uSD-M.2 Adapter Landing Page 	Landing page for uSD-M.2 Adapter. In conjunction with Murata i.MX Landing Page, this should provide the user with comprehensive getting started documentation.
Murata Module Landing Page 	No login credentials required. Murata documentation covering all Infineon-based Wi-Fi/BT modules is provided here.

5 Appendix A: Sample Output of Murata NXP RF Test Script

5.1 Test scenario 1 – Continuous Transmission Test

Running Continuous Transmission test on Murata 1ZM module for 5 GHz band (40 MHz bandwidth) on channel 62 and data rate 180 Mbps.

```
Murata NXP Regulatory Script Version 1.17

Select MODULE
-----

-----
| Entry | MODULE Name          | Description          |
|-----|-----|-----|
| 1     | 1ZM                  | 802.11 a/b/g/n/ac  |
| 2     | 1YM-PCIe             | 802.11 a/b/g/n/ac MIMO |
| 3     | 1YM-SDIO             | 802.11 a/b/g/n/ac MIMO |
| 4     | 1XK                  | 802.11 a/b/g/n      |
|-----|-----|-----|

Select your entry for MODULE: 1

Select Test Mode
-----

-----
| Entry | Test Mode          |
|-----|-----|
| 1     | Continuous Transmit |
| 2     | Carrier Wave       |
| 3     | Receive            |
|-----|-----|

Select your entry for Test Mode: 1

Running Continuous Transmit test for 1ZM

Select Band
-----

-----
| Entry | Band          |
|-----|-----|
| 2     | 2.4 GHz      |
| 5     | 5 GHz        |
|-----|-----|

Select your entry for band: 5

Select Bandwidth
-----

-----
| Entry | Bandwidth      |
|-----|-----|
| 1     | 20 MHz        |
|-----|-----|
```

```

| 2 | 40 MHz |
| 3 | 80 MHz |
-----

Select your entry for Bandwidth: 2

Do you want to include DFS channels (Y/N): Y

Select channel
[38, 46, 54, 62, 102, 110, 118, 134, 142, 151, 159]
Enter a Channel Number: 62

Select data rate
[13.5, 27, 40.5, 54, 81, 108, 121.5, 135, 162, 180]

Enter data rate: 180

Please verify your selection
-----

| Module | 1ZM |
| Test | Continuous Transmit test |
| Bandwidth | 40 MHz |
| Band | 5 GHz |
| Channel Number | 62 |
| Antenna | Default |
| Data Rate | 180 Mbps |
| Transmit Power | 12 dBm |
-----

Do you accept selected configurations ? (Y/N): Y

Transmission starts

Press Enter to stop transmission
. . .

Transmission stopped
    
```

5.2 Test scenario 2 – Carrier Wave Test

Running Carrier Wave test on Murata 1ZM module for 5 GHz band on channel 100 and transmit power 17 dBm.

```

Murata NXP Regulatory Script Version 1.17

Select MODULE
-----

| Entry | MODULE Name | Description |
|-----|-----|-----|
| 1 | 1ZM | 802.11 a/b/g/n/ac |
| 2 | 1YM-PCIe | 802.11 a/b/g/n/ac MIMO |
| 3 | 1YM-SDIO | 802.11 a/b/g/n/ac MIMO |
| 4 | 1XK | 802.11 a/b/g/n |
|-----|-----|-----|

Select your entry for MODULE: 1
    
```

Select Test Mode

Entry	Test Mode
1	Continuous Transmit
2	Carrier Wave
3	Receive

Select your entry for Test Mode: 2

Running Carrier Wave test for 1ZM

Select Band

Entry	Band
2	2.4 GHz
5	5 GHz

Select your entry for band: 5

Do you want to include DFS channels (Y/N): Y

Select channel

[36, 44, 48, 52, 60, 64, 100, 116, 120, 140, 144, 159, 157, 165]

Enter a Channel Number: 100

Enter transmit power in dBm: 17

Please verify your selection

Module	1ZM
Test	Carrier Wave test
Bandwidth	20 MHz
Band	5 GHz
Channel Number	100
Antenna	Default
Transmit Power	17 dBm

Do you accept selected configurations ? (Y/N): Y

Preparing test ...

Transmission starts

Press Enter to stop transmission

. . .

Transmission stopped

5.3 Test scenario 3 – Receive Test

Running Receive test on Murata 1ZM module for 5 GHz band (20 MHz bandwidth) on channel 64 and data rate 180 Mbps.

Murata NXP Regulatory Script Version 1.17

Select MODULE

Entry	MODULE Name	Description
1	1ZM	802.11 a/b/g/n/ac
2	1YM-PCIe	802.11 a/b/g/n/ac MIMO
3	1YM-SDIO	802.11 a/b/g/n/ac MIMO
4	1XK	802.11 a/b/g/n

Select your entry for MODULE: 1

Select Test Mode

Entry	Test Mode
1	Continuous Transmit
2	Carrier Wave
3	Receive

Select your entry for Test Mode: 3

Running Receive test for 1ZM

Select Band

Entry	Band
2	2.4 GHz
5	5 GHz

Select your entry for band: 5

Select Bandwidth

Entry	Bandwidth
1	20 MHz
2	40 MHz
3	80 MHz

Select your entry for Bandwidth: 1

Do you want to include DFS channels (Y/N): Y

Select channel

[36, 44, 48, 52, 60, 64, 100, 116, 120, 140, 144, 149, 157, 165]

Enter a Channel Number: 64

Please verify your selection

Module	1ZM	
Test	Receive test	
Bandwidth	20 MHz	
Band	5 GHz	
Channel Number	64	
Antenna	Default	

Do you accept selected configurations ? (Y/N): Y

Reception starts. Please start transmission now.

Press Enter to stop reception

. . .

Reception stopped

hardware_status=0

netlink_num=31

drv_mode=7

sdcmd52rw=0 0x0 0x00

rf_test_mode=1

tx_antenna=1

rx_antenna=1

band=1

bw=0

channel=64

radio_mode[0]=

radio_mode[1]=

total rx pkt count=93

rx multicast/broadcast pkt count=23

rx fcs error pkt count=56

tx_power=

tx_continuous=0

tx_frame=0

he_tb_tx=0

Please refer to the following fields in the result above to check the received packet counts

total rx pkt count

rx multicast/broadcast pkt count

rx fcs error pkt count



Please reference the 'total rx pkt count', 'rx multicast/broadcast pkt count' and 'rx fcs error pkt count' values in the above output to calculate the PER (Packet Error Rate).

6 Appendix B: Test Parameters

6.1 1ZM

Table 4: FCC Regulatory Test Parameters for 1ZM

Band	BW	U-NII Band	Operating Mode	Modulation	Data Rate	Channels (with DFS)	Channels (without DFS)	TX Power		
2.4 GHz	20	NA	802.11b	0	ALL (1, 2, 5.5, 11)	1,6,11	1,6,11	17		
			802.11g	1	6/9/12/18 Mbps	1, 11	1, 11	14		
						6	6	17		
					24/36/48/54 Mbps	1, 11	1, 11	14		
						6	6	16		
			802.11n-HT20	2	MCS0-2 (6.5, 13, 19.5)	1, 11	1, 11	13		
						6	6	16		
					MCS3-7 (26, 39, 52, 58.5, 65)	1,11	1, 11	13		
6	6	16								
5 GHz	20	U-NII-1, U-NII-2A, U-NII-2C,U-NII-3	802.11a	1	6/9/12/18/24 /36/48/54 Mbps	36, 64, 100	36	14		
			802.11n / ac (HT20)	2	MCS0-8 (6.5, 13, 19.5, 26, 39, 52, 58.5, 65)	44, 48, 52, 60, 116, 120, 140, 144, 149, 157, 165	44, 48, 149, 157, 165	15		
						36, 64, 100	36	13		
			802.11ac (VHT20)	2	MCS8 (78)	44, 48, 52, 60, 116, 120, 140, 144, 149, 157, 165	44, 48, 149, 157, 165	14		
						36, 64, 100	36	13		
			40	U-NII-1, U-NII-2A, U-NII-2C,U-NII-3	802.11n / ac (HT40)	2	MCS0-7 (13.5, 27, 40.5, 54, 81, 108, 121.5, 135)	38, 62, 102	38	12
					802.11ac (VHT40)	2	MCS8-9 (162, 180)	46, 54, 110, 118, 134, 142, 151, 159	46, 151, 159	14
								38, 62, 102	38	12
	802.11ac (VHT40)	2			MCS8-9 (162, 180)	46, 54	46	14		
						110, 118, 134, 142, 151, 159	151, 159	13		
	80	U-NII-1, U-NII-2A, U-NII-2C,U-NII-3			802.11ac (VHT80)	2	MCS0-2 (29.3, 58.5, 87.8)	42, 58, 106	42	10
								122, 155	155	14
							MCS3-9 (117, 175.5, 234, 263.3, 292.5, 351, 390)	42, 58, 106	42	10
			122, 155	155				13		

6.2 1YM

Table 5: FCC Regulatory Test Parameters for 1YM

Band	BW	U-NII Band	Operating Mode	Data Rate	Channels (with DFS)	Channels (without DFS)	TX Power
2.4 GHz	20	NA	802.11b	ALL (1, 2, 5.5, 11)	1,6,11	1,6,11	13
			802.11g	6/9/12/18 Mbps	1, 11	1, 11	10
				24/36/48/54 Mbps	6	6	16
					1, 11	1, 11	10
					6	6	13
			802.11n-HT20	MCS0-2 (6.5, 13, 19.5)	1, 11	1, 11	10
					6	6	15
				MCS3-7 (26, 39, 52, 58.5, 65)	1,11	1,11	10
					6	6	12
			5 GHz	20	U-NII-1, U-NII-2A, U-NII-2C,U-NII-3	802.11a	6/9/12/18 Mbps
52, 60, 104, 116, 120, 144		14					
64		10					
100		9					
140		7					
149, 157, 165	149, 157, 165	15					
24/36/48/54 Mbps	36, 44, 48,	36, 44, 48					8
	52, 60, 149, 157, 165	149, 157, 165					12
	64, 104, 116, 120, 144						10
	100						9
	140					7	
802.11n / ac (HT20)	MCS0-2 (6.5, 13, 19.5)	36, 44, 48,				36, 44, 48	8
		52, 60, 104, 116, 120, 144					14
		64					10
		100					9
		140					7
	MCS3-7 (26, 39, 52, 58.5, 65)	149, 157, 165				149, 157, 165	15
		36, 44, 48,				36, 44, 48	8
		52, 60, 104, 116, 120, 144, 149, 157, 165				149, 157, 165	11
		64					10
		100					9
140		7					
802.11 ac (HT20)	MCS8 (78)	36, 44, 48,				36, 44, 48	8
		52, 60, 64, 104, 116, 120, 144, 149, 157, 165		149, 157, 165	10		
		100			9		
		140			7		
40	U-NII-1, U-NII-2A, U-NII-2C,U-NII-3	802.11n / ac (HT40)		MCS0-2 (13.5, 27, 40.5)	38, 62, 102	38	7
					46, 134	46	10

Band	BW	U-NII Band	Operating Mode	Data Rate	Channels (with DFS)	Channels (without DFS)	TX Power	
					54, 110, 118, 142, 151, 159	151, 159	13	
					MCS3-7 (54, 81, 108, 121.5, 135)	38, 62, 102	38	7
						46, 134	46	10
						54, 110, 118, 142, 151, 159	151, 159	11
					MCS8-9 (162, 180)	38, 62, 102	38	7
						46, 54, 110, 118, 134, 142, 151, 159	46, 151, 159	10
					80	U-NII-1, U-NII-2A, U-NII-2C, U-NII-3	802.11ac (VHT80)	
	122, 138		12					
	155	155	13					
	MCS3-7 (117, 175.5, 234, 263.3, 292.5)	42, 58, 106,	42	5				
		122, 138, 155	155	11				
	MCS8-9 (351, 390)	42, 58, 106,	42	5				
		122, 138, 155	155	10				

6.3 1XK

Table 6: FCC Regulatory Test Parameters for 1XK

Band	BW	U-NII Band	Operating Mode	Modulation	Data Rate	Channels (with DFS)	Channels (without DFS)	TX Power
2.4 GHz	20	NA	802.11b	0	ALL (1, 2, 5.5, 11)	1,6,11	1,6,11	17
			802.11g	1	6/9/12/18 Mbps	1, 11	1, 11	14
						6	6	17
					24/36/48/54 Mbps	1, 11	1, 11	14
						6	6	16
			802.11n-HT20	2	MCS0-2 (6.5, 13, 19.5)	1, 11	1, 11	13
	MCS3-7 (26, 39, 52, 58.5, 65)	6			6	16		
	40	NA	802.11n-HT20	2	MCS0-2 (6.5, 13, 19.5)	1,11	1, 11	13
MCS3-7 (26, 39, 52, 58.5, 65)					6	6	15	
5 GHz	20	U-NII-1, U-NII-2A, U-NII-2C, U-NII-3	802.11a	1	6/9/12/18/24 /36/48/54 Mbps	36, 64, 100, 144	36	14
						44, 48, 52, 60	44, 48	16
						116, 120, 140, 149, 157, 165	149, 157, 165	15
			802.11n / ac (HT20)	2	MCS0-8 (6.5, 13, 19.5, 26, 39, 52, 58.5, 65)	36, 64, 100	36	13
						44, 48, 52, 60	44, 48	15
						116, 120, 140, 144, 149, 157, 165	149, 157, 165	14
	40	U-NII-1, U-NII-2A, U-NII-2C, U-NII-3	802.11n / ac (HT40)	2	MCS0-7 (13.5, 27, 40.5, 54, 81, 108, 121.5, 135)	38, 62, 102, 142	38	12
						46, 54, 110, 118, 134, 151, 159	46, 151, 159	14

7 Acronyms


Table 7: Acronyms used in Test Guide

Acronym	Meaning
AP	Access Point
BLE	Bluetooth Low Energy
BT	Bluetooth
CLM	Country Locale Matrix
EA	Embedded Artists designs, manufactures and distributes current Wi-Fi/BT M.2 EVBs (link here). EA also have enhanced i.MX developer kits which provide comprehensive support for Murata modules (link here).
EVB	Evaluation Board (Embedded Artists' Wi-Fi/BT module)
EVK	Evaluation Kit (includes EVB + Adapter)
FCC	Federal Communications Commission
FW	Firmware
OS	Operation System
PC	Personal Computer
PCIe	PCI Express
RF	Radio Frequency
RSSI	Received Signal Strength Indicator
RTS	Request to Send
SDIO	Secure Digital Input Output
STA	Station
UART	Universal Asynchronous Receiver/Transmitter
uSD	Micro SD
uSD-M.2	Micro SD to M.2 Adapter
Wi-Fi	Wireless LAN: "Wi-Fi" is a registered trademark of Wi-Fi Alliance
WLAN	Wireless Local Area Network


8 References

This section reviews all the key reference documents that the user may like to refer to.


8.1 FCC Regulatory Certification Guide

[This document](#)  provides general information on FCC Regulatory Certification with respect to Murata Wi-Fi/Bluetooth modules.


8.2 Murata's Community Forum Support

[Murata Community Forum](#)  provides online support for the Murata Wi-Fi/Bluetooth modules on various i.MX platforms.


8.3 Murata Wi-Fi/BT Solution Landing Page for i.MX

[This landing page](#)  provides documentation to get customers up and running quickly on NXP and Embedded Artists' i.MX reference platforms. The focus is on enabling Wi-Fi/Bluetooth interfaces.

8.4 Murata NXP RF Test Script

[This Test Script](#)  (written in python) provides a simple mechanism to perform regulatory tests using a menu driven flow.

8.5 NXP Feature Configuration Guide

[This document](#)  provides the commands and steps to run the regulatory tests for NXP based modules using the RF test mode.

Revision History

Revision	Date	Author	Change Description
1.0	October 29, 2021	TF	Initial Release
1.1	February 15, 2022	TF	Added carrier wave and receive test
2.0	May 06, 2022	TF	Updated to template 1.0
3.0	Nov 23, 2022	TF	Updated to template 2.0



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