MT7927

Test-Mode Software Application Note

Part-1: QA-Tool User Guideline

Version: V0.3

Release Date: 2022-07-08

Document Revision History

Version	Date	Author	Change List
V0.1	20220607	Jack Pan	Initial draft release.
V0.2	20220608	Leon Hsu	Update Rx related test description.
V0.3	20220708	Jack Pan	Modify some description.

Table of Contents

1 System overview

1.1 General Description

MT7927 chip is highly integrated single chip which have built in 2x2 dual-band wireless LAN and Bluetooth combo radio. It can be configured in test-mode for performance validation, production testing and regulatory certification. There are two software tools, QA-Tool and Combo-Tool responsible for evaluating WIFI and Bluetooth signal and performance testing. This document is introducing how to install and use QA-Tool.

Input rating: 3.3Vdc, Operating Temperature: -10~70ºC

2 QA-Tool

Users have to install 3 major software before using QA-Tool.

- WinPcap
- Windows7 X64 security package
- QA-Tool Windows driver

MTK strongly recommends install QA-Tool on Windows 7-64bit operating system.

2.1 How to install QA-tool

Please follow the procedure listed in below to install QA-Tool

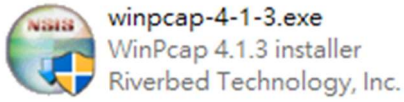
- 1st : Install WinPcap
- 2nd : Update Windows7 security package to register x64 signature mechanism
- 3rd : Instal QA-Tool Windows driver.

2.1.1 Install WinPcap

If users are the 1st time operating this tool, users should install WinpCap at first. Please follow below link and steps to install this software.

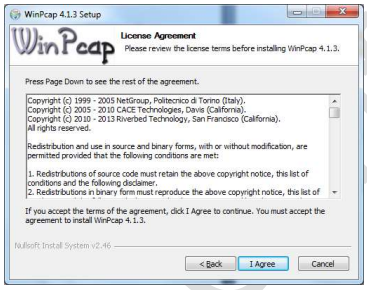
https://www.winpcap.org/install/

WinPcap version: 4.1.3 or later.

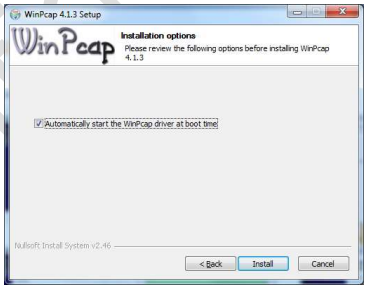


1

2



3



4

2.1.2 Windows 10 install note

If users can't install the driver in Windows 10 due to driver integrity check. Try to disable the integrity check to allow installation.

- **Disable Driver Integrity Check**

1. Open cmd as Administrator.
2. Execute 'bcdedit /set nointegritychecks on'
3. Reboot
4. Then install again. If still fail, try do 'Disable Secure Boot' below.

NOTE: Re-enable the driver integrity check by executing 'bcdedit /set nointegritychecks off' and then rebooting.

- **Disable Secure Boot**

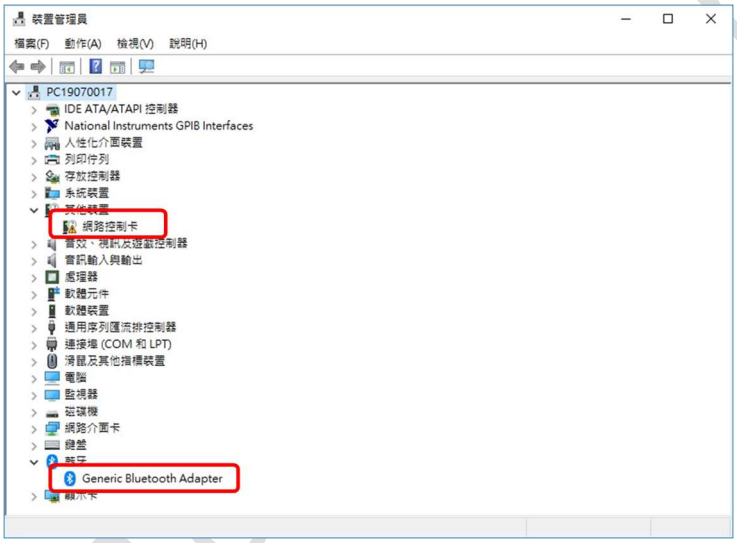
Please refer to:
https://docs.microsoft.com/en-us/windows-hardware/manufacture/desktop/disabling-secure-boot

2.1.3 QA-Tool Windows driver

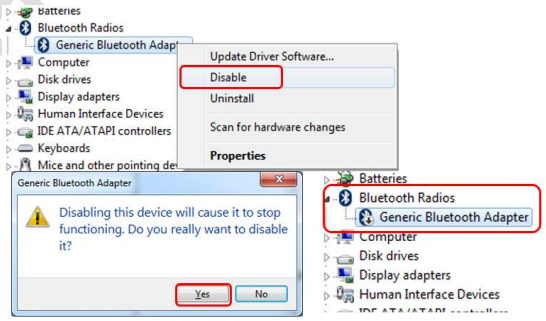
MT7927 supports USB, SDIO and PCIE interface. According to interface type of MT7927 on users' hand, please refer to steps shown below to install QA-Tool Windows driver:

USB interface:

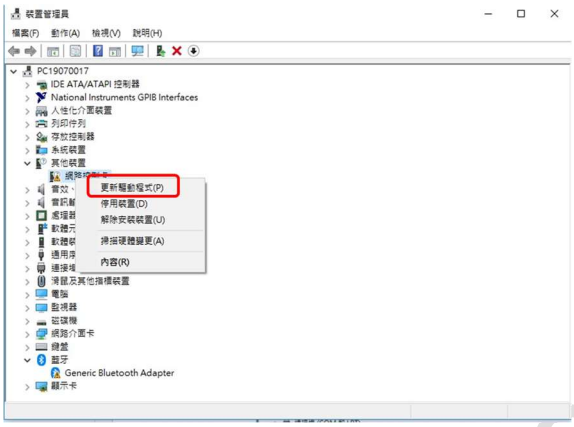
1. Connect DUT to PC/NB and check Windows Device Manager.
2. Window Device Manager would discover DUT shows "**Generic Bluetooth Adapter**"(BT device) and "**WiFi_If**"(WiFi device).



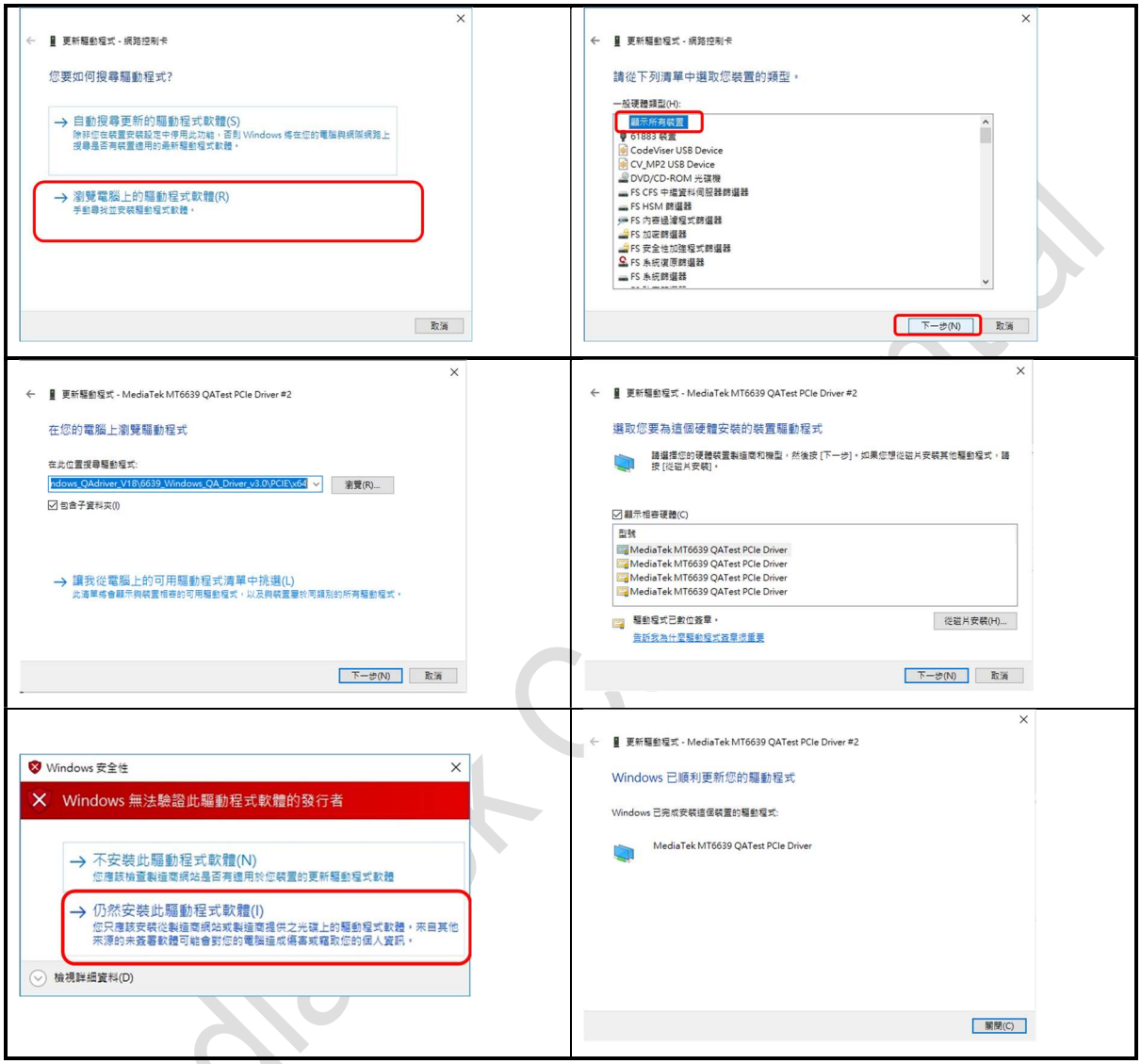
3. Right click the "**Generic Bluetooth Adapter**" BT device and select disable as follows.



4. Right-click on “**WiFi_If**” Wifi device and Update Driver Software.



5. According user's Windows' OS to select and install test tool driver.

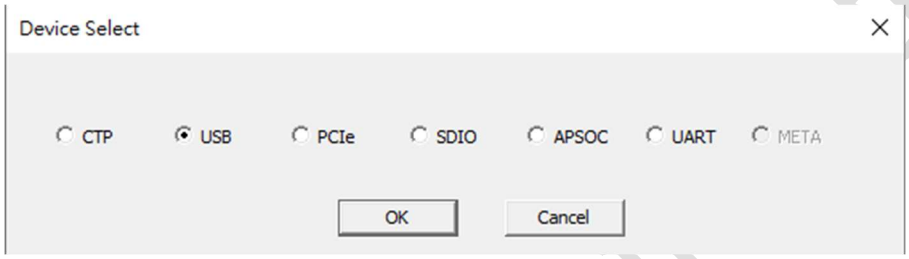


2.2 How to use QA-tool

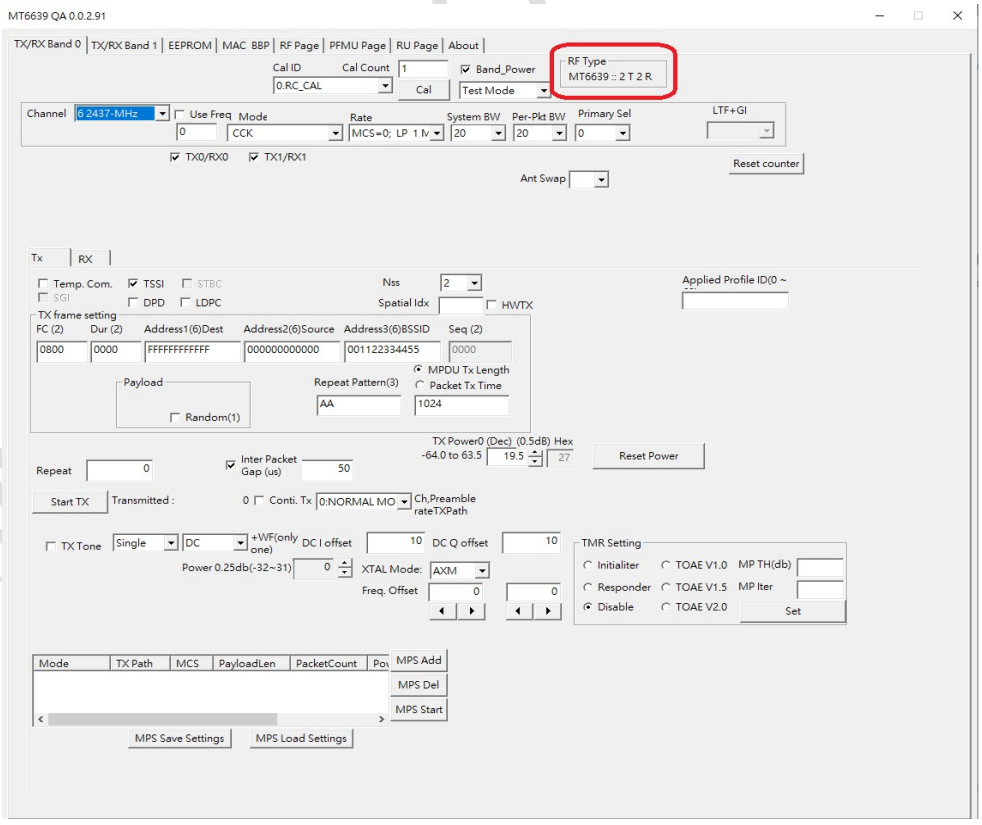
2.2.1 Launch QA-Tool

Double-click on QA-Tool icon "**QATool_Dbg.exe**" and Device Select window will pop up.

Select interface type and click "OK" button to lunch QA-Tool.

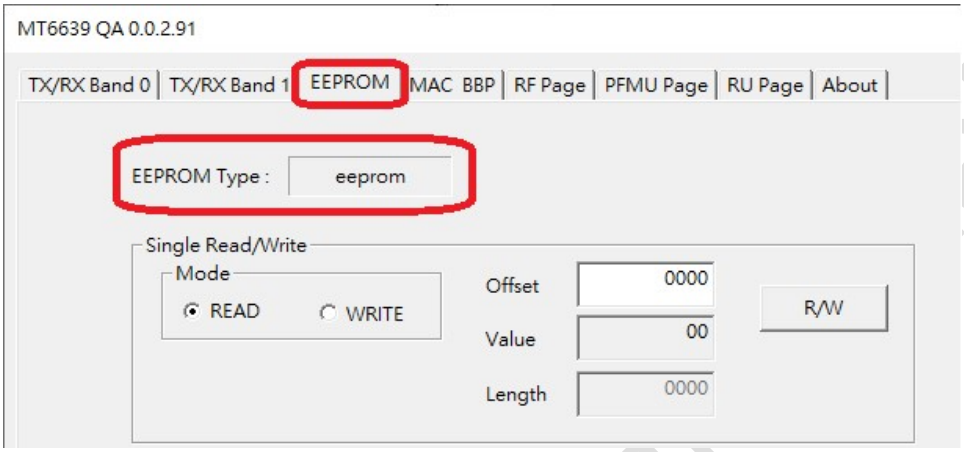


After QA-Tool UI pops out, users can check RF Type which should be shown **MT7927 : 2 T 2 R** to make sure the QA-Tool is working normally. There are two modes, BIN-file mode and E-fuse mode, supported by QA-tool. Section 2.2.2 & 2.2.3 provide details about respective mode.



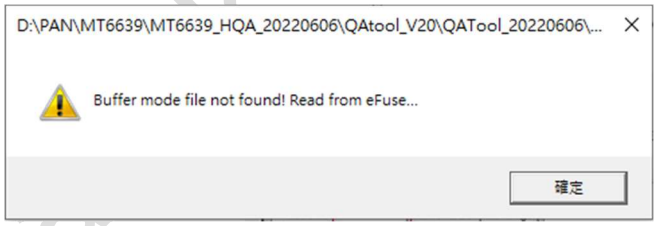
2.2.2 Start QA-Tool in BIN-file Mode

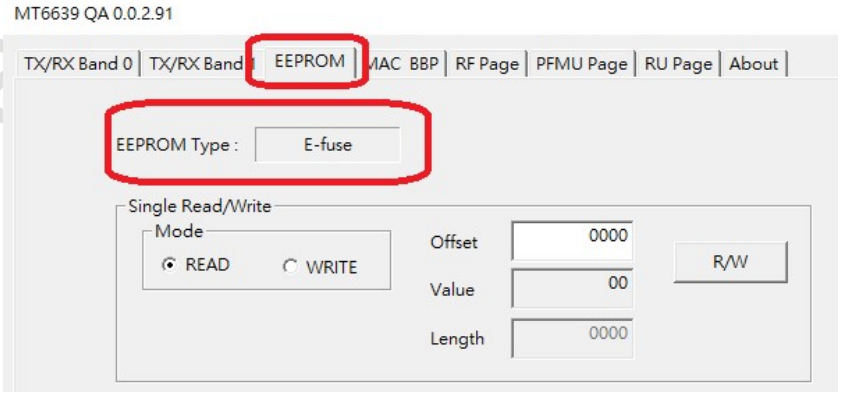
To start in BIN-file mode user can use "**eeprom.bin**" while launching QA tool. If "**QATool_Dbg.exe**" accompanies "**eeprom.bin**" file in the same folder, QA-tool will start in BIN-file mode. After QA-tool is launched, users can check "EEPROM" sheet to have **EEPROM Type : eeprom** to know the mode of QA-Tool in operating.



2.2.3 Start QA-Tool in E-fuse Mode

If "**eeprom.bin**" file leaves the folder of "**QATool_Dbg.exe**", QA-tool will starts in E-fuse mode. User also check **EEPROM Type : E-fuse** in "EEPROM" sheet.





2.3 How to Use the QA-Tool

2.3.1 WIFI Packets Transmitting –1 stream

On TX/RX page:

a. Select TX sub-page and "**Test Mode**" as following figure.
b. Select **"Band0"** for G band & **"Band1"** for A band
c. Set Channel/Mode/Rate.
    i. 802.11b CCK, 802.11g OFDM, 802.11n HT Mix Mode, 802.11ac VHT,
    ii. 802.11ax HESU, 802.11ax RU HETB (need to set step g and RU Need to set in RU Page)
    iii. 802.11be EHTSU, 802.11be RU EHTTB (need to set step g and RU Need to set in RU Page)
d. Set BW. (Generally, System BW = Pre-Packet BW).
e. Select TX0 or TX1 only
f. Select **"Nss=1"** and choose "TX/RX0" to do transmitting.
g. Set LFT+GI index. (Generally, setting index3) (this step for HESU, HETB(RU), EHTSU, EHTTB(RU))
h. Set packet number. (0 means infinite packets)
i. Click "**Start TX**" button to start packet transmitting and click "**Stop TX**" button to stop.
j. The transmitted packets number is shown at "**Transmitted:**" area.
k. Users can click "**Reset counter**" button to reset "**Transmitted:**" area.
l. Users can click " " button to modify power level of transmitting signal.
m. Users can click " " button to modify frequency offset of transmitting signal.

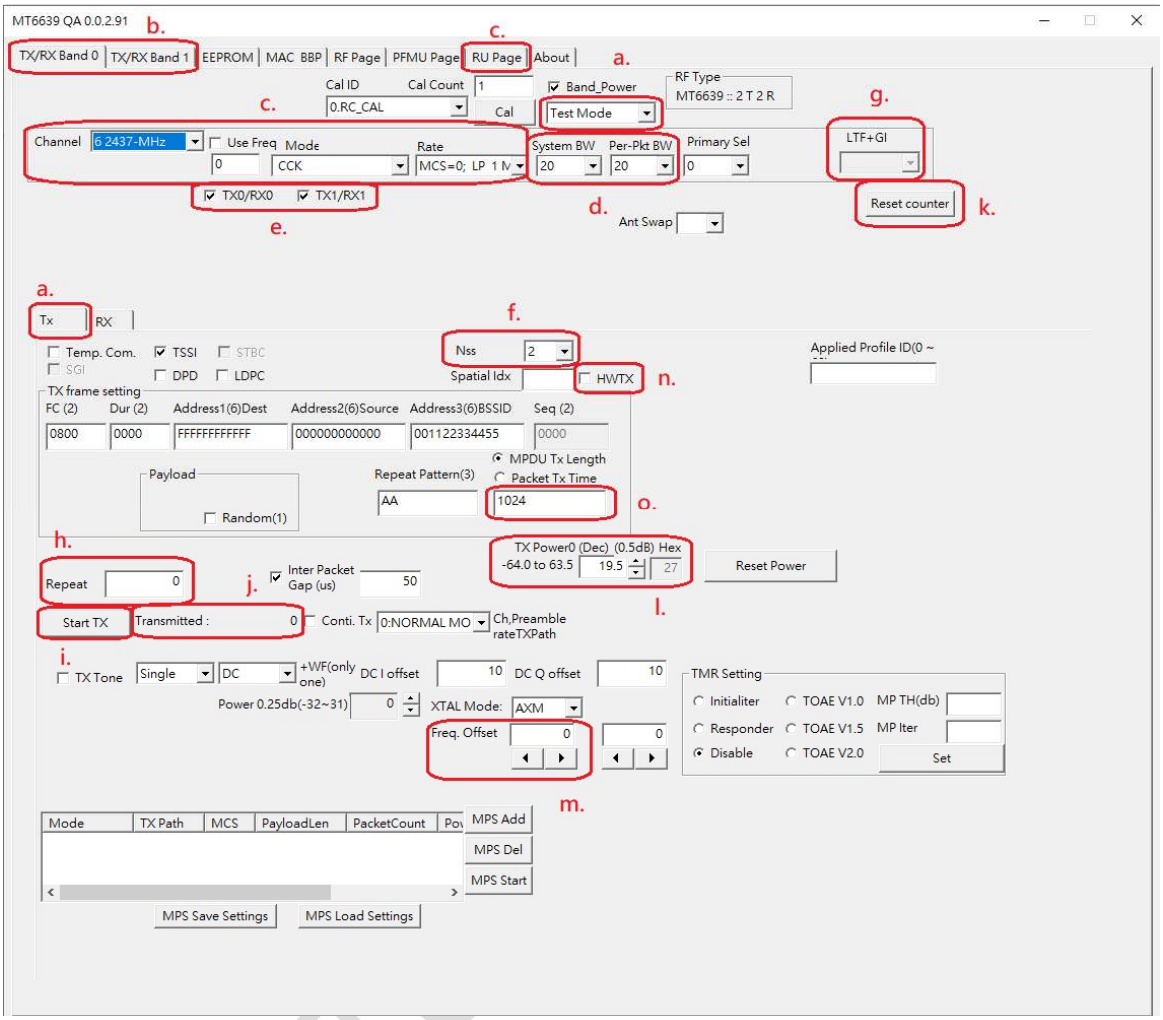
If users want to adjust packets duty cycle

n. click "HWTX"
o. adjust packets lengths(L) to modify packets duty cycle (example 512)

(Make sure "**Transmitted:**" area have counter when start TX. If not, reduce the packet lengths)

Note: Please *re-trigger "HWTX" if users change Channel/Mode/Rate/BW.

*Re-trigger "HWTX": click "**Stop TX**" button and un-click "HWTX", and then click "HWTX" and click "**Start TX**" bottom again.



2.3.2 WIFI Packets Transmitting –2 stream

On TX/RX page:

a. Select TX sub-page and "**Test Mode**" as following figure.
b. Select **"Band0"** for G band & **"Band1"** for A band
c. Set Channel/Mode/Rate.
    i. 802.11b CCK, 802.11g OFDM, 802.11n HT Mix Mode, 802.11ac VHT,
    ii. 802.11ax HESU, 802.11ax RU HETB (need to set step g and RU Need to set in RU Page)
    iii. 802.11be EHTSU, 802.11be RU EHTTB (need to set step g and RU Need to set in RU Page)
d. Set BW. (Generally, System BW = Pre-Packet BW).
e. Both TX0 and TX1
f. Select **"Nss=2"** and choose both TX0 and TX1 to do transmitting.
g. Set LFT+GI index. (Generally, setting index3) (this step for HESU, HETB(RU), EHTSU, EHTTB(RU))
h. Set packet number. (0 means infinite packets)
i. Click "**Start TX**" button to start packet transmitting and click "**Stop TX**" button to stop.
j. The transmitted packets number is shown at "**Transmitted:**" area.
k. Users can click "**Reset counter**" button to reset "**Transmitted:**" area.
l. Users can click " " button to modify power level of transmitting signal.
m. Users can click " " button to modify frequency offset of transmitting signal.

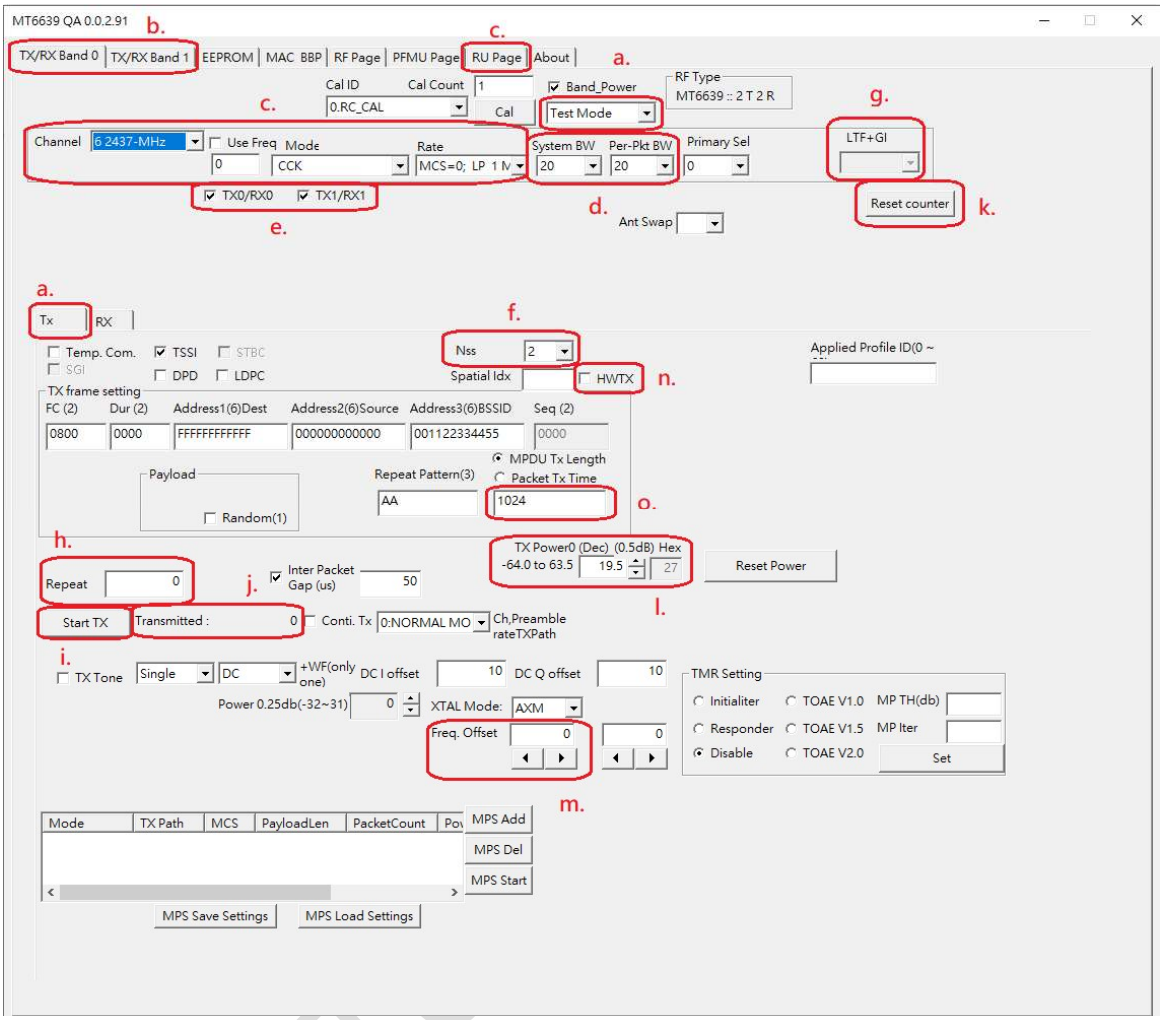
If users want to adjust packets duty cycle

n. click "HWTX"
o. adjust packets lengths(L) to modify packets duty cycle (example 512)

(Make sure "**Transmitted:**" area have counter when start TX. If not, reduce the packet lengths)

Note: Please *re-trigger "HWTX" if users change Channel/Mode/Rate/BW.

*Re-trigger "HWTX": click "**Stop TX**" button and un-click "HWTX", and then click "HWTX" and click "**Start TX**" bottom again.



2.3.3 WIFI Packets 11ax RU TX (HE TB (trigger based)) Transmitting setting

On RU page:

a. Select RU sub-page

b. Select band(0:G-band, 1:A-band)

c. Set Category

RU size	Category
RU26	26*9
RU52	52*4
RU106	106+106
RU242	242*1
RU484	484*1
RU996	996*1
RU996*2	996*2

d. Set RU index (wanted TB RU location).

Refer to the RU Index from below

e. Set data rate

f. Set MU NSS/LDPC/stream index/length

"MU Nss=1" for Antenna number.

Set LDPC or non-LDPC to do transmitting.

Set **"Nss=1"** to do transmitting.

Set **"stream index=1"**

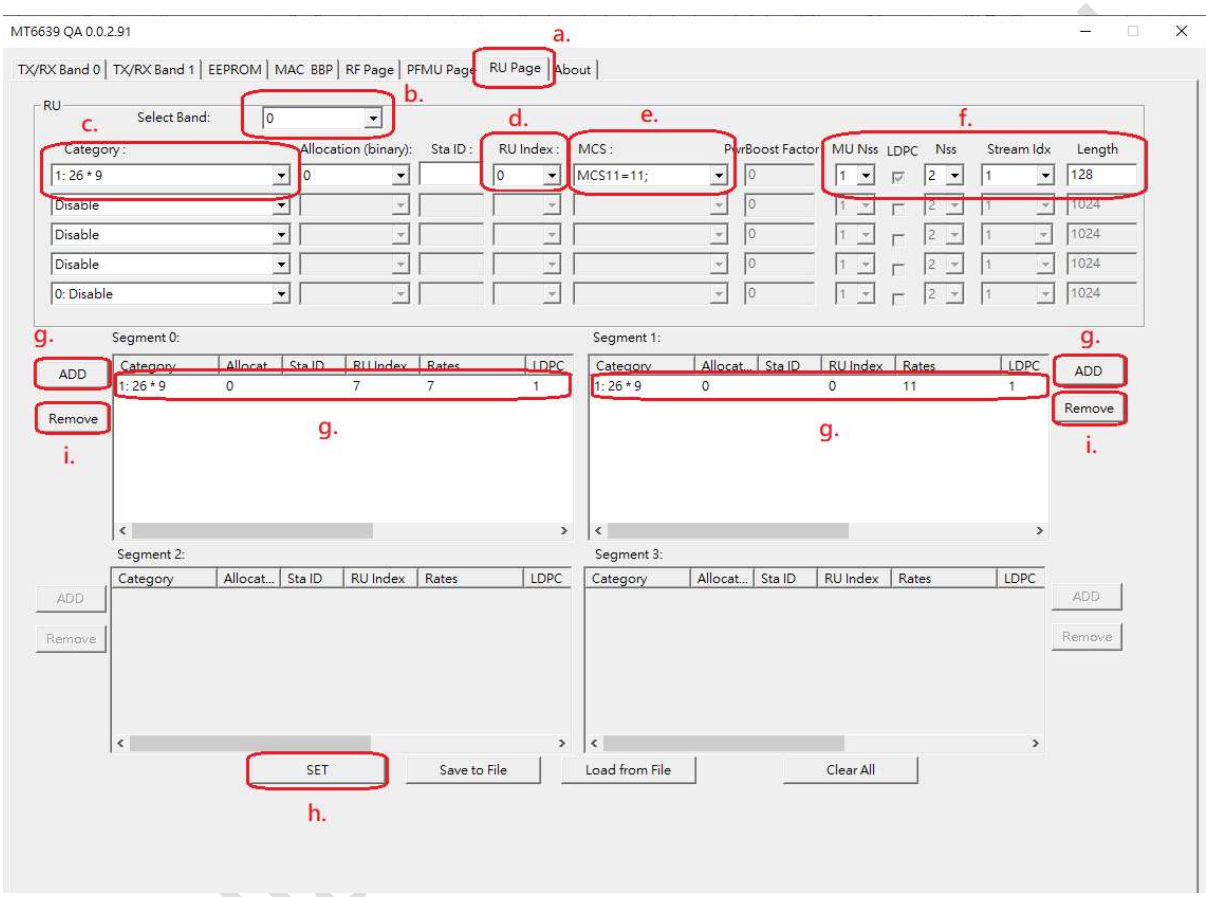
Refer to the **"Length"** from below table. (**For example, set to 128 at RU26/MCS0……**)

RU size	0	1	2	3	4	5	6	7	8	9	10	11	12	13
26	128	256	512	512	1024	1024	1024	1024	1024	2048	2048	2048	2048	2048
52	256	512	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024
78	384	768	1536	1536	1536	1536	1536	1536	1536	1536	1536	1536	1536	1536
106	512	1024	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048
132	768	1536	3072	3072	3072	3072	3072	3072	3072	3072	3072	3072	3072	3072
BW20 - 242	1024	2048	4096	4096	4096	4096	4096	16000	4096	16000	4096	16000	4096	4096
BW40 - 484	2048	4096	8192	8192	8192	8192	8192	8192	8192	8192	8192	8192	8192	8192
BW80 - 996	4096	8192	16384	16384	16384	16384	16384	16000	16384	16000	16384	16000	16384	16384
BW160 - 996*2	8192	16384	32768	32768	32768	32768	32768	16000	32768	16000	32768	16000	32768	32768

g. Click "**ADD**" button to added test case.

h. Click "**SET**" button to set test case.

i. If user wanted to test another case can select origin test case and click "**Remove**" button to remove old case and resetting another case again.

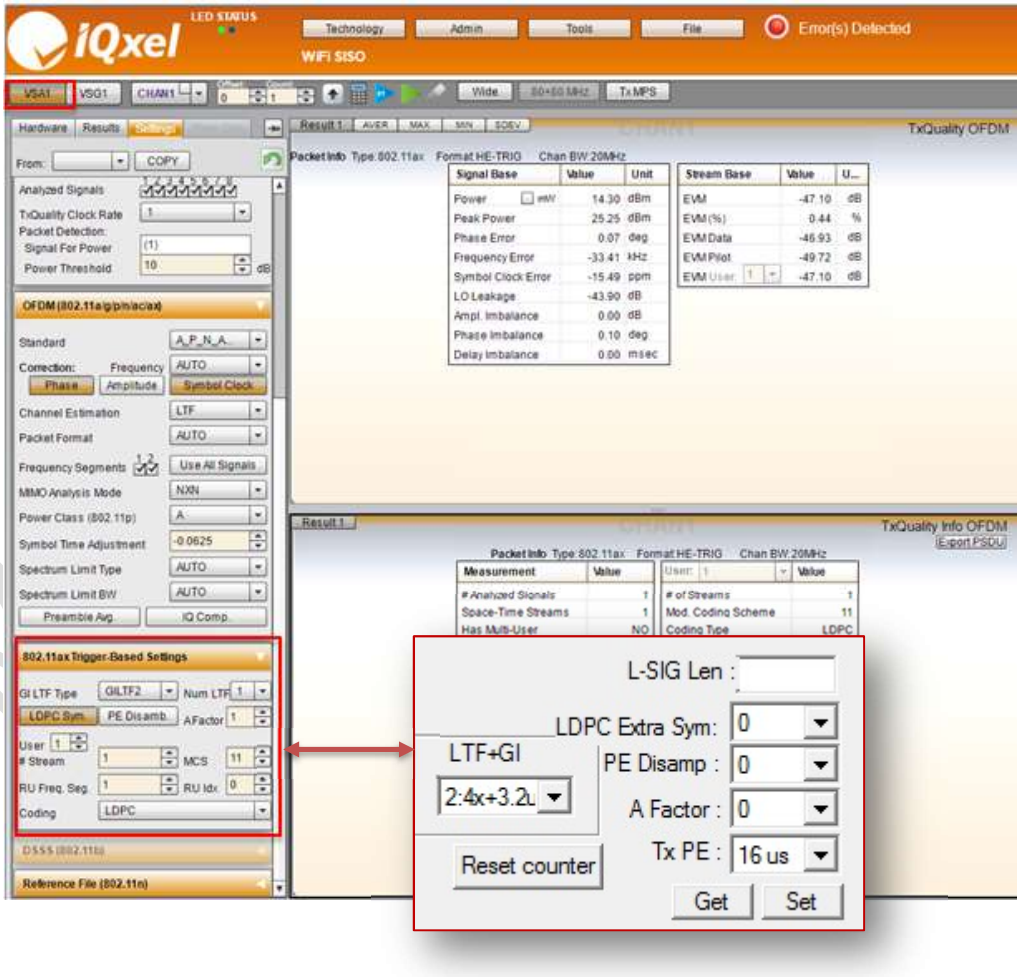


2.3.4 VSA Setting

Open Litepoint MW Web page select VSA

Setting RU info.

1. litepoint GI LTF Type align to QAtool LTF+GI
2. litepoint LDPC sym.(1=Orange light; 0=Gray light) align to QAtool LDPC Extra Sym
3. litepoint PE Disamb.(1=Orange light; 0=Gray light) align to QAtool Tx PE
4. A Factor:
    1. If QAtool A Factor set =0, set litepont A Factor =4
    2. If QAtool A Factor set =1, set litepont A Factor =1
    3. If QAtool A Factor set =2, set litepont A Factor =2
    4. If QAtool A Factor set =3, set litepont A Factor =3
5. Litepoint Stream setting (1 or 2) align to QAtool RU-page stream setting.
6. Litepoint MCS rate setting align to QAtool RU-page MCS setting.
7. Litepoint RU idx setting align to QAtool RU-page RU index setting.
8. If QAtool RU-page LDPC checked, set litepoint Coding : LDPC; Otherwise, set litepoint Coding : BCC.



2.3.5 WIFI Packets Receiving –1 stream

On TX/RX page

a. Select **"Band0"** for G band & **"Band1"** for A band.

b. Select RX sub-page and "**Test Mode**" as following figure.

c. Set Channel frequency.

d. Set BW. (Generally, System BW = Pre-Packet BW).

e. Choose "TX0/RX0" or TX1/RX1 to do receiving.

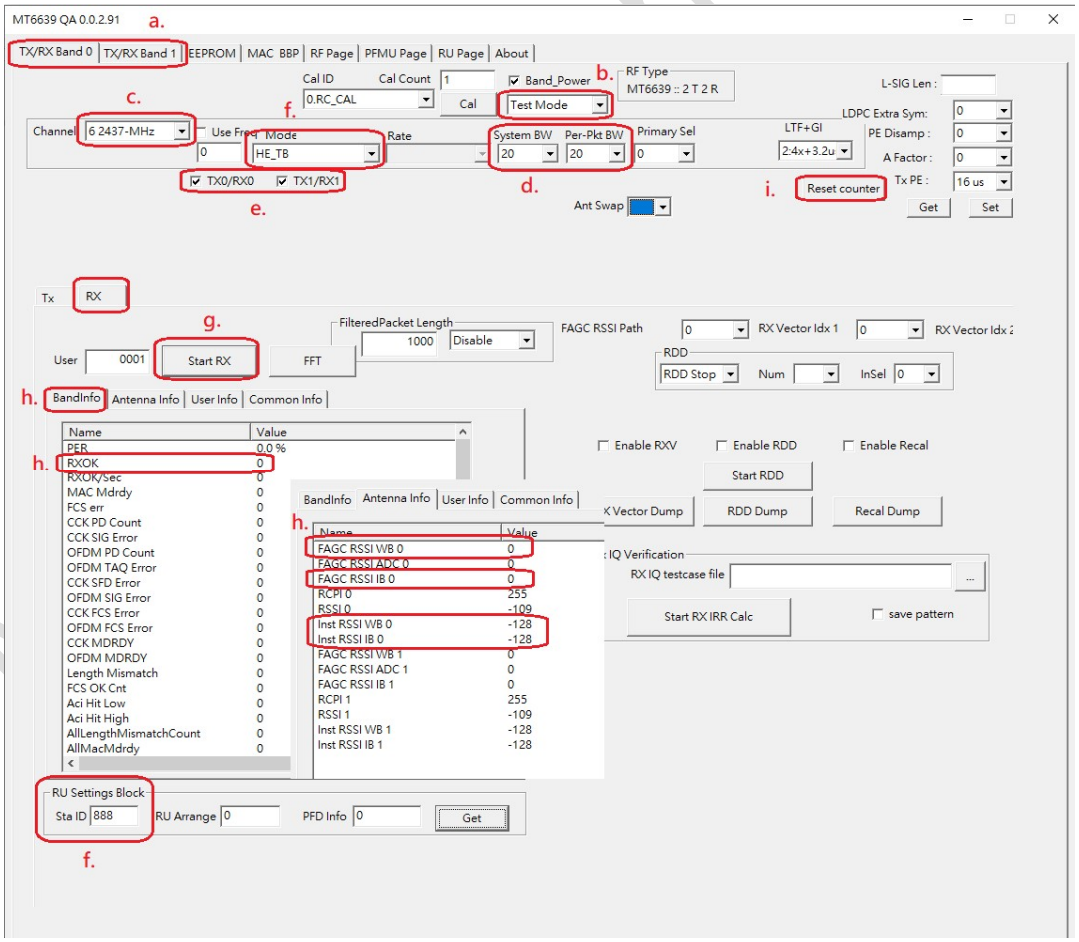
f. Select HE_MU and EHT mode and Set RU Station ID (wanted RU location station ID) (this step for HETB(RU), EHTTB(RU) and the default sat ID is "888")

g. Click "**Start RX**" button to receive WIFI packets.

Enable WIFI signal generator to transmit packets. Click "**Stop RX**" button to stop receiving.

h. Successful received packets number would be shown at "**RX OK**" area and RSSI shown at "**inst RSSI IB 0**" area.

i. Users can click "**Reset counter**" button to reset counter value.



2.3.6 WIFI Packets Receiving –2 stream

On TX/RX page

a. Select **"Band0"** for G band & **"Band1"** for A band.

b. Select RX sub-page and "**Test Mode**" as following figure.

c. Set Channel frequency.

d. Set BW. (Generally, System BW = Pre-Packet BW).

e. Choose "TX0/RX0" and TX1/RX1 to do receiving.

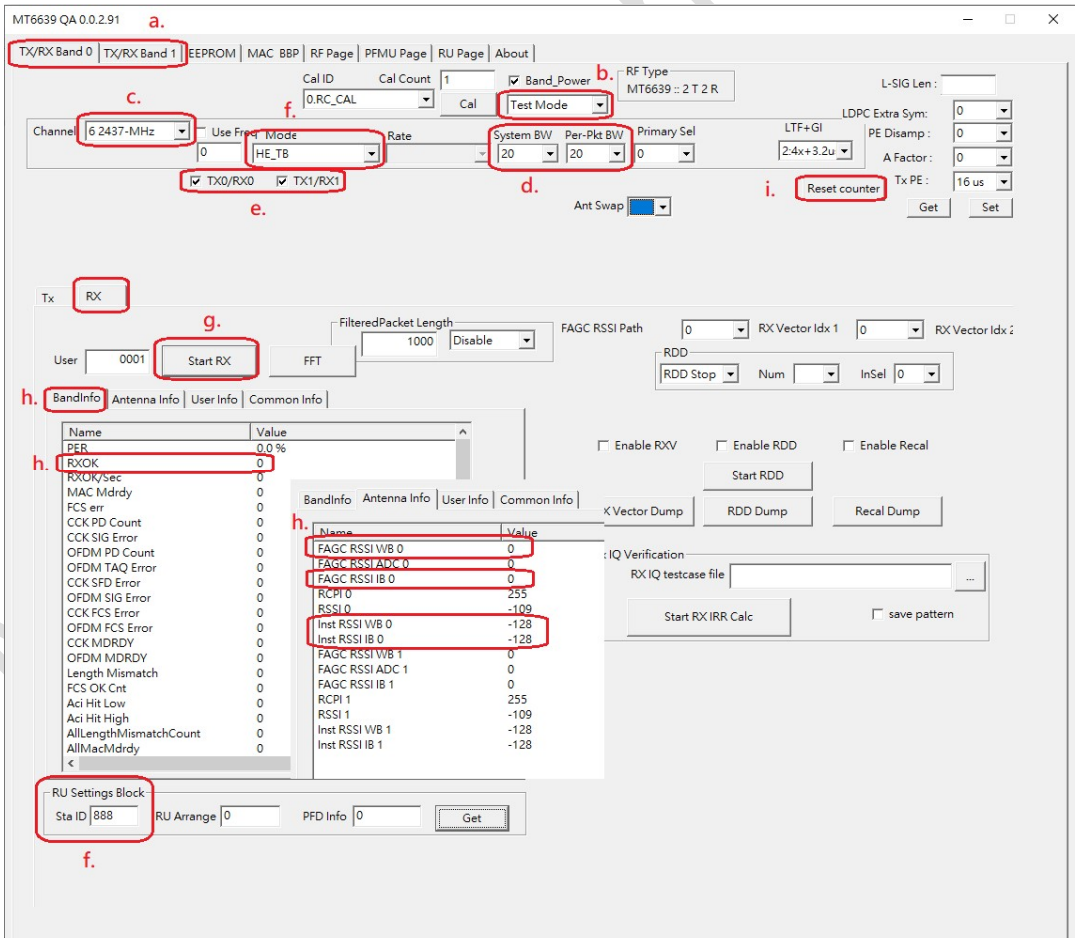
f. Select HE_MU mode and Set RU Station ID (wanted RU location station ID) (this step for HETB(RU), EHTTB(RU) and the default sat ID is "888")

g. Click "**Start RX**" button to receive WIFI packets.

Enable WIFI signal generator to transmit packets. Click "**Stop RX**" button to stop receiving.

h. Successful received packets number would be shown at "**RX OK**" area and RSSI shown at "**inst RSSI IB 0**" area.

i. Users can click "**Reset counter**" button to reset counter value.



2.4 Read, Write E-fuse Table

2.4.1 Read a Value from E-fuse

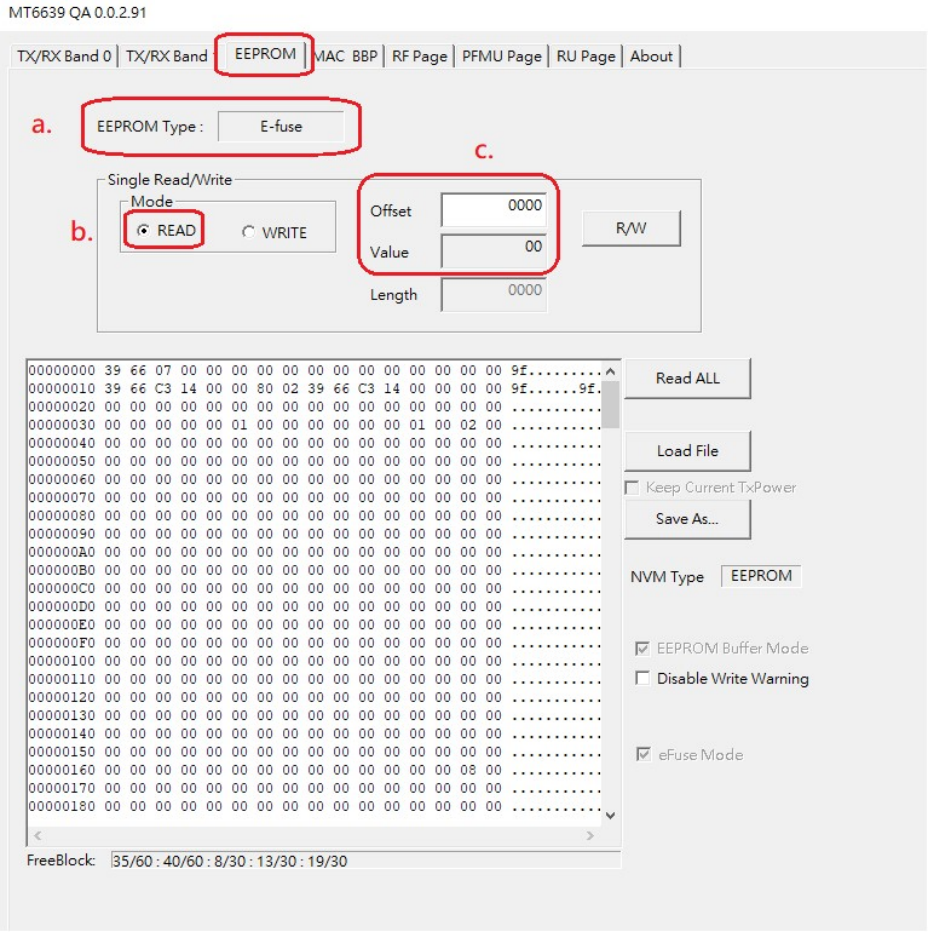
Users can use QA-Tool to read a value from an address offset of E-fuse.

On EEPROM page:

a. In E-fuse Mode, EEPROM Type is “E-fuse”.

b. Select Single Read/Write is “**READ**”.

c. Set address offset in “**Offset**” text box then click on ”**R/W**“button. The value of assigned address offset would be shown in the “**Value**” text box.



This is an example to read address offset_0x01 and get value 0x00 from E-fuse

2.4.2 Write a Value to E-fuse

Users can use QA-Tool to write a value to an address offset of E-fuse.

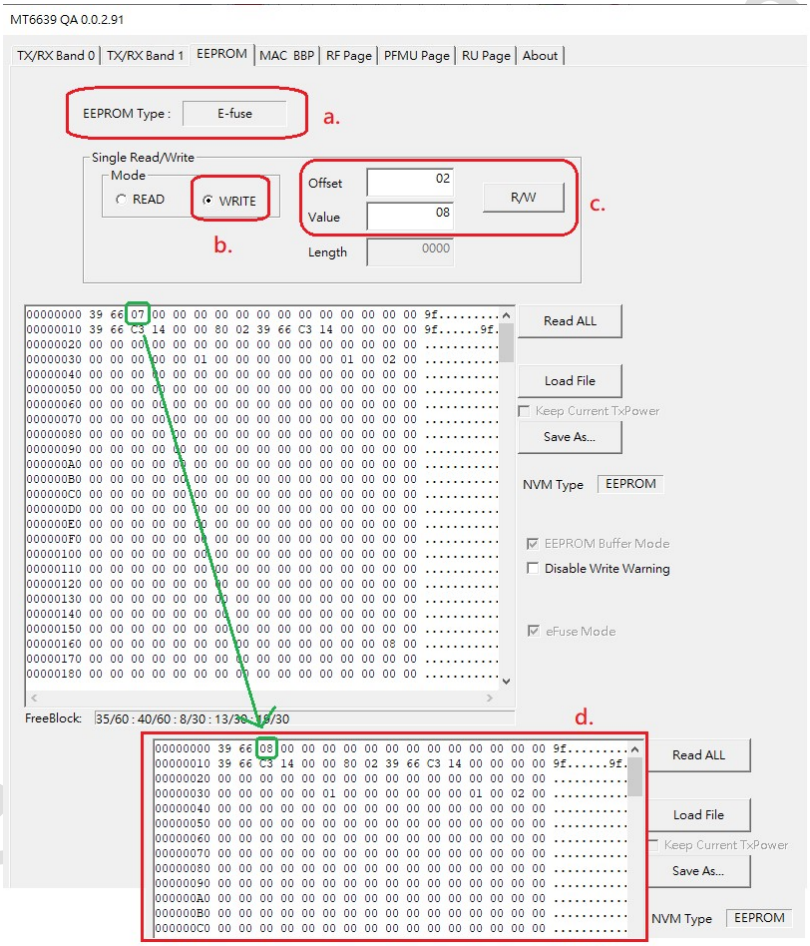
On EEPROM page:

a. In E-fuse Mode, EEPROM Type is “E-fuse”.

b. Select Single Read/Write mode is “**WRITE**”

c. Set address offset and new value in “**Offset**” and “**Value**” text boxes then click on ”**R/W**“ button.

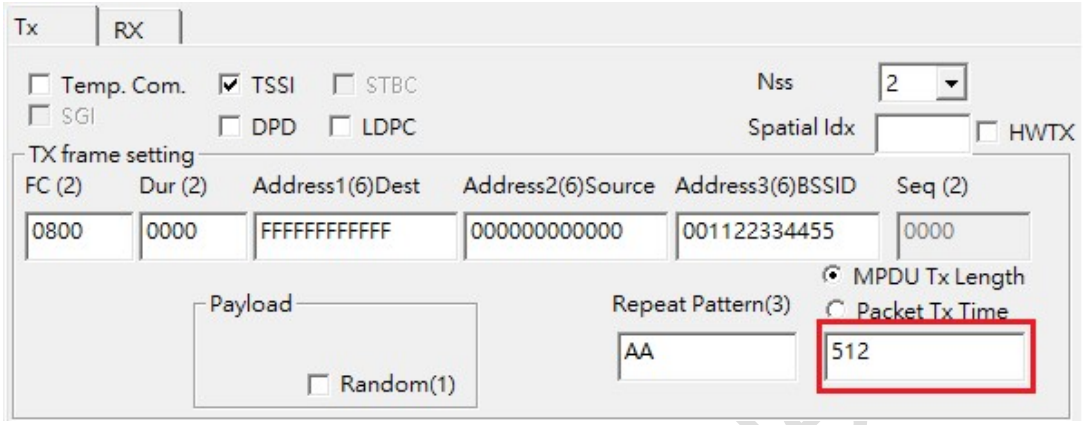
d. Click “**Read ALL**” button to update e-fuse value in e-fuse table and check it.



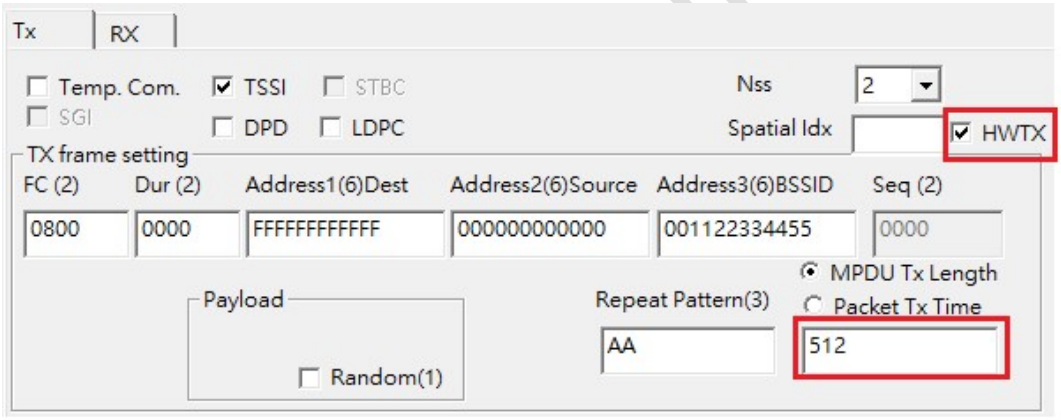
This is an example writing 0x01 to address offset_0x55 of E-fuse and check value is correcttly updated.

2.5 Homologation suggest setting

1. Normal Test item, we suggest Packet lengths use 512 Byte

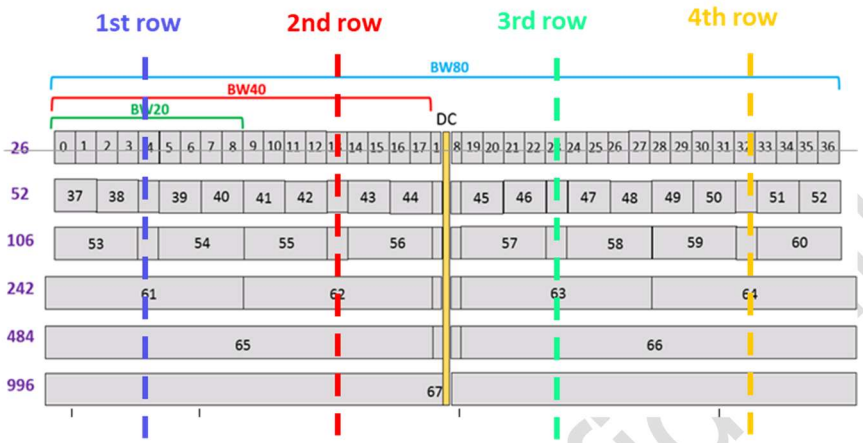


2. SAR test item, we suggest use HWTX, and adjust packet lengths that duty meet test conditions (duty 85%)

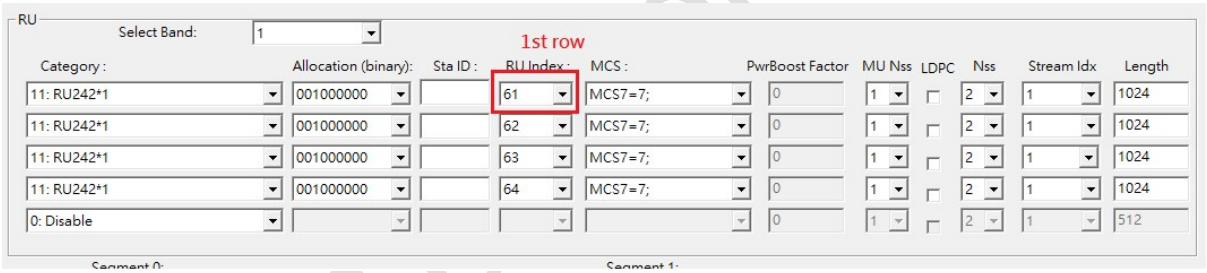


2.6 RU Setting example

RU index setting under QA Tool



Ex: RU Index 61 Can find it at RU242 1st ROW



3 General Information & Integration Instructions

3.1 General Description of MT7927

Product	2TX 11be (WiFi7) BW320 + BT/BLE Combo Card
Brand	MediaTek
Model	MT7927
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	GFSK, π/4-DQPSK, 8DPSK CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in VHT mode 1024QAM for OFDM in 11ax mode 4096QAM for OFDM in 11be mode
Modulation Technology	**BT EDR:** FHSS **BT LE:** GFSK **WLAN:** DSSS, OFDM, OFDMA
Transfer Rate	**BT EDR:** up to 3 Mbps **BT LE:** up to 2 Mbps **2.4GHz:** 802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to 300 Mbps VHT: up to 400 Mbps 802.11ax: up to 573.5 Mbps 802.11be: up to 688.2 Mbps **5GHz:** 802.11a: up to 54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 1733.3 Mbps 802.11ax: up to 2401.9Mbps 802.11be: up to 1441.2 Mbps **6GHz** 802.11a: up to 54 Mbps 802.11ax: up to 1201.0 Mbps 802.11be: up to 5764.8 Mbps
Operating Frequency	**BT EDR:** 2402MHz ~ 2480MHz **BT LE:** 2402MHz ~ 2480MHz **2.4GHz:** 2.412 ~ 2.472GHz **5GHz:** 5.18~5.25GHz, 5.25~5.32GHz, 5.5 ~ 5.72GHz, 5745~5825GHz **6GHz:** 5.955~6.425GHz, 6.435~6.525GHz, 6.525~6.875GHz, 6.875~7.115GHz
Number of Channel	**BT EDR:** 79 **BT LE:** 40 **2.4GHz:** 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20), 802.11be (EHT20): 13 802.11n (HT40), VHT40, 802.11ax (HE40), 802.11be (EHT40): 9 **5GHz:** **U-NII-1** 802.11a, 802.11n(HT20), 802.11ac(VHT20), 802.11ax(HE20), 802.11be(EHT20):4 802.11n(HT40), 802.11ac(VHT40), 802.11ax(HE40), 802.11be(EHT40):2 802.11ac(VHT80), 802.11ax(HE80), 802.11be(EHT80):1

	U-NII-2A + U-NII-2C 802.11a, 802.11n(HT20), 802.11ac(VHT20), 802.11ax(HE20), 802.11be(EHT20):16 802.11n(HT40), 802.11ac(VHT40), 802.11ax(HE40), 802.11be(EHT40):8 802.11ac(VHT80), 802.11ax(HE80), 802.11be(EHT80):4 802.11ac(VHT160), 802.11ax(HE160), 802.11be(EHT160):2 **U-NII-3** 802.11a, 802.11n(HT20), 802.11ac(VHT20), 802.11ax(HE20), 802.11be(EHT20):5 802.11n(HT40), 802.11ac(VHT40), 802.11ax(HE40), 802.11be(EHT40):2 802.11ac(VHT80), 802.11ax(HE80), 802.11be(EHT80):1 **6GHz:** For 1TX **5.955 ~ 6.425GHz:** 65.163 mW (EIRP: 22.9 dBm / 194.984 mW) **6.425 ~ 6.525GHz:** 33.806 mW (EIRP: 19.58 dBm / 90.782 mW) **6.525 ~ 6.855GHz:** 68.077 mW (EIRP: 22.94 dBm / 196.789 mW) **6.875 ~ 7.115GHz:** 69.663 mW (EIRP: 22.52 dBm / 178.649 mW) For 2TX **5.955 ~ 6.425GHz:** 65.66 mW (EIRP: 22.93 dBm / 196.336 mW) **6.425 ~ 6.525GHz:** 35.177 mW (EIRP: 20.22 dBm / 105.196 mW) **6.525 ~ 6.855GHz:** 68.169 mW (EIRP: 22.95 dBm / 197.242 mW) **6.875 ~ 7.115GHz:** 69.78 mW (EIRP: 22.53 dBm / 179.061 mW)

3.2 Antenna information

The antennas mentioned below are covered in the certification scope and the HOST can only be used with the following antennas:

Ant. Set	RF Chain No.	Brand	Model	Ant. Net Gain (dBi)	Freq. Range (GHz)	Ant. Type	Connector Type	Cable Length(mm)
1	Chain0	PSA	RFMTA340718EMLB302	3.18 4.92	2.4~2.4835 5.15~5.85	PIFA	i-pex(MHF)	200
	Chain1	PSA	RFMTA340718EMLB302	3.18 4.92	2.4~2.4835 5.15~5.85	PIFA	i-pex(MHF)	200
2	Chain0	PSA	RFMTA311020EMMB301	1.71 4.82 4.76 4.29 4.61 4.09	2.4~2.4835 5.15~5.85 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	PIFA	i-pex(MHF)	200
	Chain1	PSA	RFMTA311020EMMB301	1.71 4.82 4.76 4.29 4.61 4.09	2.4~2.4835 5.15~5.85 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	PIFA	i-pex(MHF)	200
3	Chain0	PSA	RFMTA421208IMMB701	-4.99	5.925~7.125	PIFA	IPEX	300
	Chain1	PSA	RFMTA421208IMMB701	-4.99	5.925~7.125	PIFA	IPEX	300

Only the above antennas are tested for compliance with the FCC rules, and all other antennas (even same type with lower gain) will require a re-assessment to be used with this module.

3.3 Host Integration instructions

The product is designed to be used with “NGFF (Next Generation Form Factor) M.2 2230” PCIE Bus, please install module into a M.2 2230 PCIE slot.

3.4 Host product testing guidance

HOST must follow the specific restrictions listed in "3.5 Regulatory notes" section below and section 3 of KDB996369 D04 V02 Module Integration Guide v01, to verify that the host product meets all the applicable rules.

3.5 FCC regulation requirements / installation restrictions

RF Software restrictions (Implement by MTK)

Indoor Client 6XD

1. Contention-Based Protocol, as demonstrated in the FCC test report, is permanently embedded in the module and is not host-dependent, can't change by anyone.
2. This Modular device will only associate and connect with a low-power indoor access point or subordinate device and never directly connect to other client devices. This feature is include in its firmware and can't change by anyone.
3. This Modular device will always initiate transmission under the control of a low-power indoor AP or subordinate except for brief transmissions before joining a network. These short messages will only occur if the client has detected an indoor AP or subordinate operating on a channel. These brief messages will have a time-out mechanism such that if it does not receive a response from an AP it will not continually repeat the request.
4. That transmissions will be lower or equal to the power advertised by the indoor low-power access point or subordinate and never above the maximum output power allowed by the FCC grant for equipment class 6XD.

Installation restrictions

1. When use and install this modular device, prohibited for control of or communications with unmanned aircraft systems, including drones.

Dual Client 6CD

1. This device not 6PP category and the maximum power does not exceed authorized values.
2. This device will only associate and connect with a low-power indoor Access Point, subordinate device, or standard access point and never directly link to any other client devices.
3. This device will always initiate transmission under the control of a low-power indoor AP or subordinate or standard client except access point for brief communications before joining a network. These quick messages will only occur if the client has detected an indoor AP, subordinate, or standard access point operating on a channel. These brief messages will have a time-out mechanism such that if it does not receive a response from an AP it will not continually repeat the request.

4. This device, when associated and connected with a low-power indoor access point, subordinate or standard access point device, will operate at a power lower as advertised by the indoor access point, subordinate, or standard access point:
    i. lower than or equal to the power advertised by the low-power indoor access point or subordinate and never above the maximum output power allowed by the FCC grant for clients associated with indoor clients or subordinates.
    ii. lower than or 6 dB below the power advertised by the standard access point.
5. Contention-based protocol as demonstrated in the test report is permanently embedded in the module and is not host-dependent based protocol demonstrated in the test report.

Installation restrictions

1. Prohibited for control of or communications with unmanned aircraft systems, including drones.

Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

KDB 996369 D03 OEM Manual v01 rule sections:

2.2 List of applicable FCC rules

This module has been tested for compliance to FCC Part 15 Subpart C (15.247) and Subpart E (15.407).

2.3 Summarize the specific operational use conditions

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) will need a separate reassessment through a class II permissive change application or new certification.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Not applicable.

2.6 RF exposure considerations

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. A separate SAR/Power Density evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

This device was tested for typical body operations. To comply with RF exposure requirements, a minimum separation distance of 5 mm must be maintained between the user’ s body a including the antenna.

2.7 Antennas

The following antennas have been certified with this module.

Ant. Set	RF Chain No.	Brand	Model	Ant. Net Gain (dBi)	Freq. Range (GHz)	Ant. Type	Connector Type	Cable Length(mm)
1	Chain0	PSA	RFMTA340718EMLB302	3.18 4.92	2.4~2.4835 5.15~5.85	PIFA	i-pex(MHF)	200
	Chain1	PSA	RFMTA340718EMLB302	3.18 4.92	2.4~2.4835 5.15~5.85	PIFA	i-pex(MHF)	200
2	Chain0	PSA	RFMTA311020EMMB301	1.71 4.82 4.76 4.29 4.61 4.09	2.4~2.4835 5.15~5.85 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	PIFA	i-pex(MHF)	200
	Chain1	PSA	RFMTA311020EMMB301	1.71 4.82 4.76 4.29 4.61 4.09	2.4~2.4835 5.15~5.85 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	PIFA	i-pex(MHF)	200
3	Chain0	PSA	RFMTA421208IMMB701	-4.99	5.925~7.125	PIFA	IPEX	300
	Chain1	PSA	RFMTA421208IMMB701	-4.99	5.925~7.125	PIFA	IPEX	300

Note1: Use of other antenna types or the same type of antenna with higher gain than listed above must performed additional testing and appropriate permissive change approval.
Note2: In the 5.925-7.125GHz band, use of other similar type antennas and the antenna gain not higher/lower than listed above may only require a C1PC without any additional testing/submission.
Note3: Contact MTK for additional guidance, if choose to use different antenna types or higher/lower gain antennas in the end system.
IMPORTANT: The final host product must have an integral antenna which is not removable by the end-user.

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: RAS-MT7927”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on test modes and additional testing requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) class II permissive change re-evaluation or new certification.

Verification test items as below:

FCC Rule Part	Frequency Band	Test Items (worst channel)
FCC Part 15C BT/BT LE	2402 MHz - 2480 MHz	1. radiated emission – Band edge and Harmonics 2. Conducted output power 3. RF Exposure
FCC Part 15C WLAN 2.4G	2412 MHz - 2472 MHz	1. radiated emission – Band edge and Harmonics 2. Conducted output power 3. RF Exposure
FCC Part 15E WLAN 5G	5180 MHz – 5825 MHz	1. radiated emission – Band edge and Harmonics 2. Conducted output power 3. RF Exposure
FCC Part 15E WLAN 5.9G	5845 MHz – 5885 MHz	1. radiated emission – Band edge and Harmonics 2. EIRP 3. RF Exposure
FCC Part 15E WLAN 6G	Under control by Low-power indoor access point 5955 MHz – 7115 MHz Under control by Standard power access point 5955 MHz – 6425 MHz 6525 MHz – 6875 MHz	1. Radiated versus Conducted Measurement For Radiated measurement: The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation) For Conducted measurement: The level of unwanted emissions was measured as their power in a specified load (conducted spurious emissions). 2. EIRP 3. RF Exposure

More detail test items (e.g., modes / channel / EUT setup configurations / …..) please contact MTK personnel or send request letter via https://corp.mediatek.com/about/contact-us.

2.10 Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

Modules: extended to host manufacturers by integration instructions.