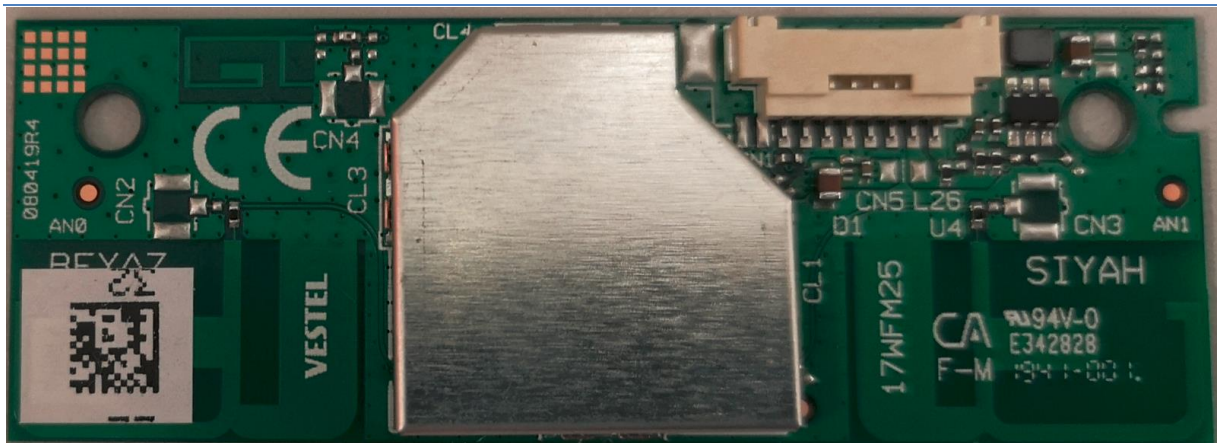


17WFM25

Product Specification and User Manual



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Author	Note	Date	Version
Gülizar Yardımoğlu Büşra Demirtaş	Initial Draft	02.05.2019	V1.0
Emre Ardalı	Add target power table, correct header formats	06.05.2019	V1.1
Gülizar Yardımoğlu	Add Country Regulations and SW Installation, Current consumption, BT RF Characteristic	20.06.2019	V1.2
Hakan Falakalıoğlu	Add FCC statements; add List of applicable FCC-rules and Test modes sections	21.01.2020	V1.3
Hakan Falakalıoğlu	Add new statements to Hardware Installation section	28.08.2020	V1.4
Hakan Falakalıoğlu	Tables in RF Characteristic section and Country Regulations section are updated List of applicable FCC-rules section is removed	02.09.2020	V1.5
Hakan Falakalıoğlu	Add FCC/IC warning section and update RF Characteristic table	21.10.2020	V1.6
Hakan Falakalıoğlu	External antenna gain table is updated	30.07.2021	V1.7

Information given in this document may change without any notification.

1. General Description

The 17WFM25 WI-FI + BT combo module design is a highly integrated MIMO wireless LAN (WLAN) and BT solution to let users enjoy the digital content via the wireless technology and connect wireless sound devices, HID devices, BT remote controller etc. The card is built with WI-FI 2T2R and Bluetooth v5.0 and BT 4.2 Low Energy (LE) capable RF/baseband single chip. 17WFM25 is based on MediaTek MT7668BUN solution.

The 17WFM25 module design implements multiple input, multiple output (MIMO) orthogonal frequency division multiplexing (OFDM) with 2 transmit and 2 receive paths and is compatible with 802.11 n/ac specifications for WI-FI.

For legacy compatibility, direct sequence spread spectrum (DSSS), complementary code keying (CCK) and OFDM baseband processing are included to support all 802.11b, and 802.11g data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK are available along with complementary code keying to provide the data rates of 1, 2, 5.5 and 11Mbps with long or short preamble. It supports BPSK, QPSK, 16QAM, and 64QAM modulation of the individual subcarriers and rate compatible punctured convolutional coding with coding rate of 1/2, 2/3, 3/4, and 5/6, provides the maximum data rate of 54 Mbps and 300 Mbps for IEEE 802.11g and 802.11n/a MIMO OFDM respectively. It can support MCS0-9 (up to 256 QAM) in 20/40/80 MHz channels for 802.11ac mode. Module has no DFS (Dynamic Frequency Selection) and is only a DFS Client.

2. Features

- IEEE 802.11a/b/g/n/ac Dual Band WLAN standards
- Support 20 MHz, 40 MHz, 80 MHz bandwidth in 2.4 GHz & 5 GHz bands
- Bluetooth specification 2.1 + EDR, Bluetooth 4.2 Low Energy (LE), Bluetooth 5.0
- 2x2 MIMO
- USB2.0 interface
- Printed PIFA antennas (WLAN Printed Antennas, BT Printed Antenna)
- External antenna option with U.F.L micro coax RF socket (with BOM option)

3. Key Specification

Main chipset	MT7668BUN, Mediatek
Frequency range *	WLAN: 2402-2482MHz, 5180-5320MHz, 5500-5700MHz
	Bluetooth: 2402-2480MHz
Channels support *	WLAN: CH1-13, CH36-64, CH100-140
	Bluetooth: CH0-78
Host interface	USB 2.0

* Country code control by host device.

4. Electrical Specification

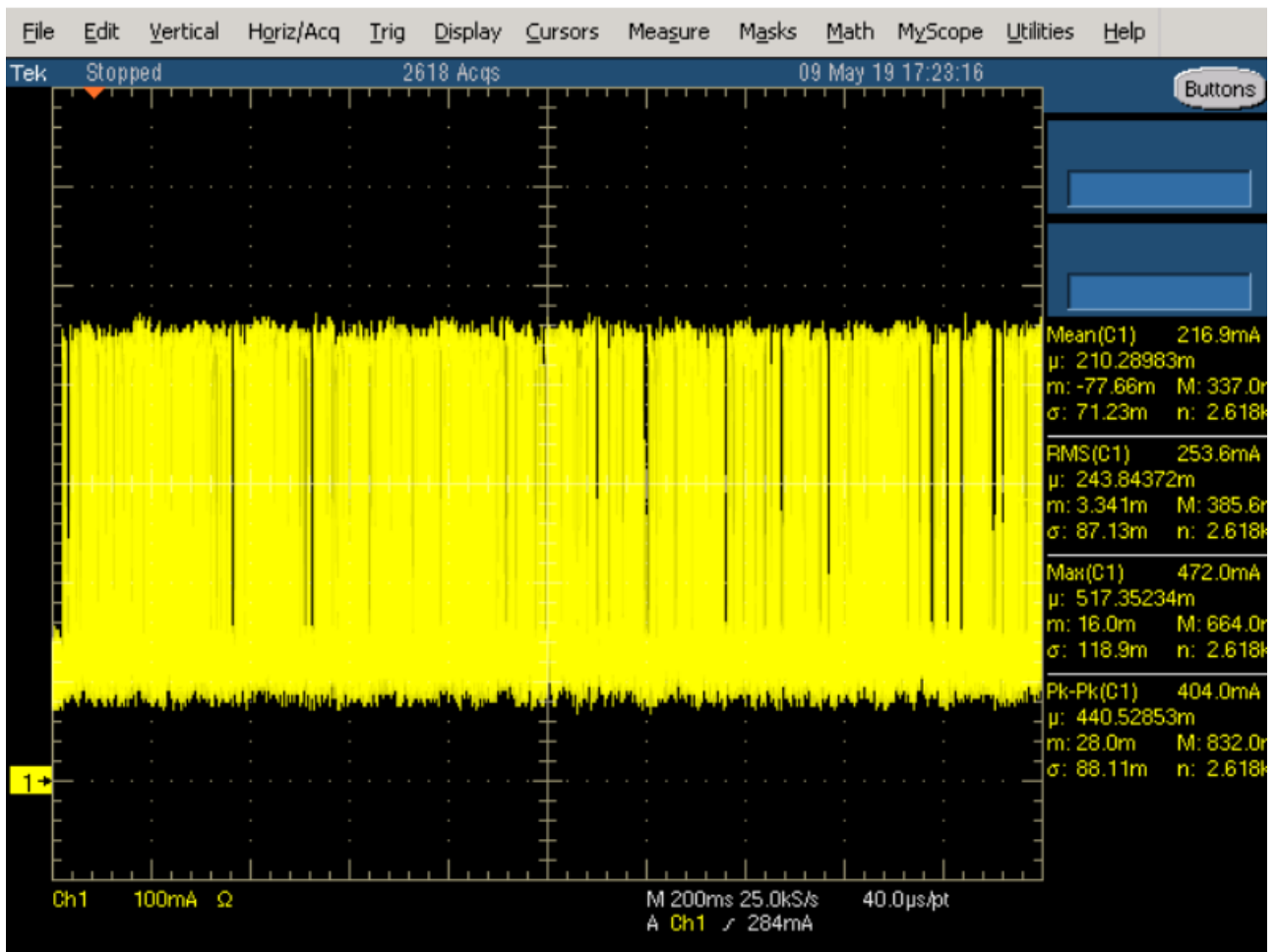
4.1 Power supply voltages

DC supply to module	Min	Typ	Max
VCC	4.75 V	5 V	5.25

4.2 Current consumption

Note (VCC 5V)	Typ (mA rms)	Max peak (mA)
Idle (2.4G, HT20, Ch6) *	91.4	340
2.4G, HT20, Ch6, Rx mode	106.7	352
2.4G, HT20, Ch6, Tx mode	209.8	364
2.4G, HT20, Ch6, Rx mode + BT	111.6	380
2.4G, HT20, Ch6, Tx mode + BT	225.1	376
Idle (5G, VHT20, Ch48) *	102.8	440
5G, VHT20, Ch48, Rx mode	148.5	460
5G, VHT20, Ch48, Tx mode	372.1	480
5G, VHT20, Ch48, Tx mode + BT	285.1	488
Idle (5G, VHT80, Ch108) *	115.8	444
5G, VHT80, Ch108, Rx mode	226	468
5G, VHT80, Ch108, Tx mode	253.6	472
5G, VHT80, Ch108, Rx mode + BT	192.8	476

* Idle means, it is connected to access point but no data streaming.



5G VHT80 Ch108, TX mode current wave form (VCC 5V)

4.3 Thermal characteristics

Operating temperature is 65 degree. Tj max 125 degree for wifi/BT SOC.

5 RF Characteristic

5.1 Wi-Fi

Typical power levels for wi-fi radio are given in figure below.

	2.4G BAND			
Standard	802.11b	802.11g	802.11n	802.11n
Modulation	DSS,CCK	OFDM	OFDM	OFDM
Data Rate	1,2,5,5,11	6,9,12,18,24,36,48,54	MCS0 - 7 (HT20)	MCS0 - 7 (HT40)
Channel*	CH 1-13	CH 1-13	CH 1-13	CH 1-13
Power (dBm)	13,5	13,5	13,5	13,5
	5G BAND			
Standard	802.11a	802.11n/ac	802.11n/ac	802.11n/ac
Modulation	OFDM	OFDM	OFDM	OFDM
Data Rate	6,9,12,18,24,36,48,54	MCS0 - 9 (HT20)	MCS0 - 9 (HT40)	MCS0 - 9 (HT40)
Channel*	CH 36-64/ CH 100-165	CH 36-64/ CH 100-165	CH 38-62/ CH 100-159	CH 42-58/ CH 100-155
Power (dBm)	14	14	14	14

***See country regulations**

5.2 Bluetooth

Typical power levels for wi-fi radio are given in figure below.

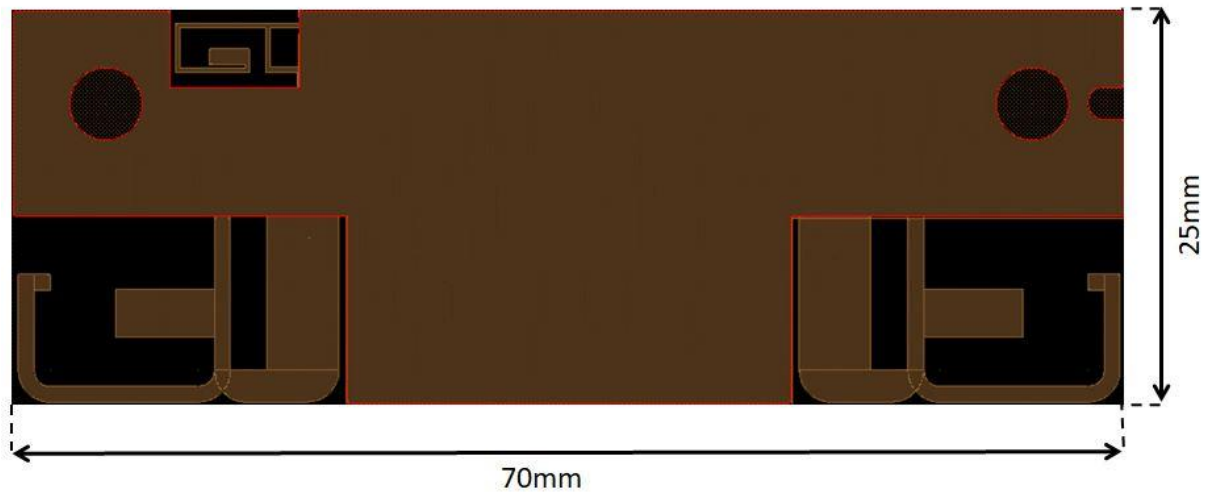
Standard	Bluetooth 5.0
Modulation	FHSS/ GFSK, pi/4-DQPSK, 8DPSK
Data Rate	1Mbps(GFSK),2Mbps(pi/4-DQPSK),3Mbps (8DPSK)
Channel	CH 0 ~ 78
Power (dBm)	4 dBm ~ 7dBm

6 Antenna Characteristic

Module has on board printed antennas with the given gain values in below. It can support also external antenna option with U.F.L micro coax RF socket (with BOM option). So, there are two possible configuration for the antennas. First option is that using two onboard antennas, and second option is one onboard antenna and one external antenna.

6.1 Onboard Printed Antenna Gains

	2.4 Ghz	5 Ghz low band (5180 to 5320) (ch 36-64)	5 Ghz medium band (5500 to 5700) (ch100-140)	5 Ghz high band (5745 to 5825) (ch149-165)
Antenna 0	3,4 dBi	2,97 dBi	3,69 dBi	2,89 dBi
Antenna 1	2,12 dBi	3,7 dBi	3,68 dBi	2,83 dBi
BT	0,29 dBi			



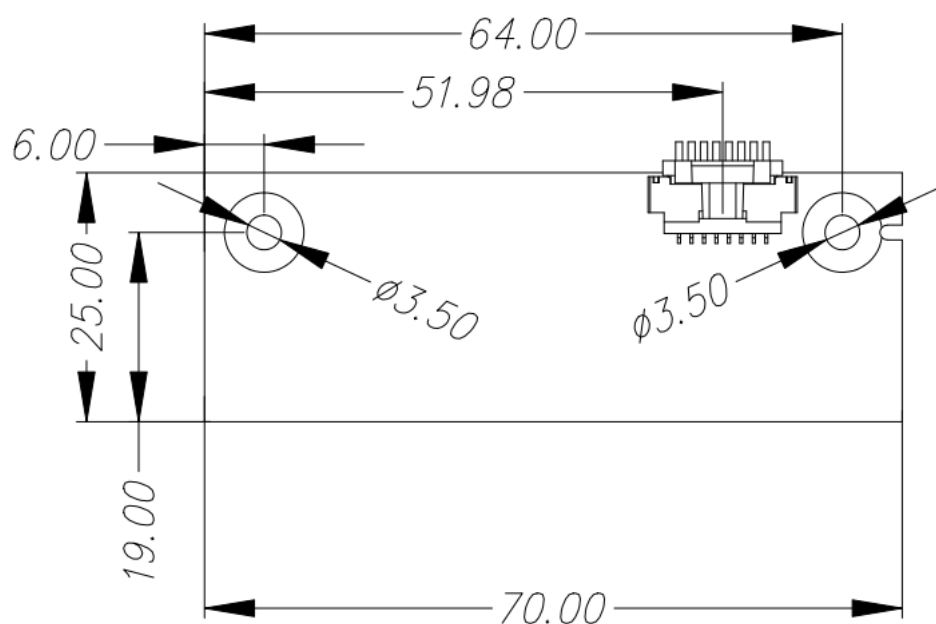
6.2 External Antenna Gains

Below two external antennas on the table may use as an option instead of the antenna 0.

Antenna	2.4 Ghz	5 Ghz low band (5180 to 5320) (ch 36-64)	5 Ghz medium band (5500 to 5700) (ch100-140)	5 Ghz high band (5745 to 5825) (ch149-165)
JC-JCW601	3 dBi	3 dBi	3 dBi	3 dBi
Taoglas_WS.01.B.305151	4,12 dBi	4,74 dBi	Not available	Not available

7 Mechanical Characteristics

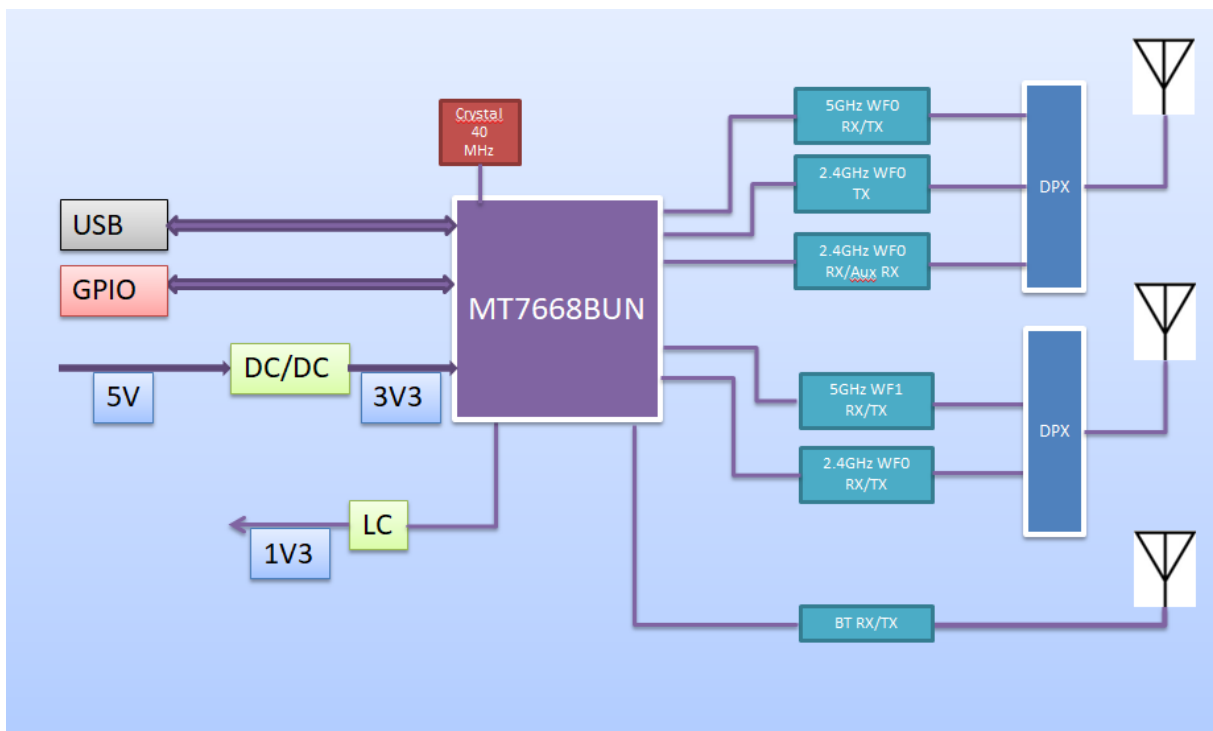
Module dimension is 70x25 mm.



8 Pin Description

Pin No.	Pin Name	I/O	Pin Description
1	WoBLE	I/O	Wake on Bluetooth Control Signal
2	WoWLAN	I/O	Wake on Wireless LAN Control Signal
3	GND	-	Ground
4	GND	-	Ground
5	USB_DP	I/O	USB Communication Signal
6	USB_DN	I/O	USB Communication Signal
7	VCC	I	VCC 5V
8	VCC	I	VCC 5V

9 Block diagram



10 Environmental

10.1 Operating

Operating Temperature: 0 to 65 °C
Relative Humidity: 5-60% (non-condensing)

10.2 Storage

Temperature: -20 to 80 °C
Relevant Humidity: 5-85% (non-condensing)

11 Hardware & Software installation

11.1 Hardware Installation

The module is a build in module. It will be used in-house production as an embedded device over USB 2.0 interface and there is no need any interaction with end-user. Positioning of the module is defined by assembly operator instructions for each product by Vestel.

The recommended installation of the module is shown below. The module should be mounted by considering operating temperature. The temperature of the installation location should be between 0°C and 65 °C.

The module can be installed in mobile or fixed hosts. For portable devices a minimum separation distance of greater than “20cm” between the antenna and the human body shall be observed to avoid SAR requirements. The implementation of the module in a specific end-product should also be reviewed to ensure compliance with the FCC and IC requirements for SAR and MPE.

The host integrator must follow the integration instructions provided by Vestel and ensure that the composite-system end product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules and to KDB Publication 996369.

Host label shows the FCC and ISSED identifier of the module. FCC and ISSED identifier will be visible on the back cover of the host device. Also, the modular transmitter meets only FCC and ISSED authorized for the specific rule parts, and the host must show complains with his own rule parts.

The module has been tested and approved as a Modular Radio in accordance with the appropriate FCC and IC standards. The supporting test data may be found in the modular test report.

Since this module has been certified as a Modular Radio, this allows the end user to integrate this module into an end-product without the requirement of re-certifying the radio module. The module-integrator is responsible for the unintentional conducted and radiated emissions and must verify that the integrated product is compliant with the rules associated with unintentional radiators. The module integrator is also required to maintain an engineering record of the verification testing and declare on the product through proper labeling and marking that the device is compliant with these particular rules. Although already certified, radio tests according to KDB996369 clause 3.4 have to be carried out also.

External antennas can be installed if S3 (jumper) and CN2 (ufl connector) is placed on the board. S3 and S4 positions on the board are jumper options that obtain which antenna (S3 =onboard, S4 = external antenna) is used.

Installed module’s FCC ID and IC numbers need to be clearly marked on the product with the following verbiage “Contains FCC ID: 2AVQS-17WFM25” and “Contains IC: 25888-17WFM25”.

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

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

Vestel provides user notices in both English and French when the product is made available for sale and/or lease in Canada. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

11.2 Software Installation

The SW driver is already installed to host device software platform which is a Linux/Android OS. Proper country information must be selected from UI during first time boot up settings. Country information is used to disable (deactivate) channels/frequency ranges which are not allowed by country regulations.

12 Country Regulations

Device is intended for home and office use in all countries and countries may have their own regulations to prohibit some wlan frequencies. Proper country information must be selected from UI during first time boot up settings. Country information is used to disable (deactivate) channels/frequency ranges which are not allowed by country regulations. Below are notes on use of devices in countries. For further information please refer to product IB or consult country regulatory organization.

Country	Restriction
Bulgaria	General authorization required for outdoor use and public service
France	In-door use only for 2454-2483.5 MHz
Italy	If used outside of own premises, general authorization is required
Greece	In-door use only for 5470 MHz to 5725 MHz band
Luxembourg	General authorization required for network and service supply (not for spectrum)
Norway	Radio transmission is prohibited for the geographical area within a radius of 20 km from the centre of Ny-Ålesund
Russian Federation	In-door use only
Israel	5 GHz band only for 5180 MHz-5320 MHz range
Canada	In-door use only for 5150 MHz to 5250 MHz band
USA / Canada	In the 2.4GHz Band channel 12 and 13 are disabled and for 802.11n (40) only CH 3-9 are enabled

Basic transmitter specification is given below figure;

Frequency Ranges	Max Output Power (eirp)
2400 - 2483,5 MHz (CH1-CH13)	< 100 mW
5150 - 5250 MHz (CH36 - CH48)	< 200 mW
5250 - 5350 MHz (CH52 - CH64)	< 200 mW
5470 - 5850 MHz (CH100 - CH165)	< 200 mW

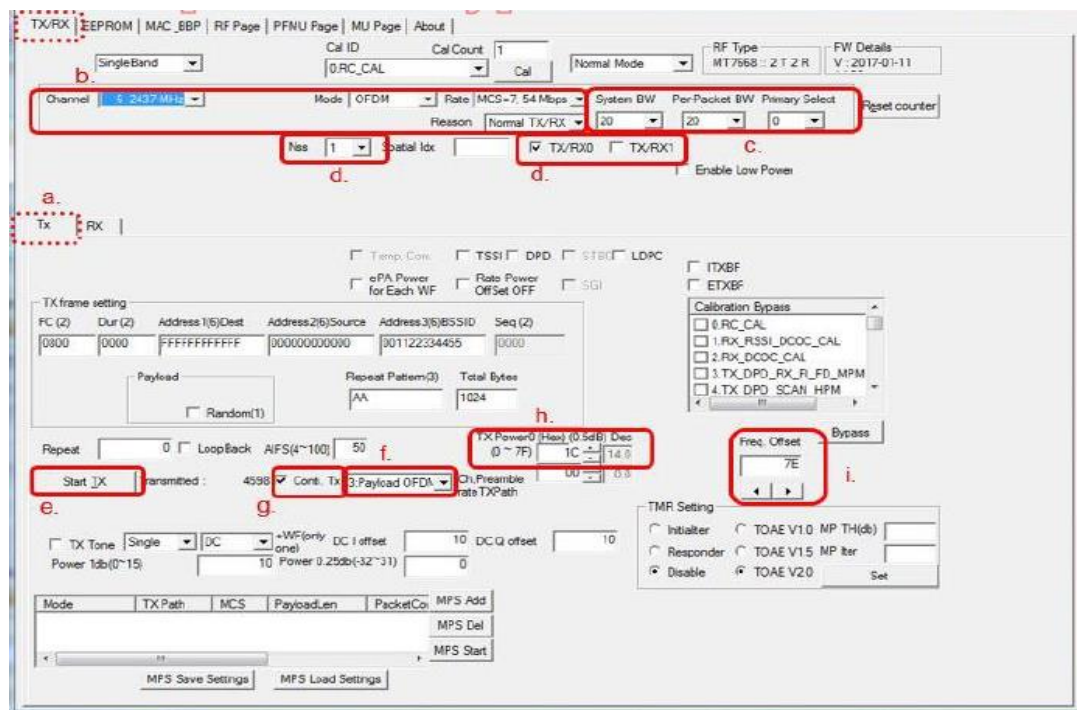
13 Test modes

Test tools of Mediatek (QA tool) allow to configure test modes for different operational conditions.

Below steps should have been followed for testing Tx power on module.

On TX/RX page:

- Select TX sub-page as following figure.
- Set Channel/Mode/Rate.
- Set BW. (Generally, System BW = Pre-Packet BW).
- Select "Nss=1 or Nss=2" and choose "TX/RX0" or "TX/RX1" to do transmitting.
- Click "Start Tx" and waiting for a while then click "Stop Tx".
(Please repeat this step if user change channel/BW/Rate)
- Choose "Payload OFDM".
- Check "Conti. Tx" to start Tx 100% duty packet transmitting and uncheck "Conti. Tx" to stop.
- Users can click "÷" button to modify power level of transmitting signal after uncheck "Conti. Tx".
- Users can click "< >" button to modify frequency offset of transmitting signal after uncheck "Conti. Tx".



Below steps should have been followed for testing Rx on module.

On TX/RX page

- Select RX sub-page and "Normal Mode" as following figure.
- Set Channel frequency.
- Set BW. (Generally, System BW = Pre-Packet BW).
- Select "Nss=1" and choose "TX/RX0" to do receiving.
- Click "Start RX" button to receive WIFI packets.
Enable WIFI signal generator to transmit packets. Click "Stop RX" button to stop receiving.
- Successful received packets number would be shown at "RX OK" area and RSSI shown at "Inst RSSI IB R0" area.
- Users can click "Reset counter" button to reset counter value.

