

User Manual

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1. General Description

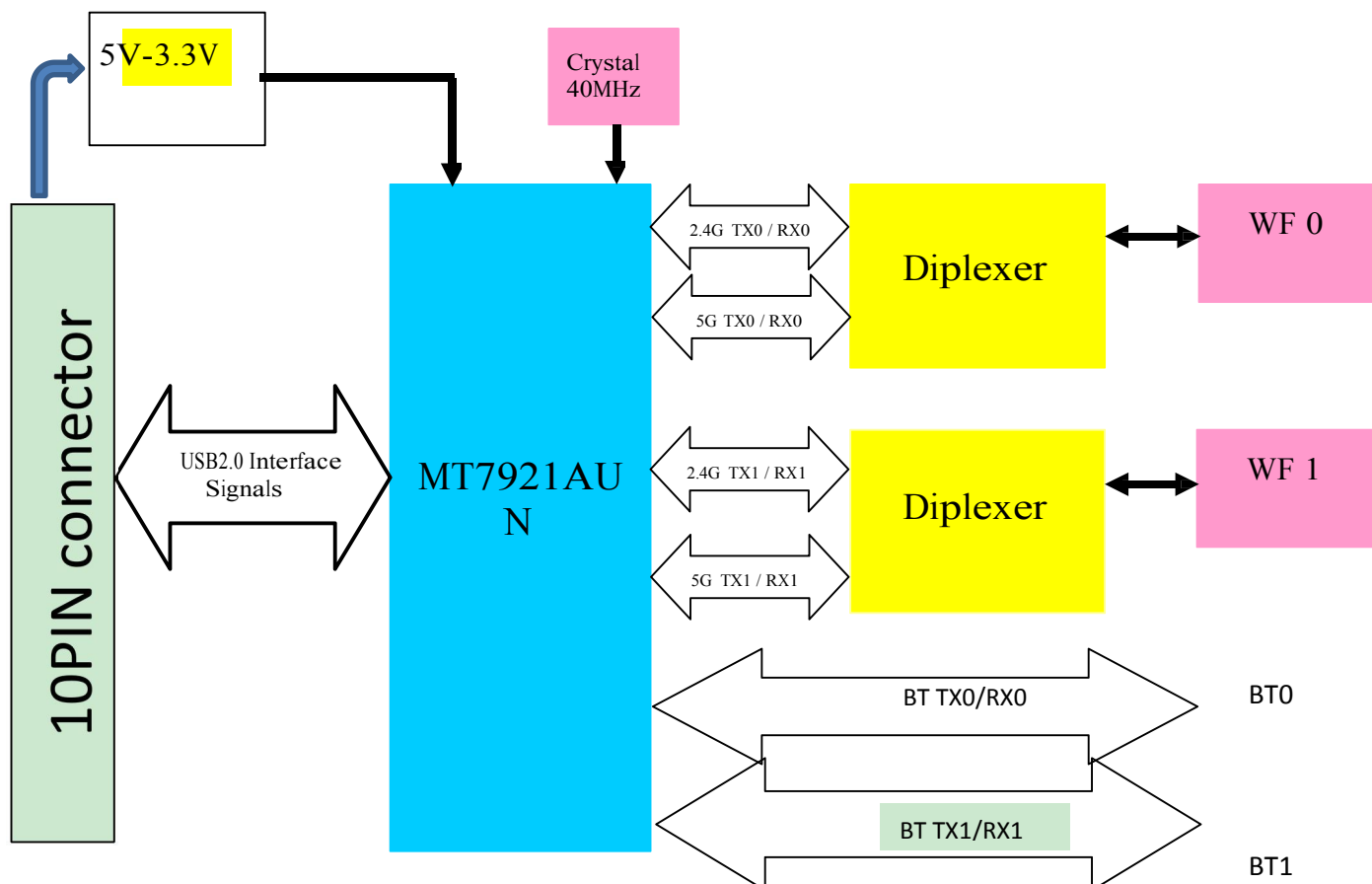
This document is to specify the product requirements for 802.11a/b/g/n/ac/ax and BT combo module. This module based on MediaTek MT7921AUN chipset that complied with IEEE 802.11b, IEEE 802.11g, IEEE 802.11n ,IEEE 802.11ac,IEEE 802.11ax standard from 2.4~2.5GHz and IEEE 802.11a, IEEE 802.11ac , IEEE 802.11n,IEEE 802.11ac,IEEE 802.11ax standard from 5.15GHz ~ 5.85GHz. It is a complete dual-band(2.4GHz and 5GHz)WIFI 2×2 MIMO MAC/PHY/Radio System-on-a-Chip. This module provides a high level of integration with adual-stream IEEE 802.11ax MAC/ base band /radio.The WLAN operation supports 20MHz,40MHz and80MHz channels for data rates up to 1201Mbps

2. Features

- Compatible with IEEE 802.11a standard to provide wireless 54Mbps data rate.
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps data rate.
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps data rate.
- Compatible with IEEE 802.11n standard to provide wireless 300Mbps data rate.
- Compatible with IEEE 802.11ac standard to provide wireless 866.7Mbps data rate.
- Compatible with IEEE 802.11ax standard to provide wireless 1201Mbps data rate.
- Support 20MHz, 40MHz bandwidth in 2.4GHz band
- Support 20MHz, 40MHz, 80MHz bandwidth in 5GHz band and 6GHz band
- Support uplink MU-OFDMA TX and downlink MU-OFDMA RX
- Support MU-MIMO RX
- Support DBDC (dual band dual concurrent)
- Support STBC, LDPC, TX Beamformer and RX Beamformee
- Greenfield, mixed mode, legacy modes support
- IEEE 802.11 d/e/h/i/j/k/mc/r/v/w support
- Security support for WFA WPA/WPA2 personal, WPS2.0, WAPI
- QoS support of WFA WMM, WMM PS
- Operation at 2.4~2.5GHz and 5.15~5.825GHz frequency band to meet worldwide regulations
- Bluetooth specification 2.1+EDR
- Bluetooth 4.2 Low Energy (LE)
- Bluetooth 5.2
- High speed USB 2.0 interface
- RoHS compliant

3. Application Diagrams

3.1 Functional Block Diagram



3.2 General Requirements

3.2.1 IEEE 802.11b Section

	Feature	Detailed Description
3.2.1.1	Standard	IEEE 802.11b
3.2.1.2	Radio and Modulation Schemes	DBPSK,DQPSK,CCK,DSSS
3.2.1.3	Operating Frequency	2400 ~ 2483.5MHz ISM band
3.2.1.4	Channel Numbers	13 channels for Worldwide
3.2.1.5	Data Rate	1,2,5.5,11Mbps
3.2.1.6	Media Access Protocol	CSMA/CA with ACK
3.2.1.7	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain,and at room Temp. 25°C 14±2 dBm at 11Mbps
3.2.1.8	Receiver Sensitivity at Antenna Connector	- Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate<8% at room Temp 25°C -83 dBm for 11Mbps
3.2.1.9	Freq Err Limit	±10ppm

3.2.2 IEEE 802.11g Section

	Feature	Detailed Description
3.2.2.1	Standard	IEEE 802.11g
3.2.2.2	Radio and Modulation Type	QPSK , BPSK , 16QAM ,64QAM with OFDM
3.2.2.3	Operating Frequency	2400 ~ 2483.5MHz ISM band
3.2.2.4	Channel Numbers	13 channels for Worldwide
3.2.2.5	Data Rate	6,9,12,18,24,36,48,54Mbps
3.2.2.6	Media Access Protocol	CSMA/CA with ACK
3.2.2.7	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain, at room Temp. 25°C 14±2 dBm at 54Mbps
3.2.2.8	Receiver Sensitivity at Antenna Connector	- Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate<10% at room Temp 25°C -71 dBm for 54Mbps
3.2.2.9	Freq Err Limit	±10ppm

3.2.3 IEEE 802.11a Section

	Feature	Detailed Description
3.2.3.1	Standard	IEEE 802.11a
3.2.3.2	Radio and Modulation Type	QPSK , BPSK , 16QAM ,64QAM with OFDM
3.2.3.3	Operating Frequency	5.15~5.25GHz 5.25~5.35GHz 5.47~5.725GHz 5.725~5.825GHz
3.2.3.4	Data Rate	6,9,12,18,24,36,48,54Mbps
3.2.3.5	Media Access Protocol	CSMA/CA with ACK
3.2.3.6	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain, at room Temp. 25°C 14±2 dBm at 54Mbps
3.2.3.7	Receiver Sensitivity at Antenna Connector	- Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate<10% at room Temp 25°C -71 dBm for 54Mbps
3.2.3.7	Freq Err Limit	±10ppm

3.2.4 IEEE 802.11n Section

	Feature	Detailed Description	
3.2.4.1	Standard	IEEE 802.11n	
3.2.4.2	Radio and Modulation Type	BPSK , QPSK , 16QAM ,64QAM with OFDM	
3.2.4.3	Operating Frequency	2.4GHz :2400 ~ 2483.5MHz for ISM band 5GHz : 5.15~5.25GHz ; 5.25~5.35GHz ; 5.47~5.725GHz ; 5.725~5.825GHz ;	
3.2.4.4	Data Rate	at most 300 Mbps	
3.2.4.5	Media Access Protocol	CSMA/CA with ACK	
3.2.4.6	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain, and at roomTemp. 25°C	
		2.4GHz Band/HT20 14±2dBm at MCS7	2.4GHz Band/HT40 14±2dBm at MCS7
		5GHz Band/HT20 14±2dBm at MCS7	5GHz Band/HT40 14±2dBm at MCS7
3.2.4.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate=10% and at room Temp. 25°C	
		2.4GHz Band/HT20 -68dBm at MCS7	2.4GHz Band/HT40 -66dBm at MCS7
		5GHz Band/HT20 -68dBmat MCS7	5GHz Band/HT40 -66dBm at MCS7
3.2.4.8	Freq Err Limit	±10ppm	

3.2.5 IEEE 802.11ac Section

	Feature	Detailed Description	
3.2.5.1	Standard	● IEEE 802.11ac	
3.2.5.2	Radio and Modulation Type	● QPSK , BPSK , 16QAM ,64QAM,256QAM with OFDM	
3.2.5.3	Operating Frequency	● 5GHz : 5.15~5.25GHz ; 5.25~5.35GHz ; 5.47~5.725GHz ; 5.725~5.825GHz ;	
3.2.5.4	Data Rate	● at most 866.7 Mbps	
3.2.5.5	Media Access Protocol	● CSMA/CA with ACK	
3.2.5.6	Transmitter Output Power at Antenna Connector	● Typical RF Output Power at each RF chain, at room Temp. 25°C ● 13±2dBm VHT80 MCS9	
3.2.5.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate<10% at room Temp 25°C	
		5GHz Band / VHT20 ● -64dBm at MCS8	5GHz Band / VHT40 ● -58dBm at MCS9
		5GHz Band / VHT80 ● -55dBm at MCS9	
3.2.5.8	Freq Err Limit	● ±10ppm	

3.2.6 IEEE 802.11ax Section

3.2.6 IEEE 802.11ax Section

	Feature	Detailed Description		
3.2.6.1	Standard	IEEE 802.11ax		
3.2.6.2	Radio and Modulation Type	QPSK , BPSK , 16QAM ,64QAM,256QAM, 1024QAM		
3.2.6.3	Operating Frequency	2G: 2400 ~ 2483.5MHz ISM band 5GHz : 5.15~5.25GHz ; 5.25~5.35GHz ; 5.47~5.725GHz ; 5.725~5.825GHz ;		
3.2.6.4	Data Rate	at most 1201 Mbps		
3.2.6.5	Media Access Protocol	CSMA/CA with ACK		
3.2.6.6	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain, at room Temp. 25°C 11±2dBm HE-SU80 at MCS11		
3.2.6.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate<10% at room Temp 25°C		
			2GHz Band / HE-SU20 -57dBm at MCS11	2GHz Band / HE-SU40 -55dBm at MCS11
			5GHz Band / HE-SU20 -57dBm at MCS11	5GHz Band / HE-SU40 -55dBm at MCS11
			5GHz Band / HE-SU80 -53dBm at MCS11	
3.2.6.8	Freq Err Limit	±10ppm		

3.2.7 IEEE 802.11ax Section(6G)

	Feature	Detailed Description			
3.2.7.1	Standard	IEEE 802.11ax			
3.2.7.2	Radio and Modulation Type	QPSK , BPSK , 16QAM ,64QAM,256QAM, 1024QAM			
3.2.7.3	Operating Frequency	6GHz : 5926~7125MHz			
3.2.7.4	Data Rate	at most 1201 Mbps			
3.2.7.5	Media Access Protocol	CSMA/CA with ACK			
3.2.7.6	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain, at room Temp. 25°C 11±2dBm HE80			
3.2.7.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate<10% at room Temp 25°C			
			6GHz Band / HE20	6GHz Band / HE40	
			-60dBm at MCS11	-57dBm at MCS11	
			6GHz Band / HE80		
			-53.5dBm at MCS11		
3.2.7.8	Freq Err Limit	±10ppm			

3.2.8 Bluetooth Section

	Feature	Detailed Description		
3.2.8.1	Bluetooth standard	● Bluetooth V2.1,V3.0, V4.2 , V5.2		
3.2.8.2	Modulation	● GFSK, $\pi/4$ -DQPSK and 8DPSK		
3.2.8.3	Operating Frequency	● 2402MHz-2480MHz		
3.2.8.4	Channel Numbers	● 79 channels for BDR+EDR ● 40 channels for BLE		
3.2.8.5	Symbol Rate	● 1,2and 3 Mbps		
		Min (dBm)	Typical (dBm)	Max (dBm)
3.2.8.6	BDR Output Power		6	
	BLE Output Power		6	
3.2.8.7	Sensitive @BER=0.1% FOR GFSK(1Mbps)		-86	
	Sensitive @BER=0.01% FOR $\pi/4$ -DQPSK(2Mbps)		-86	
	Sensitive @BER=0.01% FOR 8DPSK(3Mbps)		-80	
	Sensitive @PER=30.8% FOR BLE		-90	
3.2.8.8	Maximum input level	● GFSK(1Mbps) -20dBm		
		● $\pi/4$ -DQPSK(2Mbps) -20dBm		
		● 8DQPSK(3Mbps) -20dBm		

4. Electrical and Thermal Characteristics

4.1 Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-40	+80	C
Ambient Operating Temperature	0	60	C
Junction Temperature	0	125	C

4.2 General Section

	Feature	Detailed Description
4.2.1	Antenna Type	WIFI&BT: PCB Antenna
4.2.2	Operating Voltage	DC 3.3V-12V
4.2.3	Current Consumption	< 300mA@RX < 2000mA@TX
4.2.4	Form Factor and Interface	High Speed USB2.0 Interface

5. Software

5.1 DRIVER Information

Driver	Windows, Linux, Android
Security	64/128-bits WEP, WPA, WPA2

5.2 EEPROM Information

BT

Vendor ID	0E8D
Product ID	7961

WiFi

Reg Domain	Worldwide 2.4G/5G
	Read from registry ; Control by driver
Vendor ID	0E8D
Product ID	7961

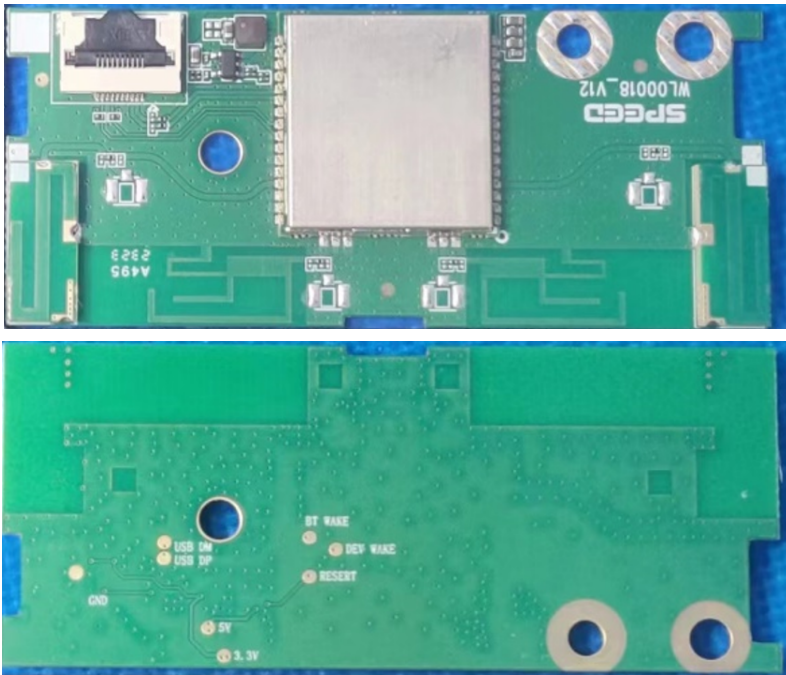
Size error range

DIM (MM)	Tolerance (MM)
0-5	± 0.15
5-10	± 0.20
10-50	± 0.30
>50	± 0.40

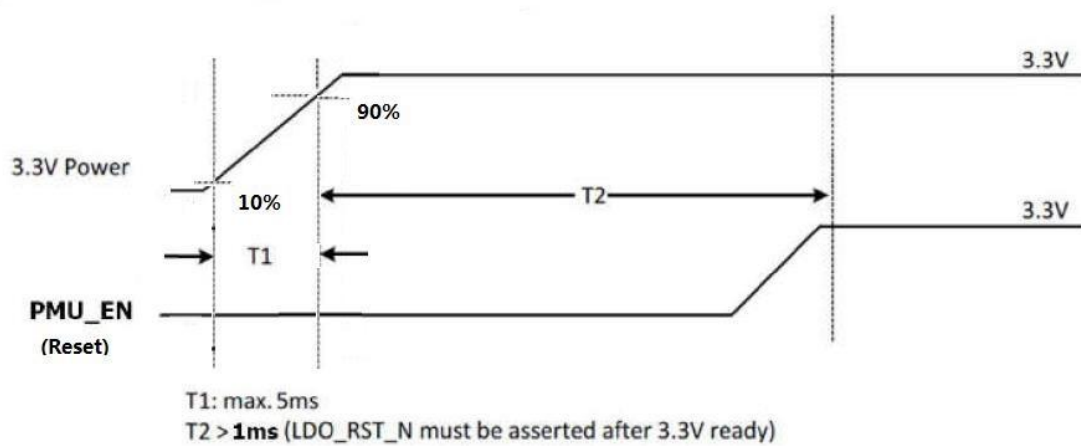
6.3 Pin Description

Pin	Symbol	DESCRIPTION	I/O
1	GND	GND	-
2	USB- DP	USB Communication signal USB-DP	I/O
3	USB -DM	USB Communication signal USB-DM	I/O
4	DC 3.3V-12V	DC 3.3V-12V	I
5	DC 3.3V-12V	DC 3.3V-12V	I
6	DC 3.3V-12V	DC 3.3V-12V	I
7	WOWLAN	Wake on Wireless LAN	O
8	RESET	Reset controlled by main SOC	I
9	BT-WAKE -HOST	BT wake up host	O
10	GND	GND	I/O

6.4 Physical map



7. Power on sequence timing & Reset



8.Environmental Requirements and Specifications TP Content

8.1 PCB Bending

The PCB bending spec shall be keep planeness under 0.1mm for both NATER and end assembly customer.

8.2 ESD

Symbol	Ratings	Max	Unit
(HBM)	Electrostatic discharge voltage (human body model)	2000	V
(CDM)	Electrostatic discharge voltage (charge device model)	500	

Please handle it under ESD protection environment.

8.3 Terminals

The product is mounted with motherboard through half hole. In order to prevent poor soldering, please do not touch the pad by hand.

8.4 Falling

It will cause damage on the mounted components when the product is falling or receiving drop shock. It may cause the product mal-function

8.5 Storage Condition

5.1 Moisture barrier bag must be stored under 30 degree C, humidity under 85% RH. The calculated shelf life for the dry packed product shall be a 12 months from the bag seal date.

5.2 Humidity indicator cards must be blue, <30%

8.6 Baking Condition

Products require baking before mounting if

- a) humidity indicator cards reads >30%
- b) temp <30 degree C, humidity < 70% RH, over 96 hours

Baking condition: 90 degree C, 12-24 hours

Baking times: 1 tim

OEM integration instructions:

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the 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 (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot 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.

End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2BBLK-WL2179A".

Information that must be placed in the end user manual:

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.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 & 15.407

2.3 Specific operational use conditions

The module WiFi Module is a module with WIFI 2.4G / BT/ WIFI 5G/WIFI 6e function.

Operation Frequency:

WIFI 2.4G:2412~2462MHz

BT:2402~2480MHz

WIFI 5G:5150 MHz ~5250MHz; 5250MHz~5350MHz; 5470MHz~5725MHz; 5725 MHz ~5850 MHz

**WIFI 6e: U-NII 5 Band(5925-6425MHz); U-NII 6 Band(6425-6525MHz); U-NII 7 Band(6525-6875MHz);
U-NII 8 Band(6875-7125MHz)**

The module can be used for mobile or applications with the maximum; The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer 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.

2.4 Limited module procedures

Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

2.5 Trace antennadesigns

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna;

The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2BBLK-WL2179A" with their finished product.

2.9 Information on test modes and additional testing requirements

Data transfer module demo board can control the EUT work in RF test mode at specified test channel. Additional testing, Part 15 Subpart B disclaimer.

The module without unintentional-radiator digital circuit, so the module does not required an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 & 15.407 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant

(when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing [14].

- * FCC regulations restrict the operation of this device to indoor use only.
- * The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft except that operation of this device is permitted in large aircraft while flying above 10,000 feet.
- * Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

FCC 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.

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

NOTE: 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 generate, 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 or more 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.

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.

A client may initiate brief messages to associate with a low-power indoor access point or subordinate and establish a connection only after receiving a confirmation signal confirming that an AP is present and operating on a particular channel. After being associated, the indoor client can only initiate transmission with that access point Indoor client devices (6XD) are prohibited from making a direct air interface connection to other clients.

An indoor client device must demonstrate via an attestation (see 6XD Attestation letter) that the device can only operate under the control of a low-power indoor access point and subordinate.

An indoor client device cannot have a direct connection to the internet.

ISED Caution:

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:

This device may not cause interference.

This device must accept any interference, including interference that may cause undesired operation of the device.

This equipment should be installed and operated with minimum distance between 20cm the radiator your body

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 :

L'appareil ne doit pas produire de brouillage;

L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps

Operating Frequency Range band 5150-5250 MHz "for indoor use only."

Devices shall not be used for control of or communications with unmanned aircraft systems.

Low-power indoor access points and indoor subordinate devices

Low-power indoor access points and indoor subordinate devices shall bear statements acknowledging both of the following restrictions in the user manual and where feasible in a conspicuous location on the device:

- Operation shall be limited to indoor use only.
- Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited except for on large aircraft flying above 3,048 m (10000 ft).