



AMD RZ608™ Data Sheet

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Revision History

Date	Revision	Description
August 2020	0.50	Initial preliminary release

Chapter 1 Introduction

The AMD RZ608™ module supports the IEEE 802.11 2X2 Wi-Fi 6E with Bluetooth 5.2 combo M.2 2230 module technology. These features deliver a significant improvement in user experience in dense deployments, supporting fast uploads and downloads, lower latency, and longer battery life.

Table 1. Features

WLAN	Bluetooth
PCIe device fully compliant to PCIe v2.1 specification	USB device fully compliant to USB v2.0 specification
IEEE 802.11 a/n/ac compliant	Supports Bluetooth v5.2 dual mode for two times the speed
Supports 20MHz, 40MHz, 80MHz bandwidth in 5GHz band	Integrated BALUN and PA
Dual-band 2T2R mode	Supports BT/Wi-Fi coexistence
Supports MU-MIMO TX/RX	Supports 79 BT links and 16 BLE link
Supports STBC, LDPC	Supports SCO and eSCO link with re-transmission
Greenfield, mixed mode, legacy modes support	Supports wide-band speech
IEEE 802.11 d/e/h/i/j/k/mc/r/v/w support	Supports mSBC and SBC including mono and stereo
Security support for WFA WPA/WPA2/WPA3 personal, WPS2.0, WAPI	Supports Packet Loss Concealment (PLC) function for better voice quality
QoS support of WFA WMM, WMM PS	Supports secure connection with AES128 and ECC256
Integrated LNA, PA, and T/R switch	Channel quality driven data rate adaptation
Optional external LNA and PA support.	Channel assessment and WB RSSI for AFH

1.1 Product Overview

The AMD **RZ608** is a highly integrated single-chip that supports 2x2 802.11ax solutions with Multi-user MIMO (Multiple-Input, Multiple-Output), Wireless LAN (WLAN) PCI Express network interface controller, with integrated Bluetooth 5.2 USB interface controller. It combines a WLAN MAC, a 2T2R capable WLAN baseband, and RF in a single chip.

The AMD **RZ608** integrates MediaTek MT7921K SoC with TDD Bluetooth function shared with a Wi-Fi antenna.

MT7921K is a highly integrated single chip that features a low power 2x2 11a/n/ac 5G Wi-Fi and a Bluetooth subsystem. The Wi-Fi subsystem contains the 802.11a/n/ac radio, baseband and MAC that are designed to meet both the low power and high throughput application.

MT7921K has a 32-bit RISC MCU that handles Wi-Fi and Bluetooth tasks. The Bluetooth subsystem contains the Bluetooth radio, baseband, and link controller, and uses the 32-bit RISC MCU for the Bluetooth protocols.

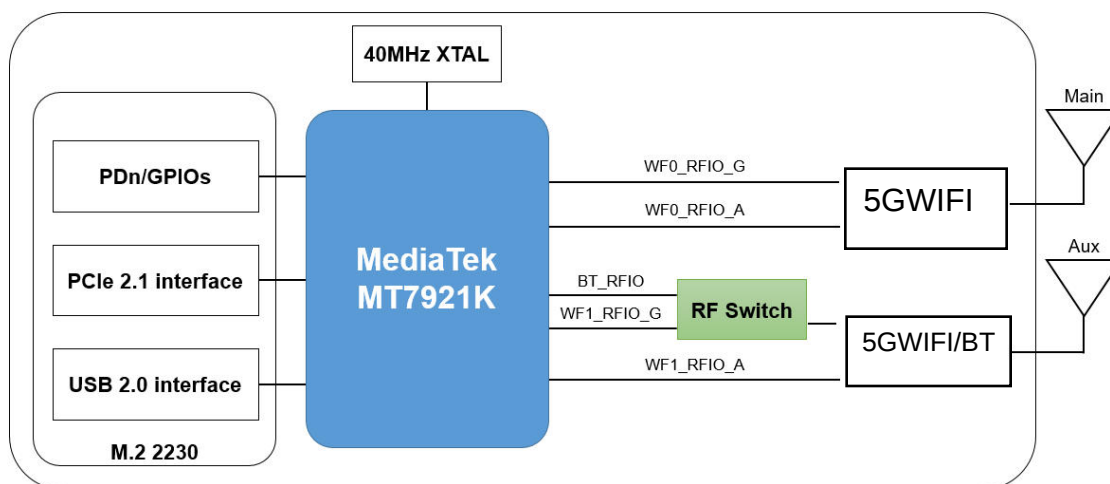


Figure 1. Block Diagram

The AMD RZ608 features include:

Table 2. General

Features	Description
Product Description	Wireless LAN & Bluetooth Combo M.2 Module
Major Chipset	MT7921K
Host Interface	Wi-Fi, PCI-E, Bluetooth, USB
Dimension	22mm x 30mm x 2.25mm (Tolerance remarked in mechanical drawing)
Package	M.2 2230 (Key A-E)
Antenna	I-PEX MHF4 Connector Receptacle (20449)
Weight	2.6 g

Table 3. WLAN

Features	Description
WLAN Standard	IEEE 802 11 a/n/ac
WLAN VID/PID/(882)	TBD
WLAN SVID/SPID(883)	TBD
Frequency Range	2.4 GHz : 2.402 ~ 2.480 GHz 5 GHz : 5150 ~ 5850 GHz
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM
Channels Supported	5 GHz See Appendix A for 5GHz supported channels.

Table 3. WLAN (continued)

Features	Description				
Output Power (Board Level Limit)	5GHz				
		Min	Typ	Max	Unit
	11a (54Mbps) @EVM $\leq$ 28dB		11 $\pm$ 2		dBm
	11n (HT20 MCS7) @EVM $\leq$ 30dB		11 $\pm$ 2		dBm
	11n (HT40 MCS7) @EVM $\leq$ 30dB		10 $\pm$ 2		dBm
	11ac (VHT20 MCS8) @EVM $\leq$ 30dB		11 $\pm$ 2		dBm
	11ac (VHT40 MCS9) @EVM $\leq$ 32dB		10 $\pm$ 2		dBm
	11ac (VHT80 MCS9) @EVM $\leq$ 32dB		9.0 $\pm$ 2		dBm

Table 3. WLAN (continued)

Features	Description				
Receiver Sensitivity	5GHz				
		Min	Typ	Max	Unit
	11a (6Mbps)		93		dBm
	11a (54Mbps)		-75		dBm
	11n (HT20 MCS7))		-74		dBm
	11n (HT40 MCS7)		-70		dBm
	11ac (VHT80 MCS9)		-60.5		dBm
	11ax (HE80 MCS11)		-57		dBm

Table 3. WLAN (continued)

Features	Description
PHY Data Rate	802.11a/g: 6,9,12, 18, 24, 36, 48, 54 Mbps 802.11n: up to 150 Mbps-single 802.11n: up to 300 Mbps-2x2 MIMO 802.11ac: up to 192.6 Mbps (20 MHz channel) 802.11ac: up to 400 Mbps (40 MHz channel) 802.11ac: up to 866.7 Mbps (80 MHz channel)
Security	64-bit WEP (WEP-40) and 128-bit WEP (WEP-104) encryption with hardware TKIP and CKIP processing - AES-CCMP hardware processing - GCMP hardware processing - SMS4-WPI (WAPI) hardware processing - WFA WPA/WPA2/WPA3 personal

* If you have any certification questions about output power, contact the FAE directly.

Table 4. Bluetooth

Features	Description				
Bluetooth Standard	Bluetooth 2.1 and 3.0+Enhanced Data Rate (EDR) + BT 5.2 + Bluetooth Low Energy (BLE)				
Bluetooth VID/PID	TBD				
Frequency Range	2402~2480MHz				
Modulation	GFSK (1 Mbps), $\Pi/4$ DQPSK (2 Mbps) and 8DPSK (3 Mbps)				
Output Power		Min	Typ	Max	Unit
	BDR		10		dBm
	EDR		7		dBm
	BLE		10		dBm

Table 4. Bluetooth (continued)

Features	Description				
Receiver Sensitivity		Min	Typ	Max	Unit
	BDR (BER<0.1%)		-93		dBm
	EDR ($\pi/4$ DQPSK) (BER<0.01%)		-92		dBm
	EDR (8PSK) (BER<0.1%)		-86		dBm
	BLE (1M) (PER< -30.8%)		-95		dBm
	BDR(2M) (PER< -30.8%)		-92		dBm

Chapter 2 Thermal Specification

The following table describes the thermal solution design of the AMD RZ608:

Table 5. Thermal Description

Item	Description
Thermal shield performance target	- Full performance at shield temperatures up to 90°C. (Functional operation is shield temperatures up to 95°C). - For thermal chamber testing condition are listed below: - High Temperature Limit : If measured as ambient temperatures in thermal chamber, it should be Chamber_Temp <= Shield_Temp - 50°C. - Low Temperature Limit : Thermal chamber temperature should not be below 0°C.
Thermal protection	Thermal protection is used to avoid abnormalities while the module is working, which will not be activated below 90 C measured on shield of module.

Chapter 3 Pin Definitions

The following table describes the power pins for the AMD **RZ608** integrated chip.

Table 6. Pin Definitions

Pin No.	Definition	Basic Description	Voltage	Type
1	GND	Ground		GND
2	VDD33	3.3 V power supply	3.3 V	VCC
3	USB_D_P	USB Differential signal	3.3 V	I/O
4	VDD33	3.3 V power supply	3.3 V	VCC
5	USB_D_N	USB Differential signal	3.3 V	I/O
6	LED_WLAN_L	Active low signal. The signal is used to provide status indicators via LED	3.3 V	Output
7	GND	Ground		GND
16	LED_BE_L	Active low signal. The signal is used to provide status indicators via LED	3.3 V	Output
17	NC	Floating Pin, does not connect to anything		Floating
18	GND	Ground		GND
19	NC	Floating Pin, does not connect to anything		Floating

Table 7. Pin Definitions (continued)

Pin No.	Definition	Basic Description	Voltage	Type
20	NC	Floating Pin, does not connect to anything		Floating
21	NC	Floating Pin, does not connect to anything		Floating
22	NC	Floating Pin, does not connect to anything		Floating
23	NC	Floating Pin, does not connect to anything		Floating
32	NC	Floating Pin, does not connect to anything		Floating
33	GND	Ground		GND
34	NC	Floating Pin, does not connect to anything		Floating
35	PERp0	Differential receive	1.8 V	Input
36	NC	Floating Pin, does not connect to anything		Floating
37	PERn0	Differential receive	1.8 V	Input
38	NC	Floating Pin, does not connect to anything		Floating
39	GND	Ground		GND
40	NC	Floating Pin, does not connect to anything		Floating
41	PETp0	Differential transmit	1.8 V	Output
42	NC	Floating Pin, does not connect to anything		Floating
43	PETn0	Differential transmit	1.8 V	Output
44	NC	Floating Pin, does not connect to anything		Floating
45	GND	Ground		GND
46	NC	Floating Pin, does not connect to anything		Floating
47	REFCLKP	Differential reference clock	1.8 V	Input
48	NC	Floating Pin, does not connect to anything		Floating
49	REFCLKN	Differential reference clock	1.8V	Input
50	NC	Floating Pin, does not connect to anything		Floating
51	GND	Ground		GND
52	PERST_N	When the PERST# is asserted at the power-on state, the RX608 returns to a pre-defined reset state and is ready for initialization and configuration after the de-assertion of the PERSt#.	3.3 V	Input
53	CLKREQ0	Reference clock request (Active low)	3.3 V	Open Drain
54	BT_RF_DISABLE#	BT-RF disable control (Active low)	3.3 V	Input
55	PEWAKE#	This signal is used to request that the system return from a sleep/suspended state to service a function-initiated wake event. (Active low)	3.3 V	Open Drain

Table 6. Pin Definitions (continued)

Pin No.	Definition	Basic Description	Voltage	Type
56	WF_RF_DISABLE#	WLAN-RF disable control (Active low)	3.3 V	Input
57	GRN	Ground		GND
58	NC	No golden finger		
59	NC	No golden finger		
60	NC	No golden finger		
61	NC	No golden finger		
62	NC	No golden finger		
63	NC	No golden finger		
64	NC	No golden finger		
65	NC	No golden finger		
66	NC	No golden finger		
67	NC	No golden finger		
68	NC	No golden finger		
69	NC	No golden finger		
70	NC	No golden finger		
71	NC	No golden finger		
72	VDD33	3.3 V power supply	3.3 V	VCC
73	NC	No golden finger		
74	VDD33	3.3 V power supply	3.3 V	VCC
75	NC	No golden finger		

Chapter 4 Electrical Characteristics

The following tables show the electrical ratings, conditions, and characteristics.

Table 7. Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VDD33	3.3 V supply voltage	-0.3	3.3	3.63	V
T _{stg}	Storage temperature	-30		85	C

Table 8. Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VDD33	3.3 V supply voltage	2.97	3.3	3.63	V
T _{AMBIENT}	Ambient temperature	-10		70	C
Humidity	Operating Humidity	□	□	85%	RH
	Storage Humidity	□	□	60%	RH
ESD	HCP/VCP	TBD	□	TBD	KV

Table 9. Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VIL	Input low voltage	-0.3		VDD33*0.25	V
VIH	Input high voltage	VDD33*0.625		VDD33+0.3	V
VOL	Output low voltage	-0.3		VDD33*0.125	V
VOH	Output high voltage	VDD33-0.4		VDD33+0.3	V

4.1 Power-On Sequence

The following figure shows the module power-on sequence:



Figure 2. Power-on Sequence

4.2 Global Reset

The AMD RZ608 supports two global resets as follows:

- Cold reset by AVDD33_BUCK, AVDD33_MISC, PMU_EN — Whole Chip reset.
- MCU WDT (watch-dog-timer) reset — Reset digital circuit, except strapping, PMU, and XTAL controller.

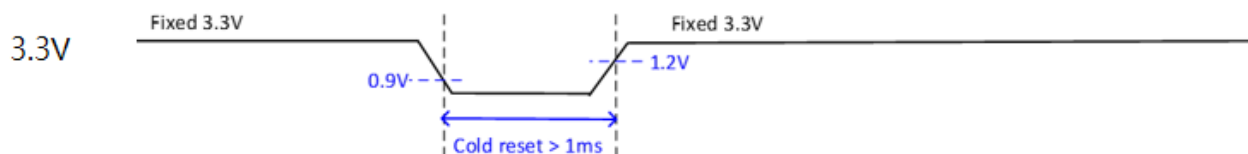


Figure 3.. Global Reset

4.3 PCIE Interface

The AMD RZ608 supports the following:

- PCI Express End Point, which is fully compliant with the PCI Express Base Specification Revision 2.1. It supports PCI Express Gen1 (2.5Gbps) and PCIe Express Gen2 (5.0Gbps) differential bus speeds.
- PCI Express low power operations such as ASPM L1.0, ASPM L1.CLK_PM, ASPM L1.SS (L1.1 and L1.2), and PCI PM L2 state. It also supports WAKE_N for the device wakeup host scenario, as well as a remote wake-up signaling.

The PCI Express interface is only used for Wi-Fi operations. The DMA ring and the data structure are controlled by the descriptor based PDMA engine over PCI Express interface.

4.4 USB Interface

The AMD RZ608 supports the USB device port, which is fully compliant with the Universal Serial Bus Specification, Revision v2.0 (USB v2.0 specification). It supports high-speed mode, suspend/resume signaling, as well as remote wake-up signaling.

Chapter 5 Mechanical Information

Figure 4 is the mechanical drawing of the AMD RZ608 chip.

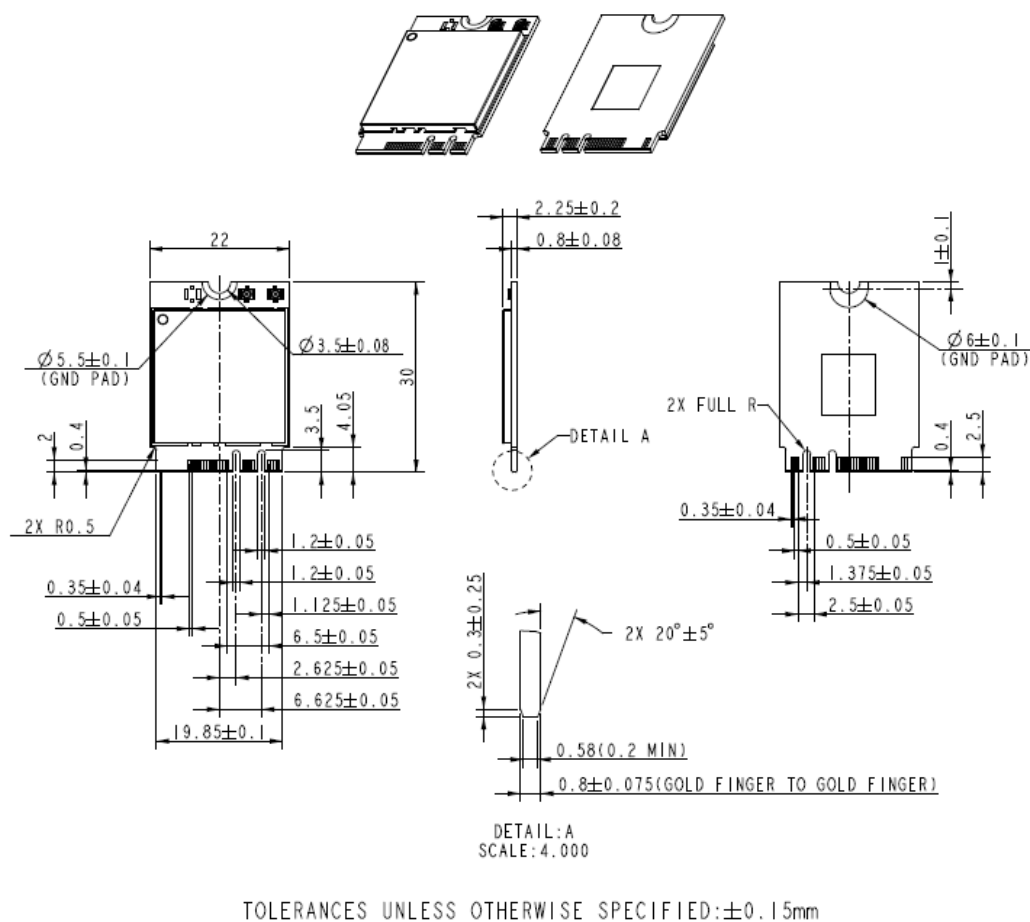


Figure 4. AMD RZ608 Mechanical Drawing

Chapter 6 Module Label Information

Figure 5 is an example the standard label information.

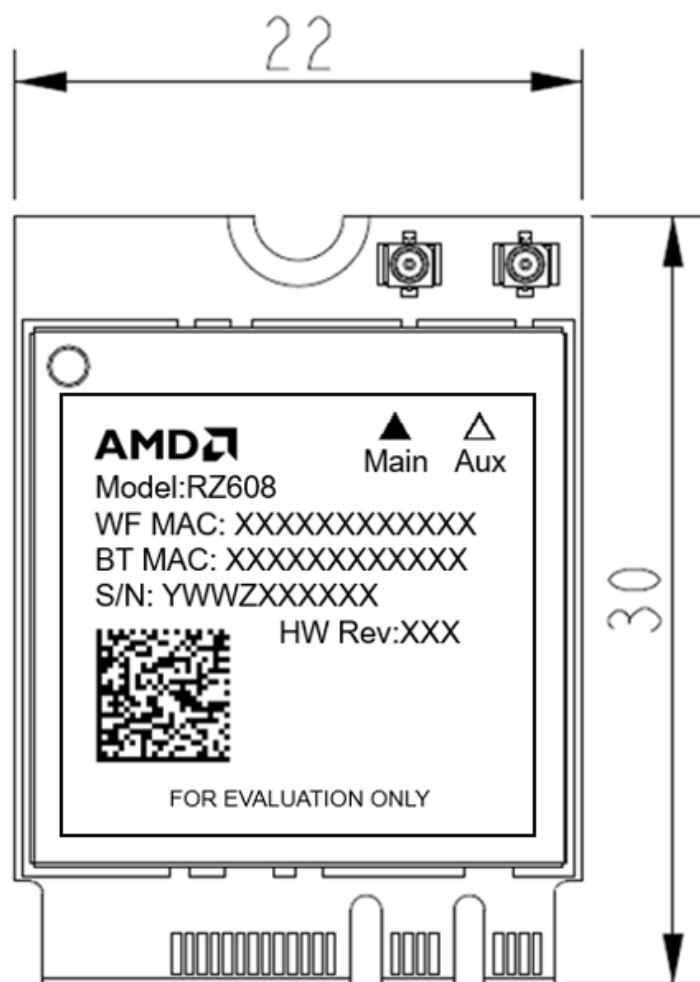


Figure 5. Label Information

Appendix A Band Channels

The following tables display the 5GHz band channels

Table 10. 5GHz Band Channel

	UNII-1			
Channel	36	40	44	48
20MHz	5180	5200	5220	5240
Channel	38		46	
40MHz	5190		5230	
Channel	42			
80MHz	5210			

	UNII-3					
Channel	149	153	157	161	165	
20MHz	5745	5765	5785	5805	5825	
Channel	151		159			
40MHz	5755		5795			
Channel	155					
80MHz	5775					

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.

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 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 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 important announcement

Important Note:

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 0cm between the radiator and your body.

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

Country Code selection feature to be disabled for products marketed to the US/Canada.

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

1. The antenna must be installed such that 0 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,

As long as the three conditions above are met, further transmitter testing 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 cannot 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 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 **FCC ID: 2A553-XC-AX3000**"

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.

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

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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.

2.7 Antennas

This radio transmitter **FCC ID: 2A553-XC-AX3000** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
BT	/	External Antenna	2.0dBi for 2402-2480MHz;	
5GWIFI	/	External Antenna	4.2dBi for 5150-5250MHz for Ant1&2	
			4.2dBi for 5725-5875MHz for Ant1&2	

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID: 2A553-XC-AX3000**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.