

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

RF Exposure evaluation**Report Reference No. : GTS20221010004-1-6****FCC ID. : 2AVED-FRX-M79AU-21**

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Date of issue : Oct. 31 2022

Representative Laboratory Name Shenzhen Global Test Service Co.,Ltd.

..... :

Address

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

Applicant's name..... : Shenzhen Feng RuiXiang Intelligent Technology Co., Ltd

Address : 302, Building 6, no.4 Zhongxing road,Zhangge community, Fucheng street, Longhua district, Shenzhen, Guangdong, P.R.China

Test specificationStandard : 47CFR §1.1310 Basis and purpose
47CFR §2.1091 Radiofrequency radiation exposure evaluation:
mobile devices
TRF Originator : Shenzhen Global Test Service Co.,Ltd.
Master TRF : Dated 2014-12**Shenzhen Global Test Service Co.,Ltd. All rights reserved.**

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Test item description : 802.11a/b/g/n/ac/ax 1200Mbps WLAN + Bluetooth v5.2 Combo USB3.0 Module

Trade Mark : N/A

Manufacturer : Shenzhen Feng RuiXiang Intelligent Technology Co., Ltd

Model/Type reference : FRX-M79AU-21

Listed Models : N/A

Modulation Type : IEEE 802.11a /802.11b/802.11g/802.11n/802.11ac/802.11ax
GFSK, $\pi/4$ -DQPSK, 8DPSK

Operation Frequency : From 2412MHz to 2462MHz, 5180MHz to 5240MHz, 5745MHz to 5825MHz, 2402MHz to 2480MHz

Hardware Version : N/A

Software Version : N/A

Rating : DC 3.3V

Result : **PASS**

TEST REPORT

Test Report No. :	GTS20221010004-1-6	Oct. 31 2022
		Date of issue

Equipment under Test : 802.11a/b/g/n/ac/ax 1200Mbps WLAN + Bluetooth v5.2 Combo USB3.0 Module

Model /Type : FRX-M79AU-21

Listed model : N/A

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Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. SUMMARY

1.1 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

● /	Length (m) :	/
	Shield :	/
	Detachable :	/

1.2 Product Description

Product Name:	802.11a/b/g/n/ac/ax 1200Mbps WLAN + Bluetooth v5.2 Combo USB3.0 Module
Trade Mark:	N/A
Model/Type reference:	FRX-M79AU-21
List Model:	N/A
Model Declaration	N/A
Power supply:	DC 3.3V
Hardware Version	N/A
Software Version	N/A
Sample ID	GTS20221010004-1-S0001-1#& GTS20221010004-1-S0001-2#
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth (DSS) 40 channels for Bluetooth (DTS)
Channel Spacing	1MHz for Bluetooth (DSS) 2MHz for Bluetooth (DTS)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth (DSS) GFSK for Bluetooth (DTS)
2.4GWLAN	
WLAN Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz IEEE 802.11ax HE20:2412-2462MHz IEEE 802.11ax HE40:2422-2452MHz
WLAN Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11ax HE20: OFDMA (1024QAM,256QAM,64QAM, 16QAM, QPSK,BPSK) IEEE 802.11ax HE40: OFDMA (1024QAM,256QAM,64QAM, 16QAM, QPSK,BPSK)
Channel number:	13 Channel for IEEE 802.11b/g/n/ax (HT20) 9 Channel for IEEE 802.11n/ax (HT40)
Channel separation:	5MHz
WIFI(5G Band)	
WLAN CE Operation frequency	5180-5240MHz
WLAN CE Modulation Type	802.11a/n/ac/ax: OFDM/OFDMA

Channel number:	4 Channels for 20MHz bandwidth(5180-5240MHz) 2 channels for 40MHz bandwidth(5190~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
SRD(5.8G Band)	
WLAN CE Operation frequency	5745-5825MHz
WLAN CE Modulation Type	802.11a/n/ac/ax: OFDM/OFDMA
Channel Number	5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)
Antenna Description	Three External antenna respectively.WLAN support 2*2MIMO technology. ANT0 used for WIFI TX/RX, 5.00dBi(Max.)for 2.4G Band and 5.00dBi(Max.) for 5G Band; ANT1 used for WIFI TX/RX, 5.00dBi(Max.)for 2.4G Band and 5.00dBi(Max.) for 5G Band; ANT2 used for Bluetooth TX/RX, 5.00dBi(Max.);

2. TEST ENVIRONMENT

2.1 Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

2.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

Industry Canada Registration Number. is 24189.

FCC Designation Number is CN1234.

FCC Registered Test Site Number is165725.

2.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

2.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. METHOD OF MEASUREMENT

3.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

3.2 Requirement

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498 D01 General RF Exposure Guidance v06 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3.3 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

3.4 MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

As declared by the Applicant, the EUT transmits with the maximum source-based Duty Cycle of 100%-see the User manual, and the EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum mobile separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna is 5.00dBi for BT&WLAN, and the power drift from Turn-up Procedure provide by manufacturer as following states, the RF power density can be obtained.

3.5 Antenna Information

FRX-M79AU-21 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Identification in Internal photos	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 0	WLAN ANT0	External antenna	2.4 – 2.5 GHz 5.0 – 6.0 GHz	5.00dBi(Max.) for 2.4G band 5.00dBi(Max.) for 5G band
Antenna 1	WLAN ANT1	External antenna	2.4 – 2.5 GHz 5.0 – 6.0 GHz	5.00dBi(Max.) for 2.4G band 5.00dBi(Max.) for 5G band
Antenna 2	BT ANT2	External antenna	2.4 – 2.5 GHz 5.0 – 6.0 GHz	5.00dBi(Max.) for 2.4G band

4. Conducted Power Results

Antenna 2:

Bluetooth

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	8.79
	39	2441	9.05
	78	2480	9.29
$\pi/4$ DQPSK	0	2402	8.81
	39	2441	8.97
	78	2480	9.20
8DPSK	0	2402	8.75
	39	2440	9.08
	78	2480	9.23
GFSK(BT LE)	0	2402	8.30
	19	2440	8.56
	39	2480	8.75

Antenna 0:

2.4G WLAN

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11b	01	2412	18.97
	06	2437	19.56
	11	2462	20.18
802.11g	01	2412	22.90
	06	2437	22.91
	11	2462	23.71
802.11n(HT20)	01	2412	21.52
	06	2437	21.63
	11	2462	22.49
802.11n(HT40)	03	2422	21.72
	06	2437	22.10
	09	2452	22.56
802.11ax(HT20)	01	2412	21.63
	06	2437	22.27
	11	2462	22.99
802.11ax(HT40)	03	2422	22.01
	06	2437	22.36
	09	2452	22.69

5.2GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	36	5180	13.00
	40	5200	14.20
	48	5240	14.55
802.11n20	36	5180	12.20
	40	5200	14.03
	48	5240	12.83
802.11n40	38	5190	12.32
	46	5230	12.18
802.11ac20	36	5180	12.97
	40	5200	12.97
	48	5240	13.36
802.11ac40	38	5190	12.30
	46	5230	12.59
802.11ac80	42	5210	9.60
802.11ax20	36	5180	12.95
	40	5200	13.10
	48	5240	12.91
802.11ax40	38	5190	16.20
	46	5230	11.27
802.11ax80	42	5210	10.03

5.8GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	149	5745	9.92
	157	5785	10.62
	165	5825	10.40
802.11n20	149	5745	9.08
	157	5785	9.34
	165	5825	9.47
802.11n40	151	5755	8.69
	159	5795	9.20
802.11ac20	149	5745	8.77
	157	5785	11.23
	165	5825	9.31
802.11ac40	151	5755	8.51
	159	5795	9.20
802.11ac80	155	5775	8.83
802.11ax20	149	5745	8.98
	157	5785	9.49
	165	5825	9.37
802.11ax40	151	5755	8.63
	159	5795	9.62
802.11ax80	155	5775	9.07

Antenna 1:

2.4GWLAN

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11b	01	2412	16.69
	06	2437	17.23
	11	2462	17.30
802.11g	01	2412	20.03
	06	2437	20.39
	11	2462	20.59
802.11n(HT20)	01	2412	19.04
	06	2437	19.42
	11	2462	19.38
802.11n(HT40)	03	2422	19.26
	06	2437	19.35
	09	2452	19.48
802.11ax(HT20)	01	2412	19.19
	06	2437	19.79
	11	2462	19.89
802.11ax(HT40)	03	2422	19.66
	06	2437	19.98
	09	2452	19.65

5.2GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	36	5180	9.27
	40	5200	9.88
	48	5240	10.41
802.11n20	36	5180	8.44
	40	5200	8.25
	48	5240	8.84
802.11n40	38	5190	8.62
	46	5230	9.32
802.11ac20	36	5180	8.46
	40	5200	8.91
	48	5240	9.62
802.11ac40	38	5190	8.74
	46	5230	9.40
802.11ac80	42	5210	8.76
802.11ax20	36	5180	8.68
	40	5200	9.05
	48	5240	9.78
802.11ax40	38	5190	9.12
	46	5230	9.77
802.11ax80	42	5210	9.11

5.8GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	149	5745	8.42
	157	5785	9.36
	165	5825	9.36
802.11n20	149	5745	7.35
	157	5785	8.43
	165	5825	8.29
802.11n40	151	5755	7.55
	159	5795	8.49
802.11ac20	149	5745	7.47
	157	5785	8.57
	165	5825	8.37
802.11ac40	151	5755	7.88
	159	5795	8.45
802.11ac80	155	5775	8.02
802.11ax20	149	5745	7.49
	157	5785	8.45
	165	5825	8.37
802.11ax40	151	5755	8.12
	159	5795	8.78
802.11ax80	155	5775	8.36

2*2MIMO(2.4GWLAN):

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11n(HT20)	01	2412	23.46
	06	2437	23.67
	11	2462	24.22
802.11n(HT40)	03	2422	23.67
	06	2437	23.95
	09	2452	24.30
802.11ax(HT20)	01	2412	23.59
	06	2437	24.21
	11	2462	24.72
802.11ax(HT40)	03	2422	24.00
	06	2437	24.34
	09	2452	24.44

2*2MIMO(5.2GWLAN):

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11n20	36	5180	13.73
	40	5200	15.05
	48	5240	14.29
802.11n40	38	5190	13.86
	46	5230	13.99
802.11ac20	36	5180	14.29
	40	5200	14.41
	48	5240	14.89
802.11ac40	38	5190	13.89
	46	5230	14.29
802.11ac80	42	5210	12.21
802.11ax20	36	5180	14.33
	40	5200	14.54
	48	5240	14.63
802.11ax40	38	5190	16.98
	46	5230	13.59
802.11ax80	42	5210	12.60

2*2MIMO(5.8GWLAN):

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11n20	149	5745	12.24
	157	5785	13.05
	165	5825	12.92
802.11n40	151	5755	11.31
	159	5795	11.92
802.11ac20	149	5745	11.93
	157	5785	11.17
	165	5825	11.87
802.11ac40	151	5755	11.18
	159	5795	13.11
802.11ac80	155	5775	11.88
802.11ax20	149	5745	11.31
	157	5785	12.01
	165	5825	11.91
802.11ax40	151	5755	11.39
	159	5795	12.23
802.11ax80	155	5775	11.74

5. Manufacturing Tolerance

Antenna 2:

Bluetooth			
GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	8.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
$\pi/4$ DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	8.0	8.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
8DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	8.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GFSK BT LE (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	8.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Antenna 0:

2.4GWLAN			
IEEE 802.11b (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	18.00	19.00	20.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	22.00	22.00	23.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	21.00	21.00	22.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Peak)			
Channel	Channel 03	Channel 06	Channel 09
Target (dBm)	21.00	22.00	22.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	21.00	22.00	22.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax HT40 (Peak)			
Channel	Channel 03	Channel 06	Channel 09
Target (dBm)	22.00	22.00	22.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0

5.2GWLAN

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	12.0	14.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	12.0	12.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	12.0	12.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	12.0	12.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	9.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/
IEEE 802.11ax VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	12.0	13.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	16.0	11.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ax VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	10.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/

5.8GWLAN

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.0	10.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	8.0	9.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	8.0	11.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	8.0	9.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	8.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/
IEEE 802.11ax VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	8.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	8.0	9.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ax VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	9.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/

Antenna 1:

2.4GWLAN

IEEE 802.11b (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	16.0	17.0	17.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	20.0	20.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	19.0	19.0	19.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	19.0	19.0	19.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	19.0	19.0	19.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax HT40 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	19.0	19.0	19.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

5.2GWLAN

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.0	9.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	8.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	8.0	9.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	8.0	8.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	8.0	9.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	8.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/
IEEE 802.11ax VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	8.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	9.0	9.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ax VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	9.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/

5.8GWLAN

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	8.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	7.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	7.0	8.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	7.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	7.0	8.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	8.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/
IEEE 802.11ax VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	7.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	8.0	8.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ax VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	8.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/

2*2MIMO(2.4GWLAN):

IEEE 802.11n HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	23.0	23.0	24.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	23.0	23.0	24.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	23.0	24.0	24.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax HT40 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	24.0	24.0	24.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

2*2MIMO(5.2GWLAN):

IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	15.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	13.0	13.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	14.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	13.0	14.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	12.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/
IEEE 802.11ax VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	14.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	16.0	13.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ax VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	12.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/

2*2MIMO(5.8GWLAN):

IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.0	13.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	11.0	11.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	11.0	13.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	11.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/
IEEE 802.11ax VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.0	12.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	11.0	12.0	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ax VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	11.0	/	/
Tolerance $\pm$ (dB)	1.0	/	/

6. Measurement Results

6.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Antenna 2:

BT

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
GFSK	10.00	10.0000	5.00	3.1623	0.0063	1.0000
$\pi/4$ DQPSK	10.00	10.0000	5.00	3.1623	0.0063	1.0000
8DPSK	10.00	10.0000	5.00	3.1623	0.0063	1.0000
GFSK(BT LE)	9.00	7.9433	5.00	3.1623	0.0050	1.0000

Antenna 0:

2.4GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
802.11b	21.00	125.8925	5.00	3.1623	0.0792	1.0000
802.11g	24.00	251.1886	5.00	3.1623	0.1580	1.0000
802.11n(HT20)	23.00	199.5262	5.00	3.1623	0.1255	1.0000
802.11n(HT40)	23.00	199.5262	5.00	3.1623	0.1255	1.0000
802.11ax(HT20)	23.00	199.5262	5.00	3.1623	0.1255	1.0000
802.11ax(HT40)	23.00	199.5262	5.00	3.1623	0.1255	1.0000

5.2GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
802.11a	15.00	31.6228	5.00	3.1623	0.0199	1.0000
802.11n20	15.00	31.6228	5.00	3.1623	0.0199	1.0000
802.11n40	13.00	19.9526	5.00	3.1623	0.0126	1.0000
802.11ac20	13.00	19.9526	5.00	3.1623	0.0126	1.0000
802.11ac40	13.00	19.9526	5.00	3.1623	0.0126	1.0000
802.11ac80	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ax20	14.00	25.1189	5.00	3.1623	0.0158	1.0000
802.11ax40	17.00	50.1187	5.00	3.1623	0.0315	1.0000
802.11ax80	11.00	12.5893	5.00	3.1623	0.0079	1.0000

5.8GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11a	11.00	12.5893	5.00	3.1623	0.0079	1.0000
802.11n20	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11n40	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ac20	12.00	15.8489	5.00	3.1623	0.0100	1.0000
802.11ac40	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ac80	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ax20	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ax40	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ax80	10.00	10.0000	5.00	3.1623	0.0063	1.0000

Antenna 1:**2.4GWLAN**

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11b	18.00	63.0957	5.00	3.1623	0.0397	1.0000
802.11g	21.00	125.8925	5.00	3.1623	0.0792	1.0000
802.11n(HT20)	20.00	100.0000	5.00	3.1623	0.0629	1.0000
802.11n(HT40)	20.00	100.0000	5.00	3.1623	0.0629	1.0000
802.11ax(HT20)	20.00	100.0000	5.00	3.1623	0.0629	1.0000
802.11ax(HT40)	20.00	100.0000	5.00	3.1623	0.0629	1.0000

5.2GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11a	11.00	12.5893	5.00	3.1623	0.0079	1.0000
802.11n20	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11n40	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ac20	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ac40	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ac80	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ax20	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ax40	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11ax80	10.00	10.0000	5.00	3.1623	0.0063	1.0000

5.8GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11a	10.00	10.0000	5.00	3.1623	0.0063	1.0000
802.11n20	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11n40	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ac20	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ac40	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ac80	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ax20	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ax40	9.00	7.9433	5.00	3.1623	0.0050	1.0000
802.11ax80	9.00	7.9433	5.00	3.1623	0.0050	1.0000

2*2MIMO(2.4GWLAN):

Modulation Type	Output power		Directional Gain (dBi)	Directional Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11n20	25.00	316.2278	8.01	6.3241	0.3979	1.0000
802.11n40	25.00	316.2278	8.01	6.3241	0.3979	1.0000
802.11ax20	25.00	316.2278	8.01	6.3241	0.3979	1.0000
802.11ax40	25.00	316.2278	8.01	6.3241	0.3979	1.0000

2*2MIMO(5.2GWLAN):

Modulation Type	Output power		Directional Gain (dBi)	Directional Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11n20	16.00	39.8107	8.01	6.3241	0.0501	1.0000
802.11n40	14.00	25.1189	8.01	6.3241	0.0316	1.0000
802.11ac20	15.00	31.6228	8.01	6.3241	0.0398	1.0000
802.11ac40	15.00	31.6228	8.01	6.3241	0.0398	1.0000
802.11ac80	13.00	19.9526	8.01	6.3241	0.0251	1.0000
802.11ax20	15.00	31.6228	8.01	6.3241	0.0398	1.0000
802.11ax40	17.00	50.1187	8.01	6.3241	0.0631	1.0000
802.11ax80	13.00	19.9526	8.01	6.3241	0.0251	1.0000

2*2MIMO(5.8GWLAN):

Modulation Type	Output power		Directional Gain (dBi)	Directional Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11n20	14.00	25.1189	8.01	6.3241	0.0316	1.0000
802.11n40	12.00	15.8489	8.01	6.3241	0.0199	1.0000
802.11ac20	12.00	15.8489	8.01	6.3241	0.0199	1.0000
802.11ac40	14.00	25.1189	8.01	6.3241	0.0316	1.0000
802.11ac80	12.00	15.8489	8.01	6.3241	0.0199	1.0000
802.11ax20	13.00	19.9526	8.01	6.3241	0.0251	1.0000
802.11ax40	13.00	19.9526	8.01	6.3241	0.0251	1.0000
802.11ax80	12.00	15.8489	8.01	6.3241	0.0199	1.0000

Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

6.2 Simultaneous Transmission MPE

The sample support one Bluetooth & WLAN modular and one Bluetooth antenna, and two WLAN antennas, WLAN support MIMO, Need consider simultaneous transmission ;

The sample supports 2T2R MIMO technology for WLAN.

According to KDB447498 D01 General RF Exposure Guidance v06 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum$ of MPE ratios ≤ 1.0

8.2.1 Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna		Antenna 0 Antenna 1 Synchronization transmit
		Antenna 0	Antenna 1	
802.11b	2.4G WLAN	Yes	Yes	No
802.11g	2.4G WLAN	Yes	Yes	No
802.11n(HT20)	2.4G WLAN	Yes	Yes	Yes
802.11n(HT40)	2.4G WLAN	Yes	Yes	Yes
802.11ax(HT20)	2.4G WLAN	Yes	Yes	Yes
802.11ax(HT40)	2.4G WLAN	Yes	Yes	Yes

Modulation Type	Work Frequency Band	Transmit Antenna		Antenna 0 Antenna 1 Synchronization transmit
		Antenna 0	Antenna 1	
802.11a	UNII Band 1 / Band 4	Yes	Yes	No
802.11n20	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11n40	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11ac20	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11ac40	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11ac80	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11ax20	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11ax40	UNII Band 1 / Band 4	Yes	Yes	Yes
802.11ax80	UNII Band 1 / Band 4	Yes	Yes	Yes

8.2.2 Summary simultaneous transmission results

Maximum Simultaneous transmission MPE Ratios for **MIMO(2.4GWLAN)**, **MIMO(5.2GWLAN)**, **MIMO(5.8GWLAN)**, **BT** .

Maximum MPE ratio MIMO(2.4G WLAN)	Maximum MPE ratio MIMO(5.2G WLAN)	Maximum MPE ratio MIMO(5.8G WLAN)	Maximum MPE ratio BT	$\sum$ MPE ratios	Limit	Results
0.3979	0.0631	0.0316	0.0063	0.4989	1.0	PASS

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB447498 D01 General RF Exposure Guidance v06, No SAR is required.

.....End of Report.....