

**Shenzhen CTA Testing Technology Co., Ltd.**

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

RF Exposure evaluation**Report Reference No. : CTA24071501906****FCC ID. : 2BCRN-SHELLS1**

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Date of issue : Aug. 13, 2024

Representative Laboratory Name

..... :

Shenzhen CTA Testing Technology Co., Ltd.

Address

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name.....

..... :

Dongguan Aika Electronic Technology Co., Ltd.

Address

Room 201, Building 2, No. 388, Bihu Road, Fenggang Town, Dongguan City, Guangdong Province, China

Test specification

..... :

47CFR §1.1310 Basis and purpose

Standard

..... :

47CFR §2.1091 Radiofrequency radiation exposure evaluation: mobile devices

TRF Originator

..... :

Shenzhen Global Test Service Co.,Ltd.

Master TRF

..... :

Dated 2014-12

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Test item description

..... :

Smart Karaoke Speaker

Trade Mark

..... :

Ikarao

Manufacturer

..... :

Guangdong Taide Zhilian Technology Co., Ltd

Model/Type reference

..... :

Shell S1

Listed Models

..... :

Shell S2

Hardware Version

..... :

V1.1

Software Version

..... :

V2.1

Rating

..... :

Input: DC 5.0 - 20.0V

Result

..... :

PASS

TEST REPORT

Test Report No. :	CTA24071501906	Aug. 13, 2024
		Date of issue

Equipment under Test : Smart Karaoke Speaker

Model /Type : Shell S1

Listed model : Shell S2

Applicant : Dongguan Aika Electronic Technology Co., Ltd.

Address : Room 201, Building 2, No. 388, Bihu Road, Fenggang Town,
Dongguan City, Guangdong Province, China

Manufacturer : Guangdong Taide Zhilian Technology Co., Ltd

Address : No. 388, Bihu Road, Fenggang Town, Dongguan City, Guangdong
Province, China

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

●	--	M/N:	--
		Manufacturer:	--

1.2 Product Description

Product Name:	Smart Karaoke Speaker
Trade Mark:	Ikarao
Model/Type reference:	Shell S1
List Model:	Shell S2
Model Declaration	PCB board, structure and internal of these model(s) are the same, only the speaker, power amplifier chip, screen size, antenna and appearance are different.
Power supply:	Input: DC 5.0 - 20.0V
Hardware Version	V1.1
Software Version	V2.1
Sample ID	CTA240715019-S0001-1# CTA240715019-1-S0001-2#
Chip1: JL7034A6	
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth (BR/EDR)
Channel Spacing	1MHz for Bluetooth (BR/EDR)
Modulation Type	GFSK, $\pi/4$ -DQPSK for Bluetooth (BR/EDR)
Antenna Description	Internal Antenna 1, 3.87dBi(Max.) for Shell S1 Internal Antenna 1, 7.87dBi(Max.) for Shell S2
Chip2: AC7066D4	
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	40 channels for Bluetooth (BT LE) 40 channels for Bluetooth (BT 2LE)
Channel Spacing	2MHz for Bluetooth (BT LE) 2MHz for Bluetooth (BT 2LE)
Modulation Type	GFSK for Bluetooth (BT LE) GFSK for Bluetooth (BT 2LE)
Antenna Description	Internal Antenna 3, 3.96dBi(Max.) for Shell S1 Internal Antenna 3, 7.87dBi(Max.) for Shell S2
Chip3: AC7066D4	
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	40 channels for Bluetooth (BT LE) 40 channels for Bluetooth (BT 2LE)
Channel Spacing	2MHz for Bluetooth (BT LE) 2MHz for Bluetooth (BT 2LE)
Modulation Type	GFSK for Bluetooth (BT LE) GFSK for Bluetooth (BT 2LE)
Antenna Description	Internal Antenna 4, 3.97dBi(Max.) for Shell S1

	Internal Antenna 4, 7.87dBi(Max.) for Shell S2
Module:RTL8821CS	
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
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)
Channel number:	11 Channel for IEEE 802.11b/g/n (HT20) 7 Channel for IEEE 802.11n (HT40)
Channel separation:	5MHz
WIFI (5.2G/5.3G/5.7G/5.8G Band)	
Frequency Range	5180-5240MHz/ 5260MHz to 5320MHz/ 5500MHz to 5700MHz/ 5745MHz to 5825MHz
Channel Number	4 Channels for 20MHz bandwidth(5180-5240MHz) 4 Channels for 20MHz bandwidth(5260-5320MHz) 11 Channels for 20MHz bandwidth(5500-5700MHz) 5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5190~5230MHz) 2 channels for 40MHz bandwidth(5270~5310MHz) 5 Channels for 40MHz bandwidth(5510-5670MHz) 2 channels for 40MHz bandwidth(5755~5795MHz) 1 channels for 80MHz bandwidth(5210MHz) 1 channels for 80MHz bandwidth(5290MHz) 2 Channels for 80MHz bandwidth(5530-5610MHz) 1 channels for 80MHz bandwidth(5775MHz)
Modulation Type	IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT20: OFDM (256QAM,64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT40: OFDM (256QAM,64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT80: OFDM (256QAM,64QAM, 16QAM, QPSK, BPSK)
Antenna Description	Shell S1: Internal Antenna 2, 4.72 dBi(Max.) for 2.4G Band and 5.26dBi(Max.) for 5G Band Shell S2: Internal Antenna 2, 5.26 dBi(Max.) for 2.4G Band and 5.33 dBi(Max.) for 5G Band
Note: Models Shell S1 and Shell S2 use different antennas of the same type and are tested using maximum antenna gain.	

2. TEST ENVIRONMENT

2.1 Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

2.2 Test Facility

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

FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

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 CTA Testing Technology 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 CTA Testing Technology Co., Ltd. :

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

$$S = \frac{PG}{4\pi R^2}$$

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 7.87dBi & 5.26dBi & 5.33dBi 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

Shell S1 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 1	BT (Chip 1:JL7034A6)	Internal Antenna	2.4 – 2.5 GHz	7.87dBi (Max.) for BT
Antenna 2	2.4G WLAN (Module: RTL8821CS)	Internal Antenna	2.4 – 2.5 GHz 5.0 – 6.0 GHz	5.26 dBi(Max.) for 2.4G Band 5.33 dBi(Max.) for 5G Band
Antenna 3	BLE (Chip 2: AC7066D4)	Internal Antenna	2.4 – 2.5 GHz	7.87dBi (Max.) for BT
Antenna 4	BLE (Chip 3: AC7066D4)	Internal Antenna	2.4 – 2.5 GHz	7.87dBi (Max.) for BT

4. Conducted Power Results

Antenna 1(Chip1: JL7034A6)

BT

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	9.59
	39	2441	11.08
	78	2480	10.80
$\pi/4$ DQPSK	0	2402	10.25
	39	2441	11.64
	78	2480	11.30

Antenna 3(Chip2: AC7066D4)

BLE

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK(BT LE 1M)	0	2402	6.83
	19	2440	8.73
	39	2480	8.70
GFSK(BT LE 2M)	0	2402	6.97
	19	2440	8.87
	39	2480	8.86

Antenna 4(Chip3: AC7066D4)

BLE

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK(BT LE 1M)	0	2402	7.13
	19	2440	8.89
	39	2480	8.84
GFSK(BT LE 2M)	0	2402	7.09
	19	2440	8.94
	39	2480	8.85

Antenna 2(Module:RTL8821CS)

2.4GWLAN

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11b	01	2412	17.22
	06	2437	18.19
	11	2462	18.65
802.11g	01	2412	20.72
	06	2437	21.82
	11	2462	20.22
802.11n(HT20)	01	2412	18.67
	06	2437	19.82
	11	2462	20.26
802.11n(HT40)	03	2422	19.40
	06	2437	20.02
	09	2452	20.33

5.2GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	36	5180	13.80
	40	5200	14.21
	48	5240	15.32
802.11n20	36	5180	13.54
	40	5200	14.11
	48	5240	14.67
802.11n40	38	5190	13.48
	46	5230	12.35
802.11ac20	36	5180	11.55
	40	5200	11.87
	48	5240	12.47
802.11ac40	38	5190	11.69
	46	5230	13.53
802.11ac80	42	5210	12.27

5.3GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	52	5260	14.31
	56	5280	14.09
	64	5320	14.27
802.11n20	52	5260	14.25
	56	5280	14.11
	64	5320	11.99
802.11n40	54	5270	14.39
	62	5310	14.12
802.11ac20	52	5260	12.12
	56	5280	12.07
	64	5320	12.26
802.11ac40	54	5270	12.39
	62	5310	12.41
802.11ac80	58	5290	10.73

5.7GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	100	5500	15.04
	116	5580	15.57
	140	5700	14.56
802.11n20	100	5500	14.78
	116	5580	15.18
	140	5700	14.85
802.11n40	102	5510	14.56
	118	5590	15.31
	134	5670	15.42
802.11ac20	100	5500	12.51
	116	5580	12.43
	140	5700	12.27
802.11ac40	102	5510	12.21
	118	5590	12.72
	134	5670	13.26
802.11ac80	106	5530	13.16
	122	5610	13.58

5.8GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	149	5745	11.53
	157	5785	12.14
	165	5825	11.79
802.11n20	149	5745	9.76
	157	5785	10.05
	165	5825	9.57
802.11n40	151	5755	11.85
	159	5795	12.00
802.11ac20	149	5745	9.67
	157	5785	10.11
	165	5825	9.63
802.11ac40	151	5755	9.91
	159	5795	10.38
802.11ac80	155	5775	8.97

5. Manufacturing Tolerance

Antenna 1(Chip1: JL7034A6)

BT

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	9.00	11.00	10.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
$\pi/4$ DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	10.00	11.00	11.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Antenna 3(Chip2: AC7066D4)

BLE

GFSK BT LE 1M(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	6.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GFSK BT LE 2M(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	6.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Antenna 4(Chip3: AC7066D4)

BLE

GFSK BT LE 1M(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	7.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GFSK BT LE 2M(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	7.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Antenna 2(Module:RTL8821CS)

2.4GWLAN

IEEE 802.11b (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	17.00	18.00	18.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	20.00	21.00	20.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (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 802.11n HT40 (Peak)			
Channel	Channel 03	Channel 06	Channel 09
Target (dBm)	19.00	20.00	20.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0

5.2G WLAN

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.00	14.00	15.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.00	14.00	14.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	13.00	12.00	
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	11.00	11.00	12.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	11.00	13.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	/	/
Target (dBm)	12.00		
Tolerance $\pm$ (dB)	1.0	/	/

5.3G WLAN

IEEE 802.11a (Average)			
Channel	Channel 52	Channel 56	Channel 64
Target (dBm)	14.00	14.00	14.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 52	Channel 56	Channel 64
Target (dBm)	14.00	14.00	11.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 54	Channel 62	/
Target (dBm)	14.00	14.00	
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 52	Channel 56	Channel 64
Target (dBm)	12.00	12.00	12.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 54	Channel 62	/
Target (dBm)	12.00	12.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 58	/	/
Target (dBm)	10.00		
Tolerance $\pm$ (dB)	1.0	/	/

5.7G WLAN

IEEE 802.11a (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	15.00	15.00	14.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	14.00	15.00	14.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 102	Channel 118	Channel 134
Target (dBm)	14.00	15.00	15.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	12.00	12.00	12.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 102	Channel 118	Channel 134
Target (dBm)	12.00	12.00	13.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 106	Channel 122	/
Target (dBm)	13.00	13.00	
Tolerance $\pm$ (dB)	1.0	1.0	/

5.8G WLAN

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.00	12.00	11.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.00	10.00	9.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	11.00	12.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.00	10.00	9.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	9.00	10.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	/	/
Target (dBm)	8.00	/	/
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 1(Chip1: JL7034A6)

BT

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
GFSK	12.00	15.8489	7.87	6.1235	0.0193	1.0000
$\pi/4$ DQPSK	12.00	15.8489	7.87	6.1235	0.0193	1.0000

Antenna 3(Chip2: AC7066D4)

BLE

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
GFSK (BT LE)	9.00	7.9433	7.87	6.1235	0.0097	1.0000
GFSK (BT 2LE)	9.00	7.9433	7.87	6.1235	0.0097	1.0000

Antenna 4(Chip3: AC7066D4)

BLE

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
GFSK (BT LE)	9.00	7.9433	7.87	6.1235	0.0097	1.0000
GFSK (BT 2LE)	9.00	7.9433	7.87	6.1235	0.0097	1.0000

Antenna 2(Module:RTL8821CS)

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	19.00	79.4328	5.26	3.3574	0.0531	1.0000
802.11g	22.00	158.4893	5.26	3.3574	0.1059	1.0000
802.11n(HT20)	21.00	125.8925	5.26	3.3574	0.0841	1.0000
802.11n(HT40)	21.00	125.8925	5.26	3.3574	0.0841	1.0000

5.2G WLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11a	16.00	39.8107	5.33	3.4119	0.0270	1.0000
802.11n20	15.00	31.6228	5.33	3.4119	0.0215	1.0000
802.11n40	14.00	25.1189	5.33	3.4119	0.0171	1.0000
802.11ac20	13.00	19.9526	5.33	3.4119	0.0135	1.0000
802.11ac40	14.00	25.1189	5.33	3.4119	0.0171	1.0000
802.11ac80	13.00	19.9526	5.33	3.4119	0.0135	1.0000

5.3G WLAN

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	5.33	3.4119	0.0215	1.0000
802.11n20	15.00	31.6228	5.33	3.4119	0.0215	1.0000
802.11n40	15.00	31.6228	5.33	3.4119	0.0215	1.0000
802.11ac20	13.00	19.9526	5.33	3.4119	0.0135	1.0000
802.11ac40	13.00	19.9526	5.33	3.4119	0.0135	1.0000
802.11ac80	11.00	12.5893	5.33	3.4119	0.0085	1.0000

5.7G WLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11a	16.00	39.8107	5.33	3.4119	0.0270	1.0000
802.11n20	16.00	39.8107	5.33	3.4119	0.0270	1.0000
802.11n40	16.00	39.8107	5.33	3.4119	0.0270	1.0000
802.11ac20	13.00	19.9526	5.33	3.4119	0.0135	1.0000
802.11ac40	14.00	25.1189	5.33	3.4119	0.0171	1.0000
802.11ac80	14.00	25.1189	5.33	3.4119	0.0171	1.0000

5.8G WLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
802.11a	13.00	19.9526	5.33	3.4119	0.0135	1.0000
802.11n20	11.00	12.5893	5.33	3.4119	0.0085	1.0000
802.11n40	13.00	19.9526	5.33	3.4119	0.0135	1.0000
802.11ac20	11.00	12.5893	5.33	3.4119	0.0085	1.0000
802.11ac40	11.00	12.5893	5.33	3.4119	0.0085	1.0000
802.11ac80	9.00	7.9433	5.33	3.4119	0.0054	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 WLAN modular and three Bluetooth Chip, and one WLAN antenna and three Bluetooth antennas, Need consider simultaneous transmission ;

According to KDB447498 D01 General RF Exposure Guidance v06 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
 Σ of MPE ratios ≤ 1.0

6.2.1 Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna				Antenna 1, Antenna 2, Antenna 3, Antenna 4 Synchronization transmits
		Antenna 1	Antenna 2	Antenna 3	Antenna 4	
BT	2.4GHz	Yes	No	Yes	Yes	Yes
WLAN	2.4GHz	No	Yes	No	No	Yes
WLAN	5GHz	No	Yes	No	No	Yes
		Antenna 1	Antenna 2	Antenna 3	Antenna 4	2.4GHzWLAN + 5GHzWLAN Synchronization transmits
WLAN	2.4GHz	No	Yes	No	No	No
WLAN	5GHz	No	Yes	No	No	No

6.2.2 Summary simultaneous transmission results

Maximum Simultaneous transmission MPE Ratios for BT(Antenna 1 (Chip1: JL7034A6), BLE (Antenna 3 (Chip2: AC7066D4), BLE (Antenna 4 (Chip3: AC7066D4), 2.4GWLAN (Antenna 2 (Module: RTL8821CS).

Maximum MPE ratio BT Antenna 1 (Chip1: JL7034A6)	Maximum MPE ratio BLE Antenna 3 (Chip2: AC7066D4)	Maximum MPE ratio BLE Antenna 4 (Chip3: AC7066D4)	Maximum MPE ratio 2.4GWLAN & 5GWLAN Antenna 2 (Module: RTL8821CS)	Σ MPE ratios	Limit	Results
0.0193	0.0097	0.0097	0.1059	0.1446	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.....