

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : W165R-D070

AGR No. : A164A-091

Applicant : RAYENCE Co., Ltd.
Address : 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, South Korea

Manufacturer : RAYENCE Co., Ltd.
Address : 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, South Korea

Type of Equipment : Interface Box

FCC ID. : QIIRYRAP001A

IC Certification No. : 10742A-RAP001A

Model Name : RAP001A

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 24 pages (including this page)

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SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:


Jae-Ho, Lee / Chief Engineer
ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W165R-D070	May 30, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : RAYENCE Co., Ltd.
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 FCC ID : QIIRYRAP001A
 IC Certification No. : 10742A-RAP001A
 Model Name : RAP001A
 Serial Number : N/A
 Date : May 30, 2016

EQUIPMENT CLASS	UNII -Unlicensed National Information infrastructure
E.U.T. DESCRIPTION	Interface Box
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The RAYENCE Co., Ltd., Model RAP001A (referred to as the EUT in this report) is an Interface Box. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Interface Box		
FREQUENCY RANGE	WLAN 2.4 GHz Band	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))	
		2 422 MHz ~ 2 452 MHz (802.11n(HT40))	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))
			5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))
			5 210 MHz (802.11ac(VHT80))
		5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))
			5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))
			5 775 MHz (802.11ac(VHT80))

MAX. RF OUTPUT POWER	WLAN 2.4 GHz Band	Ant.0	Wi-Fi 802.11b (19.01 dBm) Wi-Fi 802.11g (18.31 dBm) Wi-Fi 802.11n_20 MHz (16.56 dBm) Wi-Fi 802.11n_40 MHz (15.78 dBm)	
		Ant.1	Wi-Fi 802.11b (20.21 dBm) Wi-Fi 802.11g (19.51 dBm) Wi-Fi 802.11n_20 MHz (17.36 dBm) Wi-Fi 802.11n_40 MHz (17.59 dBm)	
		Ant.2	Wi-Fi 802.11b (19.82 dBm) Wi-Fi 802.11g (19.76 dBm) Wi-Fi 802.11n_20 MHz (17.53 dBm) Wi-Fi 802.11n_40 MHz (17.50 dBm)	
		MIMO	Wi-Fi 802.11n_20 MHz (21.94 dBm) Wi-Fi 802.11n_40 MHz (21.80 dBm)	
	WLAN 5 GHz Band	Ant.0	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (13.45 dBm) Wi-Fi 802.11n(HT20) MHz (9.16 dBm) Wi-Fi 802.11n(HT40) MHz (10.15 dBm) Wi-Fi 802.11ac(VHT20) MHz (9.04 dBm) Wi-Fi 802.11ac(VHT40) MHz (10.13 dBm) Wi-Fi 802.11ac(VHT80) MHz (10.04 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (17.03 dBm) Wi-Fi 802.11n(HT20) MHz (16.26 dBm) Wi-Fi 802.11n(HT40) MHz (6.36 dBm) Wi-Fi 802.11ac(VHT20) MHz (16.30 dBm) Wi-Fi 802.11ac(VHT40) MHz (6.40 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.96 dBm)
		Ant.1	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (12.85 dBm) Wi-Fi 802.11n(HT20) MHz (8.71 dBm) Wi-Fi 802.11n(HT40) MHz (9.81 dBm) Wi-Fi 802.11ac(VHT20) MHz (8.69 dBm) Wi-Fi 802.11ac(VHT40) MHz (9.83 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.34 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (17.19 dBm) Wi-Fi 802.11n(HT20) MHz (16.55 dBm) Wi-Fi 802.11n(HT40) MHz (6.00 dBm) Wi-Fi 802.11ac(VHT20) MHz (16.45 dBm) Wi-Fi 802.11ac(VHT40) MHz (6.00 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.96 dBm)

MAX. RF OUTPUT POWER	WLAN 5 GHz Band	Ant.2	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (12.81 dBm) Wi-Fi 802.11n(HT20) MHz (8.61 dBm) Wi-Fi 802.11n(HT40) MHz (9.82 dBm) Wi-Fi 802.11ac(VHT20) MHz (8.59 dBm) Wi-Fi 802.11ac(VHT40) MHz (9.88 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.27 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (17.06 dBm) Wi-Fi 802.11n(HT20) MHz (15.97 dBm) Wi-Fi 802.11n(HT40) MHz (6.31 dBm) Wi-Fi 802.11ac(VHT20) MHz (15.99 dBm) Wi-Fi 802.11ac(VHT40) MHz (6.31 dBm) Wi-Fi 802.11ac(VHT80) MHz (10.16 dBm)
		MIMO	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11n(HT20) MHz (13.50 dBm) Wi-Fi 802.11n(HT40) MHz (14.64 dBm) Wi-Fi 802.11ac(VHT20) MHz (13.51 dBm) Wi-Fi 802.11ac(VHT40) MHz (14.66 dBm) Wi-Fi 802.11ac(VHT80) MHz (14.80 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11n(HT20) MHz (21.04 dBm) Wi-Fi 802.11n(HT40) MHz (11.00 dBm) Wi-Fi 802.11ac(VHT20) MHz (21.02 dBm) Wi-Fi 802.11ac(VHT40) MHz (11.01 dBm) Wi-Fi 802.11ac(VHT80) MHz (14.80 dBm)
MODULATION TYPE	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11a/g/n(HT20)/ac(HT20)/n(HT40)/ac(HT40)/ac(80HT): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)			
Antenna Gain	2.4 GHz Band		4.674 dBi (Array Gain : 4.77 dBi)	
	5 GHz Band [5 150 MHz ~ 5 250 MHz Band]		6.533 dBi (Array Gain : 4.77 dBi)	
	5 GHz Band [5 725 MHz ~ 5 850 MHz Band]		6.415 dBi (Array Gain : 4.77 dBi)	
List of each Osc. or crystal Freq. (Freq. >= 1 MHz)	40 MHz, 25 MHz			

2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3. EUT MODIFICATIONS

-. None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are $f/1500$ mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric field strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using $P \text{ (mW)} = P \text{ (W)} / 1\,000$, $d \text{ (cm)} = 0.01 * d \text{ (m)}$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

4.2 EUT Description

Kind of EUT	Interface Box		
Operating Frequency Band	☐ Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz ☒ WLAN: 2 412 MHz ~ 2 462 MHz ☒ WLAN: 5 180 MHz ~ 5 240 MHz ☐ WLAN: 5 260 MHz ~ 5 320 MHz ☐ WLAN: 5 500 MHz ~ 5 700 MHz ☒ WLAN: 5 745 MHz ~ 5 825 MHz ☐ Bluetooth: 2 402 MHz ~ 2 480 MHz ☐ GFSK Modulation: 2403 MHz , 2443 MHz , 2478 MHz		
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ☒ Others		
Max. Output Power	2.4 GHz Band	Ant.0	Wi-Fi 802.11b (19.01 dBm) Wi-Fi 802.11g (18.31 dBm) Wi-Fi 802.11n_20 MHz (16.56 dBm) Wi-Fi 802.11n_40 MHz (15.78 dBm)
		Ant.1	Wi-Fi 802.11b (20.21 dBm) Wi-Fi 802.11g (19.51 dBm) Wi-Fi 802.11n_20 MHz (17.36 dBm) Wi-Fi 802.11n_40 MHz (17.59 dBm)
		Ant.2	Wi-Fi 802.11b (19.82 dBm) Wi-Fi 802.11g (19.76 dBm) Wi-Fi 802.11n_20 MHz (17.53 dBm) Wi-Fi 802.11n_40 MHz (17.50 dBm)
		MIMO	Wi-Fi 802.11n_20 MHz (21.94 dBm) Wi-Fi 802.11n_40 MHz (21.80 dBm)

Max. Output Power	5 GHz Band	Ant.0	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (13.45 dBm) Wi-Fi 802.11n(HT20) MHz (9.16 dBm) Wi-Fi 802.11n(HT40) MHz (10.15 dBm) Wi-Fi 802.11ac(VHT20) MHz (9.04 dBm) Wi-Fi 802.11ac(VHT40) MHz (10.13 dBm) Wi-Fi 802.11ac(VHT80) MHz (10.04 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (17.03 dBm) Wi-Fi 802.11n(HT20) MHz (16.26 dBm) Wi-Fi 802.11n(HT40) MHz (6.36 dBm) Wi-Fi 802.11ac(VHT20) MHz (16.30 dBm) Wi-Fi 802.11ac(VHT40) MHz (6.40 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.96 dBm)
		Ant.1	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (12.85 dBm) Wi-Fi 802.11n(HT20) MHz (8.71 dBm) Wi-Fi 802.11n(HT40) MHz (9.81 dBm) Wi-Fi 802.11ac(VHT20) MHz (8.69 dBm) Wi-Fi 802.11ac(VHT40) MHz (9.83 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.34 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (17.19 dBm) Wi-Fi 802.11n(HT20) MHz (16.55 dBm) Wi-Fi 802.11n(HT40) MHz (6.00 dBm) Wi-Fi 802.11ac(VHT20) MHz (16.45 dBm) Wi-Fi 802.11ac(VHT40) MHz (6.00 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.96 dBm)
		Ant.2	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (12.81 dBm) Wi-Fi 802.11n(HT20) MHz (8.61 dBm) Wi-Fi 802.11n(HT40) MHz (9.82 dBm) Wi-Fi 802.11ac(VHT20) MHz (8.59 dBm) Wi-Fi 802.11ac(VHT40) MHz (9.88 dBm) Wi-Fi 802.11ac(VHT80) MHz (9.27 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (17.06 dBm) Wi-Fi 802.11n(HT20) MHz (15.97 dBm) Wi-Fi 802.11n(HT40) MHz (6.31 dBm) Wi-Fi 802.11ac(VHT20) MHz (15.99 dBm) Wi-Fi 802.11ac(VHT40) MHz (6.31 dBm) Wi-Fi 802.11ac(VHT80) MHz (10.16 dBm)
		MIMO	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11n(HT20) MHz (13.50 dBm) Wi-Fi 802.11n(HT40) MHz (14.64 dBm) Wi-Fi 802.11ac(VHT20) MHz (13.51 dBm) Wi-Fi 802.11ac(VHT40) MHz (14.66 dBm) Wi-Fi 802.11ac(VHT80) MHz (14.80 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11n(HT20) MHz (21.04 dBm) Wi-Fi 802.11n(HT40) MHz (11.00 dBm) Wi-Fi 802.11ac(VHT20) MHz (21.02 dBm) Wi-Fi 802.11ac(VHT40) MHz (11.01 dBm) Wi-Fi 802.11ac(VHT80) MHz (14.80 dBm)

Used Antenna Gain	2.4 GHz Band	4.674 dBi (Array Gain : 4.77 dBi)
	5 GHz Band [5 150 MHz ~ 5 250 MHz Band]	6.533 dBi (Array Gain : 4.77 dBi)
	5 GHz Band [5 725 MHz ~ 5 850 MHz Band]	6.415 dBi (Array Gain : 4.77 dBi)
Exposure Evaluation Applied	☒ MPE ☐ SAR ☐ N/A	

2.4GHz & 5GHz can not transmit at the same time.

4.3 Calculated MPE Safe Distance

4.3.1 Test data for Antenna 0 (low frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/ cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	13.5 ± 0.5	14.0	25.12	6.533	4.501	3.00	0.022 5	1.00
	802.11n_HT20	9.0 ± 0.5	9.5	8.91			1.79	0.008 0	1.00
	802.11ac_VHT20	9.0 ± 0.5	9.5	8.91			1.79	0.008 0	1.00
	802.11n_HT40	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
	802.11ac_VHT40	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
	802.11ac_VHT80	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
5 725 ~ 5 850	802.11a	10.5 ± 0.5	11.0	12.59	6.415	4.380	2.09	0.011 0	1.00
	802.11n_HT20	8.0 ± 0.5	8.5	7.08			1.57	0.006 2	1.00
	802.11ac_VHT20	8.0 ± 0.5	8.5	7.08			1.57	0.006 2	1.00
	802.11n_HT40	6.0 ± 0.5	6.5	4.47			1.25	0.003 9	1.00
	802.11ac_VHT40	6.5 ± 0.5	7.0	5.01			1.32	0.004 4	1.00
	802.11ac_VHT80	10.0 ± 0.5	10.5	11.22			1.98	0.009 8	1.00

4.3.2 Test data for Antenna 0 (middle frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/ cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	13.5 ± 0.5	14.0	25.12	6.533	4.501	3.00	0.022 5	1.00
	802.11n_HT20	9.0 ± 0.5	9.5	8.91			1.79	0.008 0	1.00
	802.11ac_VHT20	9.0 ± 0.5	9.5	8.91			1.79	0.008 0	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	17.0 ± 0.5	17.5	56.23	6.415	4.380	4.43	0.049 0	1.00
	802.11n_HT20	16.5 ± 0.5	17.0	50.12			4.18	0.043 7	1.00
	802.11ac_VHT20	16.5 ± 0.5	17.0	50.12			4.18	0.043 7	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.3 Test data for Antenna 0 (high frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/ cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	13.0 ± 0.5	13.5	22.39	6.533	4.501	2.83	0.020 0	1.00
	802.11n_ HT20	9.0 ± 0.5	9.5	8.91			1.79	0.008 0	1.00
	802.11ac_VHT20	9.0 ± 0.5	9.5	8.91			1.79	0.008 0	1.00
	802.11n_ HT40	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
	802.11ac_VHT40	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	9.5 ± 0.5	10.0	10.00	6.415	4.380	1.87	0.008 7	1.00
	802.11n_ HT20	7.5 ± 0.5	8.0	6.31			1.48	0.005 5	1.00
	802.11ac_VHT20	8.0 ± 0.5	8.5	7.08			1.57	0.006 2	1.00
	802.11n_ HT40	6.0 ± 0.5	6.5	4.47			1.25	0.003 9	1.00
	802.11ac_VHT40	6.5 ± 0.5	7.0	5.01			1.32	0.004 4	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.4 Test data for Antenna 1(low frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	12.5 ± 0.5	13.0	19.95	6.533	4.501	2.67	0.0179	1.00
	802.11n_HT20	8.5 ± 0.5	9.0	7.94			1.69	0.0071	1.00
	802.11ac_VHT20	8.5 ± 0.5	9.0	7.94			1.69	0.0071	1.00
	802.11n_HT40	9.5 ± 0.5	10.0	10.00			1.89	0.0090	1.00
	802.11ac_VHT40	9.5 ± 0.5	10.0	10.00			1.89	0.0090	1.00
	802.11ac_VHT80	9.5 ± 0.5	10.0	10.00			1.89	0.0090	1.00
5 725 ~ 5 850	802.11a	10.5 ± 0.5	11.0	12.59	6.415	4.388	2.09	0.0110	1.00
	802.11n_HT20	8.0 ± 0.5	8.5	7.08			1.57	0.0062	1.00
	802.11ac_VHT20	8.0 ± 0.5	8.5	7.08			1.57	0.0062	1.00
	802.11n_HT40	6.0 ± 0.5	6.5	4.47			1.25	0.0039	1.00
	802.11ac_VHT40	6.0 ± 0.5	6.5	4.47			1.25	0.0039	1.00
	802.11ac_VHT80	10.0 ± 0.5	10.5	11.22			1.98	0.0098	1.00

4.3.5 Test data for Antenna 1(middle frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	12.5 ± 0.5	13.0	19.95	6.533	4.501	2.67	0.017 9	1.00
	802.11n_HT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11ac_VHT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	17.0 ± 0.5	17.5	56.23	6.415	4.380	4.43	0.049 0	1.00
	802.11n_HT20	16.0 ± 0.5	16.5	44.67			3.94	0.038 9	1.00
	802.11ac_VHT20	16.5 ± 0.5	17.0	50.12			4.18	0.043 7	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.6 Test data for Antenna 1(high frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	12.5 ± 0.5	13.0	19.95	6.533	4.501	2.67	0.017 9	1.00
	802.11n_HT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11ac_VHT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11n_HT40	9.5 ± 0.5	10.0	10.00			1.89	0.009 0	1.00
	802.11ac_VHT40	9.5 ± 0.5	10.0	10.00			1.89	0.009 0	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	9.0 ± 0.5	9.5	8.91	6.415	4.380	1.76	0.007 8	1.00
	802.11n_HT20	7.5 ± 0.5	8.0	6.31			1.48	0.005 5	1.00
	802.11ac_VHT20	6.5 ± 0.5	7.0	5.01			1.32	0.004 4	1.00
	802.11n_HT40	6.0 ± 0.5	6.5	4.47			1.25	0.003 9	1.00
	802.11ac_VHT40	6.0 ± 0.5	6.5	4.47			1.25	0.003 9	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.7 Test data for Antenna 2(low frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/ cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	13.0 ± 0.5	13.5	22.39	6.533	4.501	2.83	0.020 0	1.00
	802.11n_HT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11ac_VHT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11n_HT40	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
	802.11ac_VHT40	9.5 ± 0.5	10.0	10.00			1.89	0.009 0	1.00
	802.11ac_VHT80	9.5 ± 0.5	10.0	10.00			1.89	0.009 0	1.00
5 725 ~ 5 850	802.11a	11.0 ± 0.5	11.5	14.13	6.415	4.380	2.22	0.012 3	1.00
	802.11n_HT20	9.0 ± 0.5	9.5	8.91			1.76	0.007 8	1.00
	802.11ac_VHT20	8.0 ± 0.5	8.5	7.08			1.57	0.006 2	1.00
	802.11n_HT40	6.5 ± 0.5	7.0	5.01			1.32	0.004 4	1.00
	802.11ac_VHT40	6.0 ± 0.5	6.5	4.47			1.25	0.003 9	1.00
	802.11ac_VHT80	10.0 ± 0.5	10.5	11.22			1.98	0.009 8	1.00

4.3.8 Test data for Antenna 2(middle frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	13.0 ± 0.5	13.5	22.39	6.533	4.501	2.83	0.020 0	1.00
	802.11n_HT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11ac_VHT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	17.0 ± 0.5	17.5	56.23	6.415	4.380	4.43	0.049 0	1.00
	802.11n_HT20	16.0 ± 0.5	16.5	44.67			3.94	0.038 9	1.00
	802.11ac_VHT20	16.0 ± 0.5	16.5	44.67			3.94	0.038 9	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.9 Test data for Antenna 2(high frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	13.0 ± 0.5	13.5	22.39	6.533	4.501	2.83	0.020 0	1.00
	802.11n_HT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11ac_VHT20	8.5 ± 0.5	9.0	7.94			1.69	0.007 1	1.00
	802.11n_HT40	10.0 ± 0.5	10.5	11.22			2.00	0.010 0	1.00
	802.11ac_VHT40	9.5 ± 0.5	10.0	10.00			1.89	0.009 0	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	9.5 ± 0.5	10.0	10.00	6.415	4.380	1.87	0.008 7	1.00
	802.11n_HT20	7.5 ± 0.5	8.0	6.31			1.48	0.005 5	1.00
	802.11ac_VHT20	7.0 ± 0.5	7.5	5.62			1.40	0.004 9	1.00
	802.11n_HT40	5.5 ± 0.5	6.0	3.98			1.18	0.003 5	1.00
	802.11ac_VHT40	6.0 ± 0.5	6.5	4.47			1.25	0.003 9	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.10 Test data for Multiple Antenna(low frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	-	-	-	11.304	13.503	-	-	1.00
	802.11n_HT20	13.5 ± 0.5	14.0	25.12			5.19	0.067 5	1.00
	802.11ac_VHT20	13.5 ± 0.5	14.0	25.12			5.19	0.067 5	1.00
	802.11n_HT40	14.5 ± 0.5	15.0	31.62			5.83	0.084 9	1.00
	802.11ac_VHT40	14.5 ± 0.5	15.0	31.62			5.83	0.084 9	1.00
	802.11ac_VHT80	14.5 ± 0.5	15.0	31.62			5.83	0.084 9	1.00
5 725 ~ 5 850	802.11a	-	-	-	11.186	13.141	-	-	1.00
	802.11n_HT20	13.5 ± 0.5	14.0	25.12			5.12	0.065 7	1.00
	802.11ac_VHT20	13.0 ± 0.5	13.5	22.39			4.84	0.058 5	1.00
	802.11n_HT40	11.0 ± 0.5	11.5	14.13			3.84	0.036 9	1.00
	802.11ac_VHT40	11.0 ± 0.5	11.5	14.13			3.84	0.036 9	1.00
	802.11ac_VHT80	14.5 ± 0.5	15.0	31.62			5.75	0.082 7	1.00

4.3.11 Test data for Multiple Antenna(middle frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/ cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	-	-	-	11.304	13.503	-	-	1.00
	802.11n_HT20	13.5 ± 0.5	14.0	25.12			5.19	0.067 5	1.00
	802.11ac_VHT20	13.5 ± 0.5	14.0	25.12			5.19	0.067 5	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	-	-	-	11.186	13.141	-	-	1.00
	802.11n_HT20	21.0 ± 0.5	21.5	141.25			12.15	0.369 3	1.00
	802.11ac_VHT20	21.0 ± 0.5	21.5	141.25			12.15	0.369 3	1.00
	802.11n_HT40	-	-	-			-	-	1.00
	802.11ac_VHT40	-	-	-			-	-	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00

4.3.12 Test data for Multiple Antenna(high frequency)

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
5 150 ~ 5 250	802.11a	-	-	-	11.304	13.503	-	-	1.00
	802.11n_HT20	13.5 ± 0.5	14.0	25.12			5.19	0.067 5	1.00
	802.11ac_VHT20	13.5 ± 0.5	14.0	25.12			5.19	0.067 5	1.00
	802.11n_HT40	14.5 ± 0.5	15.0	31.62			5.83	0.084 9	1.00
	802.11ac_VHT40	15.0 ± 0.5	15.5	35.48			6.17	0.095 3	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00
5 725 ~ 5 850	802.11a	-	-	-	11.186	13.141	-	-	1.00
	802.11n_HT20	12.0 ± 0.5	12.5	17.78			4.31	0.046 5	1.00
	802.11ac_VHT20	12.0 ± 0.5	12.5	17.78			4.31	0.046 5	1.00
	802.11n_HT40	11.0 ± 0.5	11.5	14.13			3.84	0.036 9	1.00
	802.11ac_VHT40	11.0 ± 0.5	11.5	14.13			3.84	0.036 9	1.00
	802.11ac_VHT80	-	-	-			-	-	1.00