



FCC PART 15.407 TEST REPORT

For

Hyundai Technology Group, Inc.

2601 Walnut Ave. Tustin, CA, USA

FCC ID: 2AVTH-HWM10LA65

Report Type: Original Report	Product Type: Interactive Digital Display Solution 65"
Report Number: RSZ200220001-00C	
Report Date: 2020-04-02	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Interactive Digital Display Solution 65"
Model	HWM10LA65
Frequency Range	5G Wi-Fi: 5150-5250 MHz; 5725-5850 MHz
Maximum conducted output power	Wi-Fi Modular 1: 5150-5250 MHz: 15.16dBm (802.11a), 14.42dBm(802.11n20), 14.62 dBm(802.11n40) 14.52dBm (802.11ac20), 14.37dBm(802.11 ac40), 13.14dBm(802.11 ac80) 5725-5850 MHz: 15.98dBm (802.11a), 14.95dBm(802.11n20), 14.13dBm(802.11n40) 14.61dBm (802.11ac20), 14.03dBm(802.11 ac40), 12.72dBm(802.11 ac80) Wi-Fi Modular 2: 5150-5250 MHz: 15.35dBm (802.11a), 15.25dBm(802.11n20), 15.17 dBm(802.11n40) 15.24dBm (802.11ac20), 14.99dBm(802.11 ac40), 14.52dBm(802.11 ac80) 5725-5850 MHz: 15.14dBm (802.11a), 14.91dBm(802.11n20), 14.83dBm(802.11n40) 15.01dBm (802.11ac20), 14.79dBm(802.11 ac40), 14.79dBm(802.11 ac80)
Modulation Technique	OFDM
Antenna Specification	FPC Antennas: 2.2dBi External Antennas: 2.2dBi
Voltage Range	AC 120V/60Hz
Date of Test	2020/03/04~2020/04/02
Sample serial number	RSZ200220001-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020/02/20
Sample/EUT Status	Good condition

Objective

This type approval report is prepared on behalf of *Hyundai Technology Group, Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submission with FCC ID: 2AVTH-HWM10LA65.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1 °C
Humidity		±6%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT has two different Wi-Fi modulars, they are working independently. It can operate in 802.11a/n20/n40/ac20/ac40/ac80 modes.

For 5150-5250MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 802.11a, 802.1120, 802.11ac20 channel 36, 40, 48 were tested; For 802.11n40, 802.11ac40 channel 38, 46 were tested; For 802.11ac80, channel 42 was tested.

For 5725-5850MHz Band, 8 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785
151	5755	159	5795
153	5765	161	5805
155	5775	165	5825

For 802.11a, 802.1120, 802.11ac20 channel 149, 157, 165 were tested; For 802.11n40, 802.11ac40 channel 151, 159 were tested; For 802.11ac80, channel 155 was tested.

The device supports SISO and MIMO mode, per pre-test, MIMO 2TX mode was the worst and reported.

EUT Exercise Software

“WAAN Test tool” exercise software was used.

Test frequencies and power level were configured as below:

Mode	Data rate	Power level		
		Low channel	Middle channel	High channel
802.11 a	6 Mbps	45	45	45
802.11 n20	MCS0	44	44	44
802.11 n40	MCS0	43	43	43
802.11 ac20	MCS0	44	44	44
802.11 ac40	MCS0	43	43	43
802.11 ac80	MCS0	43	43	43

The two Wi-Fi modules have the same power level.

Duty cycle

Test Result: Compliant. Please refer to the Annex C & Annex D.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

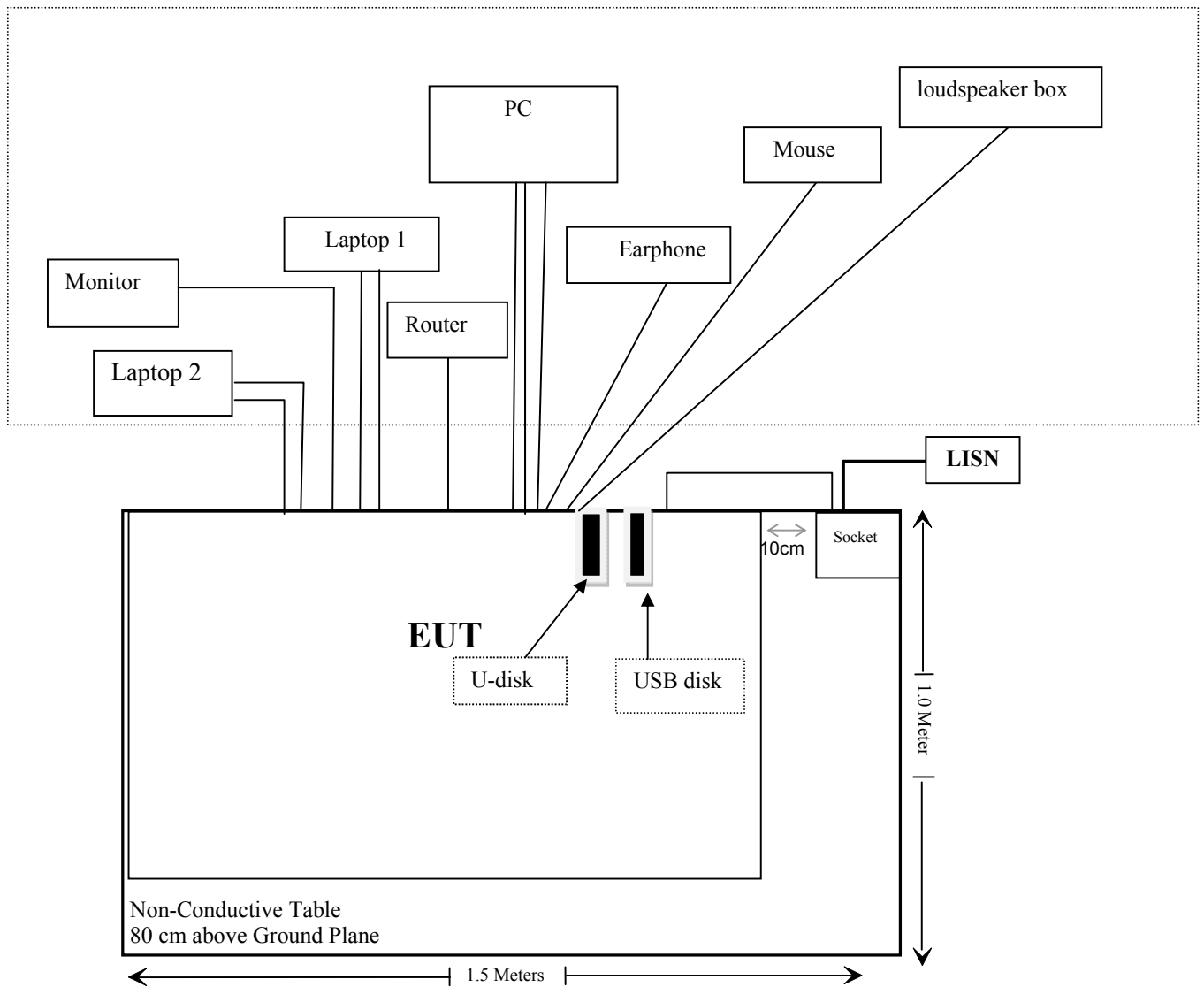
Manufacturer	Description	Model	Serial Number
Grandstream	Earphone	M431	Unknown
BULL	Socket	GN-212	A37209315081183
DELL	Mouse	MOC5UO	G1900NKD
Dwell	Laptop 1	Unknown	Unknown
DELL	Laptop 2	LATITUDE E6410	Unknown
TOSHIBA	PC	TOSHIBA Satellite C600	PSC2NQ-00G006
Zeeva International Limited	loudspeaker box	SP-0696	3190063
TP Link	Router	Unknown	Unknown
Kingston	U-disk	Unknown	Unknown
Sandisk	USB disk	Unknown	Unknown
DELL	Monitor	ST2420Lb	CN-0X0K27-74261-2AF-090U
HUAWEI	Router	WS832	SEJ7S18A10000731

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shield Detachable AC Cable	1.0	LISN	Socket
Un-Shield Detachable AC Cable	1.0	EUT	Socket
Un-Shield Detachable AV Cable	3.0	EUT	Earphone
Un-Shielded Detachable HDMI Cable	3.0	EUT	Laptop 1
Un-Shielded Detachable VGA Cable	3.0	EUT	PC
Un-Shielded Detachable AV Cable	3.0	EUT	PC
Un-Shielded Detachable USB Cable	3.0	EUT	PC
Un-Shielded Detachable AV Cable	3.0	EUT	loudspeaker box
Un-Shield Detachable RJ45 Cable	3.0	EUT	Router
Un-Shielded Detachable HDMI Cable	3.0	EUT	Monitor
Un-Shielded Detachable HDMI Cable	3.0	EUT	Laptop 2
Un-Shielded Detachable HDMI Cable	1.0	EUT	Monitor

Block Diagram of Test Setup

For conducted emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (1), (4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a)(1),(3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1),(3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019/7/9	2020/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
Ducommun technologies	RF Cable	RG-214	1	2019/11/12	2020/11/12
Ducommun technologies	RF Cable	RG-214	2	2019/11/12	2020/11/12
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2019/4/20	2020/4/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-021304	2017/12/6	2020/12/5
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-03	2017/12/6	2020/12/5

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2019/7/10	2020/7/9
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2019/7/22	2020/7/21
Unknown	RF Cable	Unknown	2301 276	2019/11/29	

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	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

Result

Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Wi-Fi Modular 1

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	2.05	1.60	21	125.89	20	0.040	1
5150-5250	2.2	1.66	16	39.81	20	0.013	1
5725-5850	2.2	1.66	16	39.81	20	0.013	1

Wi-Fi Modular 2

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	4.5	2.82	30	1000	20	0.561	1
5150-5250	2.2	1.66	16	39.81	20	0.013	1
5725-5850	2.2	1.66	16	39.81	20	0.013	1

Note: 1. the tune up conducted power was declared by the applicant
 2. For the same modular, the 2.4G Wi-Fi can't transmit at the same time with the 5G Wi-Fi.
 3. In normal condition, the two modules are working independently.

Simultaneous transmitting consideration:

The ratio= $MPE_{\text{Modular 1}}/\text{limit} + MPE_{\text{Modular 2}}/\text{limit} = 0.040 + 0.561 = 0.601 < 1.0$, so simultaneous exposure is not required.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has two internal FPC antennas arrangement for 5G Wi-Fi modular 1 which are permanently attached and the antenna gain is 2.2dBi(5.2G Wi-Fi), 2.2dBi(5.8G Wi-Fi), fulfill the requirement of this section. Please refer to the EUT photos.

The EUT has two external antennas with a RP-SMA jack for 5G Wi-Fi modular 2. The antenna gain is 2.2dBi(5.2G Wi-Fi), 2.2dBi(5.8G Wi-Fi), fulfill the requirement of this section. Please refer to the EUT photos.

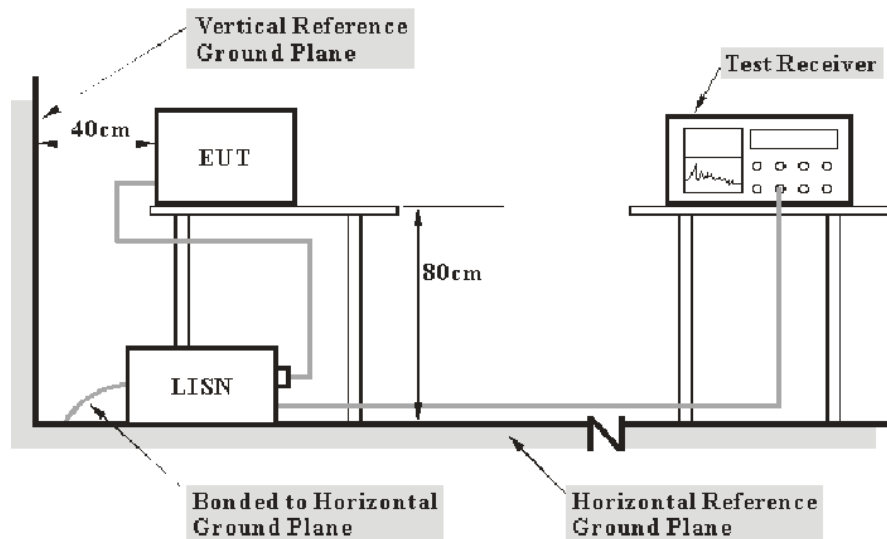
Result: Compliance.

FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

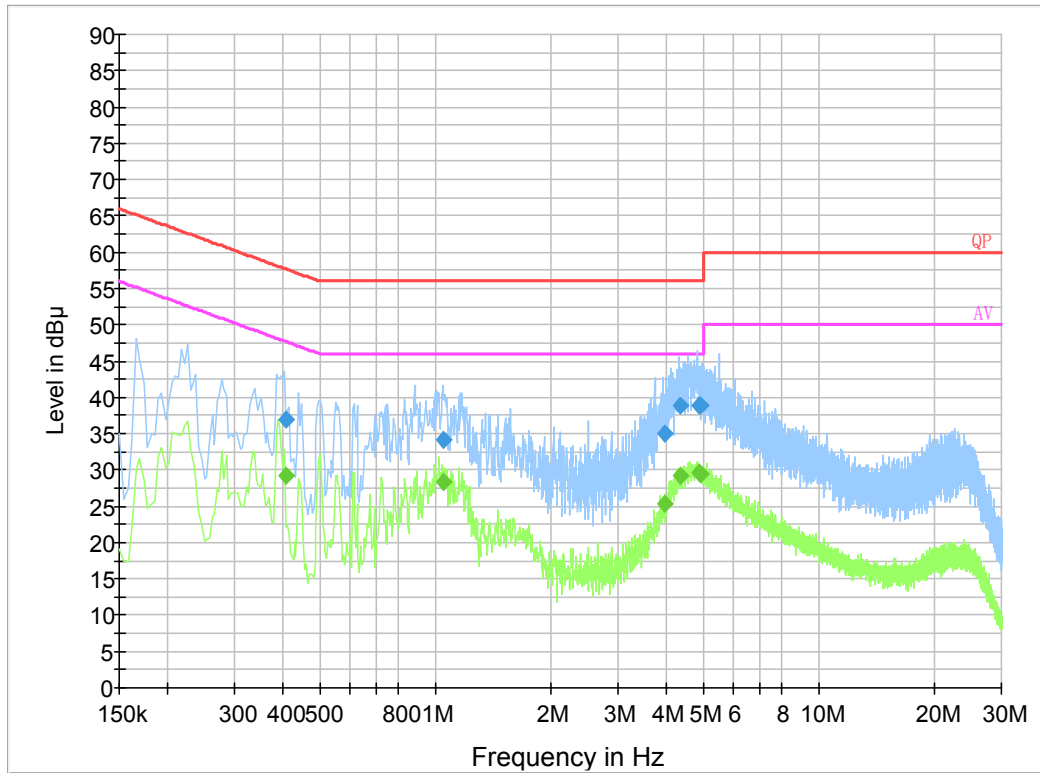
Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

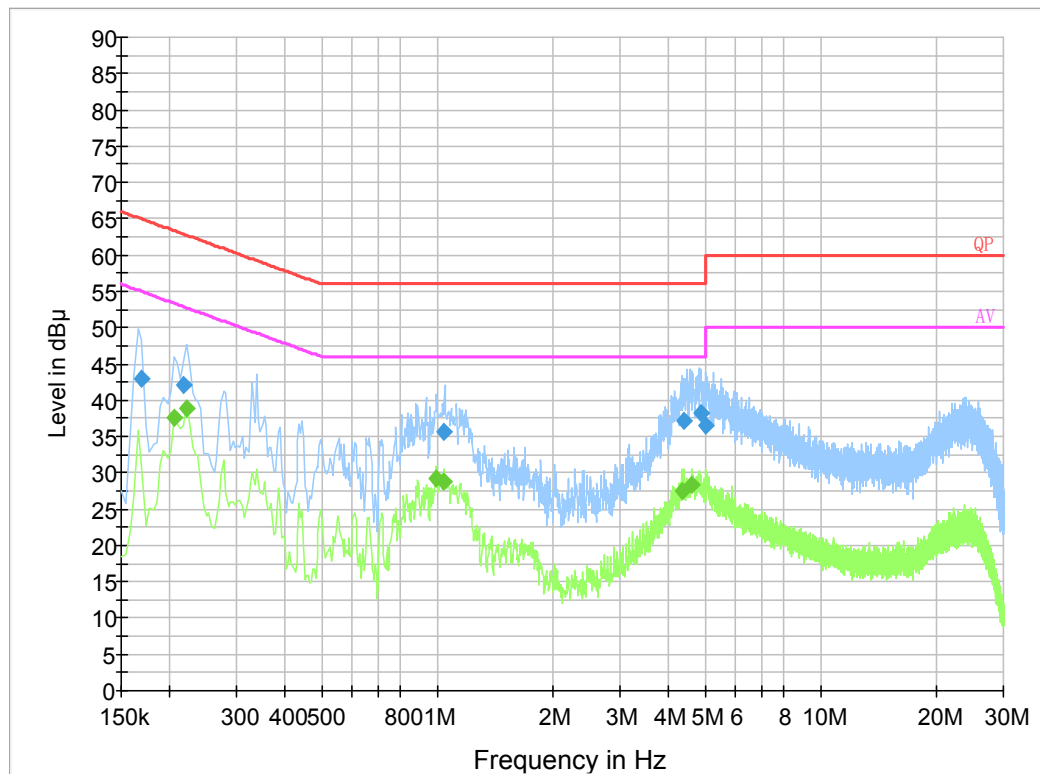
The testing was performed by Haiguo Li on 2020-03-20.

EUT operation mode: Transmitting (the worst case is Wi-Fi 802.11a Mode, Middle Channel)

Note: The two modules transmit at the same time.

AC 120V/60 Hz, Line:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.407910	36.9	19.9	57.7	20.8	QP
1.054250	34.2	19.9	56.0	21.8	QP
3.971110	35.1	19.9	56.0	20.9	QP
4.365290	38.9	19.9	56.0	17.1	QP
4.893610	38.9	19.9	56.0	17.1	QP
4.923450	38.8	19.9	56.0	17.2	QP
0.407910	29.2	19.9	47.7	18.5	Ave.
1.054250	28.4	19.9	46.0	17.6	Ave.
3.971110	25.3	19.9	46.0	20.7	Ave.
4.365290	29.2	19.9	46.0	16.8	Ave.
4.893610	29.6	19.9	46.0	16.4	Ave.
4.923450	29.5	19.9	46.0	16.5	Ave.

AC120V, 60 Hz, Neutral:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.169500	42.9	19.8	65.0	22.1	QP
0.217500	42.1	19.8	62.9	20.9	QP
1.046250	35.7	19.8	56.0	20.3	QP
4.404450	37.2	19.9	56.0	18.8	QP
4.861790	38.3	19.9	56.0	17.7	QP
4.999630	36.6	19.9	56.0	19.4	QP
0.206000	37.6	19.8	53.4	15.8	Ave.
0.222000	38.9	19.8	52.7	13.9	Ave.
0.998000	29.3	19.8	46.0	16.7	Ave.
1.042000	28.7	19.8	46.0	17.3	Ave.
4.342000	27.5	19.9	46.0	18.5	Ave.
4.618000	28.3	19.9	46.0	17.7	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

§15.205 & §15.209 & §15.407(B) (1), (4), (6), (7) – UNDESIRABLE EMISSION**Applicable Standard**

FCC §15.407 (b) (1), (4), (6), (7); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

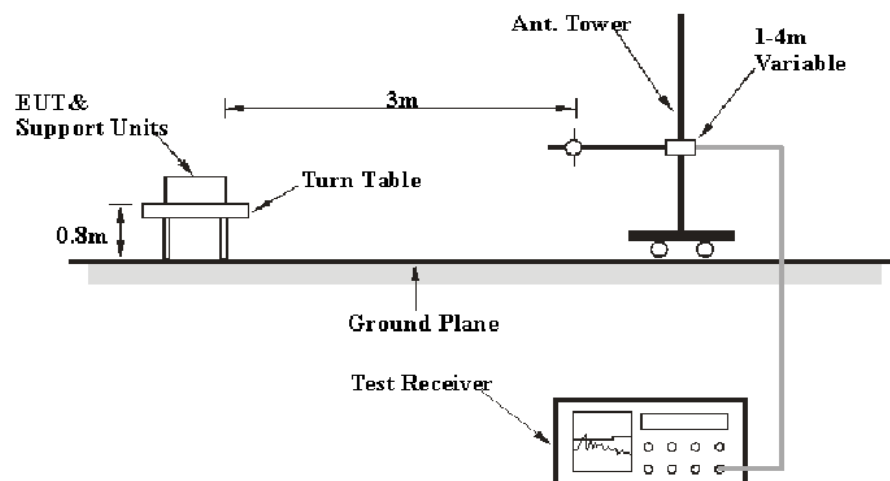
(4) For transmitters operating in the 5.725-5.85 GHz band:

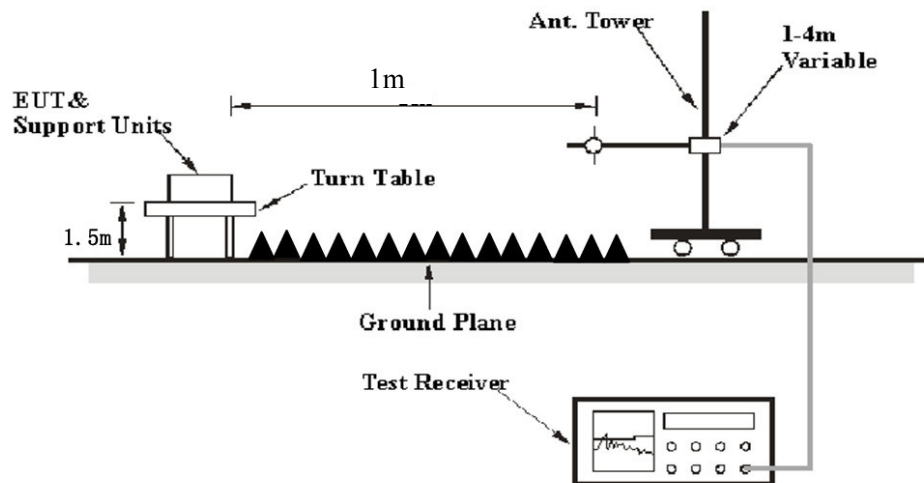
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1MHz	10 Hz ^{Note 1}	/	Average
	1MHz	> 1/T ^{Note 2}	/	Average

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

Test Procedure**Radiated Spurious Emission**

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Average detection modes for frequencies above 1GHz.

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified, extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\text{SpecLimit}} = E_{\text{Meas}} + 20 \log \left(\frac{d_{\text{Meas}}}{d_{\text{SpecLimit}}} \right)$$

where

$E_{\text{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dB μ V/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dB μ V/m
d_{Meas}	is the measurement distance, in m
$d_{\text{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is $20 \cdot \log(1/3) = -9.5$ dB

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart E, section 15.205, 15.209 and 15.407 rules.

Test Data

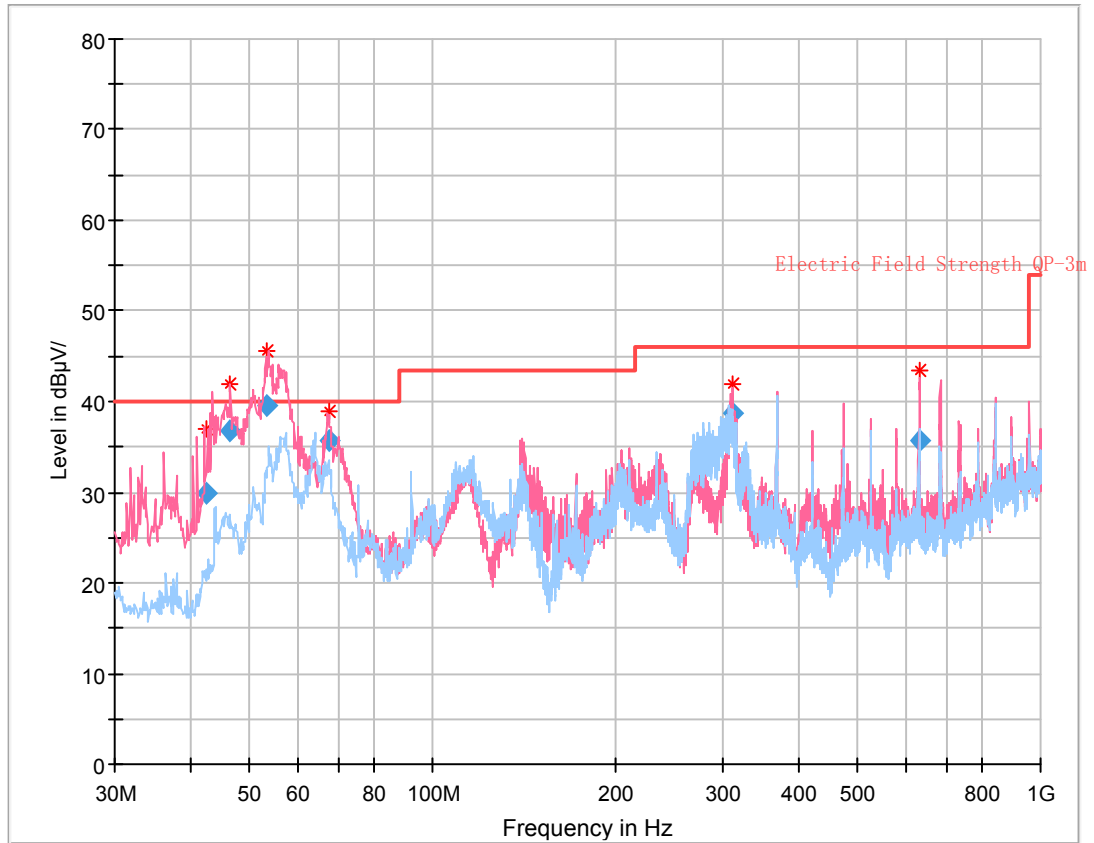
Environmental Conditions

Temperature:	23~26 °C
Relative Humidity:	51~60 %
ATM Pressure:	101.0 kPa

The testing was performed by Zero Yan on 2020-03-21 for below 1GHz and by Charlie Cha on 2020-03-19 & 2020-04-02 for above 1GHz.

EUT operation mode: Transmitting

30 MHz~1 GHz: (the worst case is Wi-Fi 802.11a Mode, Middle Channel, Module 2)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
42.435500	30.00	102.0	V	0.0	-15.5	40.00	10.00
46.317625	36.76	111.0	V	13.0	-17.9	40.00	3.24
53.468375	39.57	137.0	V	0.0	-19.8	40.00	0.43
67.574000	35.62	110.0	V	238.0	-20.5	40.00	4.38
310.951625	38.65	103.0	V	0.0	-10.7	46.00	7.35
630.851250	35.67	165.0	V	157.0	-1.6	46.00	10.33

1 ~ 40 GHz:

Note: The test distance is 1m, so the correct factor from 3m to 1m is $20\log(3/1)=9.5\text{dB}$ which was added into the final limit.

Wi-Fi Module 1:**5150-5250 MHz:**

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5180 MHz									
5147.07	40.64	PK	151	2.5	H	38.36	79.00	83.5	4.50
5147.07	24.98	Ave.	151	2.5	H	38.36	63.34	63.5	0.16
5356.81	38.34	PK	245	1.8	H	39.09	77.43	83.5	6.07
5356.81	23.83	Ave.	245	1.8	H	39.09	62.92	63.5	0.58
10360.00	50.32	PK	148	1.9	H	17.42	67.74	77.7	9.96
5200 MHz									
10400.00	49.68	PK	8	2.3	H	17.42	67.10	77.7	10.60
5240 MHz									
5148.66	39.26	PK	157	2.2	H	38.36	77.62	83.5	5.88
5148.66	24.83	Ave.	157	2.2	H	38.36	63.19	63.5	0.31
5359.25	37.87	PK	263	1.5	H	39.09	76.96	83.5	6.54
5359.25	23.59	Ave.	263	1.5	H	39.09	62.68	63.5	0.82
10480.00	48.92	PK	250	1.1	H	17.25	66.17	77.7	11.53
802.11n20									
5180 MHz									
5149.24	40.39	PK	105	1.8	H	38.36	78.75	83.5	4.75
5149.24	24.59	Ave.	105	1.8	H	38.36	62.95	63.5	0.55
5361.25	37.46	PK	252	1.7	H	39.09	76.55	83.5	6.95
5361.25	23.43	Ave.	252	1.7	H	39.09	62.52	63.5	0.98
10360.00	50.69	PK	312	1.5	H	17.25	67.94	77.7	9.76
5200 MHz									
10400.00	49.92	PK	115	1.1	H	17.25	67.17	77.7	10.53
5240 MHz									
5149.37	38.88	PK	225	1.8	H	38.36	77.24	83.5	6.26
5149.37	24.63	Ave.	225	1.8	H	38.36	62.99	63.5	0.51
5361.25	38.29	PK	107	2.4	H	39.09	77.38	83.5	6.12
5361.25	24.35	Ave.	107	2.4	H	39.09	63.44	63.5	0.06
10480.00	49.32	PK	187	1.4	H	17.25	66.57	77.7	11.13

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5190 MHz									
5147.5	42.92	PK	178	2.4	H	38.36	81.28	83.5	2.22
5147.5	25.13	Ave.	178	2.4	H	38.36	63.49	63.5	0.01
5359.41	38.26	PK	206	1.1	H	39.09	77.35	83.5	6.15
5359.41	24.18	Ave.	206	1.1	H	39.09	63.27	63.5	0.23
10380.00	49.15	PK	175	1.5	H	17.25	66.40	77.7	11.30
5230 MHz									
5148.75	39.26	PK	290	2.1	H	38.36	77.62	83.5	5.88
5148.75	24.67	Ave.	290	2.1	H	38.36	63.03	63.5	0.47
5358.66	37.55	PK	194	2.0	H	39.09	76.64	83.5	6.86
5358.66	23.63	Ave.	194	2.0	H	39.09	62.72	63.5	0.78
10460.00	48.87	PK	320	2.2	H	17.25	66.12	77.7	11.58
802.11ac20									
5180 MHz									
5149.67	40.61	PK	149	1.4	H	38.36	78.97	83.5	4.53
5149.67	24.68	Ave.	149	1.4	H	38.36	63.04	63.5	0.46
5352.42	38.55	PK	286	1.4	H	39.09	77.64	83.5	5.86
5352.42	24.32	Ave.	286	1.4	H	39.09	63.41	63.5	0.09
10360.00	48.78	PK	348	1.6	H	17.25	66.03	77.7	11.67
5200 MHz									
10400.00	48.45	PK	311	2.0	H	17.25	65.70	77.7	12.00
5240 MHz									
5149.88	39.88	PK	127	1.4	H	38.36	78.24	83.5	5.26
5149.88	24.52	Ave.	127	1.4	H	38.36	62.88	63.5	0.62
5356.28	37.28	PK	14	1.6	H	39.09	76.37	83.5	7.13
5356.28	23.39	Ave.	14	1.6	H	39.09	62.48	63.5	1.02
10480.00	48.85	PK	100	1.0	H	17.25	66.10	77.7	11.60
802.11ac40									
5190 MHz									
5149.67	40.15	PK	353	2.0	H	38.36	78.51	83.5	4.99
5149.67	24.63	Ave.	353	2.0	H	38.36	62.99	63.5	0.51
5352.33	37.23	PK	182	1.8	H	39.09	76.32	83.5	7.18
5352.33	23.42	Ave.	182	1.8	H	39.09	62.51	63.5	0.99
10380.00	49.25	PK	57	2.3	H	17.25	66.50	77.7	11.20
5230 MHz									
5148.76	40.26	PK	312	1.1	H	38.36	78.62	83.5	4.88
5148.76	24.53	Ave.	312	1.1	H	38.36	62.89	63.5	0.61
5354.22	38.21	PK	292	1.1	H	39.09	77.30	83.5	6.20
5354.22	24.13	Ave.	292	1.1	H	39.09	63.22	63.5	0.28
10460.00	49.21	PK	240	1.1	H	17.25	66.46	77.7	11.24

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac80									
5210 MHz									
5149.26	40.15	PK	106	1.3	H	38.36	78.51	83.5	4.99
5149.26	24.71	Ave.	106	1.3	H	38.36	63.07	63.5	0.43
5351.63	37.22	PK	82	2.1	H	39.09	76.31	83.5	7.19
5351.63	23.29	Ave.	82	2.1	H	39.09	62.38	63.5	1.12
10420.00	48.89	PK	59	2.4	H	17.25	66.14	77.7	11.56

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
802.11a									
5745 MHz									
5724.98	42.42	PK	216	1.4	H	39.49	81.91	131.65	49.74
5712.91	33.23	PK	216	1.4	H	39.49	72.72	118.31	45.59
5662.38	32.53	PK	106	1.6	H	39.49	72.02	86.86	14.84
11490.00	51.36	PK	222	2.1	H	17.25	68.61	83.5	14.89
11490.00	32.68	Ave.	222	2.1	H	17.47	50.15	63.5	13.35
5785 MHz									
11570.00	51.32	PK	122	1.8	H	17.25	68.57	83.5	14.93
11570.00	32.57	Ave.	122	1.8	H	17.47	50.04	63.5	13.46
5825 MHz									
5853.67	33.62	PK	233	1.6	H	39.87	73.49	121.85	48.36
5871.32	32.89	PK	233	1.6	H	39.87	72.76	115.95	43.19
5903.24	32.89	PK	170	2.3	H	39.87	72.64	95.32	22.61
11650.00	50.56	PK	302	1.4	H	17.25	67.81	83.5	15.69
11650.00	31.54	Ave.	302	1.4	H	17.47	49.01	63.5	14.49
802.11n20									
5745 MHz									
5724.06	49.62	PK	348	1.4	H	16.18	65.80	131.54	65.74
5713.95	32.56	PK	56	1.3	H	39.49	72.05	118.61	46.56
5667.32	31.33	PK	131	2.2	H	39.49	70.82	90.52	19.70
11490.00	51.24	PK	358	1.4	H	17.25	68.49	83.5	15.01
11490.00	31.89	Ave.	358	1.4	H	17.47	49.36	63.5	14.14
5785 MHz									
11570.00	51.19	PK	104	1.5	H	17.25	68.44	83.5	15.06
11570.00	31.57	Ave.	104	1.5	H	17.47	49.04	63.5	14.46
5825 MHz									
5854.32	33.49	PK	155	2.1	H	39.87	73.36	121.85	48.49
5870.55	33.51	PK	221	1.6	H	39.87	73.38	115.95	42.57
5902.61	33.11	PK	14	1.8	H	39.87	72.97	94.27	21.30
11650.00	50.87	PK	117	1.9	H	17.25	68.12	83.5	15.38
11650.00	31.26	Ave.	117	1.9	H	17.47	48.73	63.5	14.77

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5755 MHz									
5723.81	41.28	PK	139	1.6	H	39.49	80.77	128.99	48.22
5719.01	39.39	PK	139	1.6	H	39.49	78.88	120.02	41.14
5667.32	31.33	PK	339	1.6	H	39.49	70.82	90.52	19.70
11510.00	51.85	PK	252	2.2	H	17.25	69.10	83.5	14.40
11510.00	32.66	Ave.	252	2.2	H	17.47	50.13	63.5	13.37
5795 MHz									
5852.92	32.77	PK	79	1.7	H	39.87	72.64	124.93	52.29
5857.61	33.23	PK	329	1.6	H	39.87	73.00	119.56	46.56
5917.22	33.34	PK	216	2.0	H	39.97	72.93	83.41	10.48
11590.00	50.96	PK	4	1.3	H	17.25	68.21	83.5	15.29
11590.00	31.11	Ave.	4	1.3	H	17.47	48.58	63.5	14.92
802.11ac20									
5745 MHz									
5723.96	49.55	PK	217	1.4	H	39.49	89.04	129.33	40.29
5719.95	36.09	PK	217	1.4	H	39.49	75.58	120.29	44.71
5677.02	31.16	PK	196	1.6	H	39.49	70.65	97.69	27.04
11490.00	50.78	PK	97	2.0	H	17.25	68.03	83.5	15.47
11490.00	31.16	Ave.	97	2.0	H	17.47	48.63	63.5	14.87
5785 MHz									
11570.00	50.67	PK	169	1.3	H	17.25	67.92	83.5	15.58
11570.00	31.17	Ave.	169	1.3	H	17.47	48.64	63.5	14.86
5825 MHz									
5856.31	34.13	PK	155	2.1	H	39.87	73.38	120.79	48.45
5872.55	33.81	PK	221	1.6	H	39.87	73.38	113.91	41.63
5910.27	33.27	PK	14	1.8	H	39.87	72.93	96.37	21.22
11650.00	51.99	PK	351	2.2	H	17.25	68.24	83.5	14.26
11650.00	31.47	Ave.	351	2.2	H	17.47	48.94	63.5	14.56

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
802.11ac40									
5755 MHz									
5721.59	33.02	PK	202	2.3	H	39.49	72.51	123.93	51.42
5708.01	32.12	PK	202	2.3	H	39.49	71.61	116.94	45.33
5663.27	32.87	PK	195	1.5	H	39.49	72.36	87.52	15.16
11510.00	51.33	PK	244	1.9	H	17.25	68.58	83.5	14.92
11510.00	32.35	Ave.	244	1.9	H	17.47	49.82	63.5	13.68
5795 MHz									
5852.51	33.16	PK	74	1.2	H	39.87	73.03	125.98	52.95
5866.85	33.33	PK	74	1.2	H	39.87	73.20	116.98	43.78
5888.64	33.45	PK	290	1.3	H	39.87	73.32	104.61	31.29
11590.00	50.88	PK	98	1.9	H	17.25	68.13	83.5	15.37
11590.00	31.42	Ave.	98	1.9	H	17.47	48.89	63.5	14.61
802.11ac80									
5775 MHz									
5724.47	32.87	PK	222	1.8	H	39.49	72.36	130.49	58.13
5715.23	32.81	PK	222	1.8	H	39.49	72.30	118.96	46.66
5695.47	32.75	PK	213	2.4	H	39.49	72.24	111.35	39.11
5853.18	33.42	PK	353	2.4	H	39.87	73.29	124.45	51.16
5872.17	33.78	PK	353	2.4	H	39.87	73.65	115.49	41.84
5891.89	33.51	PK	357	2.1	H	39.87	73.38	102.21	28.82
11550.00	51.11	PK	53	2.4	H	17.25	68.36	83.5	15.14
11550.00	31.27	Ave.	53	2.4	H	17.47	48.74	63.5	14.76

Wi-Fi Module 2:**5150-5250 MHz:**

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5180 MHz									
5146.09	39.65	PK	353	1.9	H	38.36	78.01	83.5	5.49
5146.09	24.01	Ave.	353	1.9	H	38.36	62.37	63.5	1.13
5357.28	37.36	PK	49	1.6	H	39.09	76.45	83.5	7.05
5357.28	22.84	Ave.	49	1.6	H	39.09	61.93	63.5	1.57
10360.00	49.34	PK	159	1.5	H	17.42	66.76	77.7	10.94
5200 MHz									
10400.00	48.78	PK	249	1.4	H	17.52	66.30	77.7	11.40
5240 MHz									
5149.2	38.29	PK	126	1.6	H	38.36	76.65	83.5	6.85
5149.2	23.86	Ave.	126	1.6	H	38.36	62.22	63.5	1.28
5353.99	36.88	PK	91	1.9	H	39.09	75.97	83.5	7.53
5353.99	22.61	Ave.	91	1.9	H	39.09	61.70	63.5	1.80
10480.00	47.94	PK	148	2.0	H	17.25	65.19	77.7	12.51
802.11n20									
5180 MHz									
5148.72	39.41	PK	22	2.3	H	38.36	77.77	83.5	5.73
5148.72	23.61	Ave.	22	2.3	H	38.36	61.97	63.5	1.53
5360.34	36.47	PK	17	2.3	H	39.09	75.56	83.5	7.94
5360.34	22.43	Ave.	17	2.3	H	39.09	61.52	63.5	1.98
10360.00	49.7	PK	221	1.3	H	17.42	67.12	77.7	10.58
5200 MHz									
10400.00	48.65	PK	82	1.3	H	17.52	66.17	77.7	11.53
5240 MHz									
5149.04	37.88	PK	240	2.0	H	38.36	76.24	83.5	7.26
5149.04	23.63	Ave.	240	2.0	H	38.36	61.99	63.5	1.51
5358.18	37.32	PK	64	2.1	H	39.09	76.41	83.5	7.09
5358.18	23.37	Ave.	64	2.1	H	39.09	62.46	63.5	1.04
10480.00	48.33	PK	321	2.4	H	17.25	65.58	77.7	12.12

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5190 MHz									
5149.14	41.92	PK	351	1.9	H	38.36	80.28	83.5	3.22
5149.14	24.13	Ave.	351	1.9	H	38.36	62.49	63.5	1.01
5356.92	37.28	PK	348	1.2	H	39.09	76.37	83.5	7.13
5356.92	23.18	Ave.	348	1.2	H	39.09	62.27	63.5	1.23
10380.00	48.17	PK	178	1.4	H	17.42	65.59	77.7	12.11
5230 MHz									
5148.75	38.28	PK	281	1.3	H	38.36	76.64	83.5	6.86
5148.75	23.67	Ave.	281	1.3	H	38.36	62.03	63.5	1.47
5357.23	36.58	PK	266	1.4	H	39.09	75.67	83.5	7.83
5357.23	22.64	Ave.	266	1.4	H	39.09	61.73	63.5	1.77
10460.00	47.89	PK	208	1.7	H	17.15	65.04	77.7	12.66
802.11ac20									
5180 MHz									
5149.86	39.62	PK	272	1.6	H	38.36	77.98	83.5	5.52
5149.86	23.7	Ave.	272	1.6	H	38.36	62.06	63.5	1.44
5351.9	37.56	PK	344	2.4	H	39.09	76.65	83.5	6.85
5351.9	23.35	Ave.	344	2.4	H	39.09	62.44	63.5	1.06
10360.00	47.8	PK	78	1.5	H	17.42	65.22	77.7	12.48
5200 MHz									
10400.00	47.46	PK	245	2.4	H	17.52	64.98	77.7	12.72
5240 MHz									
5147.25	38.9	PK	176	1.1	H	38.36	77.26	83.5	6.24
5147.25	23.54	Ave.	176	1.1	H	38.36	61.90	63.5	1.60
5355.56	36.29	PK	290	2.0	H	39.09	75.38	83.5	8.12
5355.56	22.4	Ave.	290	2.0	H	39.09	61.49	63.5	2.01
10480.00	47.88	PK	142	1.1	H	17.25	65.13	77.7	12.57
802.11ac40									
5190 MHz									
5149.41	39.17	PK	62	2.3	H	38.36	77.53	83.5	5.97
5149.41	23.64	Ave.	62	2.3	H	38.36	62.00	63.5	1.50
5352.5	36.24	PK	306	2.4	H	39.09	75.33	83.5	8.17
5352.5	22.44	Ave.	306	2.4	H	39.09	61.53	63.5	1.97
10380.00	48.25	PK	178	2.0	H	17.42	65.67	77.7	12.03
5230 MHz									
5148.89	39.27	PK	149	2.0	H	38.36	77.63	83.5	5.87
5148.89	23.53	Ave.	149	2.0	H	38.36	61.89	63.5	1.61
5354.19	37.23	PK	4	2.3	H	39.09	76.32	83.5	7.18
5354.19	23.13	Ave.	4	2.3	H	39.09	62.22	63.5	1.28
10460.00	48.21	PK	273	2.1	H	17.15	65.36	77.7	12.34

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac80									
5210 MHz									
5146.75	39.17	PK	272	1.4	H	38.36	77.53	83.5	5.97
5146.75	23.72	Ave.	272	1.4	H	38.36	62.08	63.5	1.42
5353.21	36.25	PK	173	2.2	H	39.09	75.34	83.5	8.16
5353.21	22.3	Ave.	173	2.2	H	39.09	61.39	63.5	2.11
10420.00	47.91	PK	354	1.8	H	17.52	65.43	77.7	12.27

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
802.11a									
5745 MHz									
5724.96	41.45	PK	254	1.3	H	39.49	80.94	131.61	50.67
5711.34	32.24	PK	201	1.2	H	39.49	71.73	117.88	46.15
5667.33	31.54	PK	107	1.8	H	39.49	71.03	90.52	19.49
11490.00	50.39	PK	51	2.4	H	17.47	67.86	83.5	15.64
11490.00	31.7	Ave.	51	2.4	H	17.47	49.17	63.5	14.33
5785 MHz									
11570.00	50.32	PK	211	1.1	H	17.51	67.83	83.5	15.67
11570.00	31.59	Ave.	211	1.1	H	17.51	49.10	63.5	14.40
5825 MHz									
5850.99	32.64	PK	101	1.8	H	39.87	72.51	129.44	56.93
5872.31	31.92	PK	120	1.3	H	39.87	71.79	115.45	43.66
5904.7	31.92	PK	171	2.2	H	39.87	71.79	92.72	20.93
11650.00	49.58	PK	144	1.4	H	16.18	65.76	83.5	17.74
11650.00	30.55	Ave.	144	1.4	H	16.18	46.73	63.5	16.77
802.11n20									
5745 MHz									
5724.11	48.64	PK	347	1.3	H	39.49	88.13	129.67	41.54
5712.34	31.57	PK	55	1.7	H	39.49	71.06	118.16	47.1
5669.37	30.36	PK	138	2.1	H	39.49	69.85	92.03	22.18
11490.00	50.25	PK	220	1.2	H	17.47	67.72	83.5	15.78
11490.00	30.91	Ave.	220	1.2	H	17.47	48.38	63.5	15.12
5785 MHz									
11570.00	50.19	PK	239	1.8	H	17.51	67.70	83.5	15.80
11570.00	30.57	Ave.	239	1.8	H	17.51	48.08	63.5	15.42
5825 MHz									
5853.60	32.51	PK	155	2.0	H	39.87	72.38	123.49	51.11
5870.47	32.53	PK	221	1.4	H	39.87	72.4	115.97	43.57
5906.69	32.12	PK	14	1.7	H	39.87	71.99	91.25	19.26
11650.00	49.87	PK	250	1.1	H	16.18	66.05	83.5	17.45
11650.00	30.27	Ave.	250	1.1	H	16.18	46.45	63.5	17.05

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
802.11n40									
5755 MHz									
5724.15	40.29	PK	114	1.7	H	39.49	79.78	129.76	49.98
5718.71	38.41	PK	114	1.4	H	39.49	77.9	119.94	42.04
5674.04	30.33	PK	336	1.3	H	39.49	69.82	95.49	25.67
11510.00	50.87	PK	47	1.4	H	17.47	68.34	83.5	15.16
11510.00	31.68	Ave.	47	1.4	H	17.47	49.15	63.5	14.35
5795 MHz									
5853.25	31.79	PK	89	1.4	H	39.87	71.66	124.29	52.63
5858.10	32.24	PK	156	1.5	H	39.87	72.11	119.43	47.32
5911.39	32.35	PK	213	1.8	H	39.97	72.32	87.77	15.45
11590.00	49.98	PK	310	1.9	H	17.51	67.49	83.5	16.01
11590.00	30.13	Ave.	310	1.9	H	17.51	47.64	63.5	15.86
802.11ac20									
5745 MHz									
5723.89	48.57	PK	221	1.2	H	39.49	88.06	129.17	41.11
5714.83	35.1	PK	233	1.2	H	39.49	74.59	118.85	44.26
5675.29	30.18	PK	195	1.5	H	39.49	69.67	96.41	26.74
11490.00	49.79	PK	142	2.2	H	17.47	67.26	83.5	16.24
11490.00	30.17	Ave.	142	2.2	H	17.47	47.64	63.5	15.86
5785 MHz									
11570.00	49.68	PK	168	1.0	H	17.51	67.19	83.5	16.31
11570.00	30.18	Ave.	168	1.0	H	17.51	47.69	63.5	15.81
5825 MHz									
5856.65	33.15	PK	153	2.1	H	39.87	73.02	116.54	43.52
5871.99	32.82	PK	250	1.6	H	39.87	72.69	115.54	42.85
5908.13	32.29	PK	146	1.8	H	39.87	72.16	90.18	18.02
11650.00	50.99	PK	163	2.2	H	16.18	67.17	83.5	16.33
11650.00	30.48	Ave.	163	2.2	H	16.18	46.66	63.5	16.84

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11ac40									
5755 MHz									
5723.41	32.04	PK	69	1.1	H	39.49	71.53	128.07	56.54
5712.16	31.14	PK	69	1.4	H	39.49	70.63	118.1	47.47
5664.92	31.88	PK	182	1.3	H	39.49	71.37	88.74	17.37
11510.00	50.35	PK	278	2.2	H	17.47	67.82	83.5	15.68
11510.00	31.36	Ave.	278	2.2	H	17.47	48.83	63.5	14.67
5795 MHz									
5853.12	32.18	PK	93	1.2	H	39.87	72.05	124.59	52.54
5869.40	32.35	PK	93	1.2	H	39.87	72.22	116.27	44.05
5889.08	32.46	PK	262	1.3	V	39.87	72.33	104.28	31.95
11590.00	49.9	PK	20	2.2	H	17.51	67.41	83.5	16.09
11590.00	30.44	Ave.	20	2.2	H	17.51	47.95	63.5	15.55
802.11ac80									
5775 MHz									
5723.27	31.9	PK	120	1.6	H	39.49	71.39	127.76	56.37
5712.99	31.83	PK	22	1.5	H	39.49	71.32	118.34	47.02
5694.62	31.76	PK	207	2.3	H	39.49	71.25	110.72	39.47
5854.23	32.43	PK	336	2.3	H	39.87	72.3	122.06	49.76
5874.34	32.79	PK	340	2.4	H	39.87	72.66	114.88	42.22
5893.19	32.53	PK	101	2.1	H	39.87	72.4	101.24	28.84
11550.00	50.11	PK	182	1.6	H	17.51	67.62	83.5	15.88
11550.00	30.28	Ave.	182	1.6	H	17.51	47.79	63.5	15.71

Note:

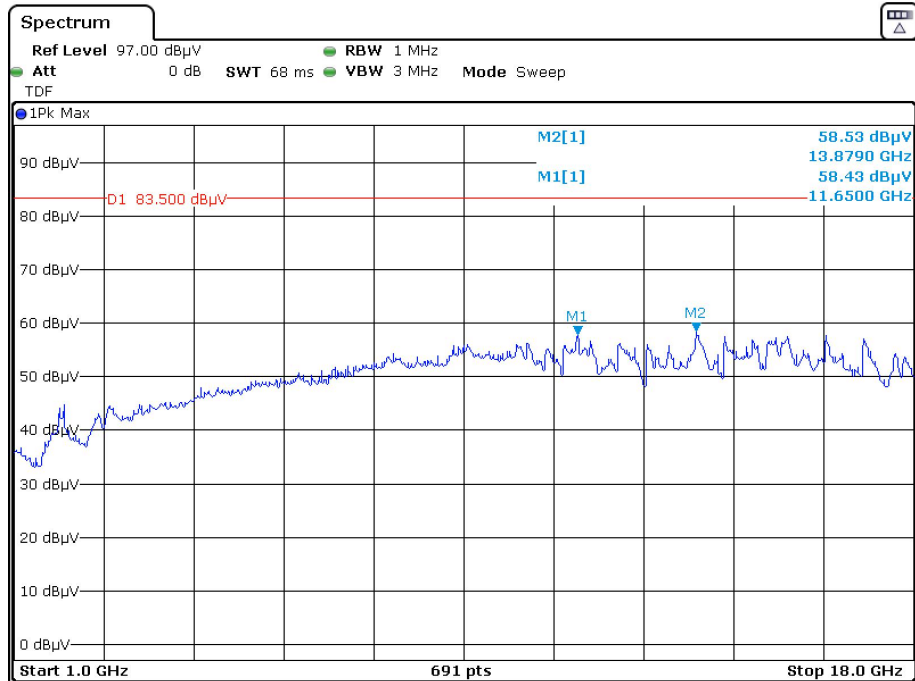
Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

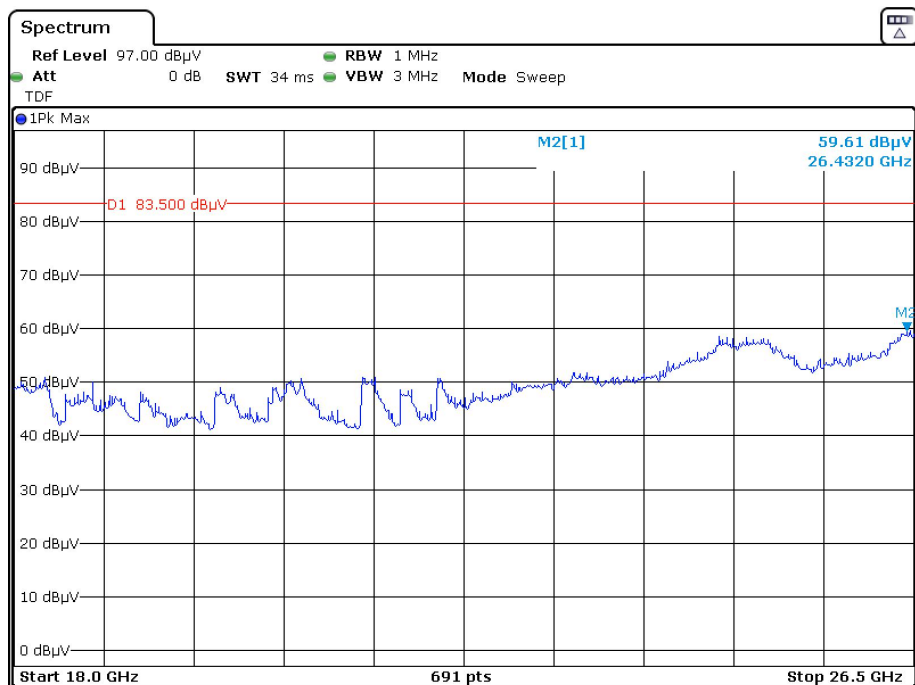
Margin = Limit- Corr. Amplitude

All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

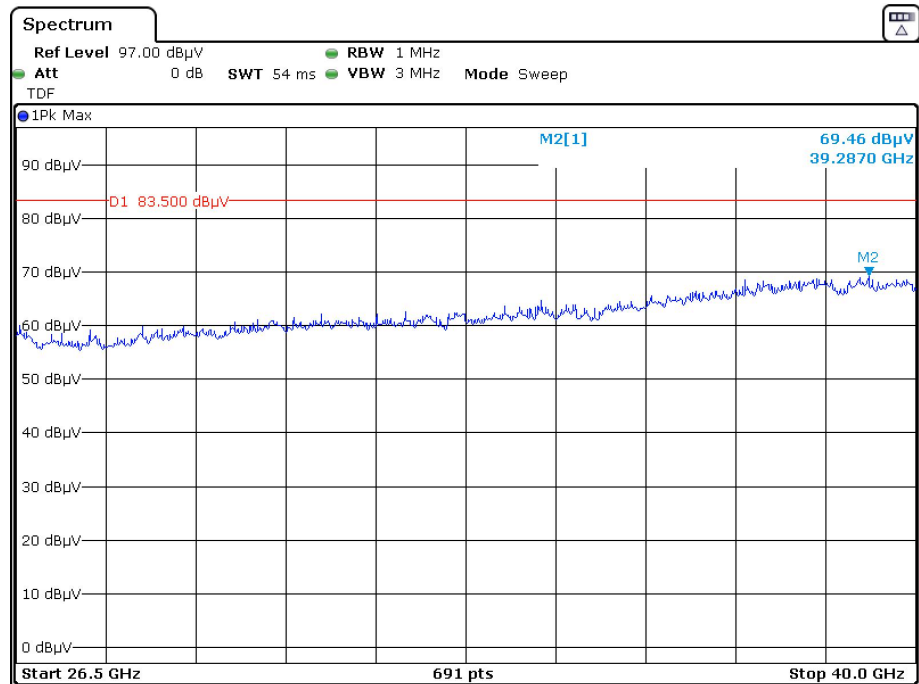
Peak

Pre-scan with 802.11n20 5825MHz
Horizontal

Date: 19.MAR.2020 22:01:18

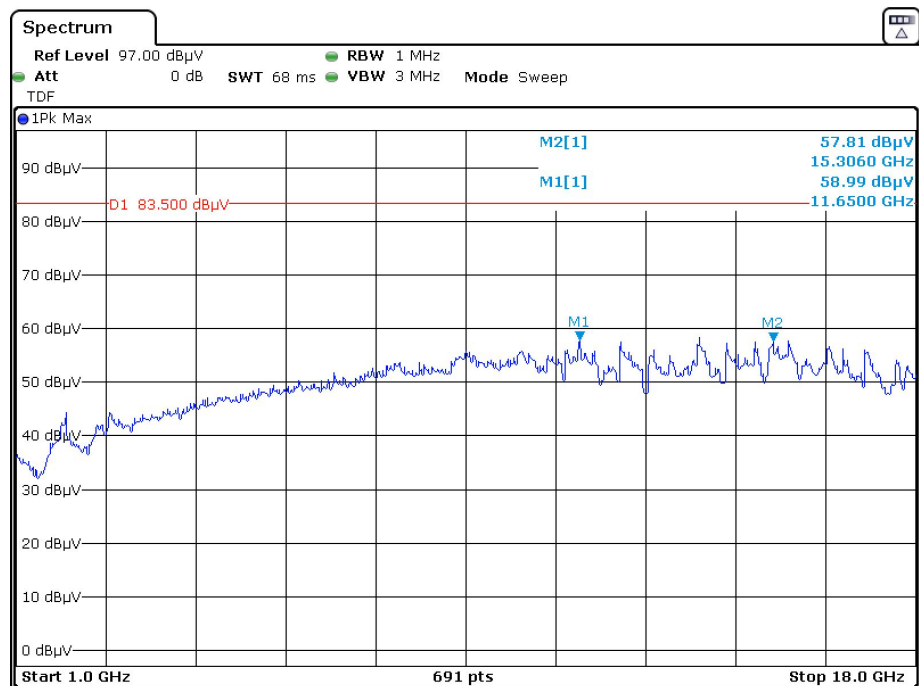


Date: 19.MAR.2020 22:31:17

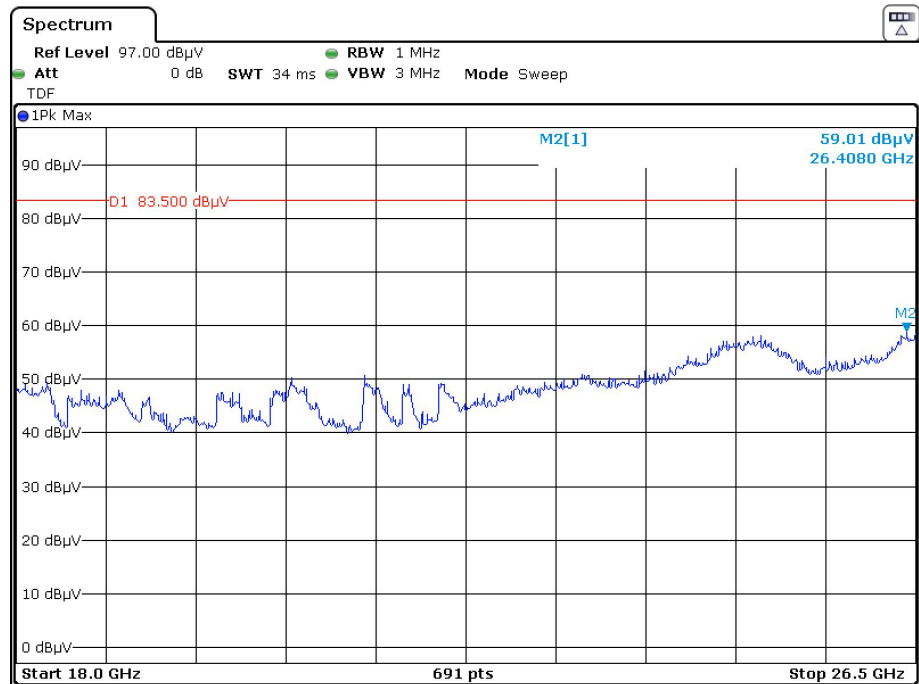


Date: 19.MAR.2020 22:59:16

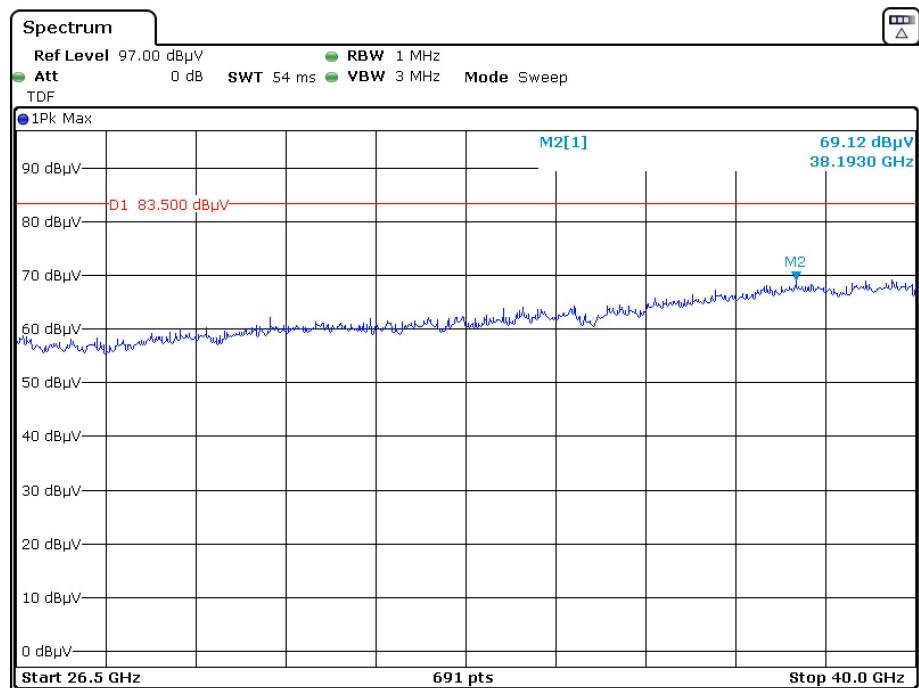
Vertical



Date: 19.MAR.2020 22:11:08

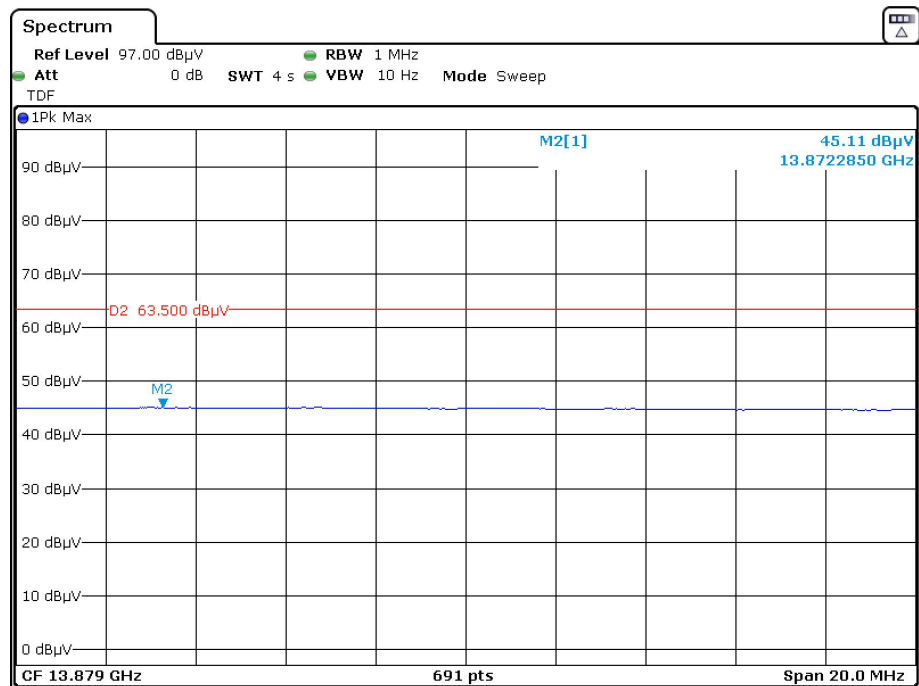


Date: 19.MAR.2020 22:44:37

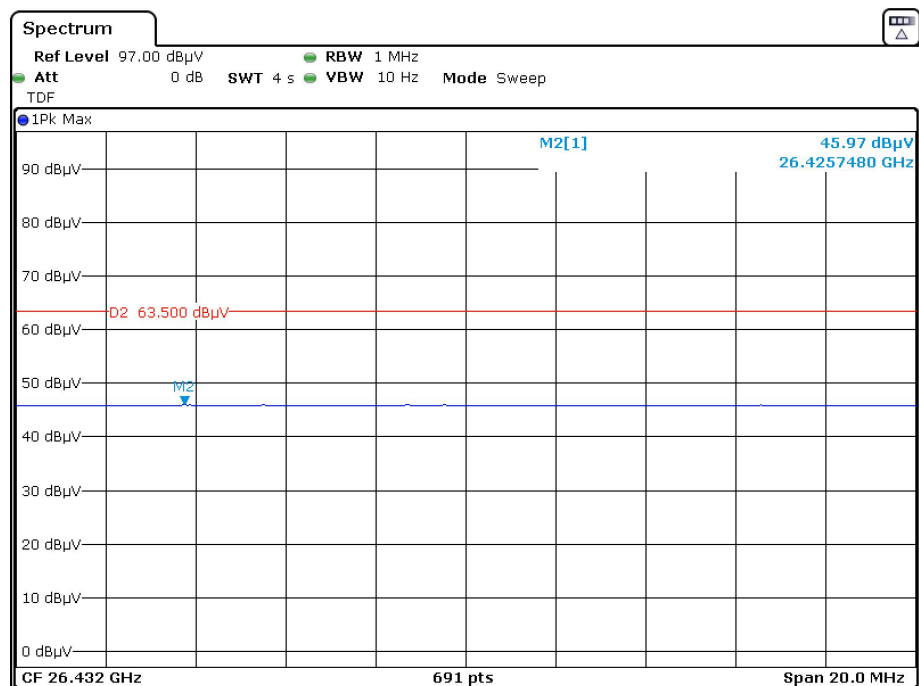


Date: 19.MAR.2020 23:13:31

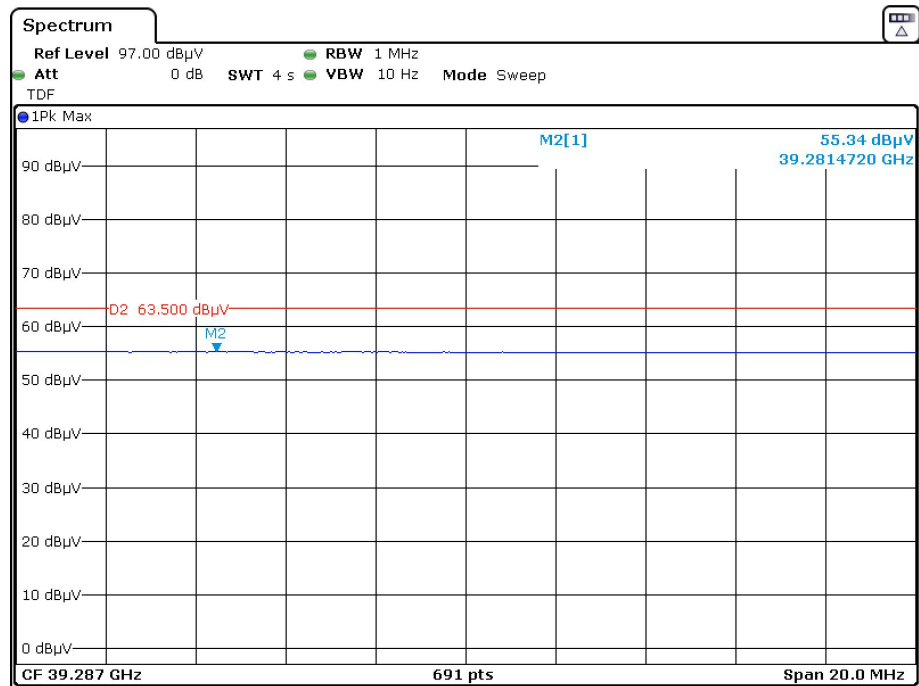
Average Horizontal



Date: 19.MAR.2020 22:04:46

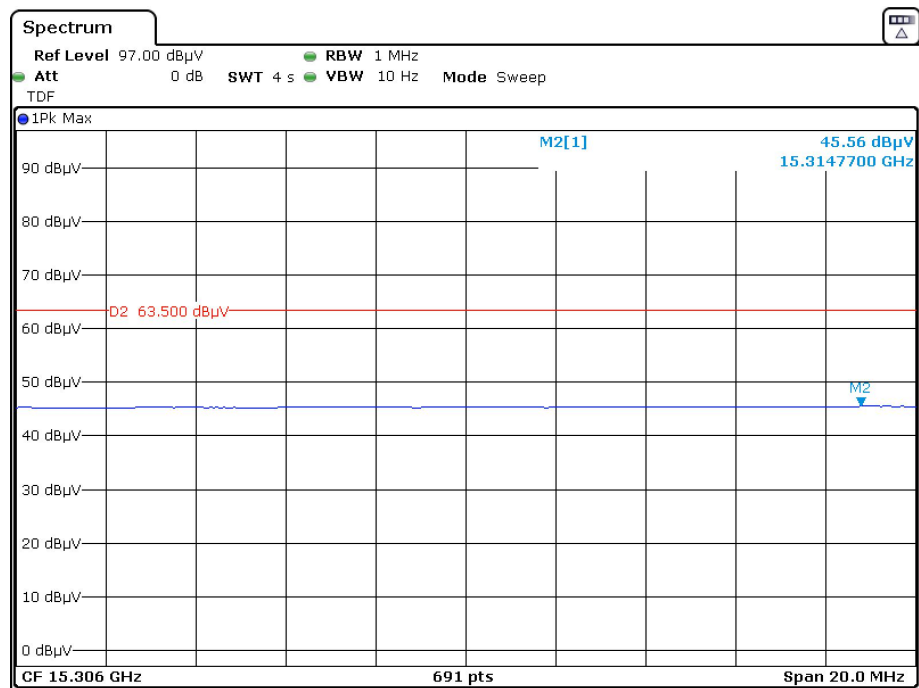


Date: 19.MAR.2020 22:34:34

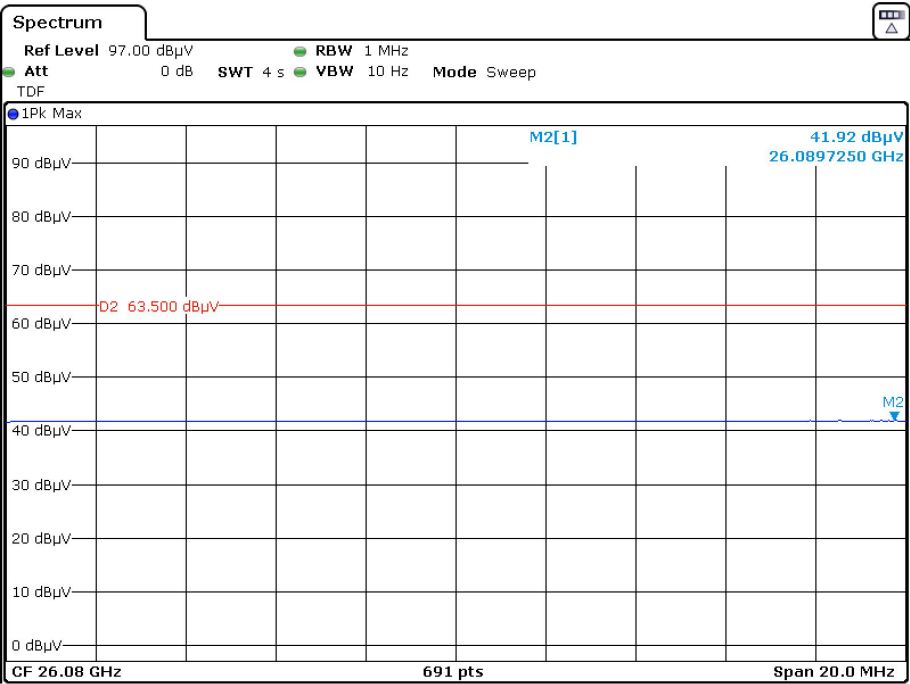


Date: 19.MAR.2020 23:04:29

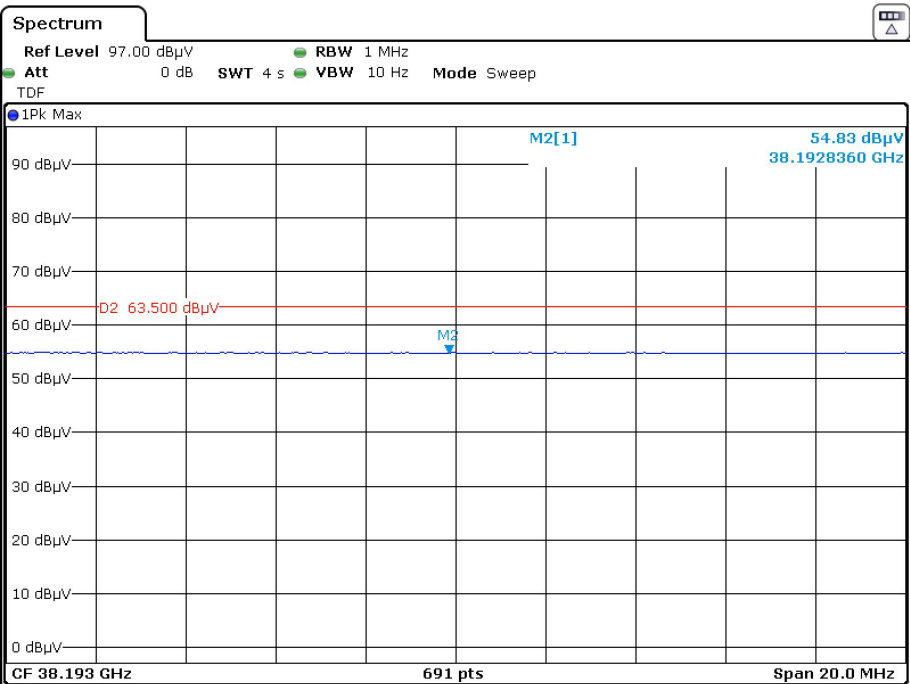
Vertical



Date: 19.MAR.2020 22:15:15



Date: 19.MAR.2020 22:47:07



Date: 19.MAR.2020 23:16:48

FCC §15.407(a) (1) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

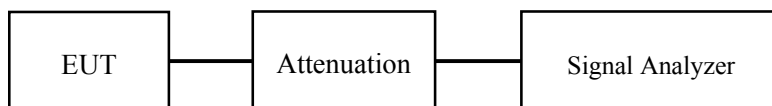
1. Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data**Environmental Conditions**

Temperature:	23~25 °C
Relative Humidity:	50~51 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan from 2020-03-04 to 2020-03-27.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Annex C & Annex D.

FCC §15.407(a) (1) (3) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

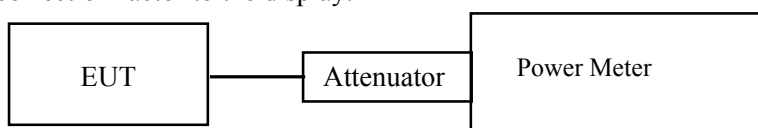
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data**Environmental Conditions**

Temperature:	23~25 °C
Relative Humidity:	50~51 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan from 2020-03-04 to 2020-03-27.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Annex C & Annex D.

Note: The maximum antenna gain is 2.2dBi. The device employed cyclic delay diversity (CDD) for 5G Wi-Fi.

According to KDB 662911 D01 v02r01, for power measurement on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for $N_{Ant} \leq 4$

So Directional gain = $G_{ANT} + \text{Array Gain} = 2.2\text{dBi} < 6\text{dBi}$

FCC §15.407(a) (1) (3) - POWER SPECTRAL DENSITY

Applicable Standard

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log (1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Test Data**Environmental Conditions**

Temperature:	23~25 °C
Relative Humidity:	50~51 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan from 2020-03-04 to 2020-03-27.

EUT operation mode: Transmitting

Note: The maximum antenna gain is 2.2dBi. The device employed cyclic delay diversity (CDD) for 5G Wi-Fi.

According to KDB 662911 D01 v02r01, for power measurement on IEEE 802.11 devices:

$$\text{Directional gain} = G_{ANT} + \text{Array Gain} = 2.2 + 10\lg 2\text{dBi} = 5.2\text{dBi} < 6\text{dBi}$$

Test Result: Compliant. Please refer to the Annex C & Annex D.

******* END OF REPORT *******