TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.407

TEST REPORT

For

Beijing COTX Networks Technologies Co. Ltd.

B218, block F, Wangjing, Wanke times center, Chaoyang District, Beijing

FCC ID: 2A2A2X3

Report Type:	**Product Name:**
Original Report	cotx x3 hotspot

Report Number: SZGMA210604-21533E-00B

Report Date: 2021-08-06

Reviewed By: Ivan Cao, Assistant Manager

Test Laboratory: Bay Area Compliance Laboratories Corp. (Dongguan)
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	cotx x3 hotspot
EUT Model:	X3
Operation Frequency:	5745-5825MHz(802.11a/n ht20/ac vht20) 5755-5795 MHz(802.11n ht40/ac vht40) 5775 MHz(802.11ac vht80)
Maximum Output Power (Conducted):	7.82 dBm
Antenna Gain▲:	2.3 dBi
Modulation Type:	OFDM
Rated Input Voltage:	DC 5V from DC Port
Serial Number:	SZGMA210604-21533E-RF-S1
EUT Received Date:	2021.06.05
EUT Received Status:	Good

Objective

This type approval report is prepared on behalf of ***Beijing COTX Networks Technologies Co. Ltd.***in accordance with Part 2-Subpart J, Part 15-Subparts A, and E of the Federal Communications Commission's rules.

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

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 KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions,conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

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

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system support 802.11a/n ht20/n ht40/ac vht20/ac vht40/ac vht80, the ac vht20/ac vht40 were reduced since the identical parameters with 802.11n ht20 and 802.11n ht40.

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, 802.11n ht20, 802.11ac vht20 channel 149, 157 and 165 was tested, for 802.11n ht40, 802.11ac vht40 channel 151, 159 were tested, for 802.11ac vht80, channel 155 was tested.

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

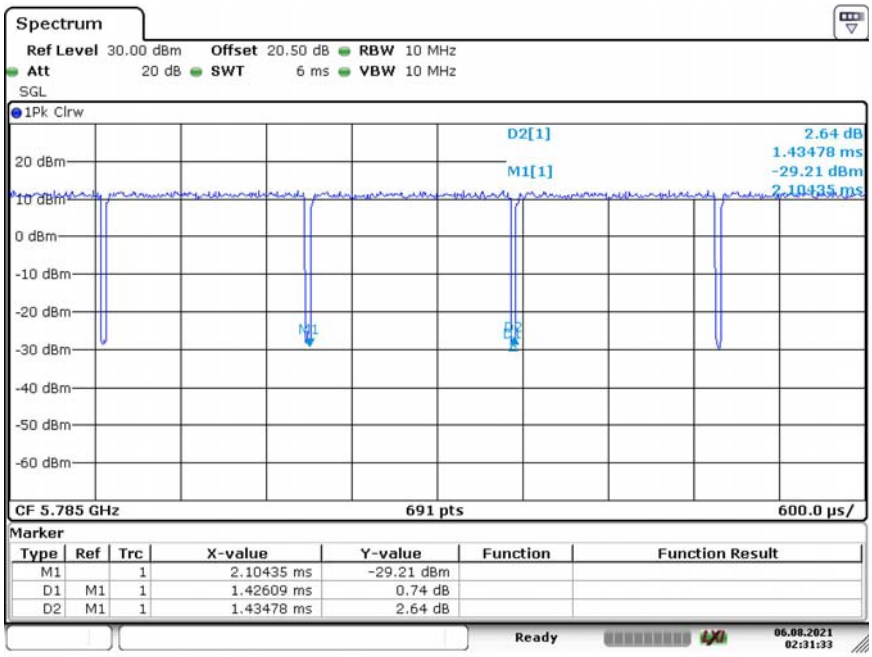
The software "PUTTY" was used for testing, which was provided by Manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all date rates, bandwidths, and modulations. The maximum power was configured as below table, that provided by the Manufacturer▲:

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Power level Setting
802.11a	Low	5745	6Mbps	6
	Middle	5785	6Mbps	6
	High	5825	6Mbps	6
802.11n ht20	Low	5745	MCS0	0
	Middle	5785	MCS0	0
	High	5825	MCS0	0
802.11n ht40	Low	5755	MCS0	0
	High	5795	MCS0	0
802.11ac vht80	Middle	5775	MCS0	0

The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11 a	1.426	1.435	99.39
802.11n ht20	1.322	1.330	99.35
802.11n ht40	0.658	0.691	95.28
802.11ac vht80	0.334	0.369	90.57

802.11a



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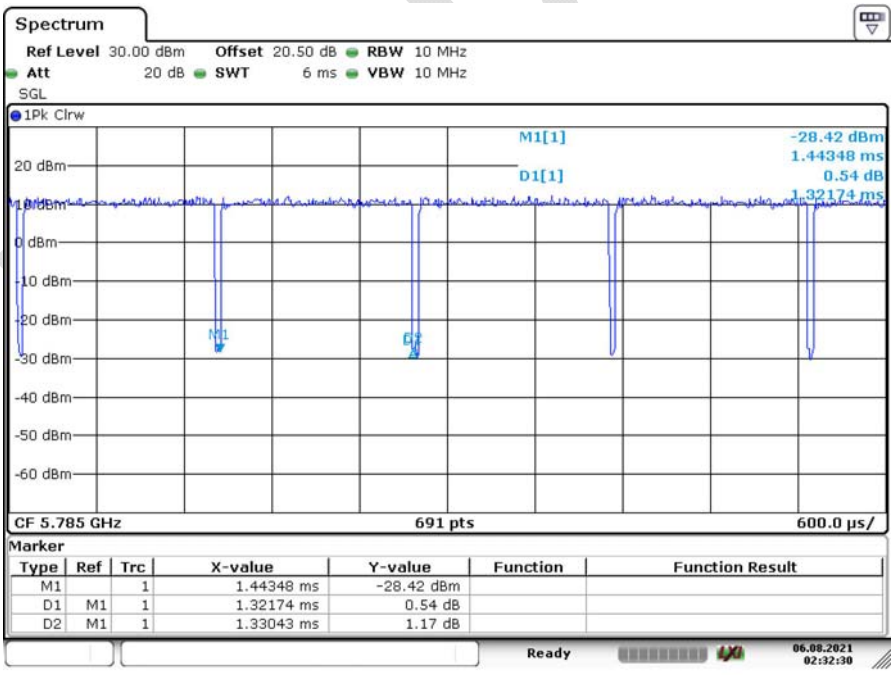
802.11n ht20



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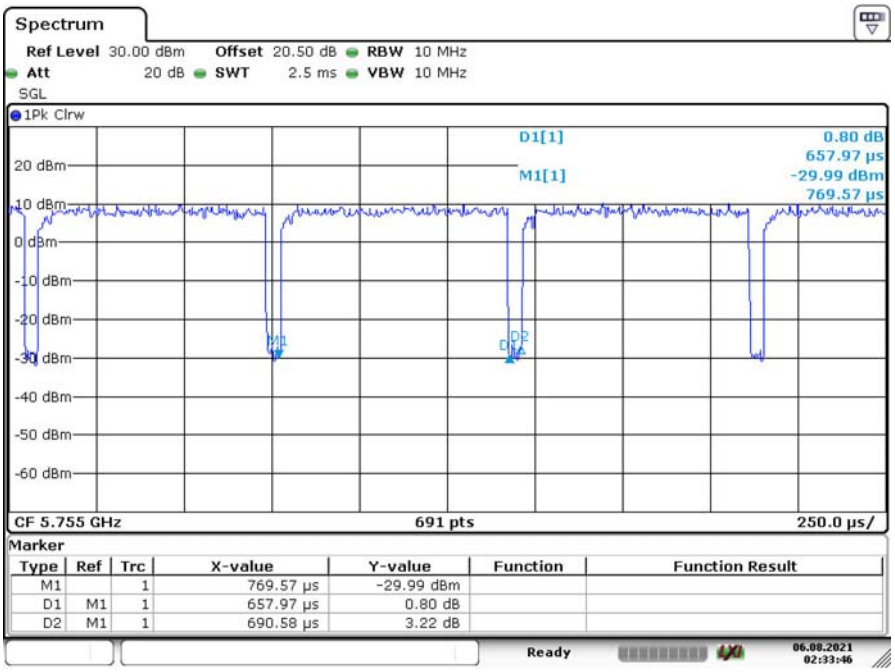
802.11n ht40



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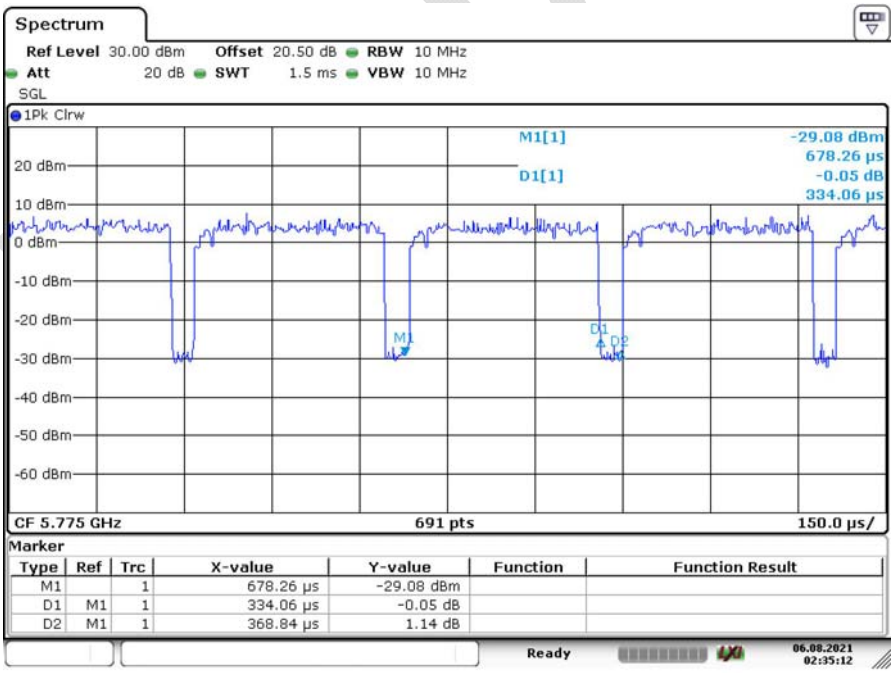
802.11ac vht80



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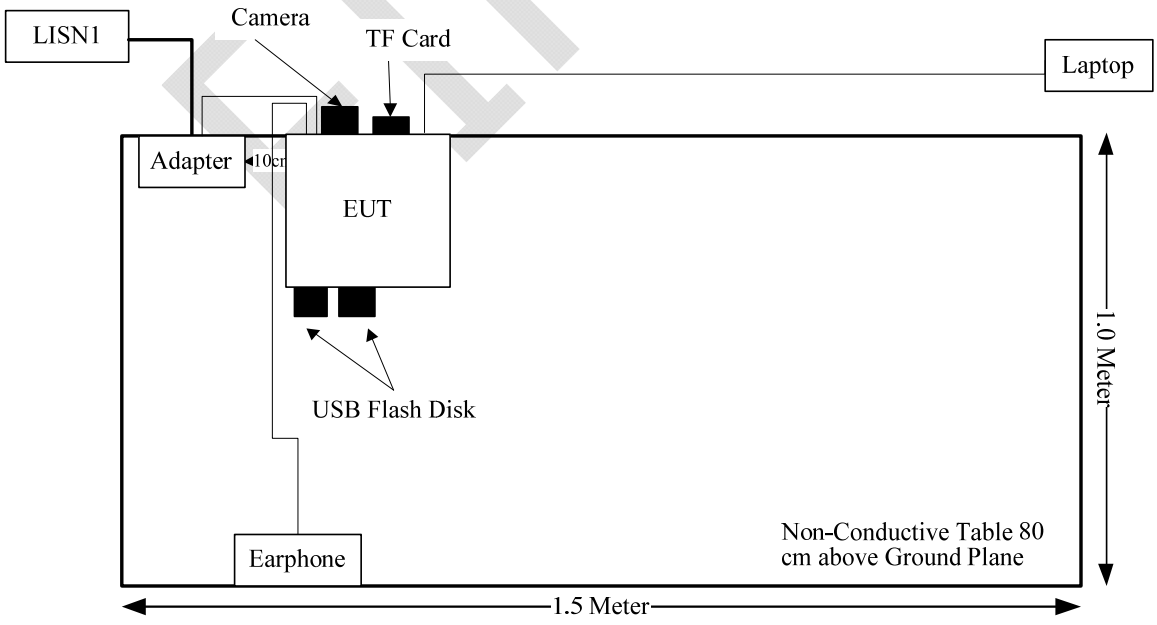
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Hytera	Adapter	S010WU0500200	S010WU0500200
COTX	Camera	Un-known	SZGMA210604-21533E-RF-S2
DELL	Laptop	E6410	QDS-BRCM1017
Un-known	Earphone	Un-known	Earphone2
KINGSTON	U disk	32G	32G-1
KEYSIGHT	U disk	32G	32G-2
SANDISK	TF card	SDDR-C531	SDDR-C531-2

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	No	No	1.5	adapter	EUT
RJ45	No	No	10	EUT	Laptop
Earphone Cable	No	No	1.2	EUT	Earphone

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC §15.407 (f) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
FCC§15.203	Antenna Requirement	Compliance
FCC§15.407(b)(9)& §15.207(a)	Conducted Emissions	Compliance
FCC§15.205& §15.209 &§15.407(b)	Undesirable Emission& Restricted Bands	Compliance
FCC§15.407(b)	Out Of Band Emissions	Compliance
FCC§15.407(a) (e)	Emission Bandwidth	Compliance
FCC§15.407(a)	Conducted Transmitter Output Power	Compliance
FCC§15.407 (a)	Power Spectral Density	Compliance

FCC §15.407 (f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.407(f)and subpart §1.1310, 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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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/f²)	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;

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

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
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:

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

Calculated Data:

Radio	Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
Lora-DSS	903.3-914.9	3.5	2.24	19	79.43	20.00	0.035	0.60
Lora-DXX	923.3-927.5	3.5	2.24	-3	0.50	20.00	0.0002	0.62
BLE	2402-2480	3.5	2.24	-4	0.40	20.00	0.0002	1.0
WLAN 2.4G	2412-2462	3.5	2.24	15	31.62	20.00	0.0141	1.0
WLAN 5.8G	5725-5850	2.3	1.70	8	6.31	20.00	0.002	1.0

The WLAN 2.4G,5G or BLE can`t transmit simultaneously, Wi-Fi/BLE can transmit simultaneously with Lora:

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

$=S_{WLAN}/S_{limit-\ WLAN}+ S_{Lora}/S_{limit-\ Lora}$

=0.0141/1+0.035/0.60

=0.072

< 1.0

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203- ANTENNA REQUIREMENT

Applicable Standard

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

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has one antenna arrangement for Wi-Fi/BLE use a unique type of connector to attach to the EUT. fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
Dipole	50	3.5 dBi/2.4~2.5GHz 2.3 dBi/5.725~5.85 GHz

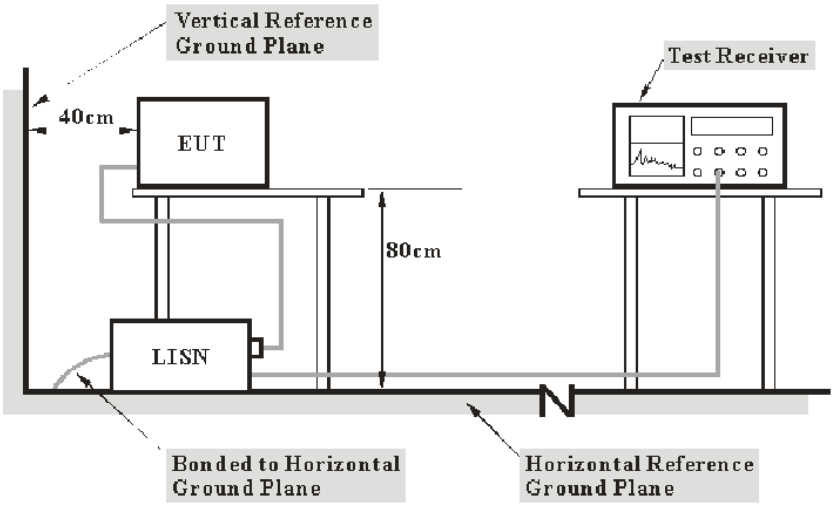
Result: Compliance.

FCC §15.207(a)– CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a), §15.407(b) (9).

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.

The adapter was connected to the main lisn with a 120 V/60 Hz AC power source.

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division Factor of AMN
C_f: Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within 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:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV 216	101614	2020-09-12	2021-09-12
R&S	EMI Test Receiver	ESCI	101121	2021-07-06	2022-07-05
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2020-09-05	2021-09-05
R&S	Test Software	EMC32	Version 9.10.00	N/A	N/A

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

Test Procedure

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

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase ("hot") line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

Test Data

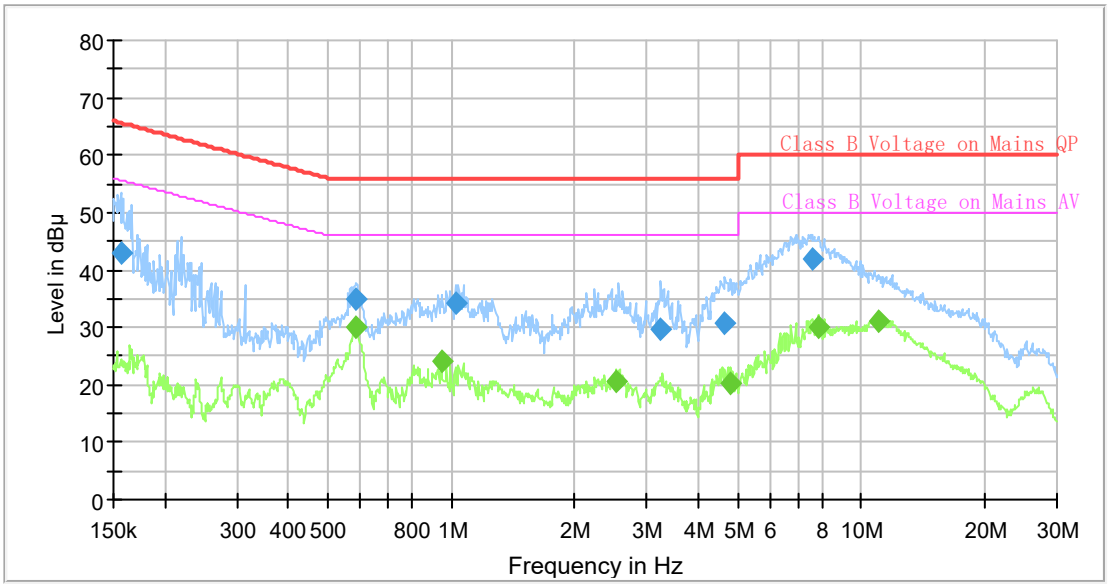
Environmental Conditions

Temperature:	26 °C
Relative Humidity:	52 %
ATM Pressure:	100.3 kPa
Tester:	Mia Huang
Test Date:	2021-07-19

Test Result: Compliance.

Test Mode: Transmitting (802.11a 5785MHz was the worst)

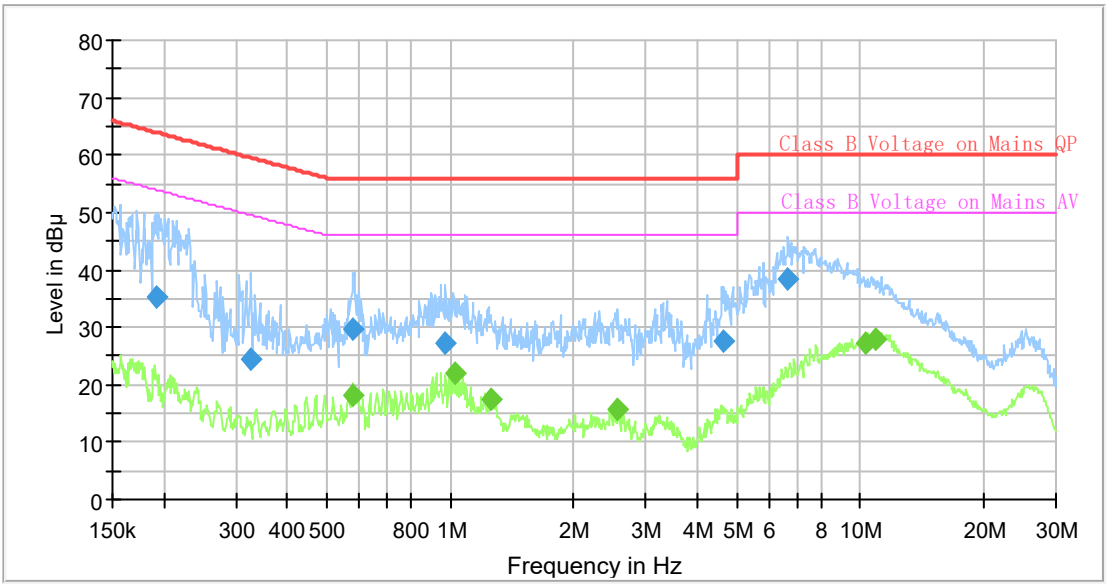
AC120 V, 60 Hz, Line:



Final_Result

Frequency (MHz)	QuasiPeak (dB µV)	Average (dB µV)	Limit (dB µV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.156106	43.13	---	65.67	22.54	9.000	L1	9.6
0.582452	---	30.06	46.00	15.94	9.000	L1	9.6
0.588291	34.97	---	56.00	21.03	9.000	L1	9.6
0.949586	---	23.94	46.00	22.06	9.000	L1	9.7
1.023352	34.11	---	56.00	21.89	9.000	L1	9.7
2.511402	---	20.73	46.00	25.27	9.000	L1	9.7
3.238809	29.59	---	56.00	26.41	9.000	L1	9.7
4.661308	30.66	---	56.00	25.34	9.000	L1	9.7
4.802907	---	20.11	46.00	25.89	9.000	L1	9.7
7.599445	42.09	---	60.00	17.91	9.000	L1	9.8
7.869448	---	29.91	50.00	20.09	9.000	L1	9.8
10.991841	---	30.96	50.00	19.04	9.000	L1	9.9

AC120 V, 60 Hz, Neutral:



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.191526	35.28	---	63.97	28.69	9.000	N	9.6
0.326585	24.54	---	59.54	35.00	9.000	N	9.6
0.579554	---	18.02	46.00	27.98	9.000	N	9.6
0.579554	29.76	---	56.00	26.24	9.000	N	9.6
0.973564	27.42	---	56.00	28.58	9.000	N	9.6
1.023352	---	22.06	46.00	23.94	9.000	N	9.6
1.261826	---	17.64	46.00	28.36	9.000	N	9.6
2.562008	---	15.60	46.00	30.40	9.000	N	9.6
4.661308	27.51	---	56.00	28.49	9.000	N	9.6
6.675200	38.33	---	60.00	21.67	9.000	N	9.6
10.353274	---	27.13	50.00	22.87	9.000	N	9.7
10.882741	---	27.90	50.00	22.10	9.000	N	9.7

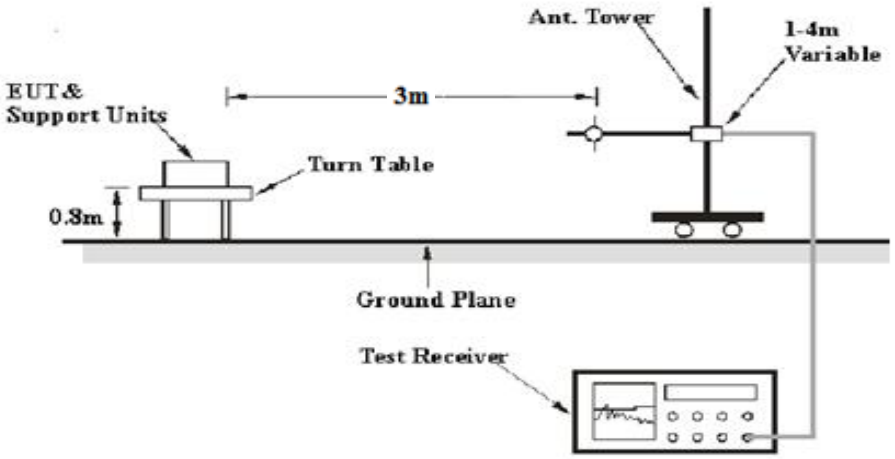
FCC §15.209, §15.205 , §15.407(b) –UNWANTED EMISSION

Applicable Standard

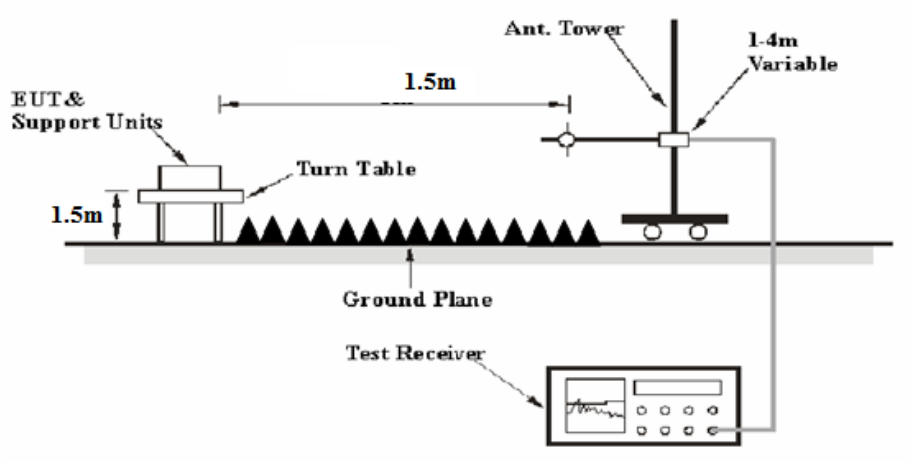
FCC §15.407(b); §15.209; §15.205;

EUT Setup

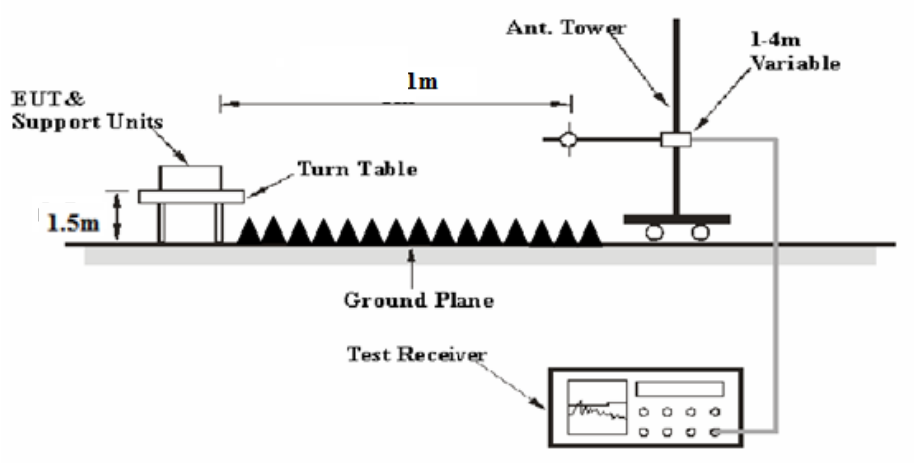
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was 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.

The spacing between the peripherals was 10 cm.

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:

30-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 40GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

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

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 KDB 789033 D02 General UNII Test Procedures New Rules v02r01, emission shall be computed as: E [dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

According to C63.10, the above 1G test result shall be extrapolated to the specified distance using an extrapolation Factor of 20dB/decade from 3m to 1.5m or 1m
Distance extrapolation Factor =20 log (specific distance [3m]/test distance [1.5m]) dB= 6.02 dB
or
Distance extrapolation Factor =20 log (specific distance [3m]/test distance [1m]) dB= 9.54 dB

All emissions under the average limit and under the noise floor have not recorded in the report.

Corrected Amplitude & Margin Calculation

For the range 30MHz-1GHz, the Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtrac vhting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit - Corrected Amplitude

For the range 1GHz-40GHz, Test performed at 1.5m or 1m, the Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtrac vhting the Amplifier Gain from the Meter Reading and the Distance extrapolation Factor. The basic equation is as follows:

Corrected Amplitude
= Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain-Distance extrapolation factor

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:

Margin = Limit- Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation Below 1GHz Test					
Sunol Sciences	Antenna	JB3	A060611-2	2020-08-25	2023-08-25
R&S	EMI Test Receiver	ESCI	100224	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2020-09-24	2021-09-24
Sonoma	Amplifier	310N	185914	2020-10-13	2021-10-13
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiation Above 1GHz Test					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2020-12-05	2023-12-04
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1302	2020-12-05	2023-12-04
R&S	Spectrum Analyzer	FSV40	101474	2021-07-06	2022-07-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2021-07-06	2022-07-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2021-06-27	2022-06-26
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2020-09-05	2021-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2021-06-27	2022-06-26
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sinoscite	Bandstop Filters	BSF5150-5850MN-0899-003	0899003	2021-05-06	2022-05-05

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

Test Data

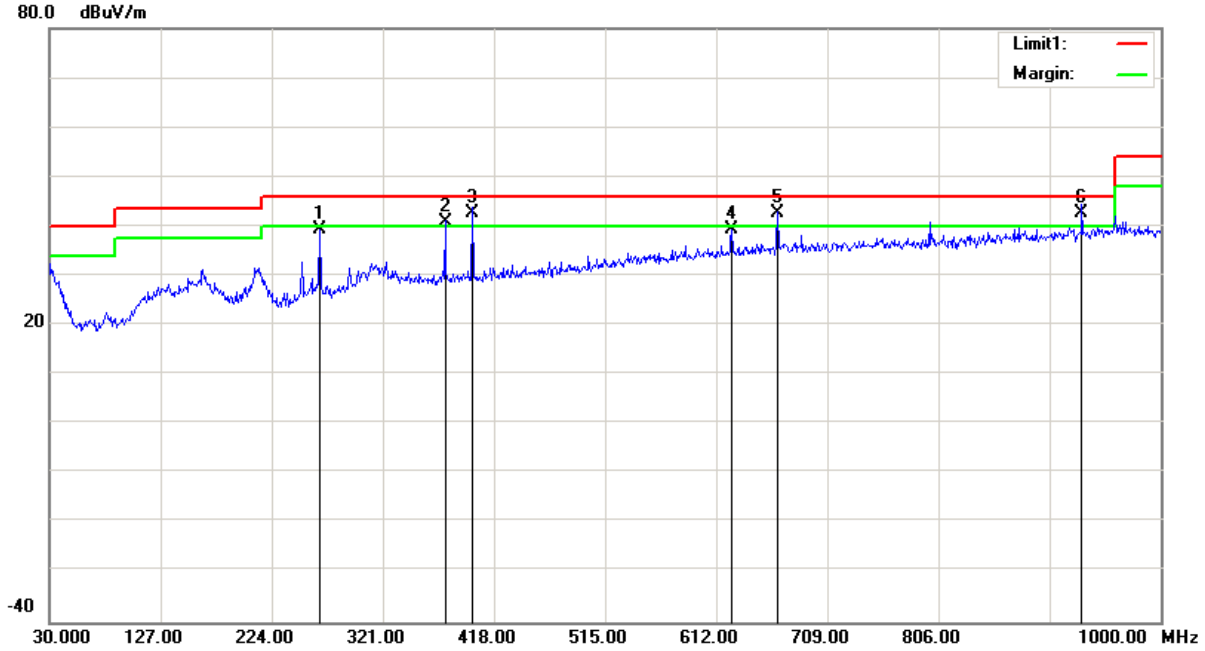
Environmental Conditions

Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	26.2°C	26.8°C
Relative Humidity:	60 %	36 %
ATM Pressure:	100.3kPa	100.3kPa
Tester:	Burt Hu	Jeremy Liang
Test Date:	2021-07-19	2021-07-21

Test Mode: Transmitting

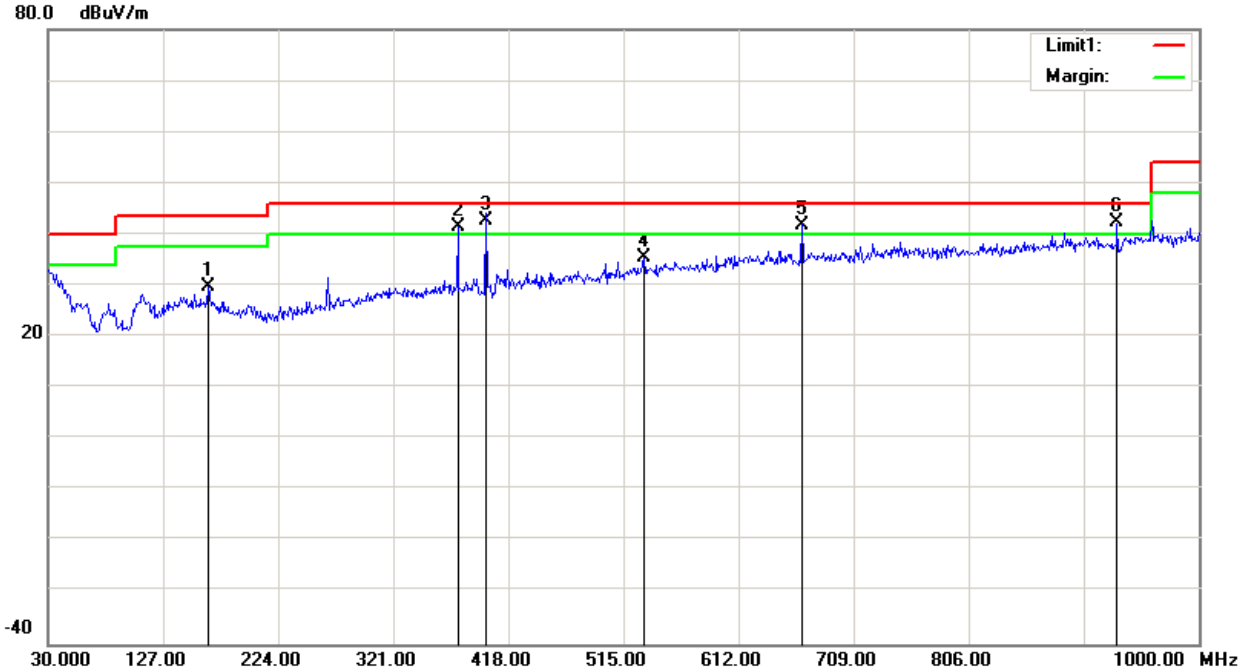
1) Below 1GHz(802.11a 5745 MHz was the worst):

Horizontal:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
265.7100	17.60	peak	21.83	39.43	46.00	6.57
375.3200	16.19	QP	24.81	41.00	46.00	5.00
398.6000	17.17	QP	25.43	42.60	46.00	3.40
625.5800	9.37	peak	29.86	39.23	46.00	6.77
665.3500	12.43	QP	30.37	42.80	46.00	3.20
931.1300	9.00	QP	33.70	42.70	46.00	3.30

Vertical:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
164.8300	8.49	peak	21.36	29.85	43.50	13.65
375.3200	16.59	QP	24.81	41.40	46.00	4.60
399.5700	17.14	QP	25.46	42.60	46.00	3.40
532.4600	7.06	peak	28.25	35.31	46.00	10.69
665.3500	11.53	QP	30.37	41.90	46.00	4.10
931.1300	8.80	QP	33.70	42.50	46.00	3.50

2) 1GHz-40GHz:

5725-5850MHz
802.11a

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5725.00	26.51	PK	H	34.19	3.69	0.00	64.39	58.37	122.20	63.83
5720.00	26.35	PK	H	34.19	3.69	0.00	64.23	58.21	110.80	52.59
5700.00	26.89	PK	H	34.18	3.68	0.00	64.75	58.73	105.20	46.47
5650.00	26.35	PK	H	34.16	3.63	0.00	64.14	58.12	68.20	10.08
11490.00	34.26	PK	H	38.99	6.59	25.51	54.33	48.31	74.00	25.69
11490.00	22.15	AV	H	38.99	6.59	25.51	42.22	36.2	54.00	17.80
17235.00	34.28	PK	H	41.56	8.78	23.72	60.90	54.88	68.20	13.32
1197.50	58.64	PK	H	24.17	1.47	25.99	58.29	52.27	74.00	21.73
1197.50	58.14	AV	H	24.17	1.47	25.99	57.79	51.77	54.00	2.23
Middle Channel: 5785 MHz										
11570.00	34.26	PK	H	39.00	6.61	25.46	54.41	48.39	74.00	25.61
11570.00	22.35	AV	H	39.00	6.61	25.46	42.50	36.48	54.00	17.52
17355.00	34.75	PK	H	42.26	8.81	23.60	62.22	56.2	68.20	12.00
High Channel: 5825 MHz										
5850.00	27.28	PK	H	34.24	3.75	0.00	65.27	59.25	122.20	62.95
5855.00	27.13	PK	H	34.24	3.75	0.00	65.12	59.1	110.80	51.70
5875.00	26.79	PK	H	34.25	3.77	0.00	64.81	58.79	105.20	46.41
5925.00	26.35	PK	H	34.27	3.80	0.00	64.42	58.4	68.20	9.80
11650.00	34.25	PK	H	39.00	6.64	25.41	54.48	48.46	74.00	25.54
11650.00	22.16	AV	H	39.00	6.64	25.41	42.39	36.37	54.00	17.63
17475.00	34.63	PK	H	42.96	8.84	23.48	62.95	56.93	68.20	11.27

802.11n ht20:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5725.00	26.89	PK	H	34.19	3.69	0.00	64.77	58.75	122.20	63.45
5720.00	26.47	PK	H	34.19	3.69	0.00	64.35	58.33	110.80	52.47
5700.00	26.38	PK	H	34.18	3.68	0.00	64.24	58.22	105.20	46.98
5650.00	26.47	PK	H	34.16	3.63	0.00	64.26	58.24	68.20	9.96
11490.00	34.26	PK	H	38.99	6.59	25.51	54.33	48.31	74.00	25.69
11490.00	23.26	AV	H	38.99	6.59	25.51	43.33	37.31	54.00	16.69
17235.00	34.85	PK	H	41.56	8.78	23.72	61.47	55.45	68.20	12.75
Middle Channel: 5785 MHz										
11570.00	34.63	PK	H	39.00	6.61	25.46	54.78	48.76	74.00	25.24
11570.00	22.36	AV	H	39.00	6.61	25.46	42.51	36.49	54.00	17.51
17355.00	34.69	PK	H	42.26	8.81	23.60	62.16	56.14	68.20	12.06
High Channel: 5825 MHz										
5850.00	27.45	PK	H	34.24	3.75	0.00	65.44	59.42	122.20	62.78
5855.00	27.73	PK	H	34.24	3.75	0.00	65.72	59.7	110.80	51.10
5875.00	26.92	PK	H	34.25	3.77	0.00	64.94	58.92	105.20	46.28
5925.00	27.38	PK	H	34.27	3.80	0.00	65.45	59.43	68.20	8.77
11650.00	34.26	PK	H	39.00	6.64	25.41	54.49	48.47	74.00	25.53
11650.00	22.35	AV	H	39.00	6.64	25.41	42.58	36.56	54.00	17.44
17475.00	34.63	PK	H	42.96	8.84	23.48	62.95	56.93	68.20	11.27

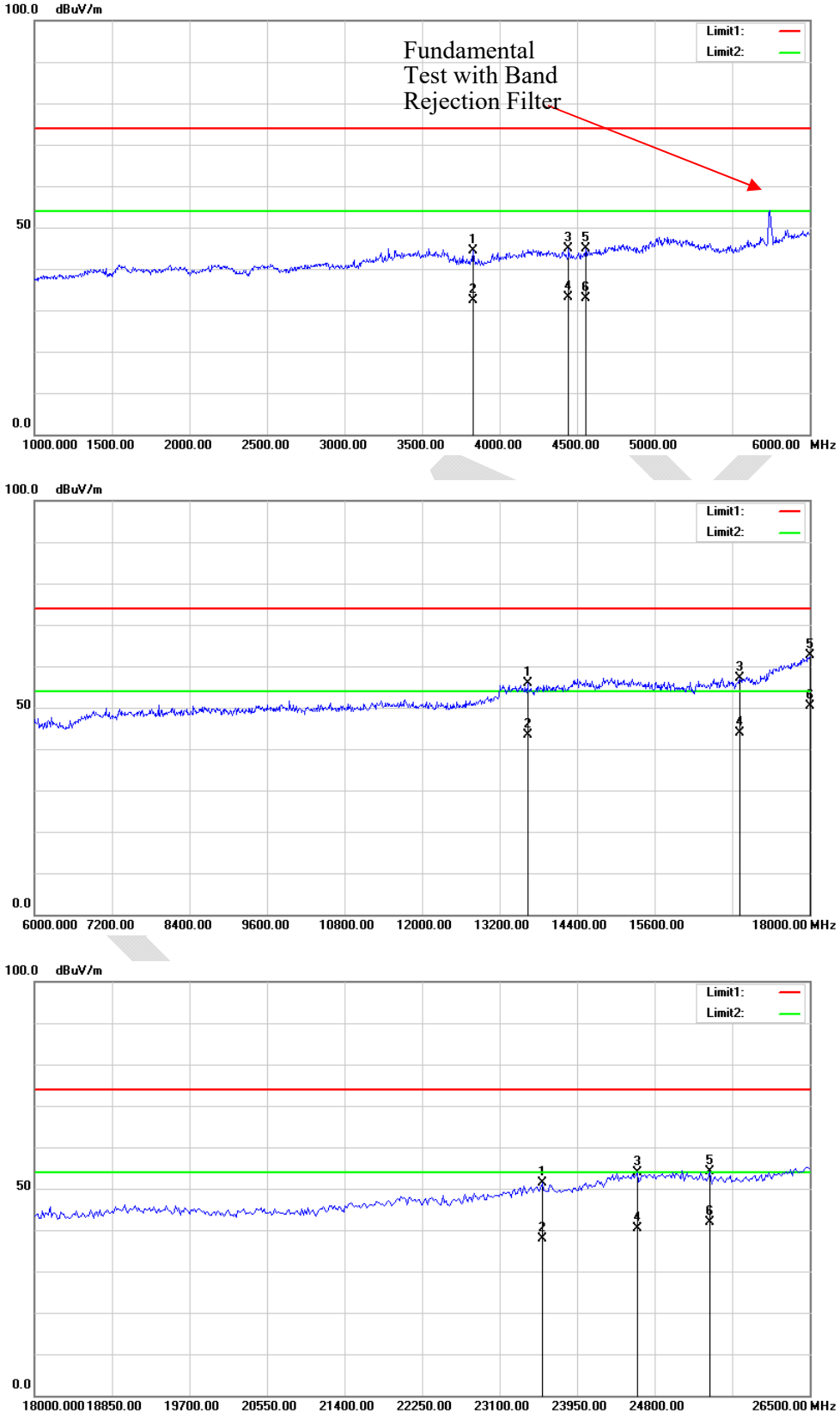
802.11n ht40:

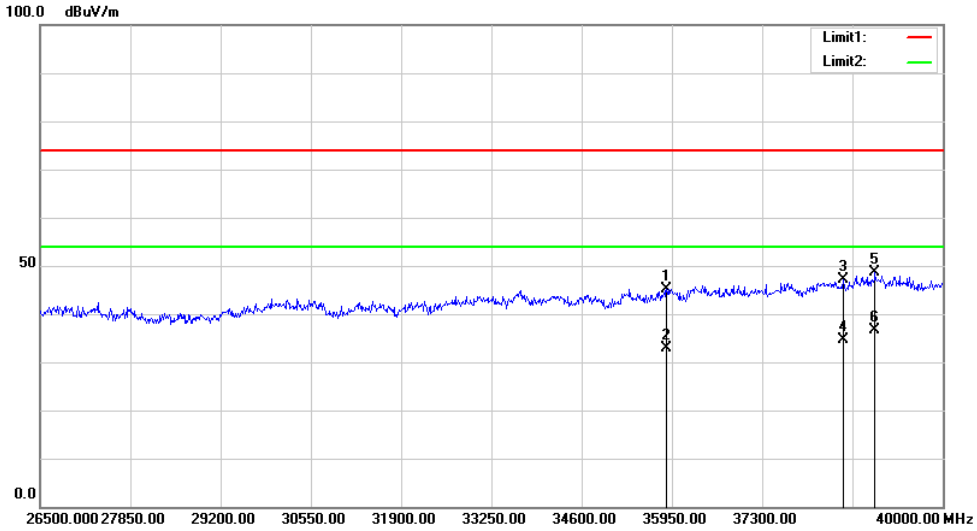
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5755 MHz										
5725.00	27.36	PK	H	34.19	3.69	0.00	65.24	59.22	122.20	62.98
5720.00	26.32	PK	H	34.19	3.69	0.00	64.20	58.18	110.80	52.62
5700.00	27.56	PK	H	34.18	3.68	0.00	65.42	59.4	105.20	45.80
5650.00	26.35	PK	H	34.16	3.63	0.00	64.14	58.12	68.20	10.08
11510.00	34.62	PK	H	39.00	6.59	25.50	54.71	48.69	74.00	25.31
11510.00	22.36	AV	H	39.00	6.59	25.50	42.45	36.43	54.00	17.57
17265.00	34.16	PK	H	41.74	8.79	23.69	61.00	54.98	68.20	13.22
High Channel: 5795 MHz										
5850.00	26.35	PK	H	34.24	3.75	0.00	64.34	58.32	122.20	63.88
5855.00	27.69	PK	H	34.24	3.75	0.00	65.68	59.66	110.80	51.14
5875.00	26.85	PK	H	34.25	3.77	0.00	64.87	58.85	105.20	46.35
5925.00	27.53	PK	H	34.27	3.80	0.00	65.60	59.58	68.20	8.62
11590.00	34.62	PK	H	39.00	6.62	25.45	54.79	48.77	74.00	25.23
11590.00	22.35	AV	H	39.00	6.62	25.45	42.52	36.5	54.00	17.50
17385.00	34.86	PK	H	42.43	8.82	23.57	62.54	56.52	68.20	11.68

802.11ac vht80:

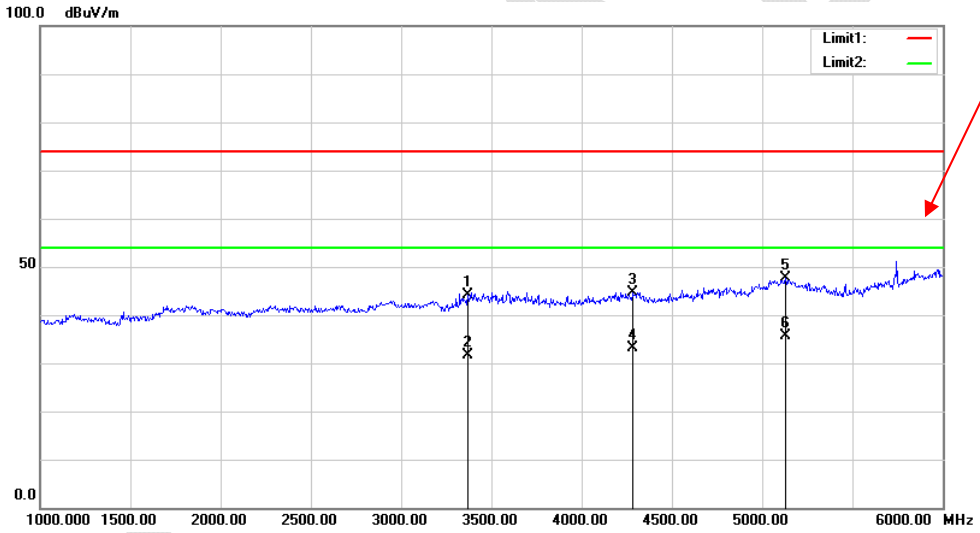
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Middle Channel: 5775 MHz										
5725.00	26.67	PK	H	34.19	3.69	0.00	64.55	58.53	122.20	63.67
5720.00	27.52	PK	H	34.19	3.69	0.00	65.40	59.38	110.80	51.42
5700.00	25.85	PK	H	34.18	3.68	0.00	63.71	57.69	105.20	47.51
5650.00	25.22	PK	H	34.16	3.63	0.00	63.01	56.99	68.20	11.21
5850.00	25.72	PK	H	34.24	3.75	0.00	63.71	57.69	122.20	64.51
5855.00	27.03	PK	H	34.24	3.75	0.00	65.02	59	110.80	51.80
5875.00	26.69	PK	H	34.25	3.77	0.00	64.71	58.69	105.20	46.51
5925.00	26.91	PK	H	34.27	3.80	0.00	64.98	58.96	68.20	9.24
11550.00	34.72	PK	H	39.00	6.61	25.48	54.85	48.83	74.00	25.17
11550.00	22.65	AV	H	39.00	6.61	25.48	42.78	36.76	54.00	17.24
17325.00	34.25	PK	H	42.09	8.80	23.63	61.51	55.49	68.20	12.71

Test Plots(802.11a mode 5825MHz was the worst)
Horizontal

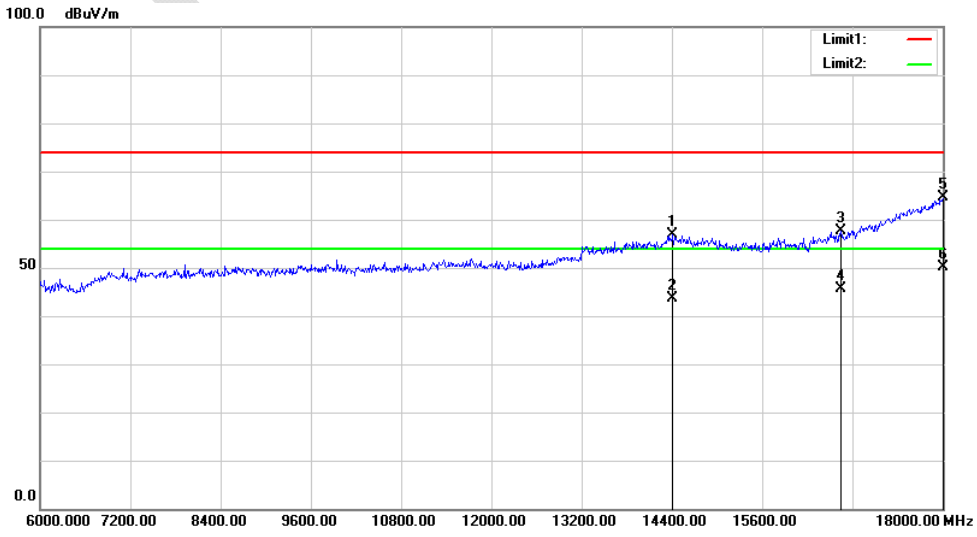


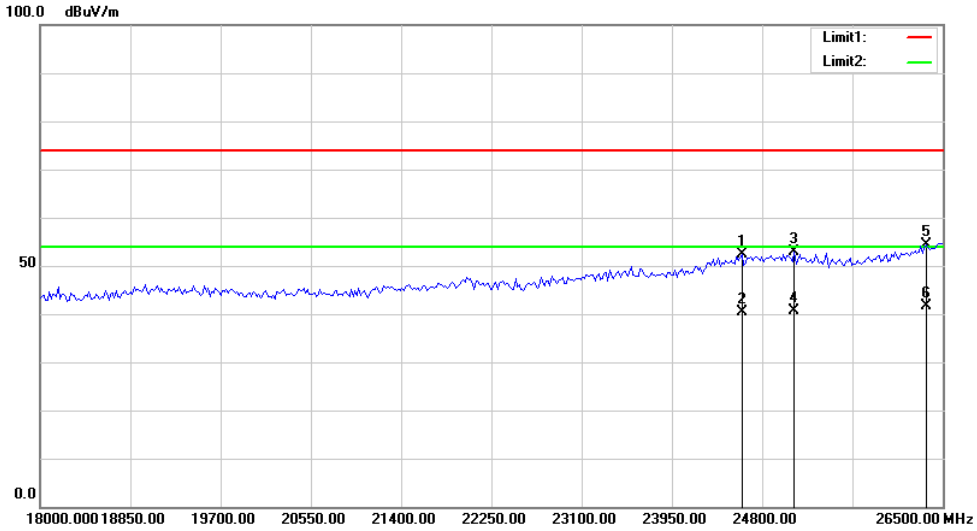


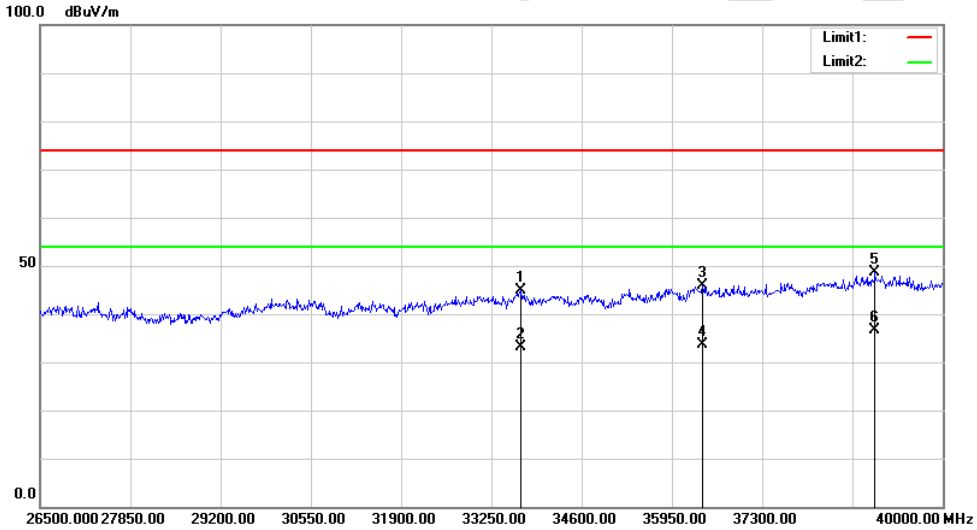
Vertical:



Fundamental Test with Band Rejection Filter




100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
3
4
5
6
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
3
4
5
6
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

FCC §15.407(a)(e)–EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH

Applicable Standard

15.407(a) (e).

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101591	2021-06-29	2022-06-28
E-Microwave	Coaxial Attenuators	EMCA20-2RN-2	OE0120328	Each time	N/A
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A

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

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Data

Environmental Conditions

Temperature:	27.5 °C
Relative Humidity:	48 %
ATM Pressure:	101.1kPa
Test by:	Wayne Wei
Test Date:	2021-07-10~2021-07-29

Test Result: Compliance. Please refer to the following tables and plots.

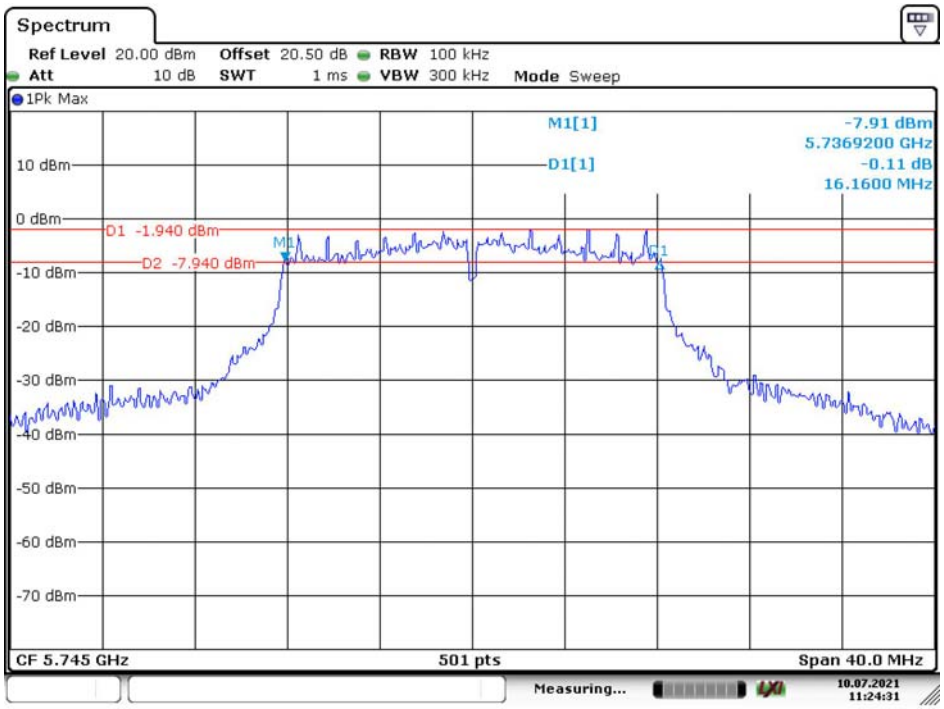
Test mode: Transmitting

Mode	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	6 dB Emission Bandwidth Limits (MHz)	99% Occupied Bandwidth (MHz)
802.11 a	5745	16.160	≥0.5	17.246
	5785	16.240	≥0.5	17.325
	5825	16.320	≥0.5	17.405
802.11n ht20	5745	17.440	≥0.5	18.443
	5785	17.280	≥0.5	18.443
	5825	17.440	≥0.5	18.523
802.11n ht40	5755	35.520	≥0.5	37.525
	5795	36.160	≥0.5	38.323
802.11ac vht80	5775	75.520	≥0.5	76.008

Note: the 99% Occupied Bandwidth have not fall into the band 5250-5350MHz or 5470-5725MHz, please refer to the test plots of 99% Occupied Bandwidth.

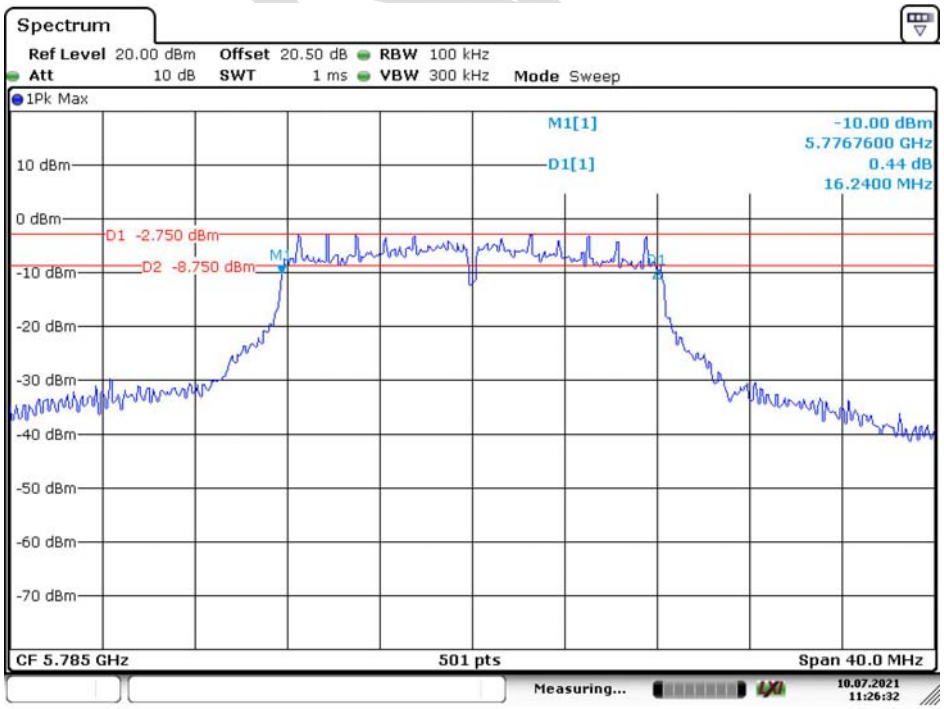
6dB Emission Bandwidth:

802.11a Low Channel



Date: 10.JUL.2021 11:24:32

802.11a Middle Channel



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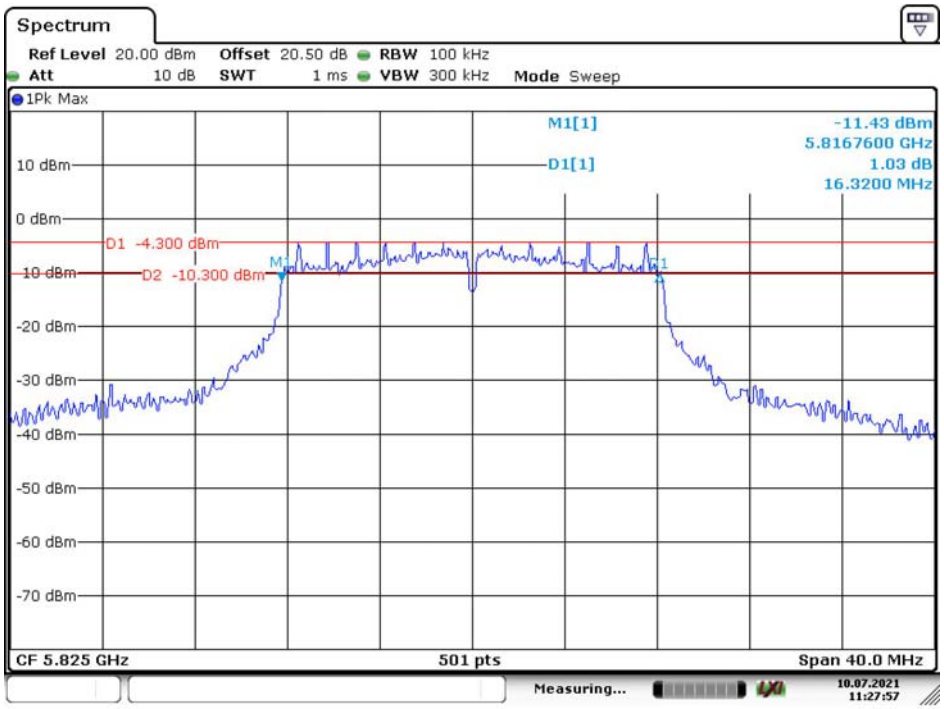
802.11a High Channel



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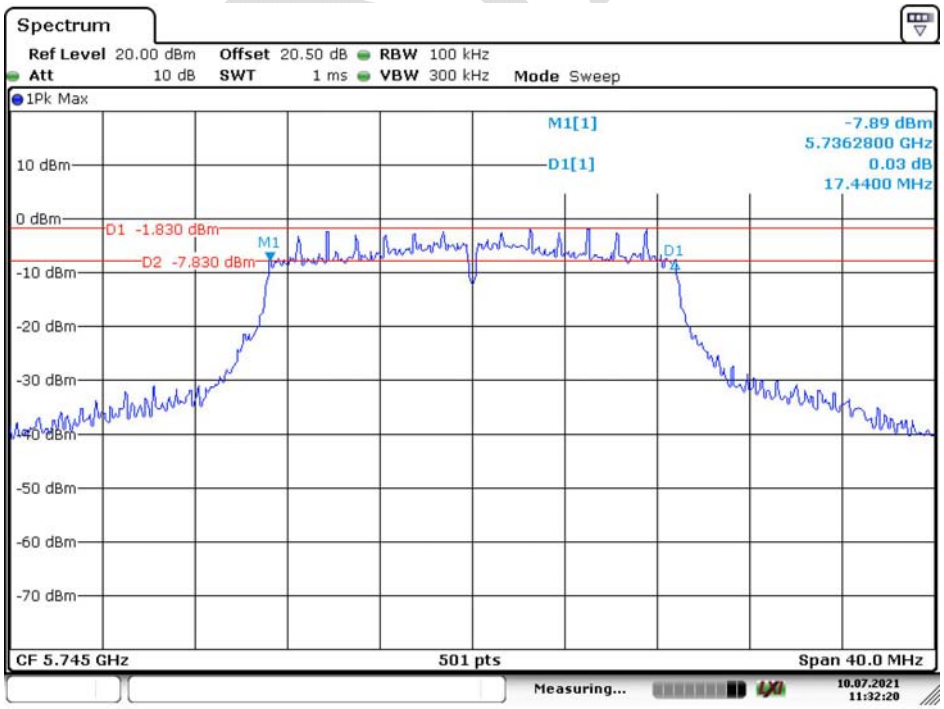
802.11n ht20 Low Channel



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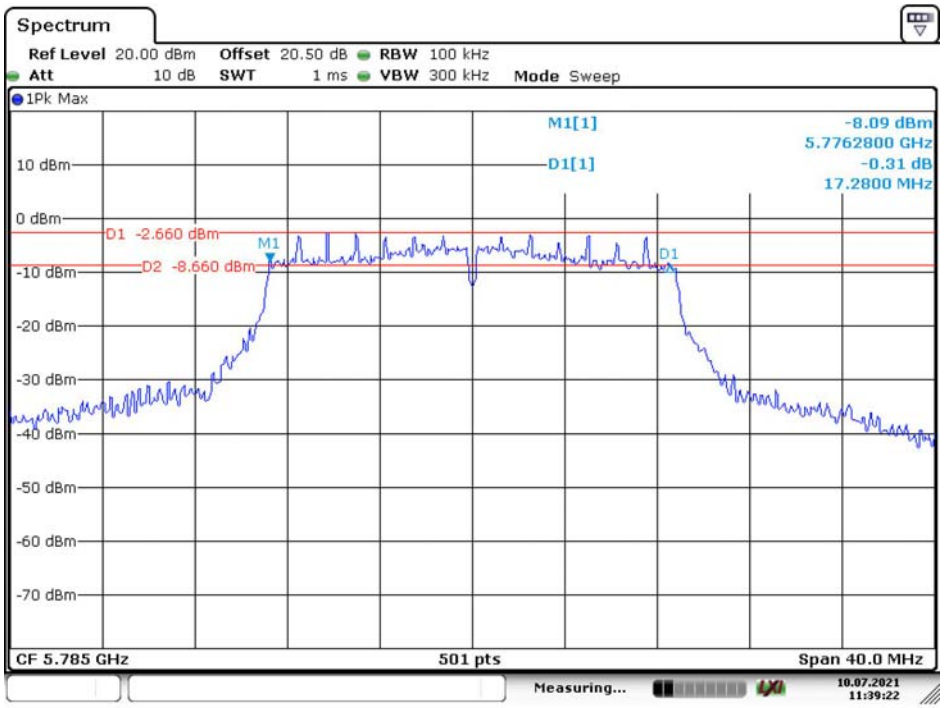
802.11n ht20 Middle Channel



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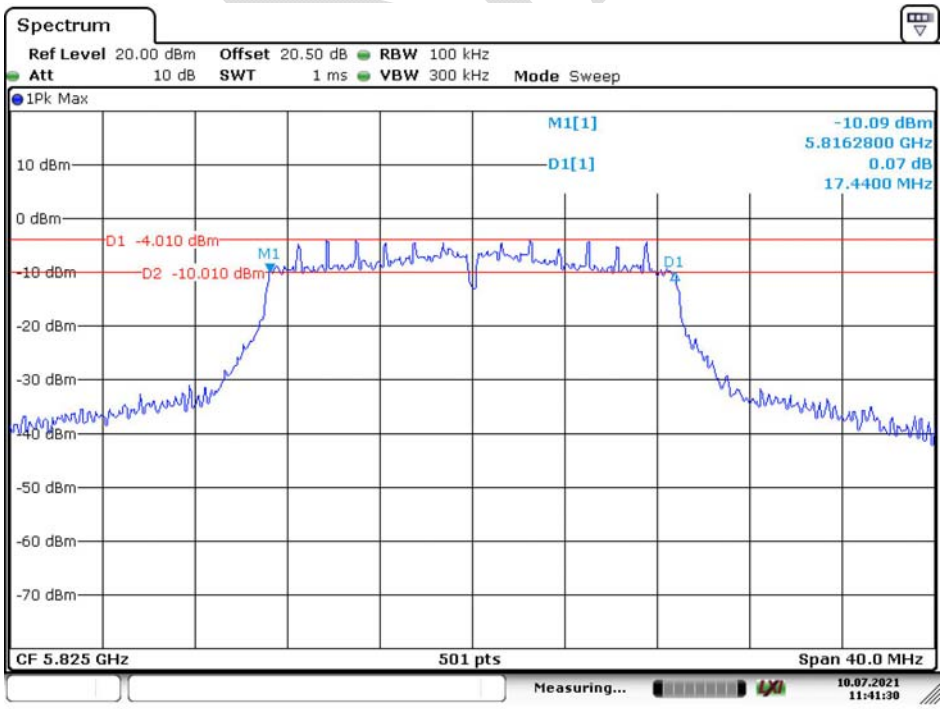
802.11n ht20 High Channel



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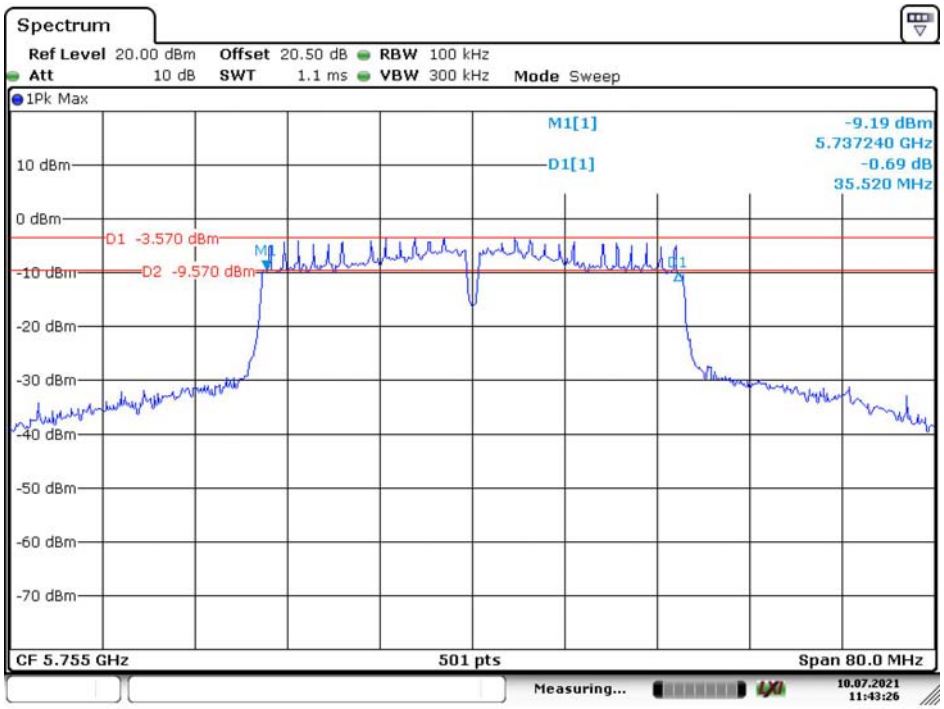
802.11n ht40 Low Channel



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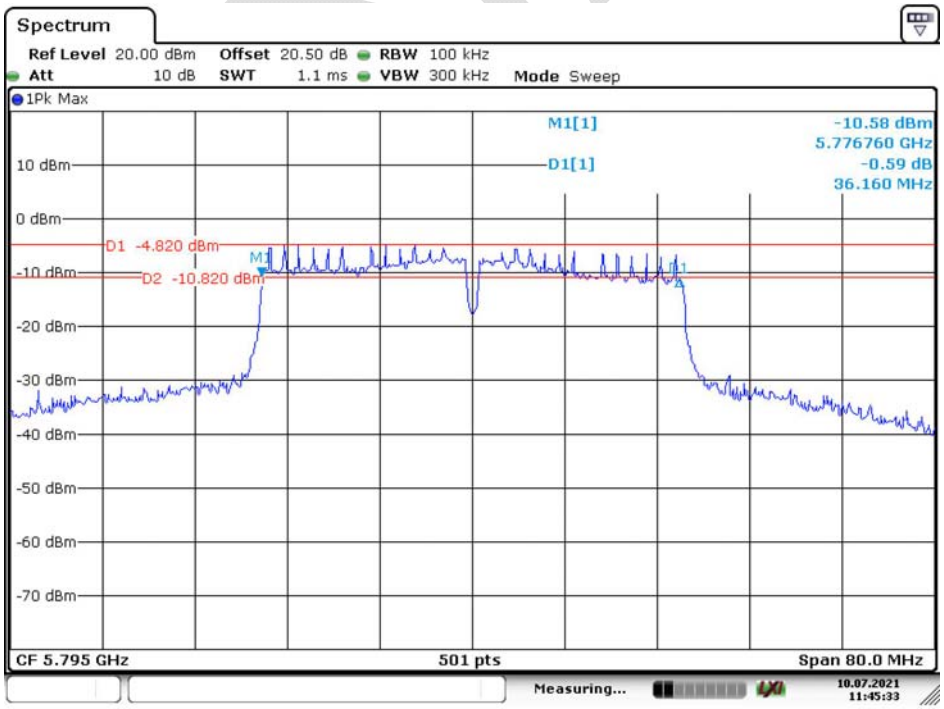
802.11n ht40 High Channel



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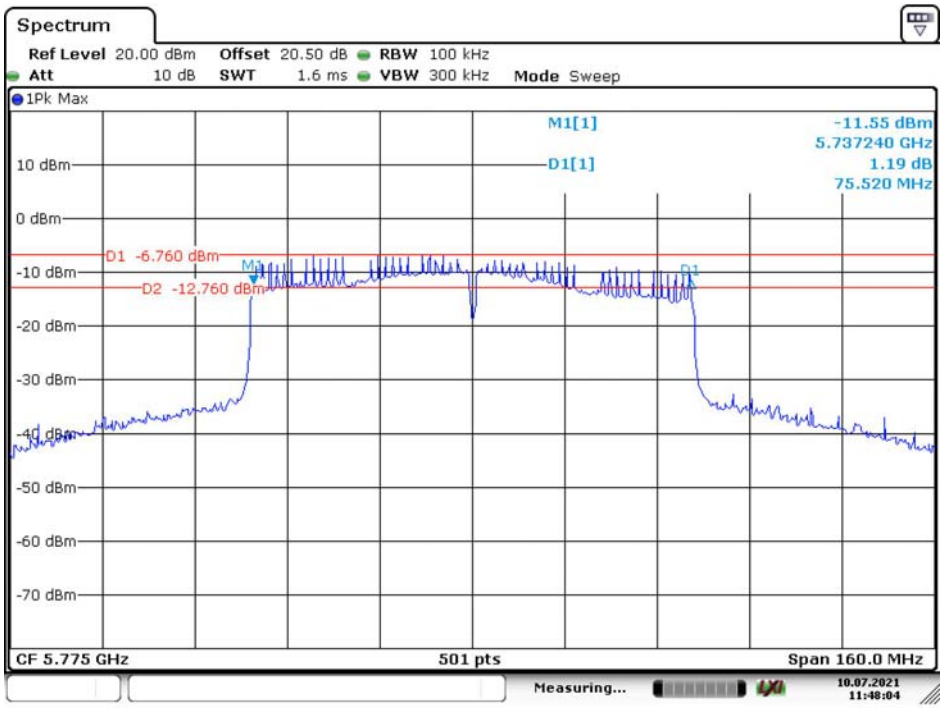
802.11ac vht80 Middle Channel



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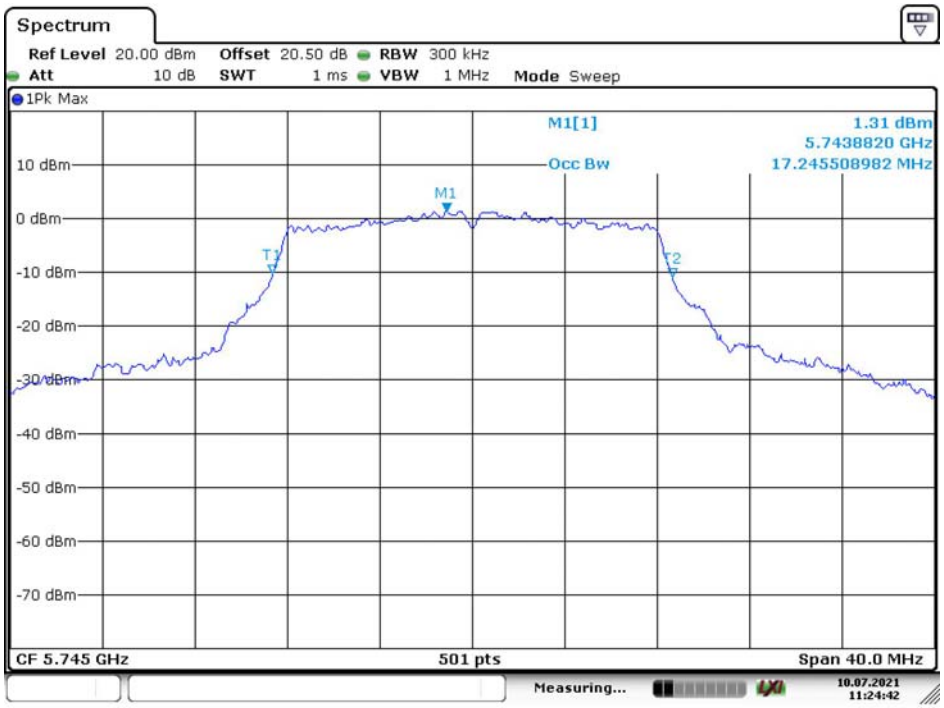
99% Occupied Bandwidth:

802.11a Low Channel



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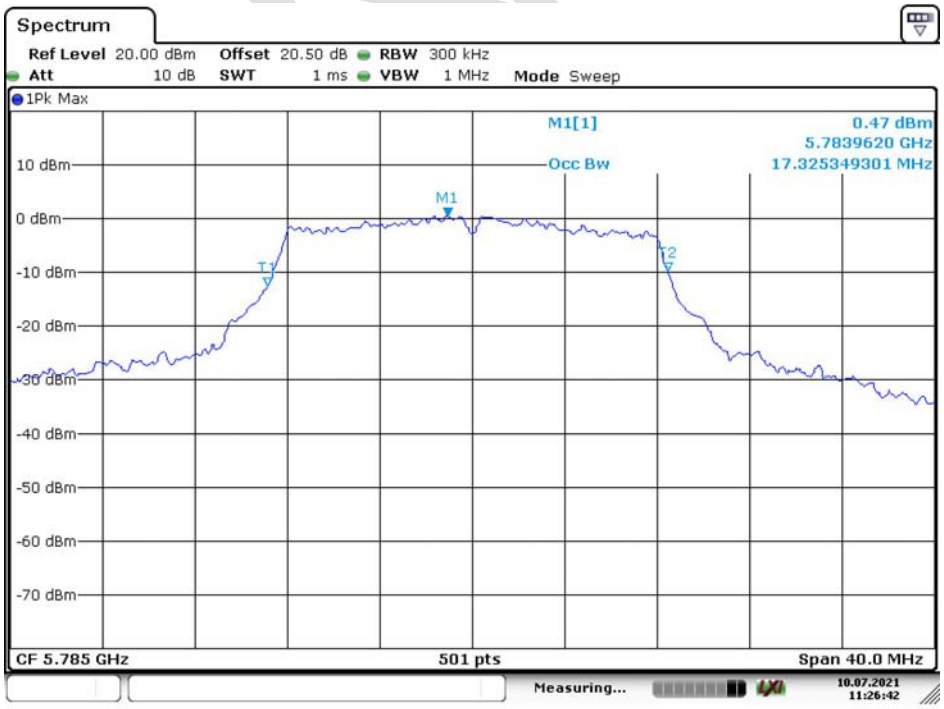
802.11a Middle Channel



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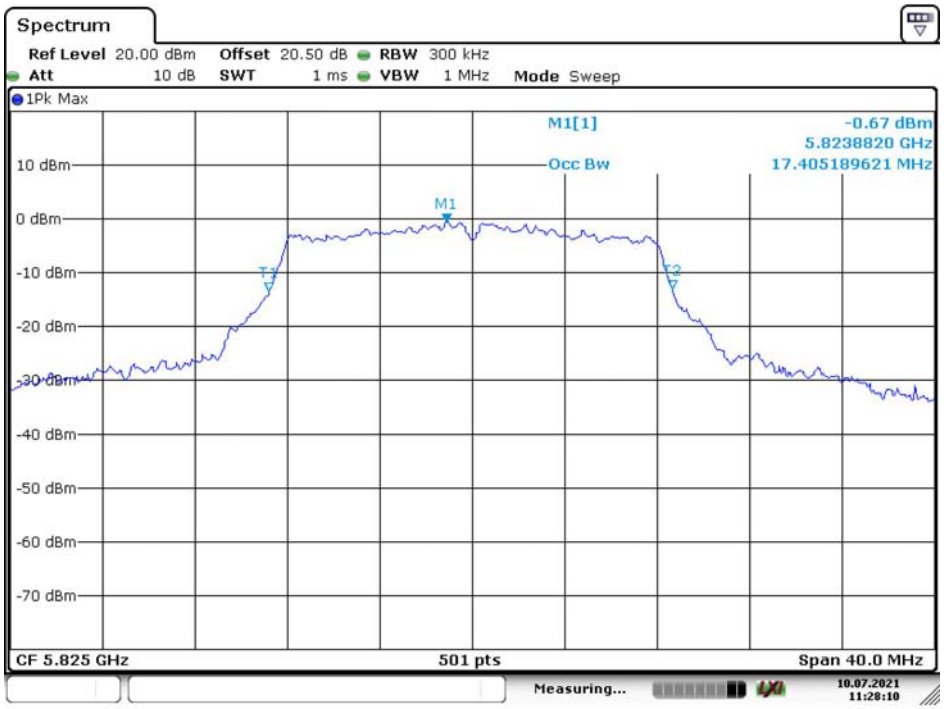
802.11a High Channel



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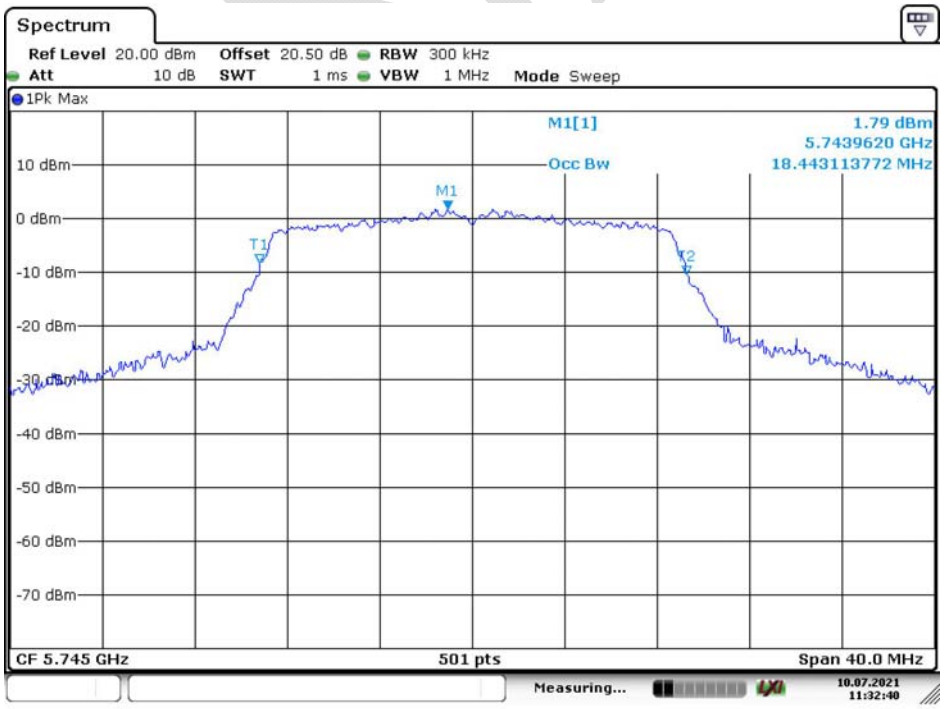
802.11n ht20 Low Channel



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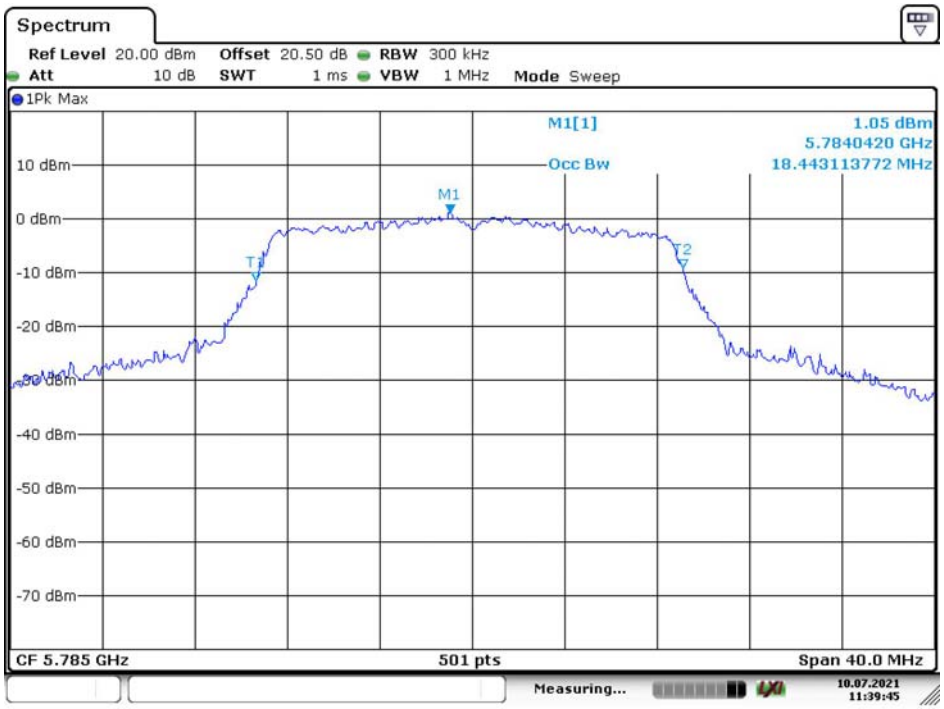
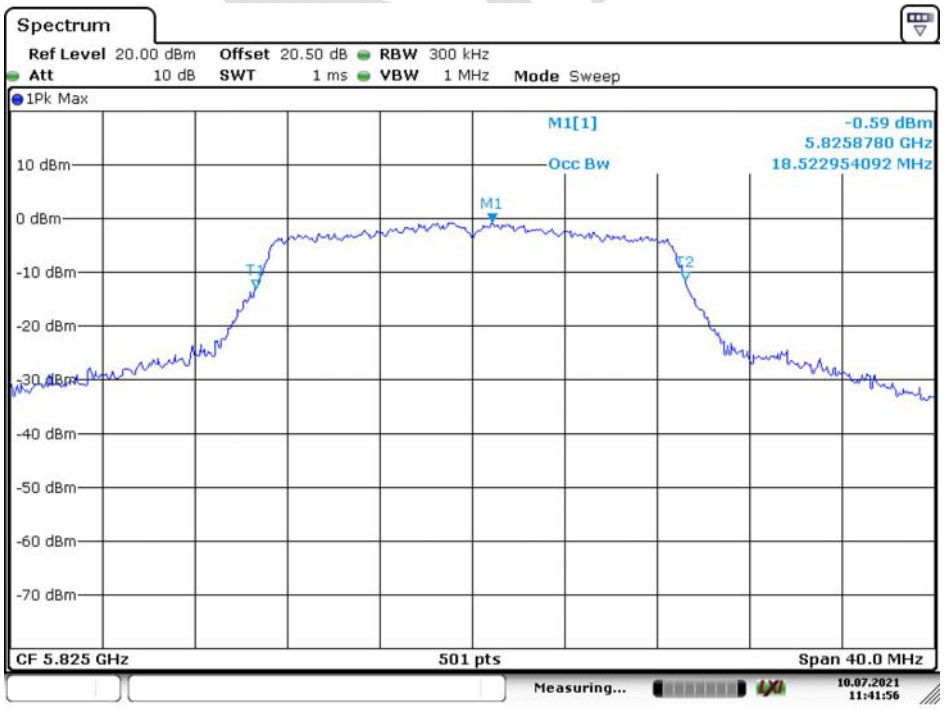
802.11n ht20 Middle Channel



Date: 10.JUL.2021 11:39:45

802.11n ht20 High Channel



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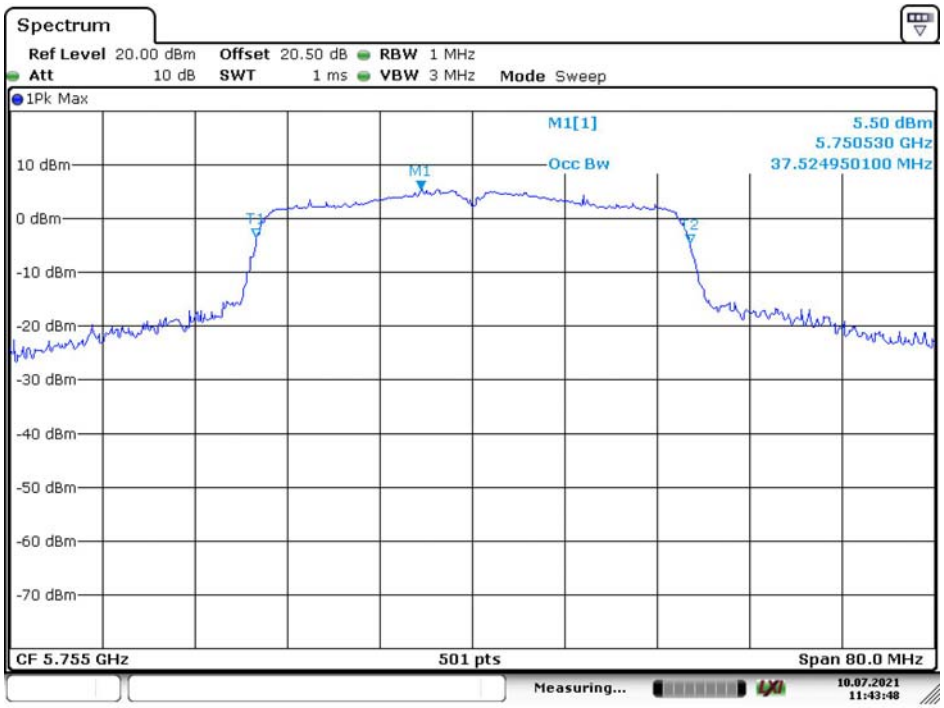
802.11n ht40 Low Channel



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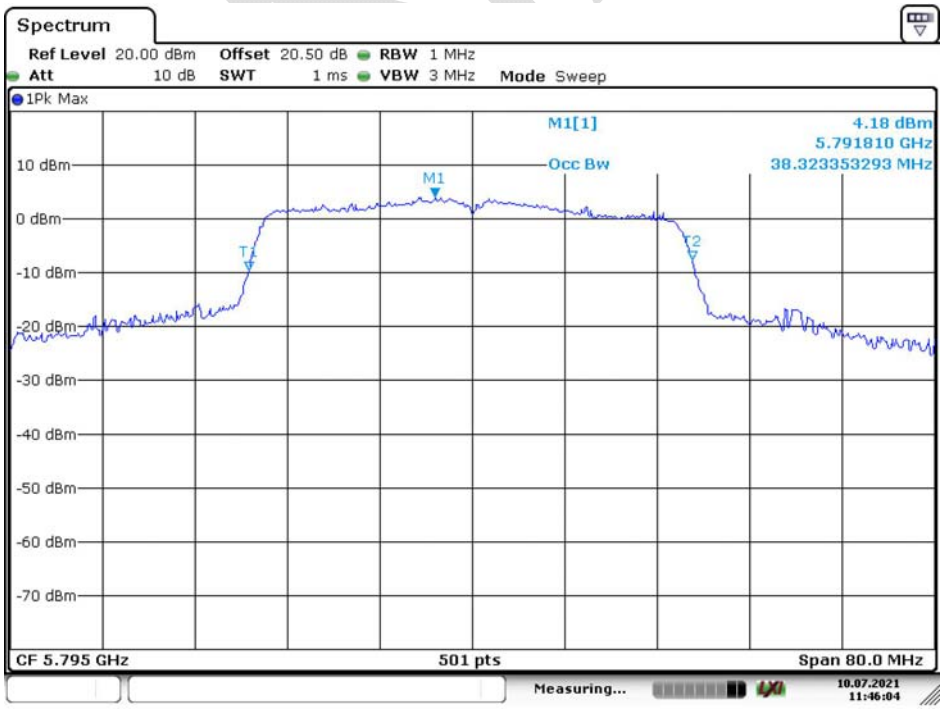
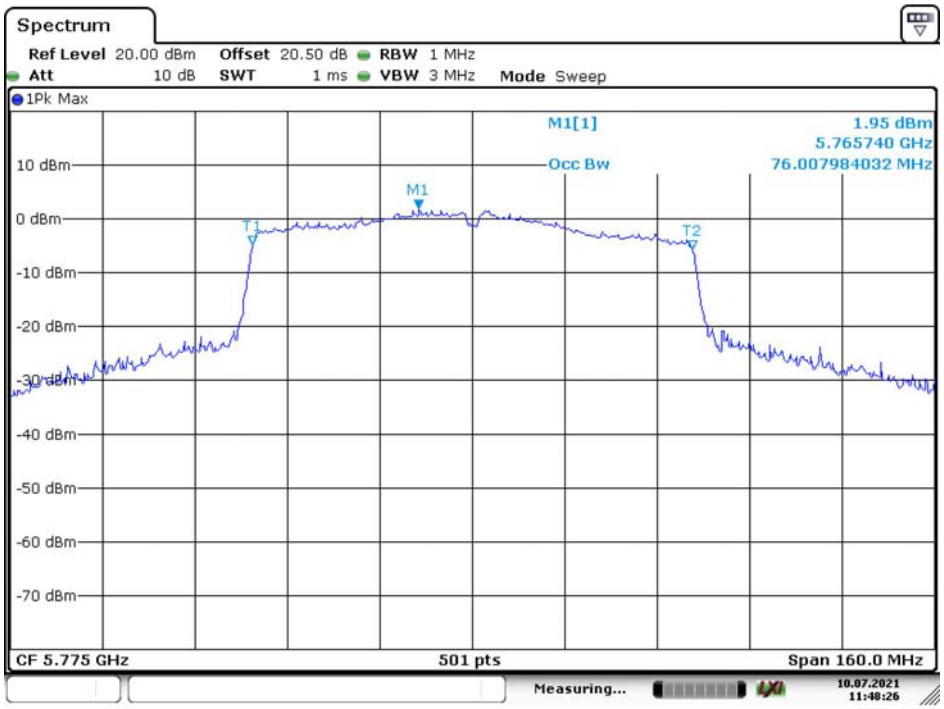
802.11n ht40 High Channel



Date: 10.JUL.2021 11:46:05

802.11ac vht80 Middle Channel



Date: 10.JUL.2021 11:48:26

FCC §15.407(a) –MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.407(a)

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(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.

(iii) For fixed point-to-point access points 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. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

(3) 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.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A
E-Microwave	Coaxial Attenuators	EMCA20-2RN-2	OE0120328	Each time	N/A
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2020-09-12	2021-09-12

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

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Data

Environmental Conditions

Temperature:	27.5 °C
Relative Humidity:	48 %
ATM Pressure:	101.1 kPa
Test by:	Wayne Wei
Test Date:	2021-07-10

Test Mode: Transmitting

Mode	Frequency (MHz)	Conducted Average Output Power (dBm)	Limit (dBm)
802.11 a	5745	7.43	30
	5785	7.58	30
	5825	7.70	30
802.11n ht20	5745	7.03	30
	5785	7.27	30
	5825	7.30	30
802.11n ht40	5755	7.72	30
	5795	7.82	30
802.11ac vht80	5775	7.45	30

Note:
The duty cycle factor has been calculated into the test data.

FCC §15.407(a) - POWER SPECTRAL DENSITY

Applicable Standard

According to FCC §15.407(a)

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(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.

(iii) For fixed point-to-point access points 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. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

(3) 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

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101591	2021-06-29	2022-06-28
E-Microwave	Coaxial Attenuators	EMCA20-2RN-2	OE0120328	Each time	N/A
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A

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

Test Data

Environmental Conditions

Temperature:	27.5 °C
Relative Humidity:	48 %
ATM Pressure:	101.1 kPa
Test by:	Wayne Wei
Test Date:	2021-07-10~2021-07-29

Test Mode: Transmitting

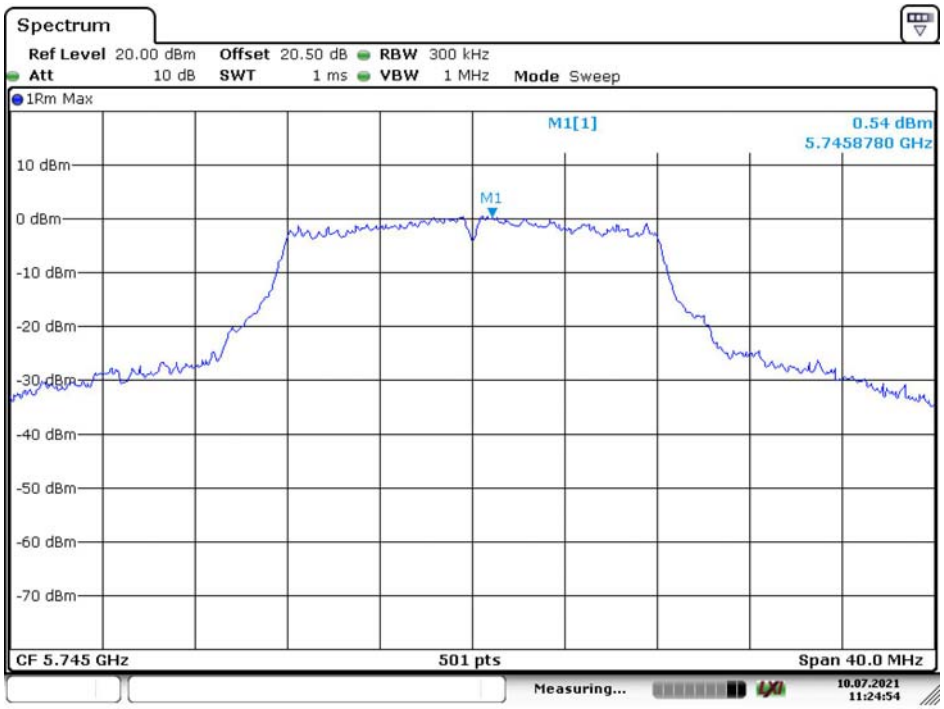
Test Result:Compliance.Please refer to the following table and plot.

Mode	Frequency (MHz)	Reading (dBm/300kHz)	Maximum Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
802.11a	5745	0.54	2.76	30
	5785	-0.26	1.96	30
	5825	-1.38	0.84	30
802.11n ht20	5745	0.67	2.89	30
	5785	-0.44	1.78	30
	5825	-1.54	0.68	30
802.11n ht40	5755	-1.16	1.06	30
	5795	-2.68	-0.46	30
802.11ac vht80	5775	-5.32	-3.1	30

Note:
For 5.8GHz band, If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
Method SA-3 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01was used for PSD test.

5725-5850MHz

802.11a Low Channel



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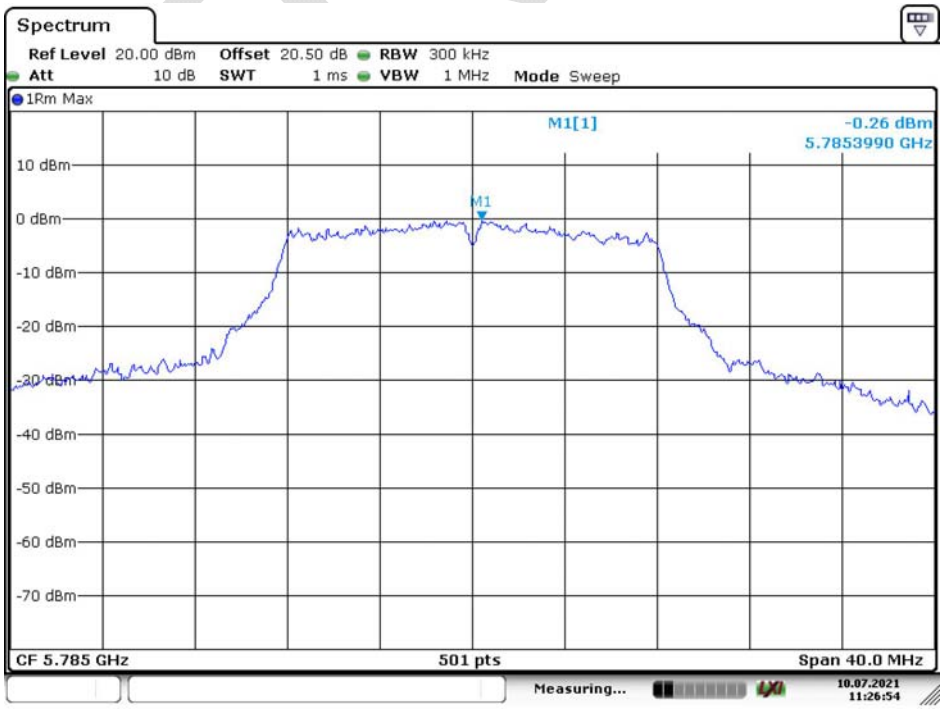
802.11a Middle Channel



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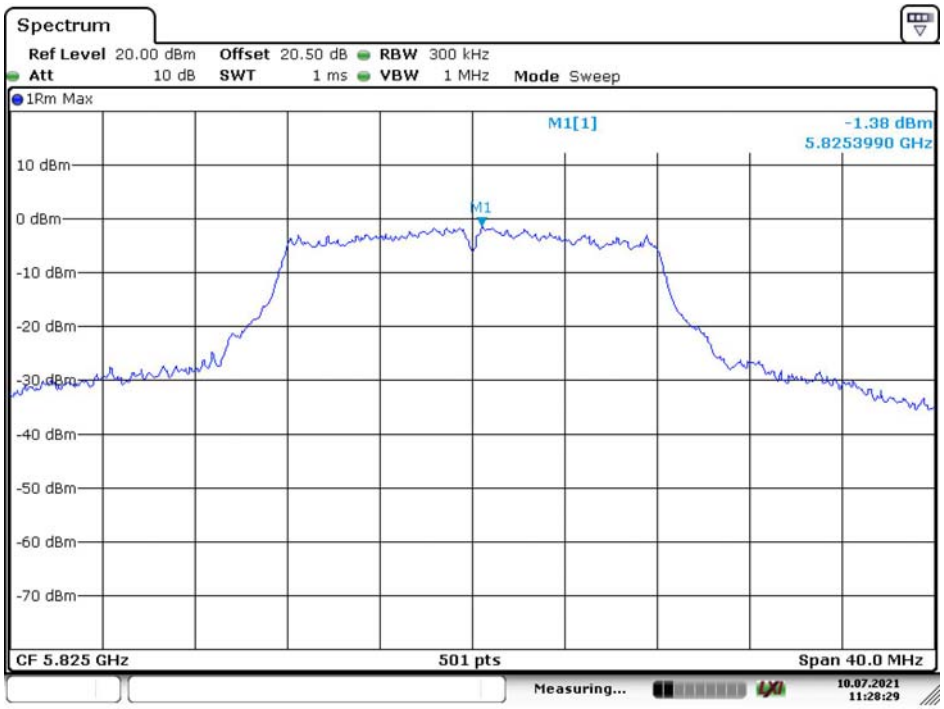
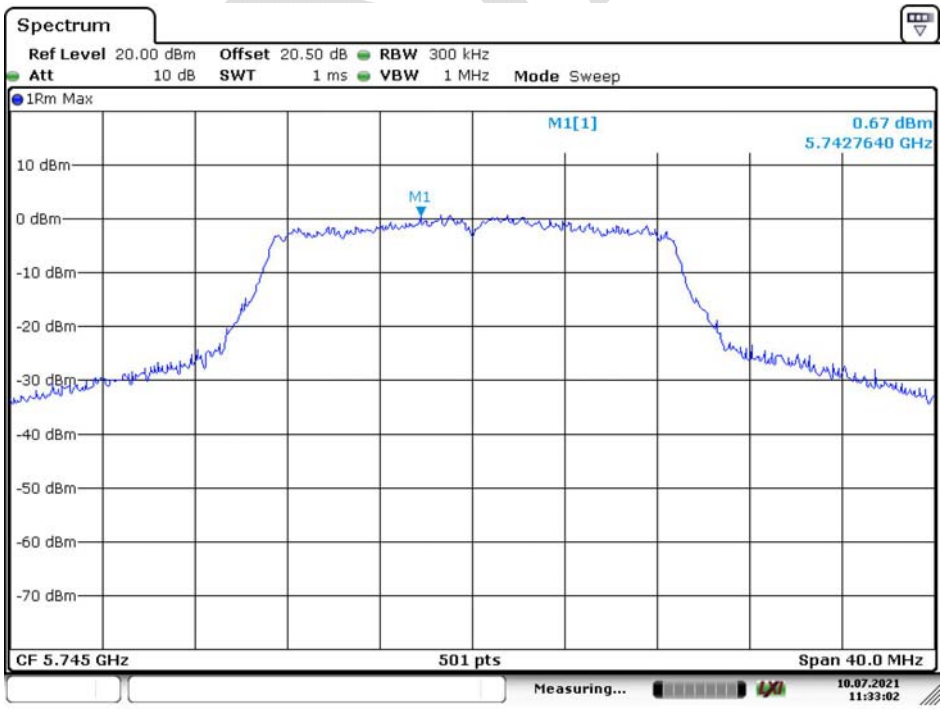
802.11a High Channel



Date: 10.JUL.2021 11:28:29

802.11n ht20 Low Channel



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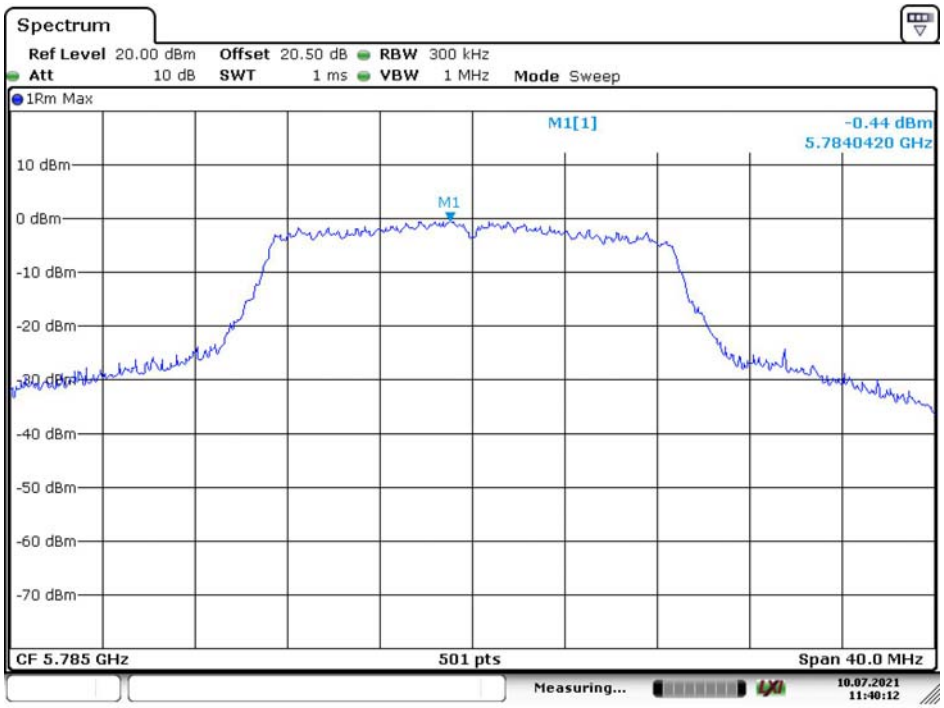
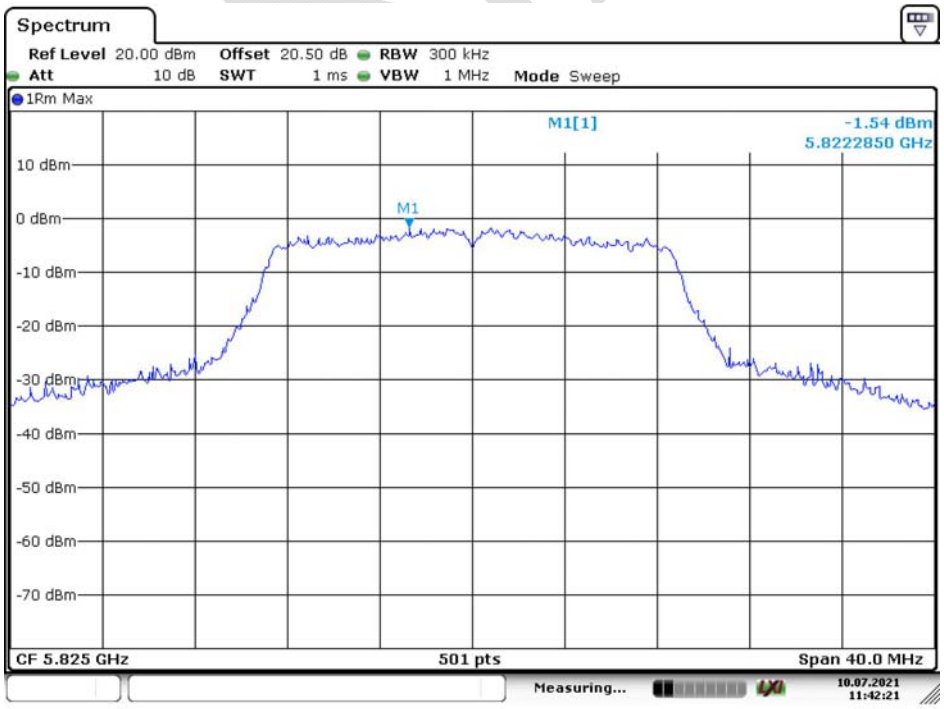
802.11n ht20 Middle Channel



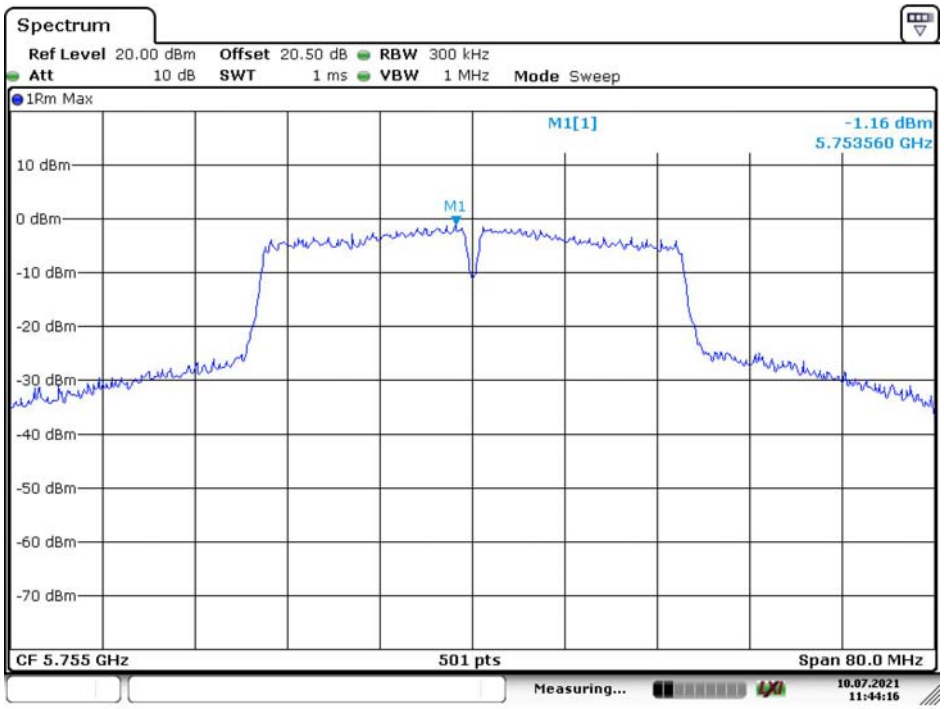
Date: 10.JUL.2021 11:40:13

802.11n ht20 High Channel



Date: 10.JUL.2021 11:42:21

802.11n ht40 Low Channel



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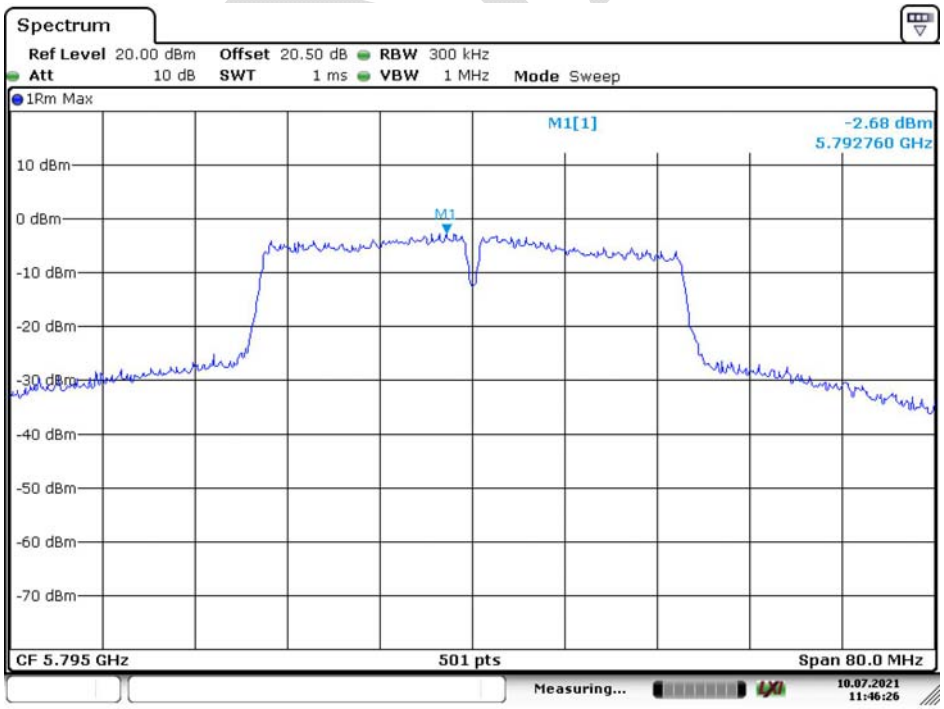
802.11n ht40 High Channel



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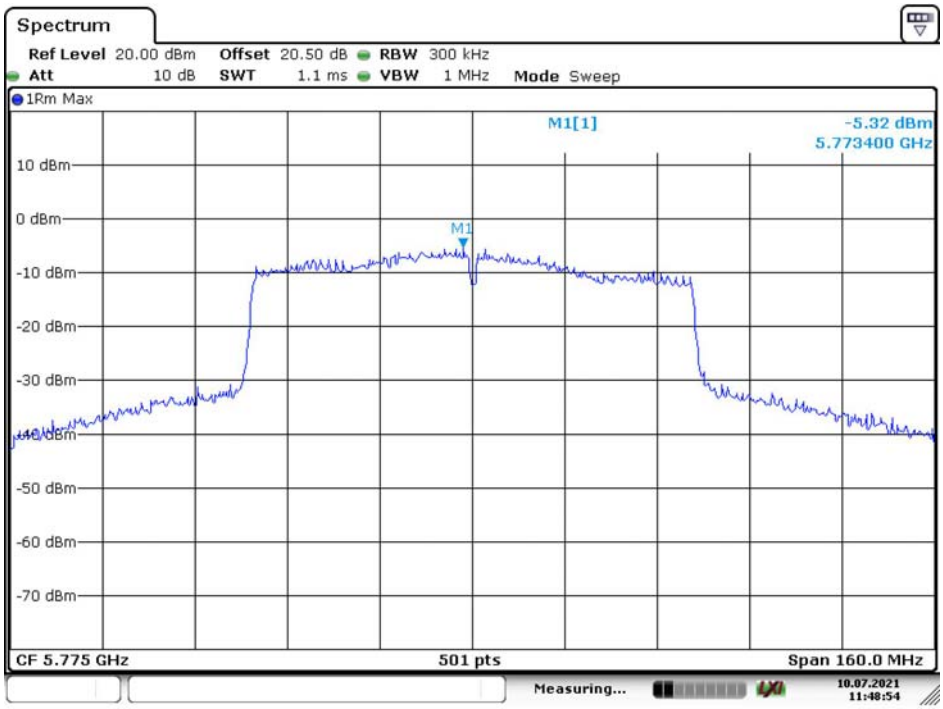
802.11ac vht80 Middle Channel



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