



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.247

TEST REPORT

For

INGENICO

9 Avenue de la gare - Rolvatain TGV, Valence Cedex 9, 26958, France

FCC ID: XKB-APOSA8WULEWF

Report Type: Original Report	Product Name: Smart POS Terminal
Report Number: <u>RXM200310053-00B</u>	
Report Date: <u>2020-04-17</u>	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Smart POS Terminal
EUT Model:		APOS A8
Operation Frequency:		2412-2462 MHz(802.11b/g/n ht20), 2422-2452 MHz(802.11n ht40)
Maximum Peak Output Power (Conducted):		20.90 dBm(802.11b/g/n)
Modulation Type:		DSSS, OFDM(802.11b/g/n)
Rated Input Voltage:		DC 7.2V from battery or DC 5V from USB port
Adapter Information	Model:	P12GUSB050200
	Input:	AC 100-240V, 50/60Hz, 0.3A
	Output:	DC 5.0V, 2.0A
Serial Number:		RXM200310053-RF -S7
EUT Received Date:		2020.03.15
EUT Received Status:		Good

Note: Per pre-test of FCC Part 15B test, the EUT configuration #1 was the worst, and was selected to perform the test items in this report. The EUT configuration information as below, and more please refer to the Product similarity declaration.

EUT Configuration	Screen Model	Manufacturer	Serial Number
#1	MDT0550B	SKYWORTH LCD MODULES(SHENZHEN) CO., LTD	RXM200310053-RF-S4
#2	MDT0550B	TIANMA MICRO-ELECTRONICS Corporation	RXM200310053-RF-S5

Objective

This report is prepared on behalf of *INGENICO* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the Bluetooth BDR and EDR mode of EUT compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS, DXX, 15B JBP, Part 22H, 24E, 27.90 PCE submissions with
FCC ID: XKB-APOSA8WULEWF.

Test Methodology

All measurements detailed in this test report were performed in accordance with ANSI C63.10-2013 “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices” and KDB 558074 D01 15.247 Meas Guidance v05r02.

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 °C
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.69 Pulongcun, Puxinhu Industry Area, Tangxia, 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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This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For 2.4GHz band, total 11 channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

For 802.11b, 802.11g, and 802.11n ht20 modes were test with channel 1,6,11. For 802.11n ht40 mode was tested with channel 3, 6, 9.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

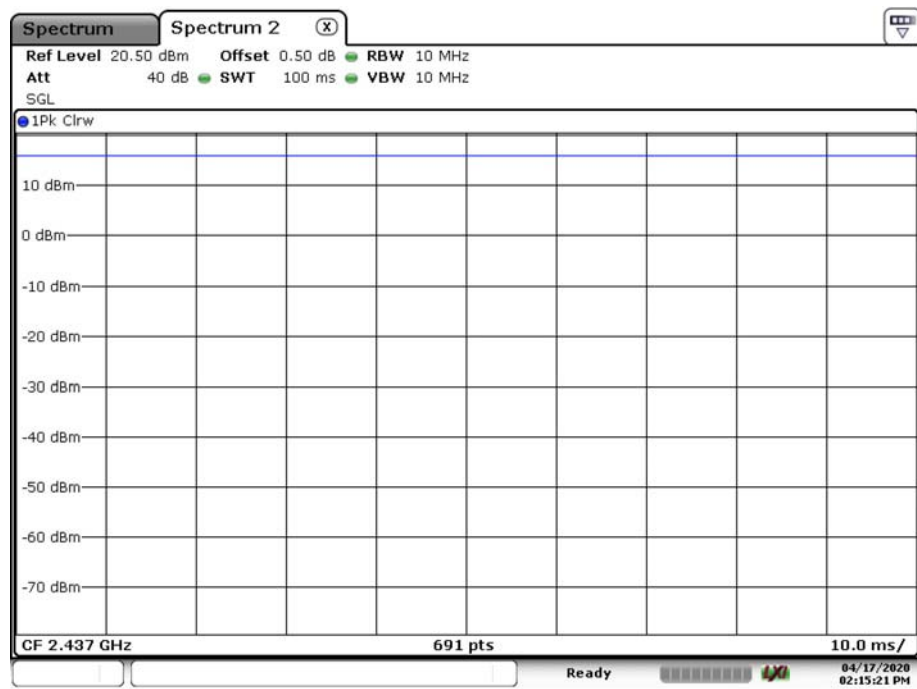
The software "QRCT3.0"was used for testing and the maximum power was configured as below:

Mode	Channel	Frequency (MHz)	Data rate	Power level Setting
802.11 b	Low	2412	1 Mbps	18
	Middle	2437	1 Mbps	19
	High	2462	1 Mbps	19
802.11 g	Low	2412	6 Mbps	17
	Middle	2437	6 Mbps	17
	High	2462	6 Mbps	17
802.11n ht20	Low	2412	MCS0	16
	Middle	2437	MCS0	17
	High	2462	MCS0	17
802.11n ht40	Low	2422	MCS0	15
	Middle	2437	MCS0	13
	High	2452	MCS0	14

The duty cycle as below:

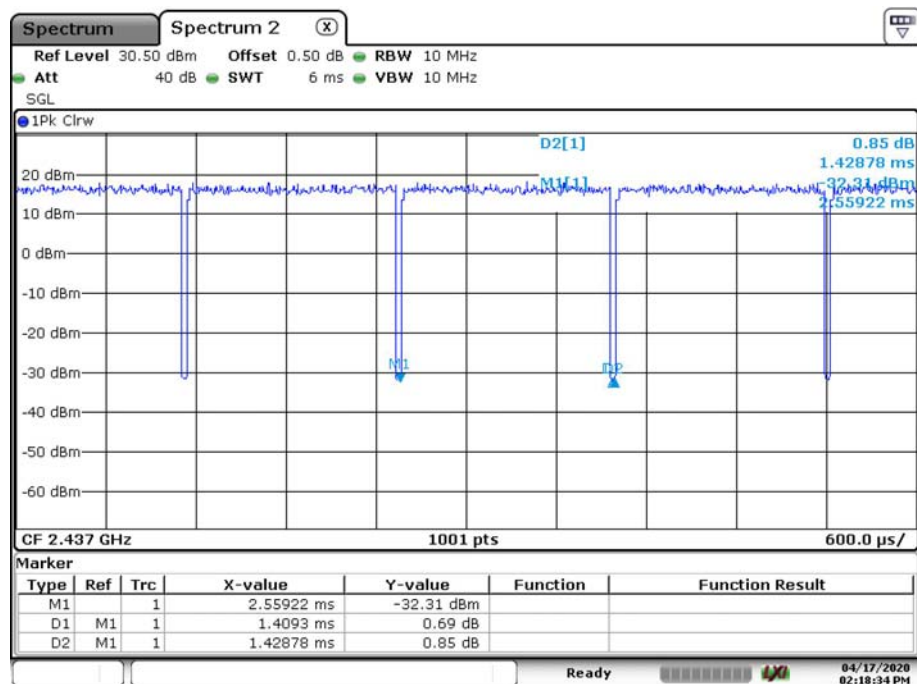
Test mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)
802.11b	100	100	100
802.11g	1.409	1.429	98.60
802.11n ht20	1.313	1.339	98.06
802.11n ht40	0.658	0.686	95.92

802.11b



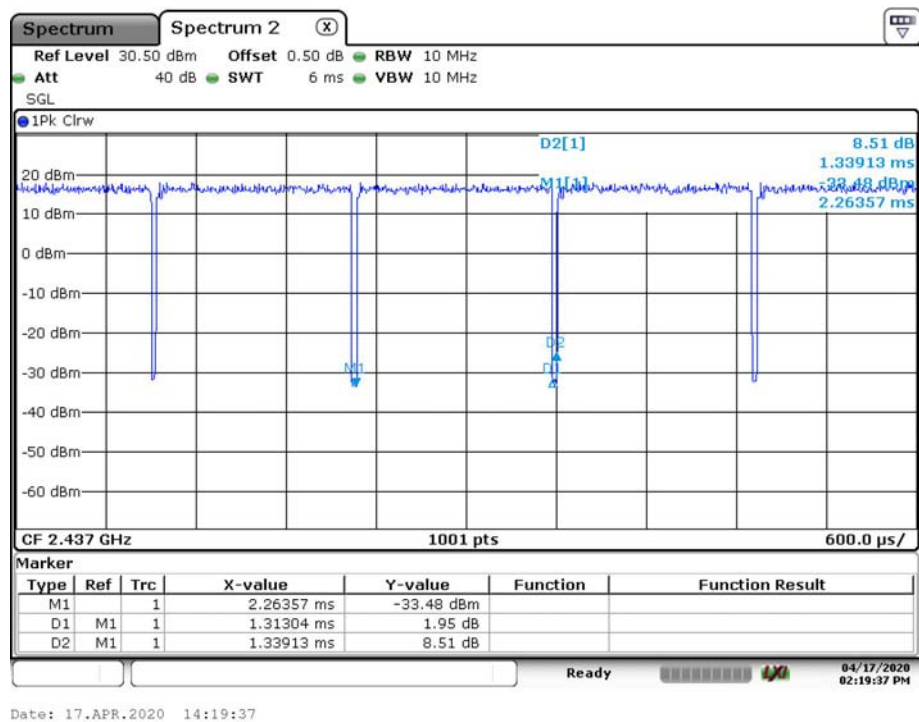
Date: 17.APR.2020 14:15:21

802.11g

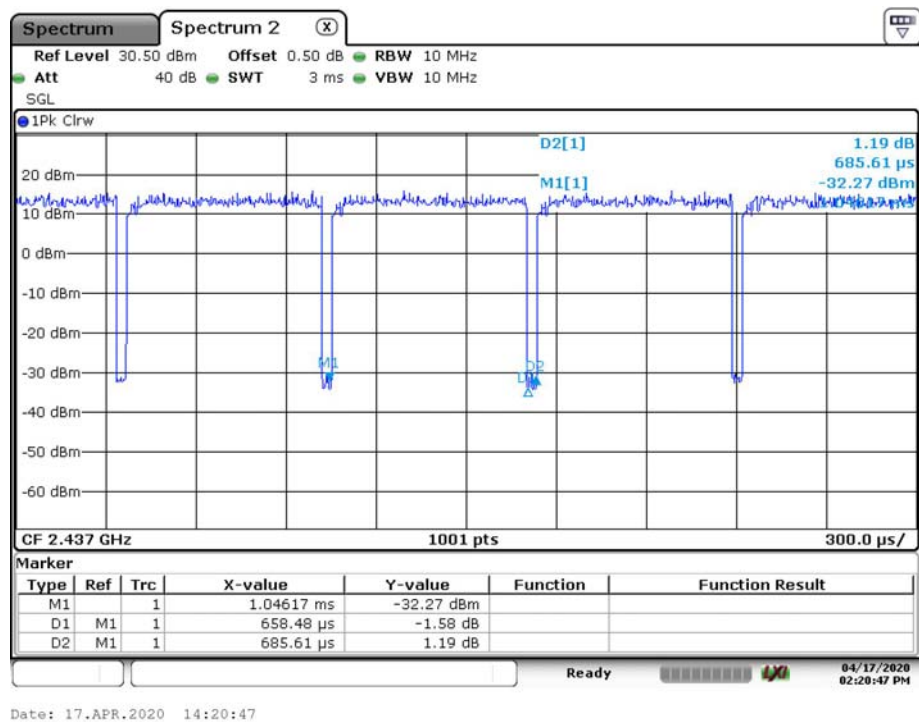


Date: 17.APR.2020 14:18:34

802.11n ht20



802.11n ht40



Equipment Modifications

No modification was made to the EUT.

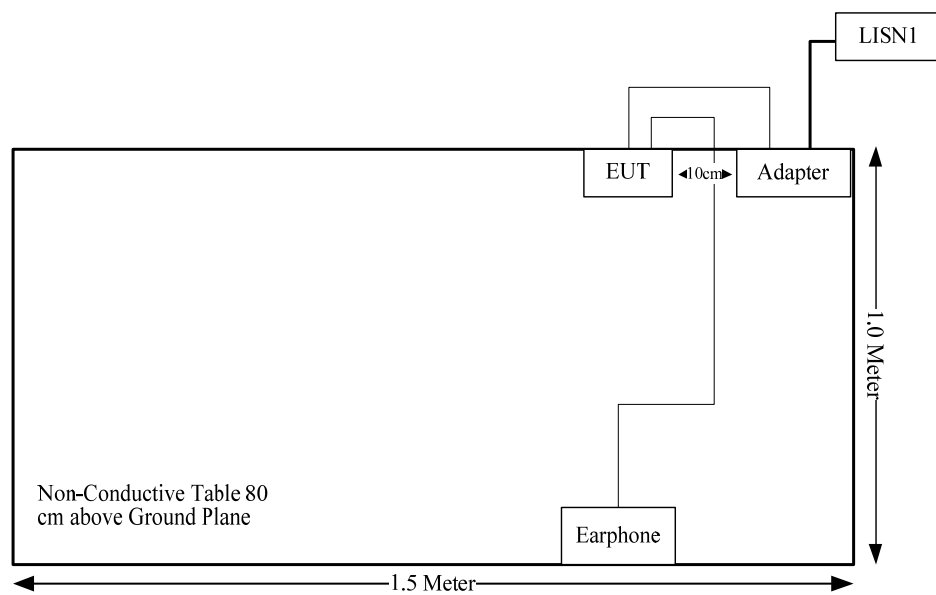
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
1MORE	Earphone	1m301	5521427

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Earphone Cable	No	No	1.0	EUT	Earphone
USB Cable	No	No	0.8	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
FCC§15.203	Antenna Requirement	Compliance
FCC§15.207 (a)	AC Line Conducted Emissions	Compliance
FCC§15.205, §15.209, FCC §15.247(d)	Spurious Emissions	Compliance
FCC§15.247 (a)(2)	6 dB Bandwidth	Compliance
FCC§15.247(b)(3)	Maximum Conducted Output Power	Compliance
FCC§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
FCC§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

Measurement Result

Compliance. Please refer the SAR report RXM200310053-20.

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.

Antenna Information And Connector Construction

The EUT has one internal antenna arrangement, fulfill the requirement of this section. Please refer to below information and the EUT photos:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
FPC	50	0.8 dBi/2.4~2.5GHz

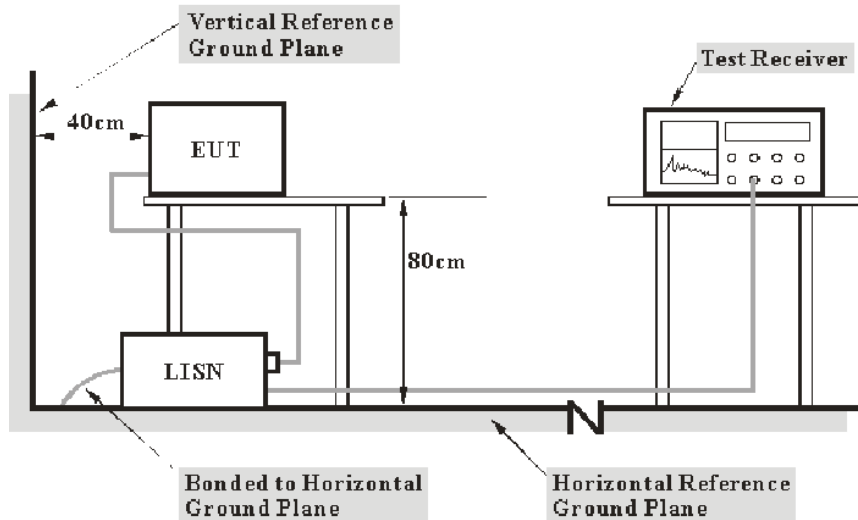
Result: Compliance.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a).

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

Test Procedure

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

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:

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

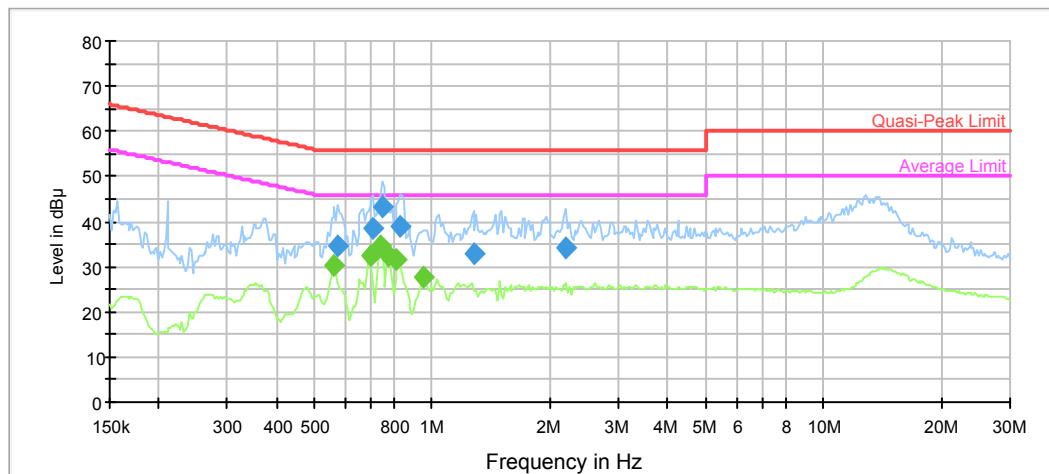
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	LISN	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2019-05-09	2020-05-09

* **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).

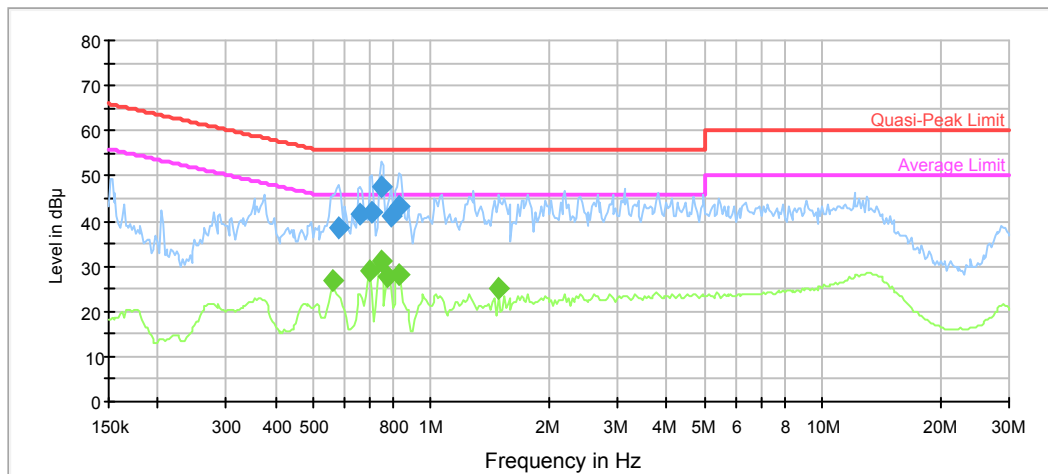
Test Data**Environmental Conditions**

Temperature:	24°C
Relative Humidity:	71%
ATM Pressure:	102.1kPa
Test by:	Sem Xiang
Test Date:	2020-03-19

*Test Mode: Transmitting***AC120 V, 60 Hz, Line:**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.574747	34.7	9.000	L1	9.7	21.3	56.0
0.708314	38.6	9.000	L1	9.7	17.4	56.0
0.744445	43.4	9.000	L1	9.7	12.6	56.0
0.830554	39.1	9.000	L1	9.7	16.9	56.0
1.274051	32.9	9.000	L1	9.7	23.1	56.0
2.202229	34.1	9.000	L1	9.8	21.9	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.563423	30.2	9.000	L1	9.7	15.8	46.0
0.694357	32.4	9.000	L1	9.7	13.6	46.0
0.737074	34.5	9.000	L1	9.7	11.5	46.0
0.774673	32.4	9.000	L1	9.7	13.6	46.0
0.814189	31.7	9.000	L1	9.7	14.3	46.0
0.954700	27.8	9.000	L1	9.7	18.2	46.0

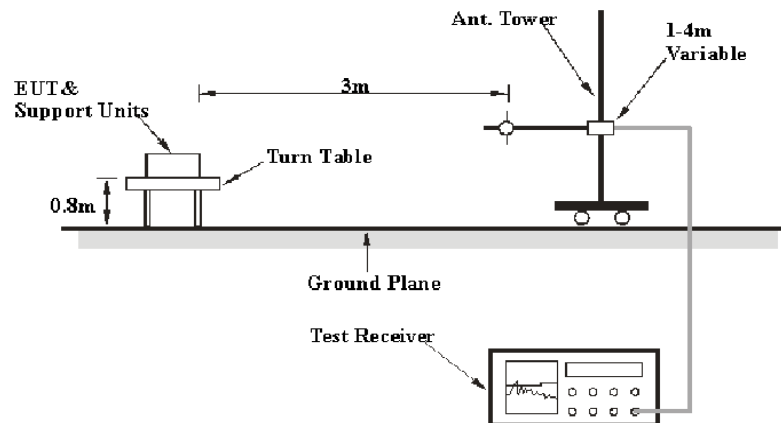
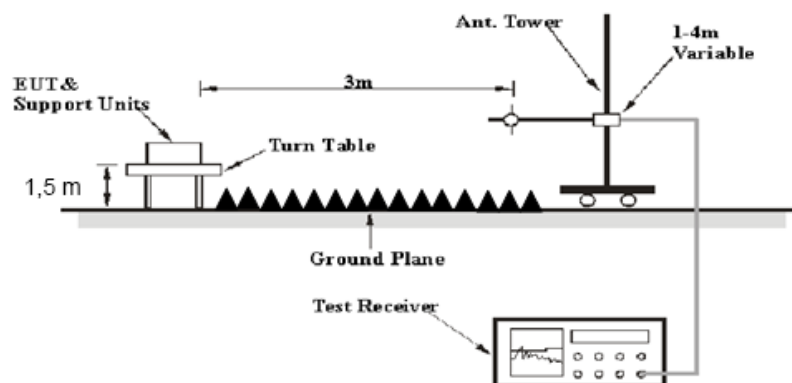
AC120 V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.580495	38.7	9.000	N	9.6	17.3	56.0
0.660657	41.5	9.000	N	9.6	14.5	56.0
0.708314	42.1	9.000	N	9.6	13.9	56.0
0.744445	47.8	9.000	N	9.6	8.2	56.0
0.790244	41.0	9.000	N	9.6	15.0	56.0
0.830554	43.4	9.000	N	9.6	12.6	56.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.563423	26.7	9.000	N	9.6	19.3	46.0
0.701301	29.0	9.000	N	9.6	17.0	46.0
0.744445	31.2	9.000	N	9.6	14.8	46.0
0.774673	27.6	9.000	N	9.6	18.4	46.0
0.830554	28.2	9.000	N	9.6	17.8	46.0
1.493925	25.0	9.000	N	9.6	21.0	46.0

FCC §15.209, §15.205, §15.247(d) - SPURIOUS EMISSIONS**Applicable Standard**

FCC §15.247 (d); §15.209; §15.205.

EUT Setup**Below 1GHz:****Above 1GHz:**

The radiated emission tests were performed in the 3 meters chamber test site A for the range 30MHz to 1GHz and the 3 meters chamber B test site for above 1GHz, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits..

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

30MHz-1000MHz:

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

1GHz- 26.5GHz:

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

Note: T is minimum transmission duration

Test Procedure

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

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

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation Below 1GHz					
R&S	EMI Test Receiver	ESR3	102453	2019-09-12	2020-09-12
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2019-05-06	2020-05-06
HP	Amplifier	8447D	2727A05902	2019-09-05	2020-09-05
Radiation Above 1GHz					
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-05-09	2020-05-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2019-06-27	2020-06-27
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2019-09-05	2020-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2019-06-16	2020-06-16
Micro-tronics	High Pass Filter	HPM50111	S/N-G217	2019-06-16	2020-06-16

* **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**

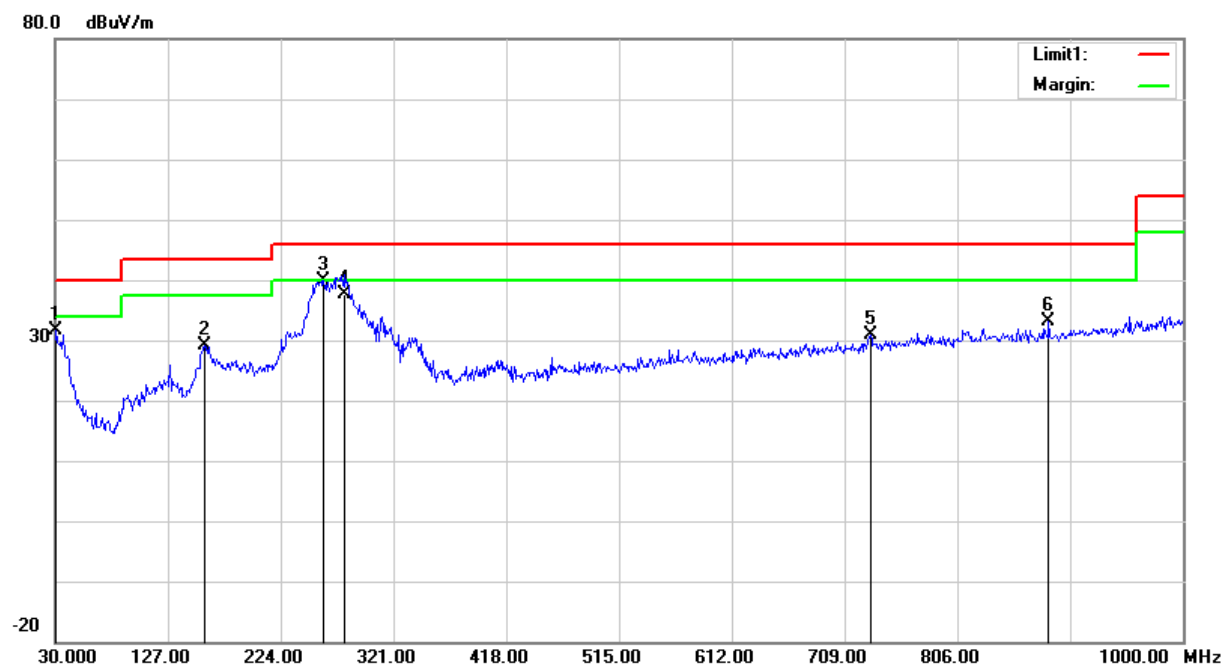
Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	24.1°C	26°C
Relative Humidity:	51%	50%
ATM Pressure:	100.9 kPa	101.4 kPa
Tester:	Bond Qin	Vern Shen
Test Date:	2020-03-28	2020-03-30

Test Mode: Transmitting

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

1) 30MHz-1GHz(High channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	30.76	peak	0.91	31.67	40.00	8.33
158.0400	34.87	peak	-5.78	29.09	43.50	14.41
260.8600	45.00	peak	-5.11	39.89	46.00	6.11
278.3200	41.70	QP	-4.12	37.58	46.00	8.42
731.3100	27.50	peak	3.26	30.76	46.00	15.24
884.5700	33.49	peak	-0.26	33.23	46.00	12.77

Vertical:

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
33.8800	33.29	peak	-1.29	32.00	40.00	8.00
130.8800	30.92	peak	-4.85	26.07	43.50	17.43
170.6500	33.75	peak	-6.63	27.12	43.50	16.38
280.2600	39.60	peak	-4.15	35.45	46.00	10.55
732.2800	28.46	peak	3.25	31.71	46.00	14.29
830.2500	28.11	peak	5.06	33.17	46.00	12.83

2) 1-25GHz:**802.11b Mode:**

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	76.50	PK	H	28.12	1.81	0.00	106.43	N/A	N/A
2412.00	73.63	AV	H	28.12	1.81	0.00	103.56	N/A	N/A
2412.00	76.90	PK	V	28.12	1.81	0.00	106.83	N/A	N/A
2412.00	73.65	AV	V	28.12	1.81	0.00	103.58	N/A	N/A
2390.00	28.79	PK	V	28.08	1.80	0.00	58.67	74.00	15.33
2390.00	15.78	AV	V	28.08	1.80	0.00	45.66	54.00	8.34
4824.00	36.35	PK	V	32.95	3.19	25.62	46.87	74.00	27.13
4824.00	25.83	AV	V	32.95	3.19	25.62	36.35	54.00	17.65
7236.00	35.87	PK	V	35.81	4.77	25.64	50.81	74.00	23.19
7236.00	23.41	AV	V	35.81	4.77	25.64	38.35	54.00	15.65
Middle Channel: 2437 MHz									
2437.00	73.05	PK	H	28.17	1.82	0.00	103.04	N/A	N/A
2437.00	70.08	AV	H	28.17	1.82	0.00	100.07	N/A	N/A
2437.00	73.42	PK	V	28.17	1.82	0.00	103.41	N/A	N/A
2437.00	70.34	AV	V	28.17	1.82	0.00	100.33	N/A	N/A
4874.00	35.99	PK	V	33.05	3.26	25.65	46.65	74.00	27.35
4874.00	25.63	AV	V	33.05	3.26	25.65	36.29	54.00	17.71
7311.00	35.68	PK	V	36.01	4.64	25.71	50.62	74.00	23.38
7311.00	25.31	AV	V	36.01	4.64	25.71	40.25	54.00	13.75
High Channel: 2462 MHz									
2462.00	71.52	PK	H	28.22	1.83	0.00	101.57	N/A	N/A
2462.00	68.10	AV	H	28.22	1.83	0.00	98.15	N/A	N/A
2462.00	71.80	PK	V	28.22	1.83	0.00	101.85	N/A	N/A
2462.00	68.45	AV	V	28.22	1.83	0.00	98.50	N/A	N/A
2483.50	27.17	PK	V	28.27	1.84	0.00	57.28	74.00	16.72
2483.50	15.33	AV	V	28.27	1.84	0.00	45.44	54.00	8.56
4924.00	35.62	PK	V	33.15	3.27	25.65	46.39	74.00	27.61
4924.00	25.40	AV	V	33.15	3.27	25.65	36.17	54.00	17.83
7386.00	35.52	PK	V	36.20	4.51	25.79	50.44	74.00	23.56
7386.00	25.06	AV	V	36.20	4.51	25.79	39.98	54.00	14.02

802.11g Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	75.56	PK	H	28.12	1.81	0.00	105.49	N/A	N/A
2412.00	72.03	AV	H	28.12	1.81	0.00	101.96	N/A	N/A
2412.00	76.01	PK	V	28.12	1.81	0.00	105.94	N/A	N/A
2412.00	72.67	AV	V	28.12	1.81	0.00	102.60	N/A	N/A
2390.00	26.39	PK	V	28.08	1.80	0.00	56.27	74.00	17.73
2390.00	14.20	AV	V	28.08	1.80	0.00	44.08	54.00	9.92
4824.00	35.62	PK	V	32.95	3.19	25.62	46.14	74.00	27.86
4824.00	25.49	AV	V	32.95	3.19	25.62	36.01	54.00	17.99
7236.00	35.31	PK	V	35.81	4.77	25.64	50.25	74.00	23.75
7236.00	25.24	AV	V	35.81	4.77	25.64	40.18	54.00	13.82
Middle Channel: 2437 MHz									
2437.00	75.12	PK	H	28.17	1.82	0.00	105.11	N/A	N/A
2437.00	72.10	AV	H	28.17	1.82	0.00	102.09	N/A	N/A
2437.00	76.05	PK	V	28.17	1.82	0.00	106.04	N/A	N/A
2437.00	72.71	AV	V	28.17	1.82	0.00	102.70	N/A	N/A
4874.00	35.24	PK	V	33.05	3.26	25.65	45.90	74.00	28.10
4874.00	25.13	AV	V	33.05	3.26	25.65	35.79	54.00	18.21
7311.00	35.22	PK	V	36.01	4.64	25.71	50.16	74.00	23.84
7311.00	25.14	AV	V	36.01	4.64	25.71	40.08	54.00	13.92
High Channel: 2462 MHz									
2462.00	75.32	PK	H	28.22	1.83	0.00	105.37	N/A	N/A
2462.00	72.05	AV	H	28.22	1.83	0.00	102.10	N/A	N/A
2462.00	75.49	PK	V	28.22	1.83	0.00	105.54	N/A	N/A
2462.00	72.16	AV	V	28.22	1.83	0.00	102.21	N/A	N/A
2483.50	26.38	PK	V	28.27	1.84	0.00	56.49	74.00	17.51
2483.50	14.18	AV	V	28.27	1.84	0.00	44.29	54.00	9.71
4924.00	35.26	PK	V	33.15	3.27	25.65	46.03	74.00	27.97
4924.00	25.19	AV	V	33.15	3.27	25.65	35.96	54.00	18.04
7386.00	36.49	PK	V	36.20	4.51	25.79	51.41	74.00	22.59
7386.00	25.73	AV	V	36.20	4.51	25.79	40.65	54.00	13.35

802.11n ht20 Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	76.01	PK	H	28.12	1.81	0.00	105.94	N/A	N/A
2412.00	72.34	AV	H	28.12	1.81	0.00	102.27	N/A	N/A
2412.00	76.18	PK	V	28.12	1.81	0.00	106.11	N/A	N/A
2412.00	72.51	AV	V	28.12	1.81	0.00	102.44	N/A	N/A
2390.00	25.99	PK	V	28.08	1.80	0.00	55.87	74.00	18.13
2390.00	14.08	AV	V	28.08	1.80	0.00	43.96	54.00	10.04
4824.00	35.29	PK	V	32.95	3.19	25.62	45.81	74.00	28.19
4824.00	25.07	AV	V	32.95	3.19	25.62	35.59	54.00	18.41
7236.00	35.94	PK	V	35.81	4.77	25.64	50.88	74.00	23.12
7236.00	25.68	AV	V	35.81	4.77	25.64	40.62	54.00	13.38
Middle Channel: 2437 MHz									
2437.00	75.68	PK	H	28.17	1.82	0.00	105.67	N/A	N/A
2437.00	72.15	AV	H	28.17	1.82	0.00	102.14	N/A	N/A
2437.00	76.05	PK	V	28.17	1.82	0.00	106.04	N/A	N/A
2437.00	72.63	AV	V	28.17	1.82	0.00	102.62	N/A	N/A
4874.00	35.29	PK	V	33.05	3.26	25.65	45.95	74.00	28.05
4874.00	25.04	AV	V	33.05	3.26	25.65	35.70	54.00	18.30
7311.00	36.03	PK	V	36.01	4.64	25.71	50.97	74.00	23.03
7311.00	25.80	AV	V	36.01	4.64	25.71	40.74	54.00	13.26
High Channel: 2462 MHz									
2462.00	75.88	PK	H	28.22	1.83	0.00	105.93	N/A	N/A
2462.00	72.30	AV	H	28.22	1.83	0.00	102.35	N/A	N/A
2462.00	76.10	PK	V	28.22	1.83	0.00	106.15	N/A	N/A
2462.00	72.65	AV	V	28.22	1.83	0.00	102.70	N/A	N/A
2483.50	26.34	PK	V	28.27	1.84	0.00	56.45	74.00	17.55
2483.50	14.11	AV	V	28.27	1.84	0.00	44.22	54.00	9.78
4924.00	36.01	PK	V	33.15	3.27	25.65	46.78	74.00	27.22
4924.00	25.08	AV	V	33.15	3.27	25.65	35.85	54.00	18.15
7386.00	36.24	PK	V	36.20	4.51	25.79	51.16	74.00	22.84
7386.00	25.35	AV	V	36.20	4.51	25.79	40.27	54.00	13.73

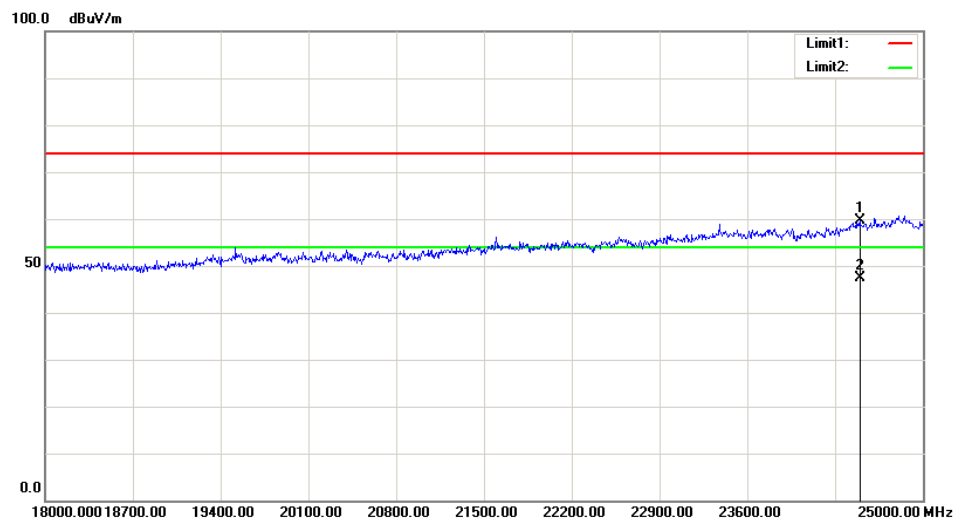
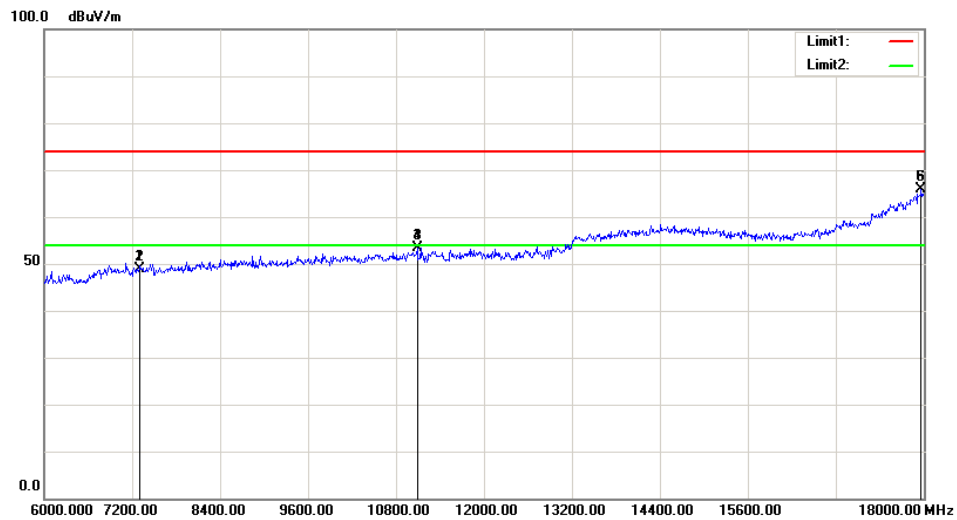
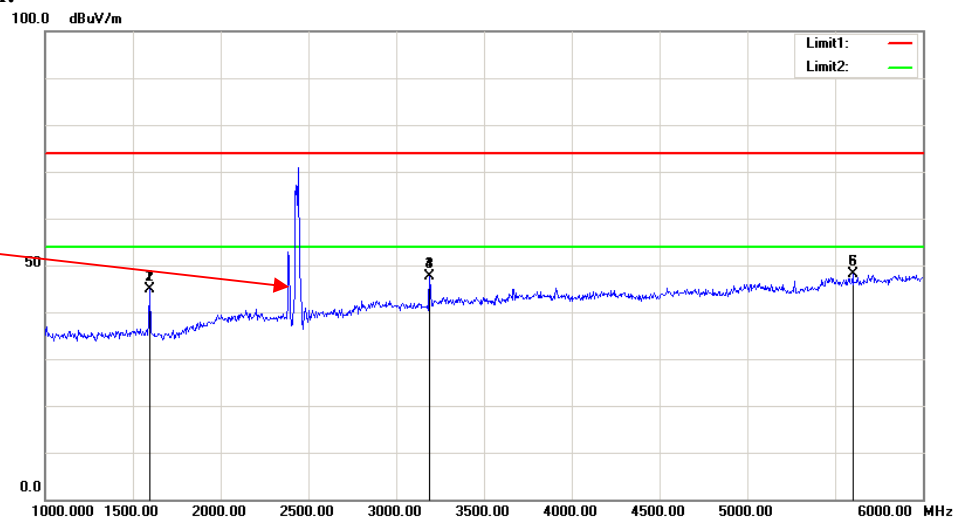
802.11n ht40 Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2422 MHz									
2422.00	74.95	PK	H	28.14	1.81	0.00	104.90	N/A	N/A
2422.00	71.87	AV	H	28.14	1.81	0.00	101.82	N/A	N/A
2422.00	75.13	PK	V	28.14	1.81	0.00	105.08	N/A	N/A
2422.00	72.05	AV	V	28.14	1.81	0.00	102.00	N/A	N/A
2390.00	25.82	PK	V	28.08	1.80	0.00	55.70	74.00	18.30
2390.00	14.00	AV	V	28.08	1.80	0.00	43.88	54.00	10.12
4844.00	35.21	PK	V	32.99	3.22	25.63	45.79	74.00	28.21
4844.00	25.16	AV	V	32.99	3.22	25.63	35.74	54.00	18.26
7266.00	35.79	PK	V	35.89	4.72	25.67	50.73	74.00	23.27
7266.00	25.44	AV	V	35.89	4.72	25.67	40.38	54.00	13.62
Middle Channel: 2437 MHz									
2437.00	74.88	PK	H	28.17	1.82	0.00	104.87	N/A	N/A
2437.00	71.65	AV	H	28.17	1.82	0.00	101.64	N/A	N/A
2437.00	74.96	PK	V	28.17	1.82	0.00	104.95	N/A	N/A
2437.00	72.03	AV	V	28.17	1.82	0.00	102.02	N/A	N/A
4874.00	35.12	PK	V	33.05	3.26	25.65	45.78	74.00	28.22
4874.00	24.97	AV	V	33.05	3.26	25.65	35.63	54.00	18.37
7311.00	35.89	PK	V	36.01	4.64	25.71	50.83	74.00	23.17
7311.00	25.71	AV	V	36.01	4.64	25.71	40.65	54.00	13.35
High Channel: 2452 MHz									
2452.00	74.52	PK	H	28.20	1.83	0.00	104.55	N/A	N/A
2452.00	71.24	AV	H	28.20	1.83	0.00	101.27	N/A	N/A
2452.00	75.01	PK	V	28.20	1.83	0.00	105.04	N/A	N/A
2452.00	71.35	AV	V	28.20	1.83	0.00	101.38	N/A	N/A
2483.50	25.94	PK	V	28.27	1.84	0.00	56.05	74.00	17.95
2483.50	14.77	AV	V	28.27	1.84	0.00	44.88	54.00	9.12
4904.00	35.26	PK	V	33.11	3.30	25.67	46.00	74.00	28.00
4904.00	25.31	AV	V	33.11	3.30	25.67	36.05	54.00	17.95
7356.00	35.60	PK	V	36.13	4.56	25.76	50.53	74.00	23.47
7356.00	25.43	AV	V	36.13	4.56	25.76	40.36	54.00	13.64

Worst Test plots(802.11n ht20 middle channel)

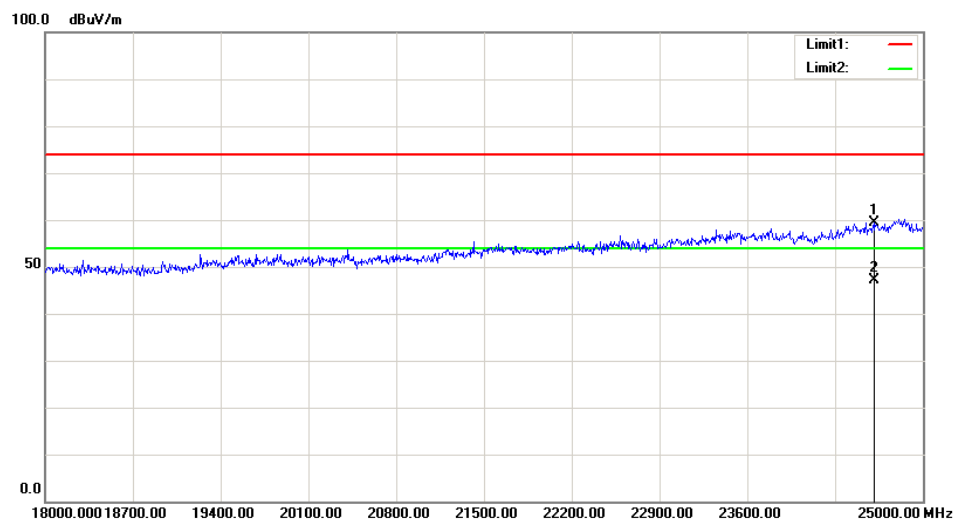
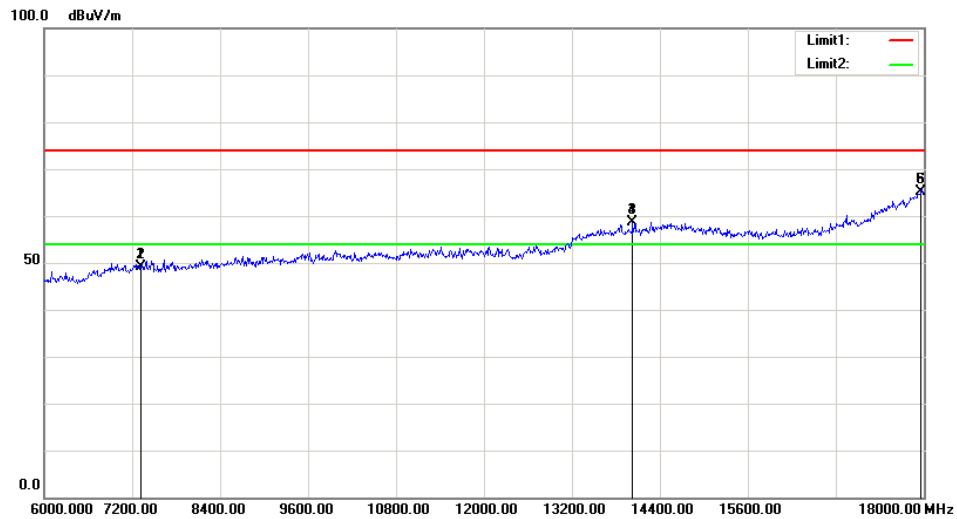
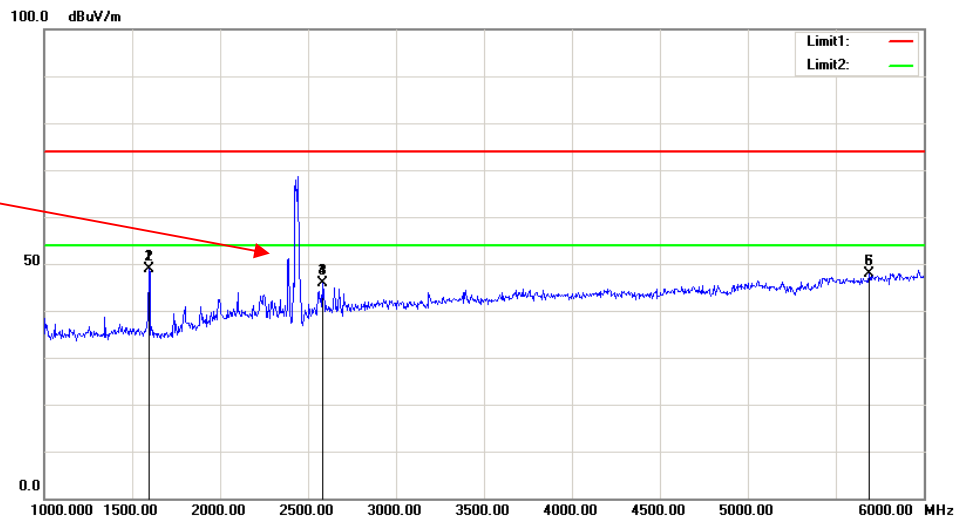
Horizontal:

Fundamental
Test with Band
Rejection Filter



Vertical:

Fundamental
Test with Band
Rejection Filter



FCC §15.247(a) (2)–6 dB EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

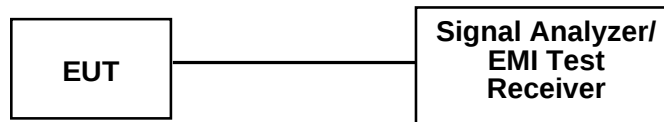
Test Procedure

6dB bandwidth test:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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.

99% Occupied bandwidth test:

Use Occupied bandwidth test function, measure the 99% Occupied bandwidth.
Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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).

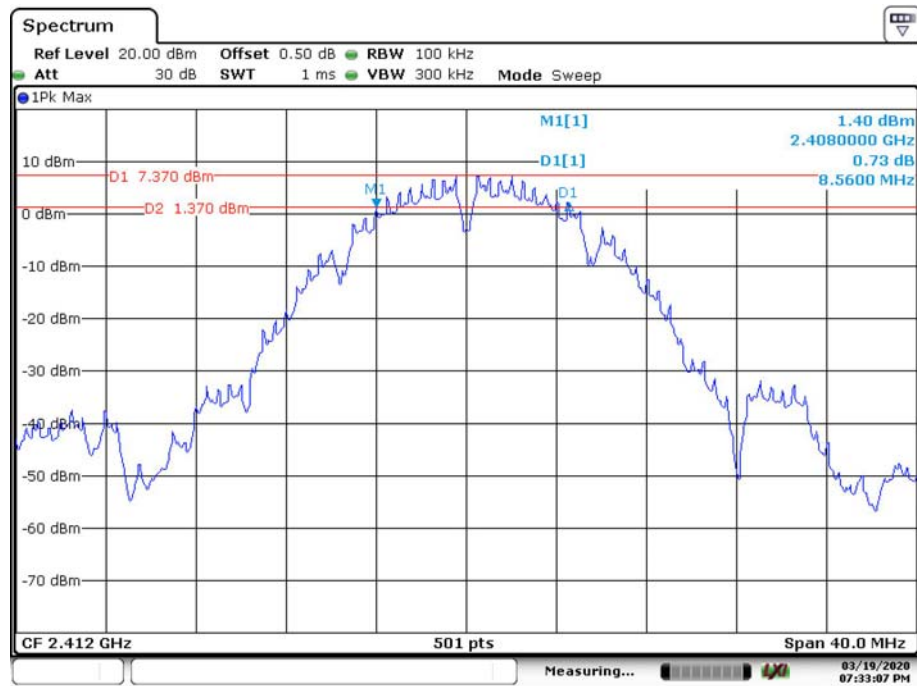
Test Data**Environmental Conditions**

Temperature:	24.1°C
Relative Humidity:	64%
ATM Pressure:	102.1 Pa
Tester:	Lucy Lu
Test Date:	2020-03-19

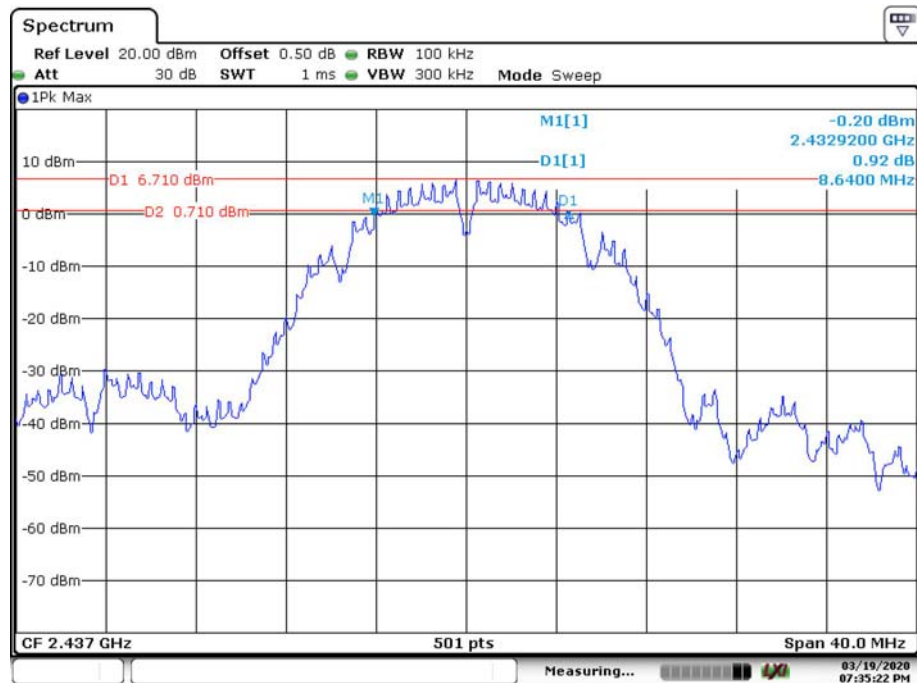
Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	6 dB Bandwidth Limit (MHz)
802.11b	Low	2412	8.560	13.253	≥0.5
	Middle	2437	8.640	13.253	≥0.5
	High	2462	9.040	13.653	≥0.5
802.11g	Low	2412	15.280	17.325	≥0.5
	Middle	2437	16.240	18.443	≥0.5
	High	2462	15.840	18.922	≥0.5
802.11n ht20	Low	2412	15.360	18.124	≥0.5
	Middle	2437	17.440	19.481	≥0.5
	High	2462	16.480	19.641	≥0.5
802.11n ht40	Low	2422	20.000	36.567	≥0.5
	Middle	2437	35.840	38.483	≥0.5
	High	2452	28.800	36.407	≥0.5

6dB bandwidth:**802.11b Low Channel**

Date: 19.MAR.2020 19:33:08

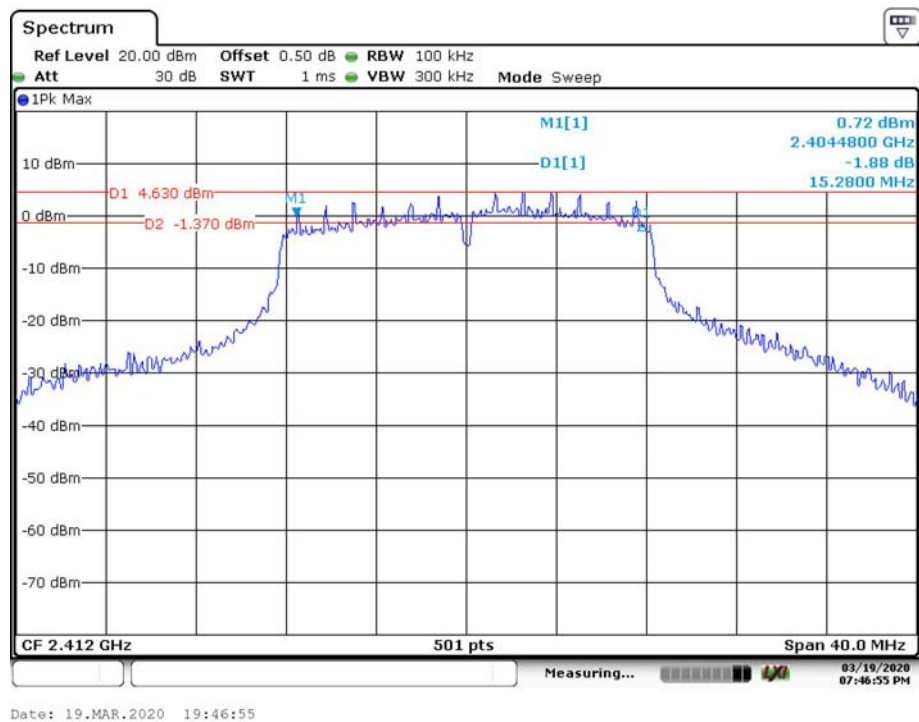
802.11b Middle Channel

Date: 19.MAR.2020 19:35:22

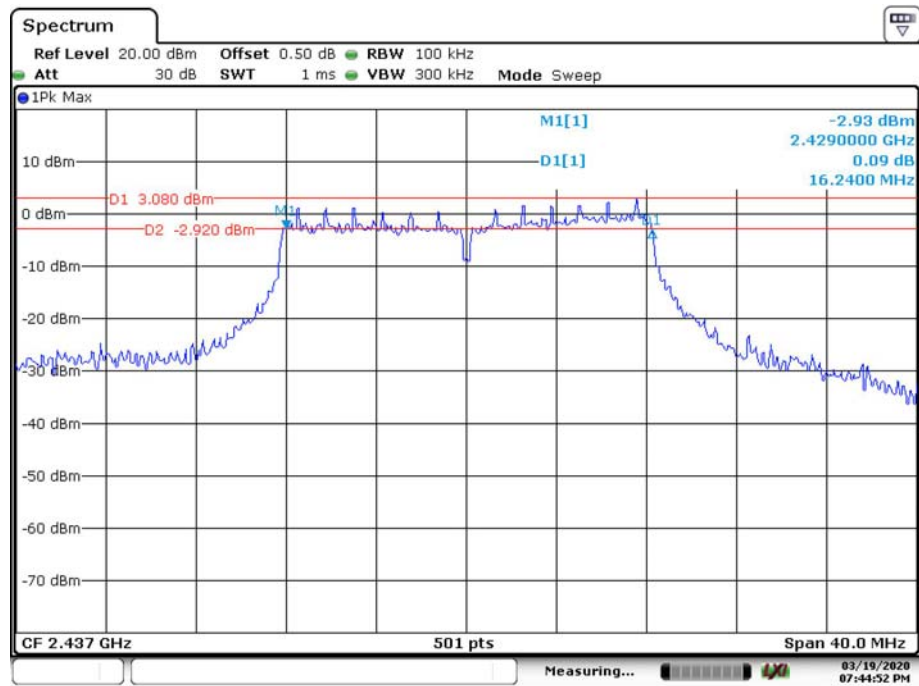
802.11b High Channel



802.11g Low Channel

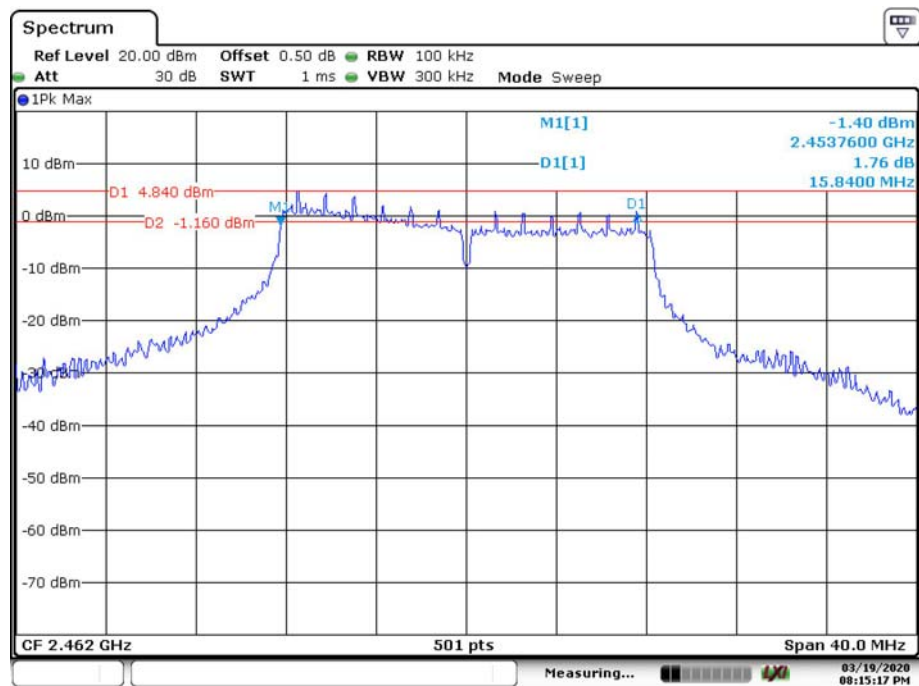


802.11g Middle Channel



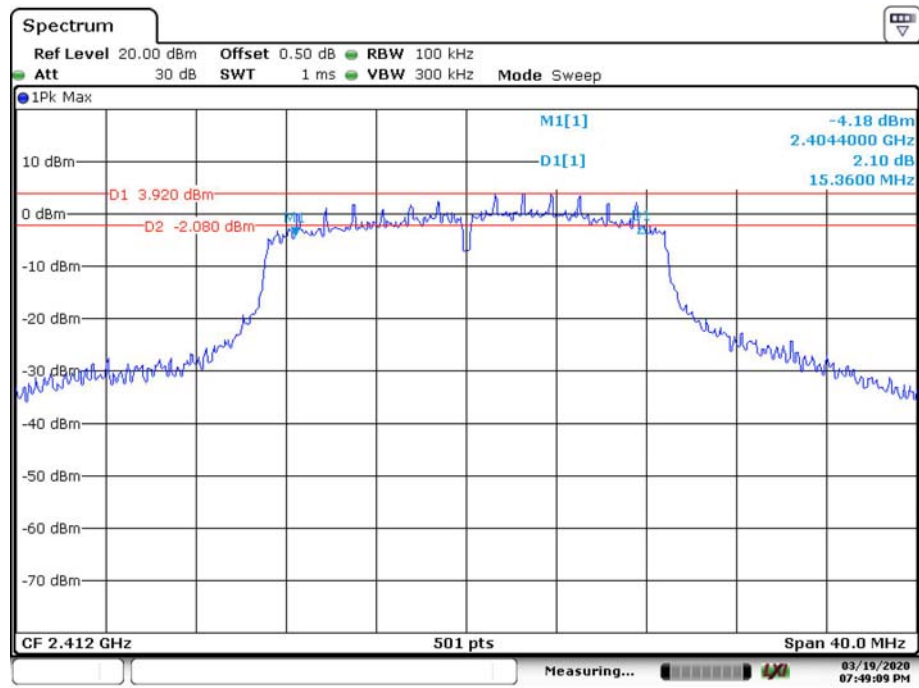
Date: 19.MAR.2020 19:44:52

802.11g High Channel



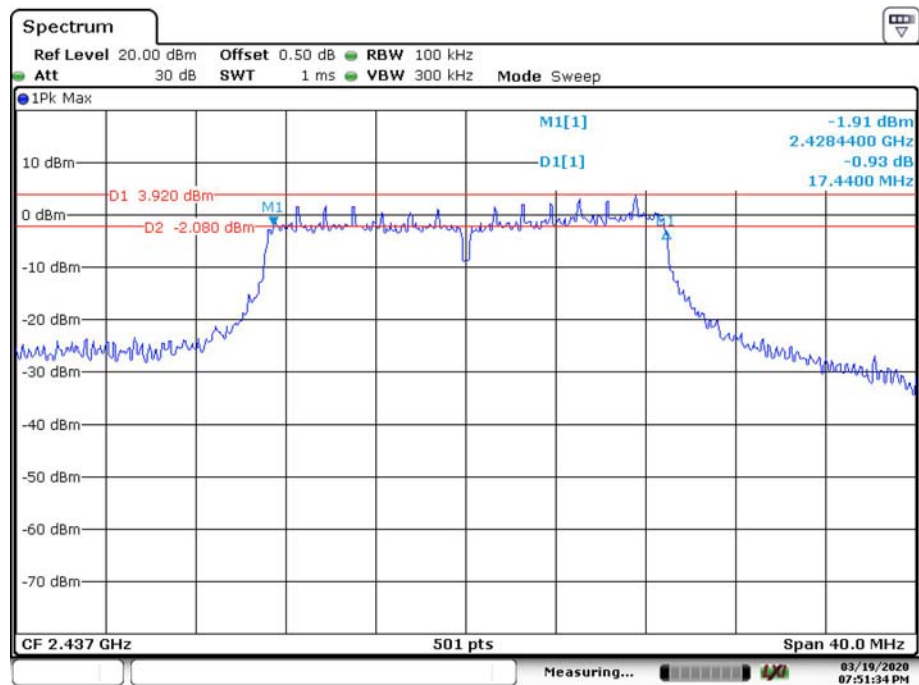
Date: 19.MAR.2020 20:15:17

802.11n ht20 Low Channel



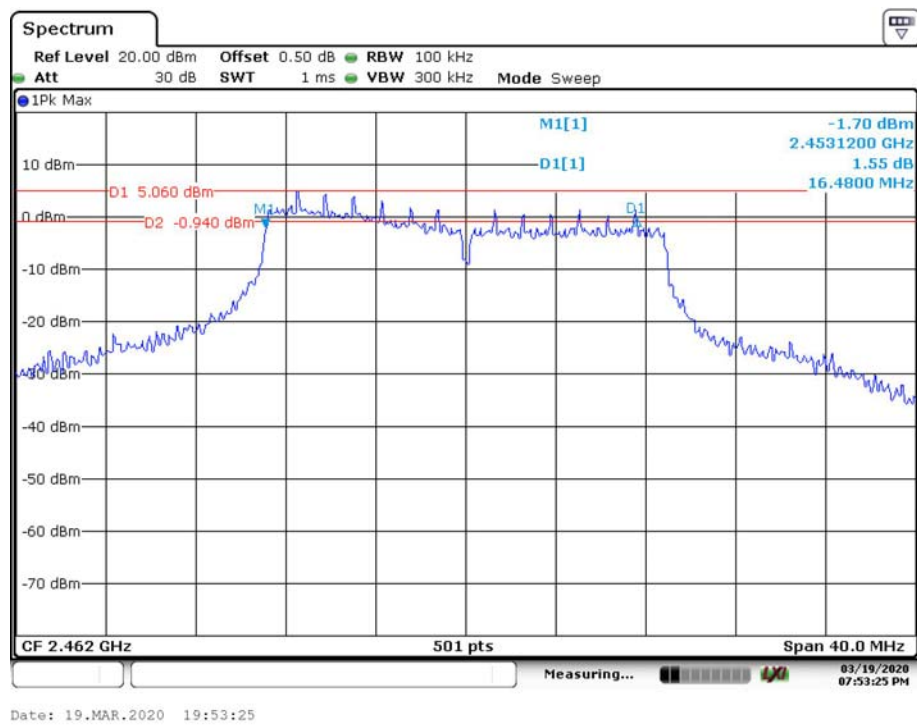
Date: 19.MAR.2020 19:49:10

802.11n ht20 Middle Channel

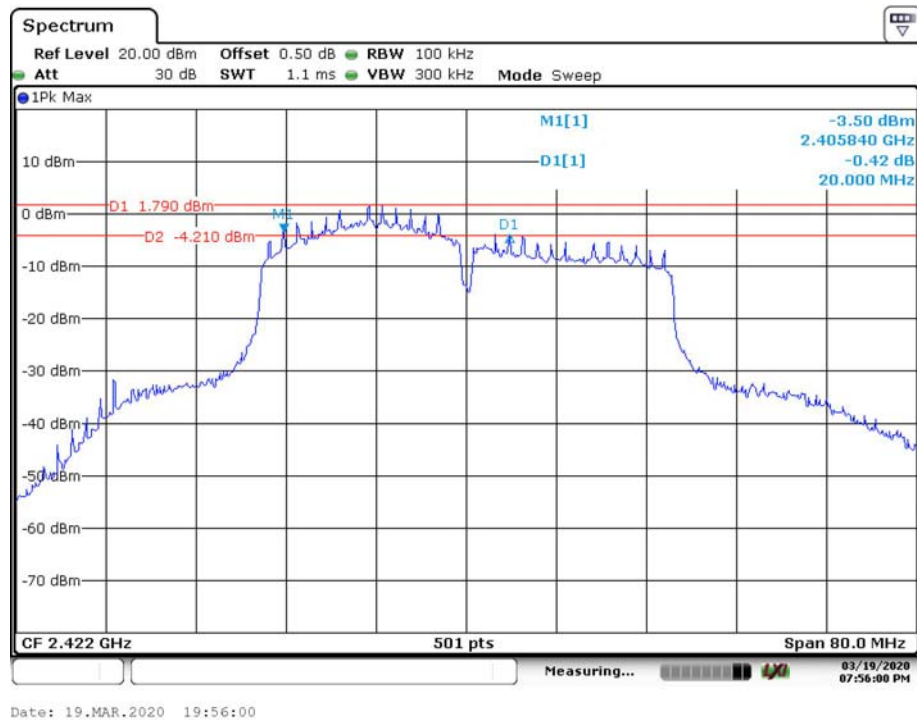


Date: 19.MAR.2020 19:51:35

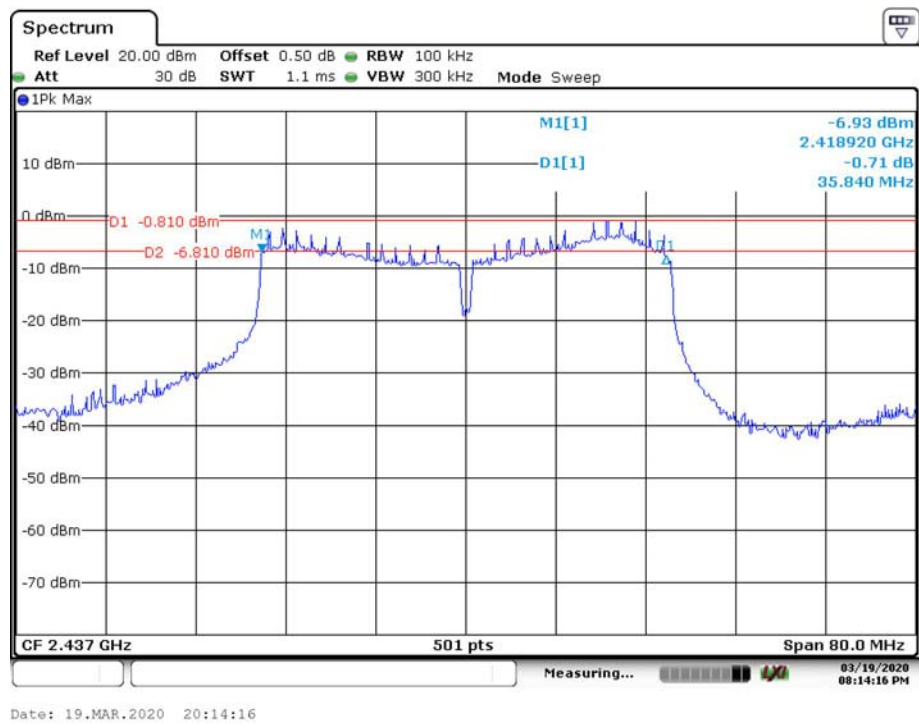
802.11n ht20 High Channel



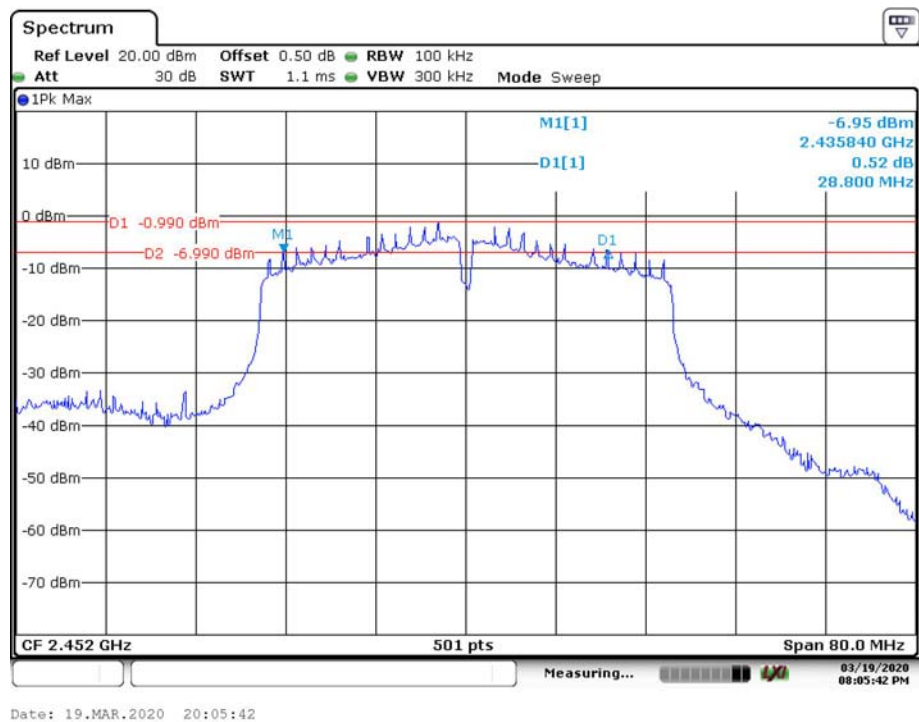
802.11n ht40 Low Channel



802.11n ht40 Middle Channel



802.11n ht40 High Channel



99% Occupied bandwidth:**802.11b Low Channel**

Date: 19.MAR.2020 19:33:23

802.11b Middle Channel

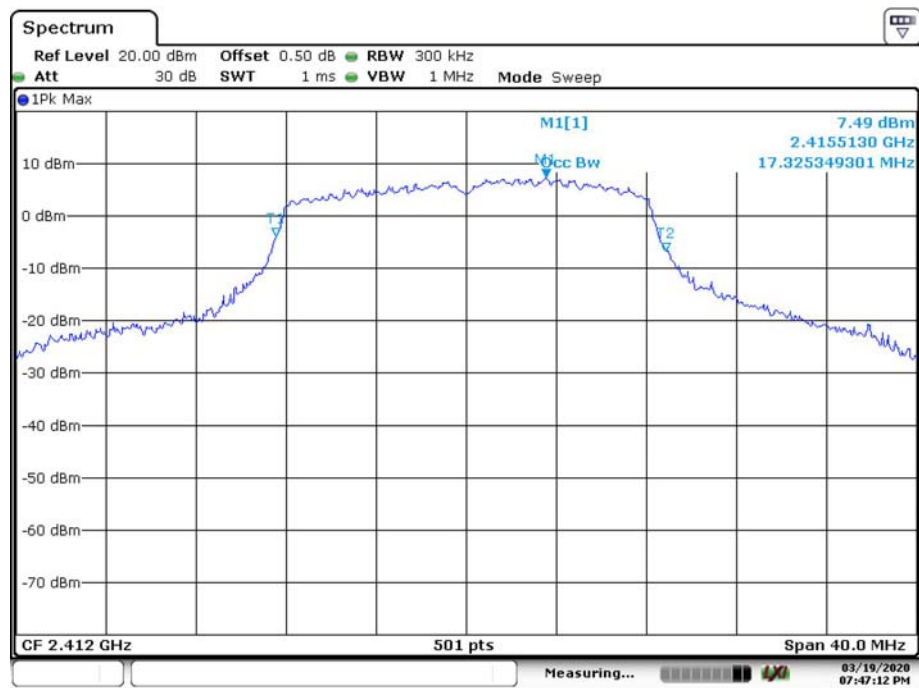
Date: 19.MAR.2020 19:35:33

802.11b High Channel



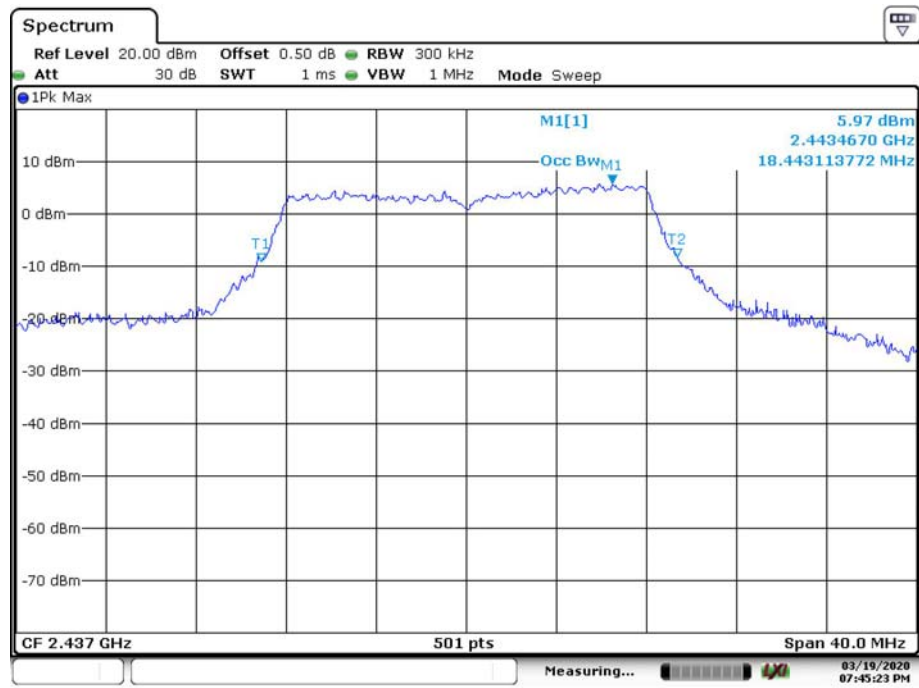
Date: 19.MAR.2020 19:37:15

802.11g Low Channel



Date: 19.MAR.2020 19:47:12

802.11g Middle Channel



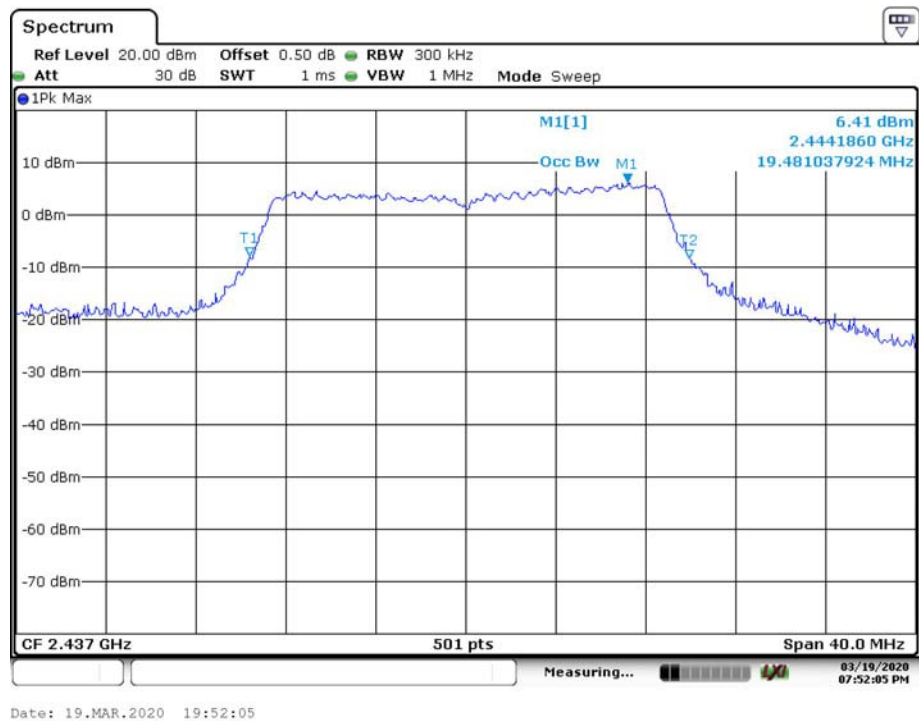
802.11g High Channel



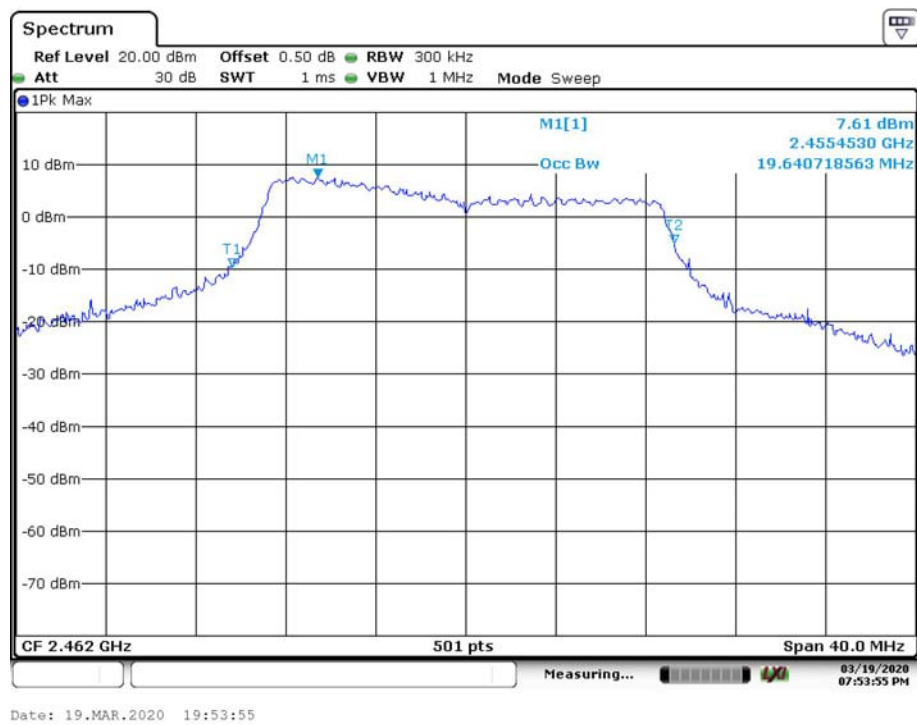
802.11n ht20 Low Channel



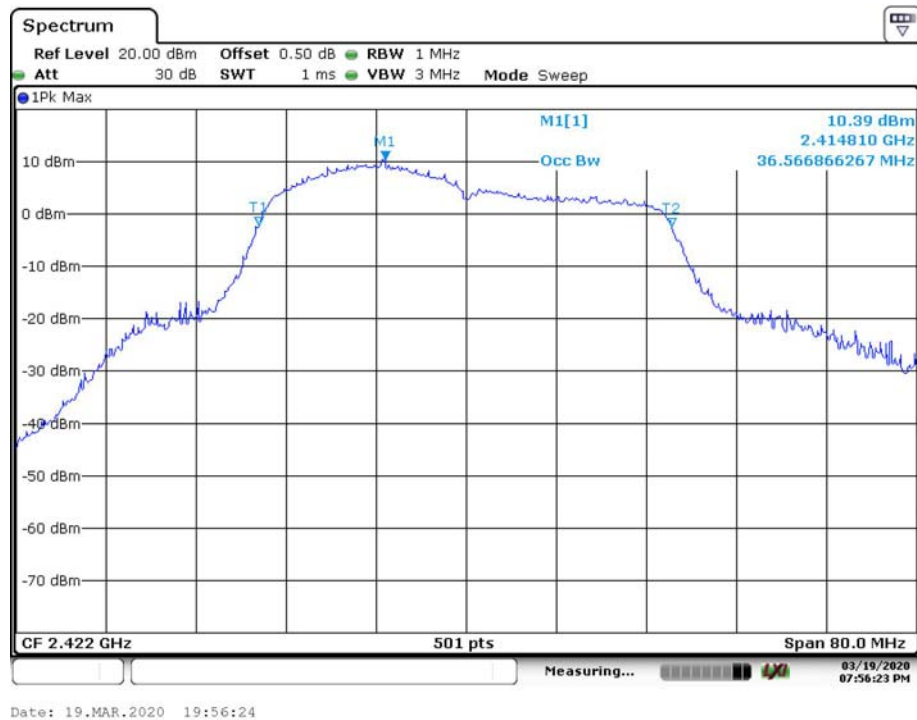
802.11n ht20 Middle Channel



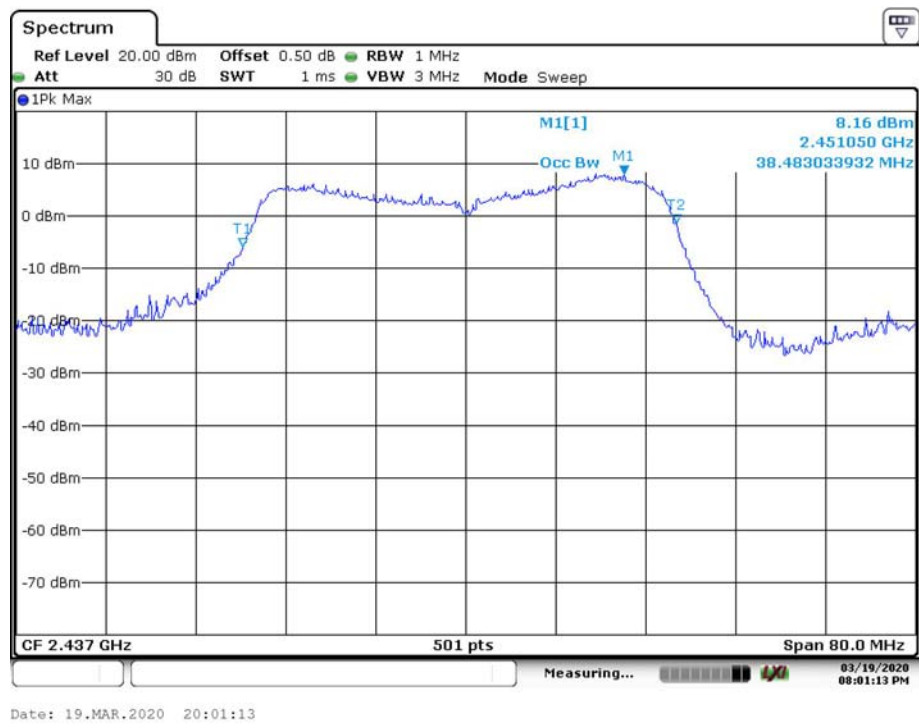
802.11n ht20 High Channel



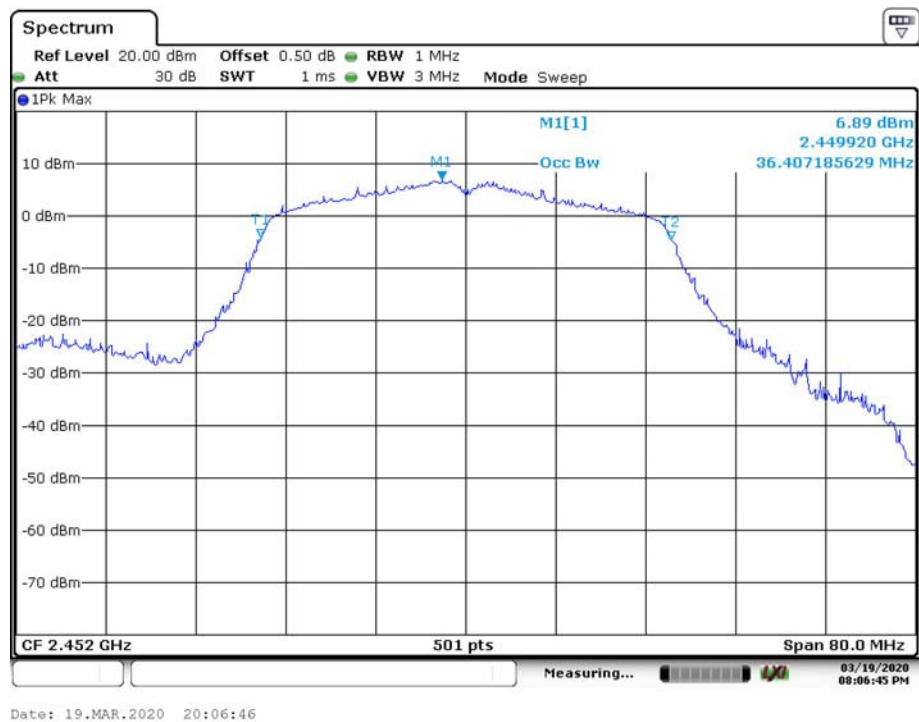
802.11n ht40 Low Channel



802.11n ht40 Middle Channel



802.11n ht40 High Channel

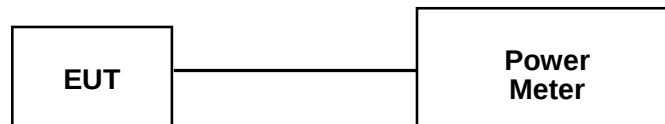


FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER**Applicable Standard**

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

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 test equipment.
3. Add a correction factor to the display.
4. Set the power Meter to test Peak output power, record the result as peak power.
5. Set the power meter to test average output power, record the result as average power.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	USB Wideband Power Sensor	U2021XA	MY54080014	2019-05-09	2020-05-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each Time	/

* **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:	24.1°C
Relative Humidity:	64%
ATM Pressure:	102.1 Pa
Tester:	Lucy Lu
Test Date:	2020-03-19

Test Mode: Transmitting

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

Test mode	Frequency (MHz)	Max Conducted Output Power (dBm)		
		Peak	Average	Limit
802.11b	2412	18.53	16.10	30
	2437	17.84	15.32	30
	2462	18.15	15.46	30
802.11g	2412	20.77	15.34	30
	2437	20.52	13.55	30
	2462	20.50	13.95	30
802.11n ht20	2412	20.72	14.13	30
	2437	20.78	13.73	30
	2462	20.80	14.34	30
802.11n ht40	2422	20.90	12.92	30
	2437	19.71	11.08	30
	2452	19.65	10.30	30

Note: The data above was tested in conducted mode, the antenna gain is 0.8 dBi.

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

According to FCC§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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

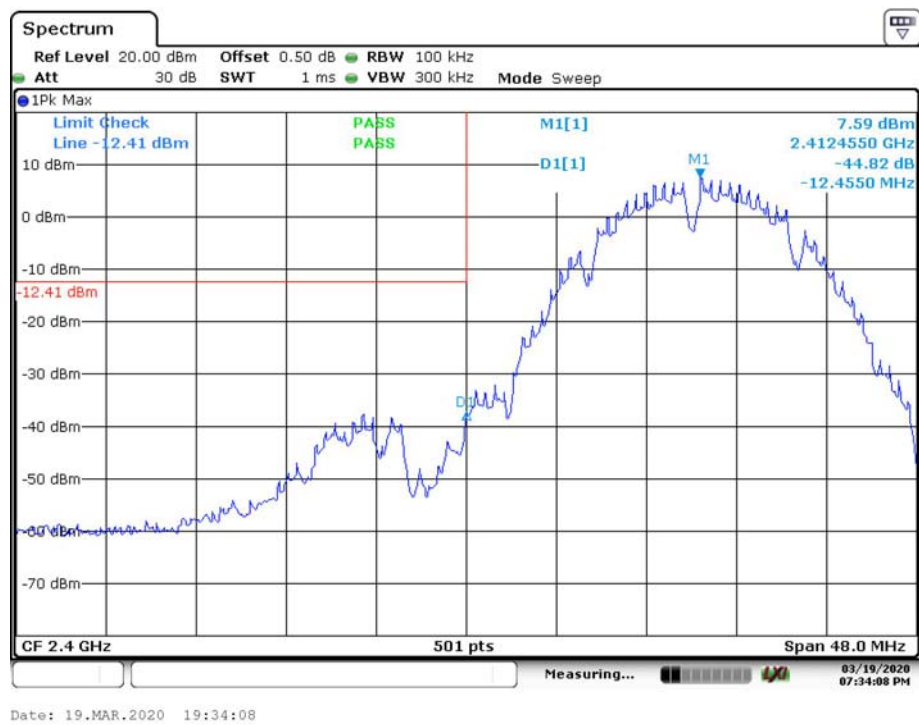
Environmental Conditions

Temperature:	24.1°C
Relative Humidity:	64%
ATM Pressure:	102.1 Pa
Tester:	Lucy Lu
Test Date:	2020-03-19

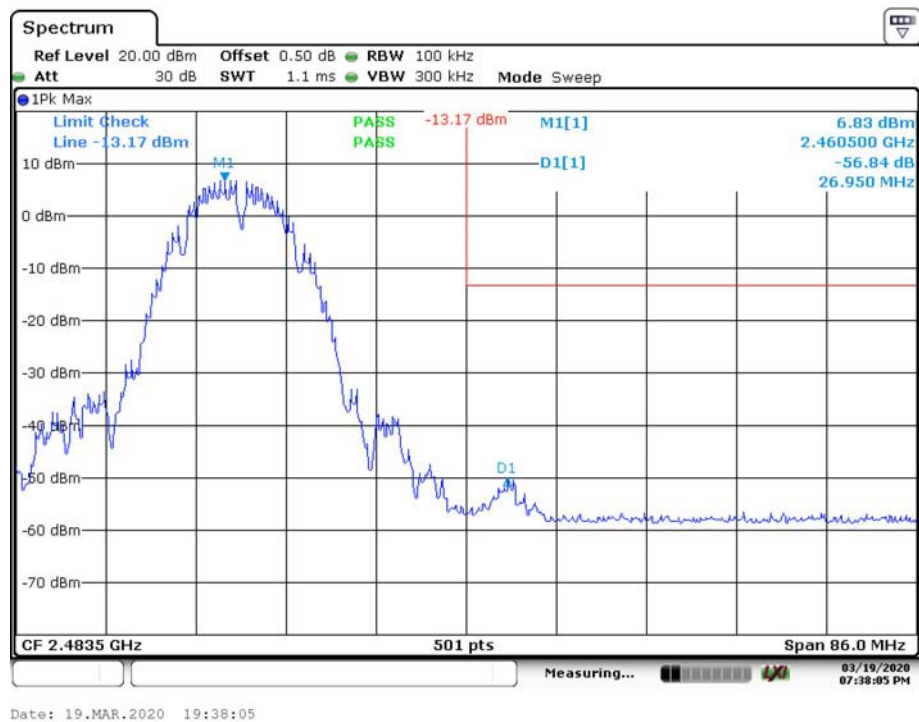
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

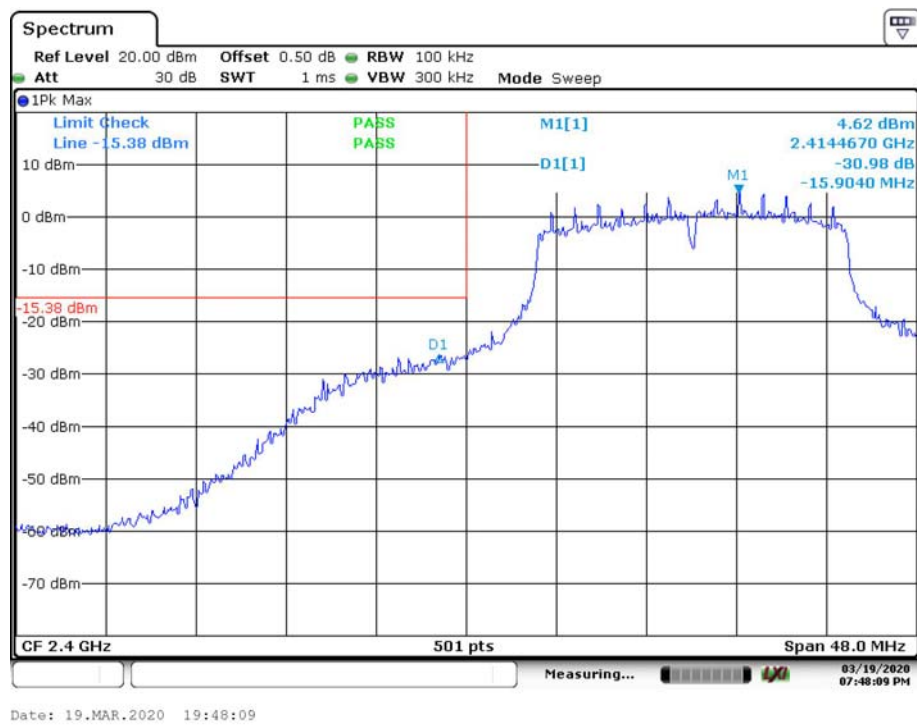
802.11b: Band Edge, Left Side



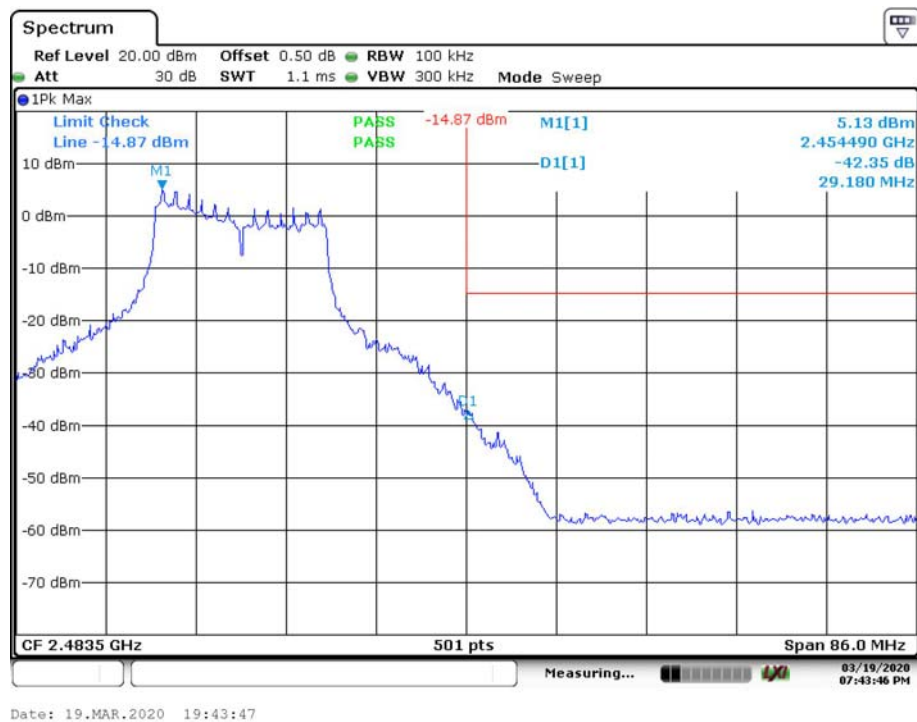
802.11b: Band Edge, Right Side



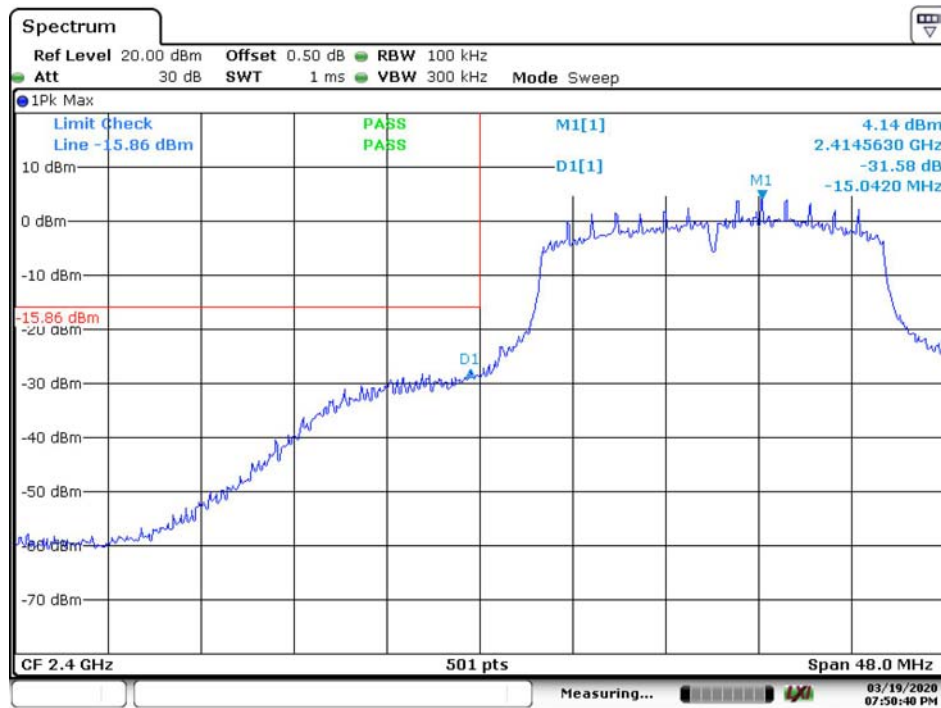
802.11g: Band Edge, Left Side



802.11g: Band Edge, Right Side

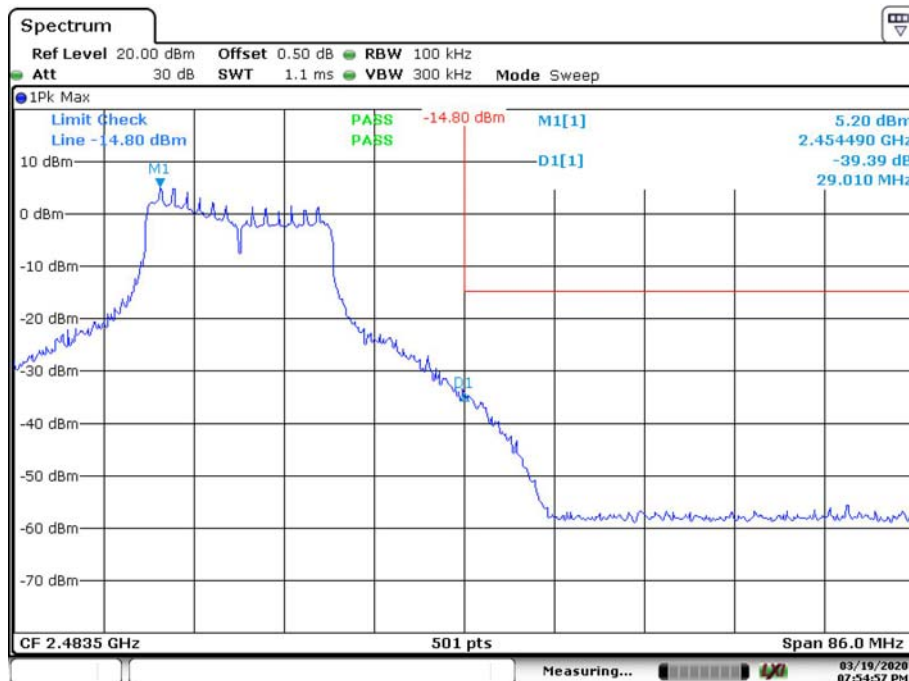


802.11n ht20 Band Edge, Left Side



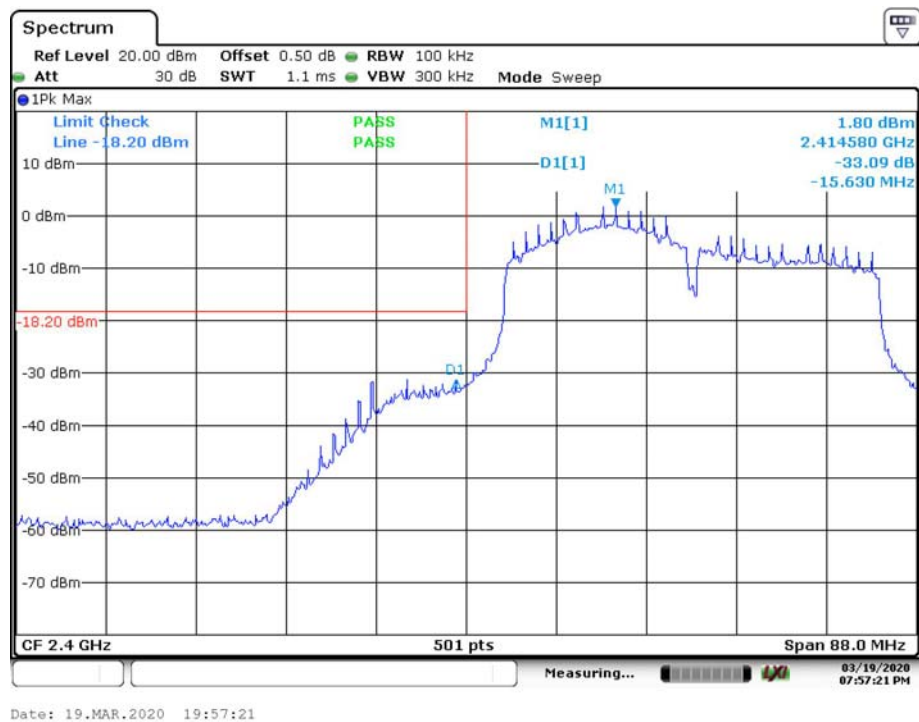
Date: 19.MAR.2020 19:50:40

802.11n ht20 Band Edge, Right Side

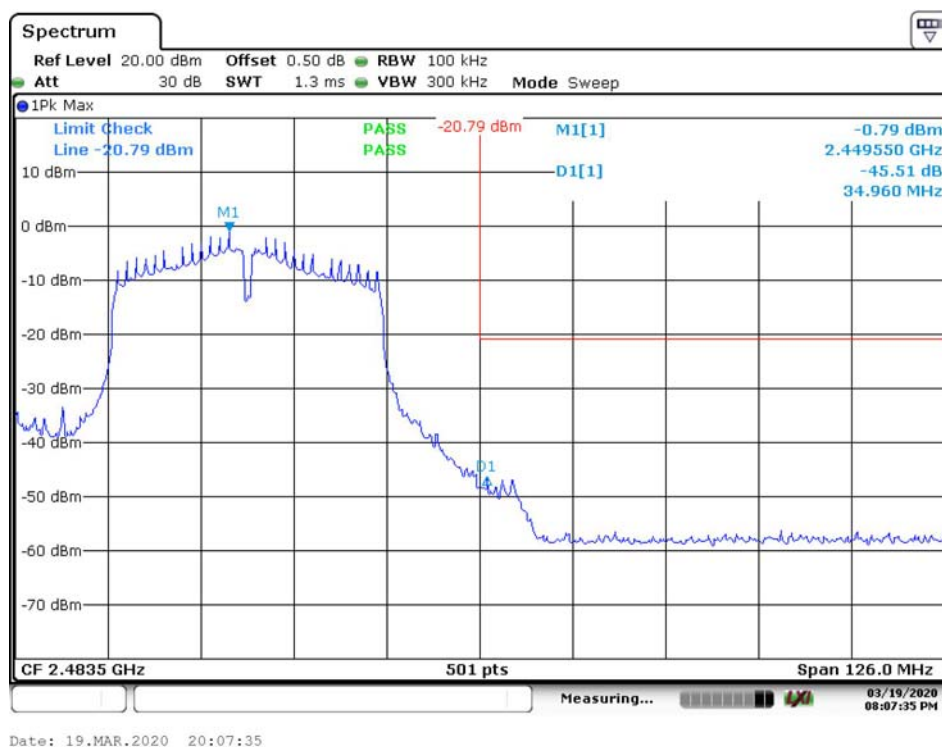


Date: 19.MAR.2020 19:54:57

802.11n ht40: Band Edge, Left Side



802.11n ht40 Band Edge, Right Side



FCC §15.247(e) - POWER SPECTRAL DENSITY**Applicable Standard**

According to FCC§15.247(e):For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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**

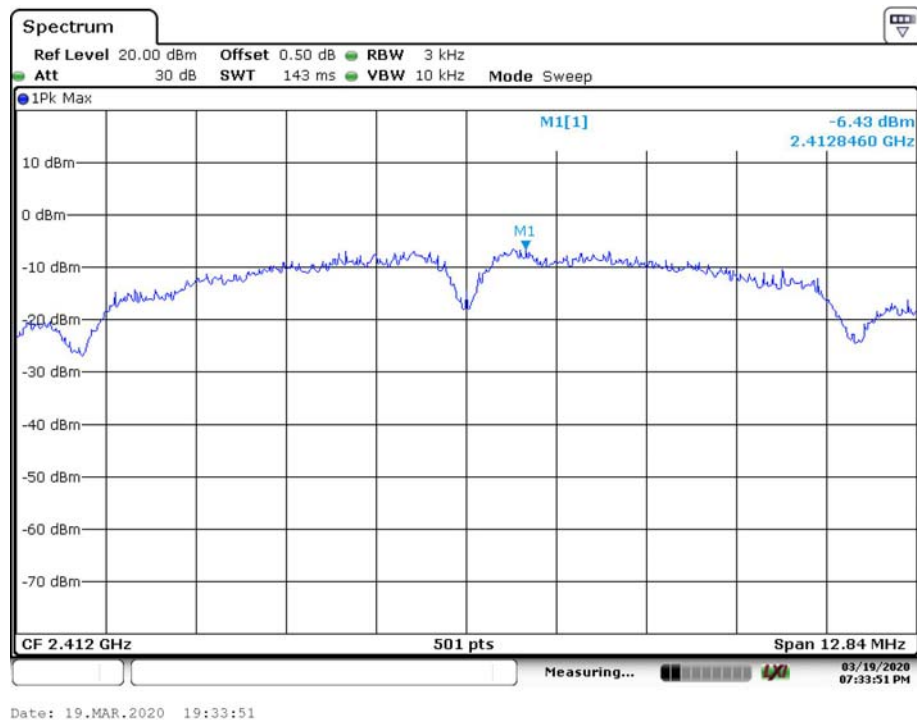
Temperature:	22.5~24.1 °C
Relative Humidity:	64~67%
ATM Pressure:	101.4~102.1Pa
Tester:	Lucy Lu
Test Date:	2020-03-19~20-04-08

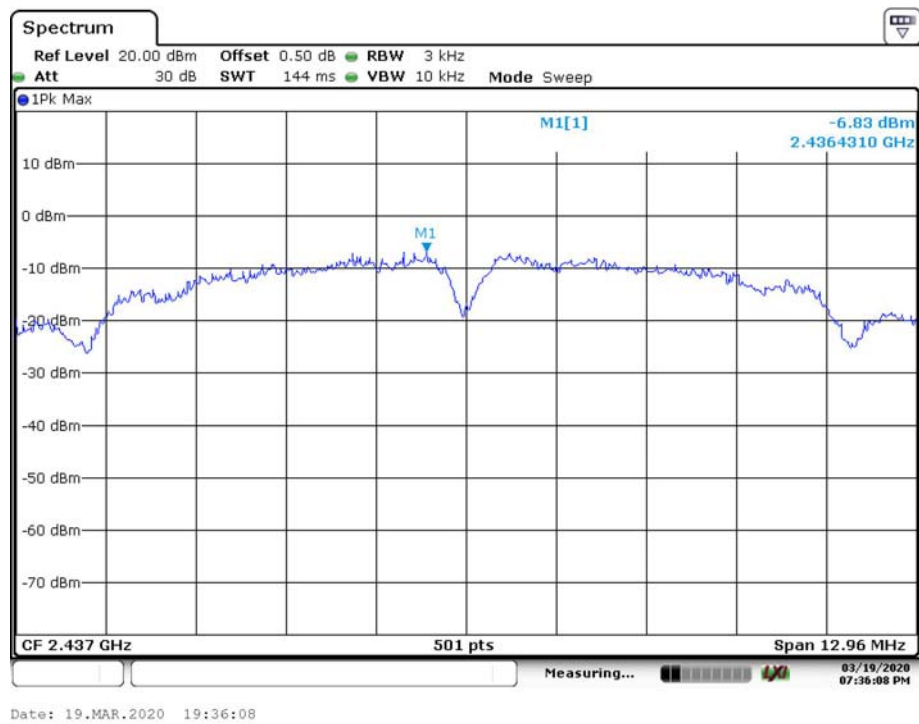
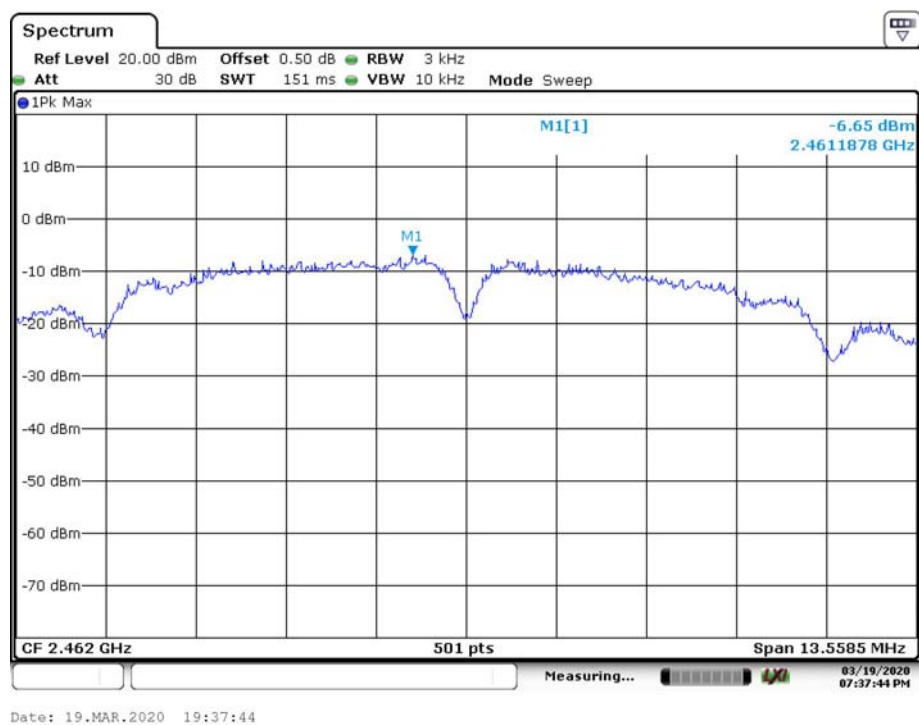
Test Mode: Transmitting

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

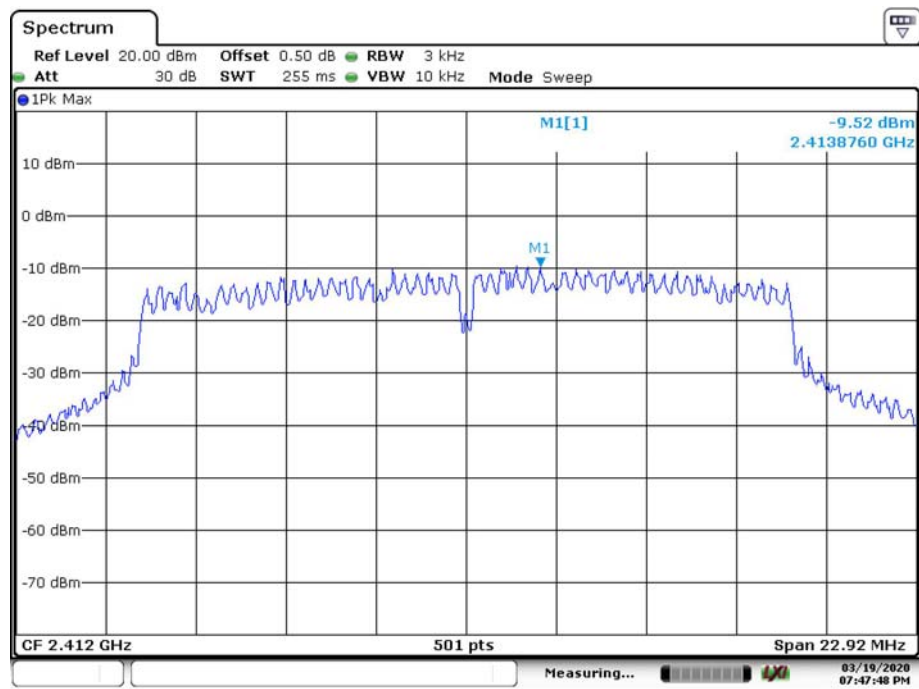
Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-6.43	≤8
	Middle	2437	-6.83	≤8
	High	2462	-6.65	≤8
802.11g	Low	2412	-9.52	≤8
	Middle	2437	-10.33	≤8
	High	2462	-8.30	≤8
802.11n ht20	Low	2412	-9.91	≤8
	Middle	2437	-10.40	≤8
	High	2462	-9.24	≤8
802.11n ht40	Low	2422	-11.82	≤8
	Middle	2437	-15.41	≤8
	High	2452	-14.90	≤8

Power Spectral Density, 802.11b Low Channel

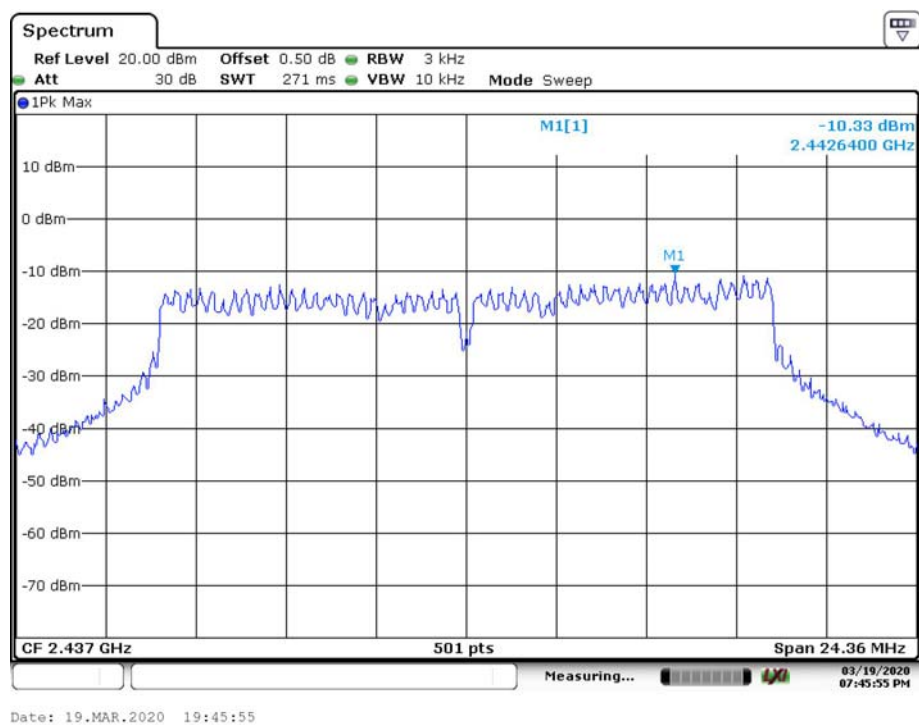


Power Spectral Density, 802.11b Middle Channel**Power Spectral Density, 802.11b High Channel**

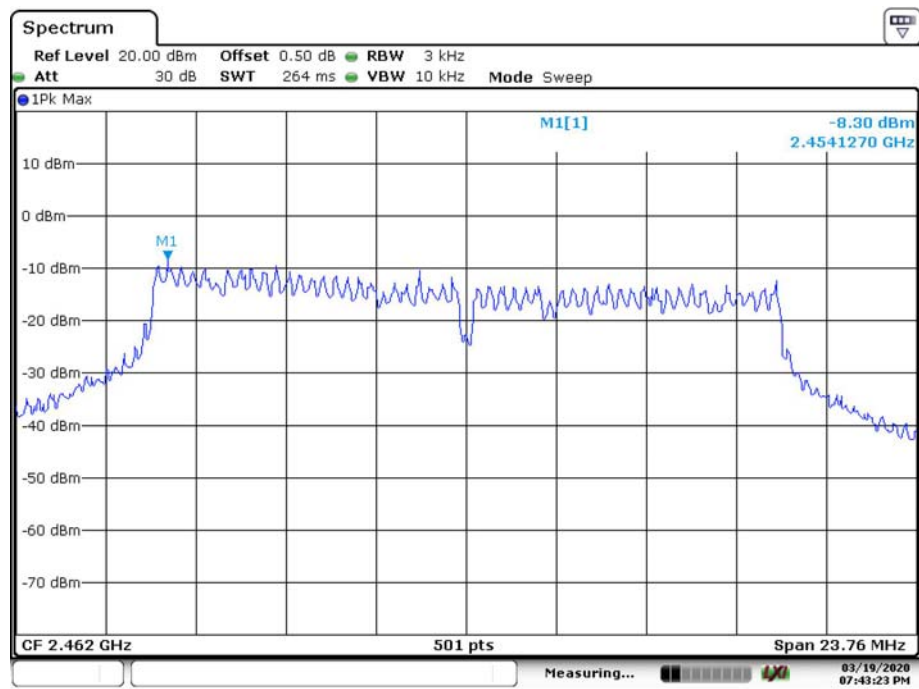
Power Spectral Density, 802.11g Low Channel



Power Spectral Density, 802.11g Middle Channel

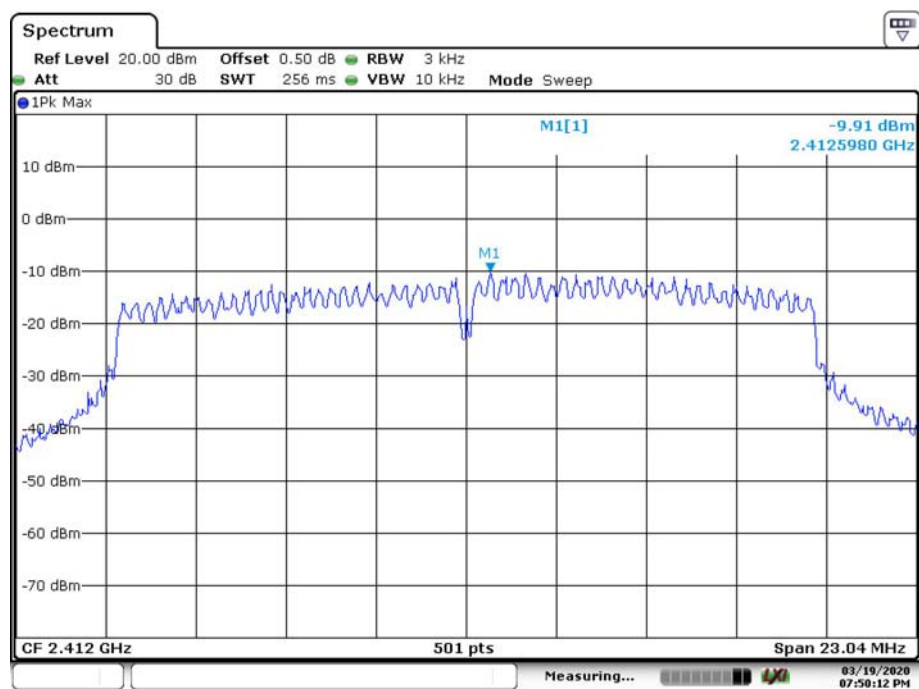


Power Spectral Density, 802.11g High Channel



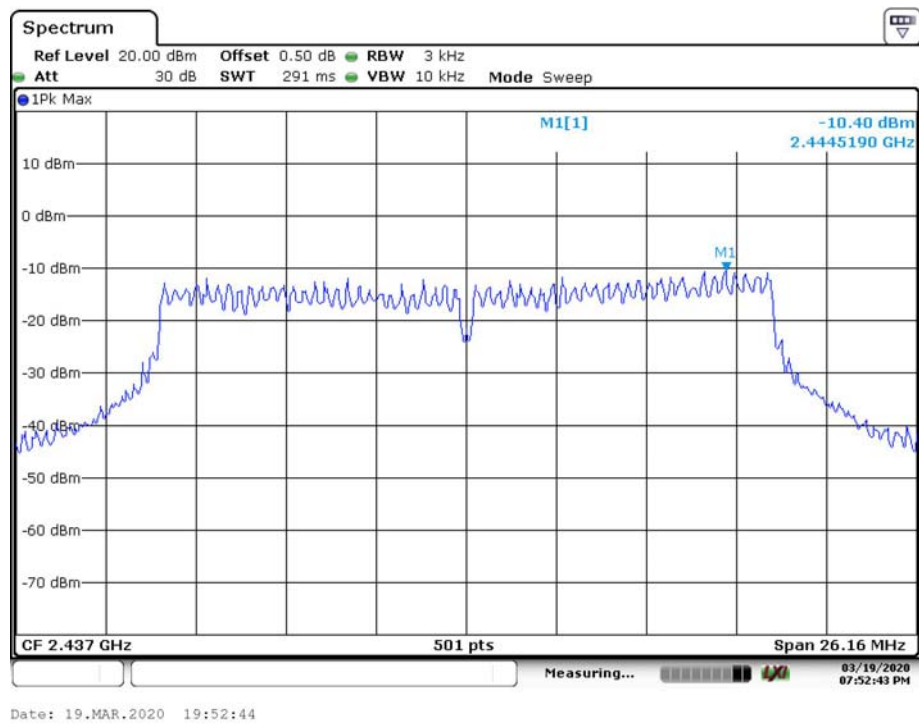
Date: 19.MAR.2020 19:43:23

Power Spectral Density, 802.11n ht20 Low Channel

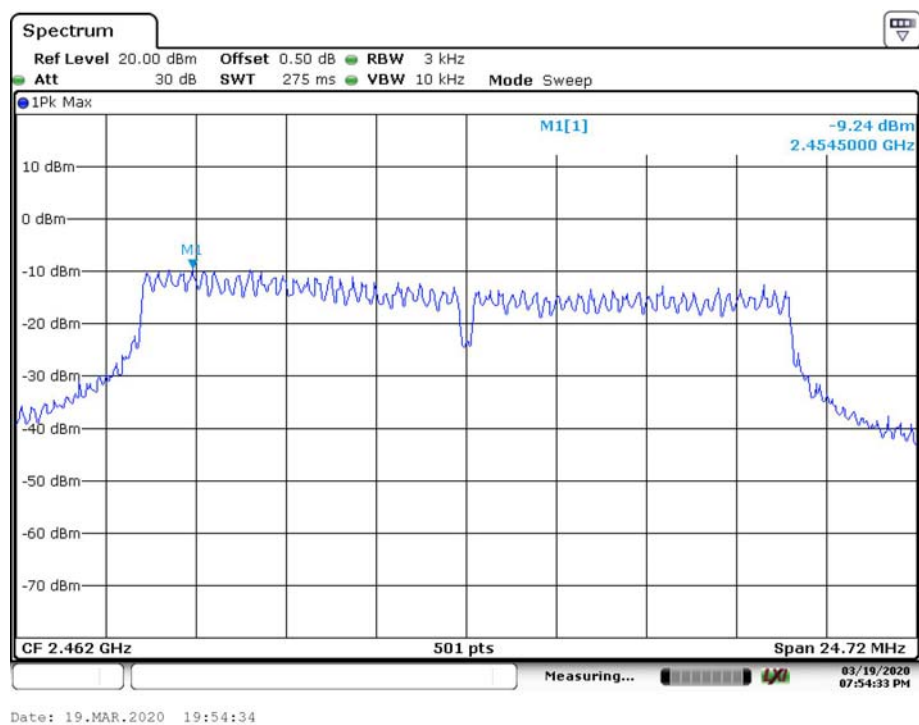


Date: 19.MAR.2020 19:50:13

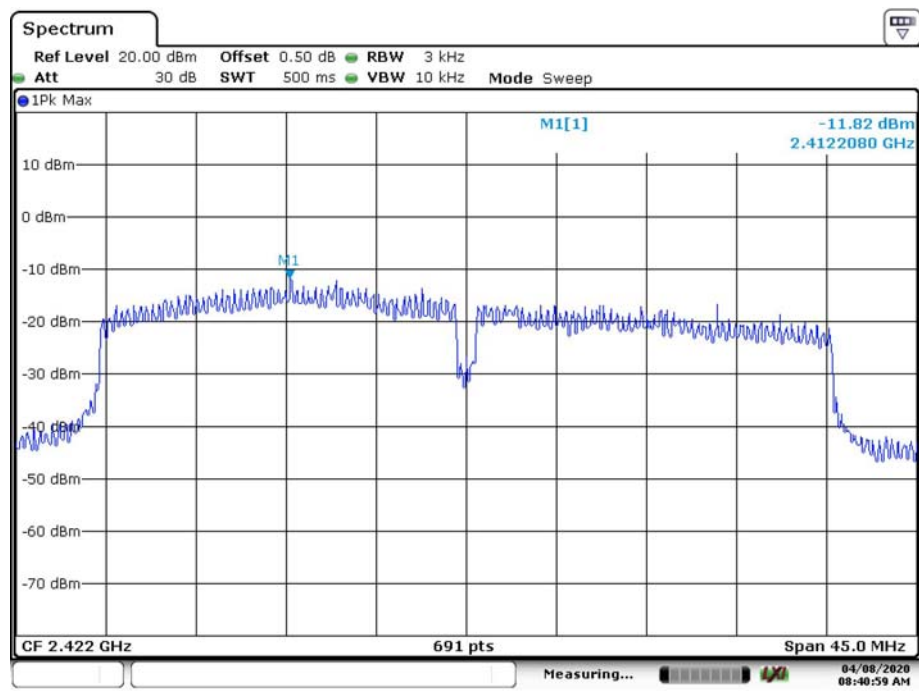
Power Spectral Density, 802.11n ht20 Middle Channel



Power Spectral Density, 802.11n ht20 High Channel

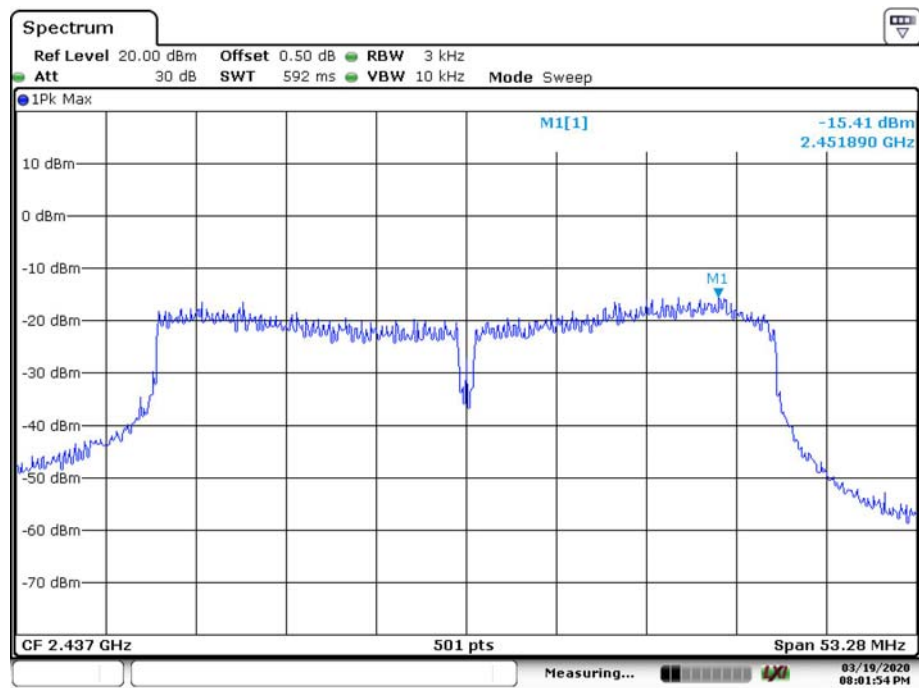


Power Spectral Density, 802.11n ht40 Low Channel



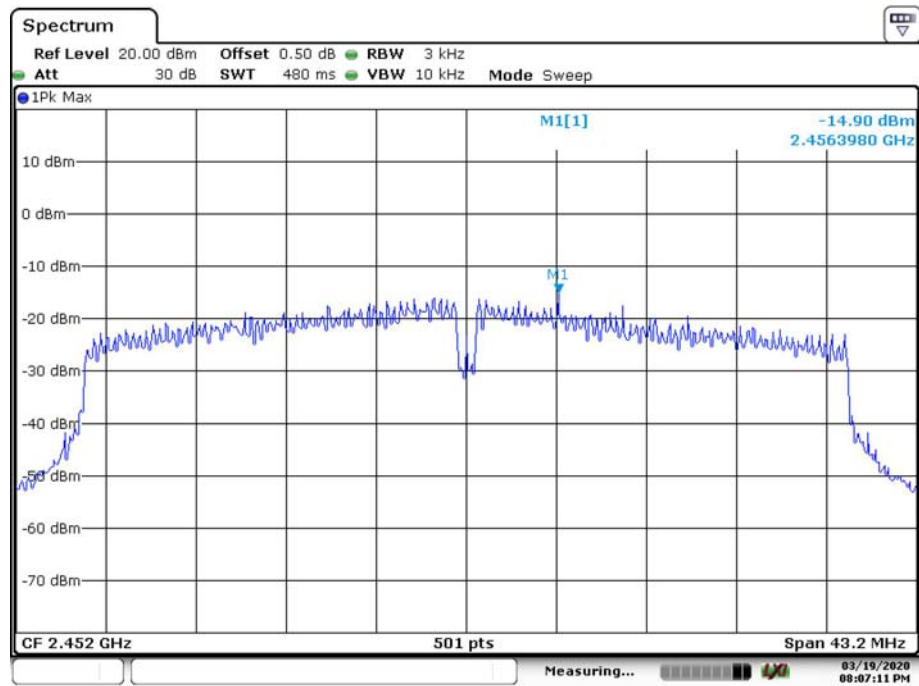
Date: 8.APR.2020 08:41:00

Power Spectral Density, 802.11n ht40 Middle Channel



Date: 19.MAR.2020 20:01:55

Power Spectral Density, 802.11n ht40 High Channel



Date: 19.MAR.2020 20:07:12

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