Test Report

Date : 2019-06-05
No. : HMD19060021

Applicant	:	Como Audio, Inc. 21 Drydock Avenue, Suite 760W Boston, Massachusetts 02210
Supplier / Manufacturer	:	Jwoodaudio Industry Co., Ltd. No.4 Industrial District, Liuwu Village, Yuanzhou Town, Huizhou City, Guangdong Province P.R.C 516123
Description of Sample(s)	:	Submitted sample(s) said to be Product: Internet and Bluetooth Speaker Brand Name: Como Audio Model No.: SpeakEasy FCC ID: 2AMWRGVASPEAK
Date Samples Received	:	2019-05-17
Date Tested	:	2019-05-23 to 2019-06-05
Investigation Requested	:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 and ANSI C63.10:2013 for FCC Certification.
Conclusions	:	The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.
Remarks	:	WIFI (802.11b/g/n20)

CHEUNG Chi, Kenneth
Authorized Signatory

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Test Report

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1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
Head Office: 10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong
Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product:	Internet and Bluetooth Speaker
Manufacturer:	Jwoodaudio Industry Co., Ltd. No.4 Industrial District, Liuwu Village, Yuanzhou Town, Huizhou City, Guangdong Province P.R.C 516123
Brand Name:	Como Audio
Model Number:	SpeakEasy
Rating:	Adapter: Input: 100-240Va.c. 50/60Hz 1.3A, Output: 18.0Vd.c. 2.8A Brand name: N/A; Model no.: DYS650-180280W-K Battery: 14.8V d.c. (Li-Ion battery 2200mAh)
RF Power:	30mW-75mW

Remark: AC mains mode have been investigated in this report.

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is an Internet and Bluetooth Speaker. The transmission signal is digital modulated with channel frequency range 2412-2462MHz.

1.3 Antenna Details

Antenna Type:	PCB antenna
Antenna Gain:	RF11C02637S gain is:2.8dBi RF11C02638S gain is:2.86dBi

This EUT has two diversity antennas, but only one antenna is working at any time.

1.4 Date of Order

2019-05-17

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2019-05-23 to 2019-06-05

1.7 Country of Origin

China

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2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 Regulations and ANSI C63.10:2013 for FCC Certification.
According FCC KDB 558074 DTS Measurement Guidance, Duty cycle ≧98%.
The device was realized by Linux system, file description and running environment, refer to the "Customer Wi-Fi Test Mode Instructions for Minuet Module Cast Variants.pdf" provided by manufacturer.

2.2 Test Standards and Results Summary Tables

EMISSION
Results Summary

Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(3)	ANSI C63.10:2013	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	☒	☐	☐
Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	☒	☐	☐
Power Spectral Density	FCC 47CFR 15.247(e)	N/A	N/A	☒	☐	☐
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	N/A	N/A	☒	☐	☐
Band Edge Emissions	FCC 47CFR 15.247(d)	N/A	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐

Note: N/A - Not Applicable

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3.0 Test Results

3.1 Emission

3.1.1 Maximum Peak Output Power

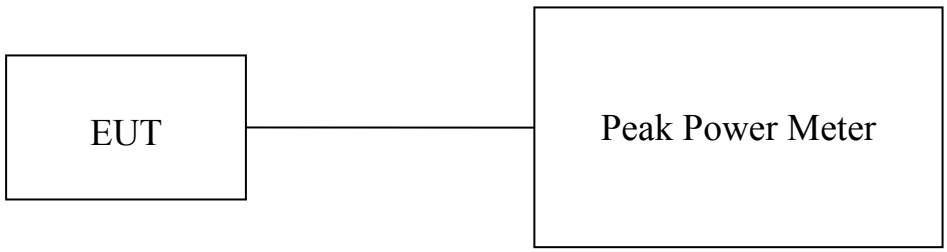
Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	N/A
Test Date:	2019-05-24
Mode of Operation:	Wifi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The RF output of the EUT was connected to the peak power meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

Test Setup:



Note: a temporary antenna connector was soldered to the RF output.

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Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

Results of WiFi mode 802.11 b, (2412MHz to 2462MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2412	0.03758
Middle	2437	0.03516
High	2462	0.03459

Results of WiFi mode 802.11 g, (2412MHz to 2462MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2412	0.06855
Middle	2437	0.06714
High	2462	0.06637

Results of WiFi mode 802.11 n20, (2412MHz to 2462MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2412	0.07311
Middle	2437	0.07015
High	2462	0.06871

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB
1GHz to 26GHz 1.7dB

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3.1.2 Radiated Emissions

Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10:2013
Test Date:	2019-05-27 to 2019-06-05
Mode of Operation:	Tx mode / Wifi mode

Ambient Temperature: 24℃ Relative Humidity: 52% Atmospheric Pressure: 101 kPa

Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

* Semi-Anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

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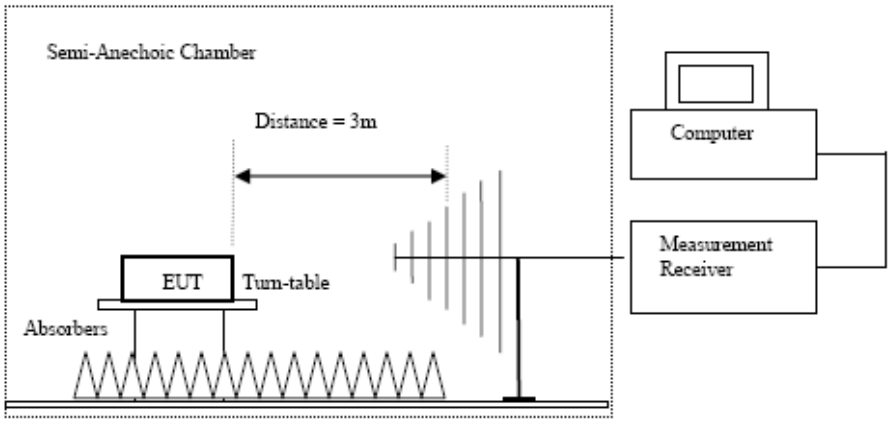
Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)	RBW:	10kHz
	VBW:	30kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
30MHz – 1GHz (QP)	RBW:	120kHz
	VBW:	120kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
Above 1GHz (Pk)	RBW:	1MHz
	VBW:	1MHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
Above 1GHz (Av)	RBW:	1MHz
	VBW:	10Hz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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Limits for Radiated Emissions FCC 47 CFR 15.247]:

Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Tx mode (2412.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit μV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2412.0 MHz) (802.11b) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dB	E-Field Polarity
4824.0	14.5	41.5	56.0	74.0	18.0	Vertical
4824.0	13.8	42.4	56.2	74.0	17.8	Horizontal
7236.0	10.1	45.1	55.2	74.0	18.8	Vertical
7236.0	9.2	46.2	55.4	74.0	18.6	Horizontal
9648.0	7.1	48	55.1	74.0	18.9	Vertical
9648.0	5.6	48.8	54.4	74.0	19.6	Horizontal
12060.0	4.0	51.5	55.5	74.0	18.5	Vertical
12060.0	2.4	52.4	54.8	74.0	19.2	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	2.8	41.5	44.3	54.0	9.7	Vertical
4824.0	-0.3	42.4	42.1	54.0	11.9	Horizontal
7236.0	-2.6	45.1	42.5	54.0	11.5	Vertical
7236.0	-4.6	46.2	41.6	54.0	12.4	Horizontal
9648.0	-6.0	48	42.0	54.0	12.0	Vertical
9648.0	-7.2	48.8	41.6	54.0	12.4	Horizontal
12060.0	-10.4	51.5	41.1	54.0	12.9	Vertical
12060.0	-10.1	52.4	42.3	54.0	11.7	Horizontal

Result of Tx mode (2437.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2437.0 MHz) (802.11b) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	14.7	41.6	56.3	74.0	17.7	Vertical
4874.0	13.6	42.5	56.1	74.0	17.9	Horizontal
7311.0	10.1	45.2	55.3	74.0	18.7	Vertical
7311.0	9.3	46.3	55.6	74.0	18.4	Horizontal
9748.0	7.0	48.1	55.1	74.0	18.9	Vertical
9748.0	7.4	48.9	56.3	74.0	17.7	Horizontal
12185.0	3.9	51.6	55.5	74.0	18.5	Vertical
12185.0	2.5	52.5	55.0	74.0	19.0	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	
4874.0	0.9	41.6	42.5	54.0	11.5	Vertical
4874.0	0.4	42.5	42.9	54.0	11.1	Horizontal
7311.0	-2.8	45.2	42.4	54.0	11.6	Vertical
7311.0	-4.2	46.3	42.1	54.0	11.9	Horizontal
9748.0	-6.3	48.1	41.8	54.0	12.2	Vertical
9748.0	-6.9	48.9	42.0	54.0	12.0	Horizontal
12185.0	-10.2	51.6	41.4	54.0	12.6	Vertical
12185.0	-9.9	52.5	42.6	54.0	11.4	Horizontal

Result of Tx mode (2462.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency	Measured Level	Correction Factor	Field Strength	Field Strength	Limit	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	µV/m	µV/m	
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2462.0 MHz) (802.11b) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	
4924.0	15.2	41.4	56.6	74.0	17.4	Vertical
4924.0	12.6	42.7	55.3	74.0	18.7	Horizontal
7386.0	8.6	45.6	54.2	74.0	19.8	Vertical
7386.0	7.9	46.5	54.4	74.0	19.6	Horizontal
9848.0	6.4	48.6	55.0	74.0	19.0	Vertical
9848.0	4.5	49.7	54.2	74.0	19.8	Horizontal
12310.0	3.6	51.7	55.3	74.0	18.7	Vertical
12310.0	2.8	52.7	55.5	74.0	18.5	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	0.7	41.4	42.1	54.0	11.9	Vertical
4924.0	-0.1	42.7	42.6	54.0	11.4	Horizontal
7386.0	-4.3	45.6	41.3	54.0	12.7	Vertical
7386.0	-5.5	46.5	41.0	54.0	13.0	Horizontal
9848.0	-6.2	48.6	42.4	54.0	11.6	Vertical
9848.0	-8.4	49.7	41.3	54.0	12.7	Horizontal
12310.0	-10.6	51.7	41.1	54.0	12.9	Vertical
12310.0	-11.7	52.7	41.0	54.0	13.0	Horizontal

Result of Tx mode (2412.0 MHz) (802.11g) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2412.0 MHz) (802.11g) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	14.9	41.5	56.4	74.0	17.6	Vertical
4824.0	12.7	42.4	55.1	74.0	18.9	Horizontal
7236.0	10.8	45.1	55.9	74.0	18.1	Vertical
7236.0	8.1	46.2	54.3	74.0	19.7	Horizontal
9648.0	7.9	48	55.9	74.0	18.1	Vertical
9648.0	5.5	48.8	54.3	74.0	19.7	Horizontal
12060.0	3.9	51.5	55.4	74.0	18.6	Vertical
12060.0	3.2	52.4	55.6	74.0	18.4	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	1.0	41.5	42.5	54.0	11.5	Vertical
4824.0	-10.0	42.4	32.4	54.0	21.6	Horizontal
7236.0	-3.1	45.1	42.0	54.0	12.0	Vertical
7236.0	-3.4	46.2	42.8	54.0	11.2	Horizontal
9648.0	-6.8	48	41.2	54.0	12.8	Vertical
9648.0	-7.3	48.8	41.5	54.0	12.5	Horizontal
12060.0	-9.5	51.5	42.0	54.0	12.0	Vertical
12060.0	-9.9	52.4	42.5	54.0	11.5	Horizontal

Result of Tx mode (2437.0 MHz) (802.11g) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2437.0 MHz) (802.11g) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	14.0	41.6	55.6	74.0	18.4	Vertical
4874.0	13.3	42.5	55.8	74.0	18.2	Horizontal
7311.0	9.8	45.2	55.0	74.0	19.0	Vertical
7311.0	9.4	46.3	55.7	74.0	18.3	Horizontal
9748.0	7.1	48.1	55.2	74.0	18.8	Vertical
9748.0	6.5	48.9	55.4	74.0	18.6	Horizontal
12185.0	4.1	51.6	55.7	74.0	18.3	Vertical
12185.0	3.7	52.5	56.2	74.0	17.8	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	-0.4	41.6	41.2	54.0	12.8	Vertical
4874.0	-0.9	42.5	41.6	54.0	12.4	Horizontal
7311.0	-2.9	45.2	42.3	54.0	11.7	Vertical
7311.0	-5.2	46.3	41.1	54.0	12.9	Horizontal
9748.0	-6.4	48.1	41.7	54.0	12.3	Vertical
9748.0	-6.9	48.9	42.0	54.0	12.0	Horizontal
12185.0	-10.2	51.6	41.4	54.0	12.6	Vertical
12185.0	-9.6	52.5	42.9	54.0	11.1	Horizontal

Result of Tx mode (2462.0 MHz) (802.11g) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2462.0 MHz) (802.11g) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	15.3	41.4	56.7	74.0	17.3	Vertical
4924.0	12.8	42.7	55.5	74.0	18.5	Horizontal
7386.0	9.2	45.6	54.8	74.0	19.2	Vertical
7386.0	8.0	46.5	54.5	74.0	19.5	Horizontal
9848.0	7.4	48.6	56.0	74.0	18.0	Vertical
9848.0	5.4	49.7	55.1	74.0	18.9	Horizontal
12310.0	4.2	51.7	55.9	74.0	18.1	Vertical
12310.0	2.9	52.7	55.6	74.0	18.4	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	0.6	41.4	42.0	54.0	12.0	Vertical
4924.0	-0.3	42.7	42.4	54.0	11.6	Horizontal
7386.0	-4.4	45.6	41.2	54.0	12.8	Vertical
7386.0	-5.5	46.5	41.0	54.0	13.0	Horizontal
9848.0	-6.1	48.6	42.5	54.0	11.5	Vertical
9848.0	-8.1	49.7	41.6	54.0	12.4	Horizontal
12310.0	-9.5	51.7	42.2	54.0	11.8	Vertical
12310.0	-11.4	52.7	41.3	54.0	12.7	Horizontal

Result of Tx mode (2412.0 MHz) (802.11n20) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2412.0 MHz) (802.11n20) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	14.8	41.5	56.3	74.0	17.7	Vertical
4824.0	13.4	42.4	55.8	74.0	18.2	Horizontal
7236.0	10.0	45.1	55.1	74.0	18.9	Vertical
7236.0	8.8	46.2	55.0	74.0	19.0	Horizontal
9648.0	7.7	48	55.7	74.0	18.3	Vertical
9648.0	5.4	48.8	54.2	74.0	19.8	Horizontal
12060.0	5.3	51.5	56.8	74.0	17.2	Vertical
12060.0	3.5	52.4	55.9	74.0	18.1	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	-0.2	41.5	41.3	54.0	12.7	Vertical
4824.0	-0.1	42.4	42.3	54.0	11.7	Horizontal
7236.0	-2.8	45.1	42.3	54.0	11.7	Vertical
7236.0	-4.3	46.2	41.9	54.0	12.1	Horizontal
9648.0	-6.3	48	41.7	54.0	12.3	Vertical
9648.0	-7.8	48.8	41.0	54.0	13.0	Horizontal
12060.0	-9.4	51.5	42.1	54.0	11.9	Vertical
12060.0	-10.0	52.4	42.4	54.0	11.6	Horizontal

Result of Tx mode (2437.0 MHz) (802.11n20) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2437.0 MHz) (802.11n20) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	14.0	41.6	55.6	74.0	18.4	Vertical
4874.0	14.0	42.5	56.5	74.0	17.5	Horizontal
7311.0	10.6	45.2	55.8	74.0	18.2	Vertical
7311.0	8.9	46.3	55.2	74.0	18.8	Horizontal
9748.0	8.4	48.1	56.5	74.0	17.5	Vertical
9748.0	7.3	48.9	56.2	74.0	17.8	Horizontal
12185.0	3.7	51.6	55.3	74.0	18.7	Vertical
12185.0	4.2	52.5	56.7	74.0	17.3	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	-1.2	41.6	40.4	54.0	13.6	Vertical
4874.0	-0.5	42.5	42.0	54.0	12.0	Horizontal
7311.0	-3.7	45.2	41.5	54.0	12.5	Vertical
7311.0	-4.2	46.3	42.1	54.0	11.9	Horizontal
9748.0	-6.0	48.1	42.1	54.0	11.9	Vertical
9748.0	-6.5	48.9	42.4	54.0	11.6	Horizontal
12185.0	-10.6	51.6	41.0	54.0	13.0	Vertical
12185.0	-11.3	52.5	41.2	54.0	12.8	Horizontal

Result of Tx mode (2462.0 MHz) (802.11n20) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit µV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (2462.0 MHz) (802.11n20) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	14.7	41.4	56.1	74.0	17.9	Vertical
4924.0	12.8	42.7	55.5	74.0	18.5	Horizontal
7386.0	9.2	45.6	54.8	74.0	19.2	Vertical
7386.0	8.6	46.5	55.1	74.0	18.9	Horizontal
9848.0	6.7	48.6	55.3	74.0	18.7	Vertical
9848.0	4.5	49.7	54.2	74.0	19.8	Horizontal
12310.0	3.8	51.7	55.5	74.0	18.5	Vertical
12310.0	3.2	52.7	55.9	74.0	18.1	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	1.9	41.4	43.3	54.0	10.7	Vertical
4924.0	-0.7	42.7	42.0	54.0	12.0	Horizontal
7386.0	-4.2	45.6	41.4	54.0	12.6	Vertical
7386.0	-4.9	46.5	41.6	54.0	12.4	Horizontal
9848.0	-6.1	48.6	42.5	54.0	11.5	Vertical
9848.0	7.9	49.7	57.6	54.0	-3.6	Horizontal
12310.0	-10.5	51.7	41.2	54.0	12.8	Vertical
12310.0	-11.3	52.7	41.4	54.0	12.6	Horizontal

Remarks:
No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty (9kHz-30MHz): 2.0dB
(30MHz -1GHz): 4.9dB
(1GHz -26GHz): 4.02dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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Radiated Emissions Measurement:

Limit：

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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

Result： RF Radiated Emissions (Lowest)-802.11b

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	21.4	36.8	58.2	74.0	15.8	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	6.9	36.8	43.7	54.0	10.3	Vertical

Result： RF Radiated Emissions (Highest) -802.11b

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	24.6	36.4	61.0	74.0	13.0	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	8.8	36.4	45.2	54.0	8.8	Horizontal

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Result： RF Radiated Emissions (Lowest)-802.11g

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	22.2	36.8	59.0	74.0	15.0	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	9.8	36.8	46.6	54.0	7.4	Vertical

Result： RF Radiated Emissions (Highest) -802.11g

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	27.3	36.4	63.7	74.0	10.3	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	12.9	36.4	49.3	54.0	4.7	Horizontal

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Result： RF Radiated Emissions (Lowest)-802.11n20

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	23.0	36.8	59.8	74.0	14.2	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	8.7	36.8	45.5	54.0	8.5	Vertical

Result： RF Radiated Emissions (Highest) -802.11n20

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	27.9	36.4	64.3	74.0	9.7	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	14.2	36.4	50.6	54.0	3.4	Horizontal

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Limits for Radiated Emissions FCC 47 CFR 15.247]:

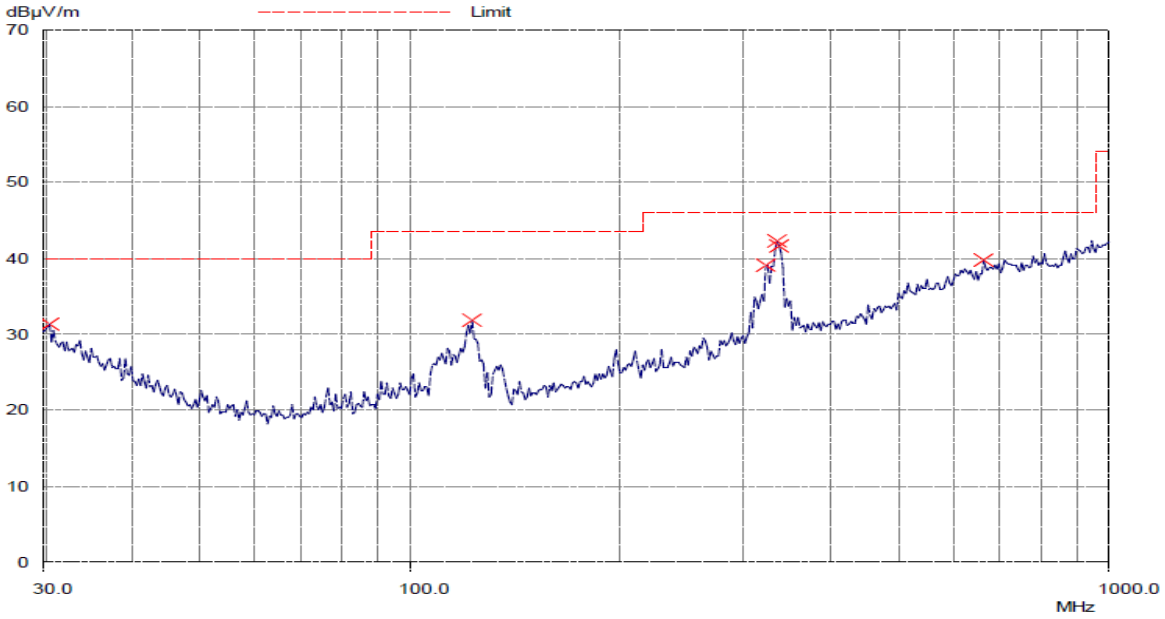
Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of WiFi mode (2412MHz, 802.11b) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Horizontal



Frequency MHz	QP Level dBμV/m	QP Limit dBμV/m	QP Delta dB
30.25	31.42	40.00	8.58
122.1875	31.78	43.50	11.72
322.375	39.08	46.00	6.92
334.8125	42.24	46.00	3.76
338.0625	41.68	46.00	4.32
665.5625	39.75	46.00	6.25

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Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

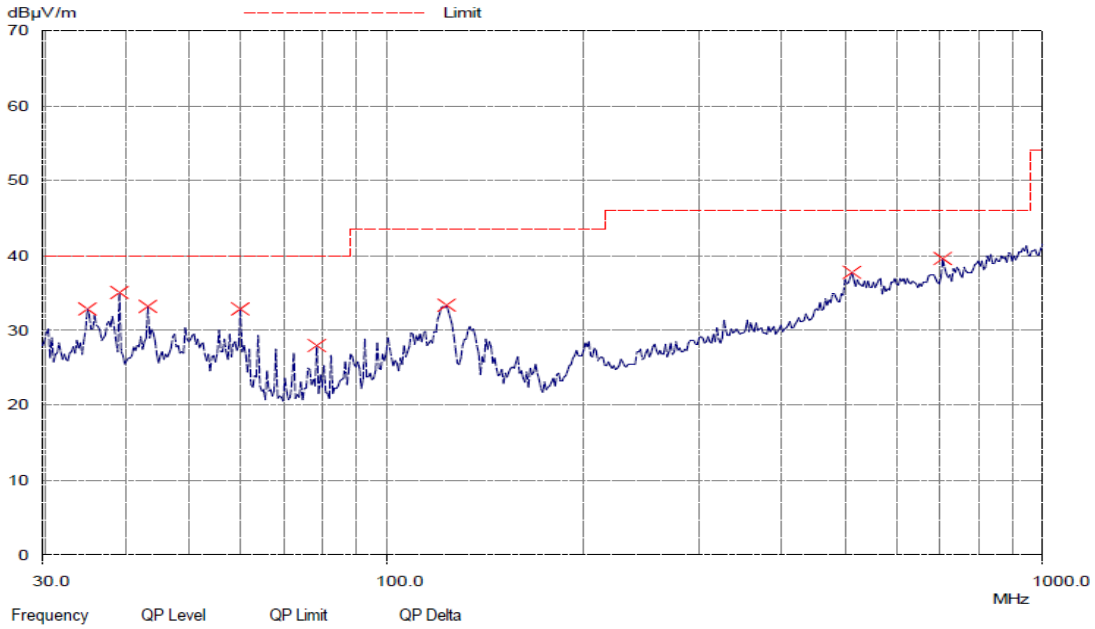
Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of WiFi mode (2412MHz, 802.11b) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Vertical



Frequency MHz	QP Level dBμV/m	QP Limit dBμV/m	QP Delta dB
34.8125	32.91	40.00	7.09
38.9375	34.97	40.00	5.03
43.0625	33.18	40.00	6.82
59.4375	32.92	40.00	7.08
77.8125	27.96	40.00	12.04
123.125	33.34	43.50	10.16
512.9375	37.68	46.00	8.32
706.25	39.52	46.00	6.48

Remarks: Calculated measurement uncertainty (30MHz – 1GHz): 4.9dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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3.1.3 AC Mains Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.10:2013
Test Date:	2019-05-24
Mode of Operation:	WIFI mode
Test Voltage:	120Va.c. 60Hz

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

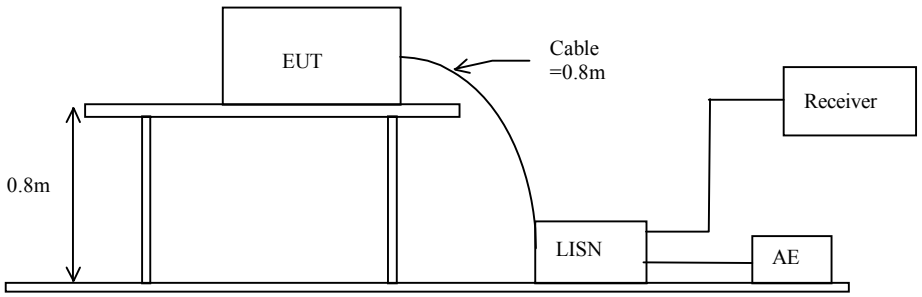
Test Method:

The test was performed in accordance with ANSI ANSI C63.10:2013, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Receiver Setting:

Bandw. = 9 kHz, Meas. Time= 10.0 ms, Step Width = 5.0kHz
Detector = MaxPeak and CISPR AV

Test Setup:



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Limits for Conducted Emissions (FCC 47 CFR 15.207):

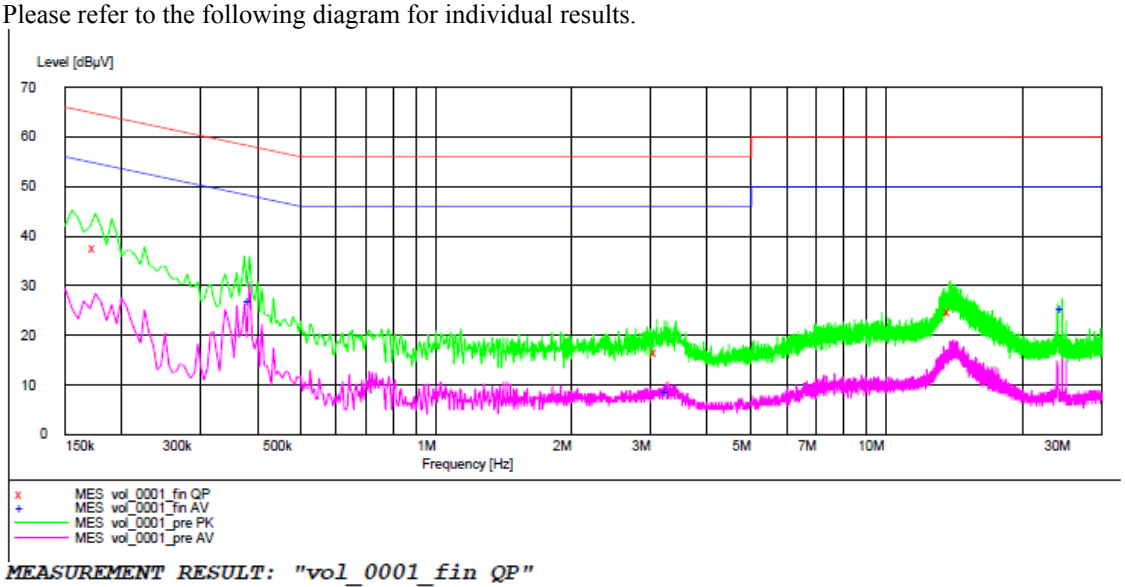
Frequency Range [MHz]	Quasi-Peak Limits [dBµV]	Average [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Results of WIFI mode (L): PASS

Please refer to the following diagram for individual results.



MEASUREMENT RESULT: "vol_0001_fin QP"

5/24/2019 4:59PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.175000	37.60	9.7	65	27.1	L1	GND
3.090000	16.70	9.8	56	39.3	L1	GND
13.870000	24.70	10.2	60	35.3	L1	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

5/24/2019 4:59PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.385000	27.10	9.7	48	21.0	L1	GND
3.265000	8.60	9.8	46	37.4	L1	GND
24.575000	25.50	10.6	50	24.5	L1	GND

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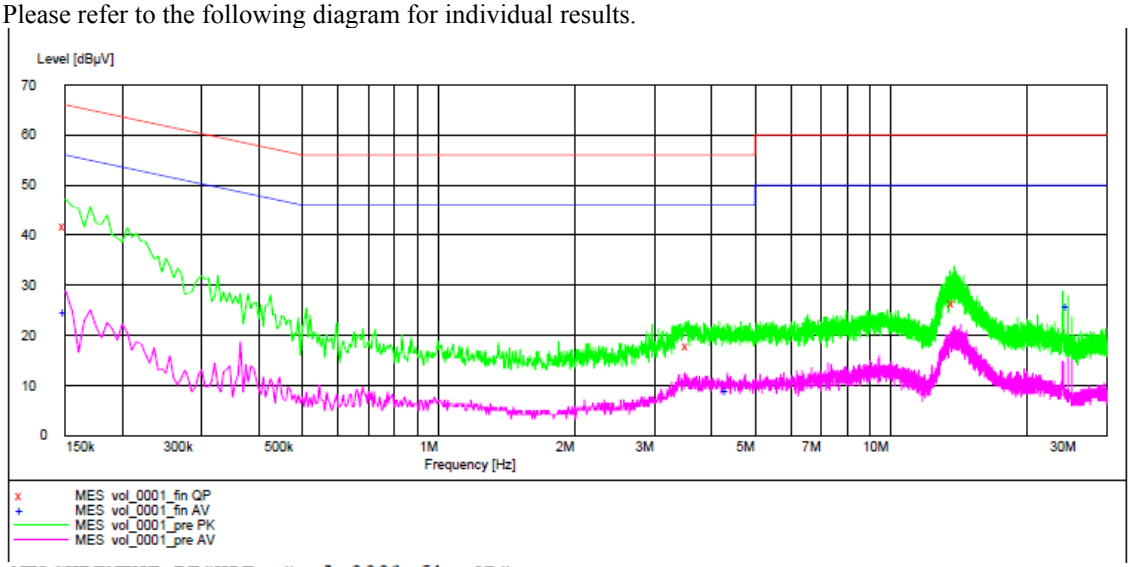
Frequency Range [MHz]	Quasi-Peak Limits [dBµV]	Average [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.
Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Results of WIFI mode (N): PASS
Please refer to the following diagram for individual results.



MEASUREMENT RESULT: "vol_0001_fin QP"

5/24/2019 4:56PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	41.90	9.7	66	24.1	N	GND
3.570000	17.90	9.8	56	38.1	N	GND
13.775000	26.60	10.2	60	33.4	N	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

5/24/2019 4:56PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	24.70	9.7	56	31.3	N	GND
4.345000	9.00	9.8	46	37.0	N	GND
24.575000	25.80	10.6	50	24.2	N	GND

Remarks:
Calculated measurement uncertainty (0.15MHz – 30MHz): 3.25dB
-*- Emission(s) that is far below the corresponding limit line.

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3.1.4 Power Spectral Density

Test Requirement:	FCC 47CFR 15.247(e)
Test Method:	ANSI C63.10:2013
Test Date:	2019-05-23
Mode of Operation:	Wifi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The RF output of the EUT was connected to the spectrum analyzer. Set the fundamental frequency as the center frequency of the spectral analyzer. Use RBW=100kHz , VBW= 300KHz , Set the span to 1.5 times the DTS channel bandwidth. Detector = peak, Sweep time = auto couple , Trace mode = max hold. Measure the Power Spectral Density (PSD) and record the results in dBm.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Test Limit:
The maximum power spectral density (PSD) shall not exceeded 8dBm in any 3kHz band.

Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF=10log (3 kHz/100 kHz=-15.2dB)

Results of WiFi Mode 802.11 b (Tx:2412MHz to 2462MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2412.0	-11.434	8dBm
2437.0	-11.347	8dBm
2462.0	-11.461	8dBm

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Results of WiFi Mode 802.11 g (Tx:2412MHz to 2462MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2412.0	-11.326	8dBm
2437.0	-10.969	8dBm
2462.0	-10.396	8dBm

Results of WiFi Mode 802.11 n20 (Tx:2412MHz to 2462MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2412.0	-12.301	8dBm
2437.0	-11.898	8dBm
2462.0	-11.879	8dBm

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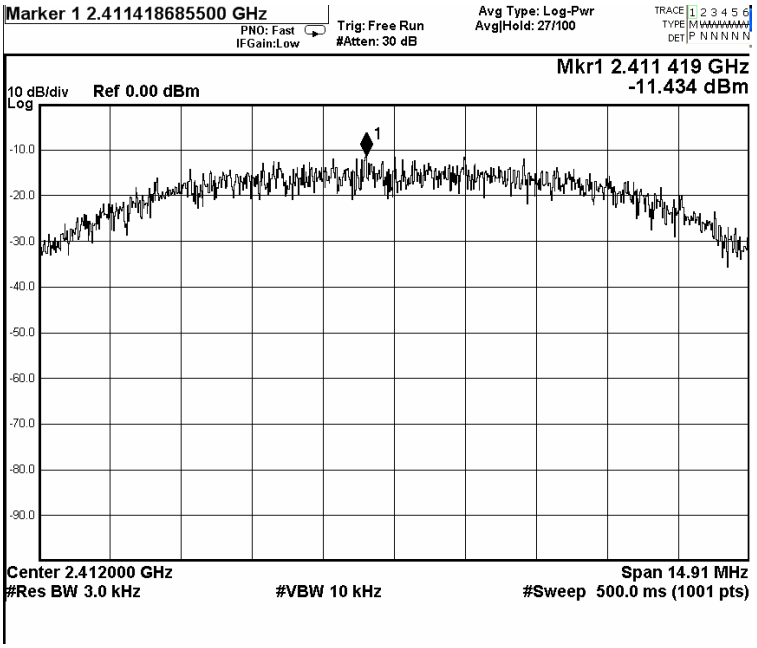
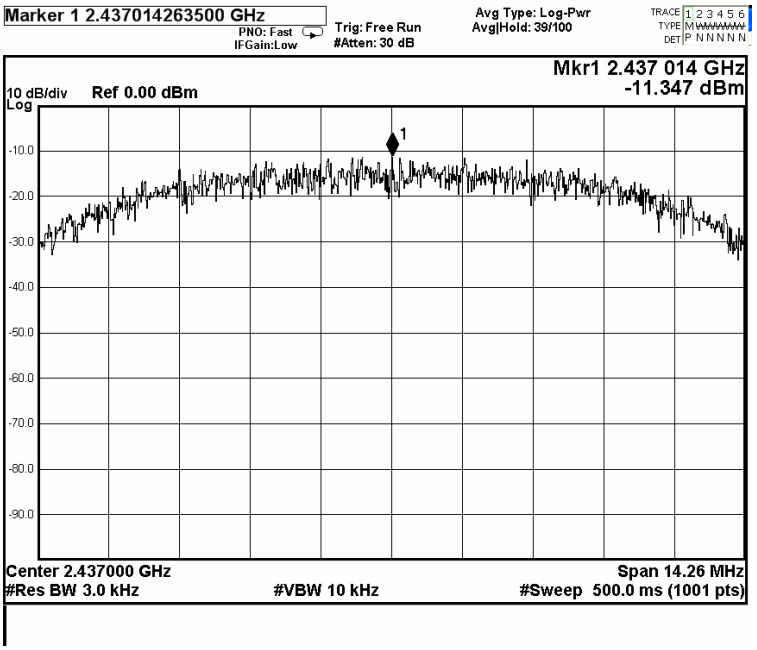
WiFi mode 802.11 b, (Tx: 2412MHz to 2462MHz)

CH 1 (2412.0 MHz)



CH 6 (2437.0 MHz)



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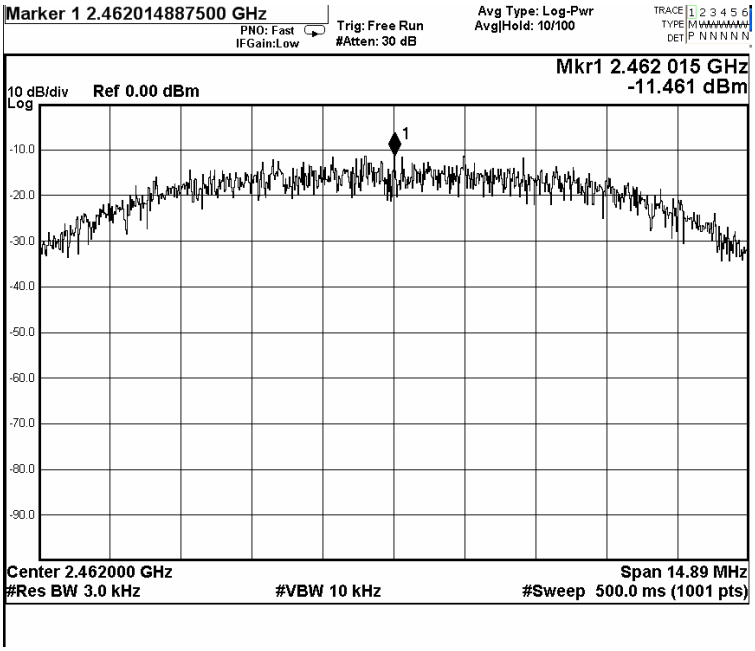
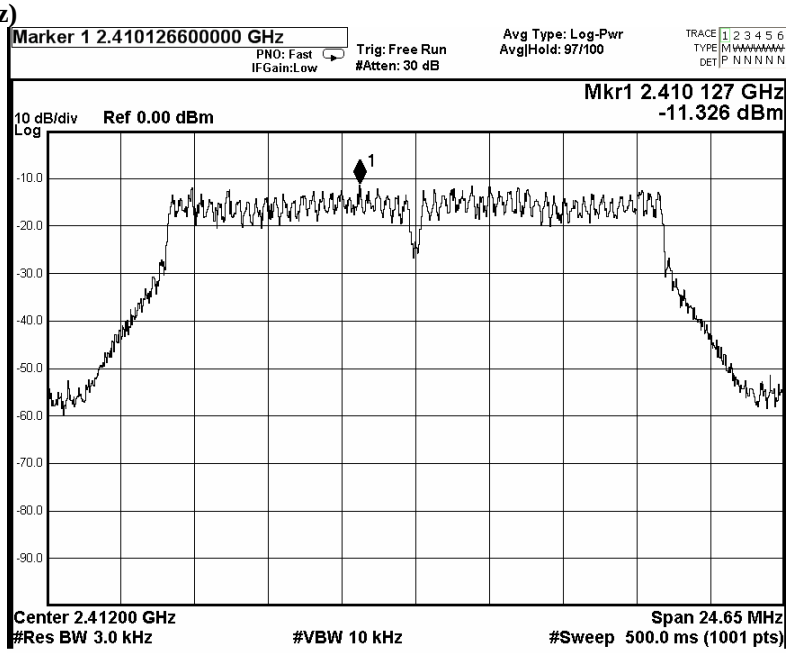
CH 11 (2462.0 MHz)



WiFi mode 802.11 g, (Tx: 2412MHz to 2462MHz)
CH 1 (2412.0 MHz)



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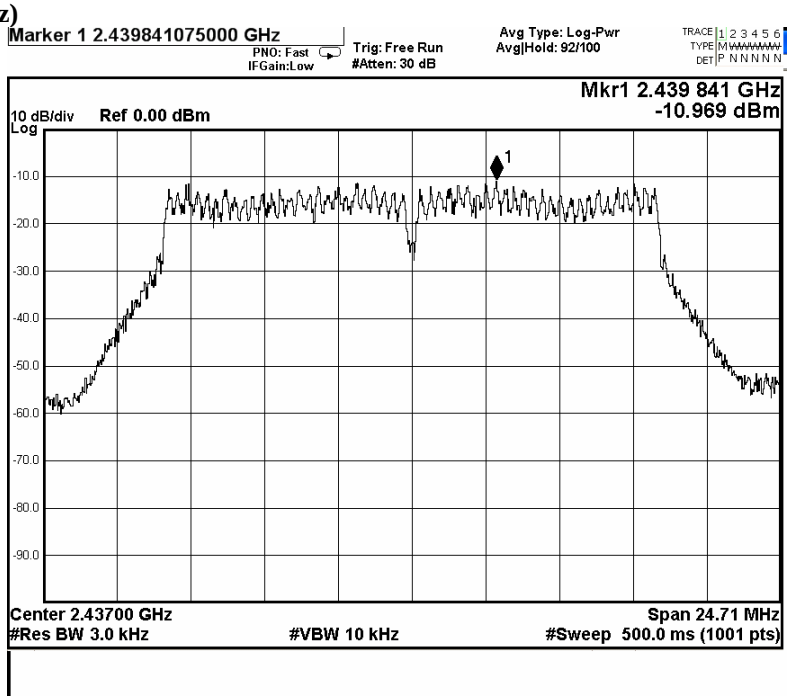
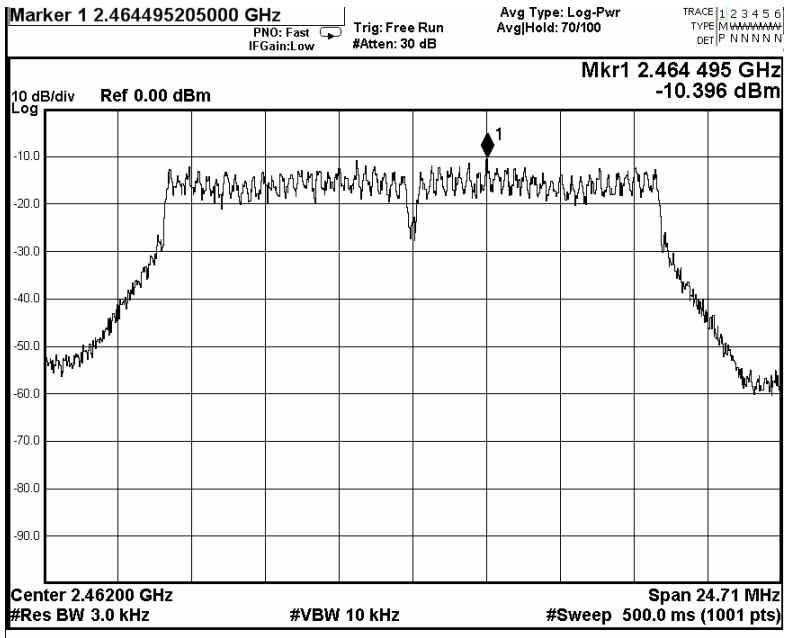
CH 6 (2437.0 MHz)



CH 11 (2462.0 MHz)



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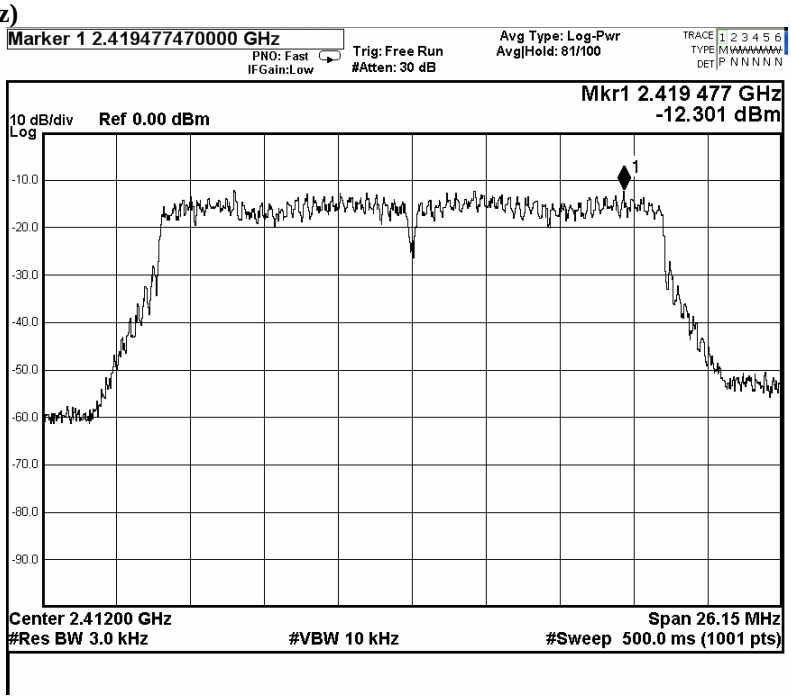
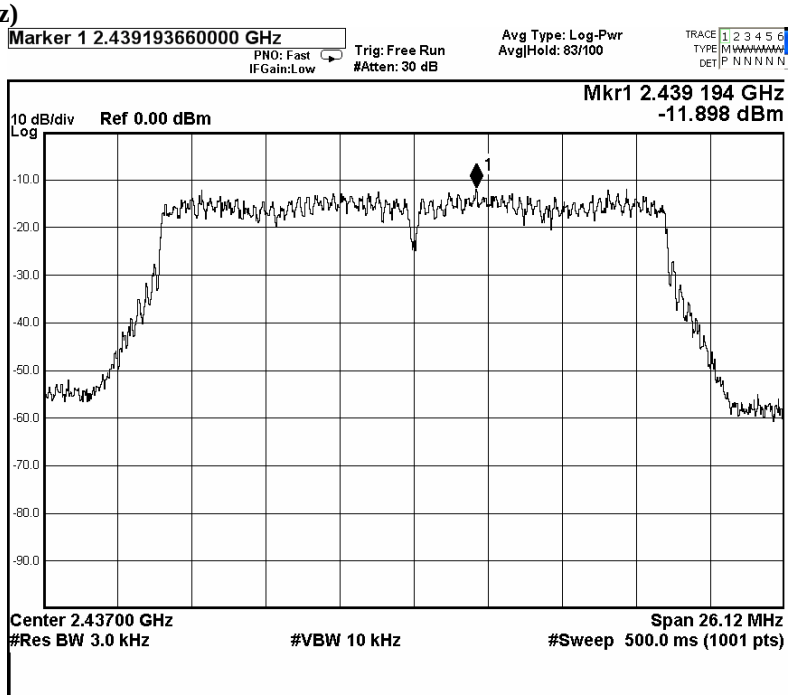
WiFi mode 802.11 n20, (Tx: 2412MHz to 2462MHz)
CH 1 (2412.0 MHz)



CH 6 (2437.0 MHz)



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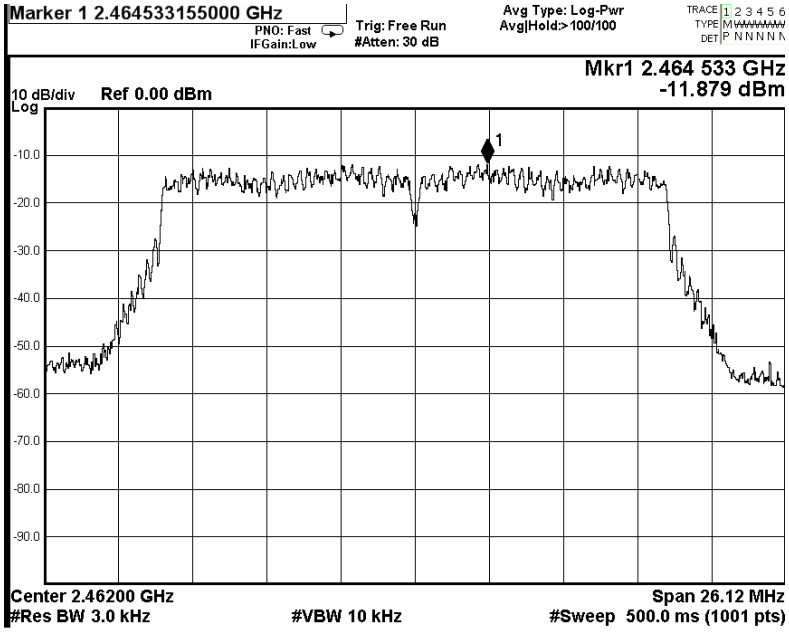
CH 11 (2462.0 MHz)



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3.1.5 6dB Spectrum Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	ANSI C63.10:2013
Test Date:	2019-05-23
Mode of Operation:	WiFi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Spectrum Analyzer Setting:

RBW = 100kHz, VBW ≥ 3*RBW, Sweep = Auto couple
Detector = Peak, Trace = Max. hold

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

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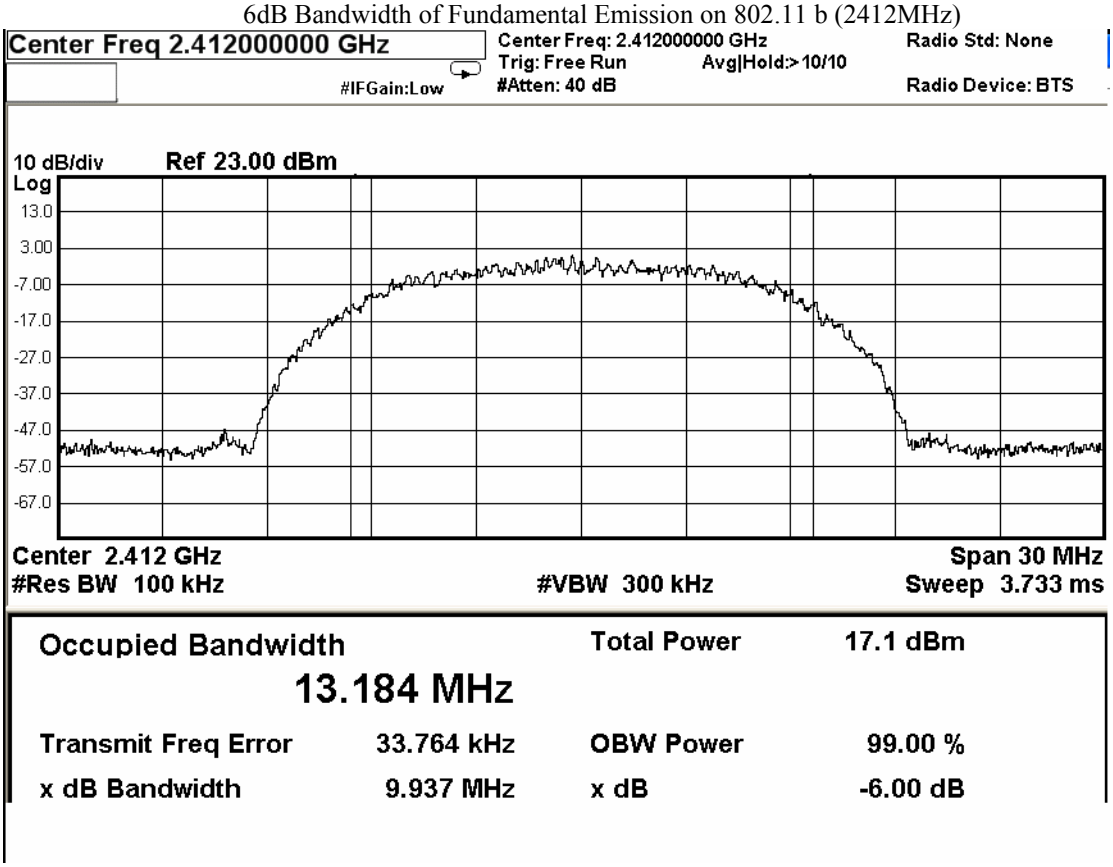
Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	9.937	> 500

6dB Bandwidth of Fundamental Emission on 802.11 b (2412MHz)



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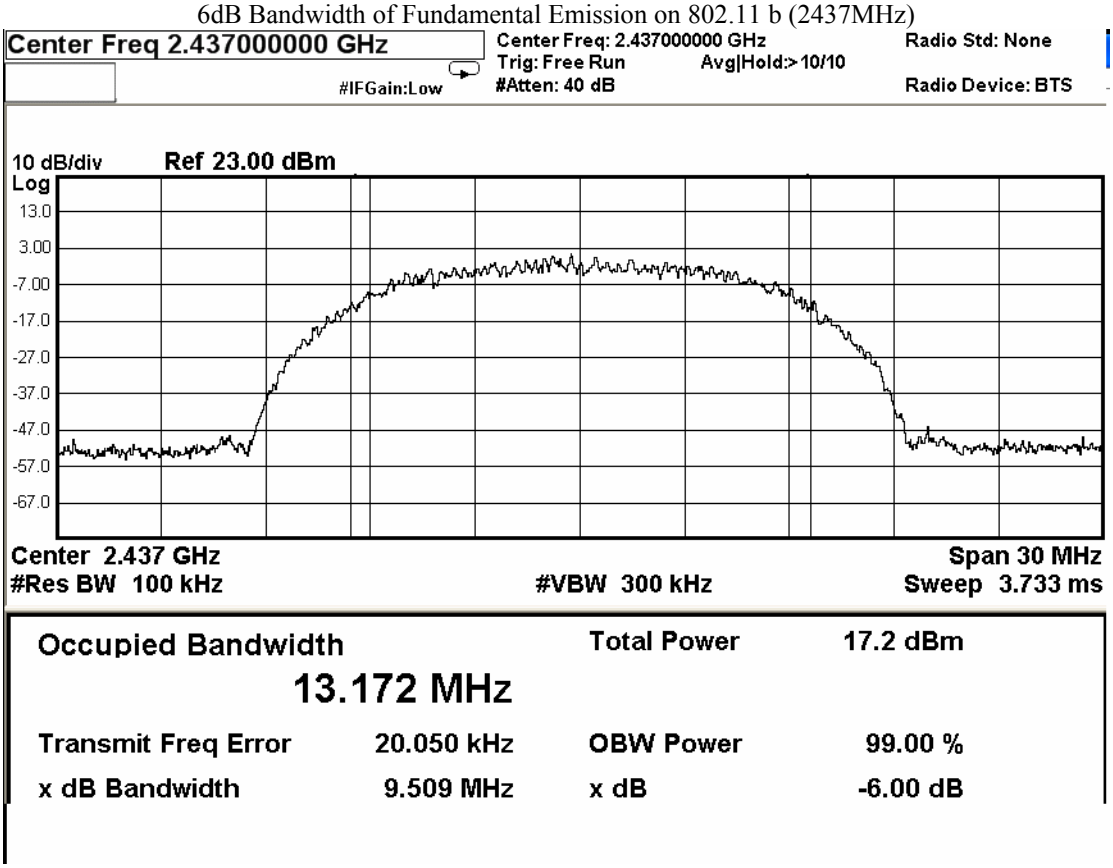
Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	9.509	> 500

6dB Bandwidth of Fundamental Emission on 802.11 b (2437MHz)



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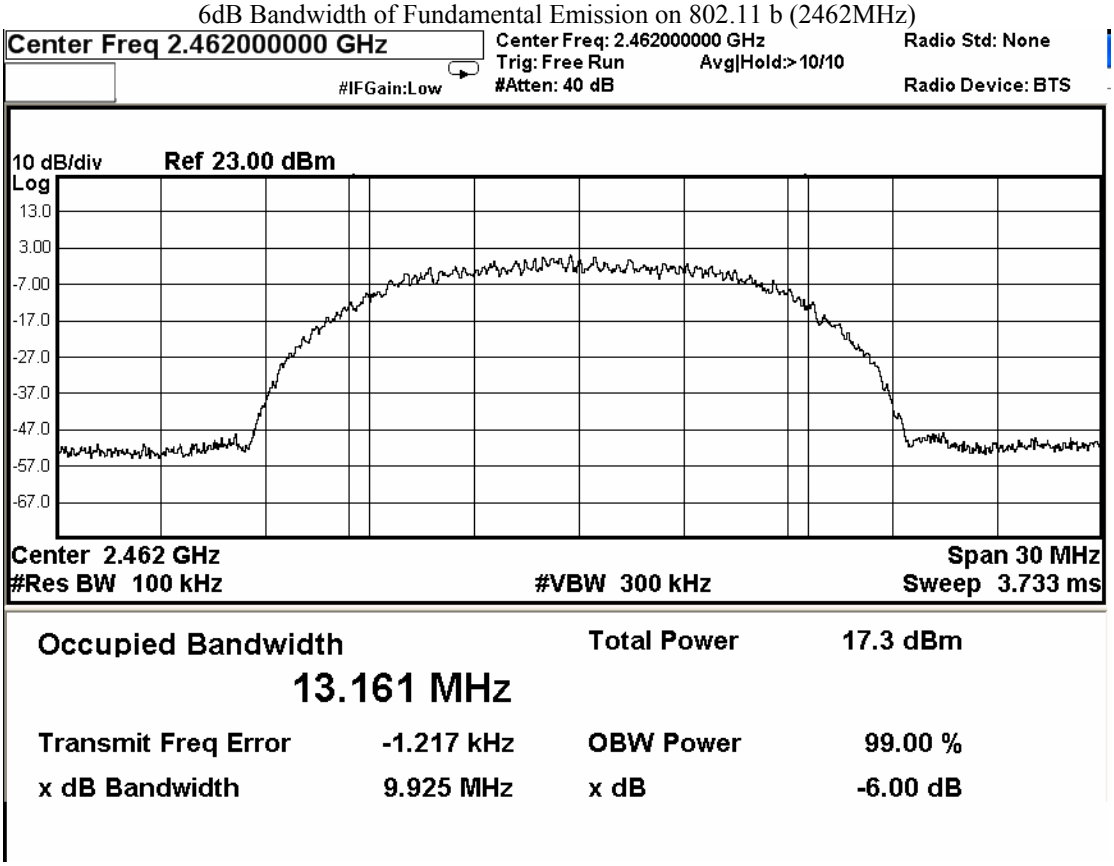
Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	9.925	> 500

6dB Bandwidth of Fundamental Emission on 802.11 b (2462MHz)



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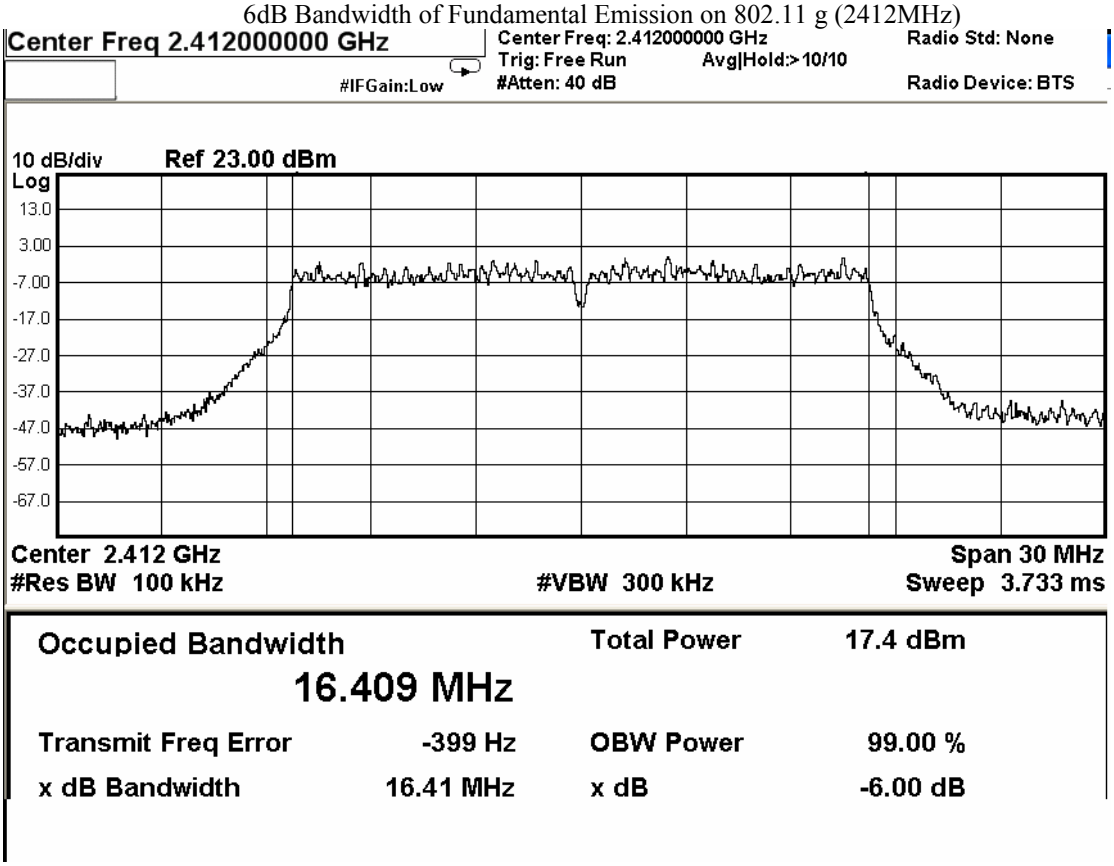
Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	16.41	> 500

6dB Bandwidth of Fundamental Emission on 802.11 g (2412MHz)



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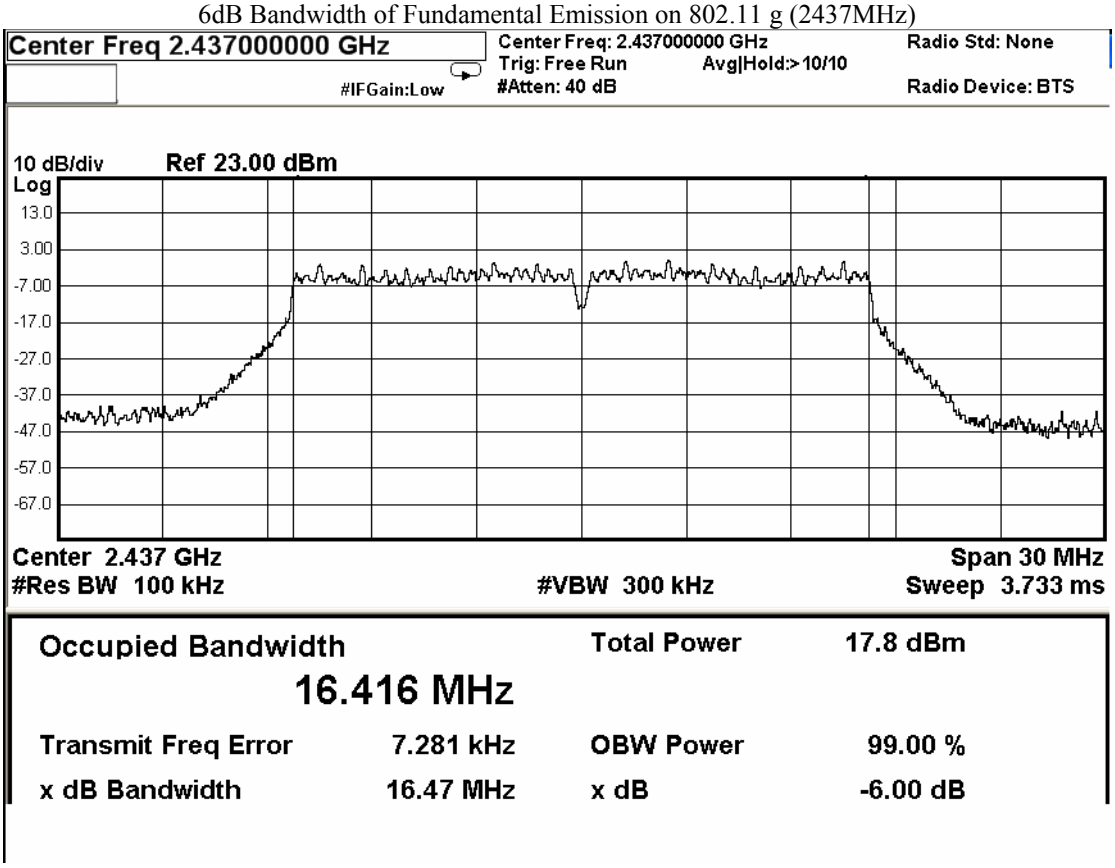
Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	16.47	> 500

6dB Bandwidth of Fundamental Emission on 802.11 g (2437MHz)



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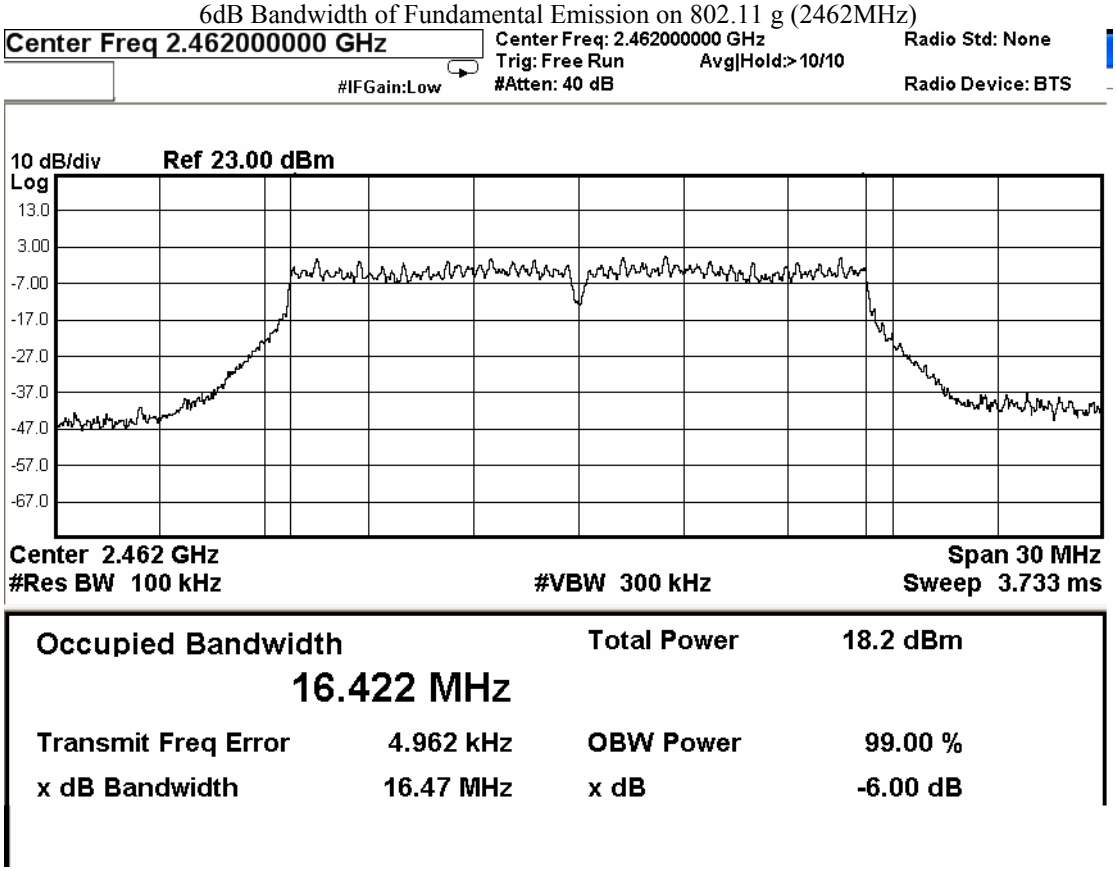
Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	16.47	> 500

6dB Bandwidth of Fundamental Emission on 802.11 g (2462MHz)



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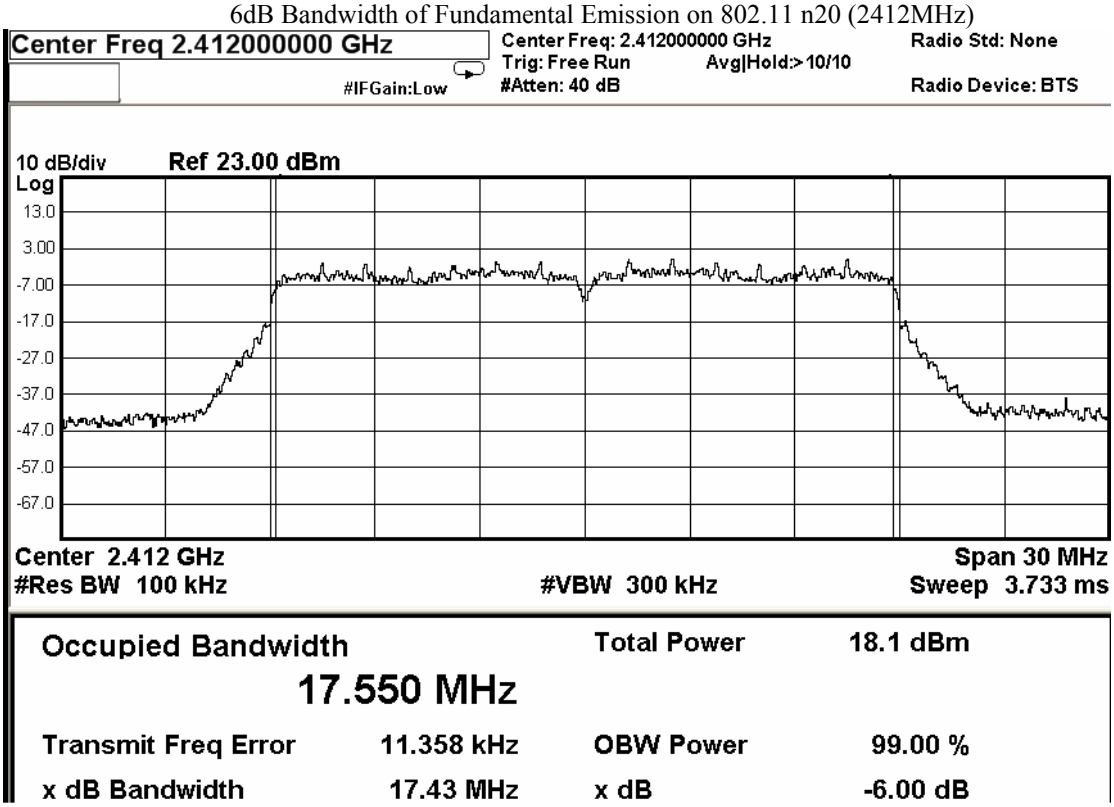
Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	17.43	> 500

6dB Bandwidth of Fundamental Emission on 802.11 n20 (2412MHz)



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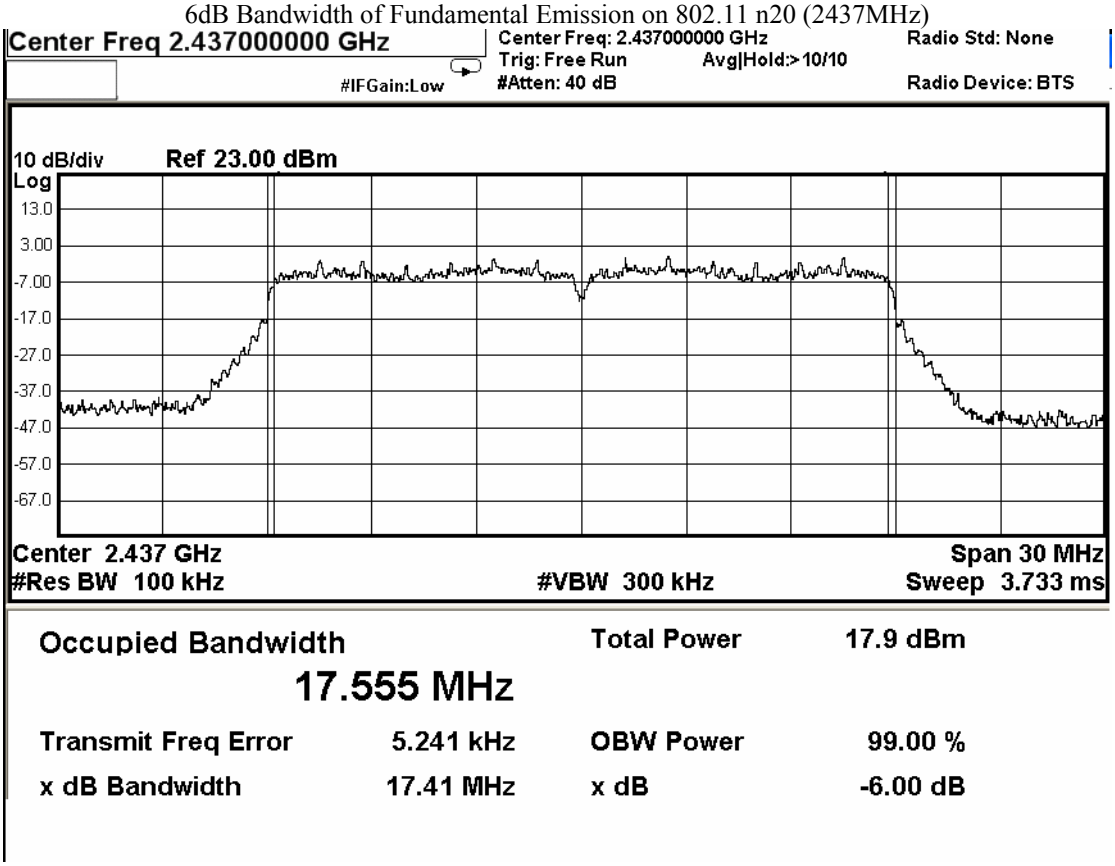
Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	17.41	> 500

6dB Bandwidth of Fundamental Emission on 802.11 n20 (2437MHz)



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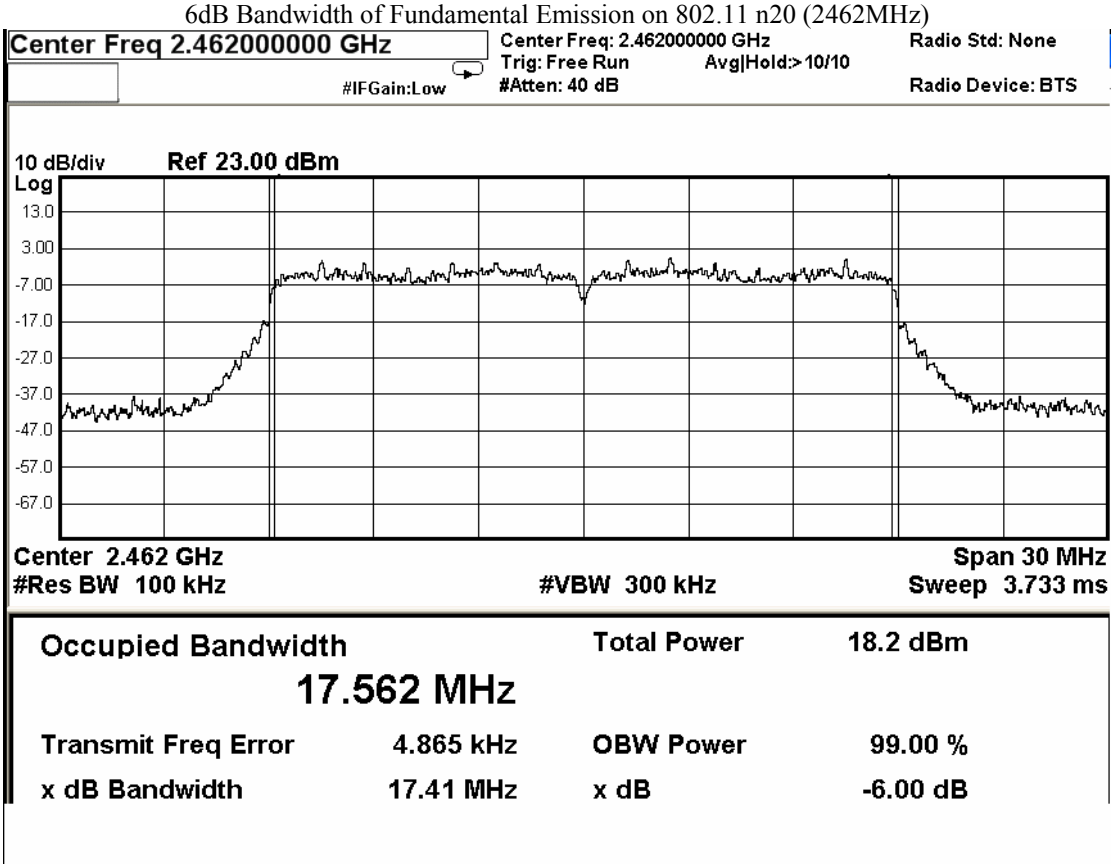
Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	17.41	> 500

6dB Bandwidth of Fundamental Emission on 802.11 n20 (2462MHz)



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3.1.6 Band Edges Measurement

Test Requirement:	FCC 47CFR 15.247
Test Method:	ANSI C63.10:2013
Test Date:	2019-05-23
Mode of Operation:	Wifi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The band edge is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. The RBW are set to 100kHz and VBW are set to 300kHz for this measurement.

Test Setup:

As Test Setup of clause 3.1.2 in this test report.

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Band-edge Compliance of RF Conducted Emissions Measurement:

Limit：

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. Attenuation below the general limits specified in Section 15.209(a) is not required.

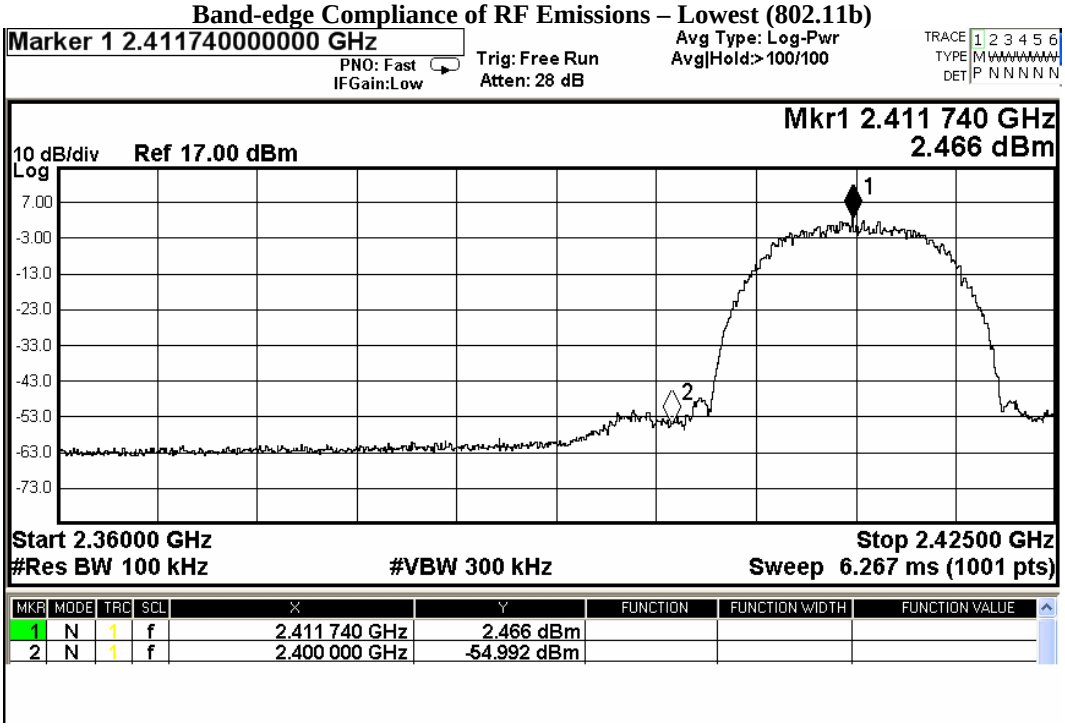
Remark: The worst-case measurement results were recorded in the test report

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	57.458

Frequency MHz	Mesured Level@3m dBuV/m	Correction Factor dB	Result Level@3m dBuV/m
2411.740	2.466	10.1	-7.634
2400.000	-54.992	10.1	-65.092

Note: Correction Factor=Cable loss+Antenna loss

Band-edge Compliance of RF Emissions – Lowest (802.11b)



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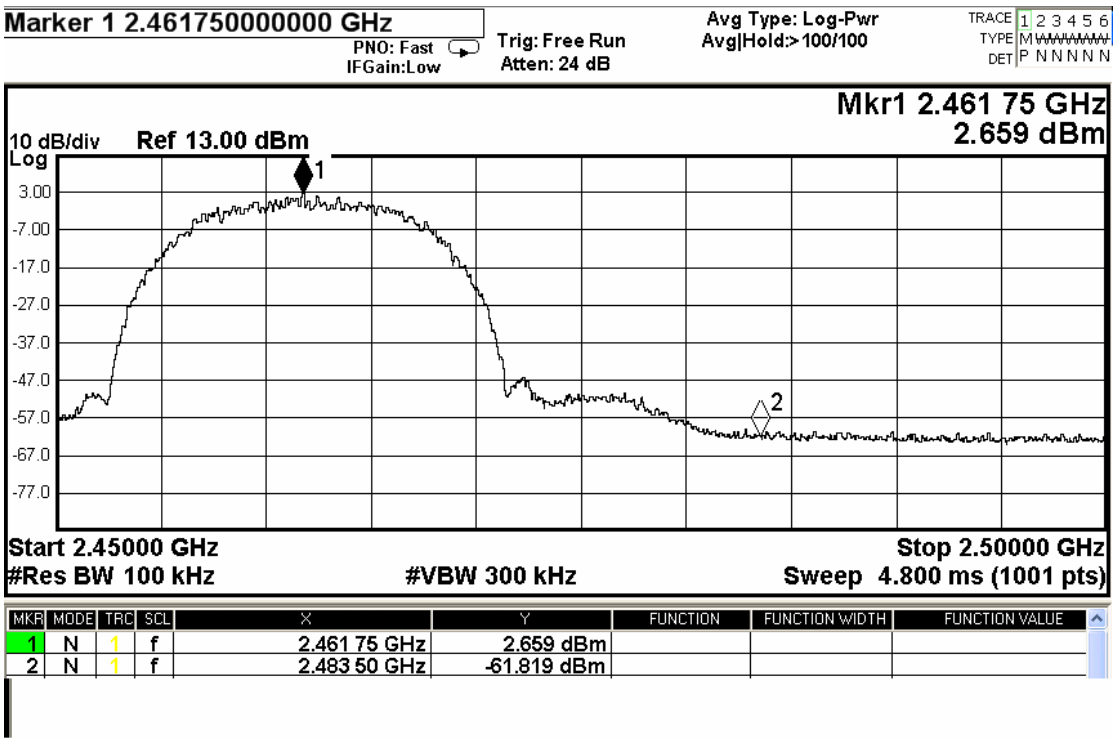
Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	64.478

Frequency MHz	Mesured Level@3m dBuV/m	Correction Factor dB	Result Level@3m dBuV/m
2461.750	2.659	10.1	-7.441
2483.500	-61.819	10.1	-71.919

Note: Correction Factor=Cable loss+Antenna loss

Band-edge Compliance of RF Emissions – Highest (802.11b)



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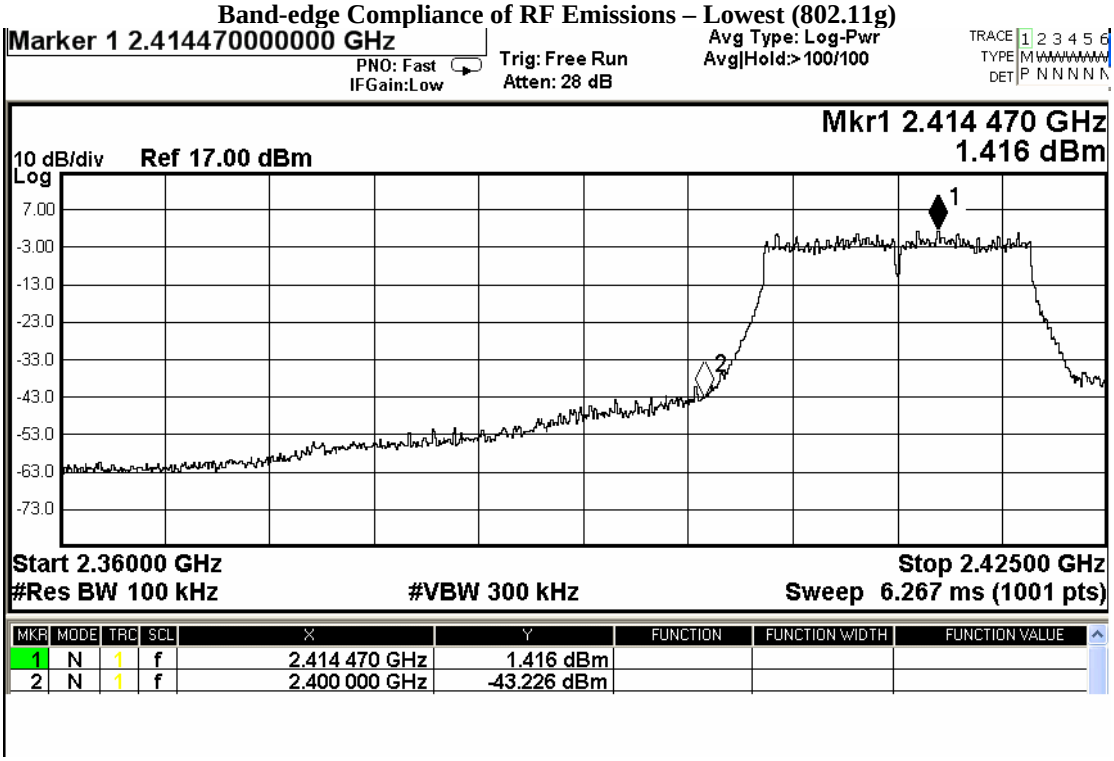
Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	44.642

Frequency MHz	Mesured Level@3m dBuV/m	Correction Factor dB	Result Level@3m dBuV/m
2414.470	1.416	10.1	-8.684
2400.000	-43.226	10.1	-53.326

Note: Correction Factor=Cable loss+Antenna loss

Band-edge Compliance of RF Emissions – Lowest (802.11g)



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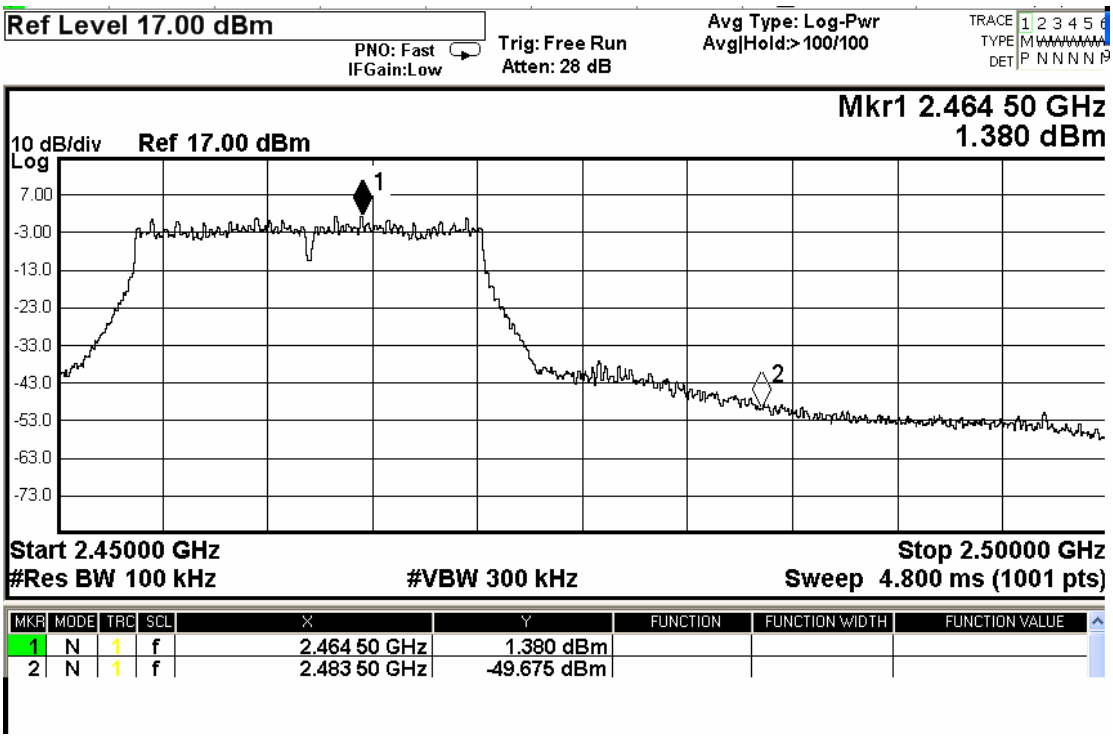
Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	51.055

Frequency MHz	Mesured Level@3m dBuV/m	Correction Factor dB	Result Level@3m dBuV/m
2464.500	1.380	10.1	-8.72
2483.500	-49.675	10.1	-59.775

Note: Correction Factor=Cable loss+Antenna loss

Band-edge Compliance of RF Emissions – Highest (802.11g)



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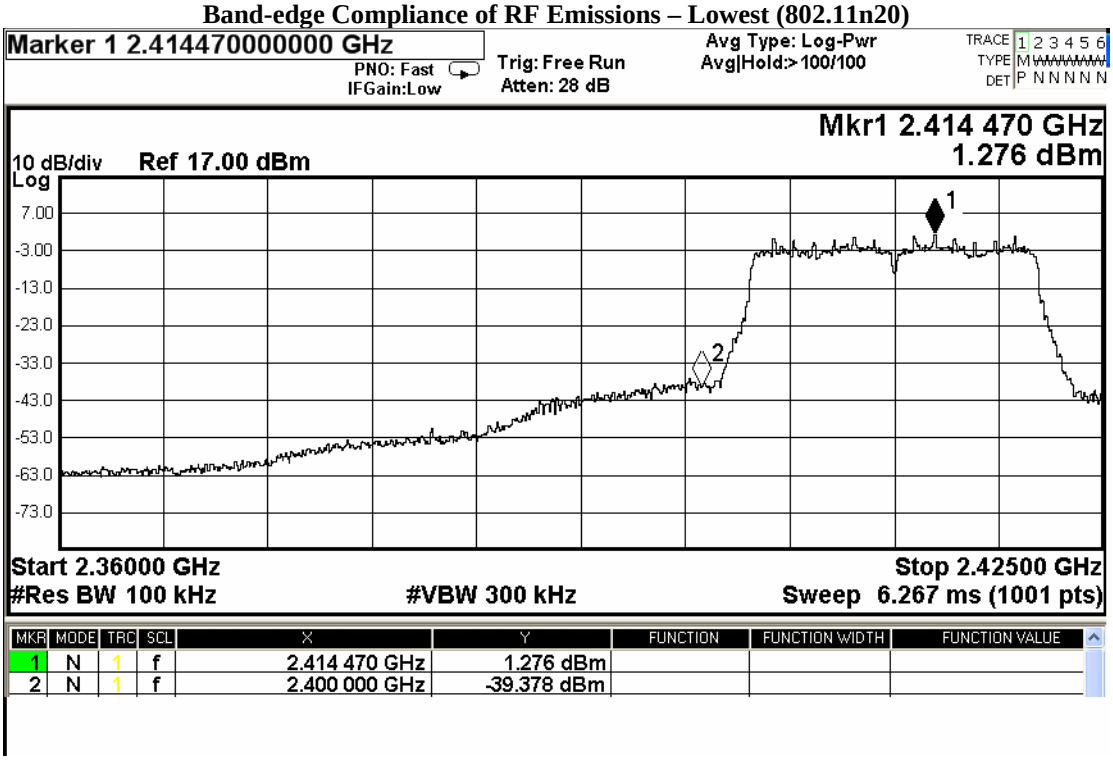
Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	40.654

Frequency MHz	Mesured Level@3m dBuV/m	Correction Factor dB	Result Level@3m dBuV/m
2414.470	1.276	10.1	-8.824
2400.000	-39.378	10.1	-49.478

Note: Correction Factor=Cable loss+Antenna loss

Band-edge Compliance of RF Emissions – Lowest (802.11n20)



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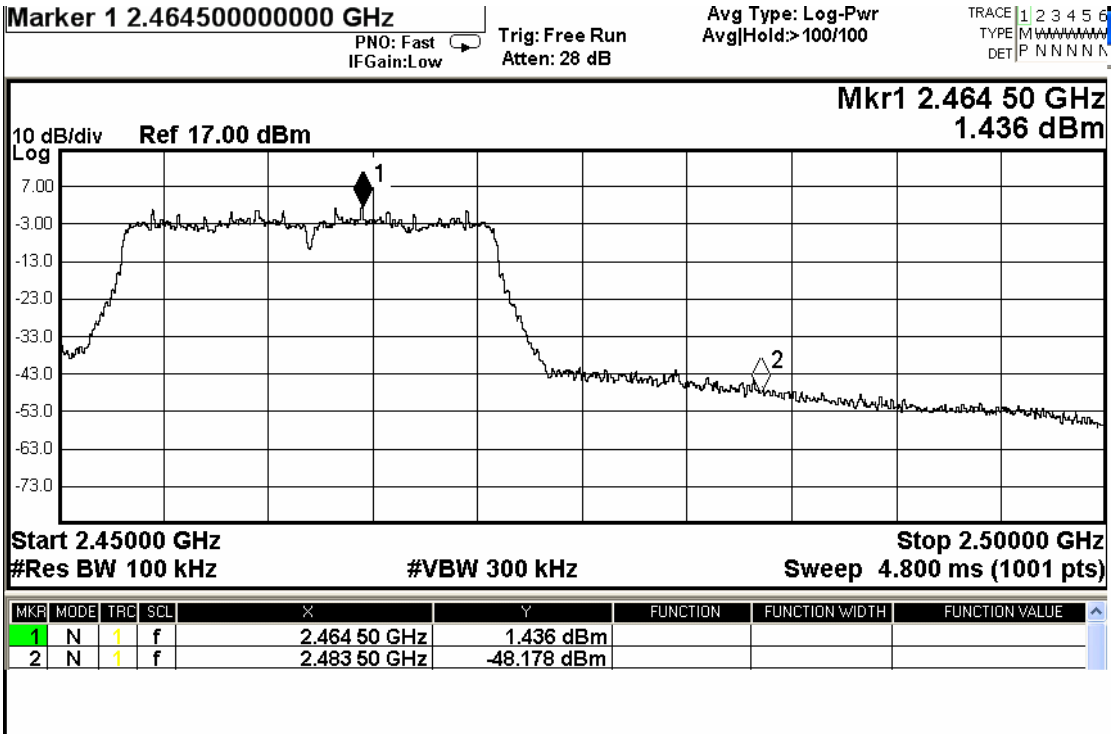
Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	49.614

Frequency MHz	Mesured Level@3m dBuV/m	Correction Factor dB	Result Level@3m dBuV/m
2464.500	1.436	10.1	-8.664
2483.500	-48.178	10.1	-58.278

Note: Correction Factor=Cable loss+Antenna loss

Band-edge Compliance of RF Emissions – Highest (802.11n20)



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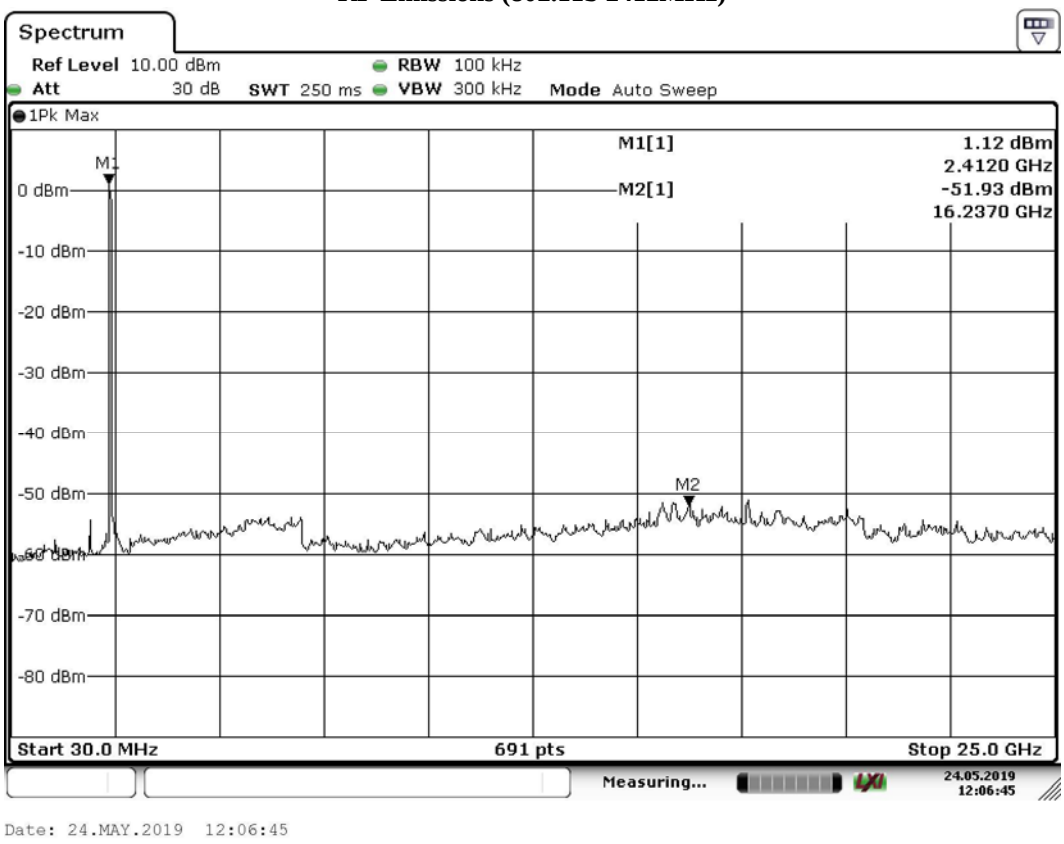
RF Conducted Emissions Measurement:

Limit：

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. Attenuation below the general limits specified in Section 15.209(a) is not required.

Remark: The worst-case measurement results were recorded in the test report

RF Emissions (802.11b 2412MHz)



Date: 24.MAY.2019 12:06:45

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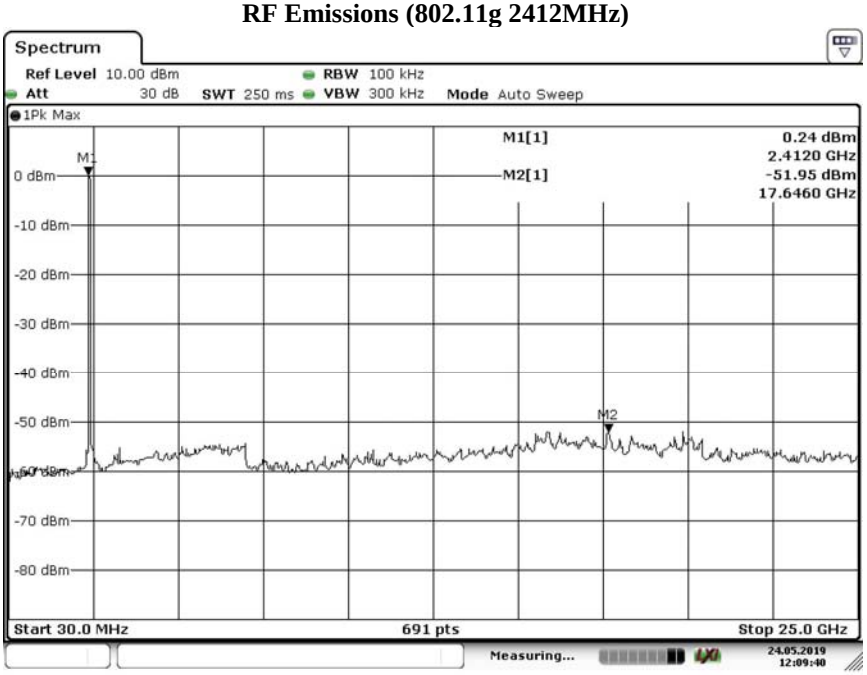
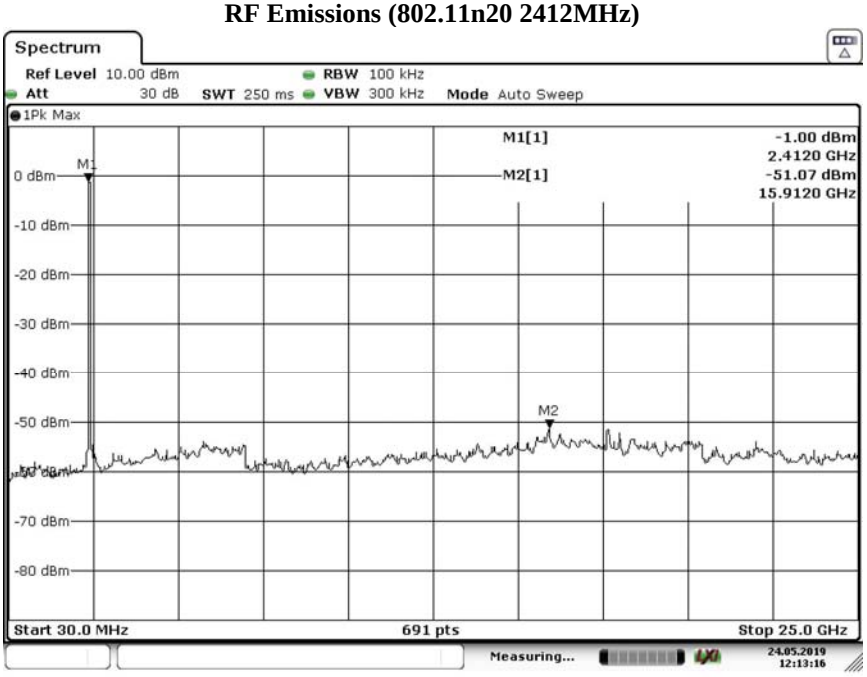
RF Emissions (802.11g 2412MHz)



Date: 24.MAY.2019 12:09:41

RF Emissions (802.11n20 2412MHz)



Date: 24.MAY.2019 12:13:17

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3.1.7 Antenna Requirement

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Requirements: § 15.203

Test Specification:

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 use of a standard antenna jack or electrical connector is prohibited.

Test Results:

This EUT has two diversity antennas, but only one antenna is working at any time.
This is PCB antenna. There is no external antenna, the RF11C02637S antenna gain is 2.8dBi, the RF11C02638S antenna gain is 2.86dBi. User is unable to remove or changed the Antenna.

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Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2018/04/20	2020/04/20
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM354	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00142073	2018/03/29	2020/03/29
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2018/06/01	2019/06/01
EM276	BROADBAND HORN ANTENNA	A-INFOMW	JXTXLB-10180-SF	J203109090300 7	2018/04/27	2020/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2018/05/13	2020/05/13
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2018/05/13	2020/05/13
EM302	PRECISION OMNIDIRECTIONAL DIPOLE (1 – 6GHZ)	SEIBERSDORF LABORATORIES	POD 16	161806/L	2018/05/11	2020/05/11
EM303	PRECISION OMNIDIRECTIONAL DIPOLE (6 – 18GHZ)	SEIBERSDORF LABORATORIES	POD 618	6181908/L	2018/05/11	2020/05/11
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2018/04/16	2020/04/16
EM045	POWER METER	ROHDE & SCHWARZ	NRVD	843246/028	2018/06/01	2020/06/01

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2018/11/09	2019/11/09
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	2018/06/01	2020/06/01
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2019/01/11	2020/01/11
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2017/02/02	2022/02/02
N/A	MEASUREMENT AND EVALUATION SOFTWARE	ROHDE & SCHWARZ	BSIB-K1	V1.20	N/A	N/A

Remarks:-

CM Corrective Maintenance
N/A Not Applicable
TBD To Be Determined

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Appendix B

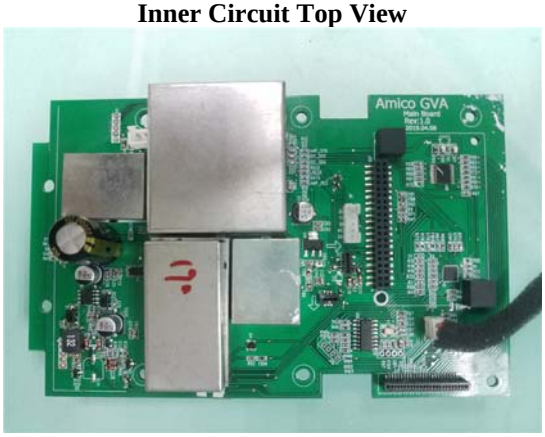
Photographs of EUT

View of the product

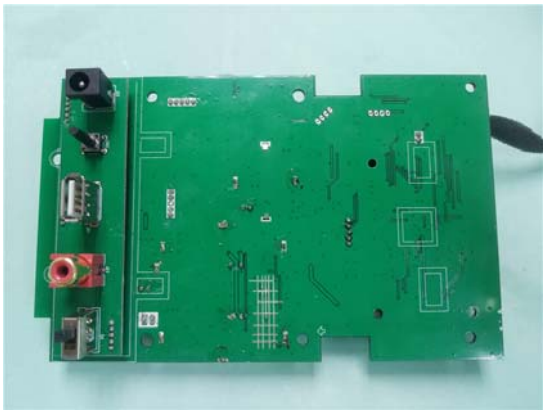
View of the product

Inside View of the product

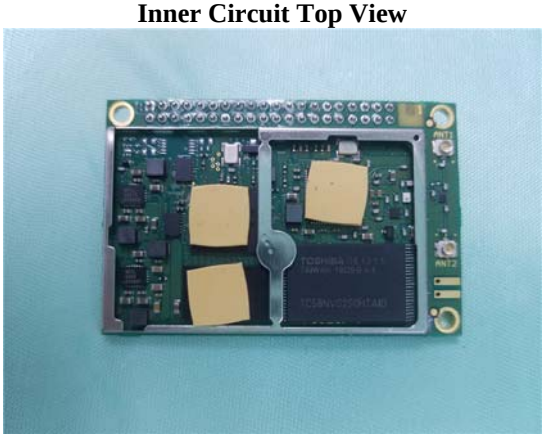
Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



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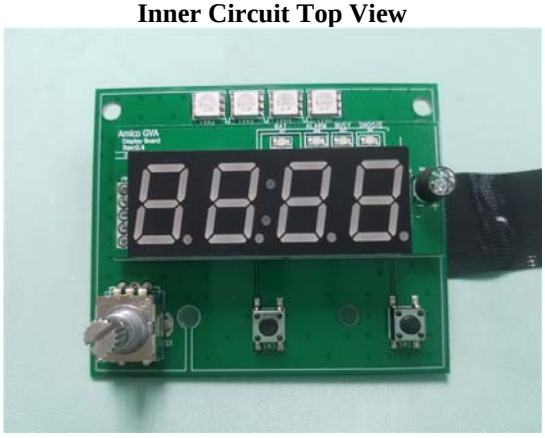
Photographs of EUT

Inner Circuit Bottom View

Inner Circuit Top View



Inner Circuit Bottom View

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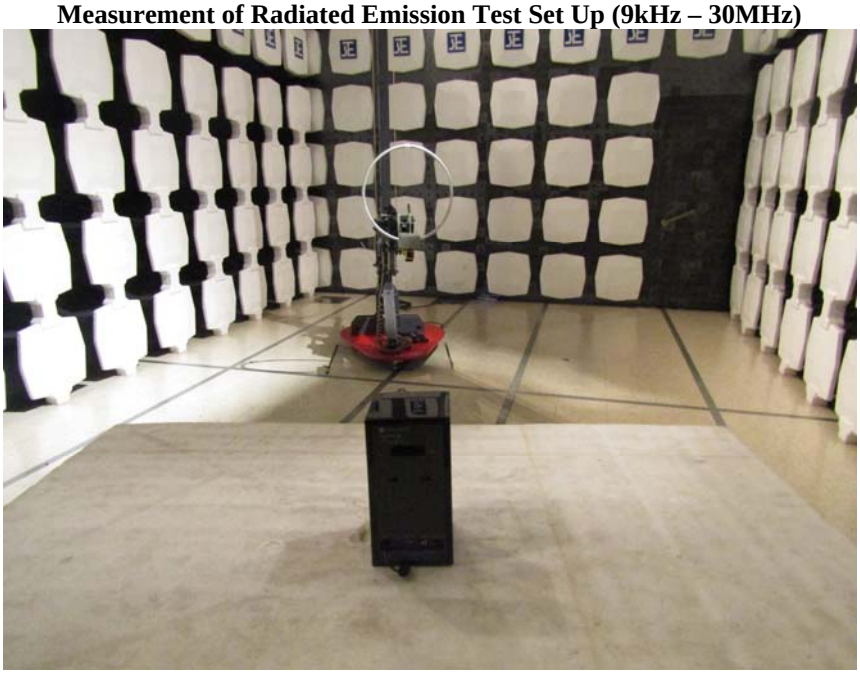
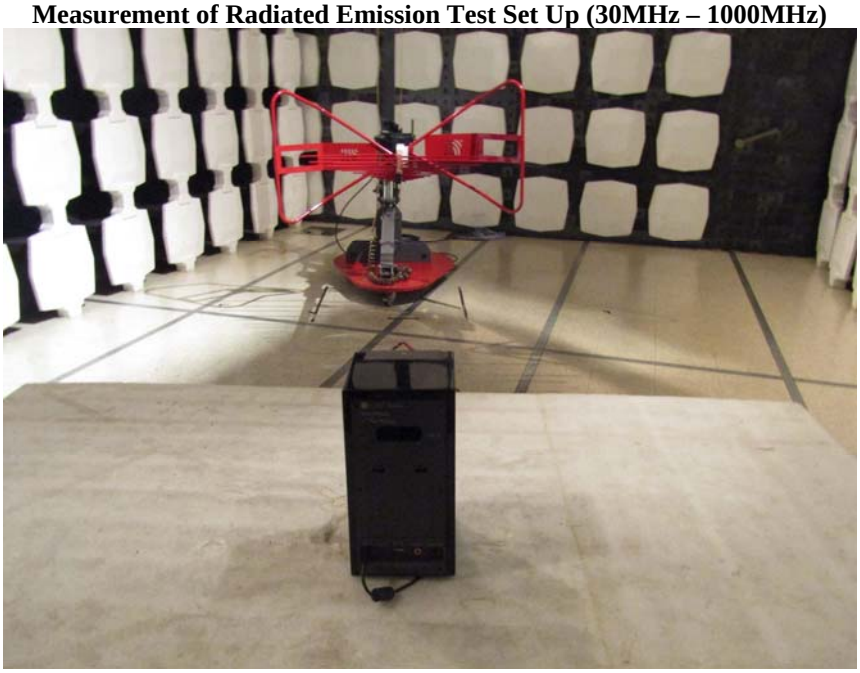
Photographs of EUT

Measurement of Radiated Emission Test Set Up (9kHz – 30MHz)



Measurement of Radiated Emission Test Set Up (30MHz – 1000MHz)



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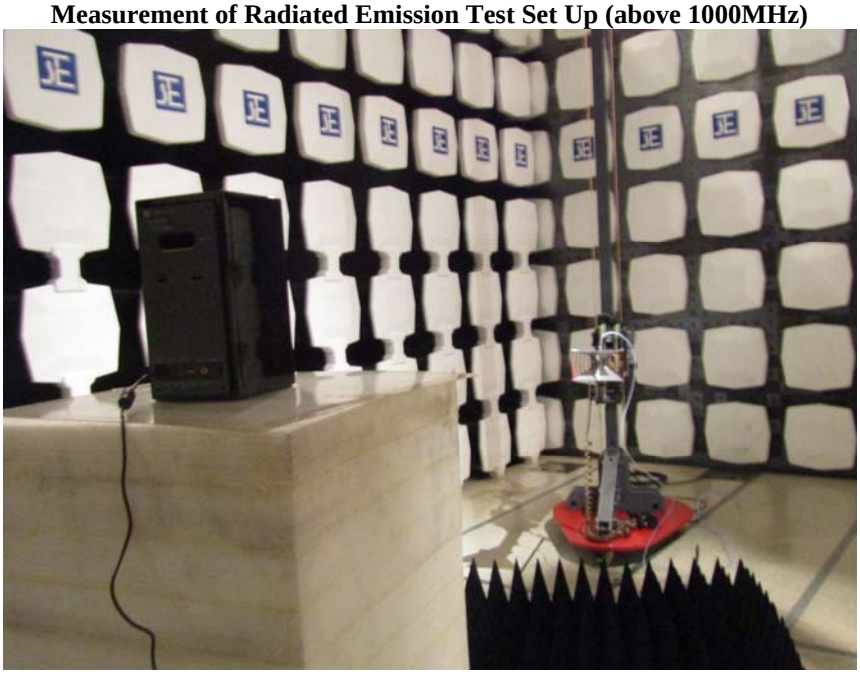
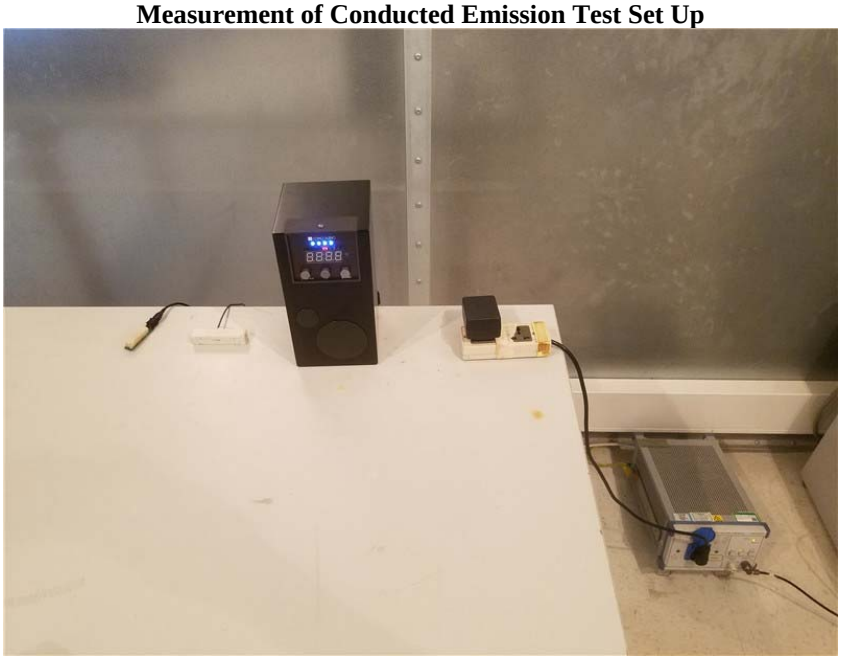
Photographs of EUT

Measurement of Radiated Emission Test Set Up (above 1000MHz)



Measurement of Conducted Emission Test Set Up



******* End of Test Report *******

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