



Test Report

Date : 2022-04-28

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No. : HMD22040014

Applicant : Hip Shing Electronics Limited
Units 1.2&3,20/F., New Treasure Centre, 10., Ng Fong Street, San Po Kong, Kowloon, Hong Kong

Supplier / Manufacturer : Dongguan Zhi Cheng Electronic Products Co., Ltd.
No.32 Shangbao Road, 188 Industrial Zone, Pingshan, Tangxia, Dongguan, Guangdong, China

Description of Sample(s) : Submitted sample(s) said to be
Product: Internet, DAB/DAB+ and FM Digital Radio With Bluetooth and CD
Brand Name: REVO
Model No.: SUPERCD
FCC ID: BZAIDFB2215H5X

Date Samples Received : 2022-04-08

Date Tested : 2022-04-08 to 2022-04-24

Investigation Requested : Perform Electro Magnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 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/n40)


Dr.CHAN Kwok Hung, Brian
Authorized Signatory

The Hong Kong Standards and Testing Centre Limited

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1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate, New Territories, Hong Kong
Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product: Internet, DAB/DAB+ and FM Digital Radio With Bluetooth and CD
Manufacturer: Dongguan Zhi Cheng Electronic Products Co., Ltd.
No.32 Shangbao Road, 188 Industrial Zone, Pingshan, Tangxia, Dongguan, Guangdong, China
Brand Name: REVO
Model Number: SUPERCD
Rating: 20.0Vd.c. by adapter
The AC/DC adapter was provided by the applicant with following details:
Brand name: REVO, Model no.: BQ60A-2003000-D
Input: 100-240Va.c. 50/60Hz 1500mA, Output: 20.0Vd.c. 3.0A 60.0W

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is an Internet, DAB/DAB+ and FM Digital Radio With Bluetooth and CD. The transmission signal is digital modulated with channel frequency range 2412-2462MHz.

1.3 Antenna Details

Antenna Type: PCB antenna
Antenna Gain: 2.5dBi

1.4 Date of Order

2022-04-08

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2022-04-08 to 2022-04-24

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 Regulations and ANSI C63.10:2013 for FCC Certification.
According FCC KDB 558074 DTS Measurement Guidance, Duty cycle $\geq 98\%$.
The test mode sample is provided by manufacturer.

2.1.0 Operating conditions for the EUT

The sample went into test mode handled by the manufacturer using the software.



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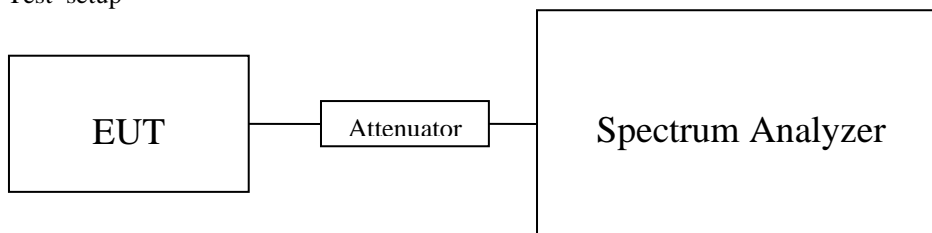
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2.1.1 EUT Duty cycle

The EUT shall be configured or modified to transmit continuously. The intent is to test at 100% duty cycle; however, a small reduction in duty cycle (to no lower than 98%) is permitted if required by the EUT for amplitude control purposes.

The test mode sample is provided by manufacturer.

Test setup

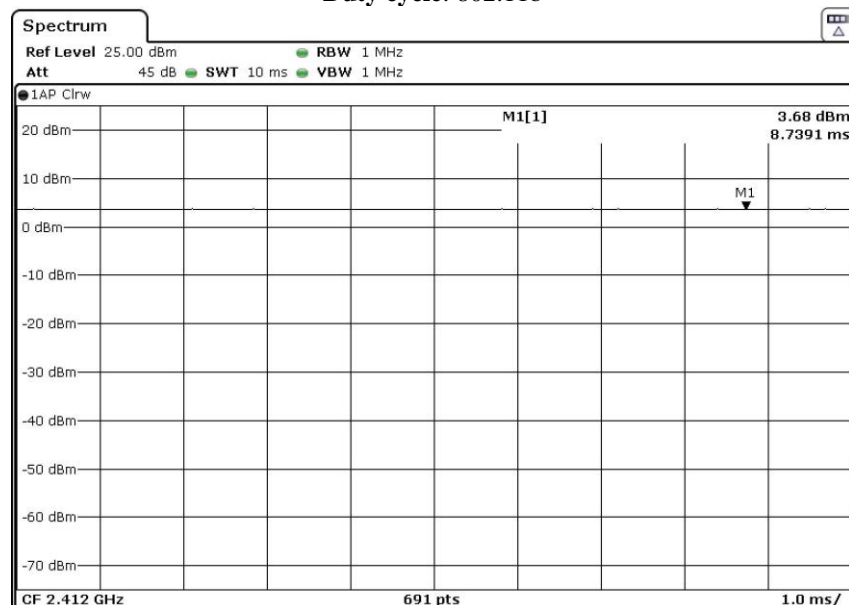


Results

Mode	On Time (msec)	Period (msec)	Duty Cycle X (Linear)	Duty Cycle (%)*
802.11b	1	1	1	100
802.11g	1	1	1	100
802.11n20	1	1	1	100
802.11n40	1	1	1	100

-*: If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Duty cycle: 802.11b



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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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Spectral Density	FCC 47CFR 15.247(e)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band Edge Emissions	FCC 47CFR 15.247(d)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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:	ANSI C63.10: 2013
Test Date:	2022-04-18
Mode of Operation:	WIFI Tx mode

Ambient Temperature: 25°C

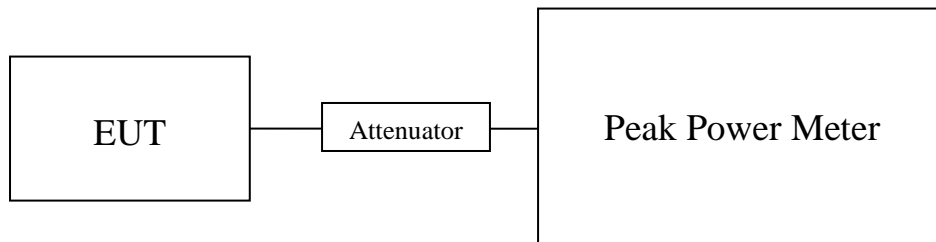
Relative Humidity: 51%

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	0.056990
Middle	2437	0.050442
High	2462	0.049034

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	0.076984
Middle	2437	0.069694
High	2462	0.067951

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	0.072995
Middle	2437	0.086964
High	2462	0.063576

Results of WiFi mode 802.11 n40, (2422MHz to 2452MHz): Pass (TX Unit) Maximum conducted output power

Channel	Frequency (MHz)	Output Power (Watt)
Low	2422	0.047853
Middle	2437	0.042338
High	2452	0.039435

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:	2022-04-19
Mode of Operation:	WIFI Tx mode

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

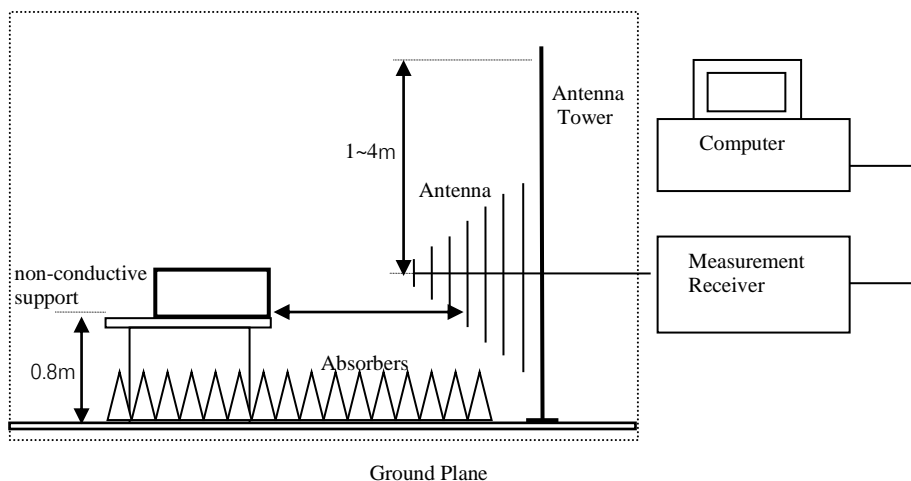
Above 1GHz (Pk)

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.

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Limits for Radiated Emissions FCC 47 CFR 15.247]:

Frequency Range [MHz]	Quasi-Peak Limits [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
Above 960	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	57.2	0.82	58.0	74.0	16.0	Vertical
4824.0	57.9	0.52	58.4	74.0	15.6	Horizontal
7236.0	50.2	7.00	57.2	74.0	16.8	Vertical
7236.0	50.7	6.50	57.2	74.0	16.8	Horizontal
9648.0	47.3	8.50	55.8	74.0	18.2	Vertical
9648.0	47.1	8.30	55.4	74.0	18.6	Horizontal
12060.0	45.8	10.90	56.7	74.0	17.3	Vertical
12060.0	45.2	10.80	56.0	74.0	18.0	Horizontal

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Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4824.0	41.3	0.82	42.1	54.0	11.9	Vertical
4824.0	42.5	0.52	43.0	54.0	11.0	Horizontal
7236.0	35.4	7.00	42.4	54.0	11.6	Vertical
7236.0	35.3	6.50	41.8	54.0	12.2	Horizontal
9648.0	32.3	8.50	40.8	54.0	13.2	Vertical
9648.0	31.6	8.30	39.9	54.0	14.1	Horizontal
12060.0	29.8	10.90	40.7	54.0	13.3	Vertical
12060.0	29.4	10.80	40.2	54.0	13.8	Horizontal

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

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit μ V/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 dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4874.0	57.1	0.82	57.9	74.0	16.1	Vertical
4874.0	57.3	0.52	57.8	74.0	16.2	Horizontal
7311.0	50.4	7.00	57.4	74.0	16.6	Vertical
7311.0	51.2	6.50	57.7	74.0	16.3	Horizontal
9748.0	48.5	8.50	57.0	74.0	17.0	Vertical
9748.0	47.9	8.30	56.2	74.0	17.8	Horizontal
12185.0	45.4	10.90	56.3	74.0	17.7	Vertical
12185.0	45.2	10.80	56.0	74.0	18.0	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	42.3	0.82	43.1	54.0	10.9	Vertical
4874.0	41.7	0.52	42.3	54.0	11.8	Horizontal
7311.0	35.2	7.00	42.2	54.0	11.8	Vertical
7311.0	35.8	6.50	42.3	54.0	11.7	Horizontal
9748.0	32.8	8.50	41.3	54.0	12.7	Vertical
9748.0	32.8	8.30	41.1	54.0	12.9	Horizontal
12185.0	30.3	10.90	41.2	54.0	12.8	Vertical
12185.0	30.8	10.80	41.6	54.0	12.4	Horizontal

Result of Tx mode (2462.0 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 (2462.0 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
4924.0	57.1	0.82	57.9	74.0	16.1	Vertical
4924.0	57.4	0.52	57.9	74.0	16.1	Horizontal
7386.0	50.9	7.00	57.9	74.0	16.1	Vertical
7386.0	51.2	6.50	57.7	74.0	16.3	Horizontal
9848.0	47.6	8.50	56.1	74.0	17.9	Vertical
9848.0	47.3	8.30	55.6	74.0	18.4	Horizontal
12310.0	45.9	10.90	56.8	74.0	17.2	Vertical
12310.0	45.4	10.80	56.2	74.0	17.8	Horizontal

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Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4924.0	42.4	0.82	43.2	54.0	10.8	Vertical
4924.0	42.5	0.52	43.0	54.0	11.0	Horizontal
7386.0	35.1	7.00	42.1	54.0	11.9	Vertical
7386.0	35.6	6.50	42.1	54.0	11.9	Horizontal
9848.0	32.6	8.50	41.1	54.0	12.9	Vertical
9848.0	33.1	8.30	41.4	54.0	12.6	Horizontal
12310.0	29.4	10.90	40.3	54.0	13.7	Vertical
12310.0	30.5	10.80	41.3	54.0	12.7	Horizontal

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

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit μ V/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 dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4824.0	56.5	0.82	57.3	74.0	16.7	Vertical
4824.0	56.4	0.52	56.9	74.0	17.1	Horizontal
7236.0	49.5	7.00	56.5	74.0	17.5	Vertical
7236.0	51.1	6.50	57.6	74.0	16.4	Horizontal
9648.0	47.4	8.50	55.9	74.0	18.1	Vertical
9648.0	47.5	8.30	55.8	74.0	18.2	Horizontal
12060.0	45.1	10.90	56.0	74.0	18.0	Vertical
12060.0	45.3	10.80	56.1	74.0	17.9	Horizontal

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Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4824.0	41.2	0.82	42.0	54.0	12.0	Vertical
4824.0	41.5	0.52	42.0	54.0	12.0	Horizontal
7236.0	35.3	7.00	42.3	54.0	11.7	Vertical
7236.0	35.4	6.50	41.9	54.0	12.1	Horizontal
9648.0	31.2	8.50	39.7	54.0	14.3	Vertical
9648.0	32.8	8.30	41.1	54.0	12.9	Horizontal
12060.0	30.5	10.90	41.4	54.0	12.6	Vertical
12060.0	29.8	10.80	40.6	54.0	13.4	Horizontal

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

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit μ V/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 dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4874.0	56.5	0.82	57.3	74.0	16.7	Vertical
4874.0	57.1	0.52	57.6	74.0	16.4	Horizontal
7311.0	48.9	7.00	55.9	74.0	18.1	Vertical
7311.0	50.2	6.50	56.7	74.0	17.3	Horizontal
9748.0	47.1	8.50	55.6	74.0	18.4	Vertical
9748.0	47.2	8.30	55.5	74.0	18.5	Horizontal
12185.0	46.1	10.90	57.0	74.0	17.0	Vertical
12185.0	45.5	10.80	56.3	74.0	17.7	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	41.8	0.82	42.6	54.0	11.4	Vertical
4874.0	41.9	0.52	42.4	54.0	11.6	Horizontal
7311.0	34.0	7.00	41.0	54.0	13.0	Vertical
7311.0	35.2	6.50	41.7	54.0	12.3	Horizontal
9748.0	31.5	8.50	40.0	54.0	14.0	Vertical
9748.0	32.6	8.30	40.9	54.0	13.1	Horizontal
12185.0	32.0	10.90	42.9	54.0	11.1	Vertical
12185.0	30.4	10.80	41.2	54.0	12.8	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	57.3	0.82	58.1	74.0	15.9	Vertical
4924.0	57.2	0.52	57.7	74.0	16.3	Horizontal
7386.0	50.1	7.00	57.1	74.0	16.9	Vertical
7386.0	51.4	6.50	57.9	74.0	16.1	Horizontal
9848.0	47.6	8.50	56.1	74.0	17.9	Vertical
9848.0	47.1	8.30	55.4	74.0	18.6	Horizontal
12310.0	45.3	10.90	56.2	74.0	17.8	Vertical
12310.0	45.4	10.80	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
4924.0	41.6	0.82	42.4	54.0	11.6	Vertical
4924.0	41.8	0.52	42.3	54.0	11.7	Horizontal
7386.0	35.4	7.00	42.4	54.0	11.6	Vertical
7386.0	36.2	6.50	42.7	54.0	11.3	Horizontal
9848.0	33.6	8.50	42.1	54.0	11.9	Vertical
9848.0	32.7	8.30	41.0	54.0	13.0	Horizontal
12310.0	29.4	10.90	40.3	54.0	13.7	Vertical
12310.0	31.3	10.80	42.1	54.0	12.0	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	56.6	0.82	57.4	74.0	16.6	Vertical
4824.0	57.2	0.52	57.7	74.0	16.3	Horizontal
7236.0	50.3	7.00	57.3	74.0	16.7	Vertical
7236.0	50.4	6.50	56.9	74.0	17.1	Horizontal
9648.0	47.9	8.50	56.4	74.0	17.6	Vertical
9648.0	46.9	8.30	55.2	74.0	18.8	Horizontal
12060.0	46.1	10.90	57.0	74.0	17.0	Vertical
12060.0	45.5	10.80	56.3	74.0	17.7	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	41.6	0.82	42.4	54.0	11.6	Vertical
4824.0	42.0	0.52	42.5	54.0	11.5	Horizontal
7236.0	35.4	7.00	42.4	54.0	11.6	Vertical
7236.0	35.6	6.50	42.1	54.0	11.9	Horizontal
9648.0	31.2	8.50	39.7	54.0	14.3	Vertical
9648.0	33.2	8.30	41.5	54.0	12.6	Horizontal
12060.0	30.3	10.90	41.2	54.0	12.9	Vertical
12060.0	30.7	10.80	41.5	54.0	12.5	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	57.4	0.82	58.2	74.0	15.8	Vertical
4874.0	57.1	0.52	57.6	74.0	16.4	Horizontal
7311.0	49.5	7.00	56.5	74.0	17.5	Vertical
7311.0	51.2	6.50	57.7	74.0	16.3	Horizontal
9748.0	47.6	8.50	56.1	74.0	17.9	Vertical
9748.0	47.0	8.30	55.3	74.0	18.7	Horizontal
12185.0	45.1	10.90	56.0	74.0	18.0	Vertical
12185.0	45.5	10.80	56.3	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	41.6	0.82	42.4	54.0	11.6	Vertical
4874.0	41.3	0.52	41.8	54.0	12.2	Horizontal
7311.0	35.6	7.00	42.6	54.0	11.4	Vertical
7311.0	35.8	6.50	42.3	54.0	11.7	Horizontal
9748.0	32.4	8.50	40.9	54.0	13.1	Vertical
9748.0	31.6	8.30	39.9	54.0	14.1	Horizontal
12185.0	30.9	10.90	41.8	54.0	12.2	Vertical
12185.0	30.7	10.80	41.5	54.0	12.5	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	57.3	0.82	58.1	74.0	15.9	Vertical
4924.0	56.3	0.52	56.8	74.0	17.2	Horizontal
7386.0	50.4	7.00	57.4	74.0	16.6	Vertical
7386.0	51.3	6.50	57.8	74.0	16.2	Horizontal
9848.0	47.8	8.50	56.3	74.0	17.7	Vertical
9848.0	47.3	8.30	55.6	74.0	18.4	Horizontal
12310.0	45.2	10.90	56.1	74.0	17.9	Vertical
12310.0	45.4	10.80	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
4924.0	41.5	0.82	42.3	54.0	11.7	Vertical
4924.0	42.1	0.52	42.6	54.0	11.4	Horizontal
7386.0	35.9	7.00	42.9	54.0	11.1	Vertical
7386.0	34.4	6.50	40.9	54.0	13.1	Horizontal
9848.0	32.3	8.50	40.8	54.0	13.2	Vertical
9848.0	31.6	8.30	39.9	54.0	14.1	Horizontal
12310.0	31.9	10.90	42.8	54.0	11.2	Vertical
12310.0	30.5	10.80	41.3	54.0	12.7	Horizontal

Result of Tx mode (2422.0 MHz) (802.11n40) (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 (2422.0 MHz) (802.11n40) (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
4844.0	57.2	0.82	58.0	74.0	16.0	Vertical
4844.0	56.6	0.52	57.1	74.0	16.9	Horizontal
7266.0	49.5	7.00	56.5	74.0	17.5	Vertical
7266.0	49.3	6.50	55.8	74.0	18.2	Horizontal
9688.0	47.2	8.50	55.7	74.0	18.3	Vertical
9688.0	47.7	8.30	56.0	74.0	18.0	Horizontal
12110.0	45.4	10.90	56.3	74.0	17.7	Vertical
12110.0	45.3	10.80	56.1	74.0	17.9	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
4844.0	41.2	0.82	42.0	54.0	12.0	Vertical
4844.0	41.5	0.52	42.0	54.0	12.0	Horizontal
7266.0	34.9	7.00	41.9	54.0	12.1	Vertical
7266.0	35.1	6.50	41.6	54.0	12.4	Horizontal
9688.0	31.6	8.50	40.1	54.0	13.9	Vertical
9688.0	33.2	8.30	41.5	54.0	12.5	Horizontal
12110.0	31.0	10.90	41.9	54.0	12.1	Vertical
12110.0	30.6	10.80	41.4	54.0	12.6	Horizontal

Result of Tx mode (2437.0 MHz) (802.11n40) (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) (802.11n40) (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	56.6	0.82	57.4	74.0	16.6	Vertical
4874.0	56.2	0.52	56.7	74.0	17.3	Horizontal
7311.0	50.4	7.00	57.4	74.0	16.6	Vertical
7311.0	50.2	6.50	56.7	74.0	17.3	Horizontal
9748.0	47.8	8.50	56.3	74.0	17.7	Vertical
9748.0	47.1	8.30	55.4	74.0	18.6	Horizontal
12185.0	48.6	10.90	59.5	74.0	14.5	Vertical
12185.0	46.5	10.80	57.3	74.0	16.7	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	42.2	0.82	43.0	54.0	11.0	Vertical
4874.0	41.9	0.52	42.4	54.0	11.6	Horizontal
7311.0	35.6	7.00	42.6	54.0	11.4	Vertical
7311.0	36.1	6.50	42.6	54.0	11.4	Horizontal
9748.0	32.4	8.50	40.9	54.0	13.1	Vertical
9748.0	32.5	8.30	40.8	54.0	13.2	Horizontal
12185.0	30.9	10.90	41.8	54.0	12.2	Vertical
12185.0	30.5	10.80	41.3	54.0	12.7	Horizontal

Result of Tx mode (2452.0 MHz) (802.11n40) (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 (2452.0 MHz) (802.11n40) (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
4904.0	55.2	0.82	56.0	74.0	18.0	Vertical
4904.0	56.1	0.52	56.6	74.0	17.4	Horizontal
7356.0	48.9	7.00	55.9	74.0	18.1	Vertical
7356.0	49.2	6.50	55.7	74.0	18.3	Horizontal
9808.0	47.2	8.50	55.7	74.0	18.3	Vertical
9808.0	47.1	8.30	55.4	74.0	18.6	Horizontal
12260.0	45.4	10.90	56.3	74.0	17.7	Vertical
12260.0	45.6	10.80	56.4	74.0	17.6	Horizontal

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Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
4904.0	40.6	0.82	41.4	54.0	12.6	Vertical
4904.0	41.5	0.52	42.0	54.0	12.0	Horizontal
7356.0	34.6	7.00	41.6	54.0	12.4	Vertical
7356.0	35.2	6.50	41.7	54.0	12.3	Horizontal
9808.0	31.9	8.50	40.4	54.0	13.6	Vertical
9808.0	31.4	8.30	39.7	54.0	14.3	Horizontal
12260.0	31.5	10.90	42.4	54.0	11.6	Vertical
12260.0	30.6	10.80	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 (9kHz-30MHz): 2.0dB

uncertainty (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	55.9	-4.8	51.1	74.0	22.9	Vertical
2390.0	56.3	-4.7	51.6	74.0	22.4	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
2390.0	42.4	-4.8	37.6	54.0	16.4	Vertical
2390.0	41.8	-4.7	37.1	54.0	16.9	Horizontal

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	55.7	-4.8	50.9	74.0	23.1	Vertical
2483.5	55.3	-4.7	50.6	74.0	23.4	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	42.6	-4.8	37.8	54.0	16.2	Vertical
2483.5	42.5	-4.7	37.8	54.0	16.2	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	66.3	-4.8	61.5	74.0	12.5	Vertical
2390.0	66.1	-4.7	61.4	74.0	12.6	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
2390.0	48.6	-4.8	43.8	54.0	10.2	Vertical
2390.0	47.3	-4.7	42.6	54.0	11.4	Horizontal

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	66.1	-4.8	61.3	74.0	12.7	Vertical
2483.5	65.8	-4.7	61.1	74.0	12.9	Horizontal

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	48.9	-4.8	44.1	54.0	9.9	Vertical
2483.5	49.0	-4.7	44.3	54.0	9.7	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	65.6	-4.8	60.8	74.0	13.2	Horizontal
2390.0	64.5	-4.7	59.8	74.0	14.2	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
2390.0	49.1	-4.8	44.3	54.0	9.7	Vertical
2390.0	48.6	-4.7	43.9	54.0	10.1	Horizontal

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	62.3	-4.8	57.5	74.0	16.5	Vertical
2483.5	64.5	-4.7	59.8	74.0	14.2	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	50.1	-4.8	45.3	54.0	8.7	Horizontal
2483.5	51.4	-4.7	46.7	54.0	7.3	Horizontal

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Result: RF Radiated Emissions (Lowest)-802.11n40

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	72.5	-4.8	67.7	74.0	6.3	Vertical
2390.0	73.1	-4.7	68.4	74.0	5.6	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
2390.0	50.3	-4.8	45.5	54.0	8.5	Vertical
2390.0	50.4	-4.7	45.7	54.0	8.3	Horizontal

Result: RF Radiated Emissions (Highest) -802.11n40

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	67.7	-4.8	62.9	74.0	11.1	Vertical
2483.5	68.2	-4.7	63.5	74.0	10.5	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	48.4	-4.8	43.6	54.0	10.4	Horizontal
2483.5	47.8	-4.7	43.1	54.0	10.9	Horizontal

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Limits for Radiated Emissions FCC 47 CFR 15.247]:

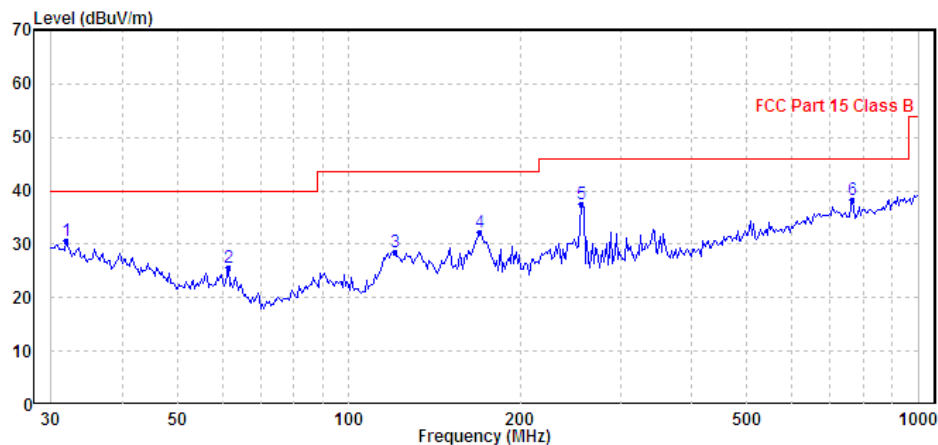
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 TX mode: Pass

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

Horizontal



Ambient Temperature: 27.0C

Relative Humidity : 45.0%

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	31.955	30.56	40.00	-9.44	QP	Horizontal
2	61.346	25.54	40.00	-14.46	QP	Horizontal
3	120.277	28.57	43.50	-14.93	QP	Horizontal
4	169.599	32.34	43.50	-11.16	QP	Horizontal
5	256.521	37.59	46.00	-8.41	QP	Horizontal
6	766.057	38.26	46.00	-7.74	QP	Horizontal

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

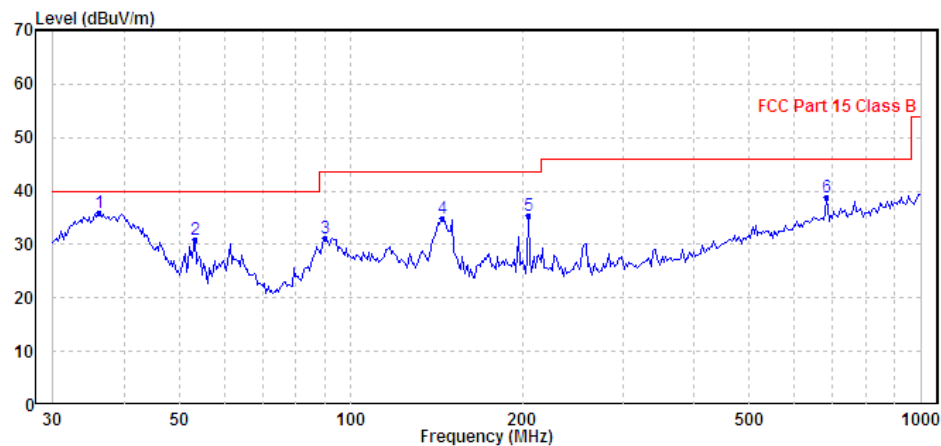
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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 TX mode: Pass

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

Vertical



Ambient Temperature: 27.0C
Relative Humidity : 45.0%

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	36.254	36.04	40.00	-3.96	QP	Vertical
2	53.318	30.98	40.00	-9.02	QP	Vertical
3	90.220	31.27	43.50	-12.23	QP	Vertical
4	144.335	34.83	43.50	-8.67	QP	Vertical
5	204.955	35.35	43.50	-8.15	QP	Vertical
6	684.745	38.94	46.00	-7.06	QP	Vertical

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:	2022-04-11
Mode of Operation:	WIFI TX mode
Test Voltage:	120V a.c. 60Hz

Ambient Temperature: 25°C	Relative Humidity: 51%	Atmospheric Pressure: 101 kPa
---------------------------	------------------------	-------------------------------

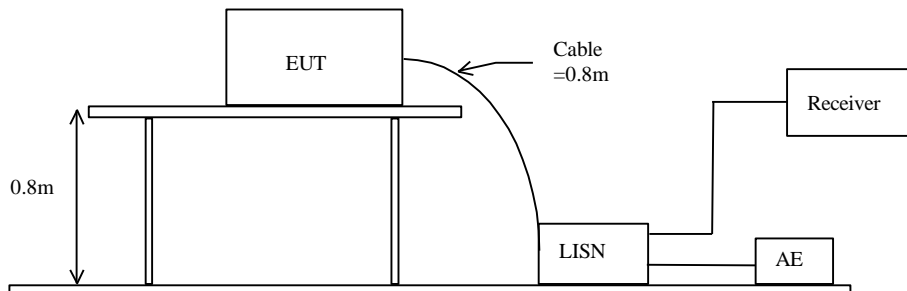
Test Method:

The test was performed in accordance with 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:



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.

Remarks:

Calculated measurement uncertainty (0.15MHz – 30MHz): 3.25dB

-*- Emission(s) that is far below the corresponding limit line.

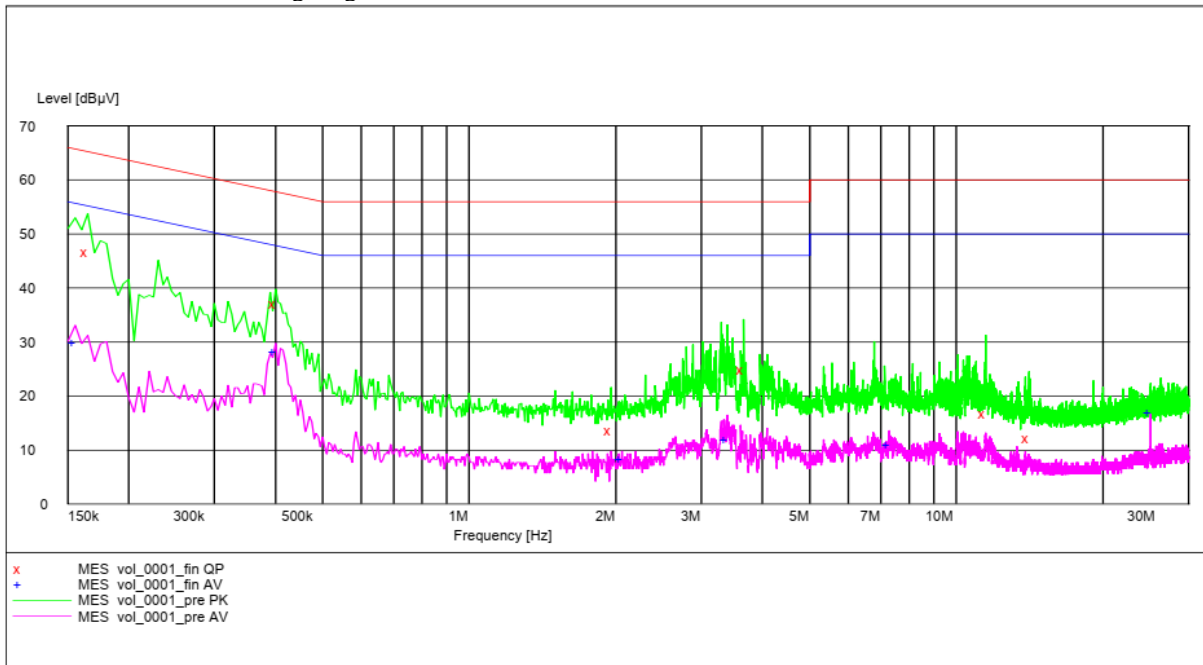
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Results of WIFI TX mode (L): PASS

Please refer to the following diagram for individual results.



MEASUREMENT RESULT: "vol_0001_fin QP"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.165000	46.6	9.7	65.2	18.6	L1	GND
0.400000	37.2	9.7	57.9	20.7	L1	GND
1.955000	13.7	9.8	56.0	42.3	L1	GND
3.660000	24.8	9.8	56.0	31.2	L1	GND
11.490000	16.8	10.1	60.0	43.2	L1	GND
14.090000	12.2	10.2	60.0	47.8	L1	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.155000	30.0	9.7	55.7	25.7	L1	GND
0.400000	28.1	9.7	47.9	19.8	L1	GND
2.060000	8.3	9.8	46.0	37.7	L1	GND
3.390000	12.0	9.8	46.0	34.0	L1	GND
7.280000	11.0	9.9	50.0	39.0	L1	GND
25.060000	17.1	10.7	50.0	32.9	L1	GND

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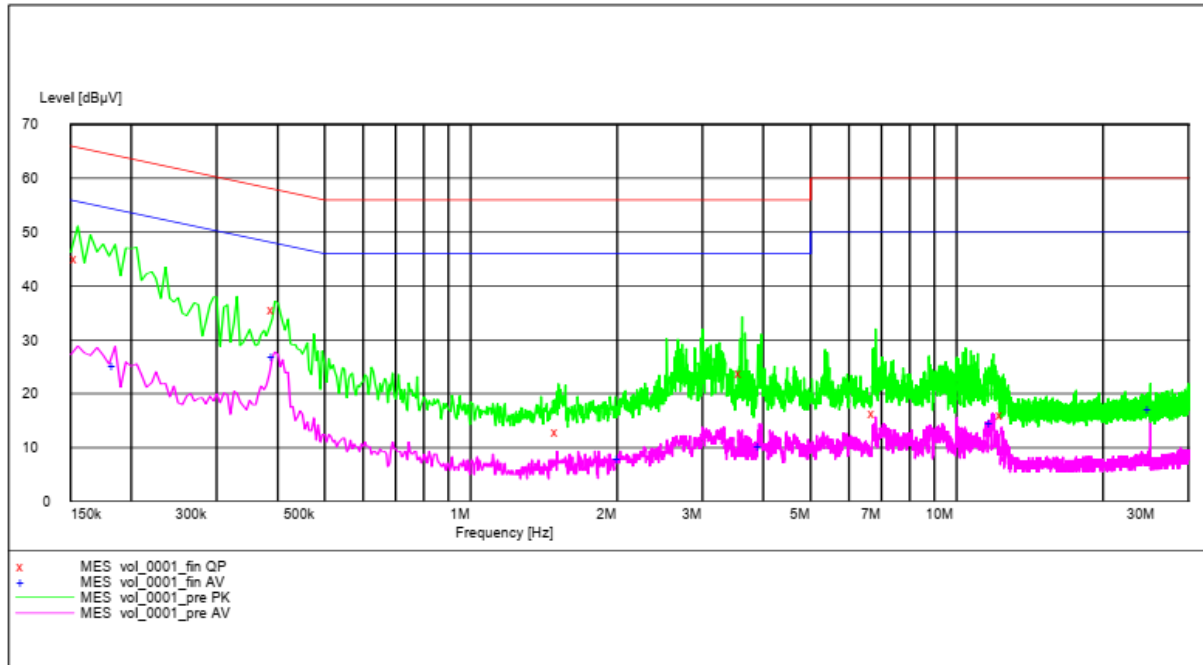
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Results of WIFI TX mode (N): PASS

Please refer to the following diagram for individual results.



MEASUREMENT RESULT: "vol_0001 fin QP"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.155000	45.2	9.7	65.7	20.5	N	GND
0.395000	35.5	9.7	58.0	22.5	N	GND
1.515000	12.8	9.8	56.0	43.2	N	GND
3.615000	23.8	9.8	56.0	32.2	N	GND
6.815000	16.4	9.9	60.0	43.6	N	GND
12.480000	16.1	10.1	60.0	43.9	N	GND

MEASUREMENT RESULT: "vol_0001 fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.185000	25.4	9.7	54.3	28.9	N	GND
0.395000	26.9	9.7	48.0	21.1	N	GND
2.030000	7.9	9.8	46.0	38.1	N	GND
3.960000	10.2	9.8	46.0	35.8	N	GND
11.860000	14.6	10.1	50.0	35.4	N	GND
25.060000	17.3	10.7	50.0	32.7	N	GND

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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: 2022-04-18
Mode of Operation: WIFI TX mode

Ambient Temperature: 25°C 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 $BWCF = 10 \log (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$



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Results of WIFI TX 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	-13.333	8dBm
2437.0	-12.765	8dBm
2462.0	-12.188	8dBm

Results of WIFI TX 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	-14.991	8dBm
2437.0	-13.891	8dBm
2462.0	-13.455	8dBm

Results of WIFI TX 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	-15.455	8dBm
2437.0	-15.195	8dBm
2462.0	-14.635	8dBm

Results of WIFI TX Mode 802.11 n40 (Tx:2422MHz to 2422MHz): 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
2422.0	-15.445	8dBm
2437.0	-15.725	8dBm
2452.0	-15.685	8dBm

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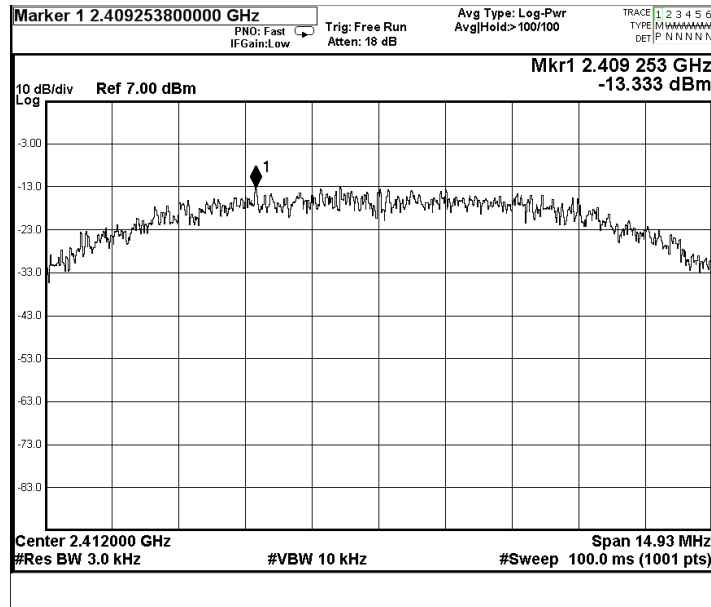


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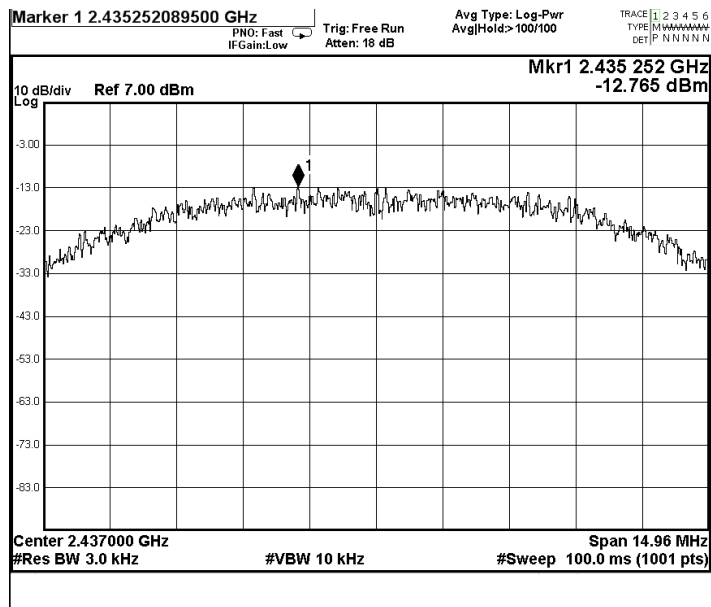
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WiFi mode 802.11 b
CH 1 (2412.0 MHz)



CH 6 (2437.0 MHz)



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CH 11 (2462.0 MHz)



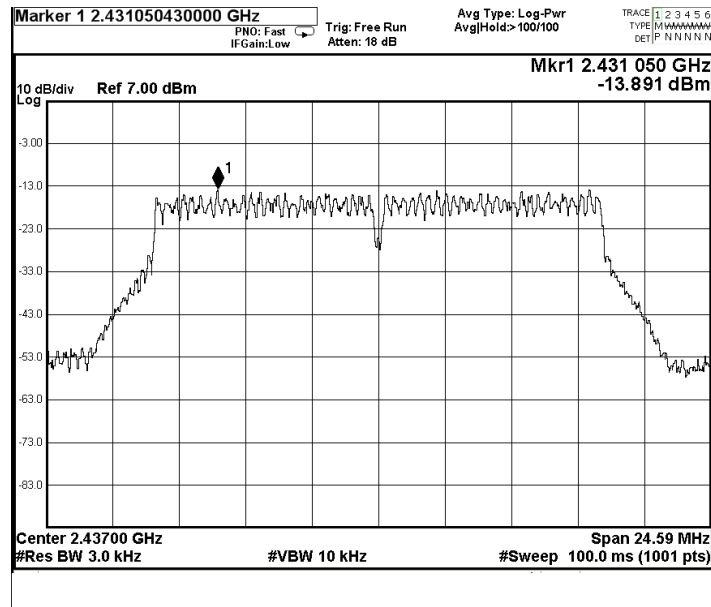
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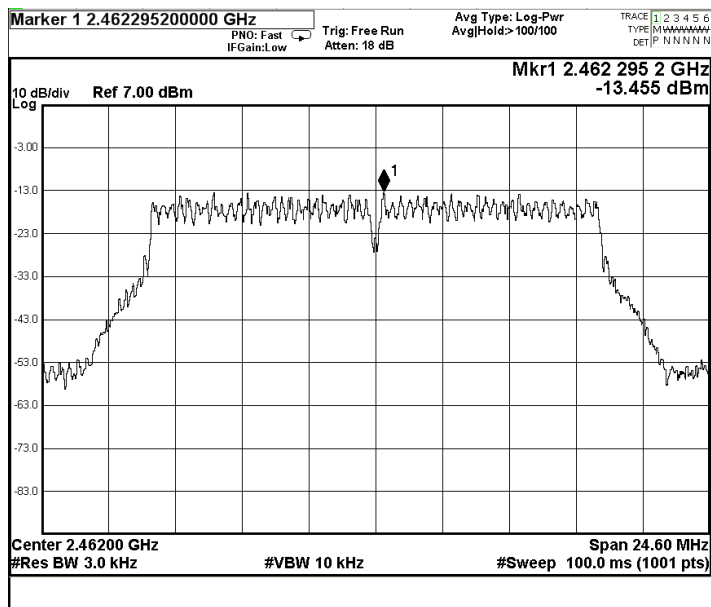
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CH 6 (2437.0 MHz)

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CH 11 (2462.0 MHz)



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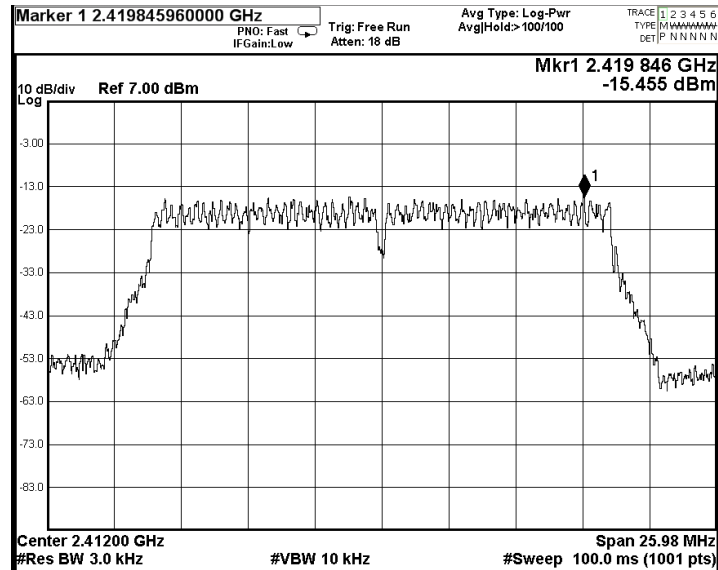
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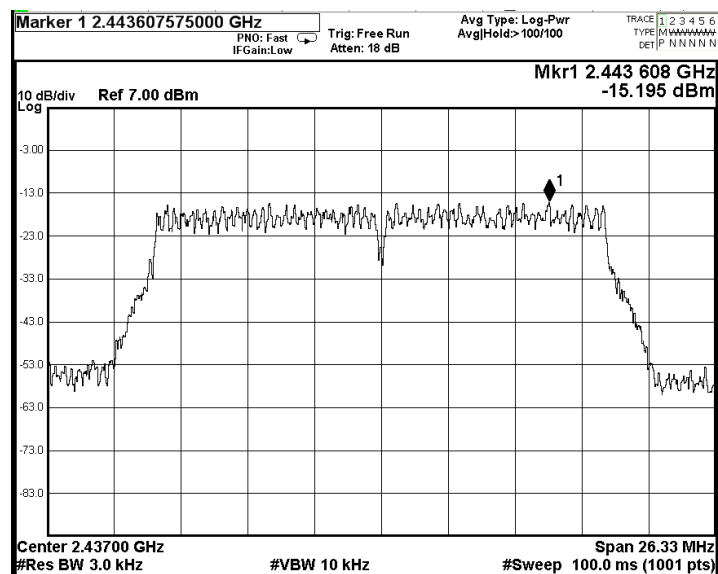
WiFi mode 802.11 n20

CH 1 (2412.0 MHz)

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CH 6 (2437.0 MHz)



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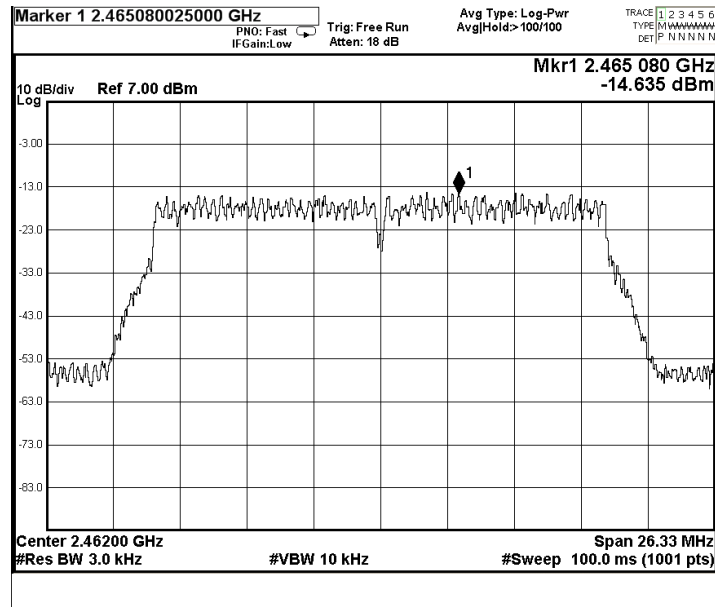
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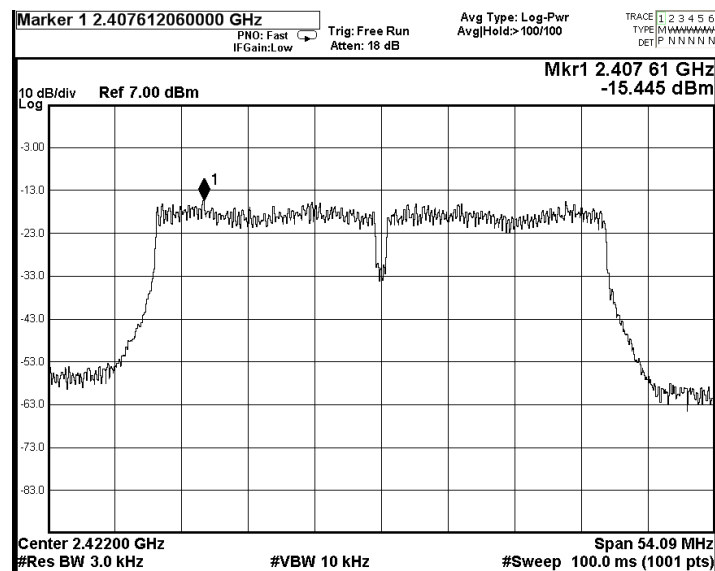
CH 11 (2462.0 MHz)

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WiFi mode 802.11 n40

CH 3 (2422.0 MHz)



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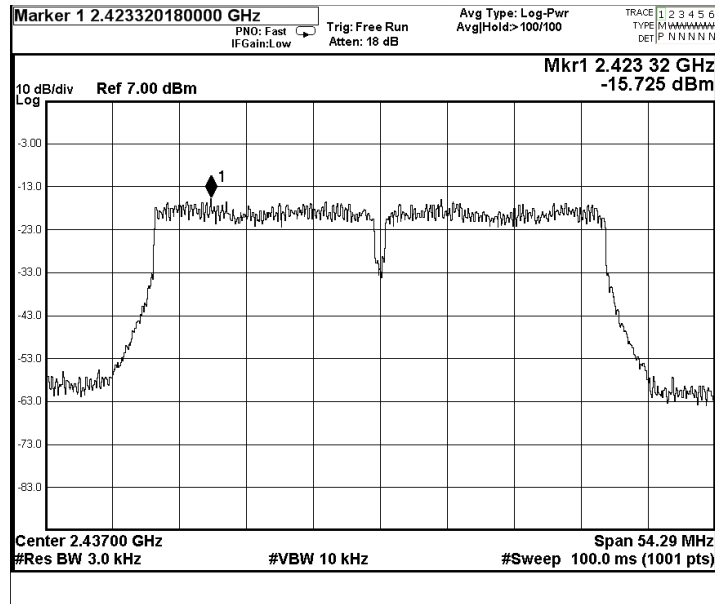


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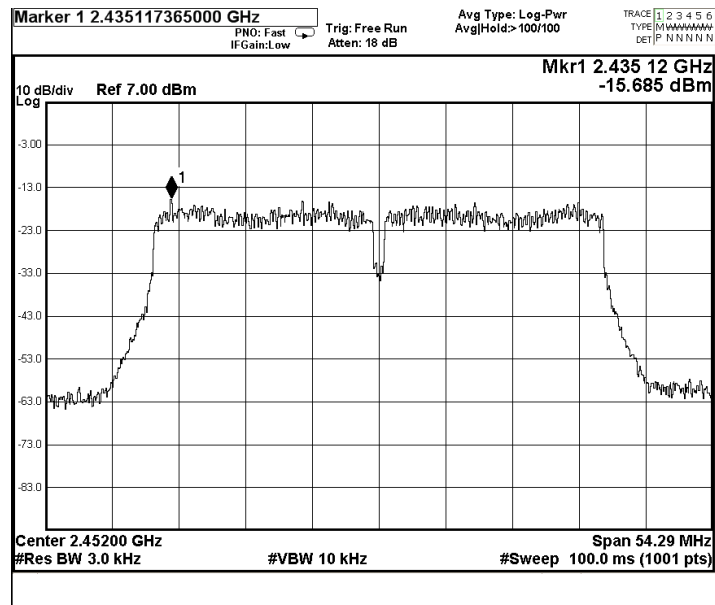
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CH 6 (2437.0 MHz)



CH 9 (2452.0 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: 2022-04-21
Mode of Operation: WIFI TX mode

Ambient Temperature: 25°C 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 $\geq 3 \times$ 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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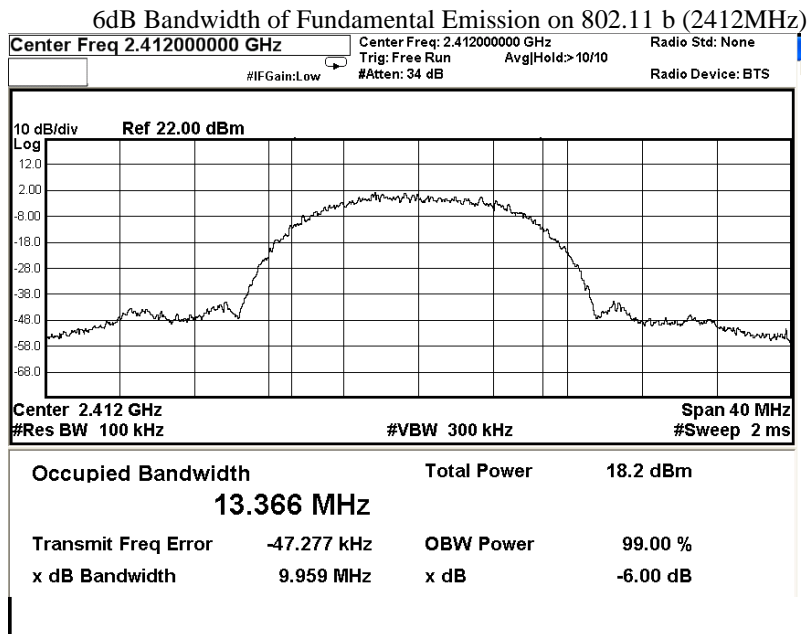
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	9.959	> 500



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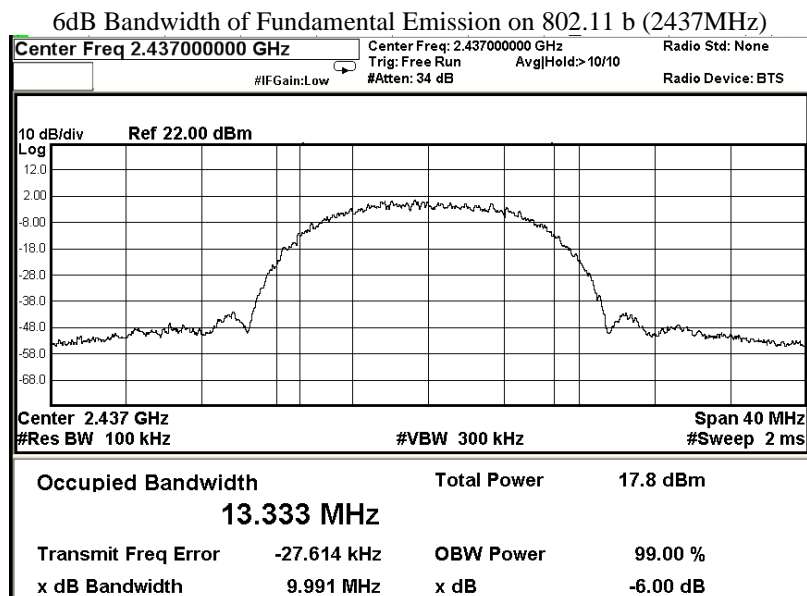
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	9.991	> 500



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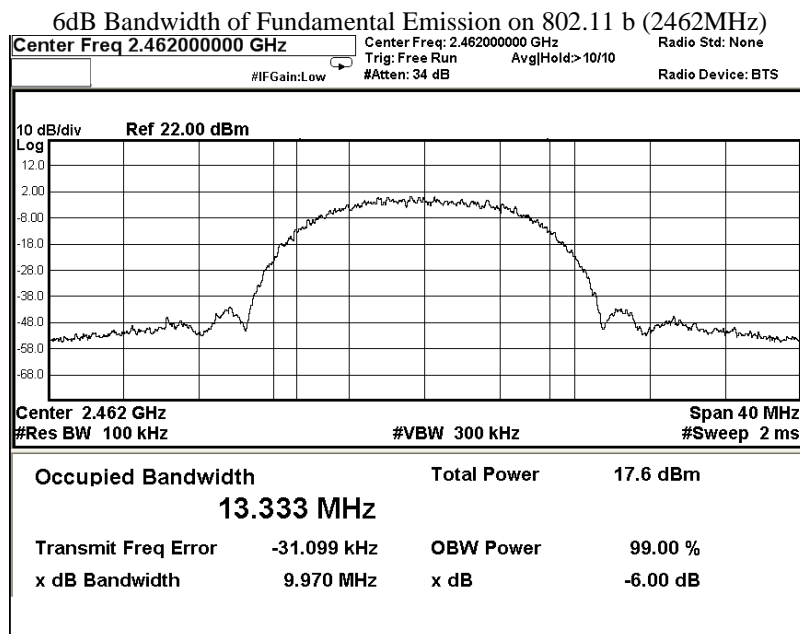
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	9.970	> 500



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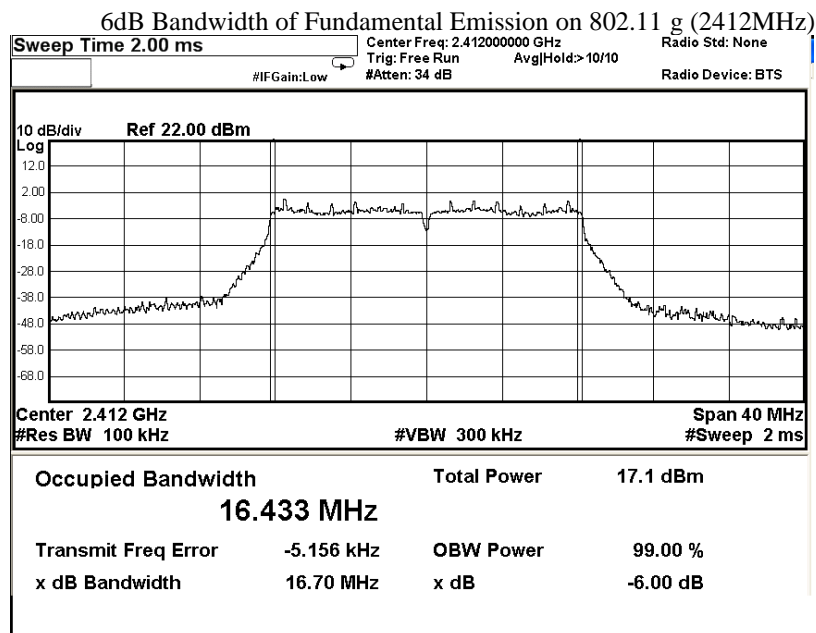
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	16.70	> 500



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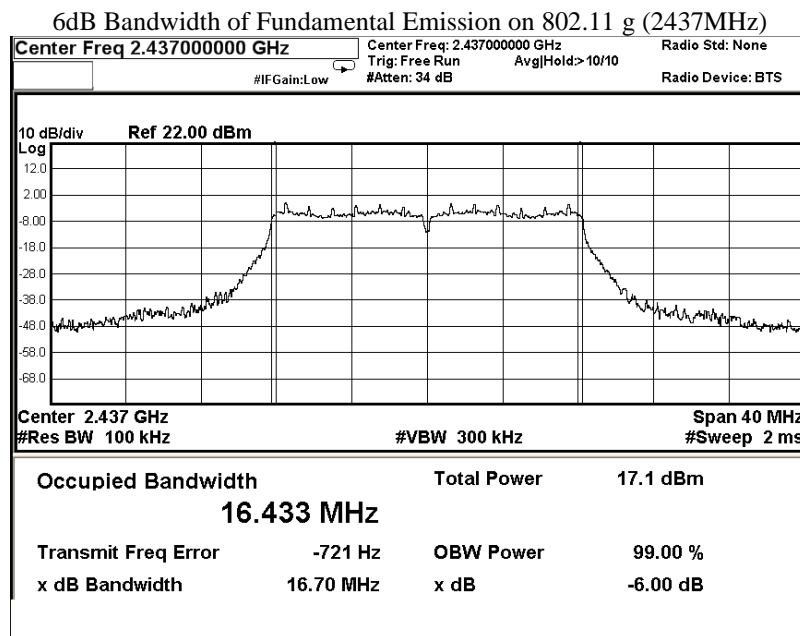
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	16.70	> 500



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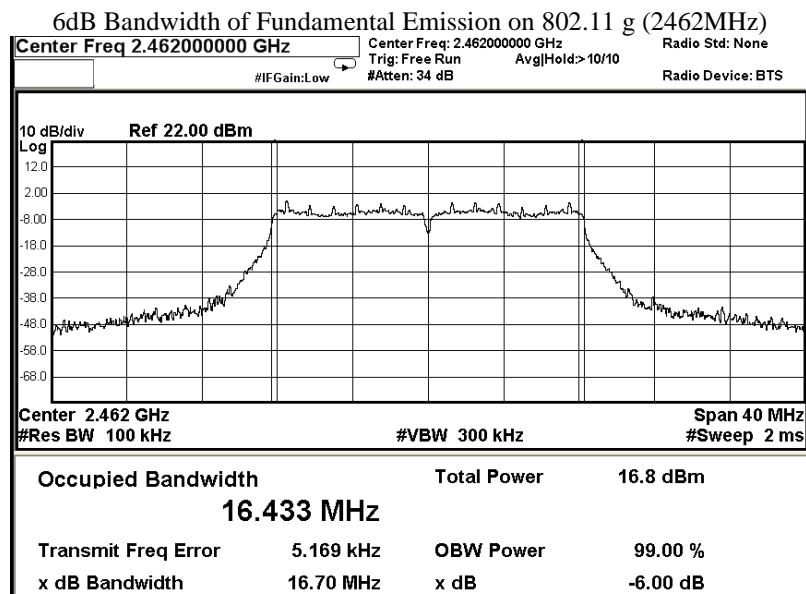
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	16.70	> 500



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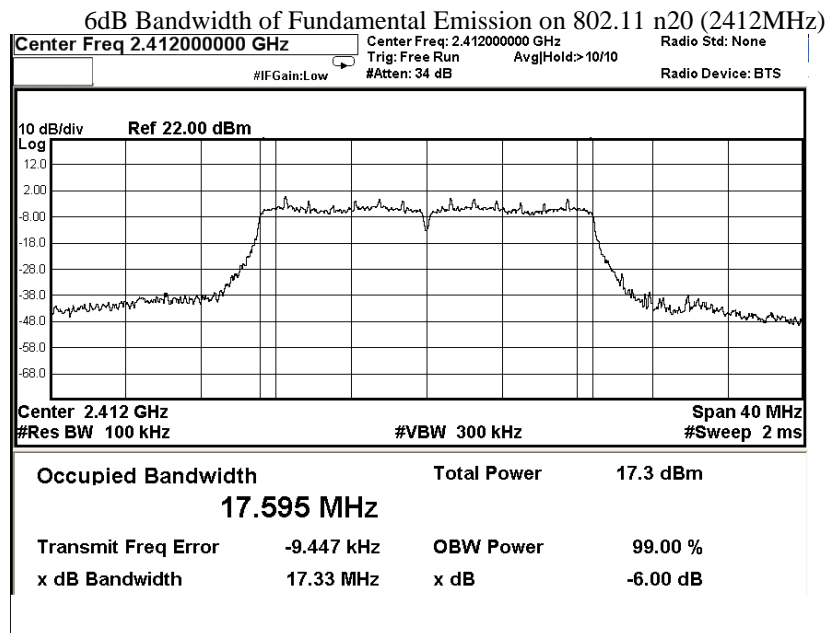
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	17.33	> 500



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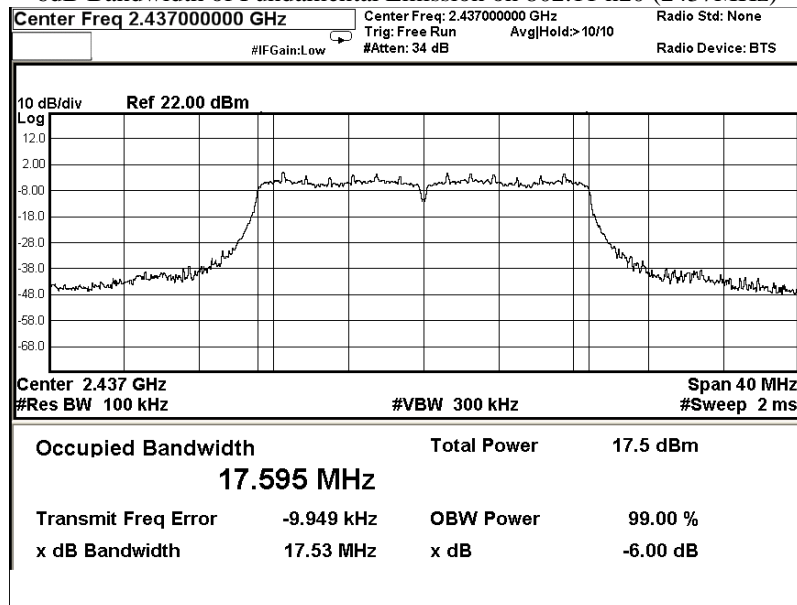
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	17.53	> 500

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



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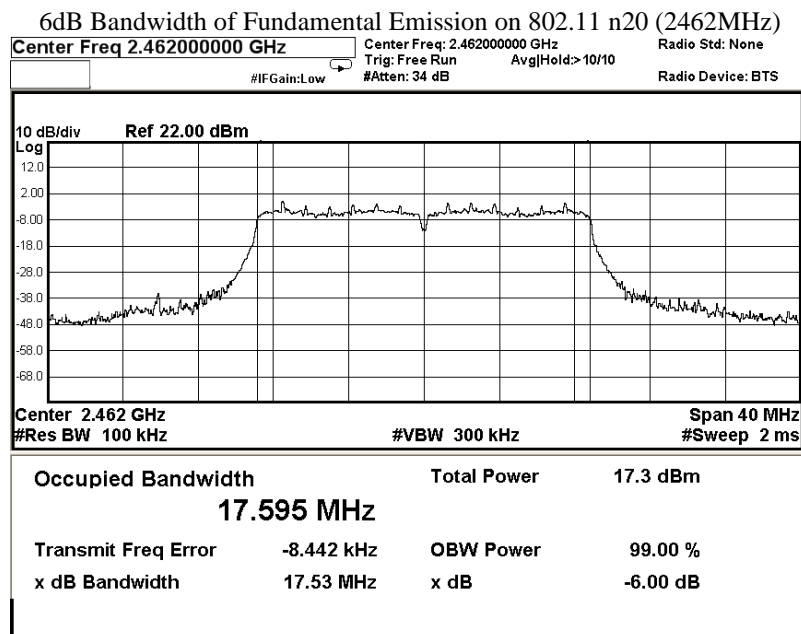
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	17.53	> 500



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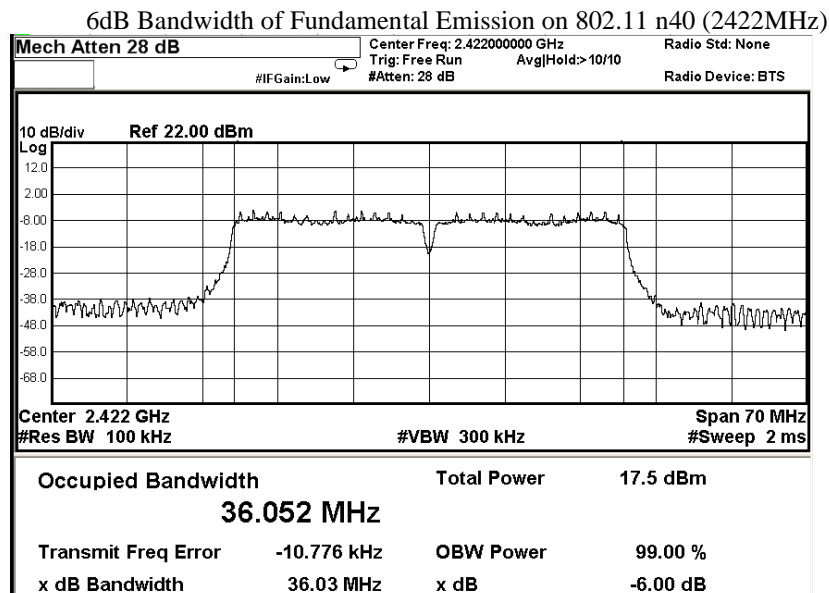
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2422.0	36.03	> 500



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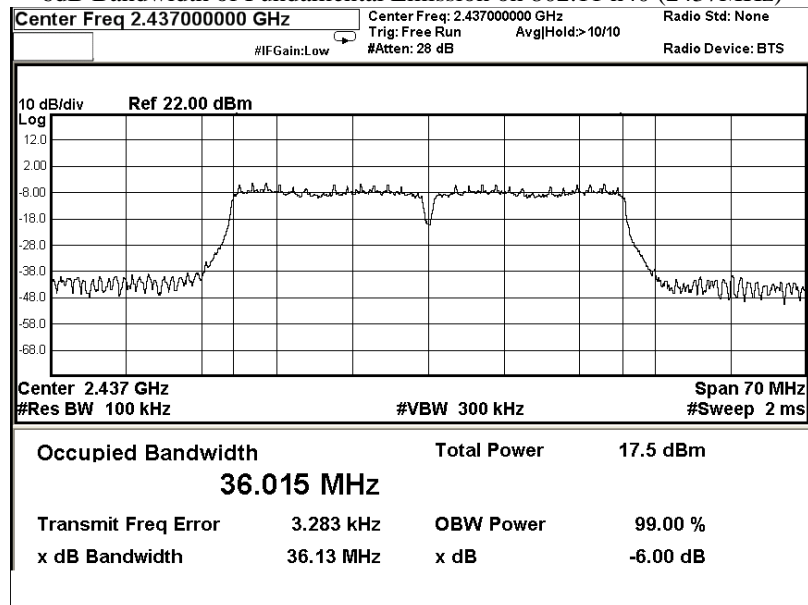
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	36.13	> 500

6dB Bandwidth of Fundamental Emission on 802.11 n40 (2437MHz)



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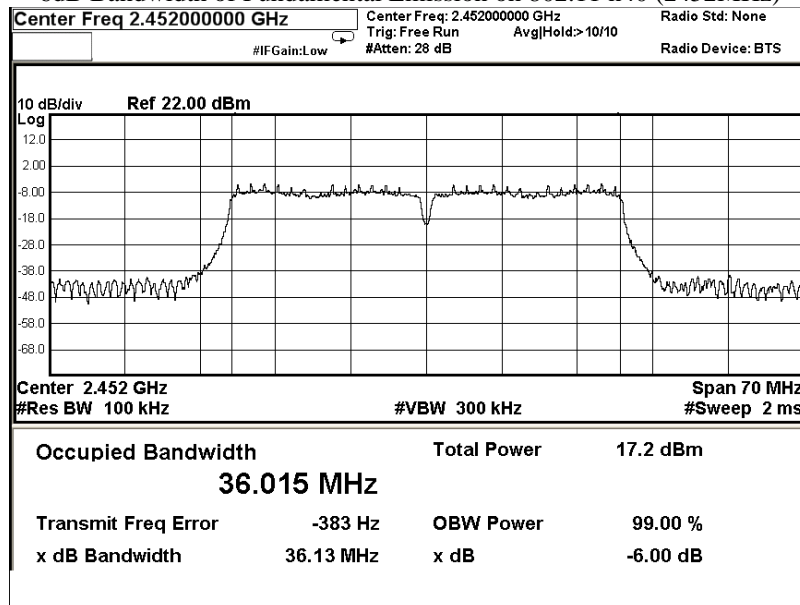
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2452.0	36.13	> 500

6dB Bandwidth of Fundamental Emission on 802.11 n40 (2452MHz)



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3.1.6 Band Edges Measurement

Test Requirement: FCC 47CFR 15.247
Test Method: ANSI C63.10:2013
Test Date: 2022-04-22
Mode of Operation: WIFI TX mode

Ambient Temperature: 25°C 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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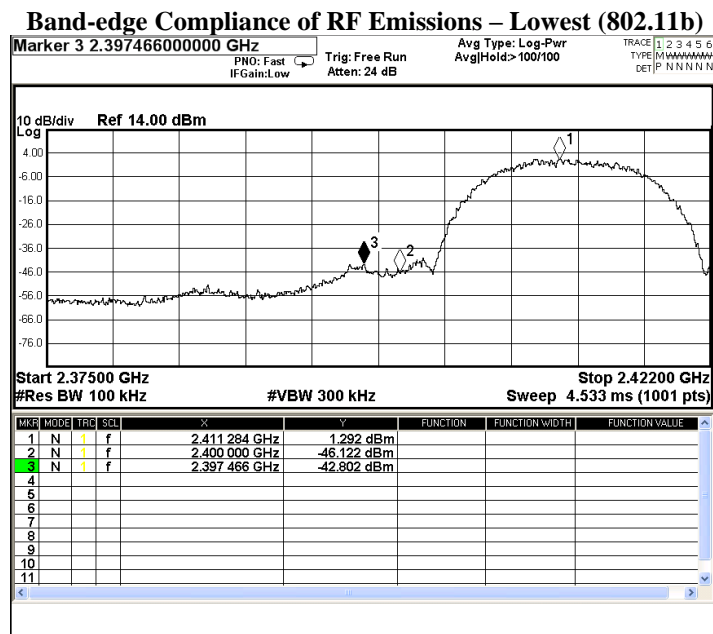
Band-edge Compliance of RF Conducted Emissions Measurement:

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
The following plots include cable losses :0.3dB (There is no Attenuator)

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2400 – Lowest Fundamental (2412)	1.292	-18.708	-42.802	Pass



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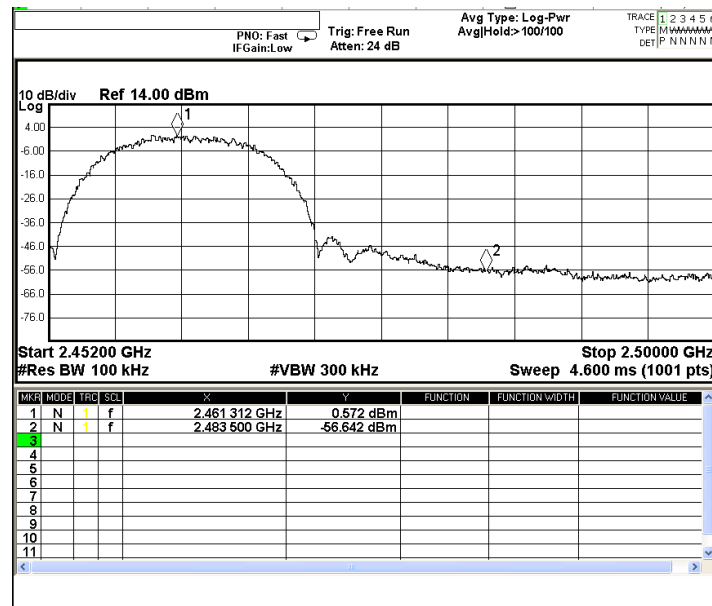
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2462)	0.572	-19.428	-56.642	Pass

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



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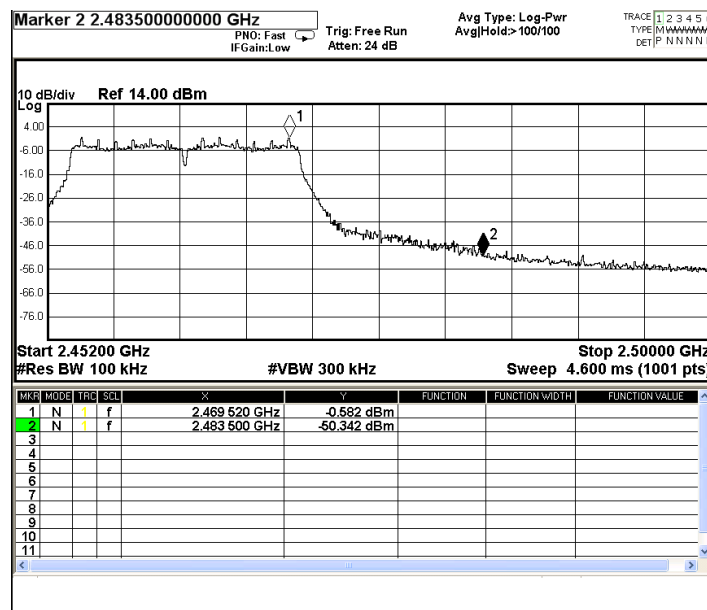
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2462)	-0.582	-20.582	-50.342	Pass

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



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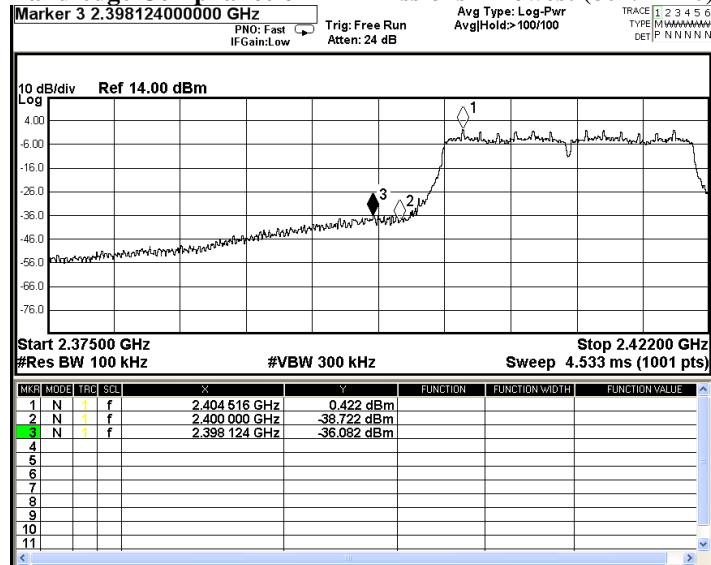
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2400 – Lowest Fundamental (2412)	0.422	-19.578	-36.082	Pass

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



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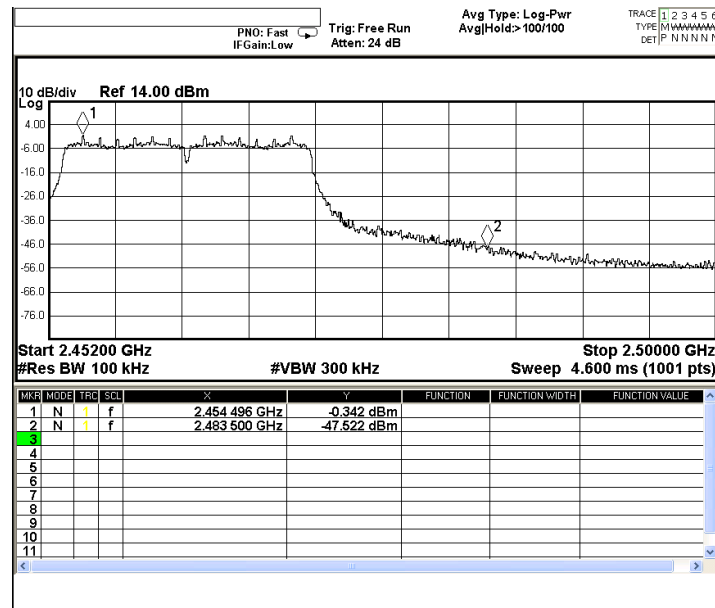
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2462)	-0.342	-20.342	-47.522	Pass

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



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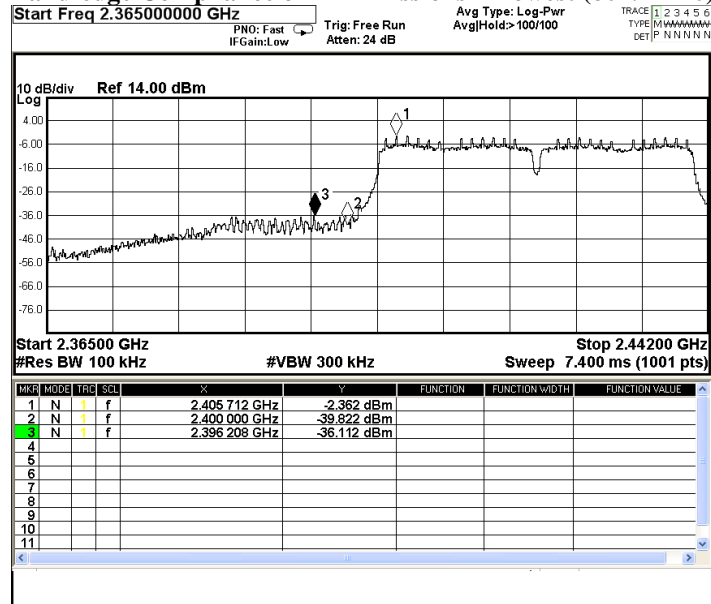
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2400 – Lowest Fundamental (2422)	-2.362	-22.362	-36.112	Pass

Band-edge Compliance of RF Emissions – Lowest (802.11n40)



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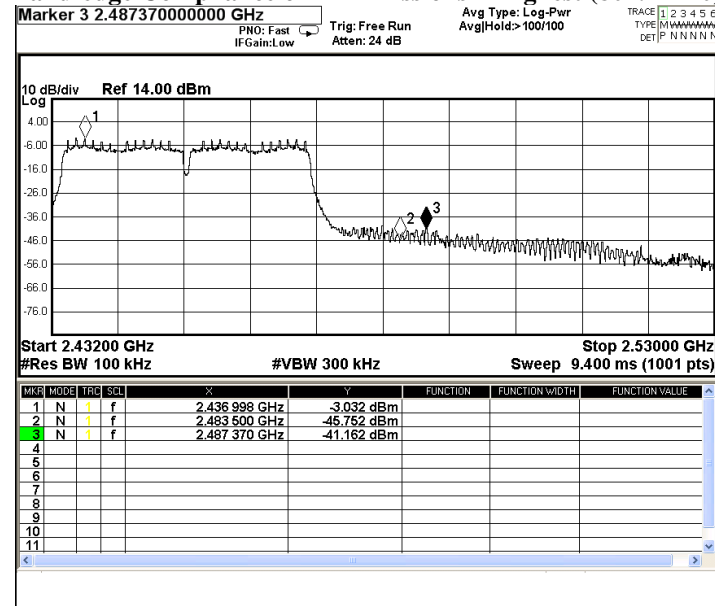
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2452)	-3.032	-23.032	-41.162	Pass

Band-edge Compliance of RF Emissions – Highest (802.11n40)



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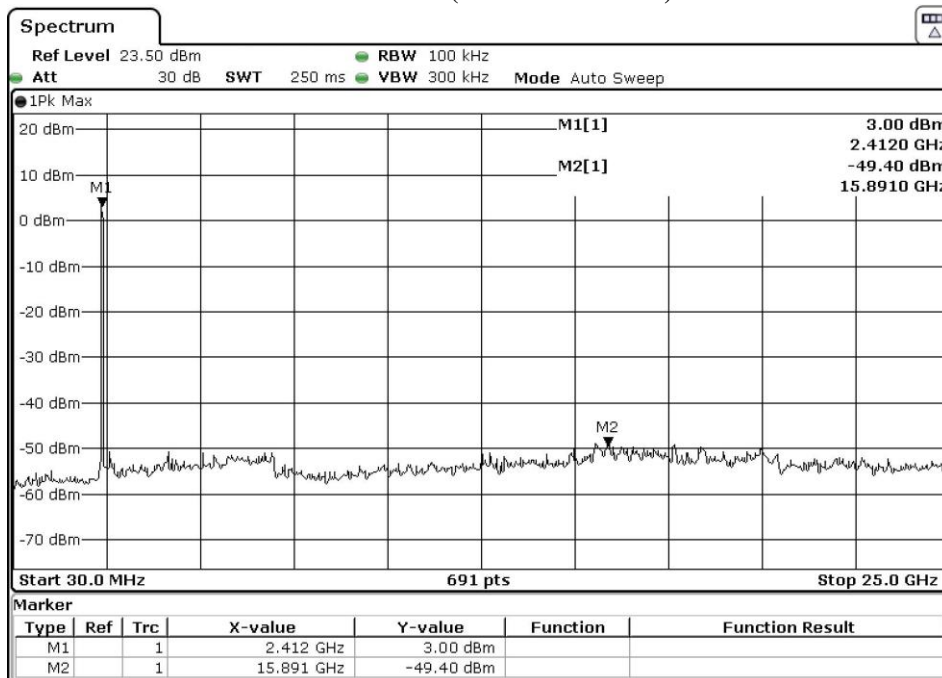
RF Conducted Emissions Measurement:

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
The following plots include cable losses :0.3dB (There is no Attenuator)

RF Emissions (802.11b 2412MHz)



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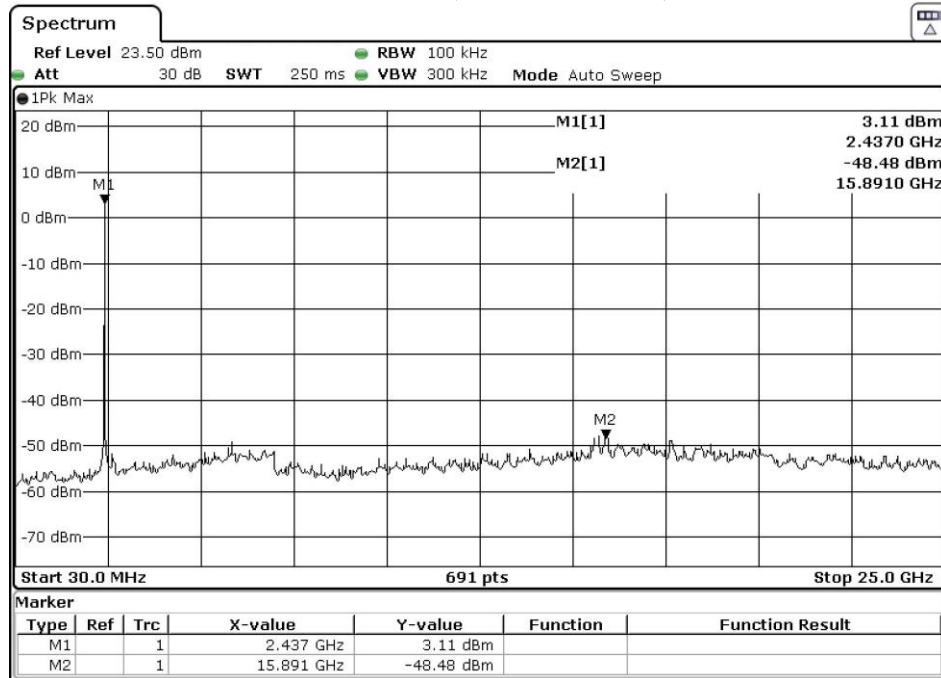
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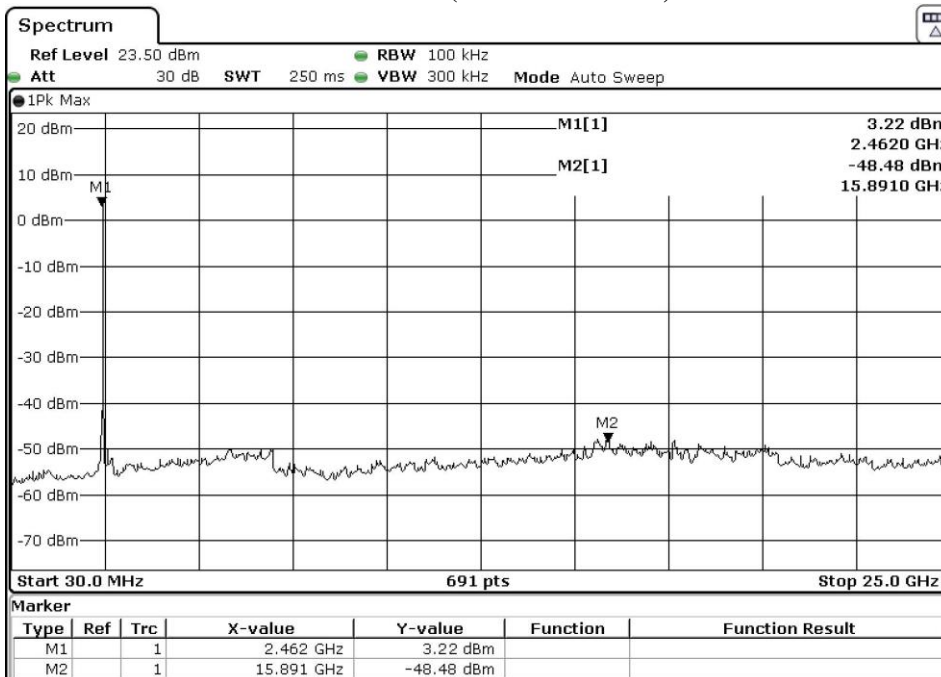
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RF Emissions (802.11b 2437MHz)



RF Emissions (802.11b 2462MHz)



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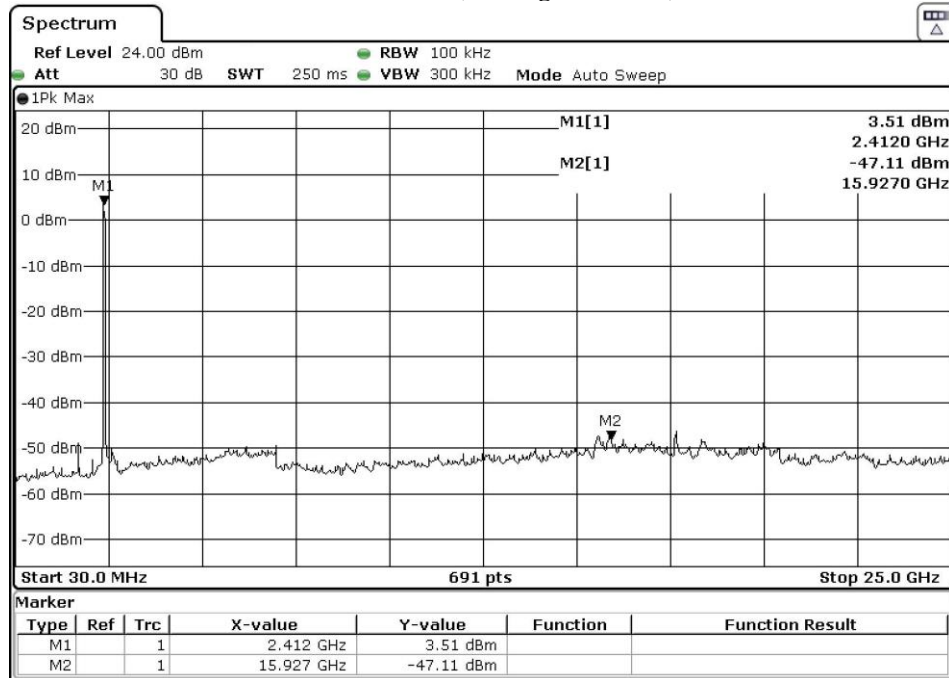


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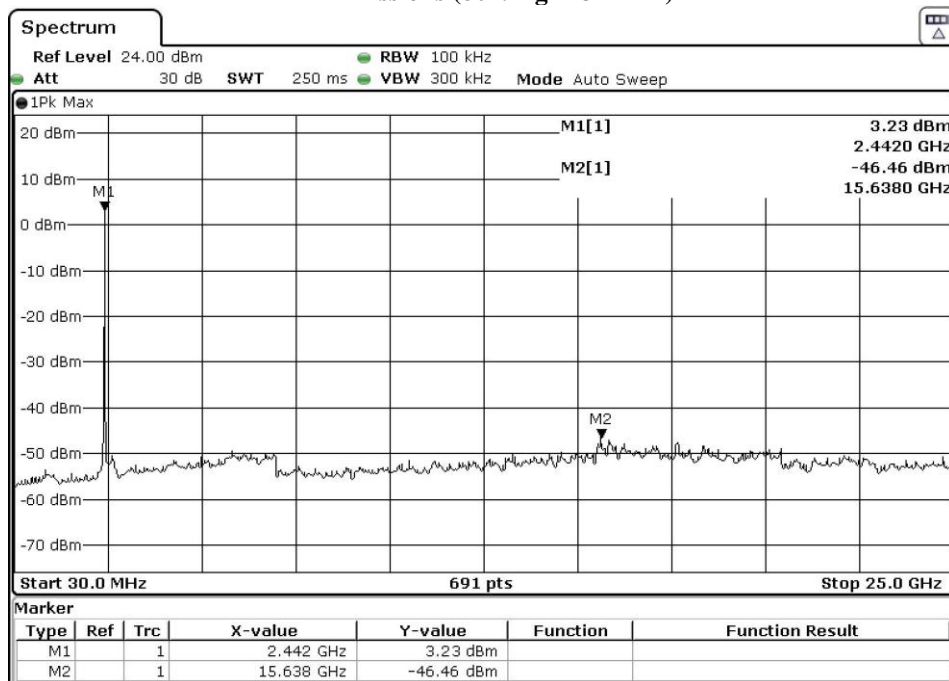
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RF Emissions (802.11g 2412MHz)



RF Emissions (802.11g 2437MHz)



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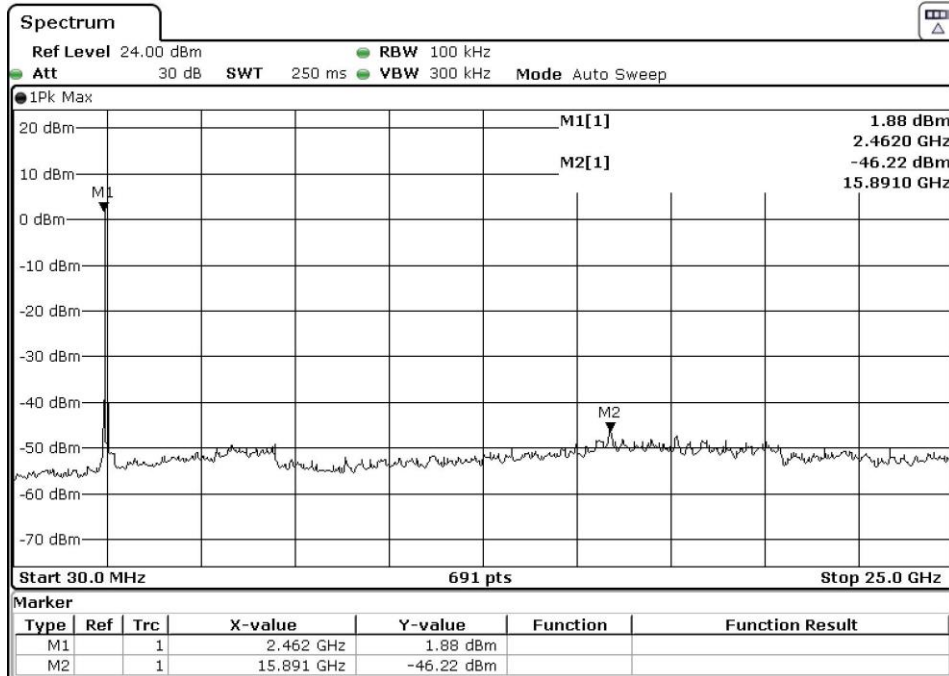


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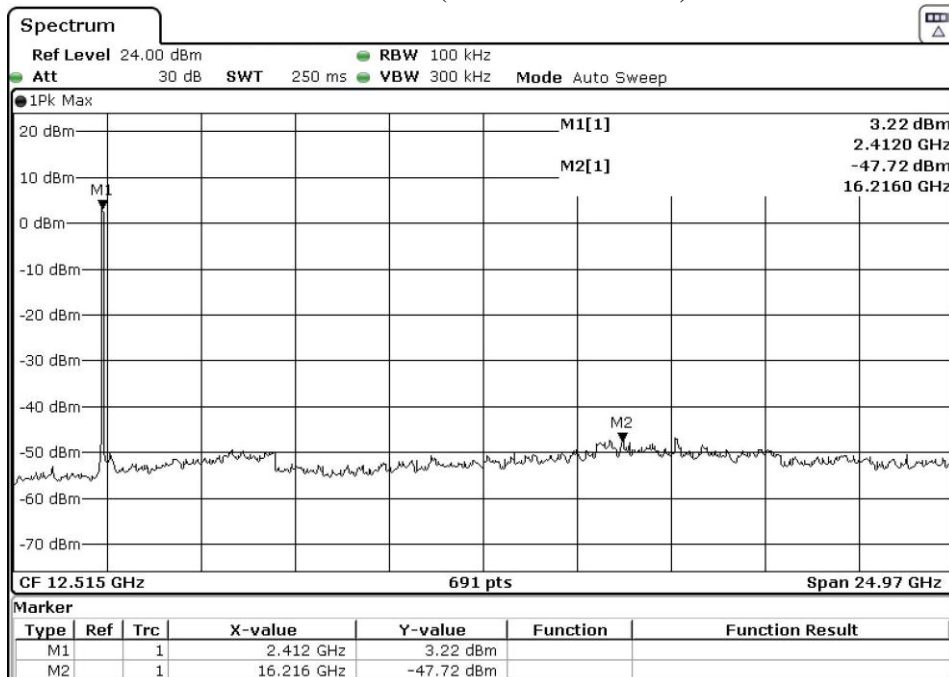
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RF Emissions (802.11g 2462MHz)



RF Emissions (802.11n20 2412MHz)



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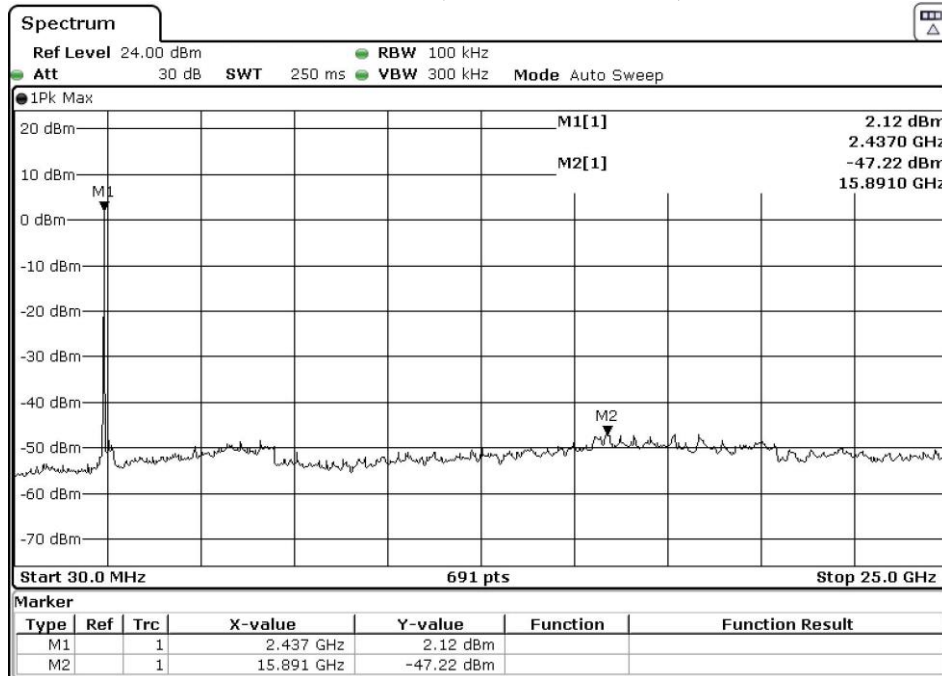


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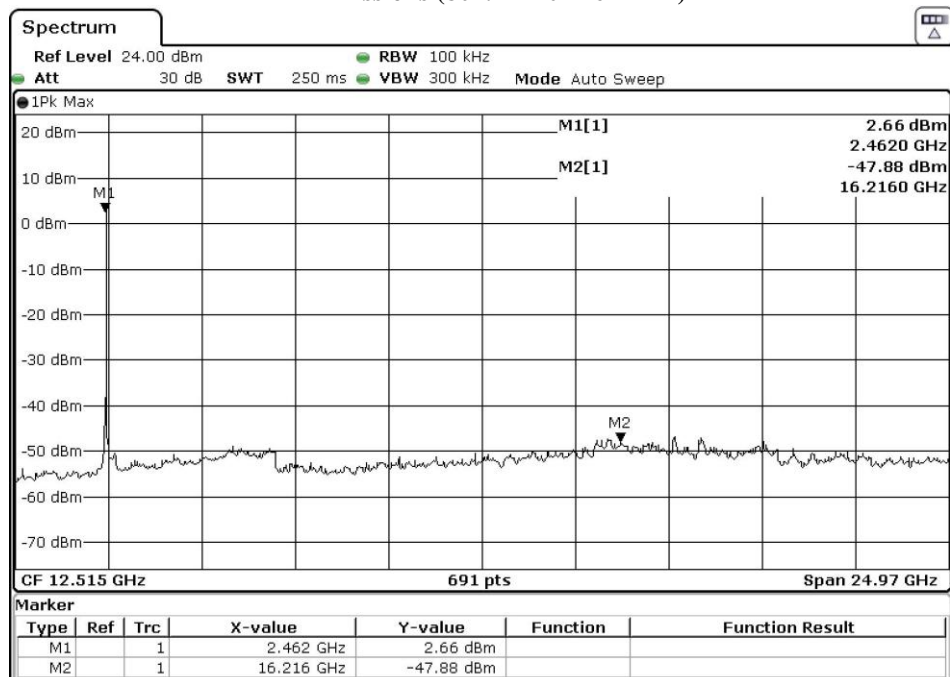
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RF Emissions (802.11n20 2437MHz)



RF Emissions (802.11n20 2462MHz)



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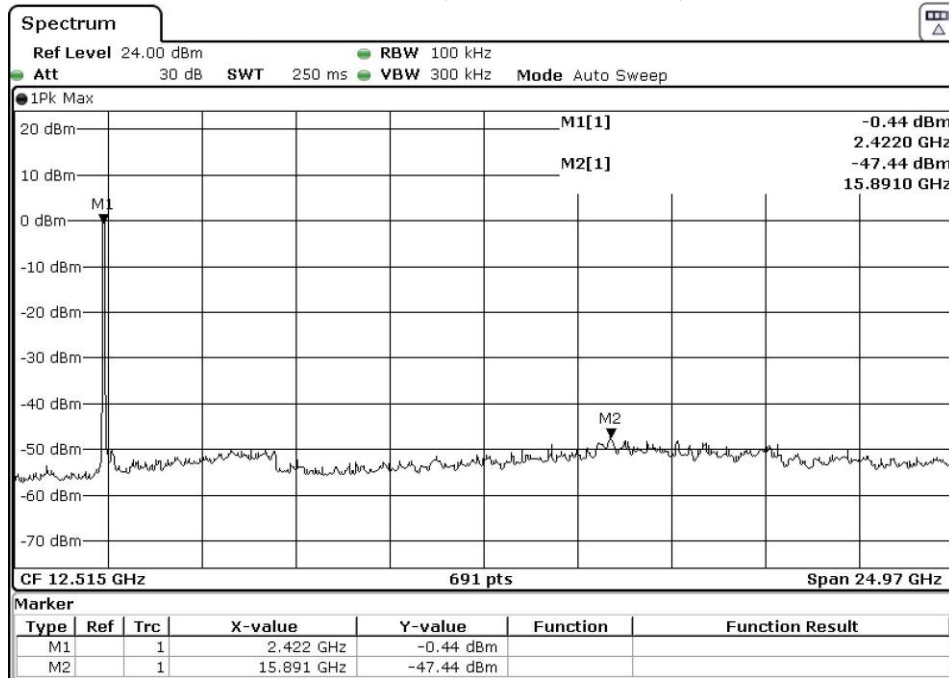


Test Report

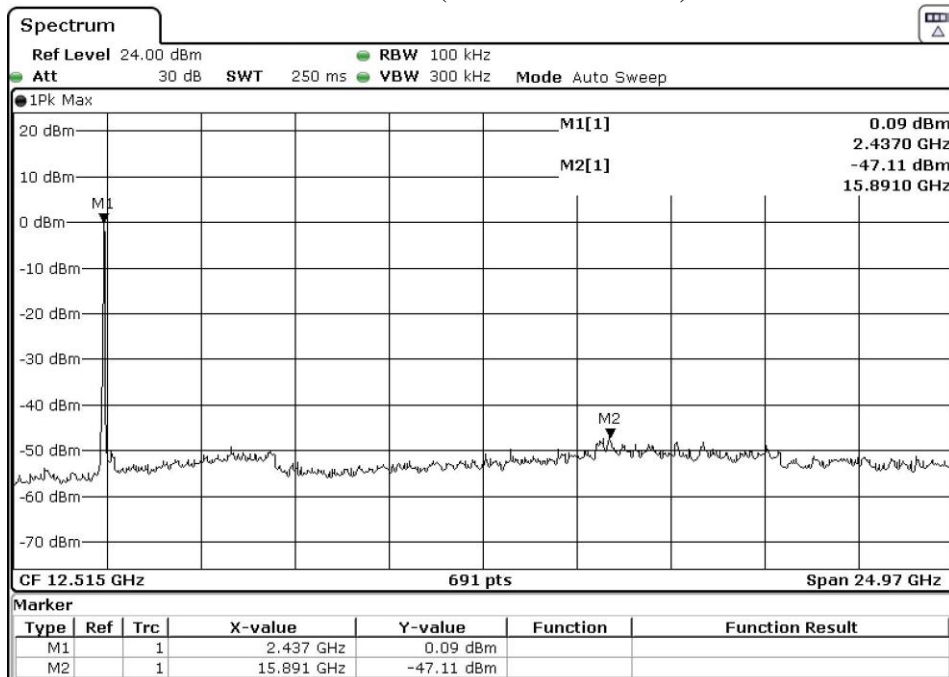
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RF Emissions (802.11n40 2422MHz)



RF Emissions (802.11n40 2437MHz)



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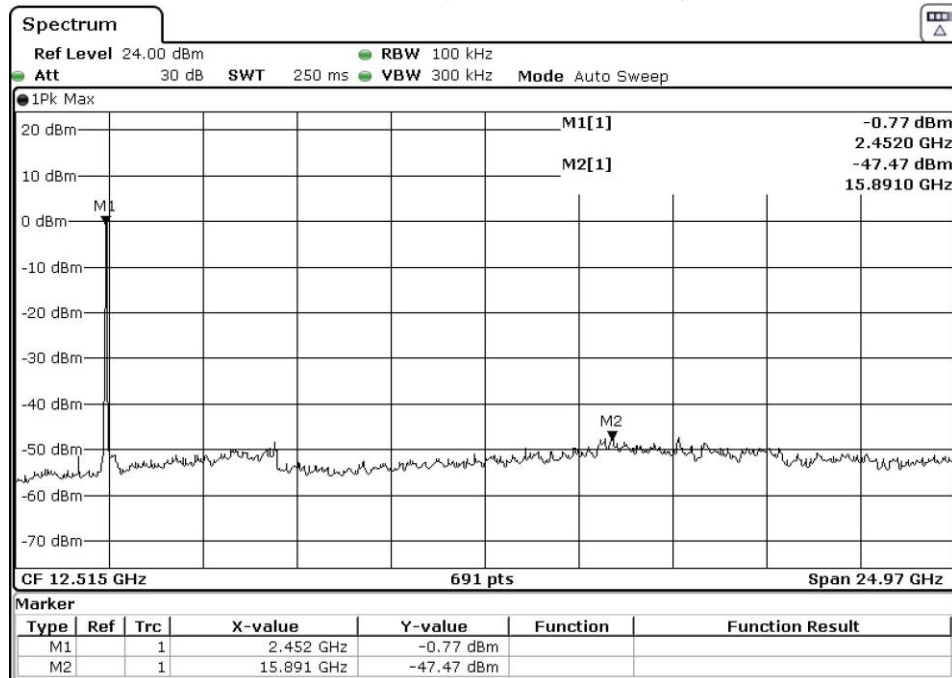
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RF Emissions (802.11n40 2452MHz)



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3.1.7 Antenna Requirement

Ambient Temperature: 25°C

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 is monopole antenna. There is no external antenna, the antenna gain = 2.5dBi. 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	ANECCHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2019/04/16	2024/04/16
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM336	PRECISION CONICAL DIPOLE	SEIBERSDORF LABORATORIES	PCD 3100	6236/M	2020/05/30	2022/05/30
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2020/05/13	2022/05/13
EM299	BROADBAND HORN ANTENNA	ETS-LINDGREN	3115	00114120	2020/11/24	2022/11/24
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2020/11/25	2022/11/25
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2020/11/25	2022/11/25
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2020/06/10	2022/06/10
EM355	Biconilog Antenna	ETS-Lindgren	3143B	00094856	2020/06/17	2022/06/17
EM200	DUAL CHANNEL POWER METER	R & S	NRVD	100592	2019/10/11	2022/10/11
EM012	PRE-AMPLIFIER	HP	HP8448B	3008A00262	2019/11/08	2022/11/08

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2020/06/30	2022/06/30
EM145	EMI TEST RECEIVER	R & S	ESIB7	100072	2020/05/13	2022/05/13
EM233	PULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	100314	2021/01/18	2023/01/18
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2022/02/02	2027/02/02
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



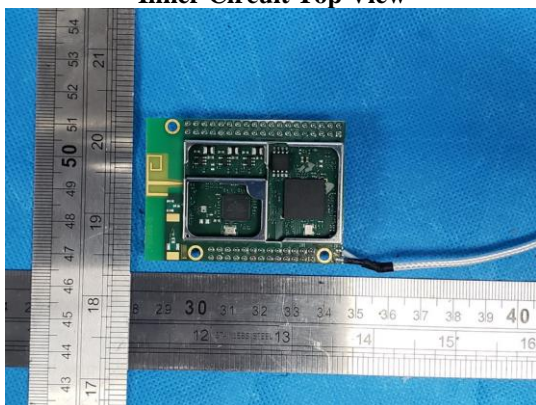
Inner Circuit Top View



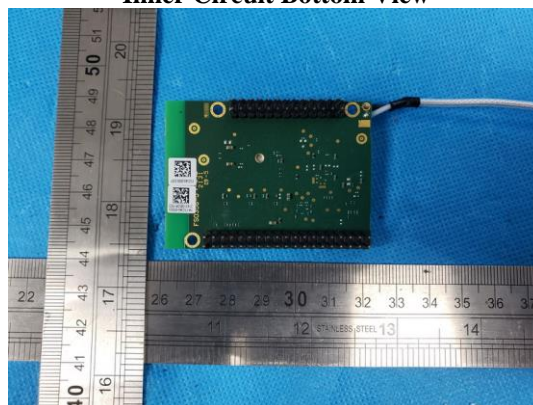
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



Test Report

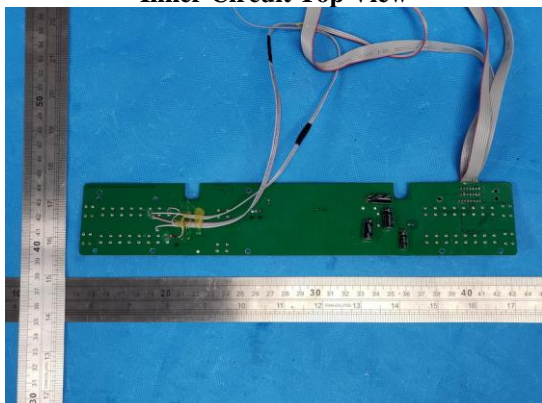
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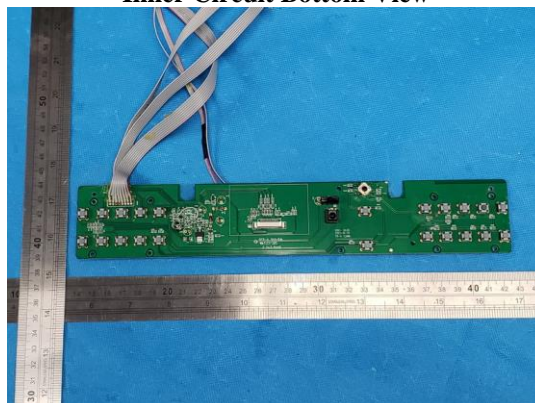
Photographs of EUT

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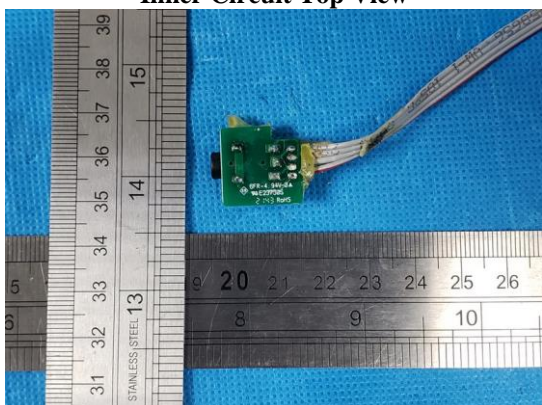
Inner Circuit Top View



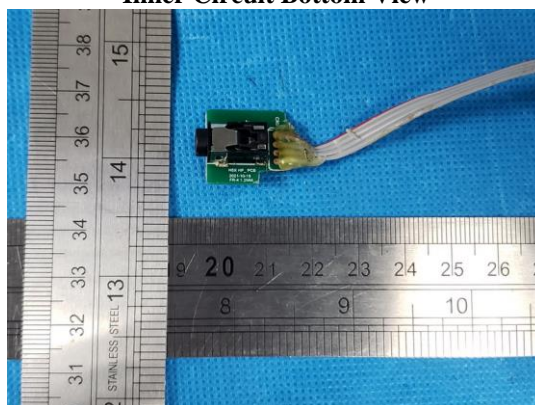
Inner Circuit Bottom View



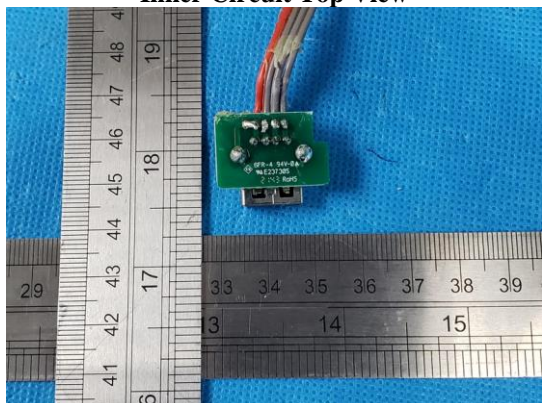
Inner Circuit Top View



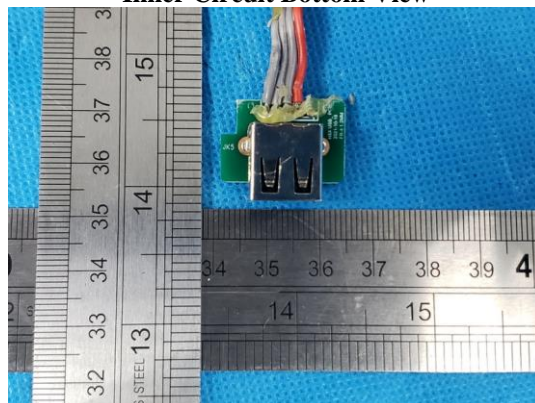
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



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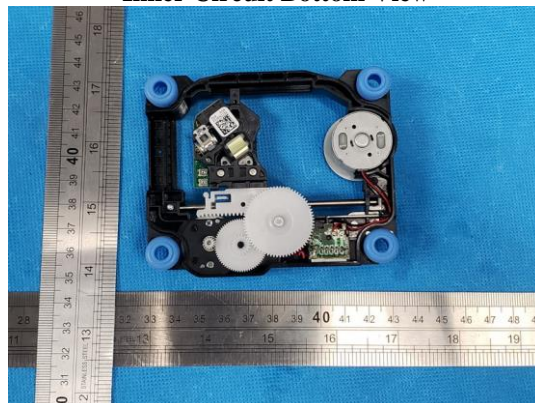
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Photographs of EUT

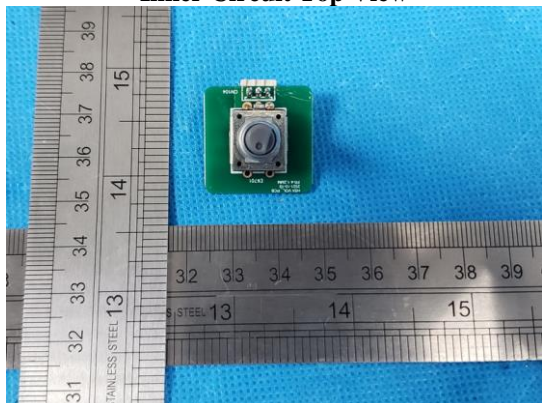
Inner Circuit Top View



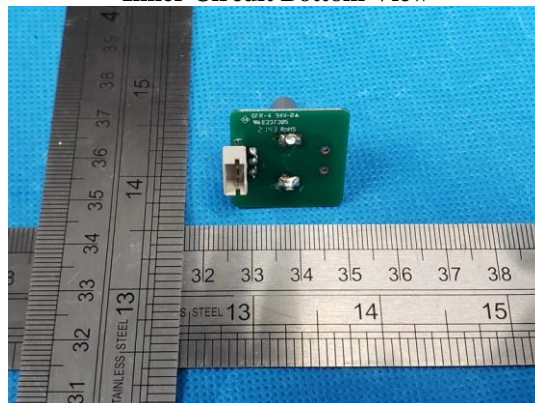
Inner Circuit Bottom View



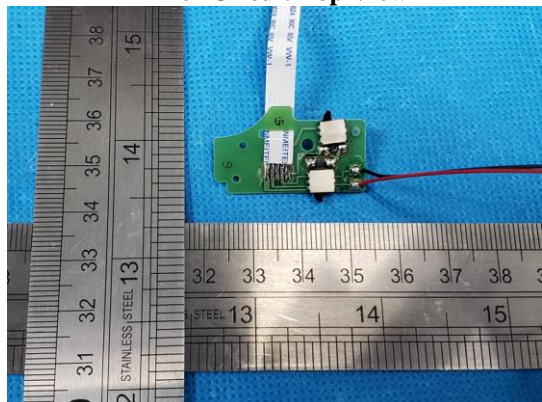
Inner Circuit Top View



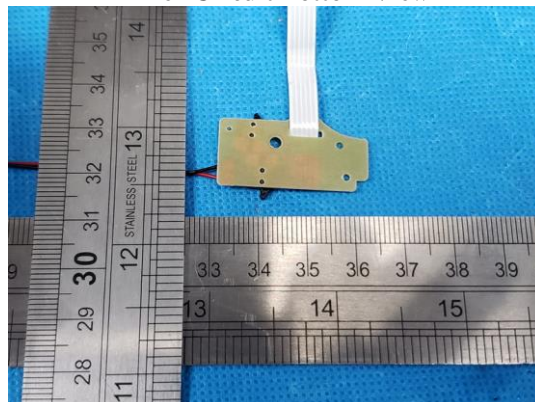
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



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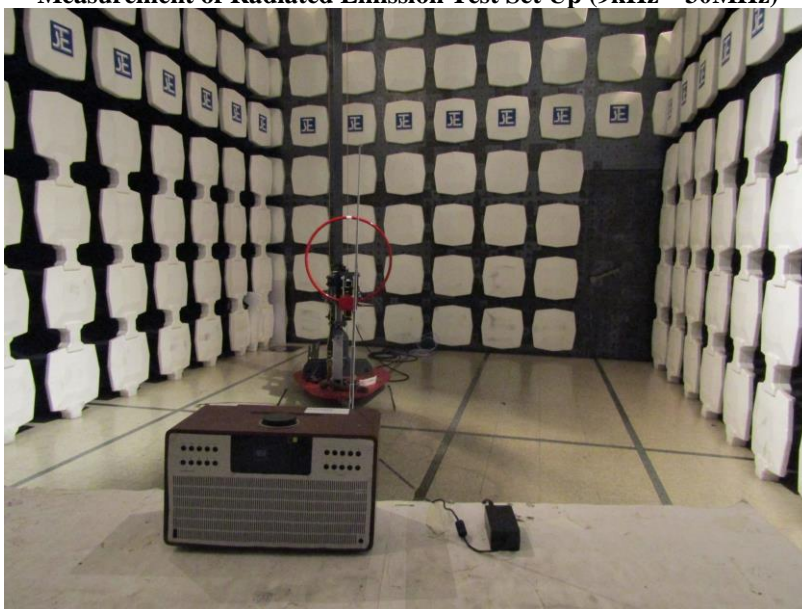
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Photographs of EUT

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

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



Measurement of Conducted Emission Test Set Up



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