



Test Report

Date : 2022-05-30
No. : HMD23040028

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Applicant : The Singing Machine Company, inc.
6301 NW 5th Way, Suite 2900, Fort Lauderdale, FL 33309, USA

Supplier / Manufacturer : ZHUHAI FULLWING ELECTRONIC CO., LTD ZHONGSHAN BRANCH.
4/F & 5/F, No 10, Xingye Road, Xinxu, San Xiang, Zhongshan, Guangdong, China

Description of Sample(s) : Submitted sample(s) said to be
Product: SINGCAST HOME STAGE MINI
Brand Name: Singing Machine
Model No.: SMC2020
FCC ID: 2AAXO-SMC2020

Date Samples Received : 2023-04-26

Date Tested : 2023-04-26 to 2023-05-18

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)
For additional model(s) details, please see page 3.

Test by : Susu


Dr.CHAN Kwok Hung, Brian
Authorized Signatory





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10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

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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: SINGCAST HOME STAGE MINI
Manufacturer: ZHUHAI FULLWING ELECTRONIC CO., LTD
ZHONGSHAN BRANCH
4/F&5/F, No 10, Xingye Road, Xinxu, San Xiang, Zhongshan,
Guangdong, China
Brand Name: Singing Machine
Model Number: SMC2020
Additional Model Number: SMC2024, SMC2027
Rating: 12Vd.c. by adapter
The AC/DC adapter was provided by the applicant with following details:
Brand name: REYIPOWER; Model no.: RY24D120125US
Input: 100-240Va.c. 50-60Hz 1.0A MAX, Output:12Vd.c. 1250mA

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a SINGCAST HOME STAGE MINI. The transmission signal is digital modulated with channel frequency range 2412-2462MHz.

1.3 Antenna Details

Antenna Type: integral antenna
Antenna Gain: 2.0 dBi

1.4 Date of Order

2023-04-26

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2023-04-26 to 2023-05-18

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 and no the RF power for select.

```
命令提示符 - adb shell
C:\Users\STC-EMD>adb shell
root@rk3036:/ # ifconfig wlan0 down
/system/bin/sh: ifconfig: not found
127|root@rk3036:/ # ifconfig wlan0 up
/system/bin/sh: ifconfig: not found
priv wlan0|root@rk3036:/ # iwpriv wlan0 mp_ctx stop
OM=0, shortGI=0
iwpriv wlan0 mp_ant_tx a
iwpriv wlan0 mp_rate 6
iwpriv wlan0 mp_ctx background, pkt
iwpriv wlan0 mp_pwrctldm startwlan0      mp_ctx:Error: can't tx ,not in MP mode.

root@rk3036:/ # iwpriv wlan0 mp_stop
root@rk3036:/ # iwpriv wlan0 mp_start
wlan0      mp_start:mp_start ok

root@rk3036:/ # iwpriv wlan0 mp_channel 1
wlan0      mp_channel:Change channel 1 to channel 1
an0 mp_bandwidth 40M=0, shortGI=0
wlan0      mp_bandwidth:Change BW 0 to BW 0

root@rk3036:/ # iwpriv wlan0 mp_ant_tx a
wlan0      mp_ant_tx:switch Tx antenna to a
root@rk3036:/ # iwpriv wlan0 mp_rate 6
wlan0      mp_rate:Set data rate to 6 index 0
root@rk3036:/ # iwpriv wlan0 mp_ctx background, pkt
wlan0      mp_ctx:
Start continuous DA=fffffffffff len=1500 count=0

root@rk3036:/ # iwpriv wlan0 mp_pwrctldm start
```

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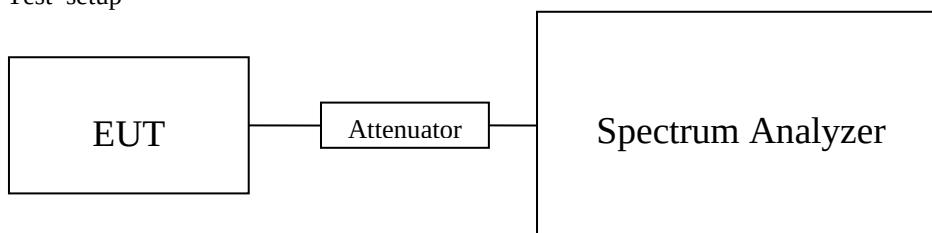
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2.1.1 EUT Duty cycle

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

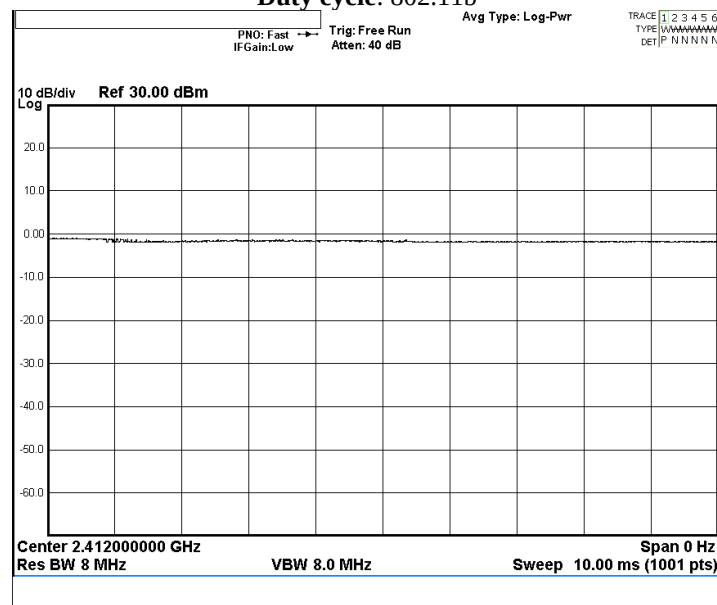


Results

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	☒	☐	☐
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)	ANSI C63.10:2013	N/A	☒	☐	☐
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	ANSI C63.10:2013	N/A	☒	☐	☐
Band Edge Emissions	FCC 47CFR 15.247(d)	ANSI C63.10:2013	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	ANSI C63.10:2013	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:	ANSI C63.10: 2013
Test Date:	2023-05-05
Mode of Operation:	WIFI Tx mode

Ambient Temperature: 25°C

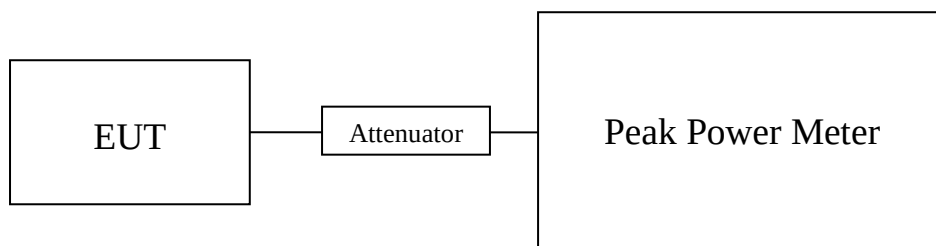
Relative Humidity: 51%

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)

Channel	Frequency (MHz)	Conducted power(dBm)	Antenna Gain(dBi)	E.I.R.P.(dBm)	E.I.R.P (Watt)
Low	2412	17.726	2.0	19.726	0.093886
Middle	2437	17.315	2.0	19.315	0.085408
High	2462	17.014	2.0	19.014	0.079689

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

Channel	Frequency (MHz)	Conducted power(dBm)	Antenna Gain(dBi)	E.I.R.P.(dBm)	E.I.R.P (Watt)
Low	2412	13.531	2.0	15.531	0.035736
Middle	2437	13.201	2.0	15.201	0.033121
High	2462	13.082	2.0	15.082	0.032226

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

Channel	Frequency (MHz)	Conducted power(dBm)	Antenna Gain(dBi)	E.I.R.P.(dBm)	E.I.R.P (Watt)
Low	2412	14.179	2.0	16.179	0.041486
Middle	2437	13.851	2.0	15.851	0.038468
High	2462	13.684	2.0	15.684	0.037017

Results of WiFi mode 802.11 n20, (2422MHz to 2452MHz) : Pass (TX Unit)

Channel	Frequency (MHz)	Conducted power(dBm)	Antenna Gain(dBi)	E.I.R.P.(dBm)	E.I.R.P (Watt)
Low	2422	12.318	2.0	14.318	0.027027
Middle	2437	12.045	2.0	14.045	0.025380
High	2452	11.951	2.0	13.951	0.024837

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:	2023-05-06
Mode of Operation:	WIFI Tx mode

Ambient Temperature: 24°C	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
Registration Number: HK0001
Test Firm Registration Number: 367672

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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

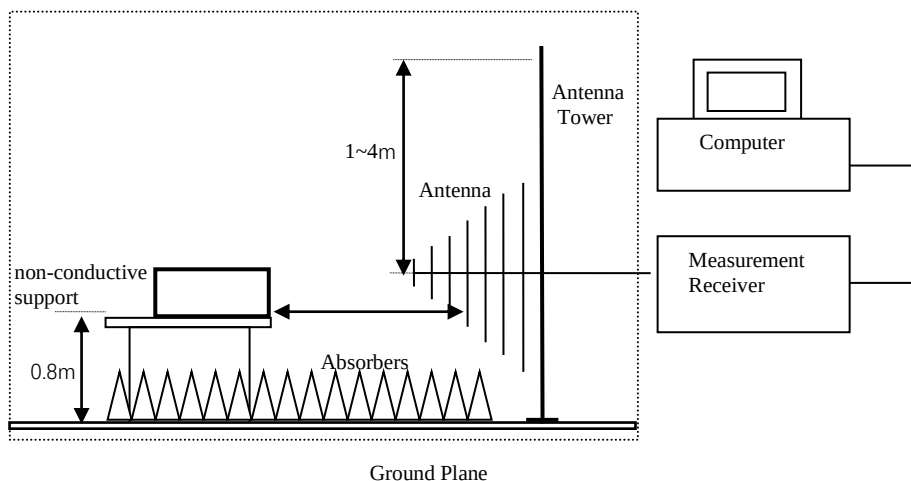
Above 1GHz (Pk)

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	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
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
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	Measured Level	Correction Factor	Field Strength	Field Strength	Limit	E-Field Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	$\mu\text{V/m}$	$\mu\text{V/m}$	
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	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	dB $\mu\text{V/m}$	dB	
4824.0	58.7	0.82	59.5	74.0	14.5	Vertical
4824.0	58.2	0.52	58.7	74.0	15.3	Horizontal
7236.0	50.1	7.00	57.1	74.0	16.9	Vertical
7236.0	51.0	6.50	57.5	74.0	16.5	Horizontal
9648.0	47.3	8.50	55.8	74.0	18.2	Vertical
9648.0	47.1	8.30	55.4	74.0	18.7	Horizontal
12060.0	45.3	10.90	56.2	74.0	17.8	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 dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dB	E-Field Polarity
4824.0	41.8	0.82	42.6	54.0	11.4	Vertical
4824.0	42.3	0.52	42.8	54.0	11.2	Horizontal
7236.0	35.1	7.00	42.1	54.0	11.9	Vertical
7236.0	35.4	6.50	41.9	54.0	12.1	Horizontal
9648.0	31.6	8.50	40.1	54.0	13.9	Vertical
9648.0	31.2	8.30	39.5	54.0	14.5	Horizontal
12060.0	29.3	10.90	40.2	54.0	13.8	Vertical
12060.0	29.3	10.80	40.1	54.0	14.0	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	57.9	0.82	58.7	74.0	15.3	Vertical
4874.0	57.2	0.52	57.7	74.0	16.3	Horizontal
7311.0	50.4	7.00	57.4	74.0	16.6	Vertical
7311.0	51.3	6.50	57.8	74.0	16.2	Horizontal
9748.0	48.2	8.50	56.7	74.0	17.3	Vertical
9748.0	47.4	8.30	55.7	74.0	18.3	Horizontal
12185.0	45.1	10.90	56.0	74.0	18.0	Vertical
12185.0	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 dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	42.0	0.82	42.8	54.0	11.2	Vertical
4874.0	41.9	0.52	42.4	54.0	11.6	Horizontal
7311.0	35.1	7.00	42.1	54.0	11.9	Vertical
7311.0	34.9	6.50	41.4	54.0	12.6	Horizontal
9748.0	33.2	8.50	41.7	54.0	12.3	Vertical
9748.0	32.8	8.30	41.1	54.0	12.9	Horizontal
12185.0	30.4	10.90	41.3	54.0	12.7	Vertical
12185.0	30.3	10.80	41.1	54.0	13.0	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	57.8	0.82	58.6	74.0	15.4	Vertical
4924.0	58.3	0.52	58.8	74.0	15.2	Horizontal
7386.0	50.9	7.00	57.9	74.0	16.1	Vertical
7386.0	50.9	6.50	57.4	74.0	16.6	Horizontal
9848.0	47.8	8.50	56.3	74.0	17.7	Vertical
9848.0	47.5	8.30	55.8	74.0	18.2	Horizontal
12310.0	45.6	10.90	56.5	74.0	17.5	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	42.1	0.82	42.9	54.0	11.1	Vertical
4924.0	42.3	0.52	42.8	54.0	11.2	Horizontal
7386.0	35.1	7.00	42.1	54.0	11.9	Vertical
7386.0	35.4	6.50	41.9	54.0	12.1	Horizontal
9848.0	32.7	8.50	41.2	54.0	12.8	Vertical
9848.0	33.5	8.30	41.8	54.0	12.2	Horizontal
12310.0	29.8	10.90	40.7	54.0	13.3	Vertical
12310.0	30.4	10.80	41.2	54.0	12.8	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	57.8	0.82	58.6	74.0	15.4	Vertical
4824.0	57.9	0.52	58.4	74.0	15.6	Horizontal
7236.0	49.7	7.00	56.7	74.0	17.3	Vertical
7236.0	50.9	6.50	57.4	74.0	16.6	Horizontal
9648.0	47.8	8.50	56.3	74.0	17.7	Vertical
9648.0	47.9	8.30	56.2	74.0	17.8	Horizontal
12060.0	45.2	10.90	56.1	74.0	17.9	Vertical
12060.0	45.0	10.80	55.8	74.0	18.2	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	42.1	0.82	42.9	54.0	11.1	Vertical
4824.0	41.8	0.52	42.3	54.0	11.7	Horizontal
7236.0	34.2	7.00	41.2	54.0	12.8	Vertical
7236.0	35.5	6.50	42.0	54.0	12.0	Horizontal
9648.0	31.9	8.50	40.4	54.0	13.6	Vertical
9648.0	33.1	8.30	41.4	54.0	12.6	Horizontal
12060.0	30.6	10.90	41.5	54.0	12.5	Vertical
12060.0	30.0	10.80	40.8	54.0	13.2	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	57.2	0.82	58.0	74.0	16.0	Vertical
4874.0	57.8	0.52	58.3	74.0	15.7	Horizontal
7311.0	49.5	7.00	56.5	74.0	17.5	Vertical
7311.0	50.8	6.50	57.3	74.0	16.7	Horizontal
9748.0	47.9	8.50	56.4	74.0	17.6	Vertical
9748.0	47.3	8.30	55.6	74.0	18.4	Horizontal
12185.0	45.2	10.90	56.1	74.0	17.9	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 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	41.5	0.82	42.3	54.0	11.7	Vertical
4874.0	41.7	0.52	42.2	54.0	11.8	Horizontal
7311.0	34.9	7.00	41.9	54.0	12.1	Vertical
7311.0	35.6	6.50	42.1	54.0	11.9	Horizontal
9748.0	31.8	8.50	40.3	54.0	13.7	Vertical
9748.0	32.4	8.30	40.7	54.0	13.3	Horizontal
12185.0	31.1	10.90	42.0	54.0	12.0	Vertical
12185.0	30.6	10.80	41.4	54.0	12.6	Horizontal

Result of Tx mode (2462.0 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 (2462.0 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
4924.0	57.2	0.82	58.0	74.0	16.0	Vertical
4924.0	57.3	0.52	57.8	74.0	16.2	Horizontal
7386.0	50.2	7.00	57.2	74.0	16.8	Vertical
7386.0	51.3	6.50	57.8	74.0	16.2	Horizontal
9848.0	47.6	8.50	56.1	74.0	17.9	Vertical
9848.0	47.4	8.30	55.7	74.0	18.3	Horizontal
12310.0	45.2	10.90	56.1	74.0	17.9	Vertical
12310.0	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 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	41.4	0.52	41.9	54.0	12.1	Horizontal
7386.0	35.3	7.00	42.3	54.0	11.7	Vertical
7386.0	36.1	6.50	42.6	54.0	11.4	Horizontal
9848.0	33.2	8.50	41.7	54.0	12.3	Vertical
9848.0	32.1	8.30	40.4	54.0	13.6	Horizontal
12310.0	29.8	10.90	40.7	54.0	13.3	Vertical
12310.0	31.0	10.80	41.8	54.0	12.2	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	57.3	0.52	57.8	74.0	16.2	Horizontal
7236.0	50.1	7.00	57.1	74.0	16.9	Vertical
7236.0	50.2	6.50	56.7	74.0	17.3	Horizontal
9648.0	47.3	8.50	55.8	74.0	18.2	Vertical
9648.0	47.4	8.30	55.7	74.0	18.3	Horizontal
12060.0	45.2	10.90	56.1	74.0	17.9	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	41.1	0.82	41.9	54.0	12.1	Vertical
4824.0	41.2	0.52	41.7	54.0	12.3	Horizontal
7236.0	35.2	7.00	42.2	54.0	11.8	Vertical
7236.0	35.3	6.50	41.8	54.0	12.2	Horizontal
9648.0	31.9	8.50	40.4	54.0	13.6	Vertical
9648.0	33.1	8.30	41.4	54.0	12.6	Horizontal
12060.0	30.2	10.90	41.1	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	57.2	0.82	58.0	74.0	16.0	Vertical
4874.0	57.4	0.52	57.9	74.0	16.1	Horizontal
7311.0	49.8	7.00	56.8	74.0	17.2	Vertical
7311.0	50.7	6.50	57.2	74.0	16.8	Horizontal
9748.0	47.3	8.50	55.8	74.0	18.2	Vertical
9748.0	47.4	8.30	55.7	74.0	18.3	Horizontal
12185.0	45.2	10.90	56.1	74.0	17.9	Vertical
12185.0	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
4874.0	41.6	0.82	42.4	54.0	11.6	Vertical
4874.0	41.4	0.52	41.9	54.0	12.1	Horizontal
7311.0	35.4	7.00	42.4	54.0	11.6	Vertical
7311.0	35.5	6.50	42.0	54.0	12.0	Horizontal
9748.0	34.0	8.50	42.5	54.0	11.5	Vertical
9748.0	32.8	8.30	41.1	54.0	12.9	Horizontal
12185.0	30.1	10.90	41.0	54.0	13.0	Vertical
12185.0	30.9	10.80	41.7	54.0	12.3	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	57.1	0.82	57.9	74.0	16.1	Vertical
4924.0	56.9	0.52	57.4	74.0	16.6	Horizontal
7386.0	49.8	7.00	56.8	74.0	17.2	Vertical
7386.0	50.6	6.50	57.1	74.0	16.9	Horizontal
9848.0	47.2	8.50	55.7	74.0	18.3	Vertical
9848.0	47.2	8.30	55.5	74.0	18.6	Horizontal
12310.0	45.2	10.90	56.1	74.0	17.9	Vertical
12310.0	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 dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dB	E-Field Polarity
4924.0	41.2	0.82	42.0	54.0	12.0	Vertical
4924.0	41.4	0.52	41.9	54.0	12.1	Horizontal
7386.0	34.3	7.00	41.3	54.0	12.7	Vertical
7386.0	35.2	6.50	41.7	54.0	12.3	Horizontal
9848.0	31.9	8.50	40.4	54.0	13.6	Vertical
9848.0	32.8	8.30	41.1	54.0	12.9	Horizontal
12310.0	31.2	10.90	42.1	54.0	12.0	Vertical
12310.0	30.7	10.80	41.5	54.0	12.5	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	56.3	0.82	57.1	74.0	16.9	Vertical
4844.0	56.8	0.52	57.3	74.0	16.7	Horizontal
7266.0	49.7	7.00	56.7	74.0	17.3	Vertical
7266.0	50.5	6.50	57.0	74.0	17.0	Horizontal
9688.0	46.9	8.50	55.4	74.0	18.6	Vertical
9688.0	47.1	8.30	55.4	74.0	18.6	Horizontal
12110.0	45.2	10.90	56.1	74.0	17.9	Vertical
12110.0	45.6	10.80	56.4	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
4844.0	41.3	0.82	42.1	54.0	11.9	Vertical
4844.0	41.5	0.52	42.0	54.0	12.0	Horizontal
7266.0	35.2	7.00	42.2	54.0	11.8	Vertical
7266.0	35.4	6.50	41.9	54.0	12.1	Horizontal
9688.0	32.7	8.50	41.2	54.0	12.8	Vertical
9688.0	33.1	8.30	41.4	54.0	12.6	Horizontal
12110.0	30.2	10.90	41.1	54.0	12.9	Vertical
12110.0	30.8	10.80	41.6	54.0	12.4	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	56.3	0.82	57.1	74.0	16.9	Vertical
4874.0	56.7	0.52	57.2	74.0	16.8	Horizontal
7311.0	50.1	7.00	57.1	74.0	16.9	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	47.3	8.30	55.6	74.0	18.4	Horizontal
12185.0	45.1	10.90	56.0	74.0	18.0	Vertical
12185.0	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
4874.0	41.1	0.82	41.9	54.0	12.1	Vertical
4874.0	41.2	0.52	41.7	54.0	12.3	Horizontal
7311.0	35.0	7.00	42.0	54.0	12.0	Vertical
7311.0	35.2	6.50	41.7	54.0	12.3	Horizontal
9748.0	32.5	8.50	41.0	54.0	13.0	Vertical
9748.0	32.6	8.30	40.9	54.0	13.1	Horizontal
12185.0	30.2	10.90	41.1	54.0	12.9	Vertical
12185.0	30.9	10.80	41.7	54.0	12.3	Horizontal

Result of Tx mode (2452.0 MHz) (802.11n40) (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 (2452.0 MHz) (802.11n40) (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
4904.0	56.1	0.82	56.9	74.0	17.1	Vertical
4904.0	56.2	0.52	56.7	74.0	17.3	Horizontal
7356.0	49.8	7.00	56.8	74.0	17.2	Vertical
7356.0	49.7	6.50	56.2	74.0	17.8	Horizontal
9808.0	47.1	8.50	55.6	74.0	18.4	Vertical
9808.0	47.5	8.30	55.8	74.0	18.2	Horizontal
12260.0	45.2	10.90	56.1	74.0	17.9	Vertical
12260.0	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
4904.0	41.2	0.82	42.0	54.0	12.0	Vertical
4904.0	41.4	0.52	41.9	54.0	12.1	Horizontal
7356.0	34.4	7.00	41.4	54.0	12.6	Vertical
7356.0	35.5	6.50	42.0	54.0	12.0	Horizontal
9808.0	32.4	8.50	40.9	54.0	13.1	Vertical
9808.0	34.0	8.30	42.3	54.0	11.7	Horizontal
12260.0	31.0	10.90	41.9	54.0	12.1	Vertical
12260.0	30.7	10.80	41.5	54.0	12.5	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 dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB	E-Field Polarity
2390.0	67.5	-4.8	62.7	74.0	11.3	Vertical
2390.0	67.0	-4.7	62.3	74.0	11.7	Horizontal

Field Strength of Band-edge Compliance						
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
2390.0	52.5	-4.8	47.7	54.0	6.3	Vertical
2390.0	52.6	-4.7	47.9	54.0	6.1	Horizontal

Result: RF Radiated Emissions (Highest) -802.11b

Field Strength of Band-edge Compliance						
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
2483.5	67.3	-4.8	62.5	74.0	11.5	Vertical
2483.5	67.6	-4.7	62.9	74.0	11.1	Horizontal

Field Strength of Band-edge Compliance						
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
2483.5	51.0	-4.8	46.2	54.0	7.8	Vertical
2483.5	51.7	-4.7	47.0	54.0	7.0	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	68.1	-4.8	63.3	74.0	10.7	Vertical
2390.0	68.6	-4.7	63.9	74.0	10.1	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	51.3	-4.8	46.5	54.0	7.5	Vertical
2390.0	52.1	-4.7	47.4	54.0	6.7	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	69.9	-4.8	65.1	74.0	8.9	Vertical
2483.5	68.4	-4.7	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	54.4	-4.8	49.6	54.0	4.4	Vertical
2483.5	54.0	-4.7	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	68.3	-4.8	63.5	74.0	10.5	Horizontal
2390.0	68.6	-4.7	63.9	74.0	10.2	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	54.3	-4.8	49.5	54.0	4.5	Vertical
2390.0	52.8	-4.7	48.1	54.0	5.9	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	67.5	-4.8	62.7	74.0	11.3	Vertical
2483.5	67.3	-4.7	62.6	74.0	11.4	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	52.8	-4.8	48.0	54.0	6.0	Horizontal
2483.5	53.7	-4.7	49.0	54.0	5.0	Horizontal

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Result: RF Radiated Emissions (Lowest)-802.11n40

Field Strength of Band-edge Compliance						
Peak Value						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field
MHz	Level @3m	Factor	Strength	@3m		Polarity
	dBμV	dB/m	dBμV/m	dBμV/m	dB	
2390.0	70.4	-4.8	65.6	74.0	8.4	Vertical
2390.0	69.3	-4.7	64.6	74.0	9.4	Horizontal

Field Strength of Band-edge Compliance						
Average Value						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field
MHz	Level @3m	Factor	Strength	@3m		Polarity
	dBμV	dB/m	dBμV/m	dBμV/m	dB	
2390.0	52.6	-4.8	47.8	54.0	6.2	Vertical
2390.0	51.3	-4.7	46.6	54.0	7.5	Horizontal

Result: RF Radiated Emissions (Highest) -802.11n40

Field Strength of Band-edge Compliance						
Peak Value						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field
MHz	Level @3m	Factor	Strength	@3m		Polarity
	dBμV	dB/m	dBμV/m	dBμV/m	dB	
2483.5	68.2	-4.8	63.4	74.0	10.6	Vertical
2483.5	67.2	-4.7	62.5	74.0	11.5	Horizontal

Field Strength of Band-edge Compliance						
Average Value						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field
MHz	Level @3m	Factor	Strength	@3m		Polarity
	dBμV	dB/m	dBμV/m	dBμV/m	dB	
2483.5	54.3	-4.8	49.5	54.0	4.5	Horizontal
2483.5	54.6	-4.7	49.9	54.0	4.2	Horizontal

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Limits for Radiated Emissions FCC 47 CFR 15.247]:

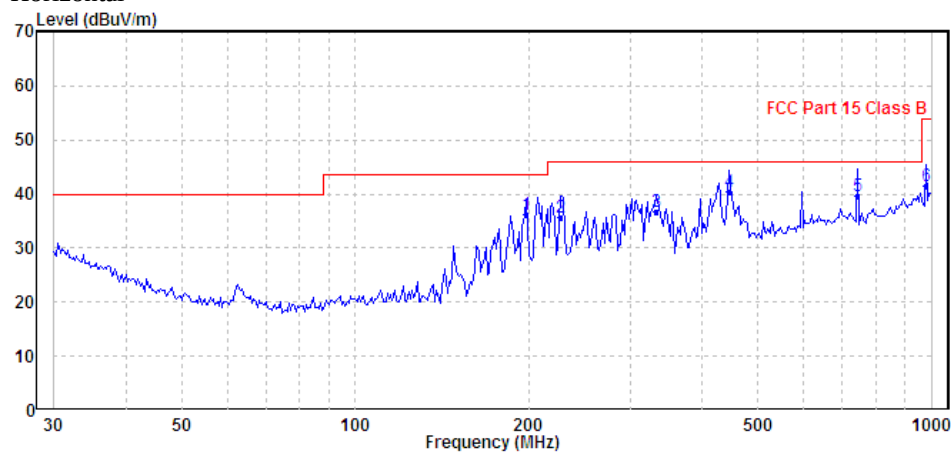
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Results of WIFI TX mode: Pass

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

Horizontal



Ambient Temperature: 22.5C

Relative Humidity : 50.6%

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	197.893	36.18	43.50	-7.32	QP	Horizontal
2	227.691	35.66	46.00	-10.34	QP	Horizontal
3	332.519	36.73	46.00	-9.27	QP	Horizontal
4	446.414	40.33	46.00	-5.67	QP	Horizontal
5	744.866	39.60	46.00	-6.40	QP	Horizontal
6	979.180	41.55	54.00	-12.45	QP	Horizontal

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

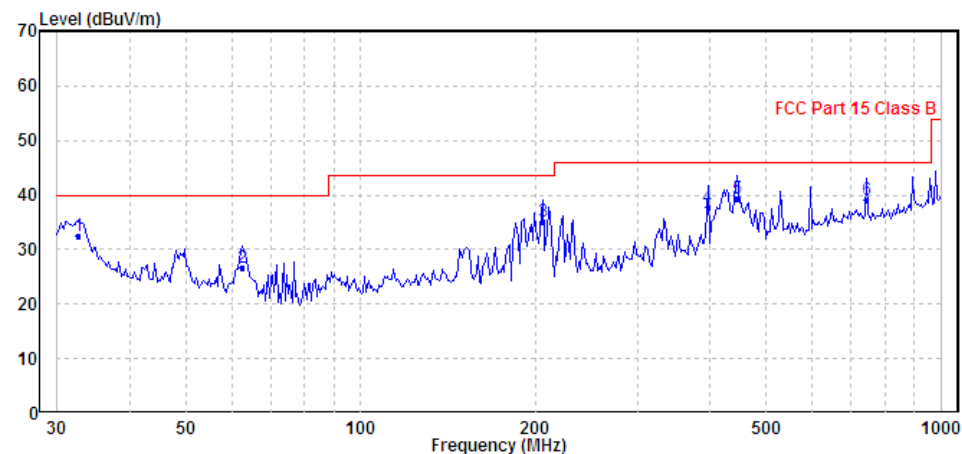
Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Results of WIFI TX mode: Pass

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

Vertical



Ambient Temperature: 22.5C

Relative Humidity : 50.6%

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	32.634	32.51	40.00	-7.49	QP	Vertical
2	62.651	26.77	40.00	-13.23	QP	Vertical
3	206.398	35.14	43.50	-8.36	QP	Vertical
4	396.242	37.84	46.00	-8.16	QP	Vertical
5	446.414	39.47	46.00	-6.53	QP	Vertical
6	744.866	39.06	46.00	-6.94	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:	2023-05-18
Mode of Operation:	WIFI TX mode
Test Voltage:	120Va.c. 60Hz

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

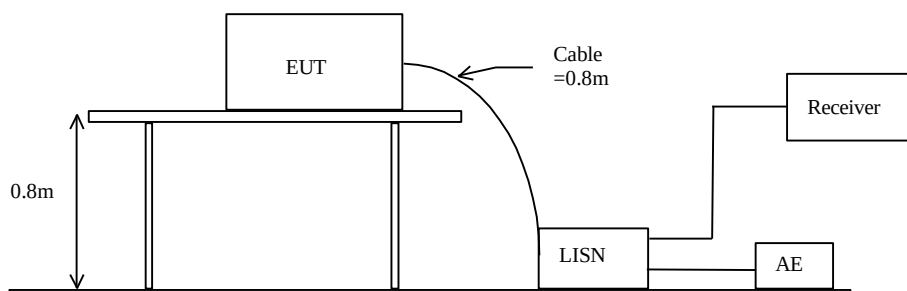
Test Method:

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.

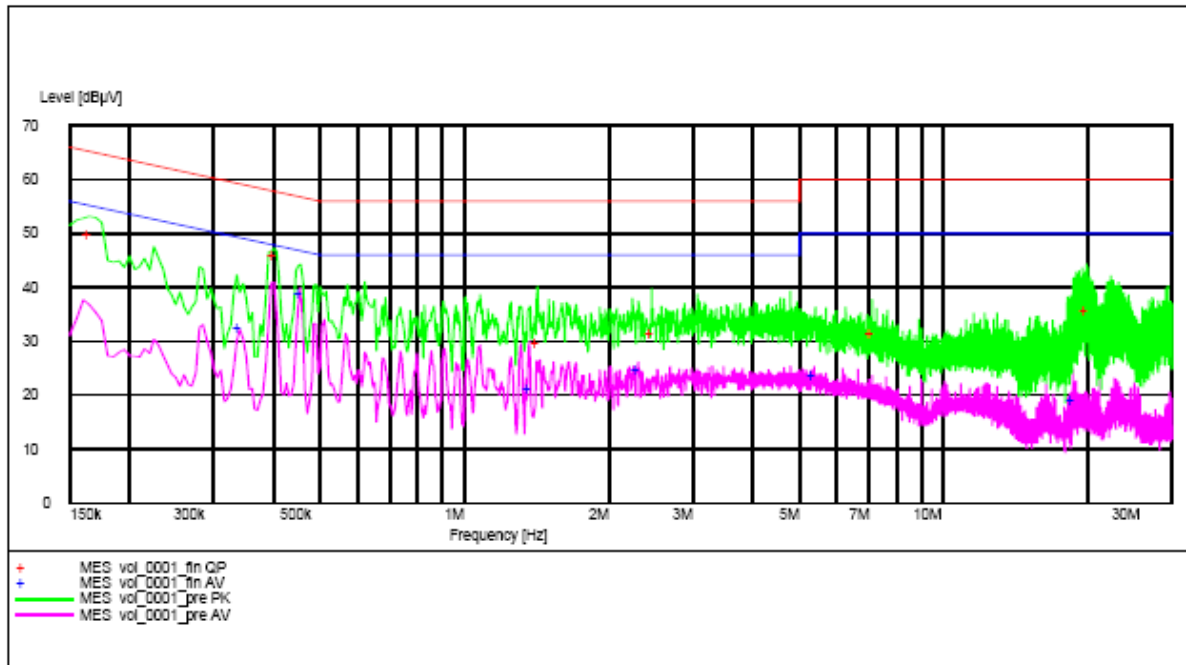
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Results of WIFI TX mode (L): PASS

Please refer to the following diagram for individual results.



MEASUREMENT RESULT: "vol_0001_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.165000	49.70	9.7	65	15.5	L1	GND
0.400000	45.80	9.7	58	12.1	L1	GND
1.420000	29.60	9.8	56	26.4	L1	GND
2.460000	31.50	9.8	56	24.5	L1	GND
7.105000	31.30	9.9	60	28.7	L1	GND
19.890000	35.60	10.4	60	24.4	L1	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.340000	32.40	9.7	49	16.8	L1	GND
0.455000	38.80	9.7	47	7.9	L1	GND
1.365000	21.10	9.8	46	24.9	L1	GND
2.305000	24.70	9.8	46	21.3	L1	GND
5.375000	23.60	9.9	50	26.4	L1	GND
18.625000	19.20	10.3	50	30.8	L1	GND

vol_0001

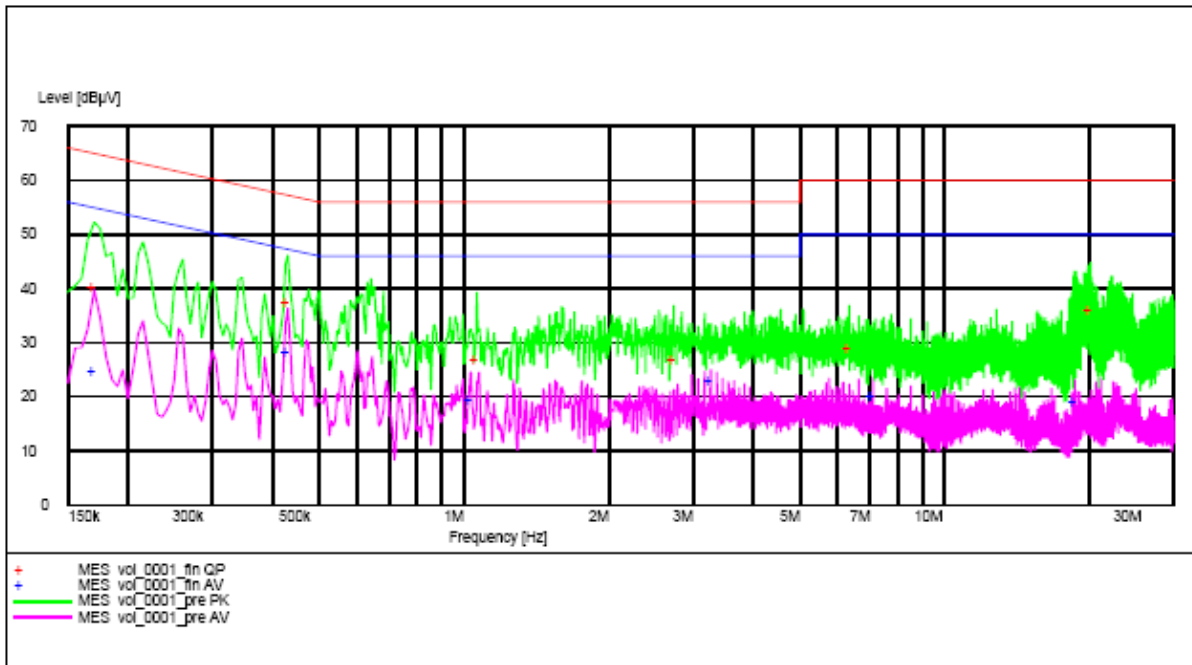
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Results of WIFI TX mode (N): PASS

Please refer to the following diagram for individual results.



MEASUREMENT RESULT: "vol_0001_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.170000	40.40	9.7	65	24.5	N	GND
0.430000	37.60	9.7	57	19.6	N	GND
1.065000	26.70	9.7	56	29.3	N	GND
2.735000	26.80	9.8	56	29.2	N	GND
6.335000	28.80	9.9	60	31.2	N	GND
20.135000	36.10	10.4	60	23.9	N	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.170000	24.90	9.7	55	30.1	N	GND
0.430000	28.20	9.7	47	19.1	N	GND
1.035000	19.50	9.7	46	26.5	N	GND
3.265000	22.90	9.8	46	23.1	N	GND
7.100000	20.00	9.9	50	30.0	N	GND
18.720000	19.00	10.3	50	31.0	N	GND

vol_0001



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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: 2023-05-05
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	-7.090	8dBm
2437.0	-7.527	8dBm
2462.0	-6.919	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	-13.354	8dBm
2437.0	-14.838	8dBm
2462.0	-14.748	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	-14.277	8dBm
2437.0	-14.616	8dBm
2462.0	-14.550	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	-15.507	8dBm
2437.0	-15.877	8dBm
2452.0	-15.228	8dBm

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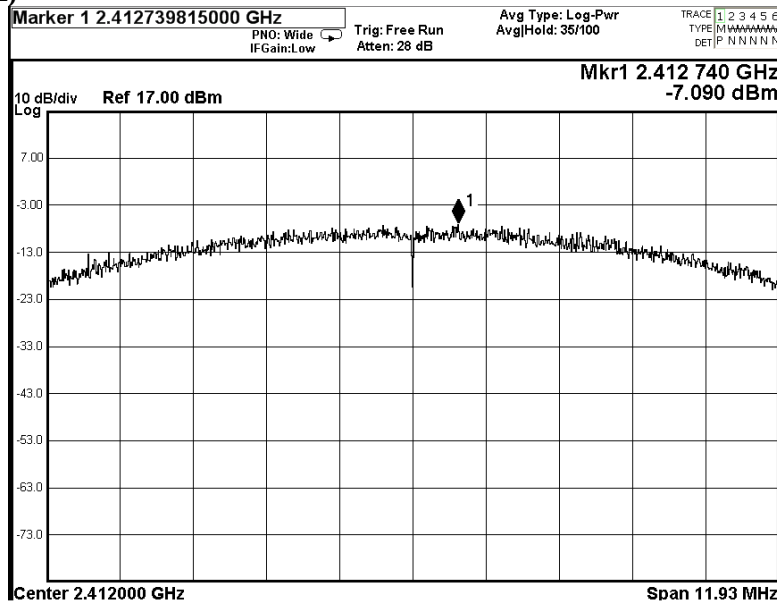
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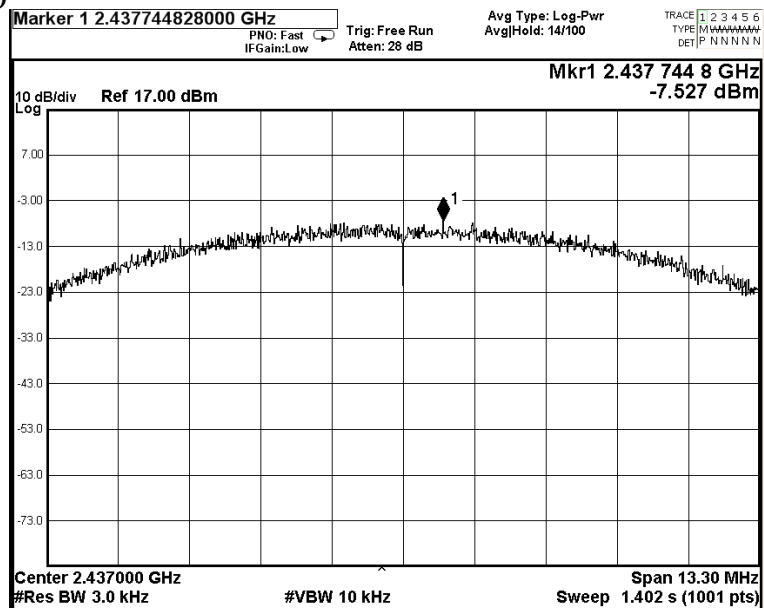
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WiFi mode 802.11 b

CH 1 (2412.0 MHz)



CH 6 (2437.0 MHz)



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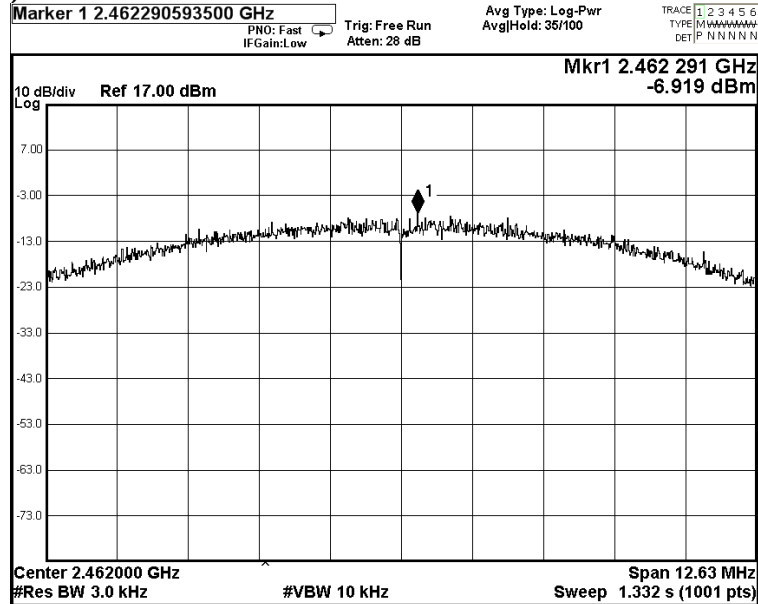


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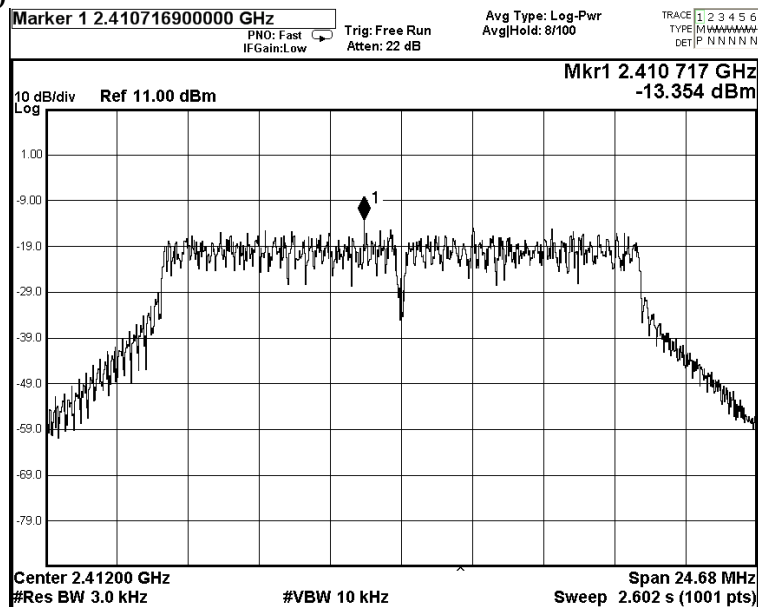
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CH 11 (2462.0 MHz)



WiFi mode 802.11 g
CH 1 (2412.0 MHz)



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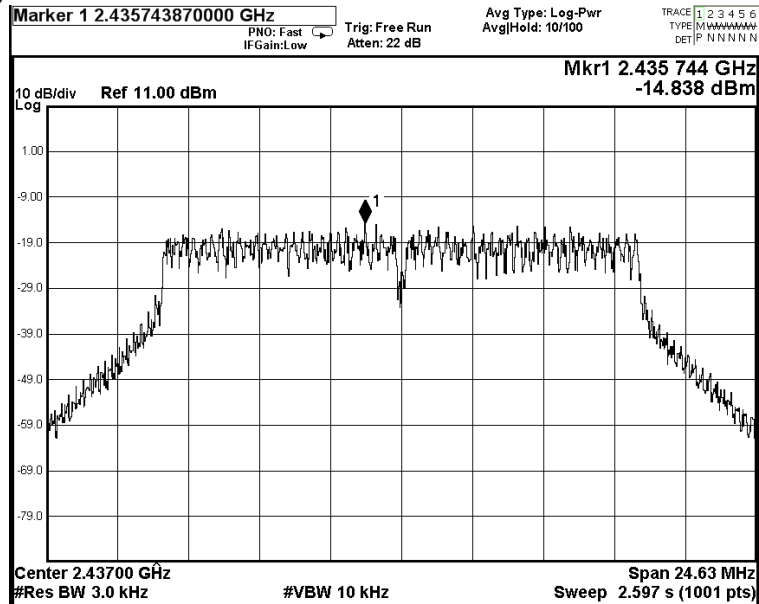


Test Report

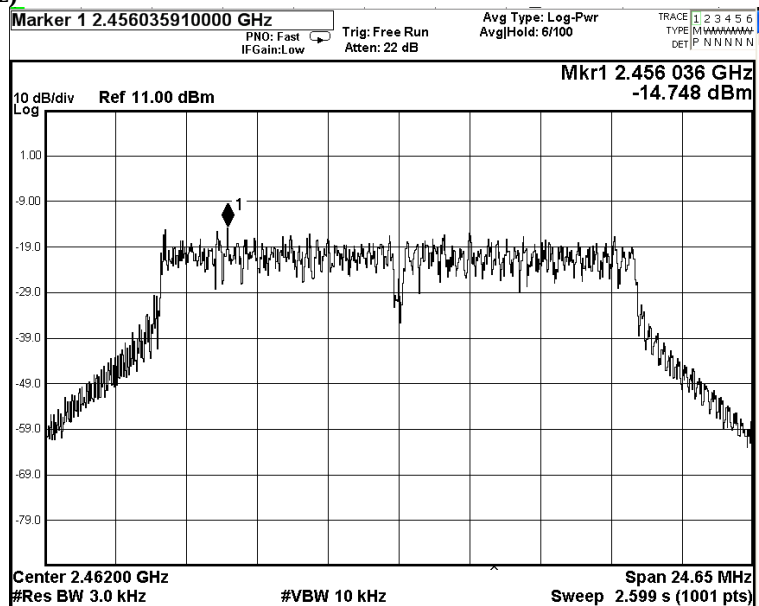
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CH 6 (2437.0 MHz)



CH 11 (2462.0 MHz)



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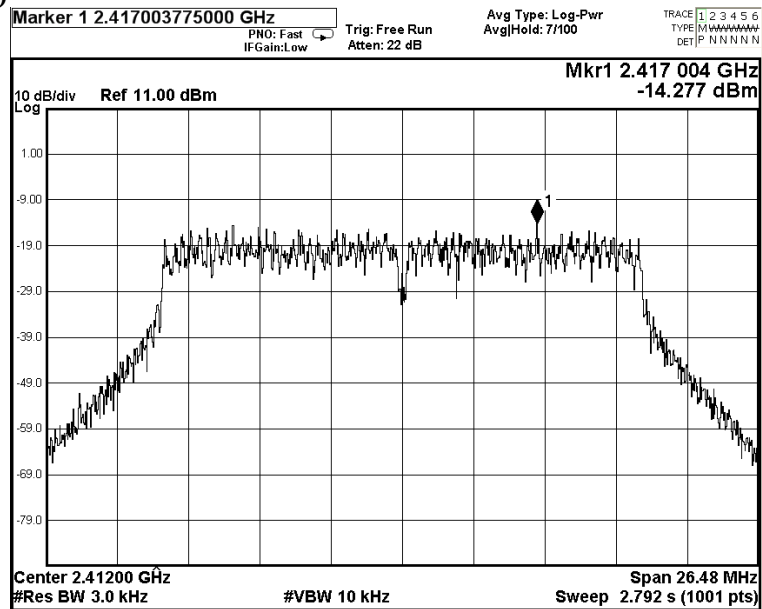


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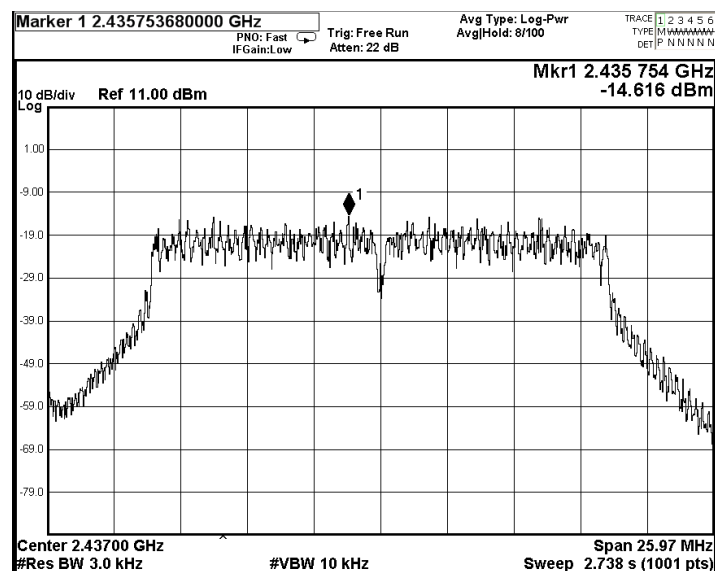
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WiFi mode 802.11 n20
CH 1 (2412.0 MHz)



CH 6 (2437.0 MHz)



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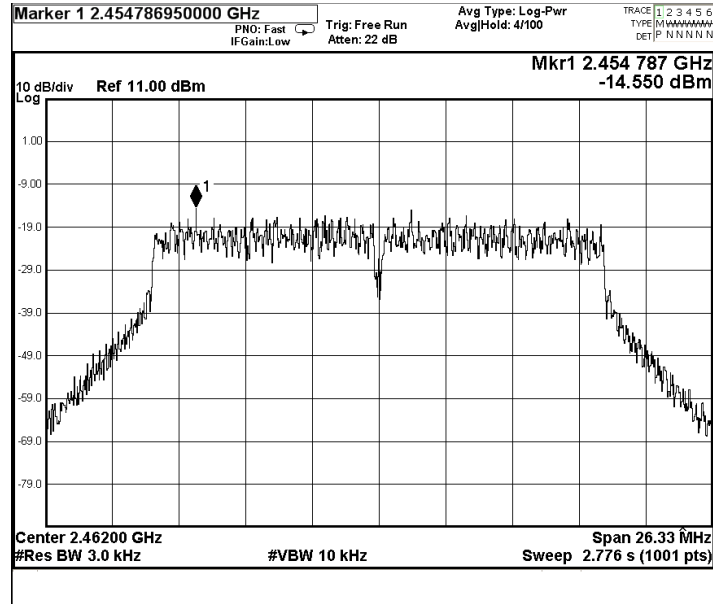


Test Report

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No. : HMD23040028

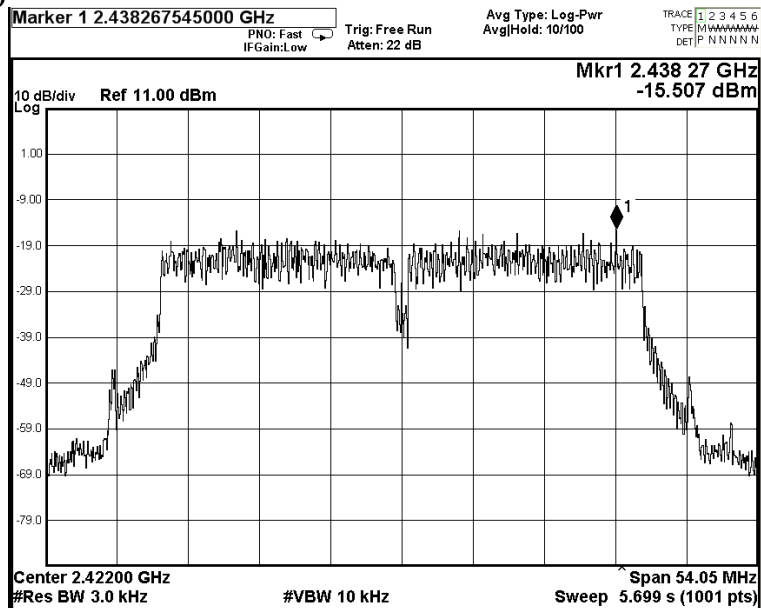
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CH 11 (2462.0 MHz)



WiFi mode 802.11 n40

CH 3 (2422.0 MHz)



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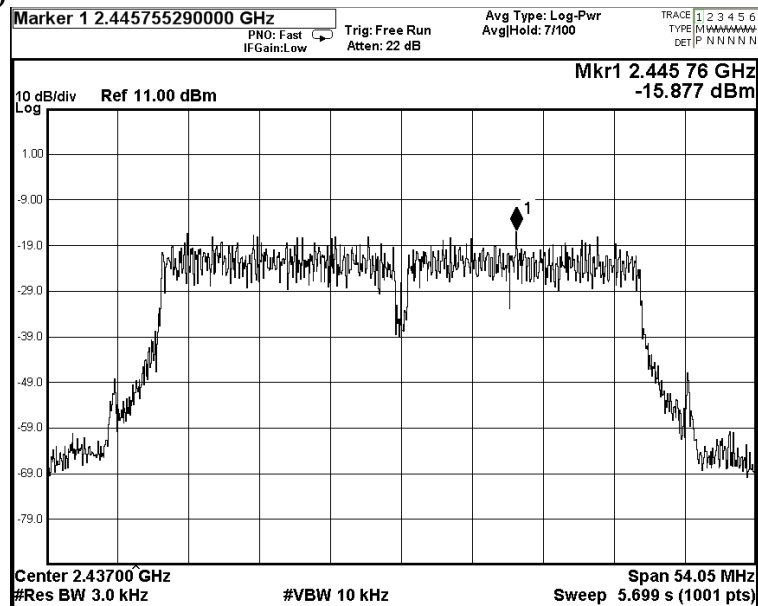


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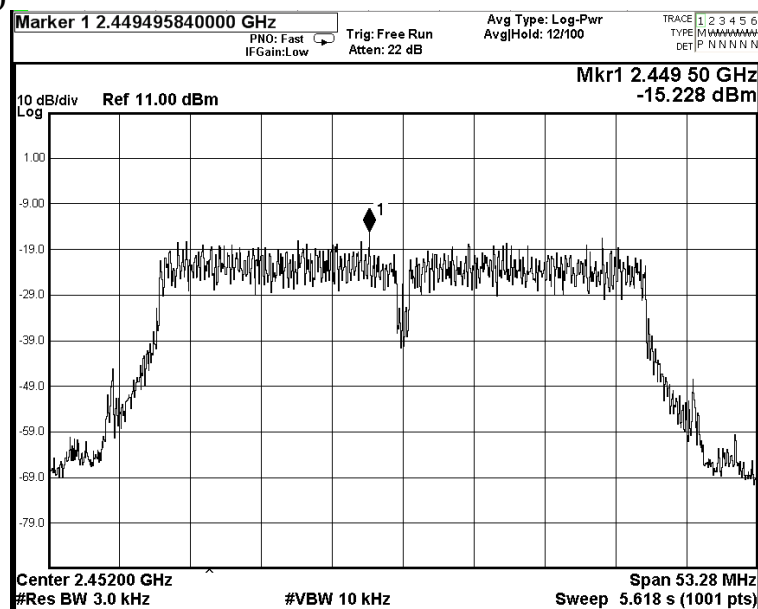
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CH 6 (2437.0 MHz)



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: 2023-05-06
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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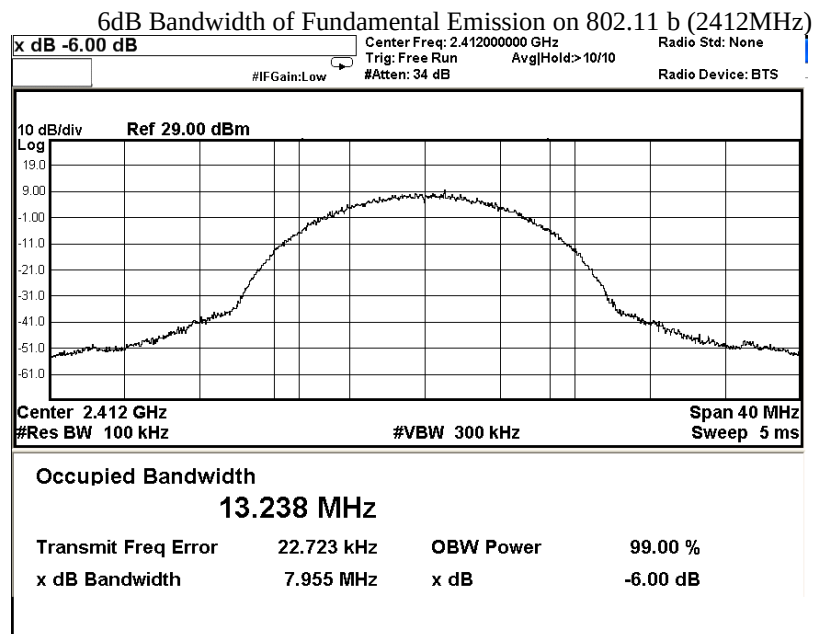
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	7.955	> 500



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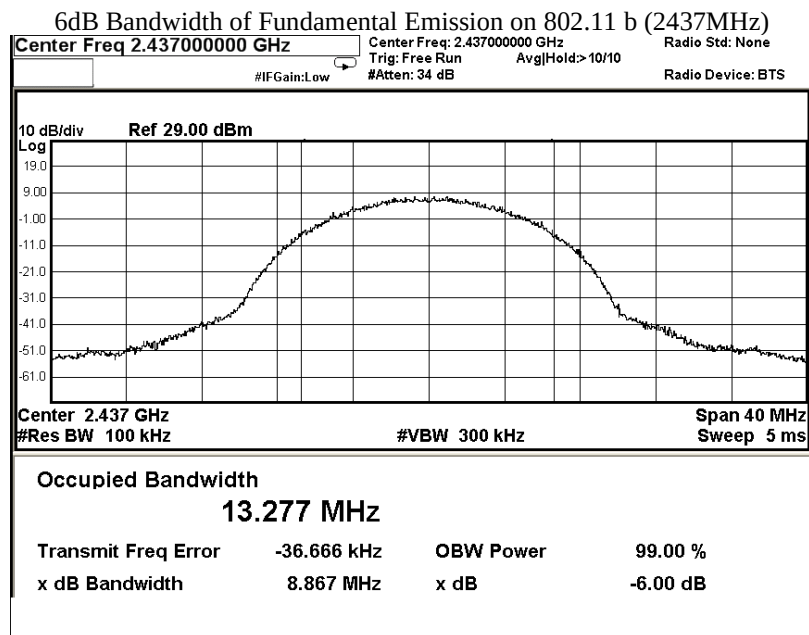
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	8.867	> 500



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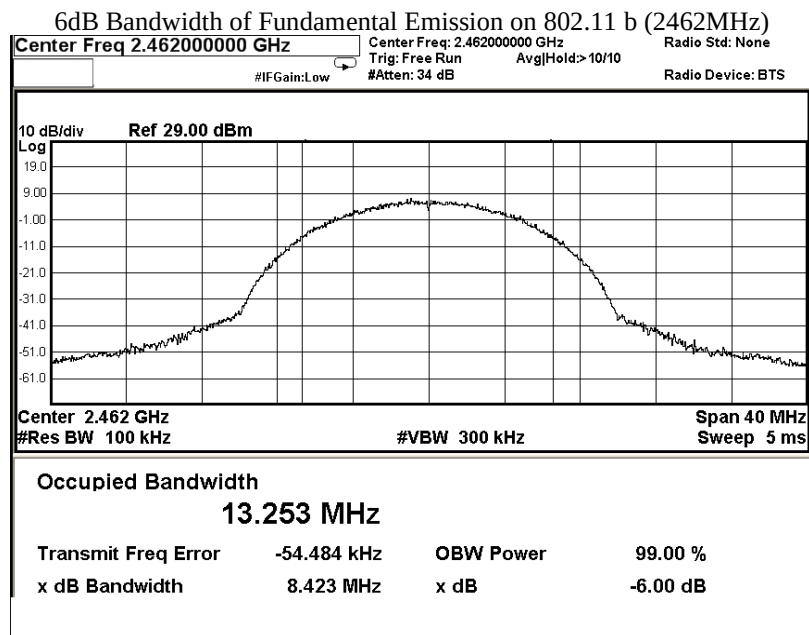
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	8.423	> 500



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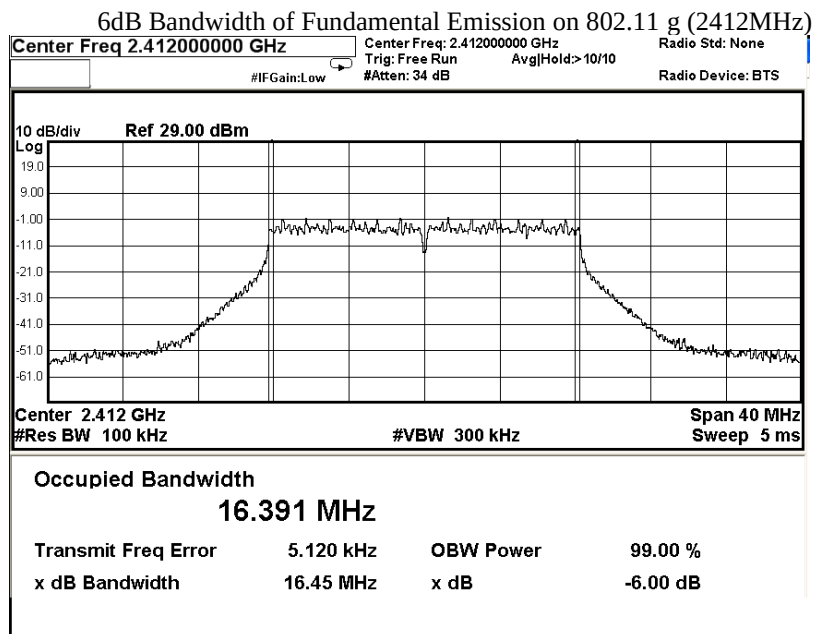
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	16.45	> 500



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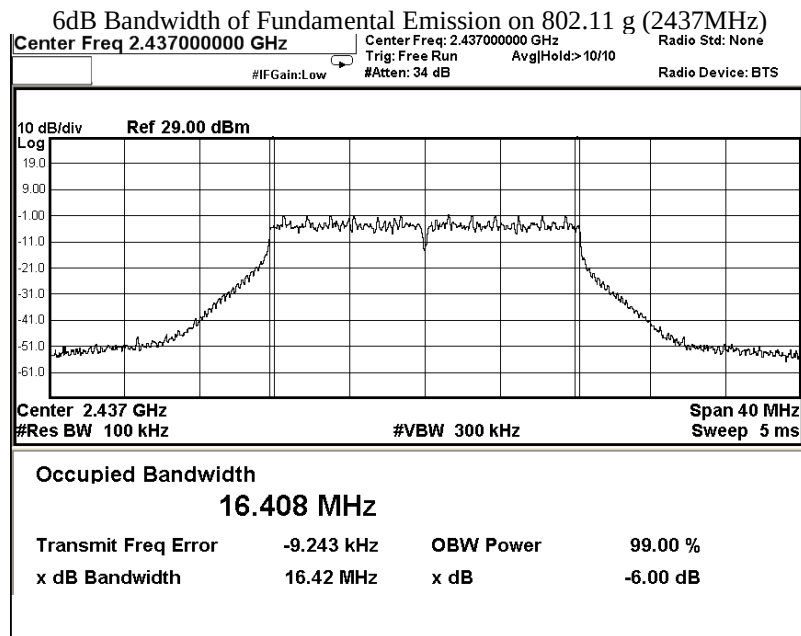
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	16.42	> 500



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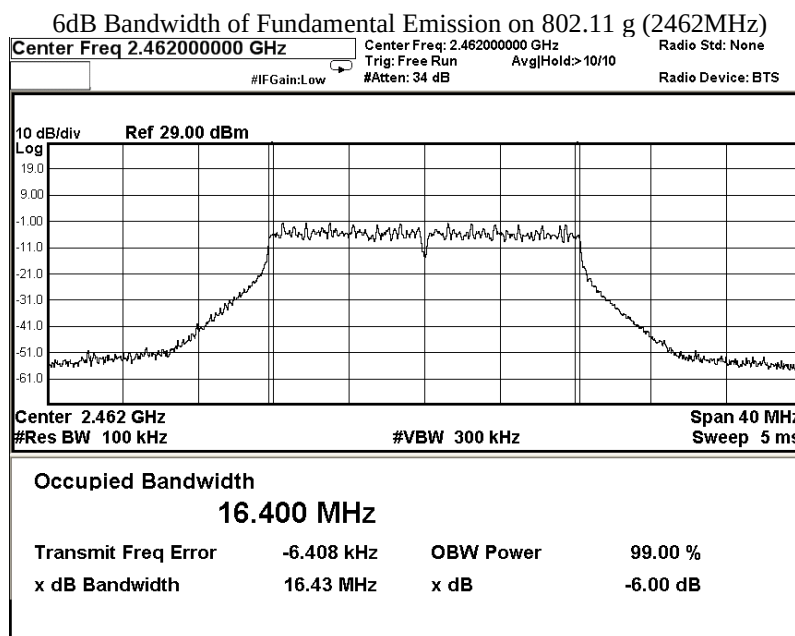
Test Report

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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	16.43	> 500



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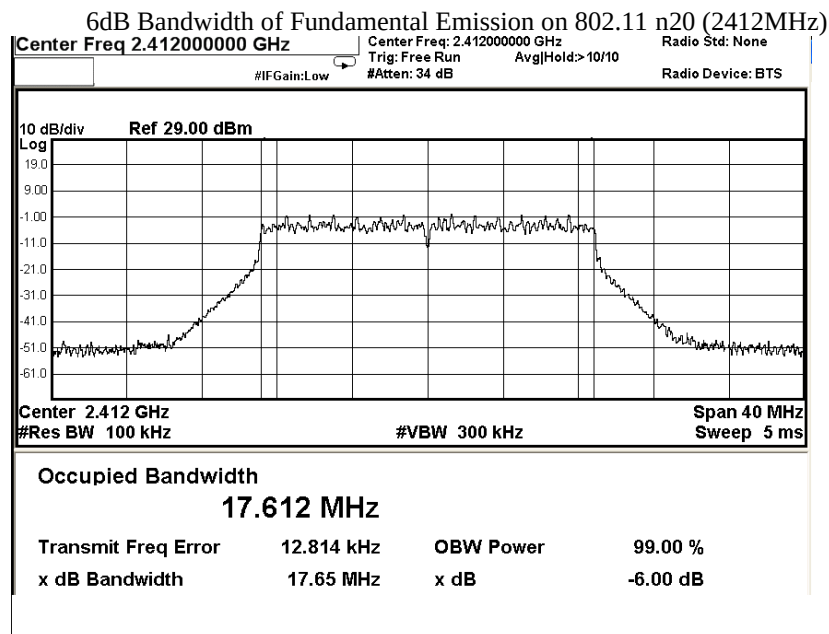
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Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	17.65	> 500



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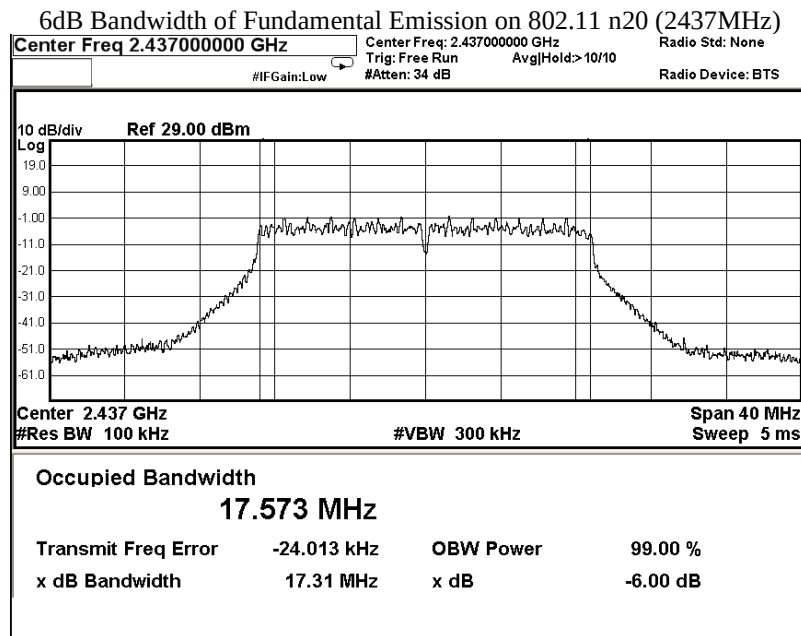
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	17.31	> 500



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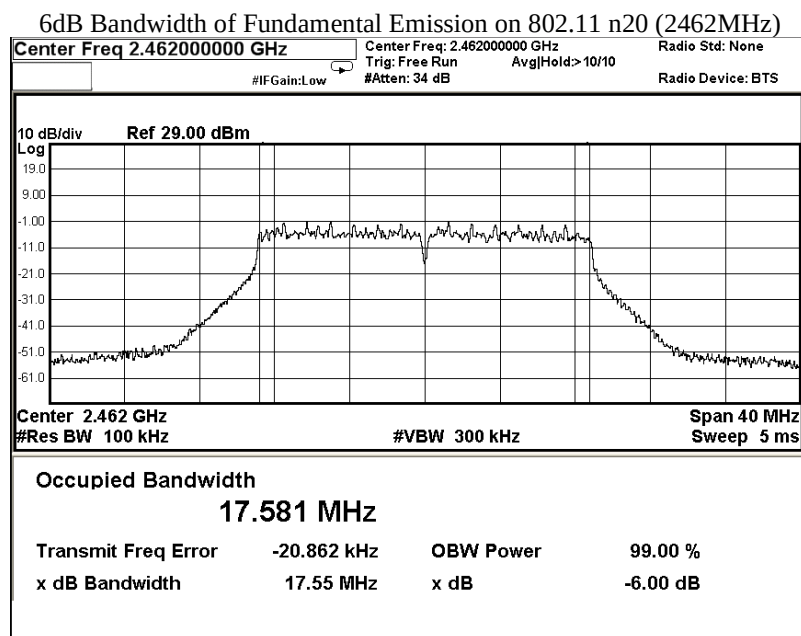
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	17.55	> 500



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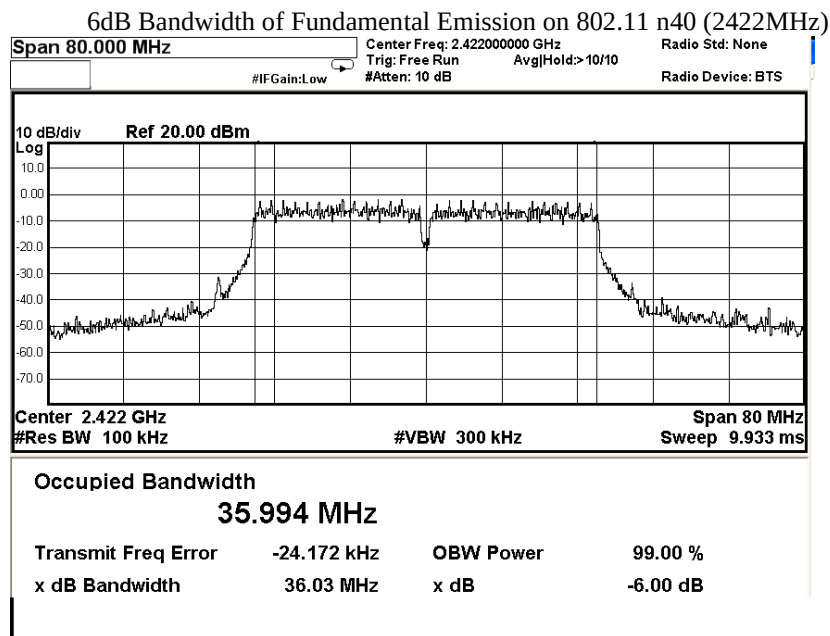
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Limits for 6dB Spectrum Bandwidth Measurement:

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



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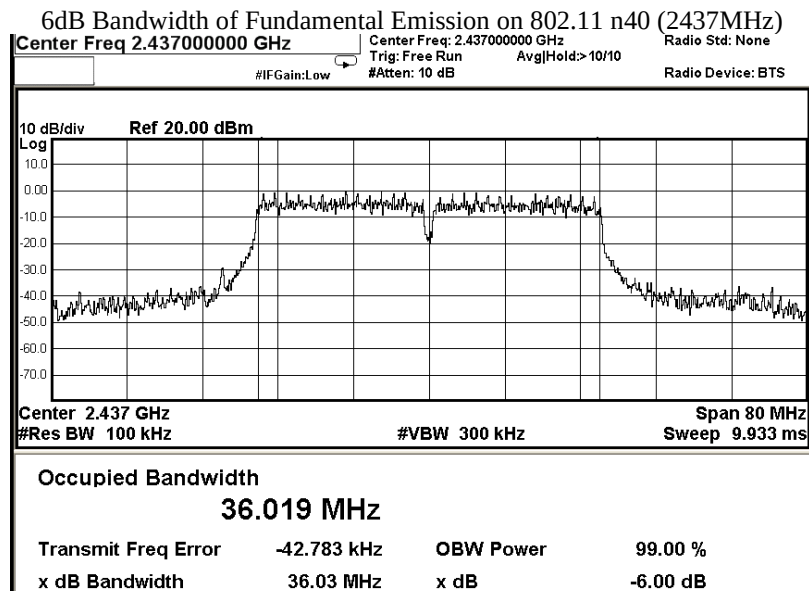
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	36.03	> 500



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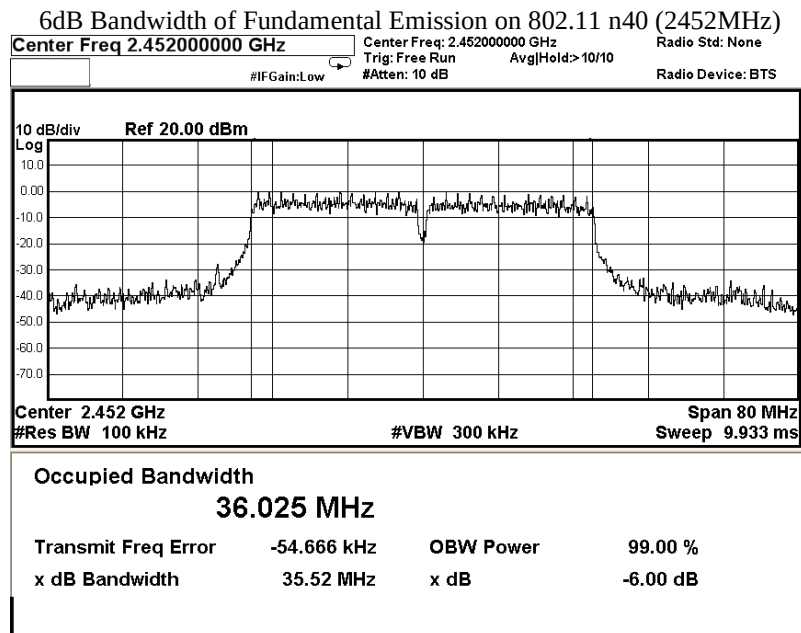
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Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2452.0	35.52	> 500



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3.1.6 Band Edges Measurement

Test Requirement: FCC 47CFR 15.247
Test Method: ANSI C63.10:2013
Test Date: 2023-05-07
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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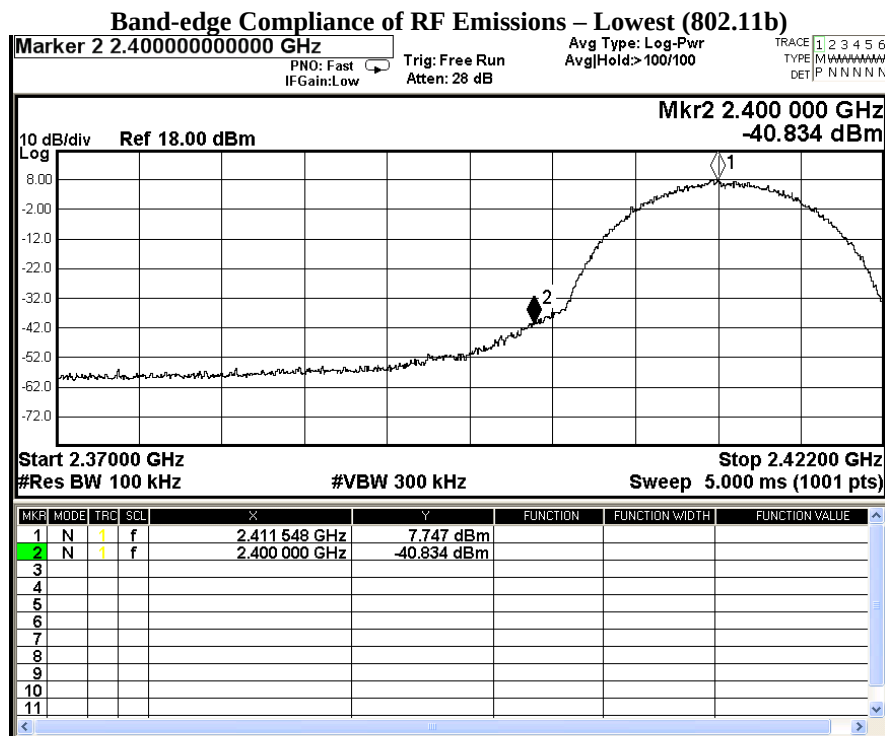
Band-edge Compliance of RF Conducted Emissions Measurement:

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)	7.747	-12.253	-40.834	Pass



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Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2462)	5.156	-14.844	-58.164	Pass

[illegible]



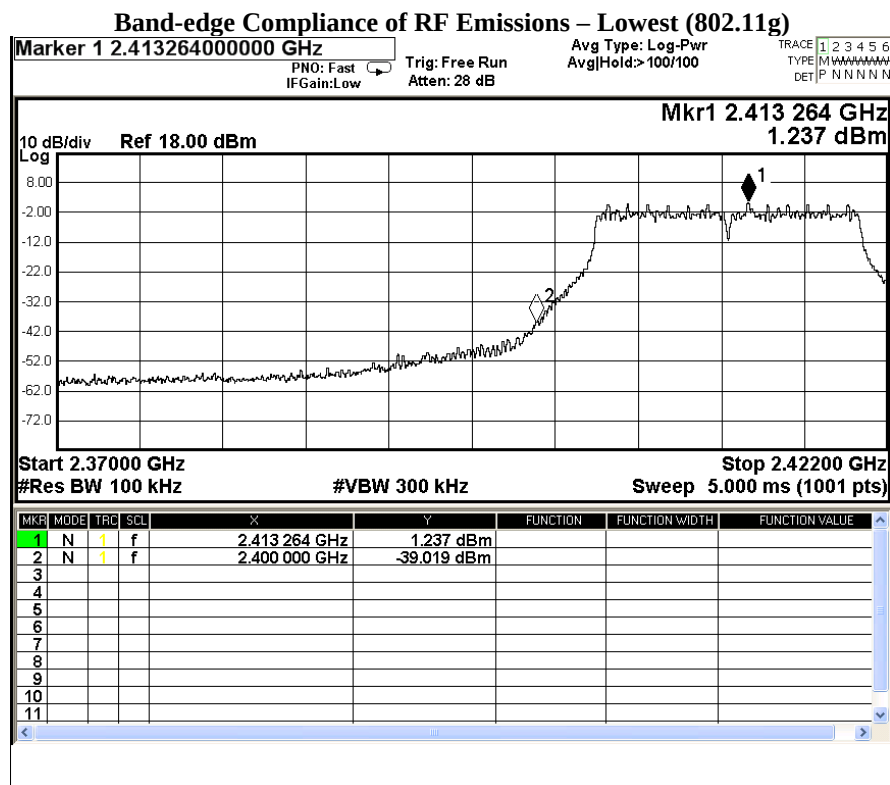
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2400 – Lowest Fundamental (2412)	1.237	-18.763	-39.019	Pass



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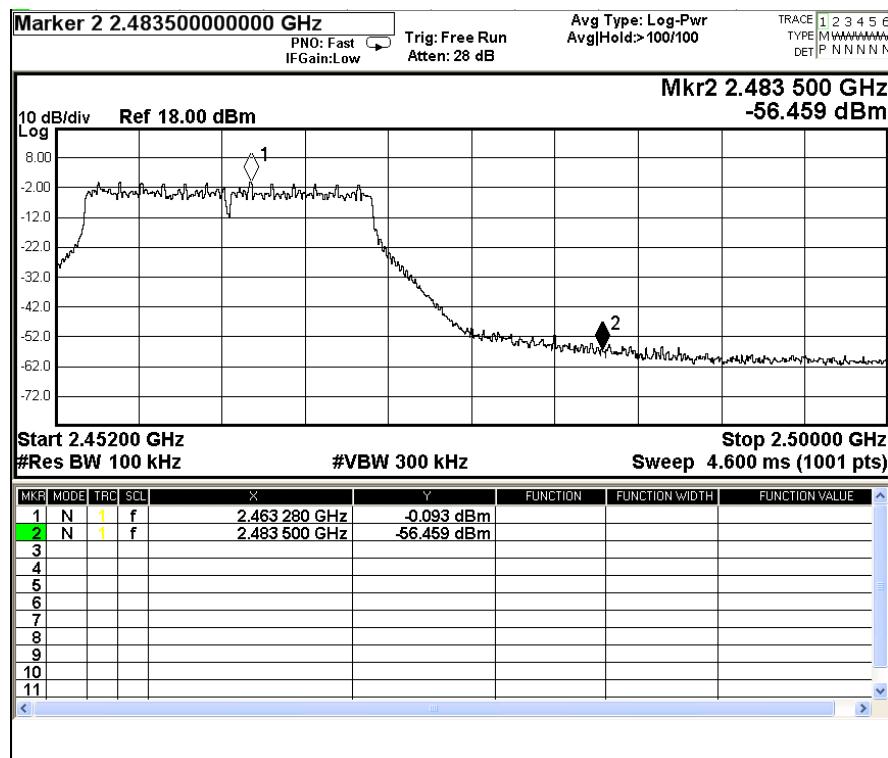
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2462)	-0.093	-20.093	-56.459	Pass

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



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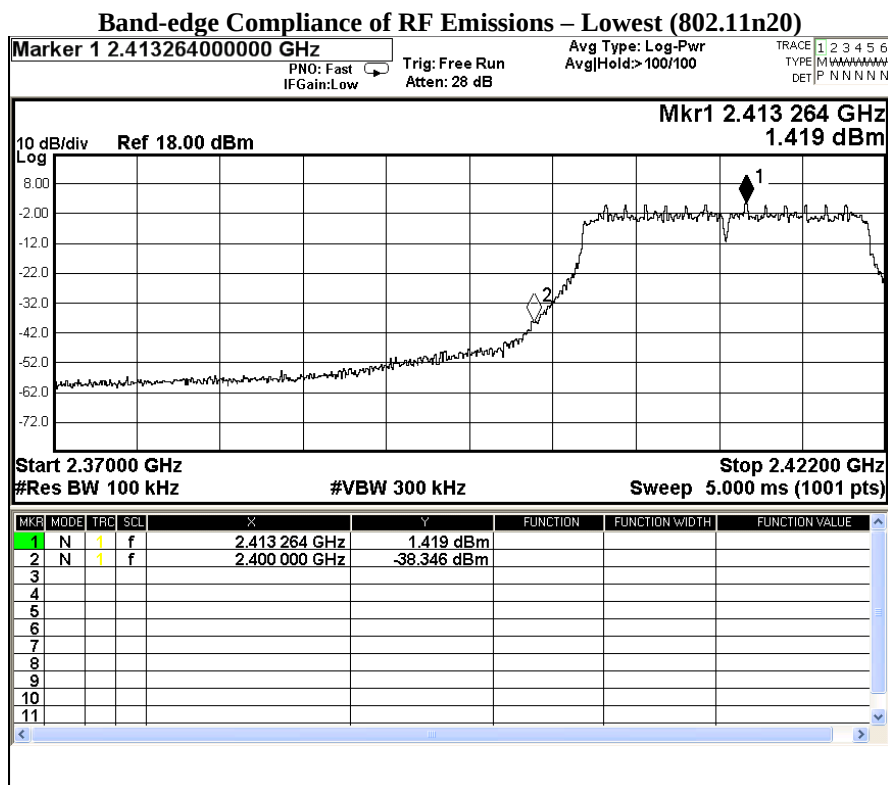
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2400 – Lowest Fundamental (2412)	1.419	-18.581	-38.346	Pass



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Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2462)	-0.127	-20.127	-55.513	Pass

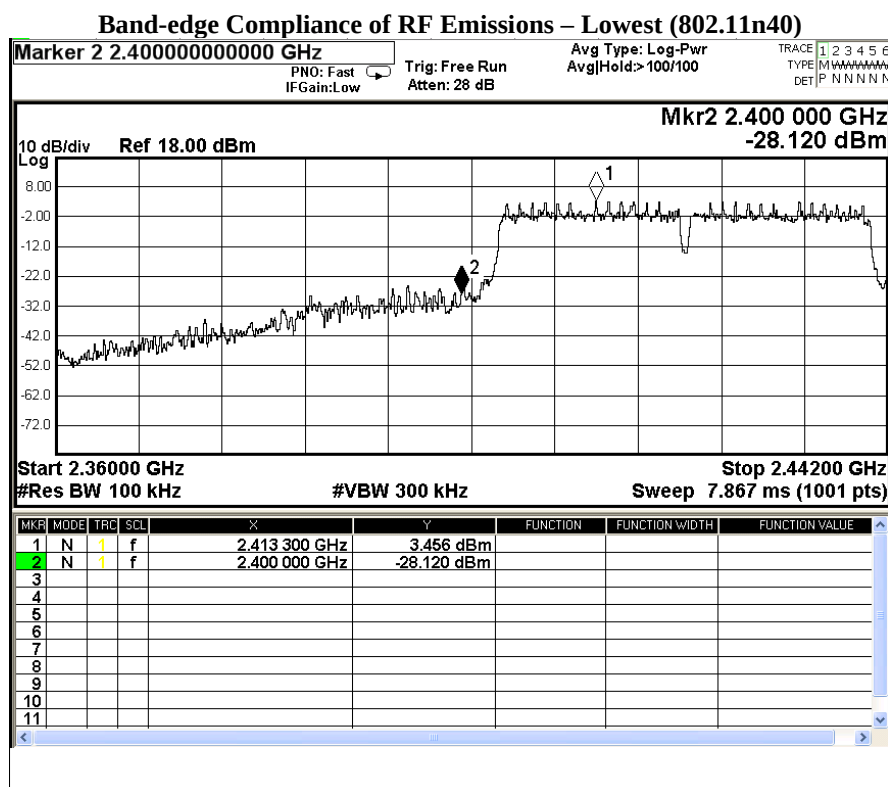
[illegible]



No. : HMD23040028

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)	3.456	-16.544	-28.120	Pass



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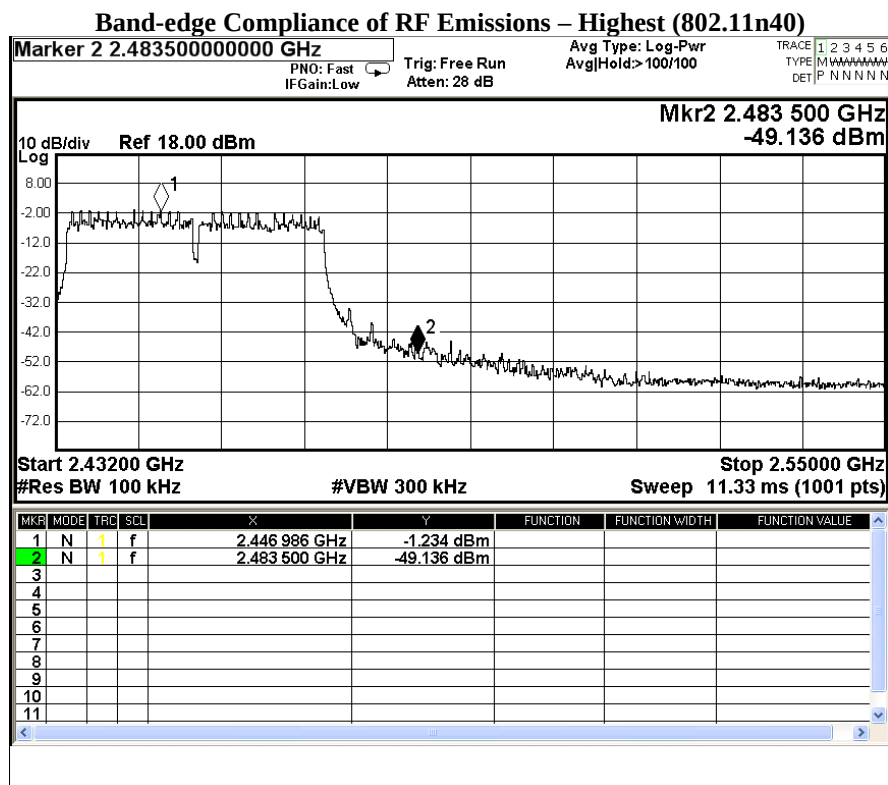
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range	Reference level	Limit	The highest conducted band edge emission	Result
[MHz]	[dBm]	[dBm]	[dBm]	
2483.5 – Highest Fundamental (2452)	-1.234	-21.234	-49.136	Pass





Test Report

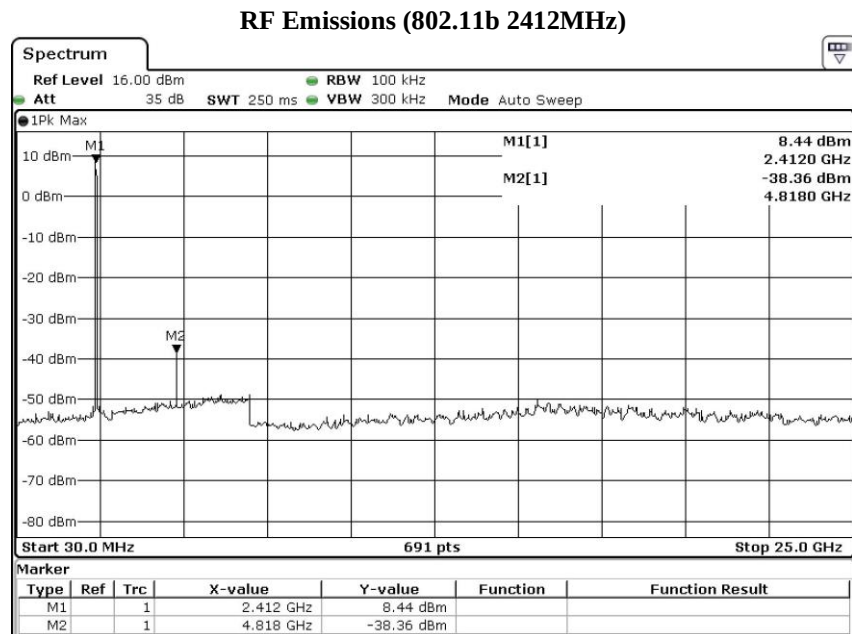
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RF Conducted Emissions Measurement:

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.



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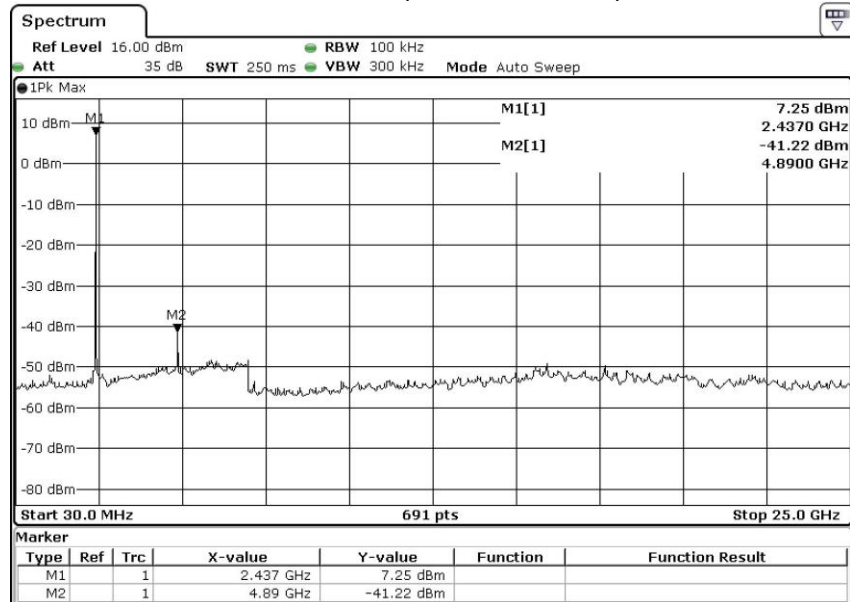


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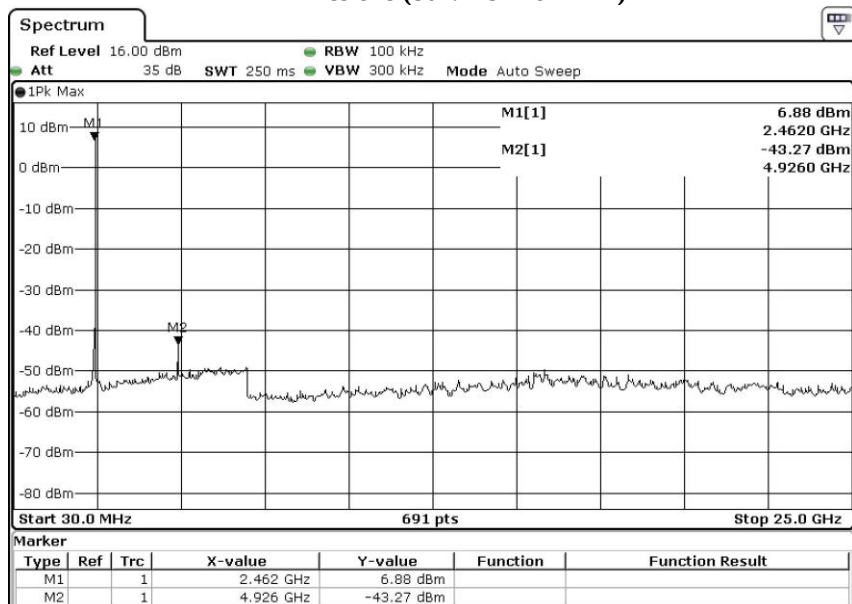
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RF Emissions (802.11b 2437MHz)



RF Emissions (802.11b 2462MHz)



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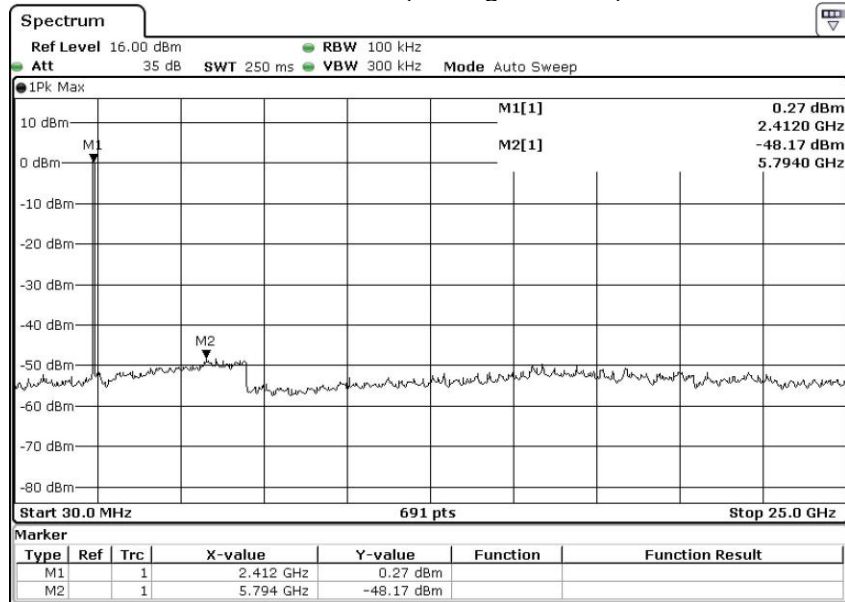


Test Report

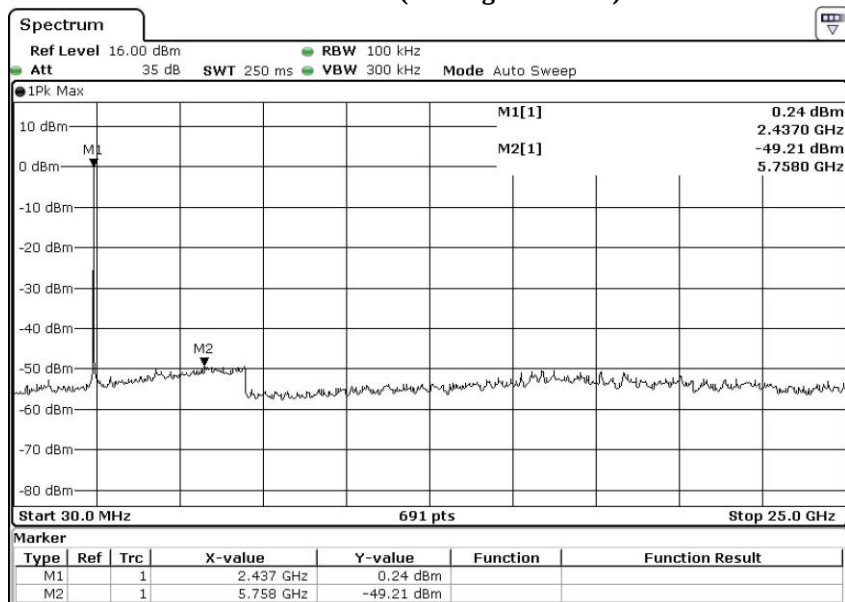
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RF Emissions (802.11g 2412MHz)



RF Emissions (802.11g 2437MHz)



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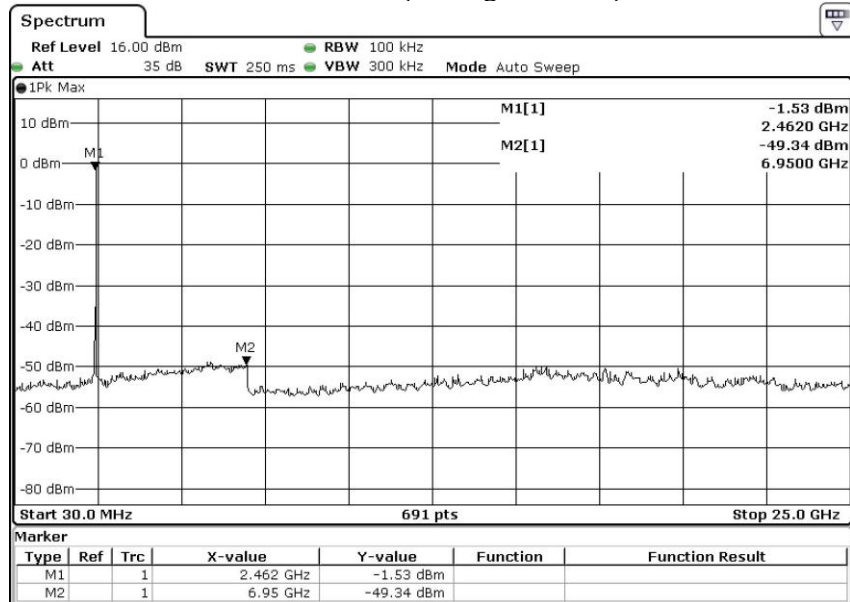


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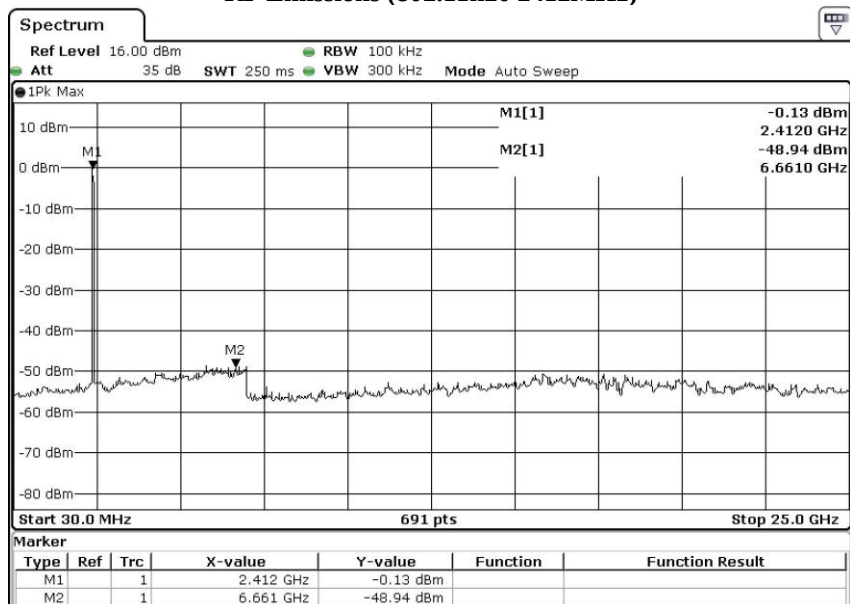
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RF Emissions (802.11g 2462MHz)



RF Emissions (802.11n20 2412MHz)



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Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

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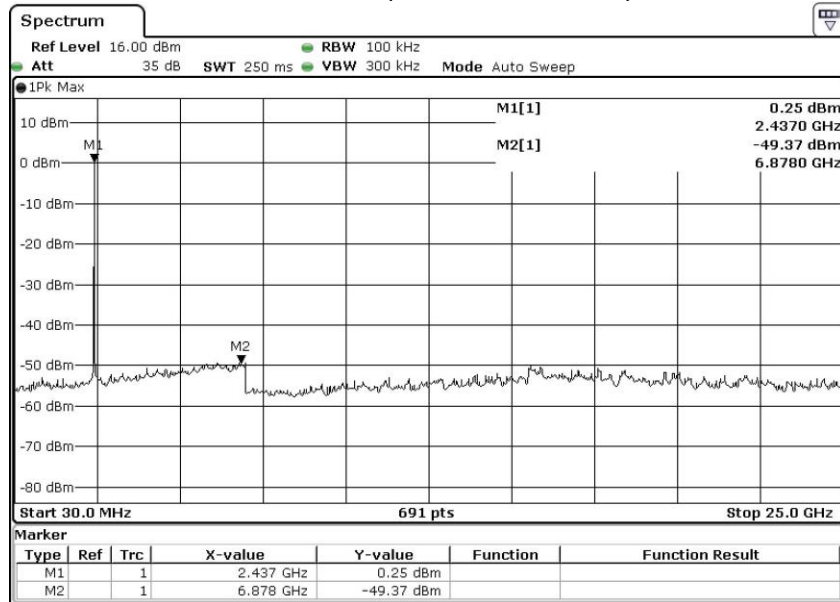


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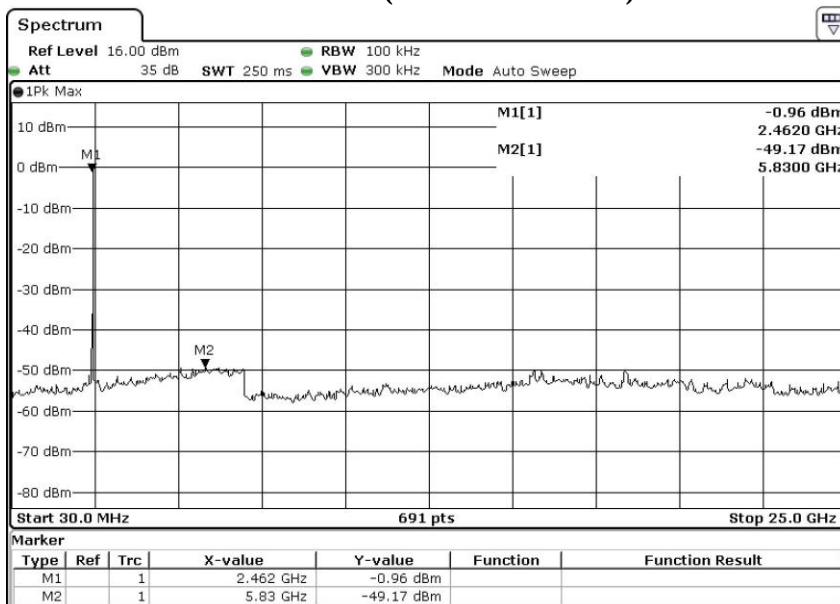
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RF Emissions (802.11n20 2437MHz)



RF Emissions (802.11n20 2462MHz)



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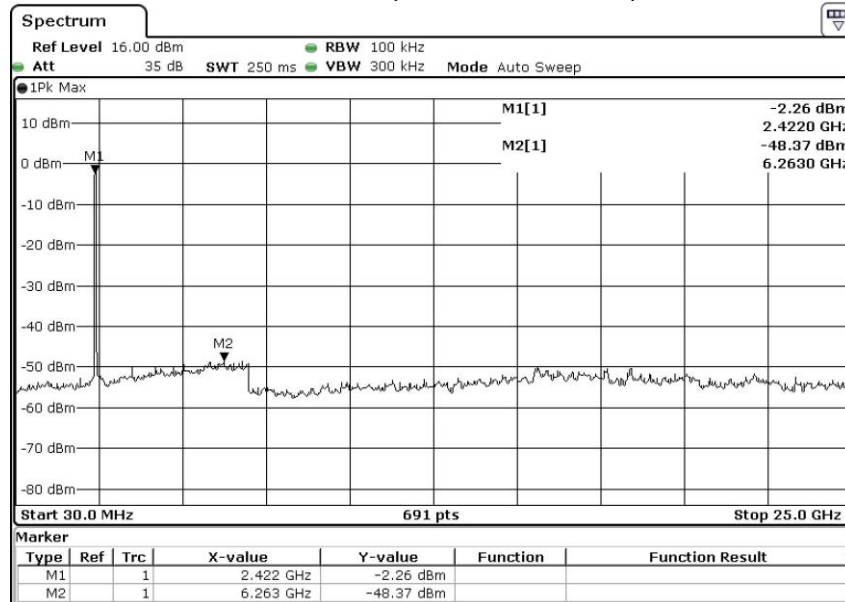


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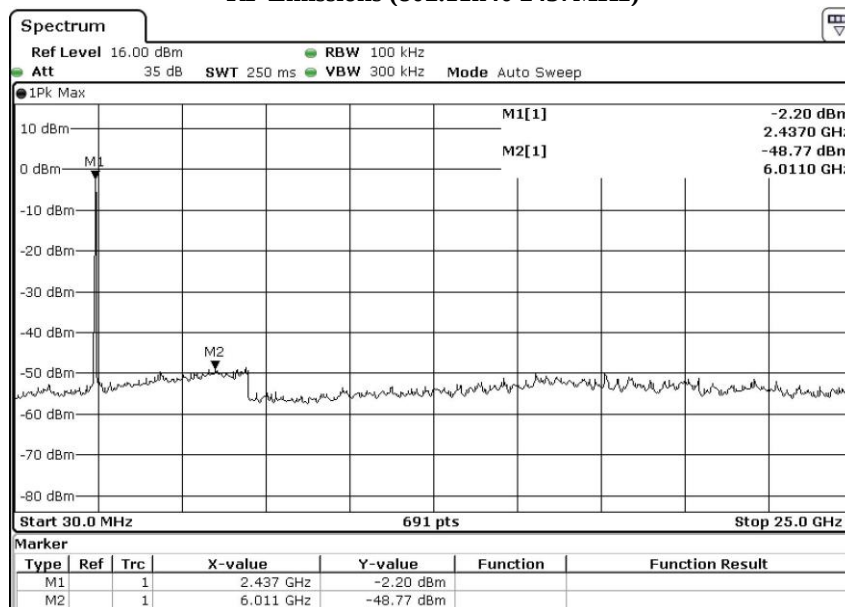
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RF Emissions (802.11n40 2422MHz)



RF Emissions (802.11n40 2437MHz)



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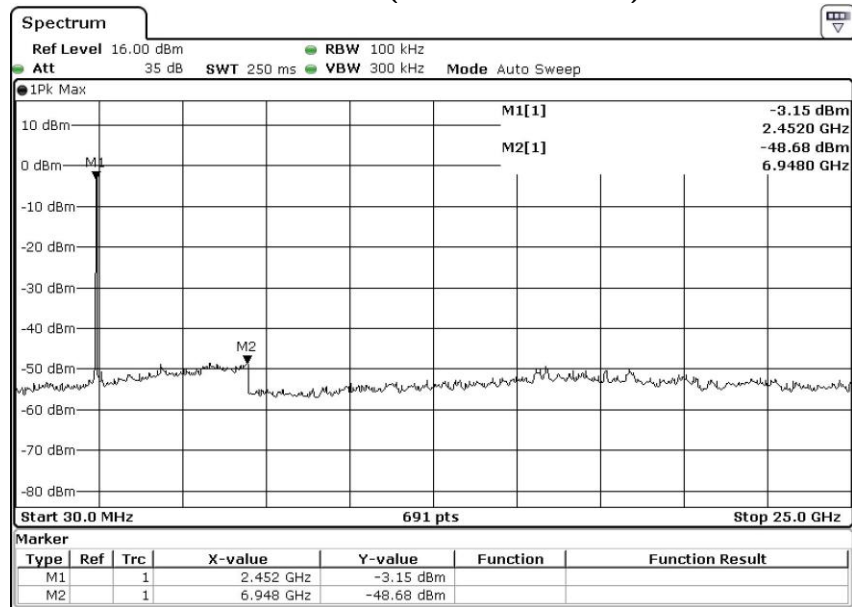


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RF Emissions (802.11n40 2452MHz)



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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 integral antenna. There is no external antenna, the antenna gain = 2.0 dBi. 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 TURNABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2019/04/16	2024/04/16
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM293	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	N9020A	MY50510152	2022/11/25	2024/11/25
EM299	BROADBAND HORN ANTENNA	ETS-LINDGREN	3115	00114120	2022/11/24	2024/11/24
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2022/11/25	2024/11/25
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2022/11/25	2024/11/25
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2022/06/10	2024/09/10
EM355	Biconilog Antenna	ETS-Lindgren	3143B	00094856	2022/06/17	2024/09/17
EM200	DUAL CHANNEL POWER METER	R & S	NRVD	100592	2022/10/11	2025/10/11
EM012	PRE-AMPLIFIER	HP	HP8448B	3008A00262	2022/11/08	2025/11/08
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM232	LISN	SCHAFFNER	NNB41	04/100082	2022/07/20	2023/07/20
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2022/05/30	2023/05/30
EM179	PULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357.8810.52/54	2023/03/17	2025/03/17
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 view



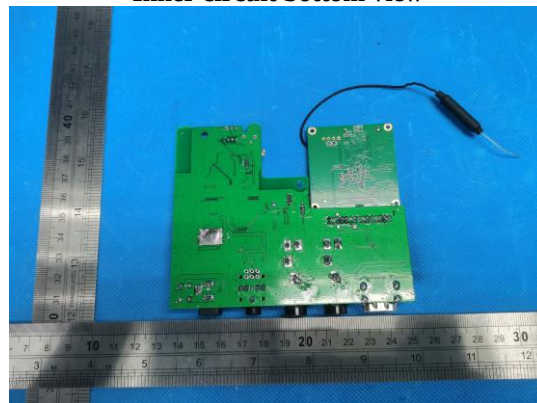
View of battery



Inner circuit top view



Inner circuit bottom view



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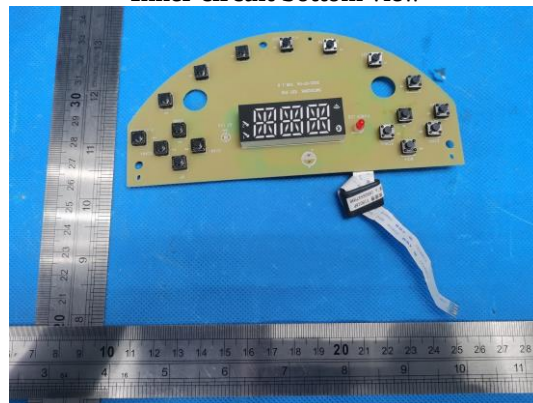
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Photographs of EUT

Inner circuit top view



Inner circuit bottom view



Inner circuit top view



Inner circuit top view



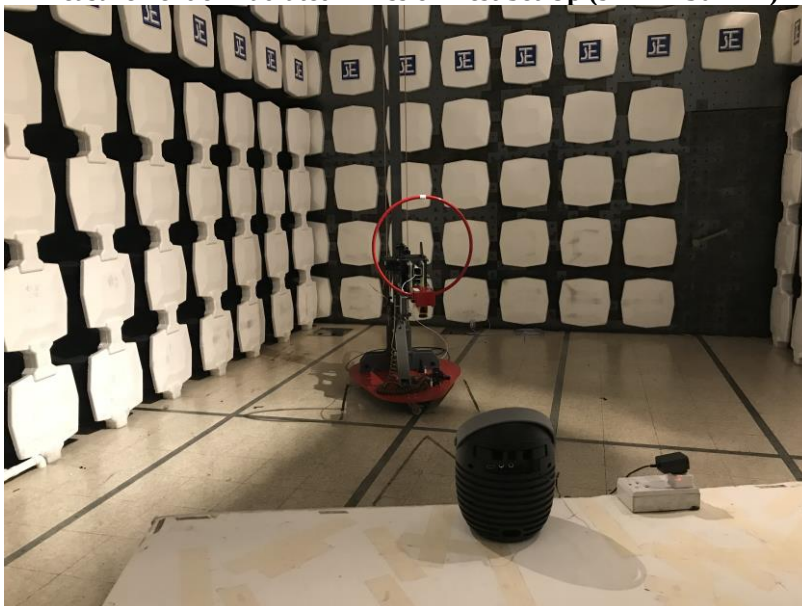
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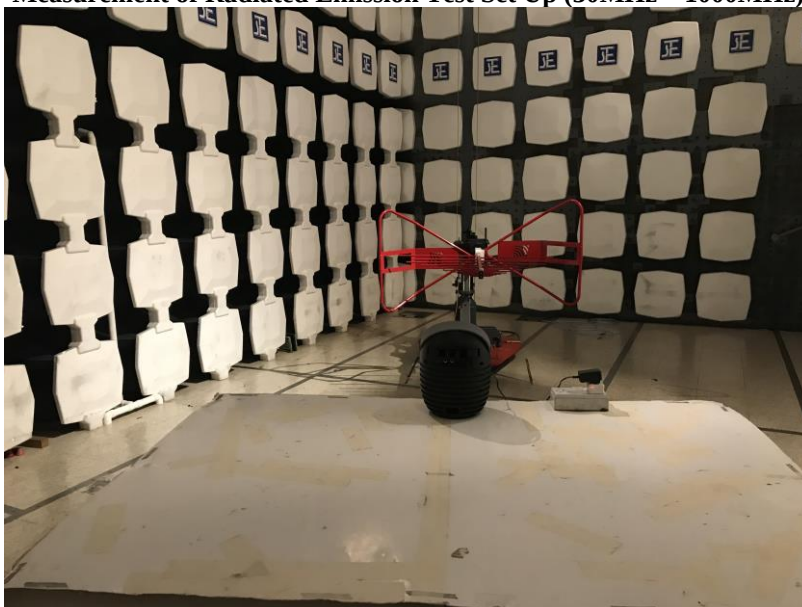
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Photographs of EUT

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

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



Measurement of Conducted Emission Test Set Up



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

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2. Any report issued by the Company as a result of this application for testing service (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to his customer, supplier or other persons directly concerned. Subject to clause 3, the Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
3. The Company shall be at liberty to disclose the testing-related documents and/or files anytime to any third-party accreditation and/or recognition bodies for audit or other related purposes. No liabilities whatsoever shall attach to the Company's act of disclosure.
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5. The results in Report apply only to the sample as received and do not apply to the bulk, unless the sampling has been carried out by the Company and is stated as such in the Report.
6. When a statement of conformity to a specification or standard is provided, the ILAC-G8 Guidance document (and/or IEC Guide 115 in the electrotechnical sector) will be adopted as a decision rule for the determination of conformity unless it is inherent in the requested specification or standard, or otherwise specified in the Report.
7. In the event of the improper use the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
8. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
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11. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.
12. Issuance records of the Report are available on the internet at www.stc.group. Further enquiry of validity or verification of the Reports should be addressed to the Company.