



Test Report

Date : 2022-04-26
No. : HMD22040011

Page 1 of 76

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
Brand Name: REVO
Model No.: SUPERCONNECT
FCC ID: BZAIDFB2215H2X

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



Test Report

Date : 2022-04-26
No. : HMD22040011

Page 2 of 76

CONTENT:

Cover	Page 1 of 76	
Content	Page 2 of 76	
<u>1.0</u>	<u>General Details</u>	
1.1	Test Laboratory	Page 3 of 76
1.2	Equipment Under Test [EUT] Description of EUT operation	Page 3 of 76
1.3	Antenna Details	Page 3 of 76
1.4	Date of Order	Page 3 of 76
1.5	Submitted Sample(s)	Page 3 of 76
1.6	Test Duration	Page 3 of 76
1.7	Country of Origin	Page 3 of 76
<u>2.0</u>	<u>Technical Details</u>	
2.1	Investigations Requested	Page 4-5 of 76
2.2	Test Standards and Results Summary	Page 6 of 76
<u>3.0</u>	<u>Test Results</u>	
3.1	Emission	Page 7-70 of 76
<u>Appendix A</u>		
List of Measurement Equipment		Page 71 of 76
<u>Appendix B</u>		
Photograph(s) of Product		Page 72-76 of 76



Test Report

Date : 2022-04-26
No. : HMD22040011

Page 3 of 76

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
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: SUPERCONNECT
Rating: 18.0Vd.c. by adapter
The AC/DC adapter was provided by the applicant with following details:
Brand name: REVO, Model no.: GPE024L-A180133-Z
Input: 100-240Va.c. 50/60Hz 0.75A, Output: 18.0Vd.c. 1.33A 23.94W

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is an Internet, DAB/DAB+ and FM Digital Radio With Bluetooth.
The transmission signal is digital modulated with channel frequency range 2422-2462MHz.

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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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 4 of 76

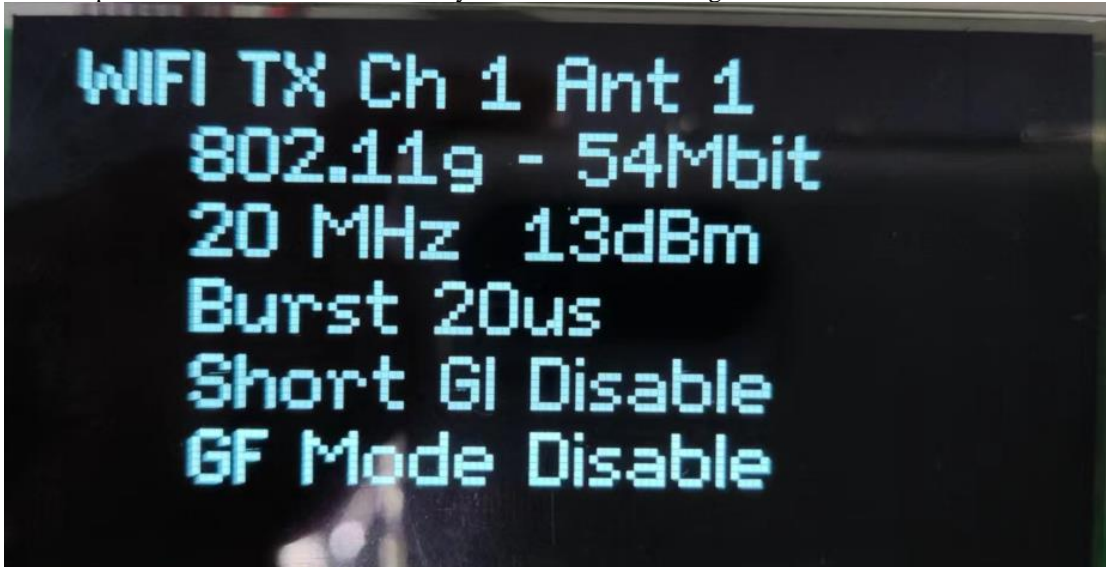
2.0 Technical Details

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 \cong 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.



Test Report

Date : 2022-04-26
 No. : HMD22040011

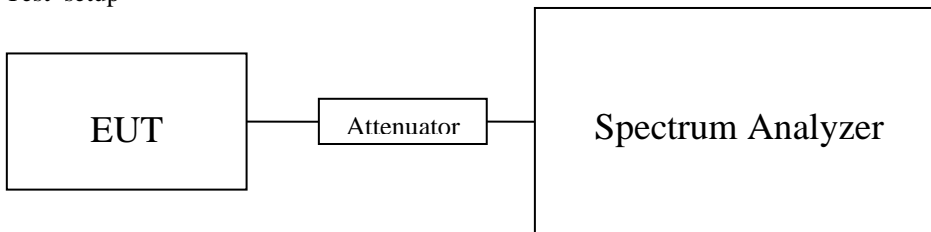
Page 5 of 76

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

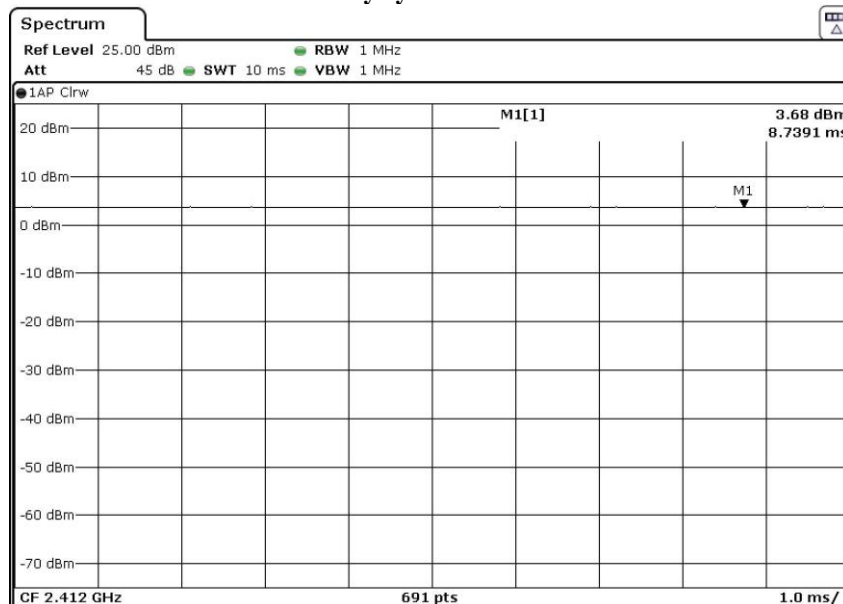


Results

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





Test Report

Date : 2022-04-26
No. : HMD22040011

Page 6 of 76

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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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 7 of 76

3.0 Test Results

3.1 Emission

3.1.1 Maximum Peak Output Power

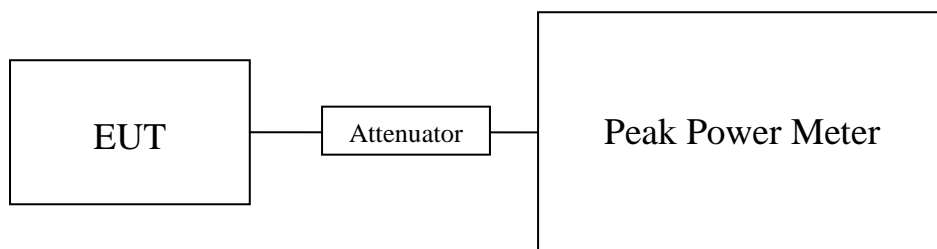
Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	ANSI C63.10: 2013
Test Date:	2022-04-18
Mode of Operation:	WIFI Tx mode

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.



Test Report

Date : 2022-04-26
No. : HMD22040011

Page 8 of 76

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	0.056991
Middle	2437	0.050443
High	2462	0.049035

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	0.076985
Middle	2437	0.069695
High	2462	0.067952

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	0.072996
Middle	2437	0.086965
High	2462	0.063577

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	0.047852
Middle	2437	0.042339
High	2452	0.039436

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

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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 9 of 76

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

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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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 10 of 76

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

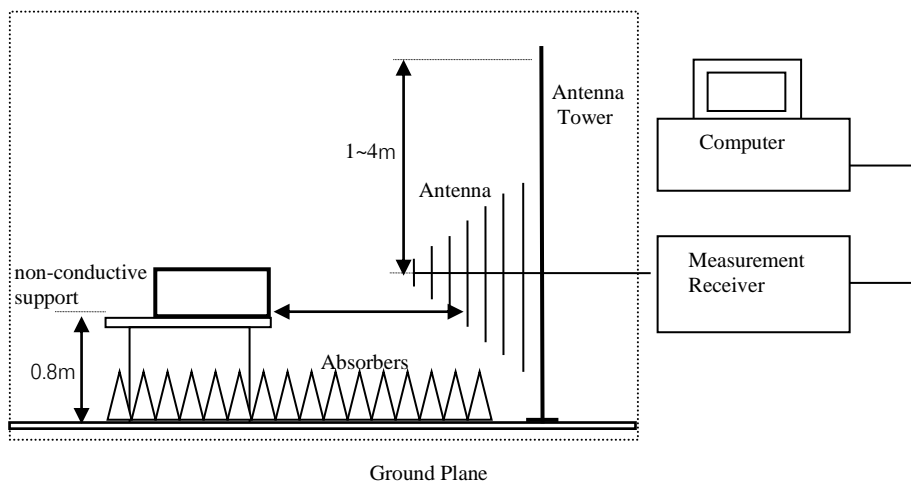
Above 1GHz (Pk)

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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Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 11 of 76

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
Above960	500

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

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

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

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

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dB	E-Field Polarity
4824.0	57.6	0.82	58.5	74.0	15.6	Vertical
4824.0	58.2	0.52	58.7	74.0	15.3	Horizontal
7236.0	50.6	7.00	57.6	74.0	16.4	Vertical
7236.0	50.7	6.50	57.2	74.0	16.8	Horizontal
9648.0	47.1	8.50	55.6	74.0	18.4	Vertical
9648.0	47.3	8.30	55.6	74.0	18.4	Horizontal
12060.0	45.3	10.90	56.2	74.0	17.8	Vertical
12060.0	45.4	10.80	56.2	74.0	17.8	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 12 of 76

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	41.5	0.82	42.4	54.0	11.6	Vertical
4824.0	42.6	0.52	43.1	54.0	10.9	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	32.1	8.50	40.6	54.0	13.5	Vertical
9648.0	31.8	8.30	40.1	54.0	13.9	Horizontal
12060.0	29.4	10.90	40.3	54.0	13.8	Vertical
12060.0	29.2	10.80	40.0	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 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	57.2	0.82	58.0	74.0	16.0	Vertical
4874.0	57.1	0.52	57.7	74.0	16.4	Horizontal
7311.0	50.4	7.00	57.4	74.0	16.6	Vertical
7311.0	51.1	6.50	57.6	74.0	16.4	Horizontal
9748.0	48.0	8.50	56.5	74.0	17.5	Vertical
9748.0	47.6	8.30	55.9	74.0	18.2	Horizontal
12185.0	45.3	10.90	56.2	74.0	17.8	Vertical
12185.0	45.4	10.80	56.2	74.0	17.8	Horizontal

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Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 13 of 76

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	57.2	0.82	58.0	74.0	16.0	Vertical
4924.0	57.8	0.52	58.3	74.0	15.7	Horizontal
7386.0	50.8	7.00	57.8	74.0	16.3	Vertical
7386.0	51.4	6.50	57.9	74.0	16.2	Horizontal
9848.0	47.7	8.50	56.2	74.0	17.8	Vertical
9848.0	47.8	8.30	56.1	74.0	17.9	Horizontal
12310.0	45.6	10.90	56.5	74.0	17.5	Vertical
12310.0	45.5	10.80	56.3	74.0	17.7	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 14 of 76

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	42.3	0.82	43.1	54.0	10.9	Vertical
4924.0	42.6	0.52	43.1	54.0	10.9	Horizontal
7386.0	35.4	7.00	42.4	54.0	11.6	Vertical
7386.0	35.9	6.50	42.4	54.0	11.6	Horizontal
9848.0	32.8	8.50	41.3	54.0	12.7	Vertical
9848.0	33.0	8.30	41.3	54.0	12.7	Horizontal
12310.0	29.2	10.90	40.1	54.0	13.9	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	56.9	0.82	57.7	74.0	16.3	Vertical
4824.0	56.8	0.52	57.4	74.0	16.7	Horizontal
7236.0	49.1	7.00	56.1	74.0	17.9	Vertical
7236.0	51.0	6.50	57.5	74.0	16.5	Horizontal
9648.0	47.5	8.50	56.0	74.0	18.1	Vertical
9648.0	47.7	8.30	56.0	74.0	18.0	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



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 15 of 76

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	41.7	0.82	42.5	54.0	11.5	Vertical
4824.0	41.7	0.52	42.3	54.0	11.8	Horizontal
7236.0	34.1	7.00	41.1	54.0	12.9	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	32.9	8.30	41.2	54.0	12.8	Horizontal
12060.0	30.4	10.90	41.3	54.0	12.7	Vertical
12060.0	29.9	10.80	40.7	54.0	13.3	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	56.7	0.82	57.5	74.0	16.5	Vertical
4874.0	57.2	0.52	57.7	74.0	16.3	Horizontal
7311.0	49.1	7.00	56.1	74.0	18.0	Vertical
7311.0	50.7	6.50	57.2	74.0	16.8	Horizontal
9748.0	47.0	8.50	55.5	74.0	18.5	Vertical
9748.0	47.1	8.30	55.4	74.0	18.6	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



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 16 of 76

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	42.0	0.82	42.8	54.0	11.2	Vertical
4874.0	42.1	0.52	42.6	54.0	11.4	Horizontal
7311.0	34.8	7.00	41.8	54.0	12.2	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	32.9	8.30	41.2	54.0	12.8	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	57.1	0.82	57.9	74.0	16.1	Vertical
4924.0	57.4	0.52	57.9	74.0	16.1	Horizontal
7386.0	50.2	7.00	57.2	74.0	16.8	Vertical
7386.0	51.3	6.50	57.8	74.0	16.2	Horizontal
9848.0	47.7	8.50	56.2	74.0	17.8	Vertical
9848.0	47.2	8.30	55.5	74.0	18.5	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



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 17 of 76

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	41.9	0.82	42.8	54.0	11.3	Vertical
4924.0	41.9	0.52	42.4	54.0	11.6	Horizontal
7386.0	35.5	7.00	42.5	54.0	11.5	Vertical
7386.0	36.0	6.50	42.5	54.0	11.5	Horizontal
9848.0	33.0	8.50	41.5	54.0	12.5	Vertical
9848.0	32.4	8.30	40.7	54.0	13.3	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 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) (802.11n20) (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	56.8	0.82	57.7	74.0	16.3	Vertical
4824.0	57.3	0.52	57.9	74.0	16.2	Horizontal
7236.0	50.1	7.00	57.1	74.0	16.9	Vertical
7236.0	50.8	6.50	57.3	74.0	16.7	Horizontal
9648.0	47.4	8.50	55.9	74.0	18.1	Vertical
9648.0	47.6	8.30	55.9	74.0	18.1	Horizontal
12060.0	45.3	10.90	56.2	74.0	17.8	Vertical
12060.0	45.6	10.80	56.4	74.0	17.6	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 18 of 76

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	41.5	0.82	42.4	54.0	11.6	Vertical
4824.0	41.7	0.52	42.2	54.0	11.8	Horizontal
7236.0	35.2	7.00	42.2	54.0	11.8	Vertical
7236.0	35.6	6.50	42.1	54.0	12.0	Horizontal
9648.0	31.8	8.50	40.3	54.0	13.7	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 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) (802.11n20) (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	49.9	7.00	56.9	74.0	17.2	Vertical
7311.0	51.4	6.50	57.9	74.0	16.1	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	45.2	10.90	56.1	74.0	17.9	Vertical
12185.0	45.5	10.80	56.3	74.0	17.8	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 19 of 76

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	41.7	0.82	42.5	54.0	11.5	Vertical
4874.0	41.8	0.52	42.3	54.0	11.7	Horizontal
7311.0	35.5	7.00	42.5	54.0	11.5	Vertical
7311.0	35.6	6.50	42.1	54.0	11.9	Horizontal
9748.0	32.2	8.50	40.7	54.0	13.3	Vertical
9748.0	32.2	8.30	40.5	54.0	13.5	Horizontal
12185.0	30.3	10.90	41.2	54.0	12.8	Vertical
12185.0	30.5	10.80	41.3	54.0	12.7	Horizontal

Result of Tx mode (2462.0 MHz) (802.11n20) (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) (802.11n20) (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	57.1	0.82	58.0	74.0	16.1	Vertical
4924.0	56.9	0.52	57.5	74.0	16.6	Horizontal
7386.0	50.0	7.00	57.0	74.0	17.0	Vertical
7386.0	51.1	6.50	57.6	74.0	16.4	Horizontal
9848.0	47.2	8.50	55.7	74.0	18.3	Vertical
9848.0	47.2	8.30	55.5	74.0	18.5	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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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 20 of 76

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	41.4	0.82	42.2	54.0	11.8	Vertical
4924.0	42.3	0.52	42.8	54.0	11.2	Horizontal
7386.0	35.3	7.00	42.3	54.0	11.8	Vertical
7386.0	35.5	6.50	42.0	54.0	12.0	Horizontal
9848.0	31.6	8.50	40.1	54.0	13.9	Vertical
9848.0	31.8	8.30	40.1	54.0	14.0	Horizontal
12310.0	31.2	10.90	42.1	54.0	12.0	Vertical
12310.0	30.4	10.80	41.2	54.0	12.8	Horizontal

Result of Tx mode (2422.0 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 (2422.0 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
4844.0	57.0	0.82	57.8	74.0	16.2	Vertical
4844.0	56.5	0.52	57.1	74.0	17.0	Horizontal
7266.0	49.9	7.00	56.9	74.0	17.2	Vertical
7266.0	49.9	6.50	56.4	74.0	17.7	Horizontal
9688.0	47.0	8.50	55.5	74.0	18.6	Vertical
9688.0	47.7	8.30	56.0	74.0	18.1	Horizontal
12110.0	45.2	10.90	56.1	74.0	18.0	Vertical
12110.0	45.6	10.80	56.4	74.0	17.6	Horizontal

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Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 21 of 76

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
4844.0	41.5	0.82	42.3	54.0	11.7	Vertical
4844.0	41.6	0.52	42.1	54.0	11.9	Horizontal
7266.0	35.0	7.00	42.0	54.0	12.0	Vertical
7266.0	35.2	6.50	41.7	54.0	12.3	Horizontal
9688.0	31.8	8.50	40.3	54.0	13.7	Vertical
9688.0	33.1	8.30	41.4	54.0	12.7	Horizontal
12110.0	30.2	10.90	41.1	54.0	12.9	Vertical
12110.0	30.4	10.80	41.2	54.0	12.8	Horizontal

Result of Tx mode (2437.0 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 (2437.0 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
4874.0	56.3	0.82	57.1	74.0	16.9	Vertical
4874.0	56.2	0.52	56.7	74.0	17.3	Horizontal
7311.0	50.0	7.00	57.0	74.0	17.1	Vertical
7311.0	50.5	6.50	57.0	74.0	17.0	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	48.2	10.90	59.1	74.0	14.9	Vertical
12185.0	45.4	10.80	56.2	74.0	17.8	Horizontal

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Test Report

Date : 2022-04-26

Page 22 of 76

No. : HMD22040011

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	42.1	0.82	42.9	54.0	11.1	Vertical
4874.0	41.6	0.52	42.1	54.0	11.9	Horizontal
7311.0	35.1	7.00	42.1	54.0	11.9	Vertical
7311.0	35.7	6.50	42.2	54.0	11.8	Horizontal
9748.0	31.9	8.50	40.4	54.0	13.6	Vertical
9748.0	31.9	8.30	40.2	54.0	13.8	Horizontal
12185.0	30.2	10.90	41.1	54.0	12.9	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 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	55.7	0.82	56.5	74.0	17.5	Vertical
4904.0	56.3	0.52	56.8	74.0	17.2	Horizontal
7356.0	49.7	7.00	56.7	74.0	17.3	Vertical
7356.0	49.9	6.50	56.4	74.0	17.7	Horizontal
9808.0	47.3	8.50	55.8	74.0	18.2	Vertical
9808.0	47.4	8.30	55.7	74.0	18.3	Horizontal
12260.0	45.2	10.90	56.1	74.0	17.9	Vertical
12260.0	45.6	10.80	56.4	74.0	17.6	Horizontal

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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 23 of 76

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	40.8	0.82	41.6	54.0	12.4	Vertical
4904.0	41.6	0.52	42.2	54.0	11.9	Horizontal
7356.0	34.8	7.00	41.8	54.0	12.2	Vertical
7356.0	35.7	6.50	42.2	54.0	11.8	Horizontal
9808.0	31.6	8.50	40.1	54.0	13.9	Vertical
9808.0	32.0	8.30	40.3	54.0	13.7	Horizontal
12260.0	31.1	10.90	42.0	54.0	12.0	Vertical
12260.0	30.4	10.80	41.2	54.0	12.8	Horizontal

Remarks:

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

* Denotes restricted band of operation.

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

Correction Factor included Antenna Factor and Cable Attenuation.

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

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

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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 24 of 76

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	55.7	-4.8	50.9	74.0	23.1	Vertical
2390.0	56.9	-4.7	52.2	74.0	21.8	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	42.5	-4.8	37.7	54.0	16.3	Vertical
2390.0	41.9	-4.7	37.2	54.0	16.8	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	55.3	-4.8	50.5	74.0	23.5	Vertical
2483.5	54.8	-4.7	50.1	74.0	23.9	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	42.3	-4.8	37.5	54.0	16.6	Vertical
2483.5	42.1	-4.7	37.4	54.0	16.7	Horizontal

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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 25 of 76

Result: RF Radiated Emissions (Lowest)-802.11g

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	66.4	-4.8	61.6	74.0	12.5	Vertical
2390.0	65.9	-4.7	61.2	74.0	12.8	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	48.4	-4.8	43.6	54.0	10.5	Vertical
2390.0	46.6	-4.7	41.9	54.0	12.1	Horizontal

Result: RF Radiated Emissions (Highest) -802.11g

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	66.3	-4.8	61.5	74.0	12.5	Vertical
2483.5	65.6	-4.7	60.9	74.0	13.1	Horizontal

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	49.0	-4.8	44.2	54.0	9.8	Vertical
2483.5	48.9	-4.7	44.2	54.0	9.8	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 26 of 76

Result: RF Radiated Emissions (Lowest)-802.11n20

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	65.4	-4.8	60.6	74.0	13.4	Horizontal
2390.0	64.9	-4.7	<u>60.2</u>	74.0	13.8	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	49.3	-4.8	44.5	54.0	9.5	Vertical
2390.0	48.8	-4.7	<u>44.1</u>	54.0	9.9	Horizontal

Result: RF Radiated Emissions (Highest) -802.11n20

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	63.4	-4.8	58.6	74.0	15.4	Vertical
2483.5	64.9	-4.7	<u>60.2</u>	74.0	13.8	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	50.2	-4.8	45.4	54.0	8.6	Horizontal
2483.5	51.1	-4.7	<u>46.4</u>	54.0	7.6	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 27 of 76

Result: RF Radiated Emissions (Lowest)-802.11n40

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	72.6	-4.8	67.8	74.0	6.2	Vertical
2390.0	73.2	-4.7	68.5	74.0	5.5	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	50.9	-4.8	46.1	54.0	8.0	Vertical
2390.0	50.0	-4.7	45.3	54.0	8.7	Horizontal

Result: RF Radiated Emissions (Highest) -802.11n40

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	67.5	-4.8	62.7	74.0	11.3	Vertical
2483.5	68.9	-4.7	64.2	74.0	9.8	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	48.5	-4.8	43.7	54.0	10.3	Horizontal
2483.5	47.9	-4.7	43.2	54.0	10.8	Horizontal

Test Report

Date : 2022-04-26
 No. : HMD22040011

Limits for Radiated Emissions FCC 47 CFR 15.247]:

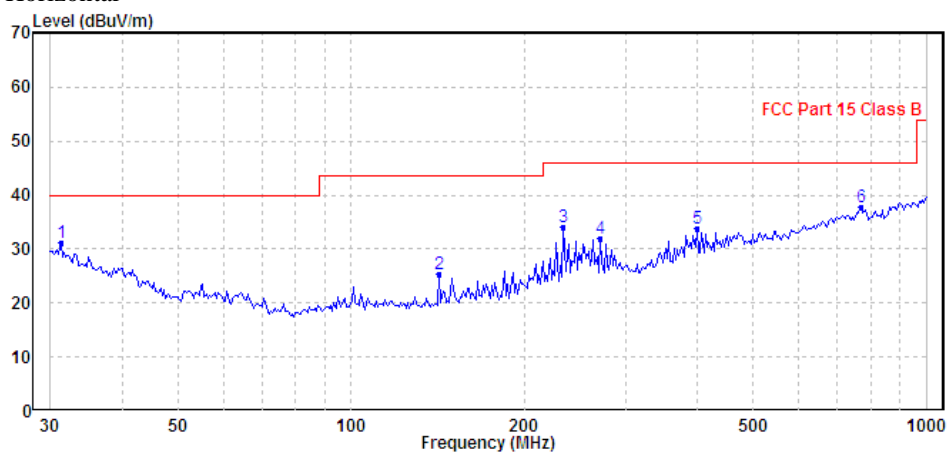
Frequency Range [MHz]	Quasi-Peak Limits [μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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



	Limit	Over				
Line	Limit	Limit	Remark	Pol/Phase		
1	2	3	4	5	6	
Freq	Level	Line	Limit	dB	QP	Pol/Phase
MHz	dBuV/m	dBuV/m				
1	31.289	31.10	40.00	-8.90	QP	Horizontal
2	142.324	25.29	43.50	-18.21	QP	Horizontal
3	234.168	34.00	46.00	-12.00	QP	Horizontal
4	271.325	32.04	46.00	-13.96	QP	Horizontal
5	399.030	33.72	46.00	-12.28	QP	Horizontal
6	771.449	37.73	46.00	-8.27	QP	Horizontal



Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 29 of 76

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

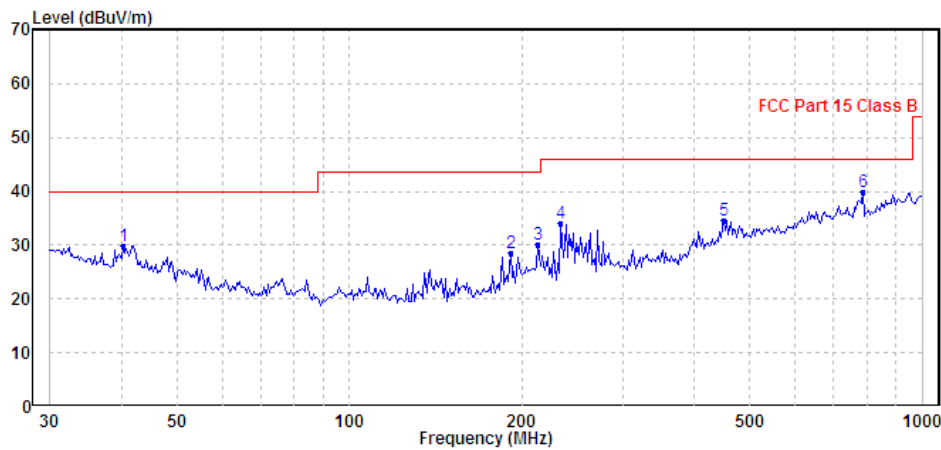
Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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	Limit	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dB		
1	40.276	29.96	40.00	-10.04	QP		Vertical
2	191.074	28.42	43.50	-15.08	QP		Vertical
3	213.763	30.20	43.50	-13.30	QP		Vertical
4	234.168	34.14	46.00	-11.86	QP		Vertical
5	449.556	34.55	46.00	-11.45	QP		Vertical
6	787.851	39.78	46.00	-6.22	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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Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 30 of 76

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

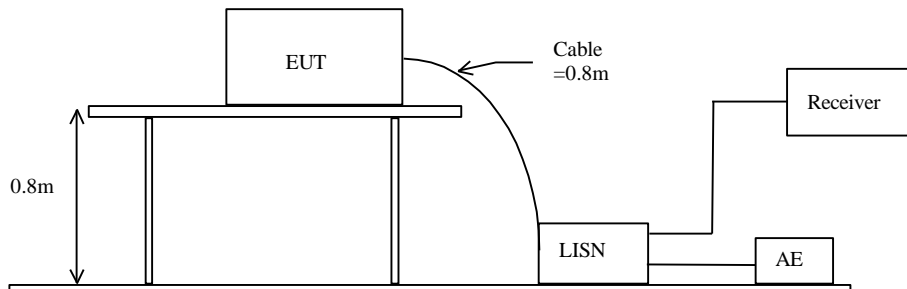
Test Method:

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.

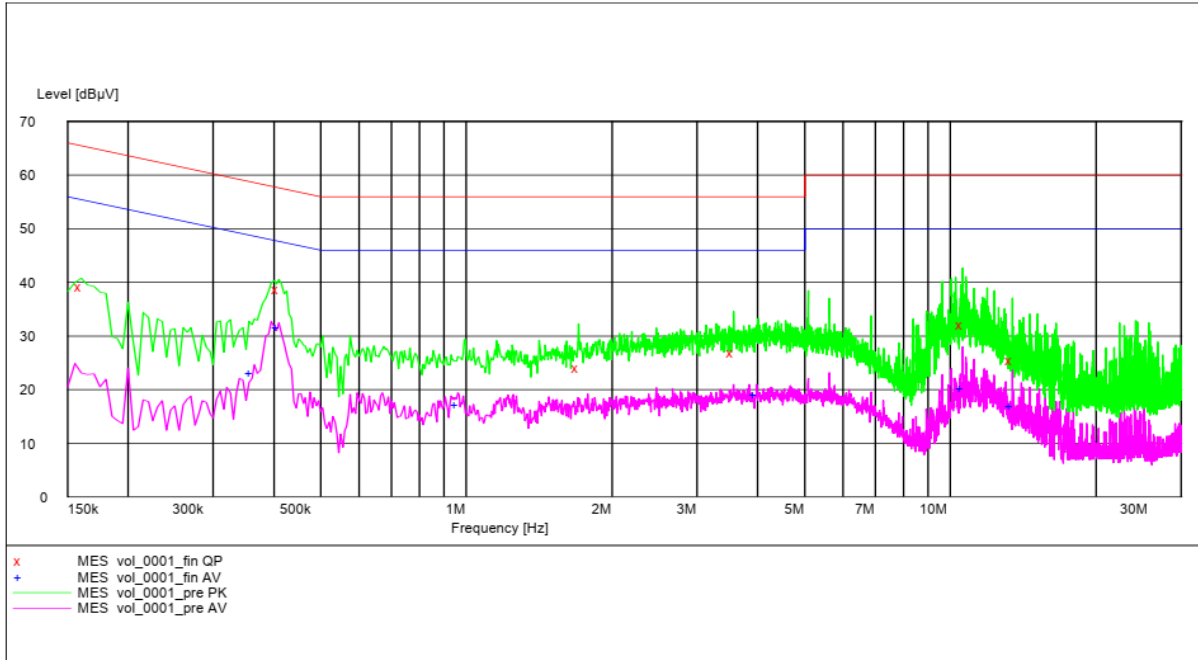
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 31 of 76

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		
0.160000	39.2	9.7	65.5	26.3	L1	GND
0.410000	38.7	9.7	57.6	18.9	L1	GND
1.705000	24.1	9.8	56.0	31.9	L1	GND
3.570000	26.8	9.8	56.0	29.2	L1	GND
10.620000	32.1	10.0	60.0	27.9	L1	GND
13.450000	25.6	10.2	60.0	34.4	L1	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
0.360000	23.1	9.7	48.7	25.6	L1	GND
0.410000	31.6	9.7	47.6	16.0	L1	GND
0.960000	17.2	9.7	46.0	28.8	L1	GND
3.975000	19.0	9.8	46.0	27.0	L1	GND
10.620000	20.3	10.0	50.0	29.7	L1	GND
13.450000	17.0	10.2	50.0	33.0	L1	GND

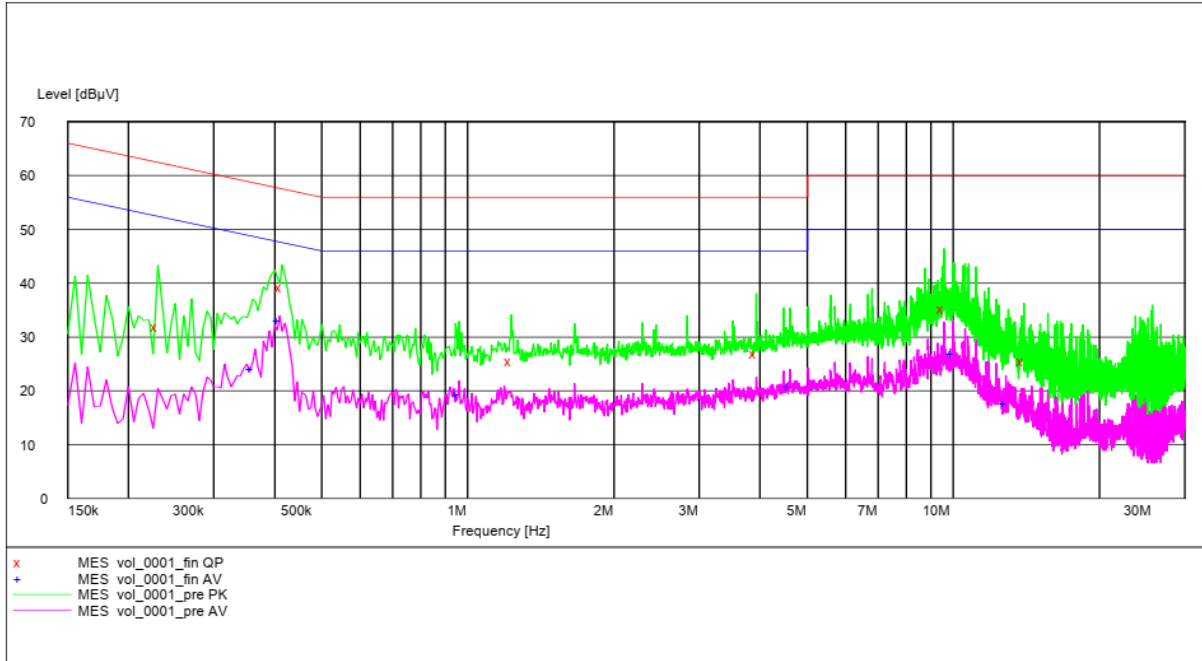
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 32 of 76

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		
0.230000	31.9	9.7	62.4	30.5	N	GND
0.415000	39.2	9.7	57.5	18.3	N	GND
1.230000	25.5	9.7	56.0	30.5	N	GND
3.925000	26.9	9.8	56.0	29.1	N	GND
9.580000	35.1	10.0	60.0	24.9	N	GND
13.980000	25.4	10.2	60.0	34.6	N	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
0.360000	24.1	9.7	48.7	24.6	N	GND
0.410000	33.1	9.7	47.6	14.5	N	GND
0.960000	19.5	9.7	46.0	26.5	N	GND
4.610000	20.8	9.8	46.0	25.2	N	GND
10.005000	26.8	10.0	50.0	23.2	N	GND
12.835000	17.8	10.1	50.0	32.2	N	GND



Test Report

Date : 2022-04-26
No. : HMD22040011

Page 33 of 76

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 $BWCF=10\log(3\text{ kHz}/100\text{ kHz}=-15.2\text{dB})$



Test Report

Date : 2022-04-26
No. : HMD22040011

Page 34 of 76

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	-13.363	8dBm
2437.0	-12.766	8dBm
2462.0	-12.185	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	-14.918	8dBm
2437.0	-13.872	8dBm
2462.0	-13.458	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	-15.451	8dBm
2437.0	-15.198	8dBm
2462.0	-14.636	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	-15.446	8dBm
2437.0	-15.726	8dBm
2452.0	-15.688	8dBm

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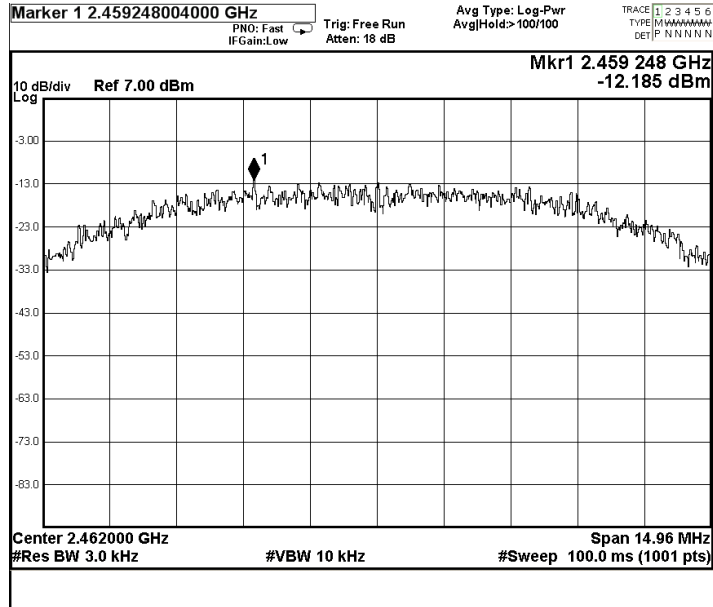


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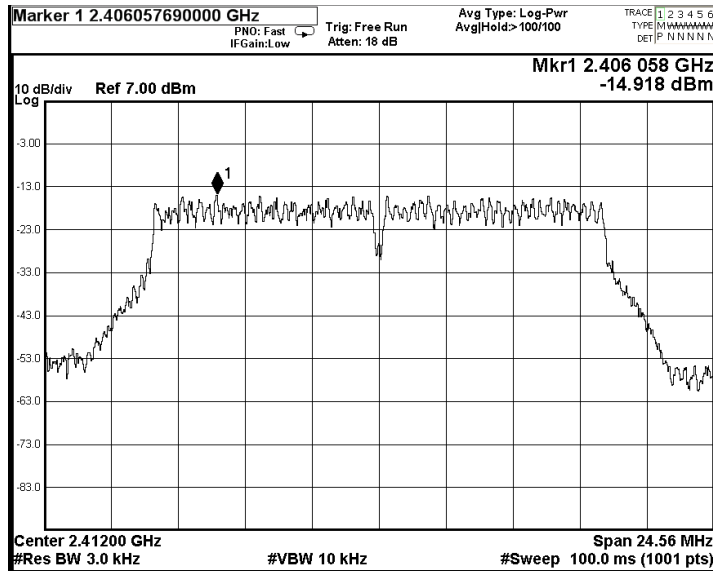
Date : 2022-04-26
No. : HMD22040011

Page 36 of 76

CH 11 (2462.0 MHz)



WiFi mode 802.11 g
CH 1 (2412.0 MHz)



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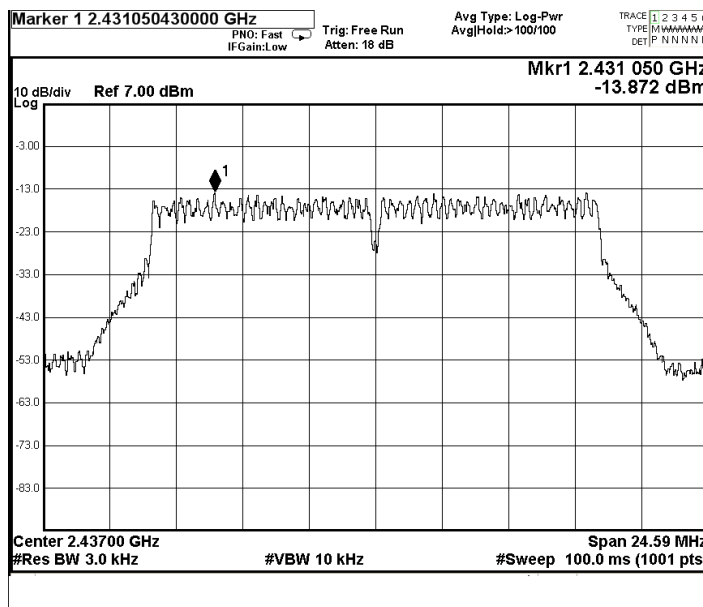


Test Report

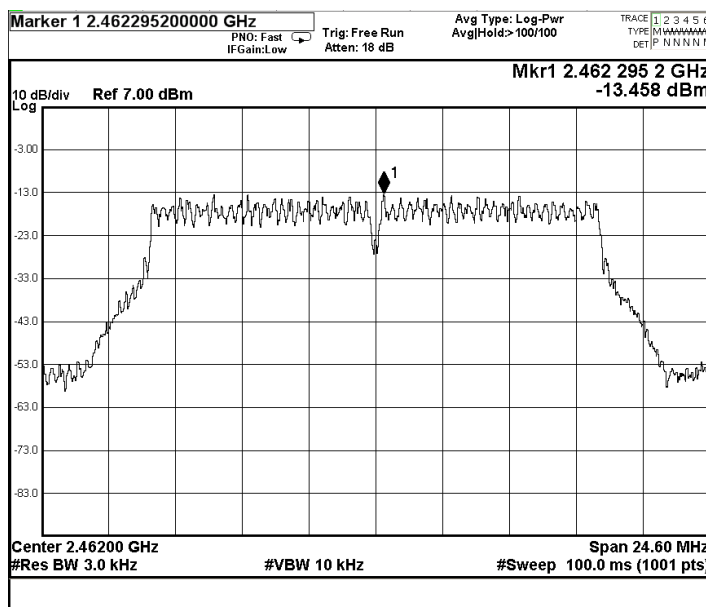
Date : 2022-04-26
No. : HMD22040011

Page 37 of 76

CH 6 (2437.0 MHz)



CH 11 (2462.0 MHz)



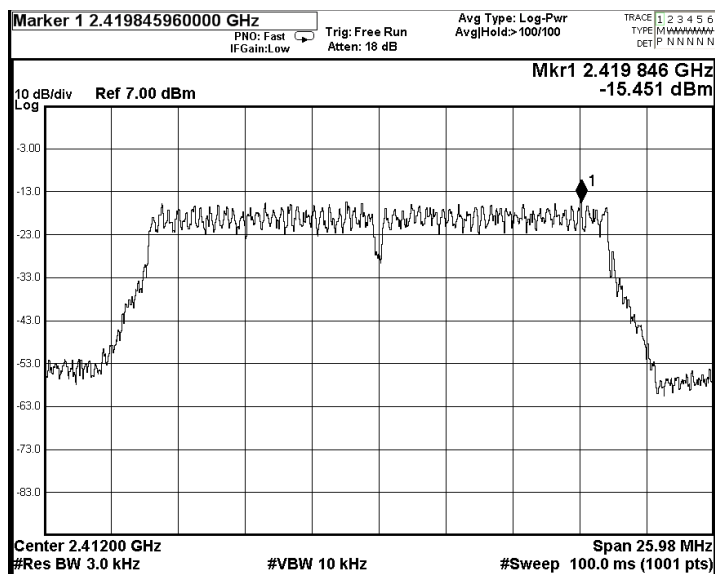


Test Report

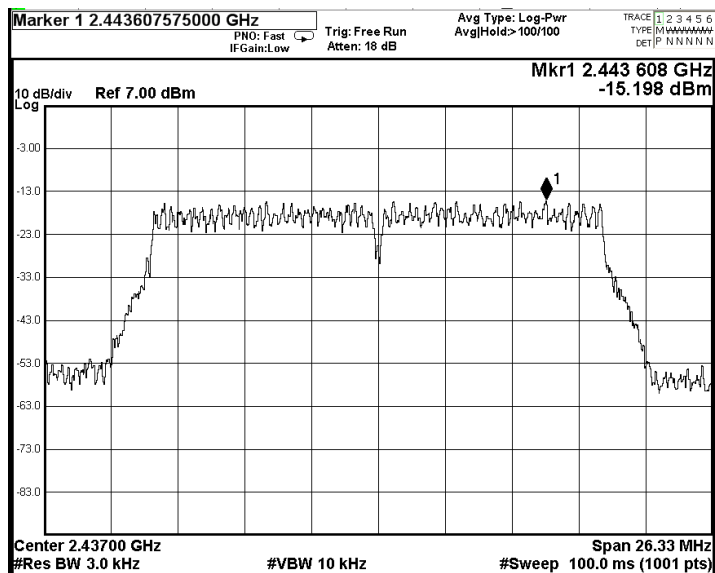
Date : 2022-04-26
No. : HMD22040011

Page 38 of 76

WiFi mode 802.11 n20
CH 1 (2412.0 MHz)



CH 6 (2437.0 MHz)



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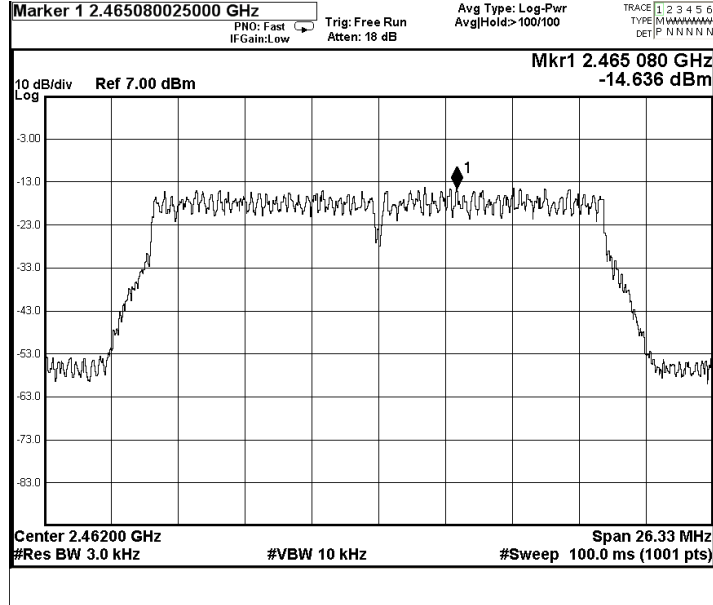


Test Report

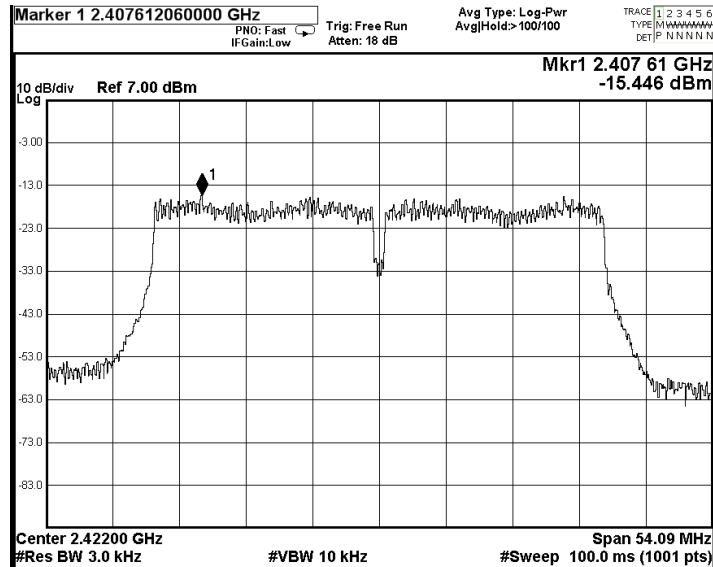
Date : 2022-04-26
No. : HMD22040011

Page 39 of 76

CH 11 (2462.0 MHz)



WiFi mode 802.11 n40
CH 3 (2422.0 MHz)



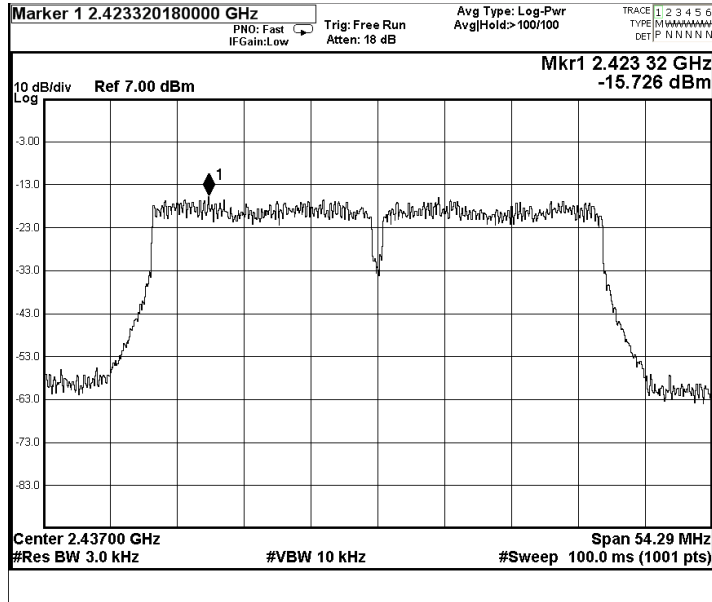


Test Report

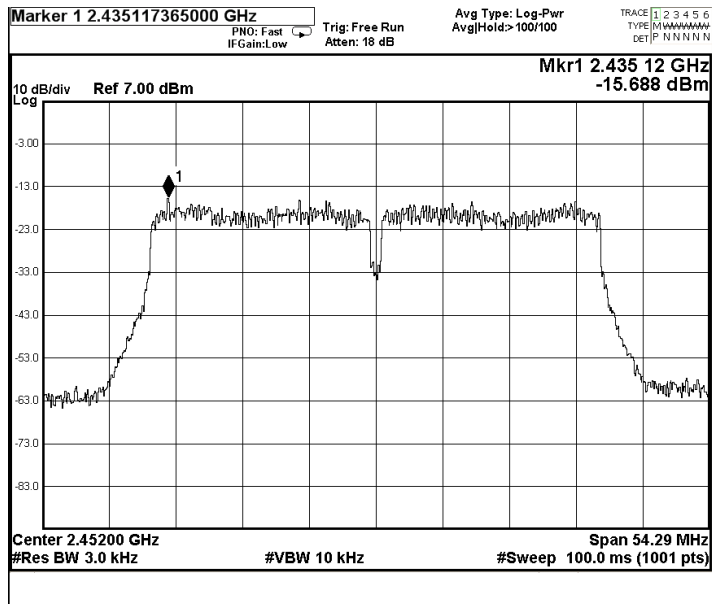
Date : 2022-04-26
No. : HMD22040011

Page 40 of 76

CH 6 (2437.0 MHz)



CH 9 (2452.0 MHz)





Test Report

Date : 2022-04-26
No. : HMD22040011

Page 41 of 76

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*RBW, Sweep = Auto couple
Detector = Peak, Trace = Max. hold

Test Setup:

As Test Setup of clause 3.1.1 in this test report.



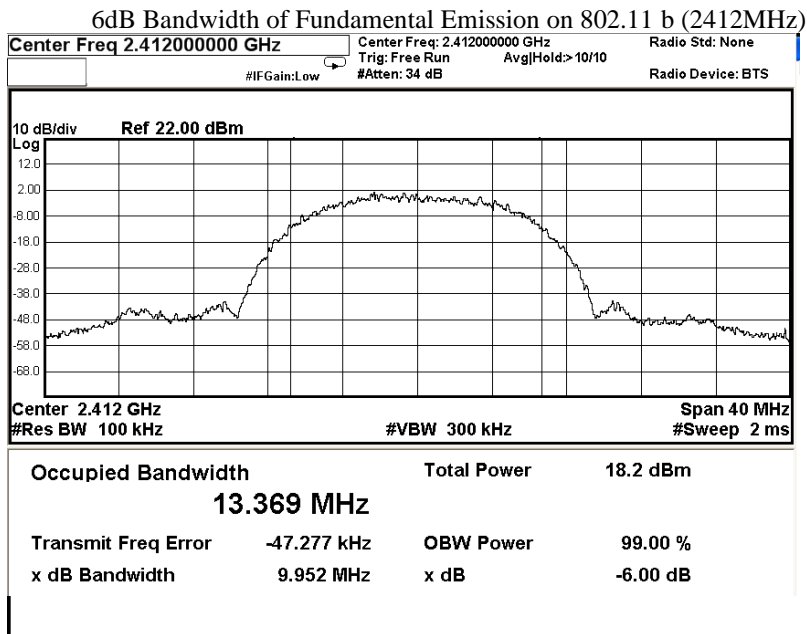
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 42 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	9.952	> 500





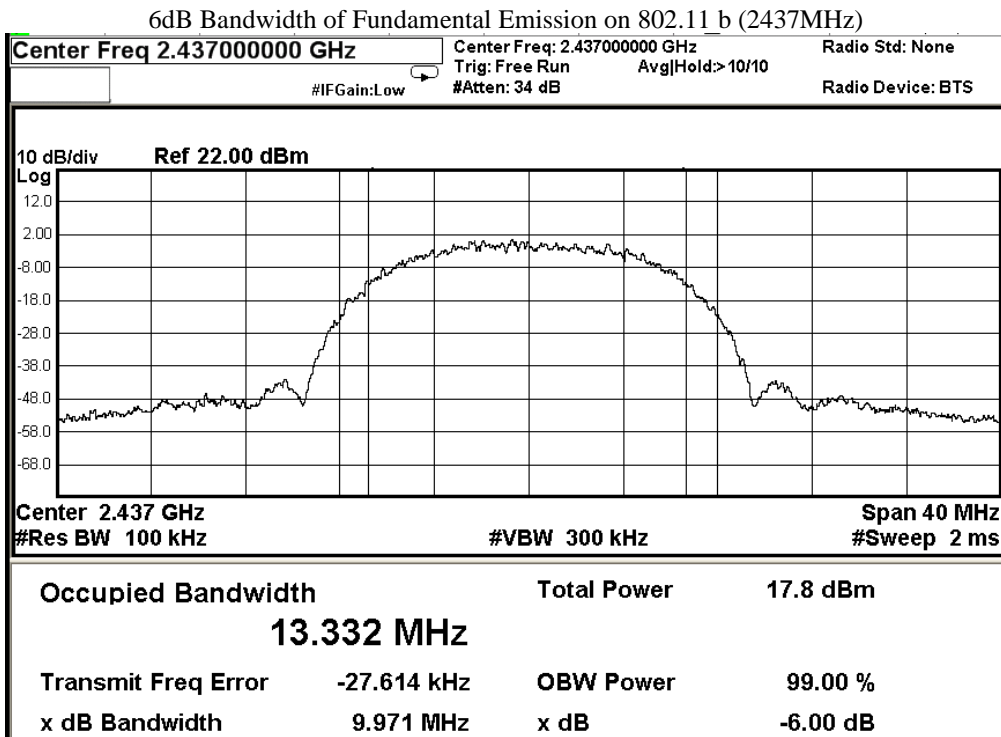
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 43 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	9.971	> 500





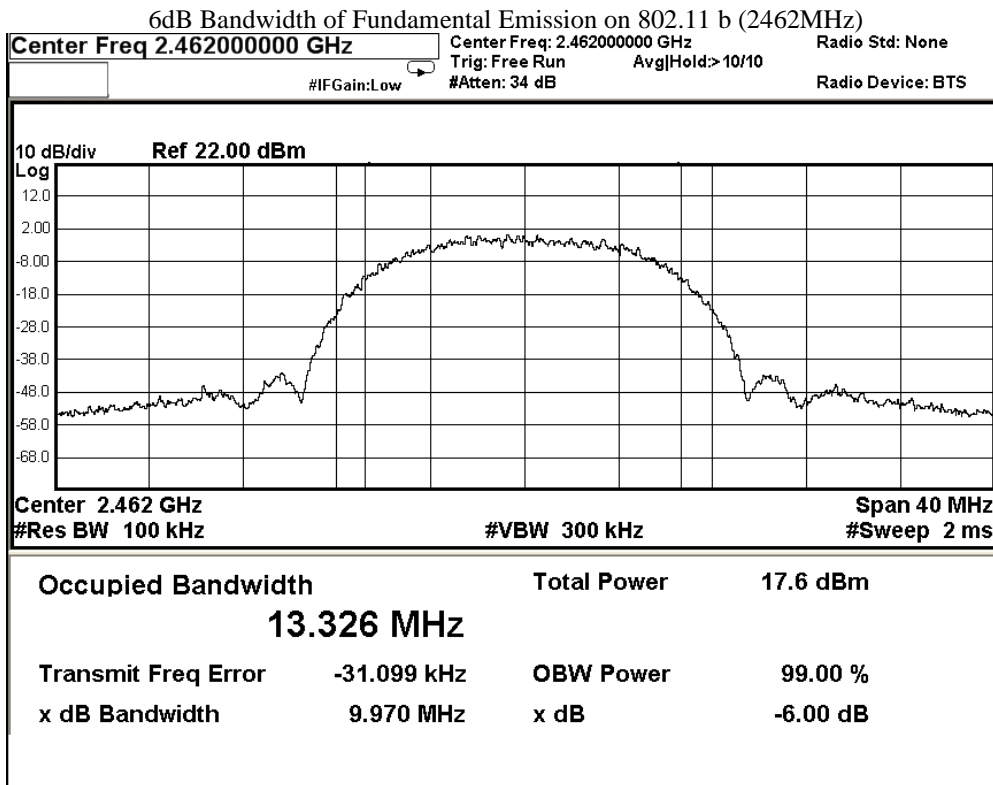
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 44 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

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





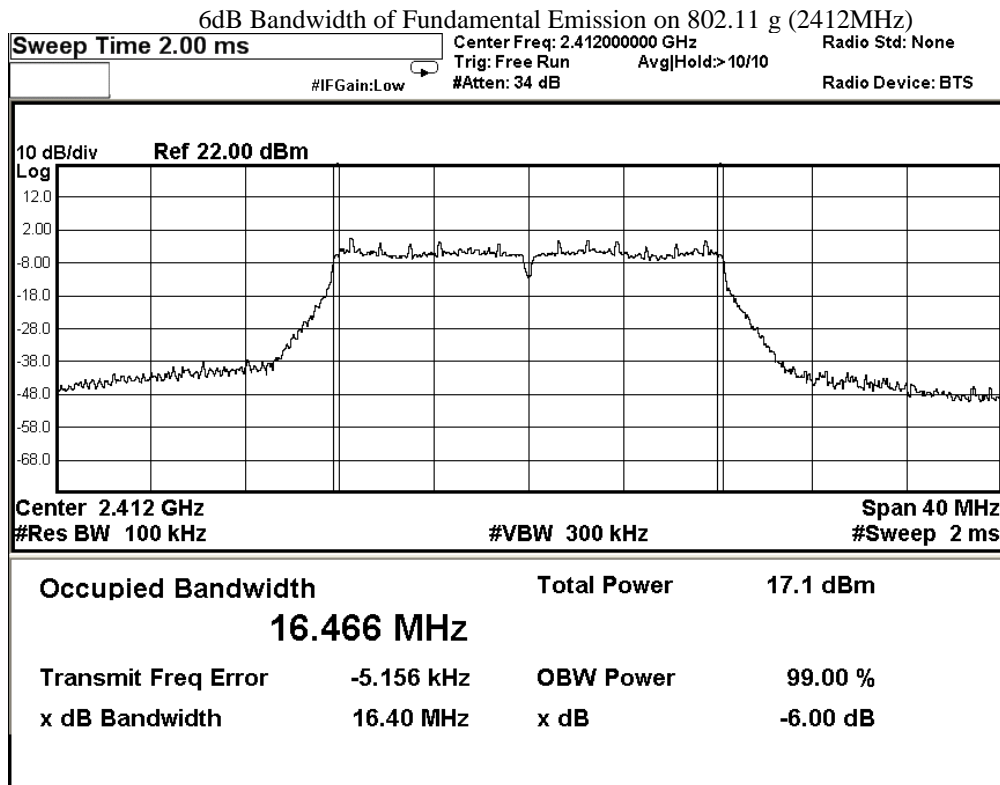
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 45 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	16.40	> 500





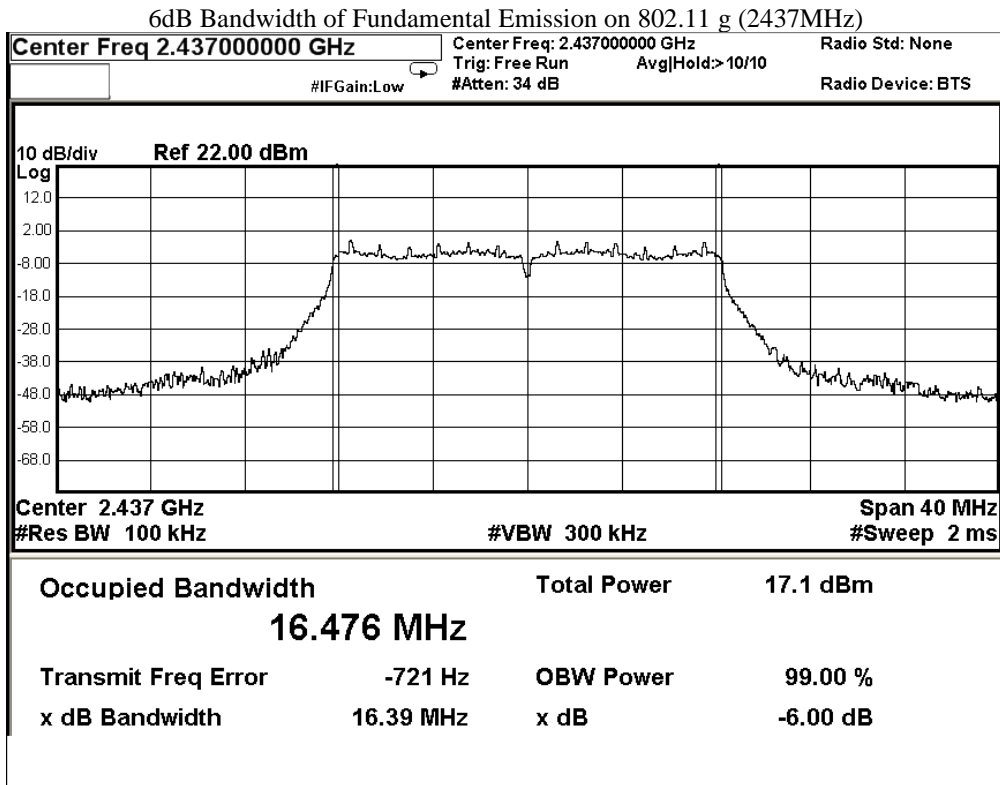
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 46 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	16.39	> 500





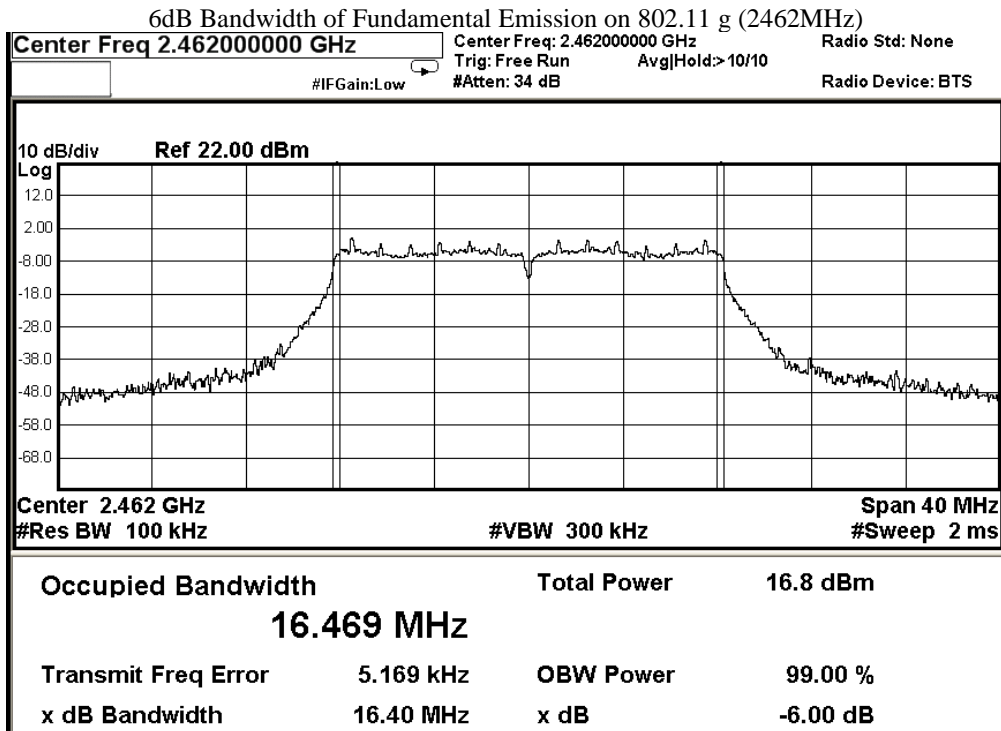
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 47 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	16.40	> 500





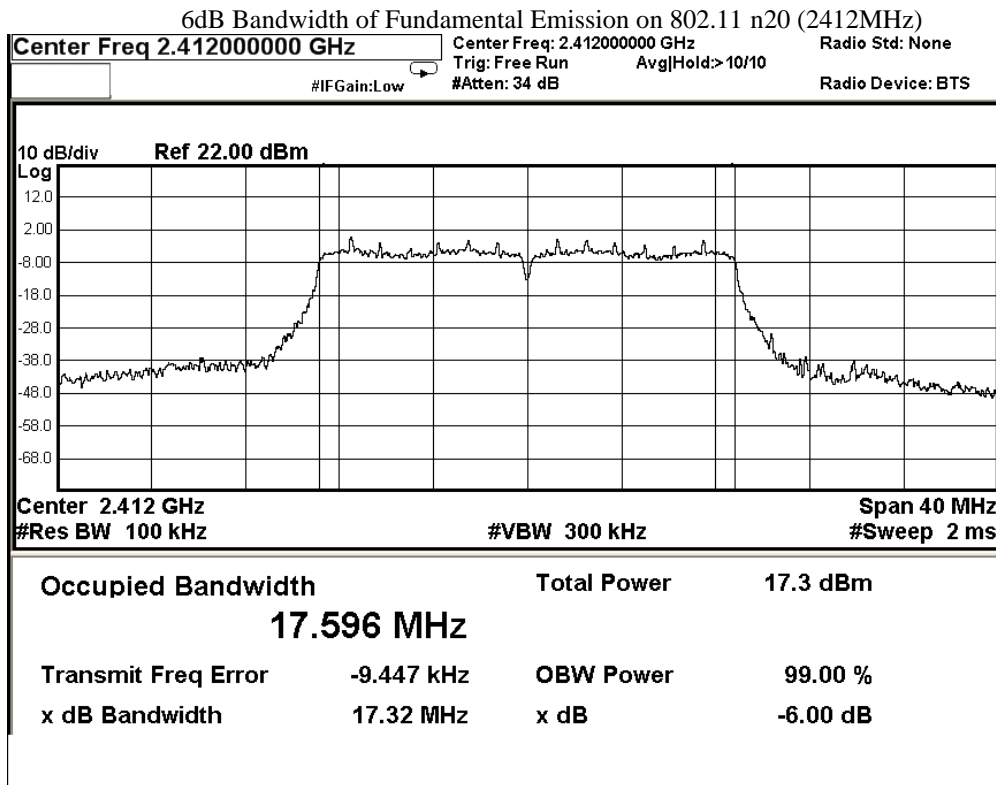
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 48 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	17.32	> 500





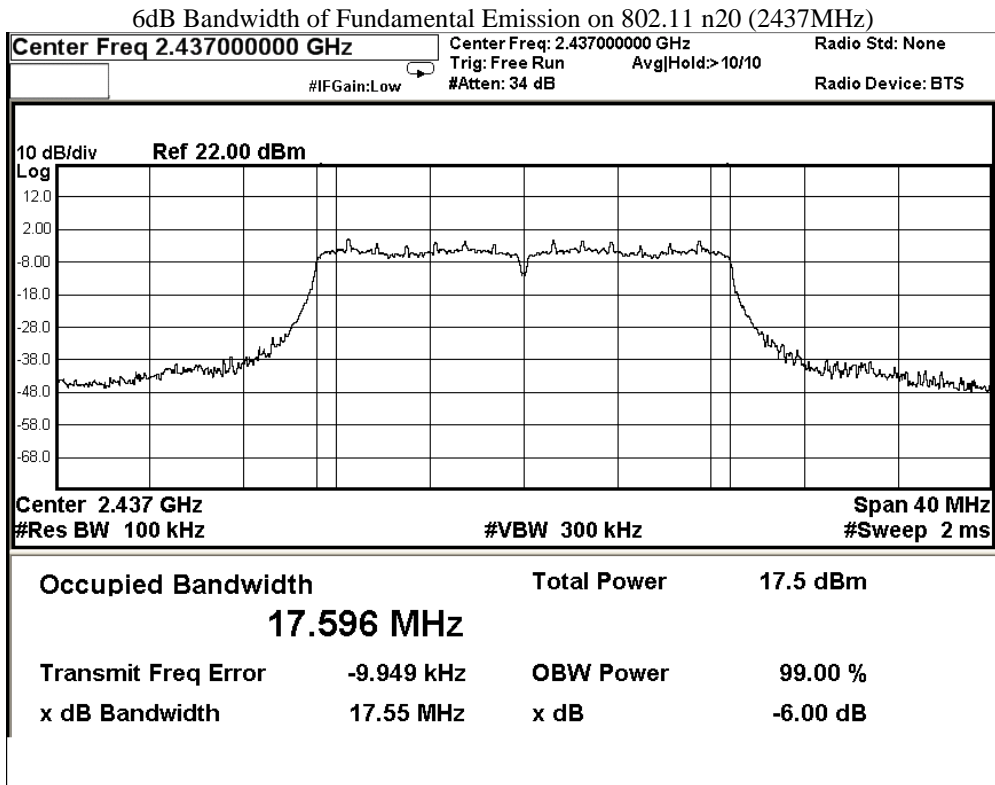
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 49 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	17.55	> 500





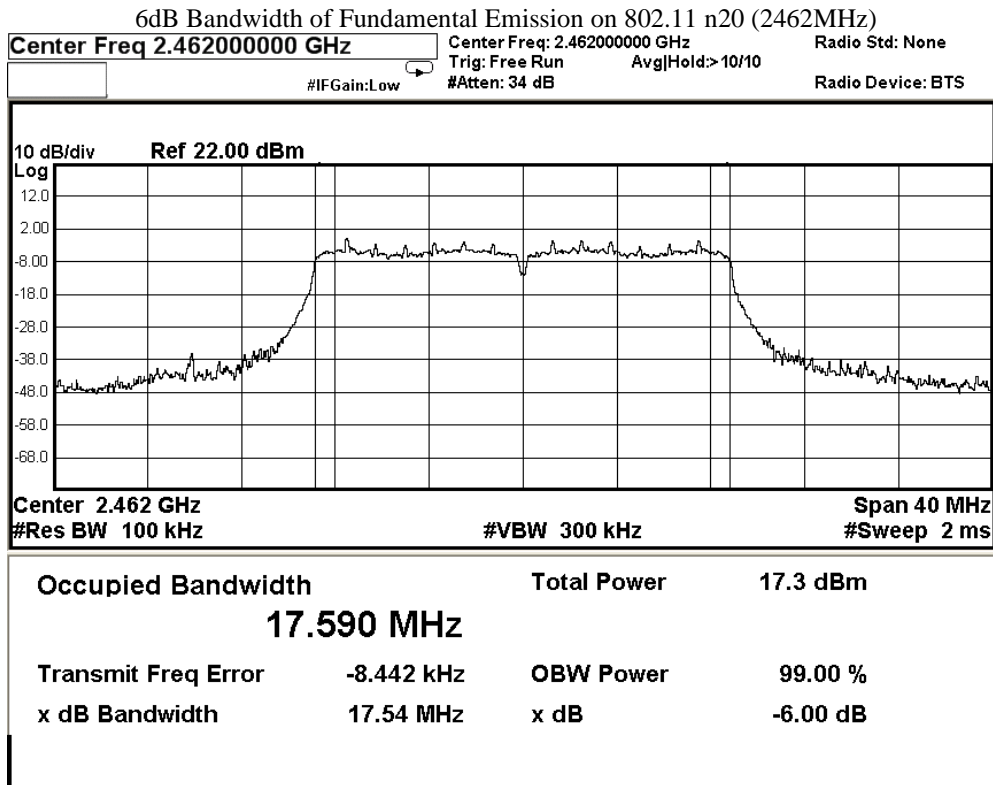
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 50 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	17.54	> 500





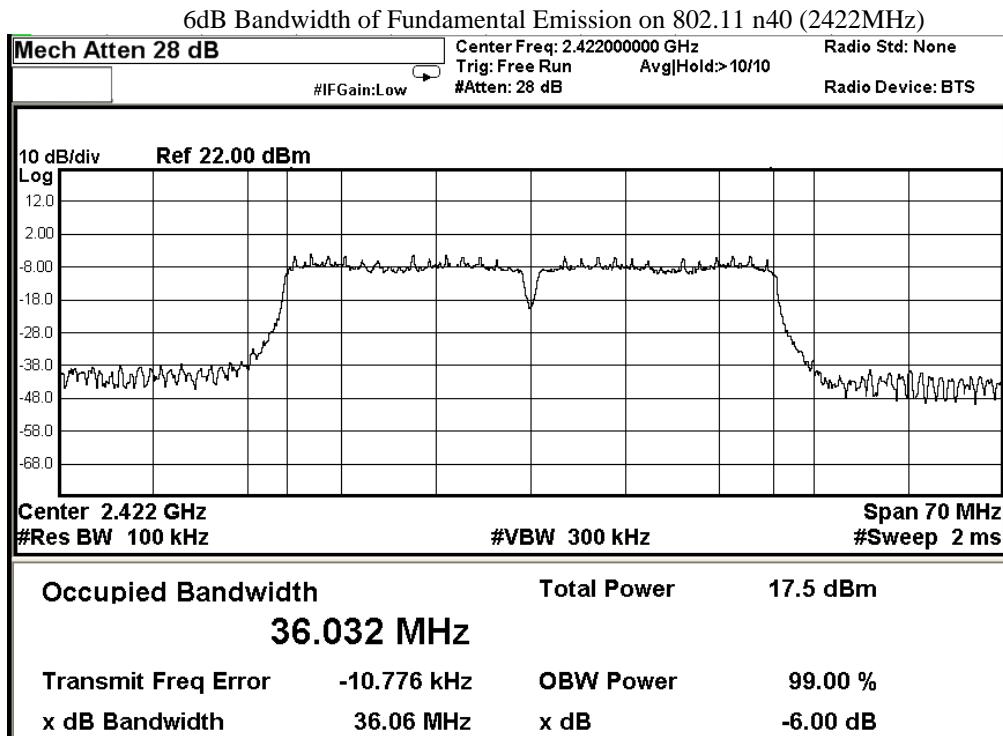
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 51 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2422.0	36.06	> 500





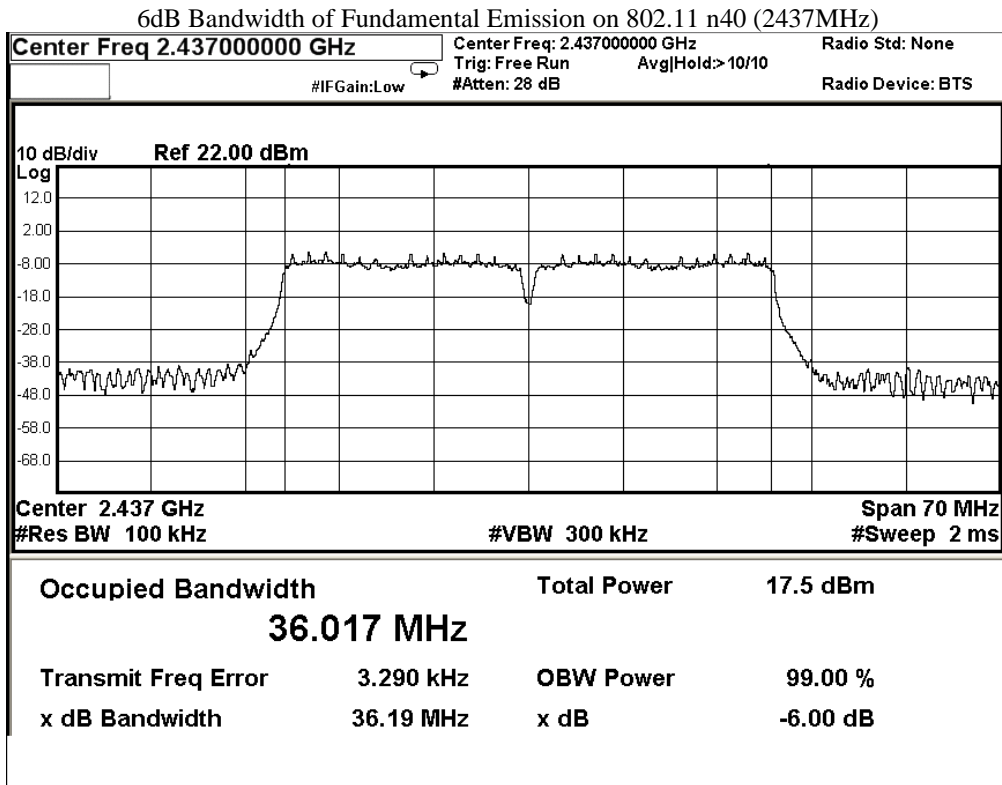
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 52 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	36.19	> 500





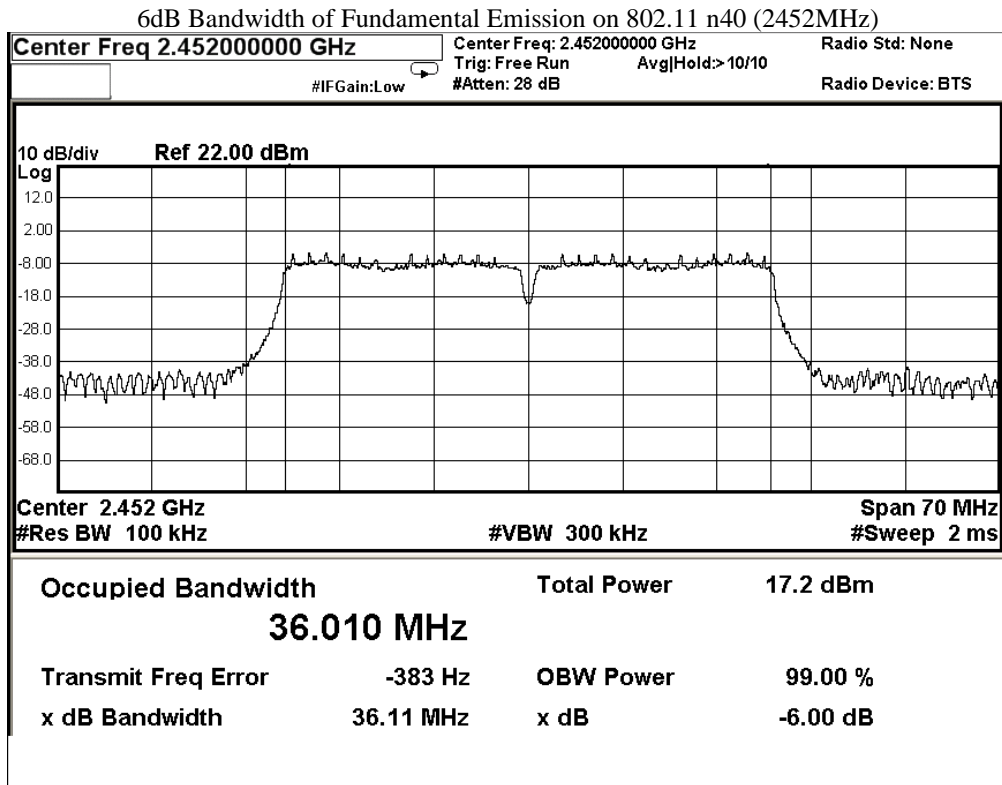
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 53 of 76

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2452.0	36.11	> 500





Test Report

Date : 2022-04-26
No. : HMD22040011

Page 54 of 76

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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Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 55 of 76

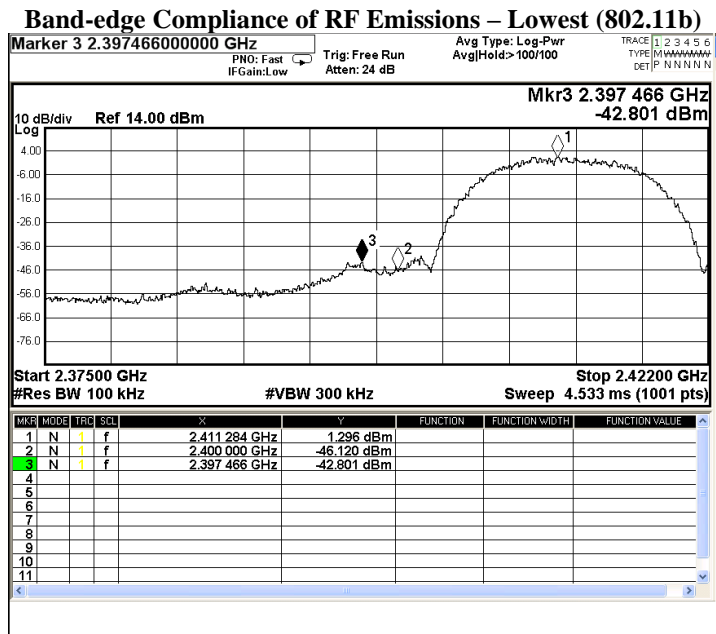
Band-edge Compliance of RF Conducted Emissions Measurement:

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)	1.296	-18.704	-42.801	Pass





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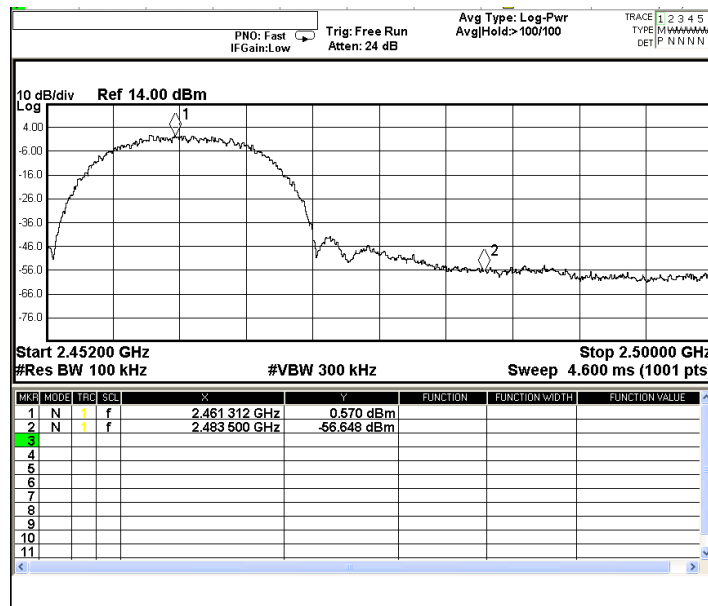
Date : 2022-04-26
 No. : HMD22040011

Page 56 of 76

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)	0.570	-19.430	-56.648	Pass

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





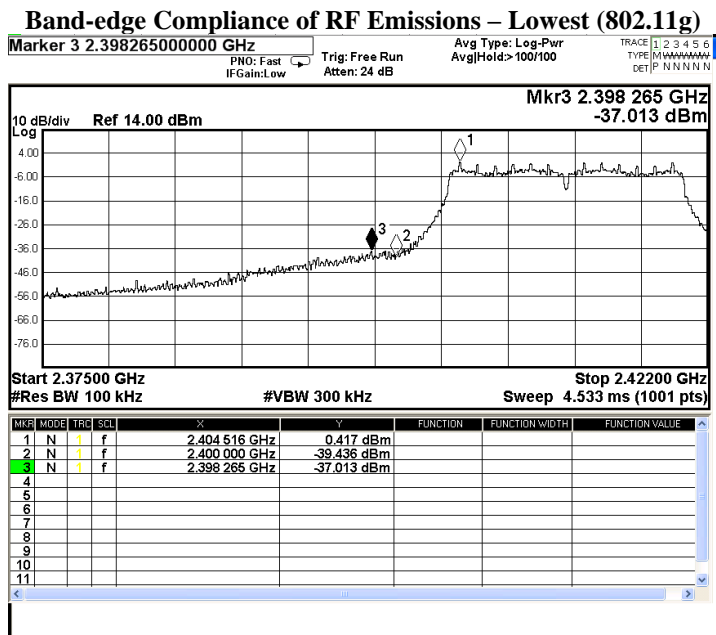
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 57 of 76

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)	0.417	-19.583	-37.013	Pass





Test Report

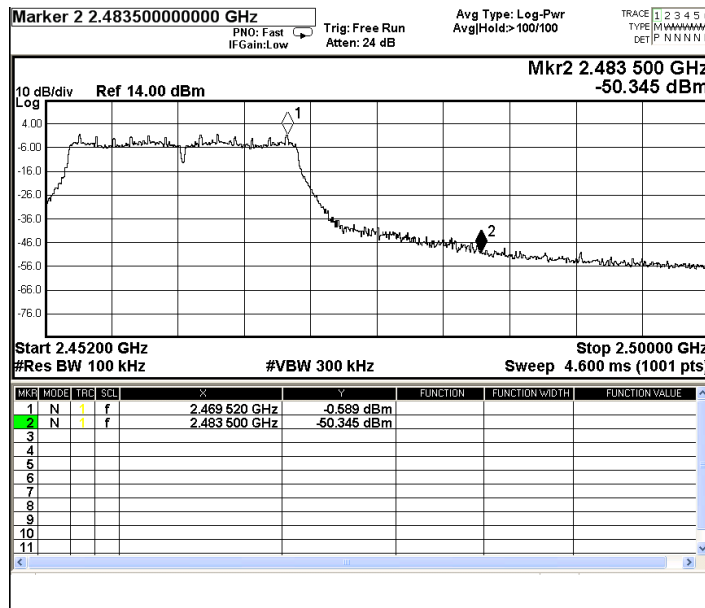
Date : 2022-04-26
 No. : HMD22040011

Page 58 of 76

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)	-0.589	-20.589	-50.345	Pass

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





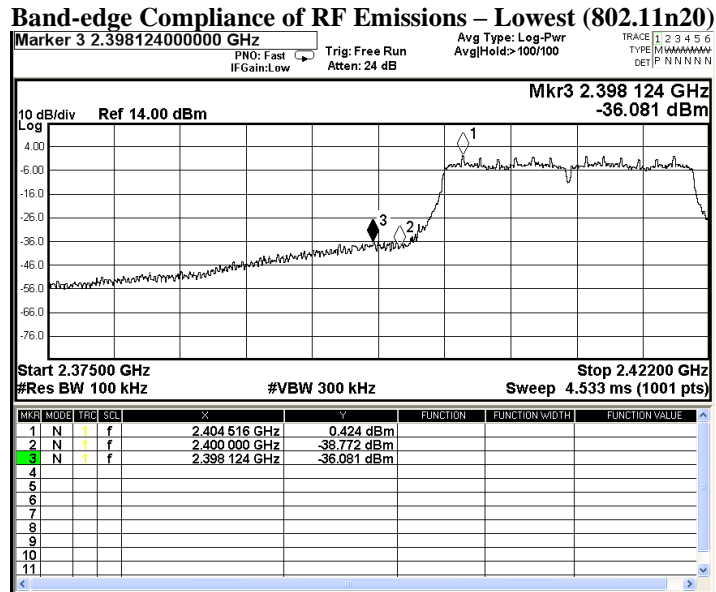
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 59 of 76

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)	0.424	-19.576	-36.081	Pass





Test Report

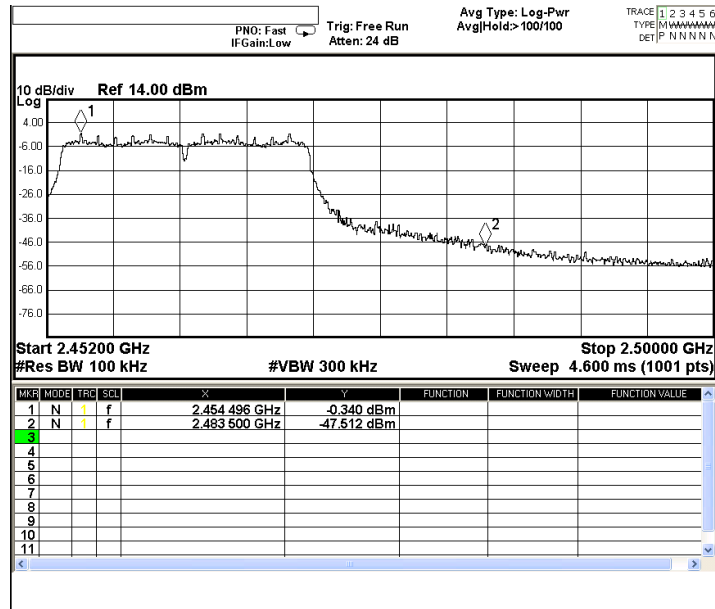
Date : 2022-04-26
 No. : HMD22040011

Page 60 of 76

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)	-0.34	-20.34	-47.512	Pass

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





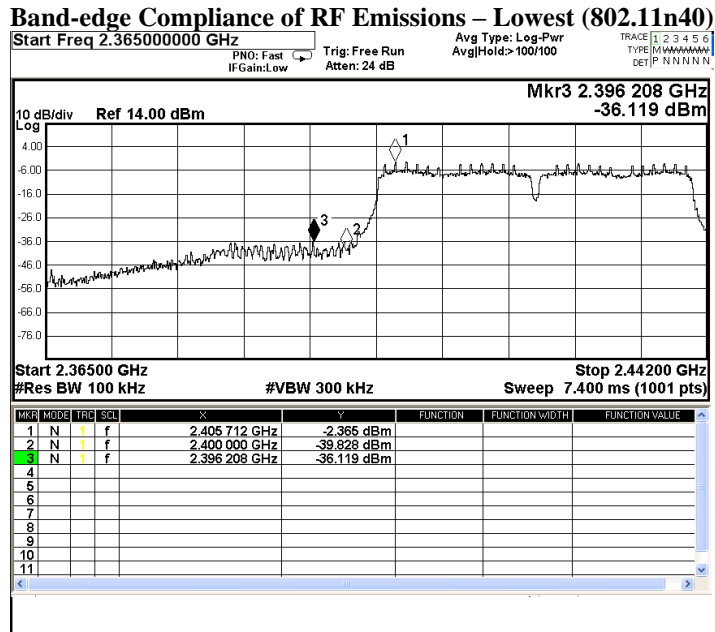
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 61 of 76

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)	-2.365	-22.365	-36.119	Pass





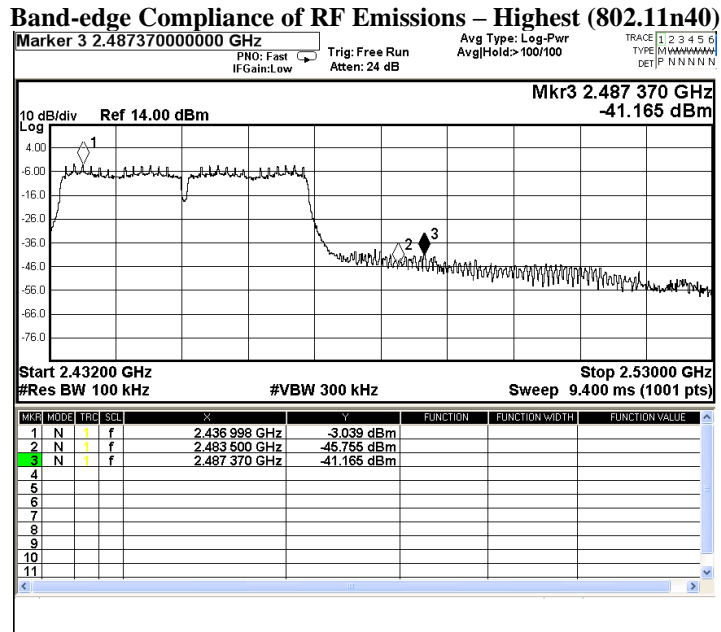
Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 62 of 76

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)	-3.309	-23.309	-41.165	Pass





Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 63 of 76

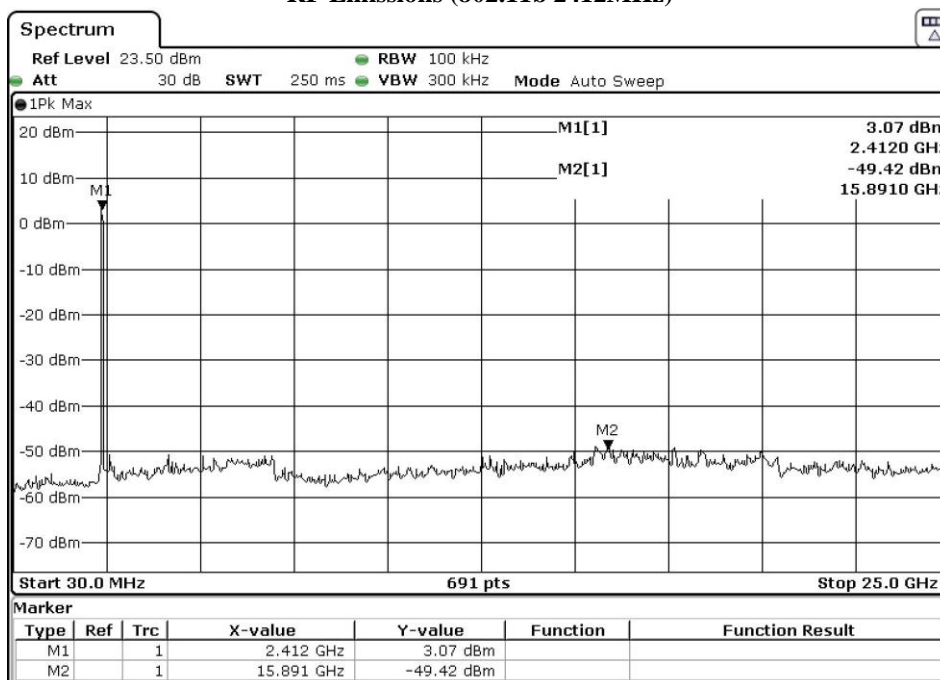
RF Conducted Emissions Measurement:

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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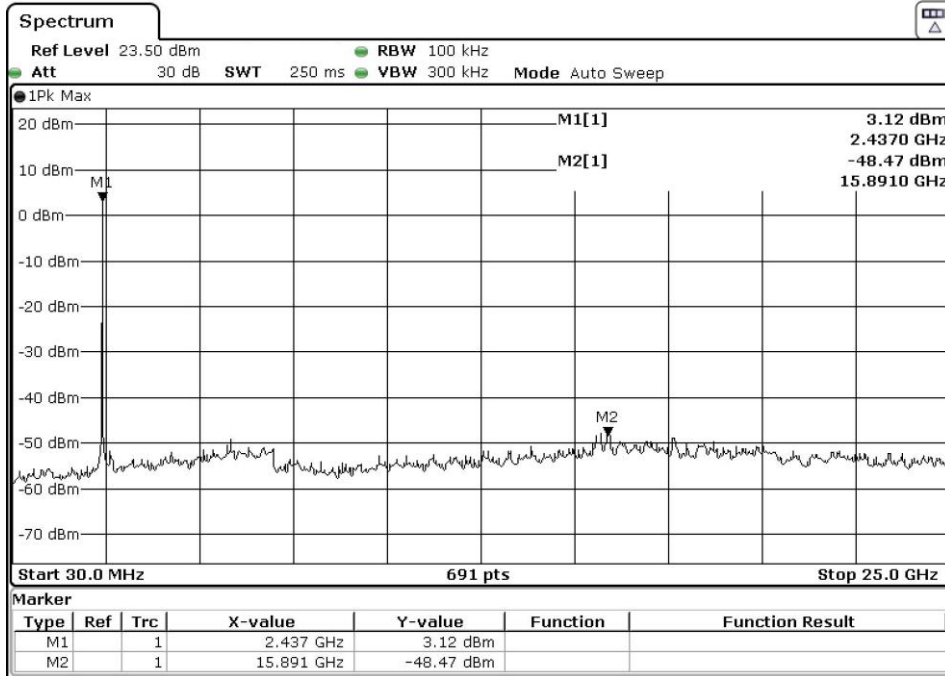


Test Report

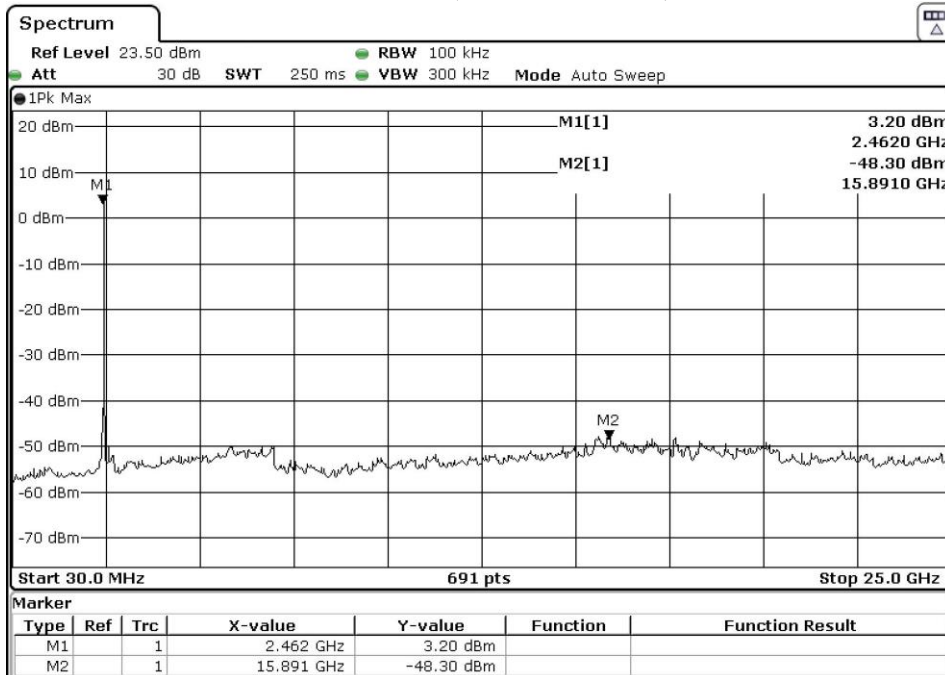
Date : 2022-04-26
 No. : HMD22040011

Page 64 of 76

RF Emissions (802.11b 2437MHz)



RF Emissions (802.11b 2462MHz)



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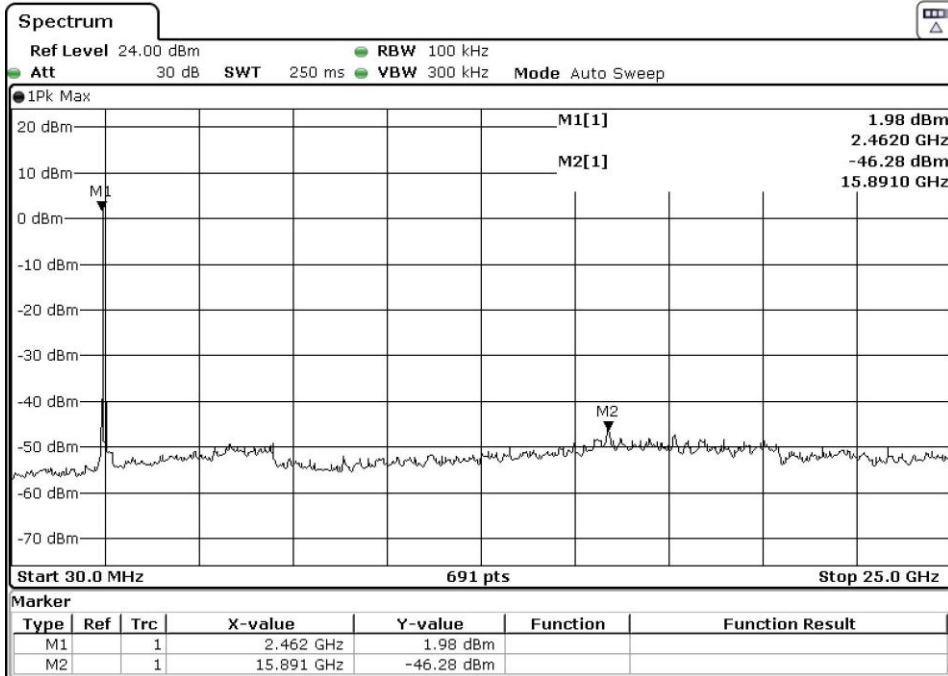


Test Report

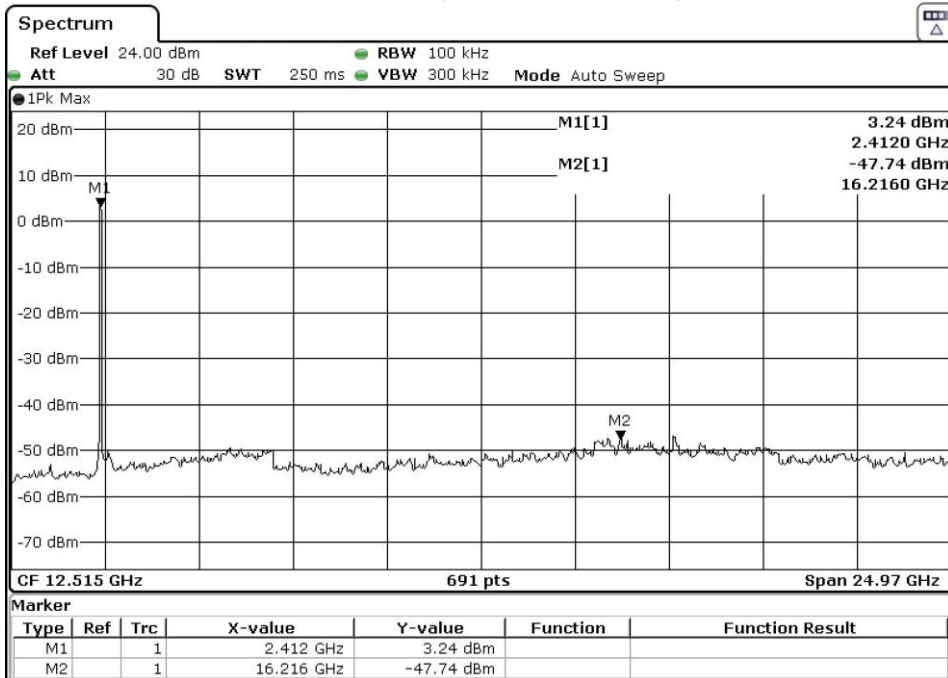
Date : 2022-04-26
 No. : HMD22040011

Page 66 of 76

RF Emissions (802.11g 2462MHz)



RF Emissions (802.11n20 2412MHz)



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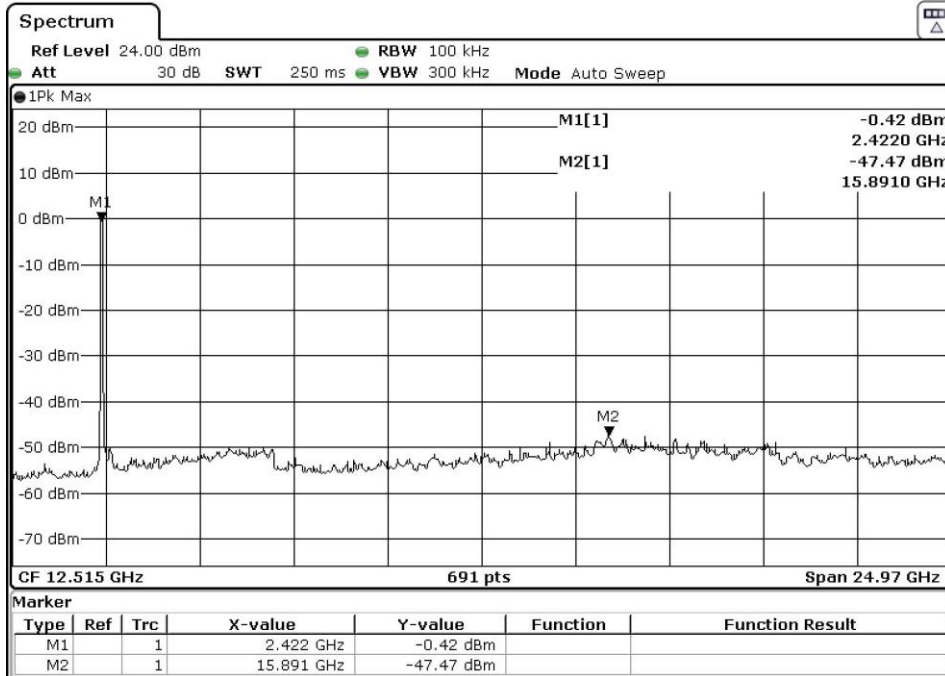


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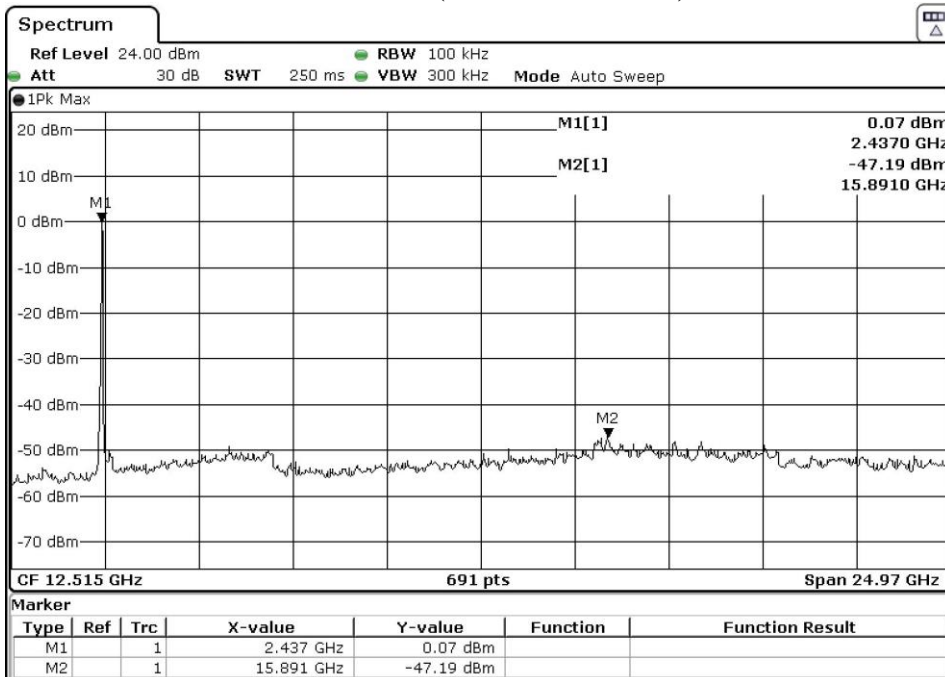
Date : 2022-04-26
 No. : HMD22040011

Page 68 of 76

RF Emissions (802.11n40 2422MHz)



RF Emissions (802.11n40 2437MHz)



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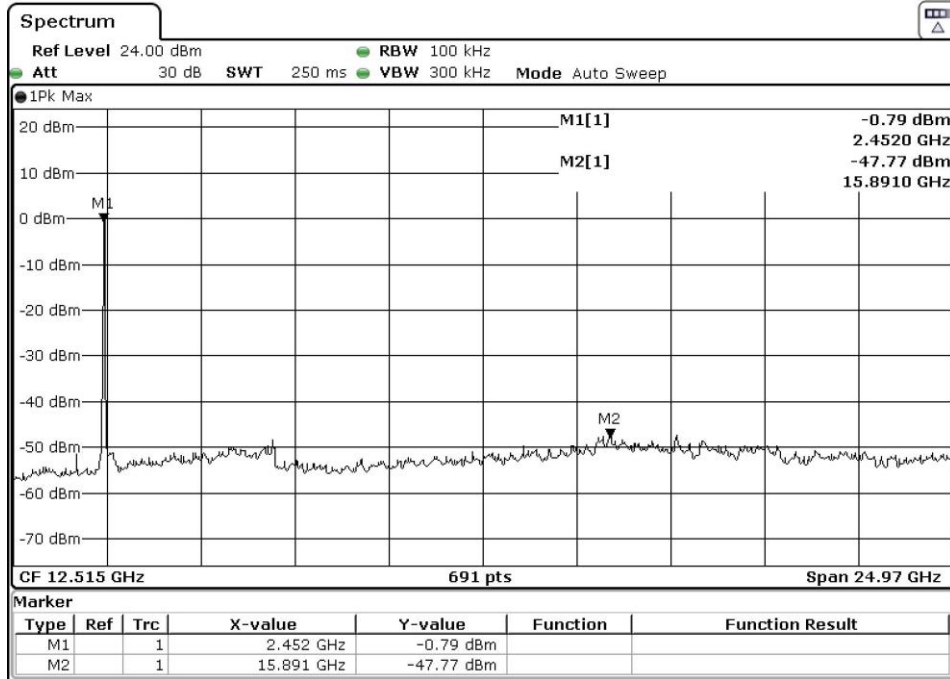


Test Report

Date : 2022-04-26
 No. : HMD22040011

Page 69 of 76

RF Emissions (802.11n40 2452MHz)



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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 70 of 76

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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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 71 of 76

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	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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Test Report

Date : 2022-04-26
No. : HMD22040011

Page 72 of 76

Appendix B

Photographs of EUT

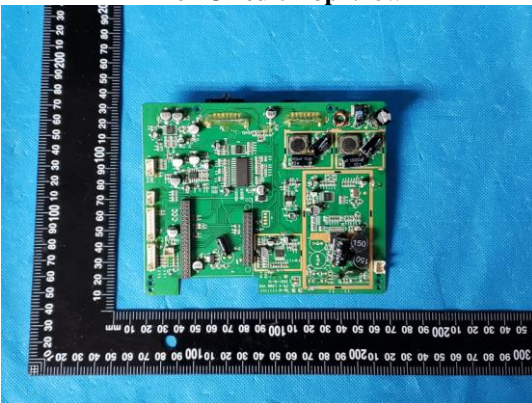
View of the product



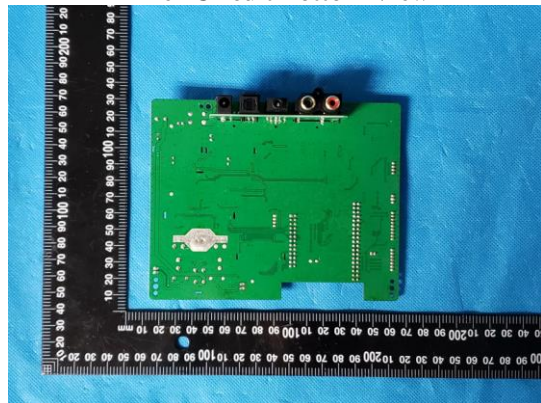
View of the product



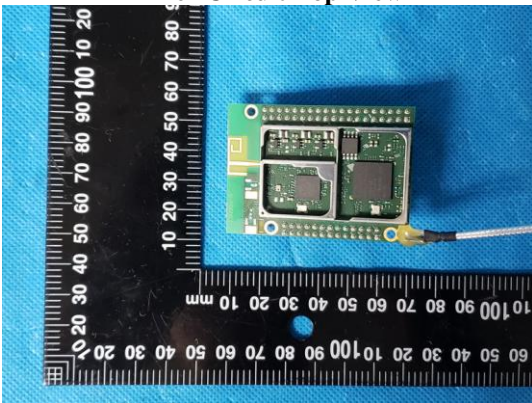
Inner Circuit Top View



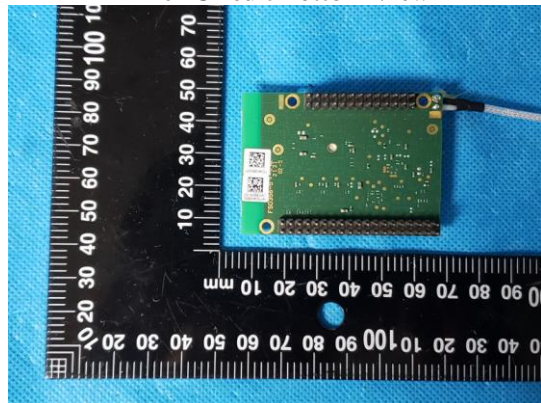
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



Test Report

Date : 2022-04-26
No. : HMD22040011

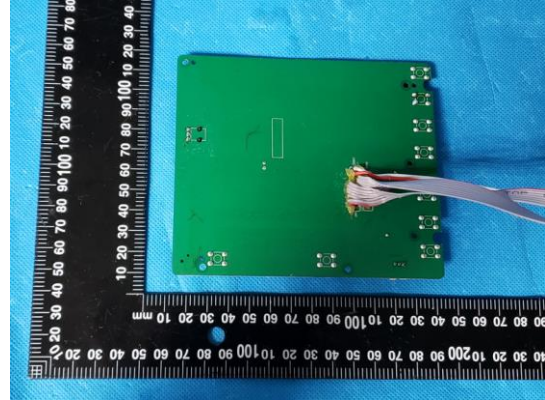
Page 73 of 76

Photographs of EUT

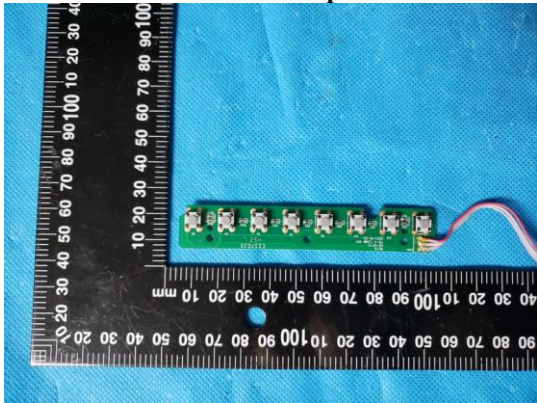
Inner Circuit Top View



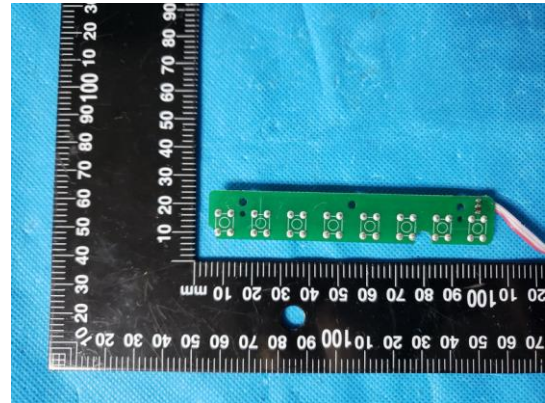
Inner Circuit Bottom View



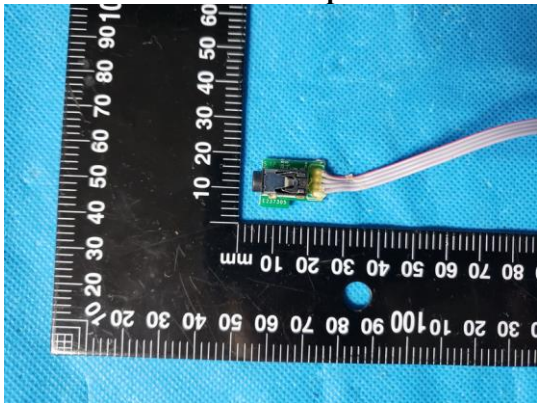
Inner Circuit Top View



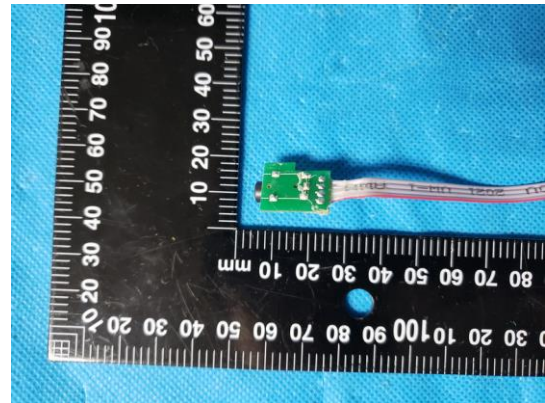
Inner Circuit Bottom View



Inner Circuit Top View



Inner Circuit Bottom View



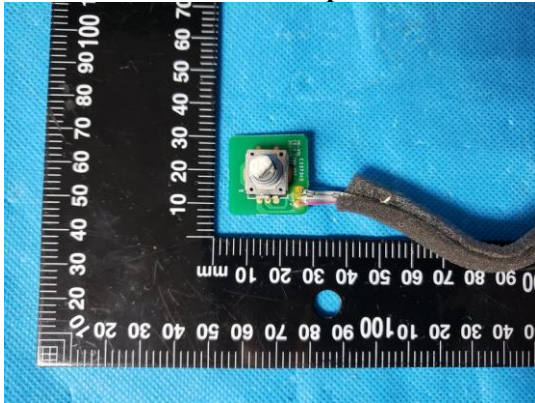
Test Report

Date : 2022-04-26
No. : HMD22040011

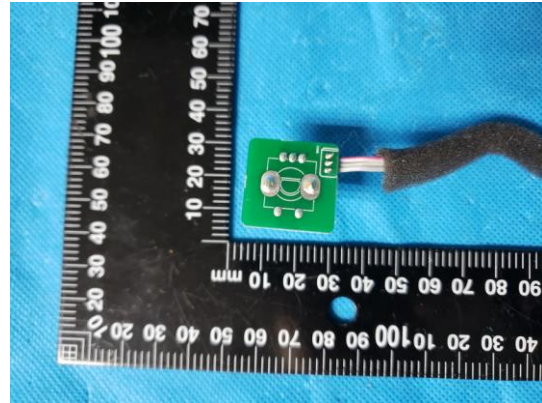
Page 74 of 76

Photographs of EUT

Inner Circuit Top View



Inner Circuit Bottom View



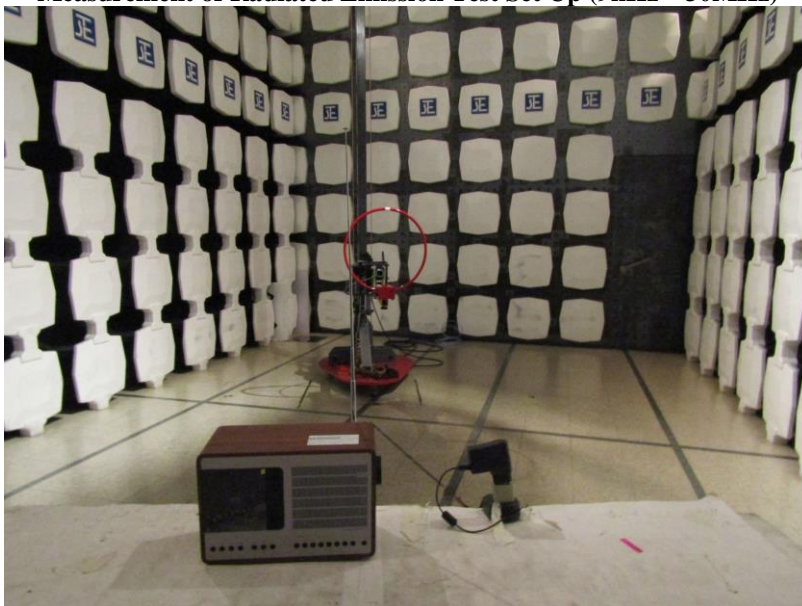
Test Report

Date : 2022-04-26
No. : HMD22040011

Page 75 of 76

Photographs of EUT

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



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



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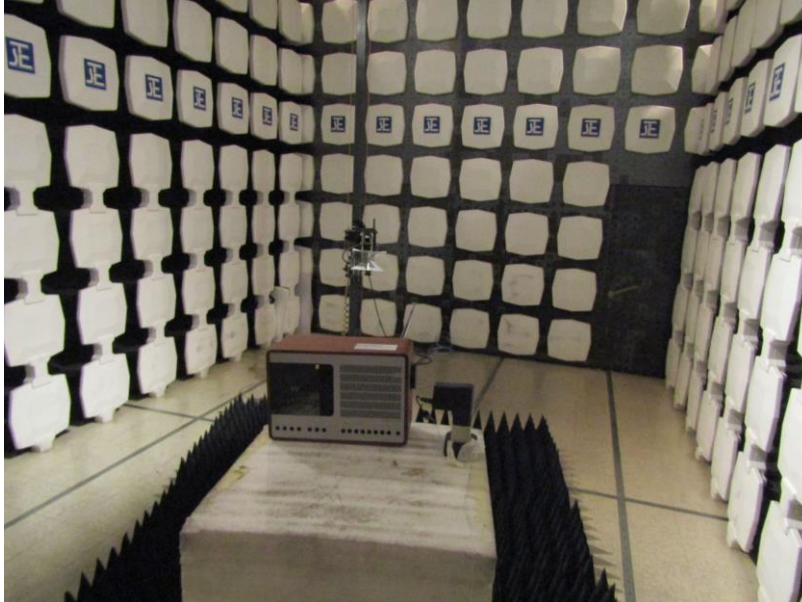
Test Report

Date : 2022-04-26
No. : HMD22040011

Page 76 of 76

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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