



FCC RF Test Report

APPLICANT : Positioning Universal Inc
EQUIPMENT : GPS TRACK
MODEL NAME : FT7000MW
FCC ID : 2AHRH-FT7000MW
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Jan. 06, 2022 ~ Feb. 15, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager



Sporton International Inc. (Kunshan)

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China**



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APPENDIX A. CONDUCTED TEST RESULTS

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 2.03 dB at 2483.680 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Applicable	-
3.6	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Remark: Not Applicable means after assessing, test items are not necessary to carry out.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Positioning Universal Inc

4660 La Jolla Village Drive, Suite 1100, San Diego , CA92122

1.2 Manufacturer

Positioning Universal Inc

4660 La Jolla Village Drive, Suite 1100, San Diego , CA92122

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	GPS TRACK
Model Name	FT7000MW
FCC ID	2AHRH-FT7000MW
IMEI	Conducted: 015678004023418 Radiation: 015678004023426
HW Version	P2.2
SW Version	A0.18.1

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	802.11b : 20.09 dBm (0.1021 W) 802.11g : 23.27 dBm (0.2123 W) 802.11n HT20 : 23.51 dBm (0.2244 W)
99% Occupied Bandwidth	802.11b : 11.34MHz 802.11g : 17.58MHz 802.11n HT20 : 18.28MHz
Antenna Type / Gain	PCB Antenna type with gain 2.0 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

No modifications are made to the EUT during all test items.



1.6 Testing Location

<FCC>-KS

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH02-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24a

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

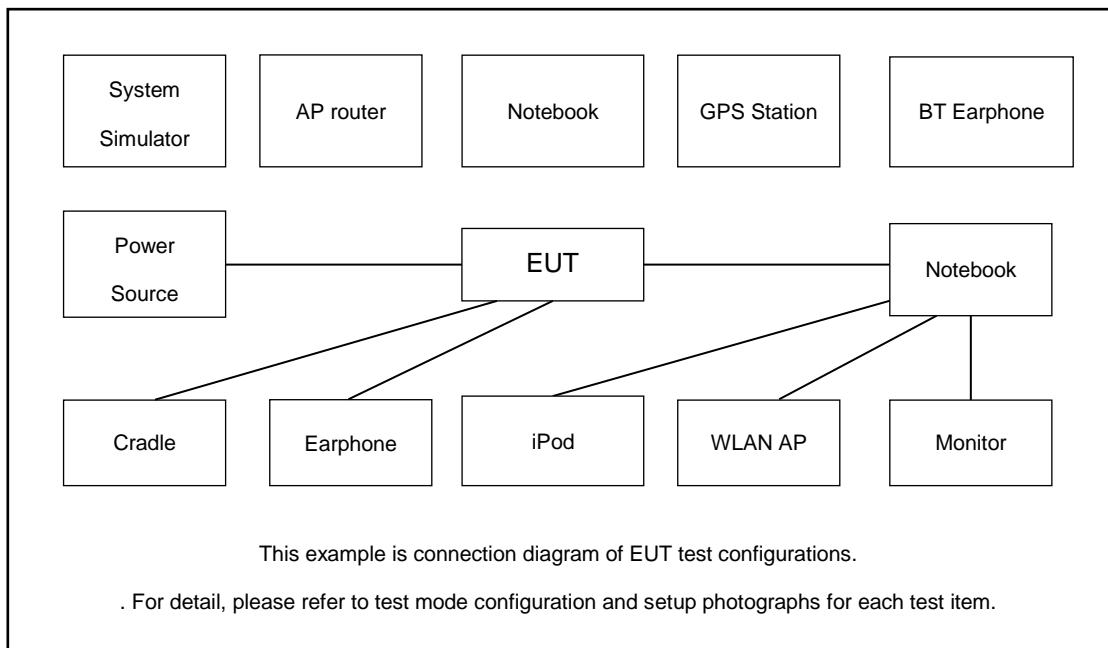
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0

Remark: All test modes of the Radiated Spurious Emission (RSE) were tested; only the worse data in each bandwidth shown in the report

Simultaneous transmission
WIFI 802.11g CH01(2412MHz)+ LTE B13 (BW=5M)

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit.



2.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5.60 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 5.60 + 10 = 15.60 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

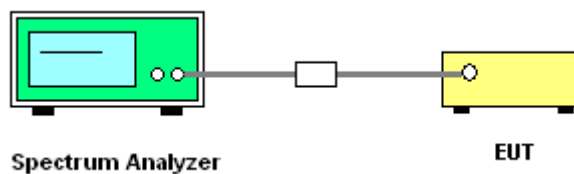
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

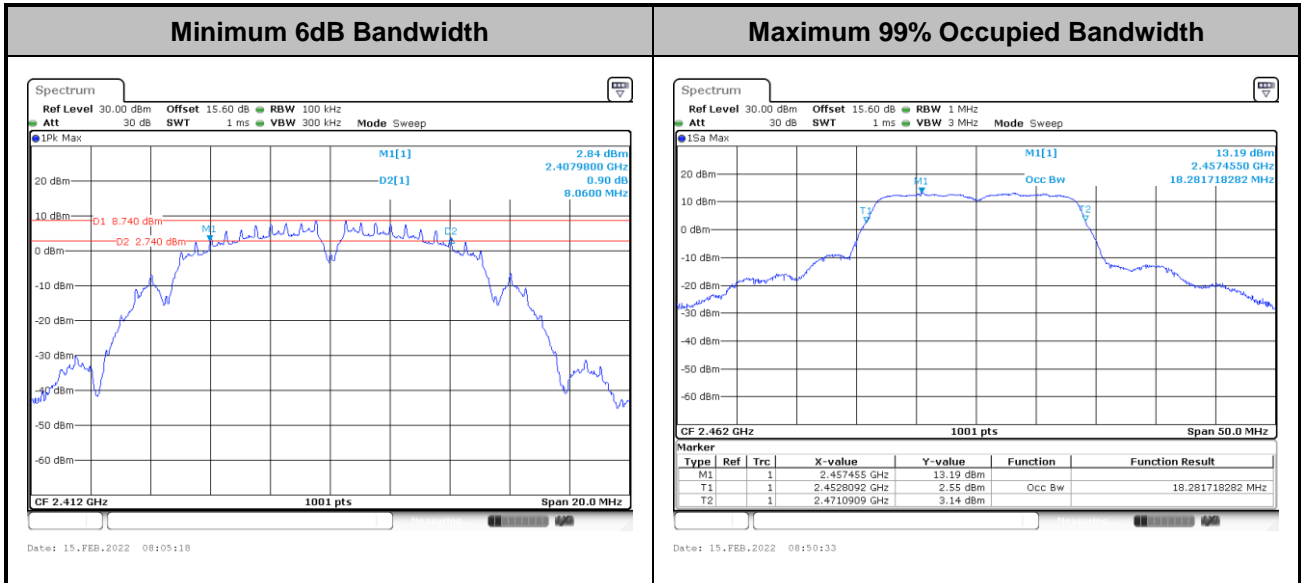
3.1.4 Test Setup





3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.



Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

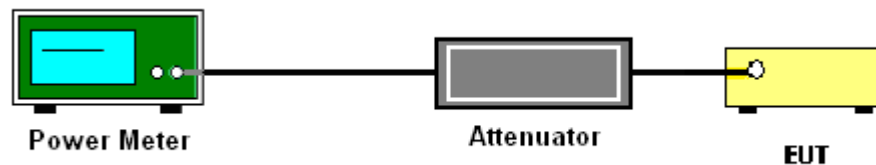
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

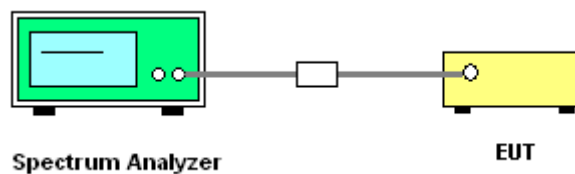
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

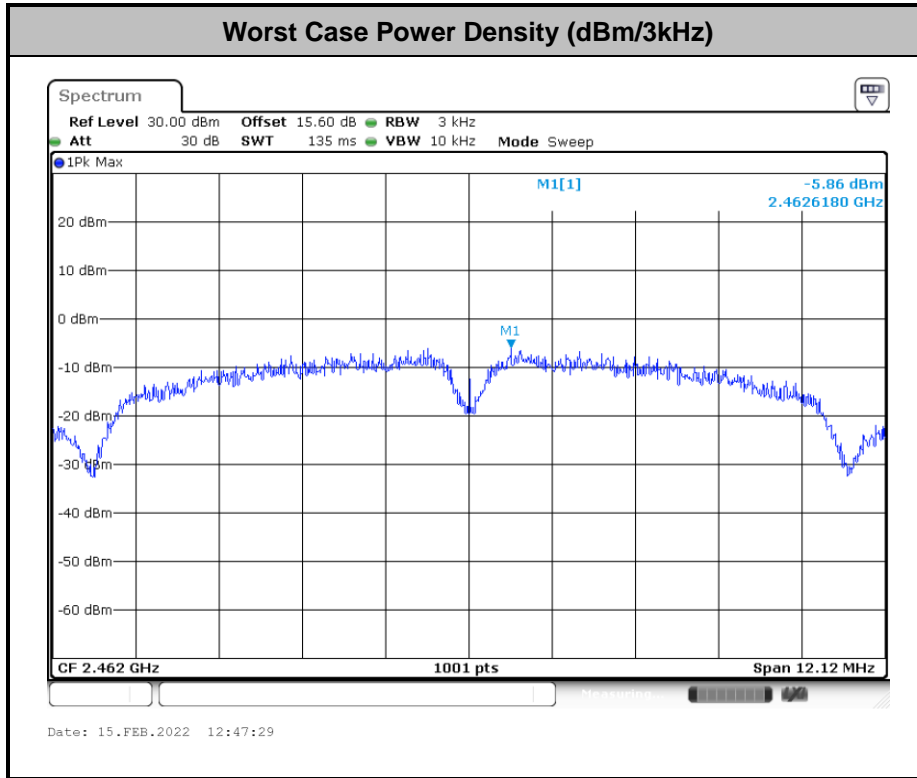
3.3.4 Test Setup





3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

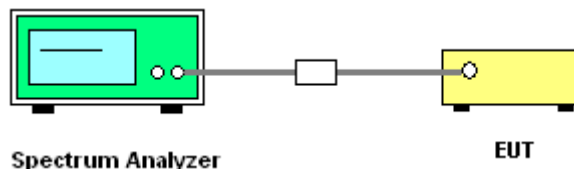
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.13
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



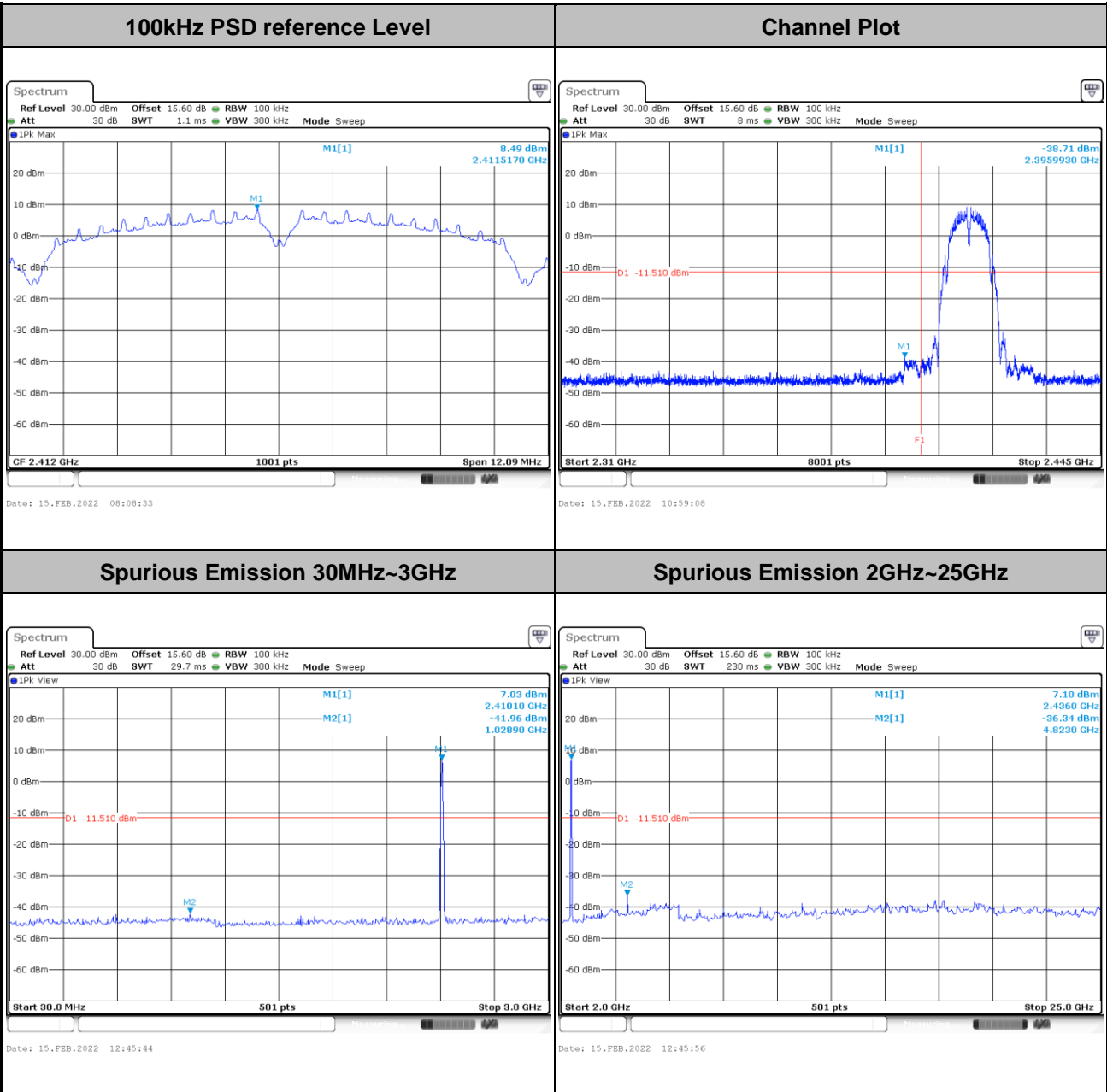


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer : Jiang Jun	Temperature :	21~25°C
	Relative Humidity :	51~54%

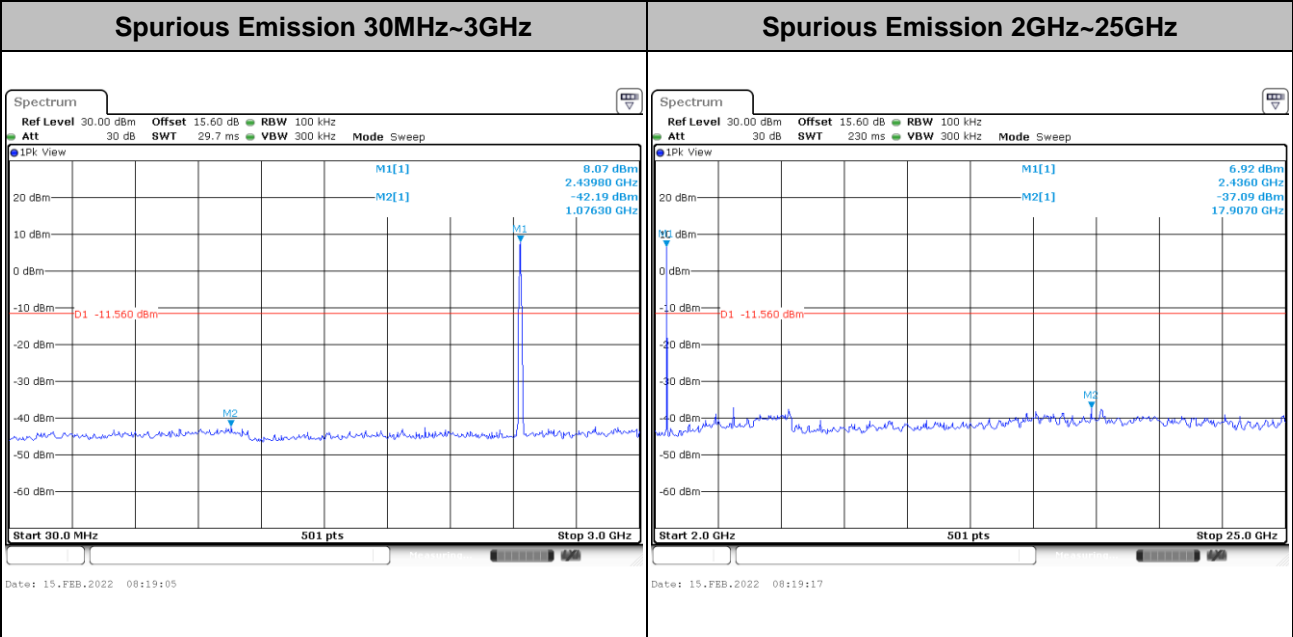
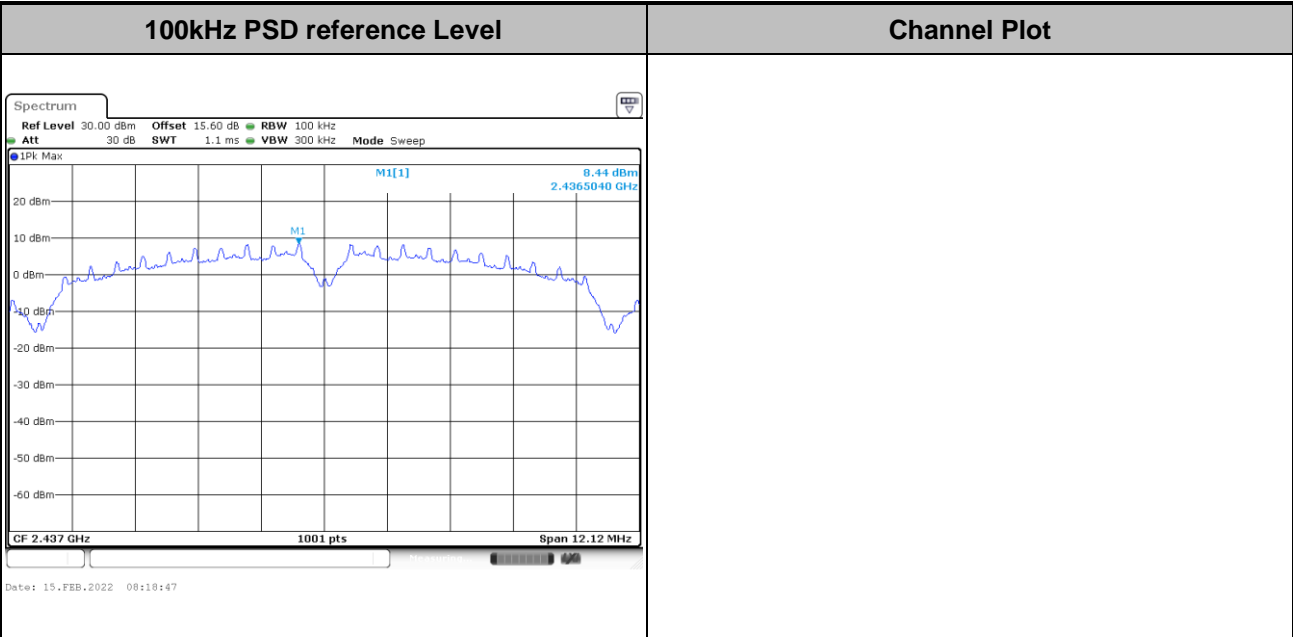
Number of TX = 1, Ant. 1 (Measured)

Test Mode :	802.11b	Test Channel :	01
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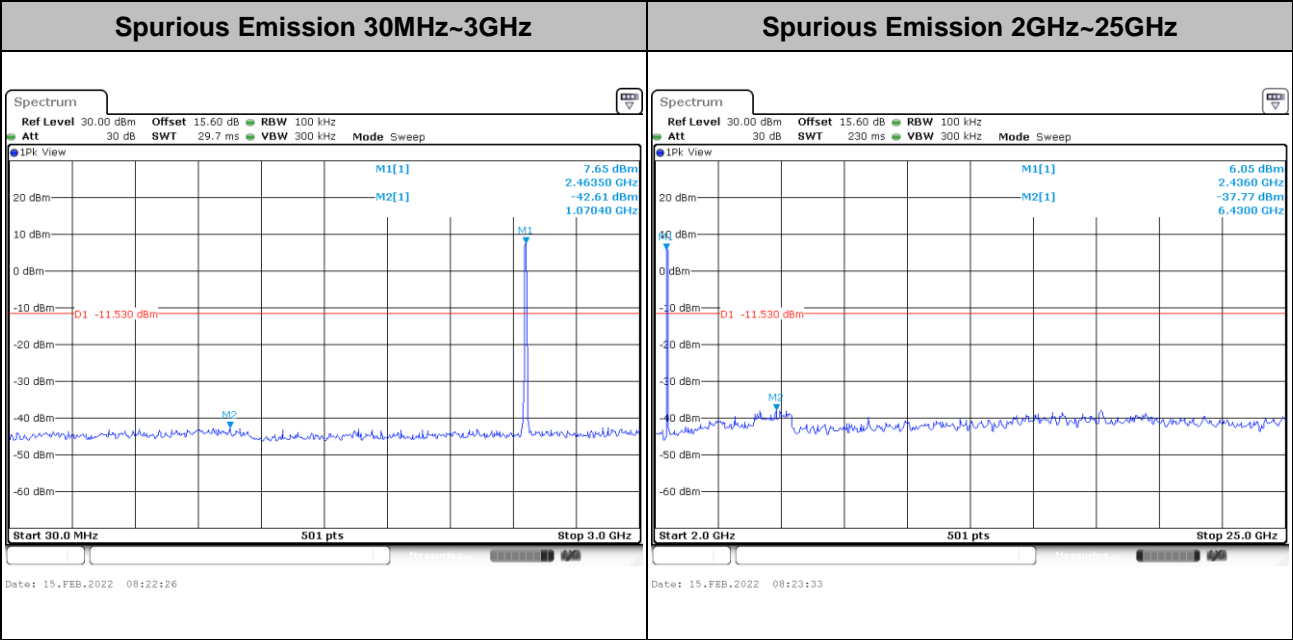
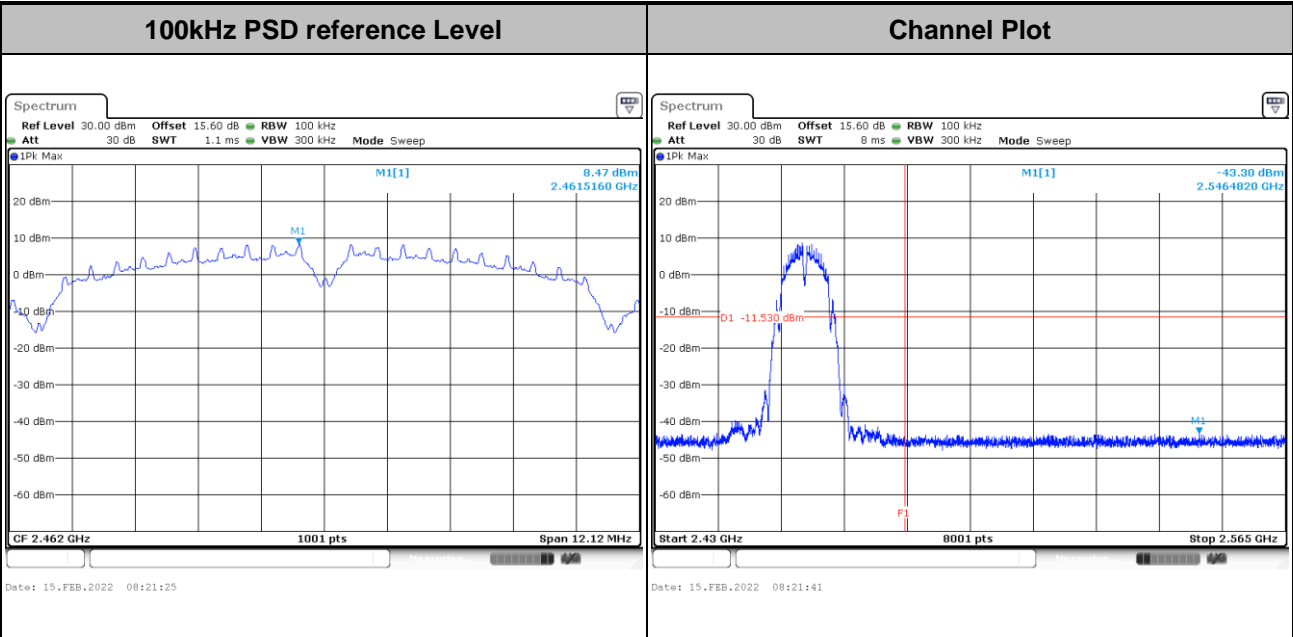


Test Mode :	802.11b	Test Channel :	06
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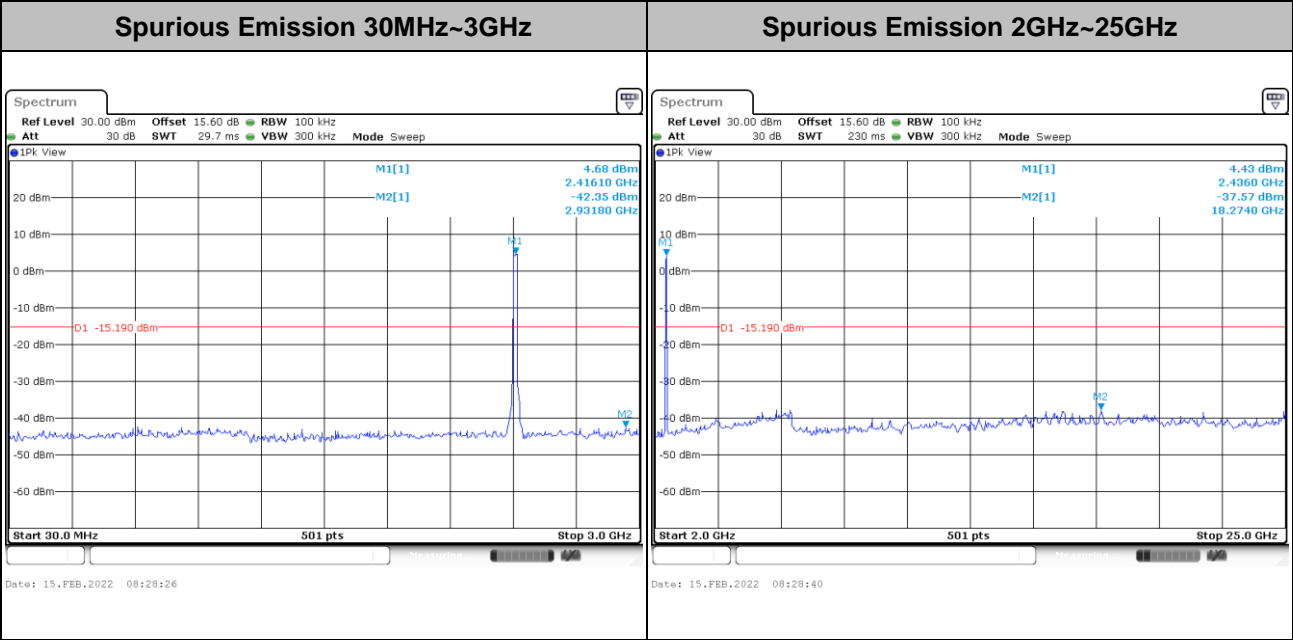
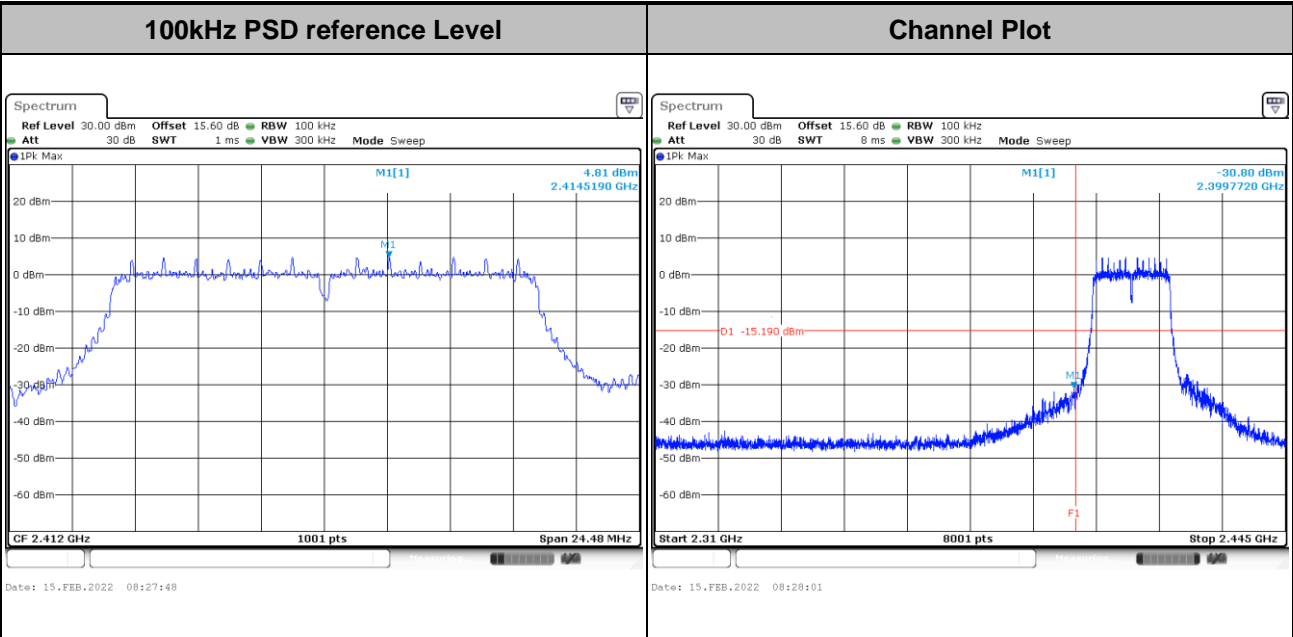


Test Mode :	802.11b	Test Channel :	11
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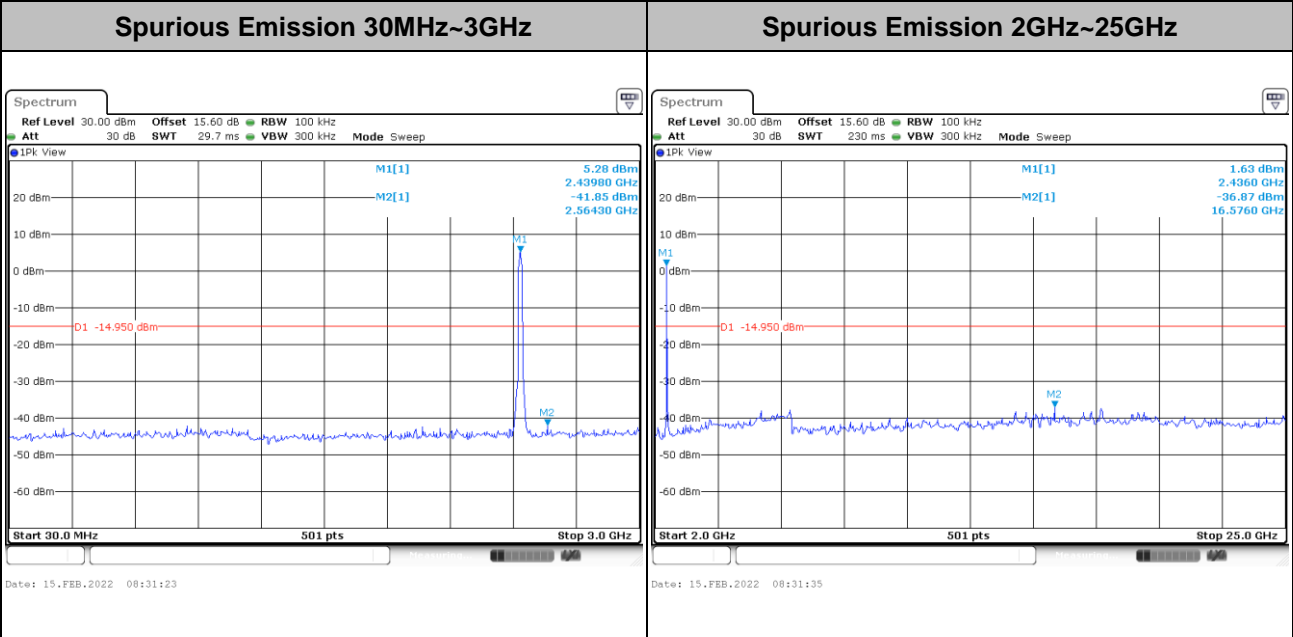
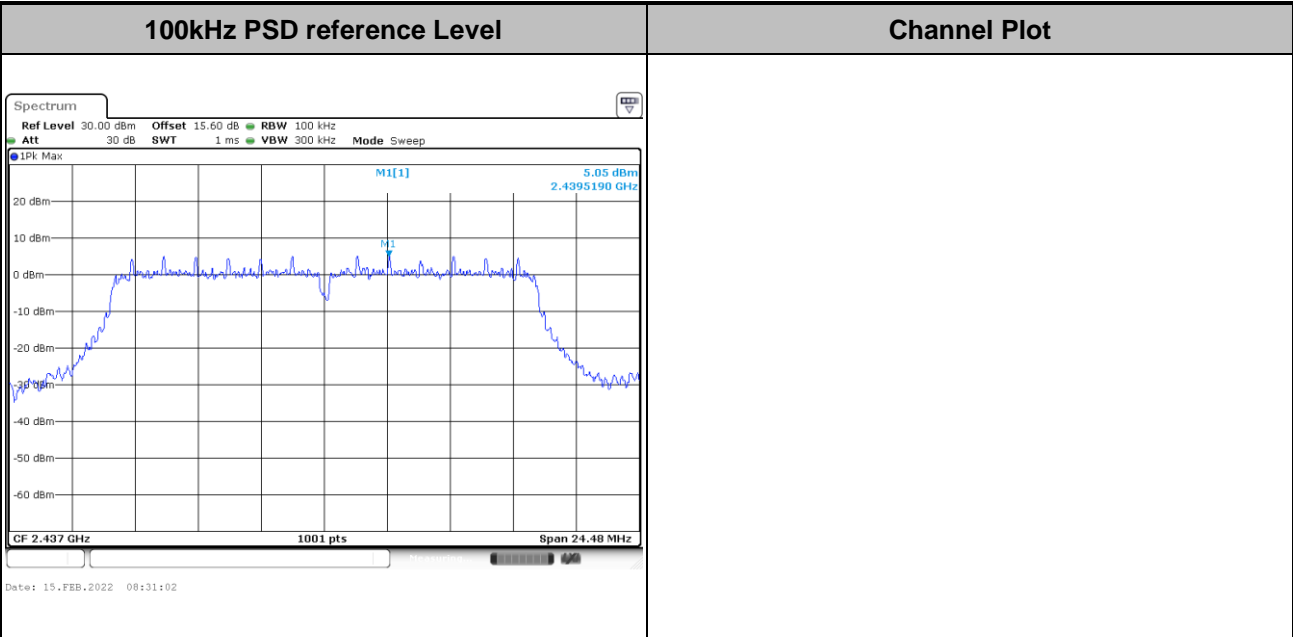


Test Mode :	802.11g	Test Channel :	01
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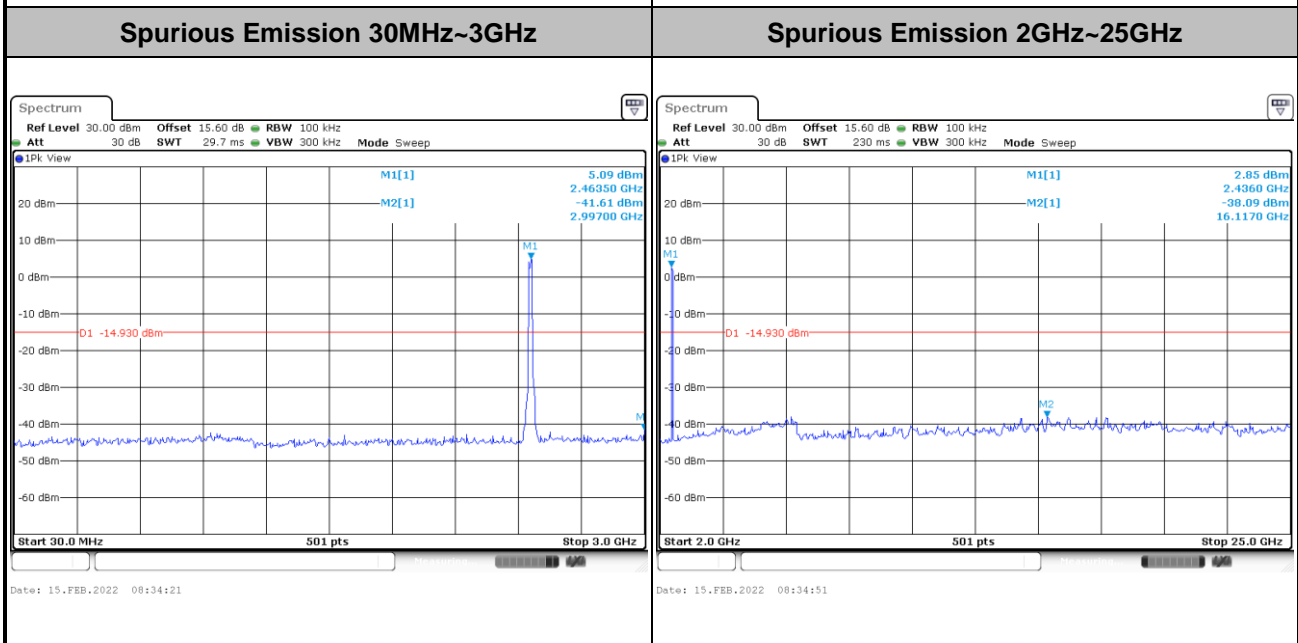
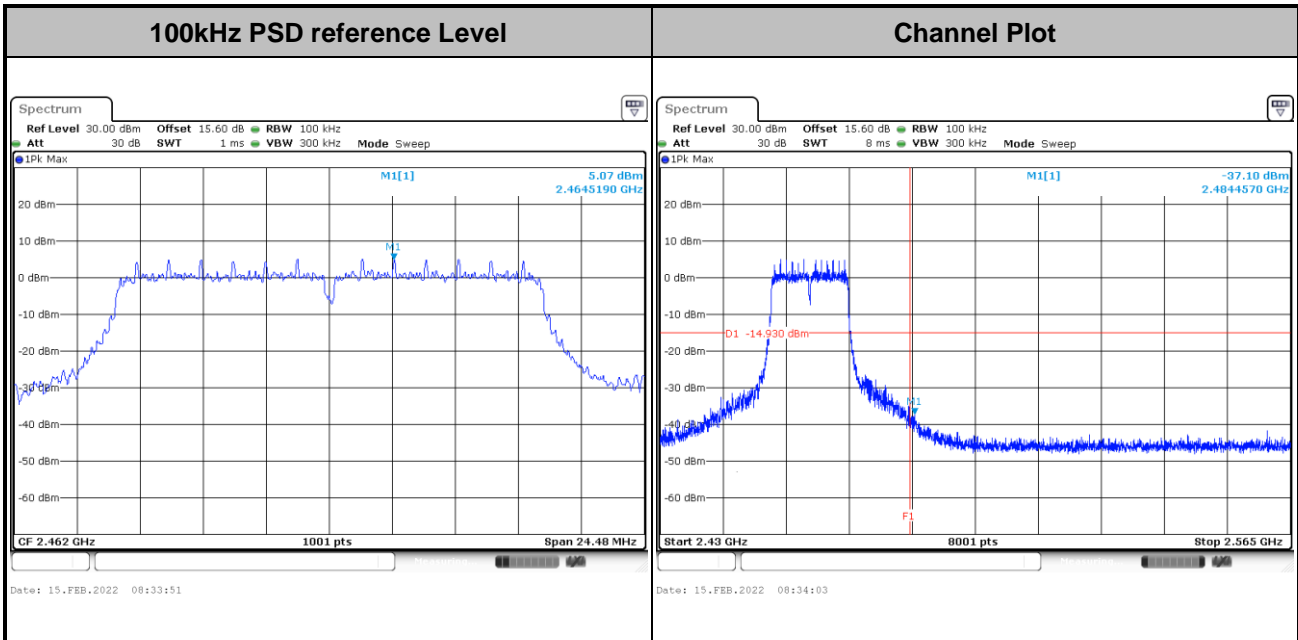


Test Mode :	802.11g	Test Channel :	06
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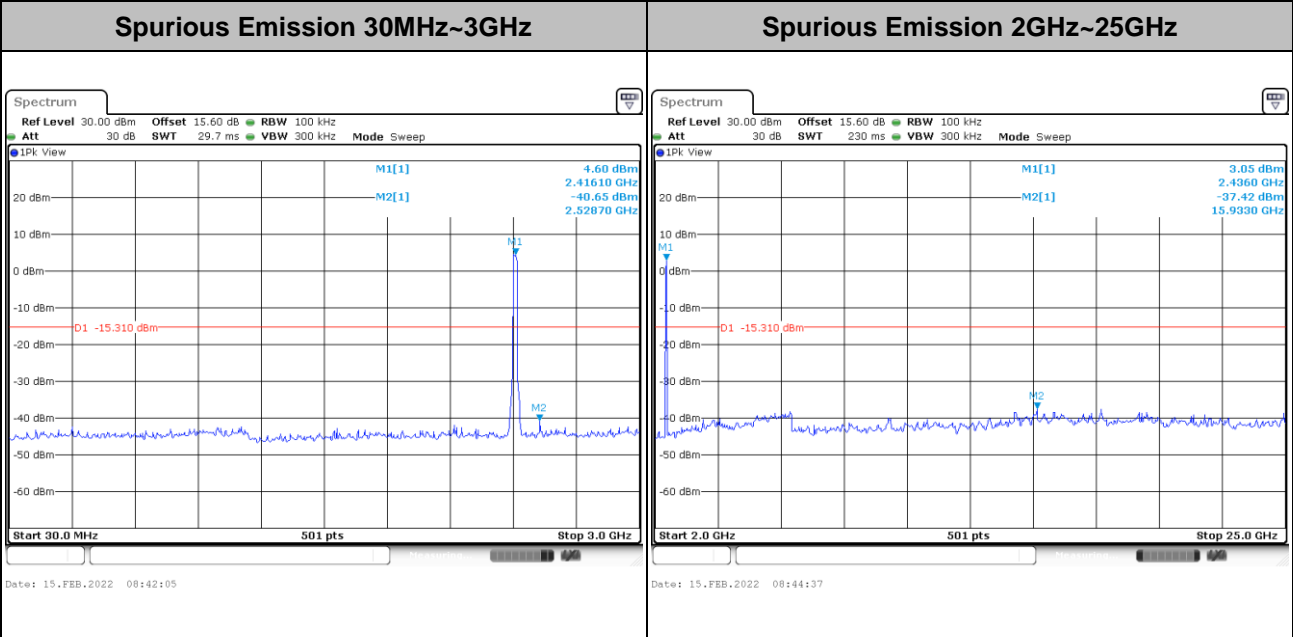
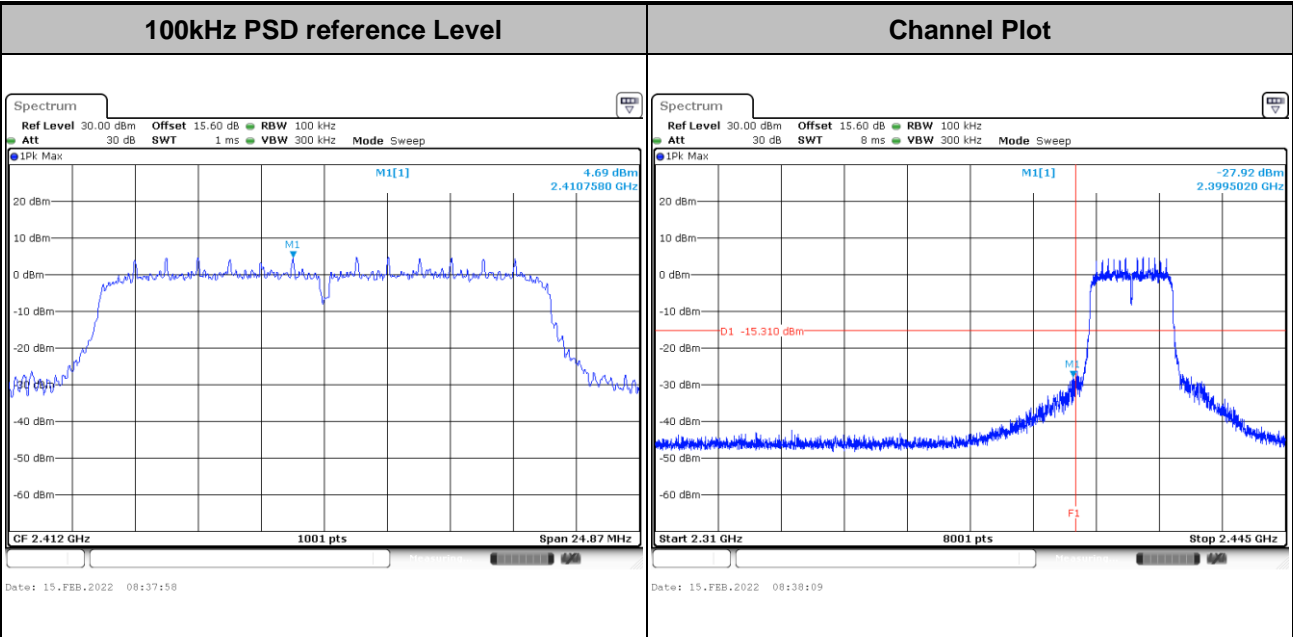


Test Mode :	802.11g	Test Channel :	11
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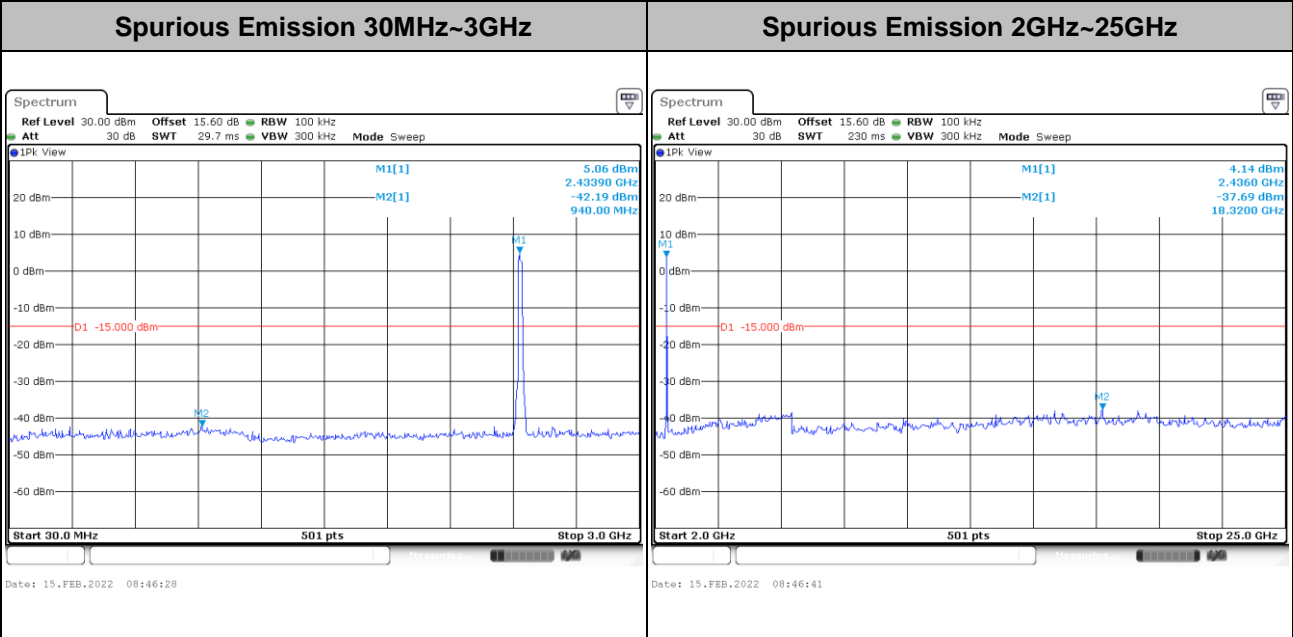
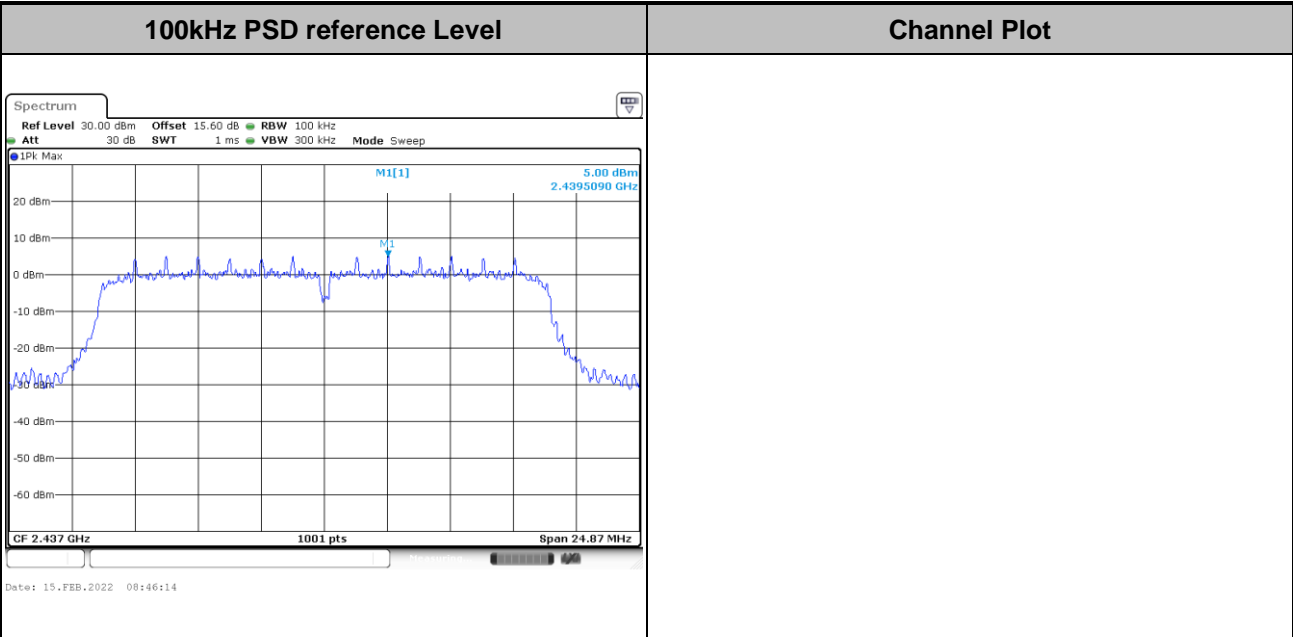


Test Mode :	802.11n HT20	Test Channel :	01
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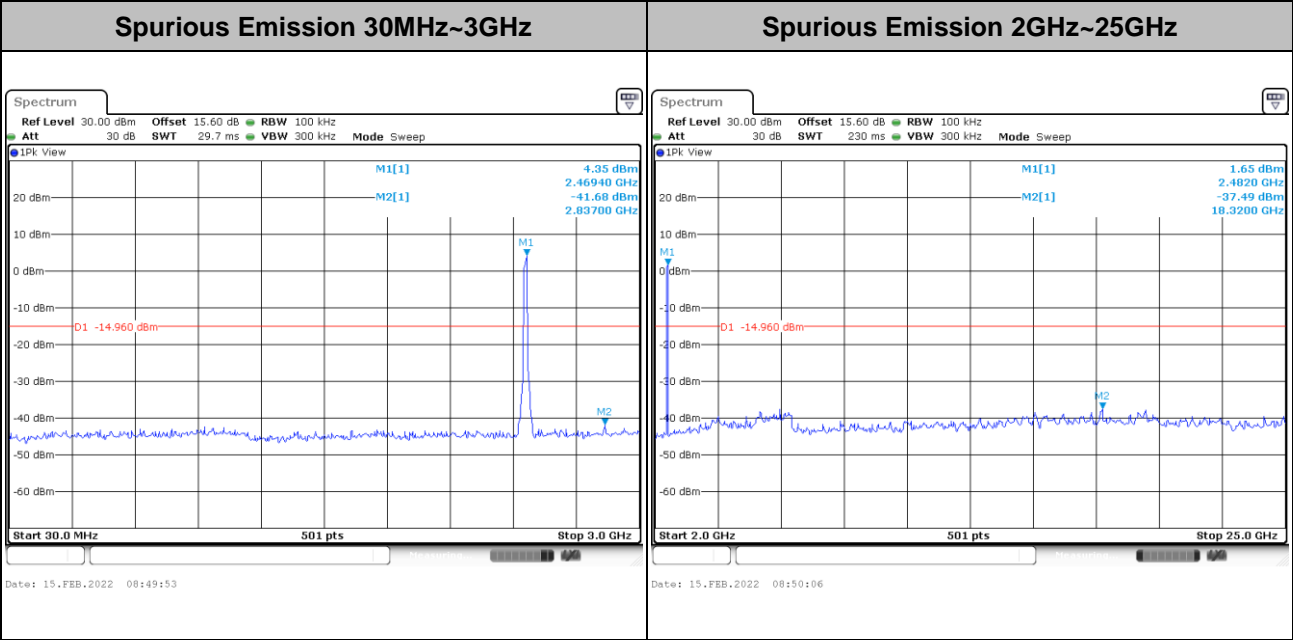
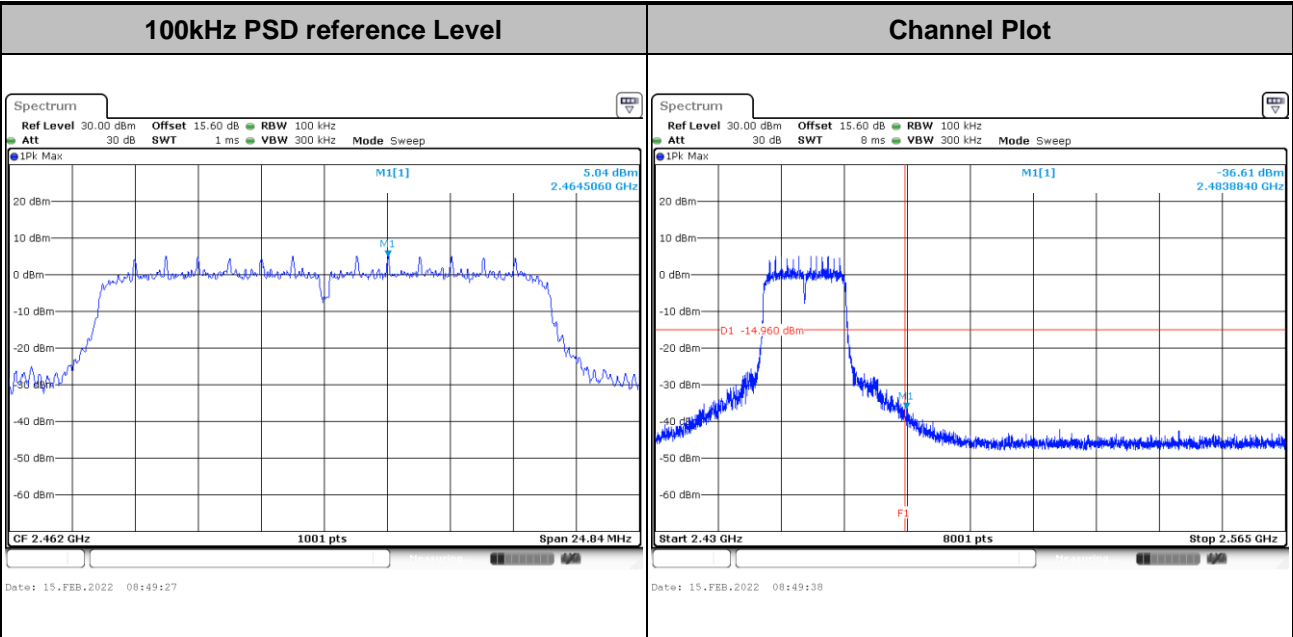


Test Mode :	802.11n HT20	Test Channel :	06
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Test Mode :	802.11n HT20	Test Channel :	11
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3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

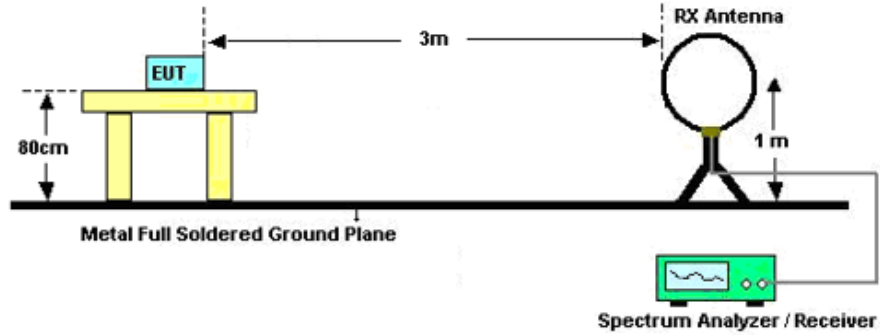


3.5.3 Test Procedures

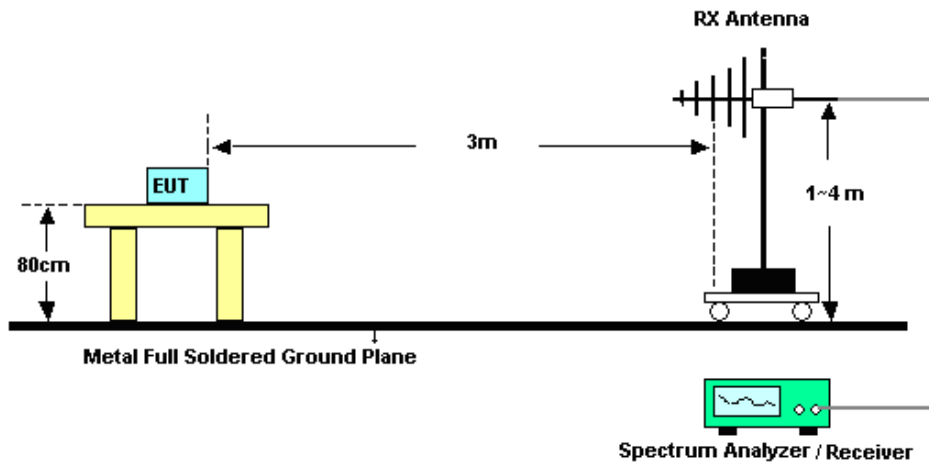
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

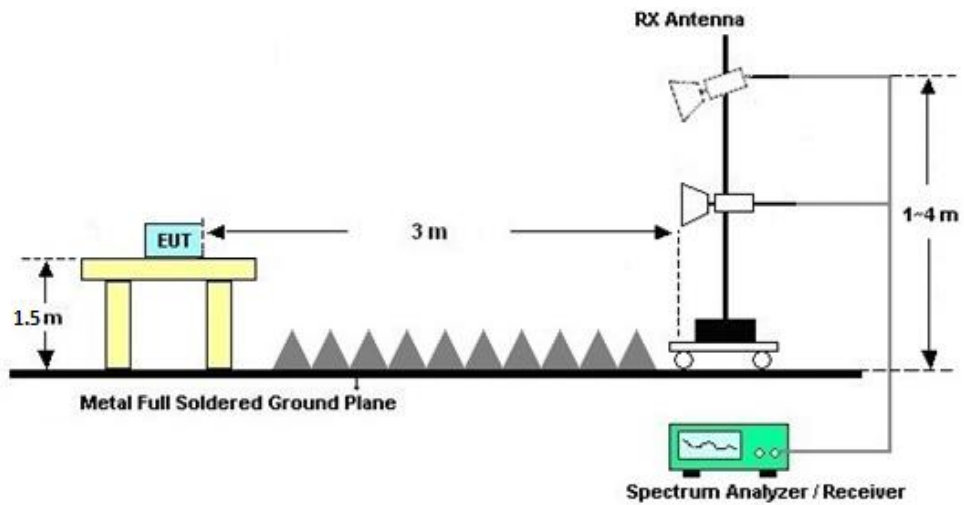
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.5.7 Duty Cycle

Please refer to Appendix C.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix B.



3.6 Antenna Requirements

3.6.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 14, 2021	Feb. 15, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 07, 2022	Feb. 15, 2022	Jan. 06, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 07, 2022	Feb. 15, 2022	Jan. 06, 2023	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 16, 2021	Jan. 06, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz~44G,MAX 30dB	Oct. 16, 2021	Jan. 06, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jan. 06, 2022	Oct. 29, 2022	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz~1GHz	Dec. 22, 2021	Jan. 06, 2022	Dec. 21, 2022	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 30, 2021	Jan. 06, 2022	Oct. 29, 2022	Radiation (03CH02-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1Ghz-18Ghz	Jul. 30, 2021	Jan. 06, 2022	Jul. 29, 2022	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Jan. 06, 2022	Jan. 04, 2023	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 05, 2022	Jan. 06, 2022	Jan. 04, 2023	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 16, 2021	Jan. 06, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 05, 2022	Jan. 06, 2022	Jan. 04, 2023	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002 473	N/A	NCR	Jan. 06, 2022	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Jan. 06, 2022	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Jan. 06, 2022	NCR	Radiation (03CH02-KS)

NCR: No Calibration Required



5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.9dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB
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----- THE END -----



Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Jiang Jun	Temperature:	21~25	°C
Test Date:	2022/2/15	Relative Humidity:	51~54	%

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	20.09	30.00	2.00	22.09	36.00	Pass
11b	1Mbps	1	6	2437	19.65	30.00	2.00	21.65	36.00	Pass
11b	1Mbps	1	11	2462	19.74	30.00	2.00	21.74	36.00	Pass
11g	6Mbps	1	1	2412	23.21	30.00	2.00	25.21	36.00	Pass
11g	6Mbps	1	6	2437	23.25	30.00	2.00	25.25	36.00	Pass
11g	6Mbps	1	11	2462	23.27	30.00	2.00	25.27	36.00	Pass
HT20	MCS0	1	1	2412	23.47	30.00	2.00	25.47	36.00	Pass
HT20	MCS0	1	6	2437	23.51	30.00	2.00	25.51	36.00	Pass
HT20	MCS0	1	11	2462	23.49	30.00	2.00	25.49	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.49	17.85
11b	1Mbps	1	6	2437	0.49	17.49
11b	1Mbps	1	11	2462	0.49	17.52
11g	6Mbps	1	1	2412	0.61	16.38
11g	6Mbps	1	6	2437	0.61	16.53
11g	6Mbps	1	11	2462	0.61	16.58
HT20	MCS0	1	1	2412	0.65	16.57
HT20	MCS0	1	6	2437	0.65	16.63
HT20	MCS0	1	11	2462	0.65	16.71

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	11.34	8.06	0.50	Pass
11b	1Mbps	1	6	2437	11.34	8.08	0.50	Pass
11b	1Mbps	1	11	2462	11.34	8.08	0.50	Pass
11g	6Mbps	1	1	2412	17.48	16.32	0.50	Pass
11g	6Mbps	1	6	2437	17.58	16.32	0.50	Pass
11g	6Mbps	1	11	2462	17.53	16.32	0.50	Pass
HT20	MCS0	1	1	2412	18.08	16.58	0.50	Pass
HT20	MCS0	1	6	2437	18.18	16.58	0.50	Pass
HT20	MCS0	1	11	2462	18.28	16.56	0.50	Pass

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-6.10	2.00	8.00	Pass
11b	1Mbps	1	6	2437	-6.01	2.00	8.00	Pass
11b	1Mbps	1	11	2462	-5.86	2.00	8.00	Pass
11g	6Mbps	1	1	2412	-9.20	2.00	8.00	Pass
11g	6Mbps	1	6	2437	-8.92	2.00	8.00	Pass
11g	6Mbps	1	11	2462	-8.91	2.00	8.00	Pass
HT20	MCS0	1	1	2412	-9.60	2.00	8.00	Pass
HT20	MCS0	1	6	2437	-9.49	2.00	8.00	Pass
HT20	MCS0	1	11	2462	-9.39	2.00	8.00	Pass



Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b Ch01 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2385.27	55.13	-18.87	74	54.5	31.96	8.15	39.48	368	103	P	H
		2389.95	46.05	-7.95	54	45.37	32	8.16	39.48	368	103	A	H
		2412	109.66	-	-	108.93	32.03	8.2	39.5	368	103	P	H
		2410	106.33	-	-	105.6	32.03	8.2	39.5	368	103	A	H
		2385.01	55.49	-18.51	74	54.86	31.96	8.15	39.48	377	223	P	V
		2389.95	46.32	-7.68	54	45.64	32	8.16	39.48	377	223	A	V
		2412	110.26	-	-	109.53	32.03	8.2	39.5	377	223	P	V
		2410	106.95	-	-	106.22	32.03	8.2	39.5	377	223	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11b Ch01 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant., Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Path Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include test data for 802.11b CH 01 at 2412MHz and a Remark section.



2.4GHz 2400~2483.5MHz

WIFI 802.11g Ch11 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 11 2462MHz		2485.42	64.34	-9.66	74	63.38	32.12	8.34	39.5	160	327	P	H
		2483.74	51.87	-2.13	54	50.92	32.12	8.33	39.5	160	327	A	H
		2456	109.02	-	-	108.14	32.1	8.28	39.5	160	327	P	H
		2456	101.29	-	-	100.41	32.1	8.28	39.5	160	327	A	H
		2485.36	63.97	-10.03	74	63.01	32.12	8.34	39.5	100	327	P	V
		2483.68	51.97	-2.03	54	51.02	32.12	8.33	39.5	100	327	A	V
		2456	108.53	-	-	107.65	32.1	8.28	39.5	100	327	P	V
		2456	100.78	-	-	99.9	32.1	8.28	39.5	100	327	A	V
Remark	3. No other spurious found. 4. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11g Ch11 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 1, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Path Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include test data for 802.11g CH 11 and a Remark section.



Emission below 1GHz
2.4GHz WIFI 802.11g (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11g LF		33.88	25.5	-14.5	40	32.75	23.42	0.64	31.31	-	-	P	H
		41.64	27.76	-12.24	40	39.8	18.86	0.75	31.65	-	-	P	H
		57.16	31.18	-8.82	40	47.74	13.88	0.98	31.42	-	-	P	H
		91.11	23.25	-20.25	43.5	37.43	16.21	1.5	31.89	-	-	P	H
		114.39	21.72	-21.78	43.5	33.76	17.93	1.73	31.7	-	-	P	H
		339.43	23.66	-22.34	46	31.17	21.15	2.99	31.65	-	-	P	H
		30	21.75	-18.25	40	27.25	25.15	0.58	31.23	-	-	P	V
		58.13	21.06	-18.94	40	38.44	13.12	1	31.5	-	-	P	V
		68.8	18.26	-21.74	40	36.36	12.65	1.15	31.9	-	-	P	V
		95.96	19.63	-23.87	43.5	33.32	16.66	1.57	31.92	-	-	P	V
		144.46	21.86	-21.64	43.5	34.62	16.69	1.93	31.38	-	-	P	V
	266.68	23.52	-22.48	46	33.55	18.78	2.64	31.45	-	-	P	V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



For Co-location:

2.4GHz 2400~2483.5MHz

WIFI 802.11g<E B13 BW=5M (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
SISO		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2485.36	62.34	-11.66	74	61.38	32.12	8.34	39.5	100	65	P	H
		2483.5	50	-4	54	49.05	32.12	8.33	39.5	100	65	A	H
		2458	105.78	-	-	104.9	32.1	8.28	39.5	100	65	P	H
		2458	98.01	-	-	97.13	32.1	8.28	39.5	100	65	A	H
		2485.54	58.38	-15.62	74	57.42	32.12	8.34	39.5	257	360	P	V
		2483.5	46.36	-7.64	54	45.41	32.12	8.33	39.5	257	360	A	V
		2466	102.37	-	-	101.48	32.1	8.29	39.5	257	360	P	V
		2464	94.6	-	-	93.71	32.1	8.29	39.5	257	360	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g<E B13 BW=5M (Harmonic @ 3m)

WIFI Ant. SISO	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4920	41.93	-32.07	74	62.39	34.1	10.88	65.44	300	0	P	H
		7386	43.52	-30.48	74	59.54	35.8	13.48	65.3	300	0	P	H
		4920	41.66	-32.34	74	62.12	34.1	10.88	65.44	100	0	P	V
		7380	43.44	-30.56	74	59.45	35.8	13.48	65.29	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

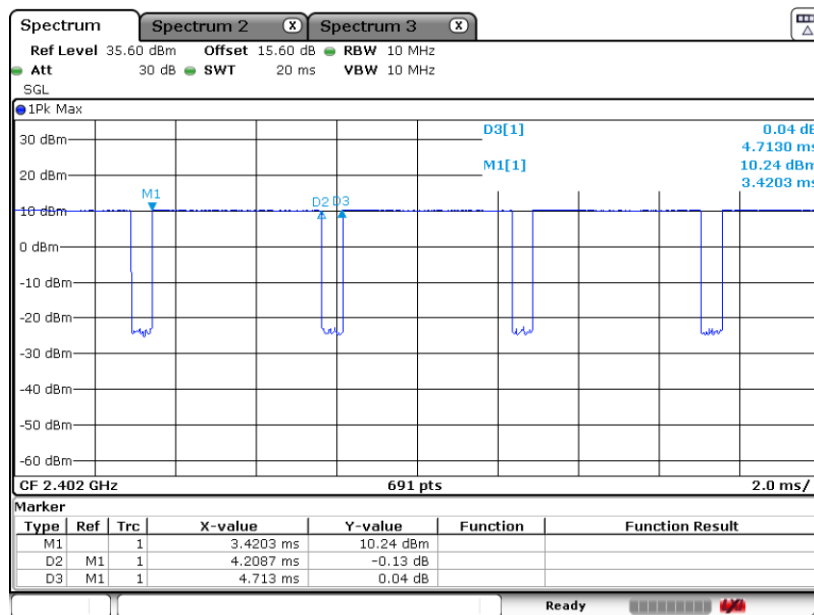
1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Duty Cycle Plots

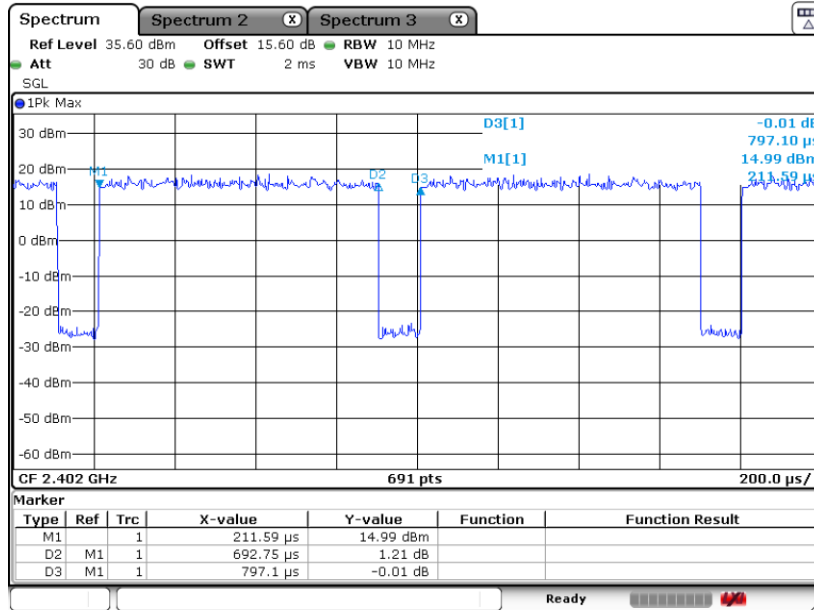
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	89.30	4.209	0.238	0.24KHZ
802.11g	86.91	0.693	1.444	1.5KHZ
802.11n HT20	86.15	0.649	1.54	1.6KHZ

802.11b





802.11g



802.11n HT20

