



FCC RF Test Report

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT2141-2
FCC ID : IHDT56ZP2
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Jun. 07, 2021 ~ Jun. 25, 2021

We, Sporton International (Shenzhen) Inc., 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 (Shenzhen) Inc., the test report shall not be reproduced except in full.

Derreck Chen

Reviewed by: Derreck Chen / Supervisor

Eric Shih

Approved by: Eric Shih / Manager



Sporton International (ShenZhen) Inc.

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055
 People's Republic of China



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR151701-01C	Rev. 01	Initial issue of report	Jul. 09, 2021



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	-	Pass	-
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	≤ 30dBc	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 4.55 dB at 37.760 MHz for Quasi-Peak
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 17.61 dB at 0.260 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	N/A	-

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

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2141-2
FCC ID	IHDT56ZP2
EUT supports Radios application	GSM/WCDMA/LTE/5G NR WLAN 2.4GHz 802.11b/g/n HT20 WLAN 2.4GHz 802.11ac/ax VHT20/HE20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/VHT160 WLAN 5GHz 802.11ax HE20/HE40/HE80/HE160 WLAN 6GHz 802.11a/n HT20/HT40 WLAN 6GHz 802.11ac VHT20/VHT40/VHT80/VHT160 WLAN 6GHz 802.11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE NFC and GNSS
IMEI Code	Conducted: 354398490012366 Conduction: 354398490013232 Radiation: 354398490013265
HW Version	DVT2
SW Version	RRM31.43
EUT Stage	Identical Prototype

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 Output Power to antenna	MIMO <Ant. 1 + 2> 802.11b : 21.66 dBm (0.1466 W) 802.11g : 20.71 dBm (0.1178 W) 802.11n HT20 : 19.91 dBm (0.0979 W) 802.11ac VHT20 : 19.81 dBm (0.0957 W) 802.11ax HE20 : 20.06 dBm (0.1014 W)						
99% Occupied Bandwidth	802.11b : 14.64MHz 802.11g : 17.73MHz 802.11n HT20 : 18.58MHz 802.11ax HE20 : 19.68MHz						
Antenna Type / Gain	Ant. 1: Loop Antenna with gain -2.95 dBi Ant. 2: PIFA Antenna with gain -5.41 dBi						
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n/ac/ax: OFDM (BPSK / QPSK / 16QAM / 64QAM/ 256QAM / 1024QAM)						
Antenna Function	<table border="1"> <thead> <tr> <th></th> <th>Ant. 1</th> <th>Ant. 2</th> </tr> </thead> <tbody> <tr> <td>802.11b/g/n/ac/ax MIMO</td> <td colspan="2" style="text-align: center;">V</td> </tr> </tbody> </table>		Ant. 1	Ant. 2	802.11b/g/n/ac/ax MIMO	V	
	Ant. 1	Ant. 2					
802.11b/g/n/ac/ax MIMO	V						

Note:

1. For 802.11n HT20 / ac VHT20 mode, the whole testing have assessed only 802.11n HT20 by referring to their maximum conducted power.
2. The EUT supports for MIMO mode only.

1.5 Modification of EUT

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



1.6 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH03-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH03-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

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
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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.



1.9 Specification of Accessory

Specification of Accessory				
AC Adapter 1	Brand Name	Motorola (Salom)	Model Name	MC-301
AC Adapter 2	Brand Name	Motorola (Acbel)	Model Name	MC-301
Battery	Brand Name	Motorola (ATL)	Model Name	MB50
USB Cable 1	Brand Name	Motorola (Luxshare)	Model Name	SC18D13217
USB Cable 2	Brand Name	Motorola (Saibao)	Model Name	SC18D13215
USB Cable 3	Brand Name	Motorola (Cabletech)	Model Name	SC18D13216



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: conduction emission (150 kHz to 30 MHz), 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 (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

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.

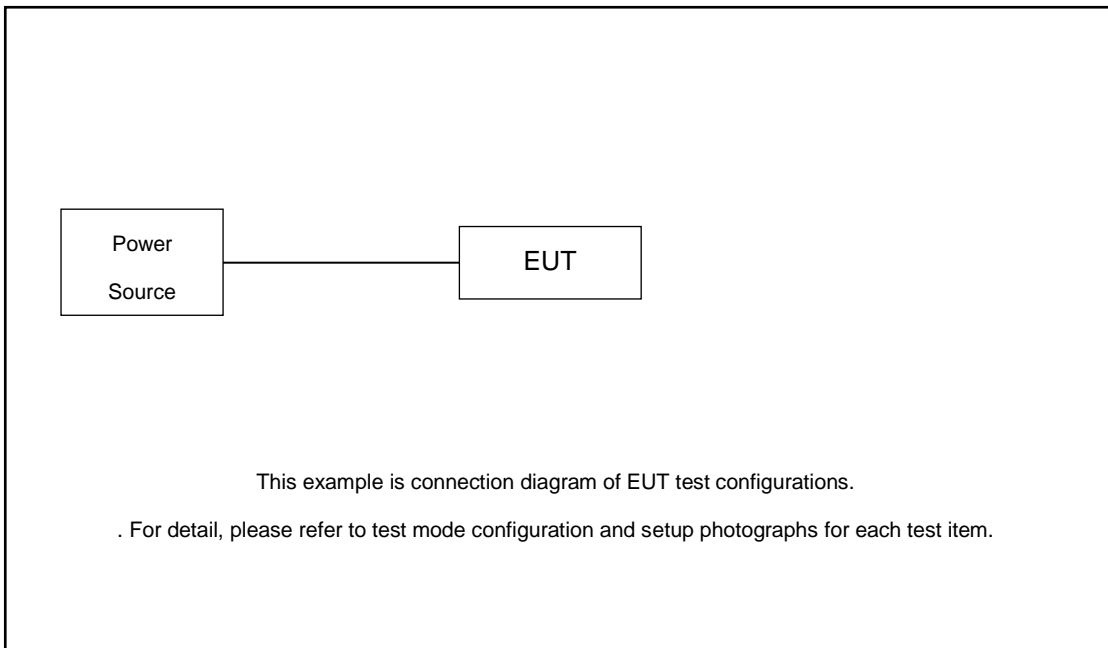
MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11ax HE20	MCS0

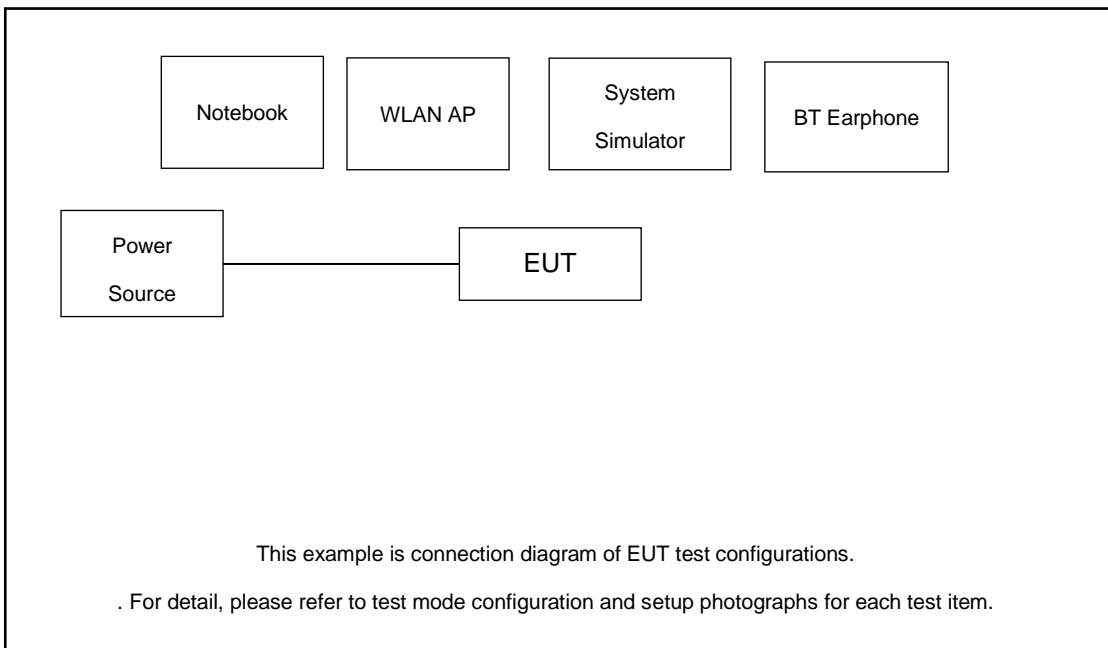
Test Cases	
AC Conducted Emission	Mode 1 :GSM850 Idle + Bluetooth Link + WLAN(2.4G)Link + USB Cable 1(Charging from Adapter 1) + Battery
Remark: For Radiated Test Cases, The tests were performed with Adapter 1, Battery and USB Cable 1.	

2.3 Connection Diagram of Test System

For Radiated Emission



For Conducted Emission





2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Bluetooth Earphone	Samsung	EO-MG900	N/A	N/A	N/A
3.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P Unshielded,1.2m DC O/P : Shielded, 1.8m
4.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m

2.5 EUT Operation Test Setup

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

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 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 5.0 dB and 10dB attenuator.

$$\begin{aligned}
\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
&= 5.0 + 10 = 15.0 \text{ (dB)}
\end{aligned}$$

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.

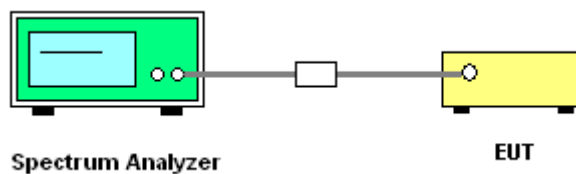
3.1.2 Measuring Instruments

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.

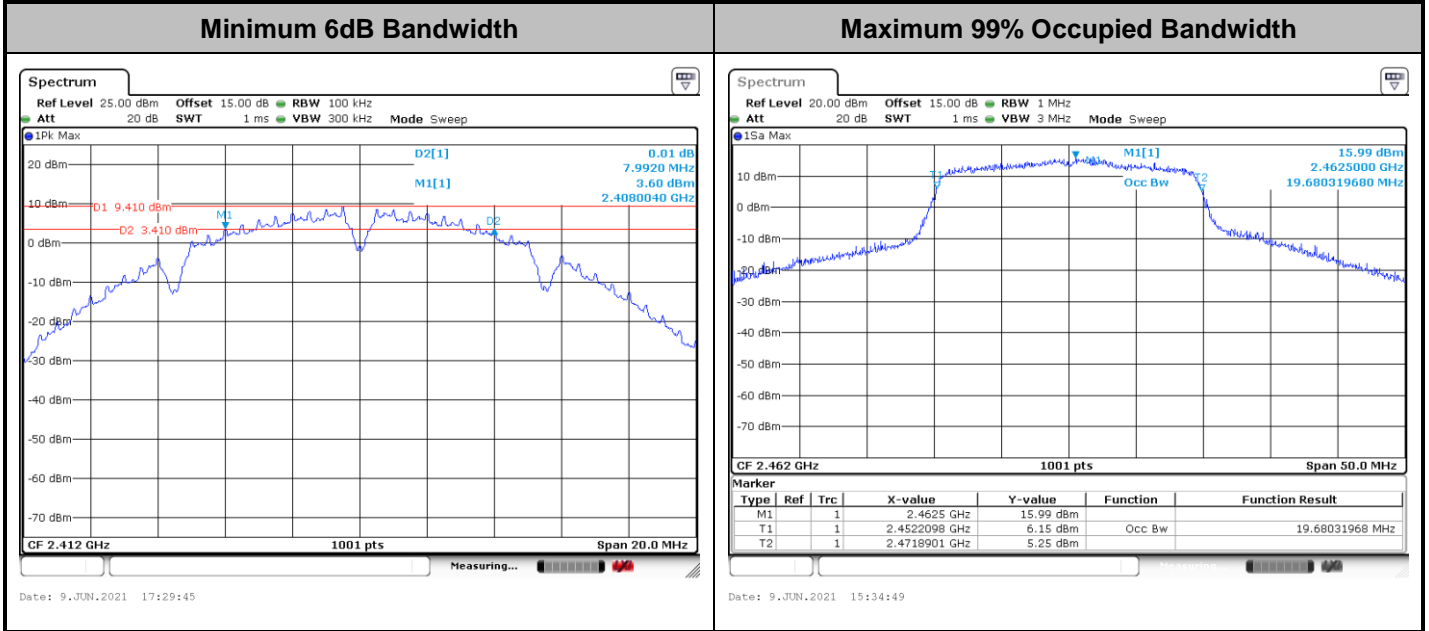
3.1.4 Test Setup





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 output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the 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.

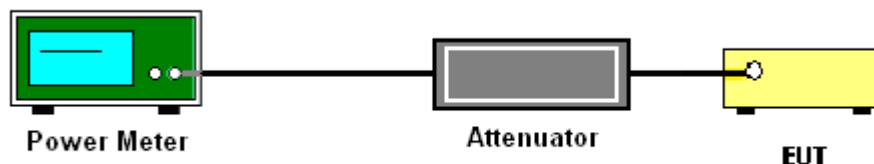
3.2.2 Measuring Instruments

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 11.9.2.3.2 Method AVGPM-G 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.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup



3.2.5 Test Result of Average output Power

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.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

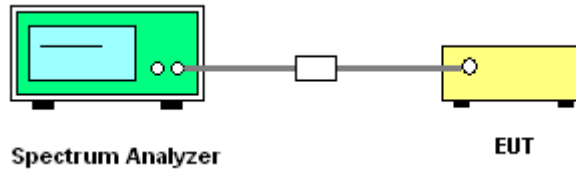
If measurements performed using method (2) plus $10 \log(N)$ exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

Method (1): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

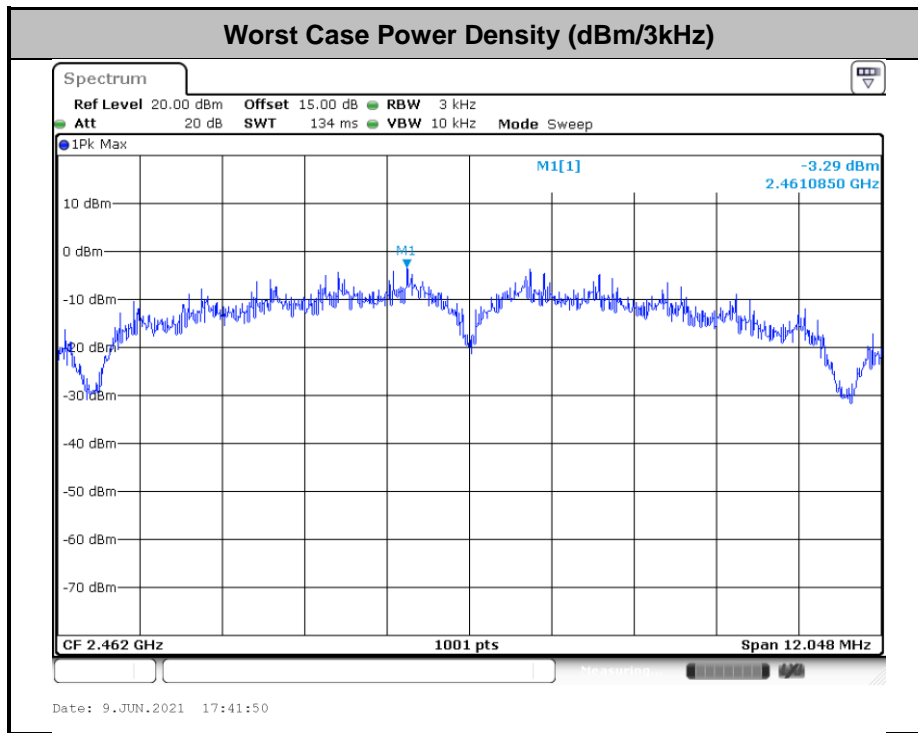
Method (2): Measure and add $10 \log(N)$ dB, where N is the number of outputs. (N=2)

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.

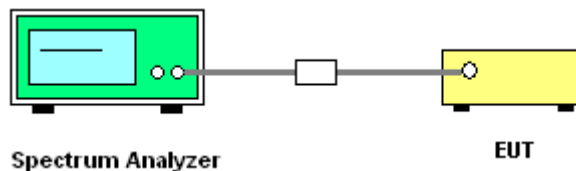
3.4.2 Measuring Instruments

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



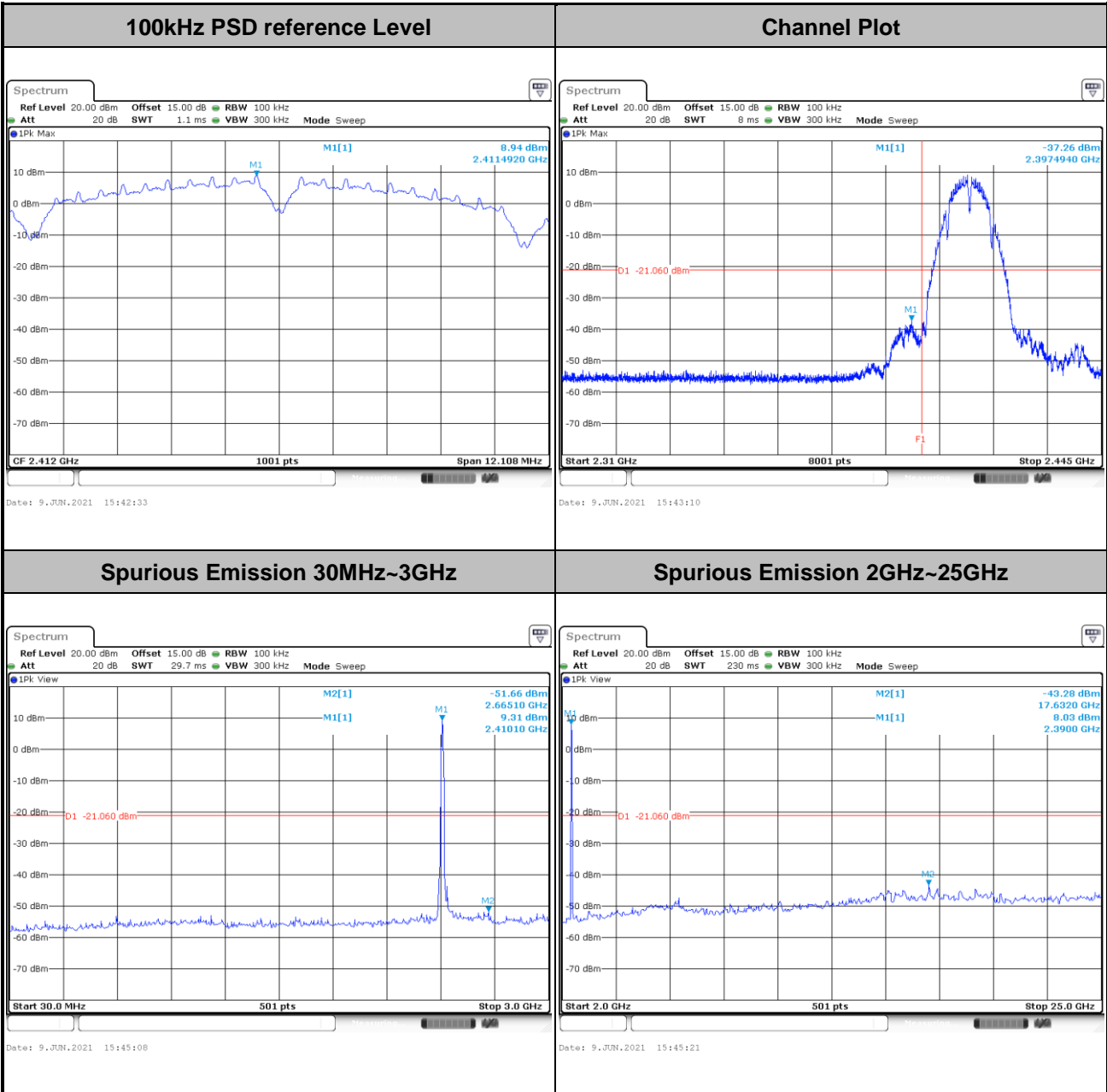


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer : Jason Zhang	Temperature : 24~26°C
	Relative Humidity : 50~53%

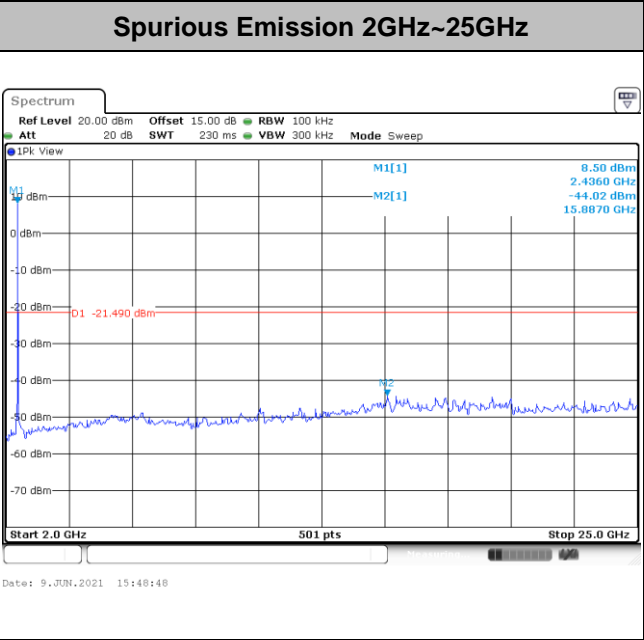
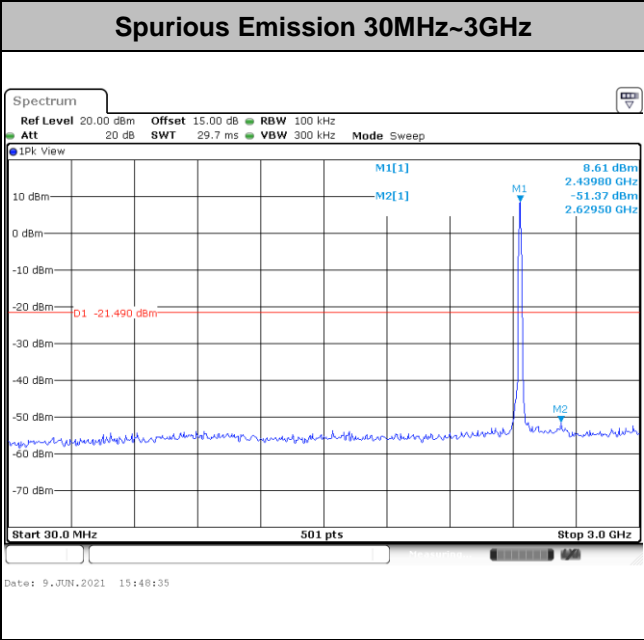
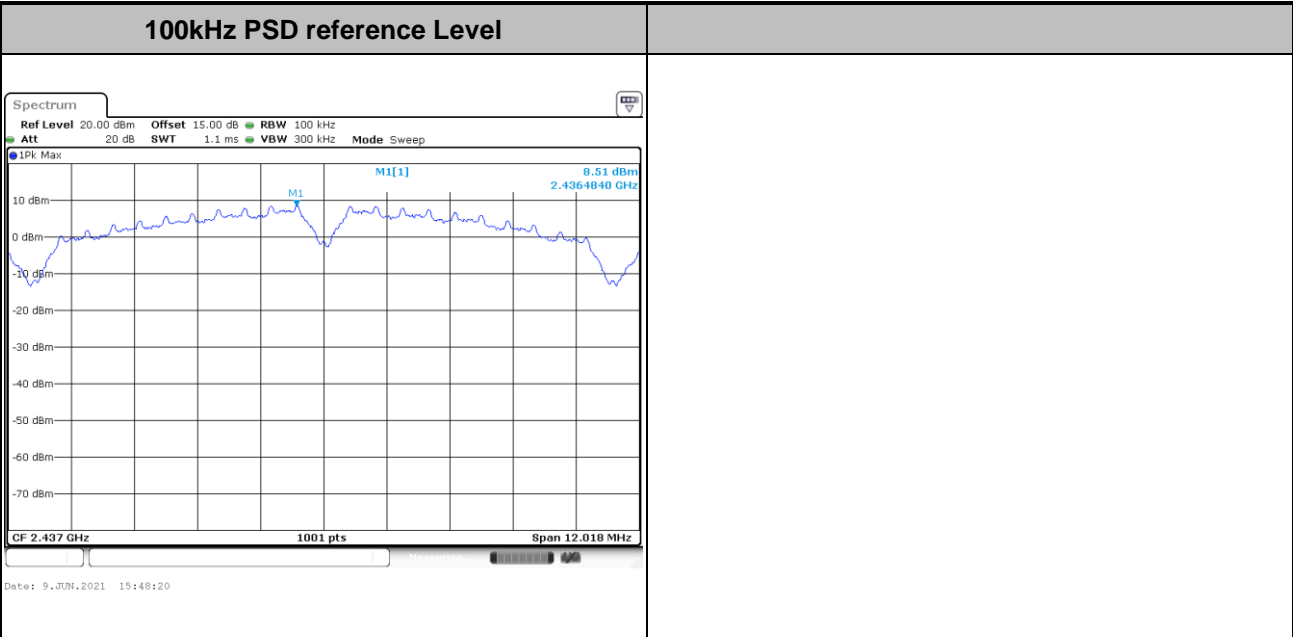
Number of TX = 2, Ant. 1 (Measured)

Test Mode : 802.11b	Test Channel : 01
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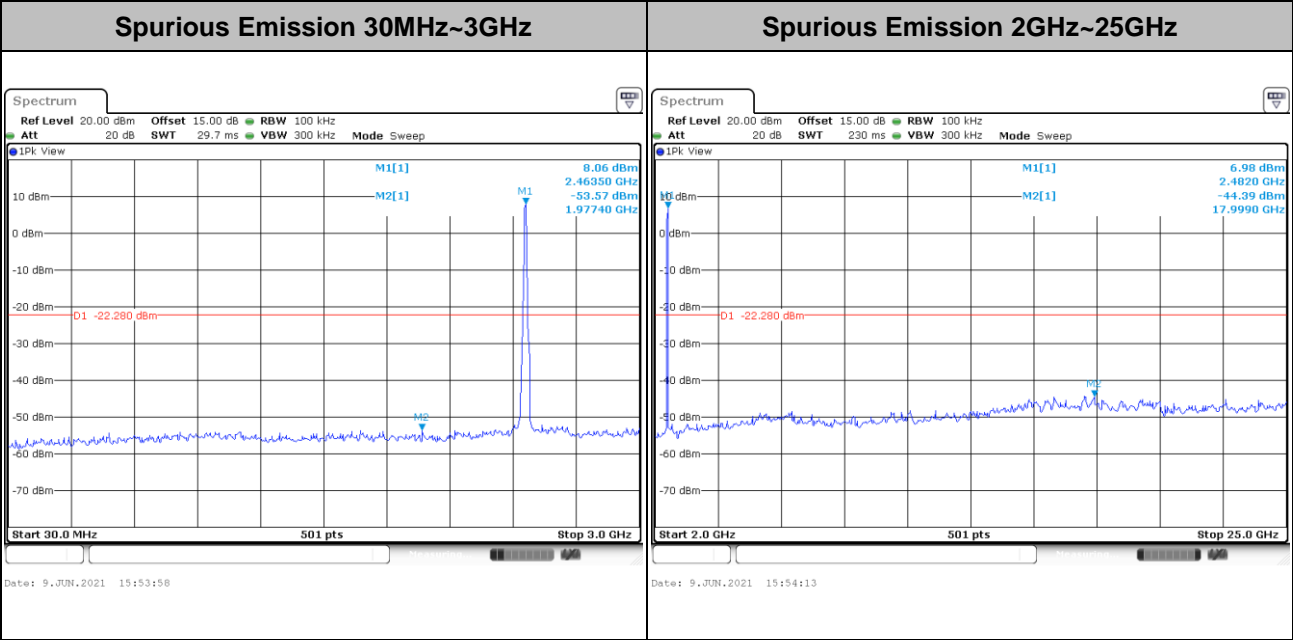
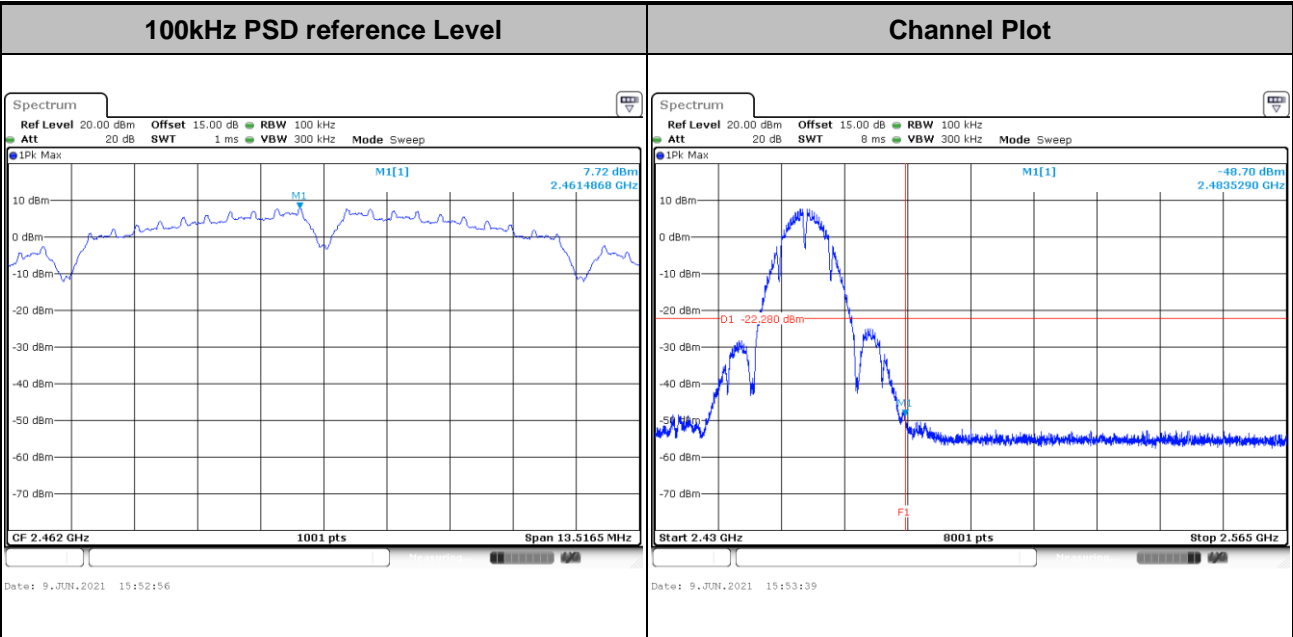


Test Mode :	802.11b	Test Channel :	06
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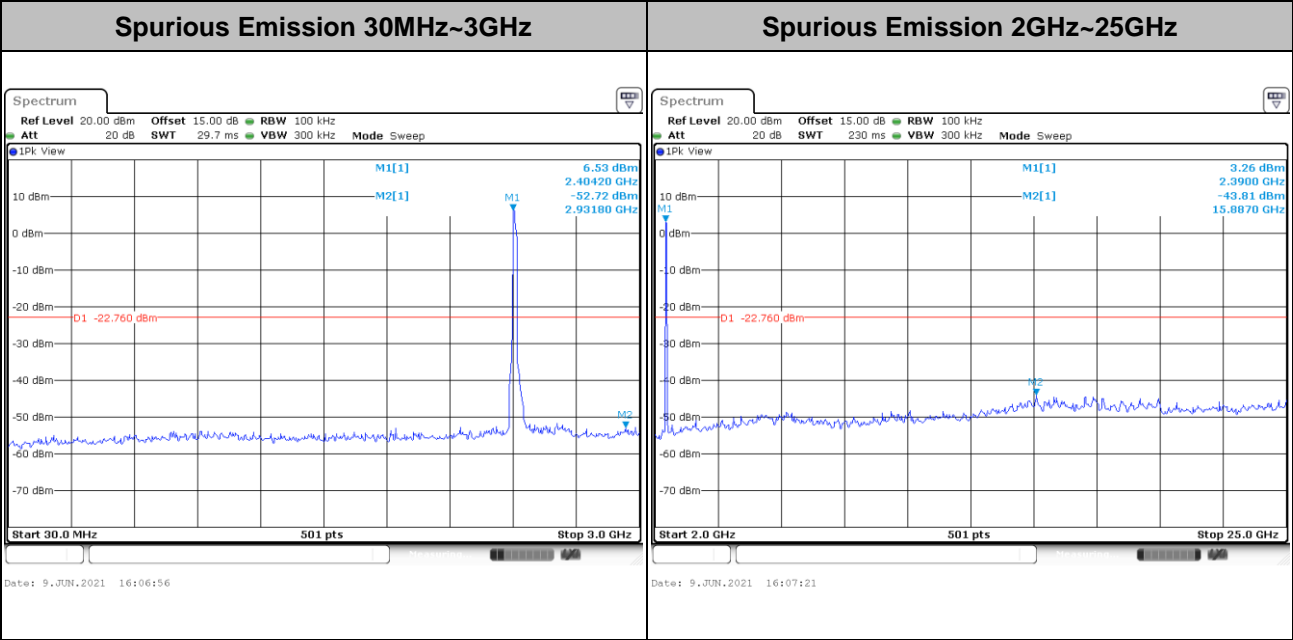
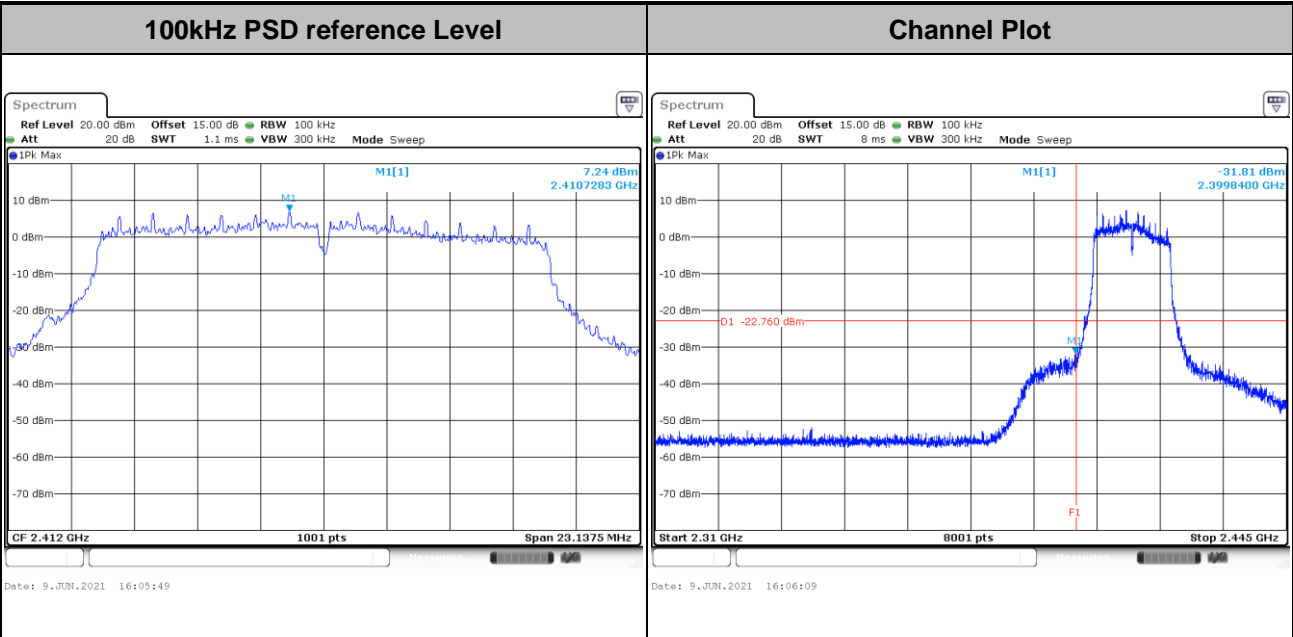


Test Mode :	802.11b	Test Channel :	11
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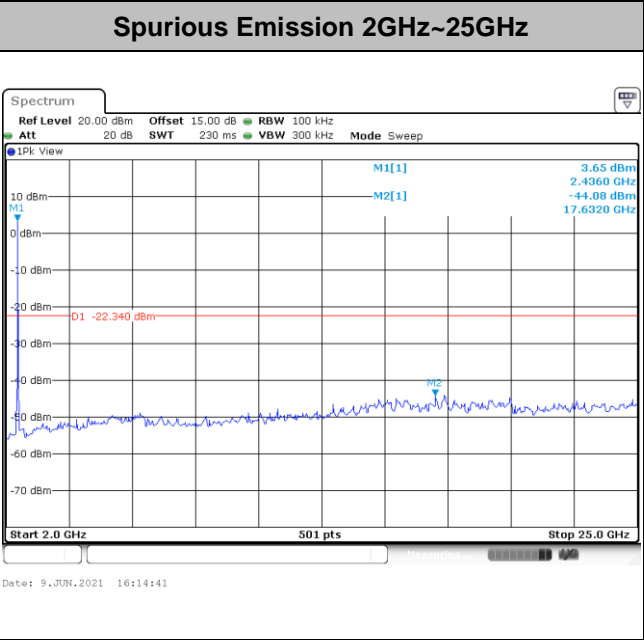
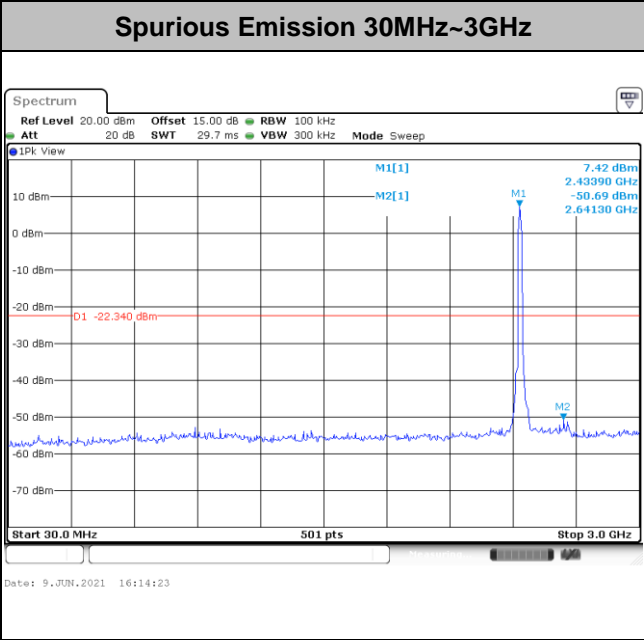
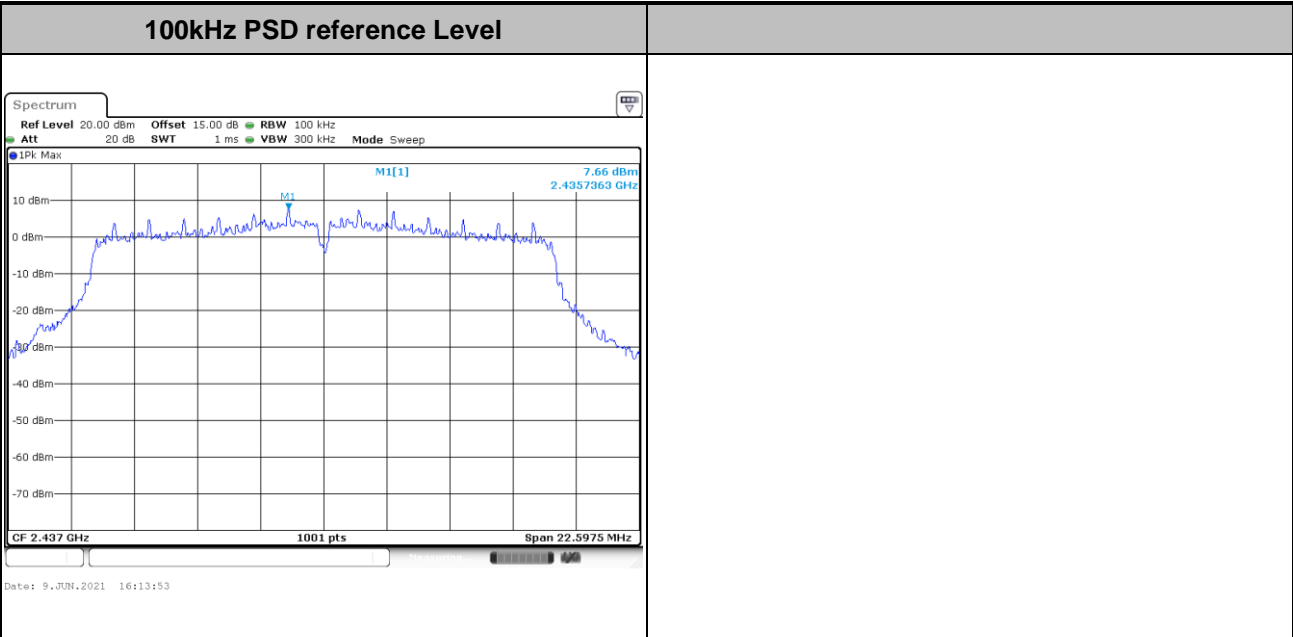


Test Mode : 802.11g	Test Channel : 01
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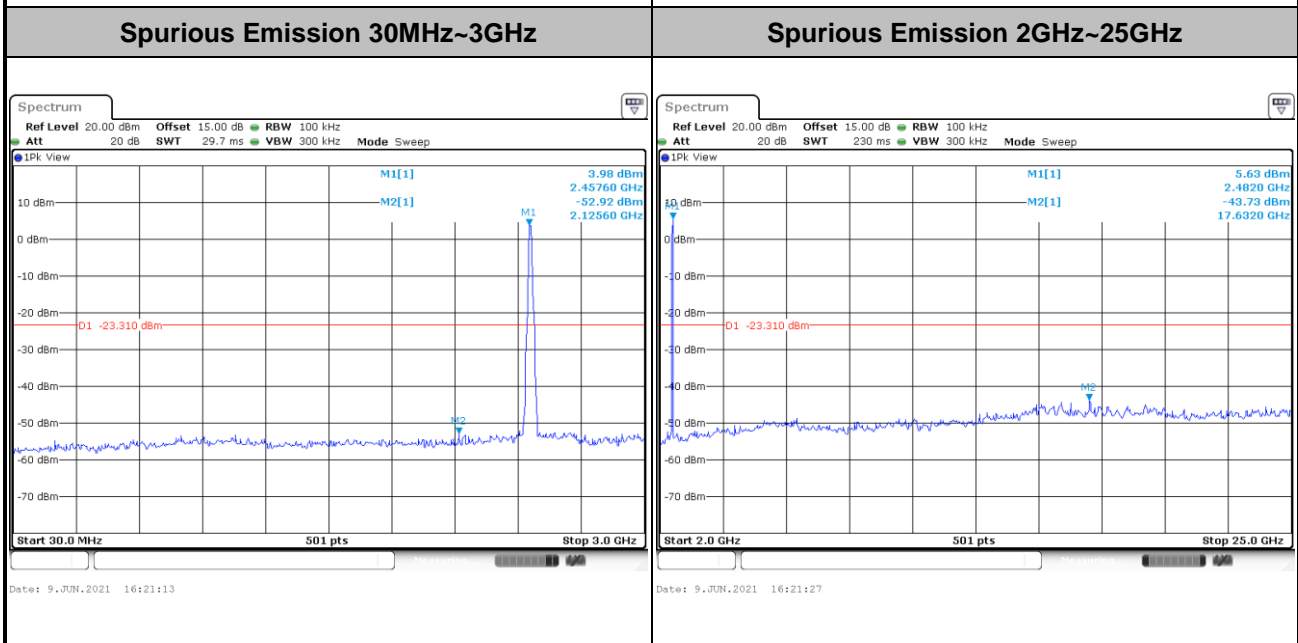
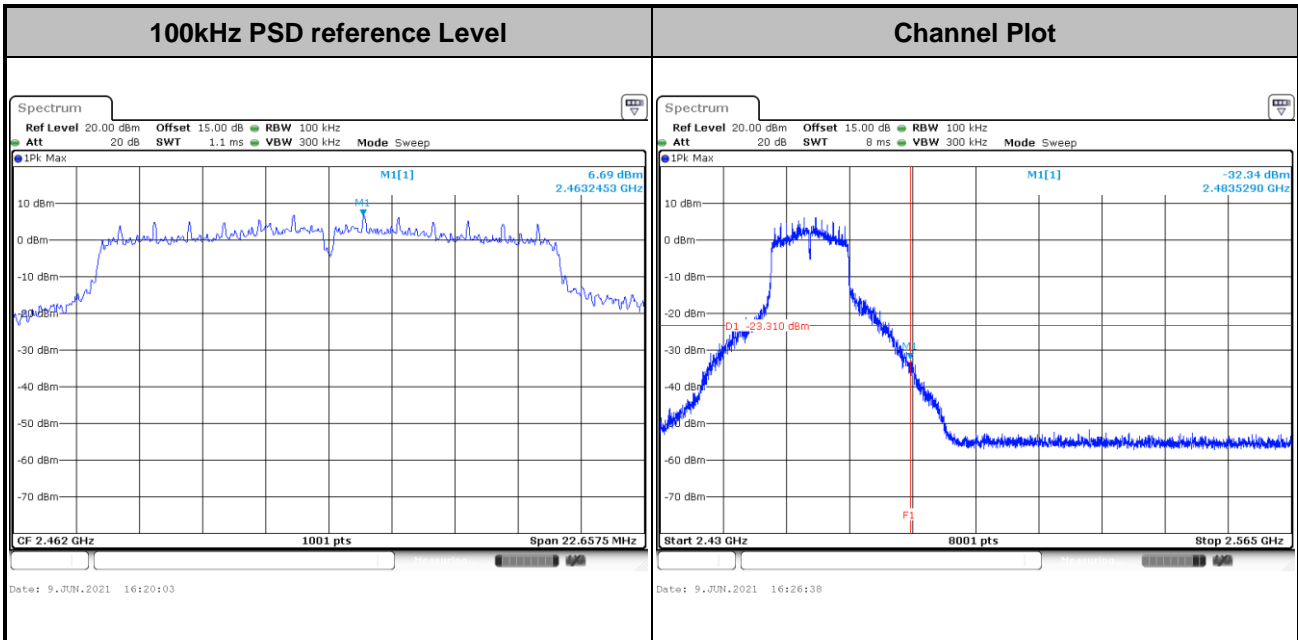


Test Mode :	802.11g	Test Channel :	06
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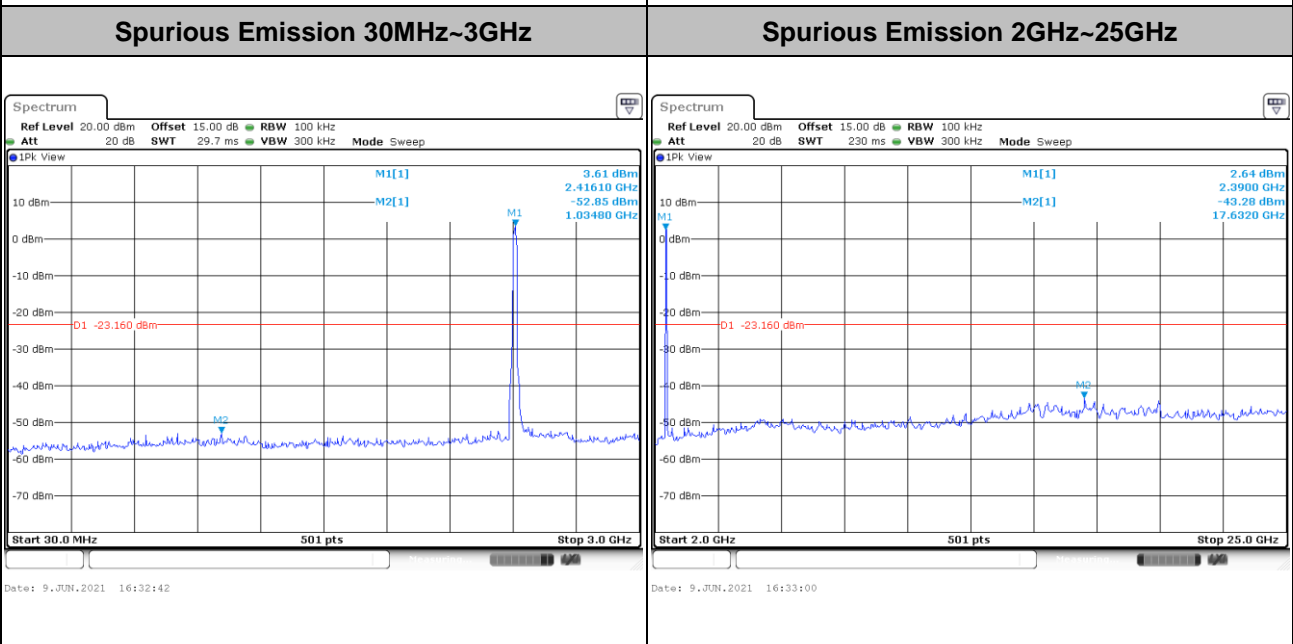
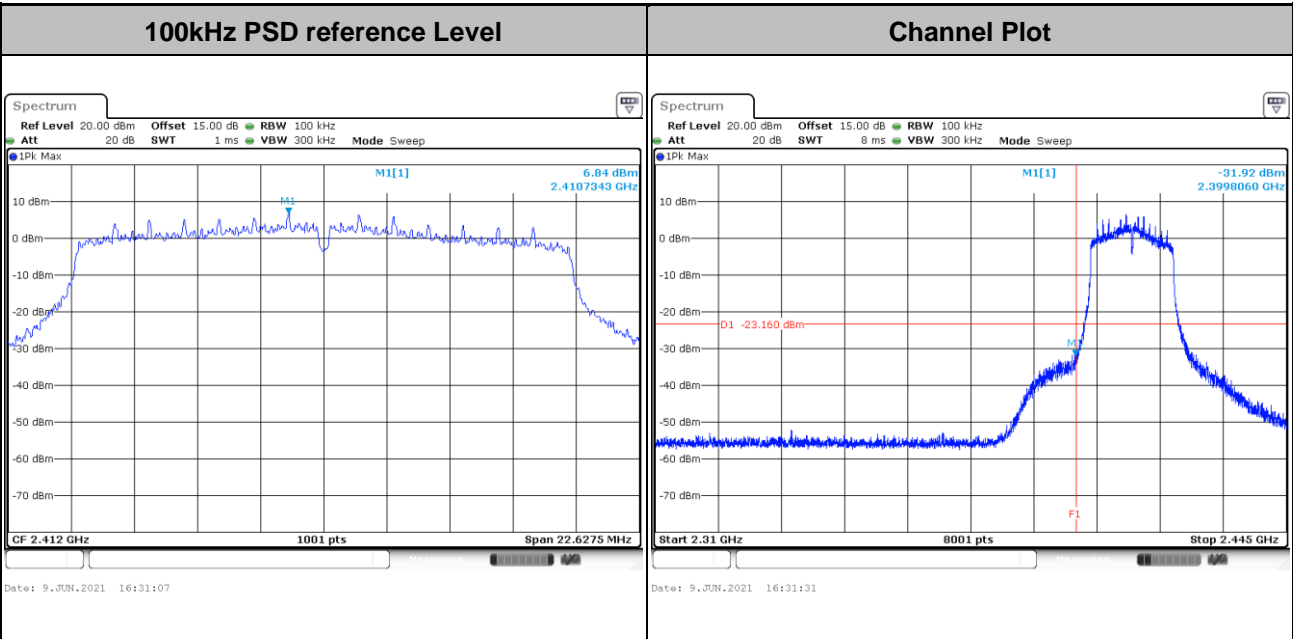


Test Mode :	802.11g	Test Channel :	11
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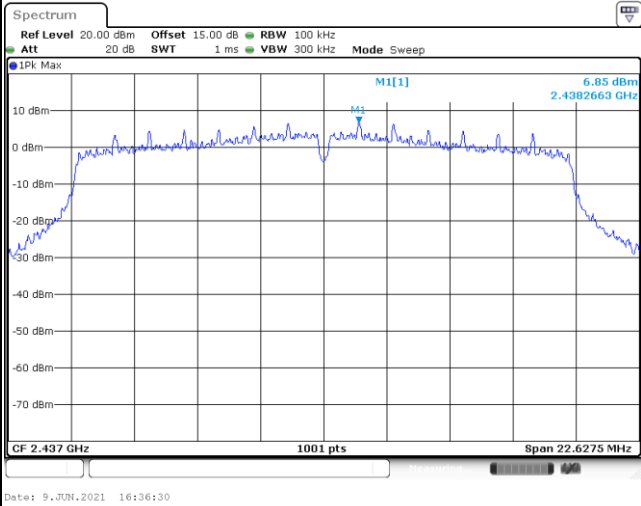
Test Mode : 802.11n HT20	Test Channel : 01
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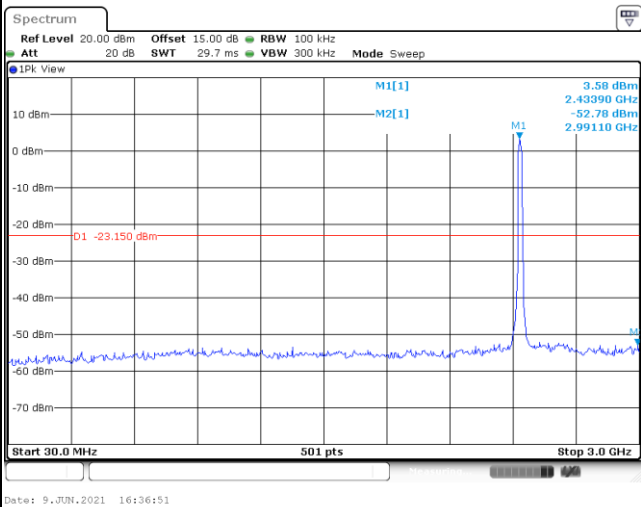


Test Mode :	802.11n HT20	Test Channel :	06
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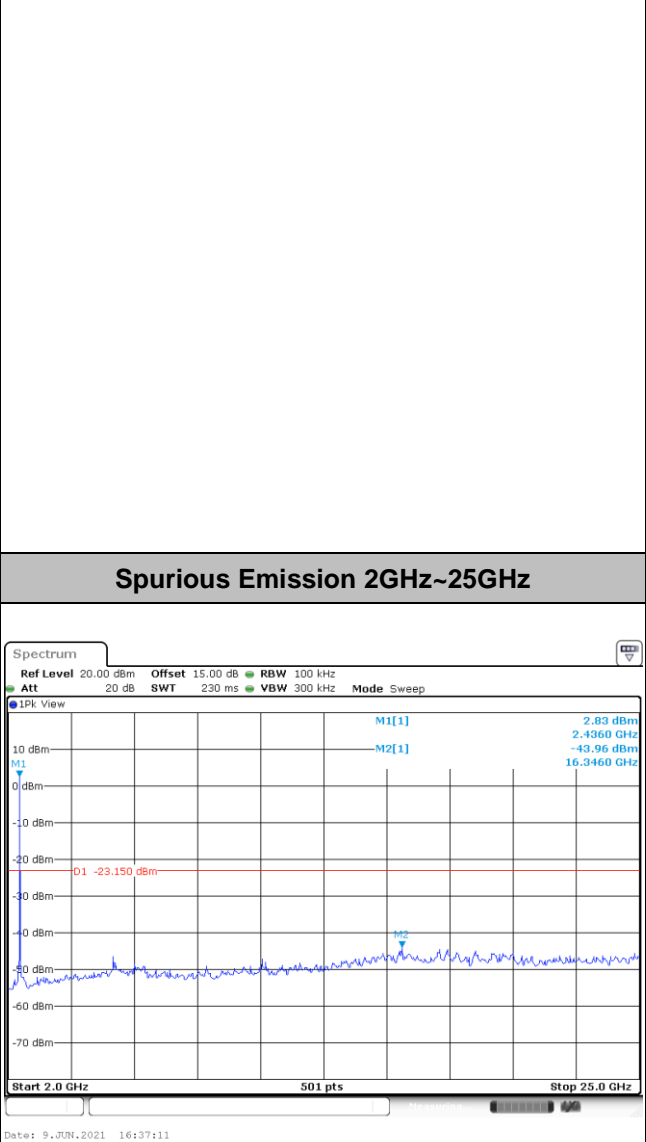
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

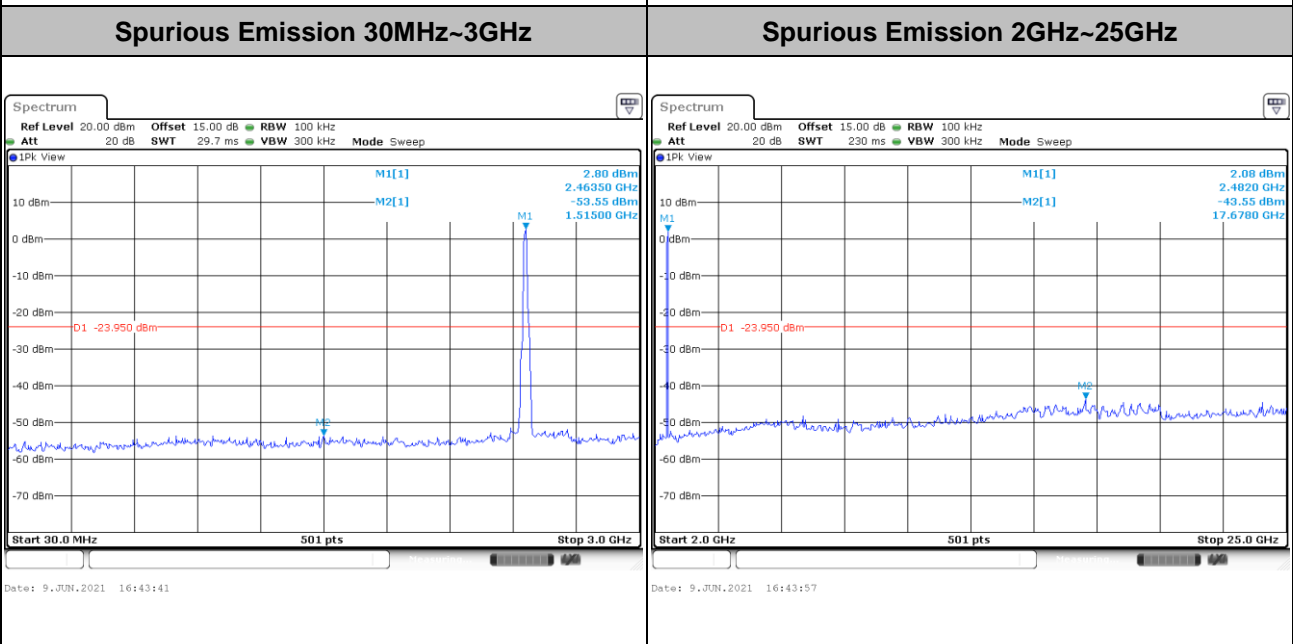
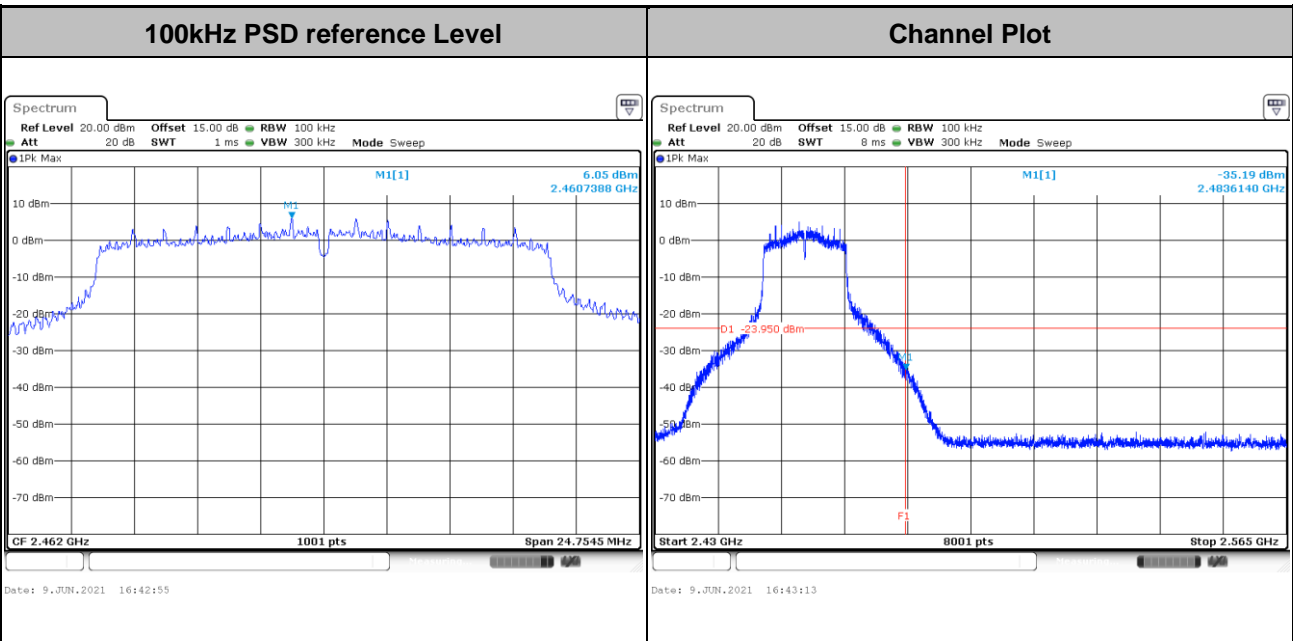


Spurious Emission 2GHz~25GHz



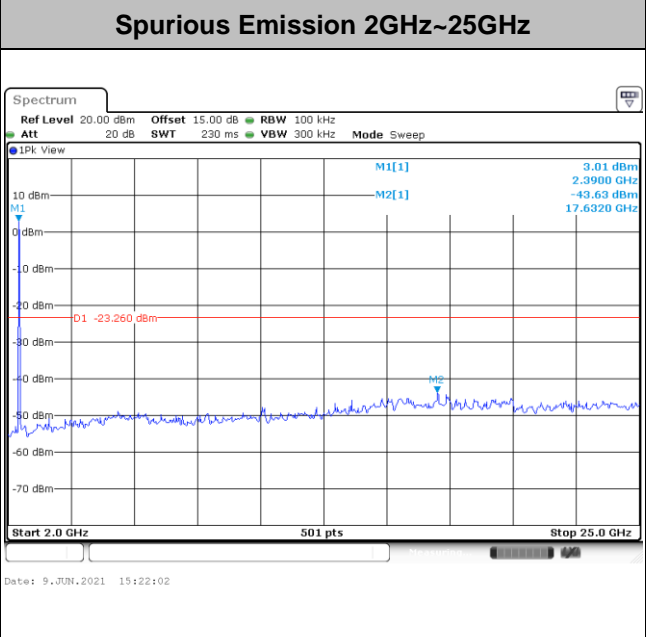
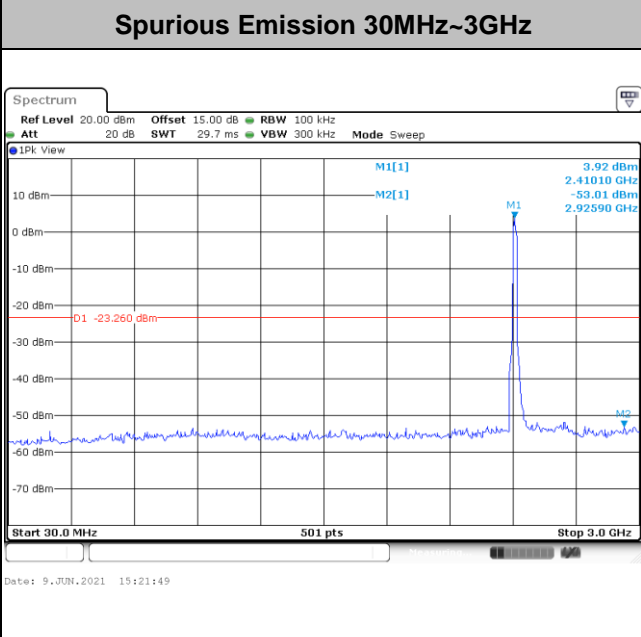
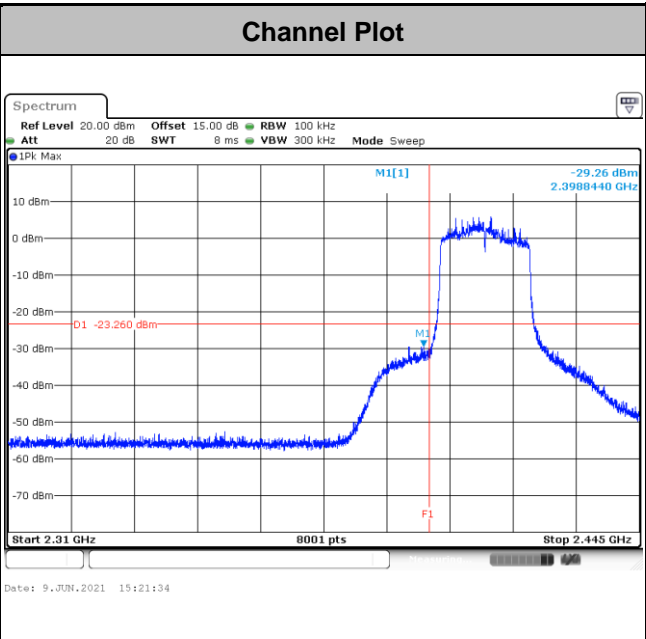
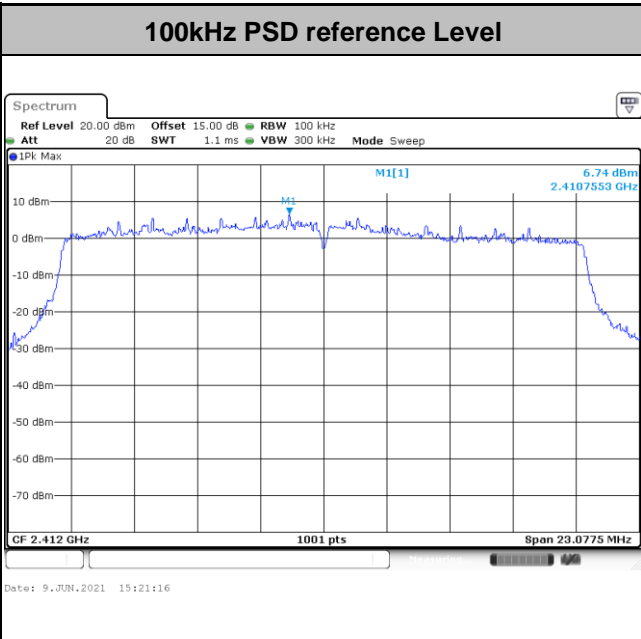


Test Mode :	802.11n HT20	Test Channel :	11
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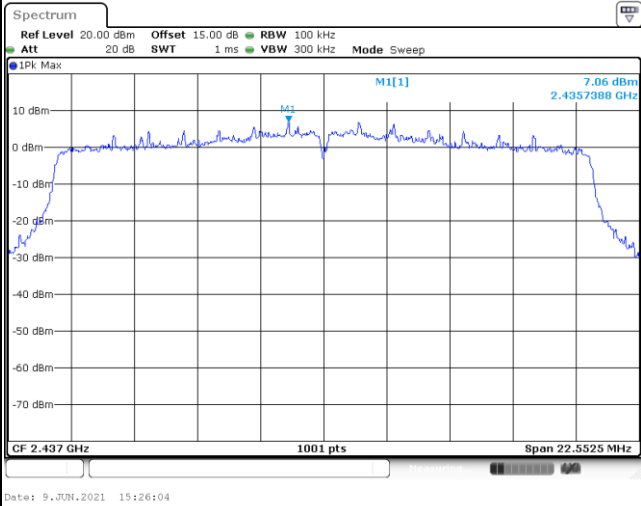
Test Mode : 802.11ax HE20 Test Channel : 01



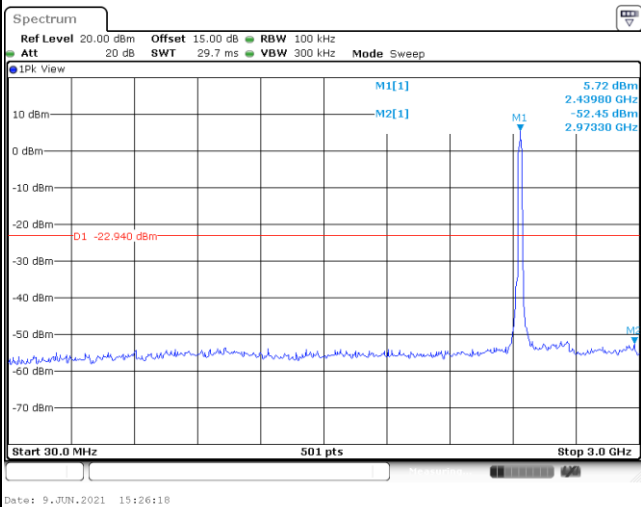


Test Mode :	802.11ax HE20	Test Channel :	06
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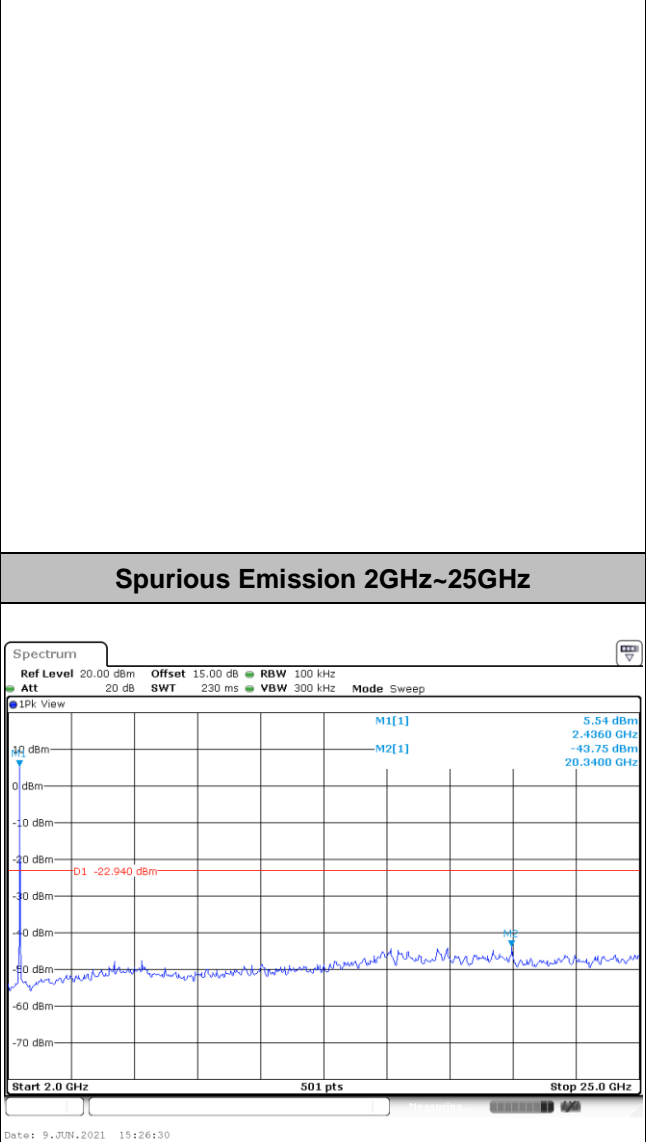
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

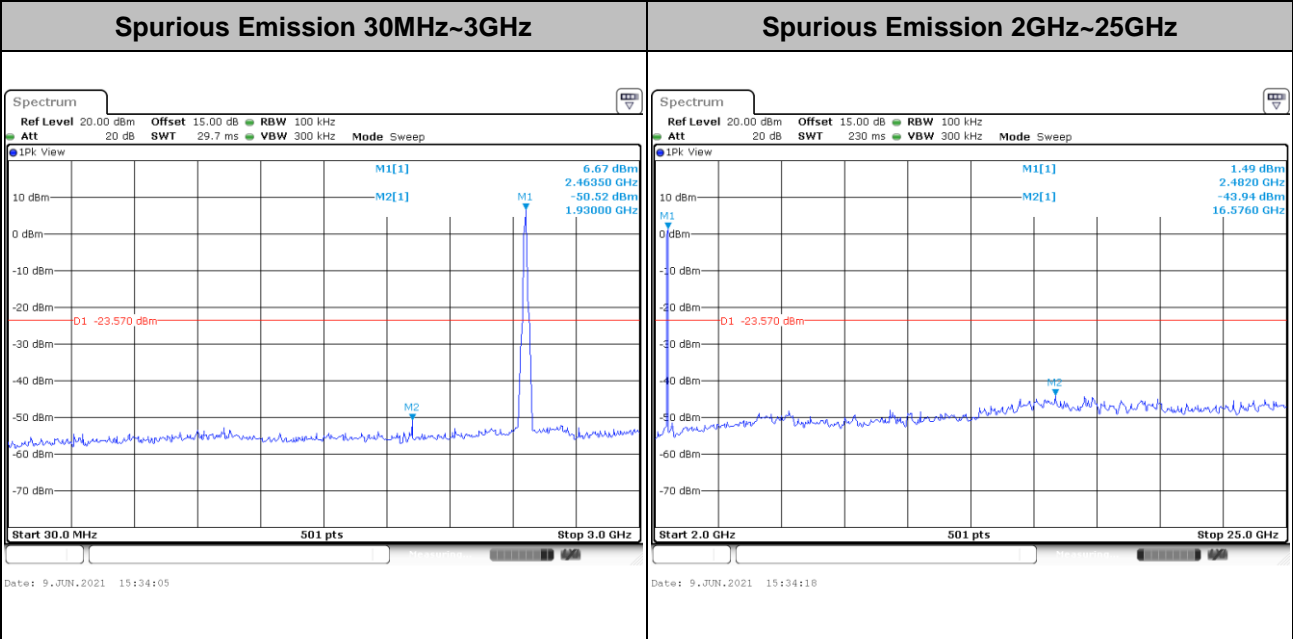
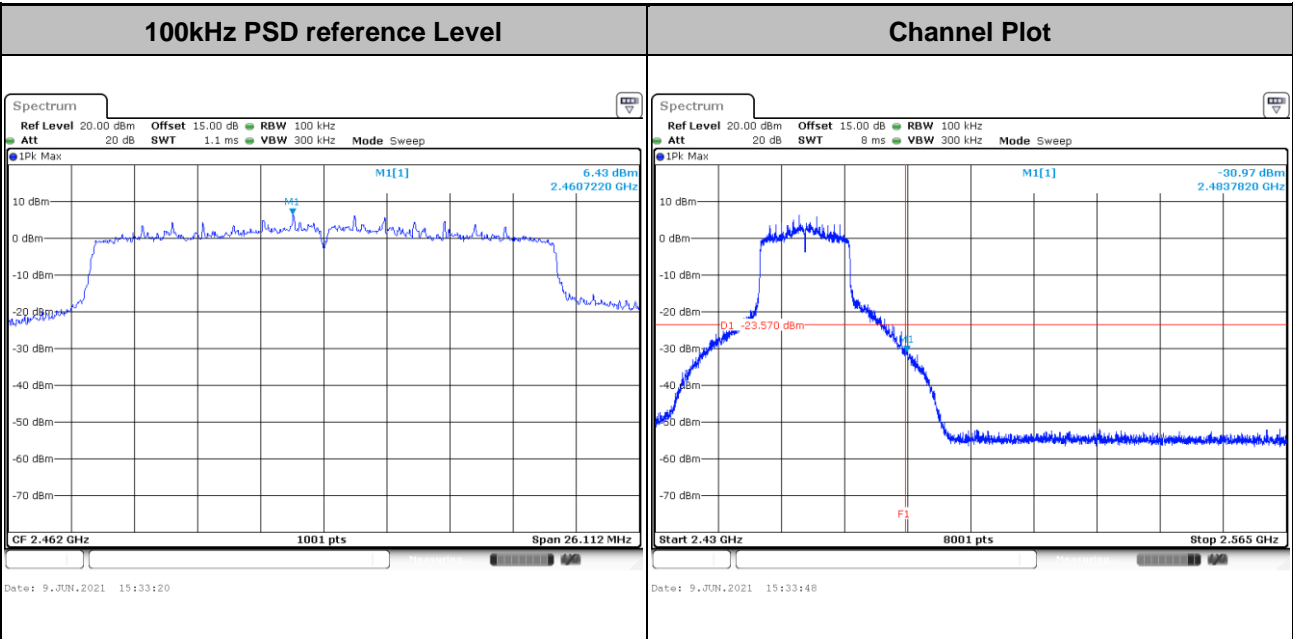


Spurious Emission 2GHz~25GHz





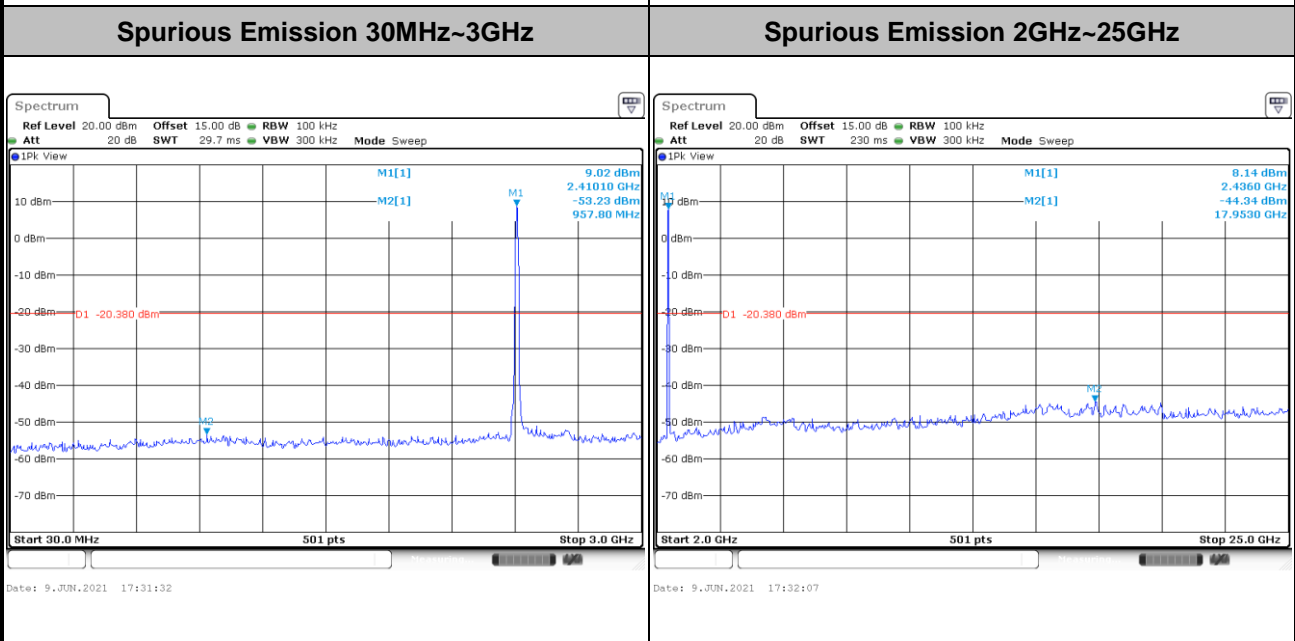
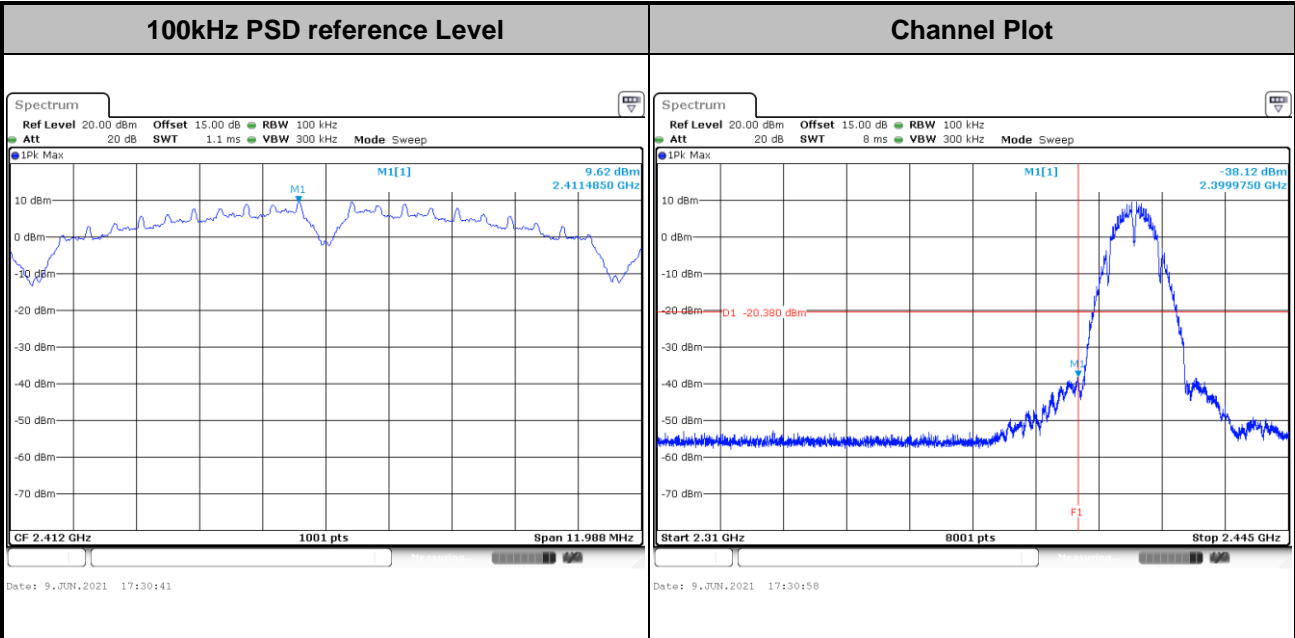
Test Mode : 802.11ax HE20	Test Channel : 11
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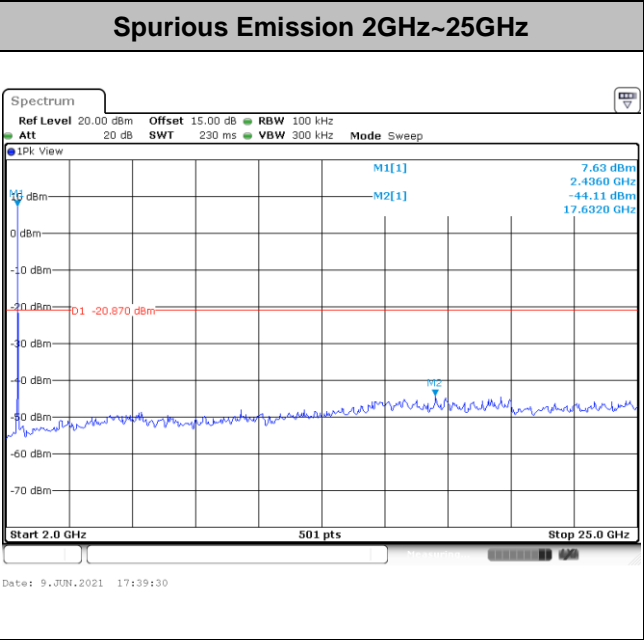
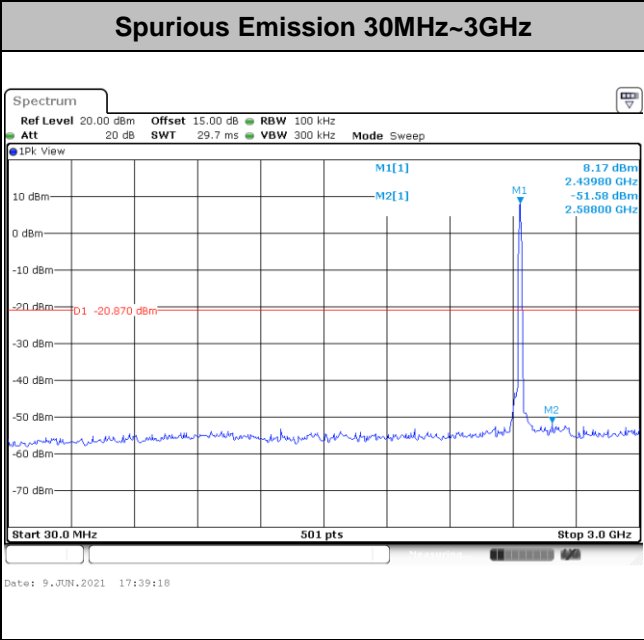
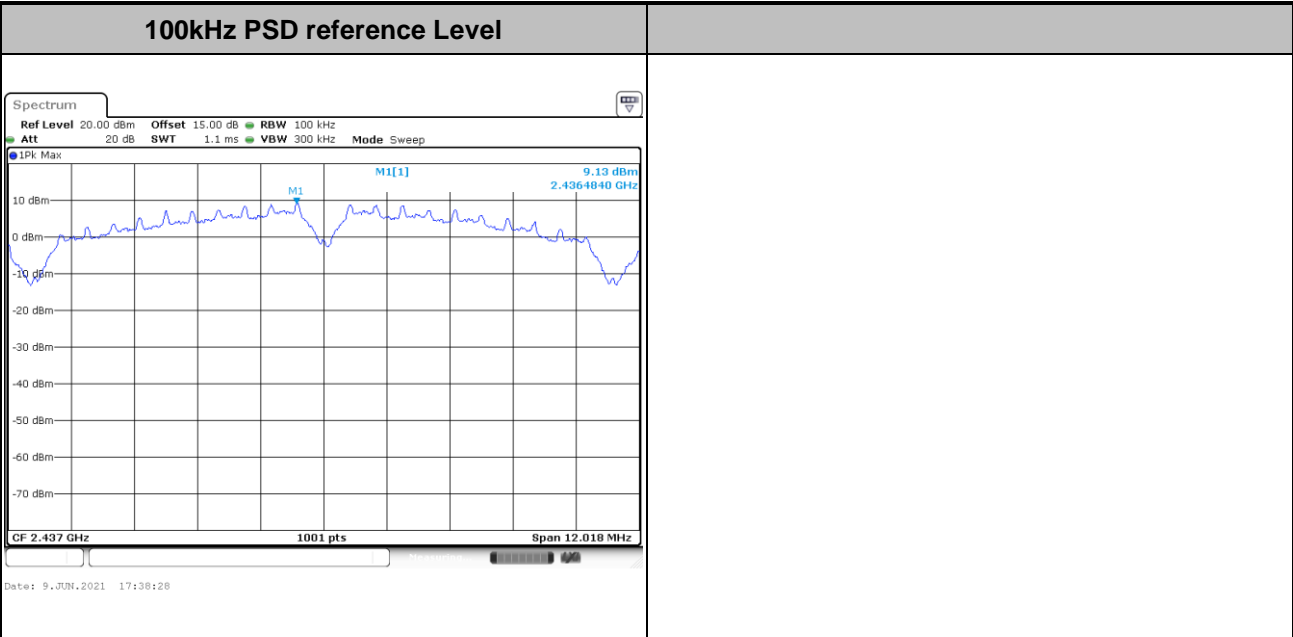
Number of TX = 2, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01
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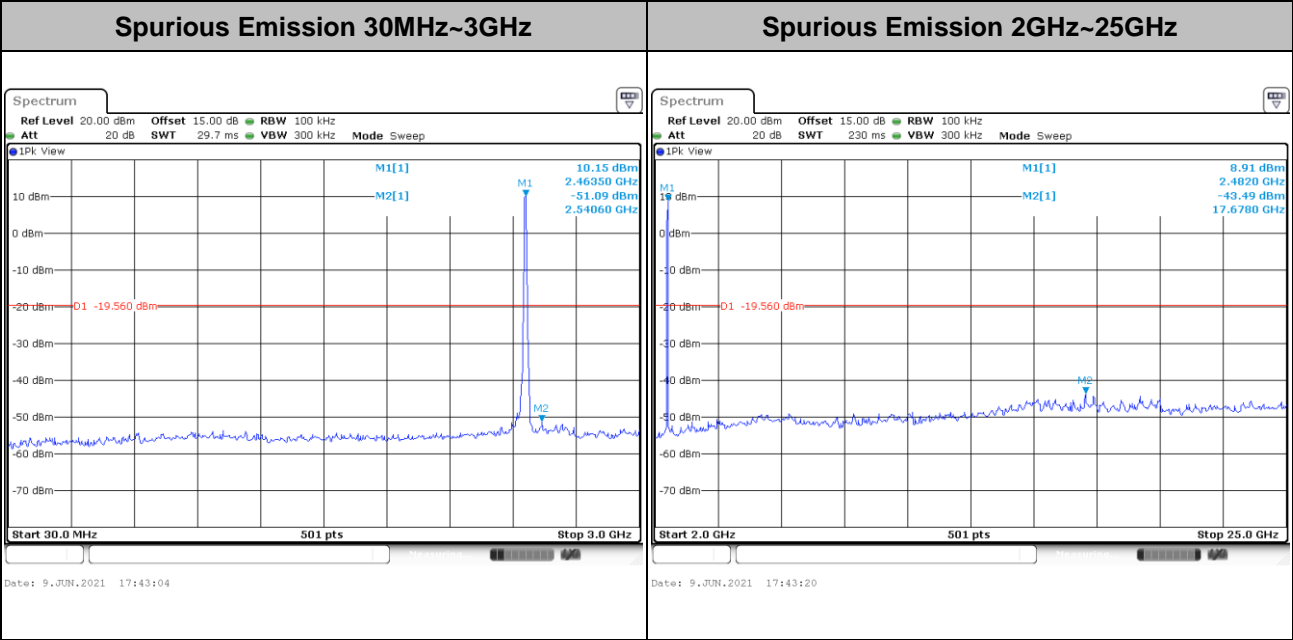
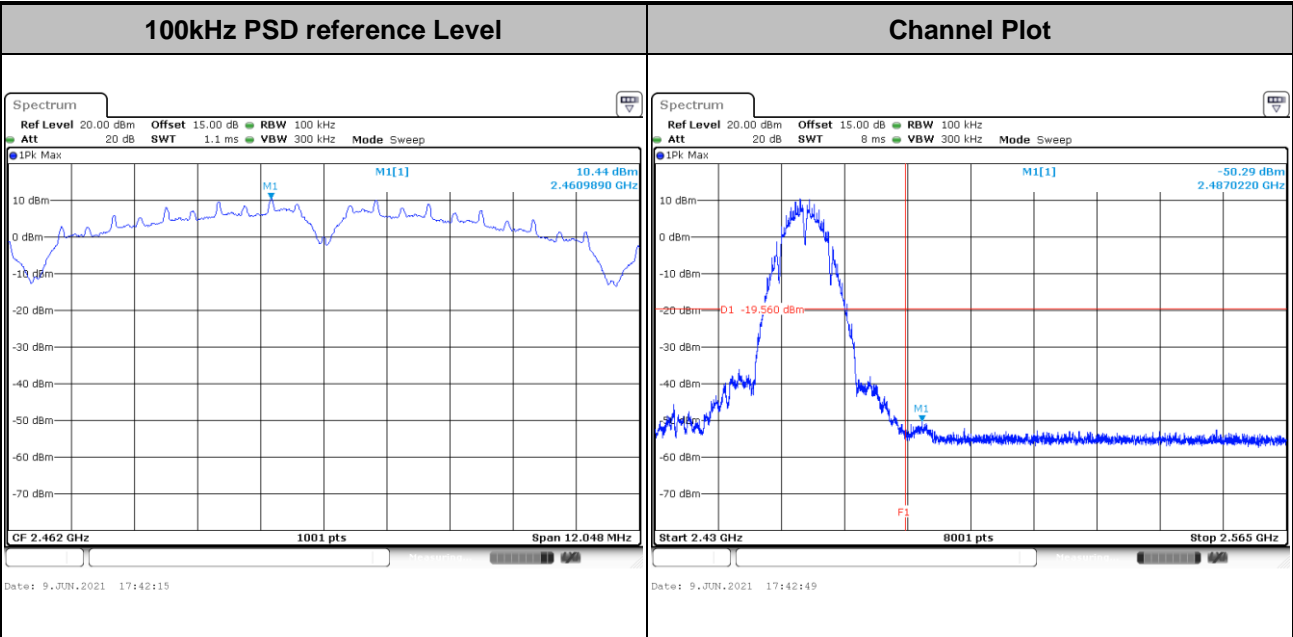


Test Mode :	802.11b	Test Channel :	06
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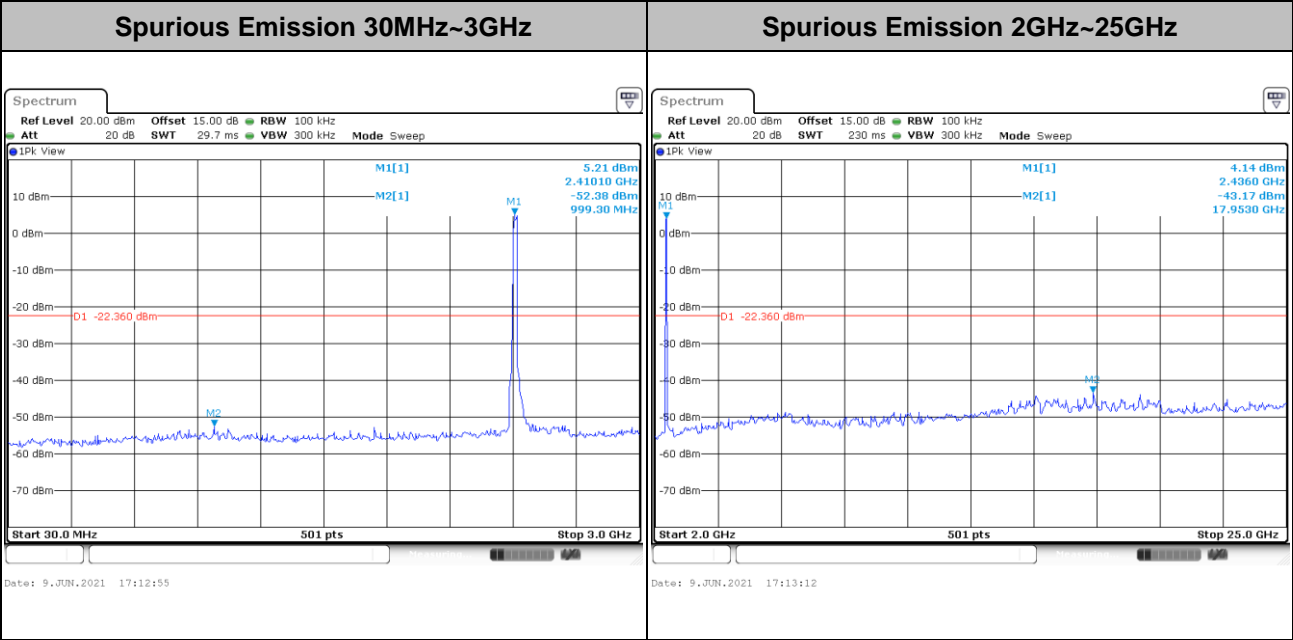
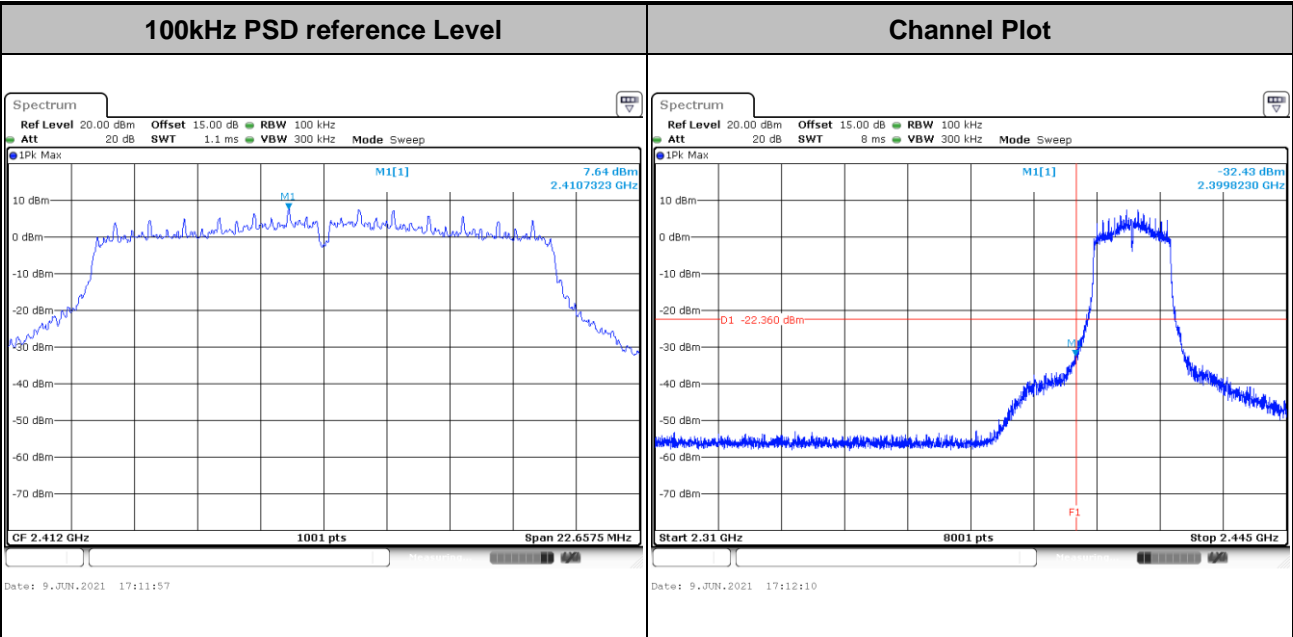


Test Mode :	802.11b	Test Channel :	11
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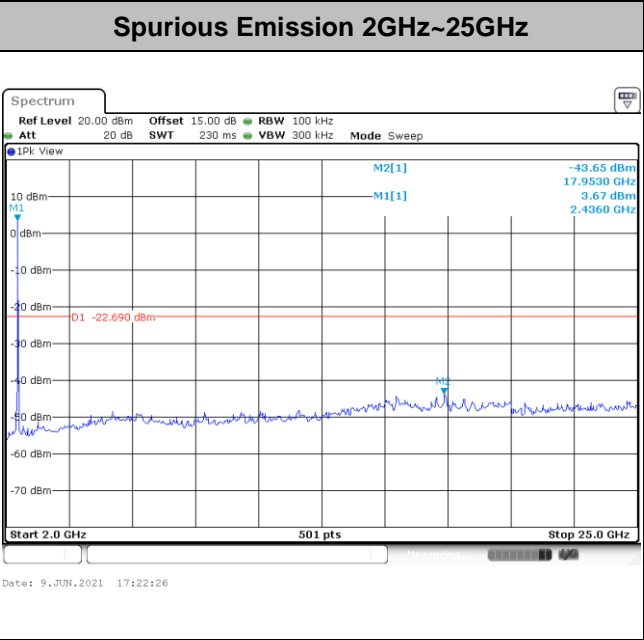
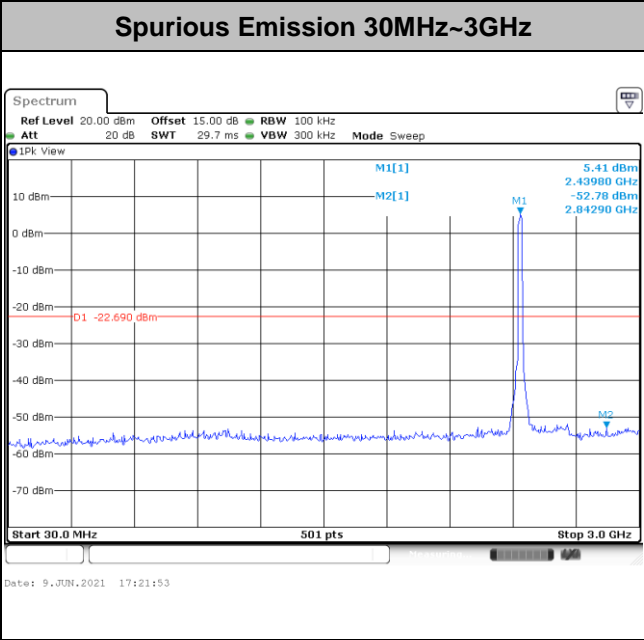
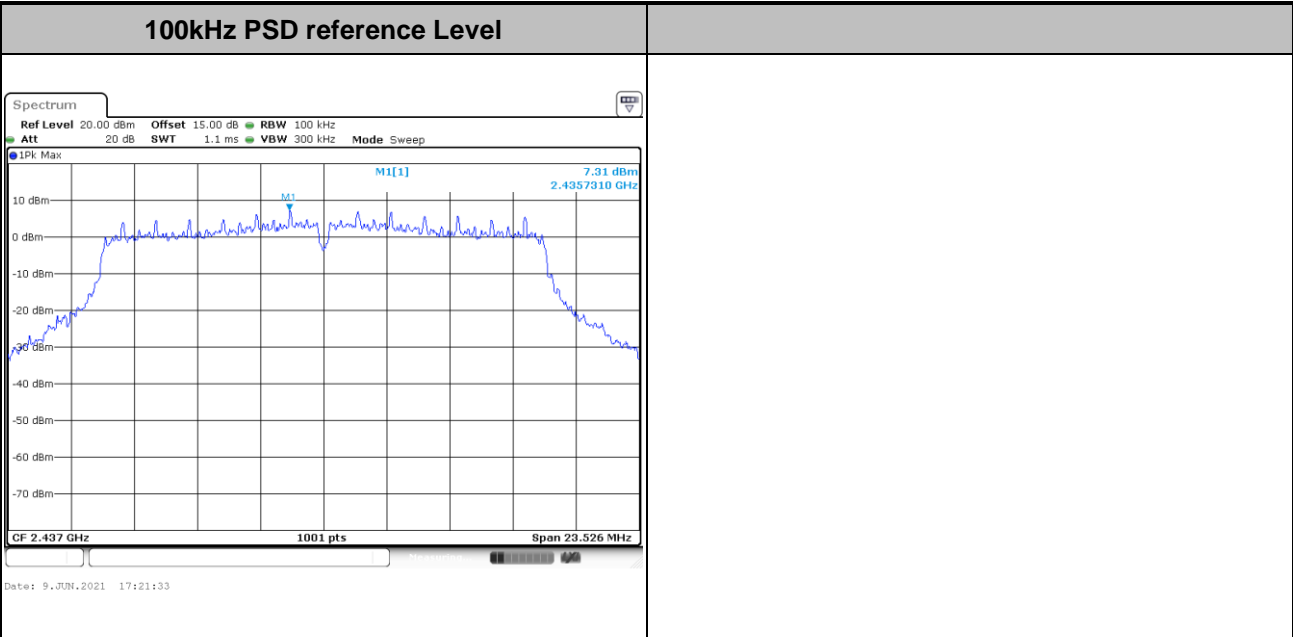


Test Mode : 802.11g Test Channel : 01



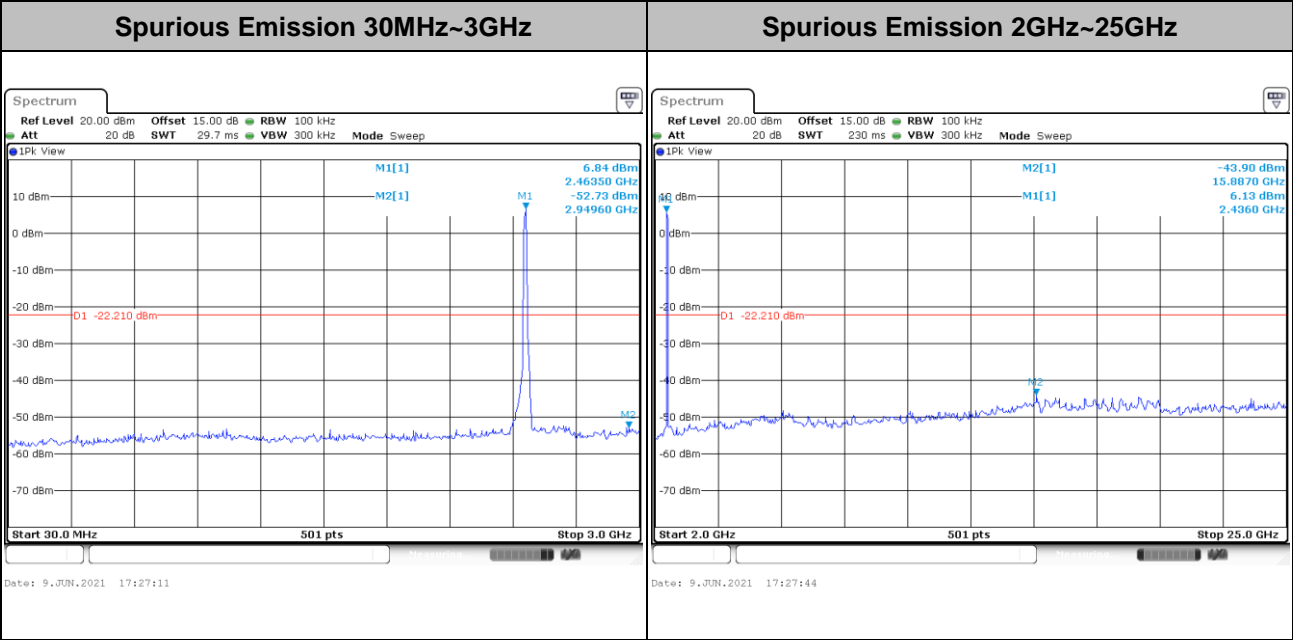
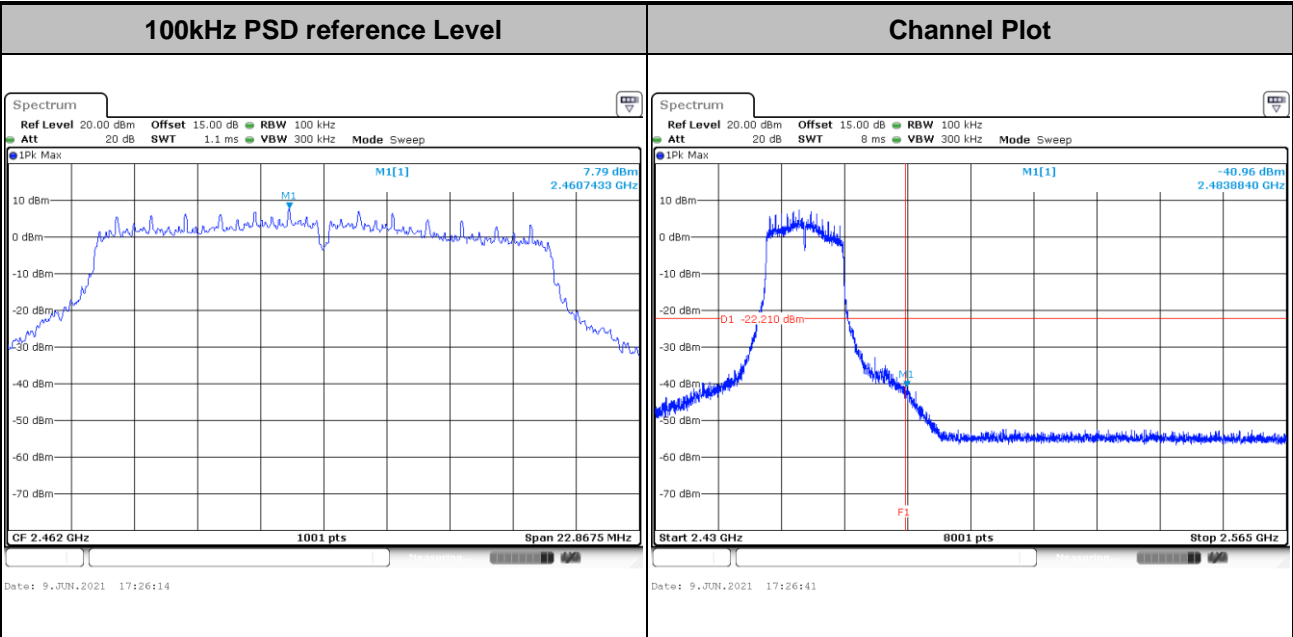


Test Mode :	802.11g	Test Channel :	06
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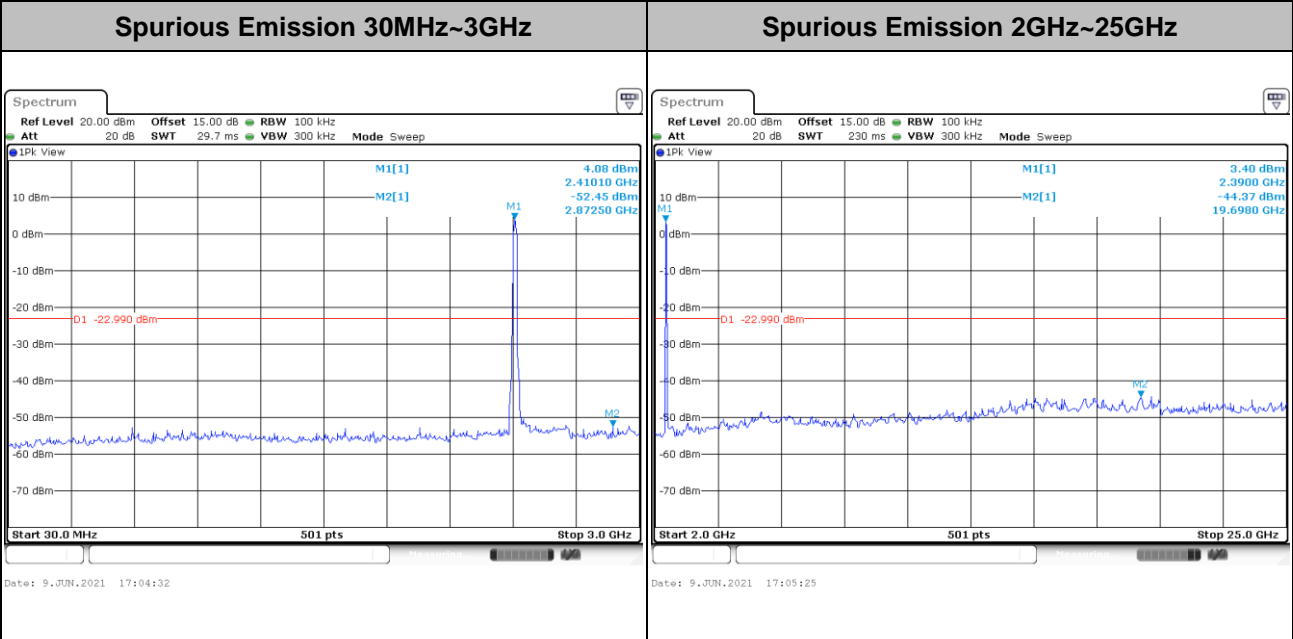
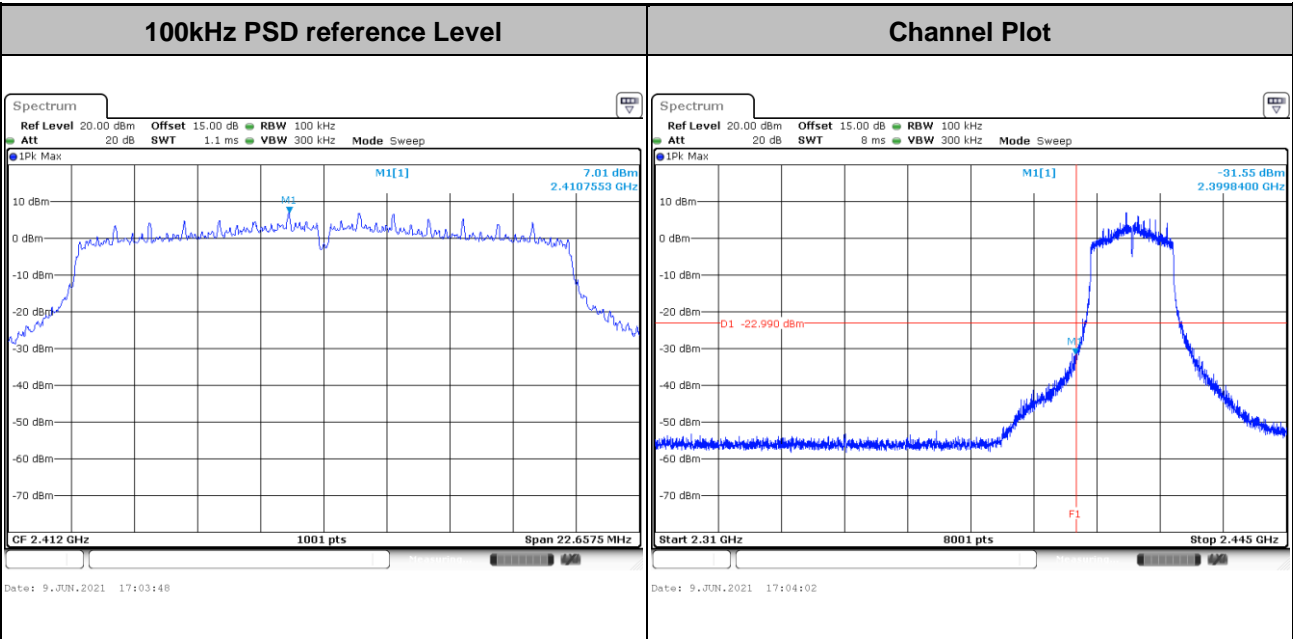


Test Mode : 802.11g Test Channel : 11





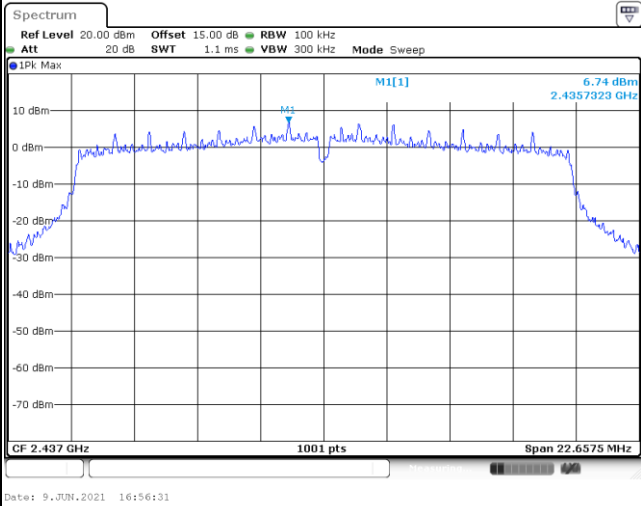
Test Mode : 802.11n HT20 Test Channel : 01



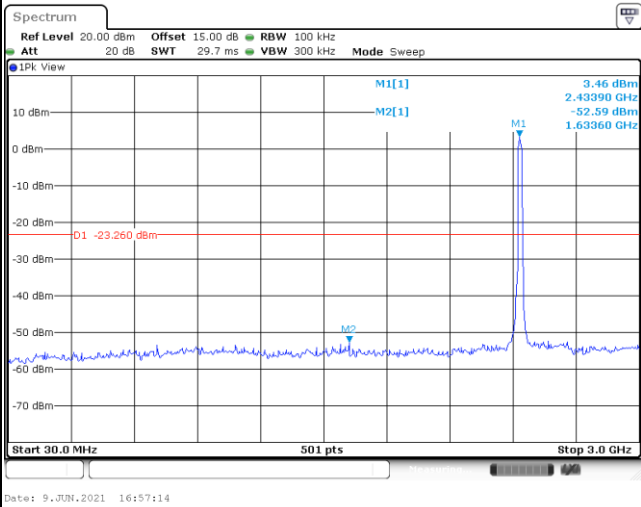


Test Mode :	802.11n HT20	Test Channel :	06
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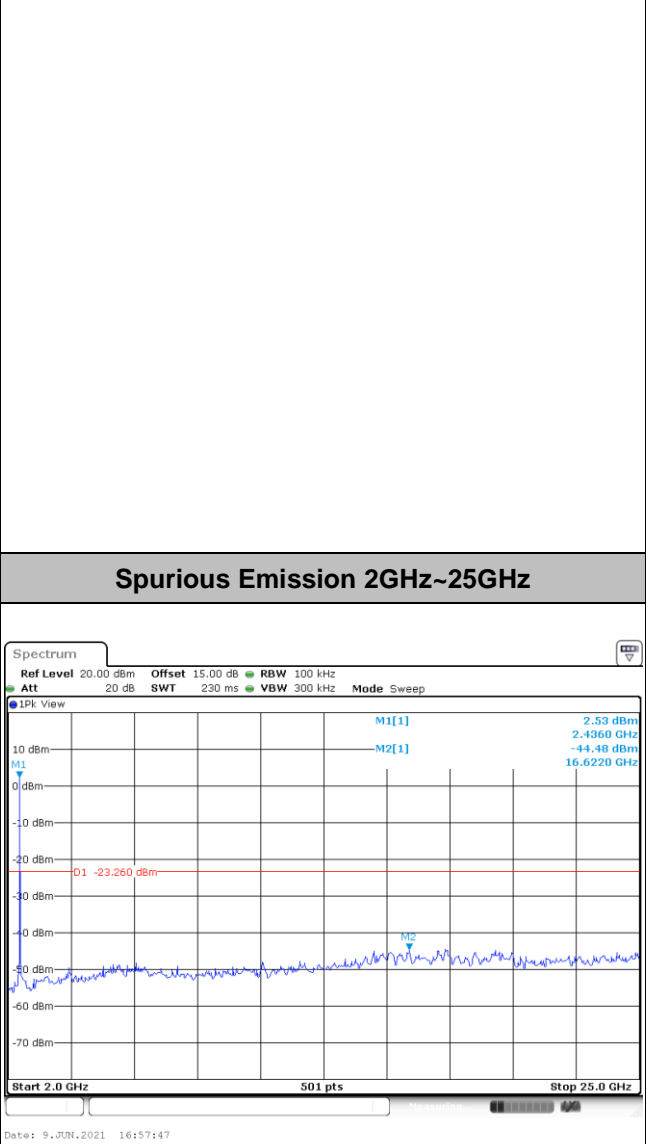
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

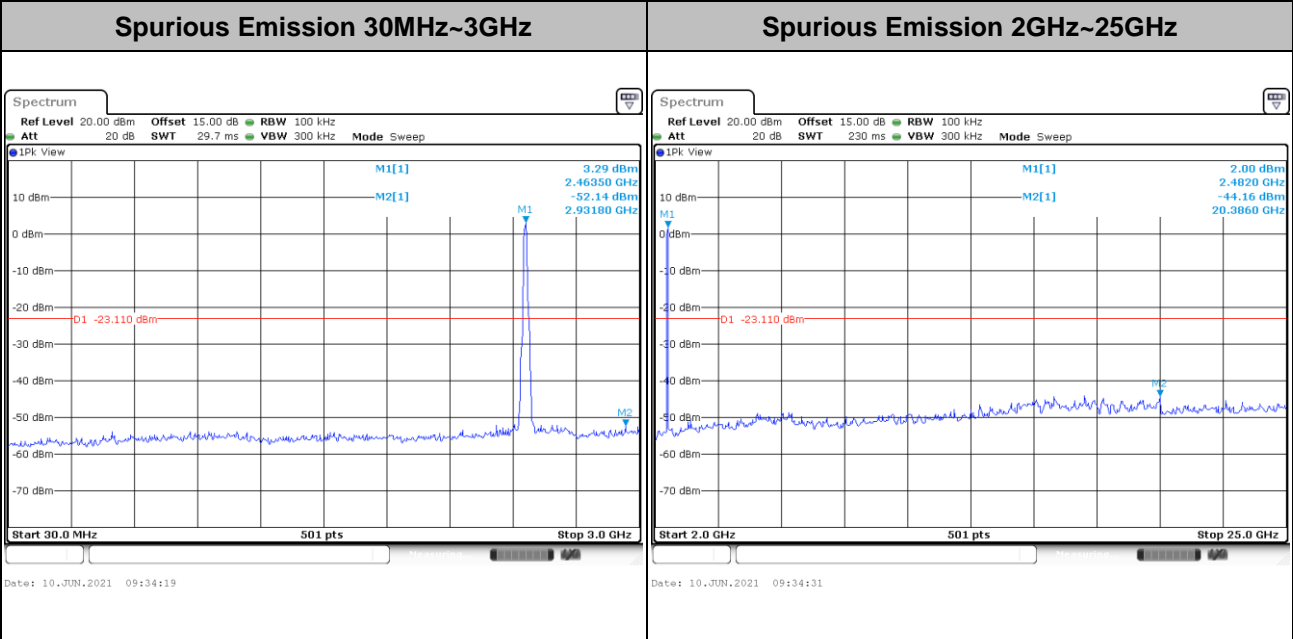
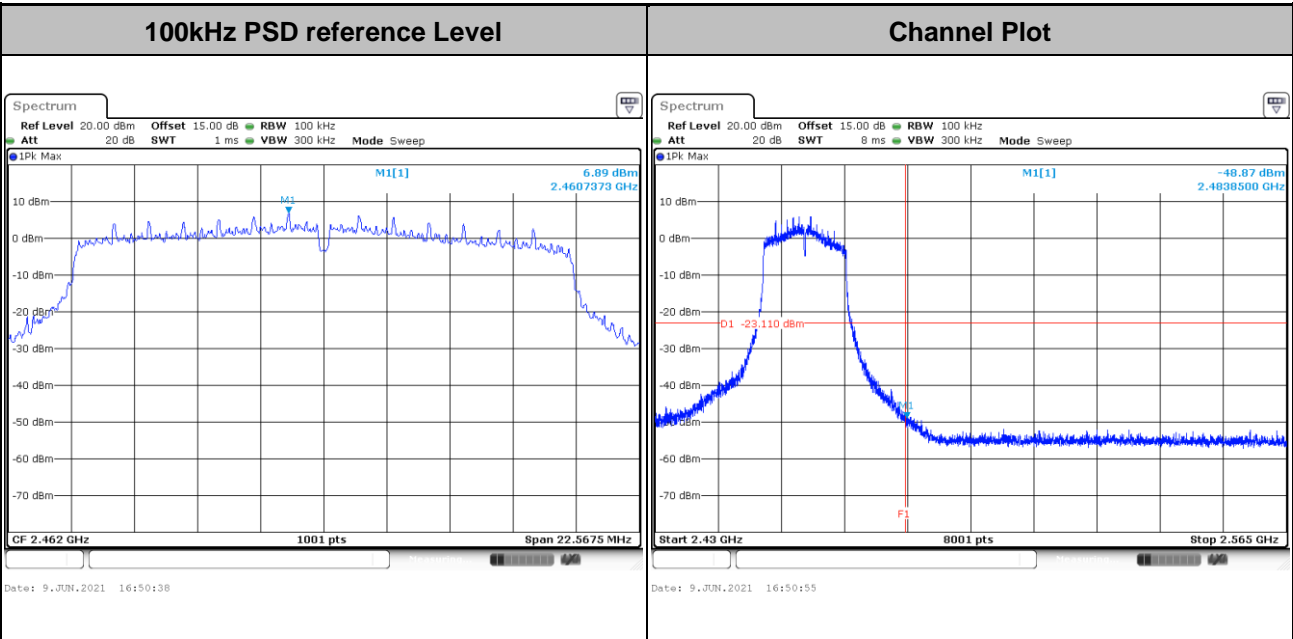


Spurious Emission 2GHz~25GHz



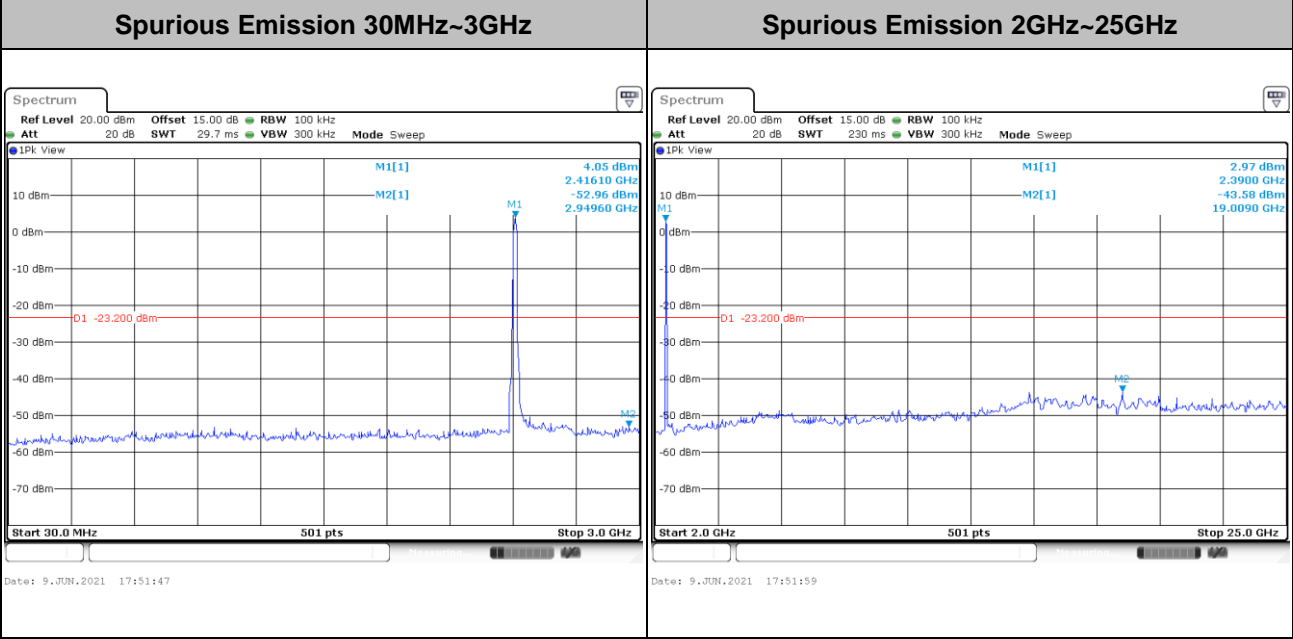
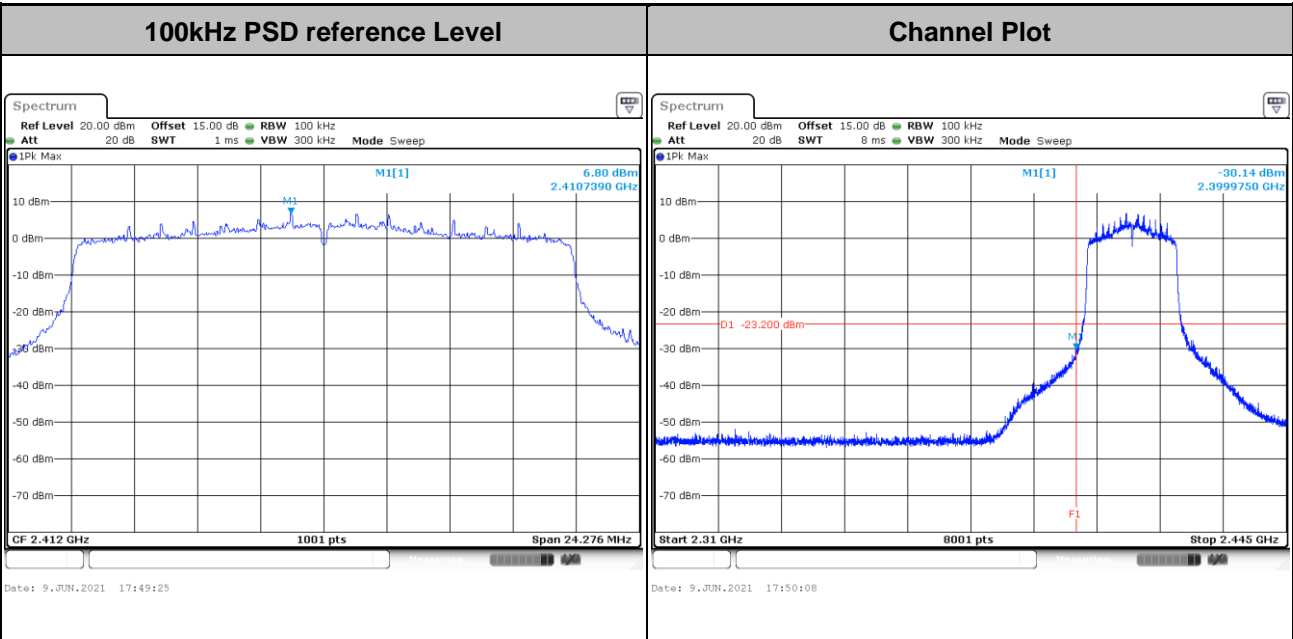


Test Mode : 802.11n HT20 Test Channel : 11





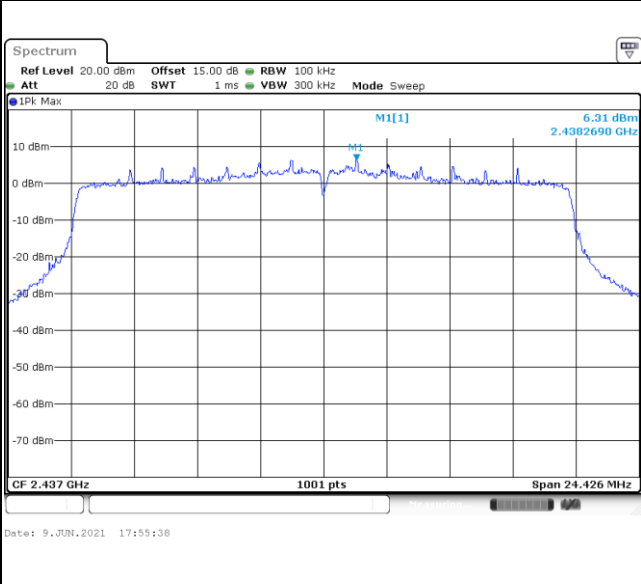
Test Mode : 802.11ax HE20 Test Channel : 01



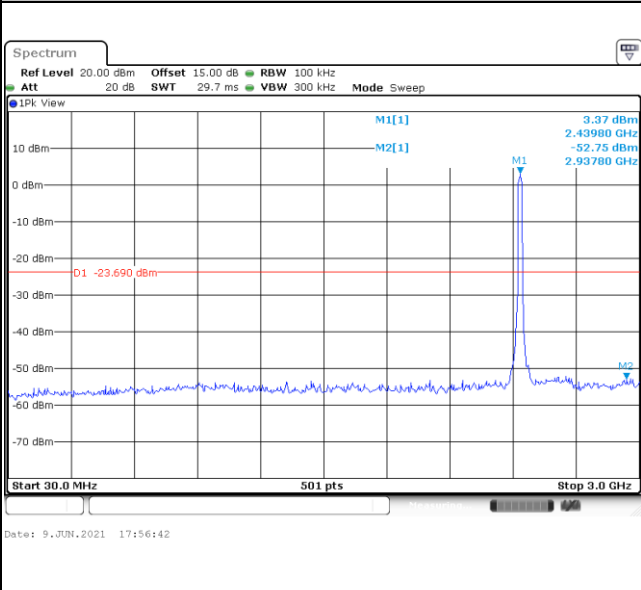


Test Mode :	802.11ax HE20	Test Channel :	06
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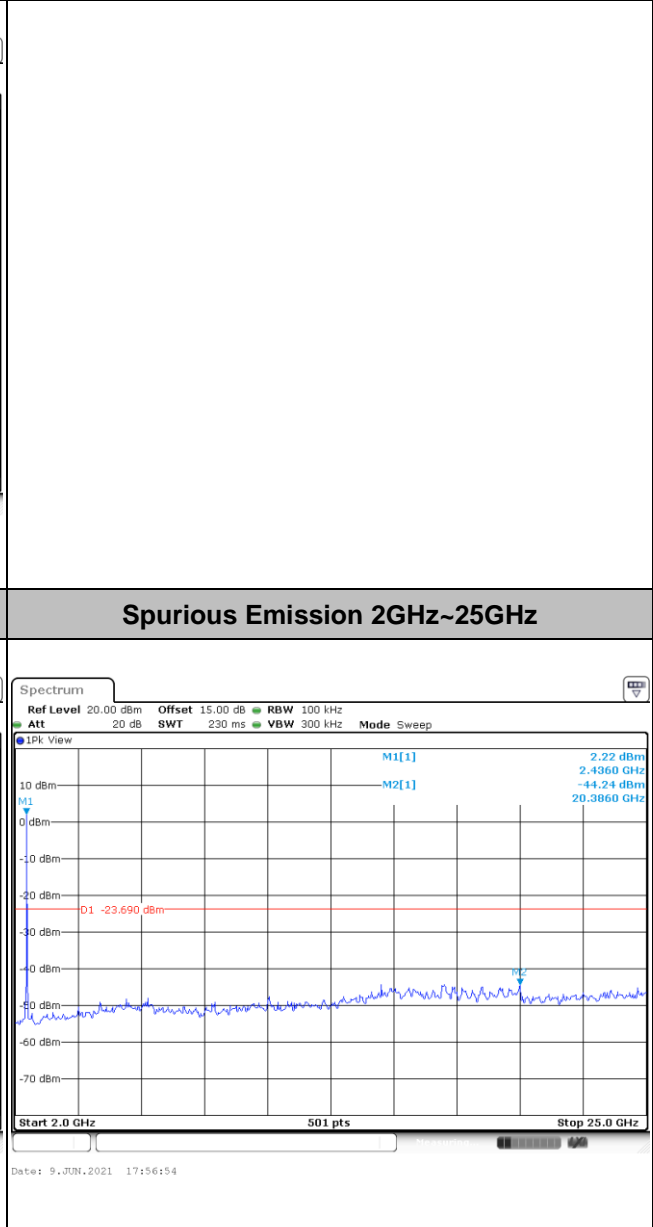
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

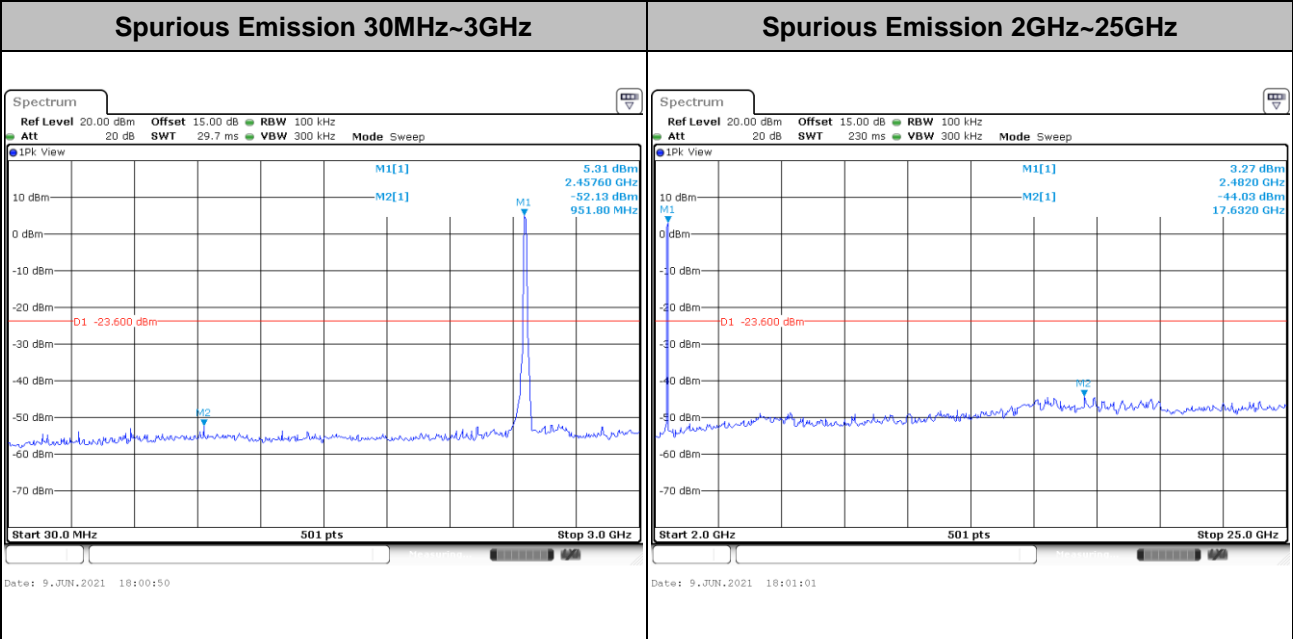
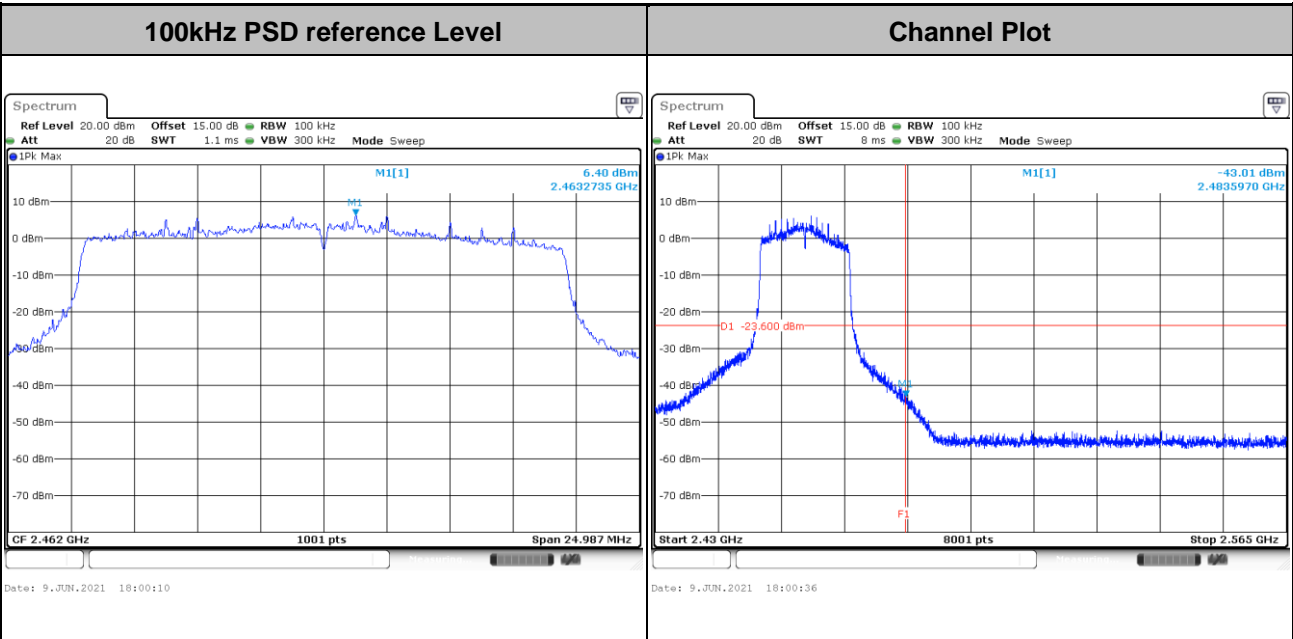


Spurious Emission 2GHz~25GHz





Test Mode :	802.11ax HE20	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.

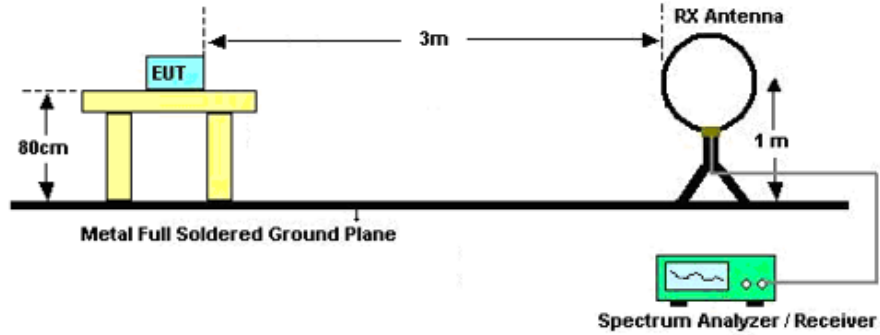


3.5.3 Test Procedures

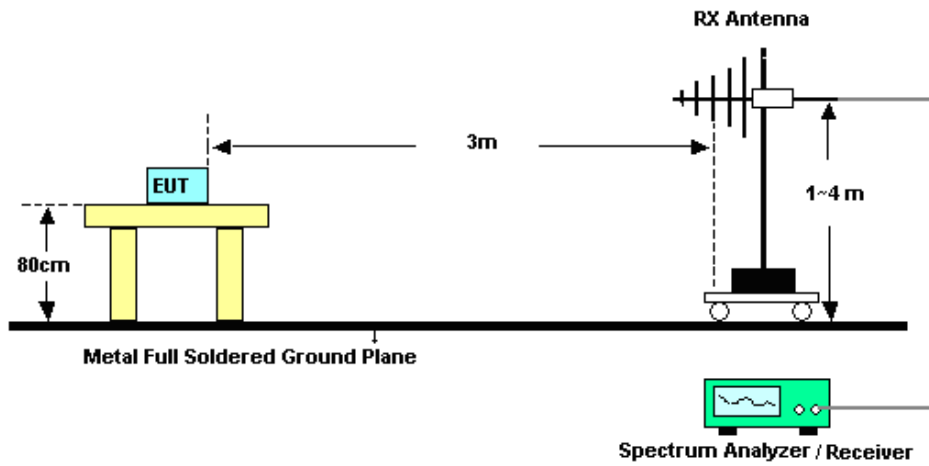
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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

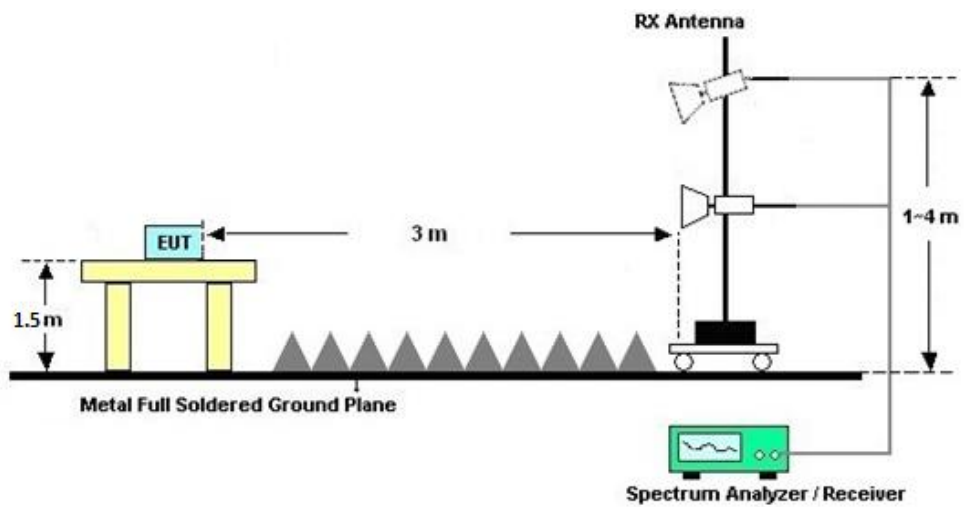
For radiated emissions below 30MHz



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 C.

3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C.



3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

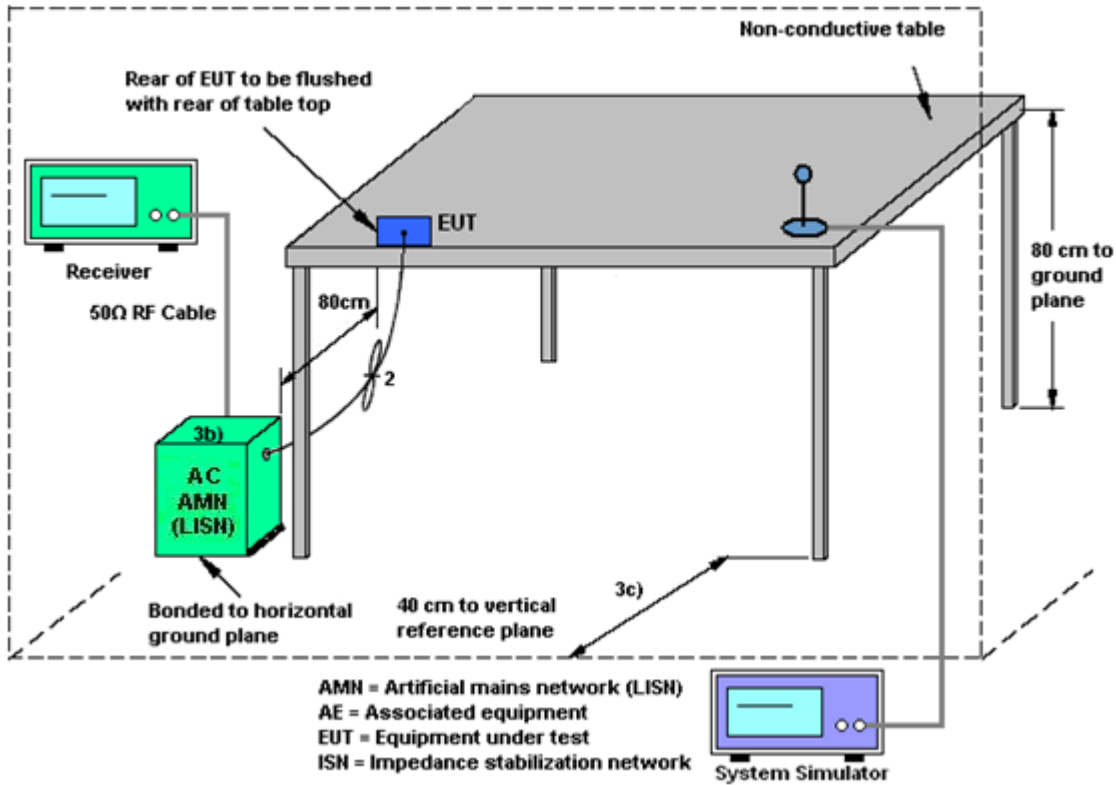
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.7 Antenna Requirements

3.7.1 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.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with

G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

<CDD Modes>						
			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant. 1 (dBi)	Ant. 2 (dBi)				
2.4 GHz	-2.95	-5.41	-2.95	-1.08	0.00	0.00

$Power\ Limit\ Reduction = DG(Power) - 6dBi, (min = 0)$

$PSD\ Limit\ Reduction = DG(PSD) - 6dBi, (min = 0)$



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 08, 2021	Jun. 09, 2021~ Jun. 10, 2021	Apr. 07, 2022	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 25, 2020	Jun. 09, 2021~ Jun. 10, 2021	Dec. 24, 2021	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 25, 2020	Jun. 09, 2021~ Jun. 10, 2021	Dec. 24, 2021	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY544500 83	20Hz~8.4GHz	Apr. 17, 2021	Jun. 25, 2021	Apr. 16, 2022	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 46	10Hz~44GHz;	Apr. 17, 2021	Jun. 25, 2021	Apr. 16, 2022	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2021	Jun. 25, 2021	Jun. 21, 2022	Radiation (03CH03-SZ)
Bilog Antenna	TESEQ	CBL6112D	23183	25MHz~2GHz	Jan. 07, 2021	Jun. 25, 2021	Jan. 06, 2022	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-135 5	1GHz~18GHz	Apr. 25, 2021	Jun. 25, 2021	Apr. 24, 2022	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 23, 2021	Jun. 25, 2021	Apr. 22, 2022	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 17, 2020	Jun. 25, 2021	Oct. 16, 2021	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 16, 2020	Jun. 25, 2021	Oct. 15, 2021	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY395013 02	500MHz~26.5G Hz	Dec. 25, 2020	Jun. 25, 2021	Dec. 24, 2021	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35- HG	1871923	18GHz~40GHz	Jul. 21, 2020	Jun. 25, 2021	Jul. 20, 2021	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001 985	N/A	NCR	Jun. 25, 2021	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 25, 2021	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 25, 2021	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Mar. 07, 2021	Jun. 07, 2021	Mar. 06, 2022	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2 LISN	00103912	9kHz~30MHz	Dec. 25, 2020	Jun. 07, 2021	Dec. 24, 2021	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 15, 2020	Jun. 07, 2021	Oct. 14, 2021	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000 891	100Vac~250Vac	Jul. 21, 2020	Jun. 07, 2021	Jul. 20, 2021	Conduction (CO01-SZ)

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 Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.2dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB
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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))	4.9dB
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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))	5.0dB
---	-------



Appendix A. Conducted Test Results

Test Engineer:	Jason Zhang	Temperature:	24~26	°C
Test Date:	2021/6/9~2021/6/10	Relative Humidity:	50~53	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band MIMO										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant1	Ant2	Ant1	Ant2		
11b	1Mbps	2	1	2412	13.49	13.29	8.07	7.99	0.50	Pass
11b	1Mbps	2	6	2437	13.04	13.29	8.01	8.01	0.50	Pass
11b	1Mbps	2	11	2462	14.64	13.24	9.01	8.03	0.50	Pass
11g	6Mbps	2	1	2412	16.88	16.78	15.43	15.11	0.50	Pass
11g	6Mbps	2	6	2437	16.68	16.93	15.07	15.68	0.50	Pass
11g	6Mbps	2	11	2462	17.73	16.88	15.11	15.25	0.50	Pass
HT20	MCS0	2	1	2412	17.98	17.93	15.09	15.11	0.50	Pass
HT20	MCS0	2	6	2437	17.93	18.08	15.09	15.11	0.50	Pass
HT20	MCS0	2	11	2462	18.58	17.93	16.50	15.05	0.50	Pass

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band MIMO											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
						Ant1	Ant2	Ant1	Ant2		
HE20	MCS0	1	1	2412	Full	19.28	19.18	15.39	16.18	0.50	Pass
HE20	MCS0	1	6	2437	Full	19.13	19.28	15.04	16.28	0.50	Pass
HE20	MCS0	1	11	2462	Full	19.68	19.08	17.41	16.66	0.50	Pass

TEST RESULTS DATA
Average Output Power

2.4GHz Band MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	18.60	18.70	21.66	30.00		-2.95		18.71		36.00		Pass
11b	1Mbps	2	6	2437	18.70	18.40	21.56	30.00		-2.95		18.61		36.00		Pass
11b	1Mbps	2	11	2462	17.90	18.70	21.33	30.00		-2.95		18.38		36.00		Pass
11g	6Mbps	2	1	2412	17.60	17.80	20.71	30.00		-2.95		17.76		36.00		Pass
11g	6Mbps	2	6	2437	17.70	17.70	20.71	30.00		-2.95		17.76		36.00		Pass
11g	6Mbps	2	11	2462	16.70	17.30	20.02	30.00		-2.95		17.07		36.00		Pass
HT20	MCS0	2	1	2412	16.80	17.00	19.91	30.00		-2.95		16.96		36.00		Pass
HT20	MCS0	2	6	2437	16.90	16.80	19.86	30.00		-2.95		16.91		36.00		Pass
HT20	MCS0	2	11	2462	15.80	16.40	19.12	30.00		-2.95		16.17		36.00		Pass
VHT20	MCS0	2	1	2412	16.70	16.90	19.81	30.00		-2.95		16.86		36.00		Pass
VHT20	MCS0	2	6	2437	16.80	16.70	19.76	30.00		-2.95		16.81		36.00		Pass
VHT20	MCS0	2	11	2462	15.70	16.30	19.02	30.00		-2.95		16.07		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	16.90	17.10	20.01	30.00		-2.95		17.06		36.00	Pass	
HE20	MCS0	2	1	2412	26/0	9.90	9.80	12.86	30.00		-2.95		9.91		36.00	Pass	
HE20	MCS0	2	1	2412	52/37	11.50	11.70	14.61	30.00		-2.95		11.66		36.00	Pass	
HE20	MCS0	2	1	2412	106/53	15.20	15.30	18.26	30.00		-2.95		15.31		36.00	Pass	
HE20	MCS0	2	6	2437	Full	17.00	17.10	20.06	30.00		-2.95		17.11		36.00	Pass	
HE20	MCS0	2	11	2462	Full	16.80	17.20	20.01	30.00		-2.95		17.06		36.00	Pass	
HE20	MCS0	2	11	2462	26/8	9.90	10.50	13.22	30.00		-2.95		10.27		36.00	Pass	
HE20	MCS0	2	11	2462	52/40	11.60	11.60	14.61	30.00		-2.95		11.66		36.00	Pass	
HE20	MCS0	2	11	2462	106/54	15.10	15.30	18.21	30.00		-2.95		15.26		36.00	Pass	

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	-5.11	-4.15	-1.14	-1.08		8.00		Pass
11b	1Mbps	2	6	2437	-4.35	-4.88	-1.34	-1.08		8.00		Pass
11b	1Mbps	2	11	2462	-5.60	-3.29	-0.28	-1.08		8.00		Pass
11g	6Mbps	2	1	2412	-8.80	-5.73	-2.72	-1.08		8.00		Pass
11g	6Mbps	2	6	2437	-5.64	-5.84	-2.63	-1.08		8.00		Pass
11g	6Mbps	2	11	2462	-8.06	-7.69	-4.68	-1.08		8.00		Pass
HT20	MCS0	2	1	2412	-6.94	-5.43	-2.42	-1.08		8.00		Pass
HT20	MCS0	2	6	2437	-7.60	-7.62	-4.59	-1.08		8.00		Pass
HT20	MCS0	2	11	2462	-8.10	-7.29	-4.28	-1.08		8.00		Pass

Measured power density (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Power Spectral Density

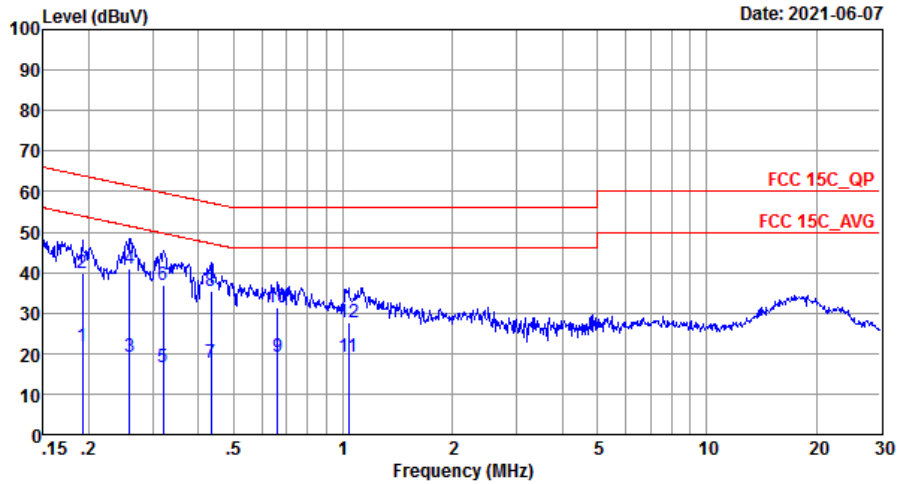
2.4GHz Band MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
						Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	-8.22	-7.13	-4.12	-1.08		8.00		Pass
HE20	MCS0	2	1	2412	26/0	-8.97	-8.84	-5.83	-1.08		8.00		Pass
HE20	MCS0	2	1	2412	52/37	-8.56	-8.94	-5.55	-1.08		8.00		Pass
HE20	MCS0	2	1	2412	106/53	-8.98	-8.17	-5.16	-1.08		8.00		Pass
HE20	MCS0	2	6	2437	Full	-7.69	-8.32	-4.68	-1.08		8.00		Pass
HE20	MCS0	2	11	2462	Full	-8.12	-7.91	-4.90	-1.08		8.00		Pass
HE20	MCS0	2	11	2462	26/8	-8.48	-8.13	-5.12	-1.08		8.00		Pass
HE20	MCS0	2	11	2462	52/40	-8.86	-8.70	-5.69	-1.08		8.00		Pass
HE20	MCS0	2	11	2462	106/54	-8.40	-8.02	-5.01	-1.08		8.00		Pass

Measured power density (dBm) has offset with cable loss.



Appendix B. AC Conducted Emission Test Results

Test Engineer :	Yuqiang Xie	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

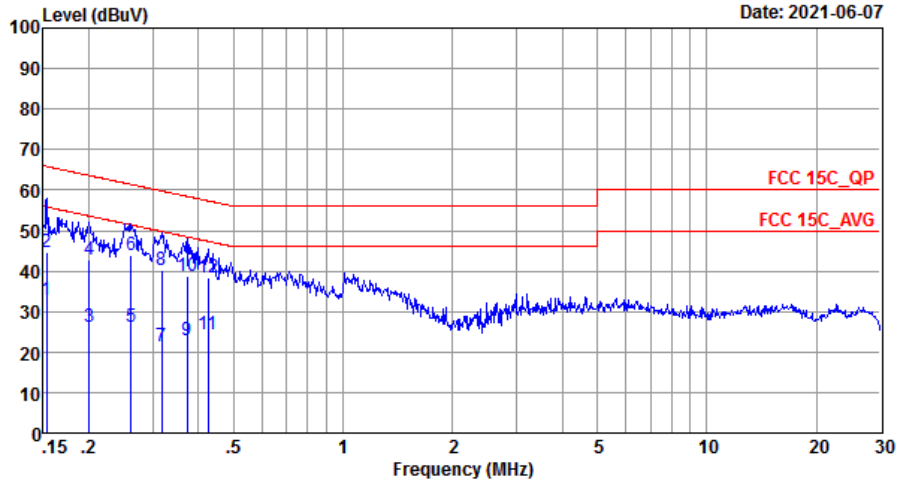


Site : CO01-SZ
 Condition: FCC 15C_QP LISN_20201030_L LINE

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.19	21.91	-32.02	53.93	11.80	0.08	10.03	Average
2	0.19	39.71	-24.22	63.93	29.60	0.08	10.03	QP
3	0.26	19.17	-32.30	51.47	9.09	0.04	10.04	Average
4 *	0.26	40.87	-20.60	61.47	30.79	0.04	10.04	QP
5	0.32	16.57	-33.14	49.71	6.50	0.03	10.04	Average
6	0.32	36.87	-22.84	59.71	26.80	0.03	10.04	QP
7	0.43	17.73	-29.47	47.20	7.59	0.09	10.05	Average
8	0.43	35.33	-21.87	57.20	25.19	0.09	10.05	QP
9	0.66	19.04	-26.96	46.00	8.90	0.10	10.04	Average
10	0.66	31.54	-24.46	56.00	21.40	0.10	10.04	QP
11	1.04	19.02	-26.98	46.00	8.90	0.10	10.02	Average
12	1.04	27.72	-28.28	56.00	17.60	0.10	10.02	QP



Test Engineer :	Yuqiang Xie	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
 Condition: FCC 15C_QP LISN_20201030_N NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	32.99	-22.83	55.82	22.90	0.08	10.01	Average
2	0.15	44.79	-21.03	65.82	34.70	0.08	10.01	QP
3	0.20	26.11	-27.47	53.58	16.00	0.08	10.03	Average
4	0.20	42.81	-20.77	63.58	32.70	0.08	10.03	QP
5	0.26	26.37	-25.01	51.38	16.30	0.03	10.04	Average
6 *	0.26	43.77	-17.61	61.38	33.70	0.03	10.04	QP
7	0.32	21.56	-28.24	49.80	11.50	0.02	10.04	Average
8	0.32	40.36	-19.44	59.80	30.30	0.02	10.04	QP
9	0.37	23.01	-25.42	48.43	12.91	0.06	10.04	Average
10	0.37	38.81	-19.62	58.43	28.71	0.06	10.04	QP
11	0.43	24.43	-22.90	47.33	14.29	0.09	10.05	Average
12	0.43	38.43	-18.90	57.33	28.29	0.09	10.05	QP

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

----- THE END -----



Appendix C. Radiated Spurious Emission

Test Engineer :	Jeff Yao	Temperature :	23~27°C
		Relative Humidity :	41~45%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		2373.42	51.4	-22.6	74	52.48	27.72	4.88	33.68	212	307	P	H
		2389.275	42.4	-11.6	54	43.45	27.7	4.91	33.66	212	307	A	H
	*	2412	106.2	-	-	107.23	27.69	4.93	33.65	212	307	P	H
	*	2412	102.93	-	-	103.96	27.69	4.93	33.65	212	307	A	H
		2389.275	52.13	-21.87	74	53.18	27.7	4.91	33.66	113	288	P	V
		2388.96	44.34	-9.66	54	45.39	27.7	4.91	33.66	113	288	A	V
	*	2412	107.11	-	-	108.14	27.69	4.93	33.65	113	288	P	V
	*	2412	104.15	-	-	105.18	27.69	4.93	33.65	113	288	A	V
802.11b CH 06 2437MHz		2388.12	50.87	-23.13	74	51.92	27.7	4.91	33.66	151	310	P	H
		2388.12	40.11	-13.89	54	41.16	27.7	4.91	33.66	151	310	A	H
	*	2437	104.49	-	-	105.52	27.66	4.96	33.65	151	310	P	H
	*	2437	101.23	-	-	102.26	27.66	4.96	33.65	151	310	A	H
		2485.58	50.52	-23.48	74	51.52	27.63	4.99	33.62	151	310	P	H
		2484.18	40.06	-13.94	54	41.06	27.63	4.99	33.62	151	310	A	H
		2348.5	51.16	-22.84	74	52.29	27.75	4.81	33.69	102	288	P	V
		2388.26	41.35	-12.65	54	42.4	27.7	4.91	33.66	102	288	A	V
	*	2437	106.5	-	-	107.53	27.66	4.96	33.65	102	288	P	V
	*	2437	102.83	-	-	103.86	27.66	4.96	33.65	102	288	A	V
		2484.46	50.95	-23.05	74	51.95	27.63	4.99	33.62	102	288	P	V
		2483.55	41.14	-12.86	54	42.14	27.63	4.99	33.62	102	288	A	V



802.11b CH 11 2462MHz	*	2462	104.8	-	-	105.81	27.64	4.98	33.63	200	310	P	H
	*	2462	101.34	-	-	102.35	27.64	4.98	33.63	200	310	A	H
		2487.92	52.03	-21.97	74	53.03	27.61	5.01	33.62	200	310	P	H
		2487.68	43.99	-10.01	54	44.99	27.61	5.01	33.62	200	310	A	H
	*	2462	107.74	-	-	108.75	27.64	4.98	33.63	102	291	P	V
	*	2462	104.48	-	-	105.49	27.64	4.98	33.63	102	291	A	V
		2487.44	53.29	-20.71	74	54.29	27.63	4.99	33.62	102	291	P	V
		2487.6	46.4	-7.6	54	47.4	27.61	5.01	33.62	102	291	A	V
Remark	<ol style="list-style-type: none"> No other spurious found. All results are PASS against Peak and Average limit line. 												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	40.61	-33.39	74	59.22	31.76	7.11	57.48	145	274	P	H
		4824	40.89	-33.11	74	59.5	31.76	7.11	57.48	191	220	P	V
802.11b CH 06 2437MHz		4874	40.21	-33.79	74	58.66	31.88	7.19	57.52	112	229	P	H
		7311	52.67	-21.33	74	65.95	36.88	8.76	58.92	218	0	A	H
		4874	41.16	-32.84	74	59.61	31.88	7.19	57.52	201	0	P	V
802.11b CH 11 2462MHz		7311	49.12	-24.88	74	62.4	36.88	8.76	58.92	120	106	A	V
		4924	42.05	-31.95	74	60.38	32	7.22	57.55	133	180	P	H
		7386	47.36	-26.64	74	60.16	37.21	8.95	58.96	145	274	A	H
		4924	42.07	-31.93	74	60.4	32	7.22	57.55	201	0	P	V
		7386	47.9	-26.1	74	60.7	37.21	8.95	58.96	166	210	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 (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 1+2, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Cable Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include data for 802.11g CH 01 (2412MHz) and 802.11g CH 06 (2437MHz).



802.11g CH 11 2462MHz	*	2462	104.53	-	-	105.54	27.64	4.98	33.63	172	123	P	H
	*	2462	97.12	-	-	98.13	27.64	4.98	33.63	172	123	A	H
		2483.56	58.29	-15.71	74	59.29	27.63	4.99	33.62	172	123	P	H
		2483.52	47.04	-6.96	54	48.04	27.63	4.99	33.62	172	123	A	H
	*	2462	108.05	-	-	109.06	27.64	4.98	33.63	139	97	P	V
	*	2462	100.39	-	-	101.4	27.64	4.98	33.63	139	97	A	V
		2483.76	58.79	-15.21	74	59.79	27.63	4.99	33.62	139	97	P	V
		2483.52	49.04	-4.96	54	50.04	27.63	4.99	33.62	139	97	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 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	41.38	-32.62	74	59.99	31.76	7.11	57.48	145	274	P	H
		4824	40.45	-33.55	74	59.06	31.76	7.11	57.48	191	220	P	V
802.11g CH 06 2437MHz		4874	41.91	-32.09	74	60.36	31.88	7.19	57.52	112	229	P	H
		7311	46.79	-27.21	74	60.07	36.88	8.76	58.92	174	100	P	H
		4874	41.22	-32.78	74	59.67	31.88	7.19	57.52	201	0	P	V
802.11g CH 11 2462MHz		7311	46.24	-27.76	74	59.52	36.88	8.76	58.92	120	106	P	V
		4924	41.76	-32.24	74	60.09	32	7.22	57.55	133	180	P	H
		7386	46.83	-27.17	74	59.63	37.21	8.95	58.96	145	274	P	H
		4924	41.54	-32.46	74	59.87	32	7.22	57.55	201	0	P	V
		7386	46.54	-27.46	74	59.34	37.21	8.95	58.96	166	210	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Band Edge @ 3m)**

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2389.8	55.45	-18.55	74	56.5	27.7	4.91	33.66	124	119	P	H
		2390	45.6	-8.4	54	46.65	27.7	4.91	33.66	124	119	A	H
	*	2412	104	-	-	105.03	27.69	4.93	33.65	124	119	P	H
	*	2412	96.29	-	-	97.32	27.69	4.93	33.65	124	119	A	H
		2389.905	56.24	-17.76	74	57.29	27.7	4.91	33.66	135	80	P	V
		2390	46.17	-7.83	54	47.22	27.7	4.91	33.66	135	80	A	V
	*	2412	106.72	-	-	107.75	27.69	4.93	33.65	135	80	P	V
		2412	98.29	-	-	99.32	27.69	4.93	33.65	135	80	A	V
802.11n HT20 CH 06 2437MHz		2336.18	51.22	-22.78	74	52.35	27.75	4.81	33.69	118	118	P	H
		2389.94	40.13	-13.87	54	41.18	27.7	4.91	33.66	118	118	A	H
	*	2437	103.29	-	-	104.32	27.66	4.96	33.65	118	118	P	H
	*	2437	95.64	-	-	96.67	27.66	4.96	33.65	118	118	A	H
		2483.55	50.61	-23.39	74	51.61	27.63	4.99	33.62	118	118	P	H
		2483.55	40.25	-13.75	54	41.25	27.63	4.99	33.62	118	118	A	H
		2317.42	50.5	-23.5	74	51.68	27.79	4.74	33.71	126	50	P	V
		2389.94	40.65	-13.35	54	41.7	27.7	4.91	33.66	126	50	A	V
	*	2437	106.49	-	-	107.52	27.66	4.96	33.65	126	50	P	V
	*	2437	98.68	-	-	99.71	27.66	4.96	33.65	126	50	A	V
		2499.09	51.27	-22.73	74	52.25	27.61	5.01	33.6	126	50	P	V
	2483.5	40.95	-13.05	54	41.95	27.63	4.99	33.62	126	50	A	V	



802.11n HT20 CH 11 2462MHz	*	2462	103.17	-	-	104.18	27.64	4.98	33.63	140	117	P	H
	*	2462	96.07	-	-	97.08	27.64	4.98	33.63	140	117	A	H
		2483.52	56.98	-17.02	74	57.98	27.63	4.99	33.62	140	117	P	H
		2483.52	45.62	-8.38	54	46.62	27.63	4.99	33.62	140	117	A	H
	*	2462	106.98	-	-	107.99	27.64	4.98	33.63	107	93	P	V
	*	2462	98.97	-	-	99.98	27.64	4.98	33.63	107	93	A	V
		2483.52	59.22	-14.78	74	60.22	27.63	4.99	33.62	107	93	P	V
		2483.52	47.08	-6.92	54	48.08	27.63	4.99	33.62	107	93	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 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	40.37	-33.63	74	58.98	31.76	7.11	57.48	145	274	P	H
		4824	40.34	-33.66	74	58.95	31.76	7.11	57.48	191	220	P	V
802.11n HT20 CH 06 2437MHz		4874	40.82	-33.18	74	59.27	31.88	7.19	57.52	112	229	P	H
		7311	46.34	-27.66	74	59.62	36.88	8.76	58.92	174	100	P	H
		4874	40.42	-33.58	74	58.87	31.88	7.19	57.52	201	0	P	V
		7311	47.55	-26.45	74	60.83	36.88	8.76	58.92	120	106	P	V
802.11n HT20 CH 11 2462MHz		4924	41.28	-32.72	74	59.61	32	7.22	57.55	133	180	P	H
		7386	46.42	-27.58	74	59.22	37.21	8.95	58.96	145	274	P	H
		4924	40.63	-33.37	74	58.96	32	7.22	57.55	201	0	P	V
		7386	47.51	-26.49	74	60.31	37.21	8.95	58.96	166	210	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11ax HE20 (Band Edge @ 3m)
Full RU

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE20 CH 01 2412MHz		2389.8	56.97	-17.03	74	58.02	27.7	4.91	33.66	123	118	P	H
		2390	47.3	-6.7	54	48.35	27.7	4.91	33.66	123	118	A	H
	*	2412	104.98	-	-	106.01	27.69	4.93	33.65	123	118	P	H
	*	2412	96.16	-	-	97.19	27.69	4.93	33.65	123	118	A	H
		2389.59	57.36	-16.64	74	58.41	27.7	4.91	33.66	103	55	P	V
		2390	47.6	-6.4	54	48.65	27.7	4.91	33.66	103	55	A	V
	*	2412	108.08	-	-	109.11	27.69	4.93	33.65	103	55	P	V
	*	2412	99.42	-	-	100.45	27.69	4.93	33.65	103	55	A	V
802.11ax HE20 CH 06 2437MHz		2388.54	51.13	-22.87	74	52.18	27.7	4.91	33.66	119	116	P	H
		2389.94	40.38	-13.62	54	41.43	27.7	4.91	33.66	119	116	A	H
	*	2437	104.03	-	-	105.06	27.66	4.96	33.65	119	116	P	H
	*	2437	95.67	-	-	96.7	27.66	4.96	33.65	119	116	A	H
		2483.55	50.72	-23.28	74	51.72	27.63	4.99	33.62	119	116	P	H
		2483.5	40.32	-13.68	54	41.32	27.63	4.99	33.62	119	116	A	H
		2389.52	51.16	-22.84	74	52.21	27.7	4.91	33.66	124	50	P	V
		2389.94	41.19	-12.81	54	42.24	27.7	4.91	33.66	124	50	A	V
	*	2437	107.14	-	-	108.17	27.66	4.96	33.65	124	50	P	V
	*	2437	98.59	-	-	99.62	27.66	4.96	33.65	124	50	A	V
	2484.67	51	-23	74	52	27.63	4.99	33.62	124	50	P	V	
	2483.5	41.21	-12.79	54	42.21	27.63	4.99	33.62	124	50	A	V	



802.11ax HE20 CH 11 2462MHz	*	2462	104.3	-	-	105.31	27.64	4.98	33.63	144	117	P	H
	*	2462	95.74	-	-	96.75	27.64	4.98	33.63	144	117	A	H
		2483.84	57.14	-16.86	74	58.14	27.63	4.99	33.62	144	117	P	H
		2483.52	46.11	-7.89	54	47.11	27.63	4.99	33.62	144	117	A	H
	*	2462	108.71	-	-	109.72	27.64	4.98	33.63	112	47	P	V
	*	2462	99.65	-	-	100.66	27.64	4.98	33.63	112	47	A	V
		2484.6	61.23	-12.77	74	62.23	27.63	4.99	33.62	112	47	P	V
		2483.52	48.91	-5.09	54	49.91	27.63	4.99	33.62	112	47	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 802.11ax HE20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE20 CH 01 2412MHz		4824	41.15	-32.85	74	59.76	31.76	7.11	57.48	145	274	P	H
		4824	41.08	-32.92	74	59.69	31.76	7.11	57.48	191	220	P	V
802.11ax HE20 CH 06 2437MHz		4874	40.55	-33.45	74	59	31.88	7.19	57.52	112	229	P	H
		7311	46.6	-27.4	74	59.88	36.88	8.76	58.92	174	100	P	H
		4874	41.07	-32.93	74	59.52	31.88	7.19	57.52	201	0	P	V
		7311	47.14	-26.86	74	60.42	36.88	8.76	58.92	120	106	P	V
802.11ax HE20 CH 11 2462MHz		4924	41.72	-32.28	74	60.05	32	7.22	57.55	133	180	P	H
		7386	46.39	-27.61	74	59.19	37.21	8.95	58.96	145	274	P	H
		4924	41.51	-32.49	74	59.84	32	7.22	57.55	201	0	P	V
		7386	47.47	-26.53	74	60.27	37.21	8.95	58.96	166	210	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**2.4GHz 2400~2483.5MHz
WIFI 802.11ax HE20 (Band Edge @ 3m)**

Partial RU

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE20 CH 01 2412MHz		2389.695	62.86	-11.14	74	63.91	27.7	4.91	33.66	100	140	P	H
		2390	43.07	-10.93	54	44.12	27.7	4.91	33.66	100	140	A	H
	*	2412	101.16	-	-	102.19	27.69	4.93	33.65	100	140	P	H
	*	2412	92.96	-	-	93.99	27.69	4.93	33.65	100	140	A	H
		2389.905	63.47	-10.53	74	64.52	27.7	4.91	33.66	104	360	P	V
		2389.065	42.8	-11.2	54	43.85	27.7	4.91	33.66	104	360	A	V
	*	2412	101.46	-	-	102.49	27.69	4.93	33.65	104	360	P	V
	*	2412	92.39	-	-	93.42	27.69	4.93	33.65	104	360	A	V
802.11ax HE20 CH 11 2462MHz	*	2462	102.44	-	-	103.45	27.64	4.98	33.63	100	141	P	H
	*	2462	93.81	-	-	94.82	27.64	4.98	33.63	100	141	A	H
		2483.92	65.74	-8.26	74	66.74	27.63	4.99	33.62	100	141	P	H
		2483.52	44.41	-9.59	54	45.41	27.63	4.99	33.62	100	141	A	H
	*	2462	102.34	-	-	103.35	27.64	4.98	33.63	100	360	P	V
	*	2462	92.91	-	-	93.92	27.64	4.98	33.63	100	360	A	V
		2485.4	66.49	-7.51	74	67.49	27.63	4.99	33.62	100	360	P	V
		2485.16	45.4	-8.6	54	46.4	27.63	4.99	33.62	100	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 802.11ax HE20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE20 CH 01 2412MHz		4824	40.64	-33.36	74	59.25	31.76	7.11	57.48	145	274	P	H
		4824	40.37	-33.63	74	58.98	31.76	7.11	57.48	145	274	P	V
802.11ax HE20 CH 11 2462MHz		4924	40.55	-33.45	74	58.88	32	7.22	57.55	112	229	P	H
		7386	46.6	-27.4	74	59.4	37.21	8.95	58.96	174	100	P	H
		4924	41.07	-32.93	74	59.4	32	7.22	57.55	201	0	P	V
		7386	47.14	-26.86	74	59.94	37.21	8.95	58.96	120	106	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

Table with 14 columns: WIFI, Note, Frequency, Level, Over, Limit, Read, Antenna, Cable, Preamp, Ant, Table, Peak, Pol. It contains 12 rows of test data for 2.4GHz WIFI 802.11g LF and a Remark section at the bottom.



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	Cable	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

- Level(dBμV/m) =
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

- Level(dBμV/m)
= Antenna Factor(dB/m) + Cable 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)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

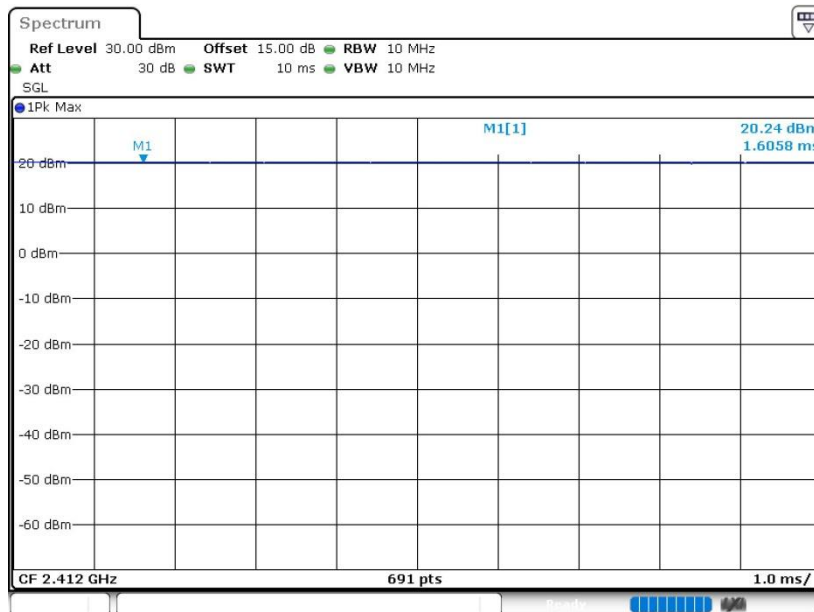
- Level(dBμV/m)
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

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

Appendix D. Duty Cycle Plots

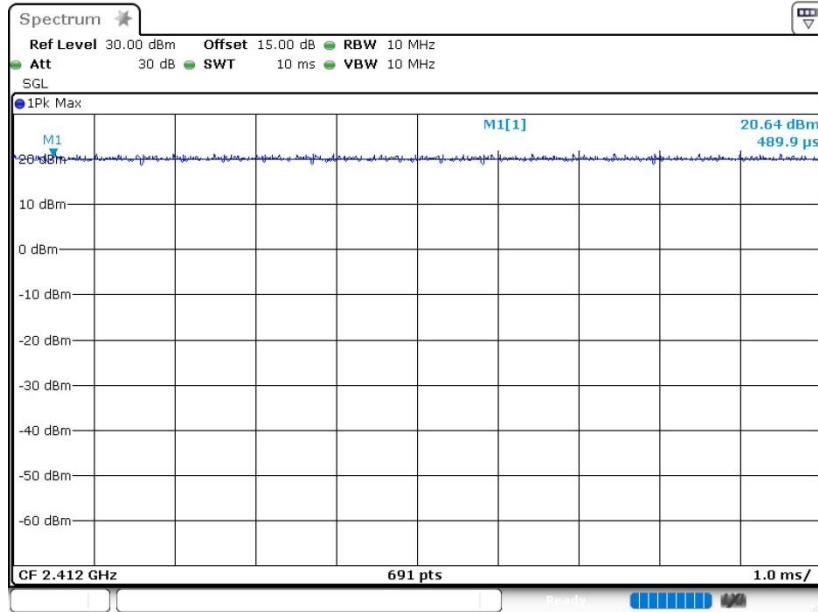
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11b	100	-	-	10Hz
1+2	802.11g	100	-	-	10Hz
1+2	802.11n HT20	100	-	-	10Hz
1+2	802.11ax HE20	100	-	-	10Hz

802.11b

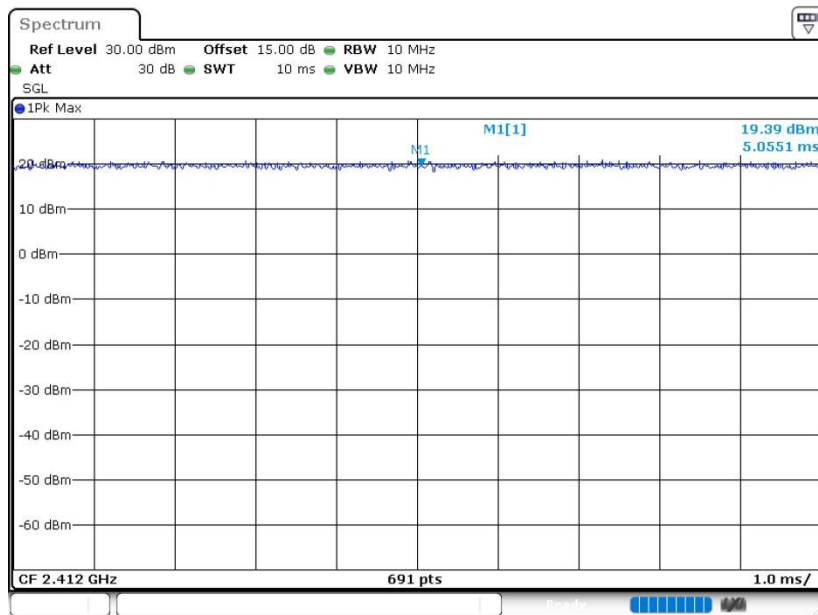




802.11g



802.11n HT20





802.11ax HE20

