




FCC RF Test Report

APPLICANT : Elo Touch Solutions, Inc.
EQUIPMENT : Mobile POS
BRAND NAME : ELO or 
MODEL NAME : EMC0600C
FCC ID : RBWEMC0600C
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Jun. 01, 2021 ~ Jun. 25, 2021

We, Sporton International (Kunshan) 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 (Kunshan) Inc., 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 (Kunshan) Inc.
 No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
 People's Republic of China



TABLE OF CONTENTS

REVISION HISTORY..... 3

SUMMARY OF TEST RESULT 4

1 GENERAL DESCRIPTION 5

 1.1 Applicant 5

 1.2 Manufacturer 5

 1.3 Product Feature of Equipment Under Test..... 5

 1.4 Product Specification of Equipment Under Test..... 6

 1.5 Modification of EUT 6

 1.6 Testing Location 7

 1.7 Test Software..... 7

 1.8 Applicable Standards..... 7

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST 8

 2.1 Carrier Frequency and Channel 8

 2.2 Test Mode 9

 2.3 Connection Diagram of Test System 10

 2.4 Support Unit used in test configuration and system 11

 2.5 EUT Operation Test Setup 11

 2.6 Measurement Results Explanation Example..... 11

3 TEST RESULT 12

 3.1 6dB and 99% Bandwidth Measurement 12

 3.2 Output Power Measurement..... 14

 3.3 Power Spectral Density Measurement 15

 3.4 Conducted Band Edges and Spurious Emission Measurement 17

 3.5 Radiated Band Edges and Spurious Emission Measurement 42

 3.6 AC Conducted Emission Measurement..... 46

 3.7 Antenna Requirements 48

4 LIST OF MEASURING EQUIPMENT 49

5 UNCERTAINTY OF EVALUATION 50

APPENDIX A. CONDUCTED TEST RESULTS

APPENDIX B. AC CONDUCTED EMISSION TEST RESULT

APPENDIX C. RADIATED SPURIOUS EMISSION

APPENDIX D. DUTY CYCLE PLOTS

APPENDIX E. SETUP PHOTOGRAPHS



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR142804-01C	Rev. 01	Initial issue of report	Sep. 03, 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	≤ 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 3.22 dB at 2389.950 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 11.89 dB at 1.236 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

Elo Touch Solutions, Inc.
670 N. McCarthy Blvd. Suite 100, Milpitas, CA 95035, United States

1.2 Manufacturer

Elo Touch Solutions, Inc.
670 N. McCarthy Blvd. Suite 100, Milpitas, CA 95035, United States

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile POS
Brand Name	ELO or 
Model Name	EMC0600C
FCC ID	RBWEMC0600C
IMEI Code	Conducted: N/A Conduction: 357830300003036 Radiation:N/A
HW Version	A01
SW Version	5.07.100
EUT Stage	Production Unit

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	<p><Ant. 1> 802.11b : 19.28 dBm (0.0847 W) 802.11g : 17.42 dBm (0.0552 W)</p> <p><Ant. 2> 802.11b : 19.41 dBm (0.0873 W) 802.11g : 17.83 dBm (0.0607 W)</p> <p>MIMO <Ant. 1+2> 802.11n HT20 : 20.47 dBm (0.1114 W) 802.11n HT40 : 22.10 dBm (0.1622 W)</p>									
99% Occupied Bandwidth	802.11b : 14.19MHz 802.11g : 17.73MHz 802.11n HT20 : 18.93MHz 802.11n HT40 : 36.46MHz									
Antenna Type / Gain	<p><Ant. 1> : PIFA Antenna type with gain 0.89 dBi <Ant. 2> : PIFA Antenna type with gain 0.52 dBi</p>									
Antenna Function for Transmitter	<table border="1"> <thead> <tr> <th></th> <th>Ant. 1</th> <th>Ant. 2</th> </tr> </thead> <tbody> <tr> <td>802.11 b/g/n SISO</td> <td>√</td> <td>√</td> </tr> <tr> <td>802.11 n MIMO/ Beamforming</td> <td>√</td> <td>√</td> </tr> </tbody> </table>		Ant. 1	Ant. 2	802.11 b/g/n SISO	√	√	802.11 n MIMO/ Beamforming	√	√
	Ant. 1	Ant. 2								
802.11 b/g/n SISO	√	√								
802.11 n MIMO/ Beamforming	√	√								
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)									

Note:

1. For WLAN SISO & MIMO mode for 802.11n mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.
2. 802.11n supports Tx beamforming mode, the power/EIRP of TX BF mode is lower than non-Tx BF mode, so only non-Tx BF test data show in the report.

1.5 Modification of EUT

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



1.6 Testing Location

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

Test Firm	Sporton International (Kunshan) Inc.		
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.
	CO01-KS 03CH05-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-KS	AUDIX	E3	6.2009-8-24

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.



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 (X 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.

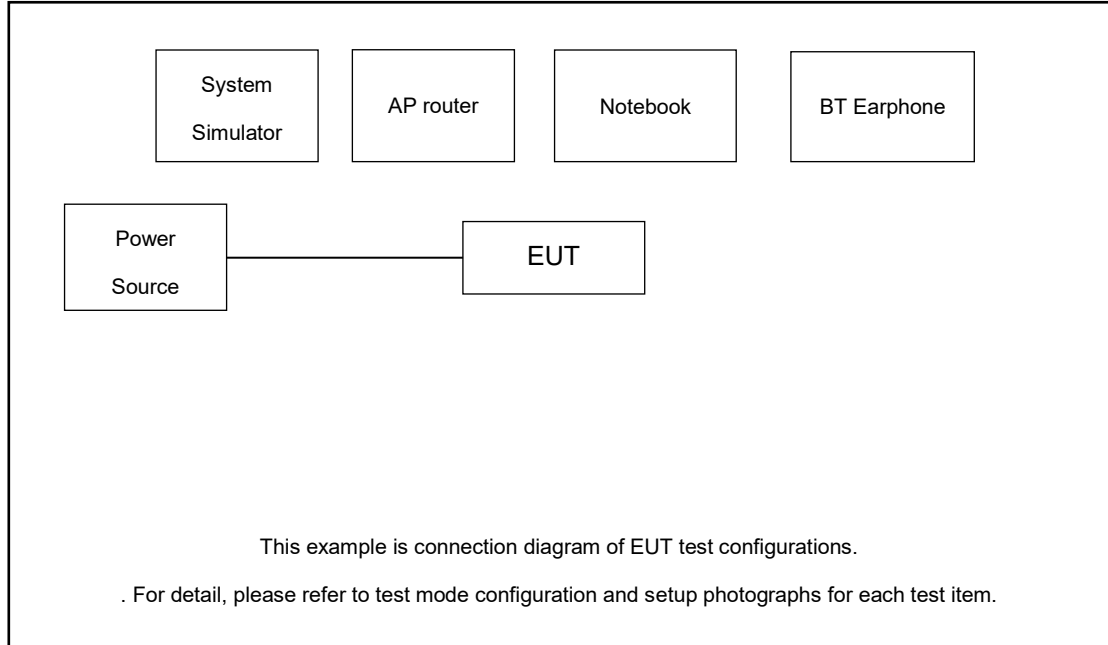
MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

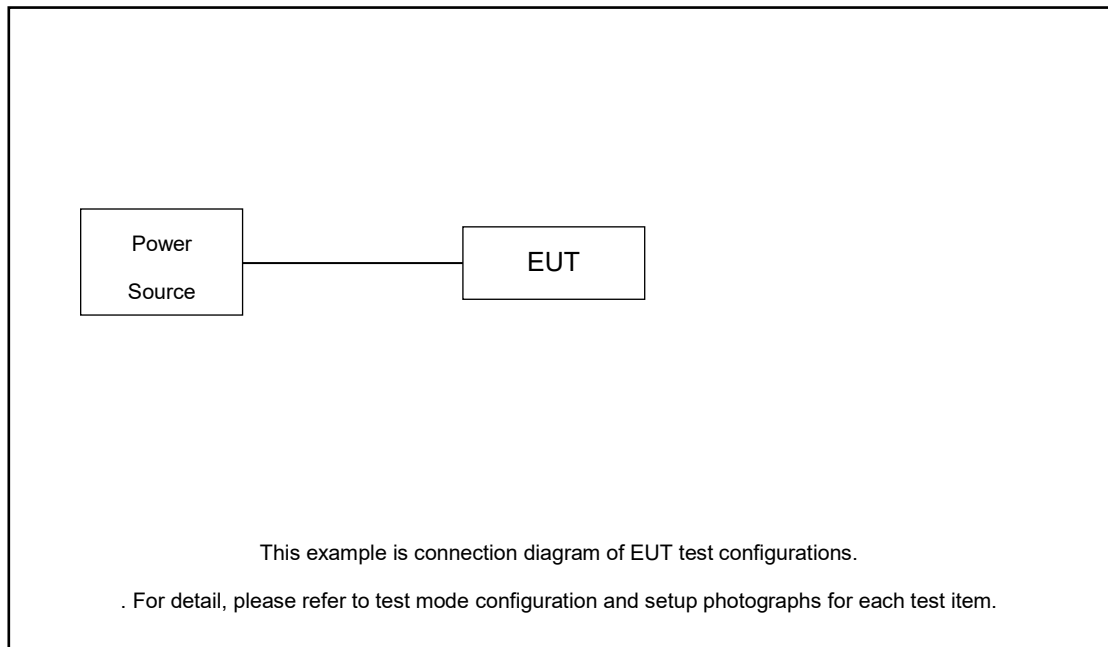
Test Cases	
AC Conducted Emission	Mode 1 :WCDMA 850 Idle+ Bluetooth Link+ WLAN Link (2.4G)+ Adapter
Remark: For Radiated Test Cases, The tests were performed with Adapter	

2.3 Connection Diagram of Test System

For Conducted Emission



For Radiated 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, 1.8 m
2.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A

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 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

Offset = RF cable loss

Following shows an offset computation example with cable loss 6dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} \\ &= 6(\text{dB}) \end{aligned}$$

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.

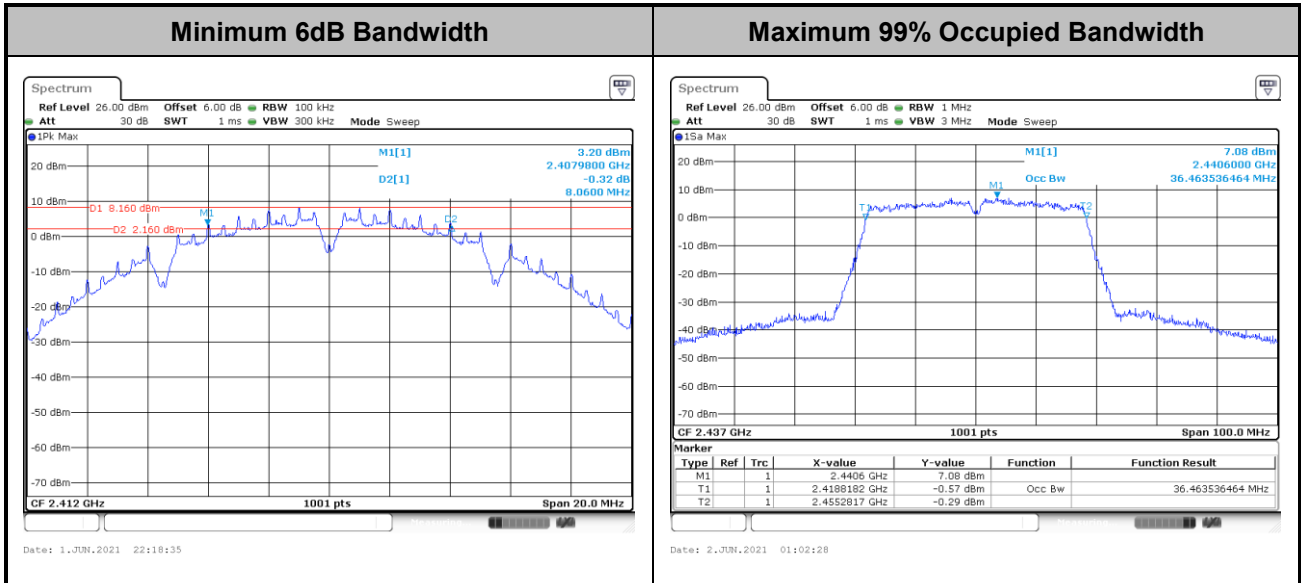
3.1.4 Test Setup





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.

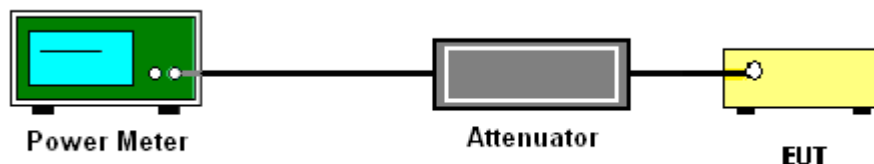
3.2.2 Measuring Instruments

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 11.9.2.3.2 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 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.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

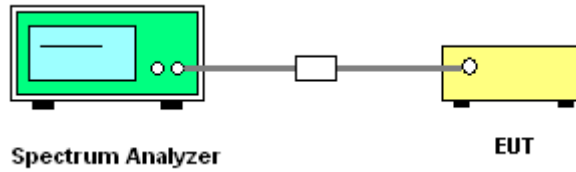
If measurements performed using method (2) plus $10 \log(N)$ exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

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.

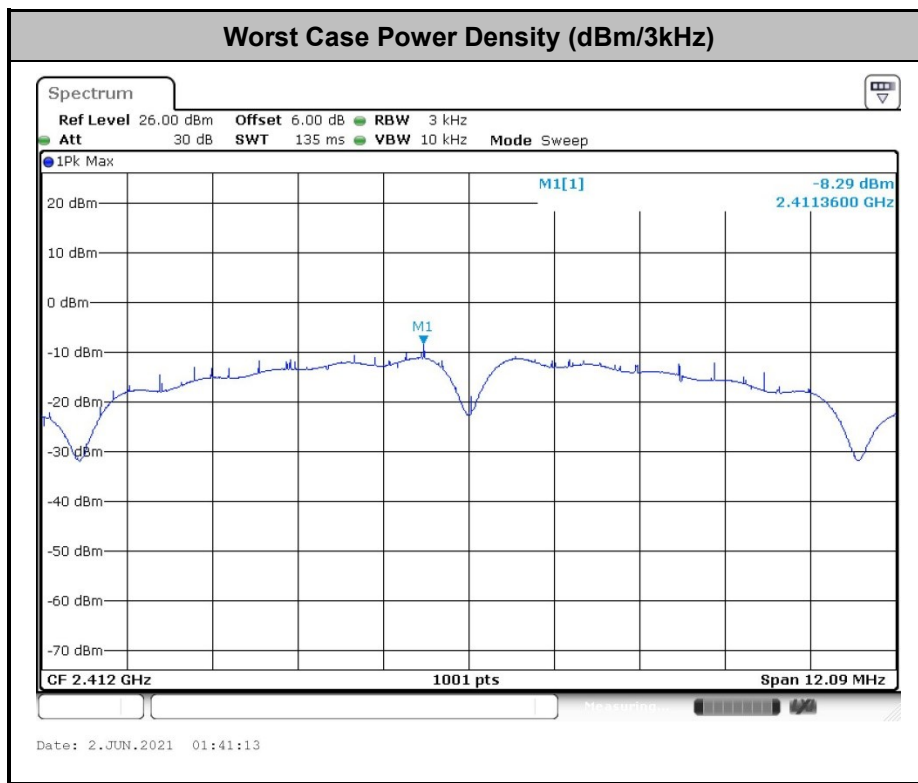
Method (2): Measure and add $10 \log(N)$ dB, where N is the number of outputs. (N=2)

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.

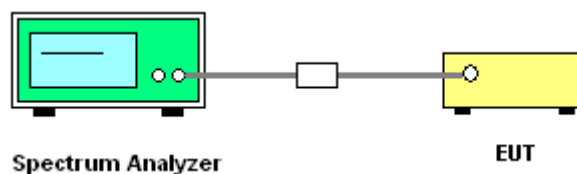
3.4.2 Measuring Instruments

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



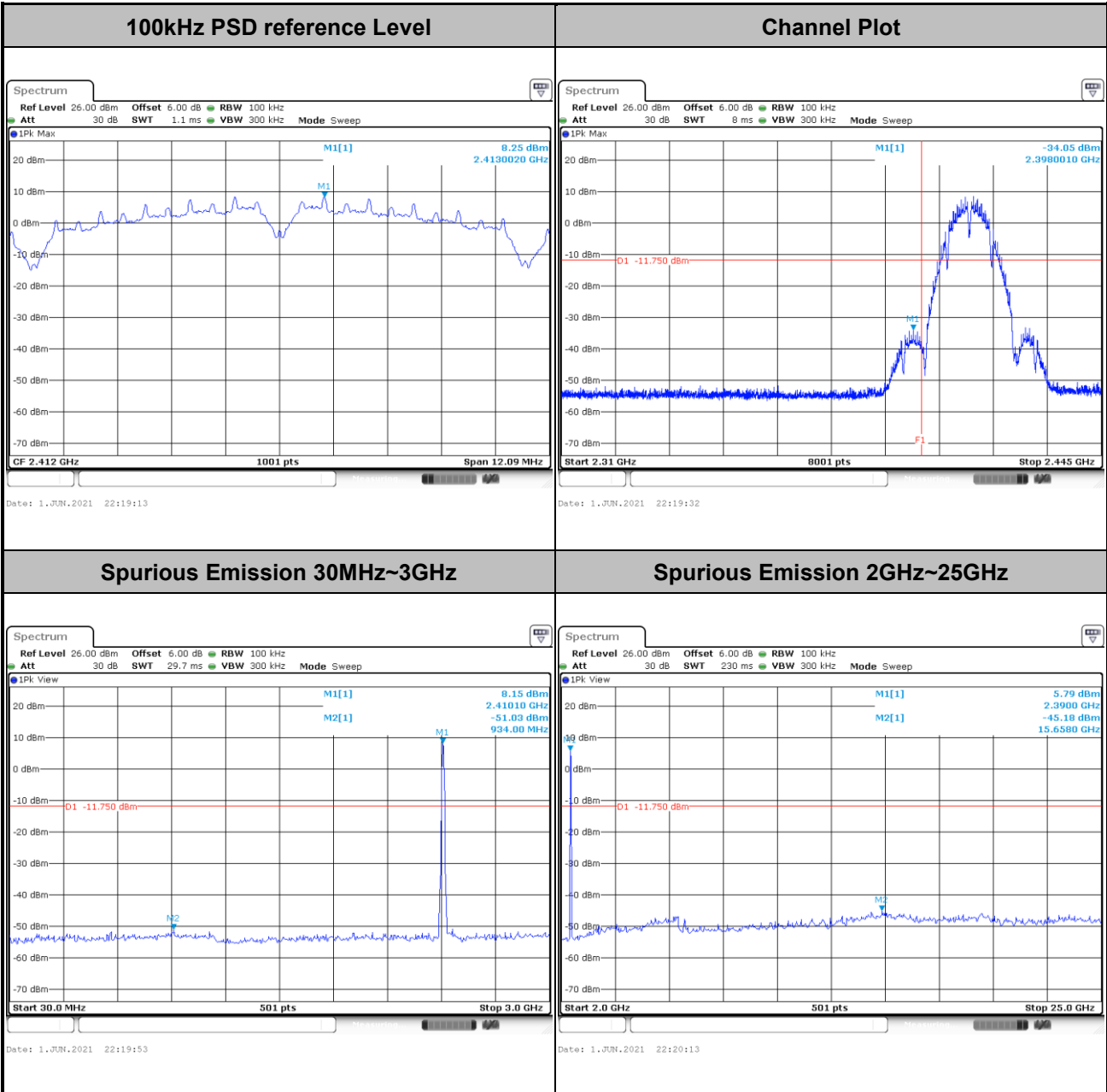


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer : albert shi	Temperature :	21~25°C
	Relative Humidity :	51~54%

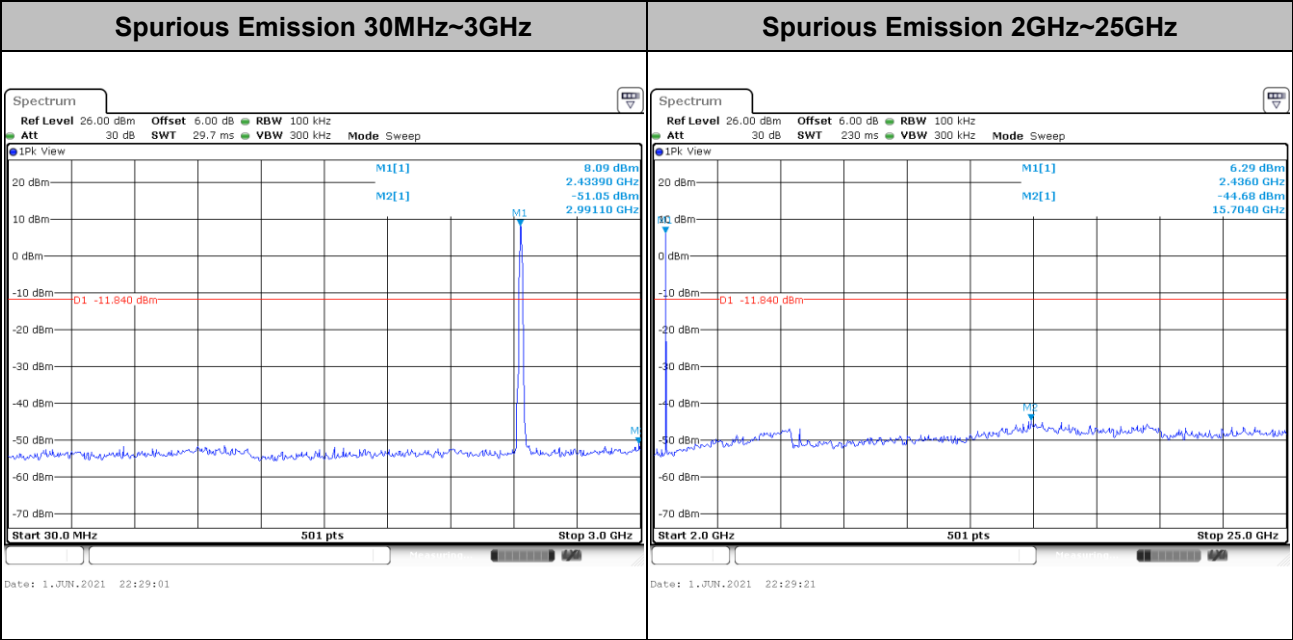
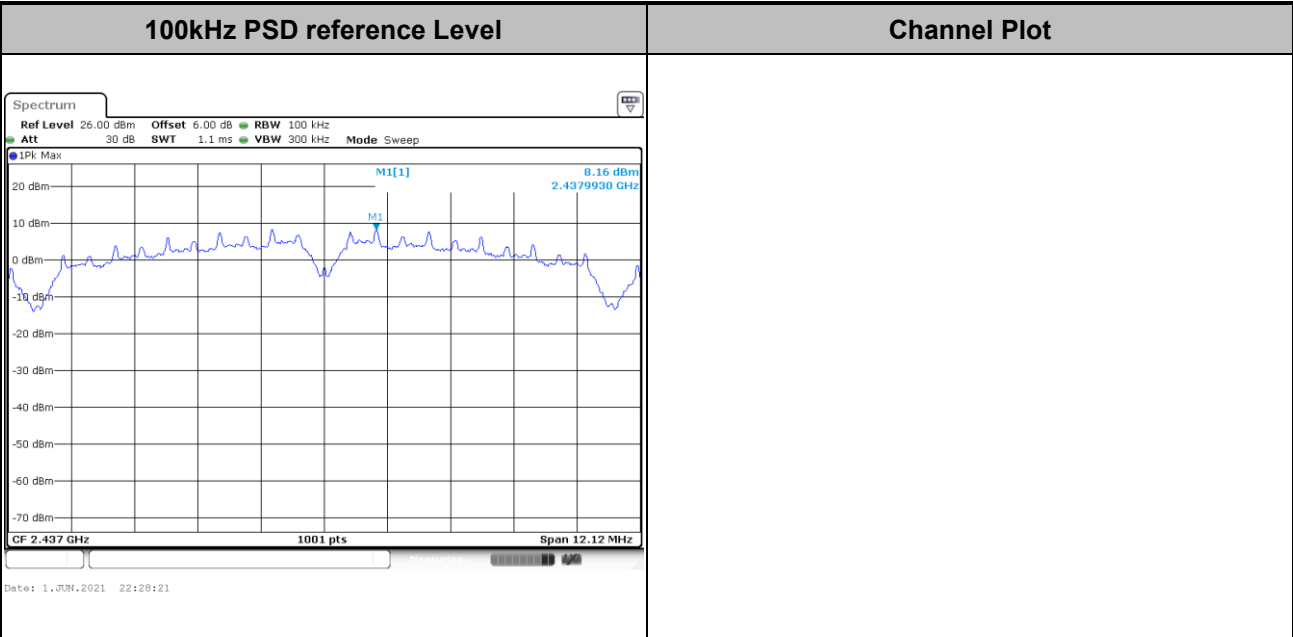
Number of TX = 1, Ant. 1 (Measured)

Test Mode :	802.11b	Test Channel :	01
-------------	---------	----------------	----



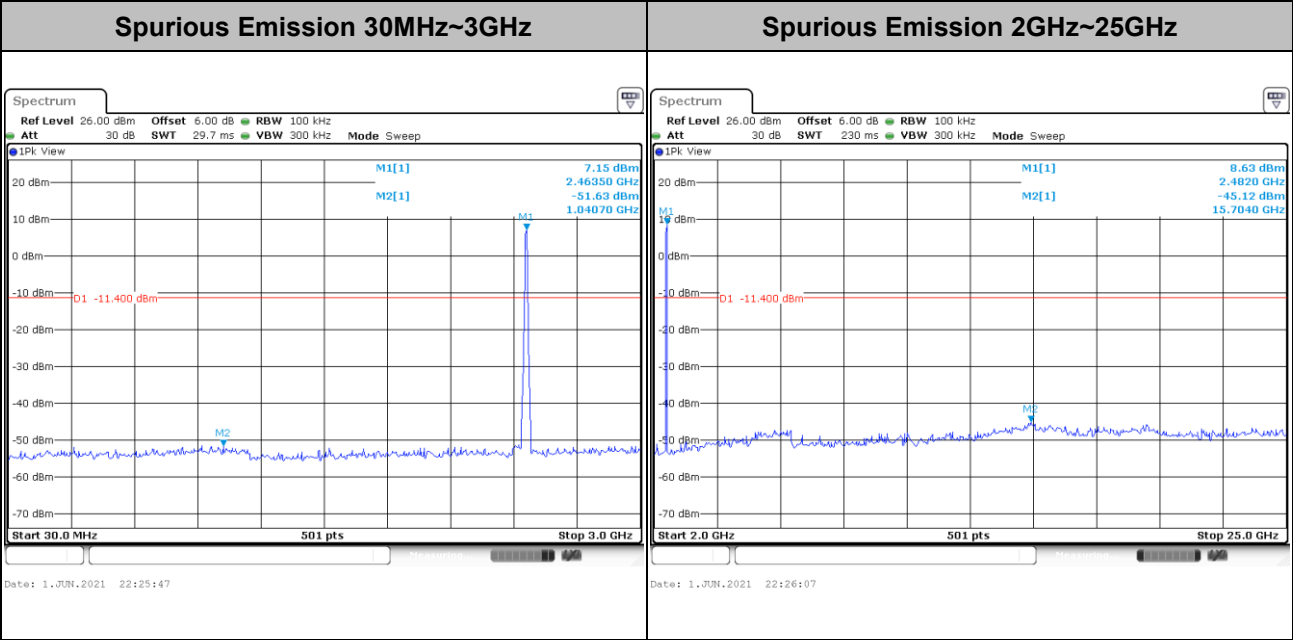
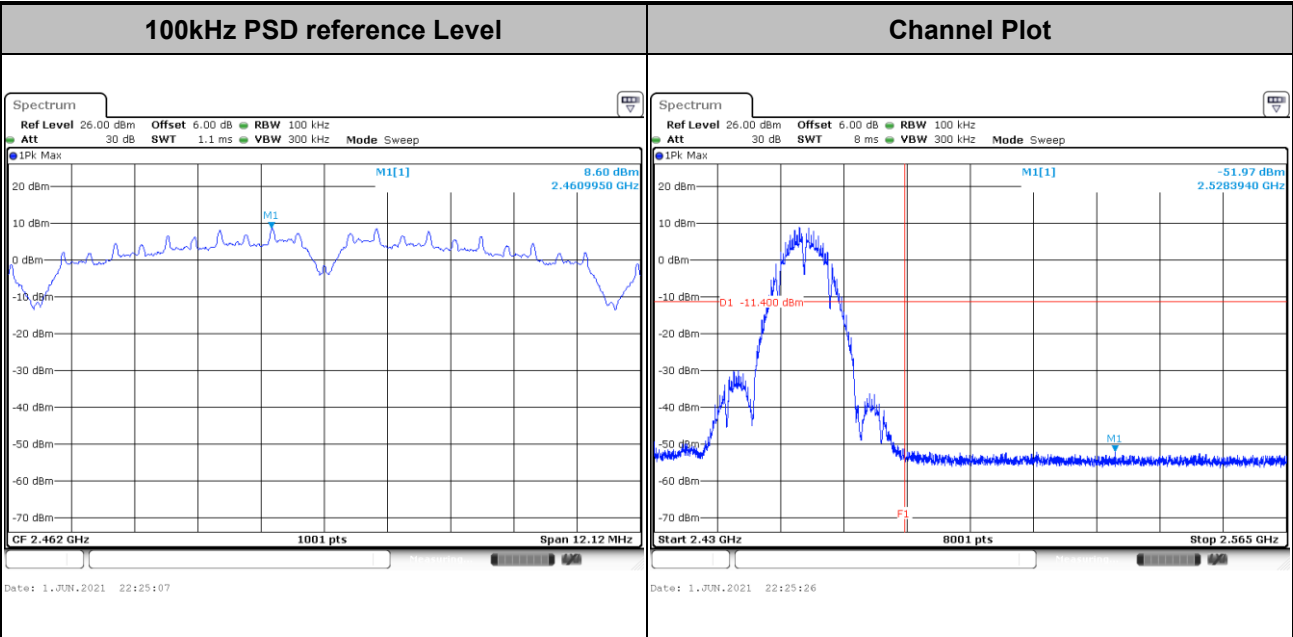


Test Mode :	802.11b	Test Channel :	06
-------------	---------	----------------	----



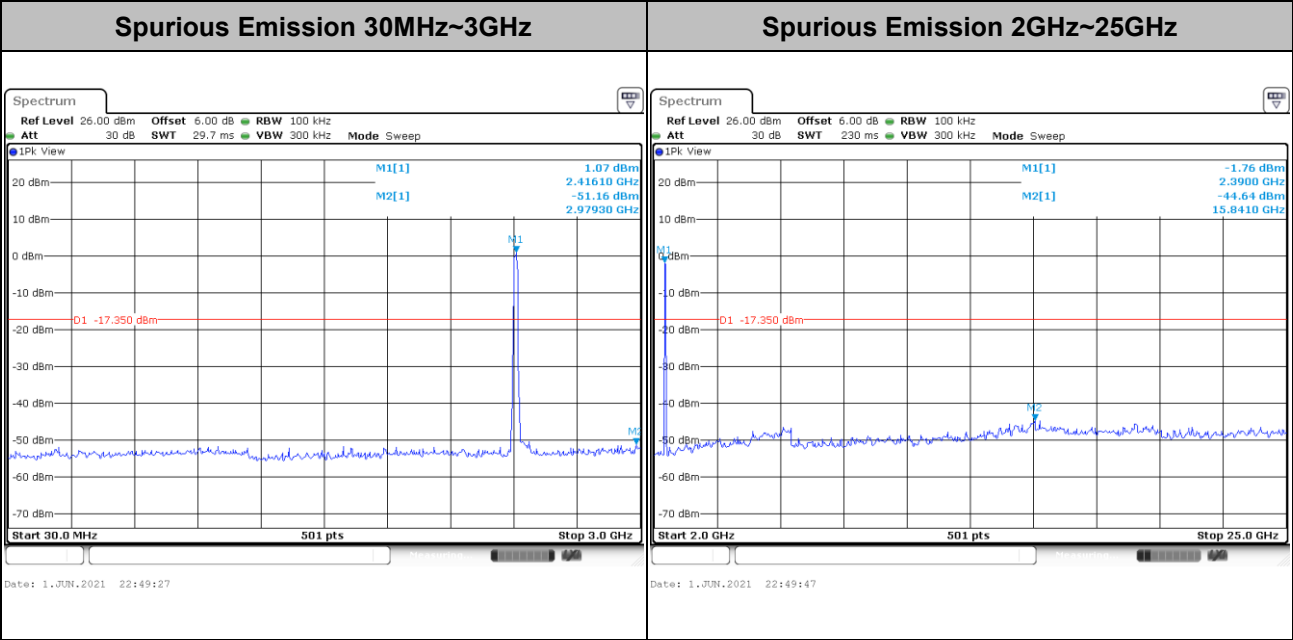
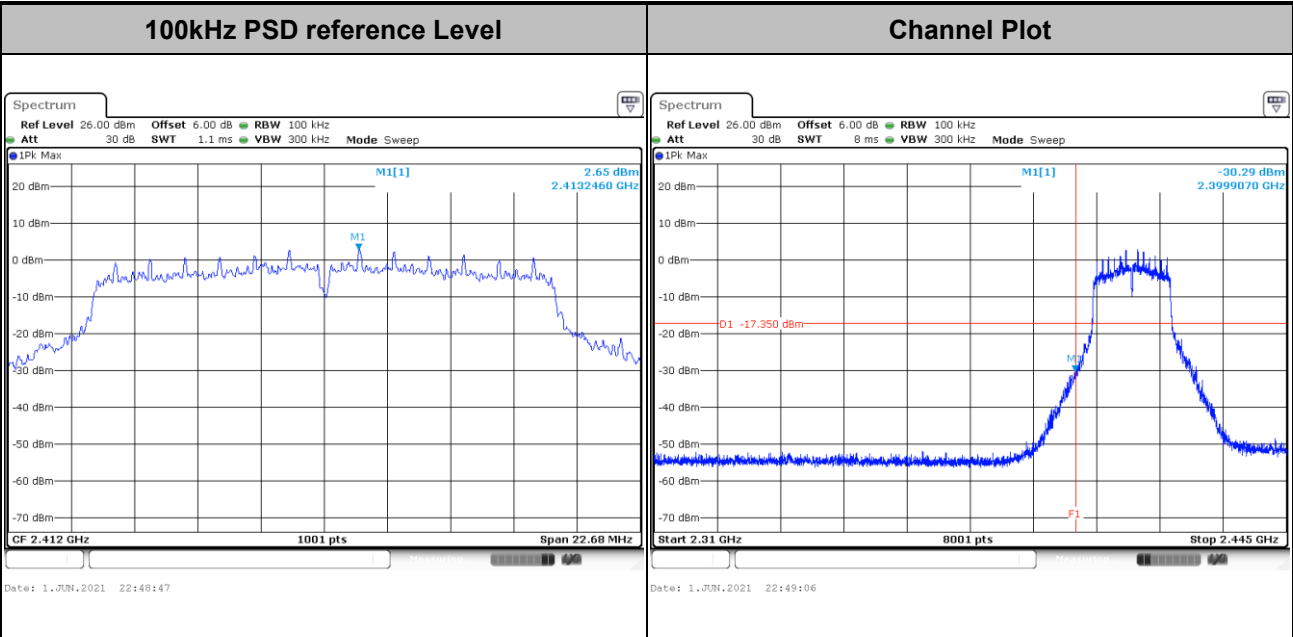


Test Mode : 802.11b Test Channel : 11



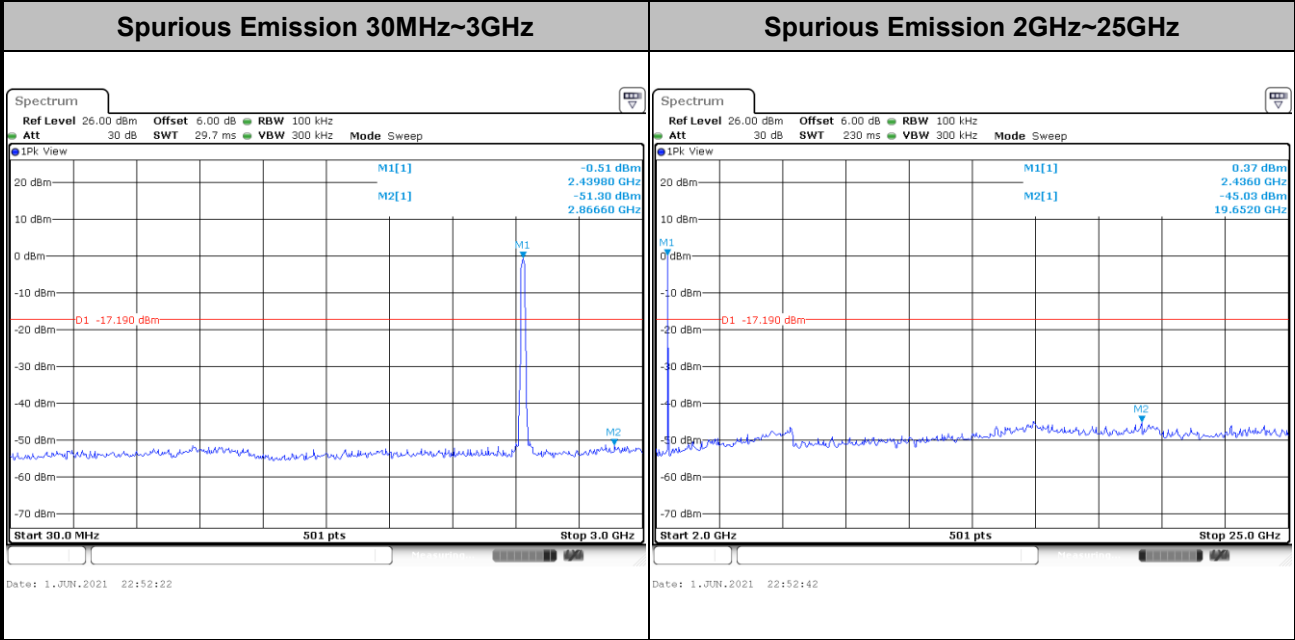
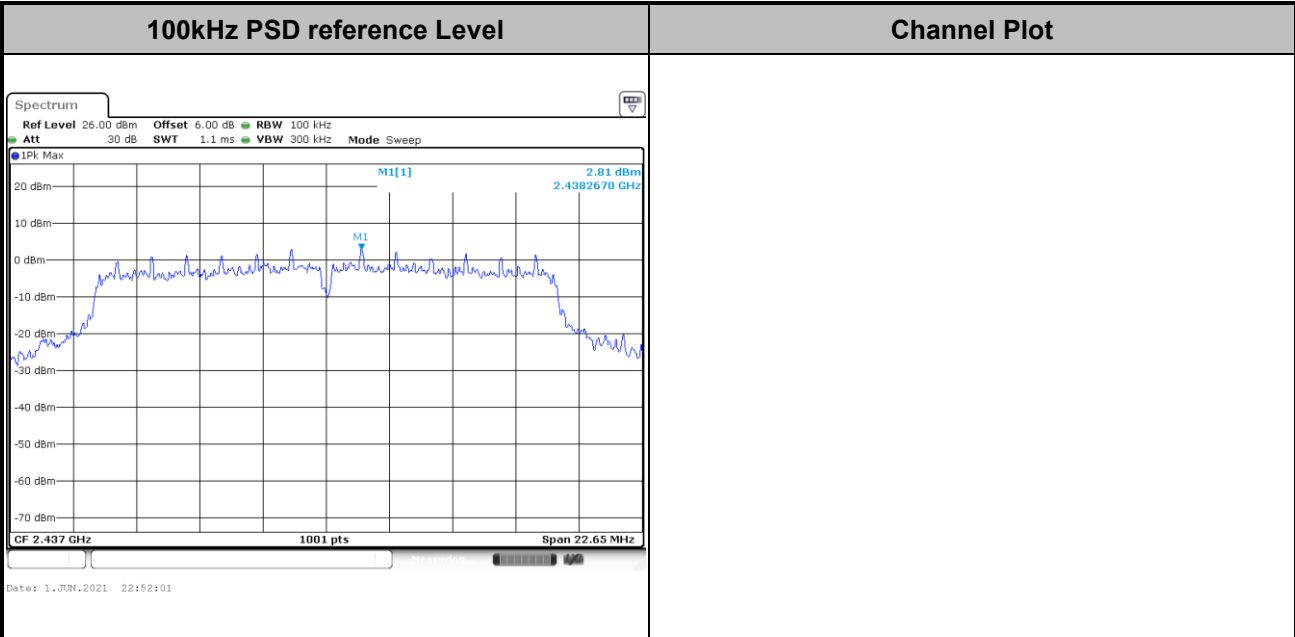


Test Mode : 802.11g Test Channel : 01



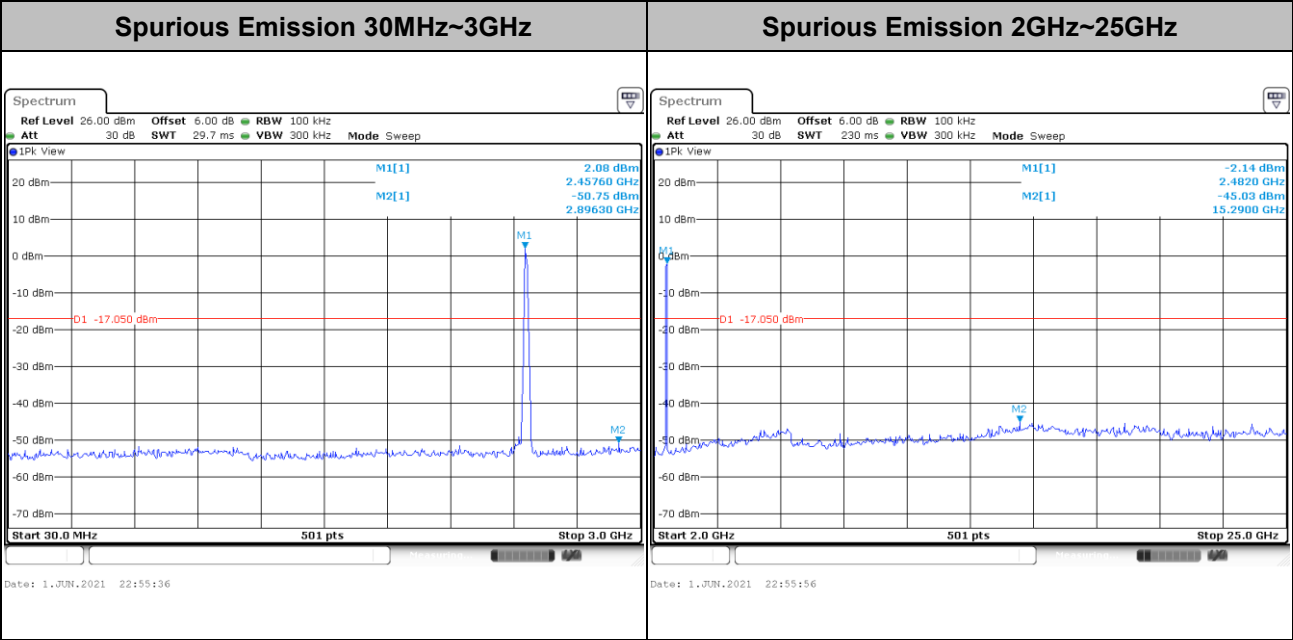
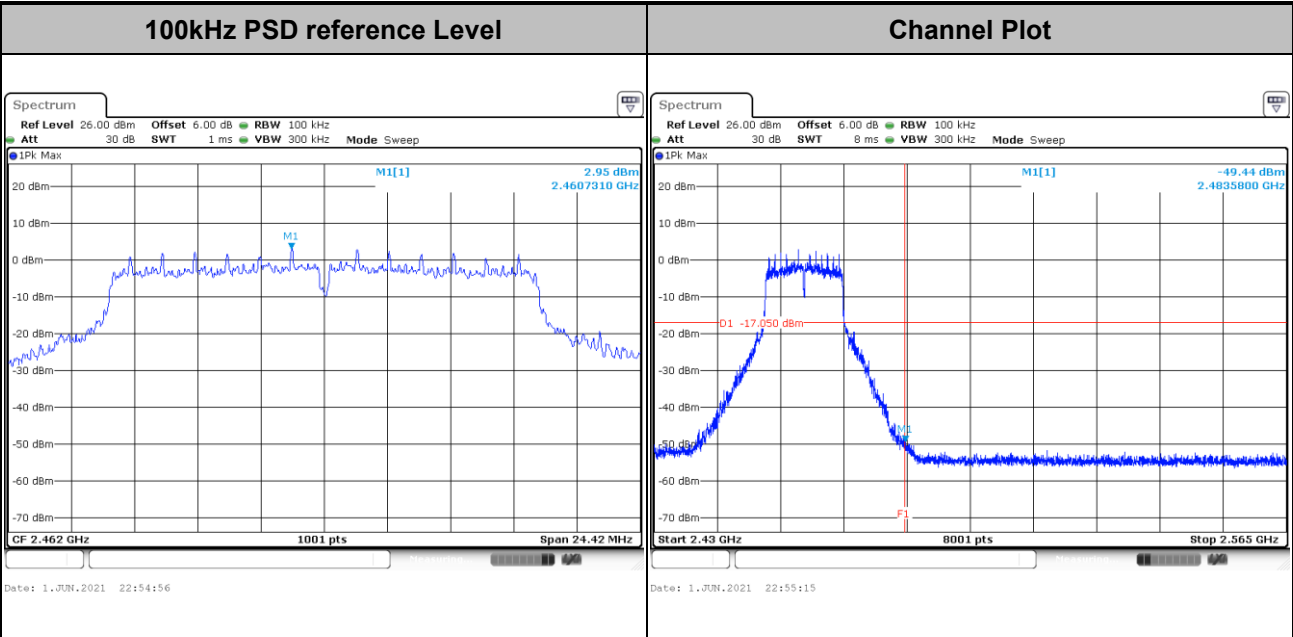


Test Mode :	802.11g	Test Channel :	06
-------------	---------	----------------	----





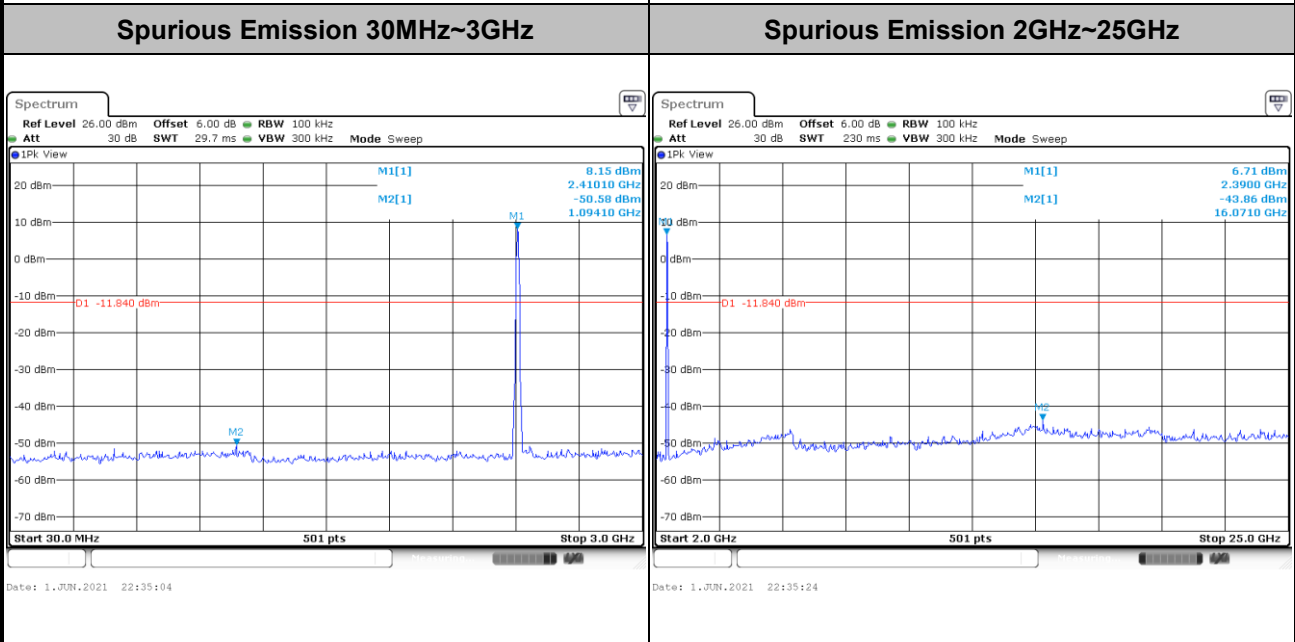
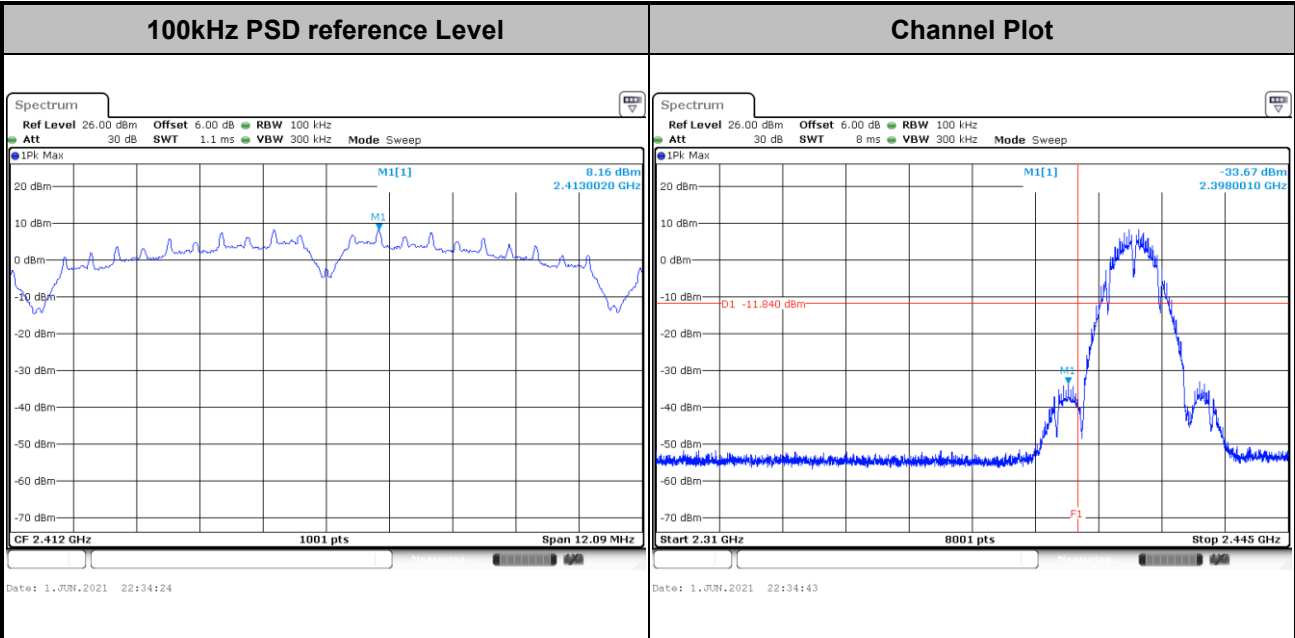
Test Mode : 802.11g Test Channel : 11





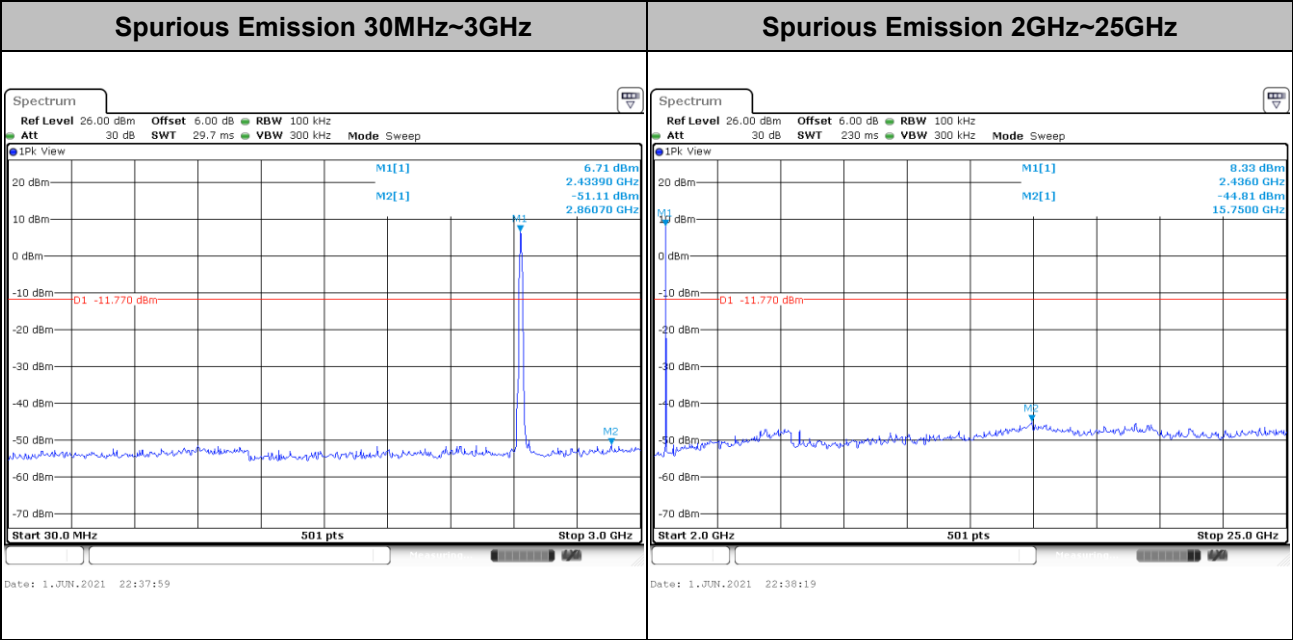
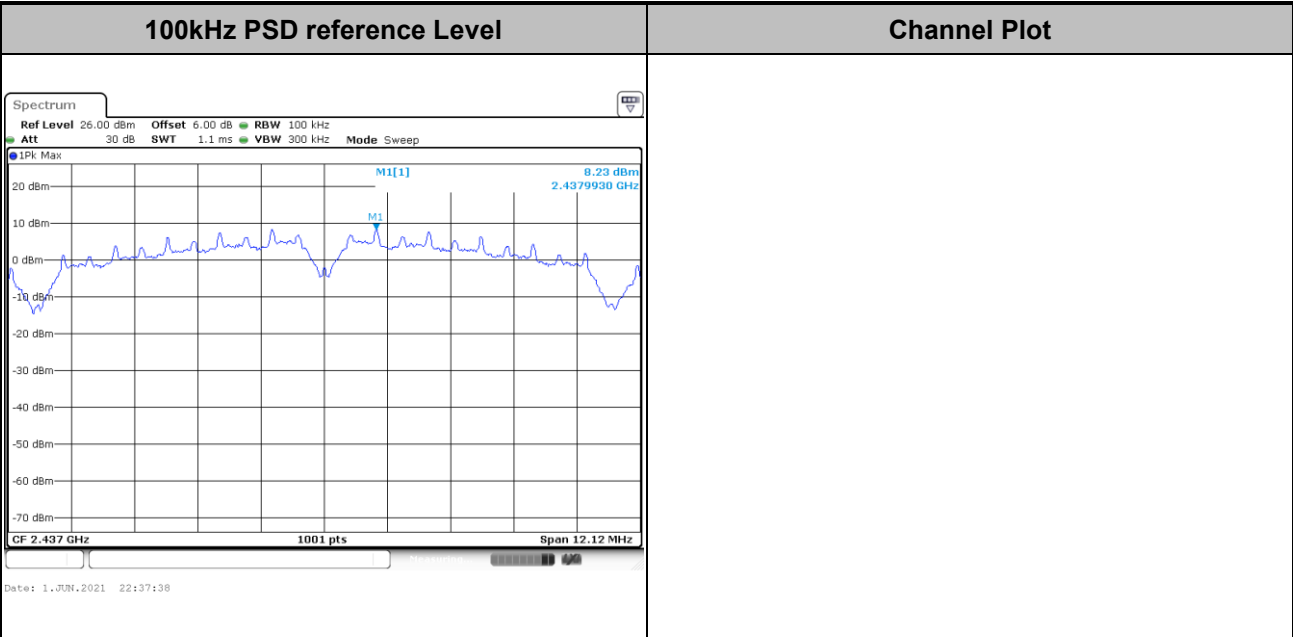
Number of TX = 1, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01
-------------	---------	----------------	----



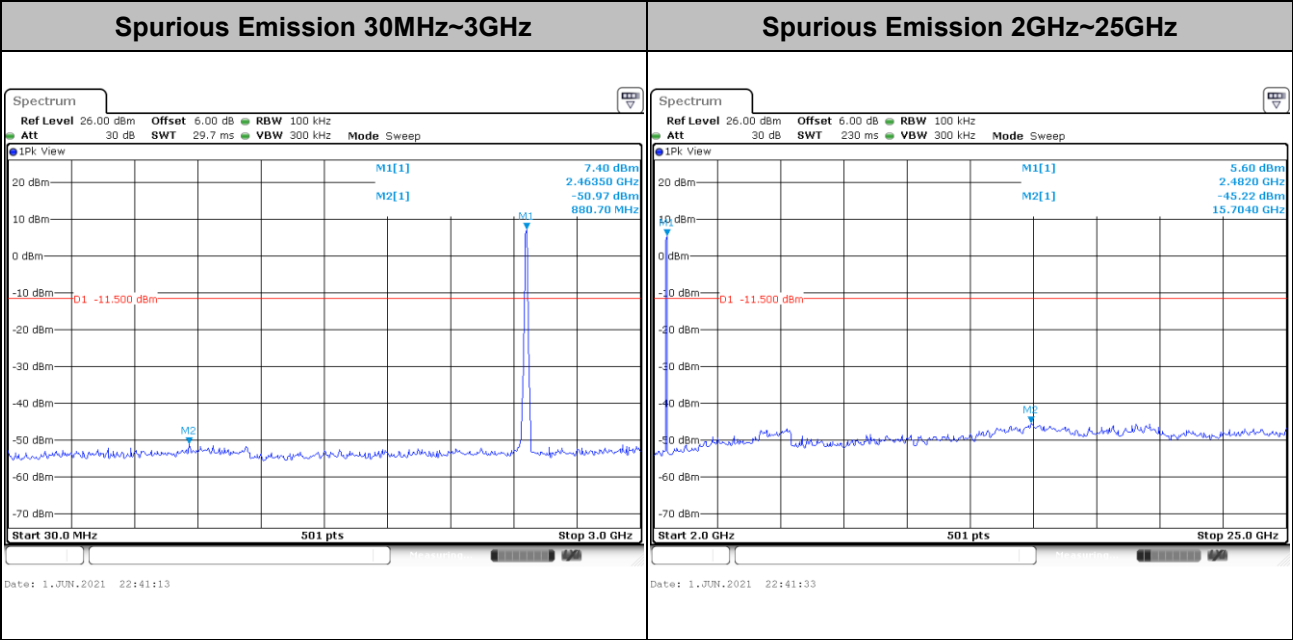
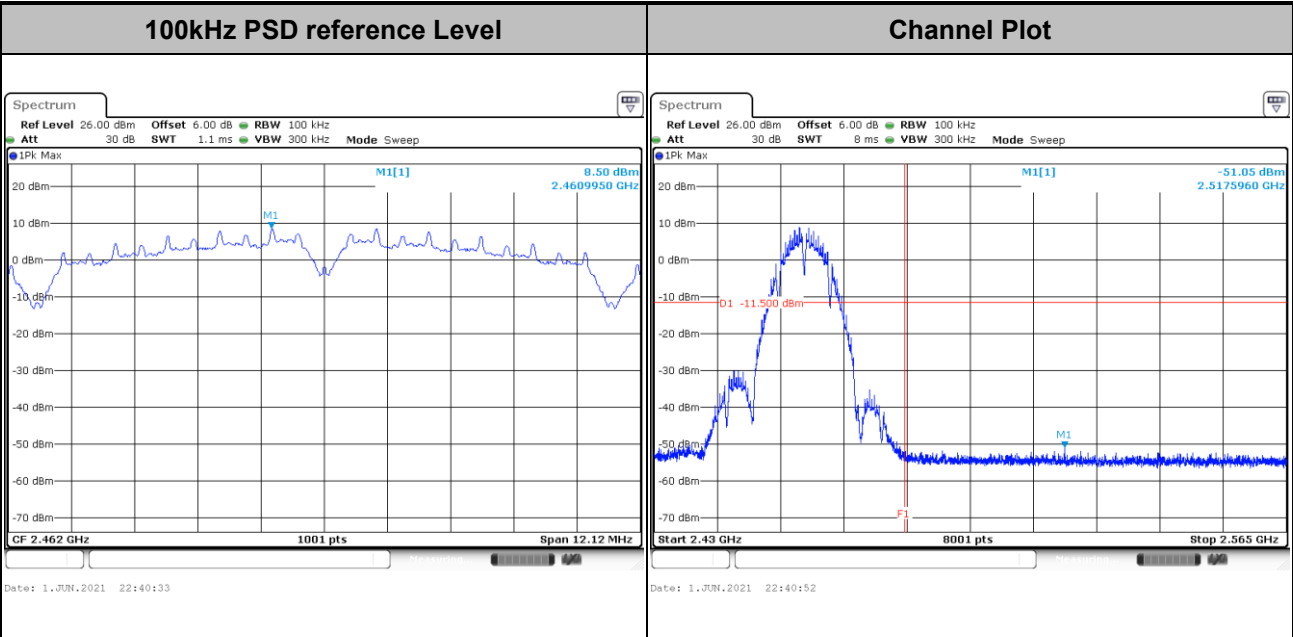


Test Mode :	802.11b	Test Channel :	06
-------------	---------	----------------	----



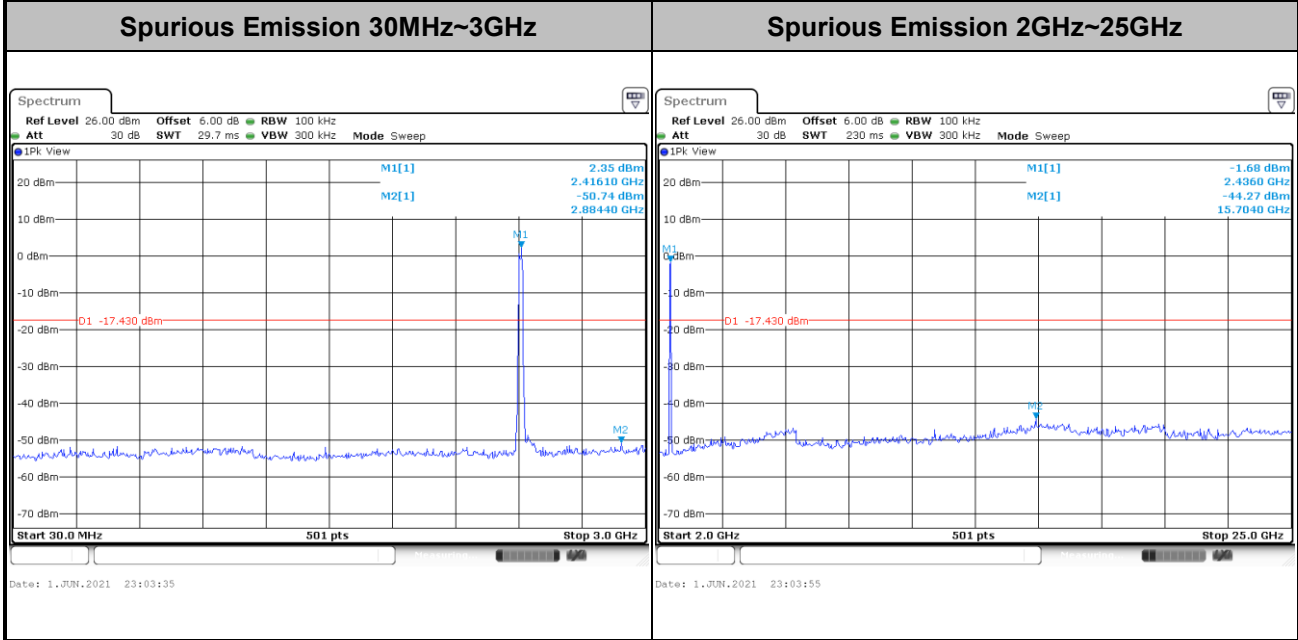
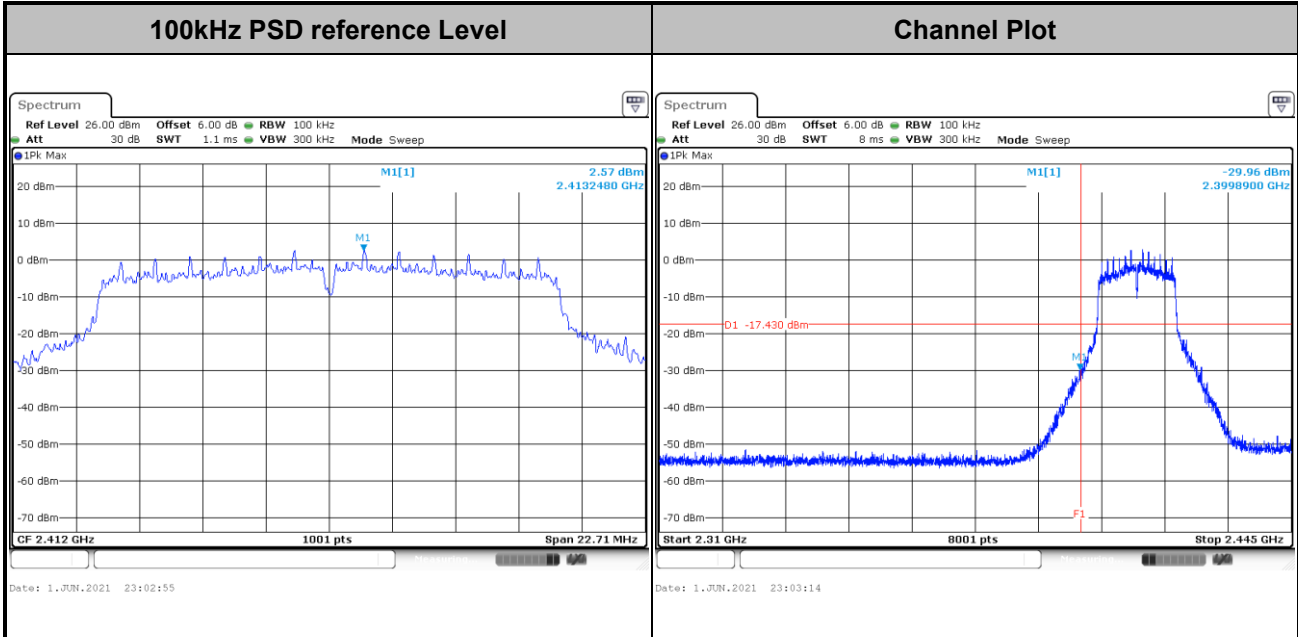


Test Mode :	802.11b	Test Channel :	11
-------------	---------	----------------	----



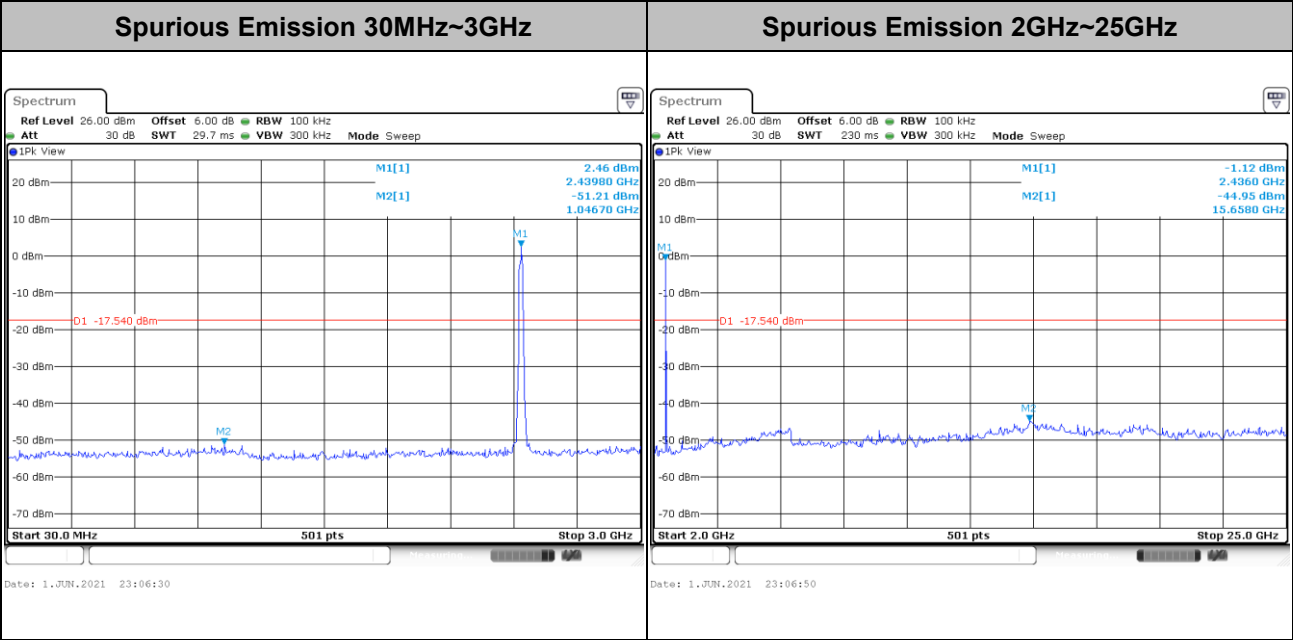
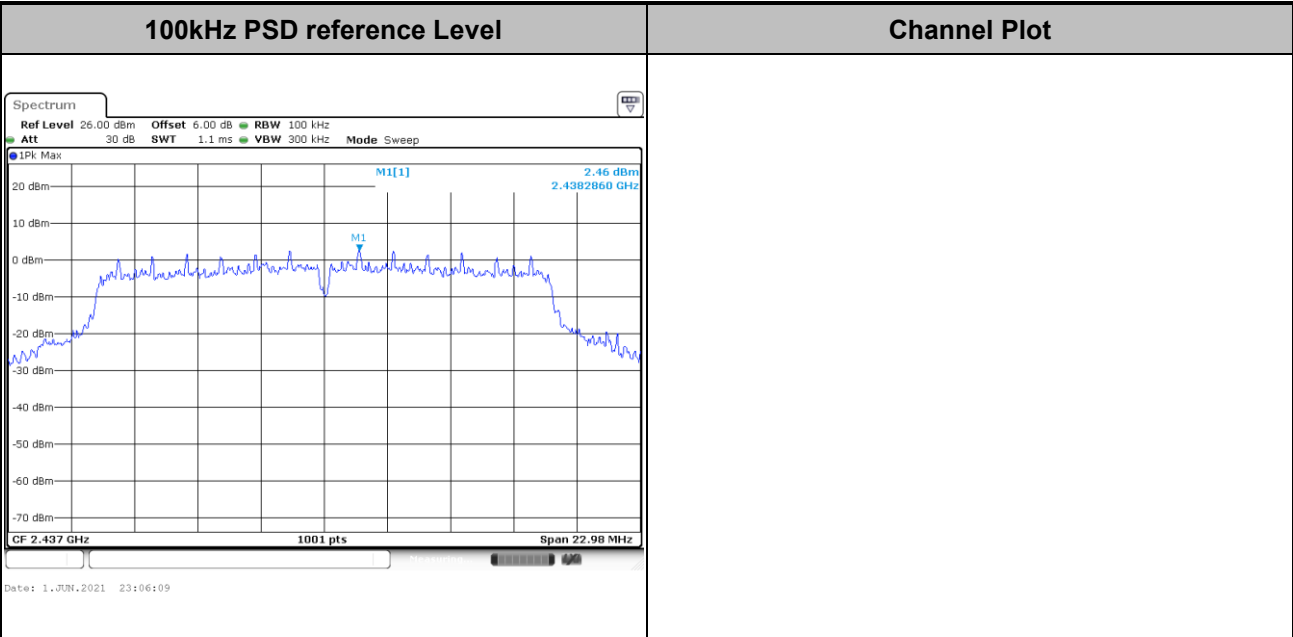


Test Mode :	802.11g	Test Channel :	01
-------------	---------	----------------	----



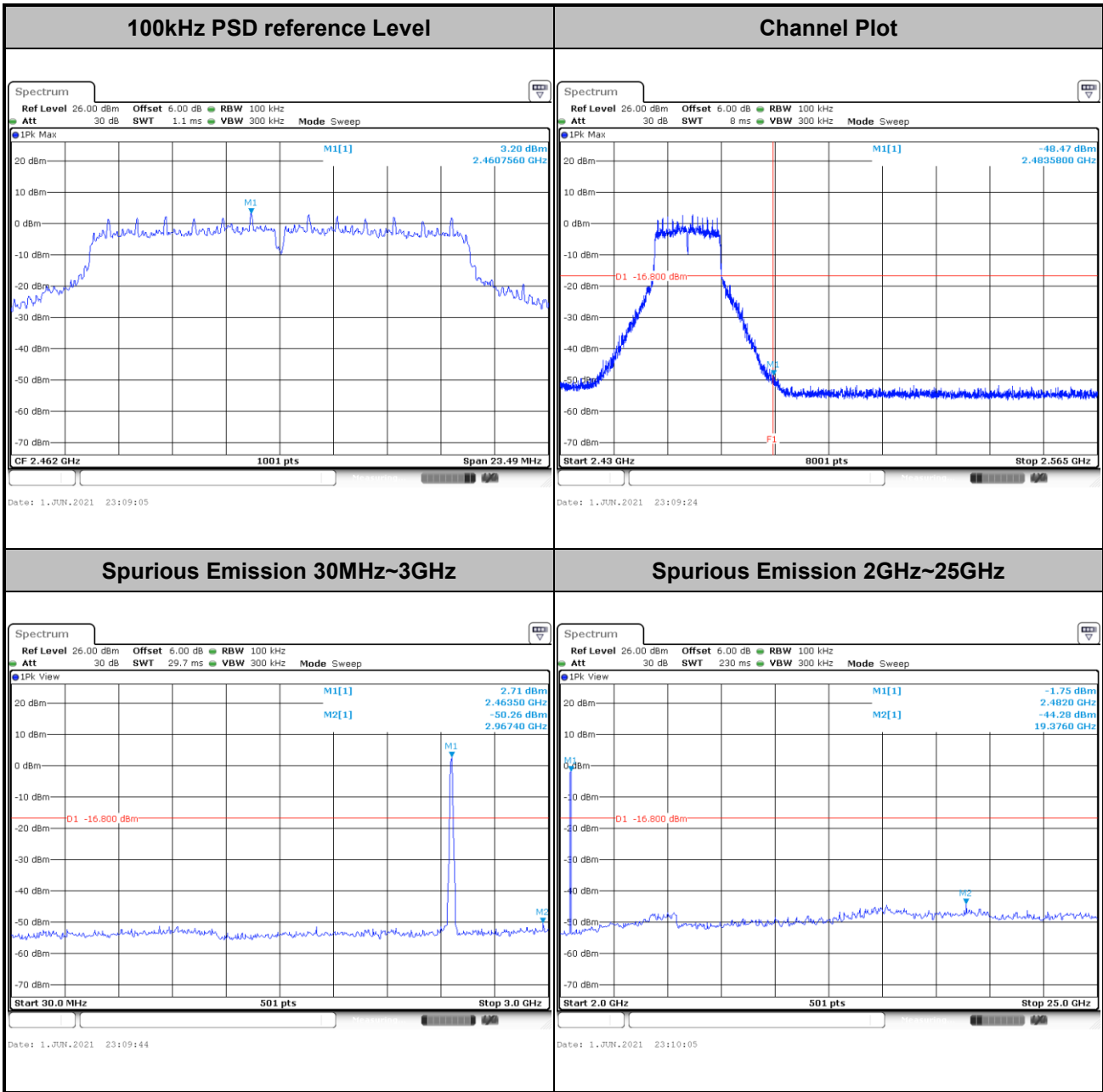


Test Mode :	802.11g	Test Channel :	06
-------------	---------	----------------	----





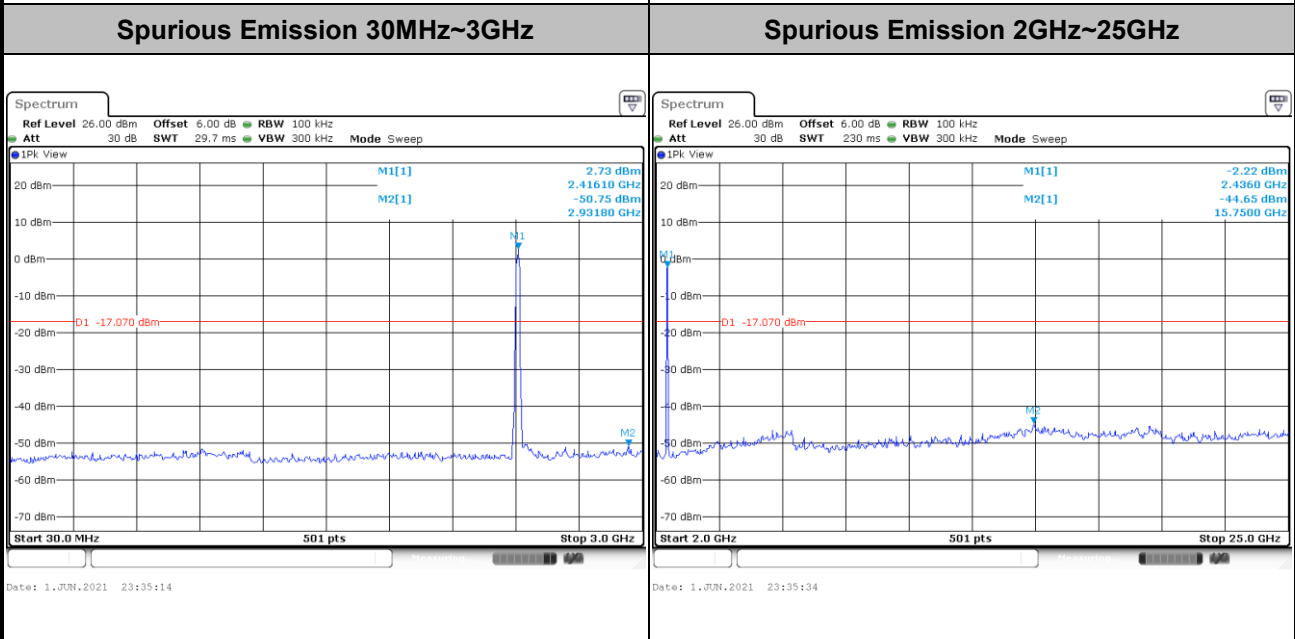
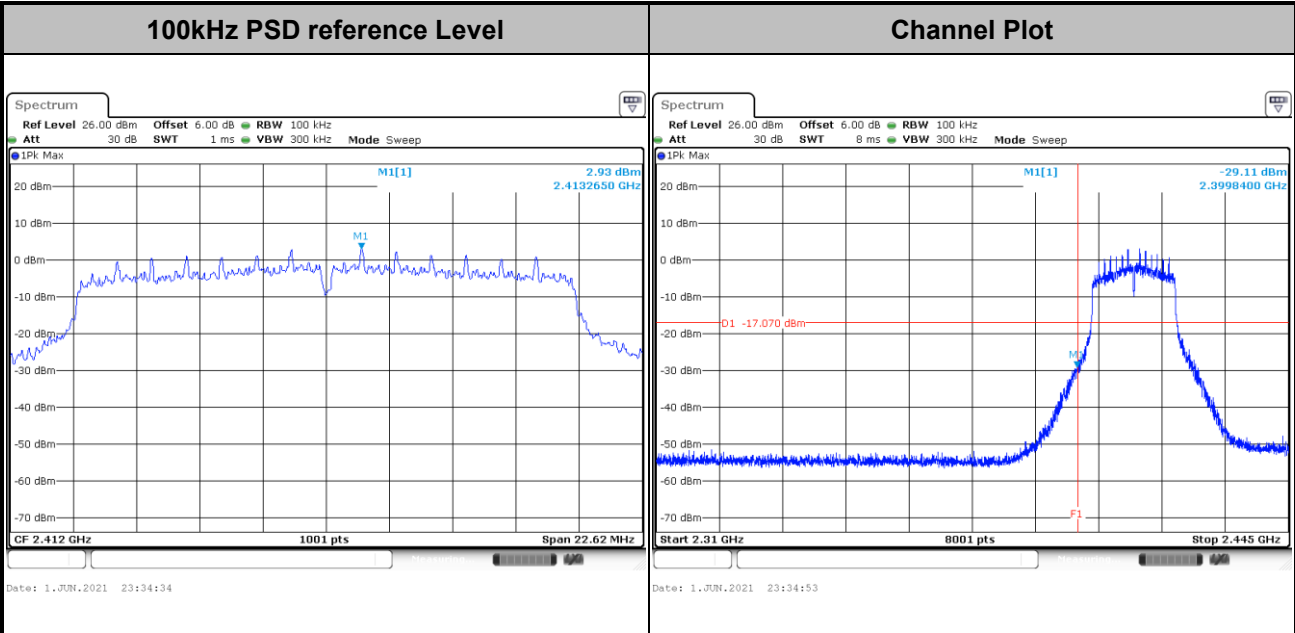
Test Mode :	802.11g	Test Channel :	11
-------------	---------	----------------	----





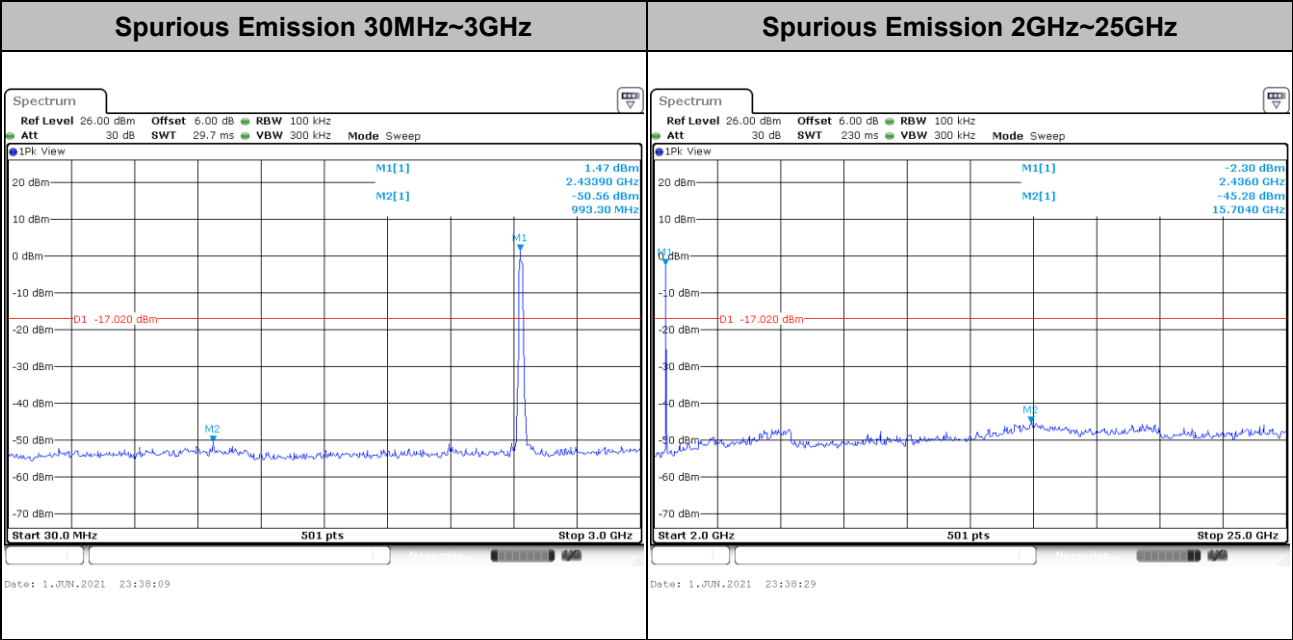
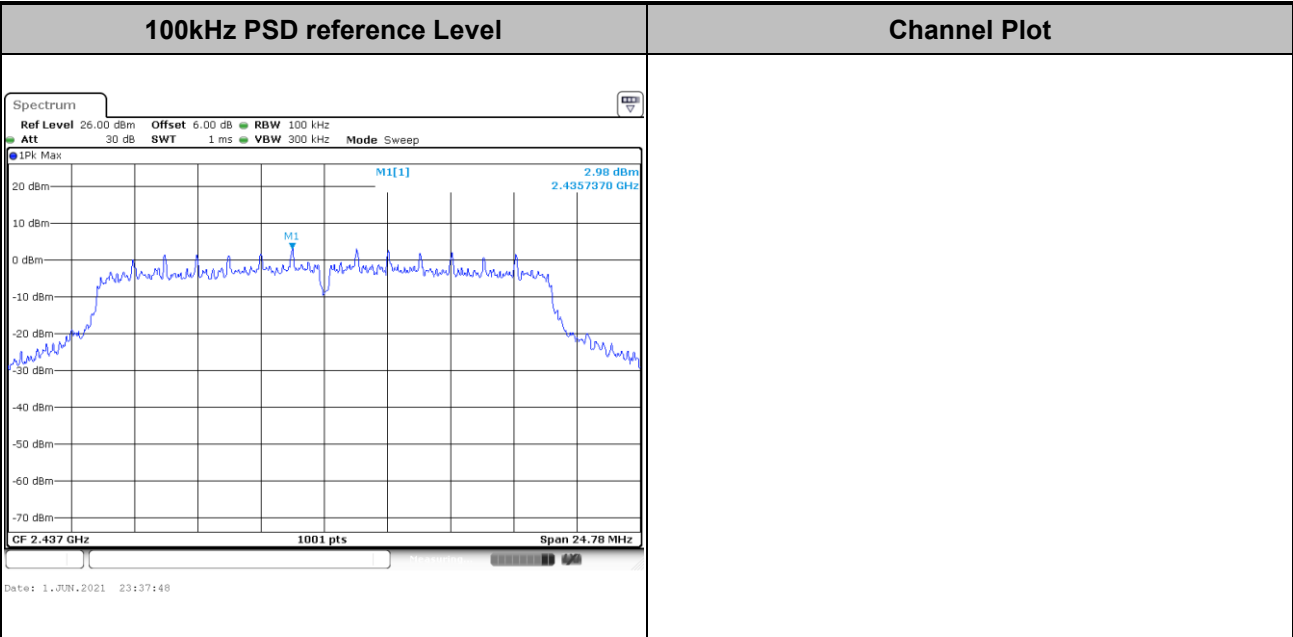
Number of TX = 2, Ant. 1 (Measured)

Test Mode :	802.11n HT20	Test Channel :	01
-------------	--------------	----------------	----



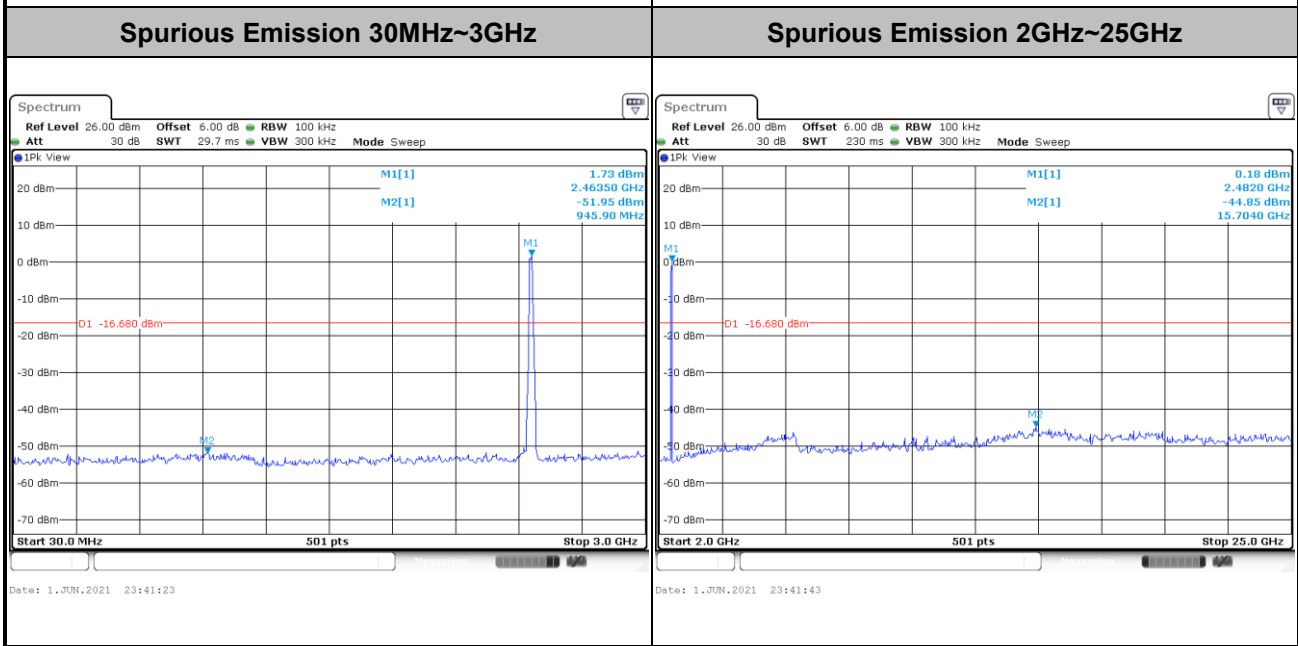
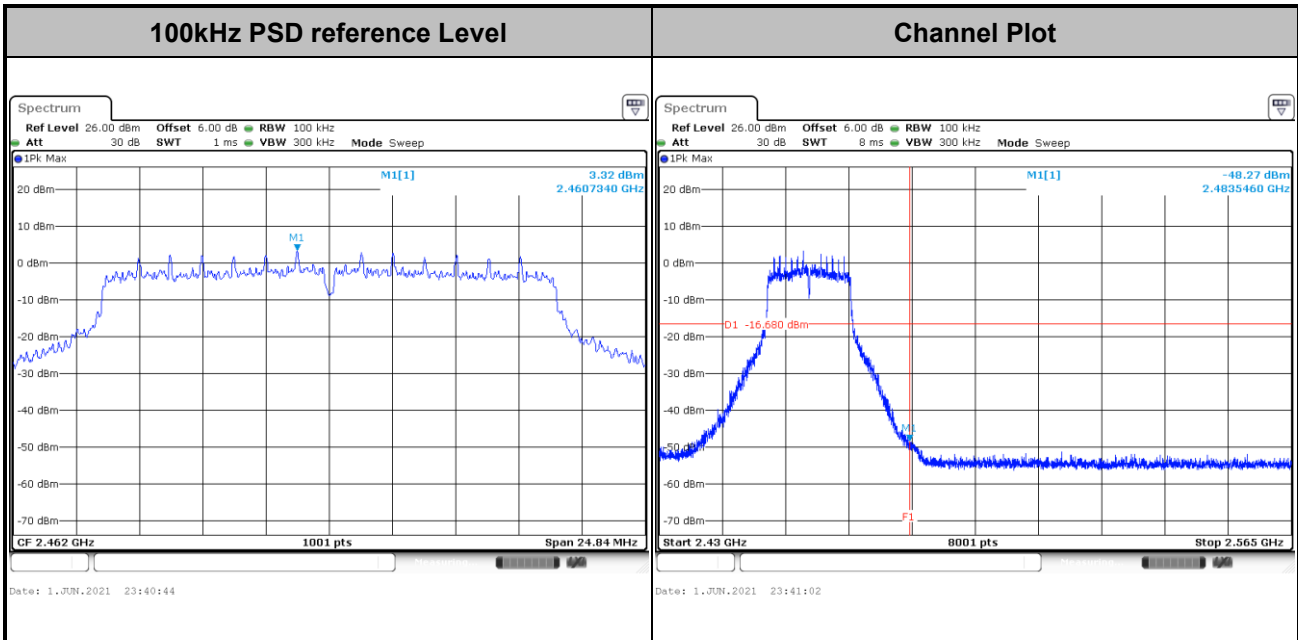


Test Mode :	802.11n HT20	Test Channel :	06
-------------	--------------	----------------	----



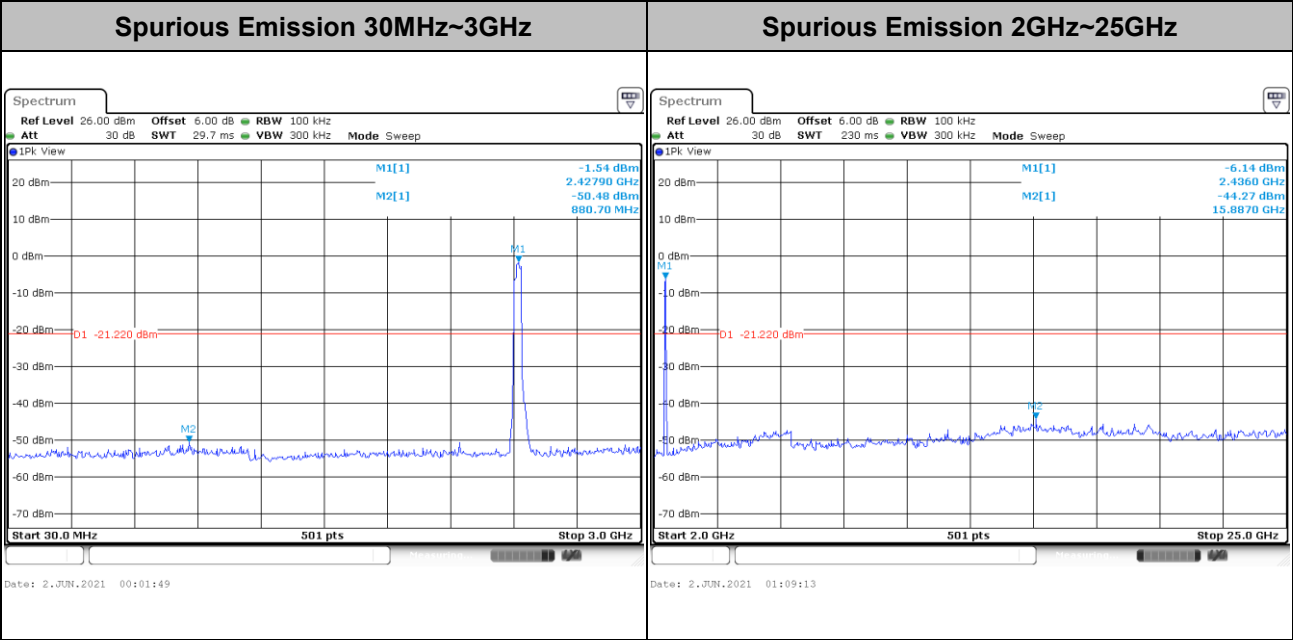
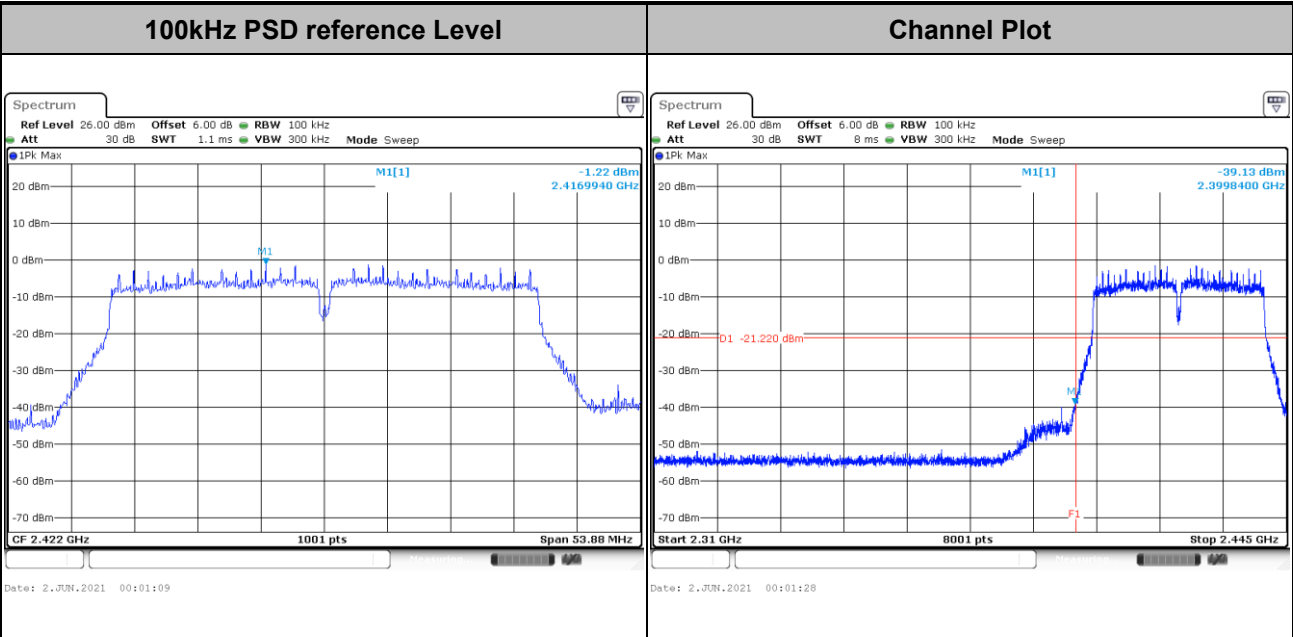


Test Mode :	802.11n HT20	Test Channel :	11
-------------	--------------	----------------	----



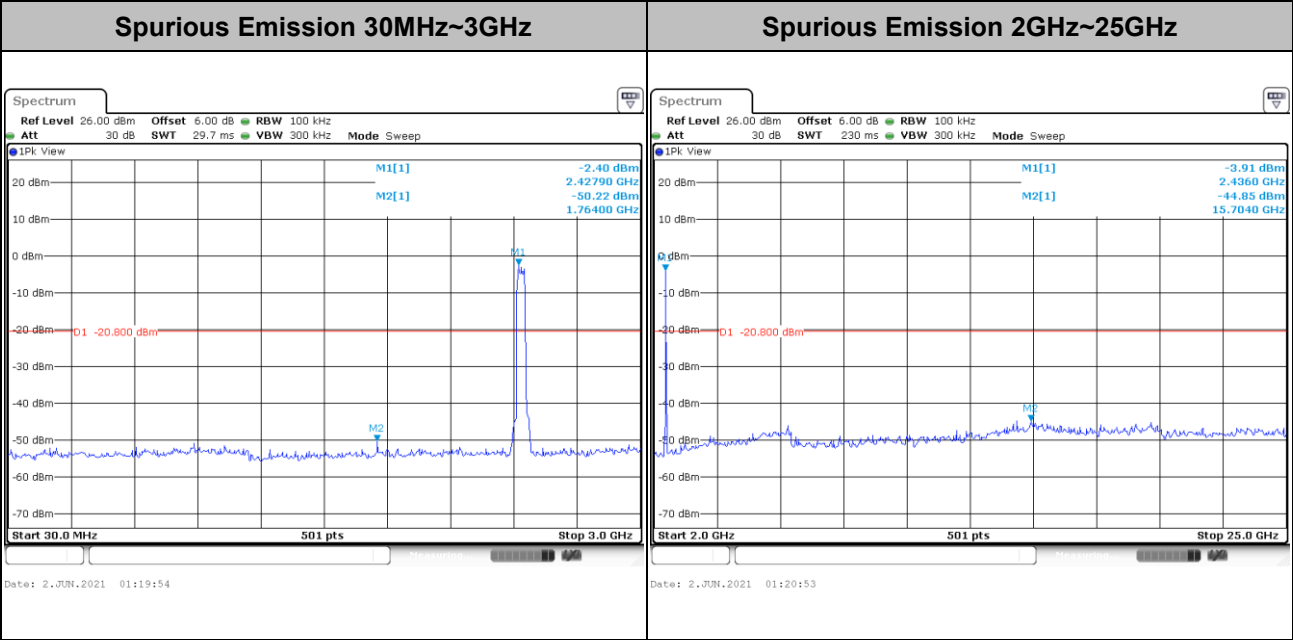
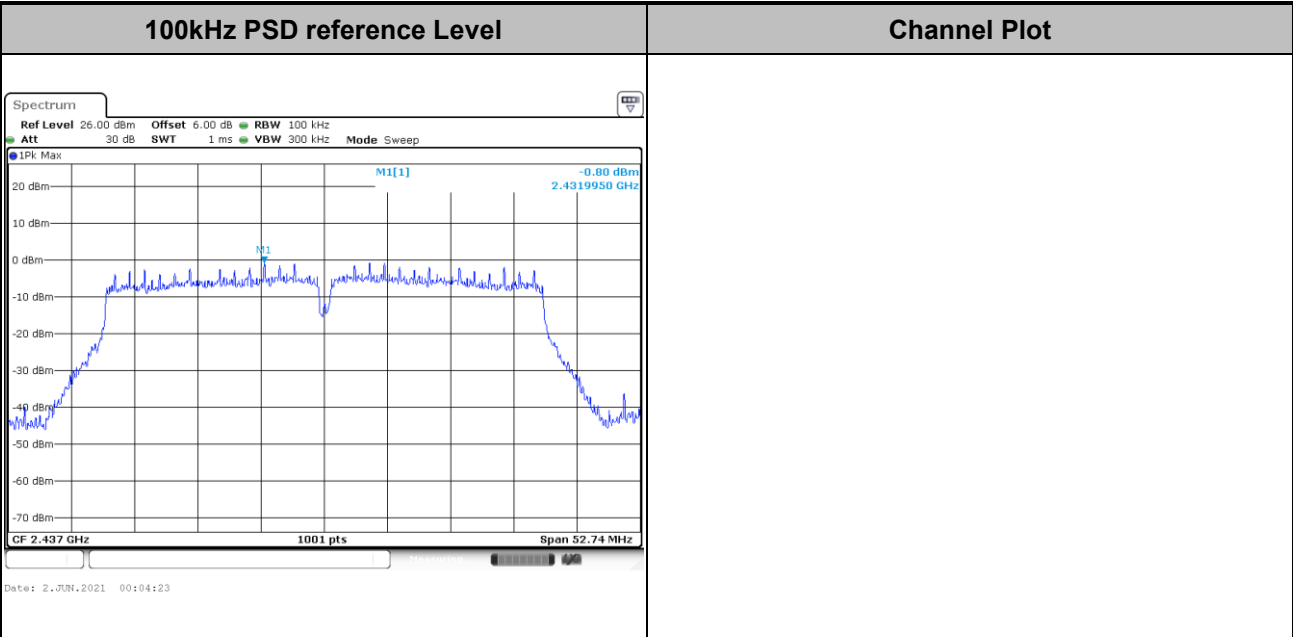


Test Mode : 802.11n HT40 Test Channel : 03



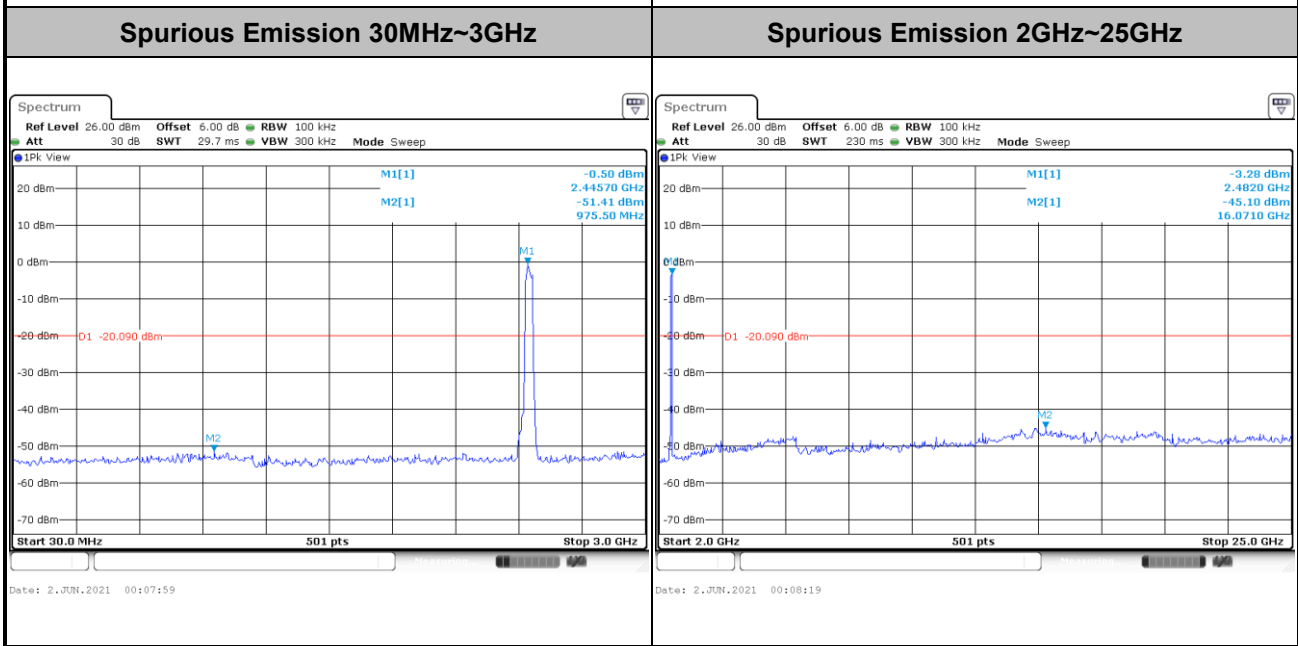
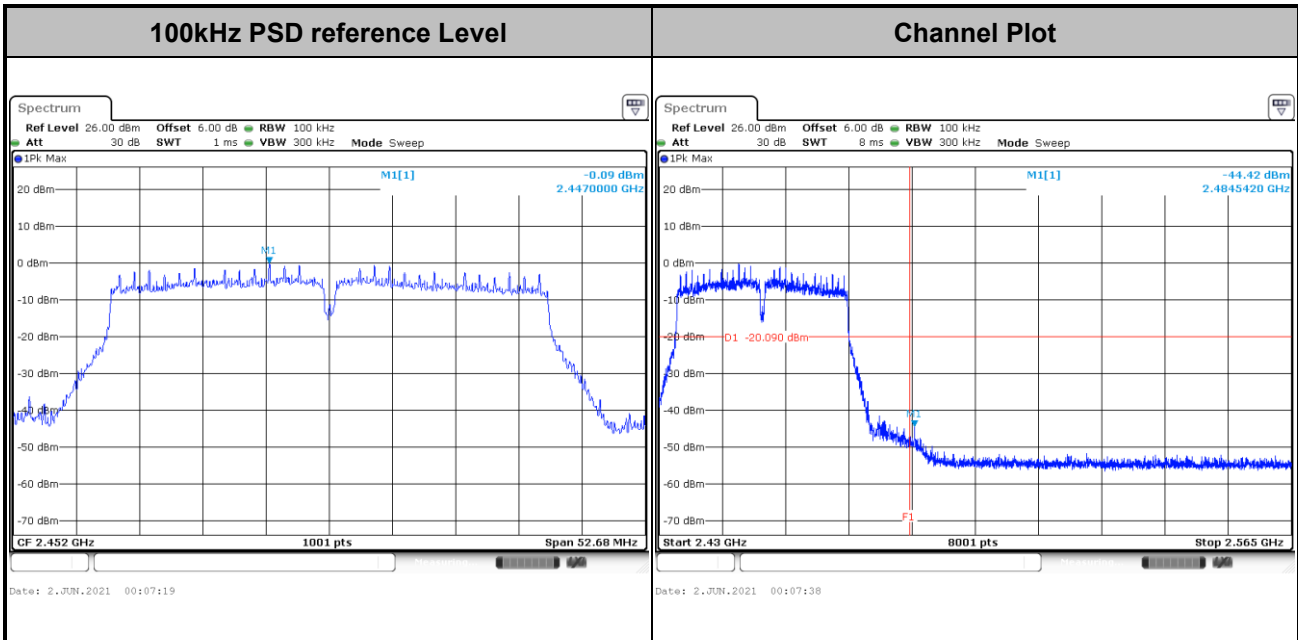


Test Mode :	802.11n HT40	Test Channel :	06
-------------	--------------	----------------	----





Test Mode :	802.11n HT40	Test Channel :	09
-------------	--------------	----------------	----

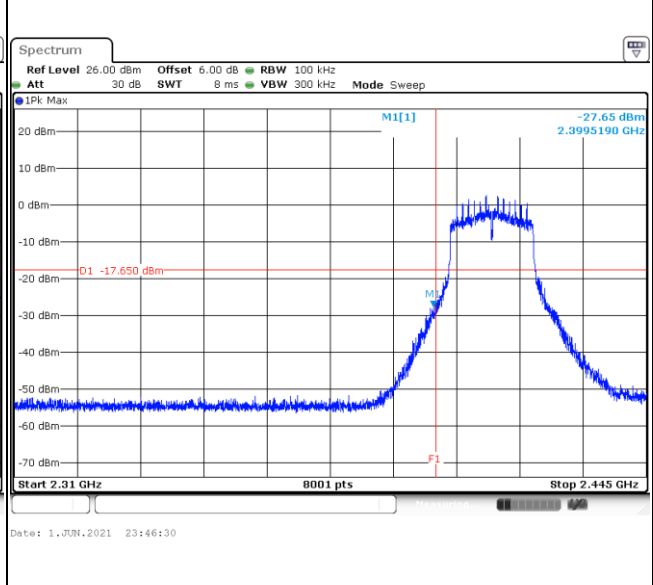
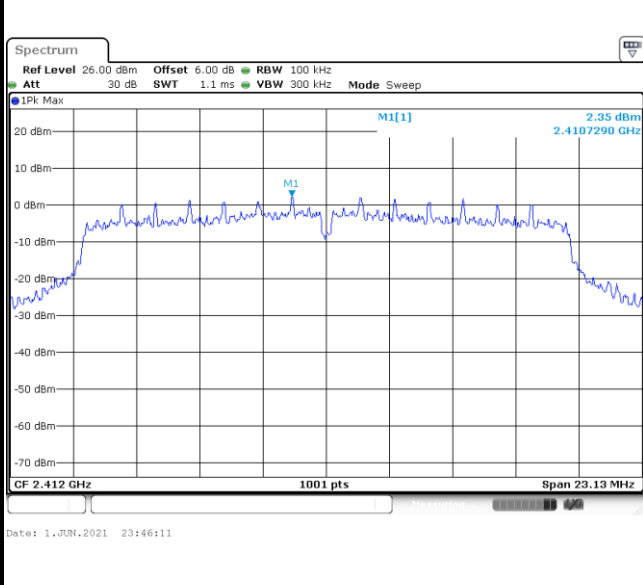




Number of TX = 2, Ant. 2 (Measured)

Test Mode :	802.11n HT20	Test Channel :	01
-------------	--------------	----------------	----

100kHz PSD reference Level	Channel Plot
-----------------------------------	---------------------



Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
-------------------------------------	-------------------------------------

