FCC RF Test Report

APPLICANT	:	Global Telecom Corp
EQUIPMENT	:	LTE Outdoor CPE
BRAND NAME	:	Global Telecom, TITAN
MODEL NAME	:	TITAN4000 B48
FCC ID	:	S3KTO48YY
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Jul. 26, 2021 ~ Aug. 06, 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.

Reviewed by: Derreck Chen / Supervisor

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

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR171309	Rev. 01	Initial issue of report	Sep. 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	-
3.2	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 4.67 dB at 250.190 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 11.50 dB at 0.240 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

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

Global Telecom Corp
17901 Von Karman Ave, Suite 600, Irvine, California 92614 United States of America

1.2 Manufacturer

Global Telecom Corp
17901 Von Karman Ave, Suite 600, Irvine, California 92614 United States of America

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	LTE Outdoor CPE
Brand Name	Global Telecom, TITAN
Model Name	TITAN4000 B48
FCC ID	S3KTO48YY
IMEI Code	Conducted: N/A Conduction: 358774100442373 Radiation: 358774100442365
HW Version	V1.0
SW Version	V1.6.0
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 Output Power to antenna	**<MIMO Ant. 1+2>** 802.11b : 18.61 dBm (0.0726 W) 802.11g : 14.91 dBm (0.0310 W) 802.11n HT20 : 15.17 dBm (0.0329 W) 802.11n HT40 : 14.37 dBm (0.0274 W)
Antenna Type / Gain	Ant. 1: PCB Antenna type with gain 3.0 dBi Ant. 2: PCB Antenna type with gain 3.0 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Function	<table><tr><td></td><td>Ant. 1</td><td>Ant. 2</td></tr><tr><td>802.11b/g/n SISO</td><td>V</td><td>V</td></tr><tr><td>802.11b/g/n MIMO</td><td colspan="2">V</td></tr></table>

Note: For WLAN SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.

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.

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

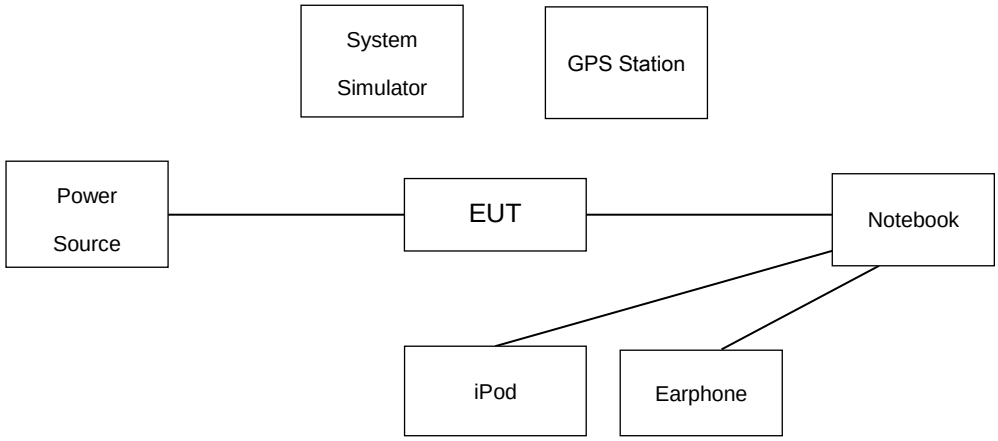
Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Co-location
LTE Band48 Link + 802.11n HT40 CH 09

Test Cases	
AC Conducted Emission	Mode 1 :LTE Band 48 Idle + LAN Link With NB + Wlan(2.4G) Idle + GPS Rx + Charging from Adapter(POE)
Remark: For Radiated Test Cases, The tests were performed with Adapter(POE)	

2.3 Connection Diagram of Test System

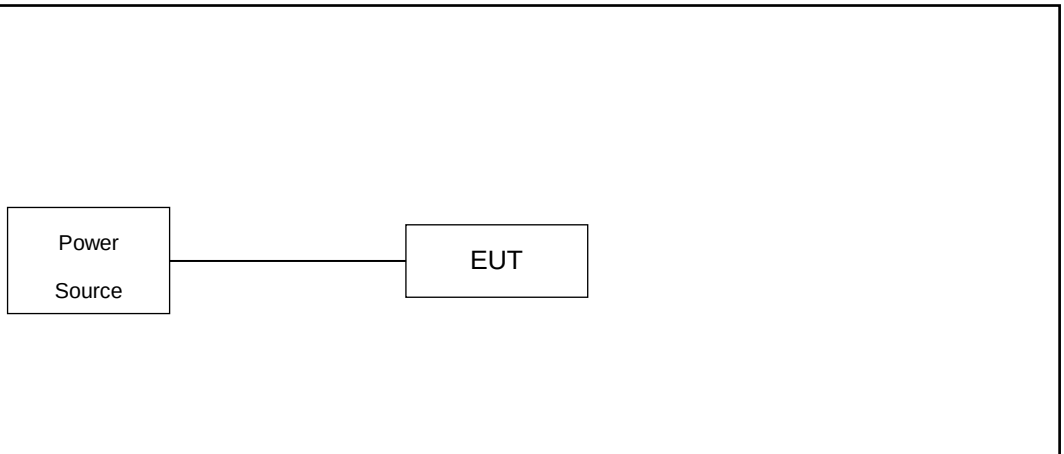
For Conducted Emission



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

For Radiated Emission



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

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	MT8821C	N/A	N/A	Unshielded,1.8m
2.	GPS Simulator	RACELOGIC	RLLS03-2P	N/A	N/A	Unshielded,1.8m
3.	NOTE BOOK	Lenovo	E540	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Earphone	Lenovo	SH100	N/A	Unshielded,1.2m	N/A
5.	IPod	Apple	MC525 ZP/A	Fcc DoC	Shielded, 1.0m	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.

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 2.0 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 2.0 + 10 = 12.0 (dB)

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

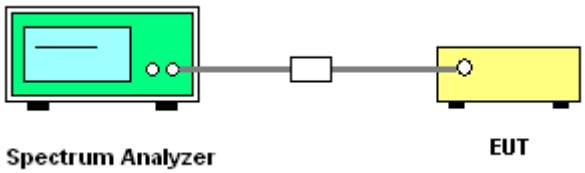
3.1.2 Measuring Instruments

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. Measure and record the results in the test report.

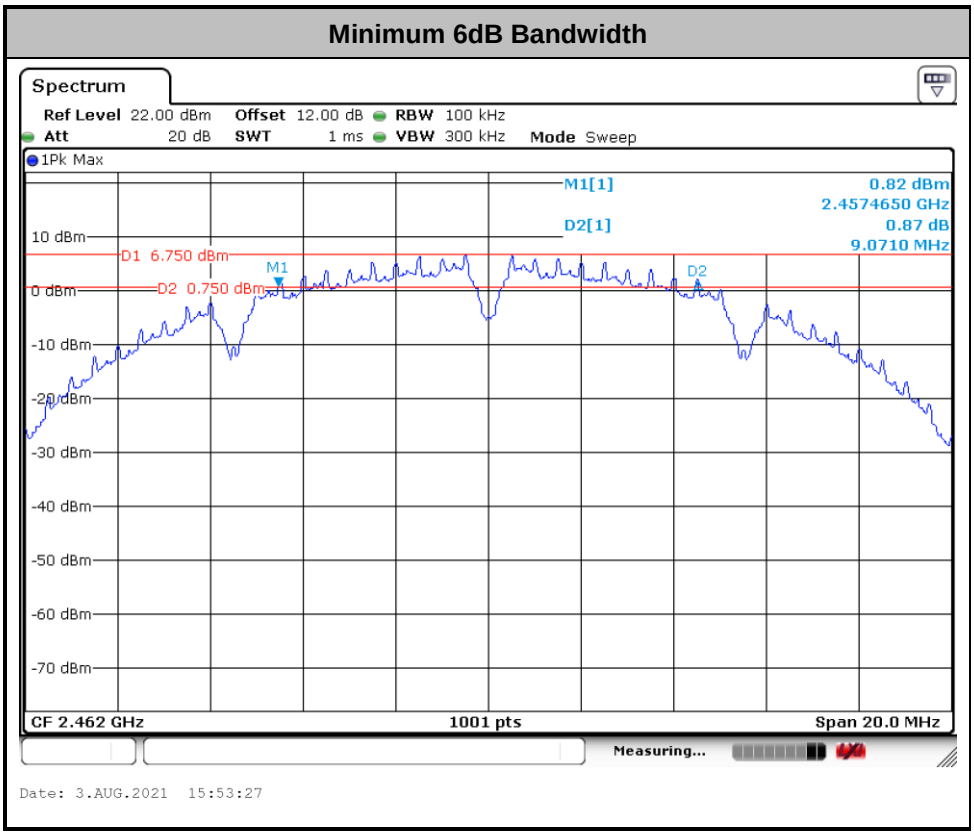
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth



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.

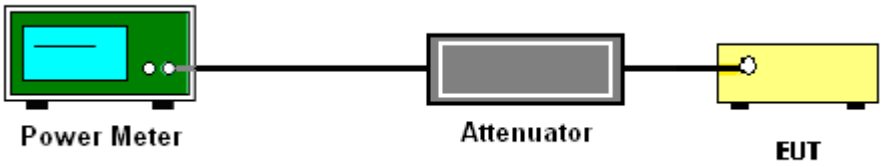
3.2.2 Measuring Instruments

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.

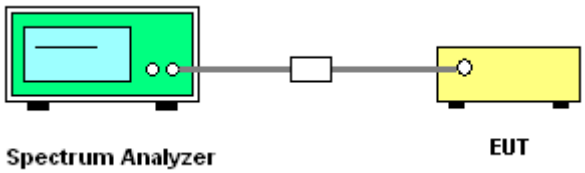
   If measurements performed using method (2) plus 10 log (N) exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

   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)

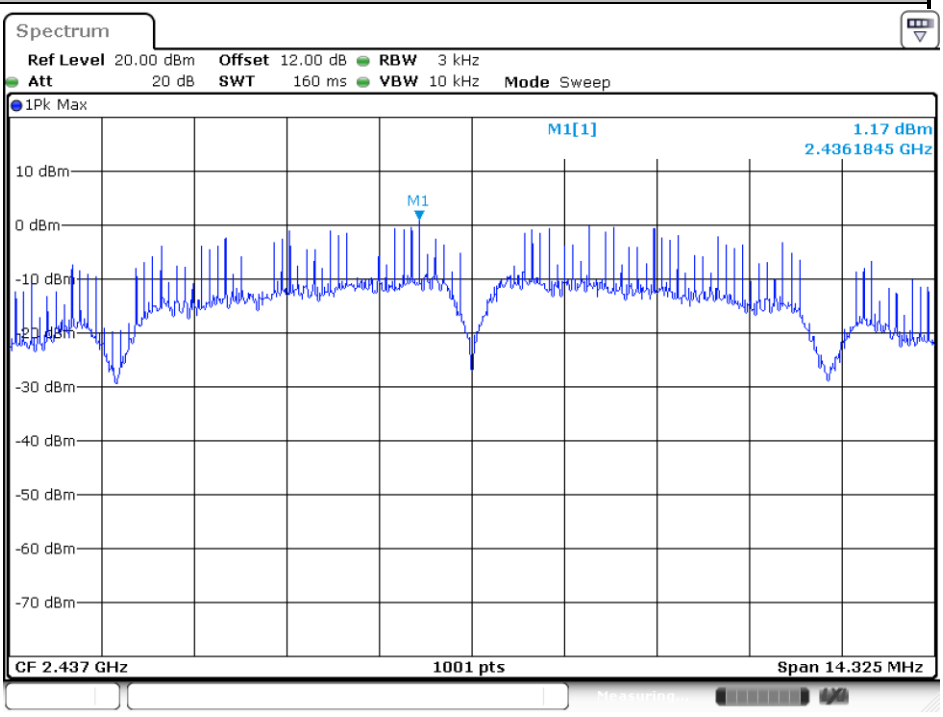
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/3kHz)



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 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 30 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used.
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.

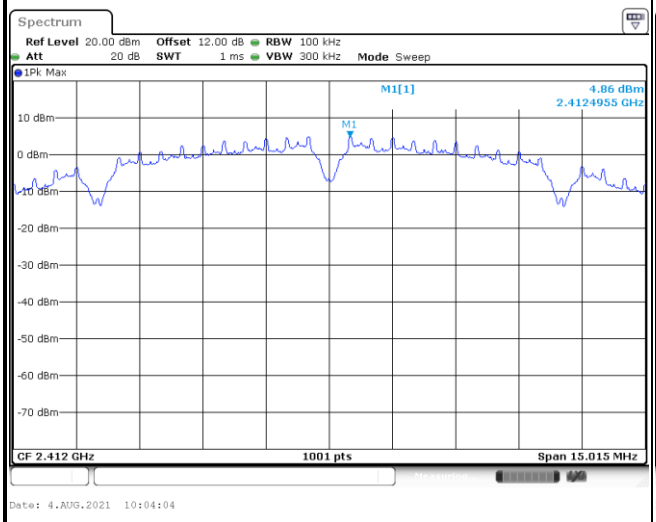
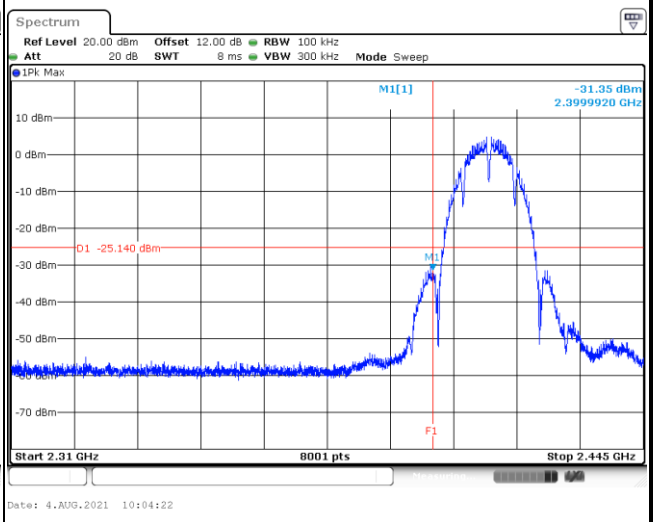
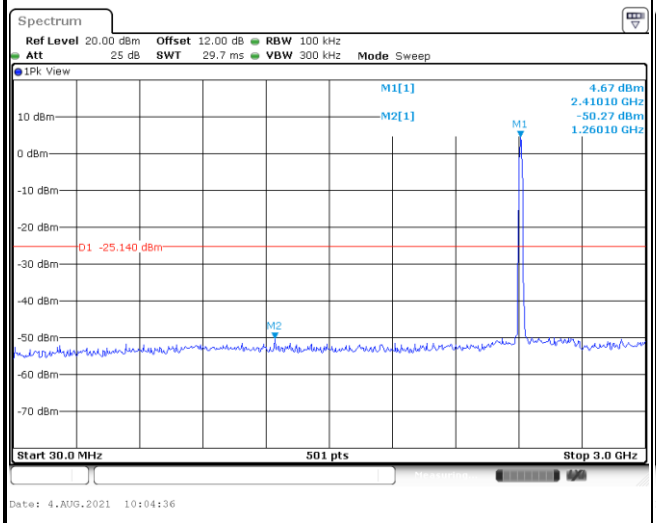
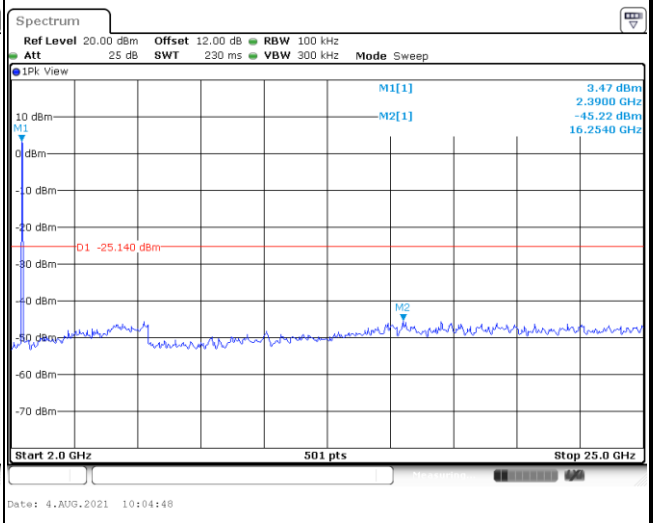
3.4.4 Test Setup

3.4.5 Test Result of Conducted Band Edges and Spurious Emission

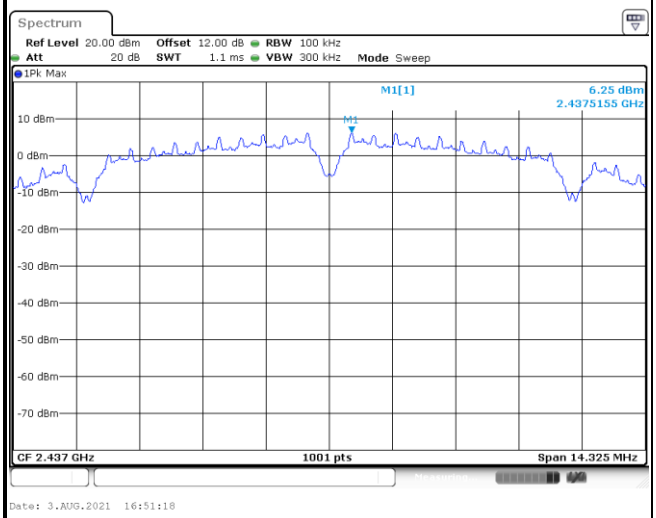
Test Engineer :	Ma Jie	**Temperature :**	21~25℃
		Relative Humidity :	51~54%

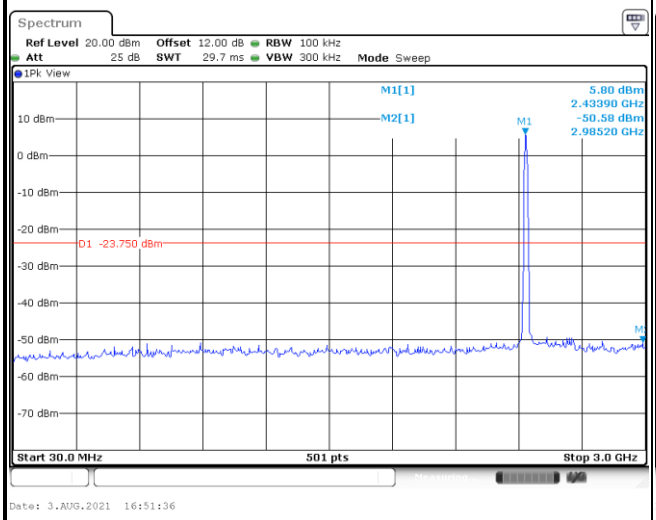
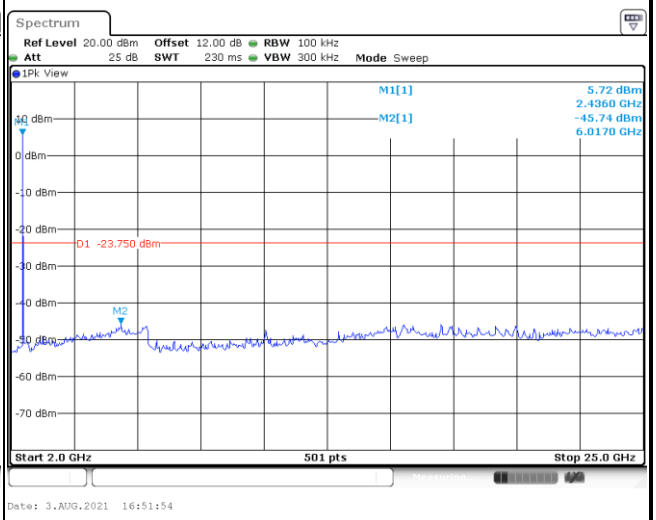
Number of TX = 2, Ant. 1 (Measured)

Test Mode :	802.11b	**Test Channel :**	01

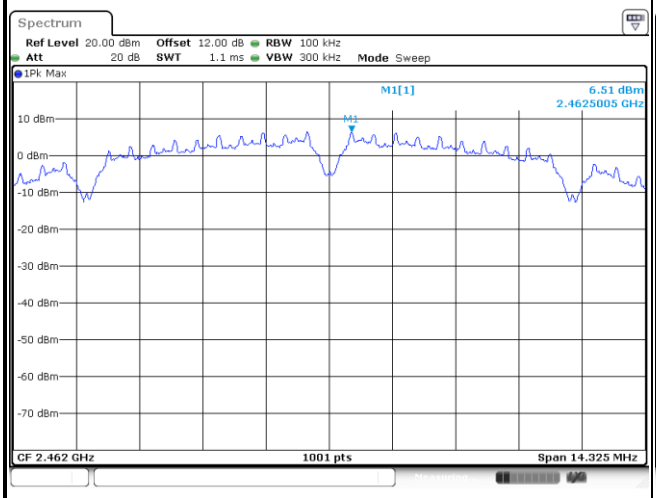
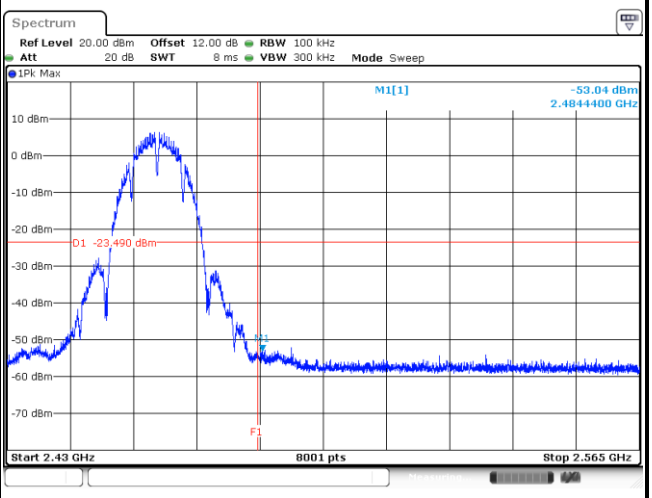
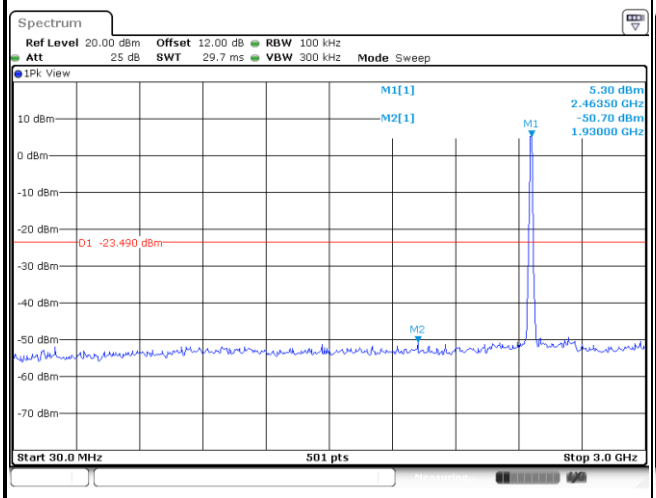
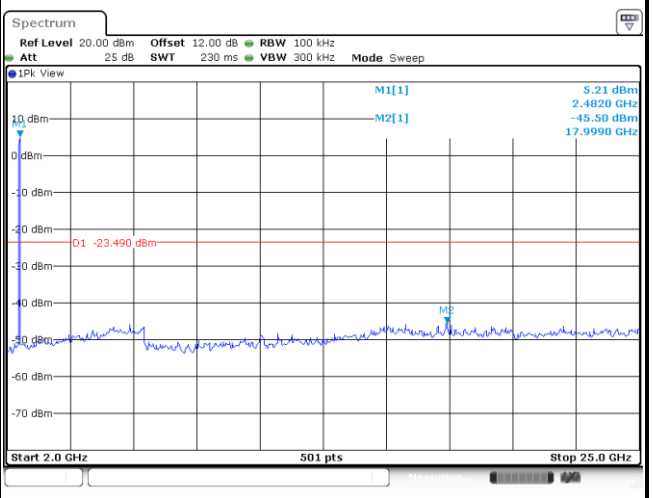
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11b	Test Channel :	06

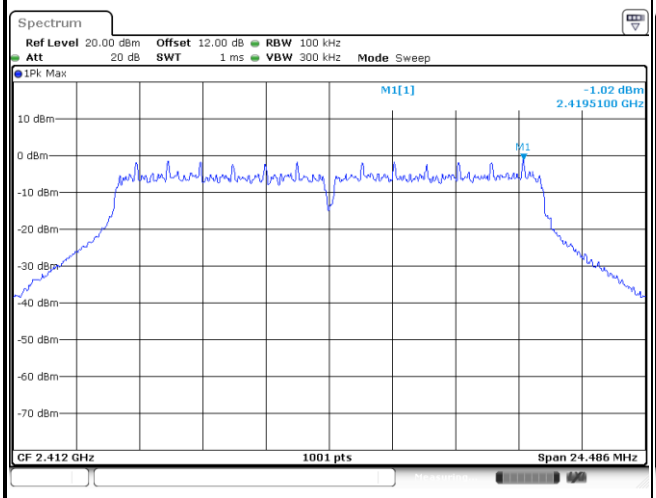
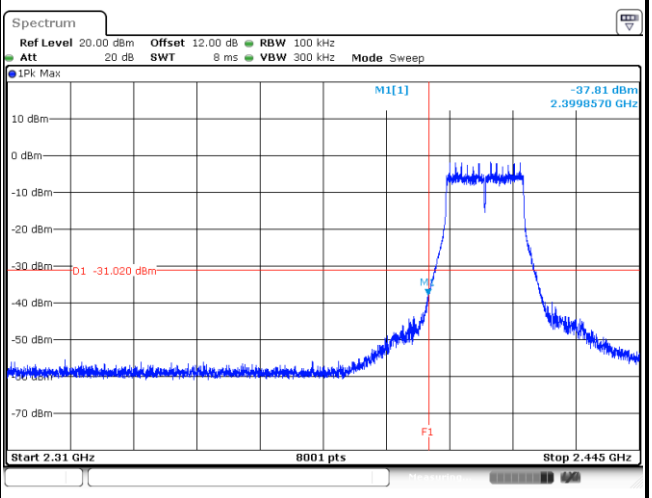
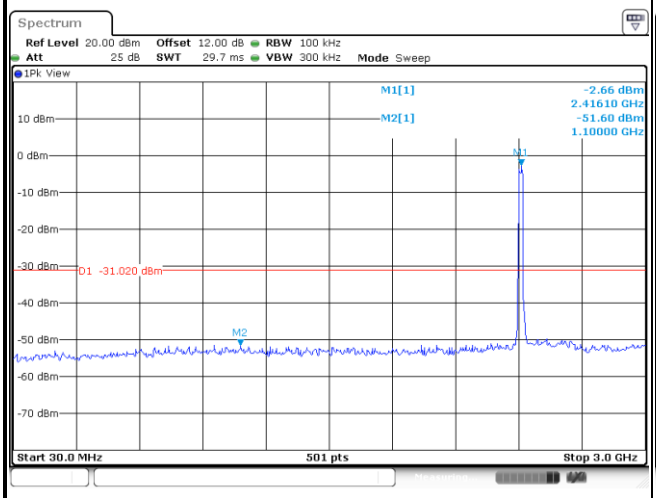
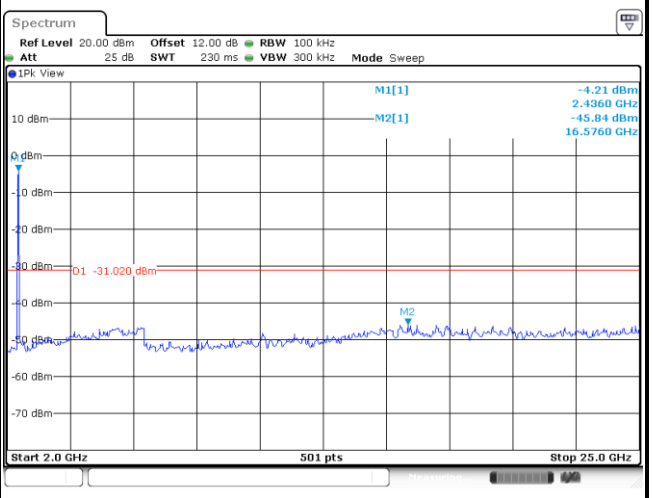
100kHz PSD reference Level	Channel Plot
	

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

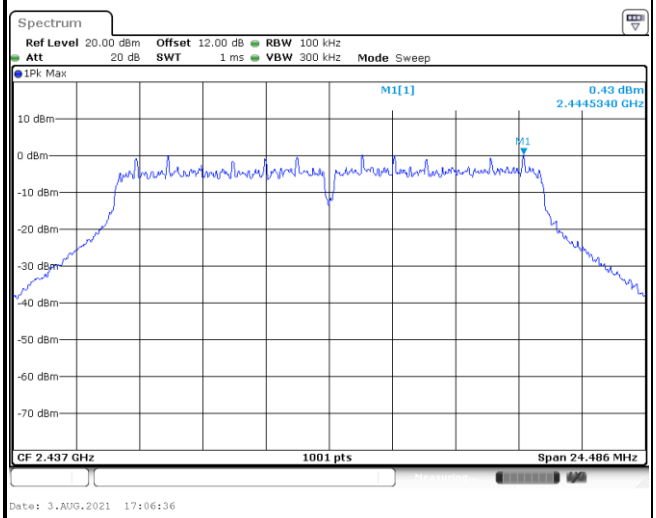
Test Mode :	802.11b	Test Channel :	11

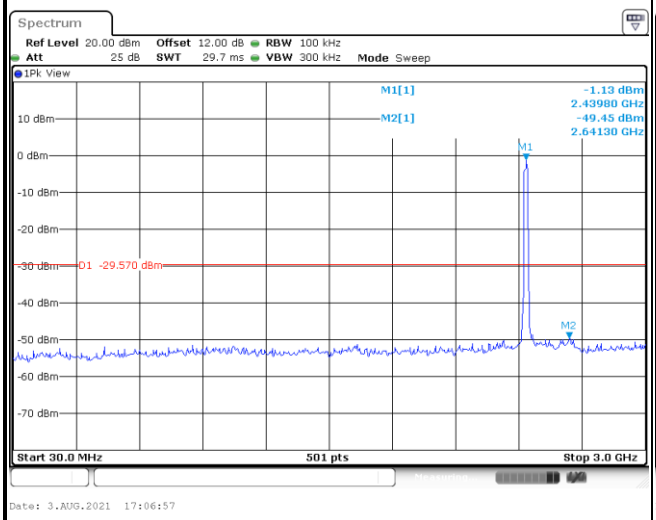
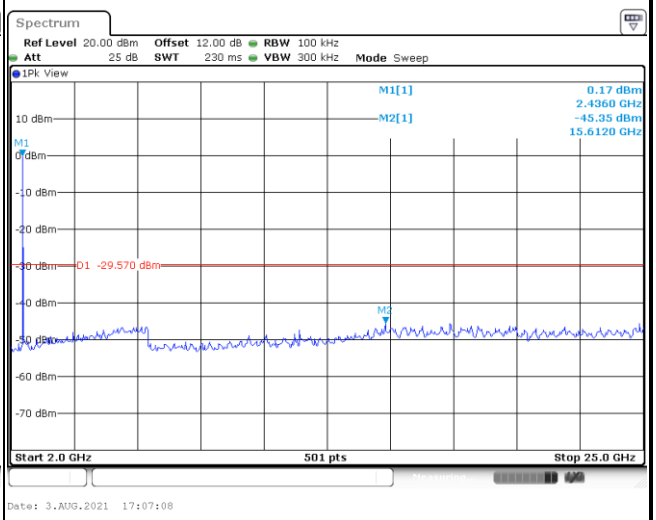
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

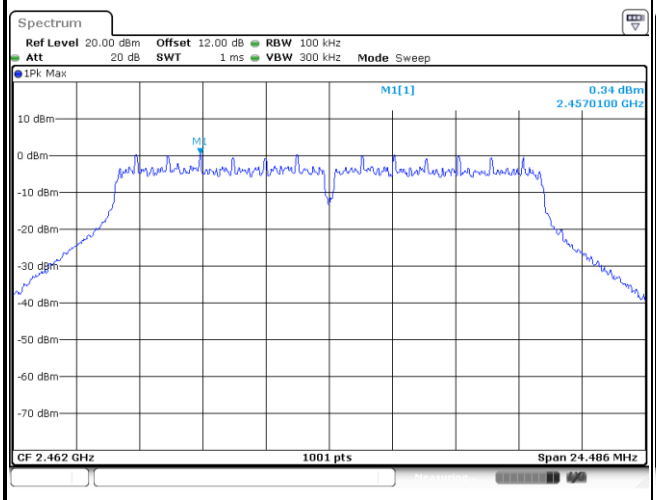
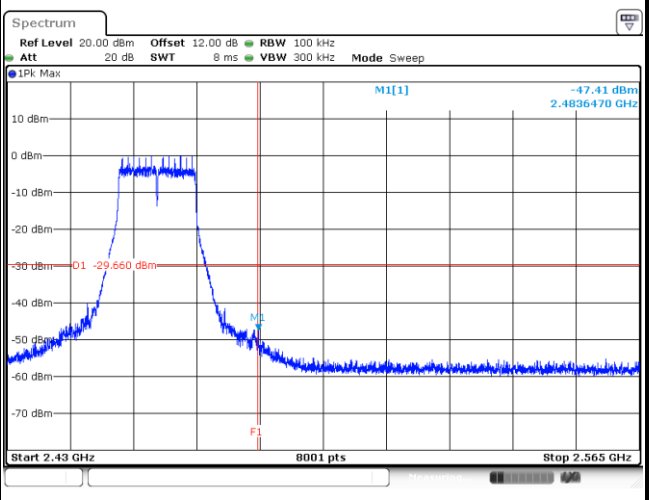
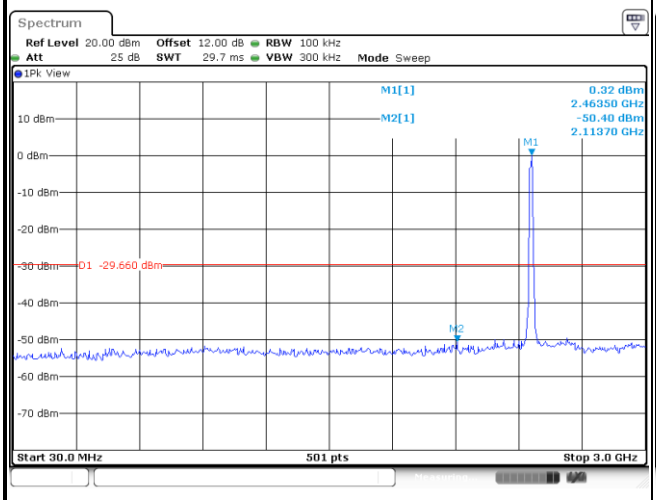
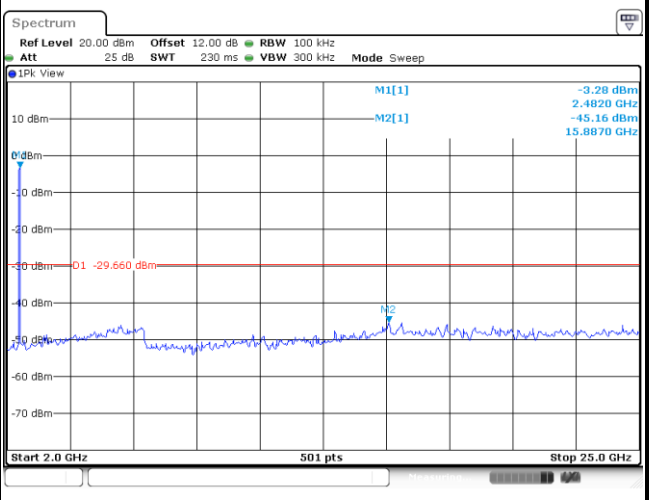
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

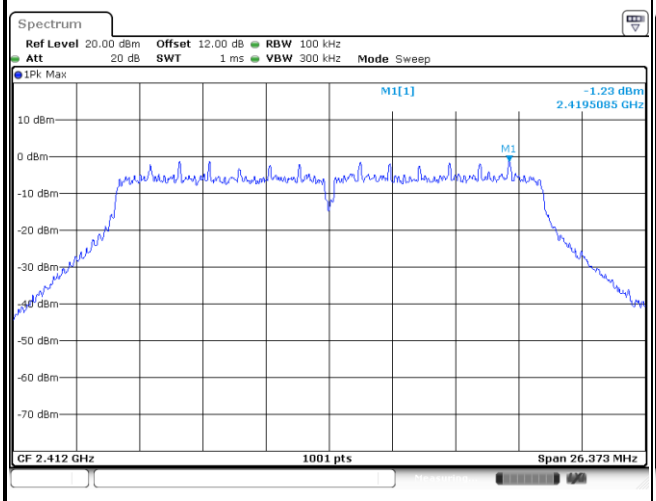
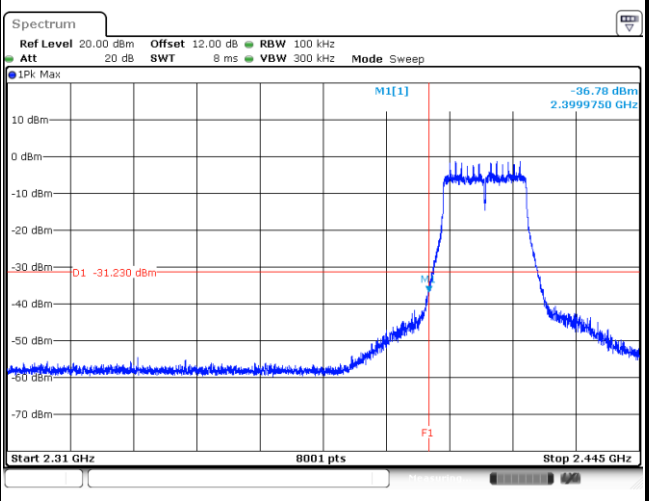
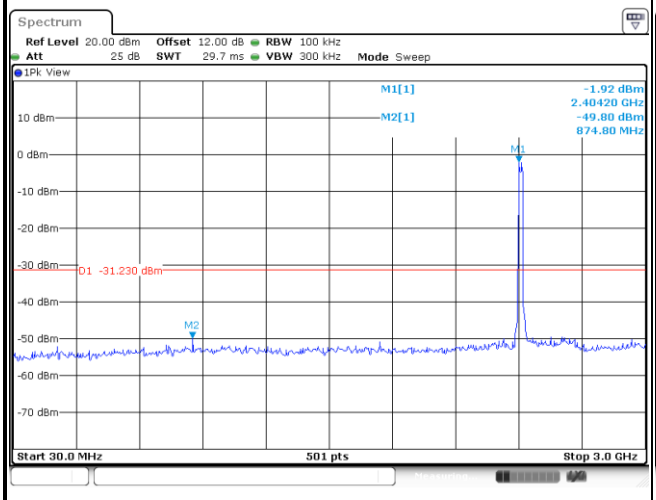
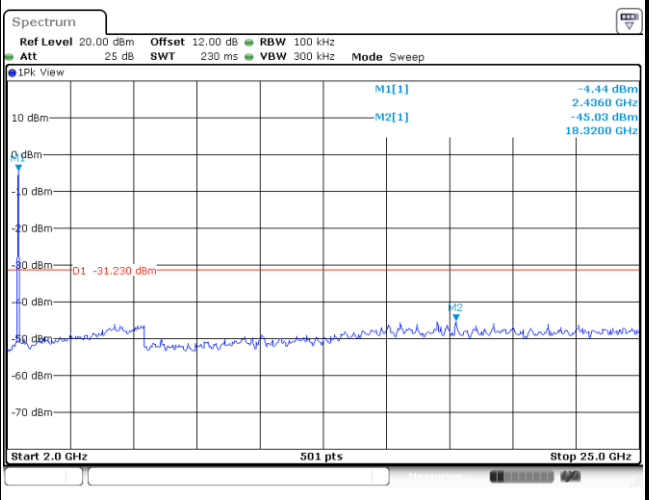
100kHz PSD reference Level	Channel Plot
	

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

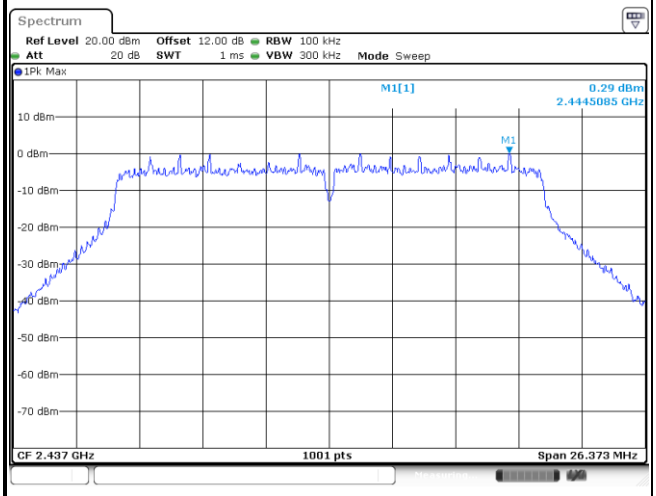
Test Mode :	802.11g	Test Channel :	11

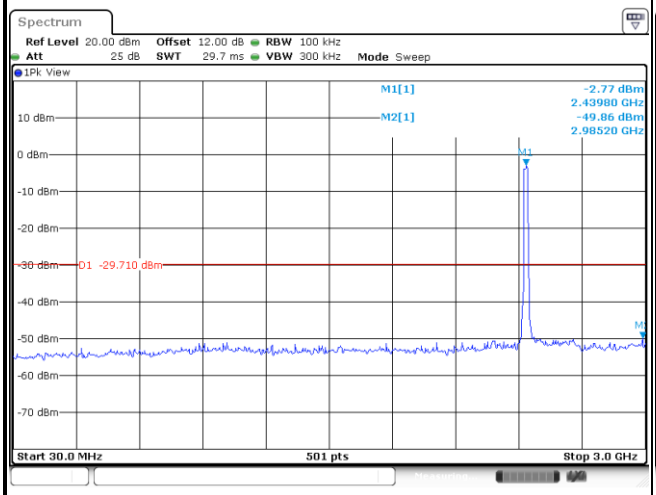
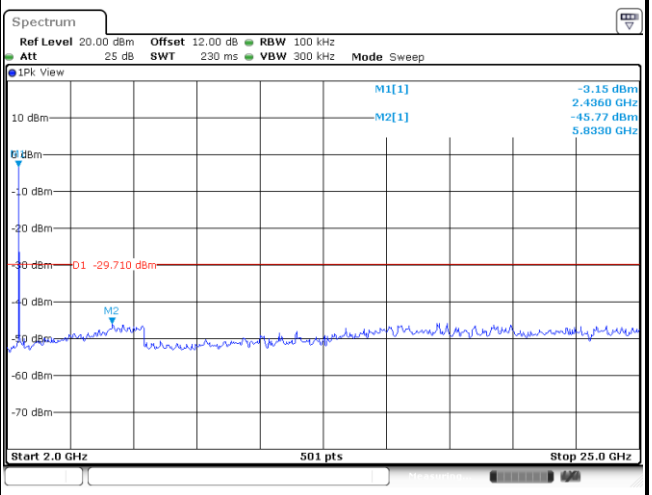
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

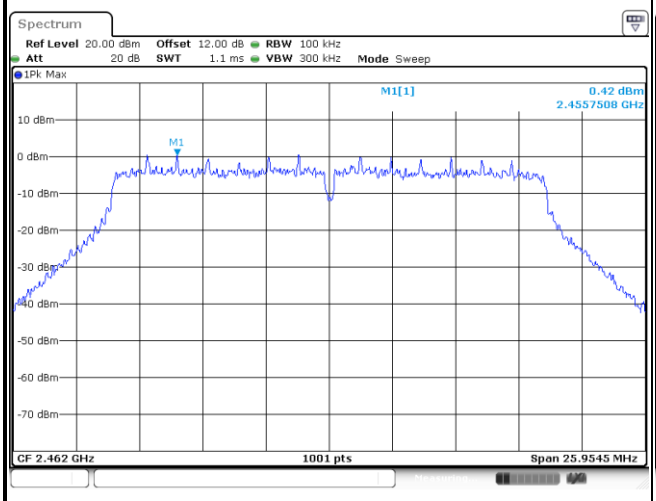
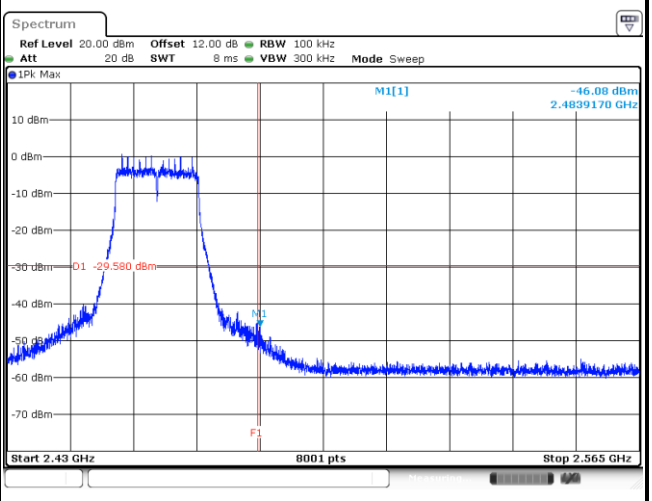
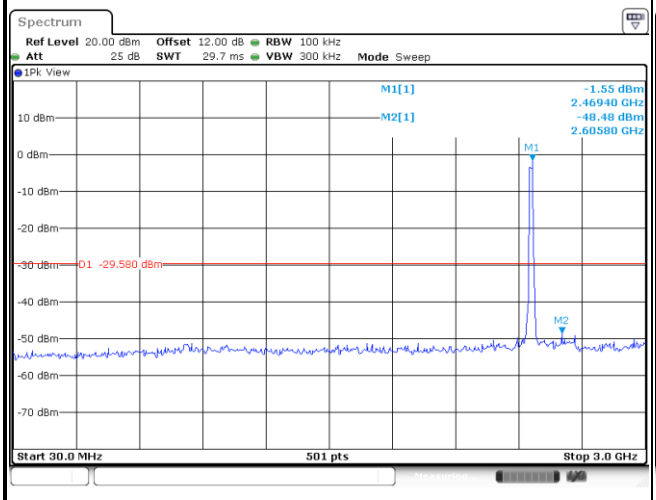
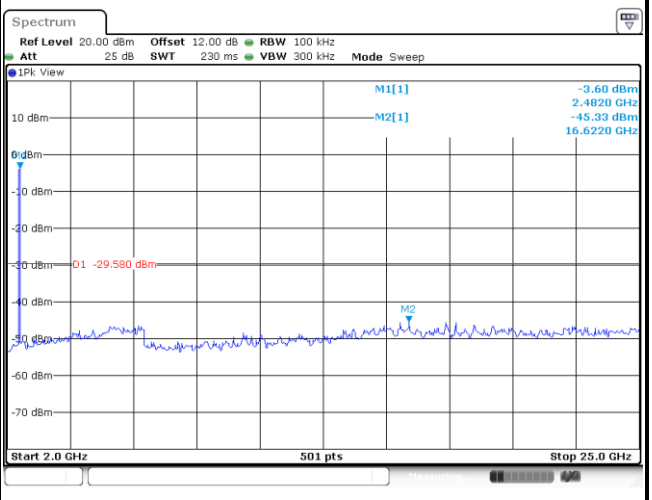
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

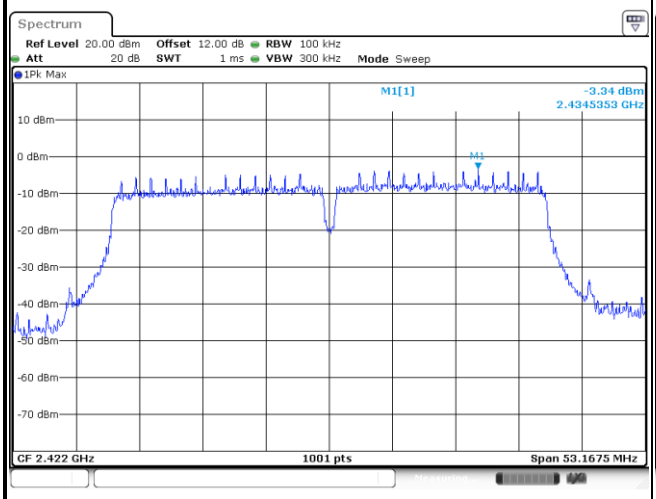
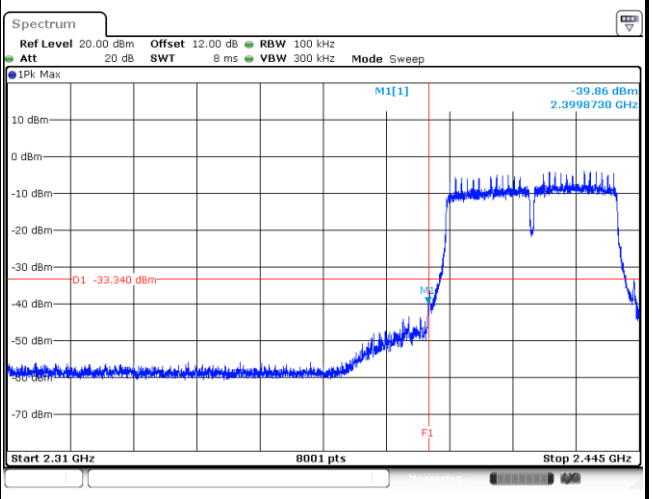
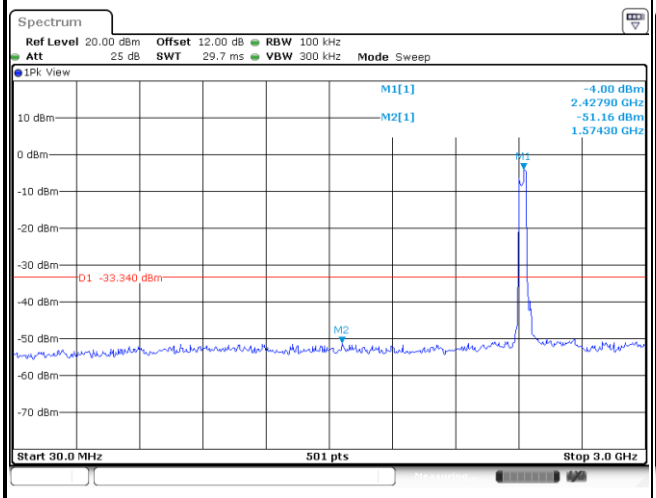
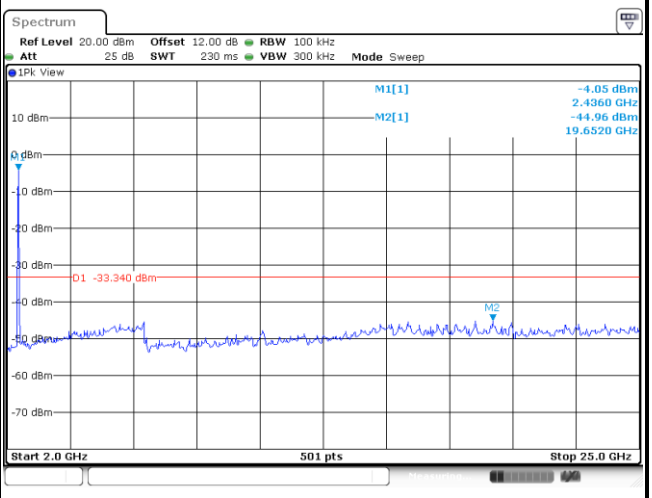
100kHz PSD reference Level	Channel Plot
	

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

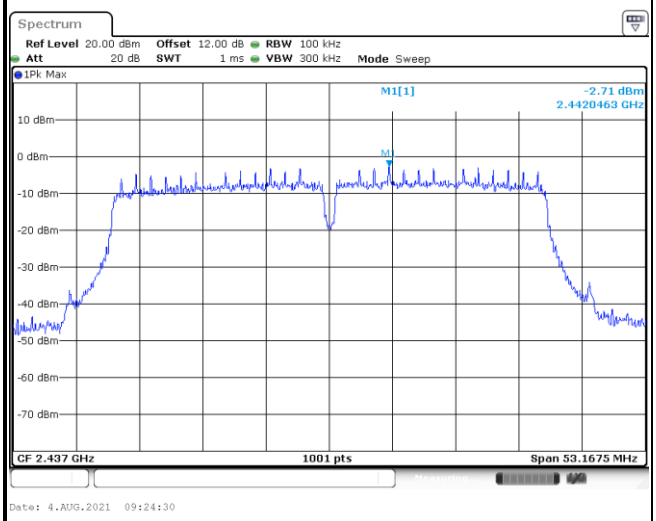
Test Mode :	802.11n HT20	Test Channel :	11

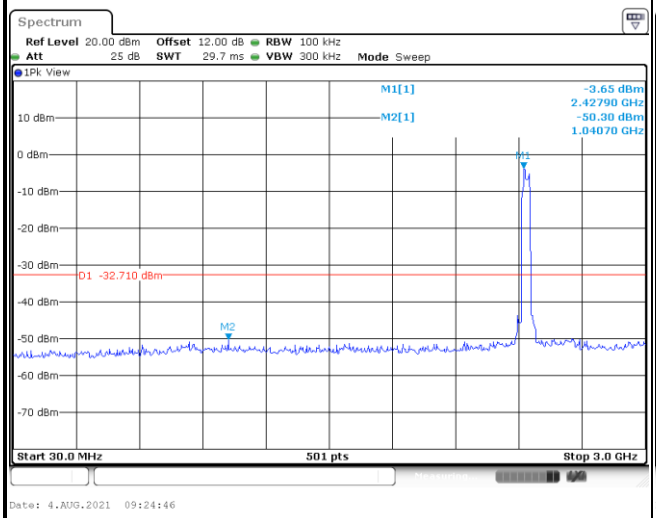
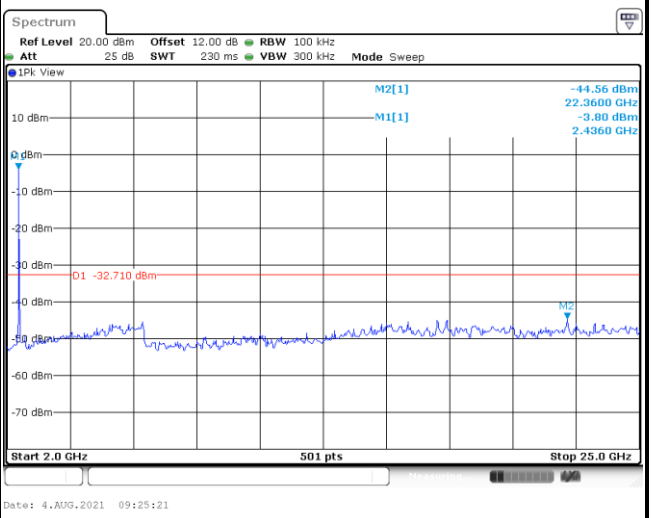
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	03

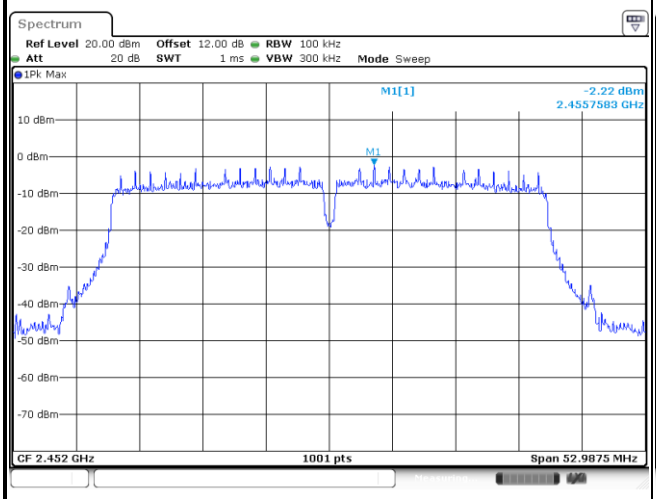
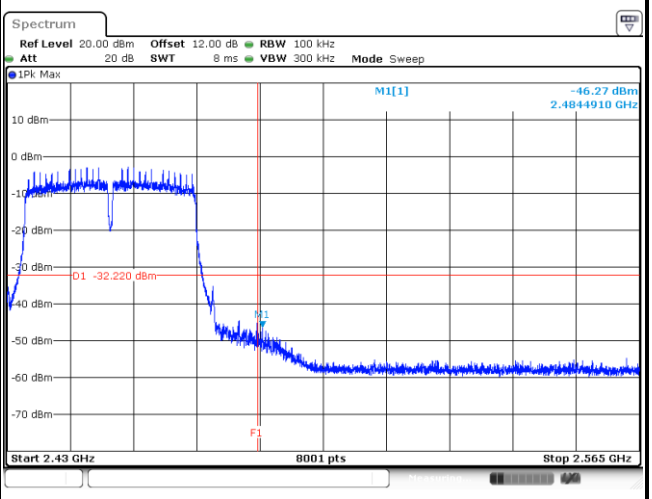
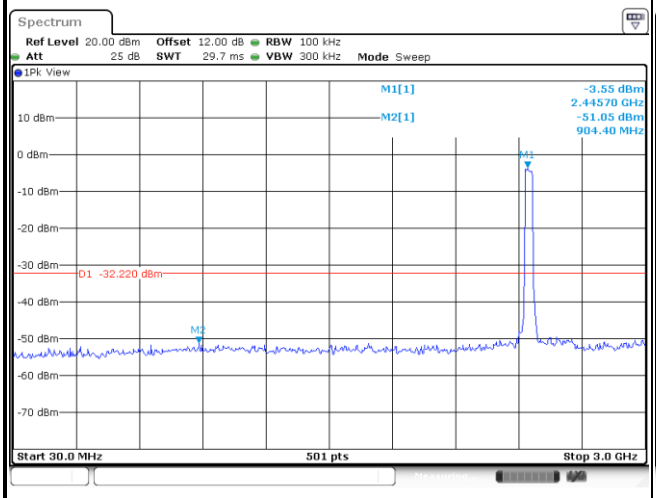
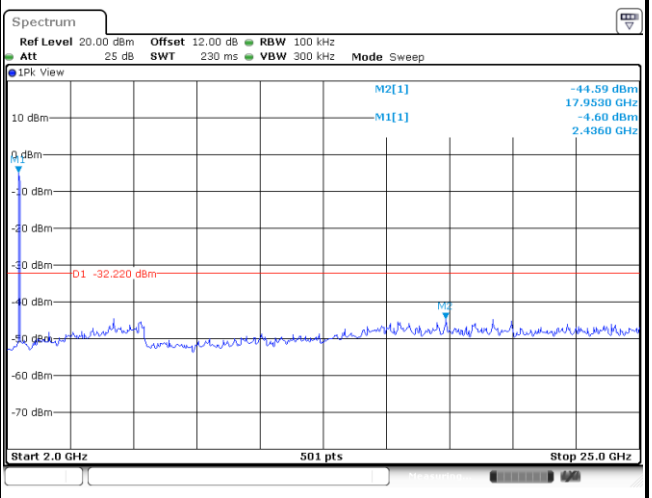
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	Channel Plot
	

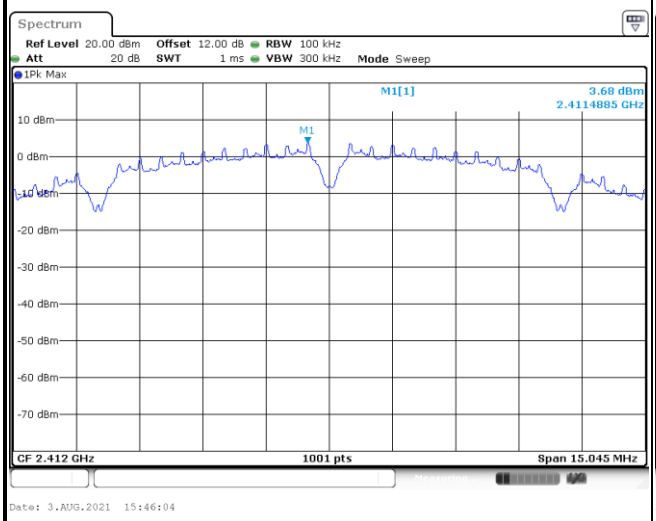
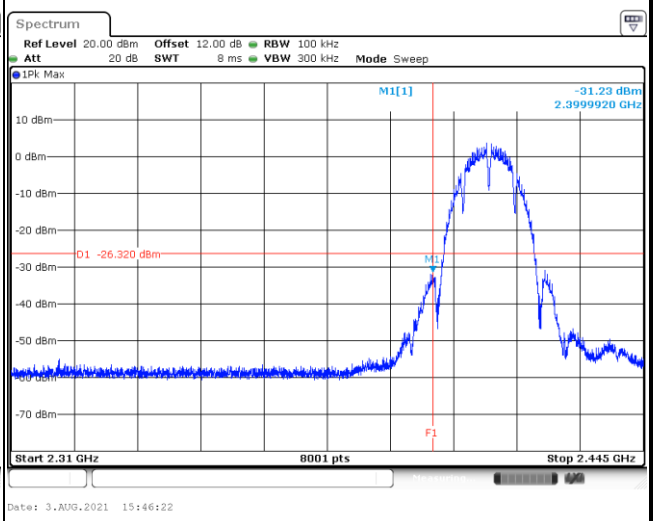
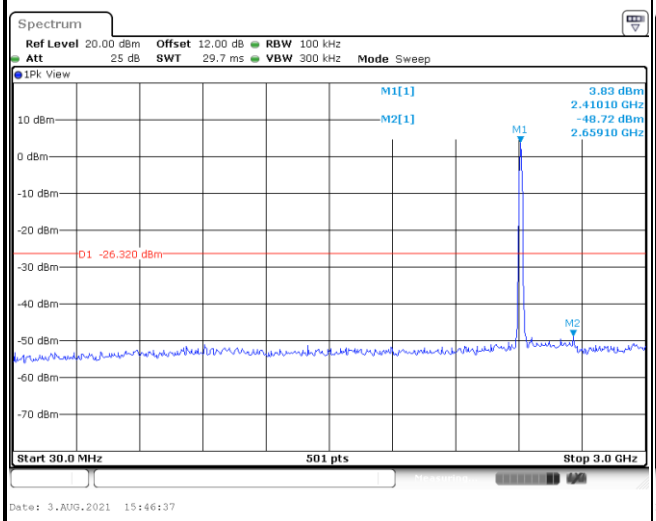
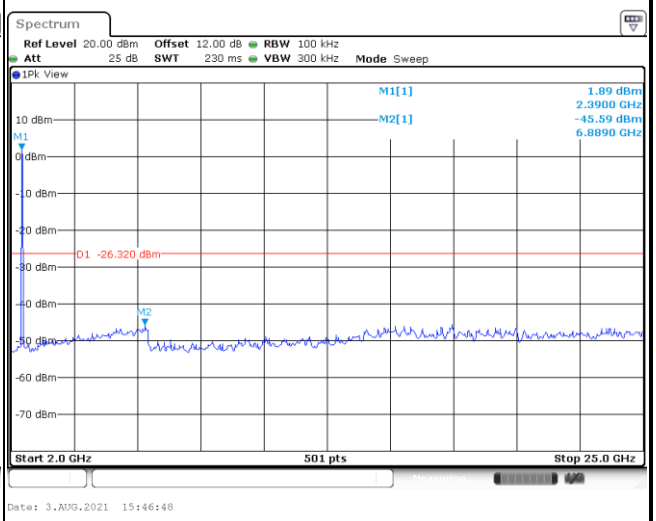
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT40	Test Channel :	09

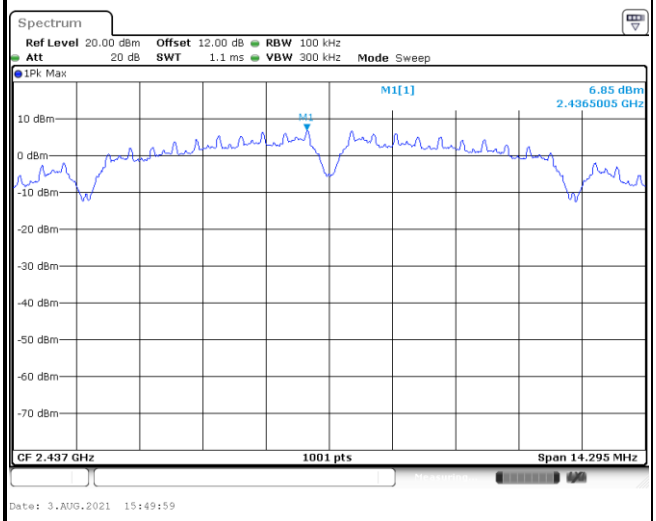
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

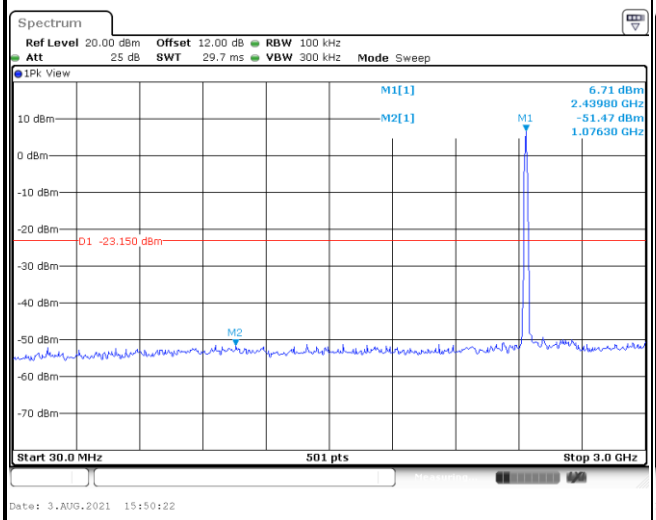
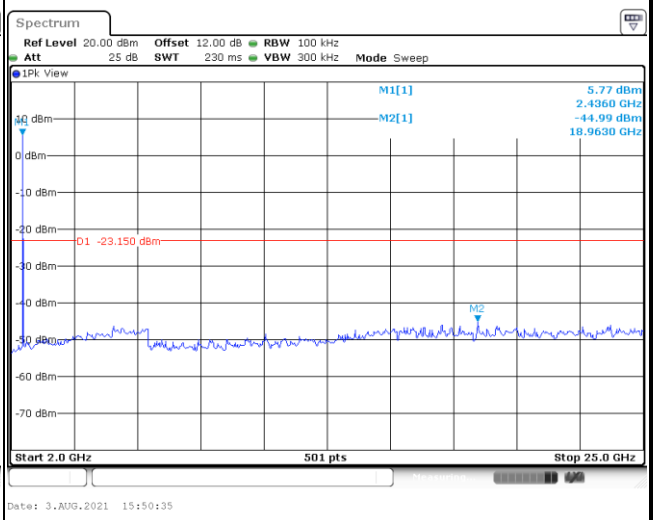
Number of TX = 2, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01

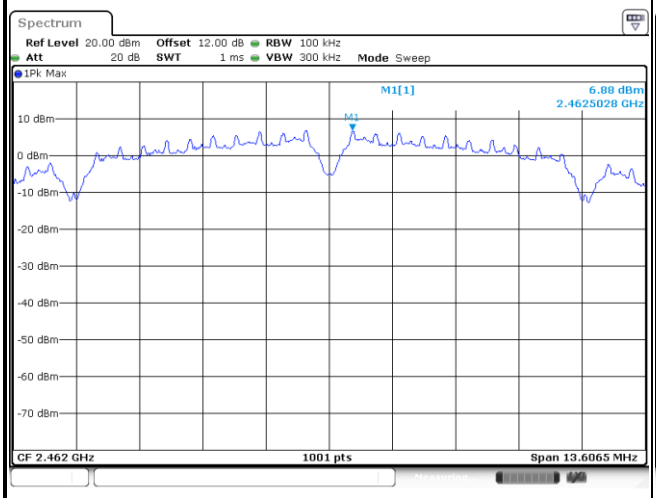
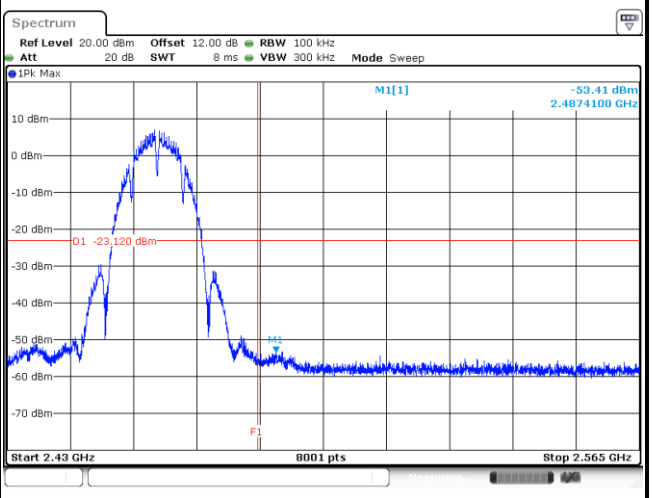
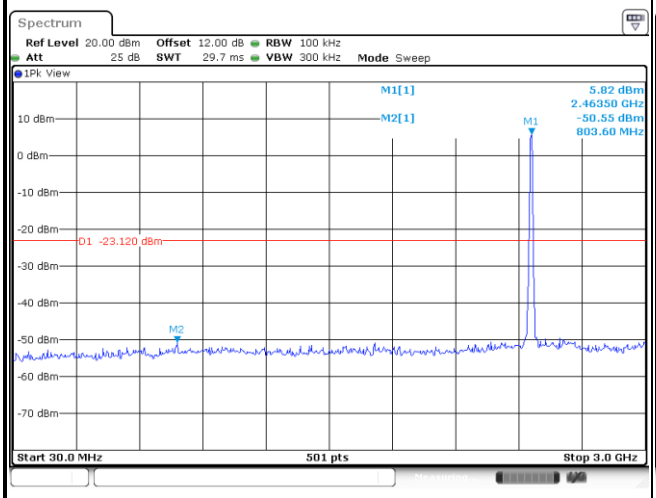
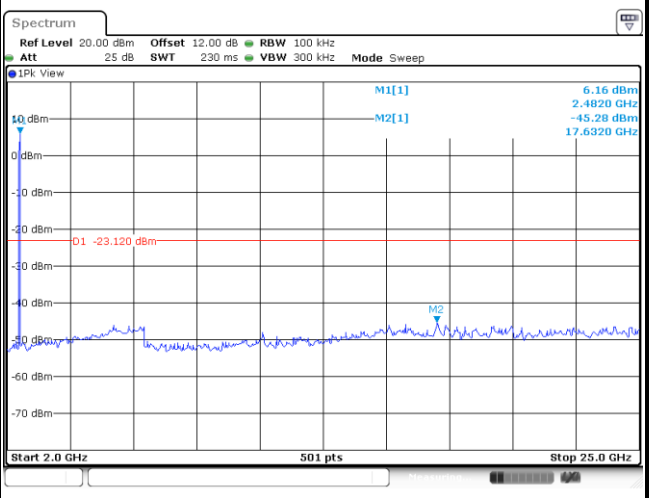
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11b	Test Channel :	06

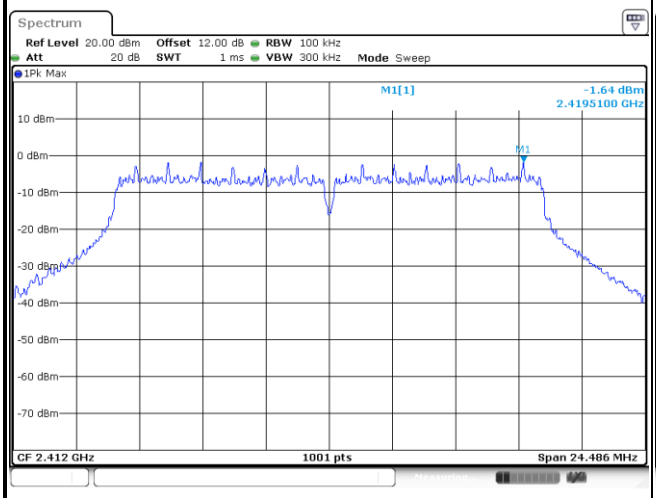
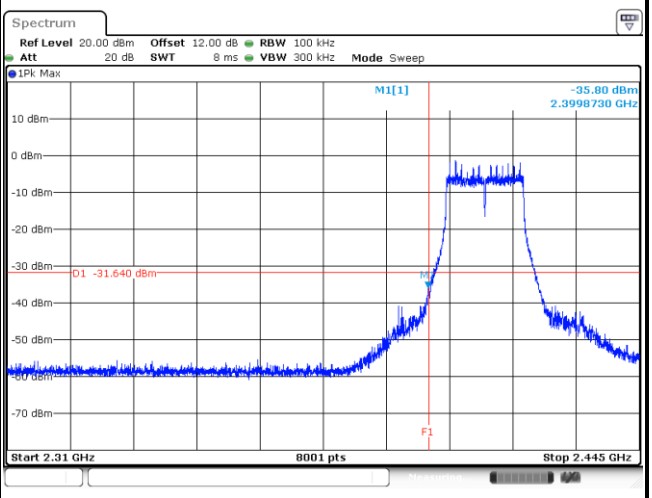
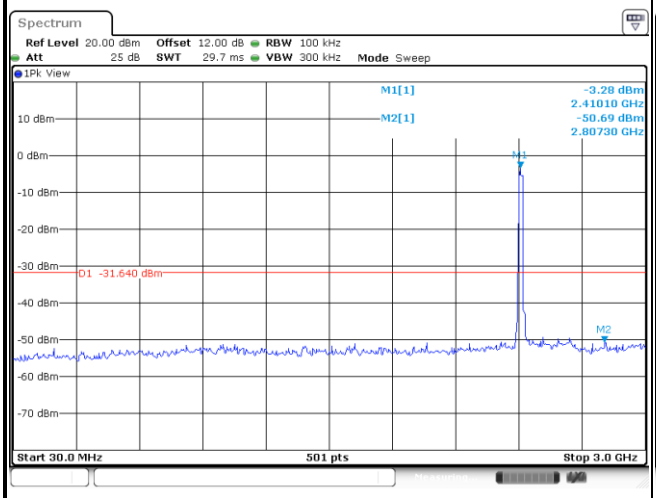
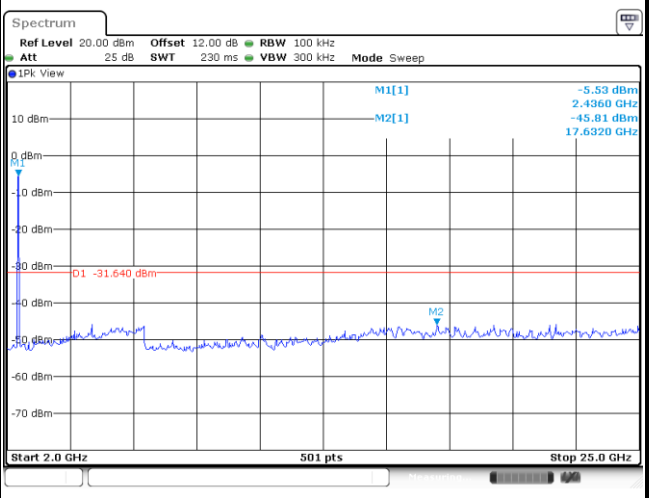
100kHz PSD reference Level	Channel Plot
	

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

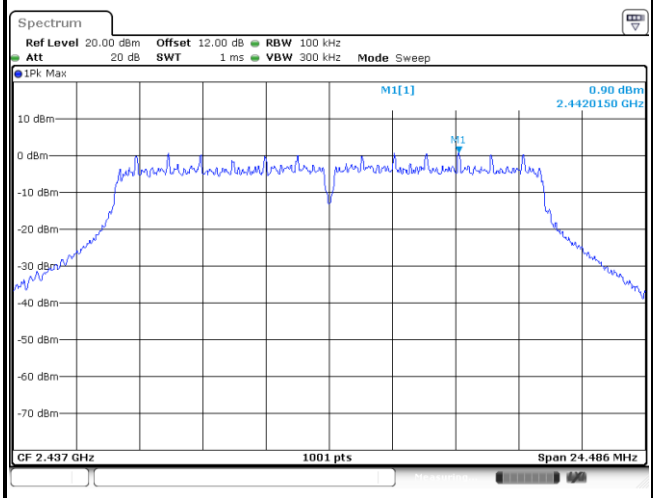
Test Mode :	802.11b	Test Channel :	11

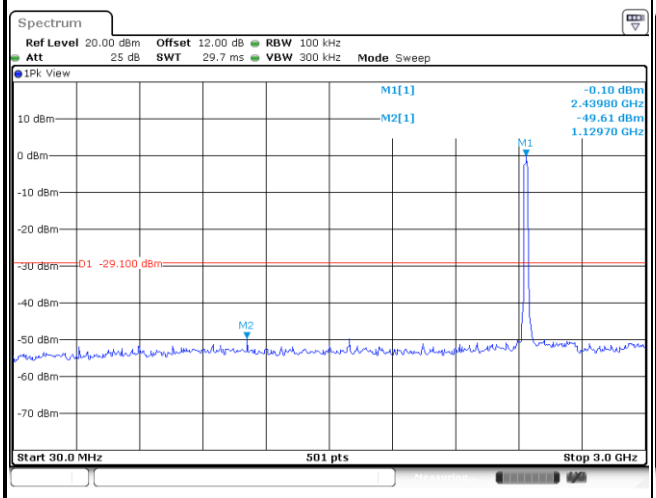
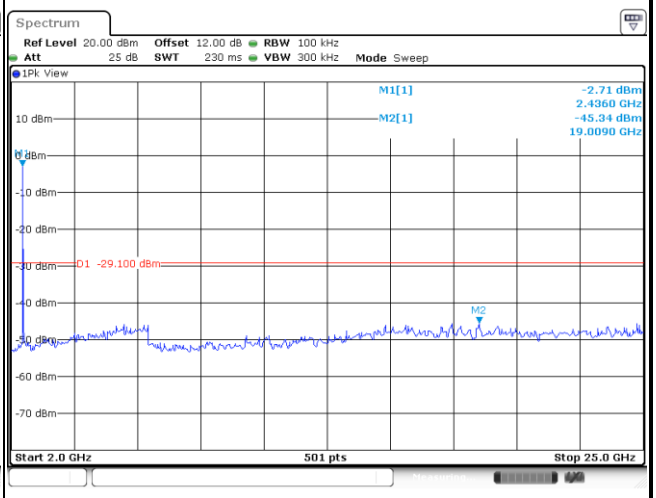
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

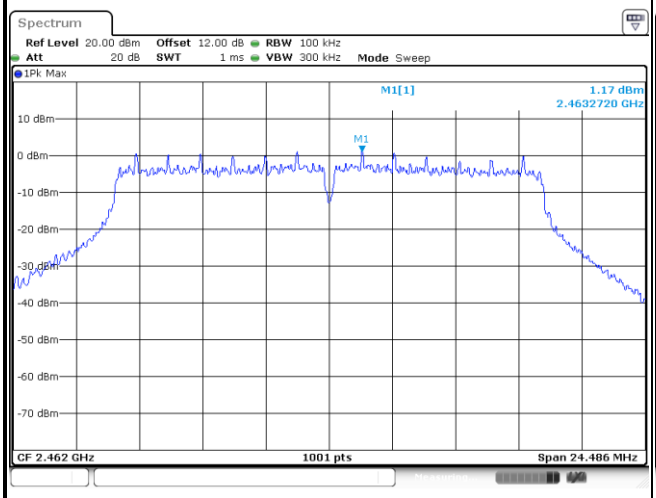
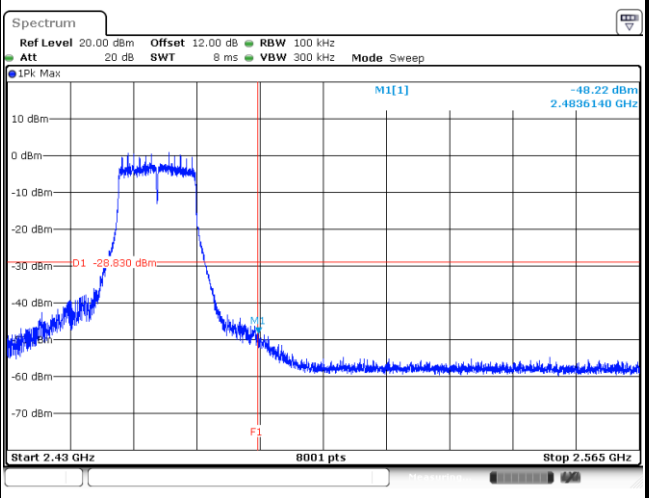
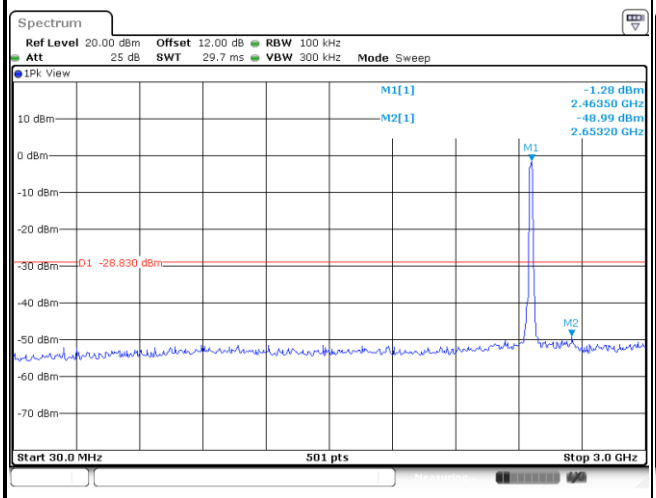
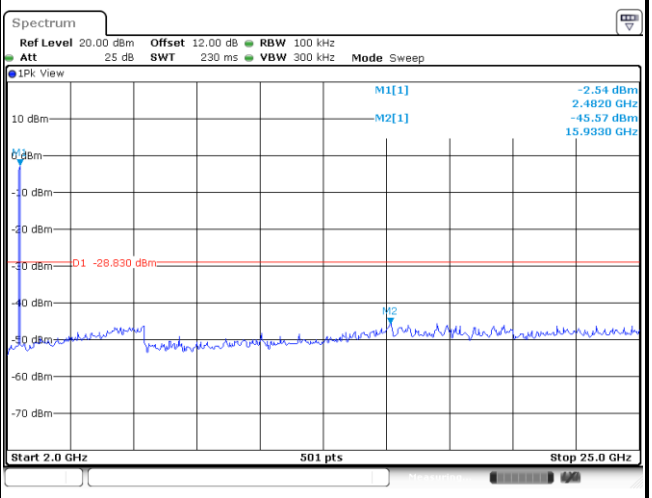
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

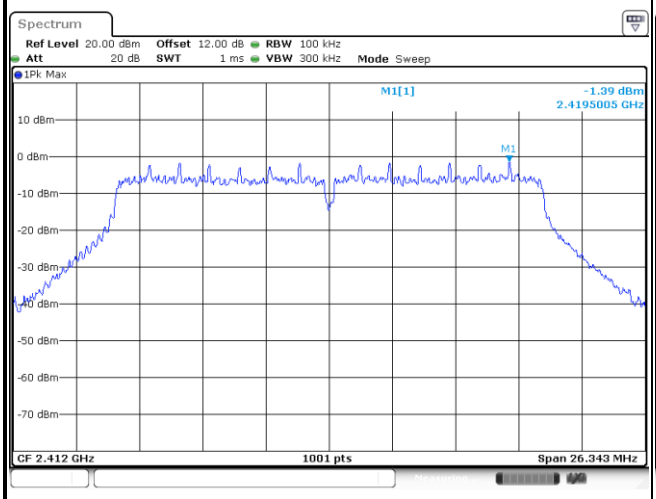
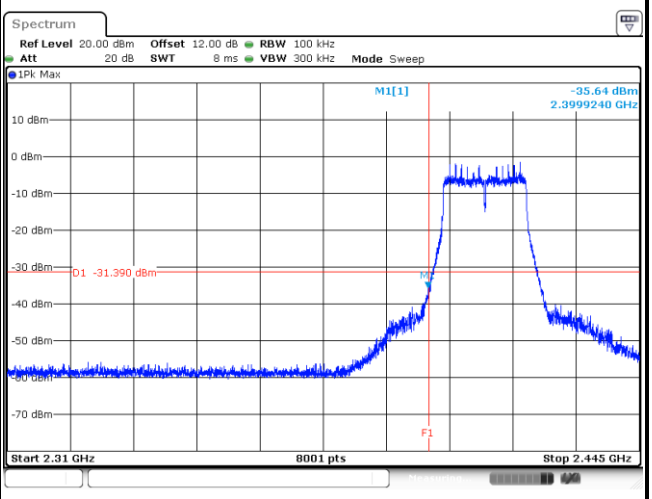
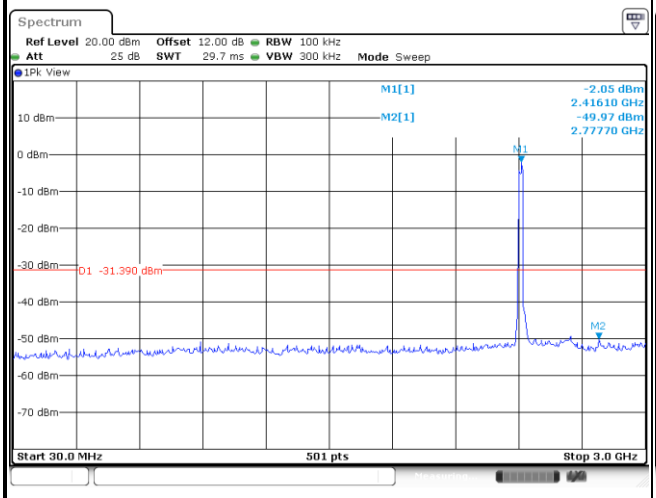
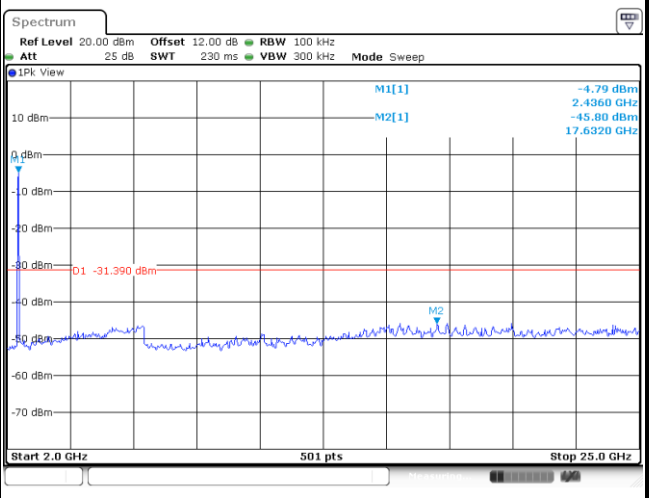
100kHz PSD reference Level	Channel Plot
	

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

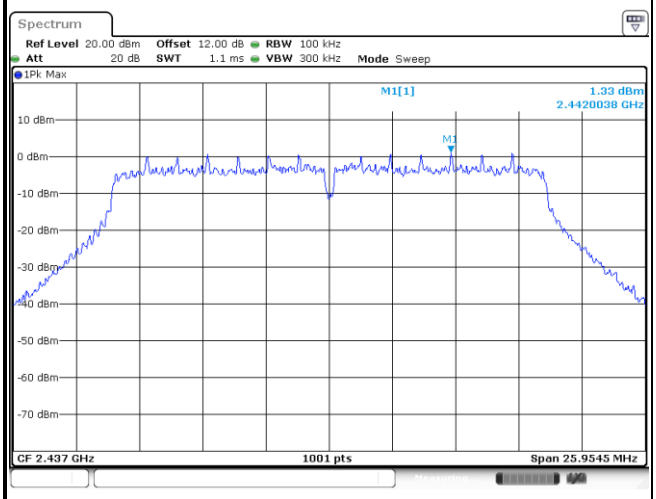
Test Mode :	802.11g	Test Channel :	11

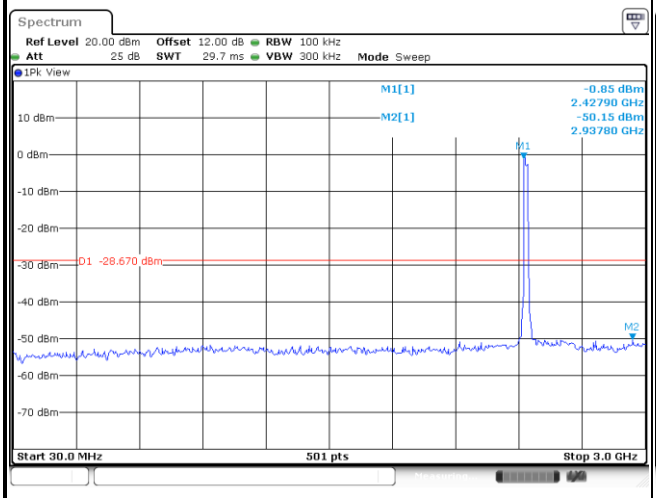
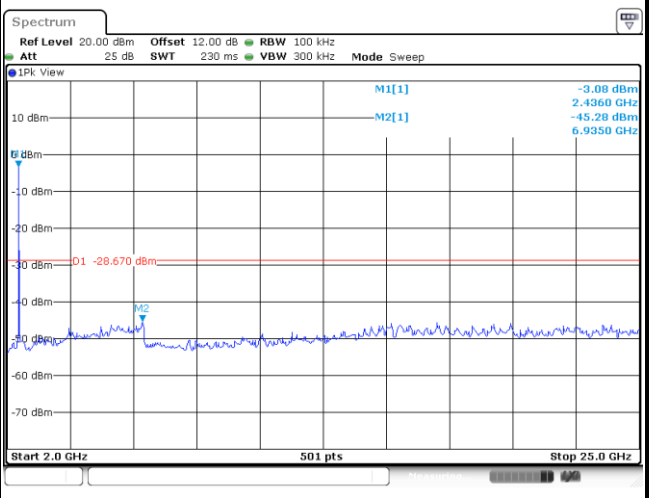
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

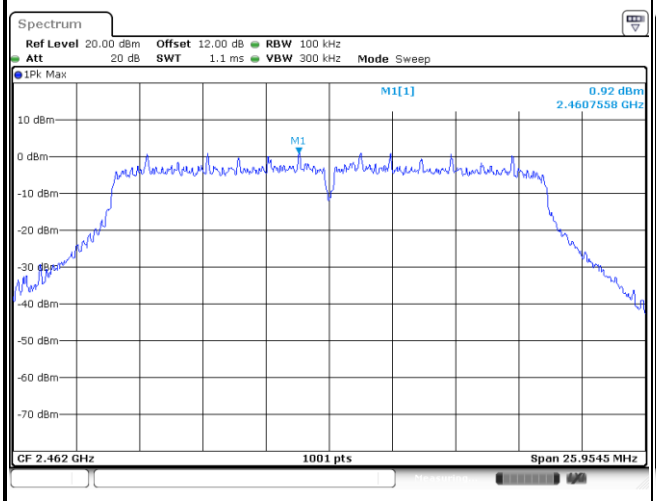
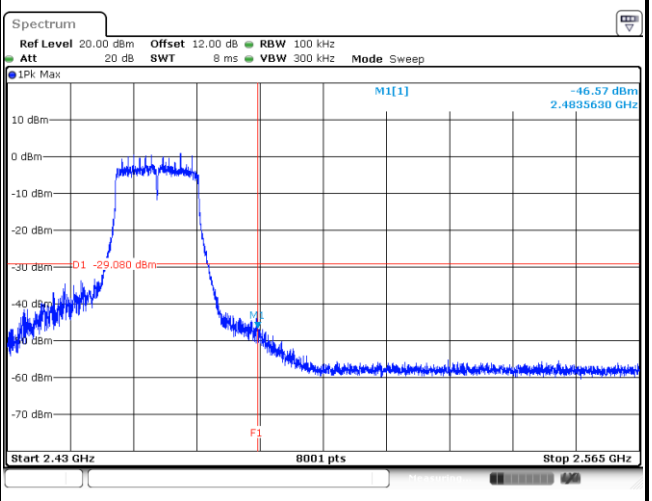
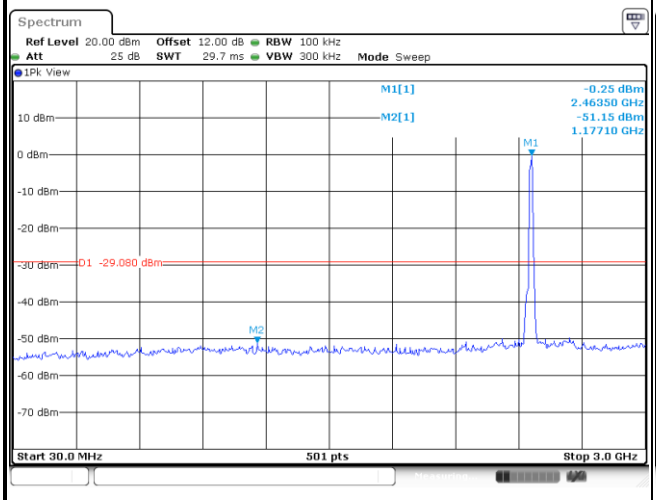
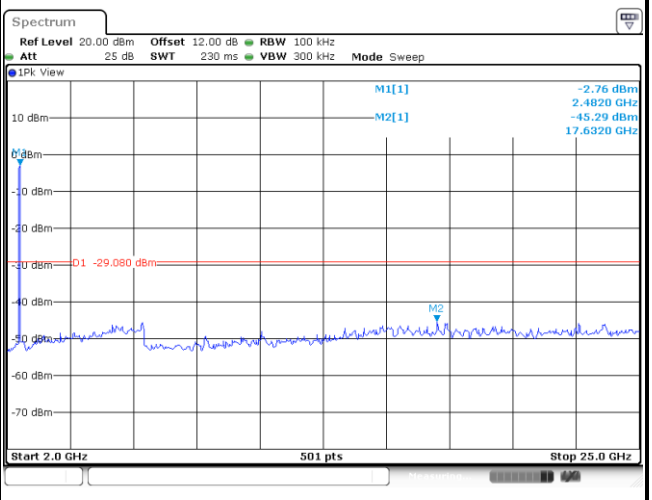
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

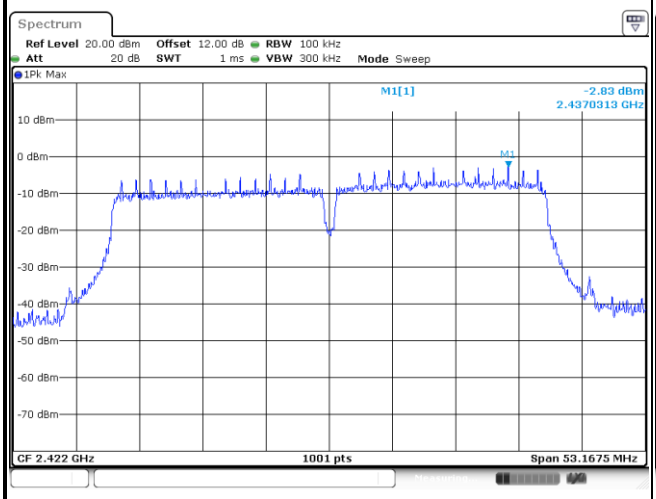
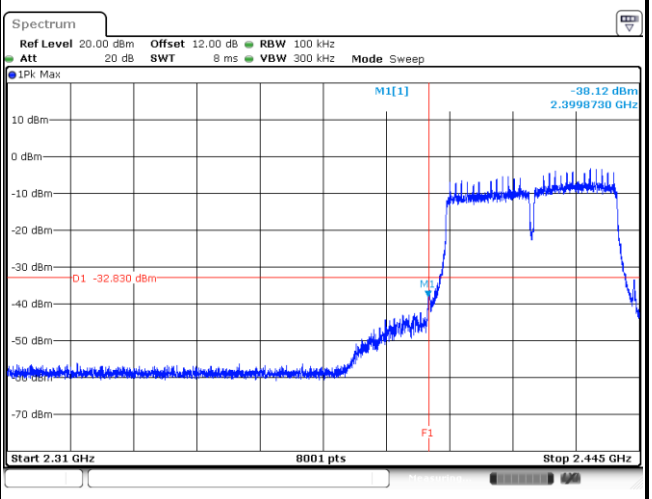
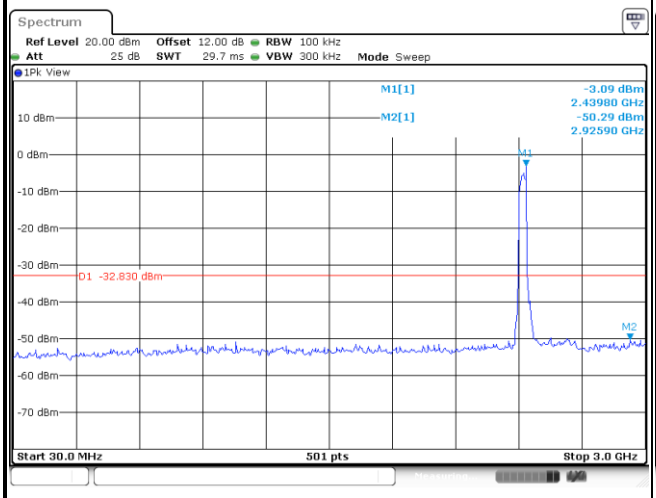
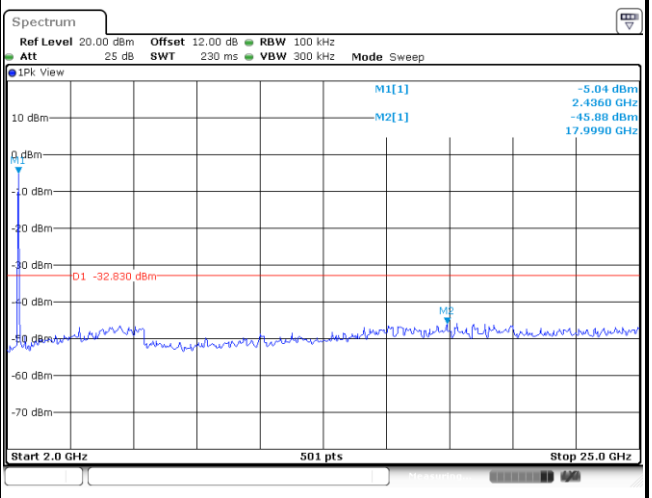
100kHz PSD reference Level	Channel Plot
	

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

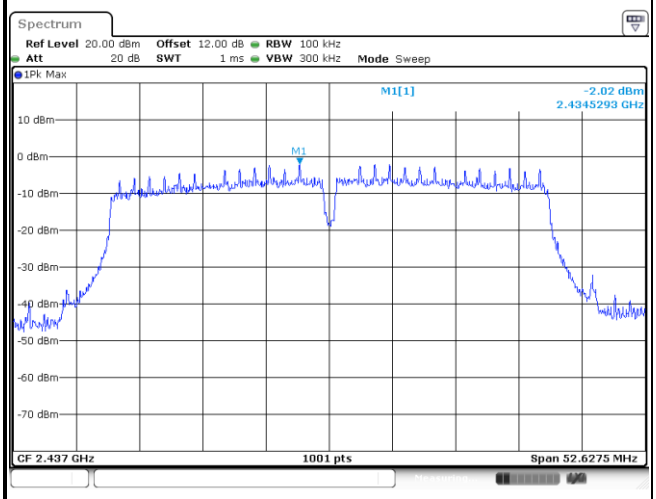
Test Mode :	802.11n HT20	Test Channel :	11

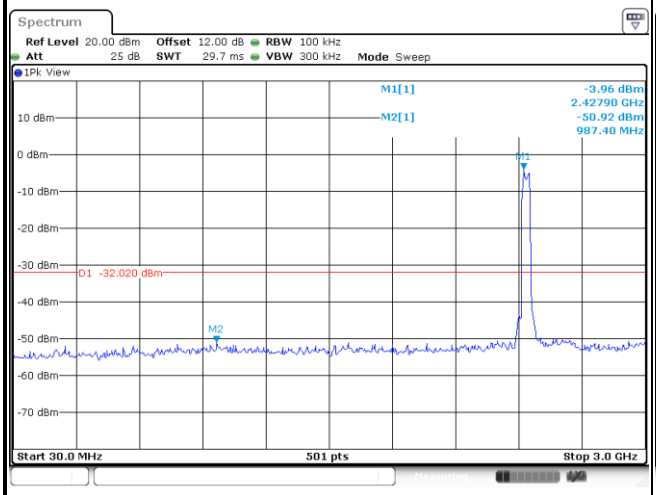
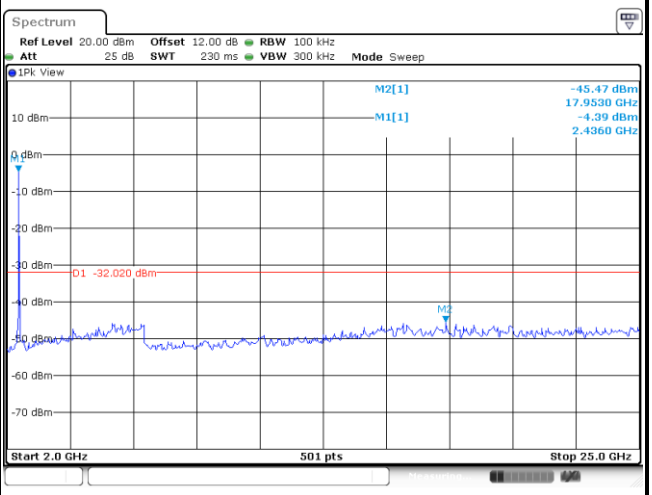
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	03

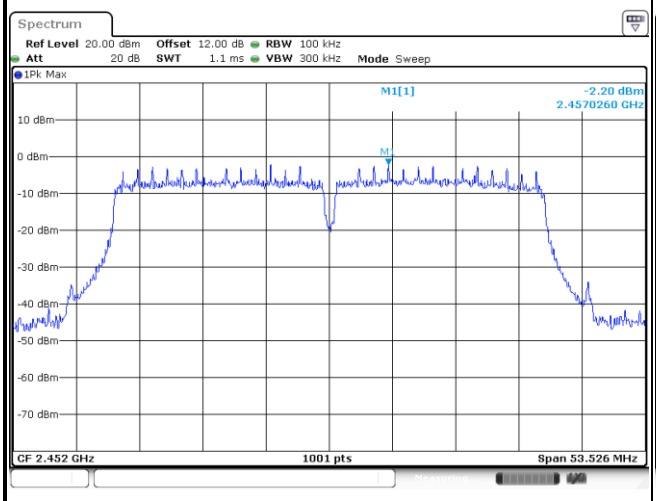
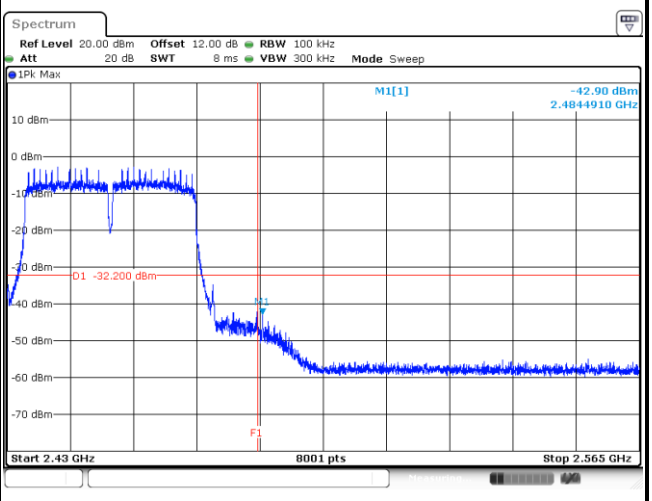
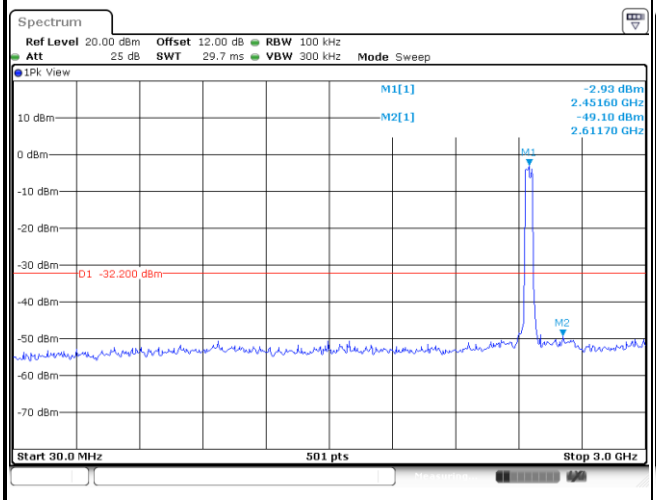
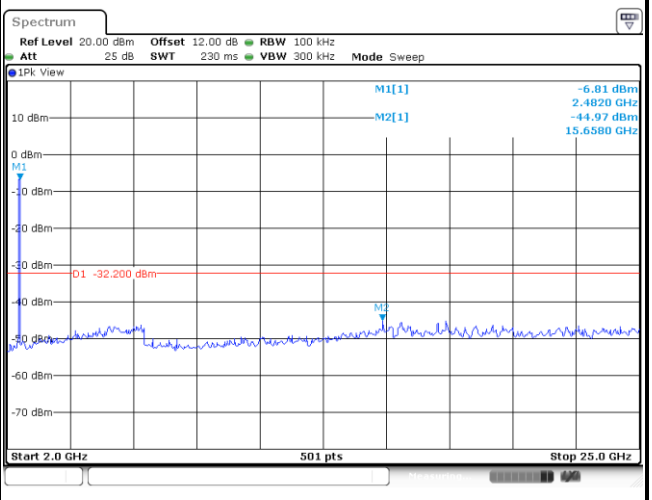
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	Channel Plot
	

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

Test Mode :	802.11n HT40	Test Channel :	09

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

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

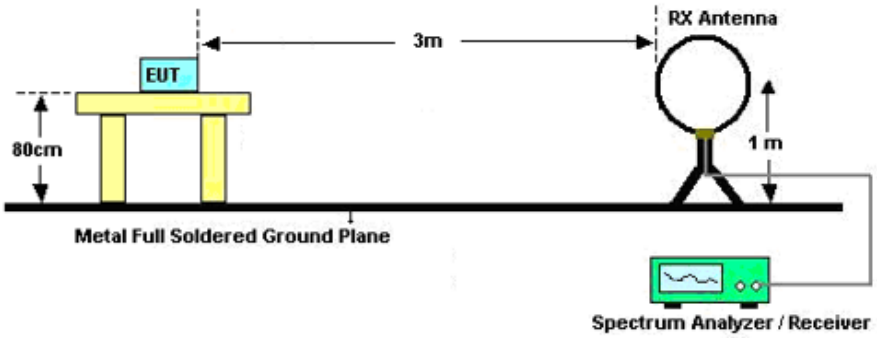
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

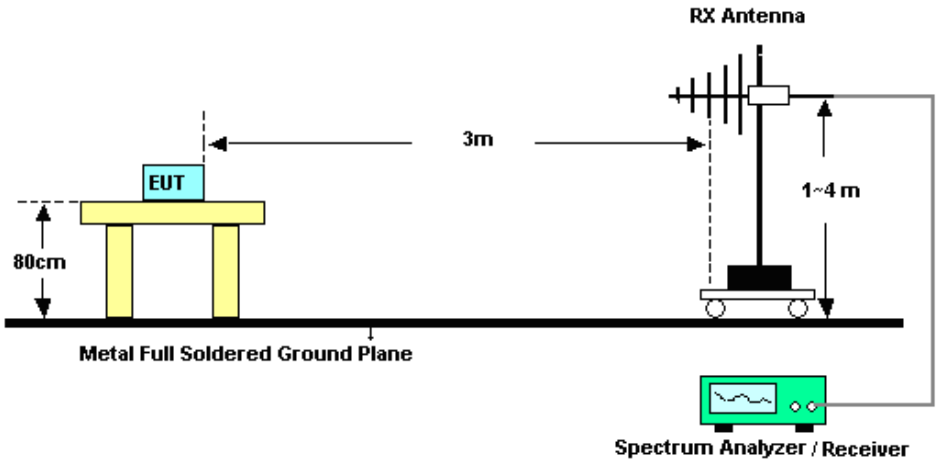
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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 ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 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

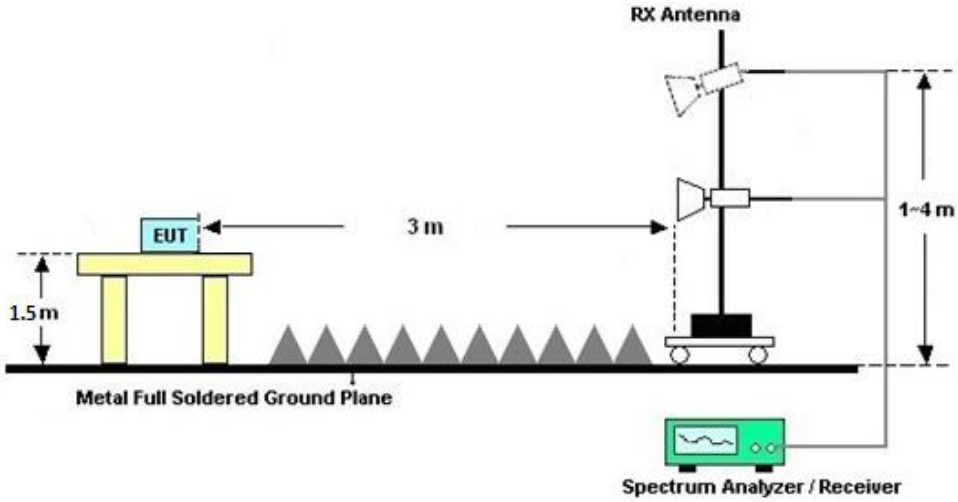
For radiated emissions below 30MHz



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.

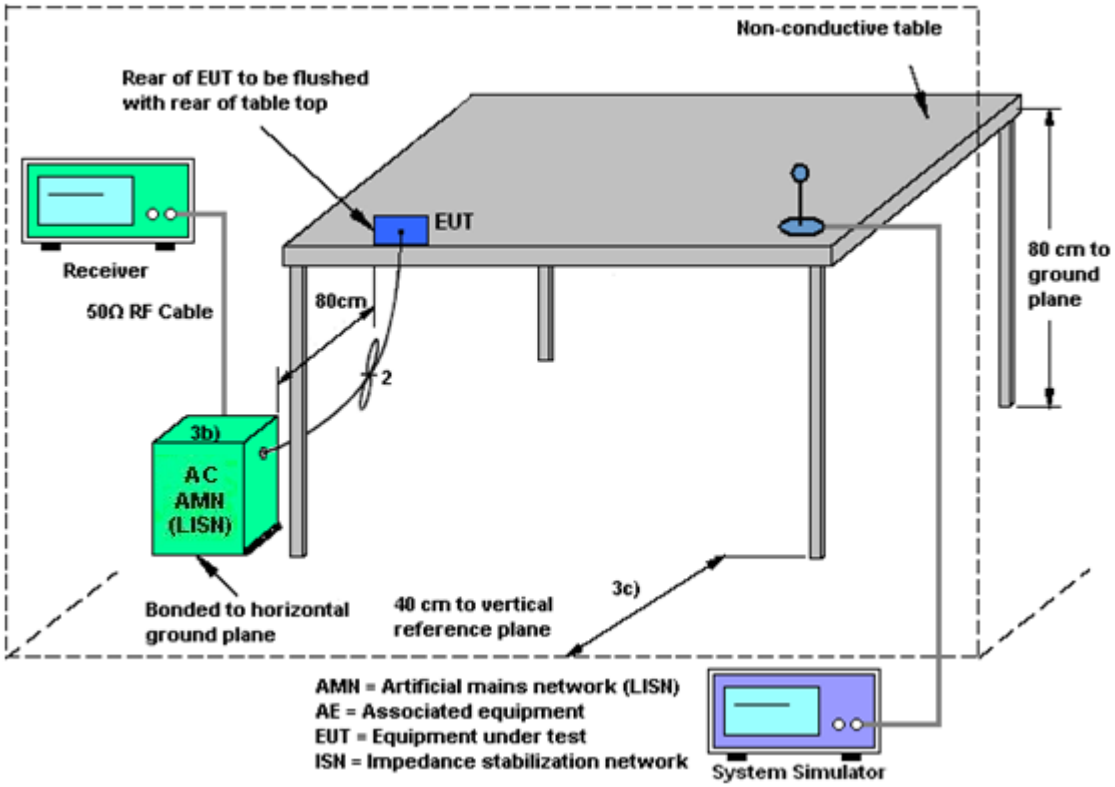
3.6.2 Measuring Instruments

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	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	Ant. 1 (dBi)	Ant. 2 (dBi)	(dBi)	(dBi)	(dB)	(dB)
2.4 GHz	3.00	3.00	3.00	6.01	0.00	0.01

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Mar. 07, 2021	Jul. 26, 2021	Mar. 06, 2022	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2 LISN	00103912	9kHz~30MHz	Dec. 25, 2020	Jul. 26, 2021	Dec. 24, 2021	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 15, 2020	Jul. 26, 2021	Oct. 14, 2021	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 14, 2021	Jul. 26, 2021	Jul. 13, 2022	Conduction (CO01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 08, 2021	Aug. 03, 2021~ Aug. 04, 2021	Apr. 07, 2022	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 25, 2020	Aug. 03, 2021~ Aug. 04, 2021	Dec. 24, 2021	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 25, 2020	Aug. 03, 2021~ Aug. 04, 2021	Dec. 24, 2021	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 07, 2021	Aug. 06, 2021	Apr. 06, 2022	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 07, 2021	Aug. 06, 2021	Apr. 06, 2022	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2021	Aug. 06, 2021	Jun. 21, 2022	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	Jun. 22, 2021	Aug. 06, 2021	Jun. 21, 2022	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	Apr. 25, 2021	Aug. 06, 2021	Apr. 24, 2022	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 20, 2021	Aug. 06, 2021	Jul. 19, 2022	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 11, 2021	Aug. 06, 2021	Apr. 10, 2022	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 16, 2020	Aug. 06, 2021	Oct. 15, 2021	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 16, 2020	Aug. 06, 2021	Oct. 15, 2021	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Dec. 30, 2020	Aug. 06, 2021	Dec. 29, 2021	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Aug. 06, 2021	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Aug. 06, 2021	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Aug. 06, 2021	NCR	Radiation (03CH03-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**

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

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

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

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

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

Appendix A. Conducted Test Results

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Ma Jie	Temperature:	21~25	°C
Test Date:	2021/8/3~2021/8/4	Relative Humidity:	51~54	%

Report Number : FR171309

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2		
11b	1Mbps	2	1	2412	15.33	15.43	10.01	10.03	0.50	Pass
11b	1Mbps	2	6	2437	15.23	15.08	9.55	9.53	0.50	Pass
11b	1Mbps	2	11	2462	15.18	14.94	9.55	9.07	0.50	Pass
11g	6Mbps	2	1	2412	18.43	18.18	16.32	16.32	0.50	Pass
11g	6Mbps	2	6	2437	18.28	17.83	16.32	16.32	0.50	Pass
11g	6Mbps	2	11	2462	18.23	17.93	16.32	16.32	0.50	Pass
HT20	MCS0	2	1	2412	19.48	19.53	17.58	17.56	0.50	Pass
HT20	MCS0	2	6	2437	19.38	19.23	17.58	17.30	0.50	Pass
HT20	MCS0	2	11	2462	19.33	19.08	17.30	17.30	0.50	Pass
HT40	MCS0	2	3	2422	36.56	36.66	35.45	35.45	0.50	Pass
HT40	MCS0	2	6	2437	36.26	36.36	35.45	35.09	0.50	Pass
HT40	MCS0	2	9	2452	36.26	36.56	35.33	35.68	0.50	Pass

Report Number : FR171309

TEST RESULTS DATA
Average Output Power

2.4GHz Band																
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
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	2	1	2412	13.80	12.80	16.34	30.00		3.00		19.34		36.00		Pass
11b	1Mbps	2	6	2437	15.40	15.50	18.46	30.00		3.00		21.46		36.00		Pass
11b	1Mbps	2	11	2462	15.60	15.60	18.61	30.00		3.00		21.61		36.00		Pass
11g	6Mbps	2	1	2412	9.90	9.60	12.76	30.00		3.00		15.76		36.00		Pass
11g	6Mbps	2	6	2437	11.30	11.90	14.62	30.00		3.00		17.62		36.00		Pass
11g	6Mbps	2	11	2462	11.70	12.10	14.91	30.00		3.00		17.91		36.00		Pass
HT20	MCS0	2	1	2412	10.20	9.80	13.01	30.00		3.00		16.01		36.00		Pass
HT20	MCS0	2	6	2437	11.40	12.30	14.88	30.00		3.00		17.88		36.00		Pass
HT20	MCS0	2	11	2462	11.80	12.50	15.17	30.00		3.00		18.17		36.00		Pass
HT40	MCS0	2	3	2422	9.60	9.80	12.71	30.00		3.00		15.71		36.00		Pass
HT40	MCS0	2	6	2437	10.70	11.00	13.86	30.00		3.00		16.86		36.00		Pass
HT40	MCS0	2	9	2452	11.10	11.60	14.37	30.00		3.00		17.37		36.00		Pass

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

Report Number : FR171309

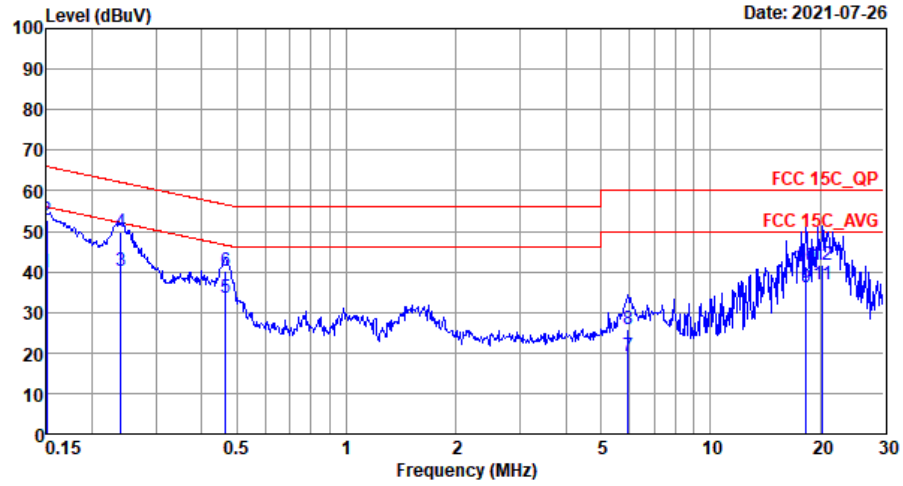
TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	2	1	2412	-0.37	-2.25	2.64	6.01		7.99		Pass
11b	1Mbps	2	6	2437	1.17	1.06	4.18	6.01		7.99		Pass
11b	1Mbps	2	11	2462	1.07	0.87	4.08	6.01		7.99		Pass
11g	6Mbps	2	1	2412	-17.10	-16.90	-13.89	6.01		7.99		Pass
11g	6Mbps	2	6	2437	-14.36	-13.94	-10.93	6.01		7.99		Pass
11g	6Mbps	2	11	2462	-13.88	-14.23	-10.87	6.01		7.99		Pass
HT20	MCS0	2	1	2412	-16.34	-17.14	-13.33	6.01		7.99		Pass
HT20	MCS0	2	6	2437	-15.25	-14.62	-11.61	6.01		7.99		Pass
HT20	MCS0	2	11	2462	-14.82	-14.16	-11.15	6.01		7.99		Pass
HT40	MCS0	2	3	2422	-18.83	-18.76	-15.75	6.01		7.99		Pass
HT40	MCS0	2	6	2437	-17.80	-17.71	-14.70	6.01		7.99		Pass
HT40	MCS0	2	9	2452	-17.40	-18.70	-14.39	6.01		7.99		Pass

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

Appendix B. AC Conducted Emission Test Results

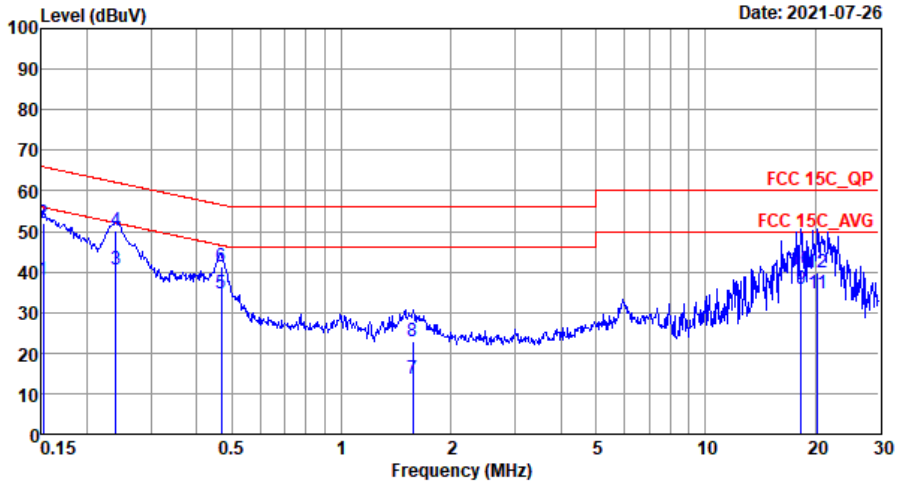
Test Engineer :	Xie YuQiang	**Temperature :**	22~25℃
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
Condition: FCC 15C QP LISN 20201030 L LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.15	39.79	-16.21	56.00	29.70	0.08	10.01	Average
2		0.15	52.69	-13.31	66.00	42.60	0.08	10.01	QP
3	*	0.24	40.28	-11.80	52.08	30.20	0.05	10.03	Average
4		0.24	49.98	-12.10	62.08	39.90	0.05	10.03	QP
5		0.47	33.44	-13.14	46.58	23.30	0.09	10.05	Average
6		0.47	40.04	-16.54	56.58	29.90	0.09	10.05	QP
7		5.93	19.30	-30.70	50.00	9.00	0.05	10.25	Average
8		5.93	25.80	-34.20	60.00	15.50	0.05	10.25	QP
9		18.33	36.24	-13.76	50.00	25.10	0.69	10.45	Average
10		18.33	41.44	-18.56	60.00	30.30	0.69	10.45	QP
11		20.27	36.99	-13.01	50.00	25.69	0.78	10.52	Average
12		20.27	41.69	-18.31	60.00	30.39	0.78	10.52	QP

Test Engineer :	Xie YuQiang	**Temperature :**	22~25℃
		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	38.19	-17.72	55.91	28.10	0.08	10.01	Average
2		0.15	52.09	-13.82	65.91	42.00	0.08	10.01	QP
3	*	0.24	40.58	-11.50	52.08	30.50	0.05	10.03	Average
4		0.24	50.28	-11.80	62.08	40.20	0.05	10.03	QP
5		0.47	34.54	-12.00	46.54	24.40	0.09	10.05	Average
6		0.47	41.24	-15.30	56.54	31.10	0.09	10.05	QP
7		1.57	13.66	-32.34	46.00	3.50	0.09	10.07	Average
8		1.57	23.06	-32.94	56.00	12.90	0.09	10.07	QP
9		18.33	35.64	-14.36	50.00	24.50	0.69	10.45	Average
10		18.33	40.74	-19.26	60.00	29.60	0.69	10.45	QP
11		20.27	34.69	-15.31	50.00	23.39	0.78	10.52	Average
12		20.27	39.89	-20.11	60.00	28.59	0.78	10.52	QP

Note:

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

Appendix C. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2389.38	50.53	-23.47	74	52.01	27.27	4.91	33.66	107	59	P	H
		2389.38	39.13	-14.87	54	40.61	27.27	4.91	33.66	107	59	A	H
	*	2412	97.34	-	-	98.75	27.31	4.93	33.65	107	59	P	H
	*	2412	94.1	-	-	95.51	27.31	4.93	33.65	107	59	A	H
		2367.435	50.42	-23.58	74	52.06	27.2	4.84	33.68	115	244	P	V
		2389.8	39.33	-14.67	54	40.81	27.27	4.91	33.66	115	244	A	V
	*	2412	101.26	-	-	102.67	27.31	4.93	33.65	115	244	P	V
	*	2412	98.34	-	-	99.75	27.31	4.93	33.65	115	244	A	V
802.11b CH 06 2437MHz		2321.9	50.01	-23.99	74	51.82	27.12	4.78	33.71	103	61	P	H
		2389.38	39.11	-14.89	54	40.59	27.27	4.91	33.66	103	61	A	H
	*	2437	102.55	-	-	103.85	27.39	4.96	33.65	103	61	P	H
	*	2437	97.31	-	-	98.61	27.39	4.96	33.65	103	61	A	H
		2492.86	50.74	-23.26	74	51.83	27.5	5.01	33.6	103	61	P	H
		2483.83	39.53	-14.47	54	40.7	27.46	4.99	33.62	103	61	A	H
		2372.72	50.26	-23.74	74	51.83	27.23	4.88	33.68	105	249	P	V
		2388.82	39.5	-14.5	54	40.98	27.27	4.91	33.66	105	249	A	V
	*	2437	104.67	-	-	105.97	27.39	4.96	33.65	105	249	P	V
	*	2437	101.75	-	-	103.05	27.39	4.96	33.65	105	249	A	V
		2498.6	50.67	-23.33	74	51.76	27.5	5.01	33.6	105	249	P	V
		2483.97	39.68	-14.32	54	40.85	27.46	4.99	33.62	105	249	A	V

802.11b CH 11 2462MHz	*	2462	102.73	-	-	103.96	27.42	4.98	33.63	134	62	P	H
	*	2462	98.11	-	-	99.34	27.42	4.98	33.63	134	62	A	H
		2488.08	49.99	-24.01	74	51.1	27.5	5.01	33.62	134	62	P	H
		2483.56	39.67	-14.33	54	40.84	27.46	4.99	33.62	134	62	A	H
	*	2462	103.41	-	-	104.64	27.42	4.98	33.63	114	245	P	V
	*	2462	99.31	-	-	100.54	27.42	4.98	33.63	114	245	A	V
		2485.68	51.72	-22.28	74	52.89	27.46	4.99	33.62	114	245	P	V
		2483.56	39.64	-14.36	54	40.81	27.46	4.99	33.62	114	245	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11b (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	46.92	-27.08	74	65.53	31.76	7.11	57.48	191	220	P	H
		4824	47.02	-26.98	74	65.63	31.76	7.11	57.48	145	274	P	V
802.11b CH 06 2437MHz		4874	49.11	-24.89	74	67.56	31.88	7.19	57.52	112	229	P	H
		7311	48.09	-25.91	74	61.37	36.88	8.76	58.92	174	134	P	H
		4874	49.12	-24.88	74	67.57	31.88	7.19	57.52	142	258	P	V
		7311	47.83	-26.17	74	61.11	36.88	8.76	58.92	174	142	P	V
802.11b CH 11 2462MHz		4924	49.72	-24.28	74	68.05	32	7.22	57.55	133	180	P	H
		7386	49.65	-24.35	74	62.45	37.21	8.95	58.96	145	274	P	H
		4924	50.01	-23.99	74	68.34	32	7.22	57.55	201	36	P	V
		7386	49.73	-24.27	74	62.53	37.21	8.95	58.96	166	256	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 802.11g (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)
802.11g CH 01 2412MHz		2343.495	49.46	-24.54	74	51.18	27.16	4.81	33.69	113	62	P	H
		2389.38	40.17	-13.83	54	41.65	27.27	4.91	33.66	113	62	A	H
	*	2412	94.96	-	-	96.37	27.31	4.93	33.65	113	62	P	H
	*	2412	87.45	-	-	88.86	27.31	4.93	33.65	113	62	A	H
		2389.695	50.72	-23.28	74	52.2	27.27	4.91	33.66	113	247	P	V
		2389.905	40.98	-13.02	54	42.46	27.27	4.91	33.66	113	247	A	V
	*	2412	101.41	-	-	102.82	27.31	4.93	33.65	113	247	P	V
	*	2412	94.38	-	-	95.79	27.31	4.93	33.65	113	247	A	V
802.11g CH 06 2437MHz		2358.58	49.41	-24.59	74	51.06	27.2	4.84	33.69	103	63	P	H
		2388.68	39.59	-14.41	54	41.07	27.27	4.91	33.66	103	63	A	H
	*	2437	99.09	-	-	100.39	27.39	4.96	33.65	103	63	P	H
	*	2437	91.71	-	-	93.01	27.39	4.96	33.65	103	63	A	H
		2498.81	51.04	-22.96	74	52.13	27.5	5.01	33.6	103	63	P	H
		2494.61	40.14	-13.86	54	41.23	27.5	5.01	33.6	103	63	A	H
		2389.66	52.5	-21.5	74	53.98	27.27	4.91	33.66	109	244	P	V
		2389.94	39.62	-14.38	54	41.1	27.27	4.91	33.66	109	244	A	V
	*	2437	102.1	-	-	103.4	27.39	4.96	33.65	109	244	P	V
	*	2437	94.45	-	-	95.75	27.39	4.96	33.65	109	244	A	V
		2483.5	49.71	-24.29	74	50.88	27.46	4.99	33.62	109	244	P	V
		2486.98	40.16	-13.84	54	41.33	27.46	4.99	33.62	109	244	A	V

802.11g CH 11 2462MHz	*	2462	100.84	-	-	102.07	27.42	4.98	33.63	345	63	P	H
	*	2462	93.16	-	-	94.39	27.42	4.98	33.63	345	63	A	H
		2484	53.75	-20.25	74	54.92	27.46	4.99	33.62	345	63	P	H
		2483.52	42.45	-11.55	54	43.62	27.46	4.99	33.62	345	63	A	H
	*	2462	103.2	-	-	104.43	27.42	4.98	33.63	335	249	P	V
	*	2462	95.28	-	-	96.51	27.42	4.98	33.63	335	249	A	V
		2483.64	56.99	-17.01	74	58.16	27.46	4.99	33.62	335	249	P	V
		2483.64	43.88	-10.12	54	45.05	27.46	4.99	33.62	335	249	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	40.21	-33.79	74	58.82	31.76	7.11	57.48	144	271	P	H
		4824	39.02	-34.98	74	57.63	31.76	7.11	57.48	191	220	P	V
802.11g CH 06 2437MHz		4874	41.09	-32.91	74	59.54	31.88	7.19	57.52	169	201	P	H
		7311	46.69	-27.31	74	59.97	36.88	8.76	58.92	196	133	P	H
		4874	41.42	-32.58	74	59.87	31.88	7.19	57.52	158	116	P	V
		7311	46.17	-27.83	74	59.45	36.88	8.76	58.92	163	124	P	V
802.11g CH 11 2462MHz		4924	41.19	-32.81	74	59.52	32	7.22	57.55	133	180	P	H
		7386	46.57	-27.43	74	59.37	37.21	8.95	58.96	145	274	P	H
		4924	41.51	-32.49	74	59.84	32	7.22	57.55	177	203	P	V
		7386	45.35	-28.65	74	58.15	37.21	8.95	58.96	162	232	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)
		2376.88	49.65	-24.35	74	51.22	27.23	4.88	33.68	248	61	P	H
		2389.48	40.27	-13.73	54	41.75	27.27	4.91	33.66	248	61	A	H
802.11n	*	2412	92.27	-	-	93.68	27.31	4.93	33.65	248	61	P	H
HT20	*	2412	84.5	-	-	85.91	27.31	4.93	33.65	248	61	A	H
CH 01		2389.38	52.04	-21.96	74	53.52	27.27	4.91	33.66	111	249	P	V
2412MHz		2389.90	42.13	-11.87	54	43.61	27.27	4.91	33.66	111	249	A	V
	*	2412	98.33	-	-	99.74	27.31	4.93	33.65	111	249	P	V
	*	2412	90.42	-	-	91.83	27.31	4.93	33.65	111	249	A	V
		2367.68	49.6	-24.4	74	51.24	27.2	4.84	33.68	240	61	P	H
		2372.58	39.82	-14.18	54	41.39	27.23	4.88	33.68	240	61	A	H
	*	2437	93.32	-	-	94.62	27.39	4.96	33.65	240	61	P	H
	*	2437	85.59	-	-	86.89	27.39	4.96	33.65	240	61	A	H
802.11n		2491.81	50.69	-23.31	74	51.78	27.5	5.01	33.6	240	61	P	H
HT20		2499.23	40.29	-13.71	54	41.38	27.5	5.01	33.6	240	61	A	H
CH 06		2387.7	50.01	-23.99	74	51.49	27.27	4.91	33.66	133	246	P	V
2437MHz		2383.64	39.83	-14.17	54	41.4	27.23	4.88	33.68	133	246	A	V
	*	2437	100.65	-	-	101.95	27.39	4.96	33.65	133	246	P	V
	*	2437	92.7	-	-	94	27.39	4.96	33.65	133	246	A	V
		2498.46	49.8	-24.2	74	50.89	27.5	5.01	33.6	133	246	P	V
		2486.84	40.51	-13.49	54	41.68	27.46	4.99	33.62	133	246	A	V

802.11n HT20 CH 11 2462MHz	*	2462	95.81	-	-	97.04	27.42	4.98	33.63	100	108	P	H
	*	2462	88.21	-	-	89.44	27.42	4.98	33.63	100	108	A	H
		2483.56	56.53	-17.47	74	57.7	27.46	4.99	33.62	100	108	P	H
		2483.56	42.09	-11.91	54	43.26	27.46	4.99	33.62	100	108	A	H
	*	2462	101.61	-	-	102.84	27.42	4.98	33.63	128	246	P	V
	*	2462	93.53	-	-	94.76	27.42	4.98	33.63	128	246	A	V
		2483.68	61.78	-12.22	74	62.95	27.46	4.99	33.62	128	246	P	V
		2483.52	44.9	-9.1	54	46.07	27.46	4.99	33.62	128	246	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	39.62	-34.38	74	58.23	31.76	7.11	57.48	144	280	P	H
		4824	39.35	-34.65	74	57.96	31.76	7.11	57.48	200	163	P	V
802.11n HT20 CH 06 2437MHz		4874	41.26	-32.74	74	59.71	31.88	7.19	57.52	112	230	P	H
		7311	45.68	-28.32	74	58.96	36.88	8.76	58.92	164	182	P	H
		4874	41.56	-32.44	74	60.01	31.88	7.19	57.52	135	246	P	V
		7311	46.36	-27.64	74	59.64	36.88	8.76	58.92	120	106	P	V
802.11n HT20 CH 11 2462MHz		4924	39.46	-34.54	74	57.79	32	7.22	57.55	140	167	P	H
		7386	45.38	-28.62	74	58.18	37.21	8.95	58.96	128	216	P	H
		4924	40.25	-33.75	74	58.58	32	7.22	57.55	146	65	P	V
		7386	46.4	-27.6	74	59.2	37.21	8.95	58.96	133	46	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 HT40 (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)
		2389.1	53.32	-20.68	74	54.8	27.27	4.91	33.66	105	59	P	H
		2388.26	41.46	-12.54	54	42.94	27.27	4.91	33.66	105	59	A	H
		2422	96.35	-	-	97.71	27.35	4.94	33.65	105	59	P	H
		2422	88.63	-	-	89.99	27.35	4.94	33.65	105	59	A	H
802.11n		2497.9	50.25	-23.75	74	51.34	27.5	5.01	33.6	105	59	P	H
HT40		2498.6	41.21	-12.79	54	42.3	27.5	5.01	33.6	105	59	A	H
CH 03		2387.7	54.52	-19.48	74	56	27.27	4.91	33.66	124	246	P	V
2422MHz		2389.52	43.81	-10.19	54	45.29	27.27	4.91	33.66	124	246	A	V
		2422	98.33	-	-	99.69	27.35	4.94	33.65	124	246	P	V
		2422	90.63	-	-	91.99	27.35	4.94	33.65	124	246	A	V
		2499.58	50.42	-23.58	74	51.51	27.5	5.01	33.6	124	246	P	V
		2494.75	41.35	-12.65	54	42.44	27.5	5.01	33.6	124	246	A	V
		2385.46	49.93	-24.07	74	51.48	27.23	4.88	33.66	106	60	P	H
		2389.1	40.91	-13.09	54	42.39	27.27	4.91	33.66	106	60	A	H
	*	2437	96.29	-	-	97.59	27.39	4.96	33.65	106	60	P	H
	*	2437	88.69	-	-	89.99	27.39	4.96	33.65	106	60	A	H
802.11n		2484.39	54.32	-19.68	74	55.49	27.46	4.99	33.62	106	60	P	H
HT40		2483.9	43.26	-10.74	54	44.43	27.46	4.99	33.62	106	60	A	H
CH 06		2388.4	50.95	-23.05	74	52.43	27.27	4.91	33.66	110	244	P	V
2437MHz		2389.52	42.28	-11.72	54	43.76	27.27	4.91	33.66	110	244	A	V
	*	2437	98.66	-	-	99.96	27.39	4.96	33.65	110	244	P	V
	*	2437	91.3	-	-	92.6	27.39	4.96	33.65	110	244	A	V
		2483.55	52.48	-21.52	74	53.65	27.46	4.99	33.62	110	244	P	V
		2483.5	43.66	-10.34	54	44.83	27.46	4.99	33.62	110	244	A	V

		2369.78	50.63	-23.37	74	52.2	27.23	4.88	33.68	103	61	P	H
		2388.96	40.75	-13.25	54	42.23	27.27	4.91	33.66	103	61	A	H
		2452	97.68	-	-	98.96	27.39	4.96	33.63	103	61	P	H
		2452	89.84	-	-	91.12	27.39	4.96	33.63	103	61	A	H
802.11n		2483.55	57.46	-16.54	74	58.63	27.46	4.99	33.62	103	61	P	H
HT40		2483.5	47.11	-6.89	54	48.28	27.46	4.99	33.62	103	61	A	H
CH 09		2389.8	50.29	-23.71	74	51.77	27.27	4.91	33.66	126	239	P	V
2452MHz		2389.1	44.15	-9.85	54	45.63	27.27	4.91	33.66	126	239	A	V
		2452	98.51	-	-	99.79	27.39	4.96	33.63	126	239	P	V
		2452	90.63	-	-	91.91	27.39	4.96	33.63	126	239	A	V
		2483.97	58.7	-15.3	74	59.87	27.46	4.99	33.62	126	239	P	V
		2483.5	47.79	-6.21	54	48.96	27.46	4.99	33.62	126	239	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 HT40 (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		4844	39.7	-34.3	74	58.25	31.8	7.14	57.49	129	172	P	H
HT40		7266	46.19	-27.81	74	59.6	36.75	8.75	58.91	200	360	P	H
CH 03		4844	38.83	-35.17	74	57.38	31.8	7.14	57.49	157	296	P	V
2422MHz		7266	47.02	-26.98	74	60.43	36.75	8.75	58.91	265	303	P	V
802.11n		4874	40.55	-33.45	74	59	31.88	7.19	57.52	163	309	P	H
HT40		7311	46.31	-27.69	74	59.59	36.88	8.76	58.92	285	151	P	H
CH 06		4874	38.89	-35.11	74	57.34	31.88	7.19	57.52	296	37	P	V
2437MHz		7311	45.56	-28.44	74	58.84	36.88	8.76	58.92	135	168	P	V
802.11n		4904	39.77	-34.23	74	58.14	31.96	7.21	57.54	199	203	P	H
HT40		7356	46.1	-27.9	74	59.09	37.08	8.87	58.94	112	72	P	H
CH 09		4904	38.82	-35.18	74	57.19	31.96	7.21	57.54	158	274	P	V
2452MHz		7356	45.93	-28.07	74	58.92	37.08	8.87	58.94	302	260	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 802.11n HT40 (LF)

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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		30.97	23.96	-16.04	40	31.12	24.7	0.54	32.4	-	-	P	H
		72.68	31.86	-8.14	40	50.66	12.7	0.85	32.35	-	-	P	H
		171.62	36.46	-7.04	43.5	51.67	15.6	1.34	32.15	-	-	P	H
		250.19	41.33	-4.67	46	52.98	18.5	1.65	31.8	124	152	P	H
		375.32	33.16	-12.84	46	41.68	21	2.04	31.56	-	-	P	H
		499.48	33.75	-12.25	46	38.72	23.9	2.33	31.2	-	-	P	H
		40.67	33.18	-6.82	40	45.66	19.3	0.62	32.4	-	-	P	V
		48.43	35.24	-4.76	40	51.45	15.5	0.69	32.4	124	145	P	V
		75.59	33.69	-6.31	40	52.32	12.9	0.87	32.4	-	-	P	V
		147.37	37.53	-5.97	43.5	51.19	17.3	1.24	32.2	-	-	P	V
		250.19	33.57	-12.43	46	45.22	18.5	1.65	31.8	-	-	P	V
		663.41	33.7	-12.3	46	35.42	26.4	2.68	30.8	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Co-location

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 HT40 CH 09+LTE B48 Link 2452MHz		2372.3	50.05	-23.95	74	51.62	27.23	4.88	33.68	107	318	P	H
		2366.98	40.65	-13.35	54	42.29	27.2	4.84	33.68	107	318	A	H
		2452	94.74	-	-	95.97	27.42	4.98	33.63	107	318	P	H
		2452	87.08	-	-	88.31	27.42	4.98	33.63	107	318	A	H
		2485.79	54.48	-19.52	74	55.65	27.46	4.99	33.62	107	318	P	H
		2483.76	44.18	-9.82	54	45.35	27.46	4.99	33.62	107	318	A	H
		2389.52	49.69	-24.31	74	51.17	27.27	4.91	33.66	123	229	P	V
		2331.14	40.95	-13.05	54	42.76	27.12	4.78	33.71	123	229	A	V
		2452	98.14	-	-	99.42	27.39	4.96	33.63	123	229	P	V
		2452	90.67	-	-	91.95	27.39	4.96	33.63	123	229	A	V
		2484.25	54.39	-19.61	74	55.56	27.46	4.99	33.62	123	229	P	V
		2483.62	46.31	-7.69	54	47.48	27.46	4.99	33.62	123	229	A	V
Remark	3. No other spurious found. 4. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (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 HT40 CH 09+LTE B48 Link 2452MHz		4904	38.07	-35.93	74	56.44	31.96	7.21	57.54	201	0	P	H
		7356	44.92	-29.08	74	57.91	37.08	8.87	58.94	201	0	P	H
		4904	39.27	-34.73	74	57.64	31.96	7.21	57.54	158	274	P	V
		7356	44.97	-29.03	74	57.96	37.08	8.87	58.94	100	0	P	V
Remark	3. No other spurious found. 4. All results are PASS against Peak and Average limit line.												

Note symbol

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

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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. 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)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + 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)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

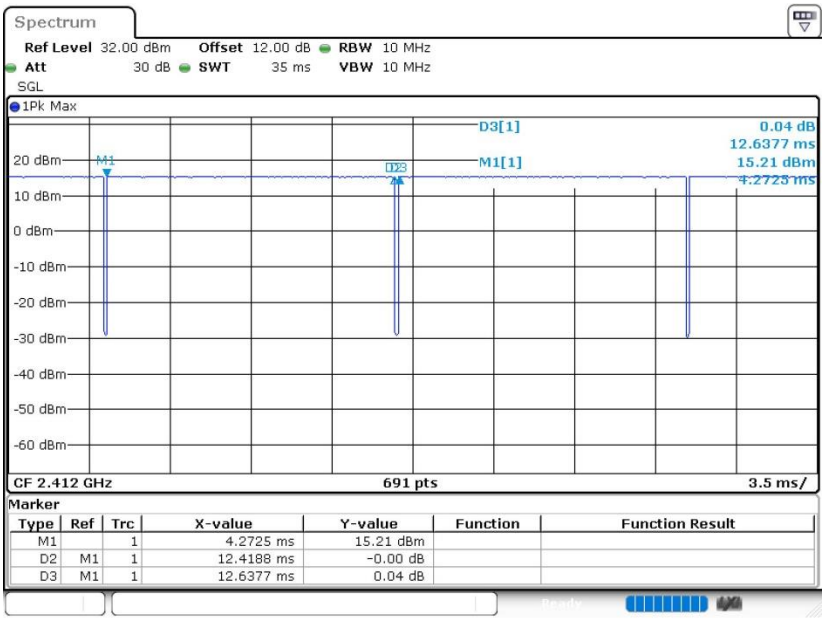
= -10.46(dB)

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

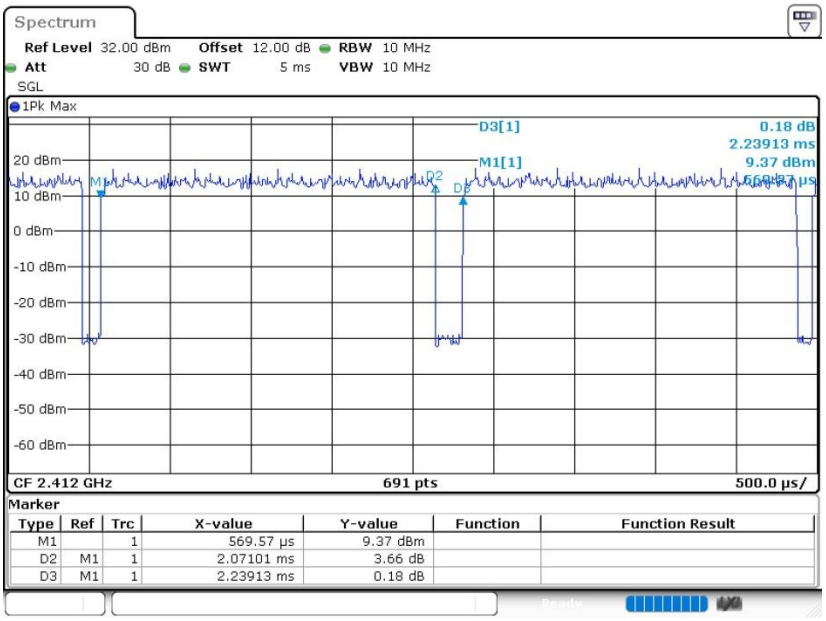
Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11b	98.27	-	-	10Hz
1+2	802.11g	92.49	2.071	0.483	1KHz
1+2	802.11n HT20	93.55	1.919	0.521	1KHz
1+2	802.11n HT40	87.20	0.948	1.055	3KHz

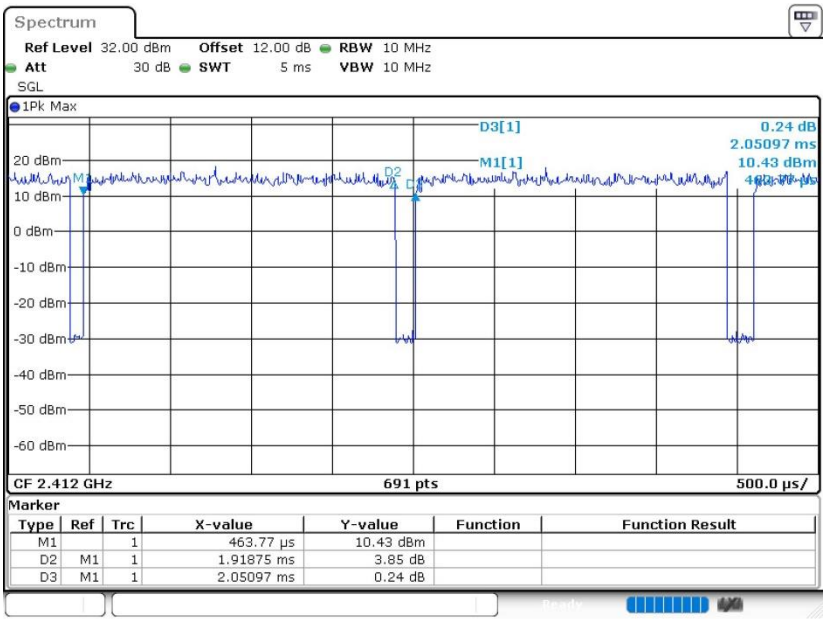
802.11b



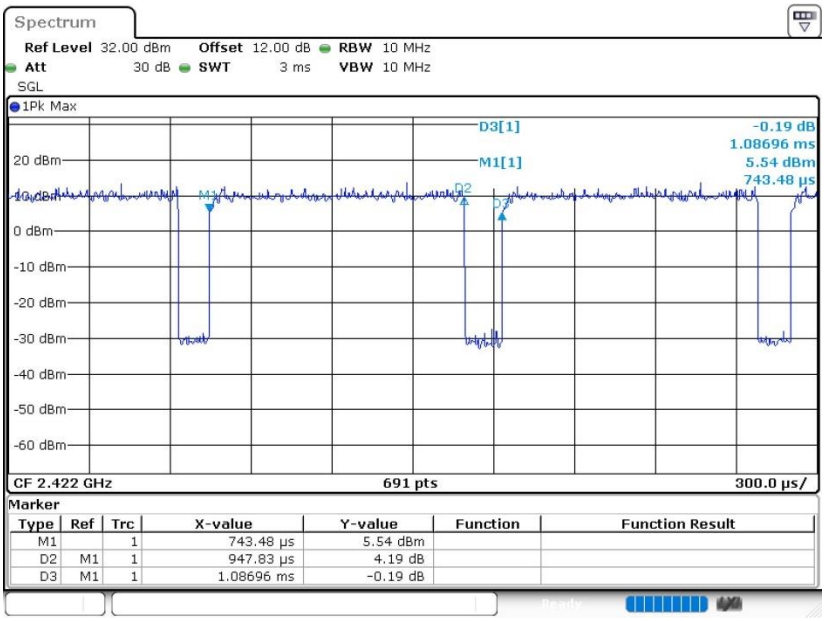
802.11g



802.11n HT20



802.11n HT40


Spectrum
Ref Level 32.00 dBm Offset 12.00 dB RBW 10 MHz
Att 30 dB SWT 3 ms VBW 10 MHz
SGL
1Pk Max
D3[1] -0.19 dB
1.08696 ms
M1[1] 5.54 dBm
743.48 µs
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.422 GHz
691 pts
300.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 743.48 µs 5.54 dBm
D2 M1 1 947.83 µs 4.19 dB
D3 M1 1 1.08696 ms -0.19 dB