FCC RF Test Report

APPLICANT	**:**	**ASUSTeK COMPUTER INC.**
EQUIPMENT	**:**	**ASUS Phone (Mobile Phone)**
BRAND NAME	**:**	**ASUS**
MODEL NAME	**:**	**ASUS_X00PD**
FCC ID	**:**	**MSQX00PD**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	**:**	**(DTS) Digital Transmission System**

The product was received on Nov. 16, 2017 and testing was completed on Apr. 19, 2018. 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.

James Huang

Approved by: James Huang / Manager

NVLAP®
TESTING
NVLAP LAB CODE 600155-0

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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 6
1.7 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 10
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 30
3.6 AC Conducted Emission Measurement 34
3.7 Antenna Requirements 36

4 LIST OF MEASURING EQUIPMENT **37**

5 UNCERTAINTY OF EVALUATION **38**

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
FR7N1602C	Rev. 01	Initial issue of report	May 04, 2018

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 7.79 dB at 2483.620 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 6.15 dB at 0.179 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

ASUSTeK COMPUTER INC.
4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

1.2 Manufacturer

ASUSTeK COMPUTER INC.
4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	ASUS Phone (Mobile Phone)
Brand Name	ASUS
Model Name	ASUS_X00PD
FCC ID	MSQX00PD
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM uplink is not supported)/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v3.0 + EDR/ Bluetooth v 4.0 LE/
IMEI Code	Conducted: N/A Conduction: 354542090026389/354542090026397 Radiation: 354542090027262/354542090027270
HW Version	W14MA1B2-3
SW Version	WW_Phone-15.00.1801.38-20180327
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	802.11b : 19.32 dBm (0.0855 W) 802.11g : 22.65 dBm (0.1841 W) 802.11n HT20 : 21.64 dBm (0.1459 W) 802.11n HT40 : 21.51 dBm (0.1416 W)
99% Occupied Bandwidth	802.11b : 12.59MHz 802.11g : 18.73MHz 802.11n HT20 : 19.53MHz 802.11n HT40 : 36.96MHz
Antenna Type / Gain	PIFA Antenna with gain 1.60 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No. is CN5013.

Test Site	Sporton International (Kunshan) Inc.			
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958			
Test Site No.	**Sporton Site No.**			**FCC Test Firm Registration No.**
	TH01-KS	03CH03-KS	CO01-KS	630927

Note: The test site complies with ANSI C63.4 2014 requirement.

1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- 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	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432		
	6	2437		
	7	2442		

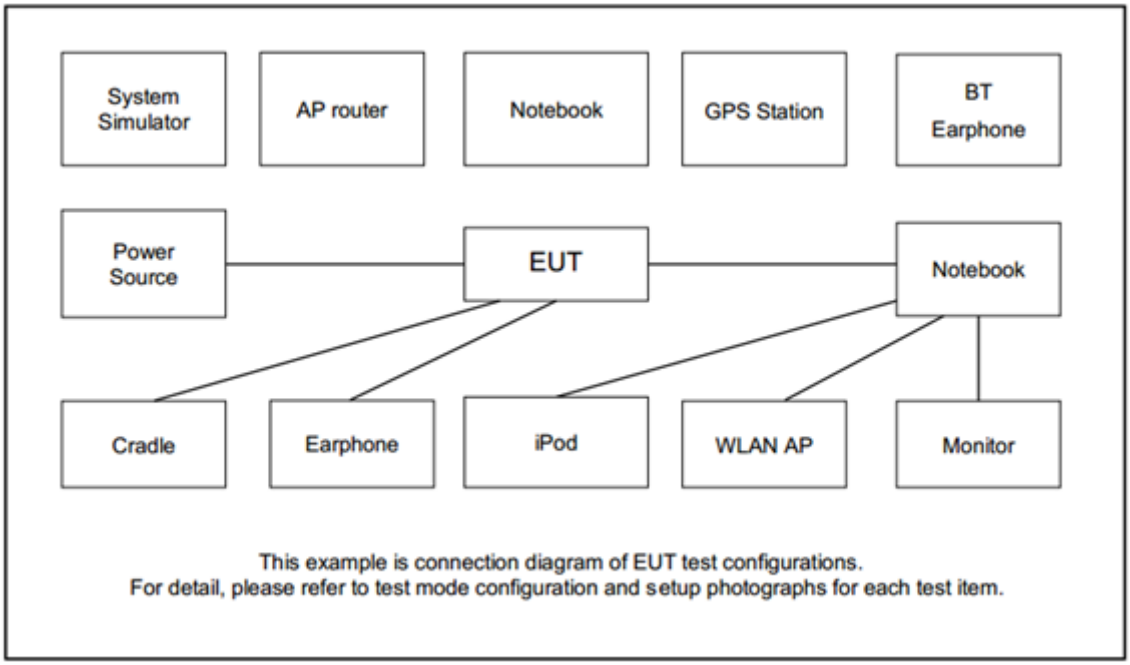
2.2 Test Mode

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

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

Test Cases	
AC Conducted Emission	Mode 1 :GSM 850 Idle + Bluetooth Link + WLAN Link + USB Cable 1(Charging from Adapter 1) + Earphone 1+ Battery 1
Remark: For Radiated Test Cases, The tests were performed with Adapter 1, Earphone 1, USB Cable 1.	

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU200	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
3.	Notebook	Lenovo	G480	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded,1.8m

2.5 EUT Operation Test Setup

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

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

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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 5.2 dB.

Offset(dB) = RF cable loss(dB).

= 5.2 (dB)

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.

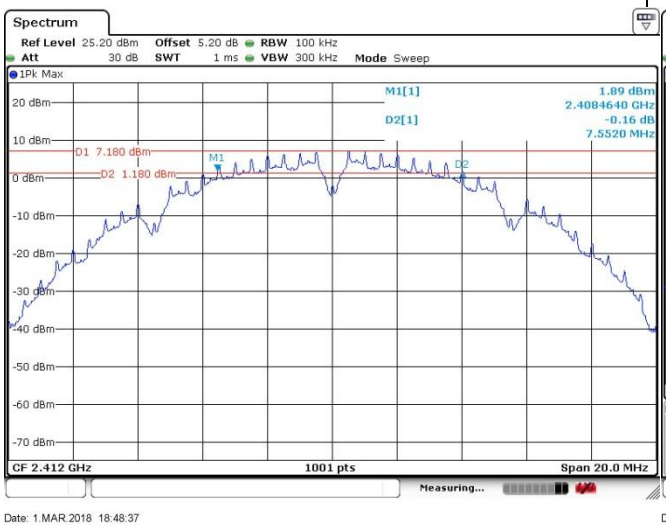
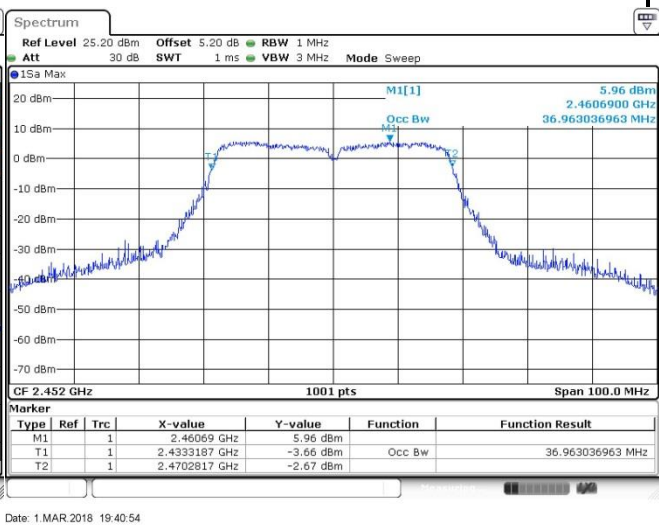
3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04.
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.

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	

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.

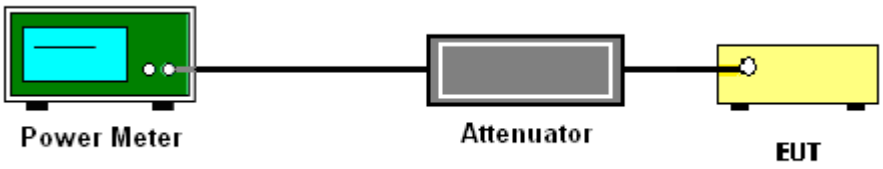
3.2.2 Measuring Instruments

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 FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.3 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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

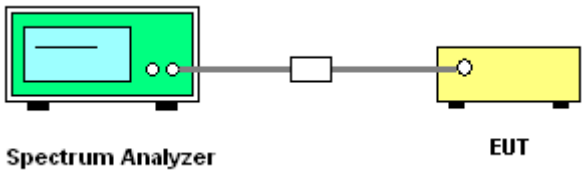
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

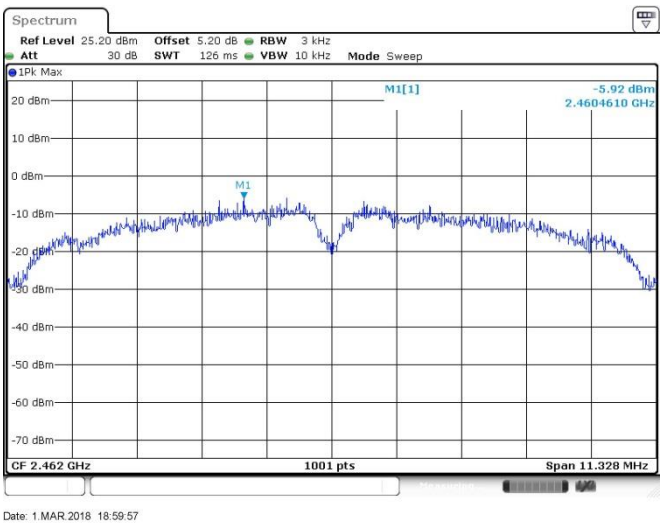
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

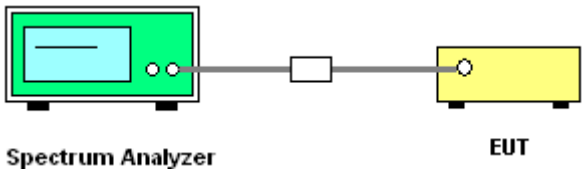
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
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.

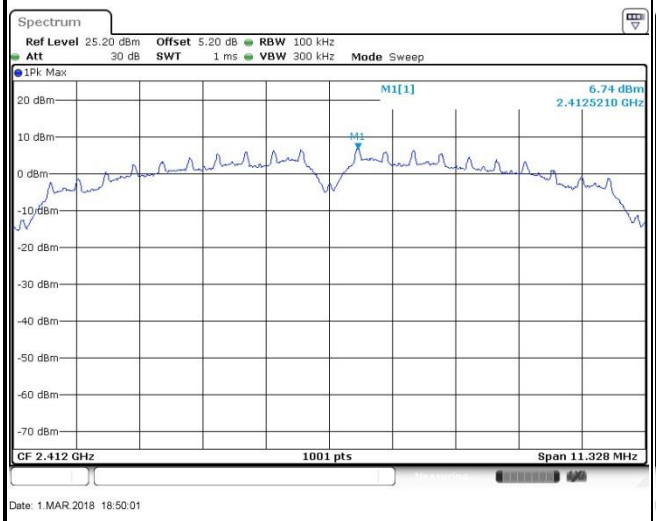
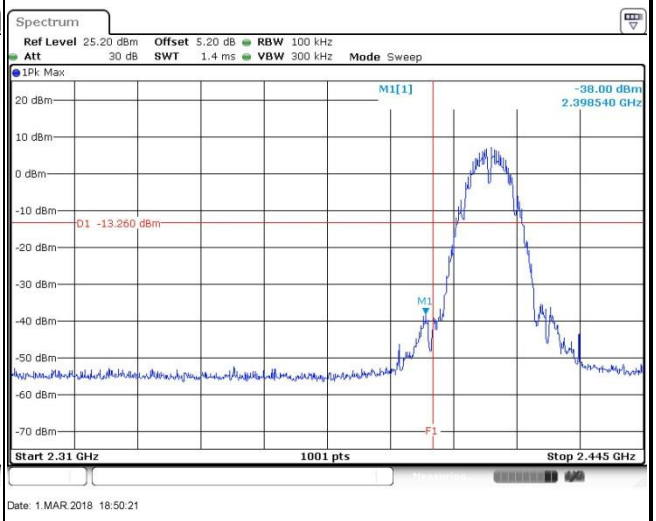
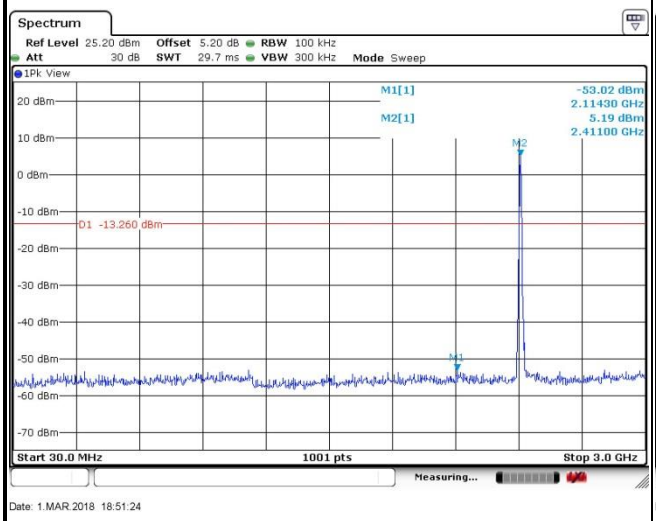
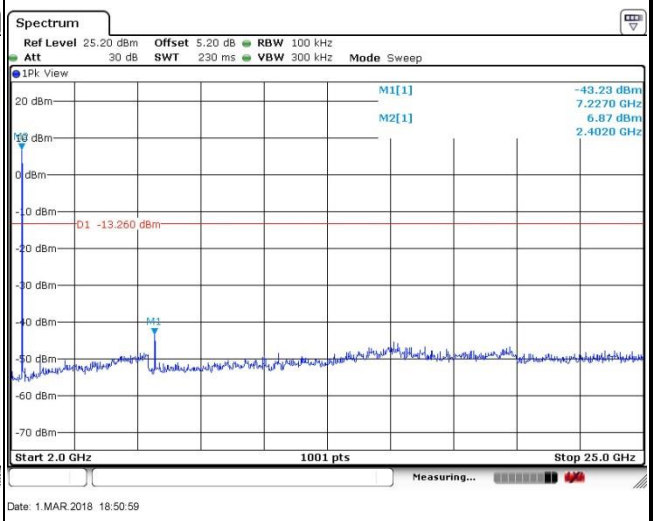
3.4.4 Test Setup



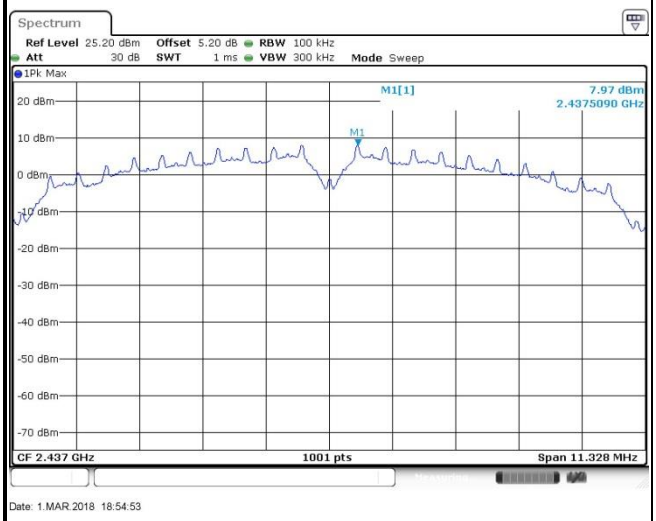
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

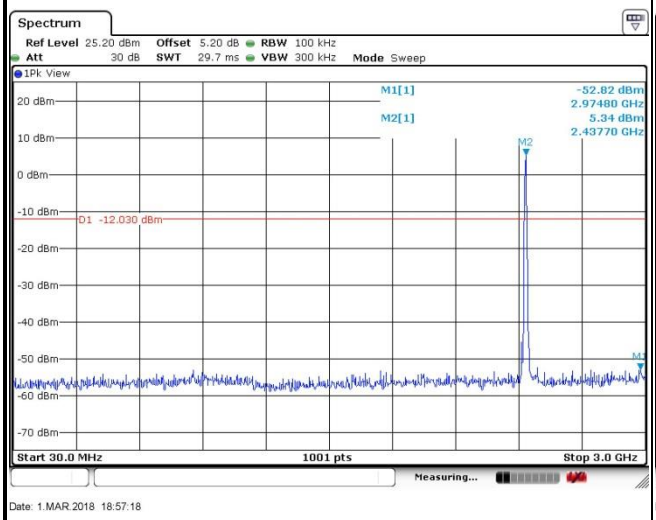
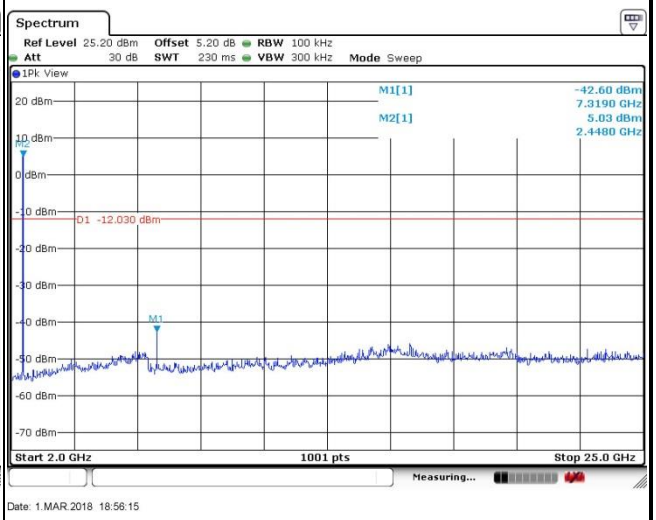
Test Engineer :	Silent Hai	Temperature :	21~25℃
		Relative Humidity :	51~55%

Test Mode :	802.11b	Test Channel :	01

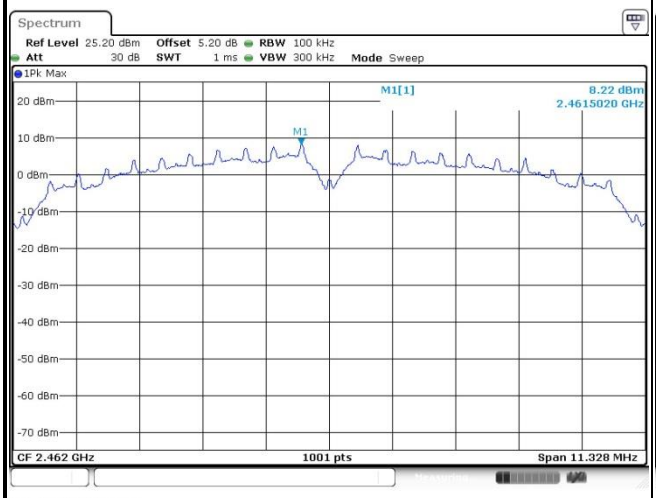
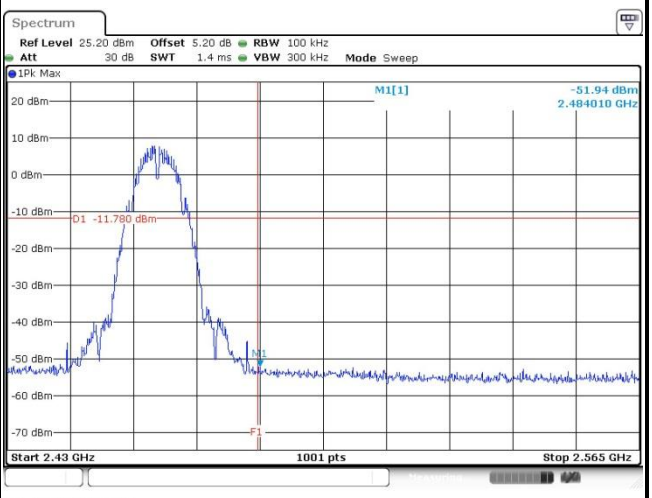
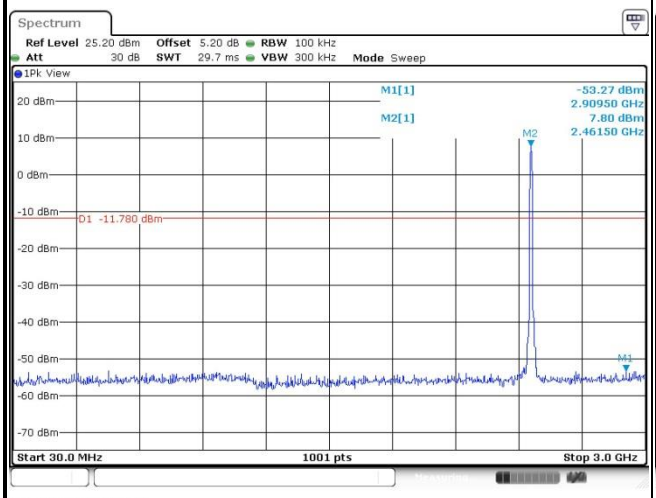
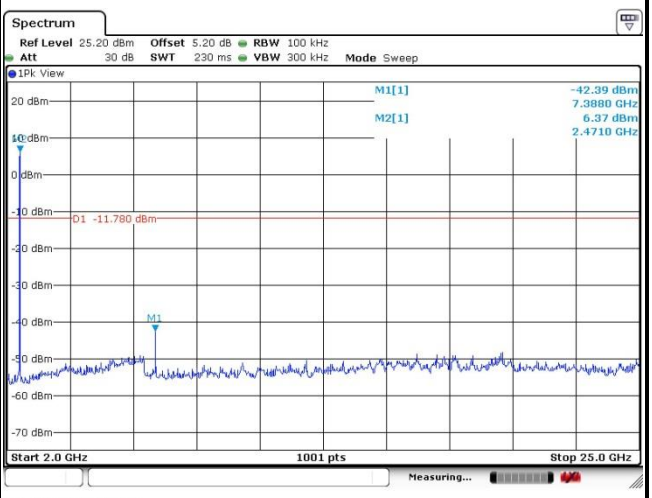
100kHz PSD reference Level	Low Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11b	Test Channel :	06

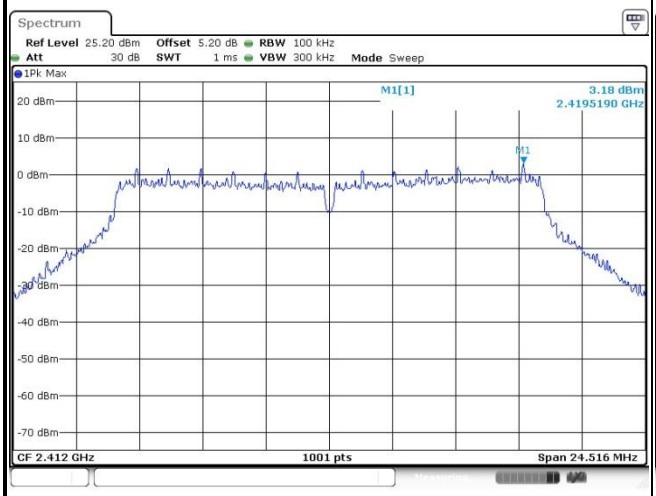
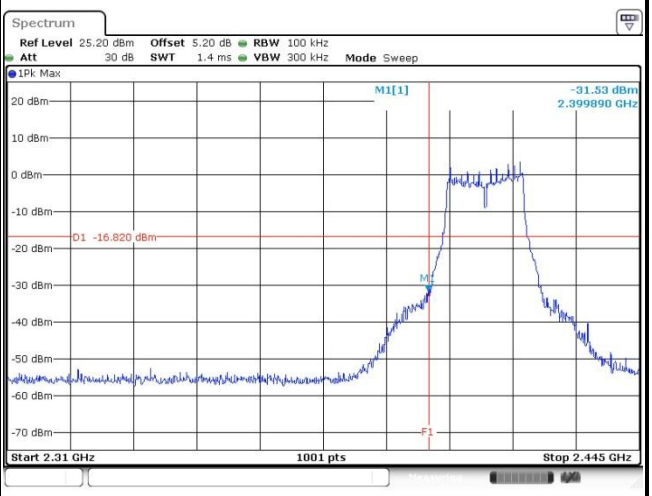
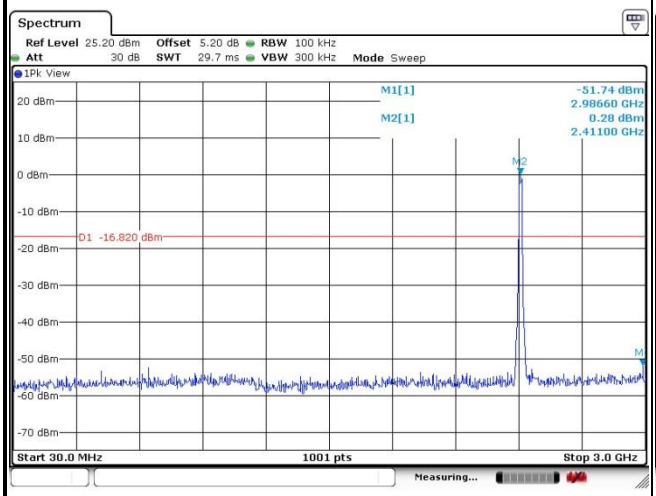
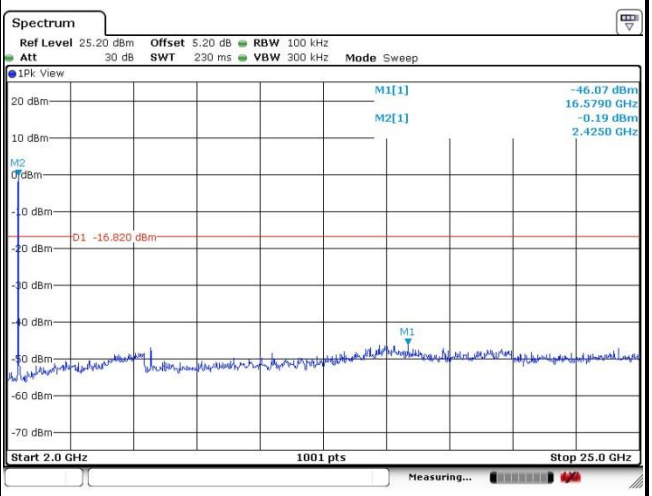
100kHz PSD reference Level	
	

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

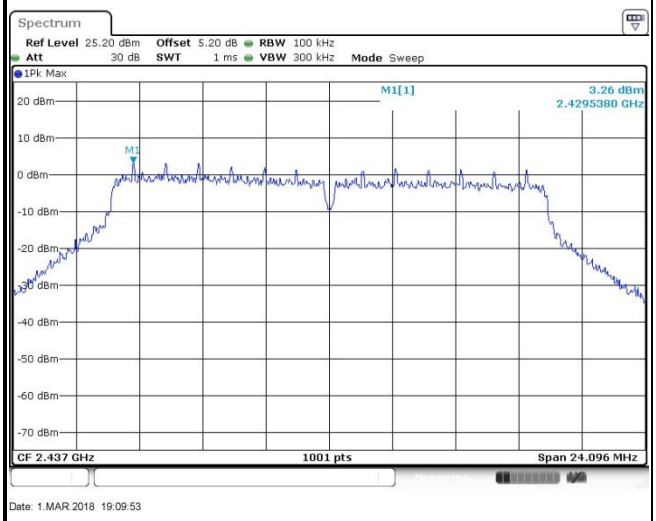
Test Mode :	802.11b	Test Channel :	11

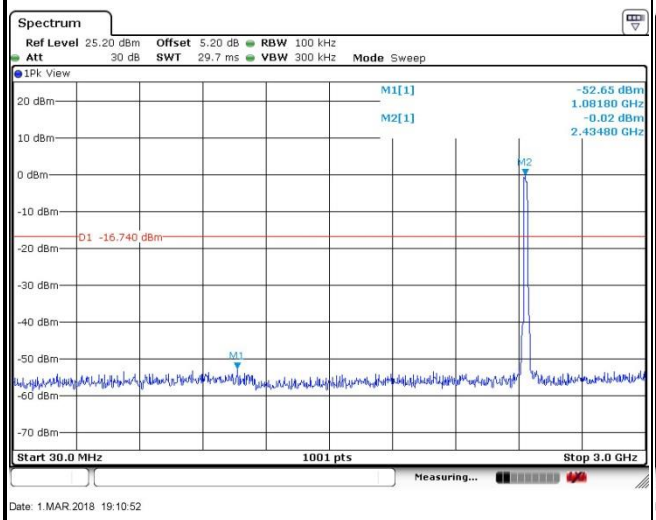
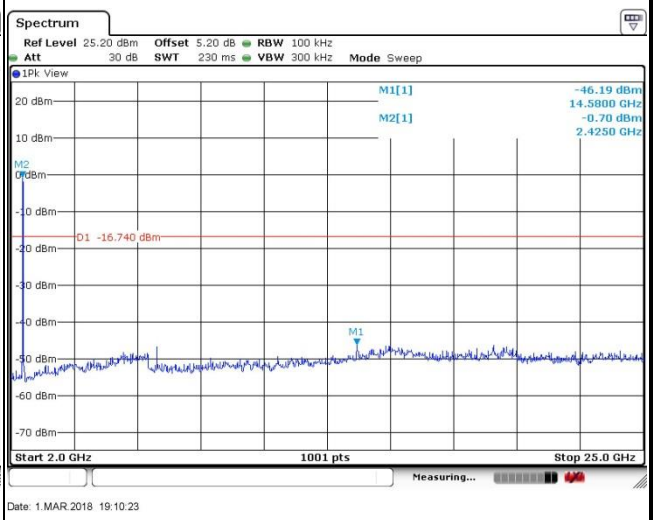
100kHz PSD reference Level	High Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

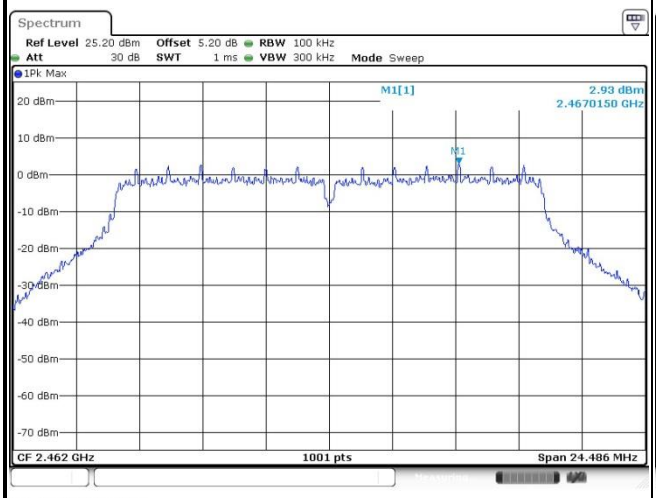
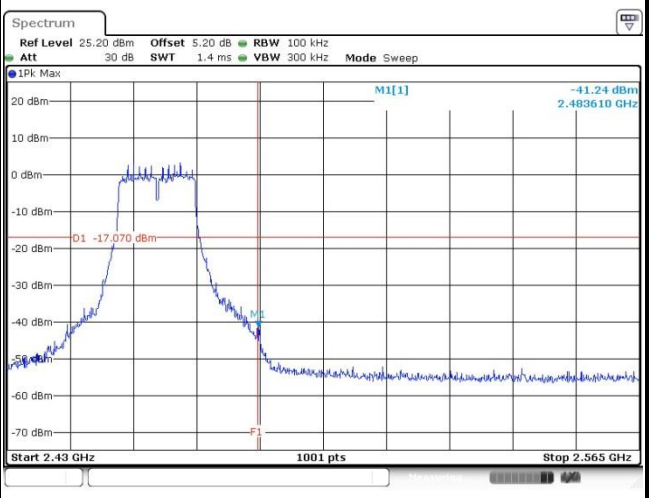
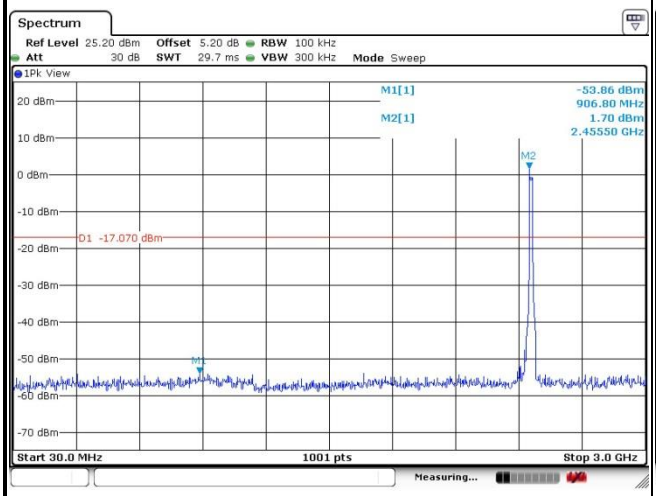
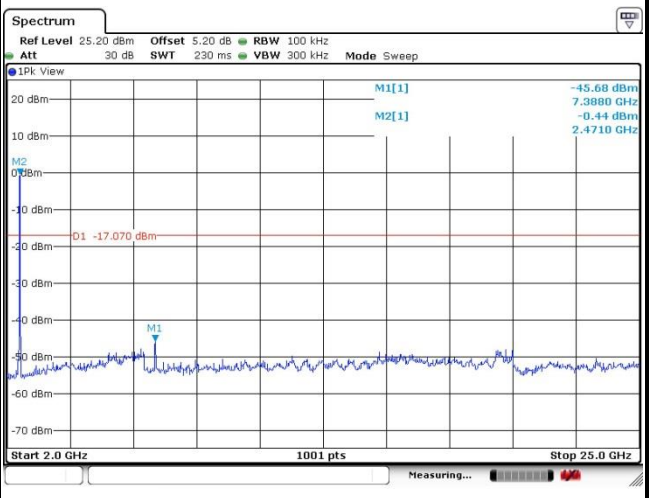
100kHz PSD reference Level	Low Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

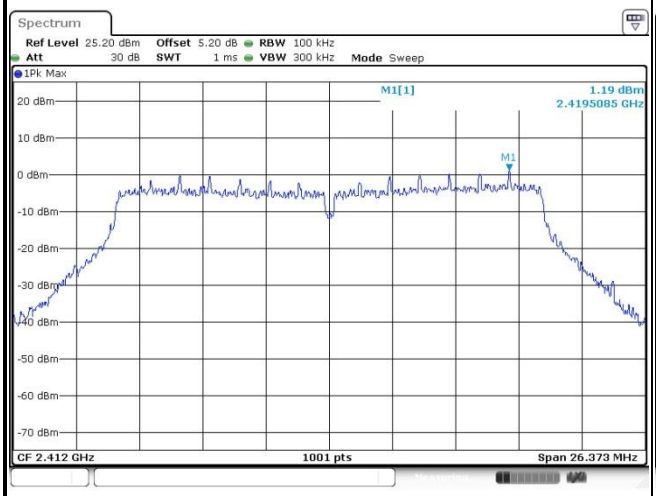
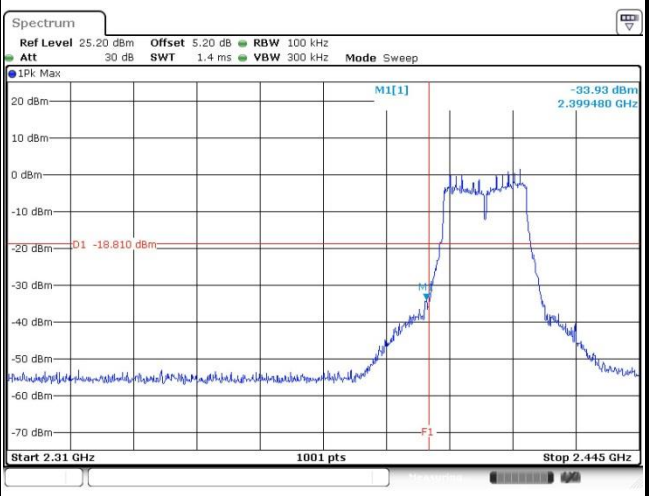
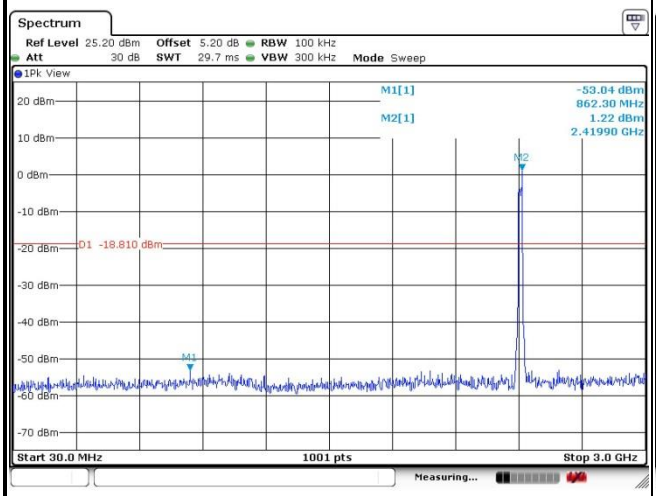
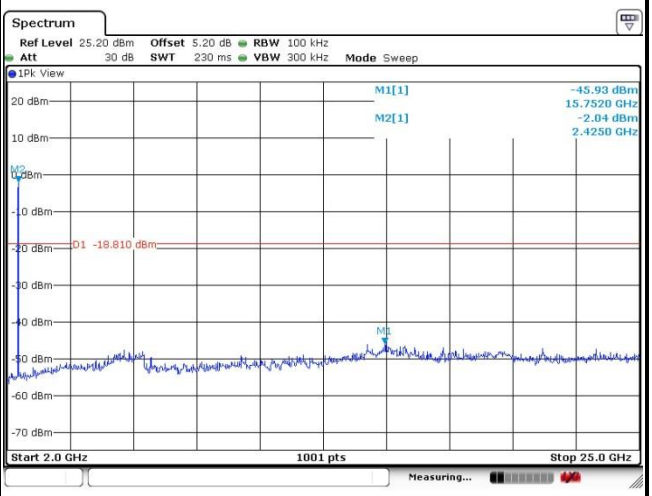
100kHz PSD reference Level	
	

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

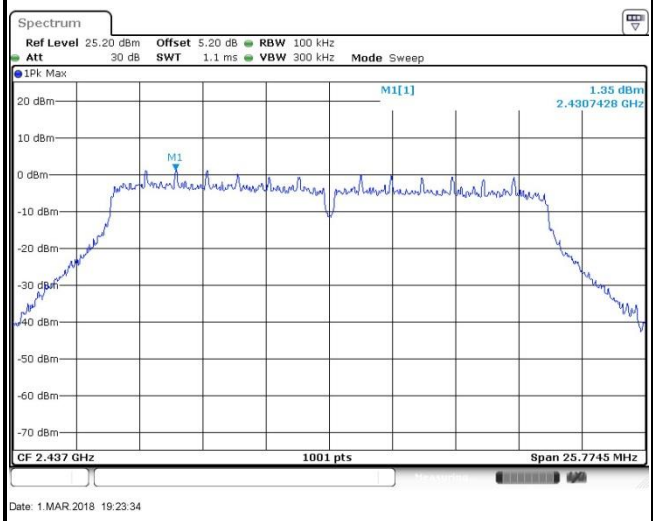
Test Mode :	802.11g	Test Channel :	11

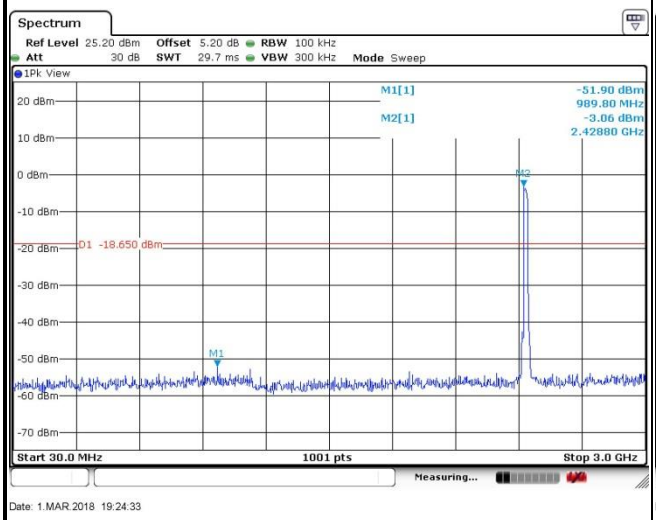
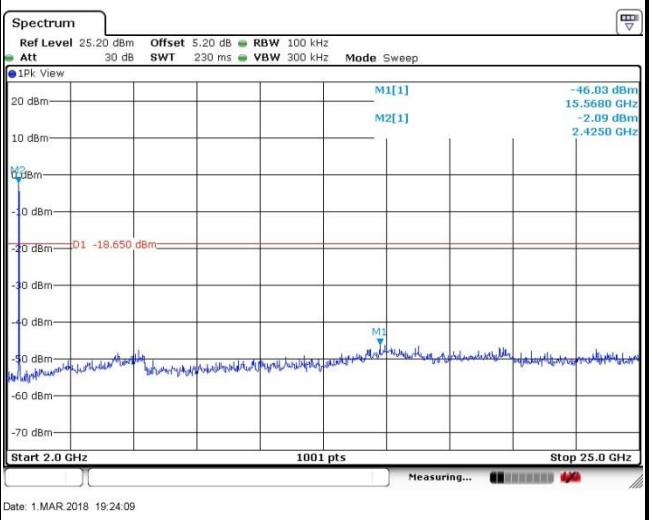
100kHz PSD reference Level	High Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

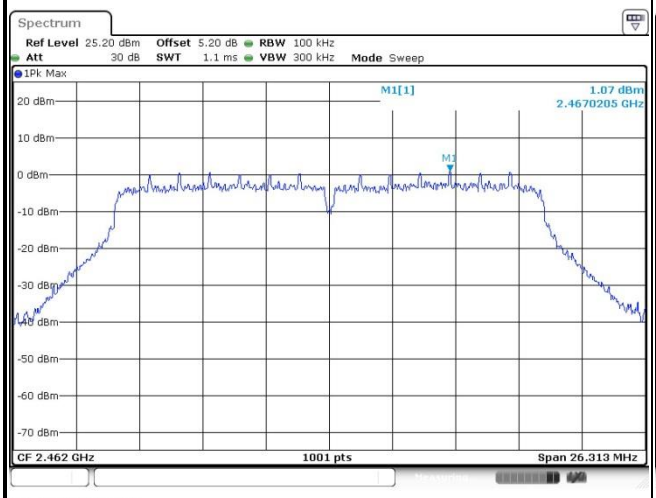
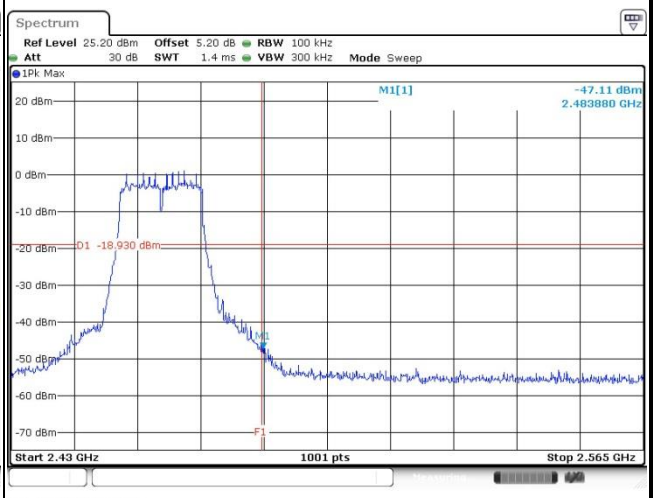
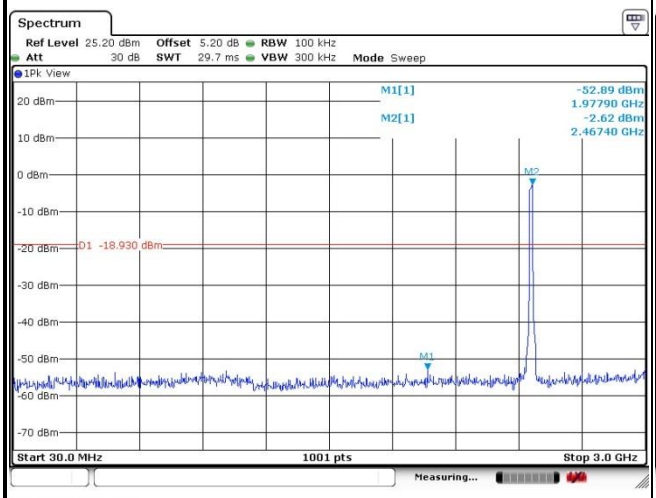
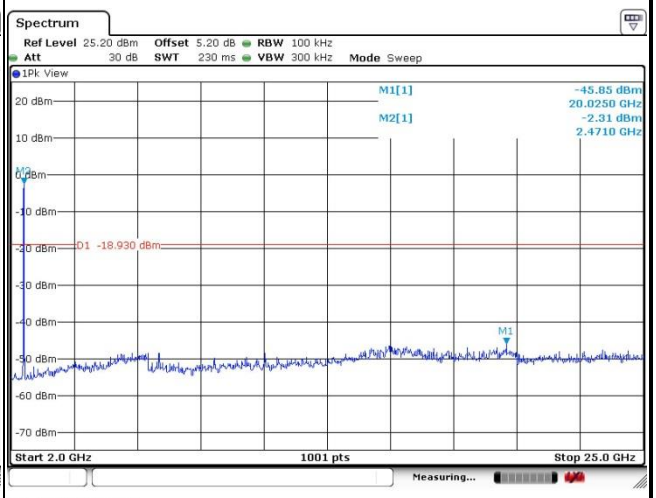
100kHz PSD reference Level	Low Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

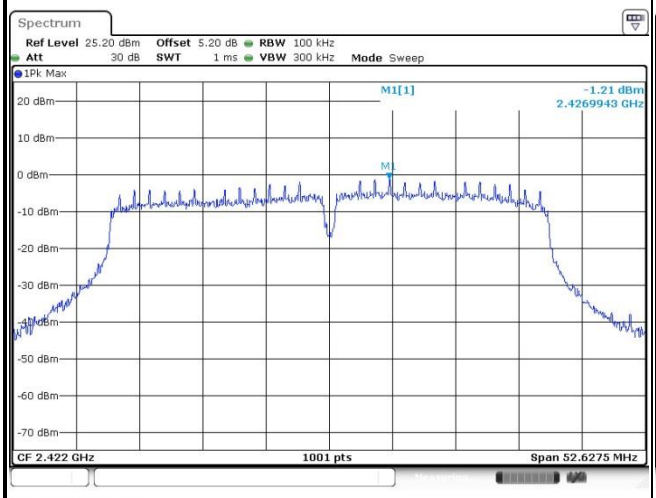
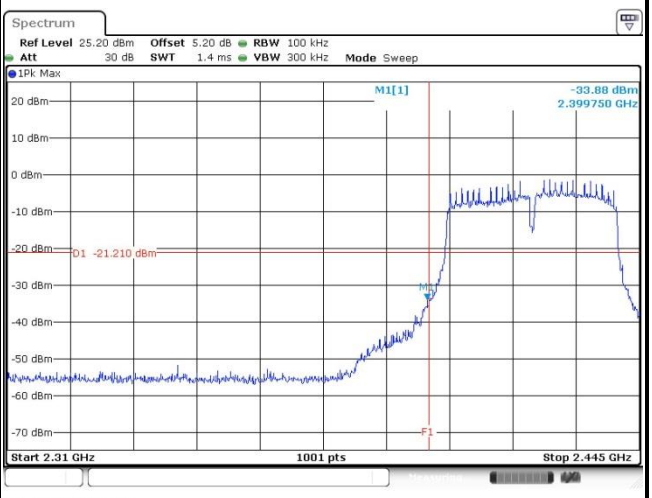
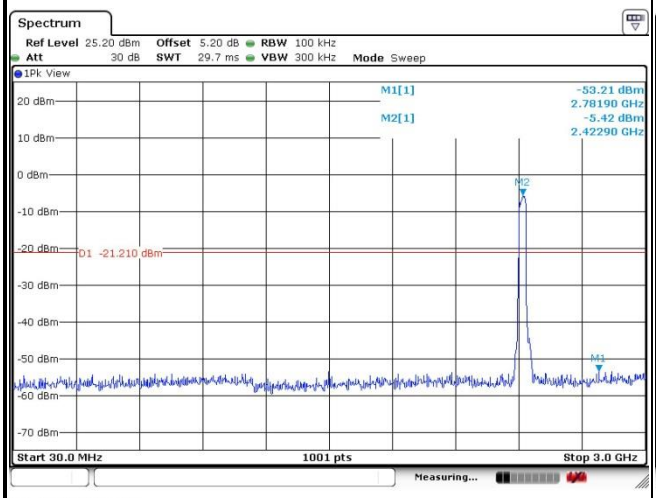
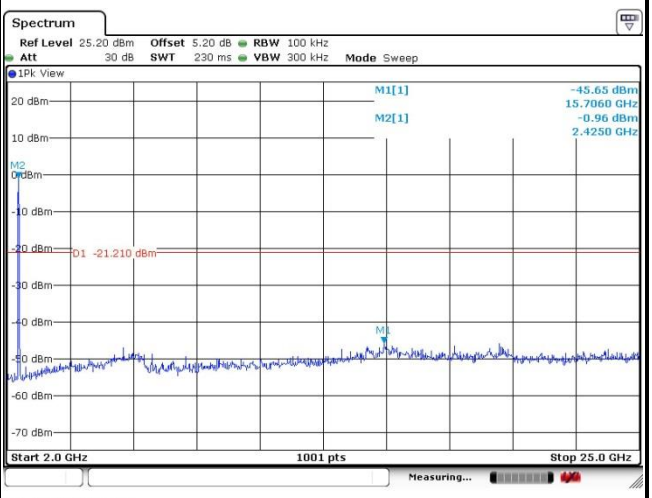
100kHz PSD reference Level	
	

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

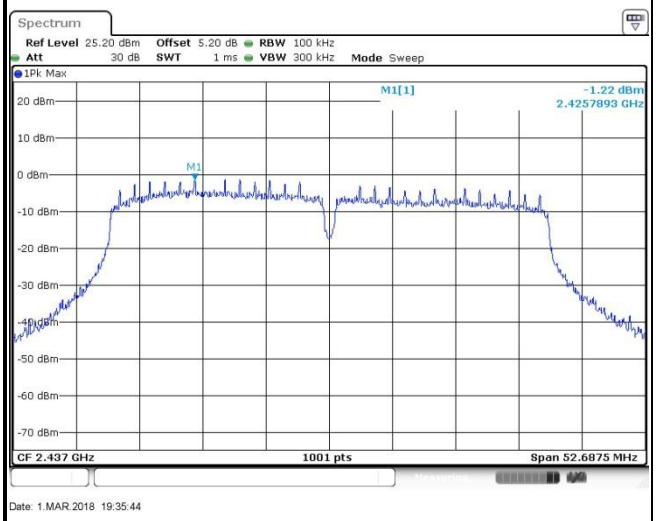
Test Mode :	802.11n HT20	Test Channel :	11

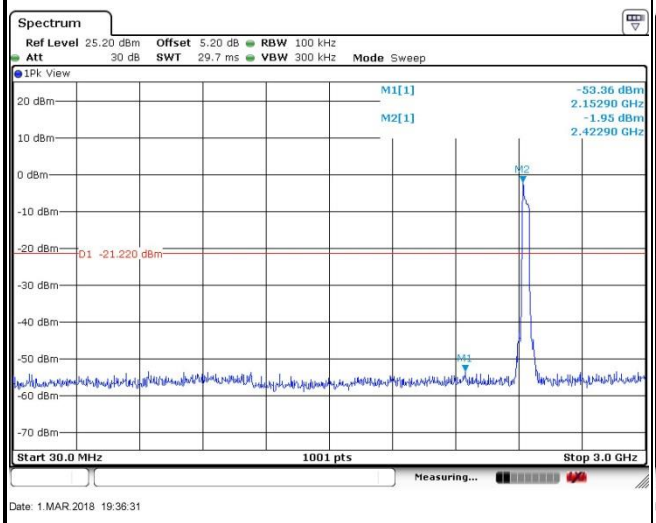
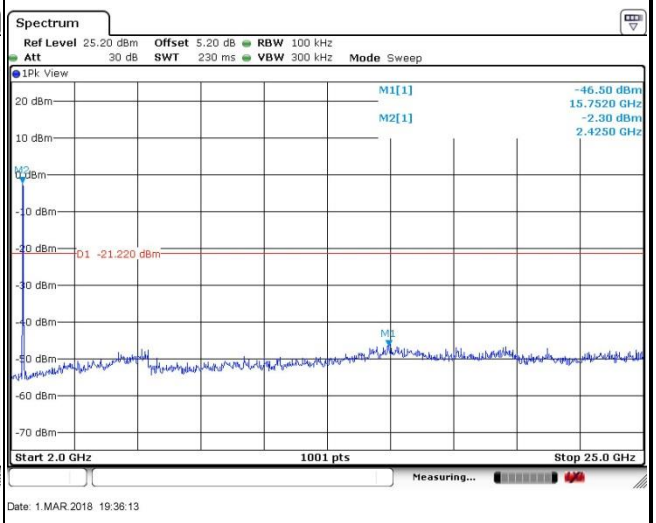
100kHz PSD reference Level	High Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	03

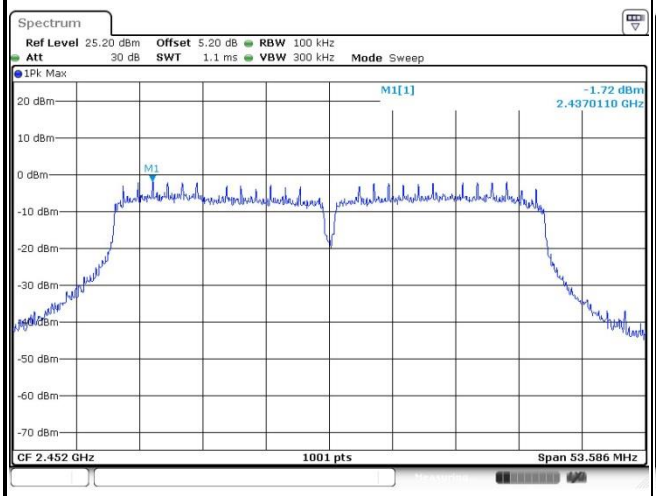
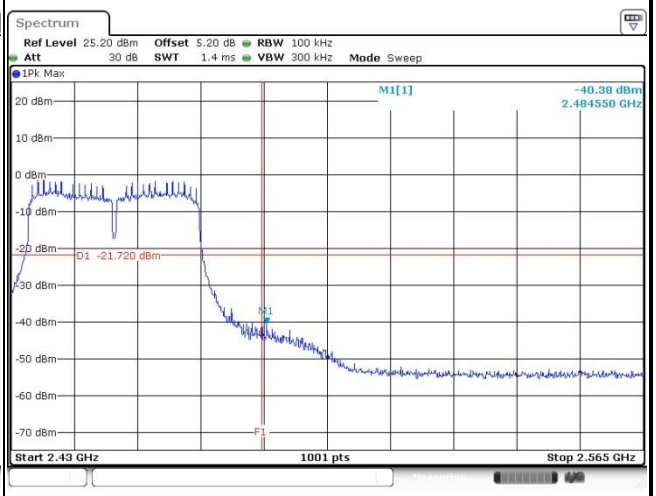
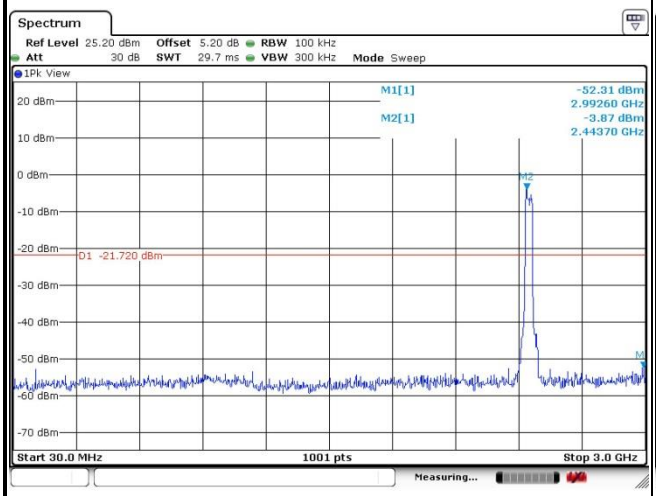
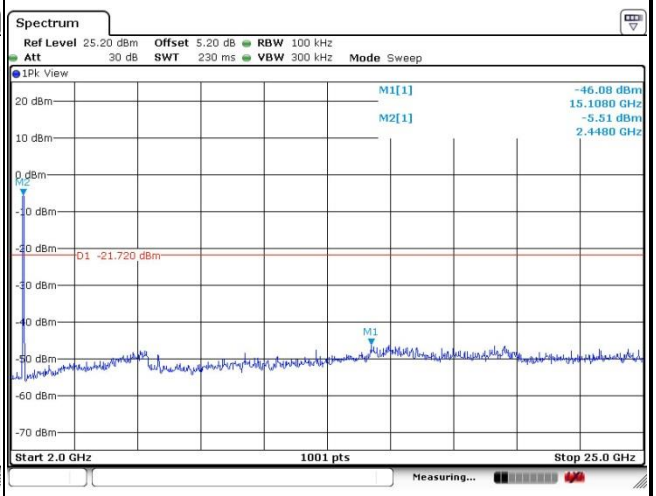
100kHz PSD reference Level	Low Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	
	

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

Test Mode :	802.11n HT40	Test Channel :	09

100kHz PSD reference Level	High 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

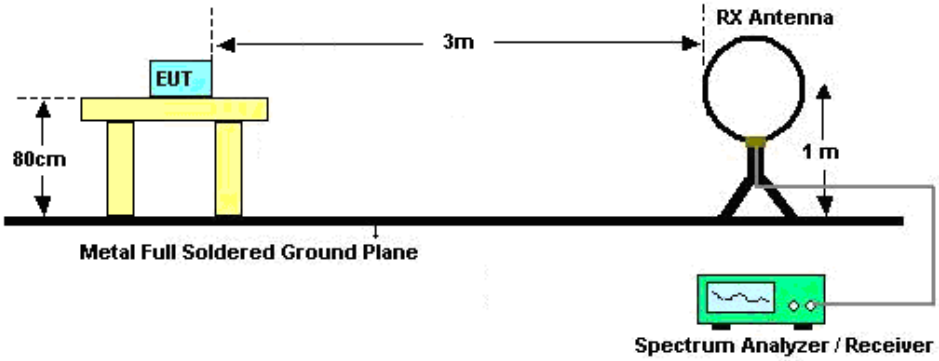
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

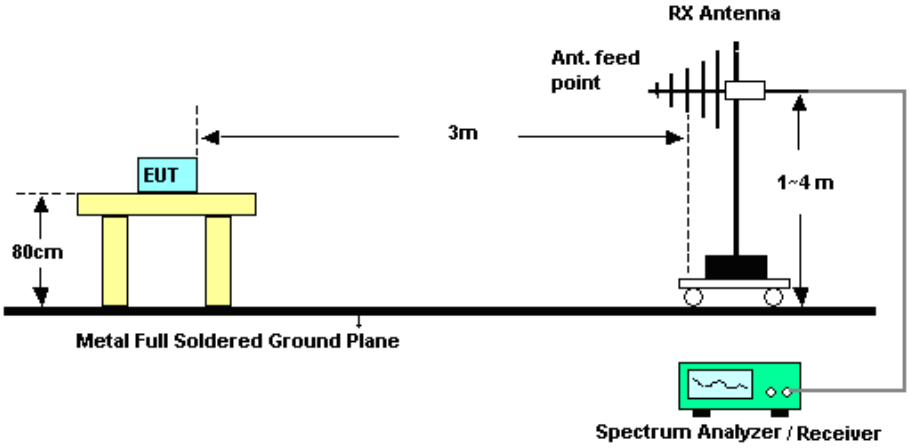
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 average 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

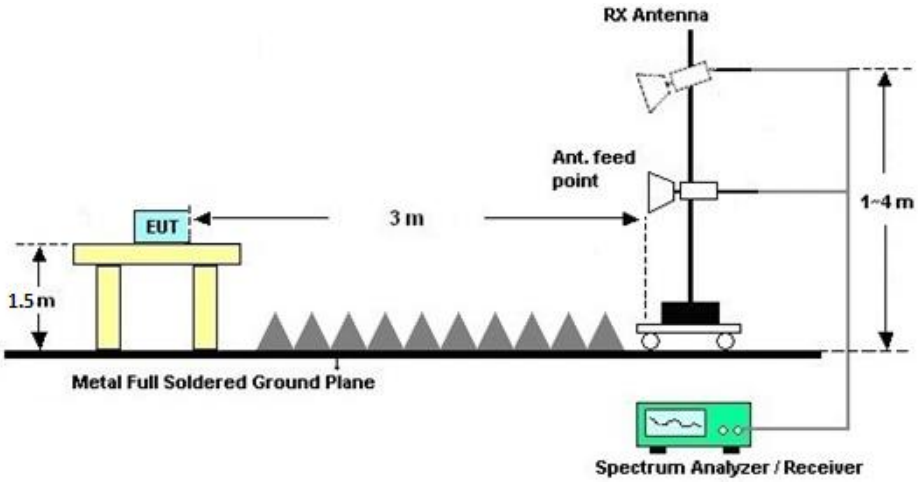
For radiated emissions below 30MHz



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)

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.

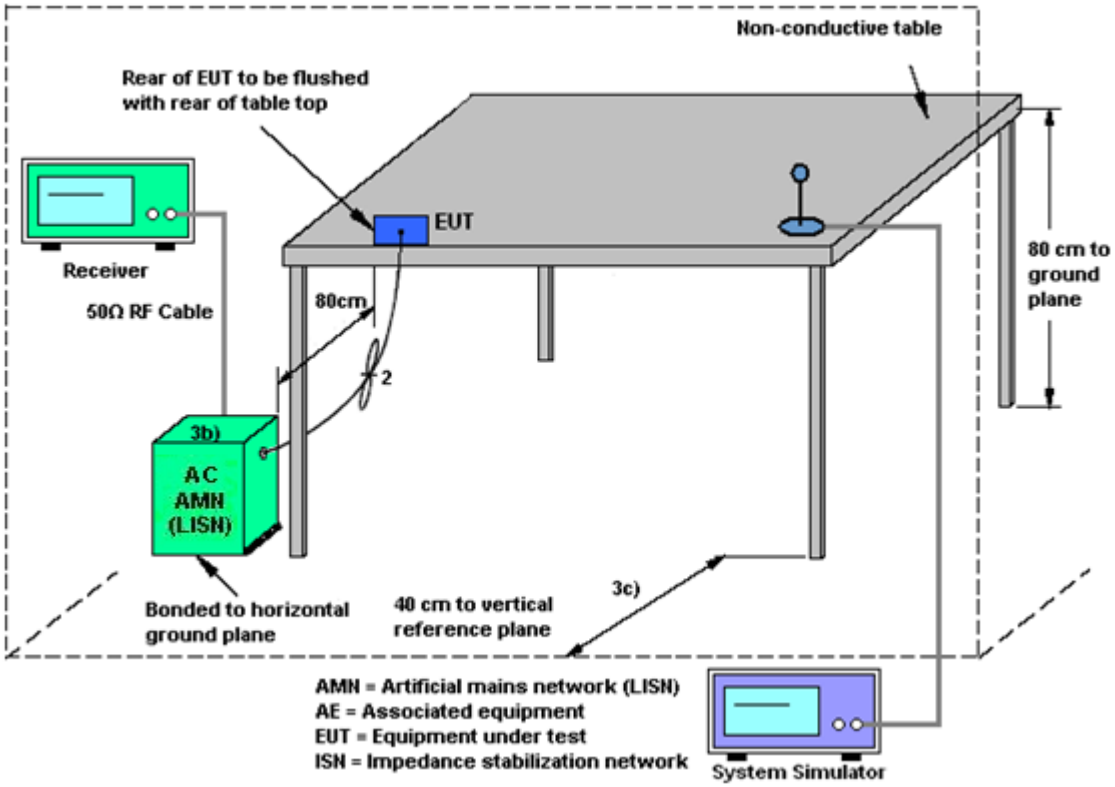
3.6.2 Measuring Instruments

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. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the Antenna exceeds 6 dBi. 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

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 08, 2017	Mar. 01, 2018~ Apr. 19, 2018	Aug. 07, 2018	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 18, 2018	Mar. 01, 2018~ Apr. 19, 2018	Jan. 17, 2019	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 18, 2018	Mar. 01, 2018~ Apr. 19, 2018	Jan. 17, 2019	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 19, 2017	Apr. 03, 2018	Oct. 18, 2018	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44GHz	Apr. 18, 2017	Apr. 03, 2018	Apr. 17, 2018	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 22, 2017	Apr. 03, 2018	Oct. 21, 2018	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz-2GHz	Apr. 22, 2017	Apr. 03, 2018	Apr. 21, 2018	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 21, 2018	Apr. 03, 2018	Jan. 20, 2019	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 07, 2018	Apr. 03, 2018	Feb. 06, 2019	Radiation (03CH03-KS)
Amplifier	com-power	PA-103A	161069	1MHz ~1000MHz / 32 dB	Apr. 18, 2017	Apr. 03, 2018	Apr. 17, 2018	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Oct. 12, 2017	Apr. 03, 2018	Oct. 11, 2018	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Apr. 18, 2017	Apr. 03, 2018	Apr. 17, 2018	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 12, 2017	Apr. 03, 2018	Oct. 11, 2018	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Apr. 03, 2018	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Apr. 03, 2018	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Apr. 03, 2018	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2017	Mar. 04, 2018	Apr. 19, 2018	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	Mar. 04, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	Mar. 04, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	Mar. 04, 2018	Oct. 11, 2018	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.3dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.5dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.1dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.5dB**

Appendix A. Conducted test results

A1 - DTS Part

Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2018/3/1 ~ 2018/4/19	Relative Humidity:	51~55	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	12.59	7.55	0.50	Pass
11b	1Mbps	1	6	2437	12.24	7.55	0.50	Pass
11b	1Mbps	1	11	2462	12.24	7.55	0.50	Pass
11g	6Mbps	1	1	2412	18.73	16.34	0.50	Pass
11g	6Mbps	1	6	2437	18.43	16.06	0.50	Pass
11g	6Mbps	1	11	2462	18.18	16.32	0.50	Pass
HT20	MCS0	1	1	2412	19.53	17.58	0.50	Pass
HT20	MCS0	1	6	2437	19.48	17.18	0.50	Pass
HT20	MCS0	1	11	2462	18.93	17.54	0.50	Pass
HT40	MCS0	1	3	2422	36.46	35.09	0.50	Pass
HT40	MCS0	1	6	2437	36.46	35.13	0.50	Pass
HT40	MCS0	1	9	2452	36.96	35.72	0.50	Pass

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	18.78	30.00	1.60	20.38	36.00	Pass
11b	1Mbps	1	6	2437	19.05	30.00	1.60	20.65	36.00	Pass
11b	1Mbps	1	11	2462	19.32	30.00	1.60	20.92	36.00	Pass
11g	6Mbps	1	1	2412	22.05	30.00	1.60	23.65	36.00	Pass
11g	6Mbps	1	6	2437	22.43	30.00	1.60	24.03	36.00	Pass
11g	6Mbps	1	11	2462	22.65	30.00	1.60	24.25	36.00	Pass
HT20	MCS0	1	1	2412	21.07	30.00	1.60	22.67	36.00	Pass
HT20	MCS0	1	6	2437	21.53	30.00	1.60	23.13	36.00	Pass
HT20	MCS0	1	11	2462	21.64	30.00	1.60	23.24	36.00	Pass
HT40	MCS0	1	3	2422	21.32	30.00	1.60	22.92	36.00	Pass
HT40	MCS0	1	6	2437	21.41	30.00	1.60	23.01	36.00	Pass
HT40	MCS0	1	9	2452	21.51	30.00	1.60	23.11	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

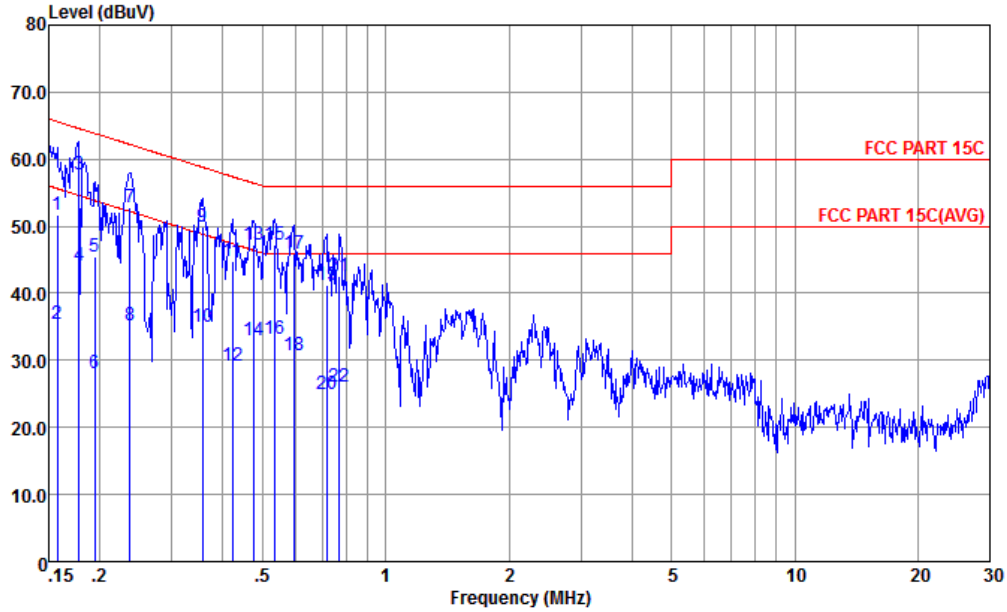
2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.11	15.23
11b	1Mbps	1	6	2437	0.11	15.73
11b	1Mbps	1	11	2462	0.11	16.08
11g	6Mbps	1	1	2412	0.58	13.59
11g	6Mbps	1	6	2437	0.58	13.94
11g	6Mbps	1	11	2462	0.58	14.09
HT20	MCS0	1	1	2412	0.64	11.70
HT20	MCS0	1	6	2437	0.64	12.05
HT20	MCS0	1	11	2462	0.64	12.16
HT40	MCS0	1	3	2422	0.67	11.81
HT40	MCS0	1	6	2437	0.67	11.91
HT40	MCS0	1	9	2452	0.67	12.04

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-6.83	1.60	8.00	Pass
11b	1Mbps	1	6	2437	-6.85	1.60	8.00	Pass
11b	1Mbps	1	11	2462	-5.92	1.60	8.00	Pass
11g	6Mbps	1	1	2412	-12.72	1.60	8.00	Pass
11g	6Mbps	1	6	2437	-10.85	1.60	8.00	Pass
11g	6Mbps	1	11	2462	-11.94	1.60	8.00	Pass
HT20	MCS0	1	1	2412	-12.13	1.60	8.00	Pass
HT20	MCS0	1	6	2437	-14.12	1.60	8.00	Pass
HT20	MCS0	1	11	2462	-13.38	1.60	8.00	Pass
HT40	MCS0	1	3	2422	-15.26	1.60	8.00	Pass
HT40	MCS0	1	6	2437	-17.11	1.60	8.00	Pass
HT40	MCS0	1	9	2452	-16.78	1.60	8.00	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Amos Zhang	Temperature :	21~23℃
		Relative Humidity :	41~44%
Test Voltage :	120Vac / 60Hz	Phase :	Line

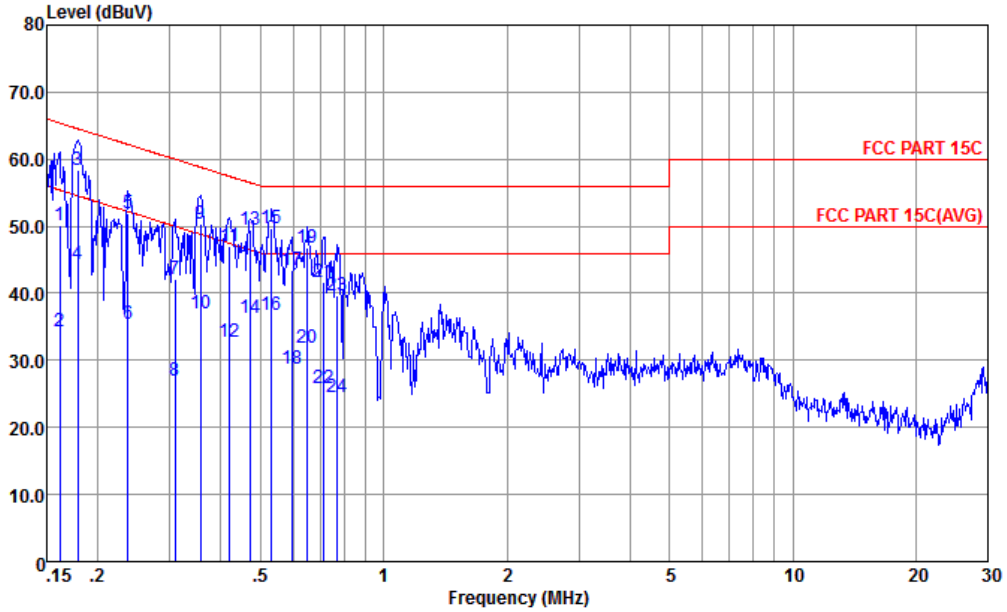


Site : CO01-KS
Condition : FCC PART 15C LISN-L-171013-060103 LINE

mode : Mode 1
: 354542090026389/354542090026397 #79

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.157	51.66	-13.94	65.60	40.90	0.17	10.59	QP
2		0.157	35.36	-20.24	55.60	24.60	0.17	10.59	Average
3	*	0.178	57.61	-6.98	64.59	46.91	0.18	10.52	QP
4		0.178	44.21	-10.38	54.59	33.51	0.18	10.52	Average
5		0.194	45.47	-18.37	63.84	34.80	0.20	10.47	QP
6		0.194	27.97	-25.87	53.84	17.30	0.20	10.47	Average
7		0.237	52.85	-9.37	62.22	42.20	0.21	10.44	QP
8		0.237	35.25	-16.97	52.22	24.60	0.21	10.44	Average
9		0.356	49.95	-8.88	58.83	39.29	0.24	10.42	QP
10		0.356	34.95	-13.88	48.83	24.29	0.24	10.42	Average
11		0.421	44.83	-12.59	57.42	34.20	0.25	10.38	QP
12		0.421	29.23	-18.19	47.42	18.60	0.25	10.38	Average
13		0.476	47.18	-9.23	56.41	36.59	0.26	10.33	QP
14		0.476	32.88	-13.53	46.41	22.29	0.26	10.33	Average
15		0.535	47.34	-8.66	56.00	36.80	0.26	10.28	QP
16		0.535	33.14	-12.86	46.00	22.60	0.26	10.28	Average
17		0.595	45.99	-10.01	56.00	35.50	0.26	10.23	QP
18		0.595	30.79	-15.21	46.00	20.30	0.26	10.23	Average
19		0.716	41.21	-14.79	56.00	30.80	0.26	10.15	QP
20		0.716	25.01	-20.99	46.00	14.60	0.26	10.15	Average
21		0.771	42.58	-13.42	56.00	32.20	0.26	10.12	QP
22		0.771	25.98	-20.02	46.00	15.60	0.26	10.12	Average

Test Engineer :	Amos Zhang	Temperature :	21~23℃
		Relative Humidity :	41~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
Condition : FCC PART 15C LISN-N-171013-060103 NEUTRAL

mode : Mode 1
: 354542090026389/354542090026397 #79

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.162	50.06	-15.32	65.38	39.20	0.28	10.58	QP
2		0.162	34.36	-21.02	55.38	23.50	0.28	10.58	Average
3	*	0.179	58.40	-6.15	64.55	47.60	0.28	10.52	QP
4		0.179	44.30	-10.25	54.55	33.50	0.28	10.52	Average
5		0.237	51.93	-10.29	62.22	41.21	0.28	10.44	QP
6		0.237	35.33	-16.89	52.22	24.61	0.28	10.44	Average
7		0.308	42.21	-17.81	60.02	31.50	0.28	10.43	QP
8		0.308	27.01	-23.01	50.02	16.30	0.28	10.43	Average
9		0.356	50.30	-8.53	58.83	39.59	0.29	10.42	QP
10		0.356	36.90	-11.93	48.83	26.19	0.29	10.42	Average
11		0.419	46.97	-10.49	57.46	36.29	0.29	10.39	QP
12		0.419	32.77	-14.69	47.46	22.09	0.29	10.39	Average
13		0.474	49.52	-6.93	56.45	38.90	0.29	10.33	QP
14		0.474	36.22	-10.23	46.45	25.60	0.29	10.33	Average
15		0.532	49.77	-6.23	56.00	39.20	0.29	10.28	QP
16		0.532	36.77	-9.23	46.00	26.20	0.29	10.28	Average
17		0.595	43.43	-12.57	56.00	32.90	0.30	10.23	QP
18		0.595	28.73	-17.27	46.00	18.20	0.30	10.23	Average
19		0.651	46.69	-9.31	56.00	36.20	0.30	10.19	QP
20		0.651	31.79	-14.21	46.00	21.30	0.30	10.19	Average
21		0.712	41.65	-14.35	56.00	31.20	0.30	10.15	QP
22		0.712	25.75	-20.25	46.00	15.30	0.30	10.15	Average
23		0.771	39.72	-16.28	56.00	29.30	0.30	10.12	QP
24		0.771	24.62	-21.38	46.00	14.20	0.30	10.12	Average

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		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2376.82	52.38	-21.62	74	49.62	31.27	5.63	34.14	170	30	P	H
		2387.35	41.88	-12.12	54	39.07	31.3	5.65	34.14	170	30	A	H
	*	2412	101.55	-	-	98.71	31.33	5.67	34.16	170	30	P	H
	*	2410	98.48	-	-	95.64	31.33	5.67	34.16	170	30	A	H
		2342.37	52.73	-21.27	74	50.06	31.22	5.59	34.14	346	129	P	V
		2387.61	41.79	-12.21	54	38.98	31.3	5.65	34.14	346	129	A	V
	*	2412	98.97	-	-	96.13	31.33	5.67	34.16	346	129	P	V
	*	2410	95.86	-	-	93.02	31.33	5.67	34.16	346	129	A	V
802.11b CH 06 2437MHz		2359.92	52.4	-21.6	74	49.68	31.25	5.61	34.14	225	30	P	H
		2388.91	41.67	-12.33	54	38.86	31.3	5.65	34.14	225	30	A	H
	*	2436	104.24	-	-	101.38	31.36	5.69	34.19	225	30	P	H
	*	2436	101.18	-	-	98.32	31.36	5.69	34.19	225	30	A	H
		2491.96	52.34	-21.66	74	49.4	31.47	5.77	34.3	225	30	P	H
		2493.52	41.96	-12.04	54	39.02	31.47	5.77	34.3	225	30	A	H
		2328.72	52.73	-21.27	74	50.11	31.19	5.57	34.14	270	253	P	V
		2385.79	41.55	-12.45	54	38.74	31.3	5.65	34.14	270	253	A	V
	*	2436	100.82	-	-	97.96	31.36	5.69	34.19	270	253	P	V
	*	2436	97.49	-	-	94.63	31.36	5.69	34.19	270	253	A	V
		2496.64	52.58	-21.42	74	49.64	31.47	5.77	34.3	270	253	P	V
		2493.34	41.91	-12.09	54	38.97	31.47	5.77	34.3	270	253	A	V

802.11b CH 11 2462MHz	*	2462	100.91	-	-	98.02	31.41	5.73	34.25	125	297	P	H
	*	2462	97.99	-	-	95.1	31.41	5.73	34.25	125	297	A	H
		2498.14	53.59	-20.41	74	50.65	31.47	5.77	34.3	125	297	P	H
		2499.22	42.28	-11.72	54	39.34	31.47	5.77	34.3	125	297	A	H
	*	2462	96.83	-	-	93.94	31.41	5.73	34.25	309	251	P	V
	*	2462	93.5	-	-	90.61	31.41	5.73	34.25	309	251	A	V
		2489.44	52.89	-21.11	74	49.95	31.47	5.77	34.3	309	251	P	V
		2494.12	41.87	-12.13	54	38.93	31.47	5.77	34.3	309	251	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	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	44.18	-29.82	74	65.2	35.65	7.86	64.53	100	360	P	H
		4824	44.19	-29.81	74	65.21	35.65	7.86	64.53	100	360	P	V
802.11b CH 06 2437MHz		4872	42.21	-31.79	74	63.3	35.61	7.9	64.6	100	360	P	H
		7308	42.01	-31.99	74	61.63	35.89	9.5	65.01	100	360	P	H
		4872	41.48	-32.52	74	62.57	35.61	7.9	64.6	100	360	P	V
		7308	43.31	-30.69	74	62.93	35.89	9.5	65.01	100	360	P	V
802.11b CH 11 2462MHz		4926	42.76	-31.24	74	63.93	35.57	7.94	64.68	100	360	P	H
		7386	42.39	-31.61	74	61.97	35.94	9.53	65.05	100	360	P	H
		4926	42.16	-31.84	74	63.33	35.57	7.94	64.68	100	360	P	V
		7386	41.64	-32.36	74	61.22	35.94	9.53	65.05	100	360	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	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		2389.43	56.81	-17.19	74	54	31.3	5.65	34.14	148	32	P	H
		2389.95	44.67	-9.33	54	41.86	31.3	5.65	34.14	148	32	A	H
	*	2406	102.27	-	-	99.43	31.33	5.67	34.16	148	32	P	H
	*	2404	94.7	-	-	91.86	31.33	5.67	34.16	148	32	A	H
		2389.95	56.65	-17.35	74	53.84	31.3	5.65	34.14	346	130	P	V
		2389.95	44.05	-9.95	54	41.24	31.3	5.65	34.14	346	130	A	V
	*	2404	100.19	-	-	97.35	31.33	5.67	34.16	346	130	P	V
	*	2404	92.66	-	-	89.82	31.33	5.67	34.16	346	130	A	V
802.11g CH 06 2437MHz		2387.48	52.18	-21.82	74	49.37	31.3	5.65	34.14	195	65	P	H
		2385.01	42.01	-11.99	54	39.25	31.27	5.63	34.14	195	65	A	H
	*	2432	102.19	-	-	99.33	31.36	5.69	34.19	195	65	P	H
	*	2434	94.7	-	-	91.84	31.36	5.69	34.19	195	65	A	H
		2491.72	52.67	-21.33	74	49.73	31.47	5.77	34.3	195	65	P	H
		2488.9	42.78	-11.22	54	39.84	31.47	5.77	34.3	195	65	A	H
		2387.74	52.37	-21.63	74	49.56	31.3	5.65	34.14	300	156	P	V
		2383.97	42.02	-11.98	54	39.26	31.27	5.63	34.14	300	156	A	V
	*	2432	100.28	-	-	97.42	31.36	5.69	34.19	300	156	P	V
	*	2434	92.09	-	-	89.23	31.36	5.69	34.19	300	156	A	V
		2489.38	52.92	-21.08	74	49.98	31.47	5.77	34.3	300	156	P	V
		2494.36	42.25	-11.75	54	39.31	31.47	5.77	34.3	300	156	A	V

802.11g CH 11 2462MHz	*	2470	101.35	-	-	98.46	31.41	5.73	34.25	190	84	P	H
	*	2470	93.81	-	-	90.92	31.41	5.73	34.25	190	84	A	H
		2483.5	56.52	-17.48	74	53.61	31.44	5.75	34.28	190	84	P	H
		2483.5	44.71	-9.29	54	41.8	31.44	5.75	34.28	190	84	A	H
	*	2470	98.5	-	-	95.61	31.41	5.73	34.25	366	125	P	V
	*	2470	90.94	-	-	88.05	31.41	5.73	34.25	366	125	A	V
		2483.62	56.67	-17.33	74	53.76	31.44	5.75	34.28	366	125	P	V
		2483.56	44.28	-9.72	54	41.37	31.44	5.75	34.28	366	125	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	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	42.87	-31.13	74	63.89	35.65	7.86	64.53	100	360	P	H
		4824	43.63	-30.37	74	64.65	35.65	7.86	64.53	100	360	P	V
802.11g CH 06 2437MHz		4872	44.24	-29.76	74	65.33	35.61	7.9	64.6	100	360	P	H
		7308	42.53	-31.47	74	62.15	35.89	9.5	65.01	100	360	P	H
		4872	42.44	-31.56	74	63.53	35.61	7.9	64.6	100	360	P	V
		7308	41.73	-32.27	74	61.35	35.89	9.5	65.01	100	360	P	V
802.11g CH 11 2462MHz		4926	42.77	-31.23	74	63.94	35.57	7.94	64.68	100	360	P	H
		7386	42.64	-31.36	74	62.22	35.94	9.53	65.05	100	360	P	H
		4926	42.95	-31.05	74	64.12	35.57	7.94	64.68	100	360	P	V
		7386	42.68	-31.32	74	62.26	35.94	9.53	65.05	100	360	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	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)
		2388.91	56.03	-17.97	74	53.22	31.3	5.65	34.14	149	29	P	H
		2389.95	43.68	-10.32	54	40.87	31.3	5.65	34.14	149	29	A	H
802.11n	*	2404	100.51	-	-	97.67	31.33	5.67	34.16	149	29	P	H
HT20	*	2404	93.04	-	-	90.2	31.33	5.67	34.16	149	29	A	H
CH 01		2389.3	55.52	-18.48	74	52.71	31.3	5.65	34.14	345	129	P	V
2412MHz		2389.82	43.08	-10.92	54	40.27	31.3	5.65	34.14	345	129	A	V
	*	2404	97.73	-	-	94.89	31.33	5.67	34.16	345	129	P	V
	*	2404	90.14	-	-	87.3	31.33	5.67	34.16	345	129	A	V
		2355.11	52.58	-21.42	74	49.86	31.25	5.61	34.14	142	27	P	H
		2385.79	42.28	-11.72	54	39.47	31.3	5.65	34.14	142	27	A	H
	*	2432	101.29	-	-	98.43	31.36	5.69	34.19	142	27	P	H
	*	2432	93.52	-	-	90.66	31.36	5.69	34.19	142	27	A	H
802.11n		2489.86	53.09	-20.91	74	50.15	31.47	5.77	34.3	142	27	P	H
HT20		2488.78	42.63	-11.37	54	39.69	31.47	5.77	34.3	142	27	A	H
CH 06		2362.39	53.19	-20.81	74	50.47	31.25	5.61	34.14	302	163	P	V
2437MHz		2385.14	42.1	-11.9	54	39.34	31.27	5.63	34.14	302	163	A	V
	*	2434	98.05	-	-	95.19	31.36	5.69	34.19	302	163	P	V
	*	2432	90.48	-	-	87.62	31.36	5.69	34.19	302	163	A	V
		2490.46	52.84	-21.16	74	49.9	31.47	5.77	34.3	302	163	P	V
		2495.02	42.4	-11.6	54	39.46	31.47	5.77	34.3	302	163	A	V

	*	2470	98.39	-	-	95.5	31.41	5.73	34.25	158	78	P	H
	*	2470	90.64	-	-	87.75	31.41	5.73	34.25	158	78	A	H
802.11n		2483.74	53.64	-20.36	74	50.73	31.44	5.75	34.28	158	78	P	H
HT20		2483.5	43.36	-10.64	54	40.45	31.44	5.75	34.28	158	78	A	H
CH 11	*	2470	95.39	-	-	92.5	31.41	5.73	34.25	324	167	P	V
2462MHz	*	2470	87.86	-	-	84.97	31.41	5.73	34.25	324	167	A	V
		2499.58	52.51	-21.49	74	49.57	31.47	5.77	34.3	324	167	P	V
		2483.62	42.61	-11.39	54	39.7	31.44	5.75	34.28	324	167	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	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	43.4	-30.6	74	64.42	35.65	7.86	64.53	100	360	P	H
		4824	43.99	-30.01	74	65.01	35.65	7.86	64.53	100	360	P	V
802.11n HT20 CH 06 2437MHz		4872	43.3	-30.7	74	64.39	35.61	7.9	64.6	100	360	P	H
		7308	42.19	-31.81	74	61.81	35.89	9.5	65.01	100	360	P	H
		4872	42.02	-31.98	74	63.11	35.61	7.9	64.6	100	225	P	V
		7308	42.34	-31.66	74	61.96	35.89	9.5	65.01	100	225	P	V
802.11n HT20 CH 11 2462MHz		4926	41.88	-32.12	74	63.05	35.57	7.94	64.68	100	51	P	H
		7386	40.98	-33.02	74	60.56	35.94	9.53	65.05	100	51	P	H
		4926	41.36	-32.64	74	62.53	35.57	7.94	64.68	100	346	P	V
		7386	41.25	-32.75	74	60.83	35.94	9.53	65.05	100	346	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	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)
		2389.56	56.31	-17.69	74	53.5	31.3	5.65	34.14	227	28	P	H
		2389.69	44.82	-9.18	54	42.01	31.3	5.65	34.14	227	28	A	H
	*	2434	98.7	-	-	95.84	31.36	5.69	34.19	227	28	P	H
	*	2434	91.05	-	-	88.19	31.36	5.69	34.19	227	28	A	H
802.11n		2498.68	52.79	-21.21	74	49.85	31.47	5.77	34.3	227	28	P	H
HT40		2495.98	42.5	-11.5	54	39.56	31.47	5.77	34.3	227	28	A	H
CH 03		2389.95	53.25	-20.75	74	50.44	31.3	5.65	34.14	302	165	P	V
2422MHz		2389.43	42.95	-11.05	54	40.14	31.3	5.65	34.14	302	165	A	V
	*	2434	95.24	-	-	92.38	31.36	5.69	34.19	302	165	P	V
	*	2434	87.43	-	-	84.57	31.36	5.69	34.19	302	165	A	V
		2483.74	52.42	-21.58	74	49.51	31.44	5.75	34.28	302	165	P	V
		2492.62	42.35	-11.65	54	39.41	31.47	5.77	34.3	302	165	A	V
		2378.25	52.8	-21.2	74	50.04	31.27	5.63	34.14	144	27	P	H
		2389.82	42.49	-11.51	54	39.68	31.3	5.65	34.14	144	27	A	H
	*	2436	99.15	-	-	96.29	31.36	5.69	34.19	144	27	P	H
	*	2434	90.85	-	-	87.99	31.36	5.69	34.19	144	27	A	H
802.11n		2491.24	53	-21	74	50.06	31.47	5.77	34.3	144	27	P	H
HT40		2483.92	42.59	-11.41	54	39.68	31.44	5.75	34.28	144	27	A	H
CH 06		2341.59	52.64	-21.36	74	49.97	31.22	5.59	34.14	299	164	P	V
2437MHz		2387.09	42.05	-11.95	54	39.24	31.3	5.65	34.14	299	164	A	V
	*	2434	95.04	-	-	92.18	31.36	5.69	34.19	299	164	P	V
	*	2432	87.26	-	-	84.4	31.36	5.69	34.19	299	164	A	V
		2495.2	53.01	-20.99	74	50.07	31.47	5.77	34.3	299	164	P	V
		2499.46	42.39	-11.61	54	39.45	31.47	5.77	34.3	299	164	A	V

		2321.57	52.44	-21.56	74	49.82	31.19	5.57	34.14	145	30	P	H
		2388.52	42.25	-11.75	54	39.44	31.3	5.65	34.14	145	30	A	H
	*	2438	98.41	-	-	95.53	31.39	5.71	34.22	145	30	P	H
	*	2438	90.63	-	-	87.75	31.39	5.71	34.22	145	30	A	H
802.11n		2485.36	57.71	-16.29	74	54.8	31.44	5.75	34.28	145	30	P	H
HT40		2483.62	46.21	-7.79	54	43.3	31.44	5.75	34.28	145	30	A	H
CH 09		2387.61	53.12	-20.88	74	50.31	31.3	5.65	34.14	300	128	P	V
2452MHz		2384.88	42.12	-11.88	54	39.36	31.27	5.63	34.14	300	128	A	V
	*	2440	95.81	-	-	92.93	31.39	5.71	34.22	300	128	P	V
	*	2438	87.81	-	-	84.93	31.39	5.71	34.22	300	128	A	V
		2483.5	55.88	-18.12	74	52.97	31.44	5.75	34.28	300	128	P	V
		2483.74	43.43	-10.57	54	40.52	31.44	5.75	34.28	300	128	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	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		4842	42.67	-31.33	74	63.72	35.63	7.87	64.55	100	298	P	H
HT40		7266	41.83	-32.17	74	61.47	35.87	9.48	64.99	100	298	P	H
CH 03		4842	43.31	-30.69	74	64.36	35.63	7.87	64.55	100	360	P	V
2422MHz		7266	41.86	-32.14	74	61.5	35.87	9.48	64.99	100	360	P	V
802.11n		4872	41.33	-32.67	74	62.42	35.61	7.9	64.6	100	56	P	H
HT40		7308	40.81	-33.19	74	60.43	35.89	9.5	65.01	100	56	P	H
CH 06		4872	42.05	-31.95	74	63.14	35.61	7.9	64.6	100	32	P	V
2437MHz		7308	41.28	-32.72	74	60.9	35.89	9.5	65.01	100	32	P	V
802.11n		4902	43.22	-30.78	74	64.36	35.58	7.93	64.65	100	0	P	H
HT40		7356	42.48	-31.52	74	62.07	35.92	9.52	65.03	100	0	P	H
CH 09		4902	41.95	-32.05	74	63.09	35.58	7.93	64.65	100	0	P	V
2452MHz		7356	39.71	-34.29	74	59.3	35.92	9.52	65.03	100	0	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		(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	21.49	-18.51	40	27.33	25.6	0.59	32.03	-	-	P	H
		97.9	19.47	-24.03	43.5	32.93	17.5	1	31.96	-	-	P	H
		180.35	27.19	-16.31	43.5	41.08	16.48	1.37	31.74	100	36	P	H
		213.33	22.31	-21.19	43.5	36.33	16.1	1.52	31.64	-	-	P	H
		418.97	24.77	-21.23	46	28	25.3	2.11	30.64	-	-	P	H
		741.01	25.41	-20.59	46	24.65	26.65	2.81	28.7	-	-	P	H
		30	22.29	-17.71	40	28.15	25.6	0.57	32.03	-	-	P	V
		97.9	27.82	-15.68	43.5	41.28	17.5	1	31.96	100	23	P	V
		181.32	26.79	-16.71	43.5	40.73	16.41	1.38	31.73	-	-	P	V
		403.45	24.12	-21.88	46	27.13	25.61	2.08	30.7	-	-	P	V
		687.66	26.63	-19.37	46	26.72	26.16	2.74	28.99	-	-	P	V
		843.83	26.01	-19.99	46	23.95	27.03	3	27.97	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against 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.	
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)

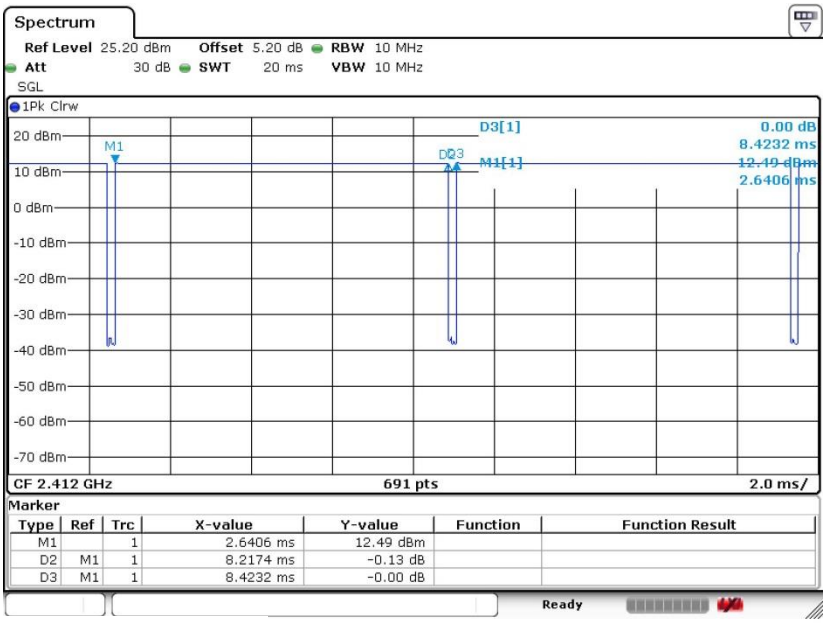
= -10.46(dB)

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

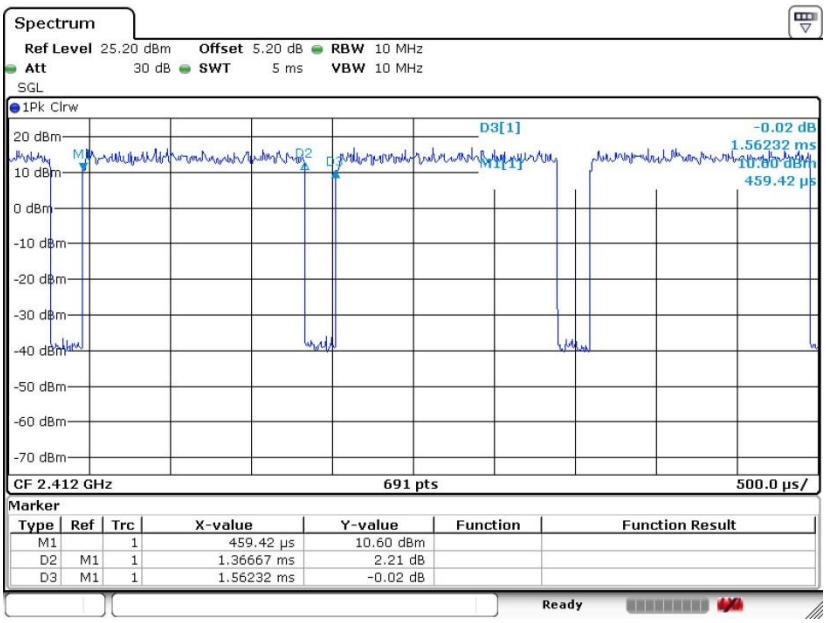
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
11b	97.56	8.217	0.122	300Hz
11g	87.48	1.367	0.732	1kHz
11n HT20	86.25	1.272	0.786	1kHz
11n HT40	85.76	1.222	0.819	1kHz

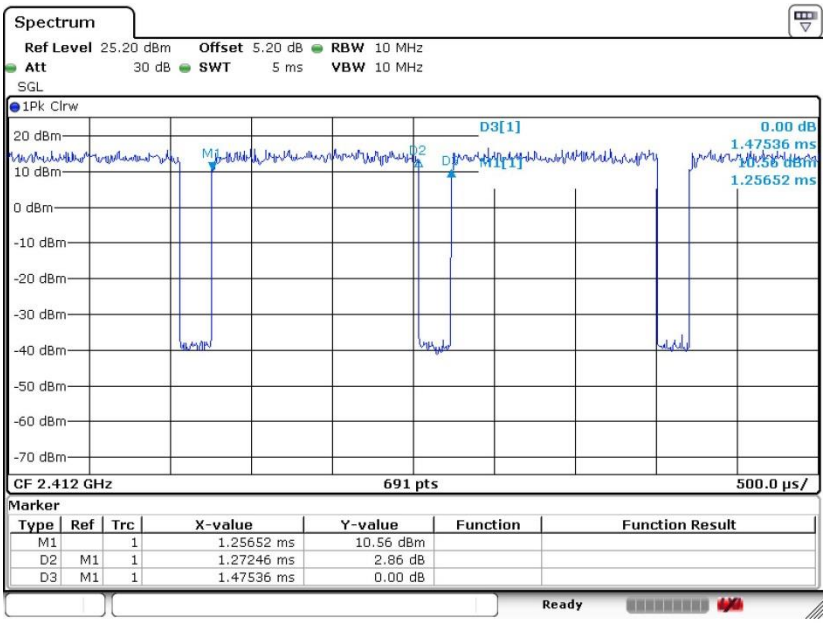
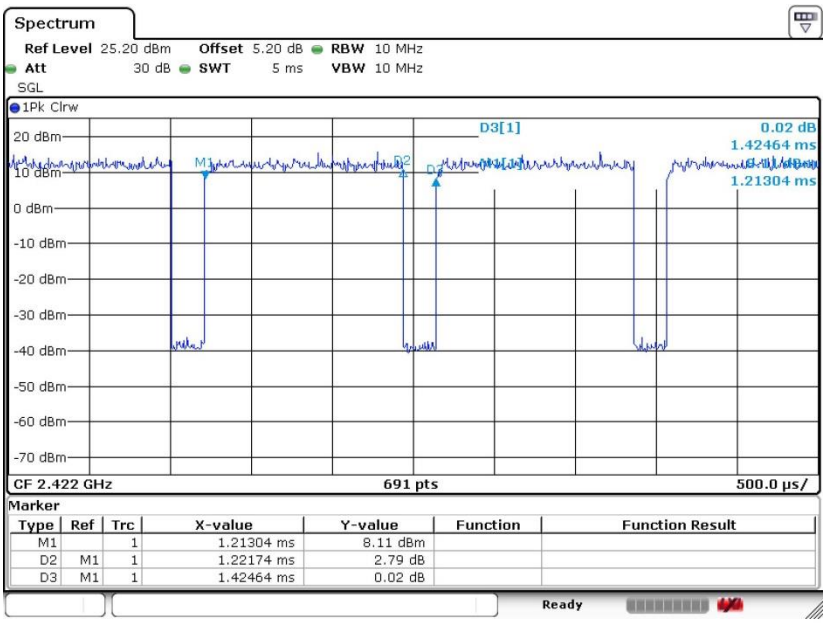
11b


Spectrum
Ref Level 25.20 dBm Offset 5.20 dB RBW 10 MHz
Att 30 dB SWT 20 ms VBW 10 MHz
SGL
1Pk Clrw
D3[1] 0.00 dB
8.4232 ms
M1[1] 12.49 dBm
2.6406 ms
CF 2.412 GHz 691 pts 2.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.6406 ms 12.49 dBm
D2 M1 1 8.2174 ms -0.13 dB
D3 M1 1 8.4232 ms -0.00 dB
Ready

11g


Spectrum
Ref Level 25.20 dBm Offset 5.20 dB RBW 10 MHz
Att 30 dB SWT 5 ms VBW 10 MHz
SGL
1Pk Clrw
D3[1] -0.02 dB
1.56232 ms
M1[1] 10.60 dBm
459.42 µs
CF 2.412 GHz 691 pts 500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 459.42 µs 10.60 dBm
D2 M1 1 1.36667 ms 2.21 dB
D3 M1 1 1.56232 ms -0.02 dB
Ready

11n HT20



11n HT40