FCC RF Test Report

APPLICANT	:	**Hangzhou Tuya Information Technology Co., Ltd**
EQUIPMENT	:	**Wi-Fi and Bluetooth Module**
MODEL NAME	:	**WB2S**
FCC ID	:	**2ANDL-WB2S**
STANDARD	:	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	:	**(DTS) Digital Transmission System**

The product was received on Nov. 14, 2019 and testing was completed on Jan. 16, 2020. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Jason Jia

Reviewed by: Jason Jia / Supervisor

James Huang

Approved by: James Huang / Manager

ACCREDITED Cert #5145.02

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR9N1406B	Rev. 01	Initial issue of report	Jan. 07, 2020
FR9N1406B	Rev. 02	Retest 802.11b	Jan. 19, 2020

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	≤ 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 1.59 dB at 4924.00 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.69 dB at 0.471 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
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

Hangzhou Tuya Information Technology Co., Ltd
Room701, Building3, More Center,No.87 GuDun Road, Hangzhou, Zhejiang, China

1.2 Manufacturer

Hangzhou Tuya Information Technology Co., Ltd
Room701, Building3, More Center,No.87 GuDun Road, Hangzhou, Zhejiang, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Wi-Fi and Bluetooth Module
Model Name	WB2S
FCC ID	2ANDL-WB2S
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v4.0 LE
HW Version	100
SW Version	V1.0.3

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 : 17.94 dBm (0.0622 W) 802.11g : 21.46 dBm (0.1400 W) 802.11n HT20 : 20.49 dBm (0.1119 W) 802.11n HT40 : 21.46 dBm (0.1400 W)
Antenna Type / Gain	PCB Antenna with gain -1.0 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Testing Location

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

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH05-KS TH01-KS	CN1257	314309

1.7 Test Software

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

1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- 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

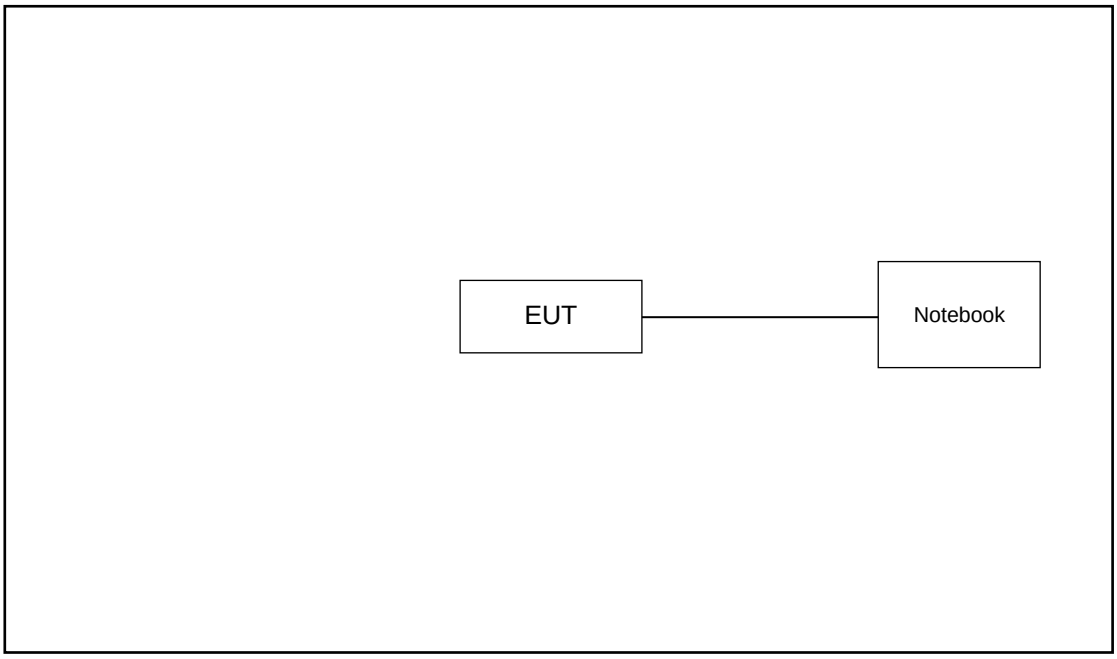
Final test modes are considering the modulation and worse data rates as below table.

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

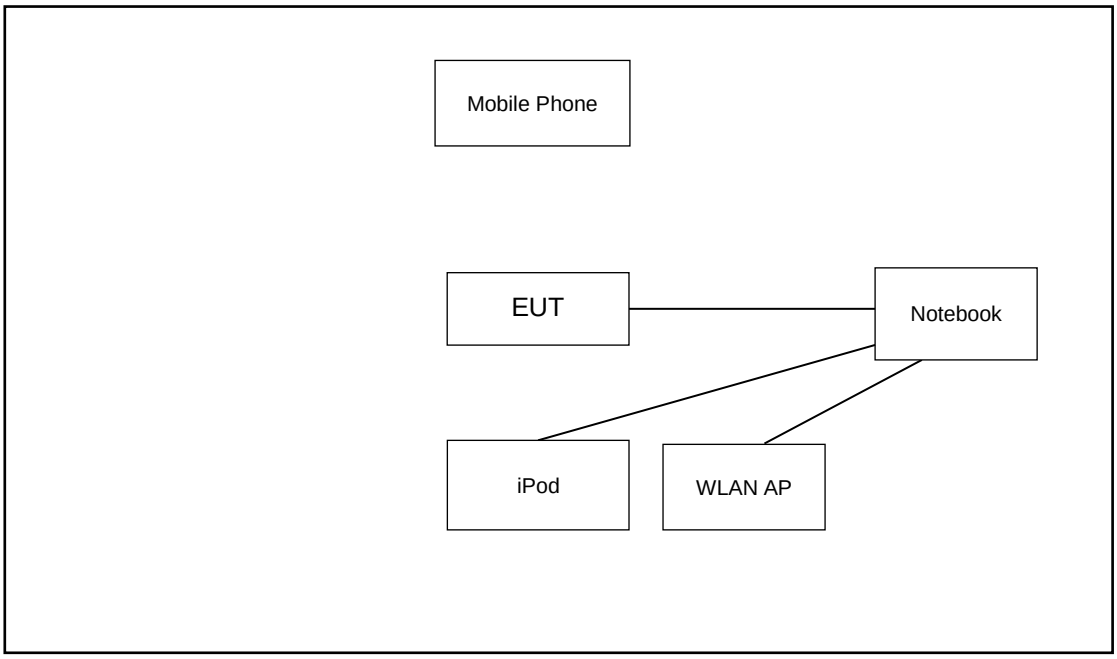
Test Cases	
AC Conducted Emission	Mode 1: Bluetooth Link + WLAN Link (2.4G) + Charging from Notebook

2.3 Connection Diagram of Test System

For Radiation



For Conducted Emission



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
2.	Notebook	Lenovo	QDS-BRCM1050I	PRC4	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
3.	iPod	Apple	A1199	Fcc DoC	Shielded, 1.2m	N/A
4.	Mobile Phone	MOTO	XT1952-1	N/A	N/A	N/A

2.5 EUT Operation Test Setup

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

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

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5.3dB.

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

= 5.3 (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.

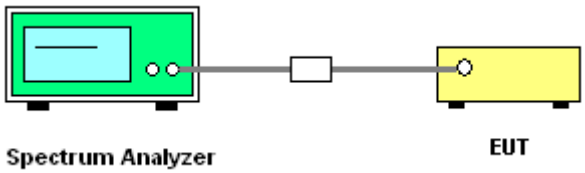
3.1.2 Measuring Instruments

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.

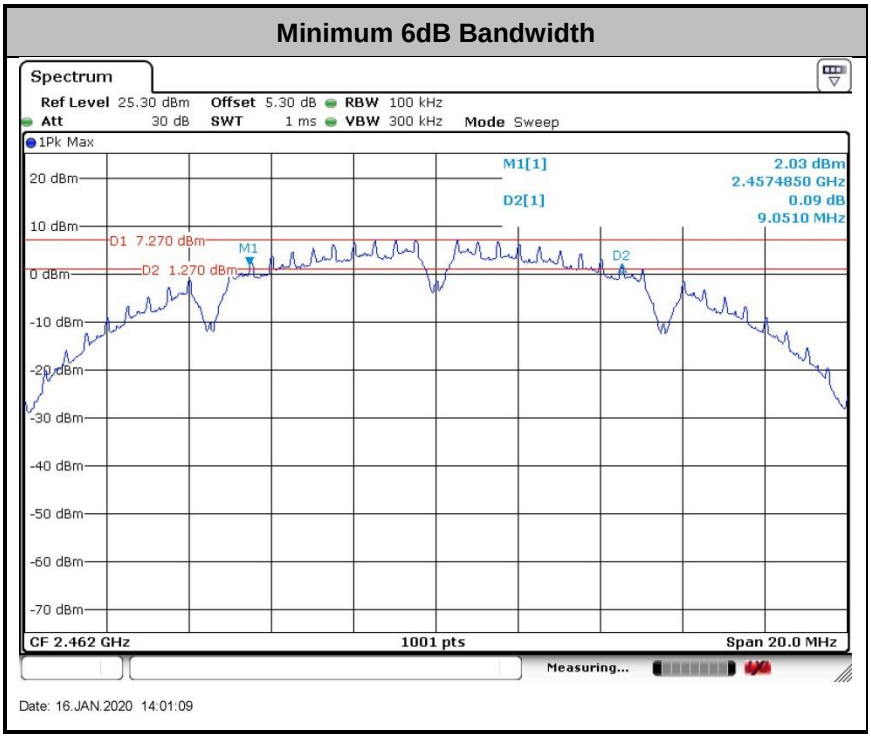
3.1.4 Test Setup



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

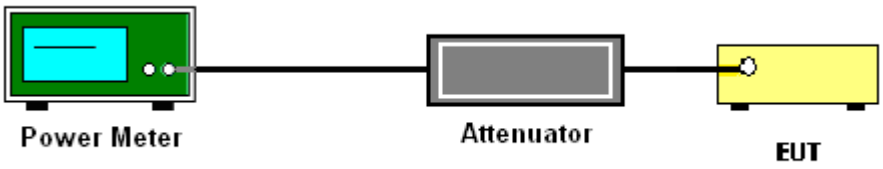
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

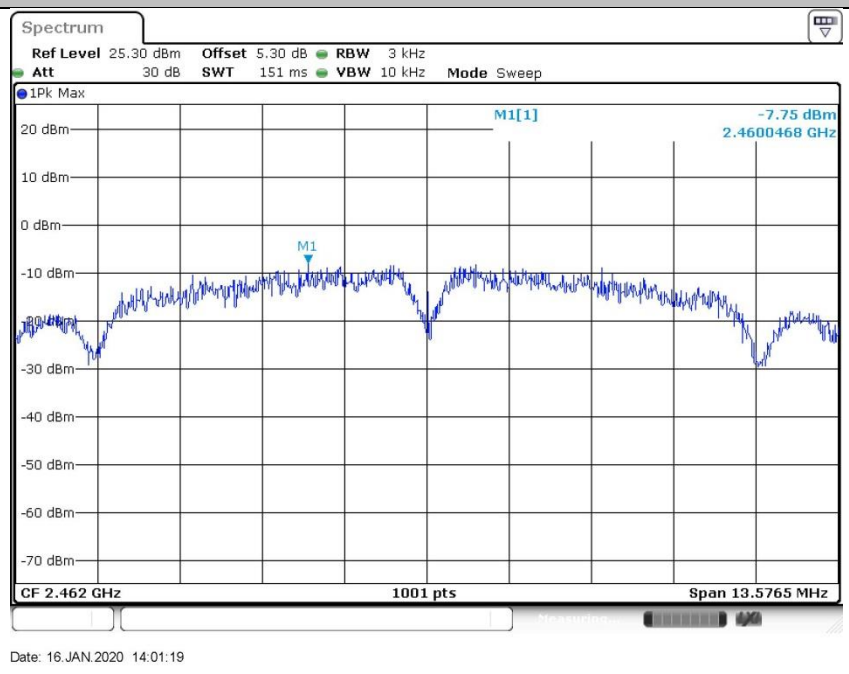
1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the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

3.3.4 Test Setup

3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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.

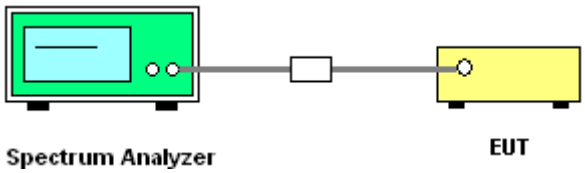
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

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

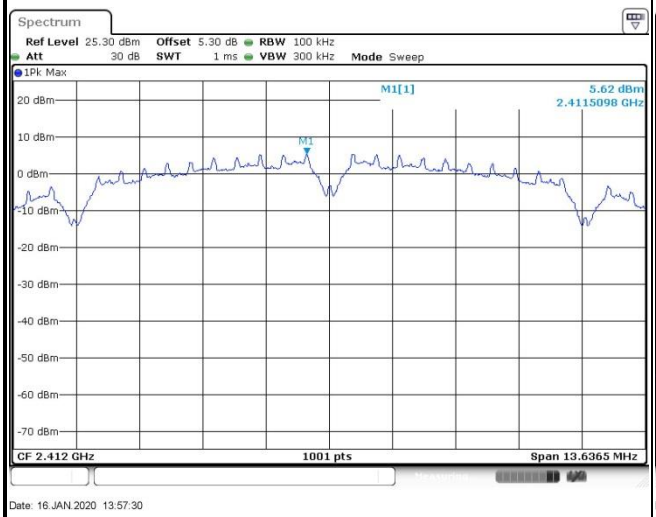
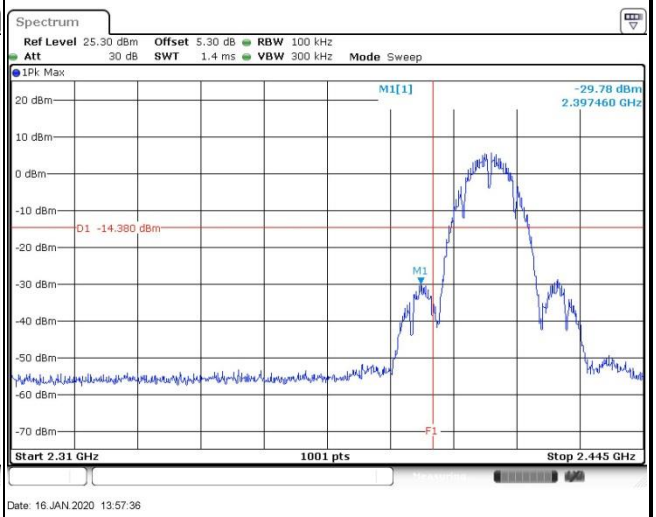
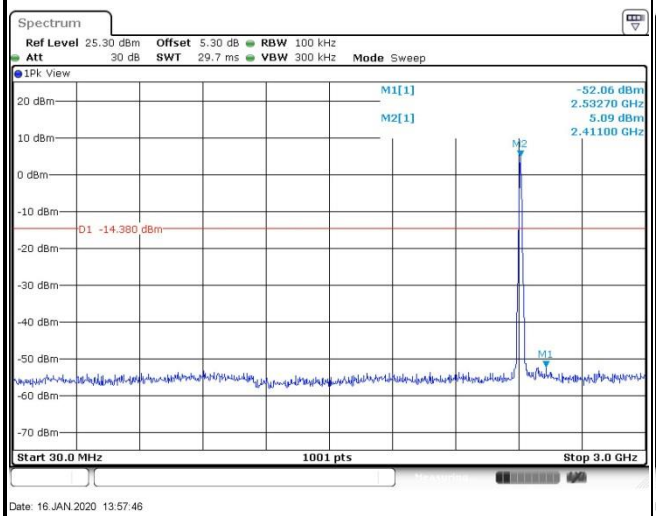
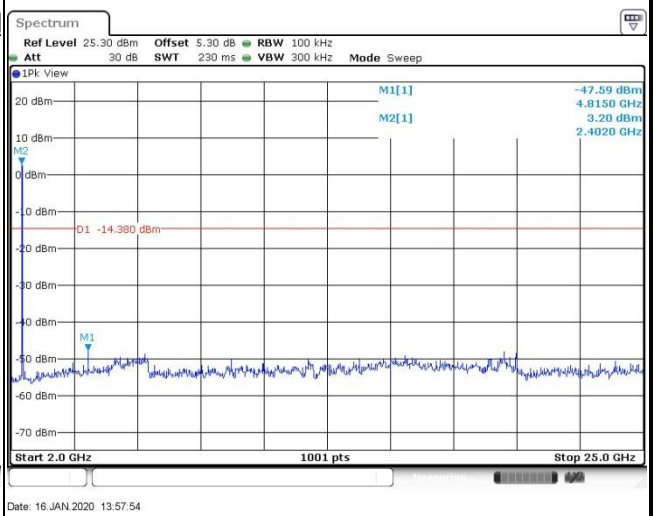
3.4.4 Test Setup



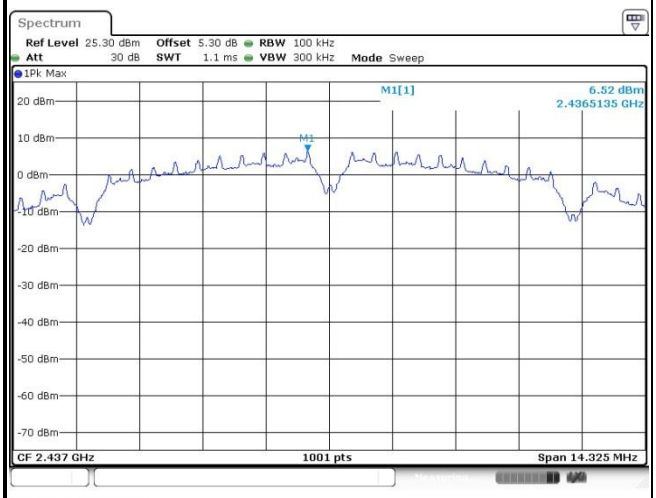
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

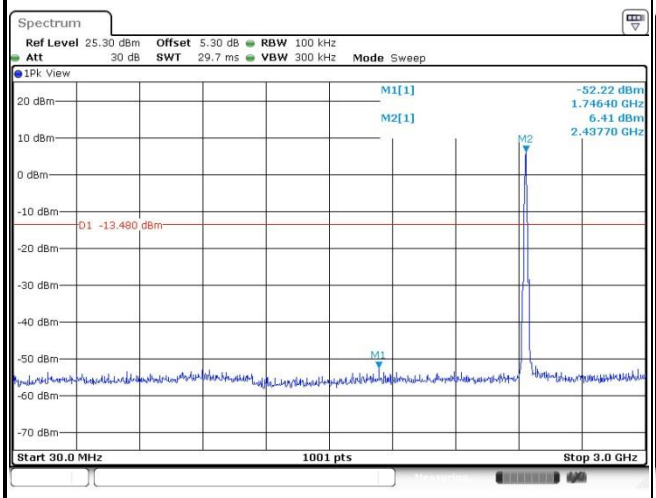
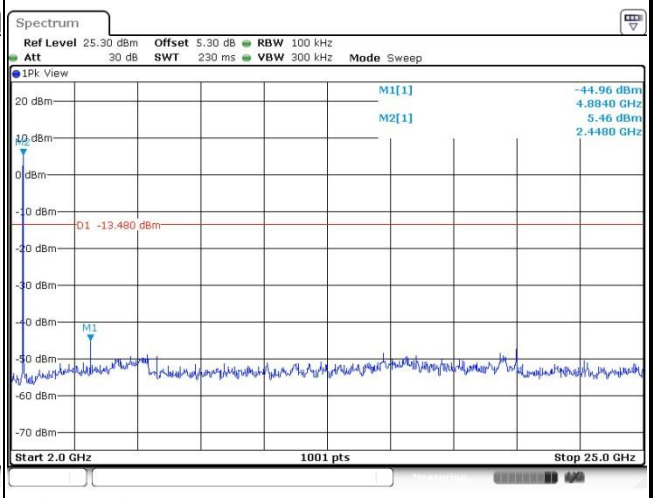
Test Engineer :	Asa Cheng	**Temperature :**	21~25℃
		Relative Humidity :	51~54%

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

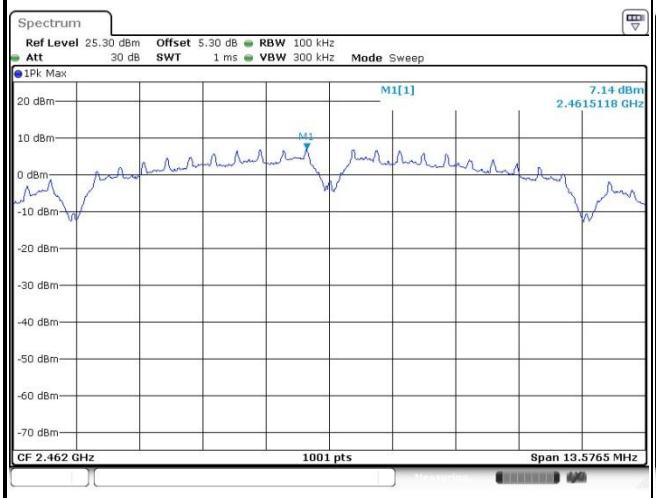
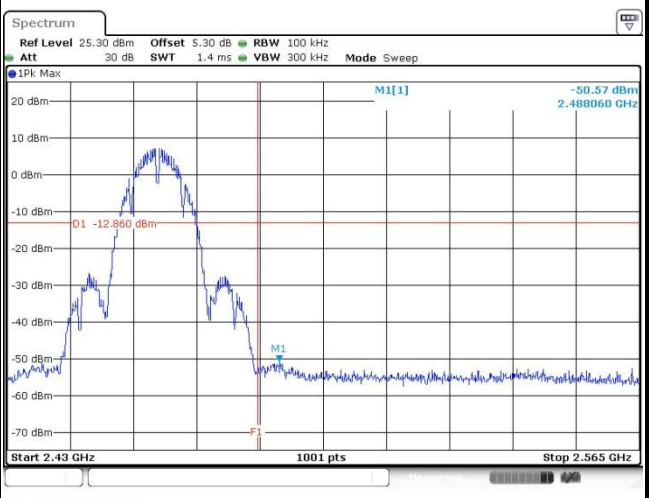
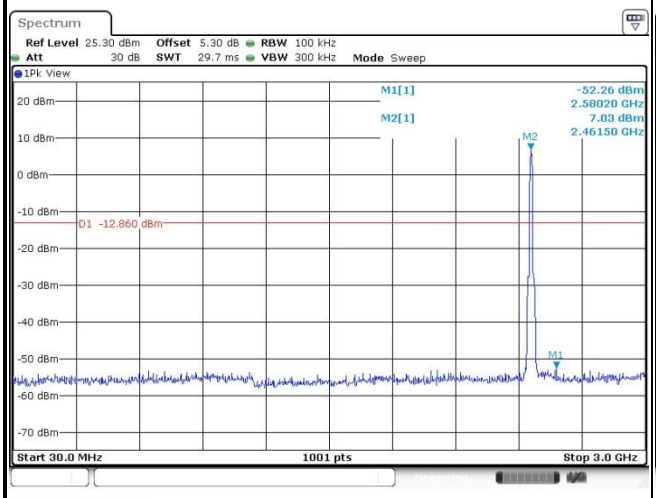
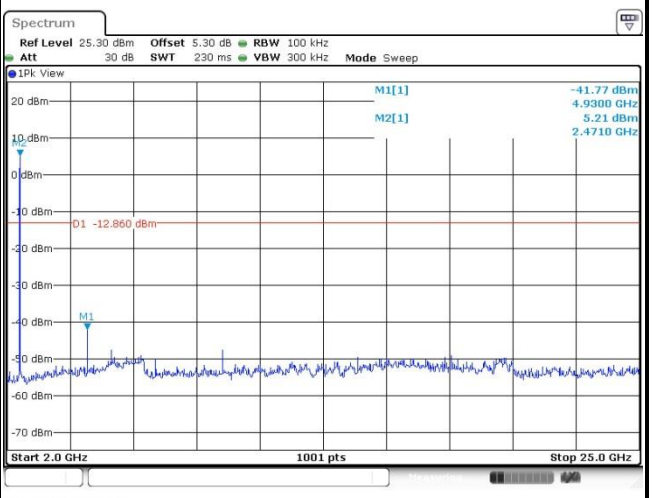
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11b	Test Channel :	06

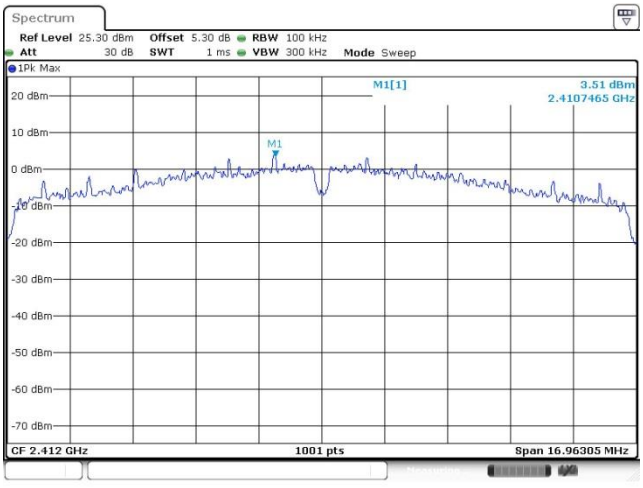
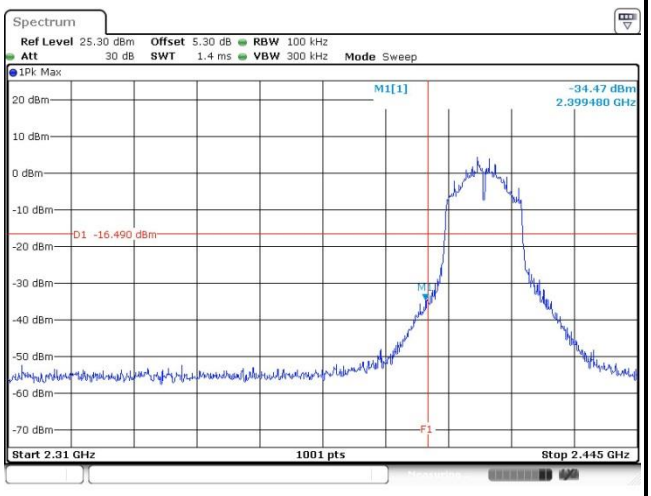
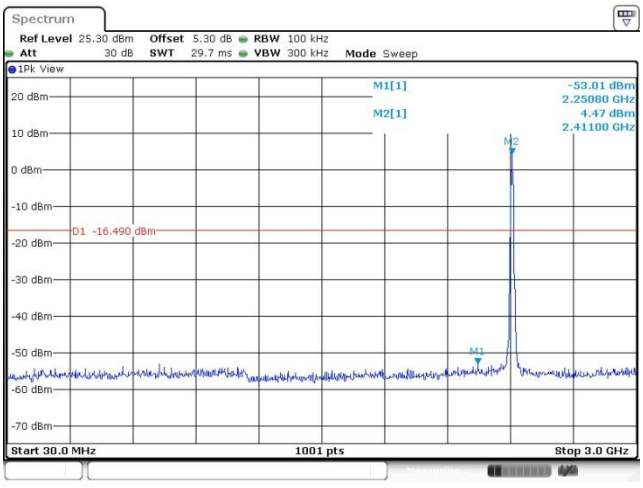
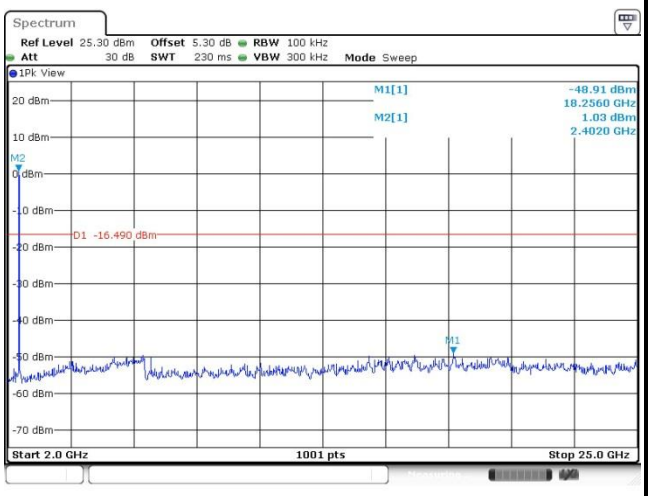
100kHz PSD reference Level	
	

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

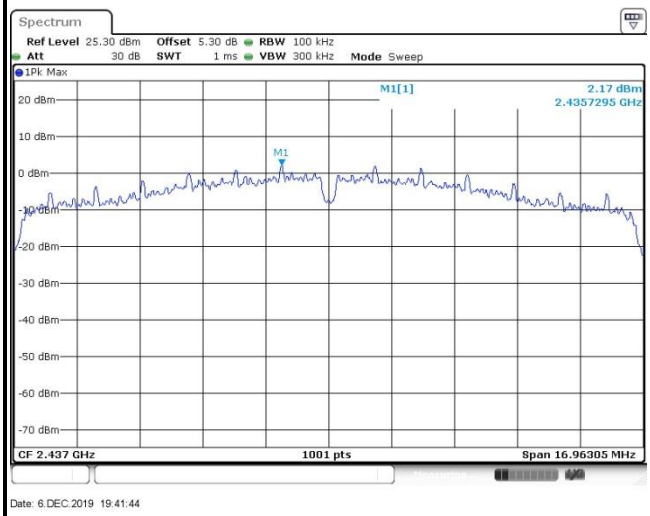
Test Mode :	802.11b	Test Channel :	11

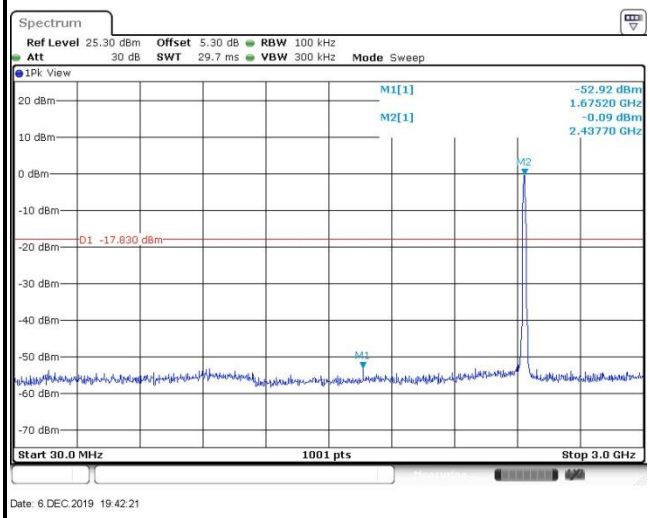
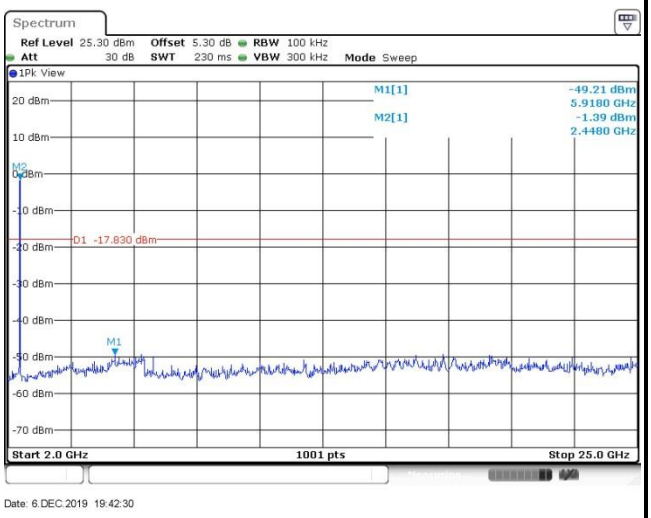
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

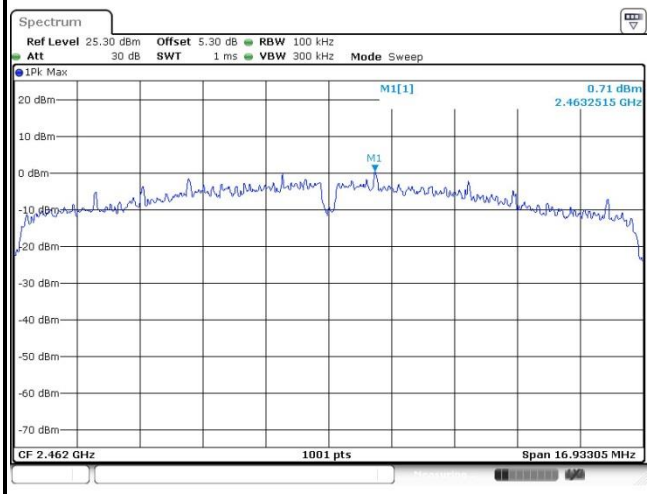
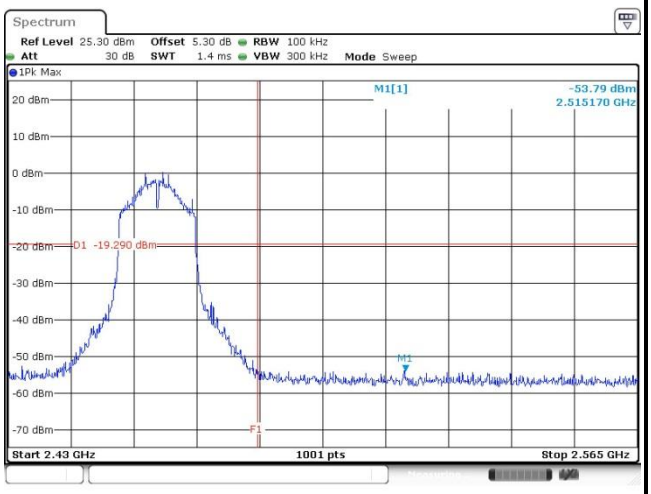
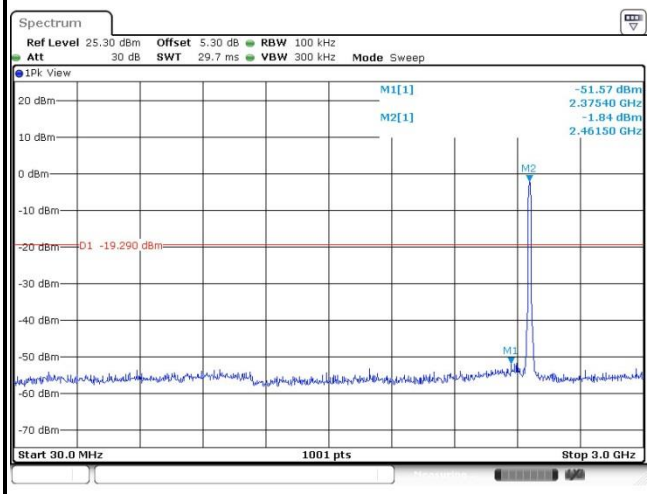
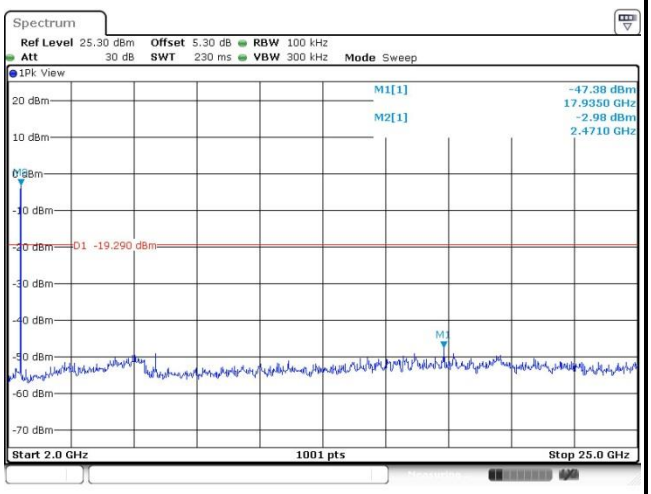
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

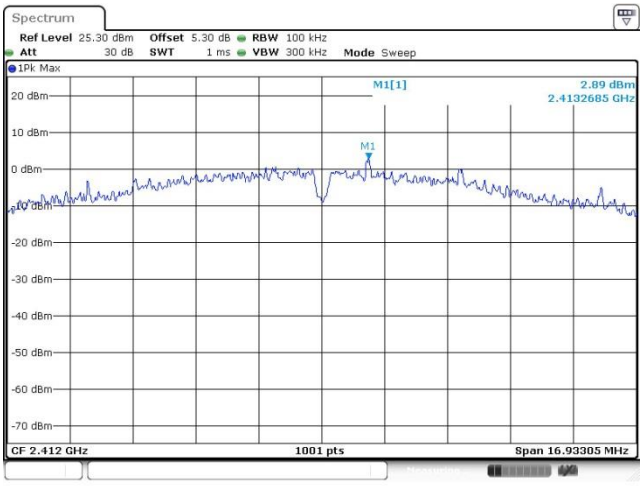
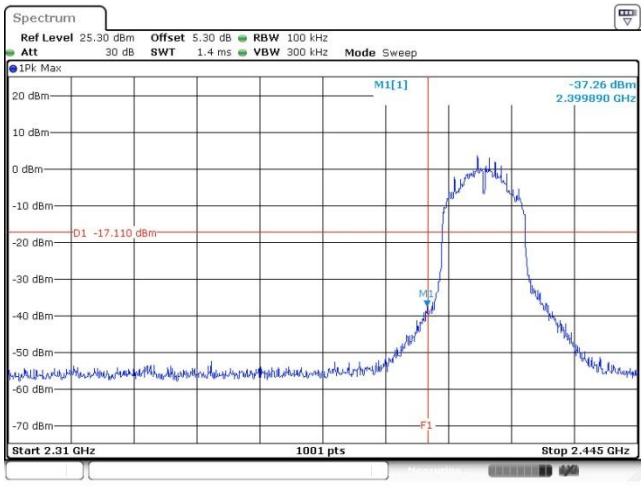
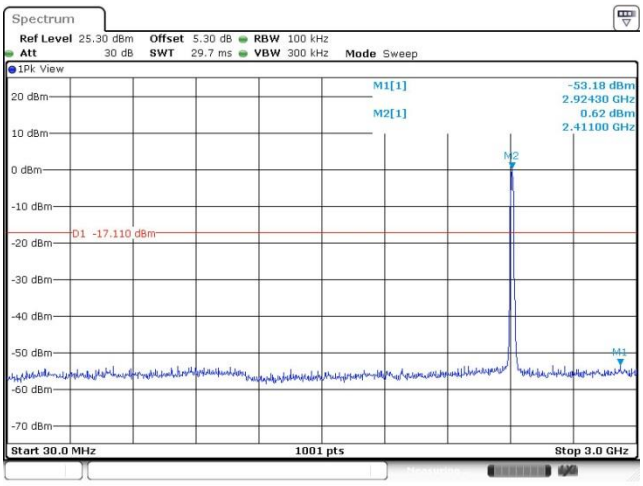
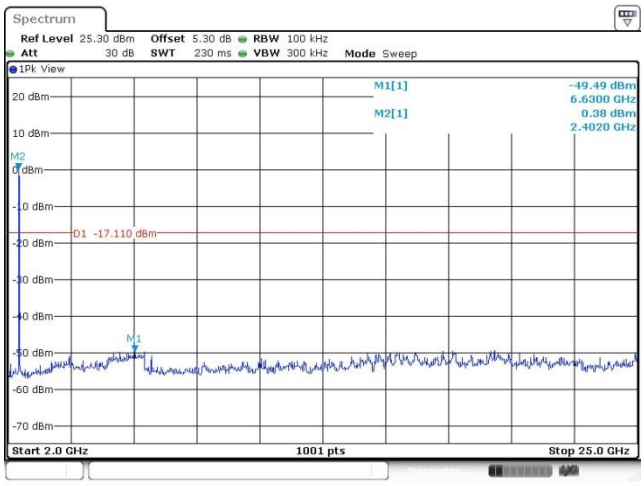
100kHz PSD reference Level	
	

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

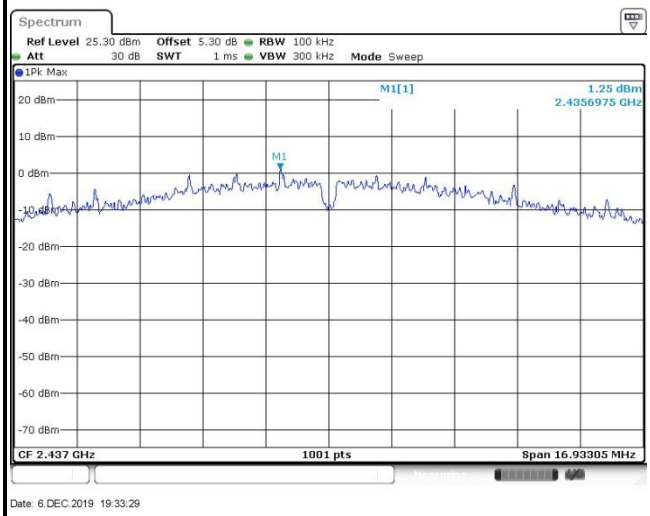
Test Mode :	802.11g	Test Channel :	11

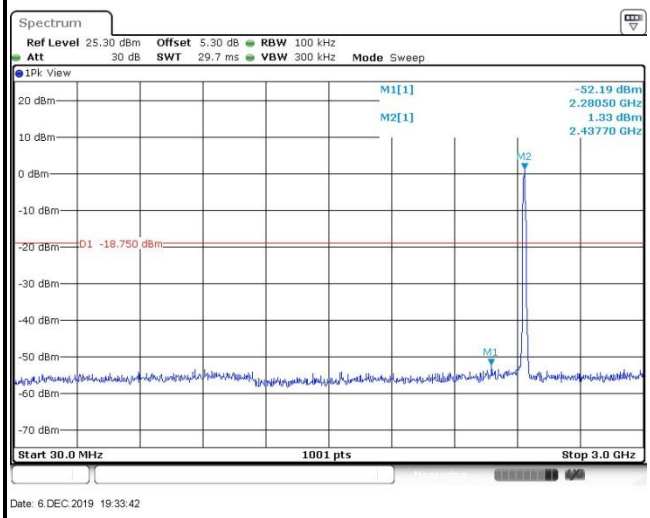
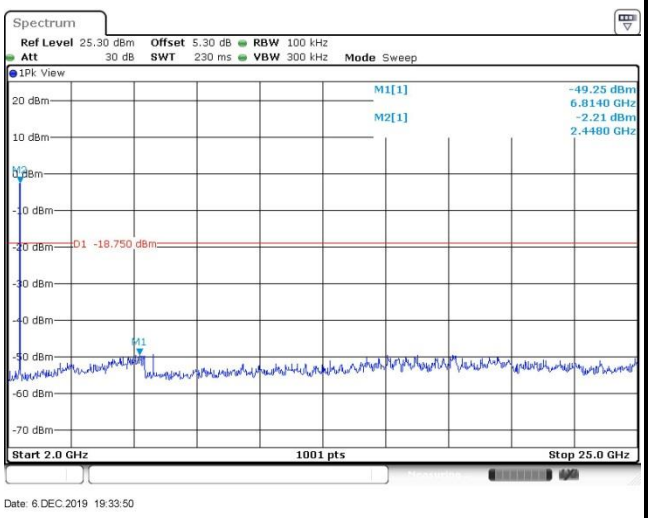
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

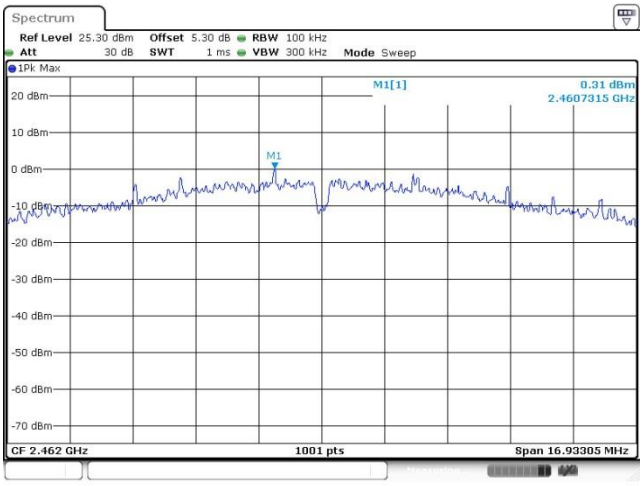
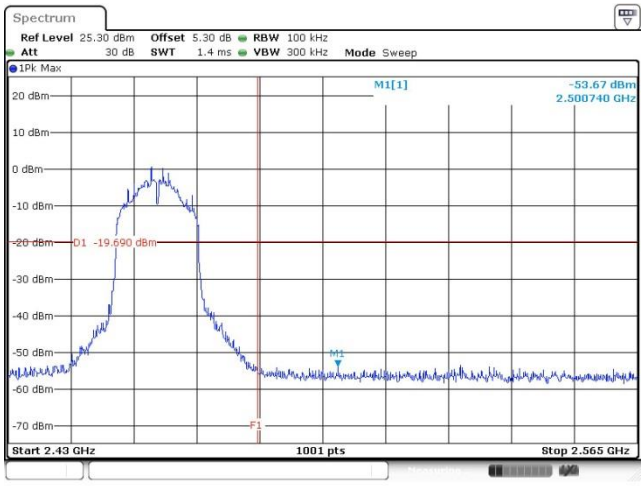
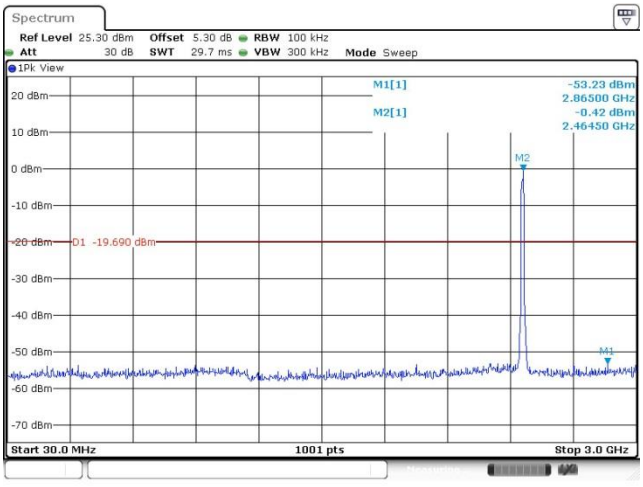
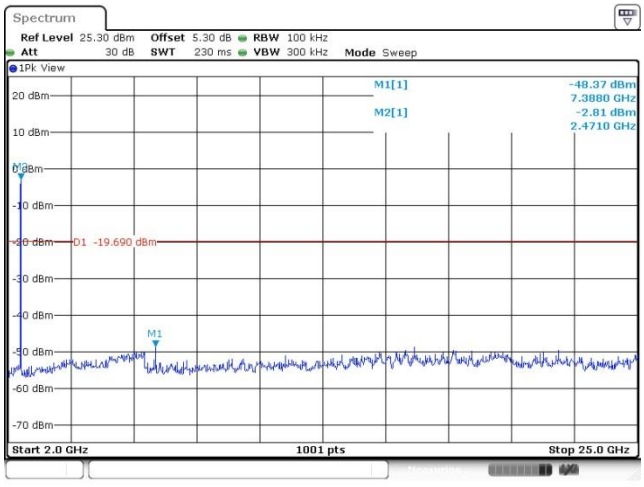
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

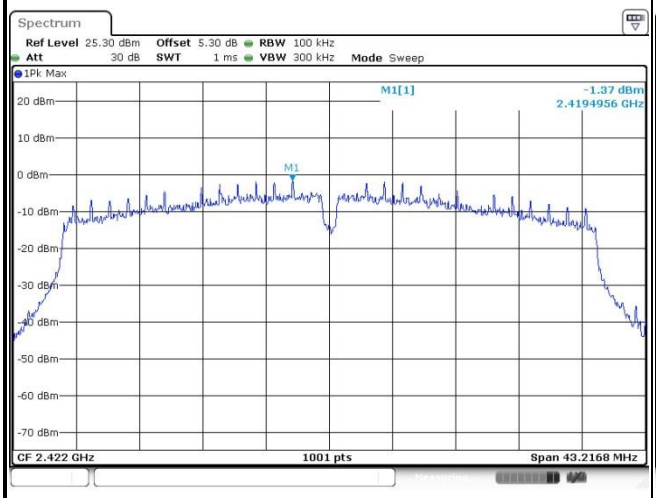
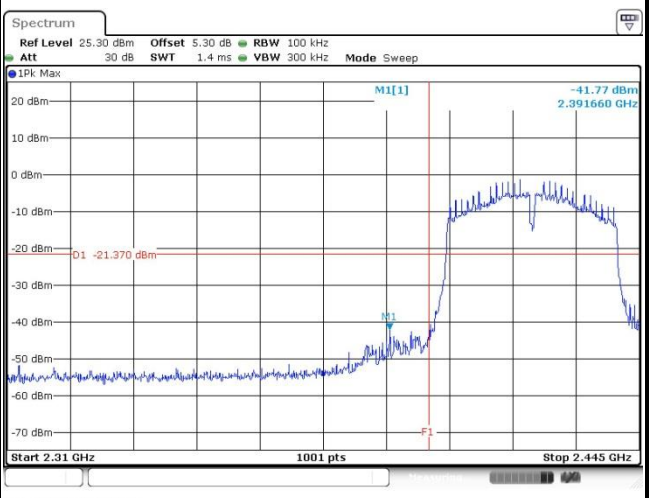
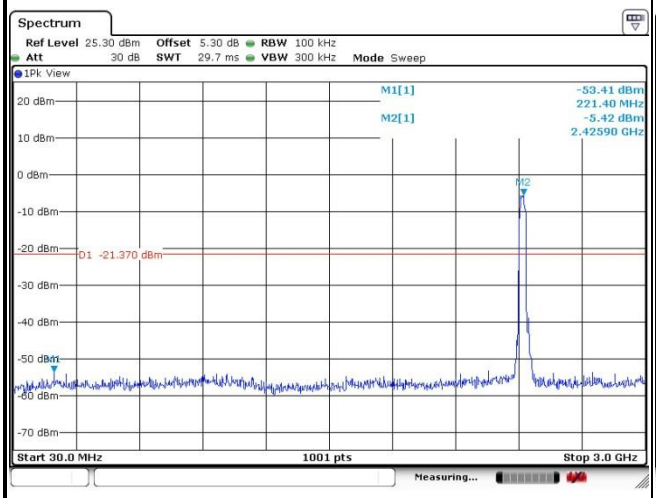
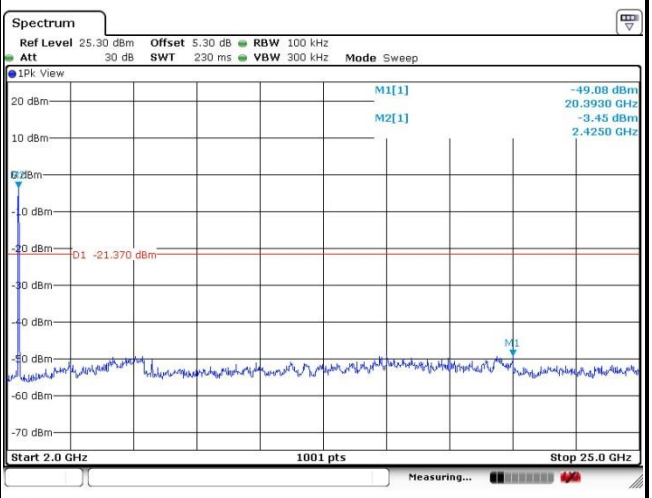
100kHz PSD reference Level	
	

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

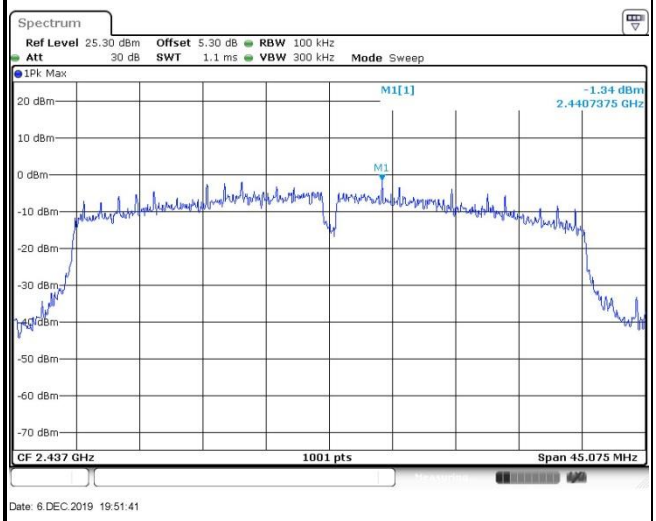
Test Mode :	802.11n HT20	Test Channel :	11

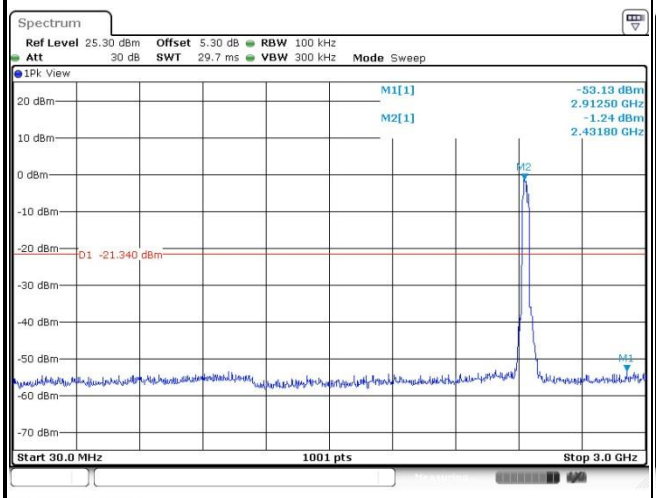
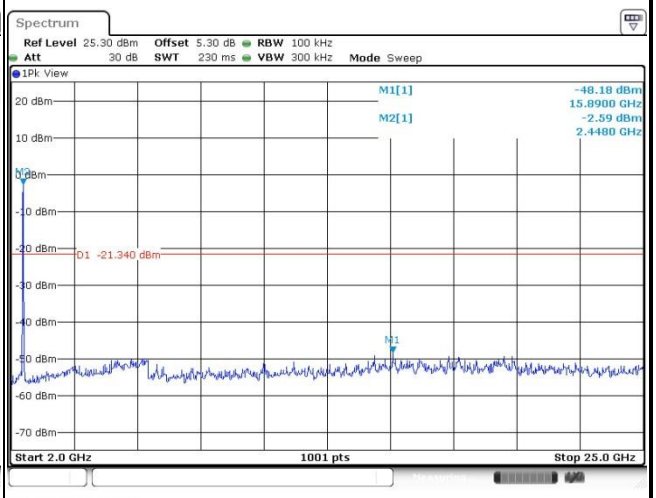
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	03

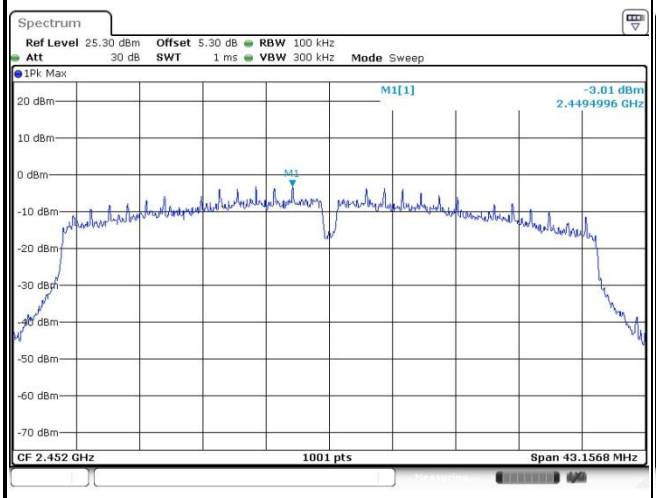
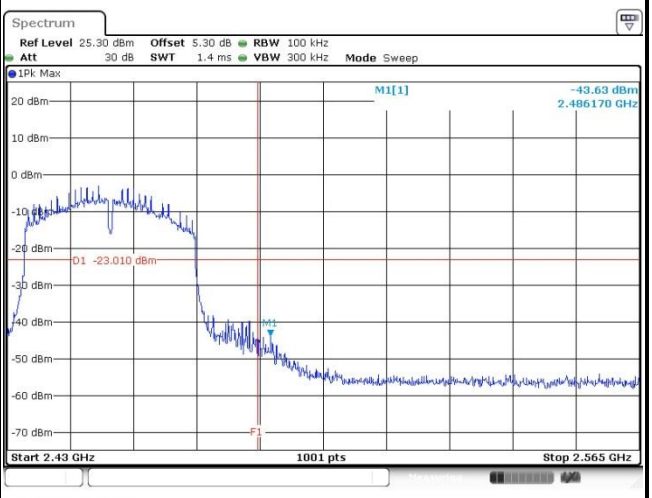
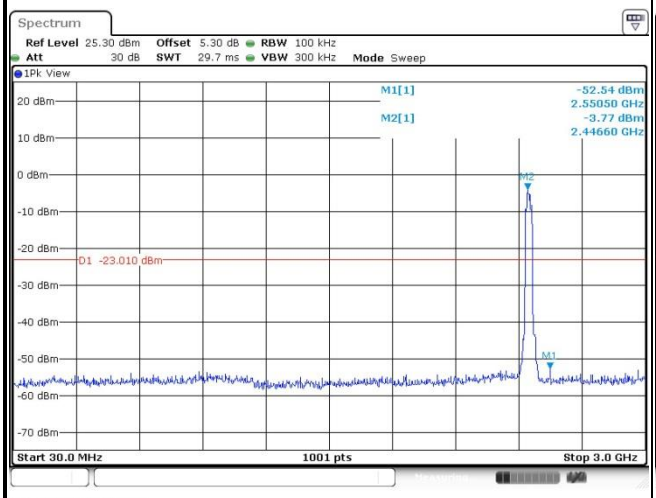
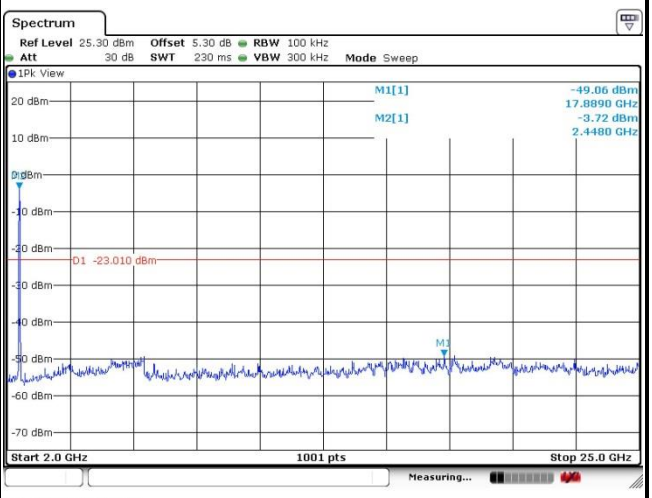
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	
	

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

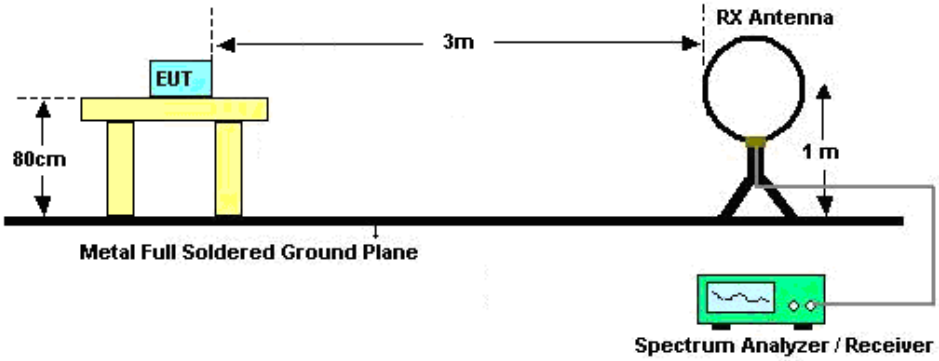
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

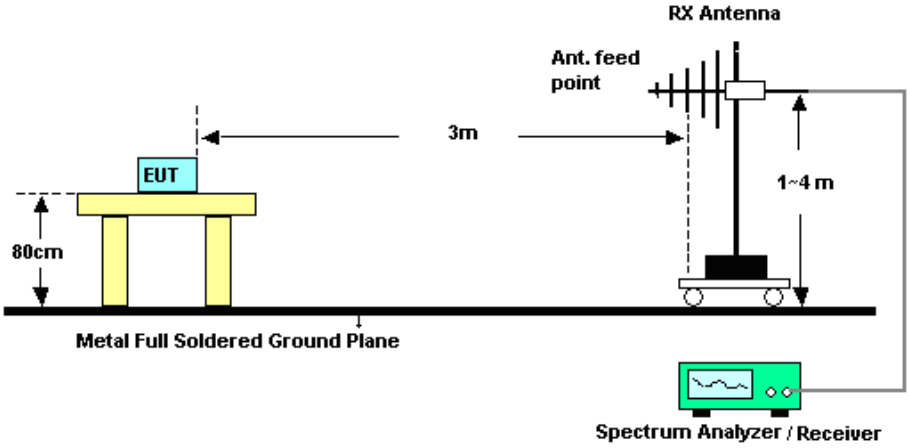
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better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

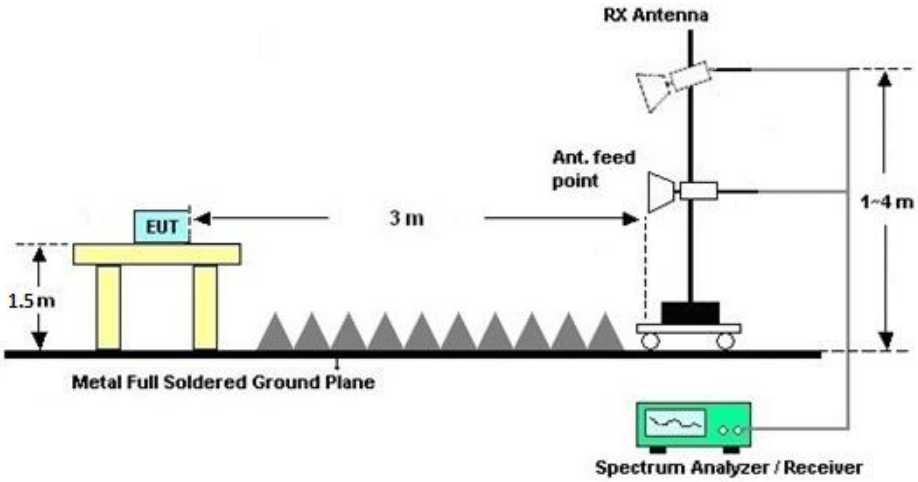
For radiated emissions below 30MHz



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.

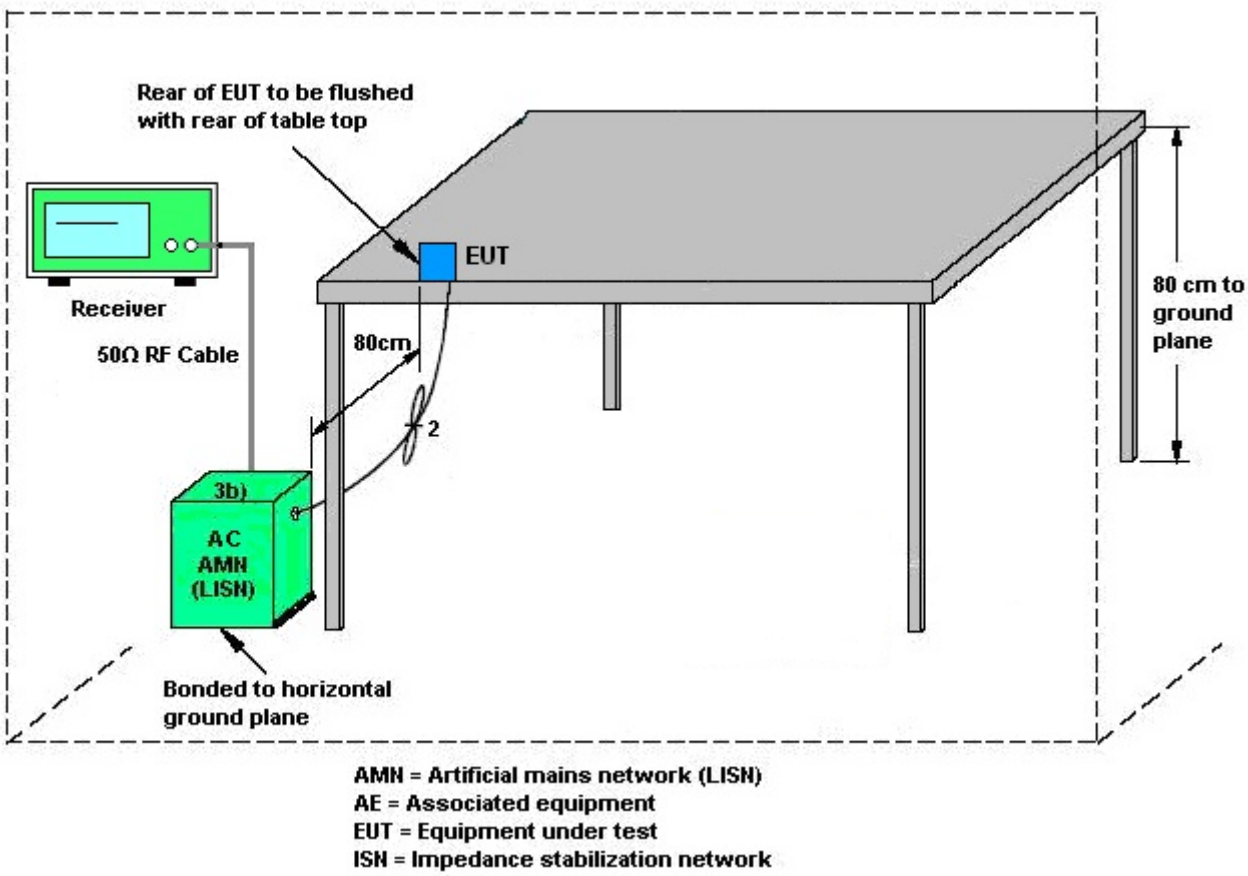
3.6.2 Measuring Instruments

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. 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	FSV30	101338	10Hz~30GHz	Apr. 16, 2019	Dec. 06, 2019~ Jan. 16, 2020	Apr. 15, 2020	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 14, 2019	Dec. 06, 2019~ Jan. 16, 2020	Jan. 13, 2020	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 08, 2020		Jan. 07, 2021	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 14, 2019	Dec. 06, 2019~ Jan. 16, 2020	Jan. 13, 2020	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 08, 2020		Jan. 07, 2021	Conducted (TH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 16, 2019	Dec. 21, 2019	Apr. 15, 2020	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 11, 2019	Dec. 21, 2019	Oct. 10, 2020	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 28, 2019	Dec. 21, 2019	Oct. 27, 2020	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 11, 2019	Dec. 21, 2019	Oct. 10, 2020	Conduction (CO01-KS)
EMI Test Receiver	Keysight	N9038A	MY572901 51	3Hz~8.5GHz;Max 30dBm	Jul. 18, 2019	Dec. 21, 2019~ Jan. 12, 2020	Jul. 17, 2020	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz-44G,MAX 30dB	Apr. 16, 2019	Dec. 21, 2019~ Jan. 12, 2020	Apr. 15, 2020	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 10, 2019	Dec. 21, 2019~ Jan. 12, 2020	Nov. 09, 2020	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	May. 30, 2019	Dec. 21, 2019~ Jan. 12, 2020	May. 29, 2020	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 27, 2019	Dec. 21, 2019~ Jan. 12, 2020	Jan. 26, 2020	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2019	Dec. 21, 2019~ Jan. 12, 2020	Jan. 04, 2020	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 04, 2020		Jan. 03, 2021	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Aug. 06, 2019	Dec. 21, 2019~ Jan. 12, 2020	Aug. 05, 2020	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY532703 16	500MHz~26.5GHz	Oct.18.2019	Dec. 21, 2019~ Jan. 12, 2020	Oct.17.2020	Radiation (03CH05-KS)
Amplifier	MITEQ	TTA1840-35-HG	2014749	18~40GHz	Jan. 14, 2019	Dec. 21, 2019~ Jan. 12, 2020	Jan. 13, 2020	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Dec. 21, 2019~ Jan. 12, 2020	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Dec. 21, 2019~ Jan. 12, 2020	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Dec. 21, 2019~ Jan. 12, 2020	NCR	Radiation (03CH05-KS)

NCR: No Calibration Required.

5 Uncertainty of Evaluation

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.9 dB**

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

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

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

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

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

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

Appendix A. Conducted Test Results

Report Number : FR9N1406B

A1 - DTS Part

Test Engineer:	Asa Cheng	Temperature:	21~25	°C
Test Date:	2019/12/6~2020/1/16	Relative Humidity:	51~54	%

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	14.89	9.09	0.50	Pass
11b	1Mbps	1	6	2437	14.94	9.55	0.50	Pass
11b	1Mbps	1	11	2462	14.94	9.05	0.50	Pass
11g	6Mbps	1	1	2412	16.03	11.31	0.50	Pass
11g	6Mbps	1	6	2437	16.08	11.31	0.50	Pass
11g	6Mbps	1	11	2462	16.08	11.29	0.50	Pass
HT20	MCS0	1	1	2412	16.88	11.29	0.50	Pass
HT20	MCS0	1	6	2437	16.83	11.29	0.50	Pass
HT20	MCS0	1	11	2462	16.78	11.29	0.50	Pass
HT40	MCS0	1	3	2422	35.36	28.81	0.50	Pass
HT40	MCS0	1	6	2437	35.46	30.05	0.50	Pass
HT40	MCS0	1	9	2452	35.36	28.77	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	17.04	30.00	-1.00	16.04	36.00	Pass
11b	1Mbps	1	6	2437	17.18	30.00	-1.00	16.18	36.00	Pass
11b	1Mbps	1	11	2462	17.94	30.00	-1.00	16.94	36.00	Pass
11g	6Mbps	1	1	2412	21.46	30.00	-1.00	20.46	36.00	Pass
11g	6Mbps	1	6	2437	21.04	30.00	-1.00	20.04	36.00	Pass
11g	6Mbps	1	11	2462	19.83	30.00	-1.00	18.83	36.00	Pass
HT20	MCS0	1	1	2412	20.49	30.00	-1.00	19.49	36.00	Pass
HT20	MCS0	1	6	2437	19.93	30.00	-1.00	18.93	36.00	Pass
HT20	MCS0	1	11	2462	18.63	30.00	-1.00	17.63	36.00	Pass
HT40	MCS0	1	3	2422	21.46	30.00	-1.00	20.46	36.00	Pass
HT40	MCS0	1	6	2437	20.72	30.00	-1.00	19.72	36.00	Pass
HT40	MCS0	1	9	2452	19.38	30.00	-1.00	18.38	36.00	Pass

TEST RESULTS DATA
Peak Power Density

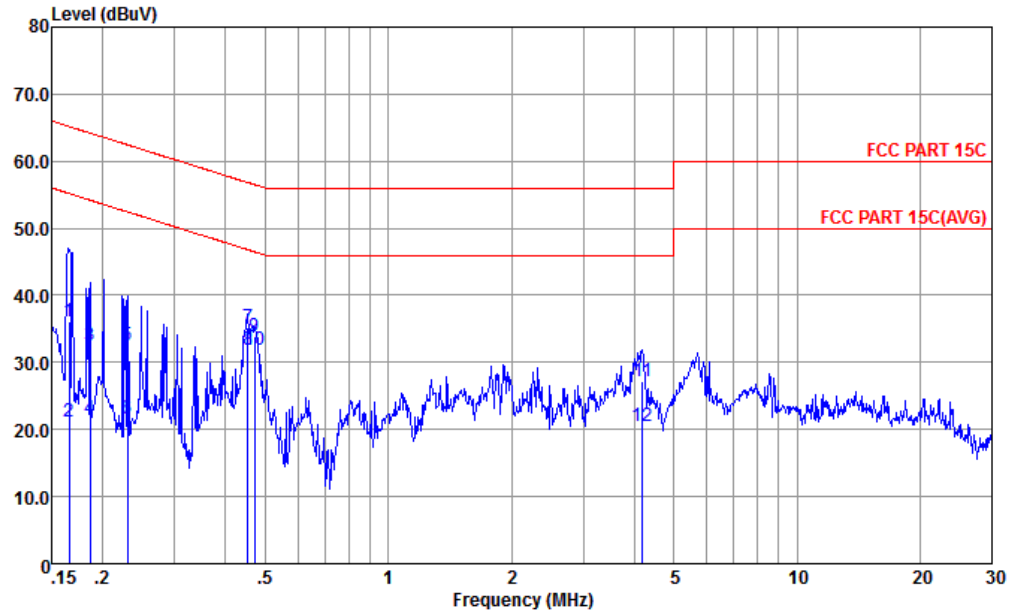
2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-8.91	-1.00	8.00	Pass
11b	1Mbps	1	6	2437	-8.04	-1.00	8.00	Pass
11b	1Mbps	1	11	2462	-7.75	-1.00	8.00	Pass
11g	6Mbps	1	1	2412	-10.15	-1.00	8.00	Pass
11g	6Mbps	1	6	2437	-10.74	-1.00	8.00	Pass
11g	6Mbps	1	11	2462	-12.08	-1.00	8.00	Pass
HT20	MCS0	1	1	2412	-10.50	-1.00	8.00	Pass
HT20	MCS0	1	6	2437	-12.85	-1.00	8.00	Pass
HT20	MCS0	1	11	2462	-13.48	-1.00	8.00	Pass
HT40	MCS0	1	3	2422	-15.55	-1.00	8.00	Pass
HT40	MCS0	1	6	2437	-15.02	-1.00	8.00	Pass
HT40	MCS0	1	9	2452	-15.94	-1.00	8.00	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	0.00	14.26
11b	1Mbps	1	6	2437	0.00	14.65
11b	1Mbps	1	11	2462	0.00	15.91
11g	6Mbps	1	1	2412	0.04	14.13
11g	6Mbps	1	6	2437	0.04	12.66
11g	6Mbps	1	11	2462	0.04	11.56
HT20	MCS0	1	1	2412	0.00	12.98
HT20	MCS0	1	6	2437	0.00	11.13
HT20	MCS0	1	11	2462	0.00	10.05
HT40	MCS0	1	3	2422	0.06	11.23
HT40	MCS0	1	6	2437	0.06	12.05
HT40	MCS0	1	9	2452	0.06	9.48

Appendix B. AC Conducted Emission Test Results

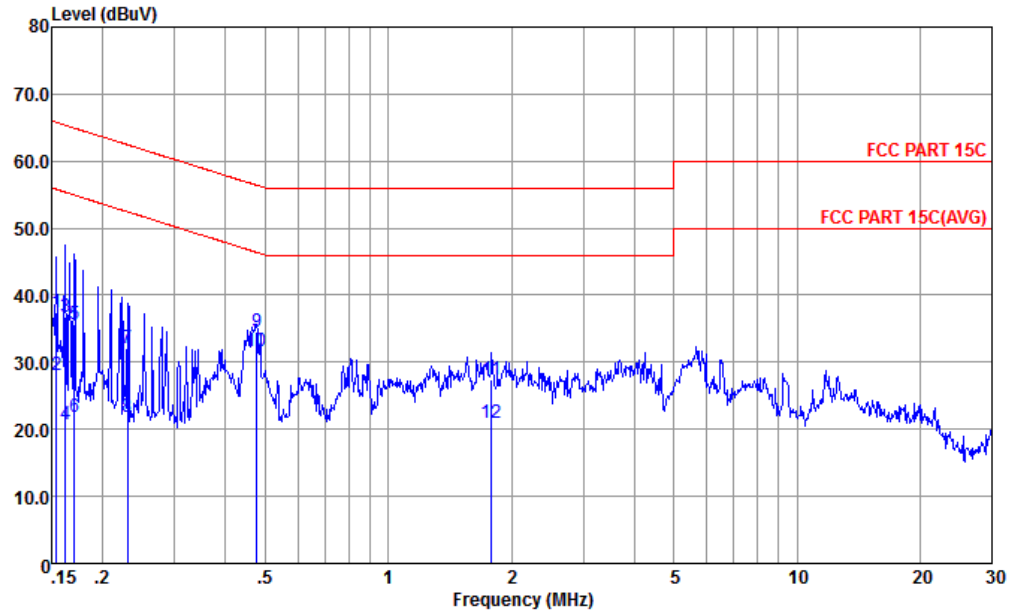
Test Engineer :	Amos Zhang	**Temperature :**	25.6~27.2℃
		Relative Humidity :	37~39%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line



Site : CO01-KS
Condition : FCC PART 15C LISN-L-191028-060105 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.166	36.07	-29.09	65.16	25.60	0.03	10.44	QP
2		0.166	21.07	-34.09	55.16	10.60	0.03	10.44	Average
3		0.186	32.53	-31.67	64.20	22.10	0.04	10.39	QP
4		0.186	21.63	-32.57	54.20	11.20	0.04	10.39	Average
5		0.230	32.49	-29.95	62.44	22.11	0.04	10.34	QP
6		0.230	21.59	-30.85	52.44	11.21	0.04	10.34	Average
7		0.454	35.21	-21.59	56.80	24.90	0.06	10.25	QP
8		0.454	31.81	-14.99	46.80	21.50	0.06	10.25	Average
9		0.471	33.80	-22.69	56.49	23.50	0.06	10.24	QP
10	*	0.471	31.80	-14.69	46.49	21.50	0.06	10.24	Average
11		4.180	27.19	-28.81	56.00	16.80	0.13	10.26	QP
12		4.180	20.59	-25.41	46.00	10.20	0.13	10.26	Average

Test Engineer :	Amos Zhang	Temperature :	25.6~27.2℃
		Relative Humidity :	37~39%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
Condition : FCC PART 15C LISN-N-191028-060105 NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.154	37.45	-28.33	65.78	26.90	0.08	10.47	QP
2		0.154	28.05	-27.73	55.78	17.50	0.08	10.47	Average
3		0.162	36.73	-28.61	65.34	26.20	0.08	10.45	QP
4		0.162	20.83	-34.51	55.34	10.30	0.08	10.45	Average
5		0.170	35.61	-29.33	64.94	25.10	0.08	10.43	QP
6		0.170	21.81	-33.13	54.94	11.30	0.08	10.43	Average
7		0.230	32.03	-30.41	62.44	21.61	0.08	10.34	QP
8		0.230	21.93	-30.51	52.44	11.51	0.08	10.34	Average
9		0.476	34.54	-21.87	56.41	24.20	0.10	10.24	QP
10	*	0.476	31.64	-14.77	46.41	21.30	0.10	10.24	Average
11		1.790	27.46	-28.54	56.00	17.10	0.13	10.23	QP
12		1.790	20.86	-25.14	46.00	10.50	0.13	10.23	Average

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		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2381.37	53.35	-20.65	74	47.8	31.19	7.01	32.65	147	98	P	H
		2389.69	42.64	-11.36	54	37.03	31.2	7.04	32.63	147	98	A	H
	*	2412	100.85	-	-	95.1	31.31	7.06	32.62	147	98	P	H
	*	2412	97.59	-	-	91.84	31.31	7.06	32.62	147	98	A	H
		2388.39	54.62	-19.38	74	49.01	31.2	7.04	32.63	297	110	P	V
		2389.82	43.66	-10.34	54	38.05	31.2	7.04	32.63	297	110	A	V
	*	2412	107.72	-	-	101.97	31.31	7.06	32.62	297	110	P	V
	*	2412	101.64	-	-	95.89	31.31	7.06	32.62	297	110	A	V
802.11b CH 11 2462MHz	*	2488.66	54.47	-19.53	74	48	31.89	7.18	32.6	154	97	P	H
	*	2487.52	43.21	-10.79	54	36.74	31.89	7.18	32.6	154	97	A	H
		2464	98.27	-	-	92.09	31.66	7.13	32.61	154	97	P	H
		2462	94.98	-	-	88.8	31.66	7.13	32.61	154	97	A	H
	*	2490.46	55.44	-18.56	74	48.97	31.89	7.18	32.6	282	103	P	V
	*	2487.28	44.42	-9.58	54	38.09	31.77	7.16	32.6	282	103	A	V
		2460	105.43	-	-	99.25	31.66	7.13	32.61	282	103	P	V
		2462	101.02	-	-	94.84	31.66	7.13	32.61	282	103	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	46.5	-27.5	74	65.49	33.72	9.85	62.56	102	246	P	H
		4824	43.2	-10.8	54	62.19	33.72	9.85	62.56	102	246	A	H
		7236	48.67	-25.33	74	63.35	35.73	12.44	62.85	100	189	P	H
		7236	44.35	-9.65	54	59.03	35.73	12.44	62.85	100	189	A	H
		4824	50.45	-23.55	74	69.44	33.72	9.85	62.56	122	82	P	V
	!	4824	48.02	-5.98	54	67.01	33.72	9.85	62.56	122	82	A	V
		7236	52.42	-21.58	74	67.1	35.73	12.44	62.85	102	65	P	V
		7236	47.66	-6.34	54	62.34	35.73	12.44	62.85	102	65	A	V
802.11b CH 06 2437MHz		4872	49.68	-24.32	74	68.5	33.77	9.95	62.54	100	200	P	H
		4872	48.07	-5.93	54	66.89	33.77	9.95	62.54	100	200	A	H
		7308	46.45	-27.55	74	61.48	35.86	12.6	63.49	300	0	P	H
		4872	53.08	-20.92	74	71.9	33.77	9.95	62.54	113	103	P	V
	!	4872	51.34	-2.66	54	70.16	33.77	9.95	62.54	113	103	A	V
		7308	48.27	-25.73	74	63.3	35.86	12.6	63.49	300	360	P	V
802.11b CH 11 2462MHz		4926	50.46	-23.54	74	69.11	33.82	10.06	62.53	100	244	P	H
		4926	48.42	-5.58	54	67.07	33.82	10.06	62.53	100	244	A	H
		7386	42.22	-31.78	74	57.7	36.01	12.8	64.29	300	0	P	H
		4924	53.58	-20.42	74	72.23	33.82	10.06	62.53	100	98	P	V
	!	4924	52.41	-1.59	54	71.06	33.82	10.06	62.53	100	98	A	V
		7386	43.04	-30.96	74	58.52	36.01	12.8	64.29	300	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	61.4	-12.6	74	57.35	31.2	5.48	32.63	178	19	P	H
		2389.95	47.85	-6.15	54	43.8	31.2	5.48	32.63	178	19	A	H
	*	2414	108.88	-	-	104.71	31.31	5.48	32.62	178	19	P	H
	*	2412	101.01	-	-	96.84	31.31	5.48	32.62	178	19	A	H
		2389.04	62.33	-11.67	74	58.28	31.2	5.48	32.63	305	11	P	V
		2389.95	48.53	-5.47	54	44.48	31.2	5.48	32.63	305	11	A	V
	*	2412	108.8	-	-	104.63	31.31	5.48	32.62	305	11	P	V
	*	2412	101.18	-	-	97.01	31.31	5.48	32.62	305	11	A	V
802.11g CH 11 2462MHz	*	2462	107.76	-	-	103.2	31.66	5.51	32.61	101	21	P	H
	*	2462	99.87	-	-	95.31	31.66	5.51	32.61	101	21	A	H
		2484.4	58.35	-15.65	74	53.63	31.77	5.55	32.6	101	21	P	H
		2483.5	45.67	-8.33	54	40.95	31.77	5.55	32.6	101	21	A	H
	*	2464	106.35	-	-	101.75	31.66	5.55	32.61	330	13	P	V
	*	2462	98.59	-	-	94.03	31.66	5.51	32.61	330	13	A	V
		2483.5	58	-16	74	53.28	31.77	5.55	32.6	330	13	P	V
		2483.5	45.46	-8.54	54	40.74	31.77	5.55	32.6	330	13	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	51.2	-22.8	74	71.94	33.72	8.1	62.56	283	72	P	H
		4824	41.94	-12.06	54	62.68	33.72	8.1	62.56	283	72	A	H
		4824	51.97	-22.03	74	72.71	33.72	8.1	62.56	118	74	P	V
		4824	44.43	-9.57	54	65.17	33.72	8.1	62.56	118	74	A	V
802.11g CH 06 2437MHz		4872	46.68	-27.32	74	67.36	33.77	8.09	62.54	310	67	P	H
		4872	40.65	-13.35	54	61.33	33.77	8.09	62.54	310	67	A	H
		7308	49.83	-24.17	74	67.71	35.86	9.75	63.49	305	137	P	H
		7308	40.37	-13.63	54	58.25	35.86	9.75	63.49	305	137	A	H
		4872	51.77	-22.23	74	72.45	33.77	8.09	62.54	100	351	P	V
		4872	43.1	-10.9	54	63.78	33.77	8.09	62.54	100	351	A	V
		7308	50.6	-23.4	74	68.48	35.86	9.75	63.49	100	116	P	V
		7308	40.55	-13.45	54	58.43	35.86	9.75	63.49	100	116	A	V
802.11g CH 11 2462MHz		4926	45.81	-28.19	74	66.46	33.82	8.06	62.53	300	0	P	H
		7386	44.98	-29.02	74	63.45	36.01	9.81	64.29	300	0	P	H
		4926	48.15	-25.85	74	68.8	33.82	8.06	62.53	148	76	P	V
		4926	43.63	-10.37	54	64.28	33.82	8.06	62.53	148	76	A	V
		7386	44.88	-29.12	74	63.35	36.01	9.81	64.29	300	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)
		2389.82	57.63	-16.37	74	53.58	31.2	5.48	32.63	137	11	P	H
		2389.95	46.66	-7.34	54	42.61	31.2	5.48	32.63	137	11	A	H
802.11n	*	2412	108.36	-	-	104.19	31.31	5.48	32.62	137	11	P	H
HT20	*	2412	100.48	-	-	96.31	31.31	5.48	32.62	137	11	A	H
CH 01		2388.52	58.68	-15.32	74	54.63	31.2	5.48	32.63	303	11	P	V
2412MHz		2389.95	47.13	-6.87	54	43.08	31.2	5.48	32.63	303	11	A	V
	*	2412	107.97	-	-	103.8	31.31	5.48	32.62	303	11	P	V
	*	2412	100.2	-	-	96.03	31.31	5.48	32.62	303	11	A	V
	*	2462	106.75	-	-	102.19	31.66	5.51	32.61	100	12	P	H
	*	2462	98.99	-	-	94.43	31.66	5.51	32.61	100	12	A	H
802.11n		2484.58	58.06	-15.94	74	53.34	31.77	5.55	32.6	100	12	P	H
HT20		2483.5	45.04	-8.96	54	40.32	31.77	5.55	32.6	100	12	A	H
CH 11	*	2460	105.52	-	-	100.96	31.66	5.51	32.61	331	15	P	V
2462MHz	*	2462	98.08	-	-	93.52	31.66	5.51	32.61	331	15	A	V
		2484.04	57.54	-16.46	74	52.82	31.77	5.55	32.6	331	15	P	V
		2483.5	45.4	-8.6	54	40.68	31.77	5.55	32.6	331	15	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	50.35	-23.65	74	71.09	33.72	8.1	62.56	363	67	P	H
		4824	41.66	-12.34	54	62.4	33.72	8.1	62.56	363	67	A	H
		4824	51.18	-22.82	74	71.92	33.72	8.1	62.56	112	24	P	V
		4824	41.61	-12.39	54	62.35	33.72	8.1	62.56	112	24	A	V
802.11n HT20 CH 06 2437MHz		4872	47.52	-26.48	74	68.2	33.77	8.09	62.54	278	73	P	H
		4872	39.17	-14.83	54	59.85	33.77	8.09	62.54	278	73	A	H
		7308	48.85	-25.15	74	66.73	35.86	9.75	63.49	278	163	P	H
		7308	39.46	-14.54	54	57.34	35.86	9.75	63.49	278	163	A	H
		4872	49.72	-24.28	74	70.4	33.77	8.09	62.54	139	75	P	V
		4872	42.55	-11.45	54	63.23	33.77	8.09	62.54	139	75	A	V
		7308	48.94	-25.06	74	66.82	35.86	9.75	63.49	105	64	P	V
		7308	40.1	-13.9	54	57.98	35.86	9.75	63.49	105	64	A	V
802.11n HT20 CH 11 2462MHz		4926	46.01	-27.99	74	66.66	33.82	8.06	62.53	300	0	P	H
		7386	44.71	-29.29	74	63.18	36.01	9.81	64.29	300	0	P	H
		4926	49.44	-24.56	74	70.09	33.82	8.06	62.53	135	76	P	V
		4926	40.57	-13.43	54	61.22	33.82	8.06	62.53	135	76	A	V
		7386	45.25	-28.75	74	63.72	36.01	9.81	64.29	300	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 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)
		2388.39	69.02	-4.98	74	64.97	31.2	5.48	32.63	127	13	P	H
		2389.95	50.89	-3.11	54	46.84	31.2	5.48	32.63	127	13	A	H
	*	2424	103.11	-	-	98.79	31.43	5.51	32.62	127	13	P	H
	*	2424	94.58	-	-	90.26	31.43	5.51	32.62	127	13	A	H
802.11n		2483.8	54.26	-19.74	74	49.54	31.77	5.55	32.6	127	13	P	H
HT40		2483.74	42.14	-11.86	54	37.42	31.77	5.55	32.6	127	13	A	H
CH 03		2389.17	68.95	-5.05	74	64.9	31.2	5.48	32.63	334	12	P	V
2422MHz		2389.95	50.94	-3.06	54	46.89	31.2	5.48	32.63	334	12	A	V
	*	2424	102.83	-	-	98.51	31.43	5.51	32.62	334	12	P	V
	*	2424	94.27	-	-	89.95	31.43	5.51	32.62	334	12	A	V
		2486.56	54.09	-19.91	74	49.37	31.77	5.55	32.6	334	12	P	V
		2483.98	42.08	-11.92	54	37.36	31.77	5.55	32.6	334	12	A	V
		2385.66	53.83	-20.17	74	49.78	31.2	5.48	32.63	142	10	P	H
		2382.67	42.12	-11.88	54	38.13	31.19	5.43	32.63	142	10	A	H
	*	2454	101.62	-	-	97.06	31.66	5.51	32.61	142	10	P	H
	*	2450	93.07	-	-	88.63	31.54	5.51	32.61	142	10	A	H
802.11n		2484.1	65.99	-8.01	74	61.27	31.77	5.55	32.6	142	10	P	H
HT40		2483.5	50.7	-3.3	54	45.98	31.77	5.55	32.6	142	10	A	H
CH 09		2380.59	52.72	-21.28	74	48.75	31.19	5.43	32.65	298	90	P	V
2452MHz		2388.65	41.45	-12.55	54	37.4	31.2	5.48	32.63	298	90	A	V
	*	2450	98.68	-	-	94.24	31.54	5.51	32.61	298	90	P	V
	*	2450	90.63	-	-	86.19	31.54	5.51	32.61	298	90	A	V
		2483.86	62.91	-11.09	74	58.19	31.77	5.55	32.6	298	90	P	V
		2483.5	47.96	-6.04	54	43.24	31.77	5.55	32.6	298	90	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	42.09	-31.91	74	62.82	33.73	8.09	62.55	300	0	P	H
HT40		7266	43.05	-30.95	74	60.7	35.8	9.72	63.17	300	0	P	H
CH 03		4844	45.04	-28.96	74	65.77	33.73	8.09	62.55	300	360	P	V
2422MHz		7266	43.02	-30.98	74	60.67	35.8	9.72	63.17	300	360	P	V
802.11n		4872	44.42	-29.58	74	65.1	33.77	8.09	62.54	100	360	P	H
HT40		7308	44.02	-29.98	74	61.9	35.86	9.75	63.49	100	360	P	H
CH 06		4872	46.2	-27.8	74	66.88	33.77	8.09	62.54	100	360	P	V
2437MHz		7308	43.75	-30.25	74	61.63	35.86	9.75	63.49	100	360	P	V
802.11n		4902	38.91	-35.09	74	59.57	33.8	8.07	62.53	100	360	P	H
HT40		7356	40.85	-33.15	74	59.09	35.95	9.78	63.97	100	360	P	H
CH 09		4902	45.02	-28.98	74	65.68	33.8	8.07	62.53	100	360	P	V
2452MHz		7356	40.04	-33.96	74	58.28	35.95	9.78	63.97	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

Emission below 1GHz

2.4GHz WIFI (LF)

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)
2.4GHz LF		30	21.35	-18.65	40	29.12	24.1	1.11	32.98	-	-	P	H
		99.84	22.95	-20.55	43.5	37.34	16.9	1.63	32.92	-	-	P	H
		214.3	30.85	-12.65	43.5	46.08	15.39	2.31	32.93	100	0	P	H
		239.52	31.38	-14.62	46	44.52	17.4	2.43	32.97	-	-	P	H
		506.27	28.75	-17.25	46	35.05	23.56	3.39	33.25	-	-	P	H
		728.4	29.86	-16.14	46	33.66	25.24	4.14	33.18	-	-	P	H
		43.58	22.15	-17.85	40	37.26	16.7	1.16	32.97	-	-	P	V
		56.19	20.85	-19.15	40	39.33	13.06	1.42	32.96	-	-	P	V
		192.96	26.83	-16.67	43.5	42.07	15.49	2.19	32.92	-	-	P	V
		198.78	26.28	-17.22	43.5	41.38	15.59	2.22	32.91	-	-	P	V
		576.11	26.92	-19.08	46	32.5	24.33	3.42	33.33	-	-	P	V
		726.46	32.19	-13.81	46	36.03	25.21	4.14	33.19	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The test channel chose from the worst case of above.												

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)

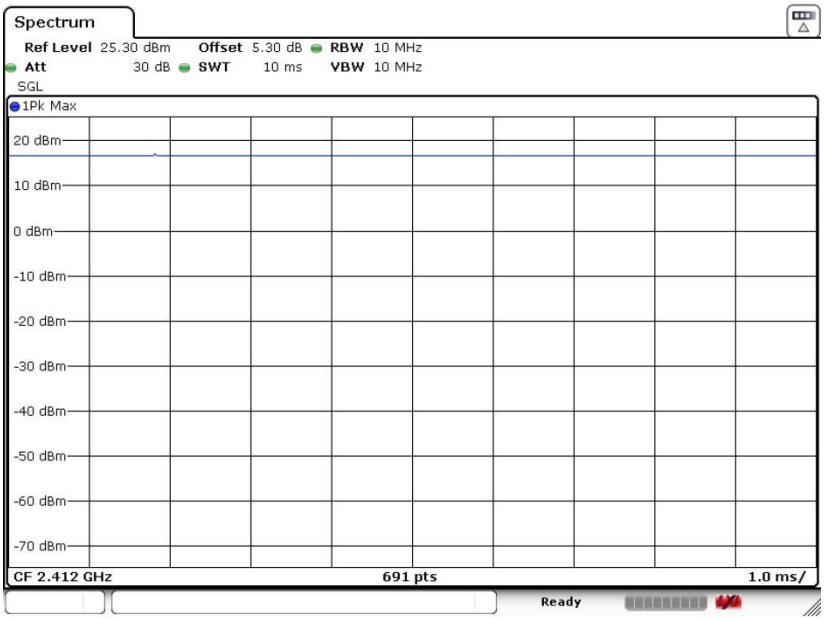
= -10.46(dB)

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

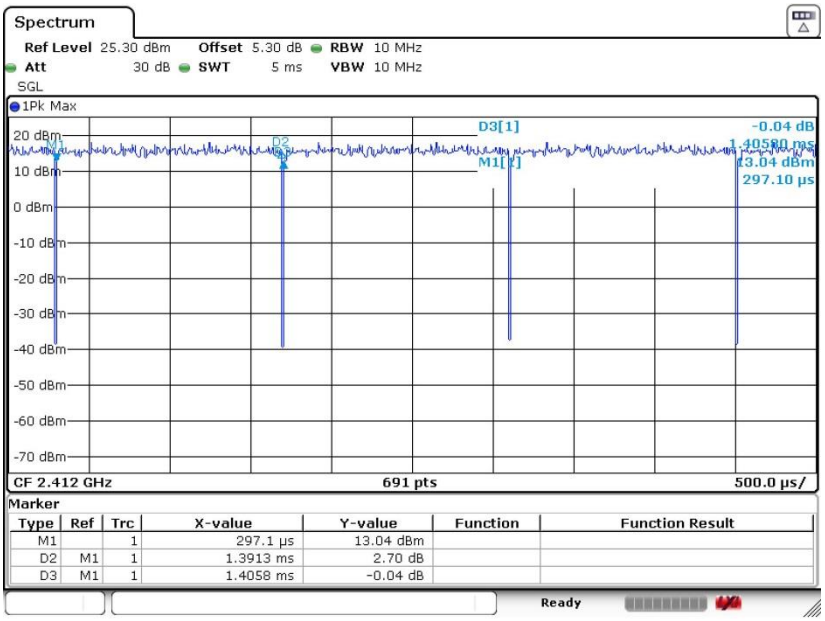
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	100	-	-	10Hz
802.11g	98.97	-	-	10Hz
802.11n HT20	100	-	-	10Hz
802.11n HT40	98.68	-	-	10Hz

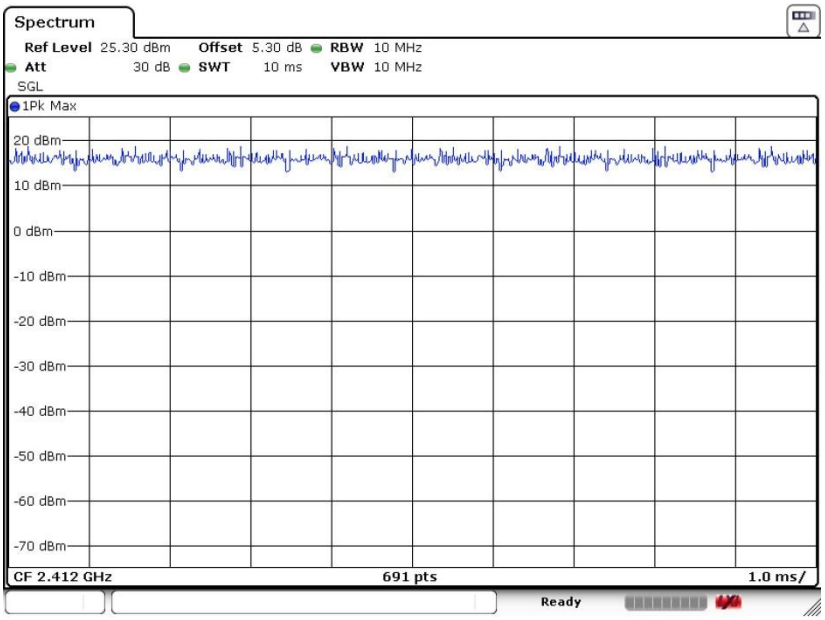
802.11b



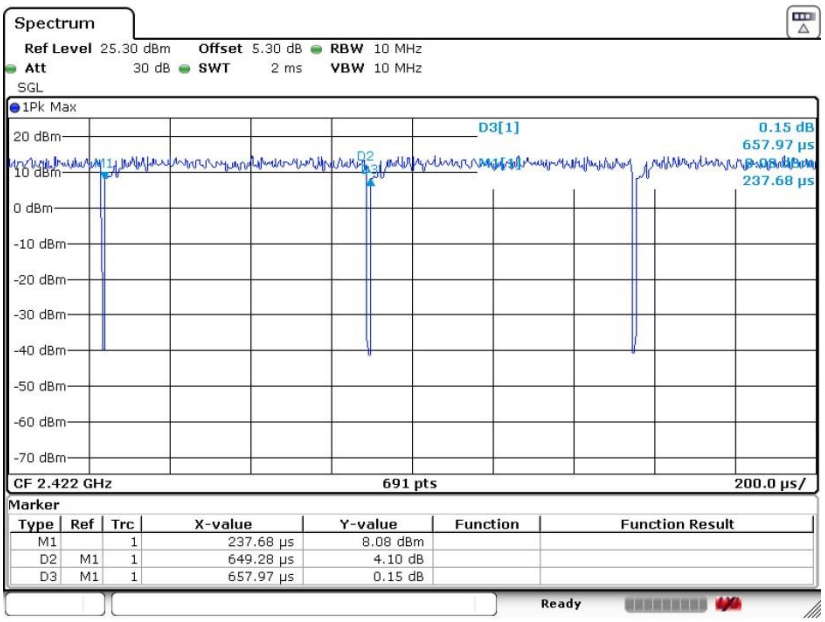
802.11g



802.11n HT20



802.11n HT40


Spectrum
Ref Level 25.30 dBm Offset 5.30 dB RBW 10 MHz
Att 30 dB SWT 2 ms VBW 10 MHz
SGL
1Pk Max
D3[1] 0.15 dB
657.97 µs
D2[1] 4.10 dB
237.68 µs
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.422 GHz
691 pts
200.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 237.68 µs 8.08 dBm
D2 M1 1 649.28 µs 4.10 dB
D3 M1 1 657.97 µs 0.15 dB
Ready