FCC RF Test Report

APPLICANT	:	**Motorola Mobility LLC**
EQUIPMENT	:	**Mobile Cellular Phone**
BRAND NAME	:	**Motorola**
MODEL NAME	:	**XT1941-5, XT1941-3**
FCC ID	:	**IHDT56XK1**
STANDARD	:	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	:	**(DTS) Digital Transmission System**

The product was received on Jun. 04, 2018 and testing was completed on Jun. 28, 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

TESTING
NVLAP LAB CODE 600155-0

Sporton International (Kunshan) Inc.
No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR860402C	Rev. 01	Initial issue of report	Jul. 12, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.03 dB at 2483.510 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 6.09 dB at 0.167 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

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

1.2 Manufacturer

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

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT1941-5, XT1941-3
FCC ID	IHDT56XK1
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM is not supported)/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 Bluetooth BR/EDR/LE
IMEI Code	Conducted: 355542090027733/355542090027741 Conduction: 355542090025752/355542090025760 Radiation: 355542090027873/355542090027881
HW Version	DVT1B
SW Version	fastboot_deen_oem_userdebug_8.1.0_OPK28.26_f325 _intcfg-test-keys_oem
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two types of EUT sample 1 and sample 2, the differences between two samples are only for SIM slot, the sample 1(XT1941-3) is dual SIM slot, the sample 2(XT1941-5) is single SIM slot. We only choose dual SIM sample to perform full tests.

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 : 21.13 dBm (0.1297 W) 802.11g : 22.69 dBm (0.1858 W) 802.11n HT20 : 21.18 dBm (0.1312 W)
Antenna Type / Gain	IFA Antenna with gain -6.0 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 Specification of Accessory

Specification of Accessory				
AC Adapter 1(US)	Brand Name	Motorola(Salom)	Model Name	SC-51
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(EU)	Brand Name	Motorola(Salom)	Model Name	SC-52
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(UK)	Brand Name	Motorola(Salom)	Model Name	SC-53
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(India)	Brand Name	Motorola(Salom)	Model Name	SC-54
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(AU)	Brand Name	Motorola(Salom)	Model Name	SC-55
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(AR)	Brand Name	Motorola(Salom)	Model Name	SC-56
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(BR)	Brand Name	Motorola(Salom)	Model Name	SC-57
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(PRC)	Brand Name	Motorola(Salom)	Model Name	SC-58
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 1(Chile)	Brand Name	Motorola(Salom)	Model Name	SC-52
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 2(US)	Brand Name	Motorola(chenyang)	Model Name	SC-51
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 2(EU)	Brand Name	Motorola(chenyang)	Model Name	SC-52
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 2(UK)	Brand Name	Motorola(chenyang)	Model Name	SC-53
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 2(AU)	Brand Name	Motorola(chenyang)	Model Name	SC-55
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 2(AR)	Brand Name	Motorola(chenyang)	Model Name	SC-56
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 2(PRC)	Brand Name	Motorola(chenyang)	Model Name	SC-58
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 3(BR)	Brand Name	Motorola(Salom/Flex)	Model Name	SC-57
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
AC Adapter 4(BR)	Brand Name	Motorola (Tenpao/Cliptech)	Model Name	SC-57
	Power Rating	I/P: 100-240 Vac, 600mA, O/P: 5/9/12 Vdc, 3000/2000/1500 mA		
Battery	Brand Name	Motorola	Model Name	JE40
	Power Rating	3.8Vdc,2820mAh	Type	Li-ion
Earphone 1	Brand Name	Motorola (New Leader)	Model Name	NLD-EM307E-09SF
	Signal Line Type	1.2 meter, non-shielded cable, without ferrite core		
Earphone 2	Brand Name	Motorola	Model Name	SH38C16618 (L20)
	Signal Line Type	1.2 meter, non-shielded cable, without ferrite core		

USB Cable 1	**Brand Name**	Motorola (Liqi)	**Model Name**	LQ-03500079
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		
USB Cable 2	**Brand Name**	Motorola (Saibao)	**Model Name**	SLQ-A1111A
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		
USB Cable 3	**Brand Name**	Motorola (I SHENG)	**Model Name**	SC18C28955
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		

1.7 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	03CH02-KS	CO01-KS	630927

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

1.8 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	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

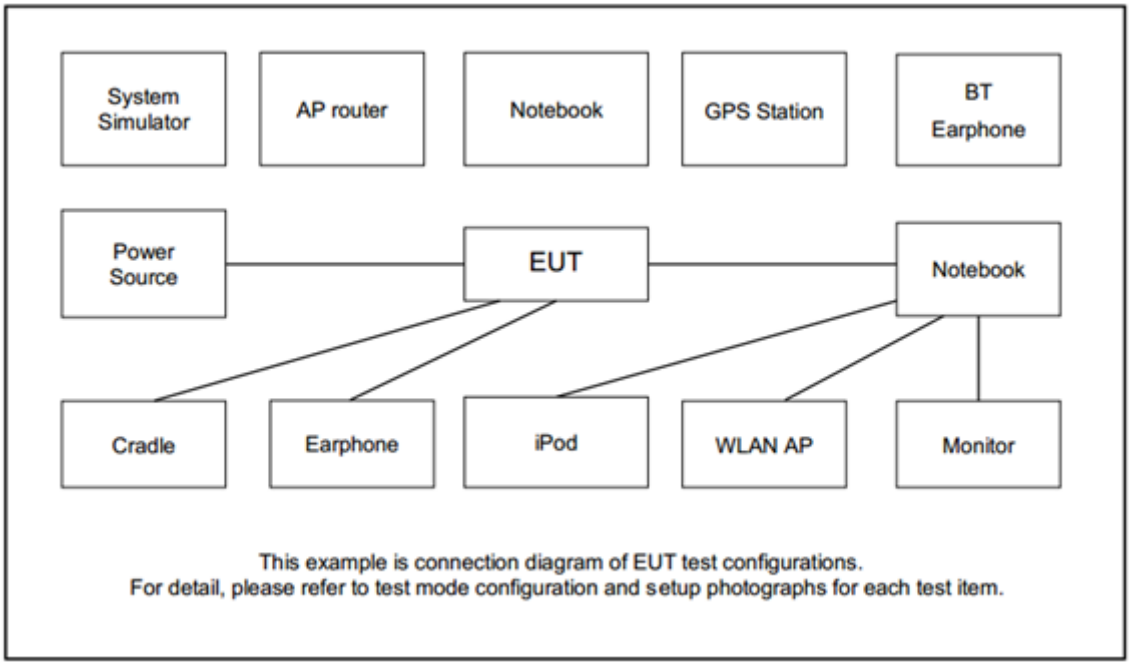
2.2 Test Mode

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

Test Cases	
AC Conducted Emission	Mode 1 :GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + USB Cable 1(Charging from Adapter 4) + Earphone 1
Remark: For Radiated Test Cases, The tests were performed with Adapter 1, USB Cable 1, Earphone 1 and Sample 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	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-link	DIR-855	KA2DIR855A2	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	FCC DoC	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously 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 5.8 dB.

Offset(dB) = RF cable loss(dB).
= 5.8 (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.

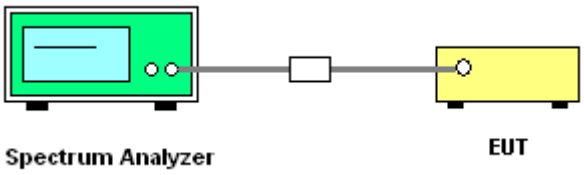
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows 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. Measure and record the results in the test report.

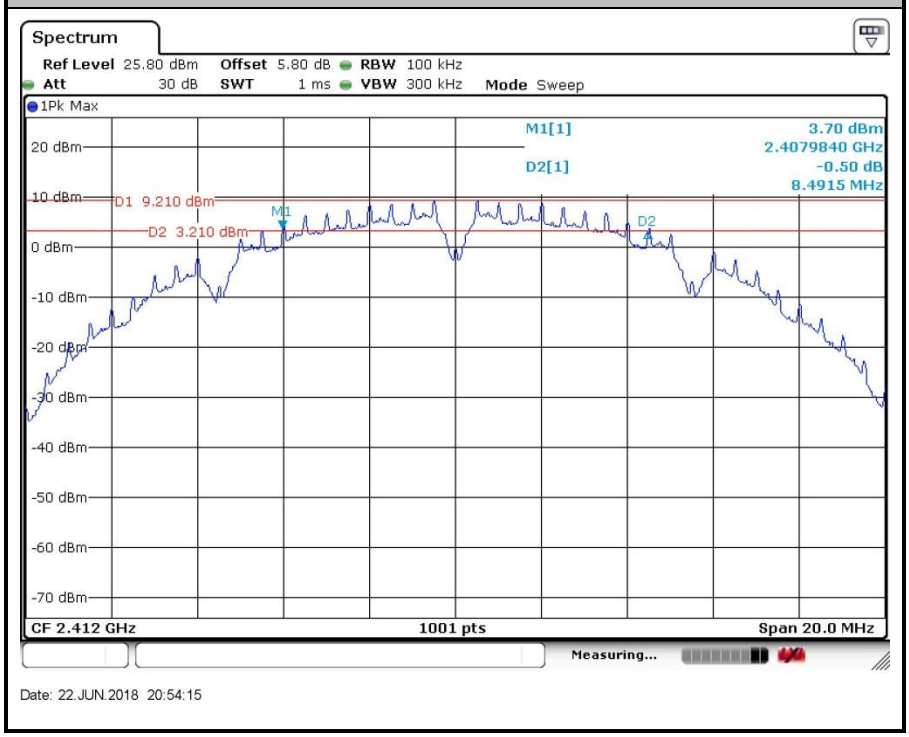
3.1.4 Test Setup



3.1.5 Test Result of 6dB Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB 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.

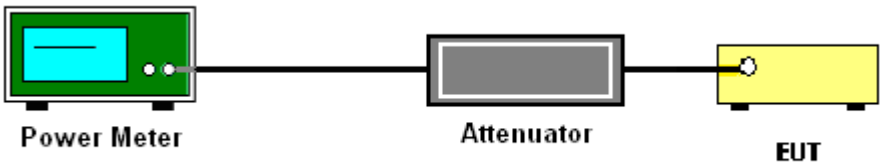
3.2.2 Measuring Instruments

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.

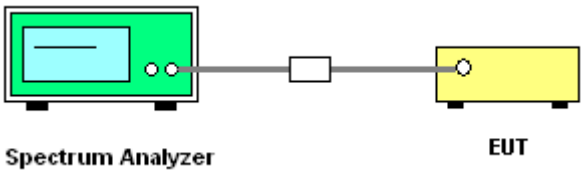
3.3.2 Measuring Instruments

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.

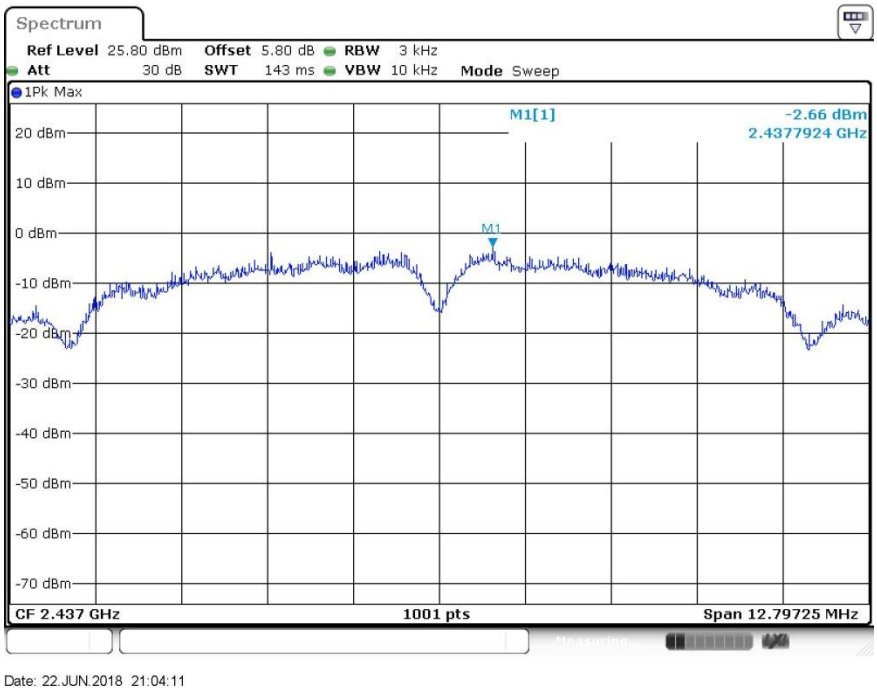
3.3.4 Test Setup



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.

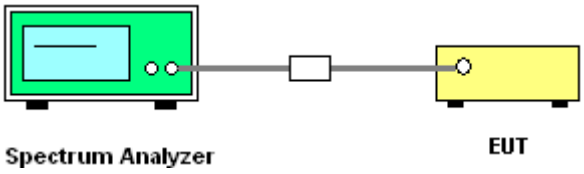
3.4.2 Measuring Instruments

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

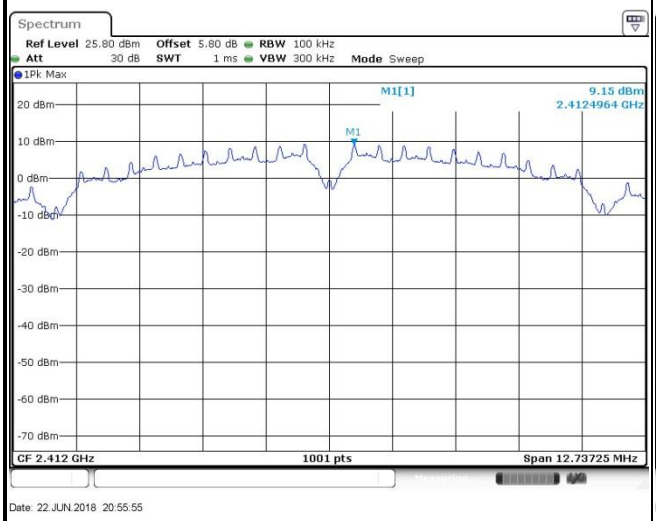


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

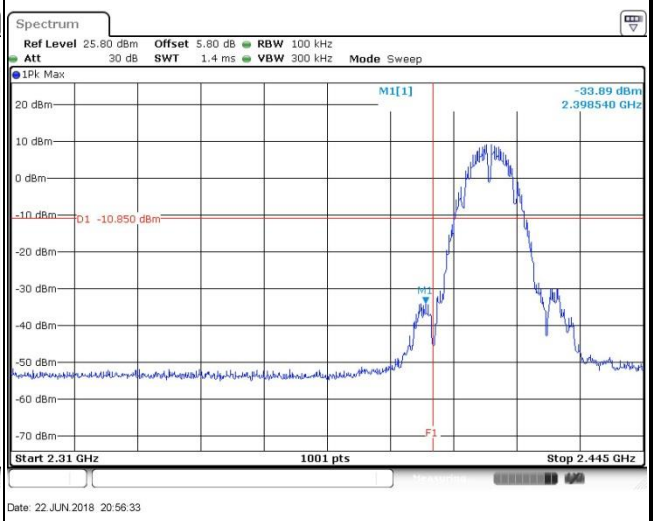
Test Engineer :	Silent Hai	**Temperature :**	21~25℃
		Relative Humidity :	51~55%

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

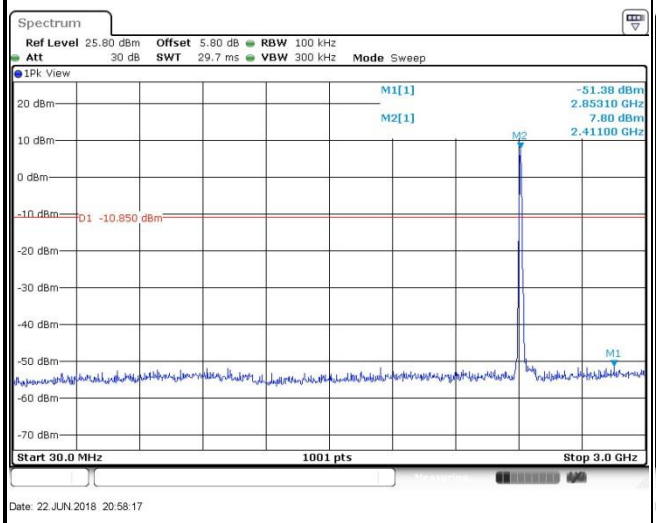
100kHz PSD reference Level



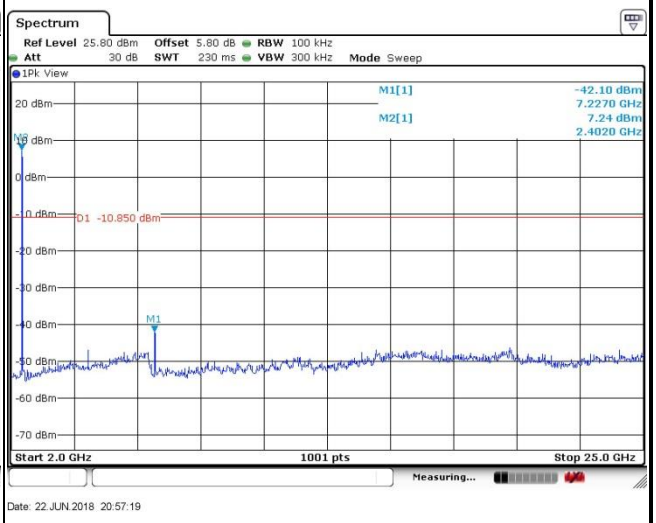
Low Channel Plot



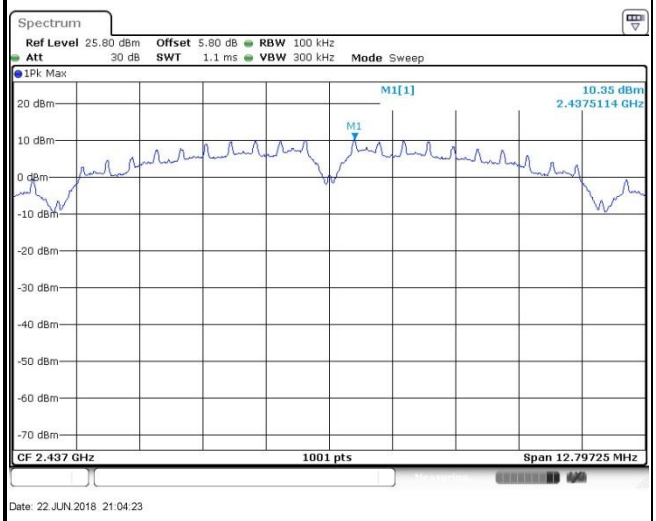
Spurious Emission 30MHz~3GHz

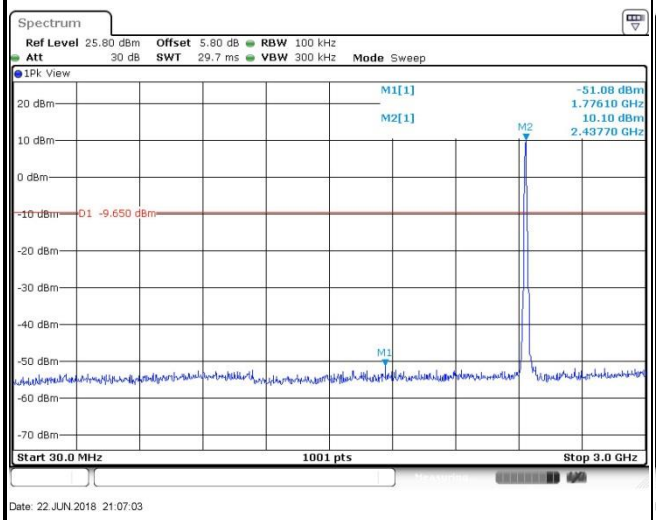
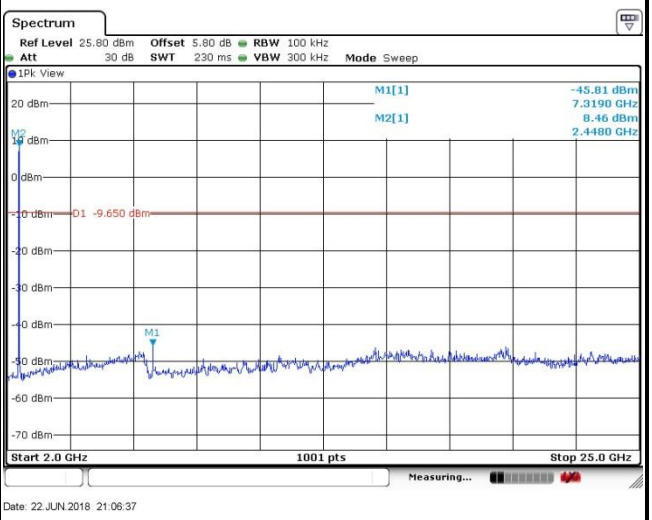


Spurious Emission 2GHz~25GHz

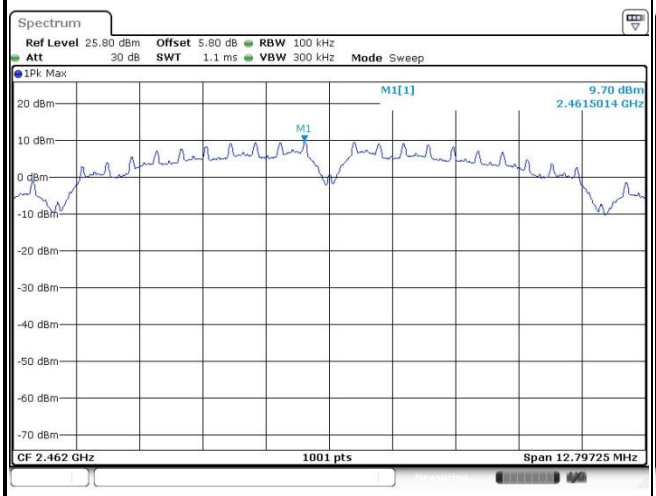
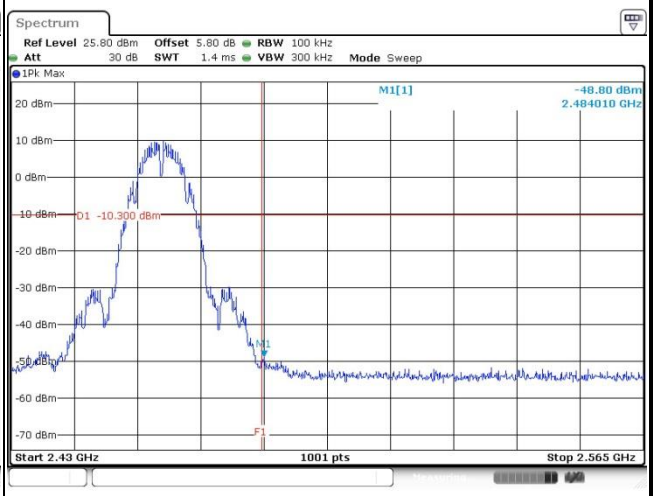
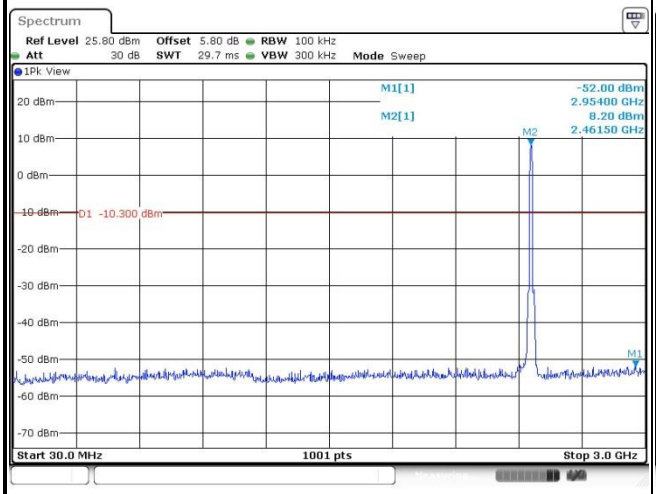
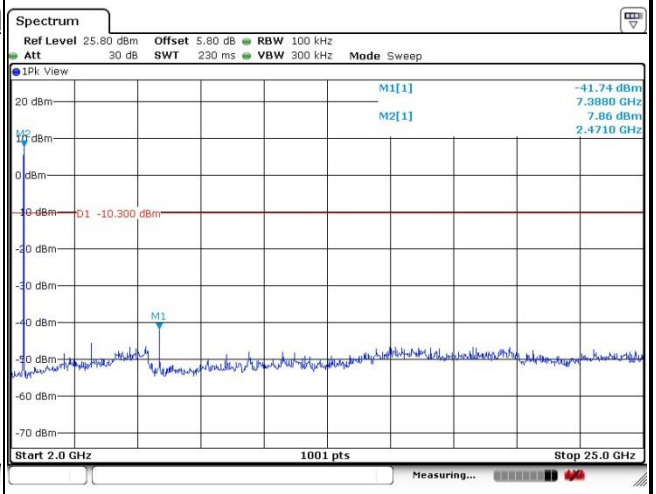


Test Mode :	802.11b	Test Channel :	06

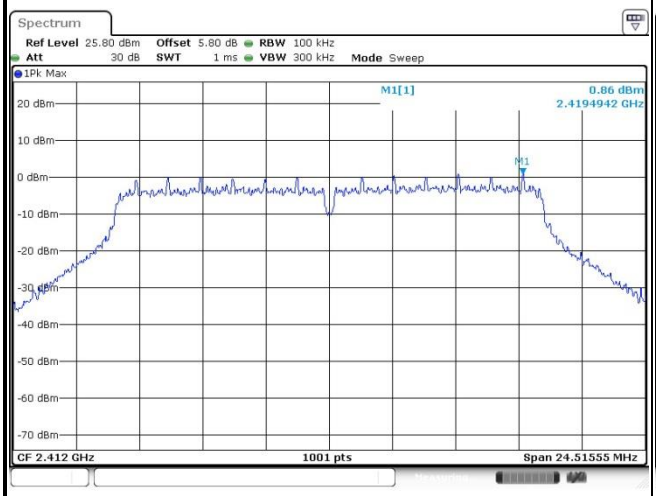
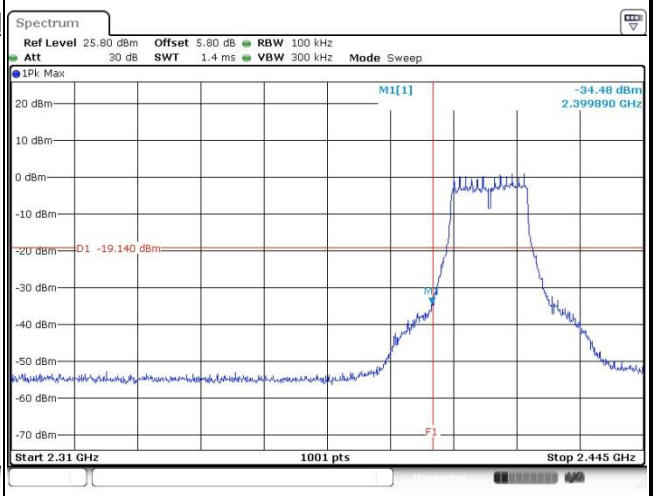
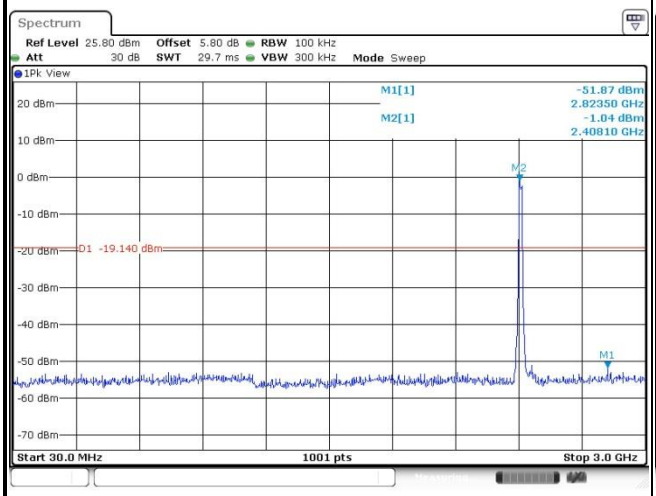
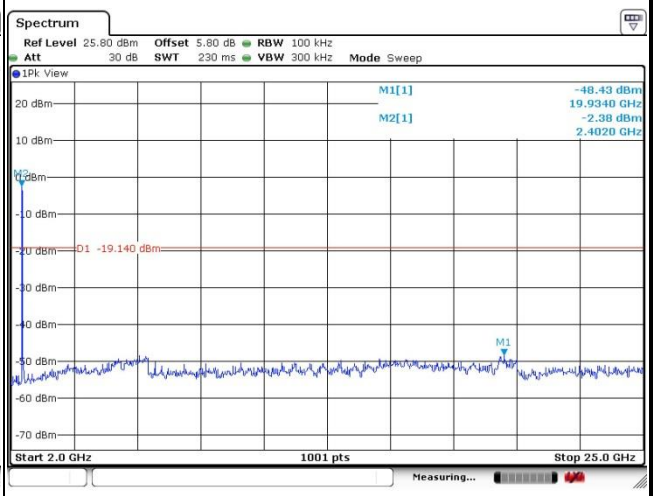
100kHz PSD reference Level	
	

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

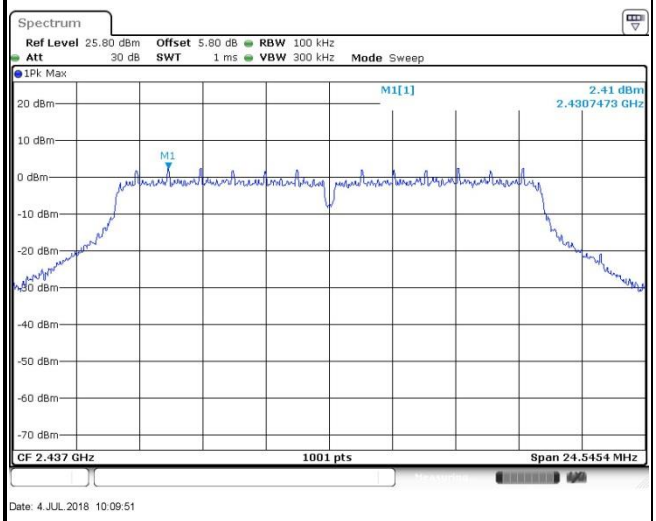
Test Mode :	802.11b	Test Channel :	11

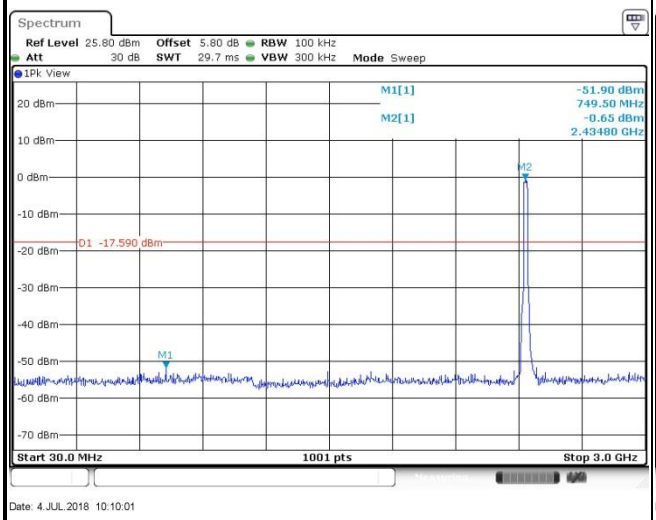
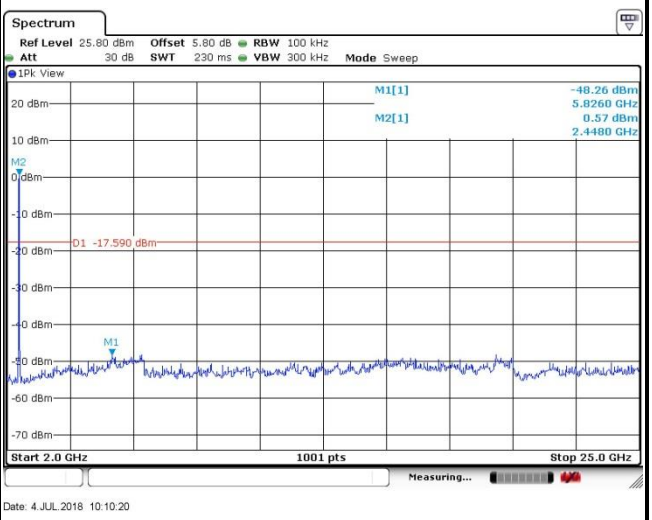
100kHz PSD reference Level	High Channel Plot
	
Date: 22.JUN.2018 21:10:38	Date: 22.JUN.2018 21:10:50
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 22.JUN.2018 21:12:06	Date: 22.JUN.2018 21:11:18

Test Mode :	802.11g	Test Channel :	01

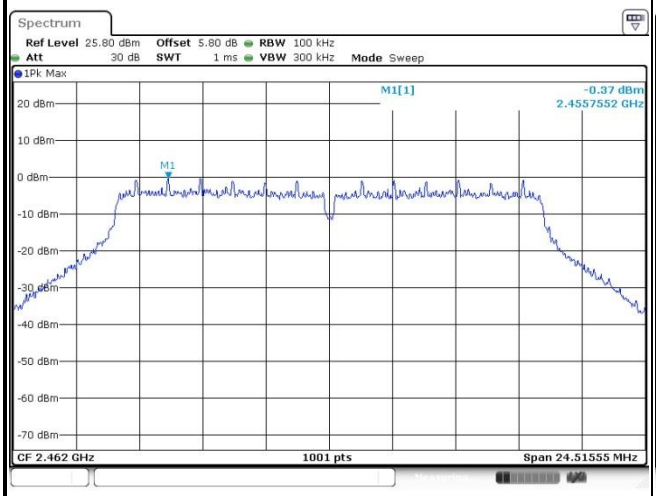
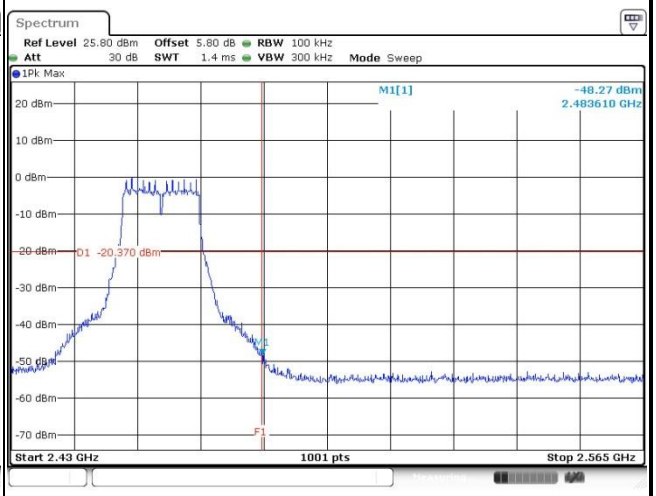
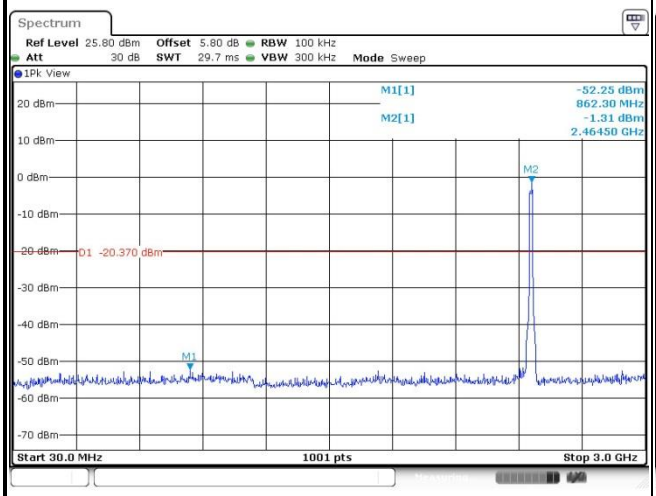
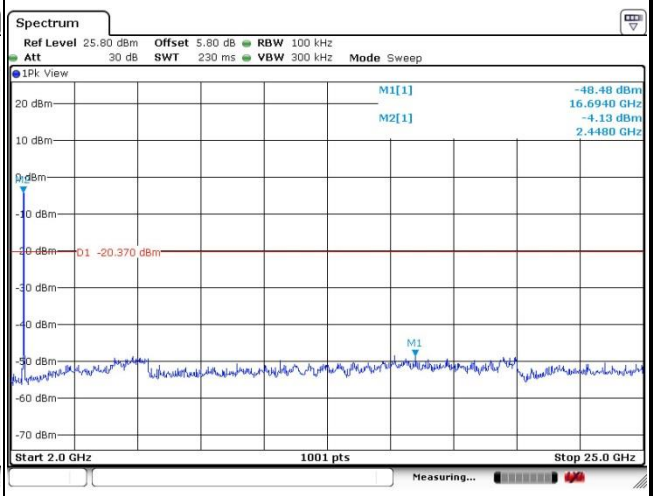
100kHz PSD reference Level	Low Channel Plot
	
Date: 4.JUL.2018 10:03:40	Date: 4.JUL.2018 10:04:18
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 4.JUL.2018 10:04:32	Date: 4.JUL.2018 10:05:03

Test Mode :	802.11g	Test Channel :	06

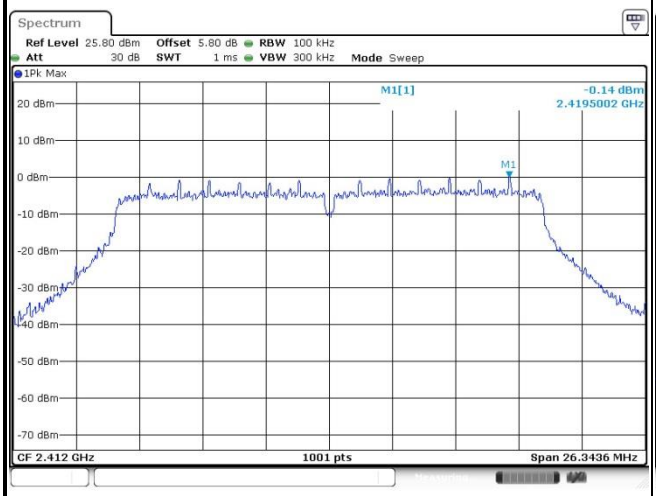
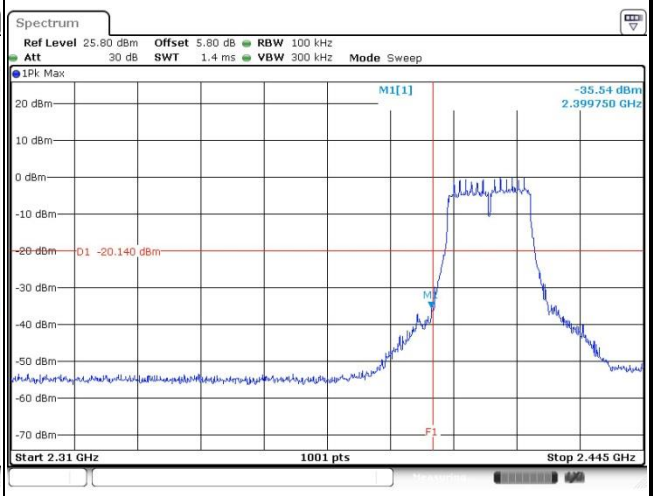
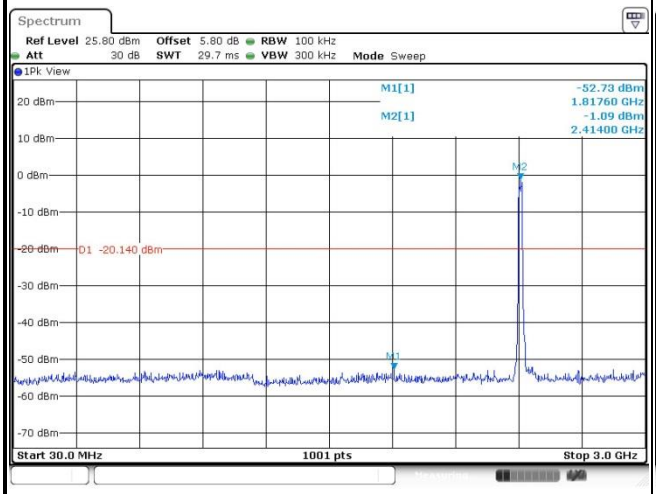
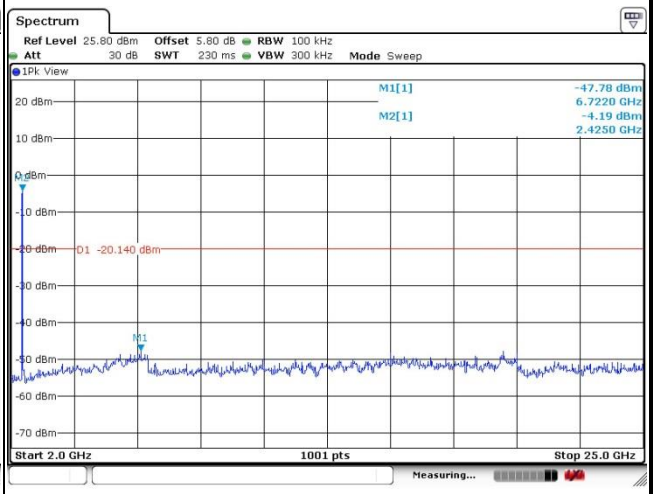
100kHz PSD reference Level	
	

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

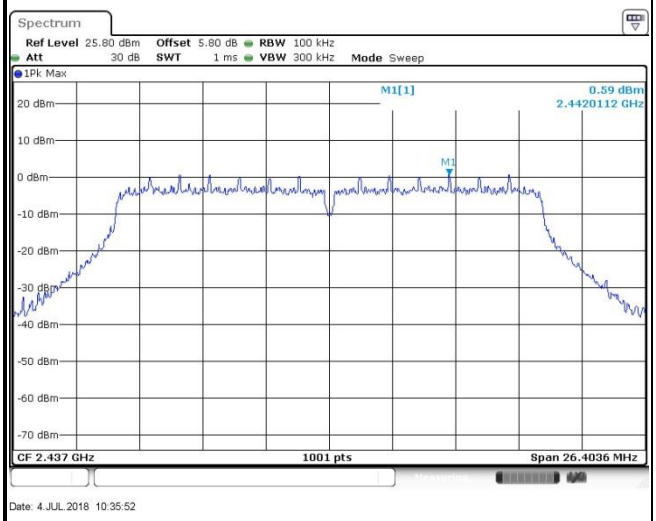
Test Mode :	802.11g	Test Channel :	11

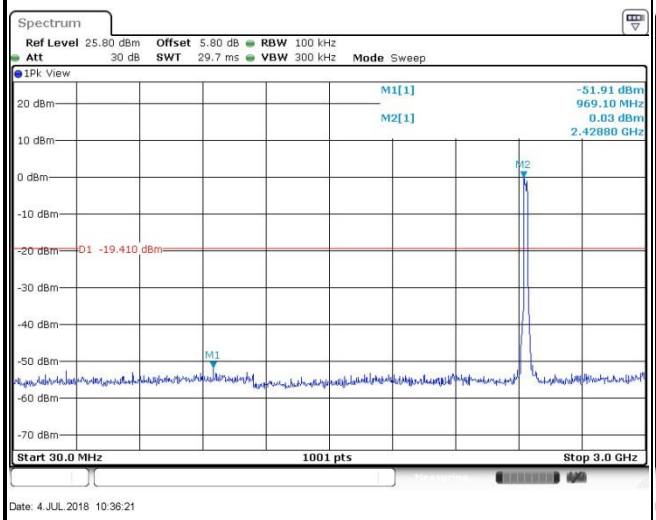
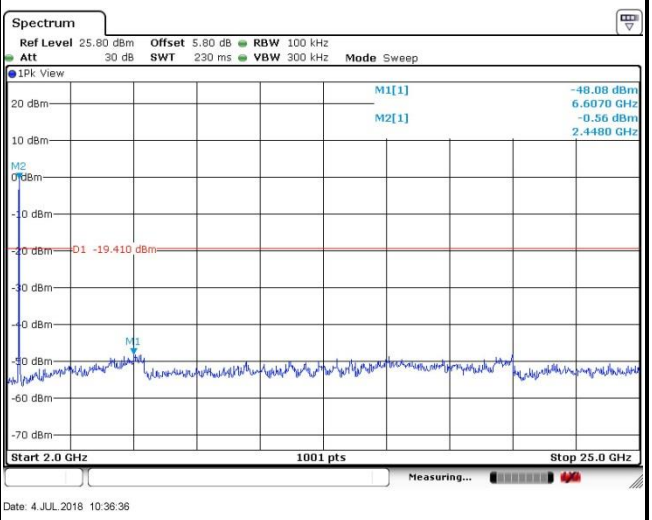
100kHz PSD reference Level	High Channel Plot
	
Date: 4.JUL.2018 10:17:21	Date: 4.JUL.2018 10:17:38
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 4.JUL.2018 10:19:15	Date: 4.JUL.2018 10:19:29

Test Mode :	802.11n HT20	Test Channel :	01

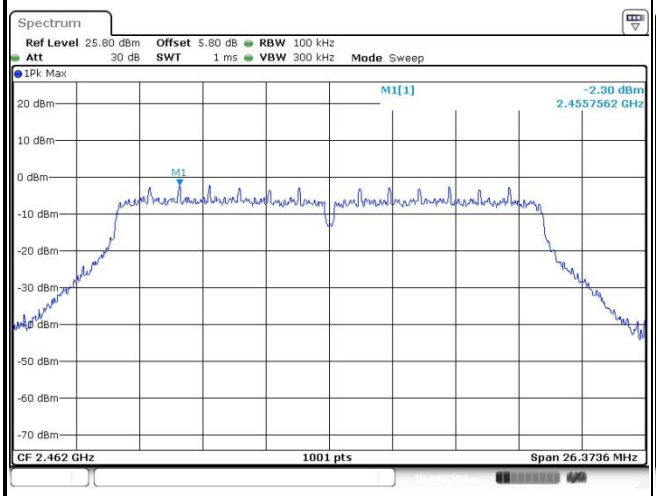
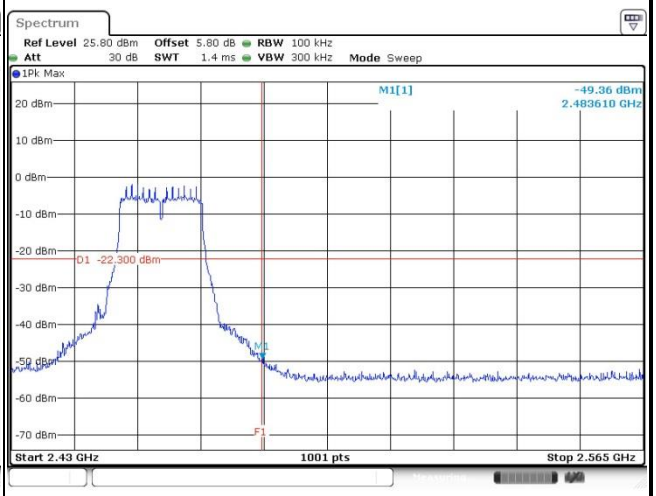
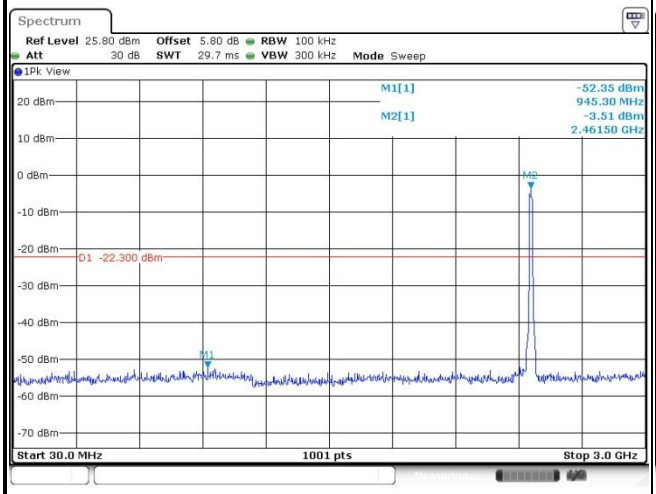
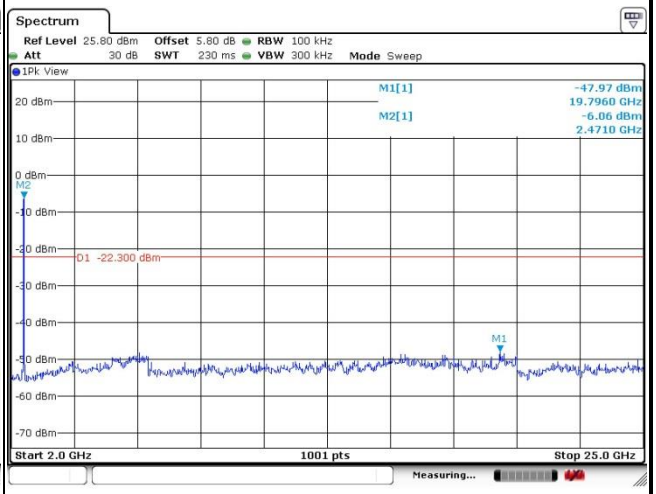
100kHz PSD reference Level	Low Channel Plot
	
Date: 4.JUL.2018 10:28:13	Date: 4.JUL.2018 10:28:48
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 4.JUL.2018 10:29:00	Date: 4.JUL.2018 10:29:42

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
	
Date: 4.JUL.2018 10:41:36	Date: 4.JUL.2018 10:42:29
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 4.JUL.2018 10:42:41	Date: 4.JUL.2018 10:43:13

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

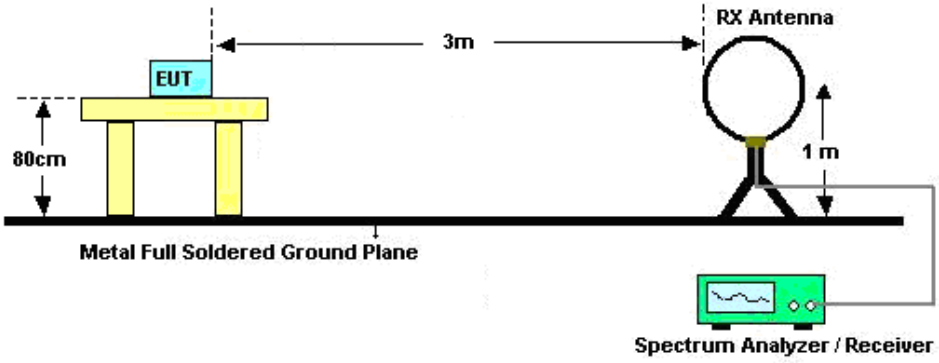
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

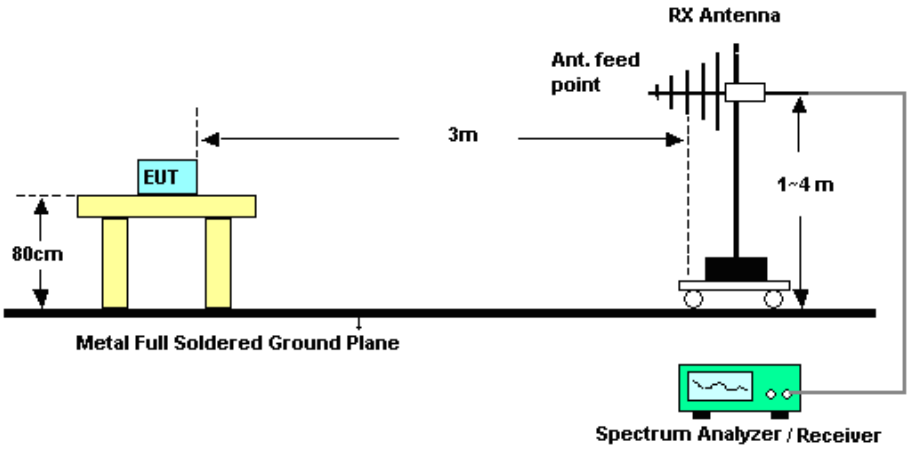
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test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

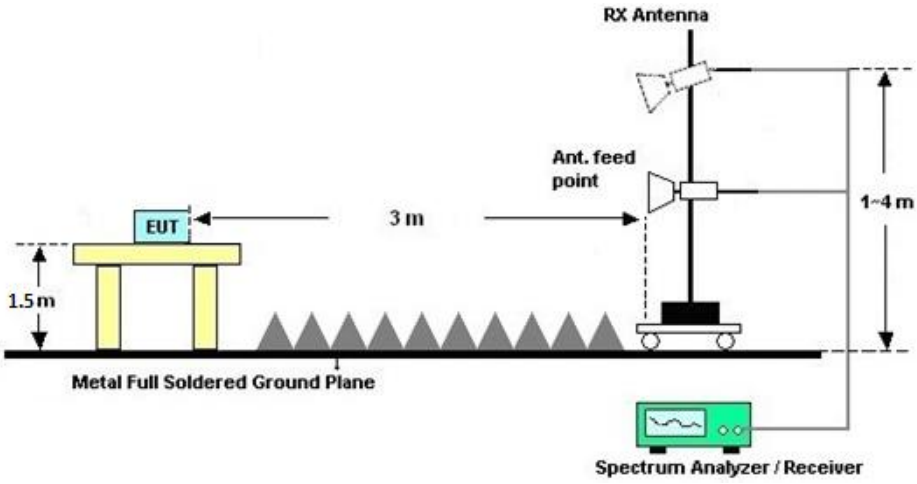
For radiated emissions below 30MHz



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.

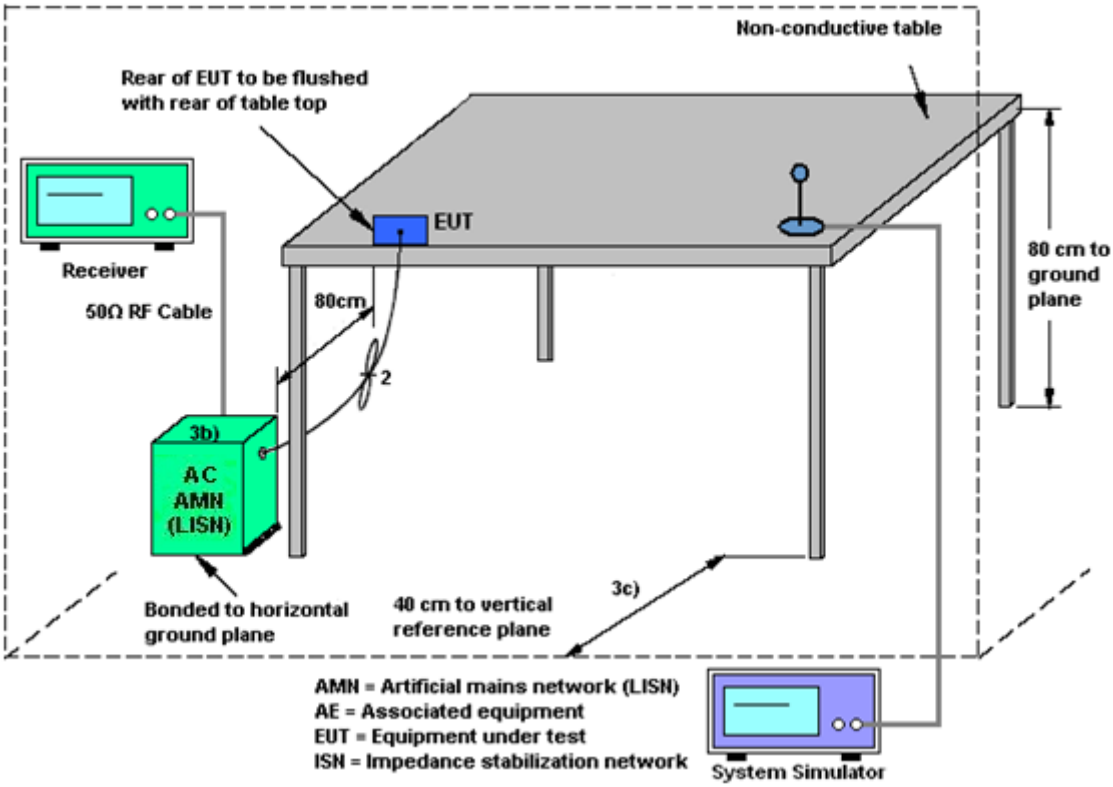
3.6.2 Measuring Instruments

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. 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	Jun. 22, 2018~ Jul. 04, 2018	Aug. 07, 2018	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 18, 2018	Jun. 22, 2018~ Jul. 04, 2018	Jan. 17, 2019	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 18, 2018	Jun. 22, 2018~ Jul. 04, 2018	Jan. 17, 2019	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Aug. 08, 2017	Jul. 05, 2018	Aug. 07, 2018	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44G,MAX 30dB	Apr. 17, 2018	Jul. 05, 2018	Apr. 16, 2019	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz-2GHz	Jan. 29, 2018	Jul. 05, 2018	Jan. 28, 2019	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 21, 2017	Jul. 05, 2018	Oct. 20, 2018	Radiation (03CH02-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 07, 2018	Jul. 05, 2018	Feb. 06, 2019	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Aug. 07, 2017	Jul. 05, 2018	Aug. 06, 2018	Radiation (03CH02-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	100MHz-18GHz	Apr. 17, 2018	Jul. 05, 2018	Apr. 16, 2019	Radiation (03CH02-KS)
Amplifier	Agilent	8449B	3008A02384	1GHz~26.5GHz	Oct. 12, 2017	Jul. 05, 2018	Oct. 11, 2018	Radiation (03CH02-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Oct. 12, 2017	Jul. 05, 2018	Oct. 11, 2018	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Jul. 05, 2018	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Jul. 05, 2018	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Jul. 05, 2018	NCR	Radiation (03CH02-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 19, 2018	Jun. 28, 2018	Apr. 18, 2019	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	Jun. 28, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	Jun. 28, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	Jun. 28, 2018	Oct. 11, 2018	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.7dB

Appendix A. Conducted Test Results

Report Number : FR860402C

A1 - DTS Part

Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2018/6/22~2018/7/4	Relative Humidity:	51~55	%

TEST RESULTS DATA
6dB Occupied Bandwidth

2.4GHz Band							
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	8.49	0.50	Pass
11b	1Mbps	1	6	2437	8.53	0.50	Pass
11b	1Mbps	1	11	2462	8.53	0.50	Pass
11g	6Mbps	1	1	2412	16.34	0.50	Pass
11g	6Mbps	1	6	2437	16.36	0.50	Pass
11g	6Mbps	1	11	2462	16.34	0.50	Pass
HT20	MCS0	1	1	2412	17.56	0.50	Pass
HT20	MCS0	1	6	2437	17.60	0.50	Pass
HT20	MCS0	1	11	2462	17.58	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	19.88	30.00	-6.00	13.88	36.00	Pass
11b	1Mbps	1	6	2437	21.13	30.00	-6.00	15.13	36.00	Pass
11b	1Mbps	1	11	2462	20.45	30.00	-6.00	14.45	36.00	Pass
11g	6Mbps	1	1	2412	20.91	30.00	-6.00	14.91	36.00	Pass
11g	6Mbps	1	6	2437	22.69	30.00	-6.00	16.69	36.00	Pass
11g	6Mbps	1	11	2462	20.68	30.00	-6.00	14.68	36.00	Pass
HT20	MCS0	1	1	2412	20.69	30.00	-6.00	14.69	36.00	Pass
HT20	MCS0	1	6	2437	21.18	30.00	-6.00	15.18	36.00	Pass
HT20	MCS0	1	11	2462	18.85	30.00	-6.00	12.85	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

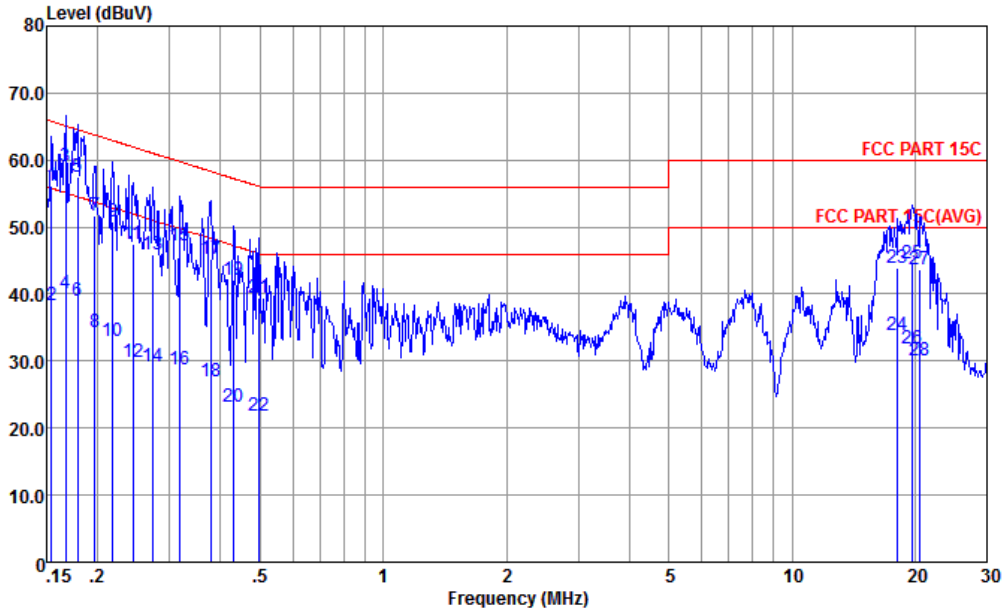
2.4GHz Band						
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.11	17.29
11b	1Mbps	1	6	2437	0.11	18.46
11b	1Mbps	1	11	2462	0.11	17.96
11g	6Mbps	1	1	2412	0.60	12.48
11g	6Mbps	1	6	2437	0.60	14.25
11g	6Mbps	1	11	2462	0.60	11.62
HT20	MCS0	1	1	2412	0.64	11.89
HT20	MCS0	1	6	2437	0.64	12.48
HT20	MCS0	1	11	2462	0.64	9.72

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	-4.46	-6.00	8.00	Pass
11b	1Mbps	1	6	2437	-2.66	-6.00	8.00	Pass
11b	1Mbps	1	11	2462	-3.09	-6.00	8.00	Pass
11g	6Mbps	1	1	2412	-12.83	-6.00	8.00	Pass
11g	6Mbps	1	6	2437	-11.14	-6.00	8.00	Pass
11g	6Mbps	1	11	2462	-13.73	-6.00	8.00	Pass
HT20	MCS0	1	1	2412	-13.62	-6.00	8.00	Pass
HT20	MCS0	1	6	2437	-12.69	-6.00	8.00	Pass
HT20	MCS0	1	11	2462	-16.42	-6.00	8.00	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Amos Zhang	**Temperature :**	24.7~25.1℃
		Relative Humidity :	46~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line

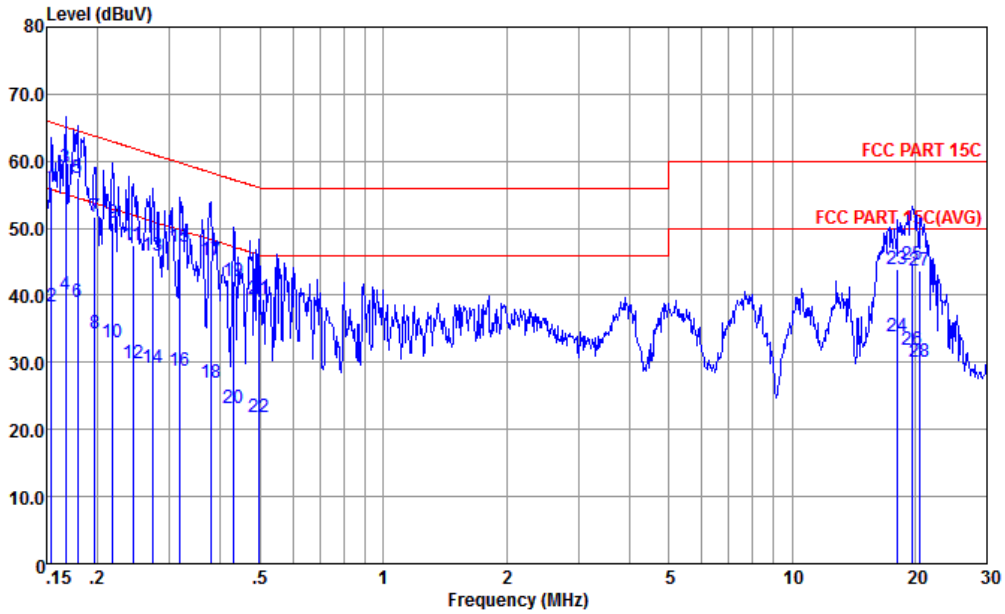


Site : CO01-KS
Condition : FCC PART 15C LISN-L-171013-060103 LINE

mode : Mode 1
: 355542090025752/355542090025760 #13

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.154	56.27	-9.51	65.78	45.51	0.16	10.60	QP
2	0.154	38.37	-17.41	55.78	27.61	0.16	10.60	Average
3 *	0.167	59.03	-6.09	65.12	48.30	0.17	10.56	QP
4	0.167	40.03	-15.09	55.12	29.30	0.17	10.56	Average
5	0.179	57.60	-6.95	64.55	46.90	0.18	10.52	QP
6	0.179	39.00	-15.55	54.55	28.30	0.18	10.52	Average
7	0.197	51.77	-11.99	63.76	41.10	0.20	10.47	QP
8	0.197	34.27	-19.49	53.76	23.60	0.20	10.47	Average
9	0.217	50.86	-12.06	62.92	40.20	0.21	10.45	QP
10	0.217	32.96	-19.96	52.92	22.30	0.21	10.45	Average
11	0.244	47.55	-14.40	61.95	36.90	0.21	10.44	QP
12	0.244	29.95	-22.00	51.95	19.30	0.21	10.44	Average
13	0.273	45.85	-15.18	61.03	35.20	0.22	10.43	QP
14	0.273	29.25	-21.78	51.03	18.60	0.22	10.43	Average
15	0.318	47.25	-12.50	59.75	36.60	0.23	10.42	QP
16	0.318	28.85	-20.90	49.75	18.20	0.23	10.42	Average
17	0.379	45.25	-13.05	58.30	34.60	0.24	10.41	QP

Test Engineer :	Amos Zhang	**Temperature :**	24.7~25.1℃
		Relative Humidity :	46~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line

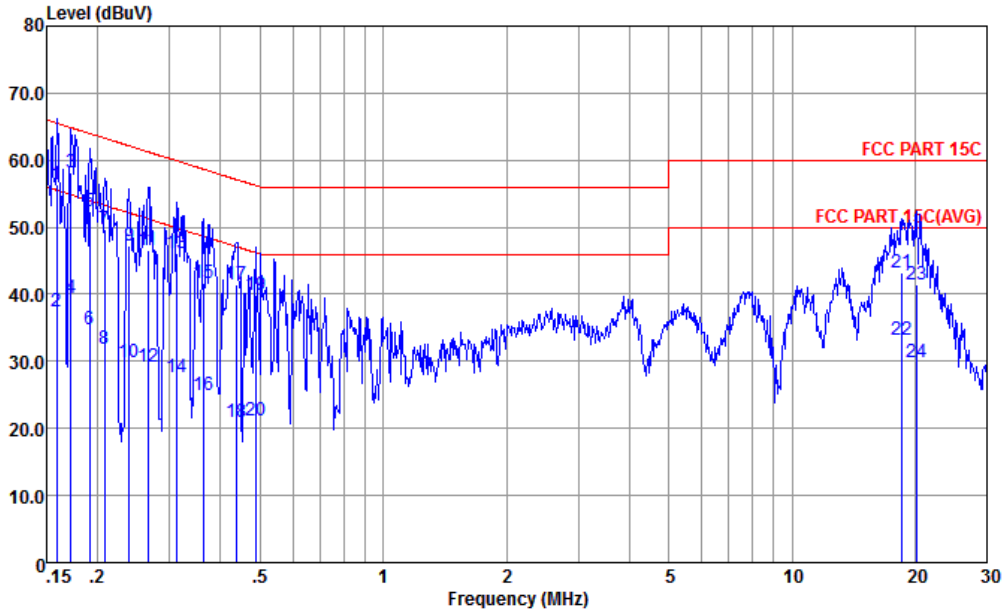


Site : CO01-KS
Condition : FCC PART 15C LISN-L-171013-060103 LINE

mode : Mode 1
: 355542090025752/355542090025760 #13

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
18	0.379	26.85	-21.45	48.30	16.20	0.24	10.41	Average
19	0.431	42.12	-15.12	57.24	31.50	0.25	10.37	QP
20	0.431	23.22	-24.02	47.24	12.60	0.25	10.37	Average
21	0.494	39.47	-16.63	56.10	28.90	0.26	10.31	QP
22	0.494	21.77	-24.33	46.10	11.20	0.26	10.31	Average
23	18.135	43.86	-16.14	60.00	33.19	0.21	10.46	QP
24	18.135	33.96	-16.04	50.00	23.29	0.21	10.46	Average
25	19.740	44.56	-15.44	60.00	33.90	0.18	10.48	QP
26	19.740	31.86	-18.14	50.00	21.20	0.18	10.48	Average
27	20.594	43.60	-16.40	60.00	32.90	0.21	10.49	QP
28	20.594	30.00	-20.00	50.00	19.30	0.21	10.49	Average

Test Engineer :	Amos Zhang	**Temperature :**	24.7~25.1℃
		Relative Humidity :	46~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral

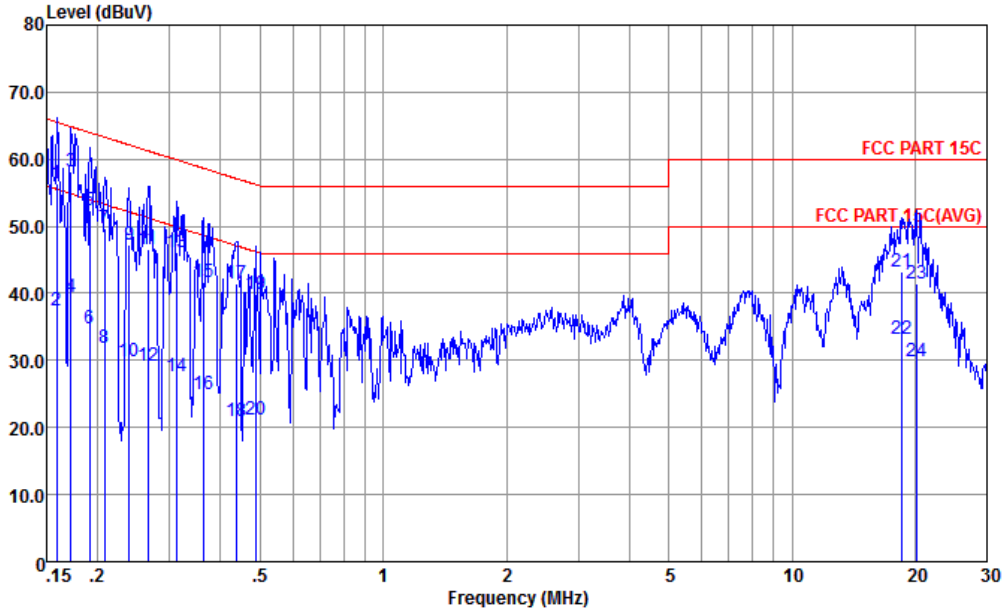


Site : CO01-KS
Condition : FCC PART 15C LISN-N-171013-060103 NEUTRAL

mode : Mode 1
: 355542090025752/355542090025760 #13

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.159	56.47	-9.05	65.52	45.60	0.28	10.59	QP
2		0.159	37.47	-18.05	55.52	26.60	0.28	10.59	Average
3	*	0.172	58.12	-6.74	64.86	47.30	0.28	10.54	QP
4		0.172	39.42	-15.44	54.86	28.60	0.28	10.54	Average
5		0.191	52.36	-11.62	63.98	41.60	0.28	10.48	QP
6		0.191	34.66	-19.32	53.98	23.90	0.28	10.48	Average
7		0.208	49.63	-13.64	63.27	38.90	0.28	10.45	QP
8		0.208	31.93	-21.34	53.27	21.20	0.28	10.45	Average
9		0.239	47.32	-14.81	62.13	36.60	0.28	10.44	QP
10		0.239	29.92	-22.21	52.13	19.20	0.28	10.44	Average
11		0.266	46.62	-14.63	61.25	35.90	0.28	10.44	QP
12		0.266	29.22	-22.03	51.25	18.50	0.28	10.44	Average
13		0.313	46.21	-13.67	59.88	35.51	0.28	10.42	QP
14		0.313	27.61	-22.27	49.88	16.91	0.28	10.42	Average
15		0.363	41.60	-17.05	58.65	30.90	0.29	10.41	QP
16		0.363	24.90	-23.75	48.65	14.20	0.29	10.41	Average
17		0.437	41.45	-15.66	57.11	30.79	0.29	10.37	QP

Test Engineer :	Amos Zhang	**Temperature :**	24.7~25.1℃
		Relative Humidity :	46~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral



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

mode : Mode 1
: 355542090025752/355542090025760 #13

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
18	0.437	20.85	-26.26	47.11	10.19	0.29	10.37	Average
19	0.486	39.81	-16.42	56.23	29.20	0.29	10.32	QP
20	0.486	21.11	-25.12	46.23	10.50	0.29	10.32	Average
21	18.524	43.20	-16.80	60.00	32.60	0.14	10.46	QP
22	18.524	33.30	-16.70	50.00	22.70	0.14	10.46	Average
23	20.270	41.41	-18.59	60.00	30.81	0.12	10.48	QP
24	20.270	29.91	-20.09	50.00	19.31	0.12	10.48	Average

Appendix C. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2388.39	57.65	-16.35	74	57.36	31.8	5.14	36.65	100	116	P	H
		2389.95	45.45	-8.55	54	45.15	31.8	5.14	36.64	100	116	A	H
	*	2414	108.86	-	-	108.48	31.86	5.16	36.64	100	116	P	H
	*	2414	105.82	-	-	105.44	31.86	5.16	36.64	100	116	A	H
		2388.78	52.71	-21.29	74	52.42	31.8	5.14	36.65	335	89	P	V
		2389.95	42.49	-11.51	54	42.19	31.8	5.14	36.64	335	89	A	V
	*	2414	106.06	-	-	105.68	31.86	5.16	36.64	335	89	P	V
	*	2414	102.7	-	-	102.32	31.86	5.16	36.64	335	89	A	V
802.11b CH 11 2462MHz		2486.56	56.68	-17.32	74	56.03	32.09	5.24	36.68	140	107	P	H
	!	2487.46	49.58	-4.42	54	48.93	32.09	5.24	36.68	140	107	A	H
	*	2462	108.58	-	-	108.01	32.03	5.21	36.67	140	107	P	H
	*	2460	105.75	-	-	105.18	32.03	5.21	36.67	140	107	A	H
		2486.68	54.89	-19.11	74	54.24	32.09	5.24	36.68	345	69	P	V
		2487.46	47.16	-6.84	54	46.51	32.09	5.24	36.68	345	69	A	V
	*	2464	105.53	-	-	104.96	32.03	5.21	36.67	345	69	P	V
	*	2464	102.39	-	-	101.82	32.03	5.21	36.67	345	69	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	39.52	-34.48	74	62.09	34.24	7.72	64.53	100	360	P	H
		4824	39.66	-34.34	74	62.23	34.24	7.72	64.53	100	360	P	V
802.11b CH 06 2437MHz		4872	39.62	-34.38	74	62.16	34.31	7.75	64.6	100	360	P	H
		7308	41.02	-32.98	74	60.95	35.79	9.29	65.01	100	360	P	H
		4872	40.53	-33.47	74	63.07	34.31	7.75	64.6	100	360	P	V
		7308	41.16	-32.84	74	61.09	35.79	9.29	65.01	100	360	P	V
802.11b CH 11 2462MHz		4926	39.83	-34.17	74	62.33	34.38	7.8	64.68	100	360	P	H
		7386	40.34	-33.66	74	60.18	35.84	9.37	65.05	100	360	P	H
		4926	39.9	-34.1	74	62.4	34.38	7.8	64.68	100	360	P	V
		7386	41.94	-32.06	74	61.78	35.84	9.37	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	!	2389.95	69.36	-4.64	74	69.06	31.8	5.14	36.64	100	96	P	H
	!	2389.95	50.53	-3.47	54	50.23	31.8	5.14	36.64	100	96	A	H
	*	2418	104.63	-	-	104.26	31.86	5.16	36.65	100	96	P	H
	*	2418	96.93	-	-	96.56	31.86	5.16	36.65	100	96	A	H
		2389.82	64.77	-9.23	74	64.47	31.8	5.14	36.64	358	85	P	V
	!	2389.95	48.88	-5.12	54	48.58	31.8	5.14	36.64	358	85	A	V
	*	2416	103.97	-	-	103.6	31.86	5.16	36.65	358	85	P	V
	*	2418	96.18	-	-	95.81	31.86	5.16	36.65	358	85	A	V
802.11g CH 11 2462MHz		2483.5	64.97	-9.03	74	64.32	32.09	5.24	36.68	100	107	P	H
	!	2483.51	50.97	-3.03	54	50.32	32.09	5.24	36.68	100	107	A	H
	*	2458	104.4	-	-	103.83	32.03	5.21	36.67	100	107	P	H
	*	2458	96.52	-	-	95.95	32.03	5.21	36.67	100	107	A	H
		2483.86	62.35	-11.65	74	61.7	32.09	5.24	36.68	300	66	P	V
		2483.56	47.11	-6.89	54	46.46	32.09	5.24	36.68	300	66	A	V
	*	2466	101.33	-	-	100.76	32.03	5.21	36.67	300	66	P	V
	*	2464	93.59	-	-	93.02	32.03	5.21	36.67	300	66	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	39.65	-34.35	74	62.22	34.24	7.72	64.53	100	360	P	H
		4824	38.78	-35.22	74	61.35	34.24	7.72	64.53	100	360	P	V
802.11g CH 06 2437MHz		4872	40.18	-33.82	74	62.72	34.31	7.75	64.6	100	360	P	H
		7308	40.69	-33.31	74	60.62	35.79	9.29	65.01	100	360	P	H
		4872	39.03	-34.97	74	61.57	34.31	7.75	64.6	100	360	P	V
		7308	40.23	-33.77	74	60.16	35.79	9.29	65.01	100	360	P	V
802.11g CH 11 2462MHz		4926	40.18	-33.82	74	62.68	34.38	7.8	64.68	100	360	P	H
		7386	40.44	-33.56	74	60.28	35.84	9.37	65.05	100	360	P	H
		4926	40.27	-33.73	74	62.77	34.38	7.8	64.68	100	360	P	V
		7386	41.66	-32.34	74	61.5	35.84	9.37	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)
802.11n HT20 CH 01 2412MHz	!	2389.69	69.86	-4.14	74	69.57	31.8	5.14	36.65	102	107	P	H
	!	2389.95	50.77	-3.23	54	50.47	31.8	5.14	36.64	102	107	A	H
	*	2418	104.14	-	-	103.77	31.86	5.16	36.65	102	107	P	H
	*	2420	96.14	-	-	95.72	31.91	5.16	36.65	102	107	A	H
		2389.56	62.87	-11.13	74	62.58	31.8	5.14	36.65	355	114	P	V
		2389.95	46.44	-7.56	54	46.14	31.8	5.14	36.64	355	114	A	V
	*	2420	99.28	-	-	98.86	31.91	5.16	36.65	355	114	P	V
	*	2420	90.75	-	-	90.33	31.91	5.16	36.65	355	114	A	V
802.11n HT20 CH 11 2462MHz		2484.1	66.7	-7.3	74	66.05	32.09	5.24	36.68	100	98	P	H
	!	2483.5	50.85	-3.15	54	50.2	32.09	5.24	36.68	100	98	A	H
	*	2458	102.52	-	-	101.95	32.03	5.21	36.67	100	98	P	H
	*	2456	94.15	-	-	93.58	32.03	5.21	36.67	100	98	A	H
		2484.1	63.59	-10.41	74	62.94	32.09	5.24	36.68	345	69	P	V
	!	2483.5	48	-6	54	47.35	32.09	5.24	36.68	345	69	A	V
	*	2466	99.55	-	-	98.98	32.03	5.21	36.67	345	69	P	V
	*	2466	91.76	-	-	91.19	32.03	5.21	36.67	345	69	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	39.01	-34.99	74	61.58	34.24	7.72	64.53	100	360	P	H
		4824	39.22	-34.78	74	61.79	34.24	7.72	64.53	100	360	P	V
802.11n HT20 CH 06 2437MHz		4872	39.39	-34.61	74	61.93	34.31	7.75	64.6	100	360	P	H
		7308	41.67	-32.33	74	61.6	35.79	9.29	65.01	100	360	P	H
		4872	40.62	-33.38	74	63.16	34.31	7.75	64.6	100	360	P	V
		7308	39.82	-34.18	74	59.75	35.79	9.29	65.01	100	360	P	V
802.11n HT20 CH 11 2462MHz		4926	40.35	-33.65	74	62.85	34.38	7.8	64.68	100	360	P	H
		7386	40.59	-33.41	74	60.43	35.84	9.37	65.05	100	360	P	H
		4926	40.35	-33.65	74	62.85	34.38	7.8	64.68	100	360	P	V
		7386	40.71	-33.29	74	60.55	35.84	9.37	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

Emission below 1GHz

2.4GHz WIFI 802.11g (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 802.11g LF		30	21.83	-18.17	40	28.79	24.5	0.57	32.03	-	-	P	H
		118.27	16.75	-26.75	43.5	29.54	18	1.11	31.9	-	-	P	H
		267.65	19.79	-26.21	46	30.31	19.07	1.81	31.4	-	-	P	H
		490.75	23.68	-22.32	46	28.64	23.05	2.34	30.35	-	-	P	H
		750.71	28.44	-17.56	46	29.06	25.21	2.82	28.65	-	-	P	H
		935.01	29.41	-16.59	46	26.71	26.78	3.17	27.25	100	0	P	H
		30	22.74	-17.26	40	29.7	24.5	0.57	32.03	-	-	P	V
		110.51	15.83	-27.67	43.5	29.09	17.58	1.07	31.91	-	-	P	V
		141.55	16.36	-27.14	43.5	29.93	17.07	1.22	31.86	-	-	P	V
		285.11	20.19	-25.81	46	30.79	18.78	1.87	31.25	-	-	P	V
		605.21	26.71	-19.29	46	29.4	24.31	2.63	29.63	-	-	P	V
		850.62	29.81	-16.19	46	28.57	26.1	3.05	27.91	100	0	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 per 15.209(c).
!	Test result is **not under limit 6dB**.
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 Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		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)

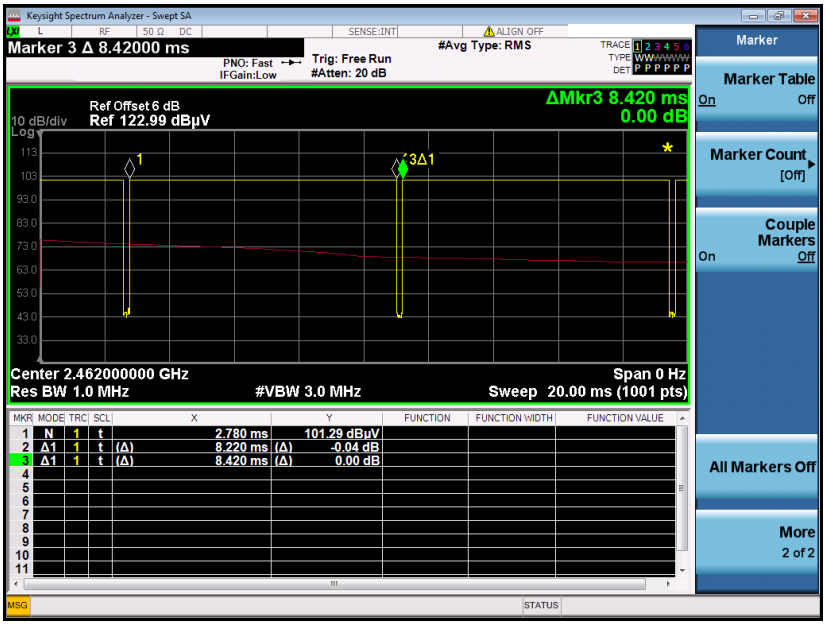
= -10.46(dB)

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

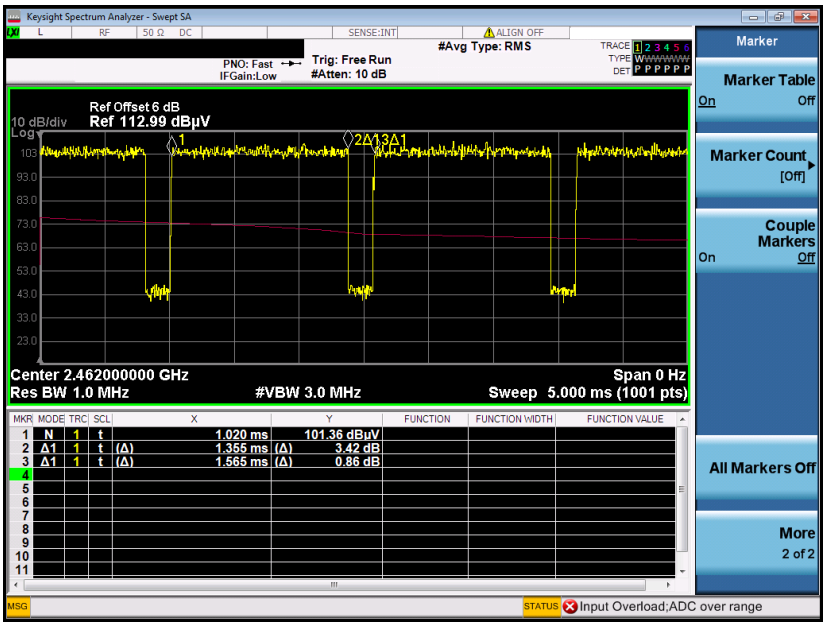
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
11b	97.62	8.220	0.122	0.12kHz
11g	86.58	1.355	0.738	0.75kHz
11n HT20	86.10	1.270	0.787	0.82kHz

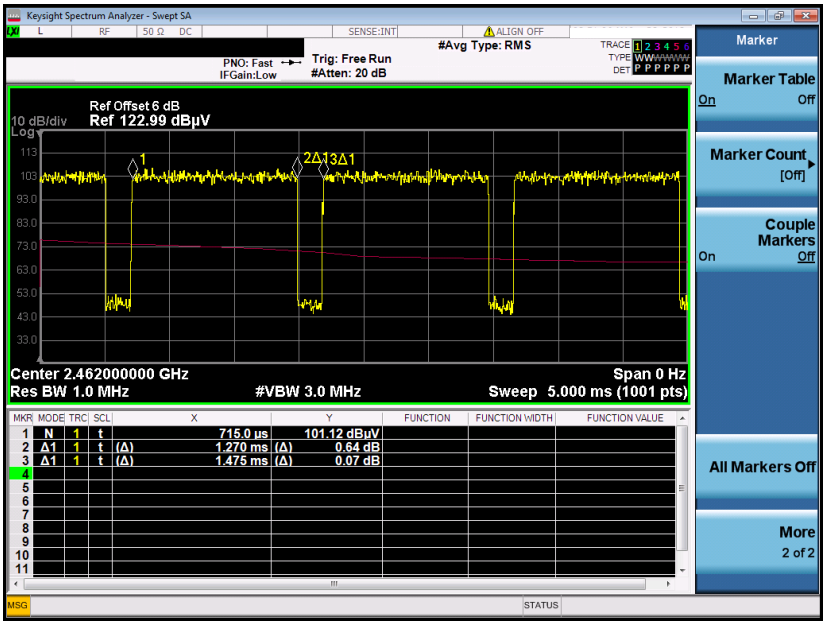
11b



11g


Keysight Spectrum Analyzer - Swept SA
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
#Avg Type: RMS
Ref Offset 6 dB
10 dB/div
Ref 112.99 dBµV
Center 2.462000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 N 1 t 1.020 ms 101.36 dBµV
2 Δ1 1 t (Δ) 1.355 ms (Δ) 3.42 dB
3 Δ1 1 t (Δ) 1.565 ms (Δ) 0.86 dB
Marker
Marker Table
Marker Count
Couple Markers
All Markers Off
More
2 of 2
Input Overload;ADC over range

11n HT20


Keysight Spectrum Analyzer - Swept SA
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Ref Offset 6 dB
10 dB/div
Ref 122.99 dBµV
Center 2.462000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 N 1 t 715.0 µs 101.12 dBµV
2 Δ1 1 t (Δ) 1.270 ms (Δ) 0.64 dB
3 Δ1 1 t (Δ) 1.475 ms (Δ) 0.07 dB
Marker
Marker Table
Marker Count
Couple Markers
All Markers Off
More
2 of 2