

FCC RF Test Report

APPLICANT : Lenovo(Shanghai) Electronics
Technology Co., Ltd.
EQUIPMENT : Lenovo Mobile Phone
BRAND NAME : Lenovo
MODEL NAME : Lenovo PB2-690Y
FCC ID : O57PB2690Y
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on May 11, 2016 and testing was completed on Jun. 13, 2016. 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.



Prepared by: James Huang / Manager



Approved by: Jones Tsai / Manager

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TABLE OF CONTENTS

1	GENERAL DESCRIPTION	5
1.1	Applicant	5
1.2	Manufacturer	5
1.3	Product Feature of Equipment Under Test	5
1.4	Product Specification of Equipment Under Test	6
1.5	Component List	6
1.6	Modification of EUT	6
1.7	Testing Location	7
1.8	Applicable Standards	7
2	TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1	Carrier Frequency Channel	8
2.2	Pre-Scanned RF Power	9
2.3	Test Mode	10
2.4	Connection Diagram of Test System	11
2.5	Support Unit used in test configuration and system	12
2.6	EUT Operation Test Setup	12
2.7	Measurement Results Explanation Example	12
3	TEST RESULT	13
3.1	6dB and 99% Bandwidth Measurement	13
3.2	Output Power Measurement	15
3.3	Power Spectral Density Measurement	16
3.4	Conducted Band Edges and Spurious Emission Measurement	18
3.5	Radiated Band Edges and Spurious Emission Measurement	28
3.6	AC Conducted Emission Measurement	32
3.7	Antenna Requirements	36
4	LIST OF MEASURING EQUIPMENT	37
5	UNCERTAINTY OF EVALUATION	38
APPENDIX A. CONDUCTED TEST RESULTS		
APPENDIX B. RADIATED TEST RESULTS		
APPENDIX C. DUTY CYCLE PLOTS		
APPENDIX D. SETUP PHOTOGRAPHS		



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR651101C	Rev. 01	Initial issue of report	Jun. 21, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-247 5.2(1)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 6.6	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-247 A5.4(4)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-247 5.2(2)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	RSS-247 5.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-247 5.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.60 dB at 2484.040 MHz
3.6	15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 11.21 dB at 0.610 MHz
3.7	15.203 & 15.247(b)	N/A	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Lenovo(Shanghai) Electronics Technology Co., Ltd.

NO.68 BUILDING, 199 FENJU RD., China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

1.2 Manufacturer

Lenovo PC HK Limited

23/F, Lincoln House, Taikoo Place, 979 King's Road, Quarry Bay, Hong Kong

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Lenovo Mobile Phone
Brand Name	Lenovo
Model Name	Lenovo PB2-690Y
FCC ID	O57PB2690Y
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM uplink is not supported)/LTE WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0 + EDR/Bluetooth v4.0 LE
IMEI Code	Conducted: 869972020004370/869972020004388 Conduction: 869972020005054/869972020005062 Radiation: 869972020005658/869972020005666
HW Version	Lenovo PB2-690Y
SW Version	PB2-690Y-160711
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 19.72 dBm (0.0938 W) 802.11g : 23.15 dBm (0.2065 W) 802.11n HT20 : 23.21 dBm (0.2094 W)
99% Occupied Bandwidth	802.11b : 13.49MHz 802.11g : 19.23MHz 802.11n HT20 : 19.93MHz
Antenna Type	802.11b/g/n : PIFA Antenna with gain -0.20 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Component List

Note: There are two types of EUT, the details refer the following table. According to the difference, we evaluate is not affect RF performance, so only choose sample 1 to perform RF test.

Component	Sample 1	Sample 2
4GB LPDDR3	Samsung K3QF4F40BM-FGCF	Hynix H9CKNNNCPTMRPR-NUH
64GB eMMC	Toshiba THGBMGG9T4LBAIR	Samsung KLMCG4JENB-B041

1.6 Modification of EUT

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

1.7 Testing Location

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.		
Test Site Location	1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595		
Test Site No.	Sporton Site No.		
	TH01-SZ		

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	03CH03-KS	CO01-KS	306251/4086E

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 v03r05
- 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

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: conducted emission (150 kHz to 30 MHz) and radiated 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.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency 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 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test shown in the following tables.

2.4GHz 802.11b RF Output Power (dBm)						
Power vs. Channel			Power vs. Data Rate			
Channel	Frequency (MHz)	Data Rate 1Mbps	Channel	2Mbps	5.5Mbps	11Mbps
CH 01	2412	19.69	CH 11	19.66	19.68	19.67
CH 06	2437	19.53				
CH 11	2462	19.72				

2.4GHz 802.11g RF Output Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 01	2412	23.15	CH 01	23.11	23.10	22.61	22.68	22.71	22.41	22.37
CH 06	2437	23.05								
CH 11	2462	23.10								

2.4GHz 802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412	23.21	CH 01	23.18	23.19	22.78	22.74	22.72	22.42	22.45
CH 06	2437	23.15								
CH 11	2462	23.14								

2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

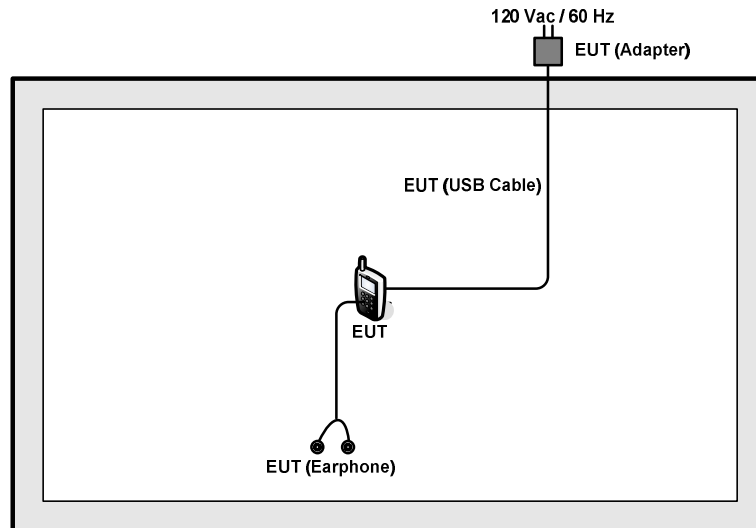
<2.4GHz>

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

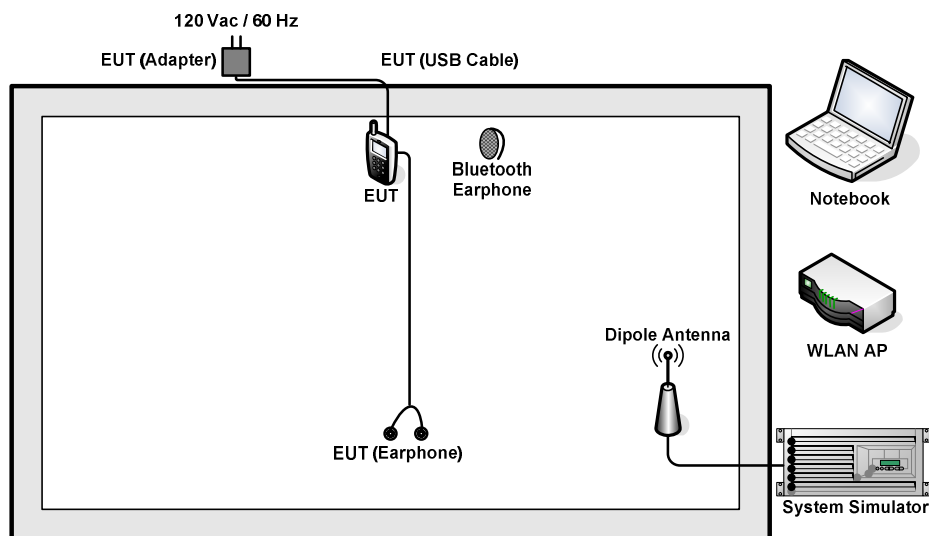
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter (12V)) for Sample 1
	Mode 2 : GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter (5.2V)) for Sample 1
Remark: - The worst case of conducted emission is mode 1; only the test data of it was reported. - For Radiated TCs, The tests were performance with Adapter, Earphone, and USB Cable for Sample 1.	

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 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	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
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	LBH505	N/A	N/A	N/A

2.6 EUT Operation Test Setup

For WLAN function, the 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.

2.7 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 5.0 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 5.0 + 10 = 15.0 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

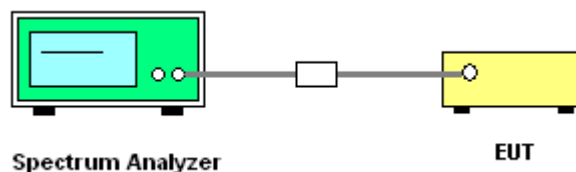
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

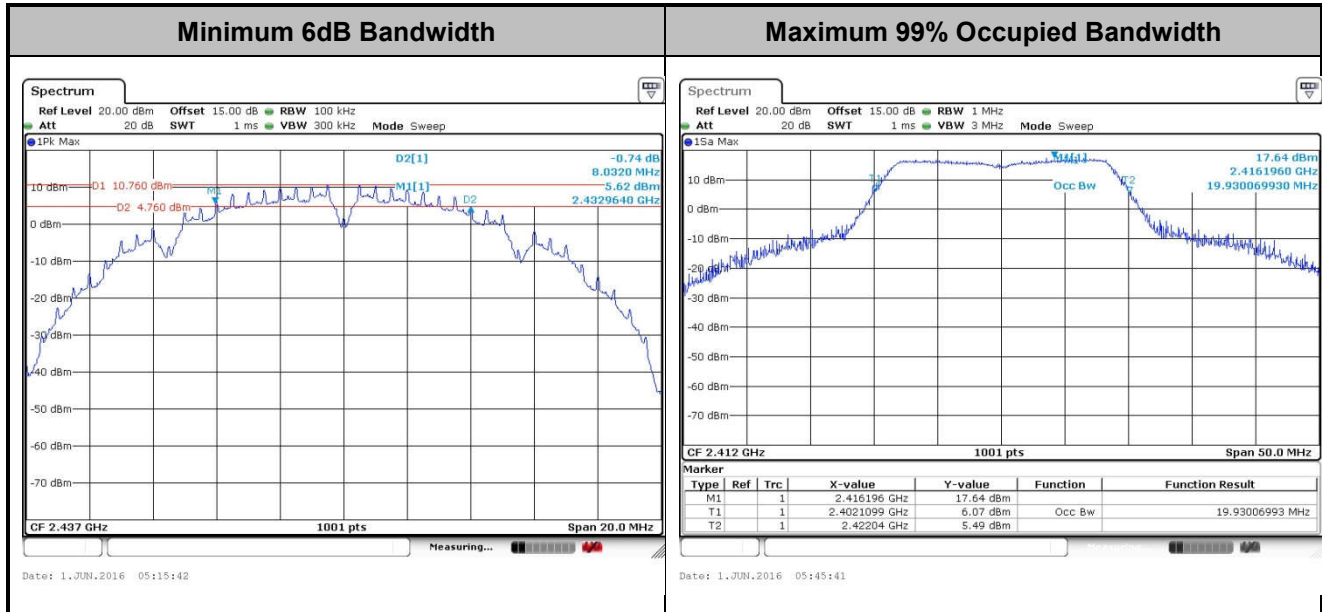
3.1.4 Test Setup





3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A of this test report.



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 of directional gain greater than 6dBi are 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.

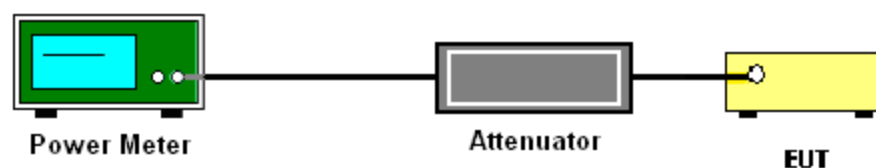
3.2.2 Measuring Instruments

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 v03r05 section 9.1.2 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 of this test report.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A of this test report.

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.

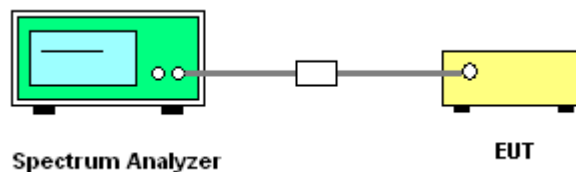
3.3.2 Measuring Instruments

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 v03r05
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.

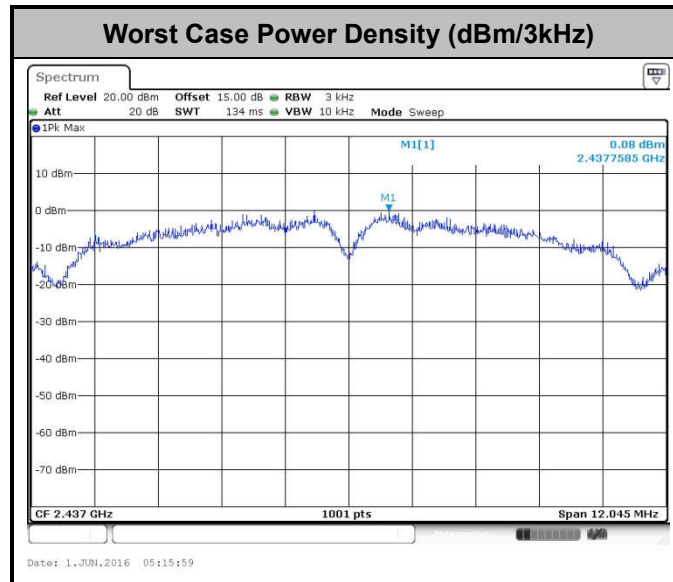
3.3.4 Test Setup





3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A of this test report.



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 and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

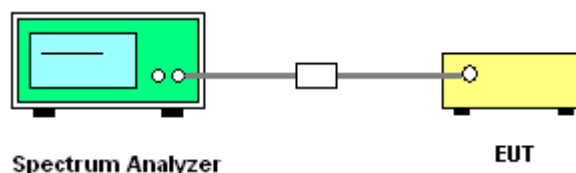
3.4.2 Measuring Instruments

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 v03r05.
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.

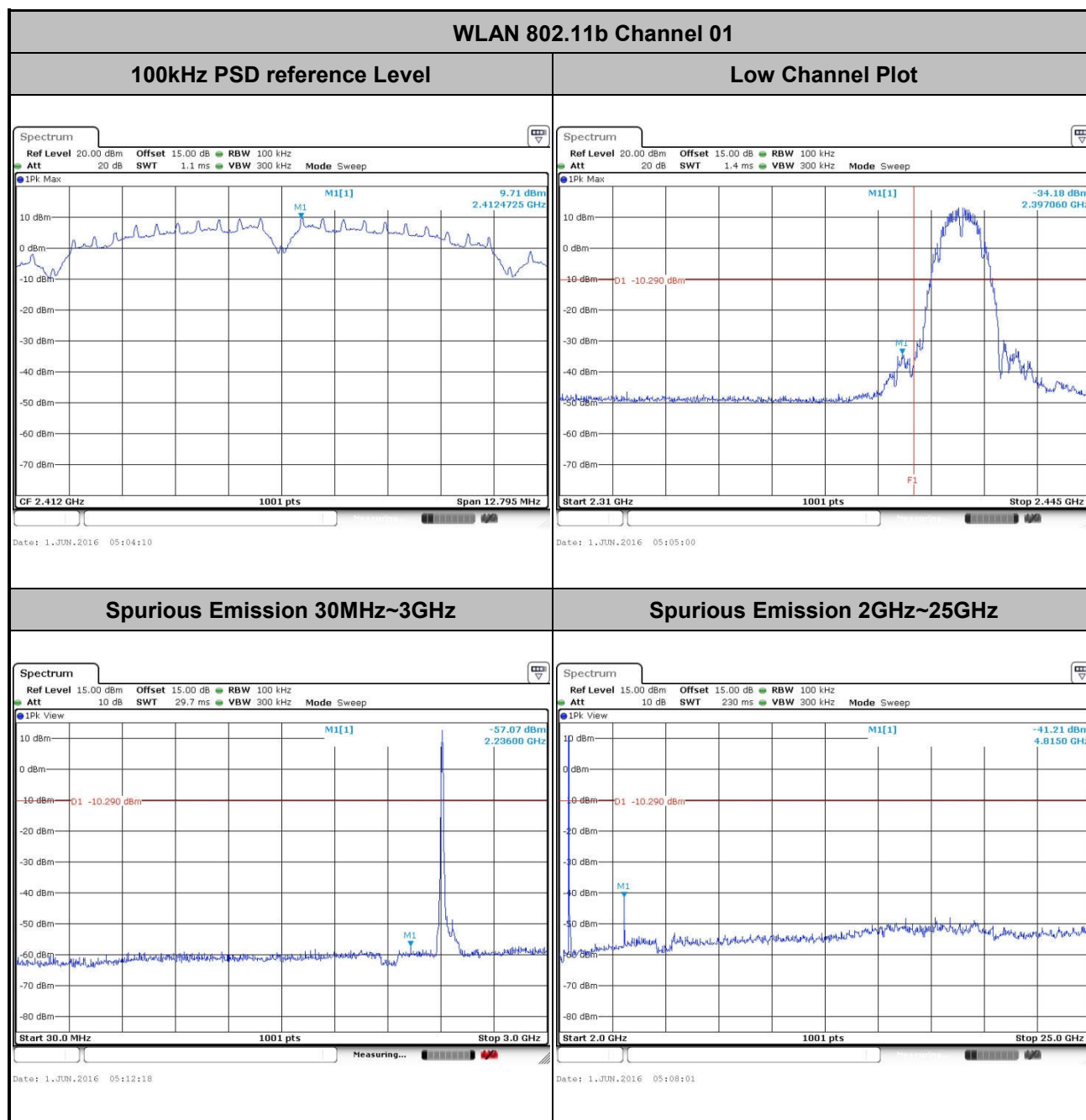
3.4.4 Test Setup





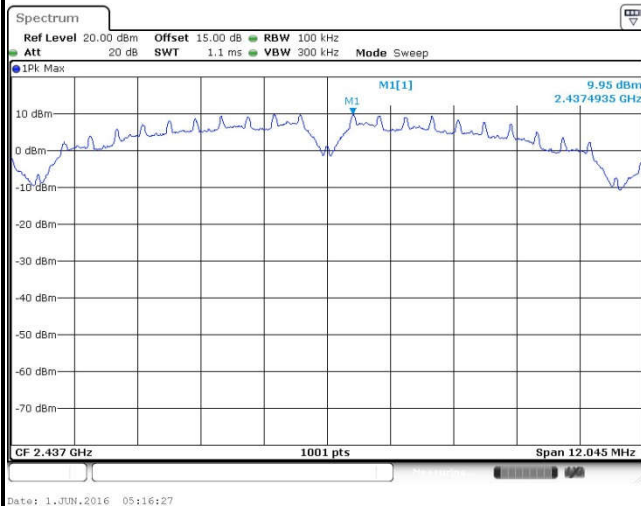
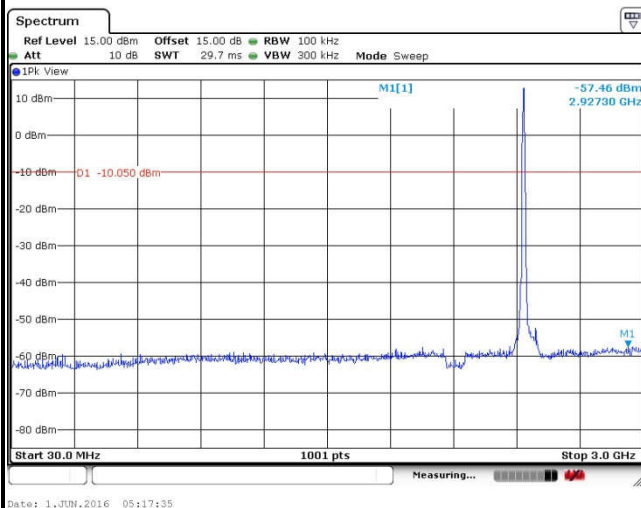
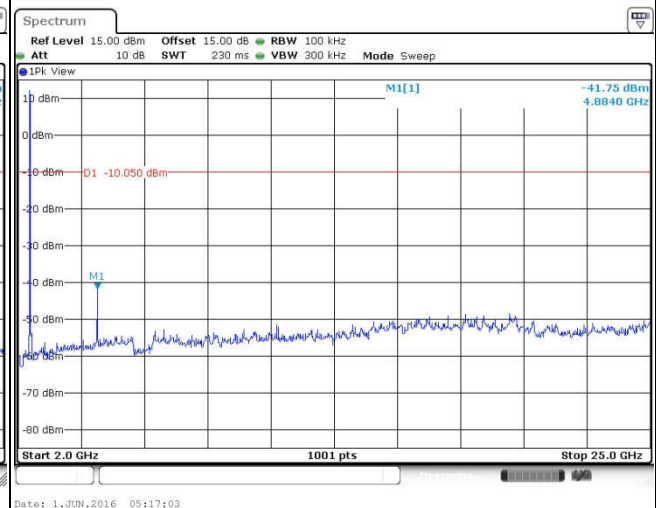
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Tiny You





Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Tiny You

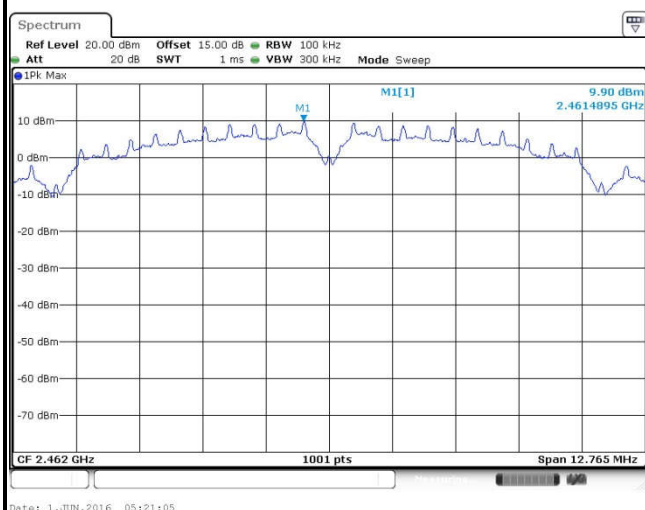
WLAN 802.11b Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



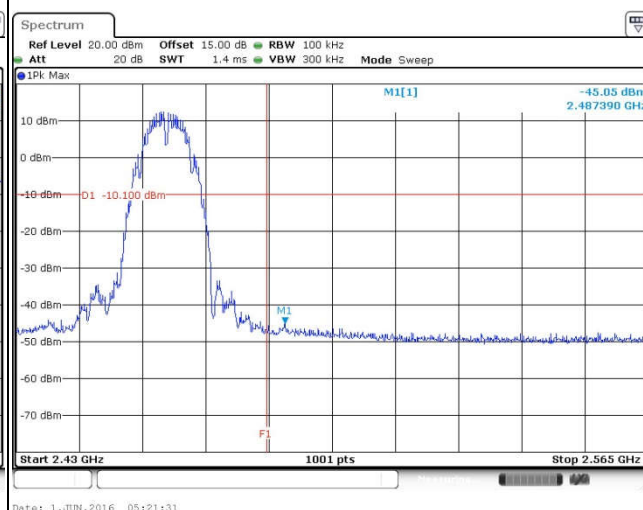
Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Tiny You

WLAN 802.11b Channel 11

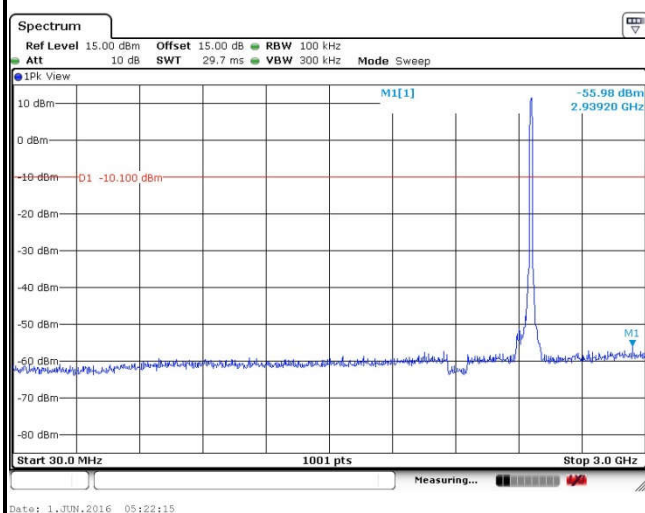
100kHz PSD reference Level



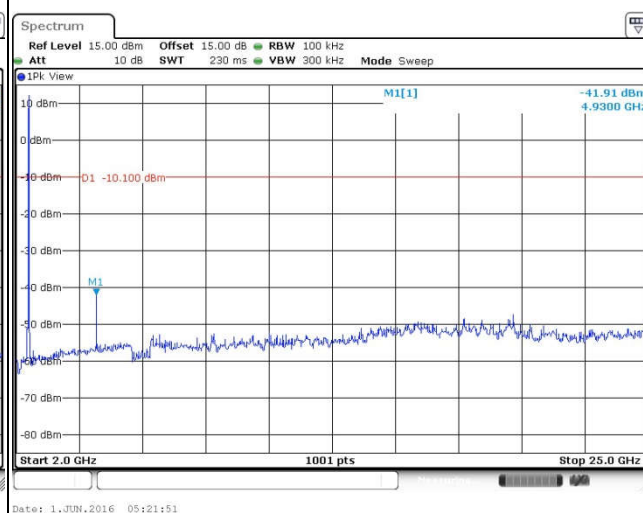
High Channel Plot



Spurious Emission 30MHz~3GHz

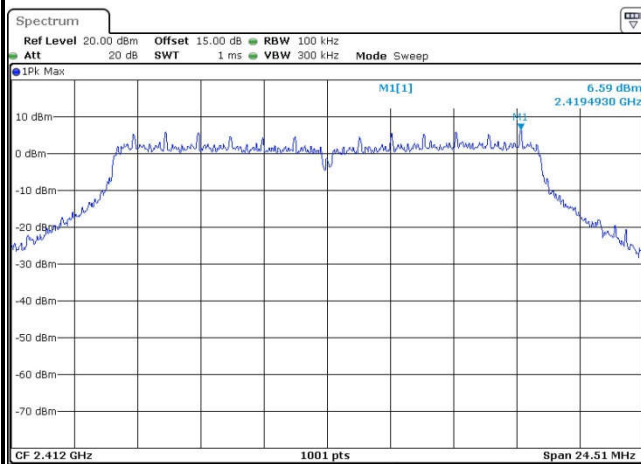
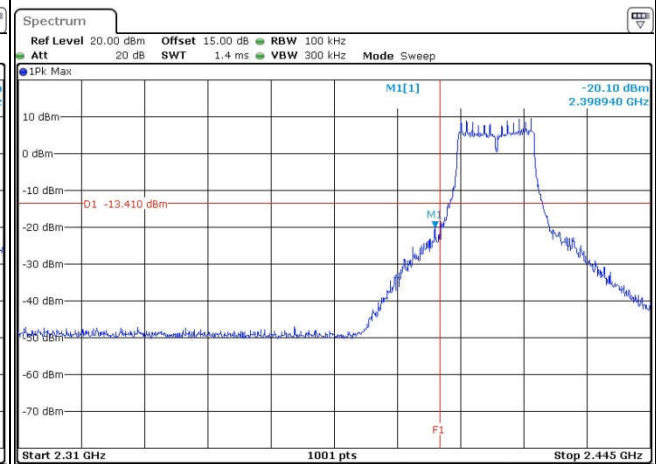
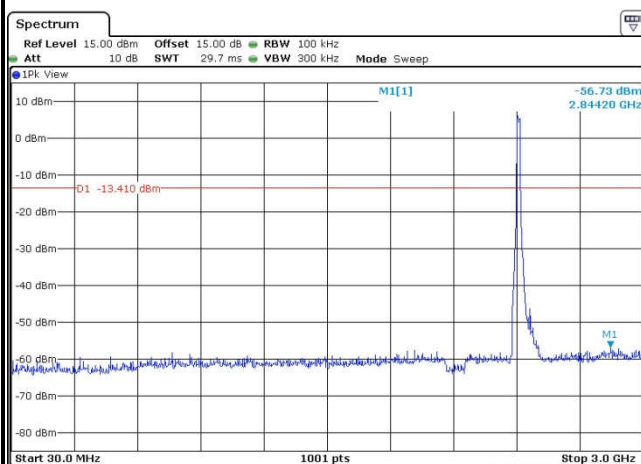
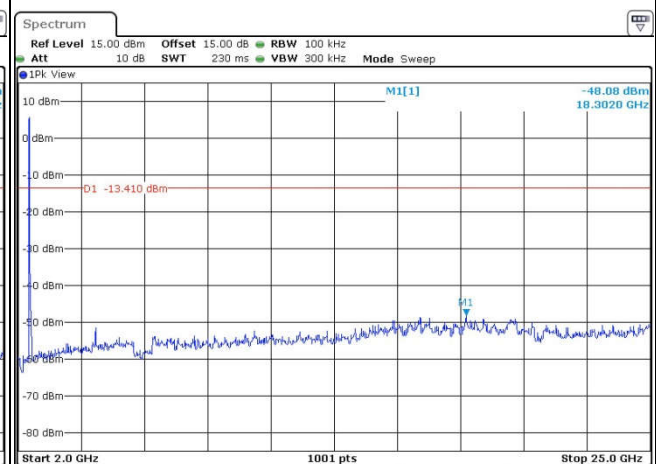


Spurious Emission 2GHz~25GHz



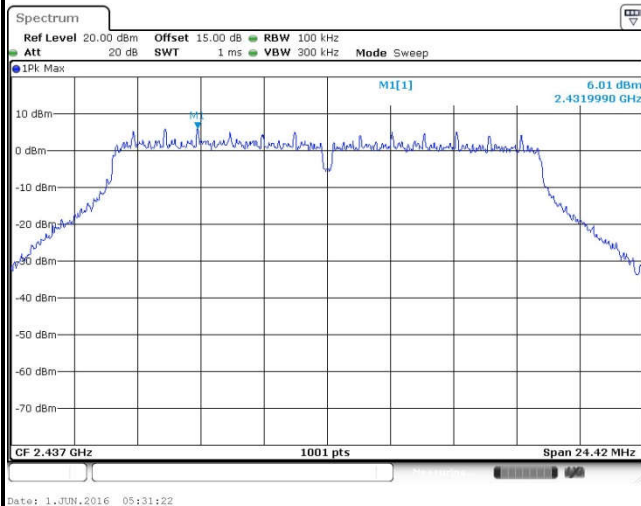
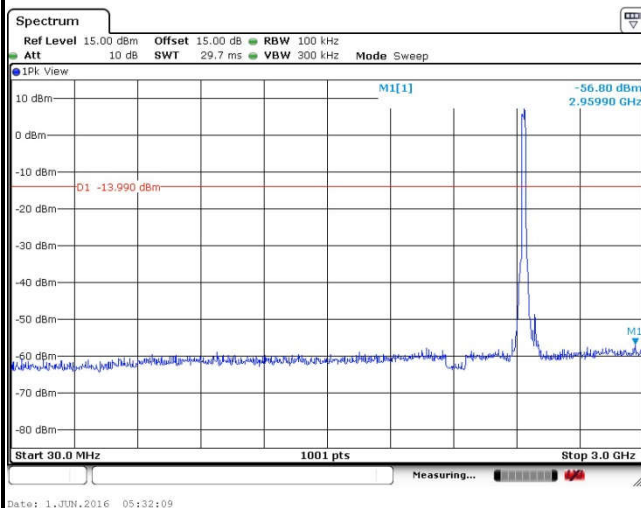
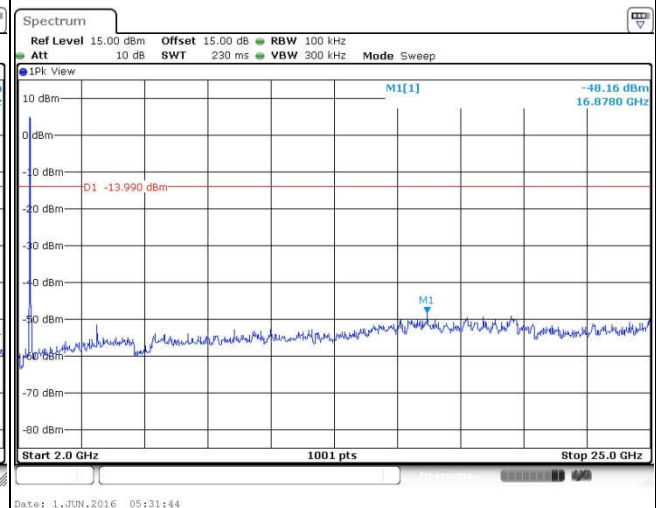


Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Tiny You

WLAN 802.11g Channel 01**100kHz PSD reference Level****Low Channel Plot****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Tiny You

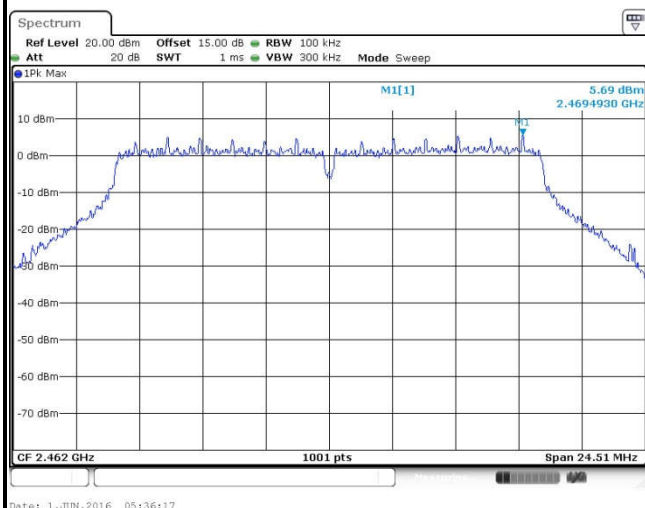
WLAN 802.11g Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



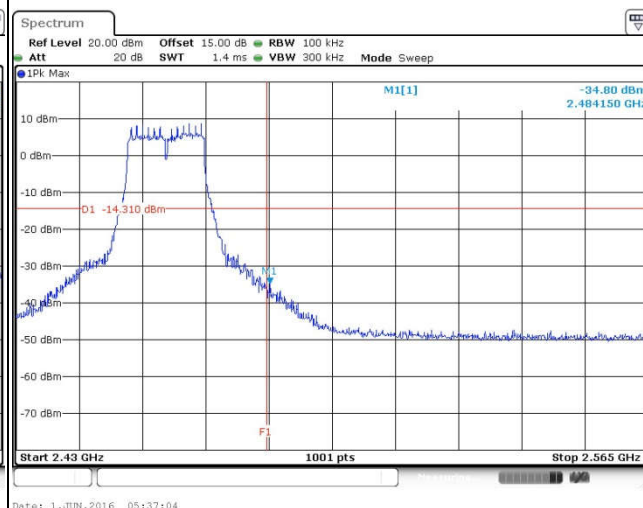
Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Tiny You

WLAN 802.11g Channel 11

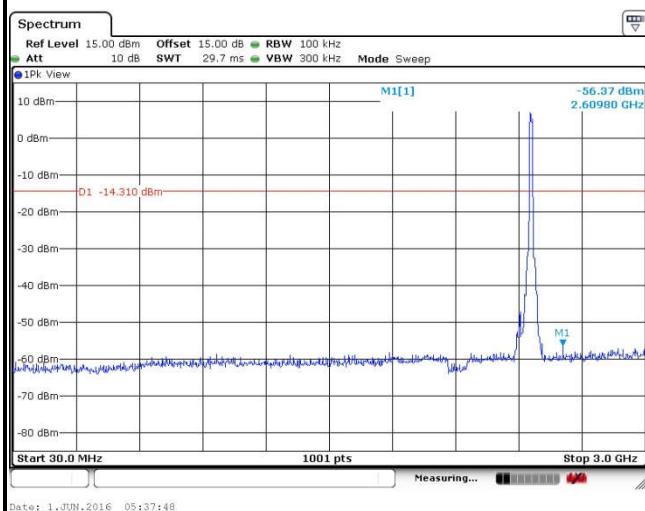
100kHz PSD reference Level



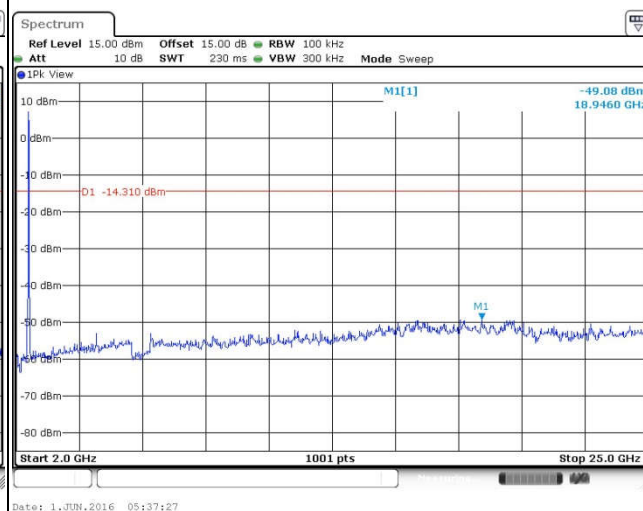
High Channel Plot



Spurious Emission 30MHz~3GHz

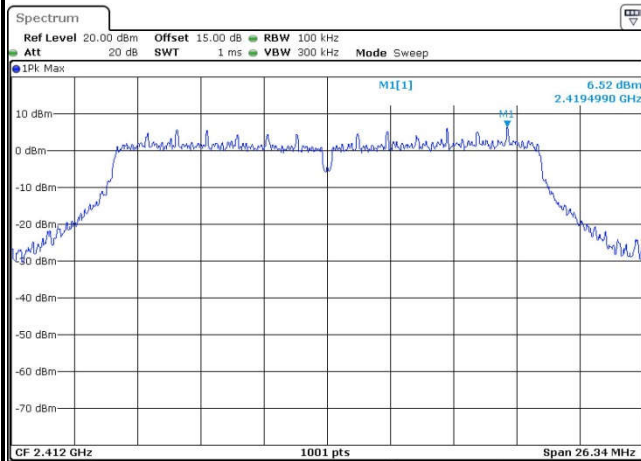
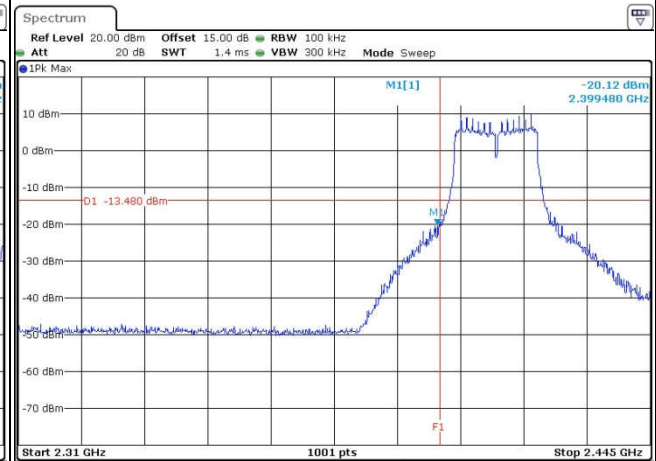
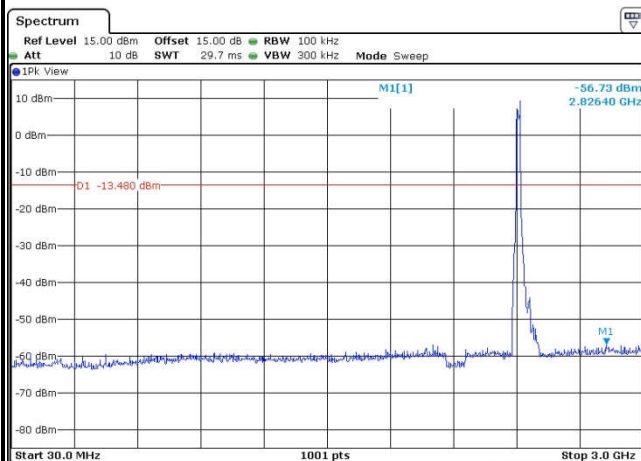
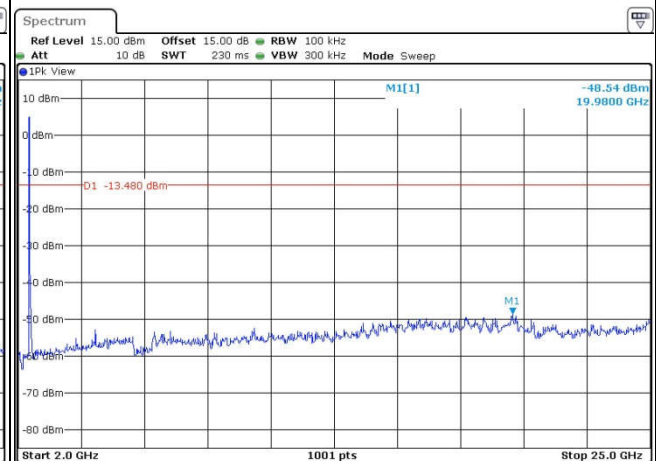


Spurious Emission 2GHz~25GHz



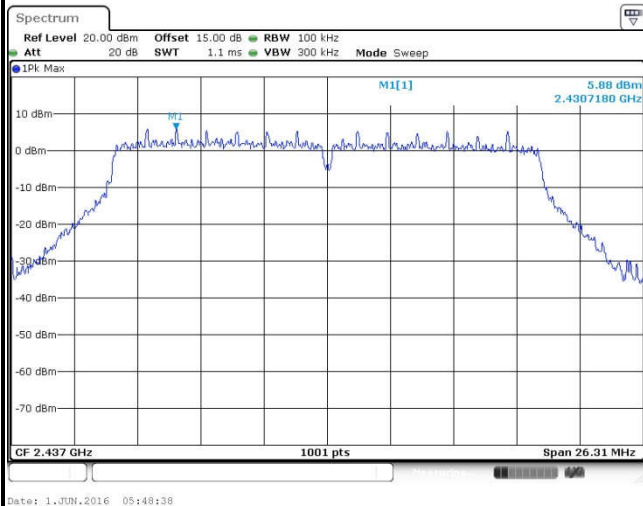
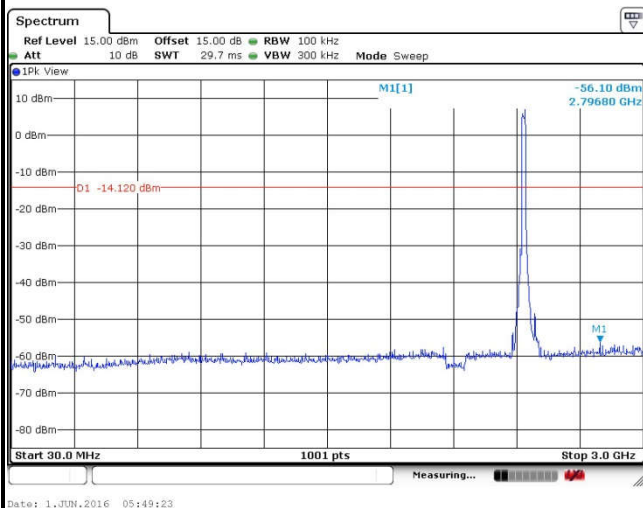
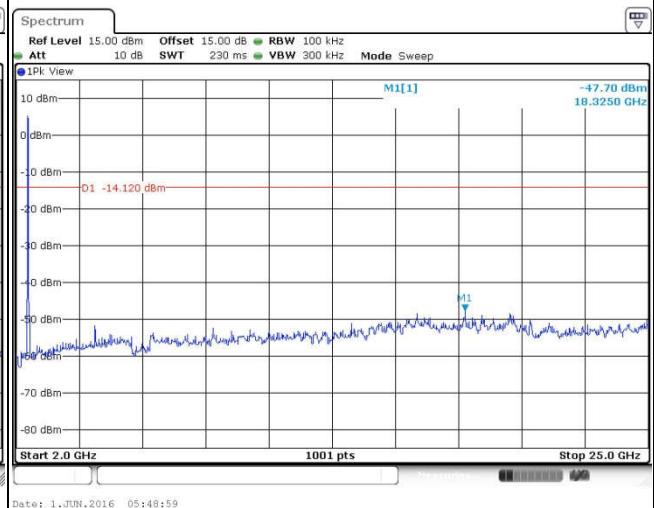


Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Tiny You

WLAN 802.11n HT20 Channel 01**100kHz PSD reference Level****Low Channel Plot****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**

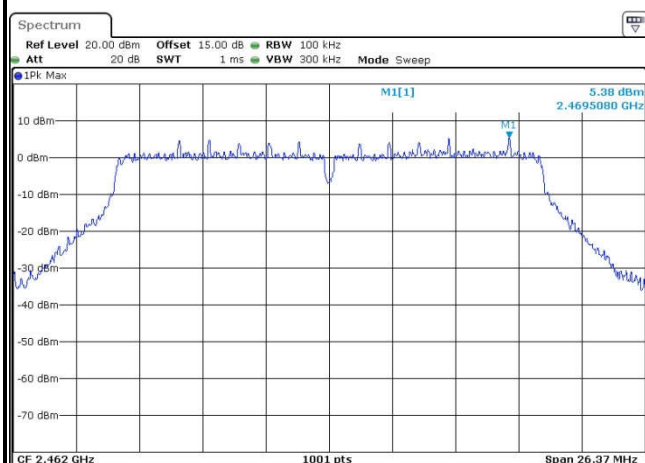


Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Tiny You

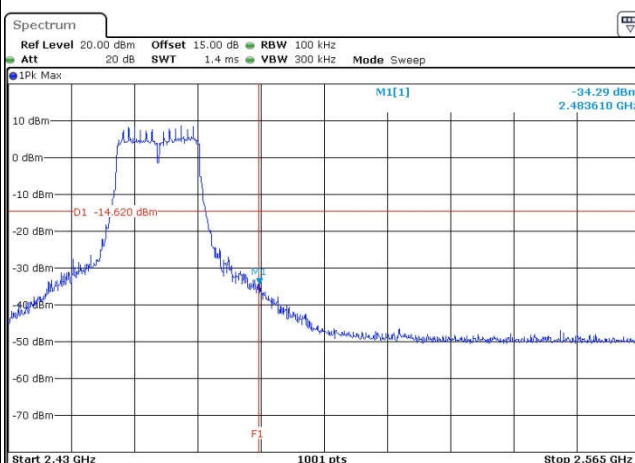
WLAN 802.11n HT20 Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



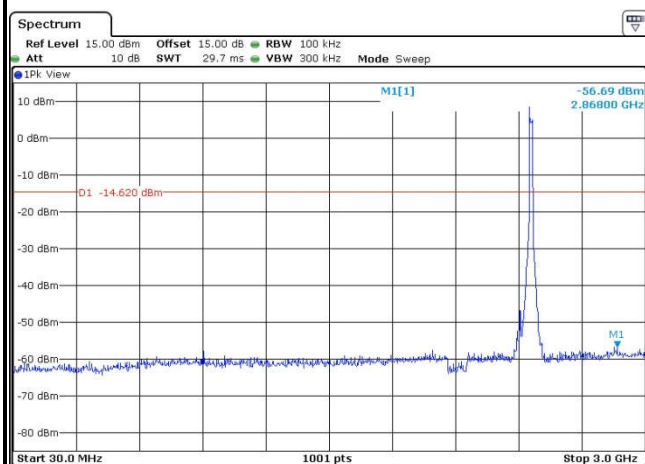
Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Tiny You

WLAN 802.11n HT20 Channel 11**100kHz PSD reference Level**

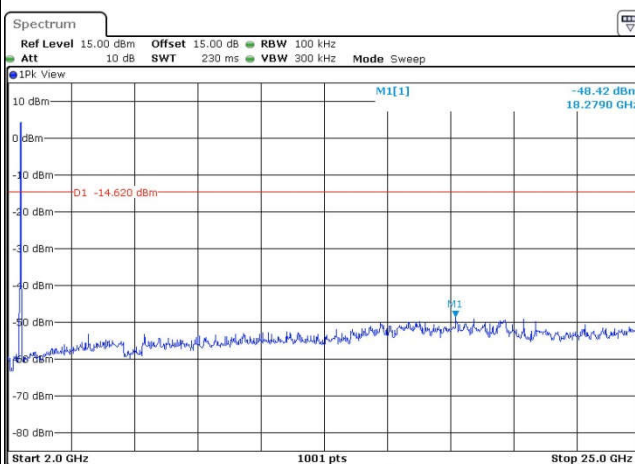
Date: 1.JUN.2016 05:55:21

High Channel Plot

Date: 1.JUN.2016 05:55:50

Spurious Emission 30MHz~3GHz

Date: 1.JUN.2016 05:56:35

Spurious Emission 2GHz~25GHz

Date: 1.JUN.2016 05:56:12

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 FCC section 15.209 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

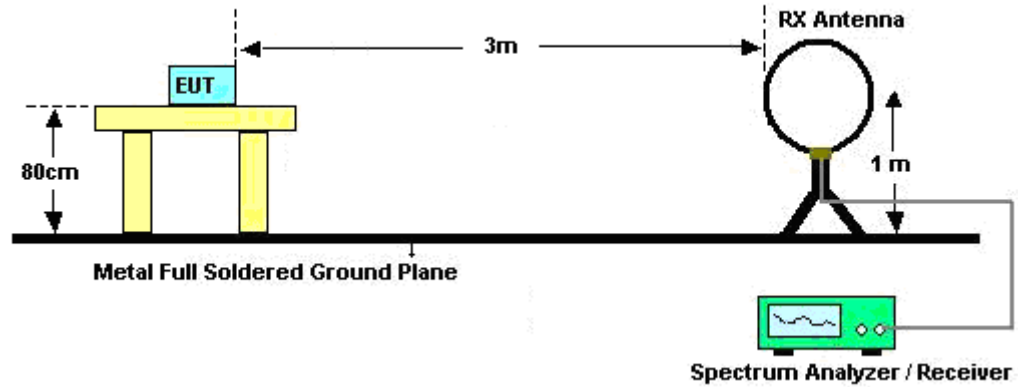
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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 measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. 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 $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

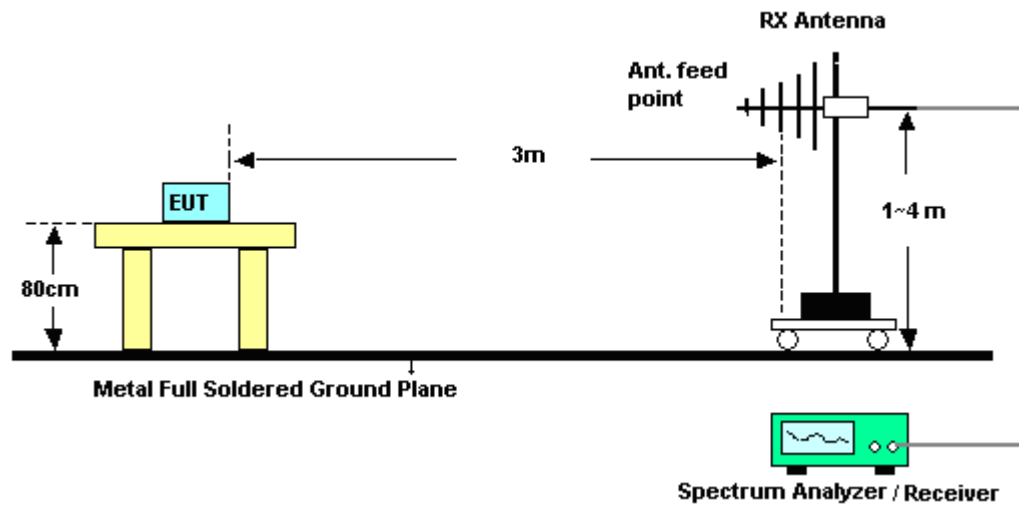
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

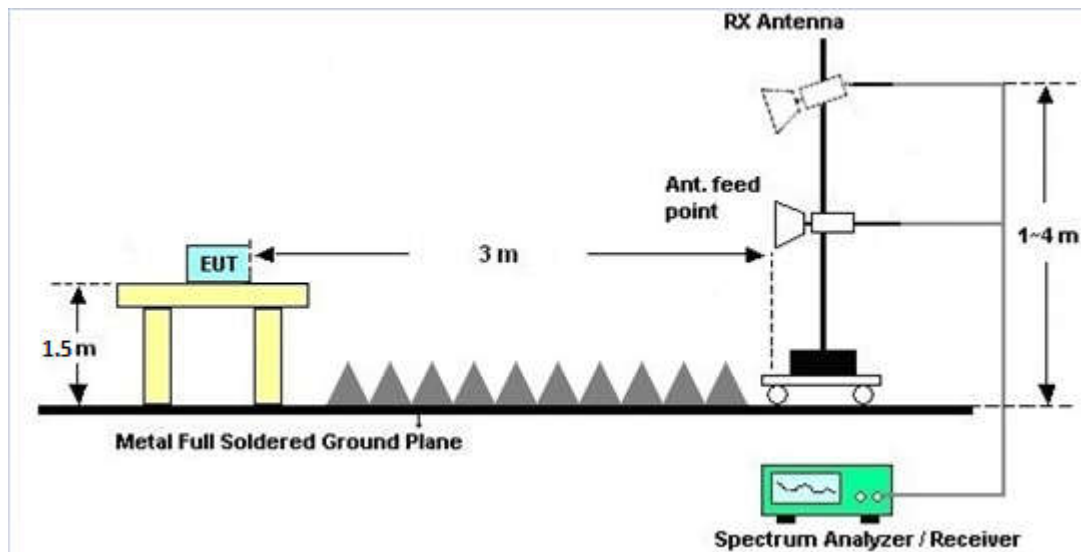
For radiated emissions below 30MHz



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 per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.5.7 Duty Cycle

Please refer to Appendix C.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.

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 (dB μ V)	
	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.

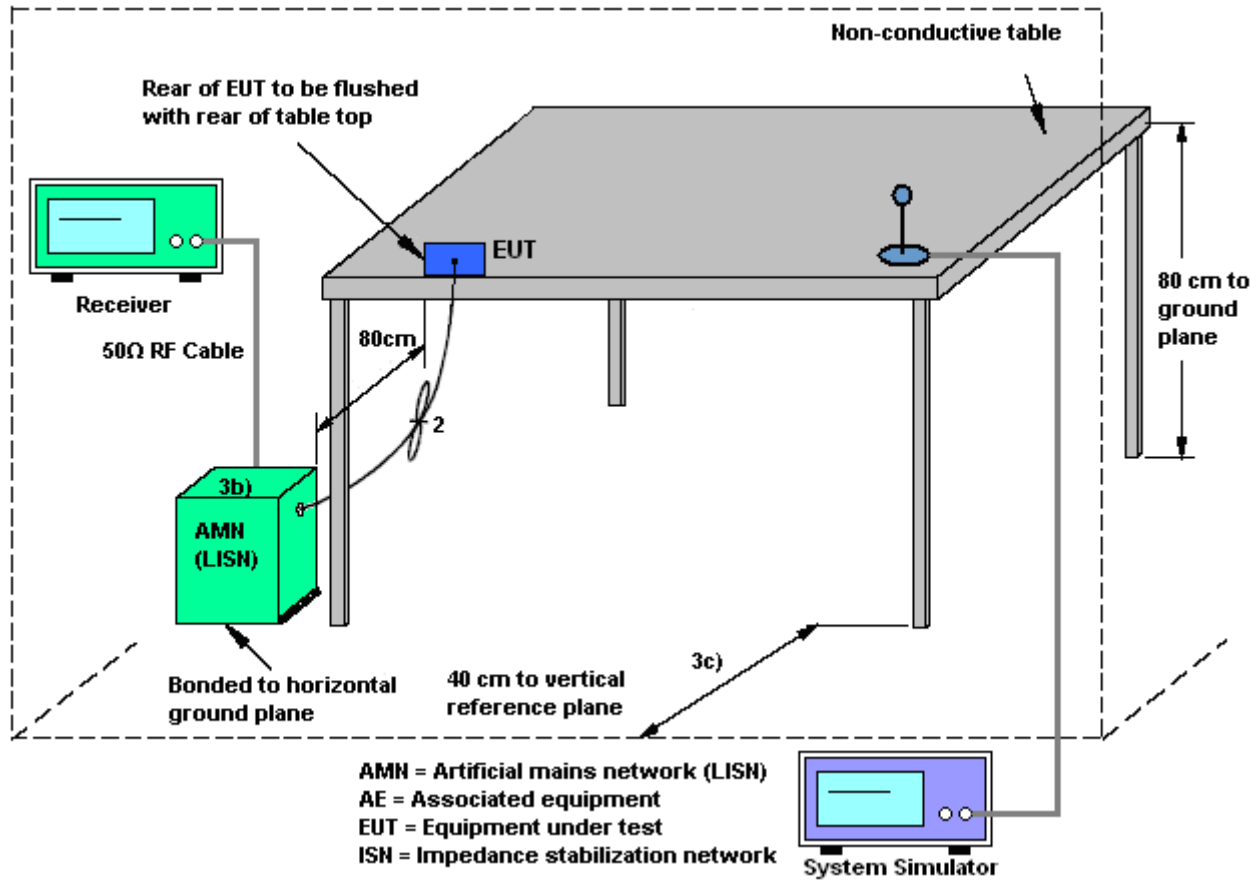
3.6.2 Measuring Instruments

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.

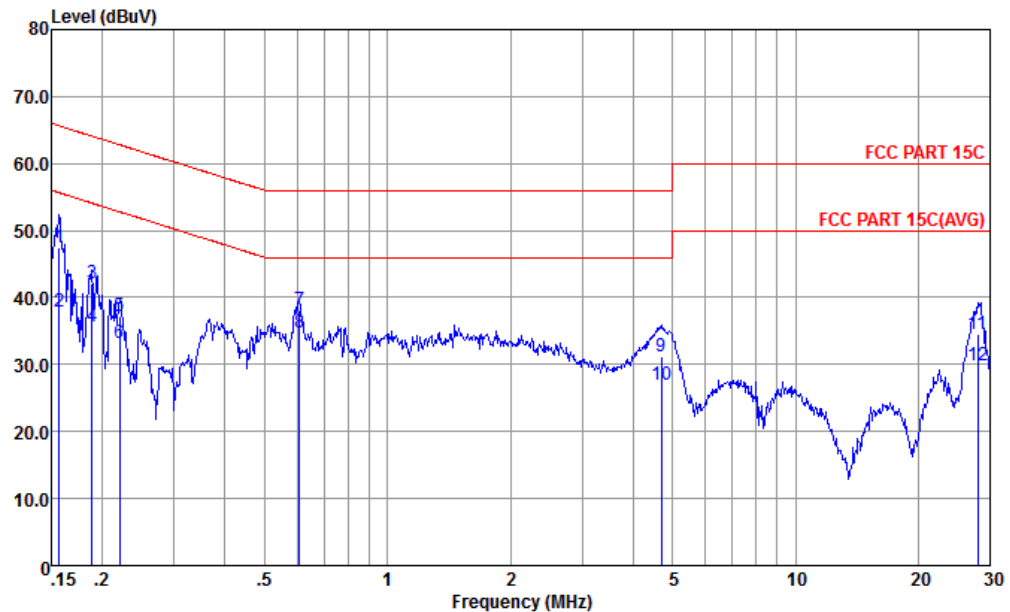
3.6.4 Test Setup





3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	44~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter (12V)) for Sample 1		

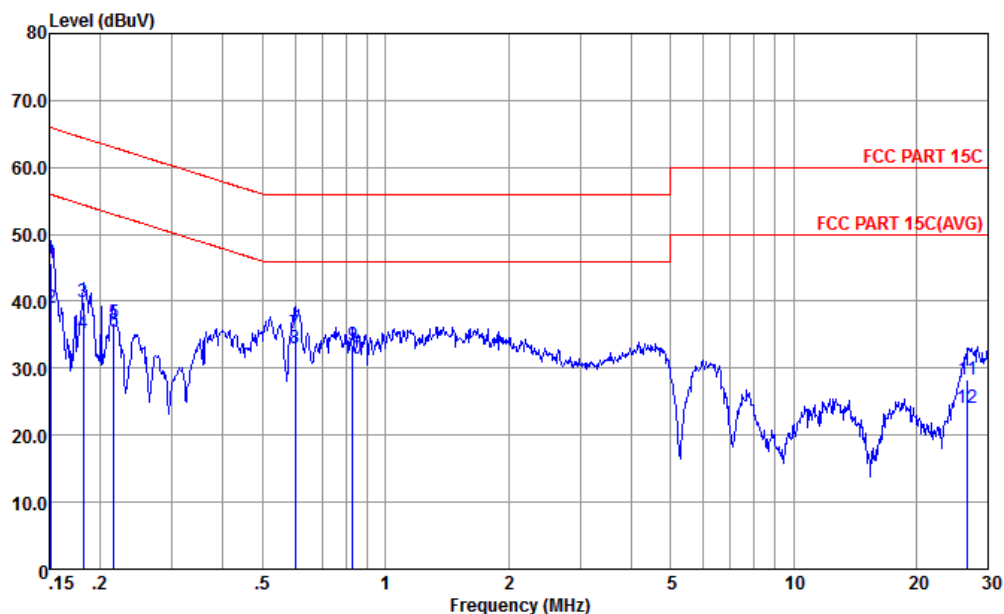


Site : CO01-KS
 Condition : FCC PART 15C LISN-L-20151024 LINE
 Project : (FR) 651101
 mode : Mode 1
 IMEI : 869972020005054/869972020005062 #1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV		dBuV	dBuV	dB	dB	
1	0.16	47.50	-18.15	65.65	36.90	0.49	10.11	QP
2	0.16	37.80	-17.85	55.65	27.20	0.49	10.11	Average
3	0.19	42.20	-21.91	64.11	31.80	0.28	10.12	QP
4	0.19	35.60	-18.51	54.11	25.20	0.28	10.12	Average
5	0.22	37.25	-25.54	62.79	26.90	0.22	10.13	QP
6	0.22	33.15	-19.64	52.79	22.80	0.22	10.13	Average
7	0.61	38.19	-17.81	56.00	27.79	0.24	10.16	QP
8 *	0.61	34.79	-11.21	46.00	24.39	0.24	10.16	Average
9	4.70	31.27	-24.73	56.00	20.90	0.19	10.18	QP
10	4.70	26.87	-19.13	46.00	16.50	0.19	10.18	Average
11	28.00	34.62	-25.38	60.00	23.60	0.23	10.79	QP
12	28.00	29.92	-20.08	50.00	18.90	0.23	10.79	Average



Test Mode :	Mode 1	Temperature :	22~24
Test Engineer :	Amos Zhang	Relative Humidity :	44~47
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter (12V)) for Sample 1		



Site : CO01-KS
Condition : FCC PART 15C LISN-N-20151024 NEUTRAL
Project : (FR) 651101
mode : Mode 1
IMEI : 869972020005054/869972020005062 #1

	Freq	Level	Over Limit	Limit	Read	LISN	Cable	Remark
	MHz	dBuV		dB	Level	Factor	Loss	
				dBuV	dBuV	dB	dB	
1	0.15	45.61	-20.30	65.91	35.20	0.30	10.11	QP
2	0.15	39.01	-16.90	55.91	28.60	0.30	10.11	Average
3	0.18	39.83	-24.59	64.42	29.40	0.31	10.12	QP
4	0.18	35.23	-19.19	54.42	24.80	0.31	10.12	Average
5	0.22	36.74	-26.22	62.96	26.30	0.31	10.13	QP
6	0.22	35.34	-17.62	52.96	24.90	0.31	10.13	Average
7	0.60	35.29	-20.71	56.00	24.80	0.33	10.16	QP
8 *	0.60	32.99	-13.01	46.00	22.50	0.33	10.16	Average
9	0.83	33.40	-22.60	56.00	22.91	0.35	10.14	QP
10	0.83	31.40	-14.60	46.00	20.91	0.35	10.14	Average
11	26.70	28.39	-31.61	60.00	17.40	0.24	10.75	QP
12	26.70	24.09	-25.91	50.00	13.10	0.24	10.75	Average

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC 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	101078	9kHz~40GHz	May 07, 2016	Jun. 01, 2016	May 06, 2017	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 12, 2016	Jun. 01, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 12, 2016	Jun. 01, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Oct. 24, 2015	May 22, 2016~ May 25, 2016	Oct. 23, 2016	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz~44GHz	Apr. 22, 2016	May 22, 2016~ May 25, 2016	Apr. 21, 2017	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 07, 2015	May 22, 2016~ May 25, 2016	Nov. 06, 2016	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz-2GHz	Apr. 16, 2016	May 22, 2016~ May 25, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-135 6	1GHz~18GHz	Apr. 16, 2016	May 22, 2016~ May 25, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA1702 49	15GHz ~40GHz	Mar. 03, 2016	May 22, 2016~ May 25, 2016	Mar. 02, 2017	Radiation (03CH03-KS)
Amplifier	Burgeon	BPA-530	102212	0.01MHz-3000M Hz	Aug. 10, 2015	May 22, 2016~ May 25, 2016	Aug. 09, 2016	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35- HG	1887435	18~40GHz	Aug. 27, 2015	May 22, 2016~ May 25, 2016	Aug. 26, 2016	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	1889560	1GHz-18GHz	Aug. 10, 2015	May 22, 2016~ May 25, 2016	Aug. 09, 2016	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A023 70	1GHz~26.5GHz	Oct. 24, 2015	May 22, 2016~ May 25, 2016	Oct. 23, 2016	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	May 22, 2016~ May 25, 2016	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 22, 2016~ May 25, 2016	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 29, 2016	Jun. 13, 2016	Apr. 28, 2017	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Jun. 13, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Jun. 13, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Jun. 13, 2016	Oct. 23, 2016	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.3dB
--	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.5dB
--	-------

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.5dB
--	-------

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.6dB
--	-------



Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Tiny You	Temperature:	24~26	°C
Test Date:	2016/6/1	Relative Humidity:	50~53	%

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	13.49	8.53	0.50	Pass
11b	1Mbps	1	6	2437	13.09	8.03	0.50	Pass
11b	1Mbps	1	11	2462	13.24	8.51	0.50	Pass
11g	6Mbps	1	1	2412	19.23	16.34	0.50	Pass
11g	6Mbps	1	6	2437	18.53	16.28	0.50	Pass
11g	6Mbps	1	11	2462	18.78	16.34	0.50	Pass
HT20	MCS0	1	1	2412	19.93	17.56	0.50	Pass
HT20	MCS0	1	6	2437	19.28	17.54	0.50	Pass
HT20	MCS0	1	11	2462	19.43	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	19.69	30.00	-0.20	19.49	36.00	Pass
11b	1Mbps	1	6	2437	19.53	30.00	-0.20	19.33	36.00	Pass
11b	1Mbps	1	11	2462	19.72	30.00	-0.20	19.52	36.00	Pass
11g	6Mbps	1	1	2412	23.15	30.00	-0.20	22.95	36.00	Pass
11g	6Mbps	1	6	2437	23.05	30.00	-0.20	22.85	36.00	Pass
11g	6Mbps	1	11	2462	23.10	30.00	-0.20	22.90	36.00	Pass
HT20	MCS0	1	1	2412	23.21	30.00	-0.20	23.01	36.00	Pass
HT20	MCS0	1	6	2437	23.15	30.00	-0.20	22.95	36.00	Pass
HT20	MCS0	1	11	2462	23.14	30.00	-0.20	22.94	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.05	16.80
11b	1Mbps	1	6	2437	0.05	16.57
11b	1Mbps	1	11	2462	0.05	16.83
11g	6Mbps	1	1	2412	0.30	15.11
11g	6Mbps	1	6	2437	0.30	14.92
11g	6Mbps	1	11	2462	0.30	14.97
HT20	MCS0	1	1	2412	0.30	15.25
HT20	MCS0	1	6	2437	0.30	15.01
HT20	MCS0	1	11	2462	0.30	14.97

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	-1.29	-0.20	8.00	Pass
11b	1Mbps	1	6	2437	0.08	-0.20	8.00	Pass
11b	1Mbps	1	11	2462	-1.13	-0.20	8.00	Pass
11g	6Mbps	1	1	2412	-4.65	-0.20	8.00	Pass
11g	6Mbps	1	6	2437	-5.18	-0.20	8.00	Pass
11g	6Mbps	1	11	2462	-4.83	-0.20	8.00	Pass
HT20	MCS0	1	1	2412	-4.69	-0.20	8.00	Pass
HT20	MCS0	1	6	2437	-5.61	-0.20	8.00	Pass
HT20	MCS0	1	11	2462	-5.77	-0.20	8.00	Pass



Appendix B. 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		2386.5	51.5	-22.50	74	55.93	27	5.59	37.02	100	103	P	H
		2388.66	40.22	-13.78	54	44.65	27	5.59	37.02	100	103	A	H
	*	2410.855	104.37	-	-	108.63	27.13	5.61	37	100	103	P	H
	*	2410.855	101.74	-	-	106	27.13	5.61	37	100	103	A	H
		2389.92	51.28	-22.72	74	55.71	27	5.59	37.02	380	69	P	V
		2388.84	40.04	-13.96	54	44.47	27	5.59	37.02	380	69	A	V
	*	2410.938	101.95	-	-	106.21	27.13	5.61	37	380	69	P	V
	*	2411.022	99.14	-	-	103.4	27.13	5.61	37	380	69	A	V
802.11b CH 06 2437MHz	*	2436.99	104.8	-	-	108.73	27.39	5.65	36.97	131	137	P	H
	*	2438.076	102.05	-	-	105.98	27.39	5.65	36.97	131	137	A	H
	*	2436.99	101.73	-	-	105.66	27.39	5.65	36.97	372	86	P	V
	*	2435.989	99.01	-	-	103.11	27.26	5.63	36.99	372	86	A	V
802.11b CH 11 2462MHz	*	2463.126	102.93	-	-	106.71	27.51	5.67	36.96	100	133	P	H
	*	2463.126	100.09	-	-	103.87	27.51	5.67	36.96	100	133	A	H
		2488.48	53	-21.00	74	56.45	27.77	5.71	36.93	100	133	P	H
		2483.52	42.27	-11.73	54	45.88	27.64	5.69	36.94	100	133	A	H
	*	2463.126	99.84	-	-	103.62	27.51	5.67	36.96	354	82	P	V
	*	2463.126	97.02	-	-	100.8	27.51	5.67	36.96	354	82	A	V
		2489.68	52.89	-21.11	74	56.34	27.77	5.71	36.93	354	82	P	V
		2483.52	41.52	-12.48	54	45.13	27.64	5.69	36.94	354	82	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	36.5	-37.50	74	57.96	31.51	9.13	62.1	100	360	P	H
		4824	38.54	-35.46	74	60	31.51	9.13	62.1	100	0	P	V
802.11b CH 06 2437MHz		4875	36.66	-37.34	74	57.9	31.59	9.2	62.03	100	360	P	H
		7311	40.12	-33.88	74	53.95	34.03	11.3	59.16	100	0	P	H
		4875	36.34	-37.66	74	57.58	31.59	9.2	62.03	100	0	P	V
		7311	39.26	-34.74	74	53.09	34.03	11.3	59.16	100	360	P	V
802.11b CH 11 2462MHz		4923	35	-39.00	74	56.03	31.67	9.27	61.97	100	360	P	H
		7386	40.09	-33.91	74	53.63	34.29	11.29	59.12	100	0	P	H
		4923	35.11	-38.89	74	56.14	31.67	9.27	61.97	100	0	P	V
		7386	39.92	-34.08	74	53.46	34.29	11.29	59.12	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		2389.56	62.51	-11.49	74	66.94	27	5.59	37.02	100	111	P	H
		2389.74	47.25	-6.75	54	51.68	27	5.59	37.02	100	111	A	H
	*	2409.603	106.06	-	-	110.32	27.13	5.61	37	100	111	P	H
	*	2407.181	98.16	-	-	102.42	27.13	5.61	37	100	111	A	H
		2389.74	61.93	-12.07	74	66.36	27	5.59	37.02	372	79	P	V
		2389.92	45.53	-8.47	54	49.96	27	5.59	37.02	372	79	A	V
	*	2407.181	103.94	-	-	108.2	27.13	5.61	37	372	79	P	V
	*	2406.513	95.74	-	-	100	27.13	5.61	37	372	79	A	V
802.11g CH 06 2437MHz	*	2436.907	106.24	-	-	110.17	27.39	5.65	36.97	123	110	P	H
	*	2440.748	98.03	-	-	101.96	27.39	5.65	36.97	123	110	A	H
	*	2432.064	103.03	-	-	107.13	27.26	5.63	36.99	361	76	P	V
	*	2432.982	95.12	-	-	99.22	27.26	5.63	36.99	361	76	A	V
802.11g CH 11 2462MHz	*	2468.386	105.22	-	-	109	27.51	5.67	36.96	100	115	P	H
	*	2469.138	97.08	-	-	100.86	27.51	5.67	36.96	100	115	A	H
		2484.88	67.42	-6.58	74	71.03	27.64	5.69	36.94	100	115	P	H
	!	2484.04	49.4	-4.60	54	53.01	27.64	5.69	36.94	100	115	A	H
	*	2456.864	101.52	-	-	105.3	27.51	5.67	36.96	355	78	P	V
	*	2468.47	93.49	-	-	97.27	27.51	5.67	36.96	355	78	A	V
		2484.16	62.27	-11.73	74	65.88	27.64	5.69	36.94	355	78	P	V
		2483.52	46.21	-7.79	54	49.82	27.64	5.69	36.94	355	78	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	37.77	-36.23	74	59.23	31.51	9.13	62.1	100	360	P	H
		4824	37.5	-36.50	74	58.96	31.51	9.13	62.1	100	0	P	V
802.11g CH 06 2437MHz		4875	36.94	-37.06	74	58.18	31.59	9.2	62.03	100	360	P	H
		7311	40.92	-33.08	74	54.75	34.03	11.3	59.16	100	0	P	H
		4875	36.71	-37.29	74	57.95	31.59	9.2	62.03	100	0	P	V
		7311	38.99	-35.01	74	52.82	34.03	11.3	59.16	100	360	P	V
802.11g CH 11 2462MHz		4923	35.86	-38.14	74	56.89	31.67	9.27	61.97	100	360	P	H
		7386	38.85	-35.15	74	52.39	34.29	11.29	59.12	100	0	P	H
		4923	36	-38.00	74	57.03	31.67	9.27	61.97	100	0	P	V
		7386	39.89	-34.11	74	53.43	34.29	11.29	59.12	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		2389.74	65.77	-8.23	74	70.2	27	5.59	37.02	100	125	P	H
	!	2390	48.52	-5.48	54	52.95	27	5.59	37.02	100	125	A	H
	*	2411.857	107.57	-	-	111.83	27.13	5.61	37	100	125	P	H
	*	2406.93	98.54	-	-	102.8	27.13	5.61	37	100	125	A	H
		2389.92	58.68	-15.32	74	63.11	27	5.59	37.02	264	81	P	V
		2389.83	43.22	-10.78	54	47.65	27	5.59	37.02	264	81	A	V
	*	2407.348	99.34	-	-	103.6	27.13	5.61	37	264	81	P	V
	*	2407.348	91.41	-	-	95.67	27.13	5.61	37	264	81	A	V
802.11n HT20 CH 06 2437MHz	*	2441.583	106.47	-	-	110.4	27.39	5.65	36.97	104	286	P	H
	*	2441.583	97.52	-	-	101.45	27.39	5.65	36.97	104	286	A	H
	*	2432.648	102.85	-	-	106.95	27.26	5.63	36.99	372	258	P	V
	*	2433.483	94.6	-	-	98.7	27.26	5.63	36.99	372	258	A	V
802.11n HT20 CH 11 2462MHz	*	2466.55	105.73	-	-	109.51	27.51	5.67	36.96	117	283	P	H
	*	2469.472	96.79	-	-	100.57	27.51	5.67	36.96	117	283	A	H
		2483.92	65.56	-8.44	74	69.17	27.64	5.69	36.94	117	283	P	H
	!	2483.52	49.17	-4.83	54	52.78	27.64	5.69	36.94	117	283	A	H
	*	2465.715	101.54	-	-	105.32	27.51	5.67	36.96	363	258	P	V
	*	2469.221	93.22	-	-	97	27.51	5.67	36.96	363	258	A	V
		2483.52	65.76	-8.24	74	69.37	27.64	5.69	36.94	363	258	P	V
		2483.52	46.66	-7.34	54	50.27	27.64	5.69	36.94	363	258	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	37.77	-36.23	74	59.23	31.51	9.13	62.1	100	360	P	H
		4824	37.5	-36.50	74	58.96	31.51	9.13	62.1	100	0	P	V
802.11n HT20 CH 06 2437MHz		4875	35.45	-38.55	74	56.69	31.59	9.2	62.03	100	360	P	H
		7311	39.38	-34.62	74	53.21	34.03	11.3	59.16	100	0	P	H
		4875	35.99	-38.01	74	57.23	31.59	9.2	62.03	100	0	P	V
		7311	40.25	-33.75	74	54.08	34.03	11.3	59.16	100	360	P	V
802.11n HT20 CH 11 2462MHz		4923	34.75	-39.25	74	55.78	31.67	9.27	61.97	100	360	P	H
		7386	40.66	-33.34	74	54.2	34.29	11.29	59.12	100	0	P	H
		4923	35.77	-38.23	74	56.8	31.67	9.27	61.97	100	0	P	V
		7386	39.62	-34.38	74	53.16	34.29	11.29	59.12	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11g (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		30.97	19.22	-20.78	40	32.68	18.46	0.66	32.58	-	-	P	H
		96.93	23.42	-20.08	43.5	41.75	12.8	1.19	32.32	-	-	P	H
		162.89	23.96	-19.54	43.5	41.83	13.01	1.54	32.42	-	-	P	H
		216.24	32.23	-13.77	46	51.32	11.52	1.73	32.34	-	-	P	H
		344.28	36.1	-9.90	46	50.28	15.7	2.28	32.16	109	255	P	H
		397.63	31.59	-14.41	46	44.32	16.95	2.46	32.14	-	-	P	H
		30	28.12	-11.88	40	41.48	18.6	0.65	32.61	-	-	P	V
		39.7	28.16	-11.84	40	45.77	14.2	0.75	32.56	103	81	P	V
		94.99	27.98	-15.52	43.5	46.54	12.6	1.17	32.33	-	-	P	V
		154.16	25.59	-17.91	43.5	42.96	13.56	1.5	32.43	-	-	P	V
		192.96	25.44	-18.06	43.5	45.16	11.13	1.69	32.54	-	-	P	V
		336.52	32.18	-13.82	46	46.51	15.56	2.26	32.15	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

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



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		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)

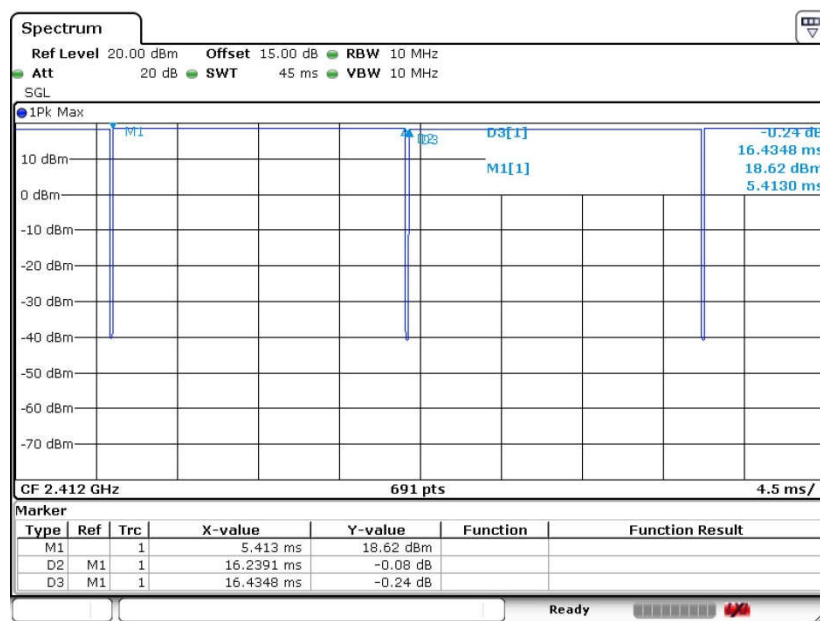
= -10.46(dB)

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

Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	98.81	-	-	10Hz
802.11g	93.23	2.70	0.37	1kHz
2.4GHz 802.11n HT20	93.30	2.52	0.40	1kHz

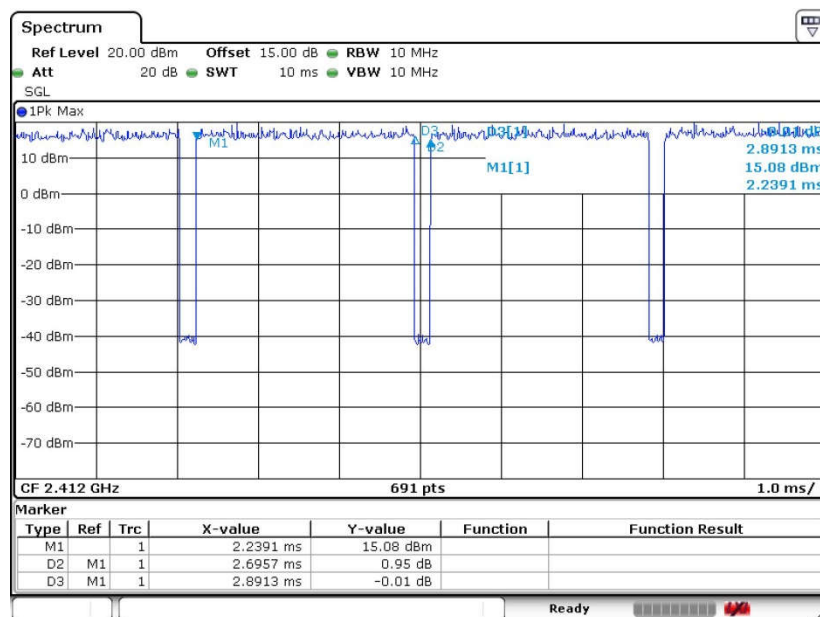
802.11b



Date: 22.MAY.2016 14:52:58

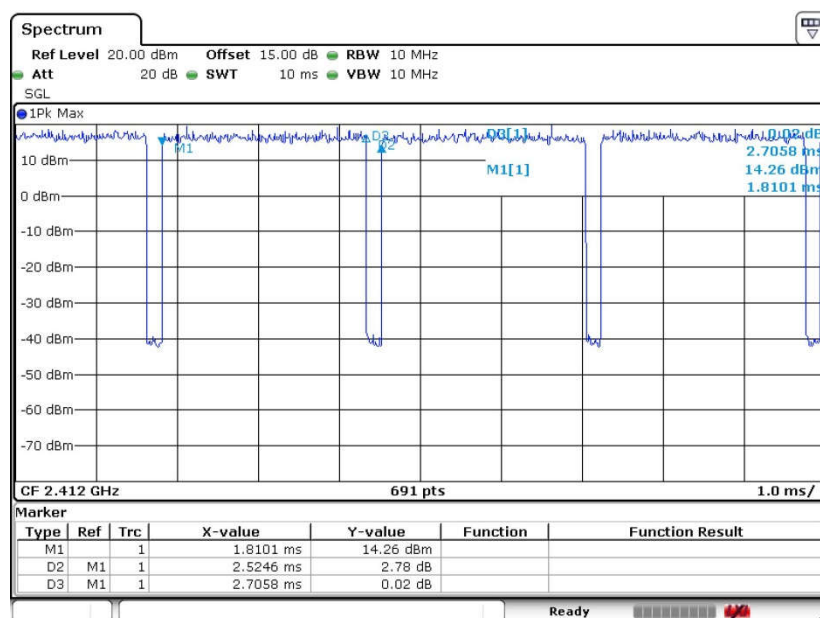


802.11g



Date: 22.MAY.2016 15:11:05

802.11n HT20



Date: 22.MAY.2016 15:20:27