FCC RF Test Report

APPLICANT	:	Lenovo Mobile Communication Technology Ltd.
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Lenovo
MODEL NAME	:	Lenovo K53b36, Lenovo K53b37
FCC ID	:	YCNK53B3
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was received on Jun. 20, 2016 and testing was completed on Sep. 07, 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.

James Huang

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory 2627

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR662005C	Rev. 01	Initial issue of report	Sep. 12, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Pass	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.77 dB at 2389.820 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.56 dB at 18.135 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Lenovo Mobile Communication Technology Ltd.
No. 999, Qishan North 2nd Road, Information & Optoelectronics Park, Torch Hi-tech Industry Development Zone, Xiamen, P. R. China

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	Lenovo
Model Name	Lenovo K53b36, Lenovo K53b37
FCC ID	YCNK53B3
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/HSPA+(16QAM uplink is not supported)/DC-HSDPA/LTE WLAN2.4GHz 802.11b/g/n HT20 Bluetooth v3.0+EDR/Bluetooth v4.0 LE/ Bluetooth v4.2 LE
IMEI Code	Conducted: 861901030021452/861901030021460 for Sample 1 Radiation: 861901030022278/861901030022286 for Sample 1 Conduction: 861901030024332/861901030024340 for Sample 1 861902030000132 for Sample 2
HW Version	82939_1_13
SW Version	K53_S016_160729_ROW
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 different types of EUT. They are single SIM card mobile (Model Name: Lenovo K53b37) and dual SIM card mobile (Model Name: Lenovo K53b36). The others are the same including circuit design, PCB board, structure and all components.

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 : 15.85 dBm (0.0385 W) 802.11g : 21.47 dBm (0.1403 W) 802.11n HT20 : 20.92 dBm (0.1236 W)
99% Occupied Bandwidth	802.11b : 14.39MHz 802.11g : 18.83MHz 802.11n HT20 : 19.43MHz
Antenna Type / Gain	LDS Antenna with gain -4.93 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter 1	**Brand Name**	Lenovo (Acbel)	**Model Name**	C-P35
	Power Rating	I/P: 100-240Vac, 300mA, O/P: 5.2Vdc, 2000mA		
AC Adapter 2	**Brand Name**	Lenovo (Huntkey)	**Model Name**	C-P35
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5.2Vdc, 2000mA		
Battery	**Brand Name**	Lenovo (SCUD)	**Model Name**	BL270
	Power Rating	3.85Vdc, 4000mAh		
Earphone	**Brand Name**	Lenovo (Cosonic)	**Model Name**	LS-118M
	Signal Line Type	1.1 meter, non-shielded cable, without ferrite core		
USB Cable 1	**Brand Name**	Lenovo(Starw)	**Model Name**	XJ-007070
	Signal Line Type	1.0 meter, non-shielded cable, without ferrite core		
USB Cable 2	**Brand Name**	Lenovo(Saibao)	**Model Name**	SWT-A053A
	Signal Line Type	1.0 meter, non-shielded cable, without ferrite core		
LCD Panel	**Brand Name**	Tianma Micro-electronics	**Model Name**	TL055VDXP64-00
Camera_ Front	**Brand Name**	Q-Tech	**Model Name**	FX219BQS
Camera _ Rear	**Brand Name**	Sunny	**Model Name**	A16S05J-200
CTP Module	**Brand Name**	O-FILM	**Model Name**	Black：MCF-055-2594 White：MCF-055-2594 Golden：MCF-055-2594

1.6 Modification of EUT

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

1.7 Testing Location

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 Registration No.
	TH01-KS	03CH03-KS	CO01-KS	306251

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 were recorded in this report.

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 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.

802.11b mode Peak Power (dBm)					
Channel	Frequency	Data Rate (MHz)			
		1M bps	2M bps	5.5M bps	11M bps
CH 01	2412 MHz	15.85	15.83	15.80	15.81
CH 06	2437 MHz	14.86	14.82	14.80	14.77
CH 11	2462 MHz	14.64	14.59	14.36	14.52

802.11g mode Peak Power (dBm)									
Channel	Frequency	Data Rate (MHz)							
		6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
CH 01	2412 MHz	21.47	21.21	21.35	21.32	21.26	21.41	21.39	21.44
CH 06	2437 MHz	20.78	20.70	20.72	20.53	20.65	20.62	20.52	20.54
CH 11	2462 MHz	20.46	20.11	20.02	20.32	20.16	20.28	20.37	20.28

802.11n HT20 mode Peak Power (dBm)									
Channel	Frequency	Data Rate (MHz)							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412 MHz	20.92	20.83	20.82	20.74	20.68	20.65	20.63	20.58
CH 06	2437 MHz	20.35	20.22	20.02	19.92	19.85	19.80	19.78	19.69
CH 11	2462 MHz	19.65	19.63	19.55	19.52	19.49	19.40	19.35	19.22

2.3 Test Mode

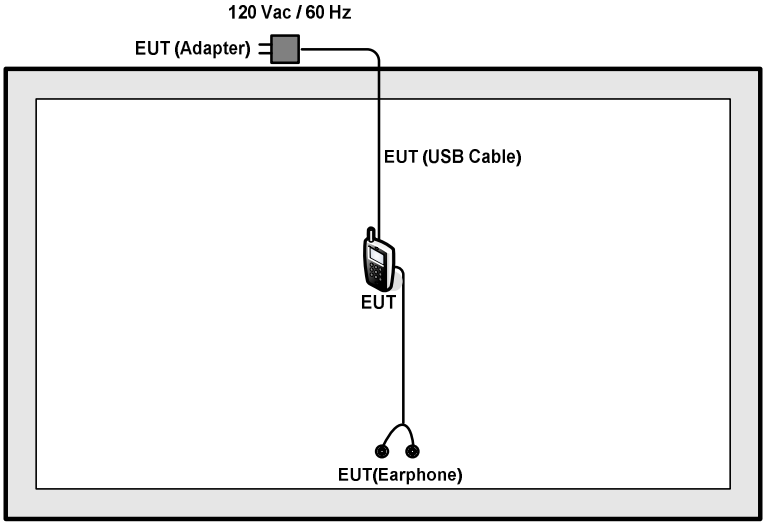
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

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

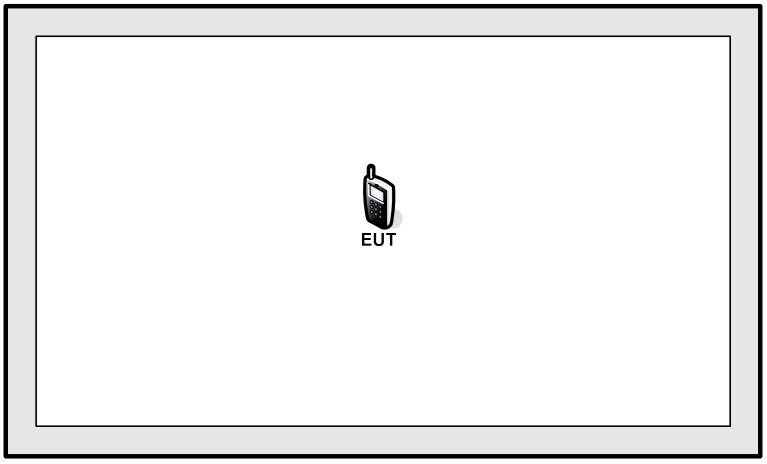
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable 1(Charging from Adapter 1) for Sample 1 Mode 2 : **GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable 2(Charging from Adapter 2) for Sample 2**
Remark: The worst case of conducted emission is mode 2; only the test data of it was reported.	

2.4 Connection Diagram of Test System

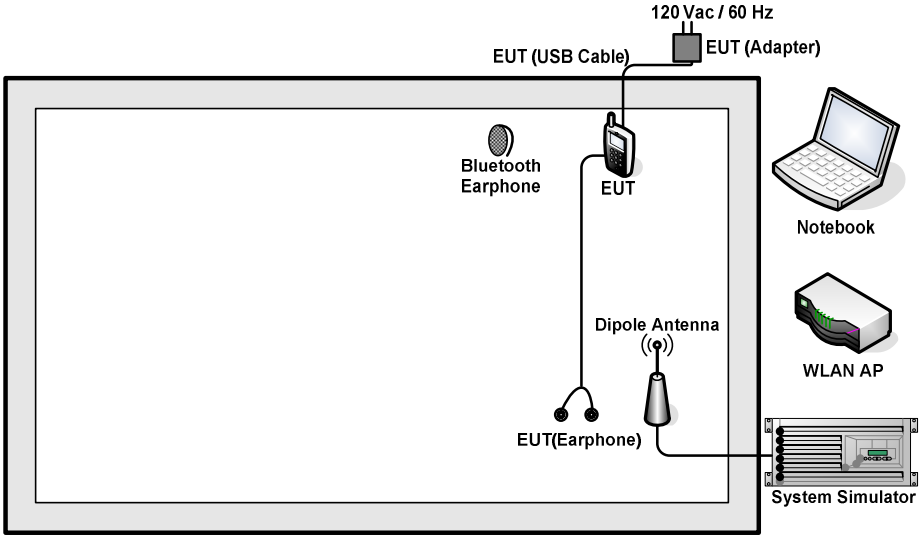
<WLAN 11b Tx Mode>



<WLAN 11g/n 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	Anritsu	MT8820C	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	N/A	N/A	Shielded cable DC O/P 1.8 m Unshielded AC I/P cable1.2 m
4.	Bluetooth Earphone	Lenovo	LBH308	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 Notebook 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 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 5.5 dB.

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

= 5.5 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

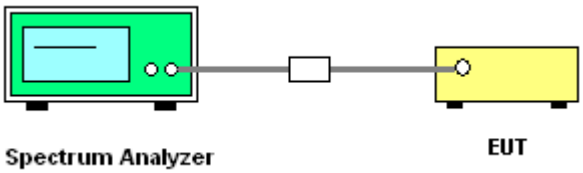
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

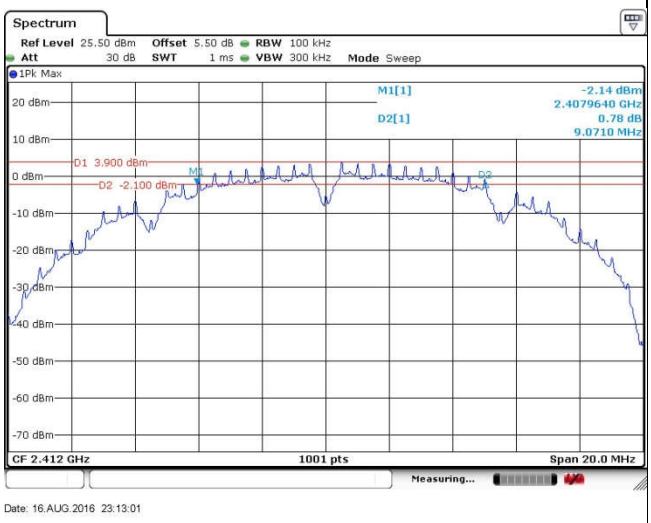
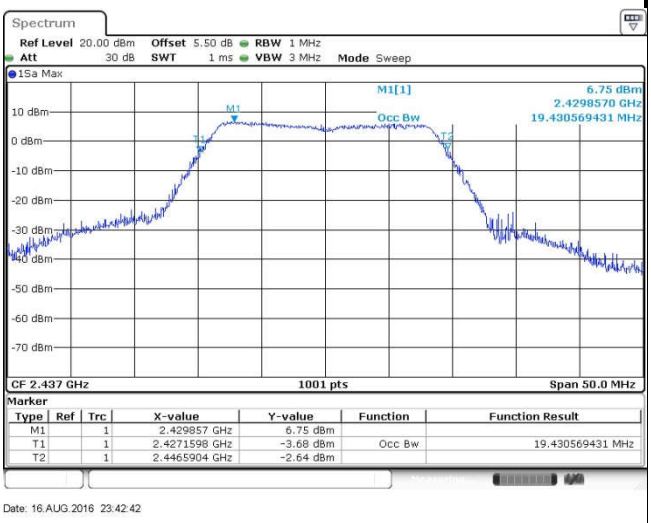
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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.

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna 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.

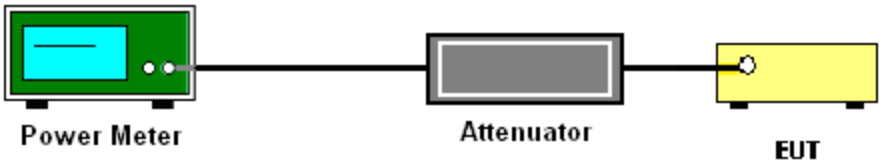
3.2.2 Measuring Instruments

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.

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.

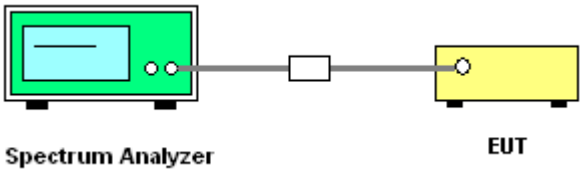
3.3.2 Measuring Instruments

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 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.

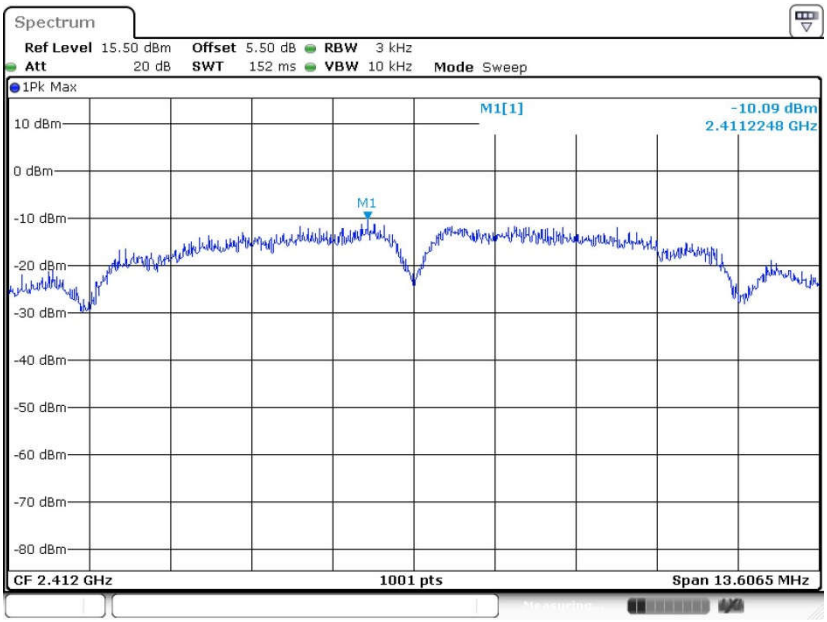
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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 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).

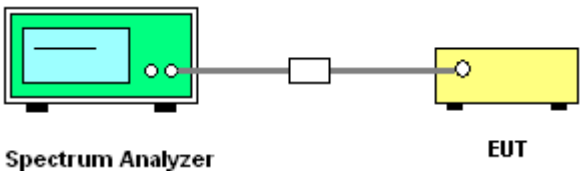
3.4.2 Measuring Instruments

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

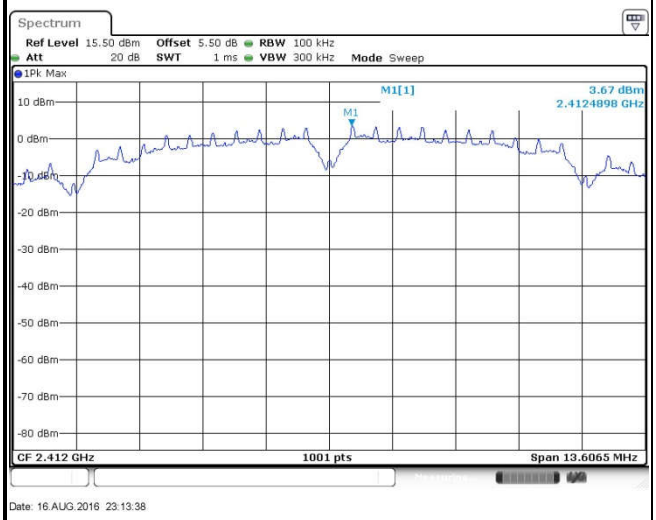


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

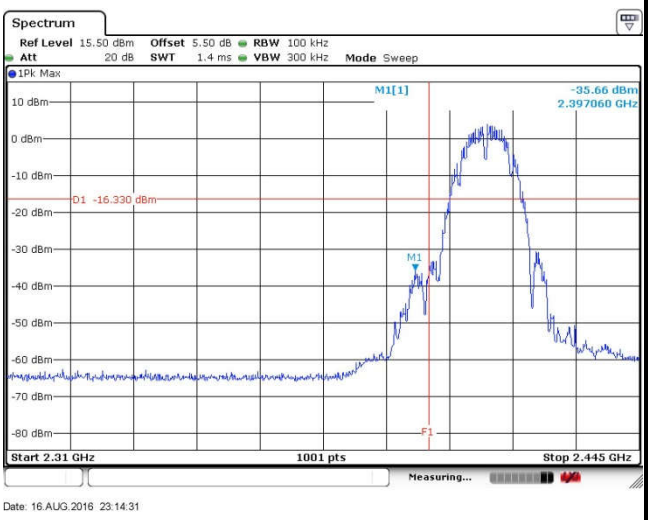
Test Mode :	802.11b	**Temperature :**	24~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	54~55%
Test Channel :	01	**Test Engineer :**	Ivan Zhang

WLAN 802.11b Channel 01

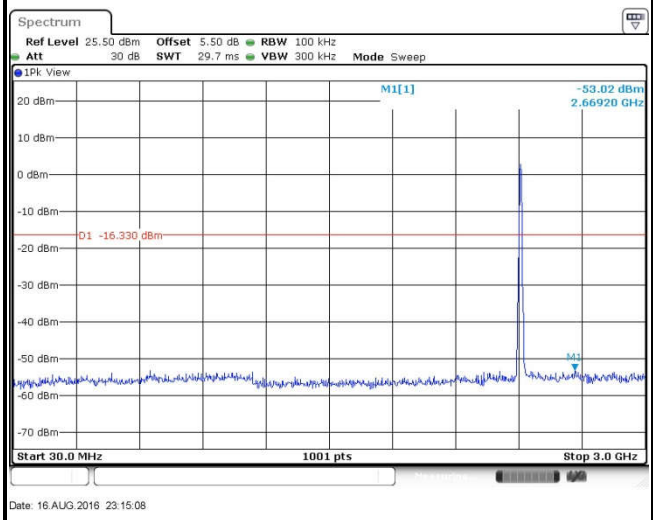
100kHz PSD reference Level



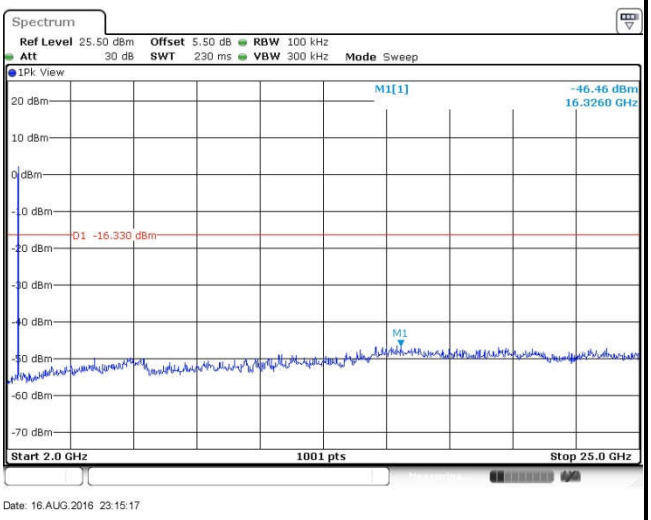
Low Channel Plot



Spurious Emission 30MHz~3GHz



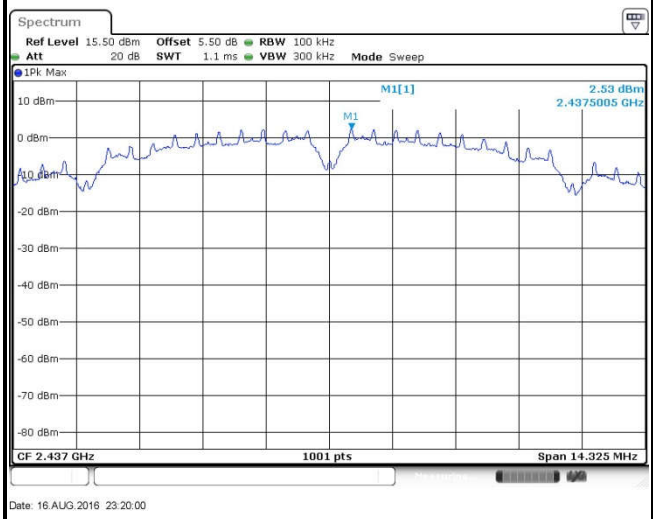
Spurious Emission 2GHz~25GHz



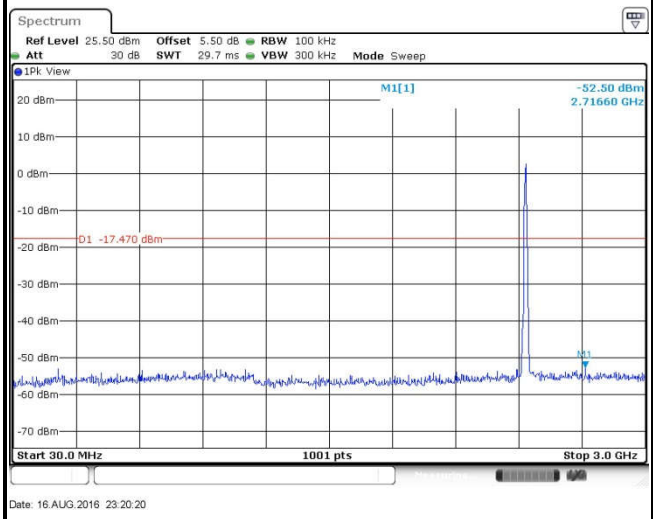
Test Mode :	802.11b	**Temperature :**	24~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	54~55%
Test Channel :	06	**Test Engineer :**	Ivan Zhang

WLAN 802.11b Channel 06

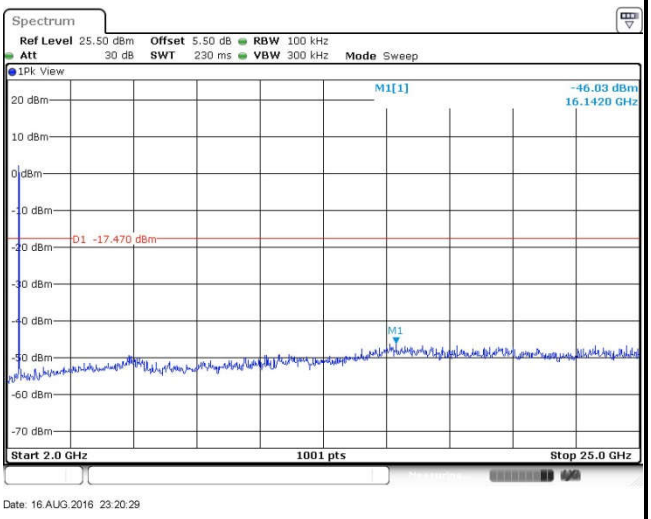
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



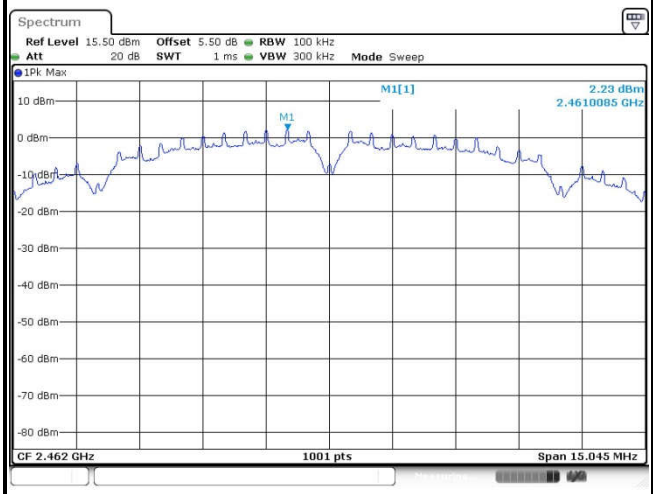
Spurious Emission 2GHz~25GHz



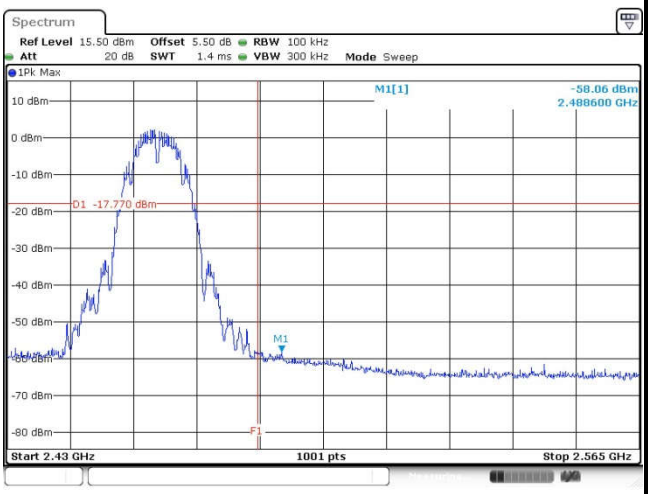
Test Mode :	802.11b	**Temperature :**	24~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	54~55%
Test Channel :	11	**Test Engineer :**	Ivan Zhang

WLAN 802.11b Channel 11

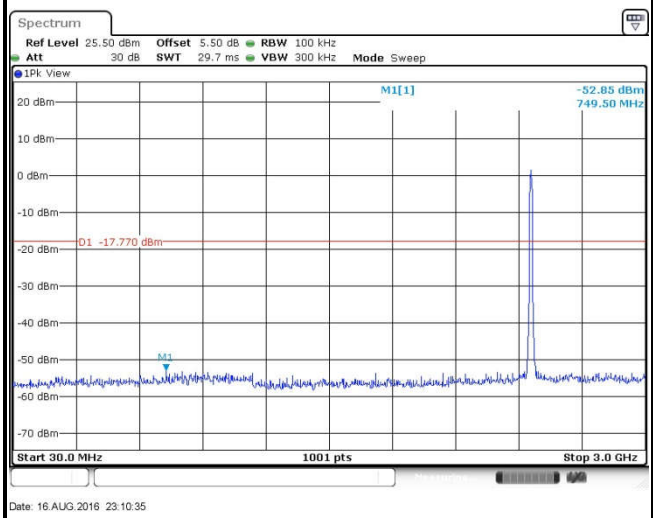
100kHz PSD reference Level



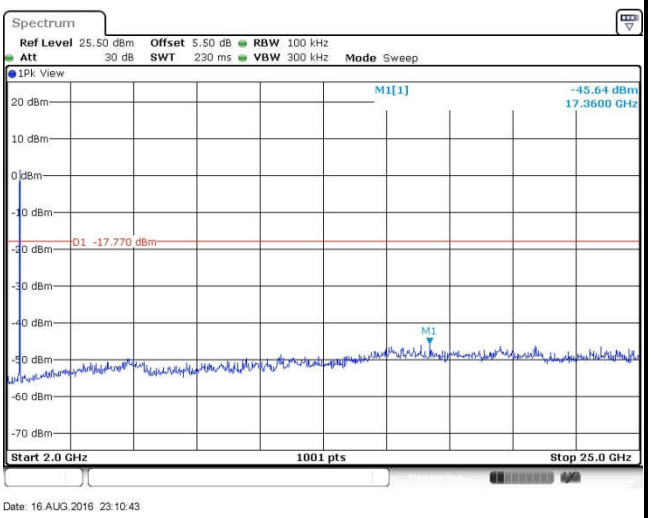
High Channel Plot



Spurious Emission 30MHz~3GHz



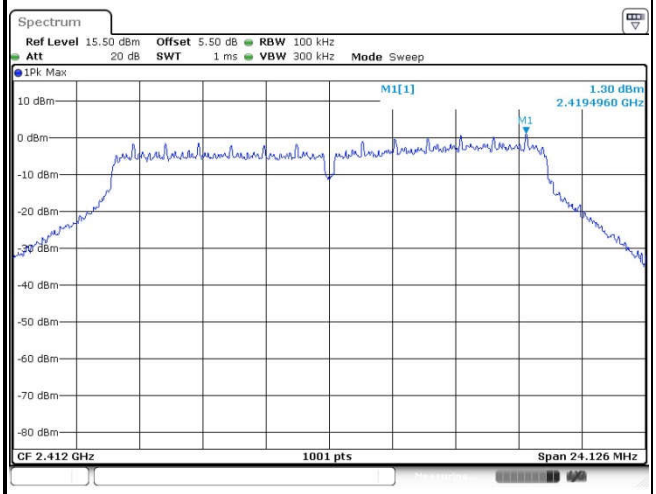
Spurious Emission 2GHz~25GHz



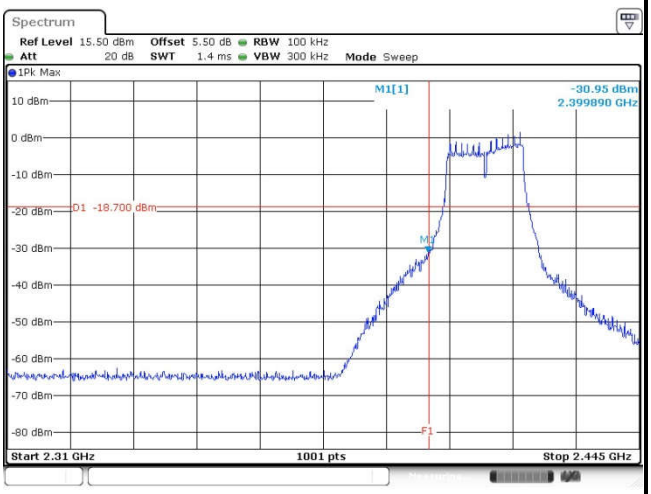
Test Mode :	802.11g	**Temperature :**	24~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	54~55%
Test Channel :	01	**Test Engineer :**	Ivan Zhang

WLAN 802.11g Channel 01

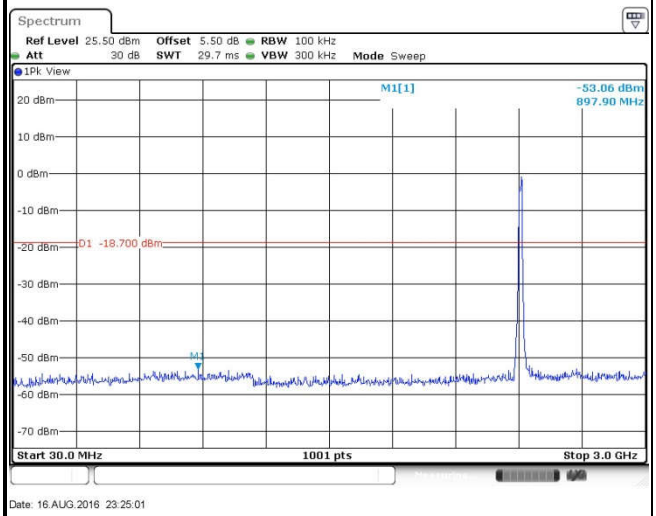
100kHz PSD reference Level



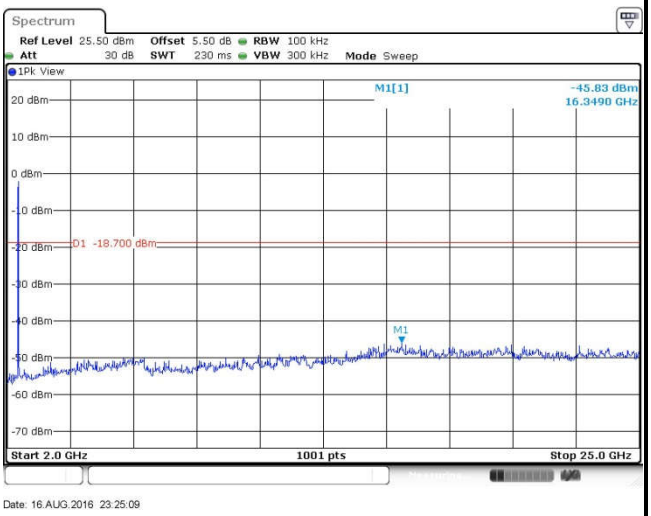
Low Channel Plot



Spurious Emission 30MHz~3GHz



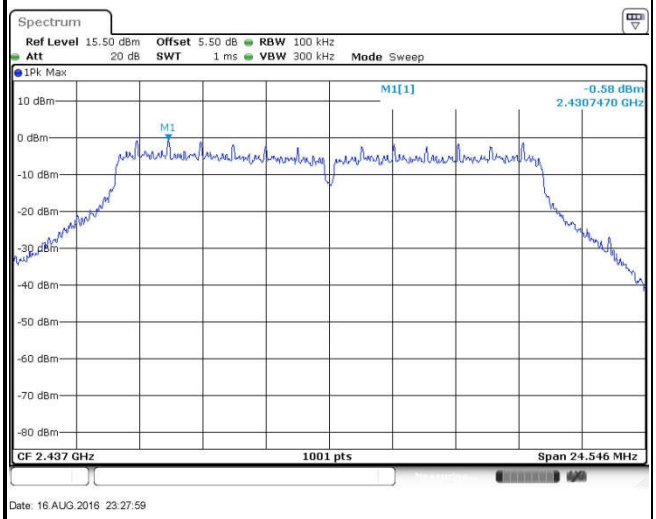
Spurious Emission 2GHz~25GHz



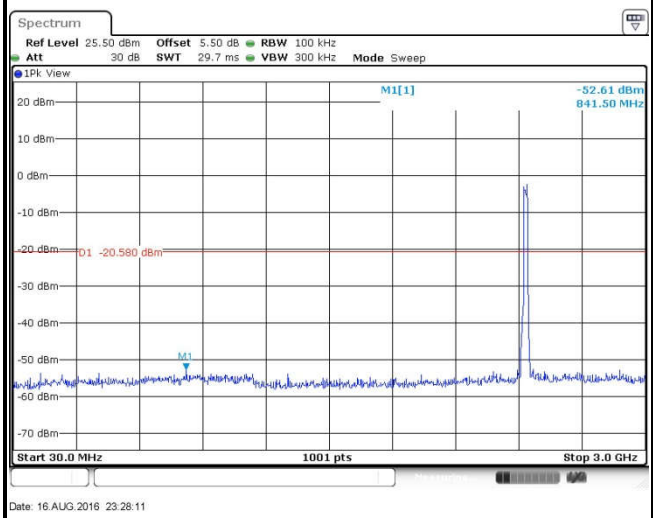
Test Mode :	802.11g	**Temperature :**	24~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	54~55%
Test Channel :	06	**Test Engineer :**	Ivan Zhang

WLAN 802.11g Channel 06

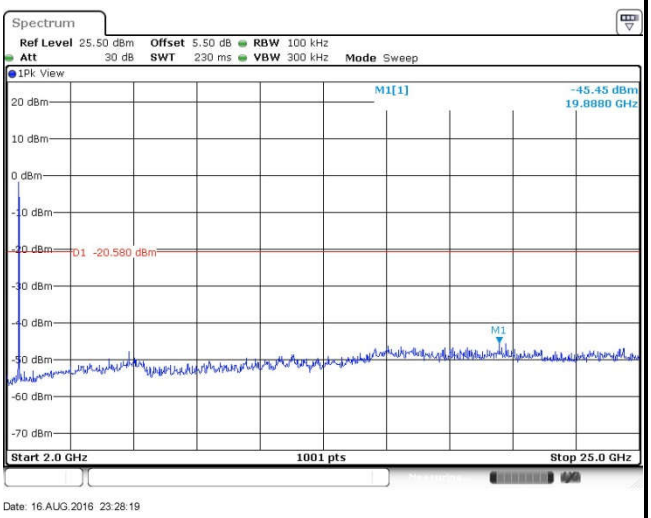
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



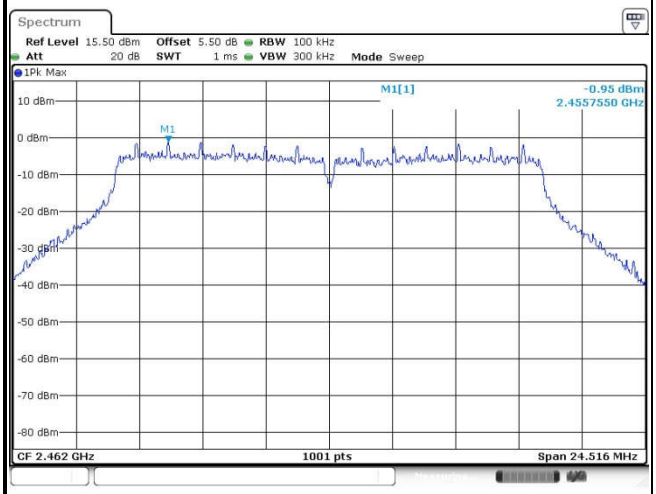
Spurious Emission 2GHz~25GHz



Test Mode :	802.11g	**Temperature :**	24~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	54~55%
Test Channel :	11	**Test Engineer :**	Ivan Zhang

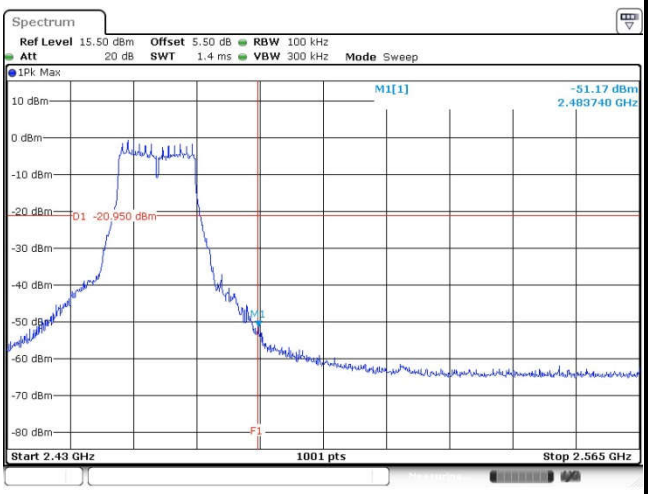
WLAN 802.11g Channel 11

100kHz PSD reference Level



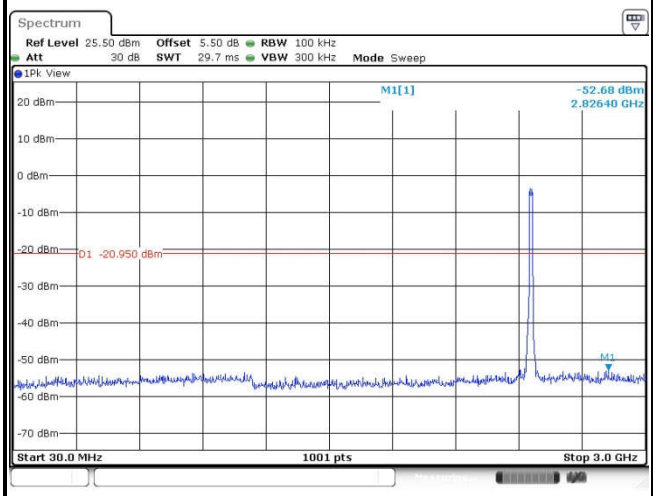
Date: 16.AUG.2016 23:31:28

High Channel Plot



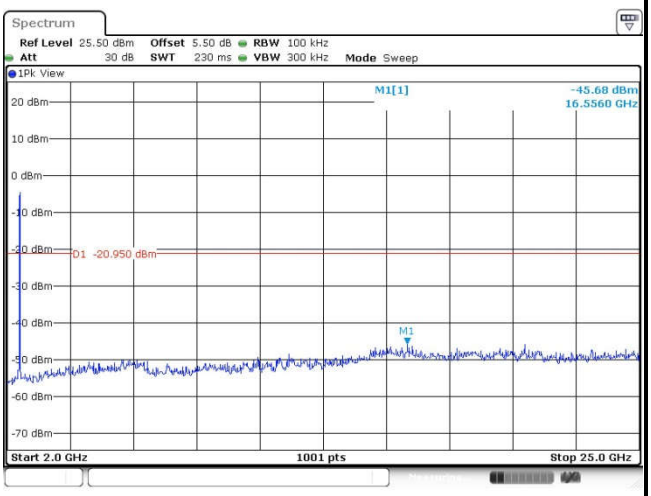
Date: 16.AUG.2016 23:32:10

Spurious Emission 30MHz~3GHz



Date: 16.AUG.2016 23:32:56

Spurious Emission 2GHz~25GHz

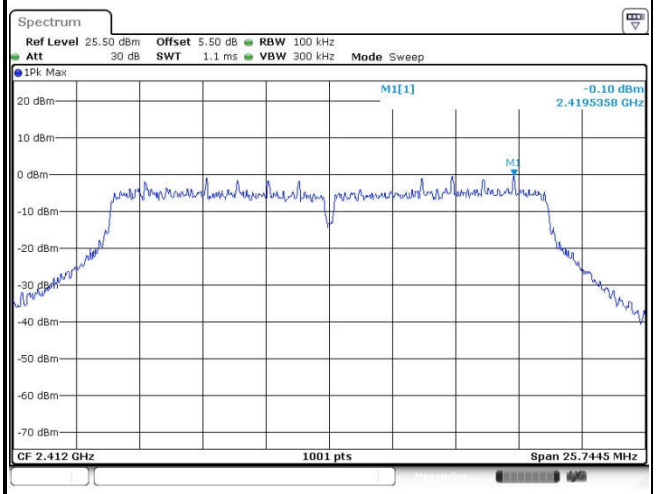


Date: 16.AUG.2016 23:33:04

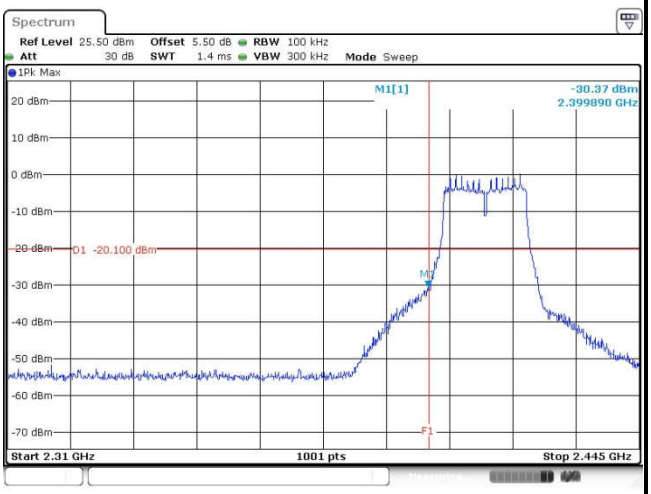
Test Mode :	802.11n HT20	**Temperature :**	24~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	54~55%
Test Channel :	01	**Test Engineer :**	Ivan Zhang

WLAN 802.11n HT20 Channel 01

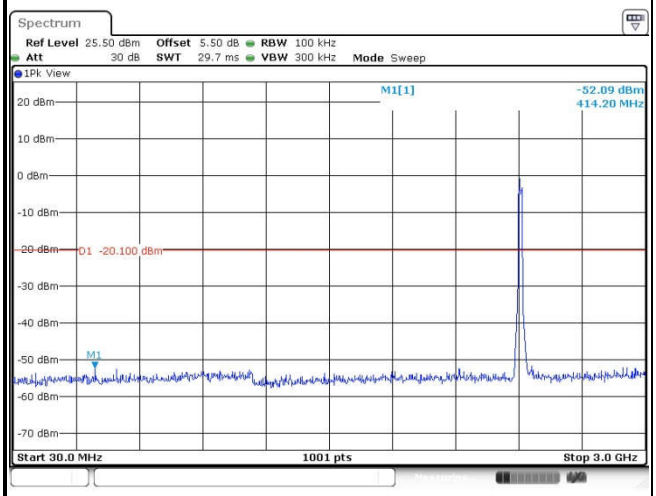
100kHz PSD reference Level



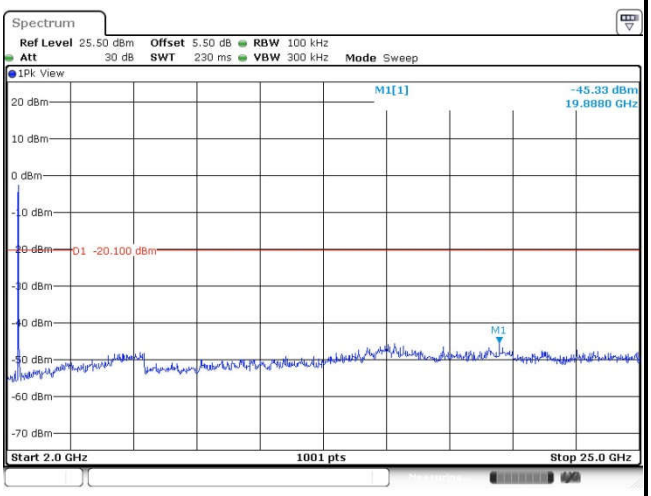
Low Channel Plot



Spurious Emission 30MHz~3GHz



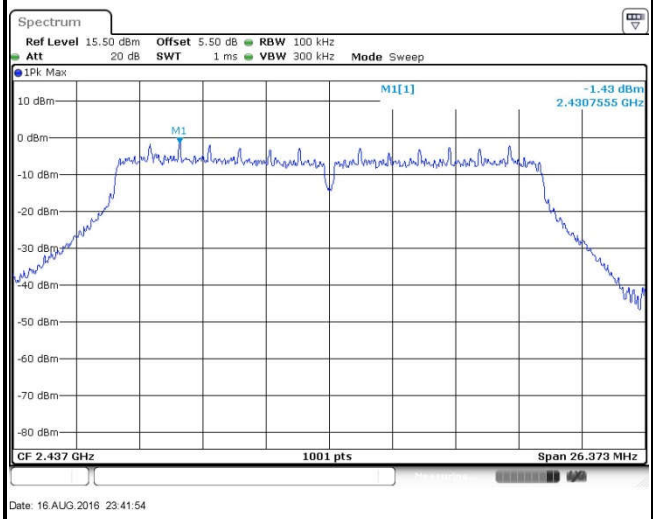
Spurious Emission 2GHz~25GHz



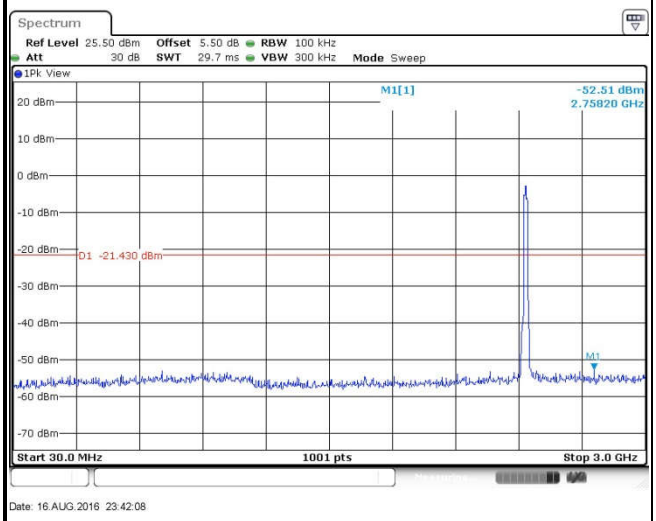
Test Mode :	802.11n HT20	**Temperature :**	24~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	54~55%
Test Channel :	06	**Test Engineer :**	Ivan Zhang

WLAN 802.11n HT20 Channel 06

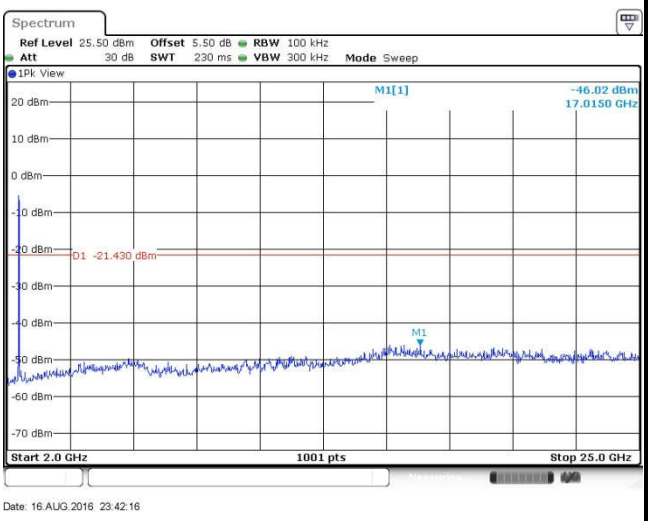
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



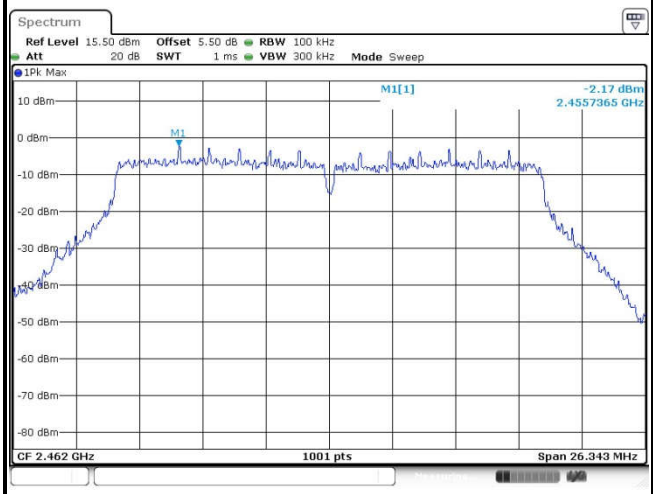
Spurious Emission 2GHz~25GHz



Test Mode :	802.11n HT20	**Temperature :**	24~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	54~55%
Test Channel :	11	**Test Engineer :**	Ivan Zhang

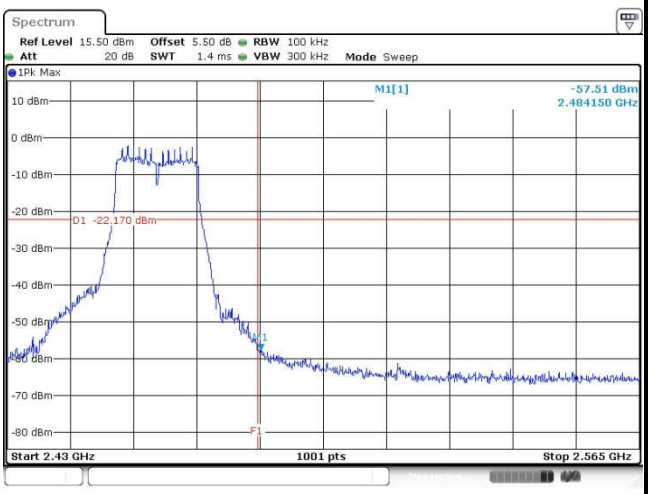
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



Date: 16.AUG.2016 23:57:42

High Channel Plot



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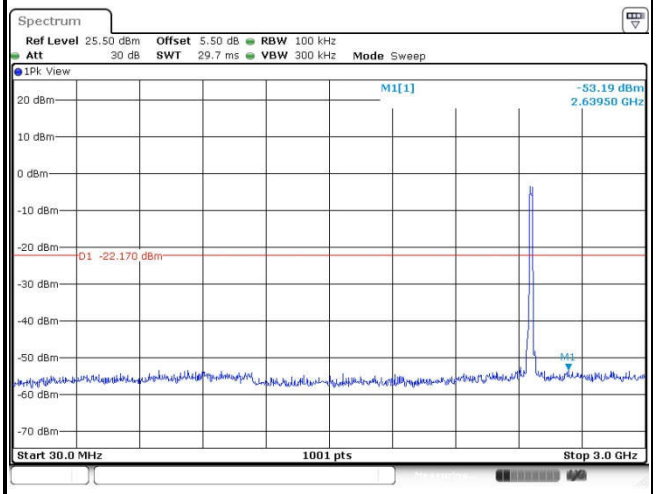
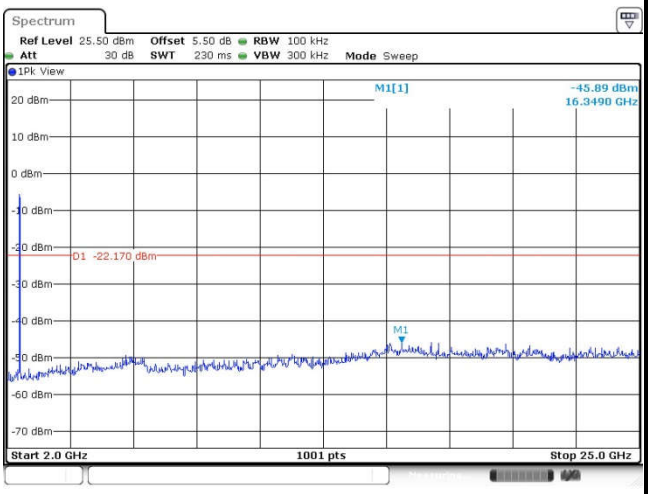
Spurious Emission 30MHz~3GHz



Date: 16.AUG.2016 23:58:03

Spurious Emission 2GHz~25GHz



Date: 16.AUG.2016 23:58:12

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

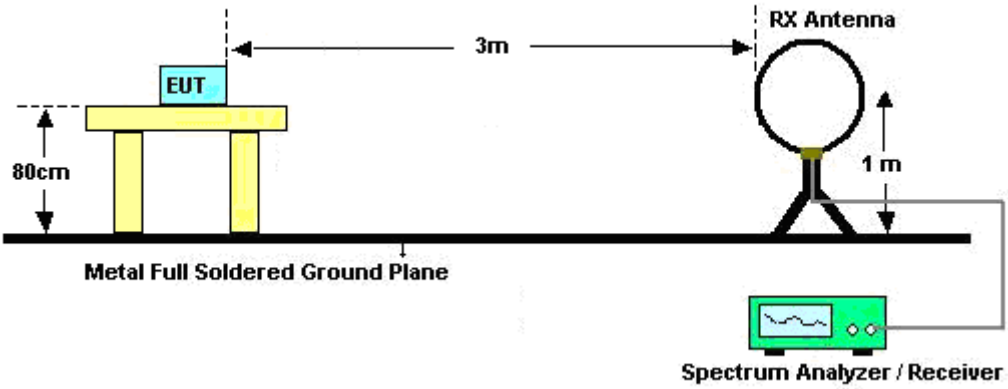
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

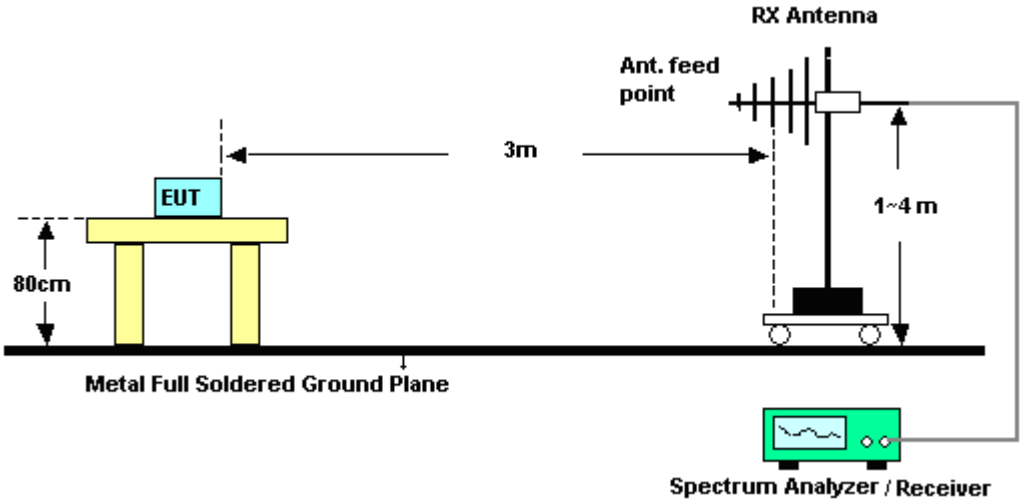
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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 ≥ 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

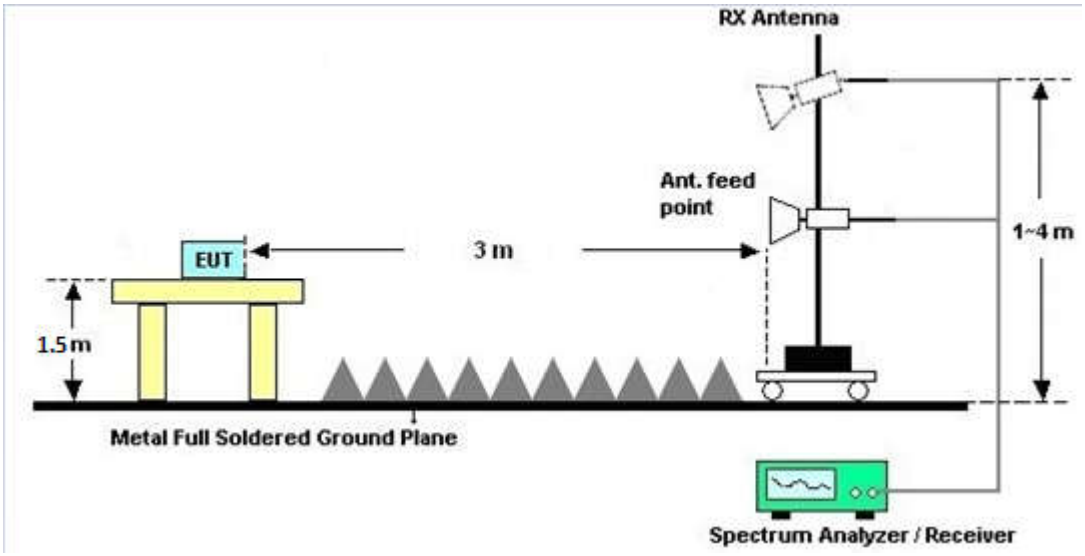
For radiated emissions below 30MHz



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 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 (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.

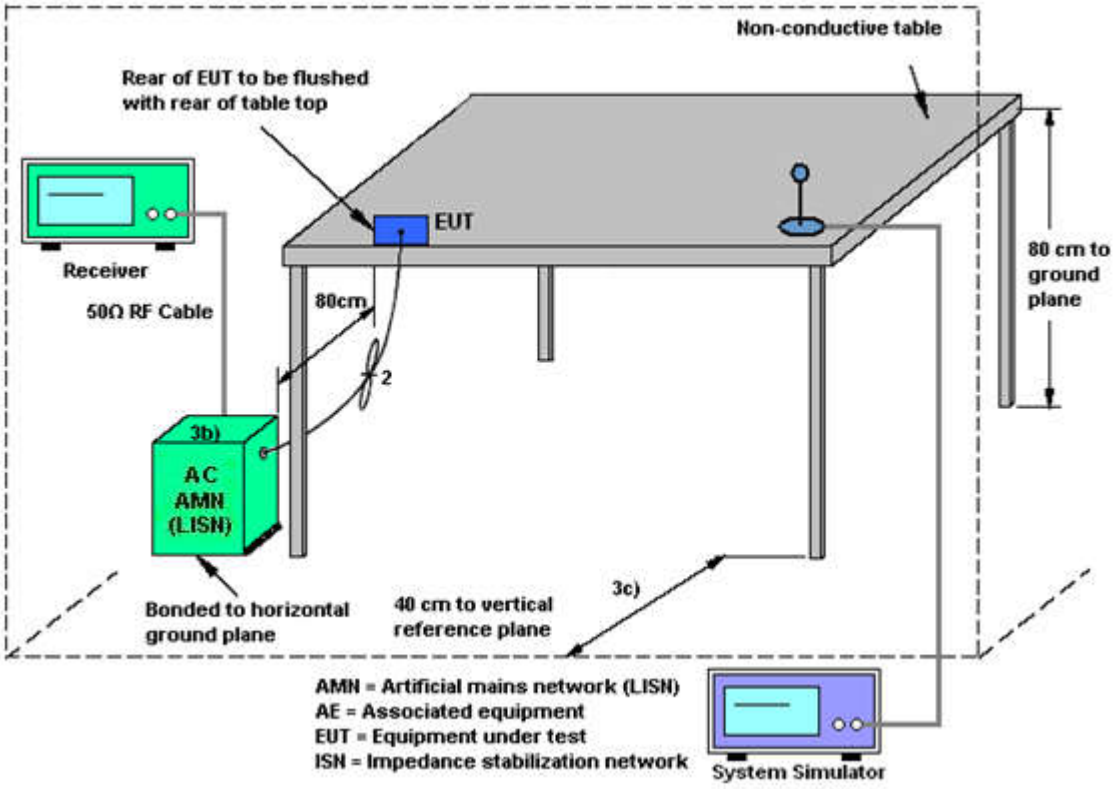
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

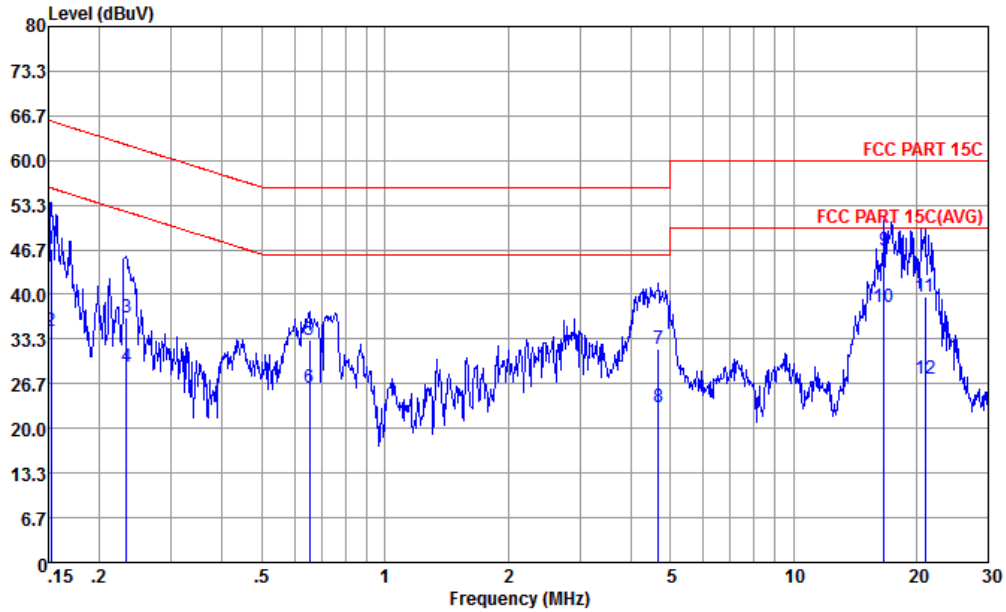
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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

Test Mode :	Mode 2	**Temperature :**	22~24℃
Test Engineer :	Morris Li	**Relative Humidity :**	42~44%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable 2(Charging from Adapter 2) for Sample 2		

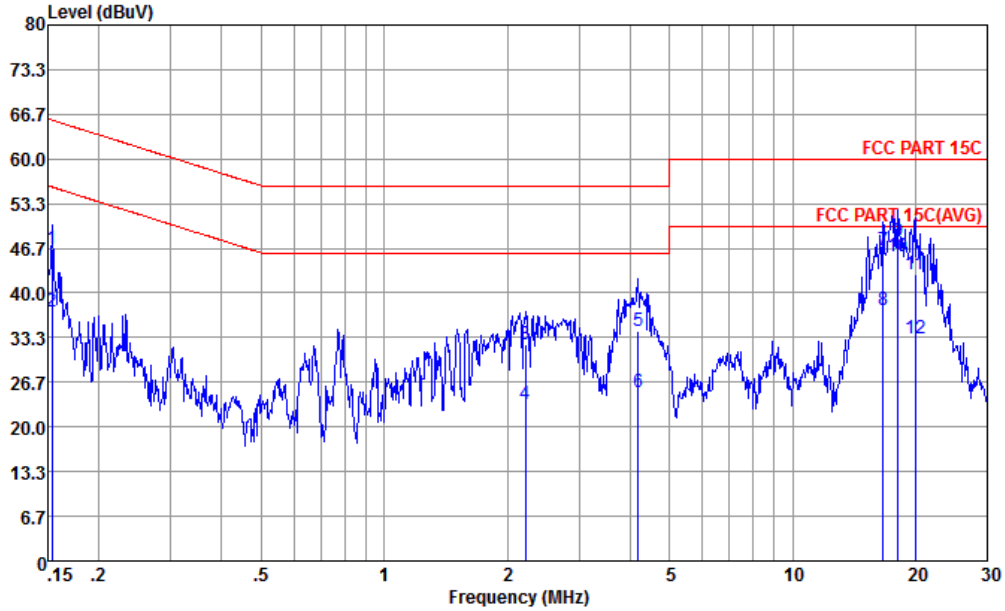


Site : CO01-KS
Condition : FCC PART 15C LISN-L-20151024 LINE

mode : Mode 2
IMEI : 861902030000132

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.152	46.82	-19.05	65.87	36.20	0.51	10.11	QP
2	0.152	34.52	-21.35	55.87	23.90	0.51	10.11	Average
3	0.233	36.46	-25.89	62.35	26.10	0.22	10.14	QP
4	0.233	29.26	-23.09	52.35	18.90	0.22	10.14	Average
5	0.654	33.29	-22.71	56.00	22.90	0.24	10.15	QP
6	0.654	26.09	-19.91	46.00	15.70	0.24	10.15	Average
7	4.672	31.77	-24.23	56.00	21.40	0.19	10.18	QP
8	4.672	23.27	-22.73	46.00	12.90	0.19	10.18	Average
9	16.661	46.50	-13.50	60.00	35.80	0.26	10.44	QP
10 *	16.661	38.20	-11.80	50.00	27.50	0.26	10.44	Average
11	21.035	39.73	-20.27	60.00	28.90	0.26	10.57	QP
12	21.035	27.33	-22.67	50.00	16.50	0.26	10.57	Average

Test Mode :	Mode 2	**Temperature :**	22~24℃
Test Engineer :	Morris Li	**Relative Humidity :**	42~44%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable 2(Charging from Adapter 2) for Sample 2		



Site : CO01-KS
Condition : FCC PART 15C LISN-N-20151024 NEUTRAL

mode : Mode 2
IMEI : 861902030000132

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.153	46.61	-19.21	65.82	36.20	0.30	10.11	QP
2		0.153	37.11	-18.71	55.82	26.70	0.30	10.11	Average
3		2.213	32.42	-23.58	56.00	21.90	0.38	10.14	QP
4		2.213	23.42	-22.58	46.00	12.90	0.38	10.14	Average
5		4.180	34.23	-21.77	56.00	23.70	0.36	10.17	QP
6		4.180	25.13	-20.87	46.00	14.60	0.36	10.17	Average
7		16.661	46.40	-13.60	60.00	35.70	0.26	10.44	QP
8		16.661	37.50	-12.50	50.00	26.80	0.26	10.44	Average
9		18.135	47.64	-12.36	60.00	36.90	0.26	10.48	QP
10	*	18.135	45.44	-4.56	50.00	34.70	0.26	10.48	Average
11		19.950	42.68	-17.32	60.00	31.90	0.25	10.53	QP
12		19.950	33.18	-16.82	50.00	22.40	0.25	10.53	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. 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	101040	10Hz~40GHz	Aug. 09, 2016	Aug. 16, 2016~ Sep. 07, 2016	Aug. 08, 2017	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 20, 2016	Aug. 16, 2016~ Sep. 07, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 20, 2016	Aug. 16, 2016~ Sep. 07, 2016	Jan. 19, 2017	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Aug. 09, 2016	Aug. 15, 2016~ Aug. 17, 2016	Aug. 08, 2017	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44GHz	Apr. 22, 2016	Aug. 15, 2016~ Aug. 17, 2016	Apr. 21, 2017	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 07, 2015	Aug. 15, 2016~ Aug. 17, 2016	Nov. 06, 2016	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz~2GHz	Apr. 16, 2016	Aug. 15, 2016~ Aug. 17, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1356	1GHz~18GHz	Apr. 16, 2016	Aug. 15, 2016~ Aug. 17, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101070	18GHz~40GHz	Oct. 10, 2015	Aug. 15, 2016~ Aug. 17, 2016	Oct. 09, 2016	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9kHz~1GHz	Aug. 09, 2016	Aug. 15, 2016~ Aug. 17, 2016	Aug. 08, 2017	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 24, 2015	Aug. 15, 2016~ Aug. 17, 2016	Oct. 23, 2016	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18GHz~40GHz	Jan. 20, 2016	Aug. 15, 2016~ Aug. 17, 2016	Jan. 19, 2017	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 15, 2016~ Aug. 17, 2016	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 15, 2016~ Aug. 17, 2016	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 15, 2016~ Aug. 17, 2016	NCR	Radiation (03CH03-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Aug. 09, 2016	Aug. 20, 2016	Aug. 08, 2017	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Aug. 20, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Aug. 20, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Aug. 20, 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 = 2Uc(y))	2.3 dB

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

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

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

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

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

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

Appendix A. Conducted Test Results

Report Number : FR662005C

A1 - DTS Part

Test Engineer:	Ivan Zhang	Temperature:	24~25	°C
Test Date:	2016/8/16~2016/9/7	Relative Humidity:	54~55	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	14.34	9.07	0.50	Pass
11b	1Mbps	1	6	2437	14.39	9.55	0.50	Pass
11b	1Mbps	1	11	2462	14.34	10.03	0.50	Pass
11g	6Mbps	1	1	2412	18.63	16.08	0.50	Pass
11g	6Mbps	1	6	2437	18.83	16.36	0.50	Pass
11g	6Mbps	1	11	2462	18.38	16.34	0.50	Pass
HT20	MCS0	1	1	2412	19.28	17.16	0.50	Pass
HT20	MCS0	1	6	2437	19.43	17.58	0.50	Pass
HT20	MCS0	1	11	2462	19.13	17.56	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	15.85	30.00	-4.93	10.92	36.00	Pass
11b	1Mbps	1	6	2437	14.86	30.00	-4.93	9.93	36.00	Pass
11b	1Mbps	1	11	2462	14.64	30.00	-4.93	9.71	36.00	Pass
11g	6Mbps	1	1	2412	21.47	30.00	-4.93	16.54	36.00	Pass
11g	6Mbps	1	6	2437	20.78	30.00	-4.93	15.85	36.00	Pass
11g	6Mbps	1	11	2462	20.46	30.00	-4.93	15.53	36.00	Pass
HT20	MCS0	1	1	2412	20.92	30.00	-4.93	15.99	36.00	Pass
HT20	MCS0	1	6	2437	20.35	30.00	-4.93	15.42	36.00	Pass
HT20	MCS0	1	11	2462	19.65	30.00	-4.93	14.72	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	0.10	13.05
11b	1Mbps	1	6	2437	0.10	12.29
11b	1Mbps	1	11	2462	0.10	11.97
11g	6Mbps	1	1	2412	0.60	12.01
11g	6Mbps	1	6	2437	0.60	10.92
11g	6Mbps	1	11	2462	0.60	10.39
HT20	MCS0	1	1	2412	0.62	11.03
HT20	MCS0	1	6	2437	0.62	10.08
HT20	MCS0	1	11	2462	0.62	9.47

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-10.09	-4.93	8.00	Pass
11b	1Mbps	1	6	2437	-10.29	-4.93	8.00	Pass
11b	1Mbps	1	11	2462	-10.97	-4.93	8.00	Pass
11g	6Mbps	1	1	2412	-11.83	-4.93	8.00	Pass
11g	6Mbps	1	6	2437	-15.31	-4.93	8.00	Pass
11g	6Mbps	1	11	2462	-14.93	-4.93	8.00	Pass
HT20	MCS0	1	1	2412	-14.36	-4.93	8.00	Pass
HT20	MCS0	1	6	2437	-15.53	-4.93	8.00	Pass
HT20	MCS0	1	11	2462	-15.94	-4.93	8.00	Pass

Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (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)
802.11b CH 01 2412MHz		2385.66	56.12	-17.88	74	60.67	27	5.47	37.02	100	138	P	H
		2386.31	45.05	-8.95	54	49.6	27	5.47	37.02	100	138	A	H
	*	2413.36	98.95	-	-	103.35	27.13	5.47	37	100	138	P	H
	*	2413.277	96.31	-	-	100.71	27.13	5.47	37	100	138	A	H
		2374.09	56.11	-17.89	74	60.73	26.95	5.45	37.02	385	63	P	V
		2388.52	44.91	-9.09	54	49.46	27	5.47	37.02	385	63	A	V
	*	2413.193	97.14	-	-	101.54	27.13	5.47	37	385	63	P	V
	*	2413.444	94.55	-	-	98.95	27.13	5.47	37	385	63	A	V
802.11b CH 06 2437MHz	*	2435.738	99.96	-	-	104.21	27.26	5.48	36.99	136	97	P	H
	*	2435.822	97.25	-	-	101.5	27.26	5.48	36.99	136	97	A	H
	*	2435.822	98.81	-	-	103.06	27.26	5.48	36.99	330	50	P	V
	*	2435.822	96.33	-	-	100.58	27.26	5.48	36.99	330	50	A	V
802.11b CH 11 2462MHz	*	2463.293	98.3	-	-	102.25	27.51	5.5	36.96	100	98	P	H
	*	2463.46	95.69	-	-	99.64	27.51	5.5	36.96	100	98	A	H
		2491.24	57.25	-16.75	74	60.89	27.77	5.52	36.93	100	98	P	H
		2490.58	46.52	-7.48	54	50.16	27.77	5.52	36.93	100	98	A	H
	*	2463.376	96.19	-	-	100.14	27.51	5.5	36.96	334	32	P	V
	*	2463.46	93.57	-	-	97.52	27.51	5.5	36.96	334	32	A	V
		2498.62	57.57	-16.43	74	61.21	27.77	5.52	36.93	334	32	P	V
		2492.5	46.43	-7.57	54	50.07	27.77	5.52	36.93	334	32	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	42.12	-31.88	74	39.57	31.51	7.72	36.68	100	360	P	H
		4824	42.36	-31.64	74	39.81	31.51	7.72	36.68	100	360	P	V
802.11b CH 06 2437MHz		4872	42.75	-31.25	74	40.06	31.59	7.76	36.66	100	360	P	H
		7308	46.57	-27.43	74	39.47	34.03	9.76	36.69	100	360	P	H
		4874	41.99	-32.01	74	39.3	31.59	7.76	36.66	100	0	P	V
		7308	45.37	-28.63	74	38.27	34.03	9.76	36.69	100	0	P	V
802.11b CH 11 2462MHz		4926	42.71	-31.29	74	39.89	31.67	7.8	36.65	100	0	P	H
		7386	45.83	-28.17	74	38.46	34.29	9.86	36.78	100	0	P	H
		4926	42.8	-31.2	74	39.98	31.67	7.8	36.65	100	360	P	V
		7386	45.6	-28.4	74	38.23	34.29	9.86	36.78	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		2389.82	60.3	-13.7	74	64.85	27	5.47	37.02	332	124	P	H
		2389.95	47.92	-6.08	54	52.47	27	5.47	37.02	332	124	A	H
	*	2417.117	102.97	-	-	107.37	27.13	5.47	37	332	124	P	H
	*	2418.704	94.36	-	-	98.76	27.13	5.47	37	332	124	A	H
		2389.95	62.53	-11.47	74	67.08	27	5.47	37.02	100	111	P	V
	!	2389.82	49.23	-4.77	54	53.78	27	5.47	37.02	100	111	A	V
	*	2416.115	105.09	-	-	109.49	27.13	5.47	37	100	111	P	V
	*	2418.537	96.22	-	-	100.62	27.13	5.47	37	100	111	A	V
802.11g CH 06 2437MHz	*	2432.481	101.18	-	-	105.43	27.26	5.48	36.99	334	129	P	H
	*	2430.06	93.47	-	-	97.72	27.26	5.48	36.99	334	129	A	H
	*	2432.899	103.18	-	-	107.43	27.26	5.48	36.99	100	71	P	V
	*	2429.81	94.75	-	-	99	27.26	5.48	36.99	100	71	A	V
802.11g CH 11 2462MHz	*	2457.949	100.35	-	-	104.3	27.51	5.5	36.96	303	45	P	H
	*	2456.864	91.85	-	-	95.8	27.51	5.5	36.96	303	45	A	H
		2486.74	58.23	-15.77	74	62.02	27.64	5.51	36.94	303	45	P	H
		2492.38	46.91	-7.09	54	50.55	27.77	5.52	36.93	303	45	A	H
	*	2457.198	101.66	-	-	105.61	27.51	5.5	36.96	100	63	P	V
	*	2457.698	93.54	-	-	97.49	27.51	5.5	36.96	100	63	A	V
		2483.8	59.25	-14.75	74	63.04	27.64	5.51	36.94	100	63	P	V
		2490.46	46.92	-7.08	54	50.56	27.77	5.52	36.93	100	63	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	42.15	-31.85	74	39.6	31.51	7.72	36.68	100	360	P	H
		4824	41.64	-32.36	74	39.09	31.51	7.72	36.68	100	360	P	V
802.11g CH 06 2437MHz		4872	42.35	-31.65	74	39.66	31.59	7.76	36.66	100	360	P	H
		7308	45.18	-28.82	74	38.08	34.03	9.76	36.69	100	360	P	H
		4872	42.89	-31.11	74	40.2	31.59	7.76	36.66	100	360	P	V
		7308	44.77	-29.23	74	37.67	34.03	9.76	36.69	100	360	P	V
802.11g CH 11 2462MHz		4926	41.99	-32.01	74	39.17	31.67	7.8	36.65	100	360	P	H
		7386	44.5	-29.5	74	37.13	34.29	9.86	36.78	100	360	P	H
		4926	42.35	-31.65	74	39.53	31.67	7.8	36.65	100	360	P	V
		7386	46.19	-27.81	74	38.82	34.29	9.86	36.78	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		2389.82	61.35	-12.65	74	65.9	27	5.47	37.02	208	94	P	H
		2389.95	46.36	-7.64	54	50.91	27	5.47	37.02	208	94	A	H
	*	2417.952	102.46	-	-	106.86	27.13	5.47	37	208	94	P	H
	*	2418.788	93.8	-	-	98.2	27.13	5.47	37	208	94	A	H
		2389.43	53.49	-20.51	74	58.04	27	5.47	37.02	358	360	P	V
		2389.95	41.54	-12.46	54	46.09	27	5.47	37.02	358	360	A	V
	*	2419.205	93.72	-	-	98.12	27.13	5.47	37	358	360	P	V
	*	2419.456	85.1	-	-	89.5	27.13	5.47	37	358	360	A	V
802.11n HT20 CH 06 2437MHz	*	2429.81	100.79	-	-	105.04	27.26	5.48	36.99	100	89	P	H
	*	2429.142	92.53	-	-	96.78	27.26	5.48	36.99	100	89	A	H
	*	2432.481	98.71	-	-	102.96	27.26	5.48	36.99	301	59	P	V
	*	2429.726	90.67	-	-	94.92	27.26	5.48	36.99	301	59	A	V
802.11n HT20 CH 11 2462MHz	*	2455.11	100.34	-	-	104.29	27.51	5.5	36.96	236	87	P	H
	*	2456.864	92.42	-	-	96.37	27.51	5.5	36.96	236	87	A	H
		2483.74	53.14	-20.86	74	56.93	27.64	5.51	36.94	236	87	P	H
		2483.5	41.97	-12.03	54	45.76	27.64	5.51	36.94	236	87	A	H
	*	2457.949	99.64	-	-	103.59	27.51	5.5	36.96	378	64	P	V
	*	2456.697	91.27	-	-	95.22	27.51	5.5	36.96	378	64	A	V
		2483.8	52.34	-21.66	74	56.13	27.64	5.51	36.94	378	64	P	V
		2483.62	41.67	-12.33	54	45.46	27.64	5.51	36.94	378	64	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	42.11	-31.89	74	39.56	31.51	7.72	36.68	100	360	P	H
		4824	42.17	-31.83	74	39.62	31.51	7.72	36.68	100	0	P	V
802.11n HT20 CH 06 2437MHz		4872	42.28	-31.72	74	39.59	31.59	7.76	36.66	100	360	P	H
		7308	45.03	-28.97	74	37.93	34.03	9.76	36.69	100	360	P	H
		4874	41.78	-32.22	74	39.09	31.59	7.76	36.66	100	0	P	V
		7308	46.35	-27.65	74	39.25	34.03	9.76	36.69	100	0	P	V
802.11n HT20 CH 11 2462MHz		4926	42.41	-31.59	74	39.59	31.67	7.8	36.65	100	360	P	H
		7386	45.5	-28.5	74	38.13	34.29	9.86	36.78	100	360	P	H
		4924	41.82	-32.18	74	39	31.67	7.8	36.65	100	0	P	V
		7386	45.23	-28.77	74	37.86	34.29	9.86	36.78	100	0	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 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)
2.4GHz 802.11g LF		32.91	26.78	-13.22	40	31.23	26.18	0.69	31.32	100	64	P	H
		104.69	20.03	-23.47	43.5	31.44	18.8	1.24	31.45	-	-	P	H
		216.24	19.63	-26.37	46	33.15	16.23	1.73	31.48	-	-	P	H
		323.91	25.76	-20.24	46	34.74	20.11	2.21	31.3	-	-	P	H
		458.74	26.88	-19.12	46	30.33	25.12	2.67	31.24	-	-	P	H
		837.04	31.64	-14.36	46	30.16	28.72	3.68	30.92	-	-	P	H
		31.94	26.75	-13.25	40	30.85	26.52	0.68	31.3	100	214	P	V
		122.15	19.56	-23.94	43.5	31.26	18.46	1.33	31.49	-	-	P	V
		269.59	21.39	-24.61	46	33.08	17.85	1.89	31.43	-	-	P	V
		306.45	23.51	-22.49	46	33.38	19.31	2.16	31.34	-	-	P	V
		323.91	27.29	-18.71	46	36.27	20.11	2.21	31.3	-	-	P	V
		450.01	27.36	-18.64	46	30.46	25.5	2.64	31.24	-	-	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 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)

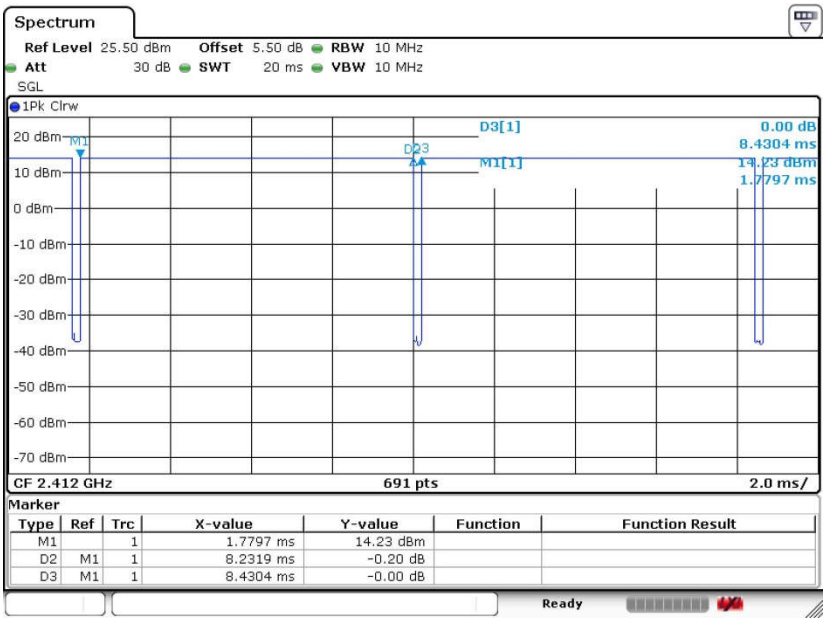
= -10.46(dB)

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

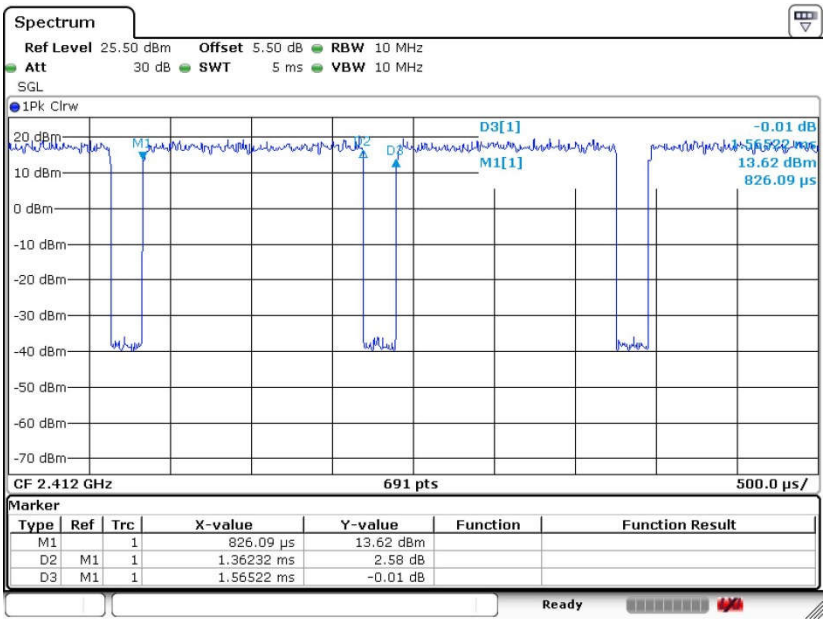
Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1	802.11b	97.65	8.232	0.121	300kHz
1	802.11g	87.04	1.362	0.734	1kHz
1	802.11n HT20	86.61	1.284	0.779	1kHz

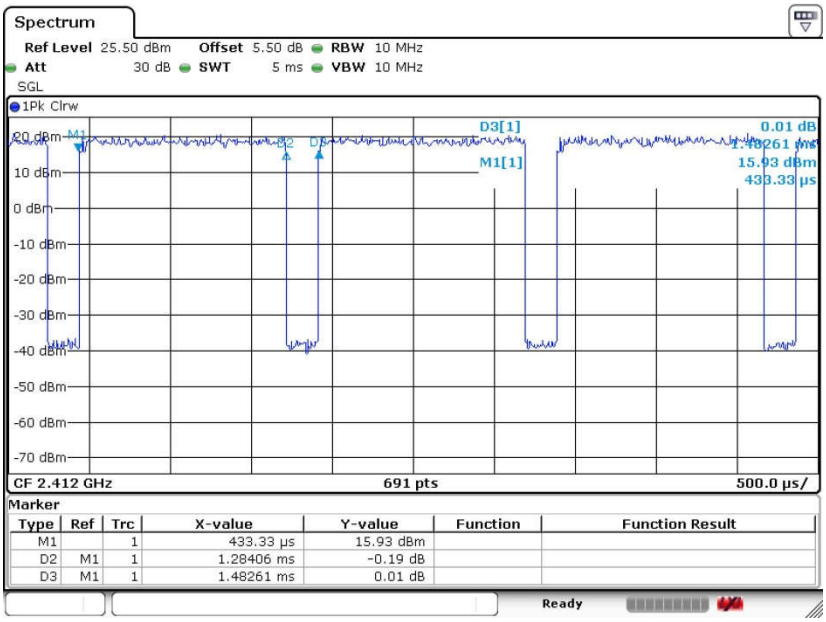
802.11b



802.11g



802.11n20


Spectrum
Ref Level 25.50 dBm Offset 5.50 dB RBW 10 MHz
Att 30 dB SWT 5 ms VBW 10 MHz
SGL
1Pk Clrw
D3[1]
0.01 dB
1.48261 ms
M1[1]
15.93 dBm
433.33 µs
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.412 GHz
691 pts
500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 433.33 µs 15.93 dBm
D2 M1 1 1.28406 ms -0.19 dB
D3 M1 1 1.48261 ms 0.01 dB
Ready