

FCC RF Test Report

APPLICANT : Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT : Tablet PC Lenovo S5000-F
BRAND NAME : lenovo
MODEL NAME : 60039; Z0AC; Lenovo S5000-F
MARKETING NAME : Lenovo S5000
FCC ID : O57S5000F
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jul. 10, 2013 and completely tested on Aug. 02, 2013. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the 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.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



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



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer.....	5
1.3 Feature of Equipment Under Test	5
1.4 Product Specification of Equipment Under Test.....	5
1.5 Testing Site.....	6
1.6 Applied Standards	6
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	7
2.1 Carrier Frequency Channel	7
2.2 Pre-Scanned RF Power.....	8
2.3 Test Mode.....	9
2.4 Connection Diagram of Test System.....	10
2.5 Support Unit used in test configuration and system	11
2.6 Description of RF Function Operation Test Setup.....	11
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	18
3.4 Conducted Band Edges and Spurious Emission Measurement	20
3.5 Radiated Band Edges and Spurious Emission Measurement	30
3.6 AC Conducted Emission Measurement.....	47
3.7 Antenna Requirements.....	52
4 LIST OF MEASURING EQUIPMENT	53
5 UNCERTAINTY OF EVALUATION	54
APPENDIX A. SETUP PHOTOGRAPHS	

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR371002-01C	Rev. 01	Initial issue of report	Aug. 14, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-210 A8.4	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.33 dB at 2488.960 MHz
3.6	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 5.36 dB at 0.150 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.

No. 68 Building, 199 Fenju Road, Wai Gao Qiao FTZ, Shanghai, China

1.2 Manufacturer

Lenovo PC HK Limited

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

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Tablet PC Lenovo S5000-F
Brand Name	lenovo
Model Name	60039; Z0AC; Lenovo S5000-F
Marketing Name	Lenovo S5000
FCC ID	O57S5000F
EUT supports Radios application	WLAN 11bgn/Bluetooth 2.1/4.0
HW Version	Lepad S5000-F
SW Version	S5000_130906
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

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum Output Power to Antenna	802.11b : 17.16 dBm (0.0520 W) 802.11g : 20.12 dBm (0.1028 W) 802.11n HT20 : 19.12 dBm (0.0817 W)
99% Occupied Bandwidth	802.11b : 12.00MHz 802.11g : 17.95MHz 802.11n HT20 : 18.60MHz
Antenna Type	802.11b/g/n : PIFA Antenna type with gain 1.50 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Testing Site

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.			
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958			
Test Site No.	Sporton Site No.			FCC/IC Registration No.
	TH01-KS	CO01-KS	03CH01-KS	149928/4086E-1

Note: The test site complies with ANSI C63.4 2003 requirement.

1.6 Applied 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 v03r01
- ♦ ANSI C63.10-2009
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 3
- ♦ NOTICE 2012-DRS0126

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.
3. Per the section 2.2.3 of Notice of 2012-DRS0126, " Receivers Excluded from Industry Canada Requirements", only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

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 (Y 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 antenna configurations as following table and the highest power data rates were chosen for full test in the following tables.

2.4GHz 802.11b mode				
Data Rate (MHz)	1M bps	2M bps	5.5M bps	11M bps
Peak Power (dBm)	15.91	15.98	15.56	15.40
	17.12	16.56	16.29	16.32
	17.16	17.01	16.98	16.75

2.4GHz 802.11g mode								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	19.60	19.10	18.90	18.30	18.81	18.71	18.62	18.51
	19.21	19.11	18.81	18.74	18.83	18.72	18.68	18.75
	20.12	20.01	19.63	19.82	19.92	20.01	19.55	19.55

2.4GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	18.53	18.31	18.12	18.02	17.89	18.15	17.85	17.78
	18.75	18.41	18.34	18.03	18.01	17.86	17.81	17.79
	19.12	19.01	18.96	18.75	18.72	18.63	18.59	18.34

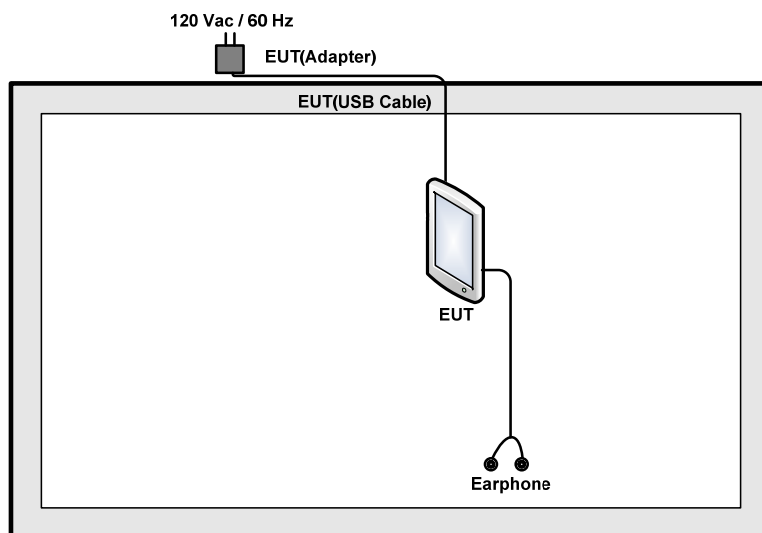
2.3 Test Mode

Final results of test modes, data rates and test channels are shown as following table.

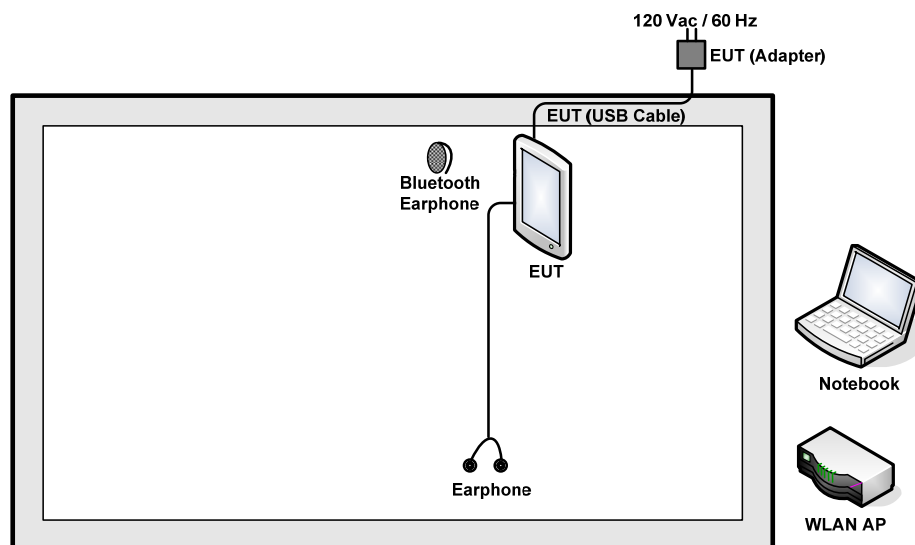
Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	6dB and 99% BW Power Spectral Density	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
	Output Power	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
	Conducted Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	6.5 Mbps	1/11
	Conducted Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
Radiated TCs	Radiated Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	6.5 Mbps	1/11
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone			
	Mode 2 Bluetooth Link + WLAN Link + USB Cable 2 (Charging from Adapter) + Earphone			
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 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.	DC Power Supply	GWINSTEK	GPS-3030D	FCC DoC	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	G480	FCC DoC	N/A	AC I/P: Unshielded, 0.9 m DC O/P: Shielded, 1.8 m
4.	Earphone	Lenovo	SH100	FCC DoC	N/A	N/A
5.	Bluetooth Earphone	Lenovo	LBH301	FCC DoC	N/A	N/A

2.6 Description of RF Function Operation Test Setup

For WLAN RF test items, 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.

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 4.2 dB and 10dB attenuator.

Example :

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

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.

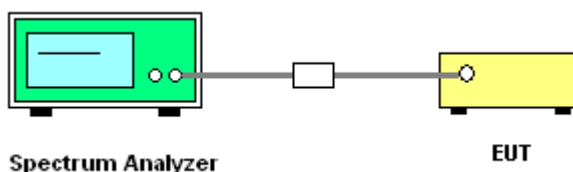
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r01.
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.

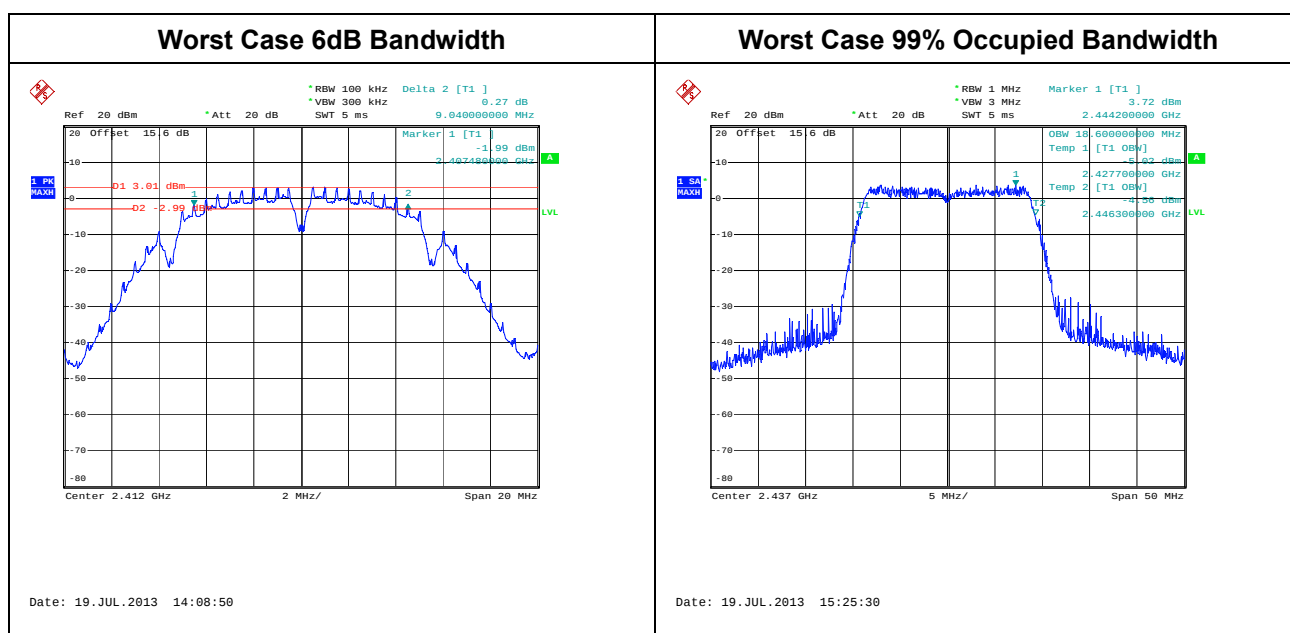
3.1.4 Test Setup



3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Test Band :	2.4GHz	Temperature :	23~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	99% Bandwidth (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	11.95	9.04	0.5	Pass
11b	1Mbps	1	6	2437	11.95	9.06	0.5	Pass
11b	1Mbps	1	11	2462	12.00	9.04	0.5	Pass
11g	6Mbps	1	1	2412	17.95	16.52	0.5	Pass
11g	6Mbps	1	6	2437	17.85	16.44	0.5	Pass
11g	6Mbps	1	11	2462	17.80	16.48	0.5	Pass
HT20	MCS0	1	1	2412	18.50	17.60	0.5	Pass
HT20	MCS0	1	6	2437	18.60	17.64	0.5	Pass
HT20	MCS0	1	11	2462	18.55	17.60	0.5	Pass



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.

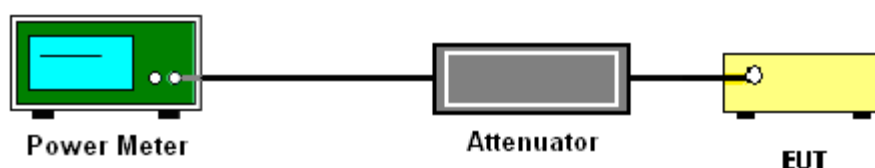
3.2.2 Measuring Instruments

See list of measuring instruments 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 v03r01.
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

Test Mode :	2.4GHz	Temperature :	23~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	15.91	30	1.50	Pass
11b	1Mbps	1	6	2437	17.12	30	1.50	Pass
11b	1Mbps	1	11	2462	17.16	30	1.50	Pass
11g	6Mbps	1	1	2412	19.60	30	1.50	Pass
11g	6Mbps	1	6	2437	19.21	30	1.50	Pass
11g	6Mbps	1	11	2462	20.12	30	1.50	Pass
HT20	MCS0	1	1	2412	18.53	30	1.50	Pass
HT20	MCS0	1	6	2437	18.75	30	1.50	Pass
HT20	MCS0	1	11	2462	19.12	30	1.50	Pass

Note: Measured power (dBm) has offset with cable loss.

3.2.6 Test Result of Average output Power (Reporting Only)

Test Mode :	2.4GHz	Temperature :	23~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	Duty Factor (dB)	Average Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	0.06	12.65	30	1.50	Pass
11b	1Mbps	1	6	2437	0.06	13.21	30	1.50	Pass
11b	1Mbps	1	11	2462	0.06	13.75	30	1.50	Pass
11g	6Mbps	1	1	2412	0.30	9.22	30	1.50	Pass
11g	6Mbps	1	6	2437	0.30	9.48	30	1.50	Pass
11g	6Mbps	1	11	2462	0.30	10.00	30	1.50	Pass
HT20	MCS0	1	1	2412	0.38	8.36	30	1.50	Pass
HT20	MCS0	1	6	2437	0.38	8.47	30	1.50	Pass
HT20	MCS0	1	11	2462	0.38	9.14	30	1.50	Pass

Note: Measured power (dBm) has offset with cable loss and duty factor.

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.

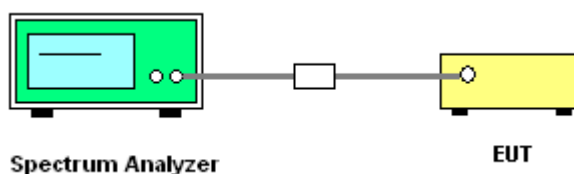
3.3.2 Measuring Instruments

See list of measuring instruments 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 v03r01
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

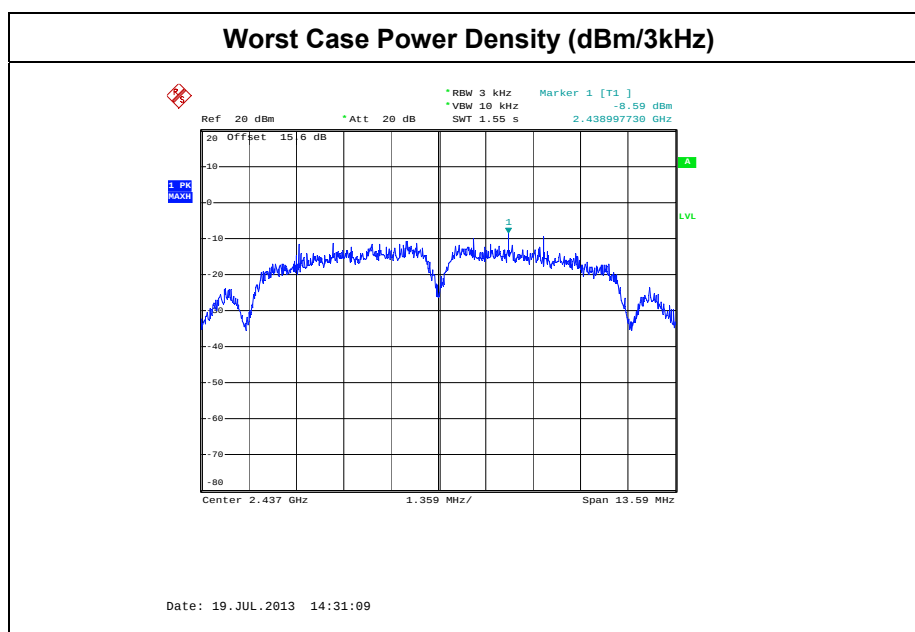


3.3.5 Test Result of Power Spectral Density

Test Mode :	2.4GHz	Temperature :	23~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	Peak Power Density (dBm/3kHz)	Max. Limits (dBm/3kHz)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	-11.01	8	1.50	Pass
11b	1Mbps	1	6	2437	-8.59	8	1.50	Pass
11b	1Mbps	1	11	2462	-10.54	8	1.50	Pass
11g	6Mbps	1	1	2412	-16.97	8	1.50	Pass
11g	6Mbps	1	6	2437	-17.58	8	1.50	Pass
11g	6Mbps	1	11	2462	-16.14	8	1.50	Pass
HT20	MCS0	1	1	2412	-18.82	8	1.50	Pass
HT20	MCS0	1	6	2437	-19.05	8	1.50	Pass
HT20	MCS0	1	11	2462	-17.72	8	1.50	Pass

Note: Measured power density (dBm) has offset with cable loss.



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).

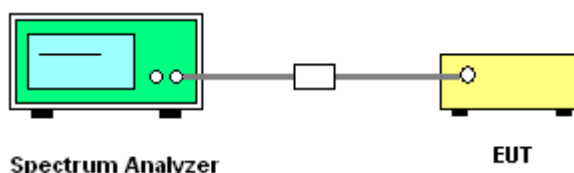
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

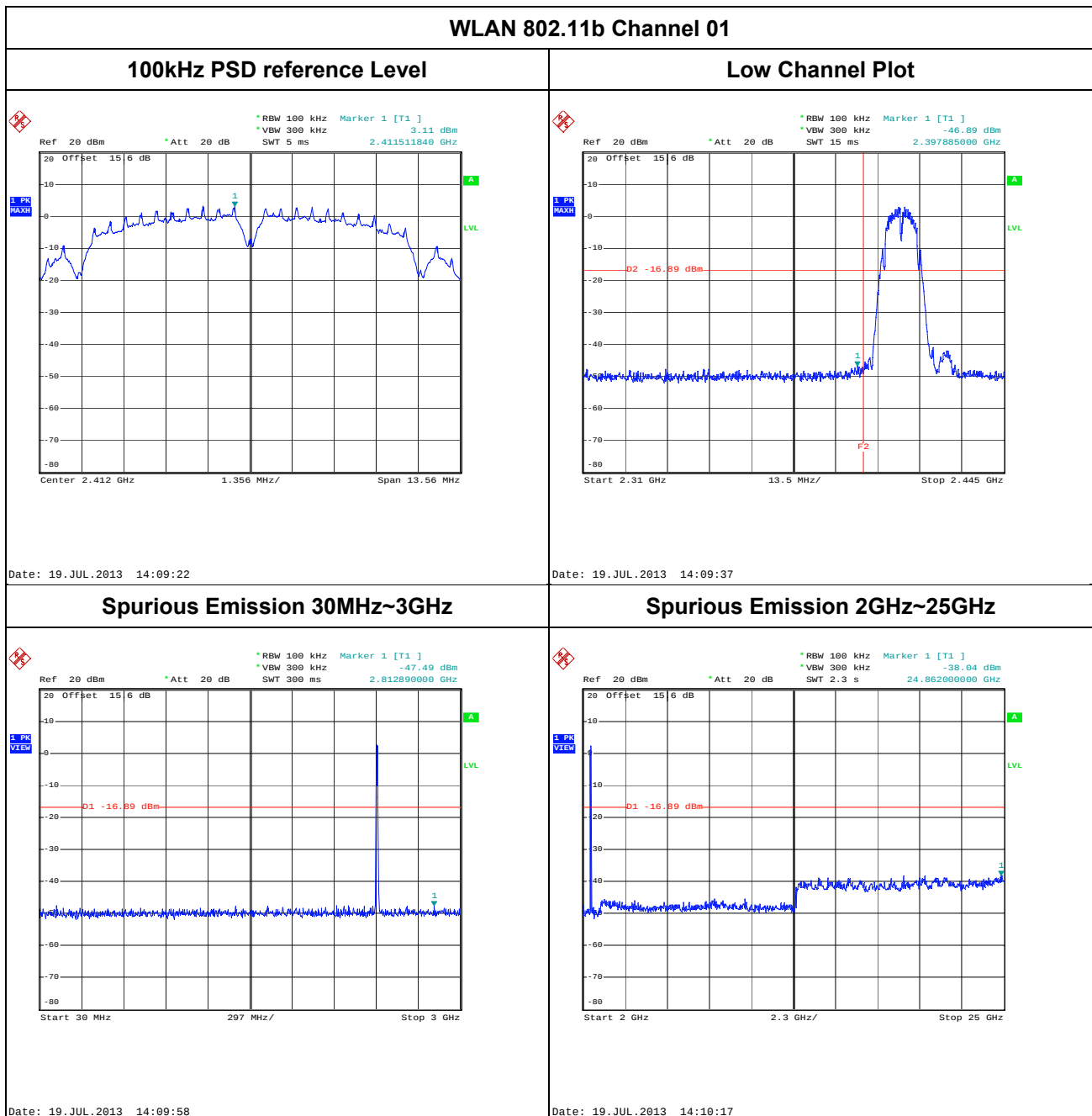
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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 :	23~24℃
Test Band :	2.4GHz Low	Relative Humidity :	47~48%
Test Channel :	01	Test Engineer :	Adonis Li

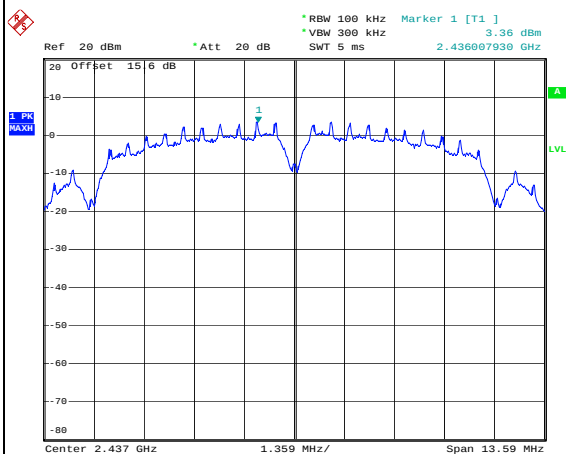




Test Mode :	802.11b	Temperature :	23~24°C
Test Band :	2.4GHz Mid	Relative Humidity :	47~48%
Test Channel :	06	Test Engineer :	Adonis Li

WLAN 802.11b Channel 06

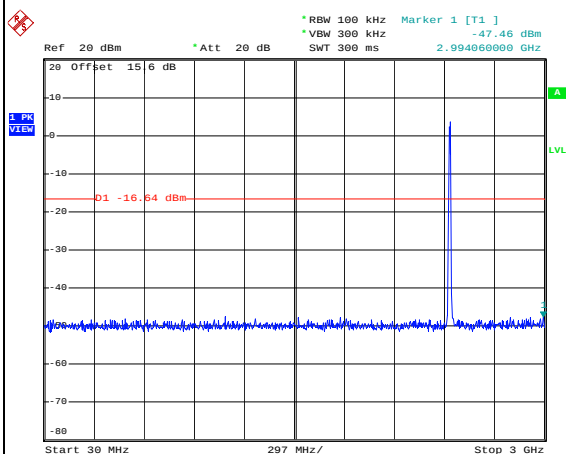
100kHz PSD reference Level



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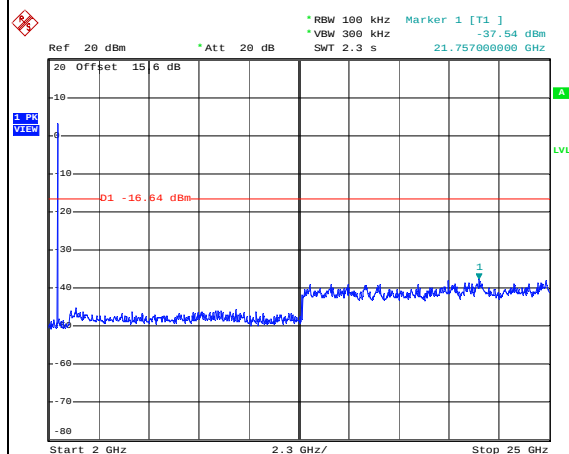
Mid Channel Plot

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 15:54:05

Spurious Emission 2GHz~25GHz



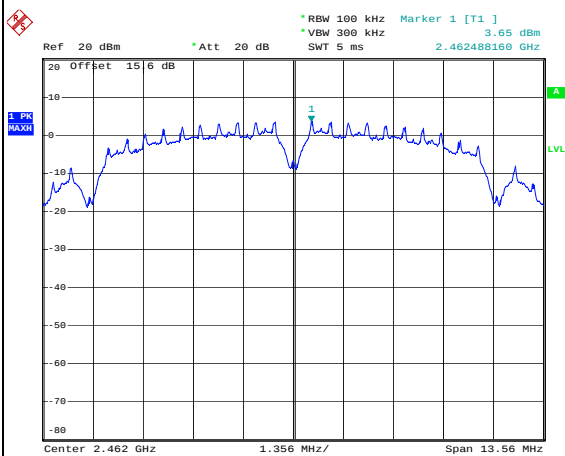
Date: 19.JUL.2013 14:32:00



Test Mode :	802.11b	Temperature :	23~24°C
Test Band :	2.4GHz High	Relative Humidity :	47~48%
Test Channel :	11	Test Engineer :	Adonis Li

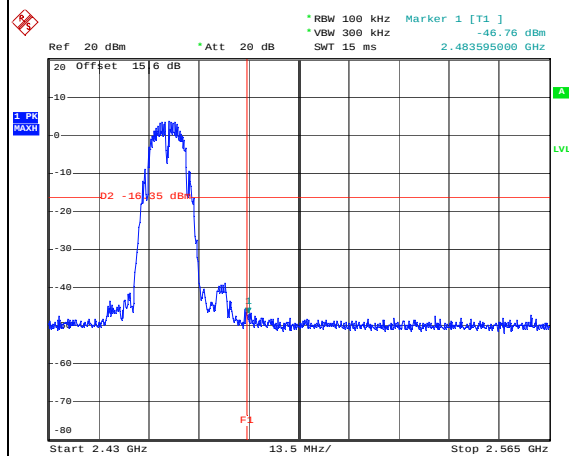
WLAN 802.11b Channel 11

100kHz PSD reference Level



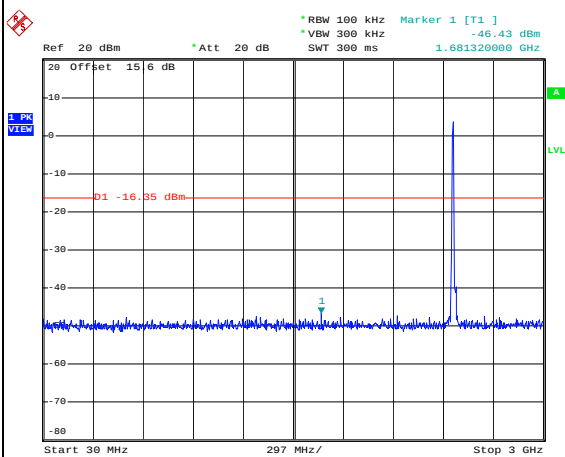
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High Channel Plot



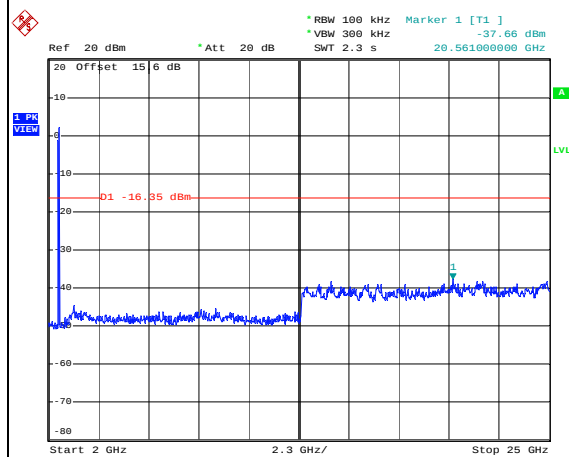
Date: 19.JUL.2013 14:38:29

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 14:38:49

Spurious Emission 2GHz~25GHz



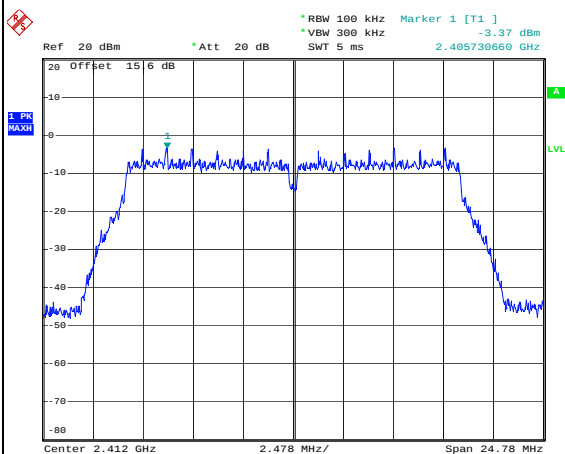
Date: 19.JUL.2013 14:39:08



Test Mode :	802.11g	Temperature :	23~24°C
Test Band :	2.4GHz Low	Relative Humidity :	47~48%
Test Channel :	01	Test Engineer :	Adonis Li

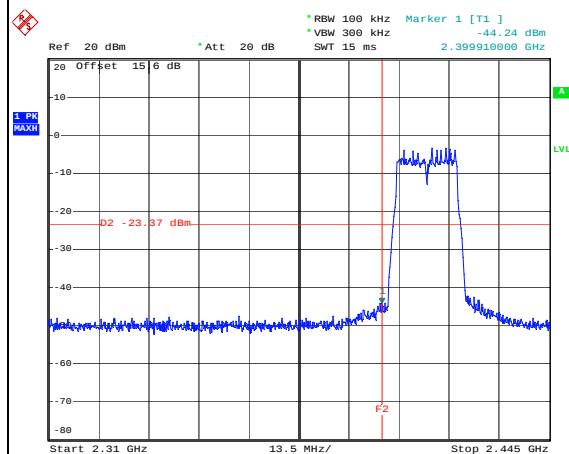
WLAN 802.11g Channel 01

100kHz PSD reference Level



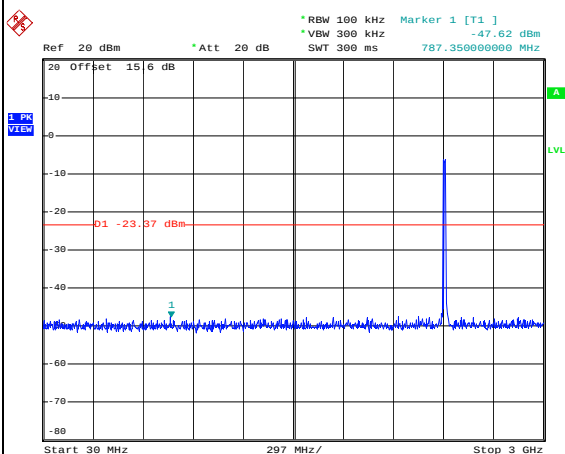
Date: 19.JUL.2013 14:49:17

Low Channel Plot



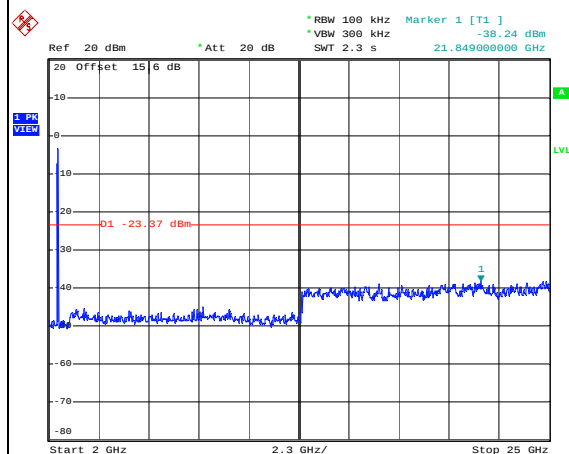
Date: 19.JUL.2013 14:49:32

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 14:49:53

Spurious Emission 2GHz~25GHz



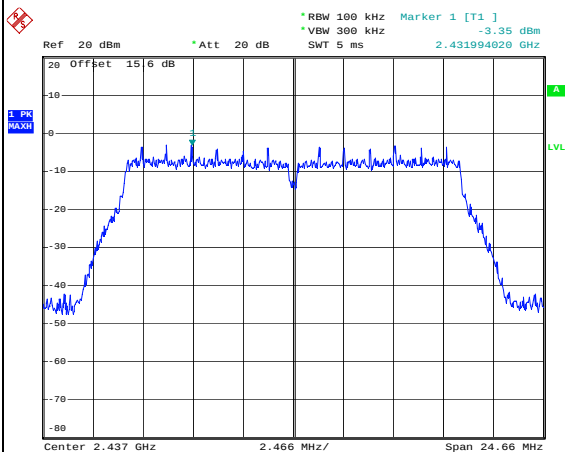
Date: 19.JUL.2013 14:50:12



Test Mode :	802.11g	Temperature :	23~24°C
Test Band :	2.4GHz Mid	Relative Humidity :	47~48%
Test Channel :	06	Test Engineer :	Adonis Li

WLAN 802.11g Channel 06

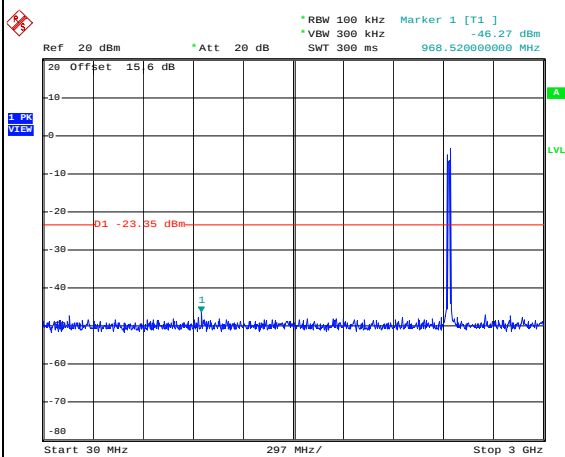
100kHz PSD reference Level



Date: 19.JUL.2013 14:57:45

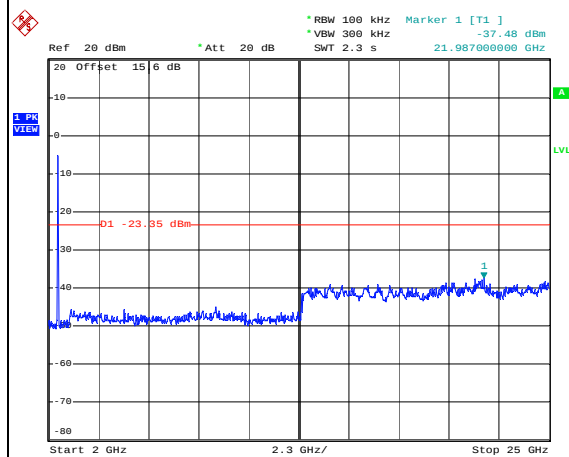
Mid Channel Plot

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 14:58:07

Spurious Emission 2GHz~25GHz



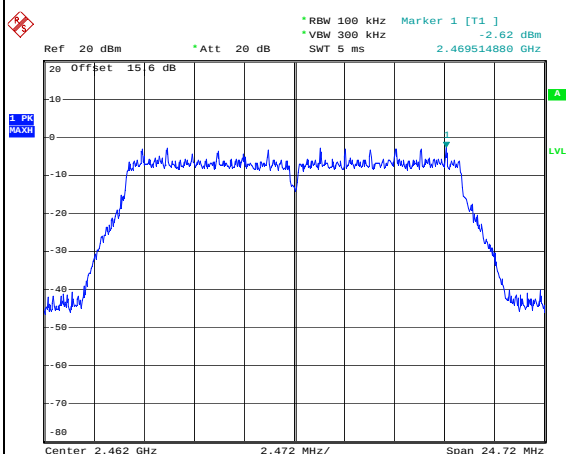
Date: 19.JUL.2013 14:58:26



Test Mode :	802.11g	Temperature :	23~24°C
Test Band :	2.4GHz High	Relative Humidity :	47~48%
Test Channel :	11	Test Engineer :	Adonis Li

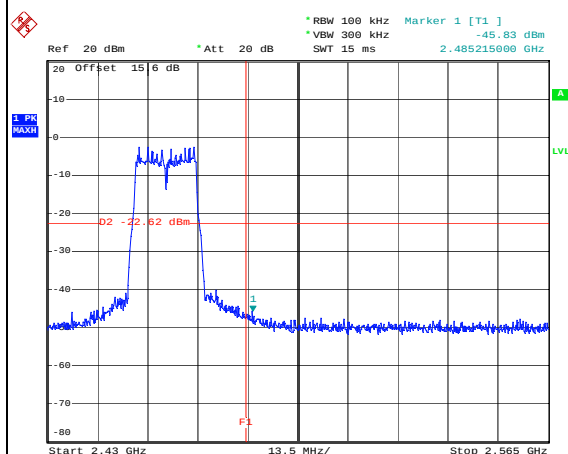
WLAN 802.11g Channel 11

100kHz PSD reference Level



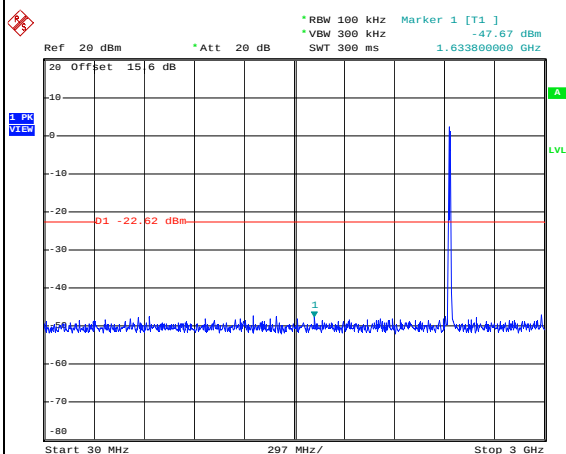
Date: 19.JUL.2013 15:03:44

High Channel Plot



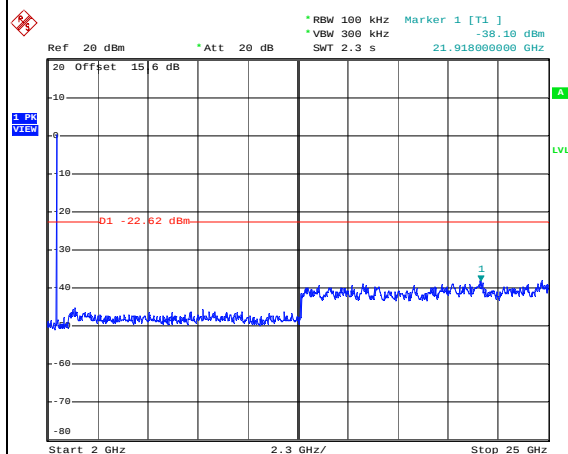
Date: 19.JUL.2013 15:03:59

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 16:05:05

Spurious Emission 2GHz~25GHz



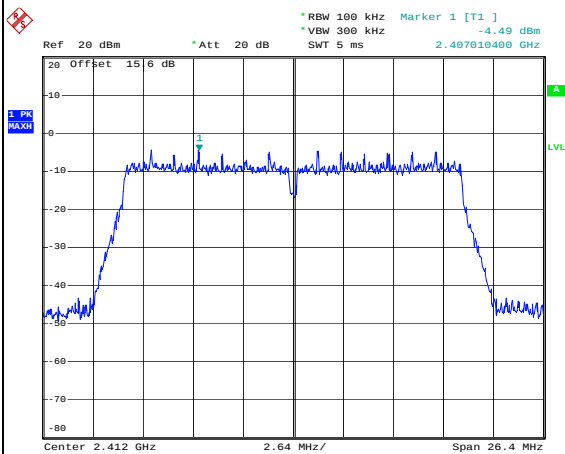
Date: 19.JUL.2013 16:05:39



Test Mode :	802.11n HT20	Temperature :	23~24°C
Test Band :	2.4GHz Low	Relative Humidity :	47~48%
Test Channel :	01	Test Engineer :	Adonis Li

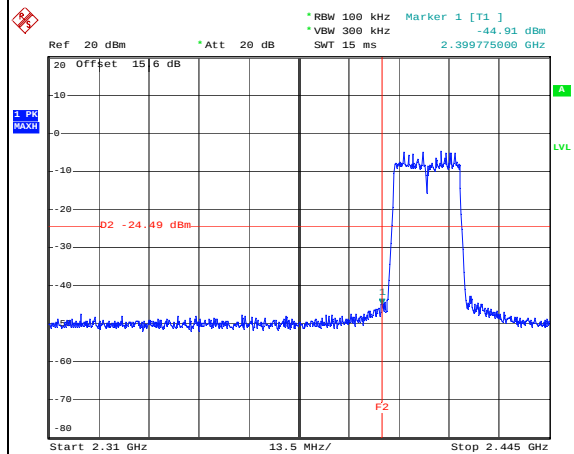
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



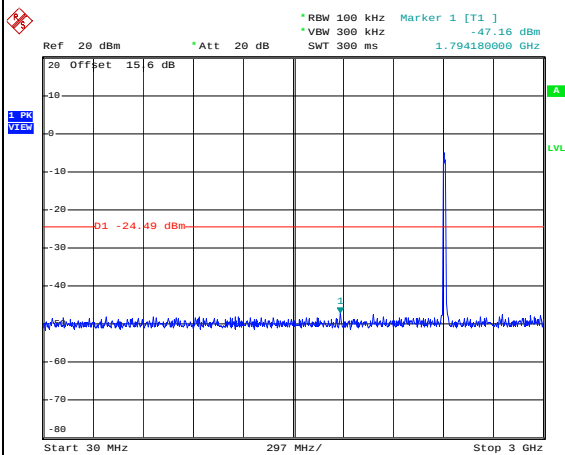
Date: 19.JUL.2013 15:14:00

Low Channel Plot



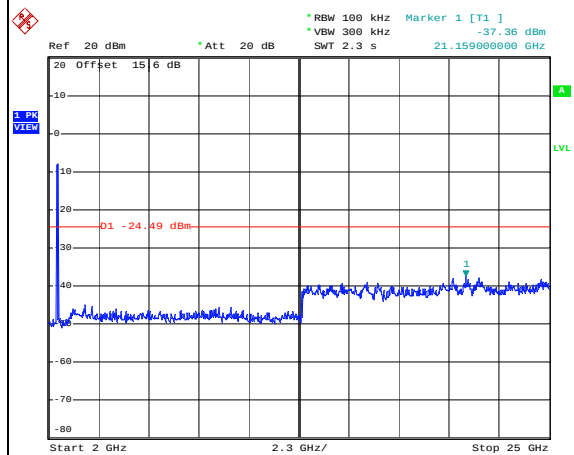
Date: 19.JUL.2013 15:14:15

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 15:14:35

Spurious Emission 2GHz~25GHz



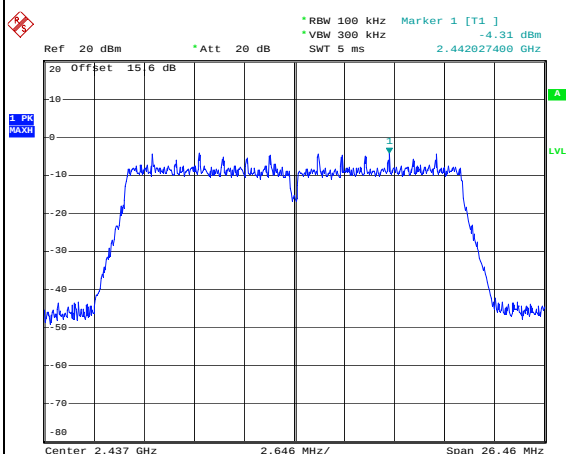
Date: 19.JUL.2013 15:14:54



Test Mode :	802.11n HT20	Temperature :	23~24℃
Test Band :	2.4GHz Mid	Relative Humidity :	47~48%
Test Channel :	06	Test Engineer :	Adonis Li

WLAN 802.11n HT20 Channel 06

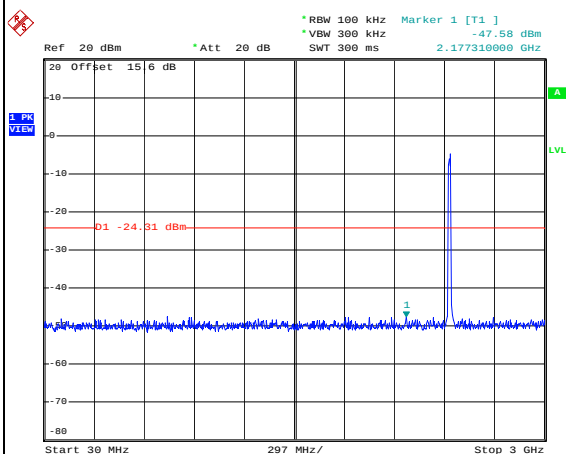
100kHz PSD reference Level



Date: 19.JUL.2013 15:24:37

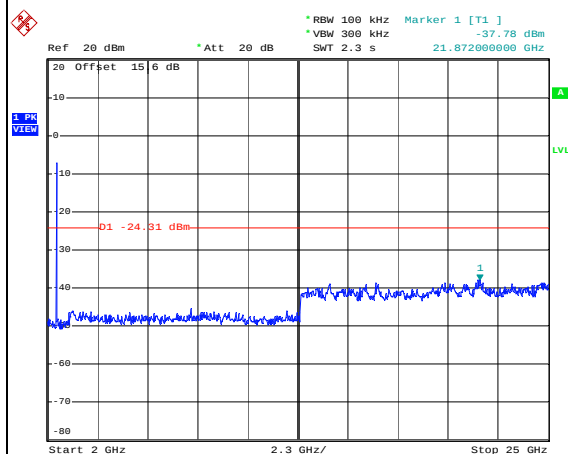
Mid Channel Plot

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 15:24:59

Spurious Emission 2GHz~25GHz



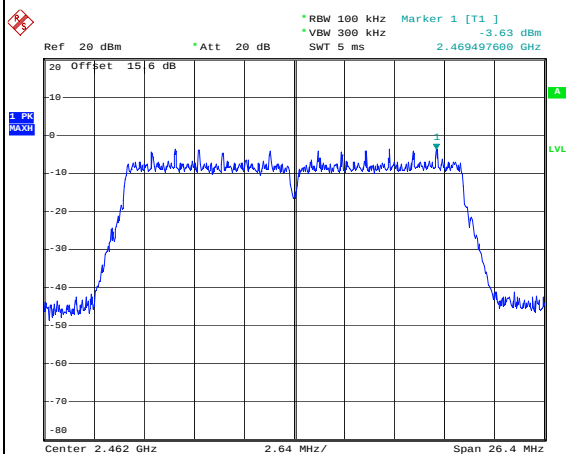
Date: 19.JUL.2013 15:25:18



Test Mode :	802.11n HT20	Temperature :	23~24°C
Test Band :	2.4GHz High	Relative Humidity :	47~48%
Test Channel :	11	Test Engineer :	Adonis Li

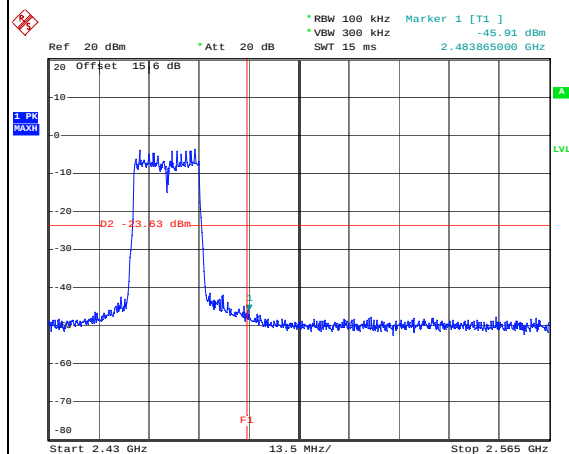
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



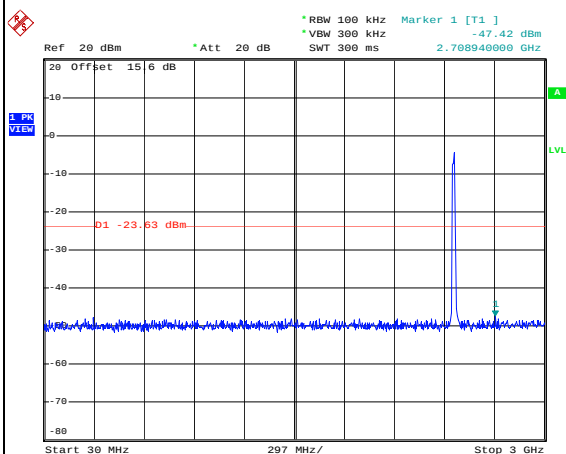
Date: 19.JUL.2013 15:29:43

High Channel Plot



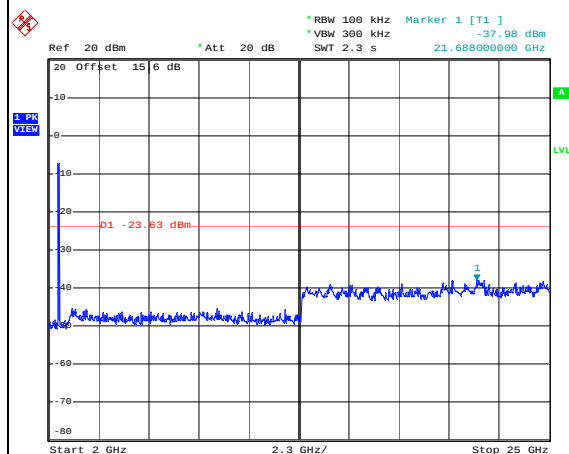
Date: 19.JUL.2013 15:29:58

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2013 15:30:18

Spurious Emission 2GHz~25GHz



Date: 19.JUL.2013 15:30:37

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

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.10-2009.
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 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, $VBW = 3$ MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

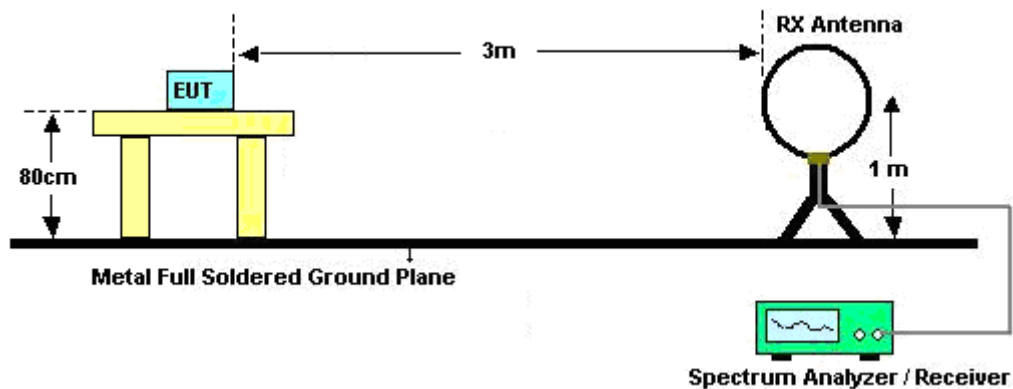
 - $VBW = 10$ Hz, when duty cycle is no less than 98 percent.
 - $VBW \geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	98.59	-	-	10Hz
802.11g	93.33	1.40	0.71	1kHz
2.4GHz 802.11n HT20	91.65	1.30	0.77	1kHz

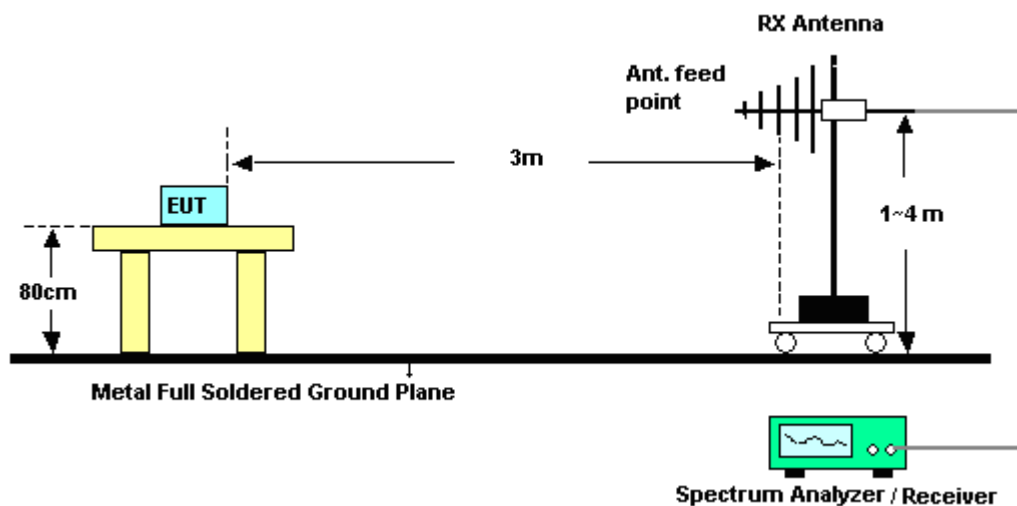
Note: For average measurement with duty cycle $< 98\%$, use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.

3.5.4 Test Setup

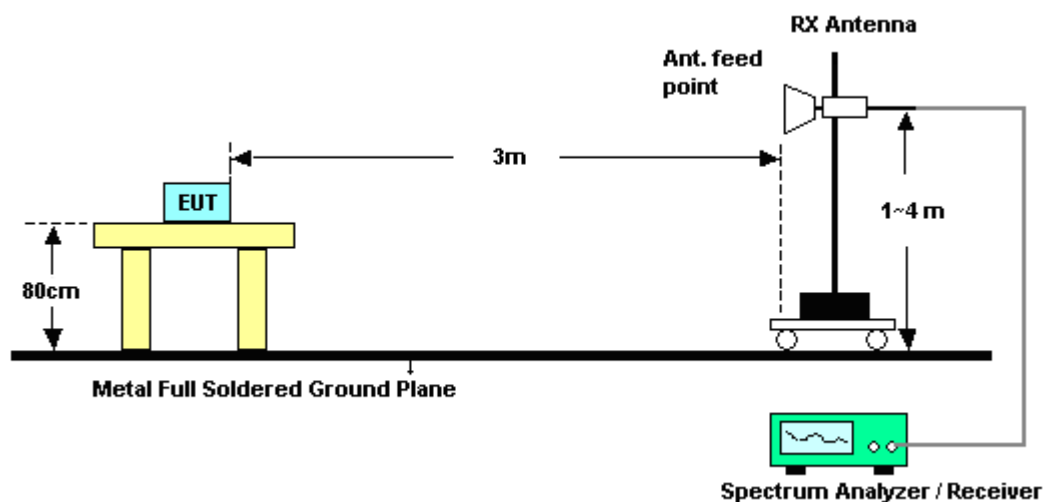
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated 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 Band Edges

Test Mode :	802.11b	Temperature :	22~23°C
Test Band :	Low	Relative Humidity :	41~42%
Test Channel :	01	Test Engineer :	Stone Gu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2390	58.37	-15.63	74	54.11	32.86	2.91	31.51	120	212	Peak
2386.95	46.66	-7.34	54	42.41	32.86	2.9	31.51	120	212	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.74	55.94	-18.06	74	51.69	32.86	2.9	31.51	108	289	Peak
2386.77	43.38	-10.62	54	39.13	32.86	2.9	31.51	108	289	Average

Test Mode :	802.11b	Temperature :	22~23°C
Test Band :	High	Relative Humidity :	41~42%
Test Channel :	11	Test Engineer :	Stone Gu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.64	61.5	-12.5	74	57.04	33.01	2.96	31.51	197	330	Peak
2483.5	50.19	-3.81	54	45.73	33.01	2.96	31.51	197	330	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2487.85	57.62	-16.38	74	53.12	33.05	2.96	31.51	101	264	Peak
2483.5	45.65	-8.35	54	41.19	33.01	2.96	31.51	101	264	Average



Test Mode :	802.11g	Temperature :	22~23°C
Test Band :	Low	Relative Humidity :	41~42%
Test Channel :	01	Test Engineer :	Stone Gu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2388.84	68.39	-5.61	74	64.14	32.86	2.9	31.51	117	315	Peak
2389.74	44.56	-9.44	54	40.31	32.86	2.9	31.51	117	315	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2390	65.66	-8.34	74	61.4	32.86	2.91	31.51	100	276	Peak
2390	42.56	-11.44	54	38.3	32.86	2.91	31.51	100	276	Average

Test Mode :	802.11g	Temperature :	22~23°C
Test Band :	High	Relative Humidity :	41~42%
Test Channel :	11	Test Engineer :	Stone Gu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2488.96	70.67	-3.33	74	66.17	33.05	2.96	31.51	100	329	Peak
2483.59	47.7	-6.3	54	43.24	33.01	2.96	31.51	100	329	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2485	70.36	-3.64	74	65.9	33.01	2.96	31.51	100	274	Peak
2483.53	45.92	-8.08	54	41.46	33.01	2.96	31.51	100	274	Average

Test Mode :	802.11n HT20	Temperature :	22~23°C
Test Band :	Low	Relative Humidity :	41~42%
Test Channel :	01	Test Engineer :	Stone Gu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2388.03	68.72	-5.28	74	64.47	32.86	2.9	31.51	123	332	Peak
2390	47.49	-6.51	54	43.23	32.86	2.91	31.51	123	332	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.38	64.35	-9.65	74	60.1	32.86	2.9	31.51	129	277	Peak
2390	44.7	-9.3	54	40.44	32.86	2.91	31.51	129	277	Average

Test Mode :	802.11n HT20	Temperature :	22~23°C
Test Band :	High	Relative Humidity :	41~42%
Test Channel :	11	Test Engineer :	Stone Gu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.56	64.81	-9.19	74	60.35	33.01	2.96	31.51	194	337	Peak
2483.56	47.65	-6.35	54	43.19	33.01	2.96	31.51	194	337	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.83	64.93	-9.07	74	60.47	33.01	2.96	31.51	100	90	Peak
2483.62	47.17	-6.83	54	42.71	33.01	2.96	31.51	100	90	Average

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

Test Mode :	802.11b	Temperature :	22~23°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 111.98dBμV/m - 20dB = 91.98dBμV/m. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	111.98	-	-	107.69	32.89	2.91	31.51	125	335	Peak
2412	105.38	-	-	101.09	32.89	2.91	31.51	125	335	Average
4824	49.37	-24.63	74	41.5	35.17	4.23	31.53	102	345	Peak
7236	52.21	-39.77	91.98	41.59	36.18	5.39	30.95	103	174	Peak

Test Mode :	802.11b	Temperature :	22~23°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	107.99	-	-	103.7	32.89	2.91	31.51	128	289	Peak
2412	101.63	-	-	97.34	32.89	2.91	31.51	128	289	Average
4824	49.88	-24.12	74	42.01	35.17	4.23	31.53	105	72	Peak
7236	51.54	-36.45	87.99	40.92	36.18	5.39	30.95	106	325	Peak

Test Mode :	802.11b	Temperature :	22~23°C
Test Channel :	06	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2437 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2437	111.23	-	-	106.86	32.95	2.93	31.51	119	227	Peak
2437	104.71	-	-	100.34	32.95	2.93	31.51	119	227	Average
4874	49.99	-24.01	74	42.07	35.18	4.26	31.52	106	45	Peak
7311	52.04	-21.96	74	41.34	36.2	5.44	30.94	124	83	Peak

Test Mode :	802.11b	Temperature :	22~23°C
Test Channel :	06	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2437 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2437	107.75	-	-	103.38	32.95	2.93	31.51	150	299	Peak
2437	101.39	-	-	97.02	32.95	2.93	31.51	150	299	Average
4874	48.92	-25.08	74	41	35.18	4.26	31.52	100	0	Peak
7311	53.63	-20.37	74	42.93	36.2	5.44	30.94	102	165	Peak

Test Mode :	802.11b	Temperature :	22~23°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	110.58	-	-	106.17	32.98	2.94	31.51	100	320	Peak
2462	103.95	-	-	99.54	32.98	2.94	31.51	100	320	Average
4924	50.38	-23.62	74	42.42	35.19	4.28	31.51	124	58	Peak
7386	52.95	-21.05	74	42.13	36.24	5.51	30.93	106	316	Peak

Test Mode :	802.11b	Temperature :	22~23°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	108.09	-	-	103.68	32.98	2.94	31.51	102	293	Peak
2462	101.73	-	-	97.32	32.98	2.94	31.51	102	293	Average
4924	50.34	-23.66	74	42.38	35.19	4.28	31.51	104	216	Peak
7386	53.12	-20.88	74	42.3	36.24	5.51	30.93	100	210	Peak

Test Mode :	802.11g	Temperature :	22~23°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	107.76	-	-	103.47	32.89	2.91	31.51	144	322	Peak
2412	96.66	-	-	92.37	32.89	2.91	31.51	144	322	Average
4824	50.23	-23.77	74	42.36	35.17	4.23	31.53	100	360	Peak
7236	52.68	-35.08	87.76	42.06	36.18	5.39	30.95	124	59	Peak

Test Mode :	802.11g	Temperature :	22~23°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	104.98	-	-	100.69	32.89	2.91	31.51	283	-	Peak
2412	93.78	-	-	89.49	32.89	2.91	31.51	283	-	Average
4824	49.66	-24.34	74	41.79	35.17	4.23	31.53	106	118	Peak
7236	52.43	-32.55	84.98	41.81	36.18	5.39	30.95	100	0	Peak

Test Mode :	802.11g	Temperature :	22~23°C
Test Channel :	06	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2437 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2437	107.06	-	-	102.69	32.95	2.93	31.51	118	212	Peak
2437	95.89	-	-	91.52	32.95	2.93	31.51	118	212	Average
4874	49.76	-24.24	74	41.84	35.18	4.26	31.52	140	326	Peak
7311	51.76	-22.24	74	41.06	36.2	5.44	30.94	124	68	Peak

Test Mode :	802.11g	Temperature :	22~23°C
Test Channel :	06	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2437 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2437	104.83	-	-	100.46	32.95	2.93	31.51	102	293	Peak
2437	93.87	-	-	89.5	32.95	2.93	31.51	102	293	Average
4874	49.83	-24.17	74	41.91	35.18	4.26	31.52	103	57	Peak
7311	53.07	-20.93	74	42.37	36.2	5.44	30.94	124	87	Peak

Test Mode :	802.11g	Temperature :	22~23°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
105.66	24.58	-18.92	43.5	46.31	11.29	0.59	33.61	-	-	Peak
159.01	30.48	-13.02	43.5	53.68	9.64	0.74	33.58	200	0	Peak
275.41	31.7	-14.3	46	51.62	12.53	0.96	33.41	-	-	Peak
359.8	23.76	-22.24	46	41.28	14.72	1.11	33.35	-	-	Peak
562.53	26.35	-19.65	46	39.49	18.52	1.34	33	-	-	Peak
941.8	27.17	-18.83	46	37.16	20.7	1.75	32.44	-	-	Peak
2462	106.9	-	-	102.49	32.98	2.94	31.51	198	324	Peak
2462	95.52	-	-	91.11	32.98	2.94	31.51	198	324	Average
4924	50.17	-23.83	74	42.21	35.19	4.28	31.51	102	354	Peak
7386	52.93	-21.07	74	42.11	36.24	5.51	30.93	121	74	Peak

Test Mode :	802.11g	Temperature :	22~23°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
159.98	26.99	-16.51	43.5	50.23	9.6	0.74	33.58	-	-	Peak
273.47	34.29	-11.71	46	54.28	12.47	0.95	33.41	-	-	Peak
362.71	34.83	-11.17	46	52.27	14.8	1.11	33.35	100	0	Peak
466.5	31	-15	46	46.39	16.55	1.24	33.18	-	-	Peak
561.56	31.37	-14.63	46	44.51	18.52	1.34	33	-	-	Peak
946.65	25.11	-20.89	46	35.08	20.72	1.75	32.44	-	-	Peak
2462	104.26	-	-	99.85	32.98	2.94	31.51	102	288	Peak
2462	93.55	-	-	89.14	32.98	2.94	31.51	102	288	Average
4924	49.52	-24.48	74	41.56	35.19	4.28	31.51	120	301	Peak
7386	53.85	-20.15	74	43.03	36.24	5.51	30.93	103	215	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	22~23°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	104.19	-	-	99.9	32.89	2.91	31.51	2000	145	Peak
2412	93.79	-	-	89.5	32.89	2.91	31.51	2000	145	Average
4824	50.97	-23.03	74	43.1	35.17	4.23	31.53	100	26	Peak
7236	53.13	-31.06	84.19	42.51	36.18	5.39	30.95	100	312	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	22~23°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	106.34	-	-	102.05	32.89	2.91	31.51	100	18	Peak
2412	94.98	-	-	90.69	32.89	2.91	31.51	100	18	Average
4824	50.18	-23.82	74	42.31	35.17	4.23	31.53	100	36	Peak
7236	52.7	-33.64	86.34	42.08	36.18	5.39	30.95	100	63	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	22~23°C
Test Channel :	06	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2437 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2437	104.07	-	-	99.7	32.95	2.93	31.51	136	146	Peak
2437	92.86	-	-	88.49	32.95	2.93	31.51	136	146	Average
4874	50.86	-23.14	74	42.94	35.18	4.26	31.52	100	46	Peak
7312	53.54	-20.46	74	42.82	36.2	5.46	30.94	100	6	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	22~23°C
Test Channel :	06	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2437 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2437	104.81	-	-	100.44	32.95	2.93	31.51	100	9	Peak
2437	93.53	-	-	89.16	32.95	2.93	31.51	100	9	Average
4874	50.08	-23.92	74	42.16	35.18	4.26	31.52	100	64	Peak
7312	53.78	-20.22	74	43.06	36.2	5.46	30.94	100	96	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	22~23°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	105.06	-	-	100.65	32.98	2.94	31.51	200	336	Peak
2462	93.25	-	-	88.84	32.98	2.94	31.51	200	336	Average
4924	50.97	-23.03	74	43.01	35.19	4.28	31.51	100	0	Peak
7386	52.9	-21.1	74	42.08	36.24	5.51	30.93	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	22~23°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Stone Gu	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	104.91	-	-	100.5	32.98	2.94	31.51	120	89	Peak
2462	93.2	-	-	88.79	32.98	2.94	31.51	120	89	Average
4924	50.86	-23.14	74	42.9	35.19	4.28	31.51	200	0	Peak
7386	52.81	-21.19	74	41.99	36.24	5.51	30.93	100	0	Peak

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.

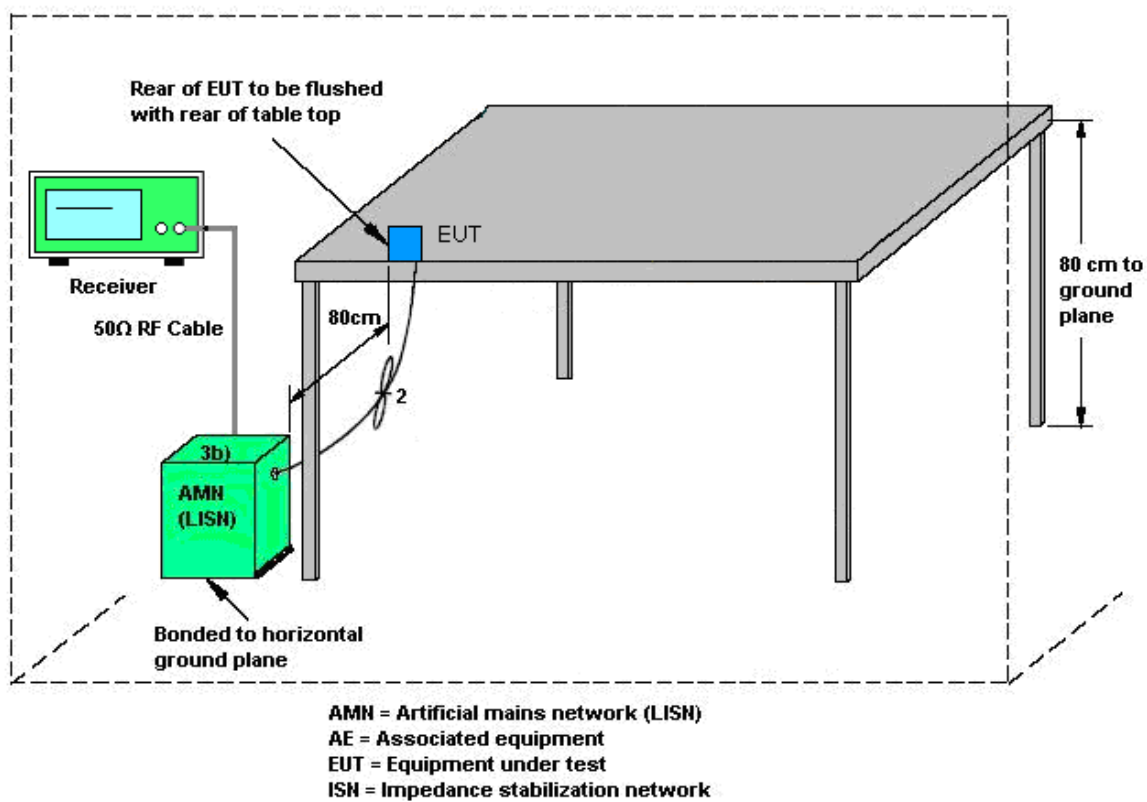
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

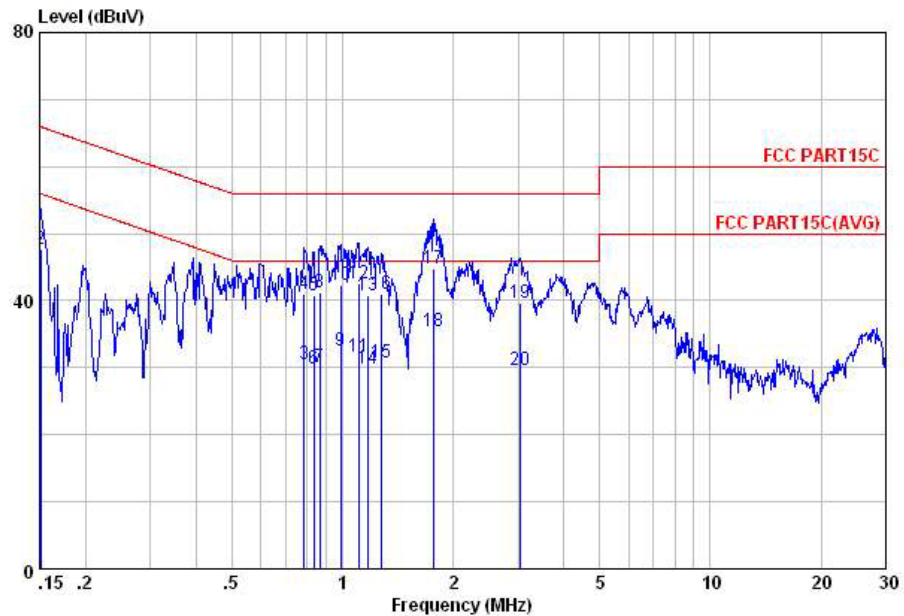
1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

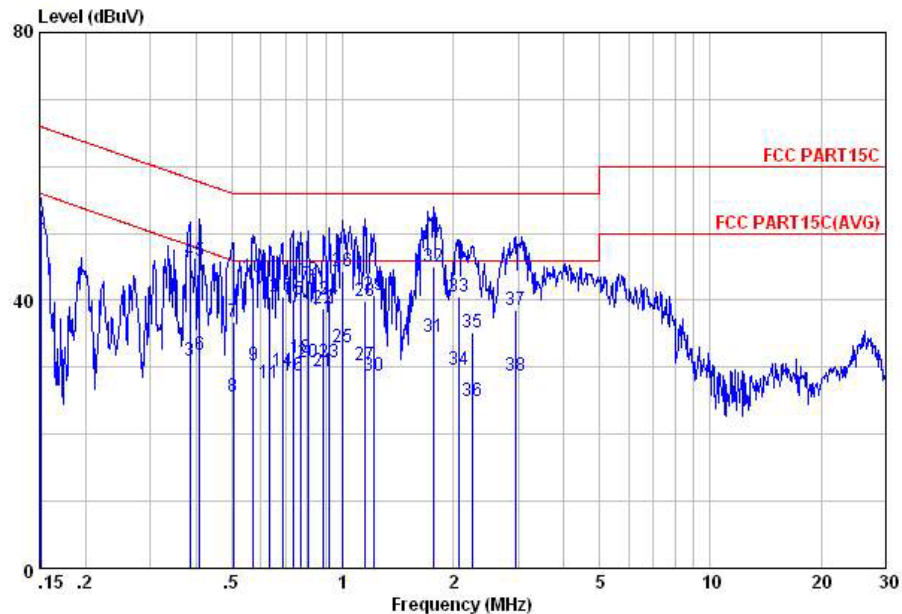
Test Mode :	Mode 2	Temperature :	22~24℃
Test Engineer :	Harvey Tang	Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone		



Site : C001-KS
Condition: FCC PART15C LISM-L20130306 LINE

	Freq	Level	Over	Limit	Read	LISM	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.15	37.35	-18.61	55.96	24.69	1.94	10.72	Average
2	0.15	47.75	-18.21	65.96	35.09	1.94	10.72	QP
3	0.79	30.47	-15.53	46.00	20.10	0.17	10.20	Average
4	0.79	40.97	-15.03	56.00	30.60	0.17	10.20	QP
5	0.83	40.84	-15.16	56.00	30.50	0.15	10.19	QP
6	0.83	29.94	-16.06	46.00	19.60	0.15	10.19	Average
7	0.87	30.12	-15.88	46.00	19.80	0.13	10.19	Average
8	0.87	41.12	-14.88	56.00	30.80	0.13	10.19	QP
9	0.99	32.58	-13.42	46.00	22.30	0.10	10.18	Average
10	0.99	42.28	-13.72	56.00	32.00	0.10	10.18	QP
11	1.11	31.68	-14.32	46.00	21.40	0.10	10.18	Average
12	1.11	42.58	-13.42	56.00	32.30	0.10	10.18	QP
13	1.17	40.88	-15.12	56.00	30.60	0.10	10.18	QP
14	1.17	29.78	-16.22	46.00	19.50	0.10	10.18	Average
15	1.27	30.68	-15.32	46.00	20.40	0.10	10.18	Average
16	1.27	40.98	-15.02	56.00	30.70	0.10	10.18	QP
17	1.77	44.79	-11.21	56.00	34.50	0.10	10.19	QP
18	1.77	35.39	-10.61	46.00	25.10	0.10	10.19	Average
19	3.04	39.66	-16.34	56.00	29.30	0.14	10.22	QP
20	3.04	29.66	-16.34	46.00	19.30	0.14	10.22	Average

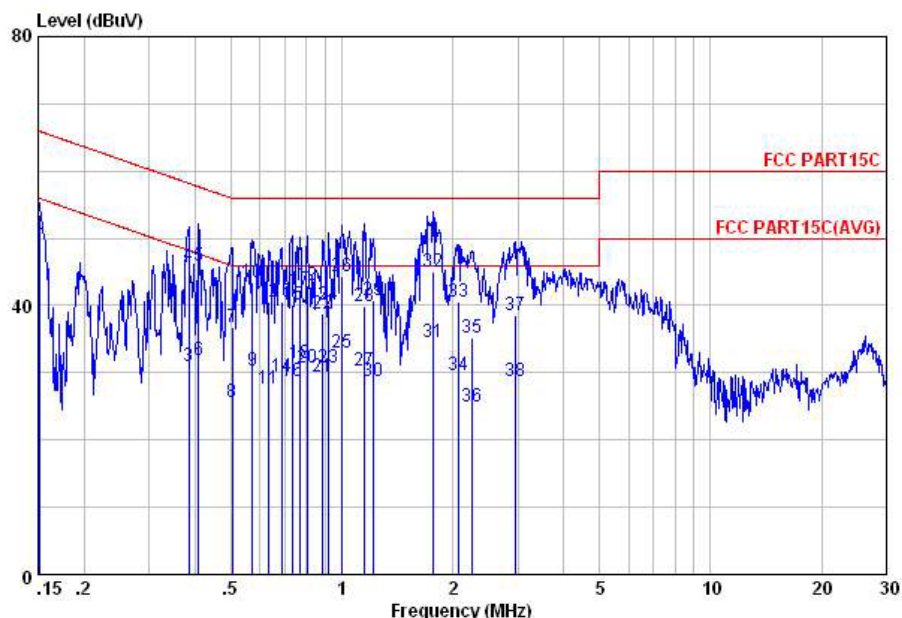
Test Mode :	Mode 2	Temperature :	22~24°C
Test Engineer :	Harvey Tang	Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone		



Site : C001-KS
Condition: FCC PART15C LISN-N20130306 NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.15	53.30	-12.66	65.96	40.69	1.89	10.72	QP
2	0.15	50.60	-5.36	55.96	37.99	1.89	10.72	Average
3	0.39	31.02	-17.15	48.17	20.30	0.43	10.29	Average
4	0.39	45.82	-12.35	58.17	35.10	0.43	10.29	QP
5	0.41	45.87	-11.81	57.68	35.20	0.39	10.28	QP
6	0.41	31.77	-15.91	47.68	21.10	0.39	10.28	Average
7	0.50	36.86	-19.14	56.00	26.30	0.30	10.26	QP
8	0.50	25.56	-20.44	46.00	15.00	0.30	10.26	Average
9	0.57	30.21	-15.79	46.00	19.70	0.26	10.25	Average
10	0.57	43.51	-12.49	56.00	33.00	0.26	10.25	QP
11	0.63	27.66	-18.34	46.00	17.20	0.23	10.23	Average
12	0.63	40.66	-15.34	56.00	30.20	0.23	10.23	QP
13	0.69	40.62	-15.38	56.00	30.21	0.20	10.21	QP
14	0.69	29.32	-16.68	46.00	18.91	0.20	10.21	Average
15	0.73	40.10	-15.90	56.00	29.70	0.19	10.21	QP
16	0.73	28.80	-17.20	46.00	18.40	0.19	10.21	Average
17	0.77	42.38	-13.62	56.00	32.00	0.18	10.20	QP
18	0.77	31.38	-14.62	46.00	21.00	0.18	10.20	Average
19	0.80	42.96	-13.04	56.00	32.59	0.17	10.20	QP
20	0.80	30.86	-15.14	46.00	20.49	0.17	10.20	Average
21	0.88	29.32	-16.68	46.00	19.00	0.13	10.19	Average
22	0.88	38.72	-17.28	56.00	28.40	0.13	10.19	QP
23	0.92	30.80	-15.20	46.00	20.49	0.12	10.19	Average
24	0.92	40.10	-15.90	56.00	29.79	0.12	10.19	QP
25	1.00	32.88	-13.12	46.00	22.60	0.10	10.18	Average
26	1.00	44.28	-11.72	56.00	34.00	0.10	10.18	QP
27	1.15	30.38	-15.62	46.00	20.10	0.10	10.18	Average
28	1.15	39.88	-16.12	56.00	29.60	0.10	10.18	QP

Test Mode :	Mode 2	Temperature :	22~24℃
Test Engineer :	Harvey Tang	Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone		



Site : C001-KS
Condition: FCC PART15C LISN-N20130306 NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
29	1.22	40.88	-15.12	56.00	30.60	0.10	10.18	QP
30	1.22	28.78	-17.22	46.00	18.50	0.10	10.18	Average
31	1.77	34.49	-11.51	46.00	24.20	0.10	10.19	Average
32	1.77	44.99	-11.01	56.00	34.70	0.10	10.19	QP
33	2.08	40.49	-15.51	56.00	30.20	0.10	10.19	QP
34	2.08	29.69	-16.31	46.00	19.40	0.10	10.19	Average
35	2.26	35.20	-20.80	56.00	24.89	0.11	10.20	QP
36	2.26	24.90	-21.10	46.00	14.59	0.11	10.20	Average
37	2.96	38.66	-17.34	56.00	28.30	0.14	10.22	QP
38	2.96	28.86	-17.14	46.00	18.50	0.14	10.22	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 Connected Construction

Non-standard connector 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	FSP40	100319	9kHz~40GHz	Dec. 29, 2012	Jul. 19, 2013~ Aug. 01, 2013	Dec. 28, 2013	Conducted (TH01-KS)
Power Meter	Agilent	E4416A	MY45101555	N/A	Aug. 22, 2012	Jul. 19, 2013~ Aug. 01, 2013	Aug. 21, 2013	Conducted (TH01-KS)
Power Sensor	Agilent	E9327A	MY44421198	N/A	Aug. 22, 2012	Jul. 19, 2013~ Aug. 01, 2013	Aug. 21, 2013	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	N/A	Dec. 29, 2012	Jul. 19, 2013~ Aug. 01, 2013	Dec. 28, 2013	Conducted (TH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz	May 23, 2013	Jul. 24, 2013	May 22, 2014	Conduction (CO01-KS)
LISN (for auxiliary equipment)	MessTec	AN3016	60103	9kHz~30MHz	Dec. 29, 2012	Jul. 24, 2013	Dec. 28, 2013	Conduction (CO01-KS)
LISN	MessTec	AN3016	60105	9kHz~30MHz	Dec. 29, 2012	Jul. 24, 2013	Dec. 28, 2013	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP0000008 11	N/A	Nov. 15, 2012	Jul. 24, 2013	Nov. 14, 2013	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Nov. 08, 2012	Aug. 02, 2013	Nov. 07, 2013	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	100400	9kHz~30GHz	May 23, 2013	Aug. 02, 2013	May 22, 2014	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Dec. 07, 2012	Aug. 02, 2013	Dec. 06, 2013	Radiation (03CH01-KS)
Double Ridge Horn Antenna	EMCO	3117	00075959	1GHz~18GHz	Dec. 07, 2012	Aug. 02, 2013	Dec. 06, 2013	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161069	1MHz~1GHz	May 23, 2013	Aug. 02, 2013	May 22, 2014	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Dec. 29, 2012	Aug. 02, 2013	Dec. 28, 2013	Radiation (03CH01-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	N/A	Aug. 02, 2013	N/A	Radiation (03CH01-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	N/A	Aug. 02, 2013	N/A	Radiation (03CH01-KS)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72
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