

FCC RF Test Report

APPLICANT : Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT : Portable Tablet Computer
BRAND NAME : lenovo
MODEL NAME : Lenovo TAB 2 A8-50F
FCC ID : O57TAB2A850F
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Feb. 04, 2015 and testing was completed on Mar. 09, 2015. 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.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



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No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China



TABLE OF CONTENTS

SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer.....	5
1.3 Product Feature of Equipment Under Test.....	5
1.4 Product Specification subjective to this standard	6
1.5 Modification of EUT	8
1.6 Testing Location	8
1.7 Applicable Standards.....	8
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	9
2.1 Carrier Frequency Channel	9
2.2 Pre-Scanned RF Power.....	10
2.3 Test Mode.....	11
2.4 Connection Diagram of Test System.....	12
2.5 Support Unit used in test configuration and system	13
2.6 EUT Operation Test Setup	13
2.7 Measurement Results Explanation Example.....	13
3 TEST RESULT.....	14
3.1 6dB and 99% Bandwidth Measurement	14
3.2 Output Power Measurement.....	16
3.3 Power Spectral Density Measurement	19
3.4 Conducted Band Edges and Spurious Emission Measurement	21
3.5 Radiated Band Edges and Spurious Emission Measurement	31
3.6 AC Conducted Emission Measurement.....	35
3.7 Antenna Requirements.....	39
4 LIST OF MEASURING EQUIPMENT	40
5 UNCERTAINTY OF EVALUATION	41
APPENDIX A. RADIATED TEST RESULTS	
APPENDIX B. SETUP PHOTOGRAPHS	

**REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR520402C	Rev. 01	Initial issue of report	Mar. 16, 2015

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 4.68 dB at 30.000 MHz
3.6	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 9.42 dB at 3.490 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 Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	lenovo
Model Name	Lenovo TAB 2 A8-50F
FCC ID	O57TAB2A850F
EUT supports Radios application	WLAN2.4GHz 802.11b/g/n HT20 Bluetooth v3.0+EDR Bluetooth v4.0 LE
HW Version	LLDM007C1-3
SW Version	A8-50F_S000005_150204_ROW
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 subjective to this standard

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 17.03 dBm (0.0505 W) 802.11g : 21.98 dBm (0.1578 W) 802.11n HT20 : 20.59 dBm (0.1146 W)
99% Occupied Bandwidth	802.11b : 12.45MHz 802.11g : 17.40MHz 802.11n HT20 : 18.20MHz
Antenna Type	PIFA Antenna with gain 1.90 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Component List

Note: there are six types of EUT, sample 1/3/5 are the 1st source, the difference between the three types are just for flash memory, sample 2/4/6 are the 2nd source, the different between the three types are also for flash memory, the difference between 1st source and 2nd source are for Flash/LCM/TP/Front Camera/back camera/Motor/Side key FPC/Main FPC and battery. The details refer the following table. According to the difference, we evaluate is not affect RF performance, so only choose sample 1 to perform RF test.



Component	Sample 1	Sample 2	Sample 3
Flash	(SAMSUNG) KMR820001M-B609	(Hynix) H9TQ17ABJTMCKURKUM	(SAMSUNG) KMQ8X000SA-B414
LCM	(BOE) TFT_8"_1280X800_TTV08 0WXM-NL0	(Dongshan) TFT_8"_1280X800_D080 0AN00	(BOE) TFT_8"_1280X800_TTV0 80WXM-NL0
TP	(AVC) 8"CTP LENS_ AP080205	(Mutto) 8"CTP LENS_ 131795E1	(AVC) 8"CTP LENS_ AP080205
Front_camera	(Sunrise) Camera_200W_F V1.0_PC0FB0002B	(Jinkang) Camera 200W FF_H7P2-A8HQ	(Sunrise) Camera_200W_F V1.0_PC0FB0002B
Back_camera	(O-Film) Camera_500W_AF_L545A 00	(Q-tech) Camera_500W-AF_BT_B 30PIN_FH545AB	(O-Film) Camera_500W_AF_L545 A00
Motor	(Huachuan) F102730-I01	(Dongci) DM-B1003-9N	(Huachuan) F102730-I01
Side key FPC	(Zrxd) FPC+DOME+Steel+TESA8 853	(Rongxinda) FPC+DOME+Steel+TESA 8853	(Zrxd) FPC+DOME+Steel+TESA 8853
Main FPC	(Zrxd) FPC+TESA8853	(Rongxinda) FPC+TESA8853	(Zrxd) FPC+TESA8853
Battery	(Sunwoda) XWD-L L13D1P32	(TWS) TWS-C L13T1P32	(Sunwoda) XWD-L L13D1P32

Component	Sample 4	Sample 5	Sample 6
Flash	(Hynix) H9TQ17A8GTMCURKUM	(SAMSUNG) KMQ7X000SA- B315	(Hynix) H9TQ64A8GTMCURKUM
LCM	(Dongshan) TFT_8"_1280X800_D0800 AN00	(BOE) TFT_8"_1280X800_TTV0 80WXM-NL0	(Dongshan) TFT_8"_1280X800_D080 0AN00
TP	(Mutto) 8"CTP LENS_ 131795E1	(AVC) 8"CTP LENS_ AP080205	(Mutto) 8"CTP LENS_ 131795E1
Front_camera	(Jinkang) Camera 200W FF_H7P2-A8HQ	(Sunrise) Camera_200W_F V1.0_PC0FB0002B	(Jinkang) Camera 200W FF_H7P2-A8HQ
Back_camera	(Q-tech) Camera_500W-AF_BT_B_3 0PIN_FH545AB	(O-Film) Camera_500W_AF_L545 A00	(Q-tech) Camera_500W-AF_BT_B_3 30PIN_FH545AB
Motor	(Dongci) DM-B1003-9N	(Huachuan) F102730-I01	(Dongci) DM-B1003-9N
Side key FPC	(Rongxinda) FPC+DOME+Steel+TESA8 853	(Zrxd) FPC+DOME+Steel+TESA 8853	(Rongxinda) FPC+DOME+Steel+TESA 8853
Main FPC	(Rongxinda) FPC+TESA8853	(Zrxd) FPC+TESA8853	(Rongxinda) FPC+TESA8853
Battery	(TWS) TWS-C L13T1P32	(Sunwoda) XWD-L L13D1P32	(TWS) TWS-C L13T1P32



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/IC Registration No.
	TH01-KS	03CH01-KS	CO01-KS	149928/4086E-1

Note: The test site complies with ANSI C63.4 2009 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 v03r02
- ♦ ANSI C63.10-2013
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 4
- ♦ NOTICE 2012-DRS0126

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table as an alternative in C63.10-2013 through inquiry tracking number 961829.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
4. 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 were recorded in this report.

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

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

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	-	-

2.2 Pre-Scanned RF Power

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

2.4GHz 802.11b RF Output Power (dBm)						
Power vs. Channel			Power vs. Data Rate			
Channel	Frequency (MHz)	Data Rate	Channel	2Mbps	5.5Mbps	11Mbps
		1Mbps				
CH 01	2412 MHz	16.47	CH 06	17.00	16.84	16.71
CH 06	2437 MHz	17.03				
CH 11	2462 MHz	16.53				

2.4GHz 802.11g RF Output Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps								
CH 01	2412 MHz	21.59	CH 06	21.59	21.91	21.63	21.72	21.46	21.84	21.92
CH 06	2437 MHz	21.98								
CH 11	2462 MHz	21.64								

2.4GHz 802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 01	2412 MHz	20.19	CH 06	20.46	20.20	20.03	20.12	20.36	20.47	20.25
CH 06	2437 MHz	20.59								
CH 11	2462 MHz	20.32								

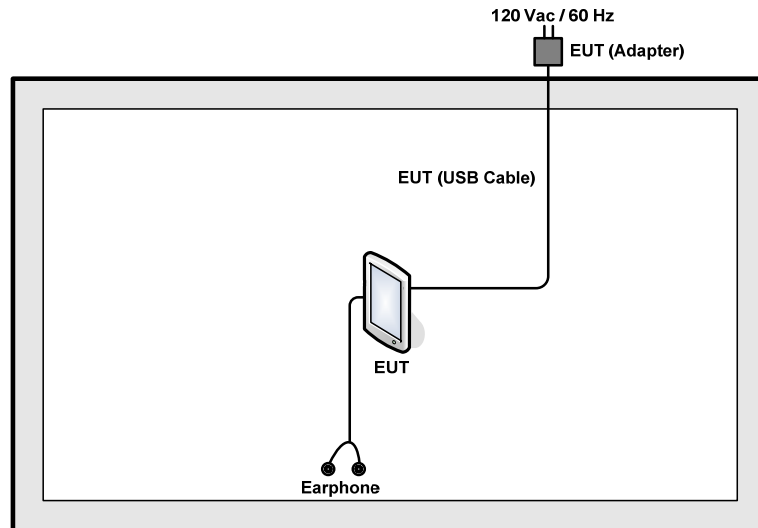
2.3 Test Mode

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

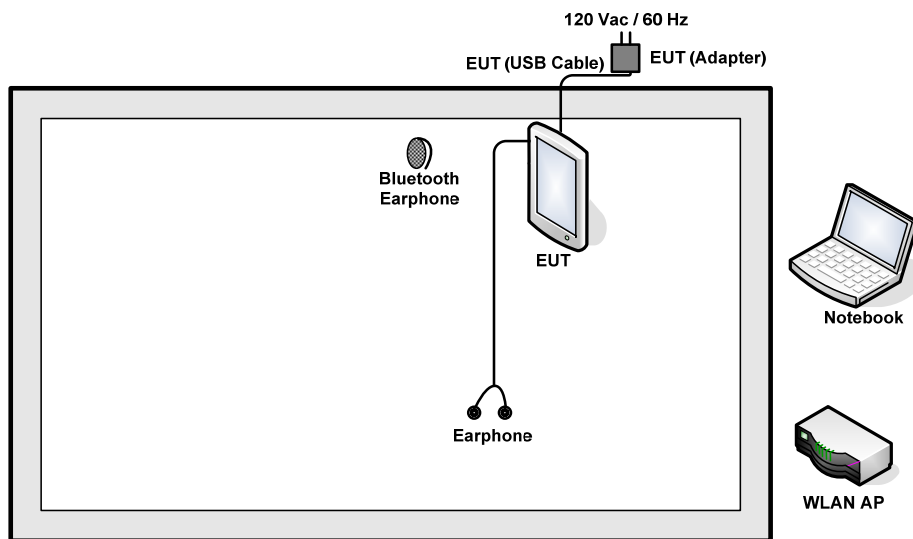
Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	6dB and 99% BW Power Spectral Density	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
	Output Power	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
	Conducted Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	MCS0	1/11
	Conducted Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
Radiated TCs	Radiated Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	MCS0	1/11
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter 1) + Earphone for Sample 1			

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	G480	PRC4	N/A	shielded cable DC O/P 1.8 m unshielded AC I/P cable 1.8 m
2.	Bluetooth Earphone	Lenovo	LBH505	N/A	N/A	N/A
3.	Earphone	Lenovo	SH100	N/A	N/A	N/A
4.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8m

2.6 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

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

2.7 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} \\
 &= 5.5 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

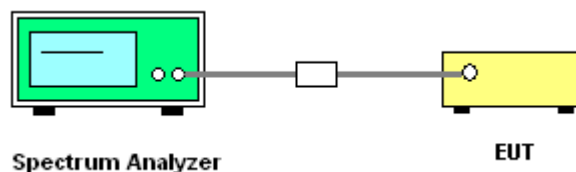
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r02.
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

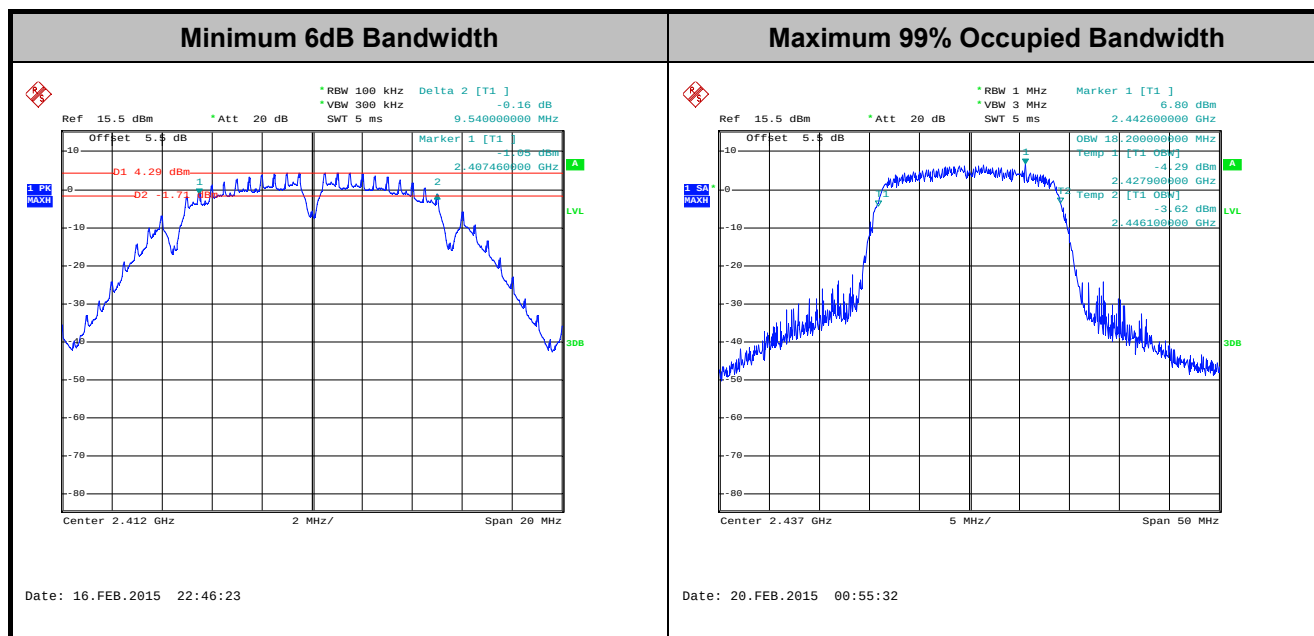




3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Test Band :	2.4GHz	Temperature :	24~25°C
Test Engineer :	Issac Song	Relative Humidity :	49~51%

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	12.45	9.54	0.5	Pass
11b	1Mbps	1	6	2437	12.35	9.54	0.5	Pass
11b	1Mbps	1	11	2462	12.35	9.54	0.5	Pass
11g	6Mbps	1	1	2412	17.40	15.40	0.5	Pass
11g	6Mbps	1	6	2437	17.35	15.10	0.5	Pass
11g	6Mbps	1	11	2462	17.40	15.46	0.5	Pass
HT20	MCS0	1	1	2412	18.10	16.08	0.5	Pass
HT20	MCS0	1	6	2437	18.20	15.10	0.5	Pass
HT20	MCS0	1	11	2462	18.15	16.06	0.5	Pass



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.

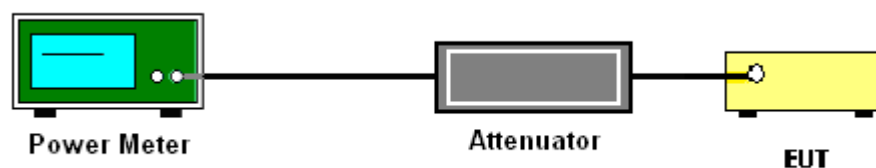
3.2.2 Measuring Instruments

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 v03r02.
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 :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	16.47	30	1.90	Pass
11b	1Mbps	1	6	2437	17.03	30	1.90	Pass
11b	1Mbps	1	11	2462	16.53	30	1.90	Pass
11g	6Mbps	1	1	2412	21.59	30	1.90	Pass
11g	6Mbps	1	6	2437	21.98	30	1.90	Pass
11g	6Mbps	1	11	2462	21.64	30	1.90	Pass
HT20	MCS0	1	1	2412	20.19	30	1.90	Pass
HT20	MCS0	1	6	2437	20.59	30	1.90	Pass
HT20	MCS0	1	11	2462	20.32	30	1.90	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 :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

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	0.08	13.34	30	1.90	Pass
11b	1Mbps	1	6	2437	0.08	13.85	30	1.90	Pass
11b	1Mbps	1	11	2462	0.08	13.47	30	1.90	Pass
11g	6Mbps	1	1	2412	0.50	12.47	30	1.90	Pass
11g	6Mbps	1	6	2437	0.50	12.83	30	1.90	Pass
11g	6Mbps	1	11	2462	0.50	12.56	30	1.90	Pass
HT20	MCS0	1	1	2412	0.57	10.45	30	1.90	Pass
HT20	MCS0	1	6	2437	0.57	10.80	30	1.90	Pass
HT20	MCS0	1	11	2462	0.57	10.54	30	1.90	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.

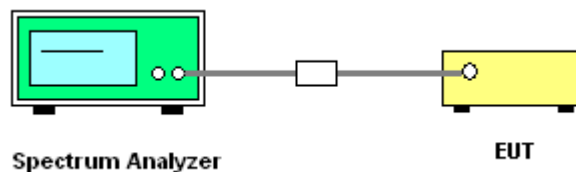
3.3.2 Measuring Instruments

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 v03r02
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



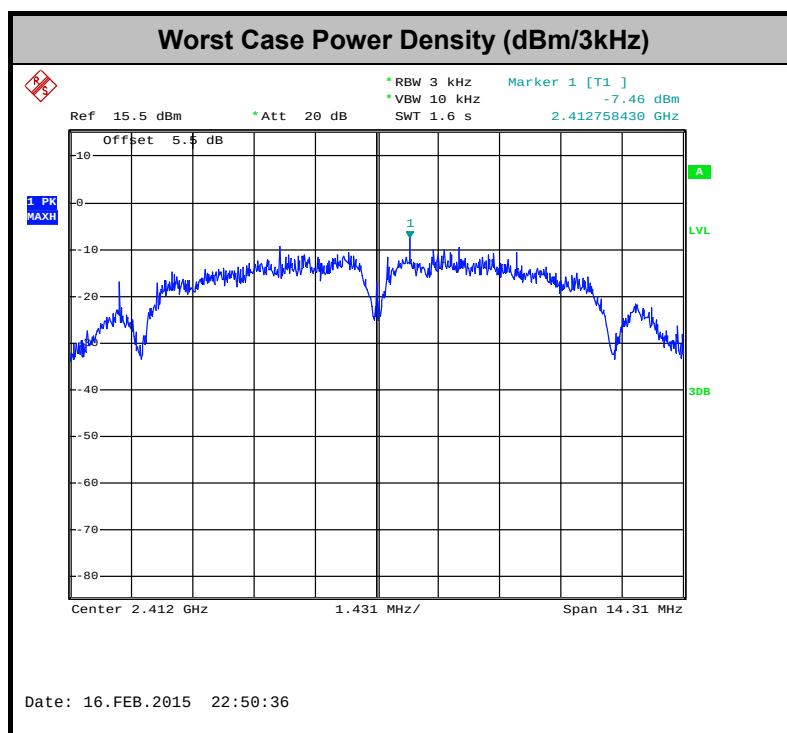


3.3.5 Test Result of Power Spectral Density

Test Mode :	2.4GHz	Temperature :	24~25°C
Test Engineer :	Issac Song	Relative Humidity :	49~51%

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	-7.46	8	1.90	Pass
11b	1Mbps	1	6	2437	-9.93	8	1.90	Pass
11b	1Mbps	1	11	2462	-8.29	8	1.90	Pass
11g	6Mbps	1	1	2412	-12.27	8	1.90	Pass
11g	6Mbps	1	6	2437	-12.63	8	1.90	Pass
11g	6Mbps	1	11	2462	-13.52	8	1.90	Pass
HT20	MCS0	1	1	2412	-15.13	8	1.90	Pass
HT20	MCS0	1	6	2437	-13.94	8	1.90	Pass
HT20	MCS0	1	11	2462	-13.87	8	1.90	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).

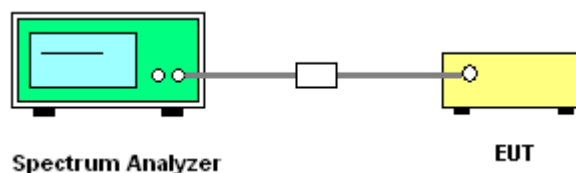
3.4.2 Measuring Instruments

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 v03r02.
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



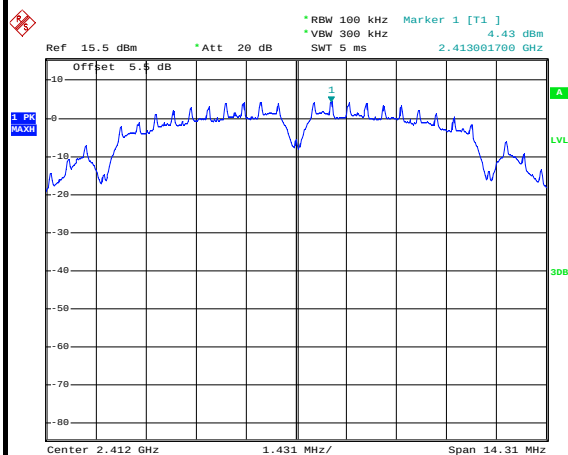


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~51%
Test Channel :	01	Test Engineer :	Issac Song

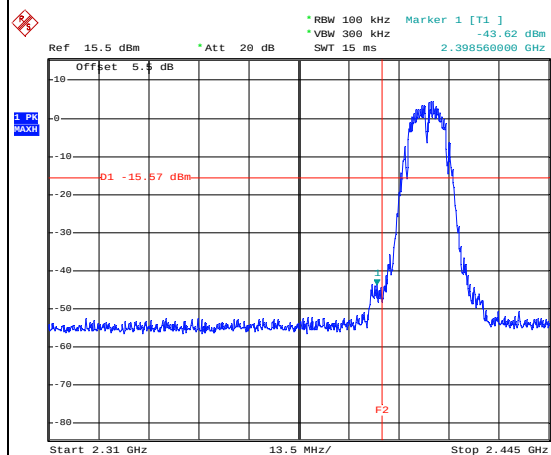
WLAN 802.11b Channel 01

100kHz PSD reference Level



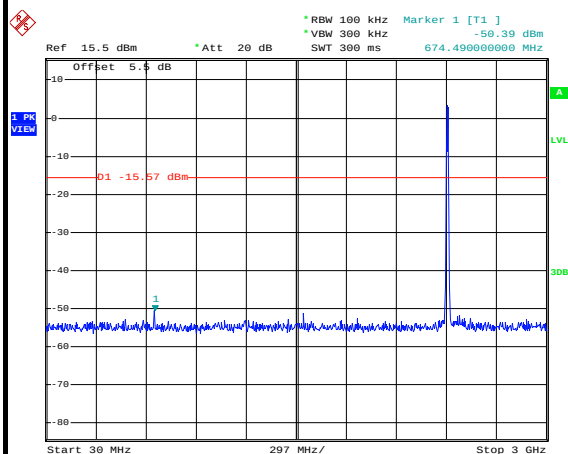
Date: 16.FEB.2015 22:49:34

Low Channel Plot



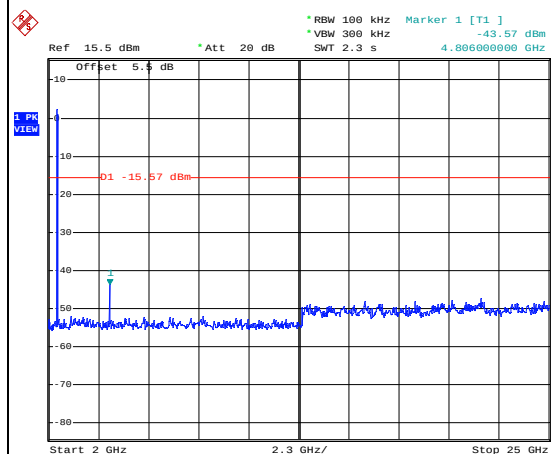
Date: 16.FEB.2015 22:51:21

Spurious Emission 30MHz~3GHz



Date: 16.FEB.2015 23:00:01

Spurious Emission 2GHz~25GHz



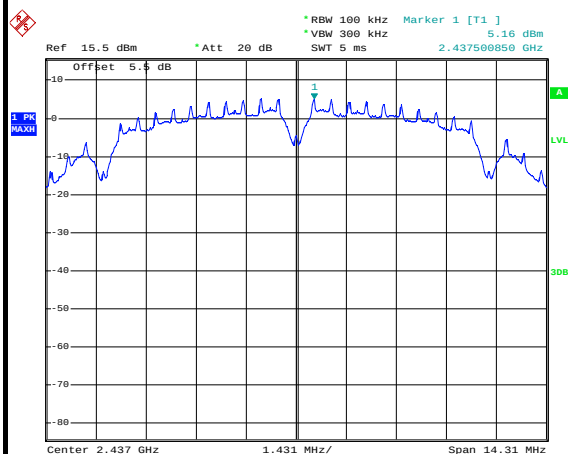
Date: 16.FEB.2015 23:00:19



Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~51%
Test Channel :	06	Test Engineer :	Issac Song

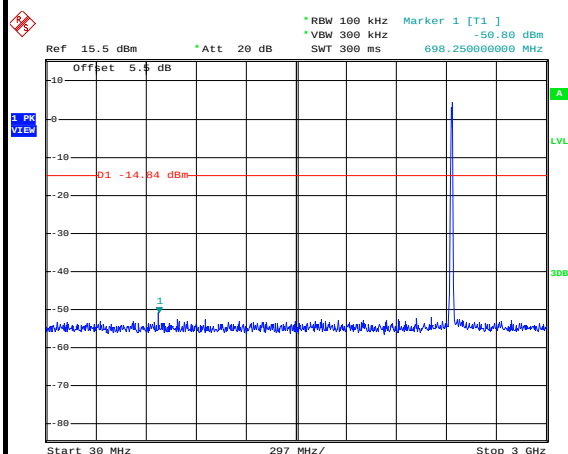
WLAN 802.11b Channel 06

100kHz PSD reference Level



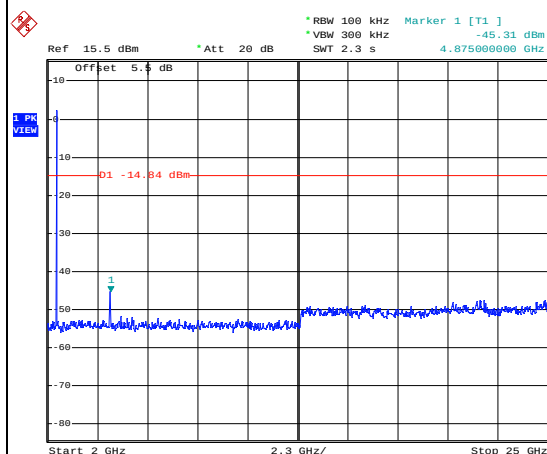
Date: 17.FEB.2015 03:55:33

Spurious Emission 30MHz~3GHz



Date: 17.FEB.2015 03:55:55

Spurious Emission 2GHz~25GHz



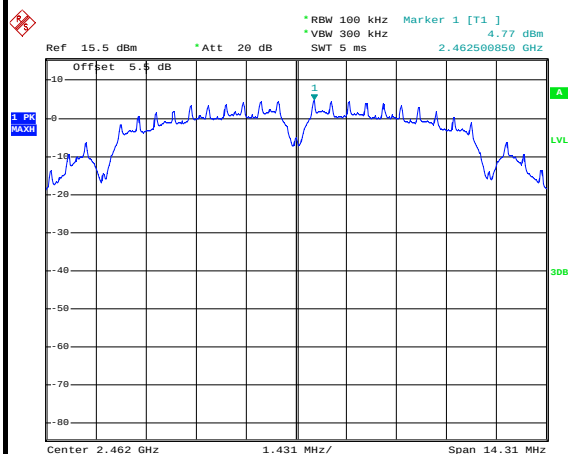
Date: 17.FEB.2015 03:56:13



Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~51%
Test Channel :	11	Test Engineer :	Issac Song

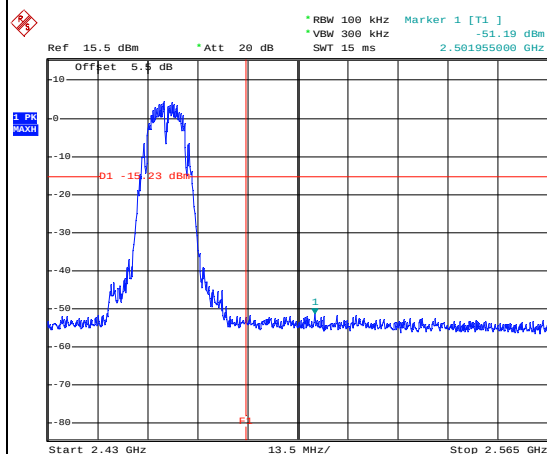
WLAN 802.11b Channel 11

100kHz PSD reference Level



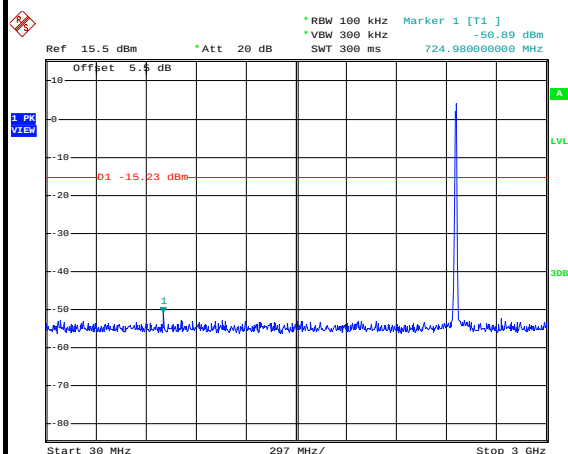
Date: 17.FEB.2015 03:59:05

High Channel Plot



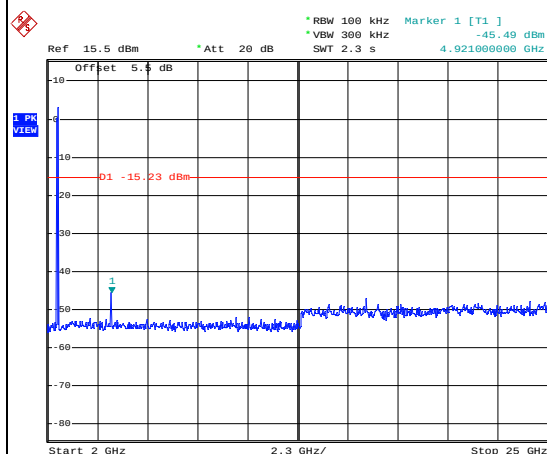
Date: 17.FEB.2015 03:59:21

Spurious Emission 30MHz~3GHz



Date: 17.FEB.2015 03:59:51

Spurious Emission 2GHz~25GHz



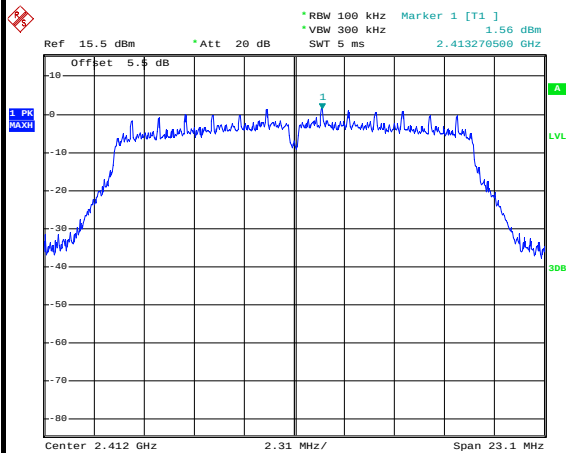
Date: 17.FEB.2015 04:00:09



Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~51%
Test Channel :	01	Test Engineer :	Issac Song

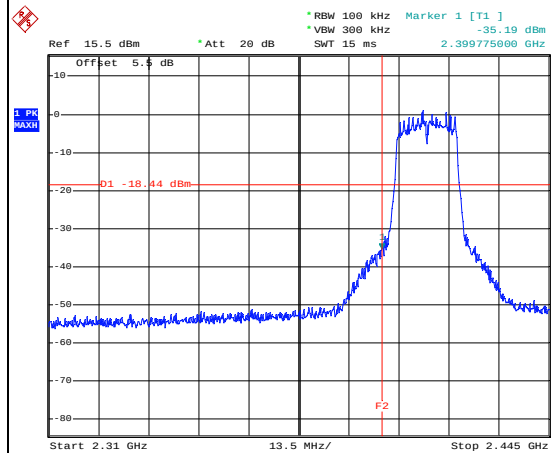
WLAN 802.11g Channel 01

100kHz PSD reference Level



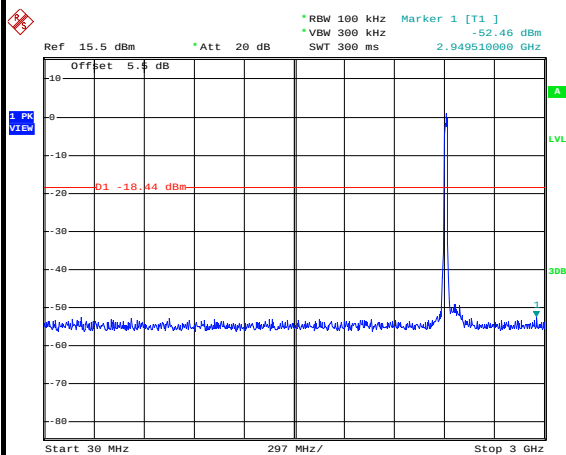
Date: 20.FEB.2015 00:34:10

Low Channel Plot



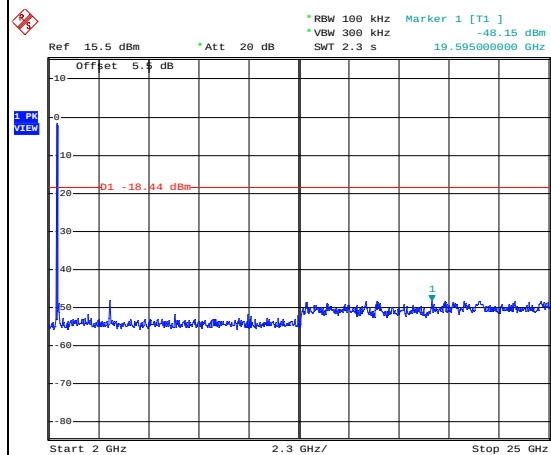
Date: 20.FEB.2015 00:34:54

Spurious Emission 30MHz~3GHz



Date: 20.FEB.2015 00:36:39

Spurious Emission 2GHz~25GHz



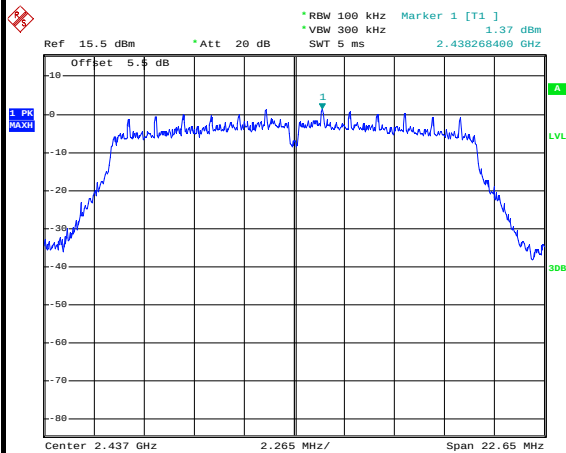
Date: 20.FEB.2015 00:36:57



Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~51%
Test Channel :	06	Test Engineer :	Issac Song

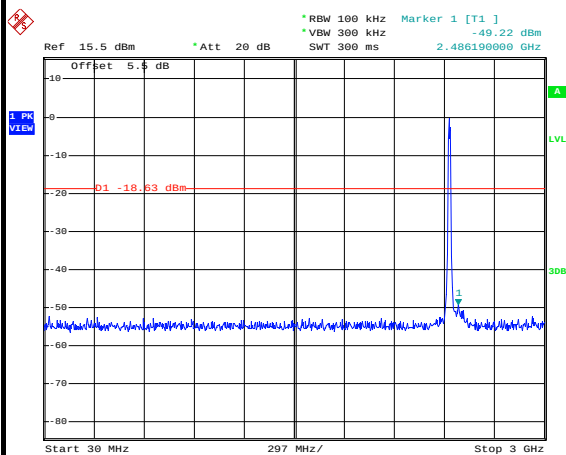
WLAN 802.11g Channel 06

100kHz PSD reference Level



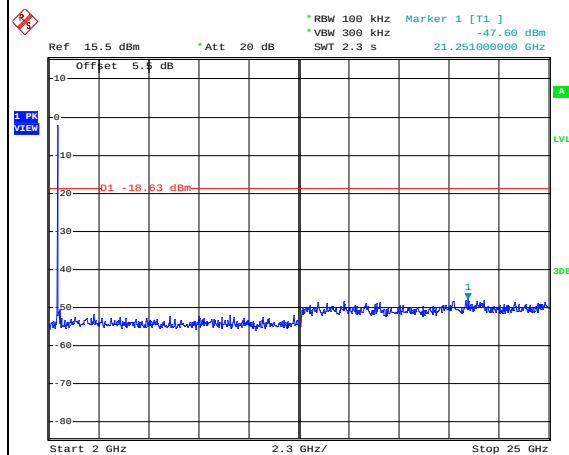
Date: 20.FEB.2015 00:39:48

Spurious Emission 30MHz~3GHz



Date: 20.FEB.2015 00:40:10

Spurious Emission 2GHz~25GHz



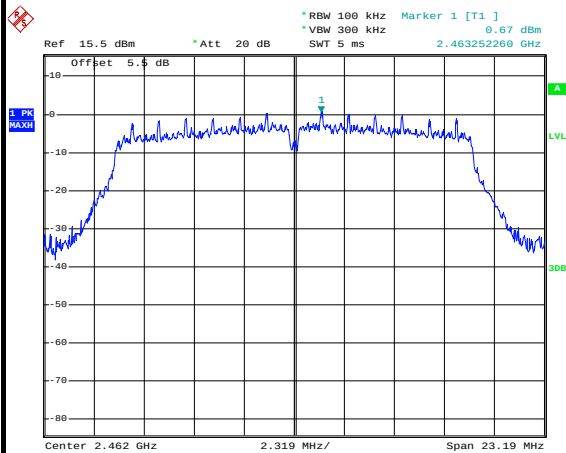
Date: 20.FEB.2015 00:40:28



Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~51%
Test Channel :	11	Test Engineer :	Issac Song

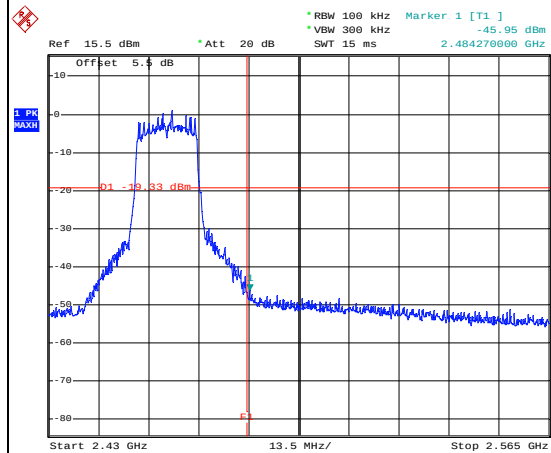
WLAN 802.11g Channel 11

100kHz PSD reference Level



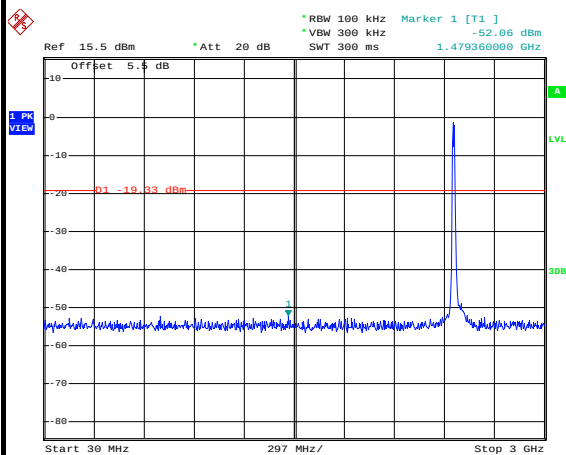
Date: 20.FEB.2015 00:43:47

High Channel Plot



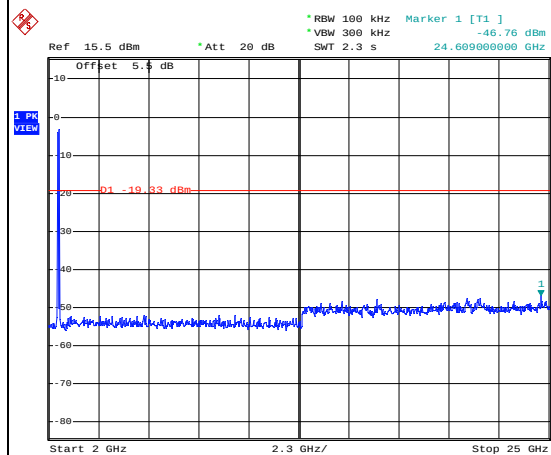
Date: 20.FEB.2015 00:44:07

Spurious Emission 30MHz~3GHz



Date: 20.FEB.2015 00:44:37

Spurious Emission 2GHz~25GHz



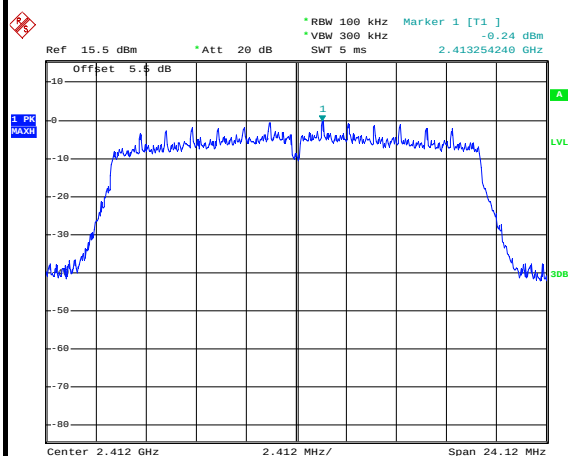
Date: 20.FEB.2015 00:44:55



Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~51%
Test Channel :	01	Test Engineer :	Issac Song

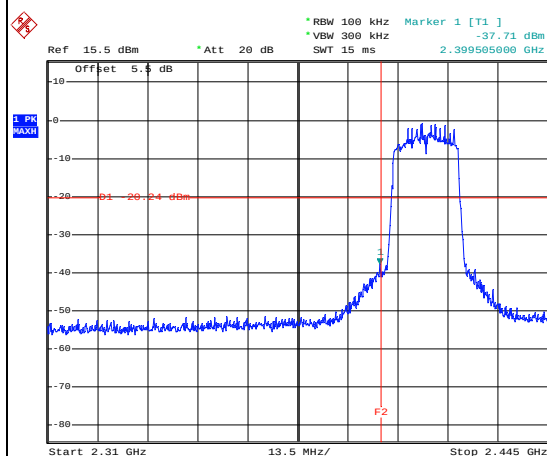
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



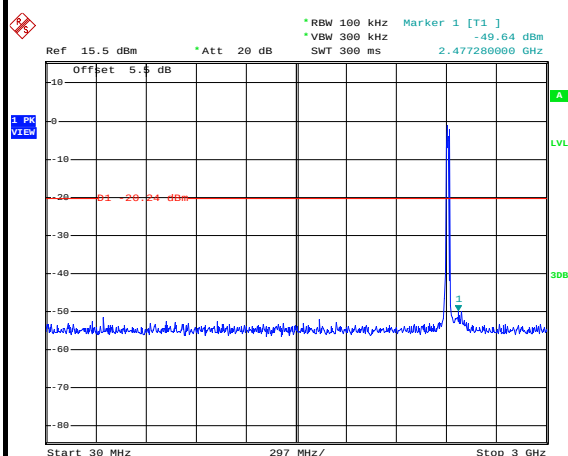
Date: 20.FEB.2015 00:48:27

Low Channel Plot



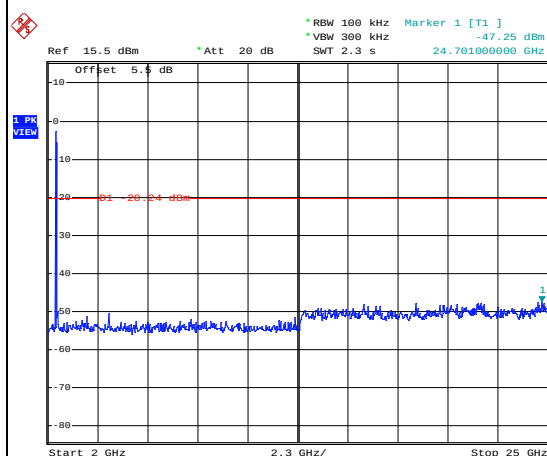
Date: 20.FEB.2015 00:48:48

Spurious Emission 30MHz~3GHz



Date: 20.FEB.2015 00:49:32

Spurious Emission 2GHz~25GHz



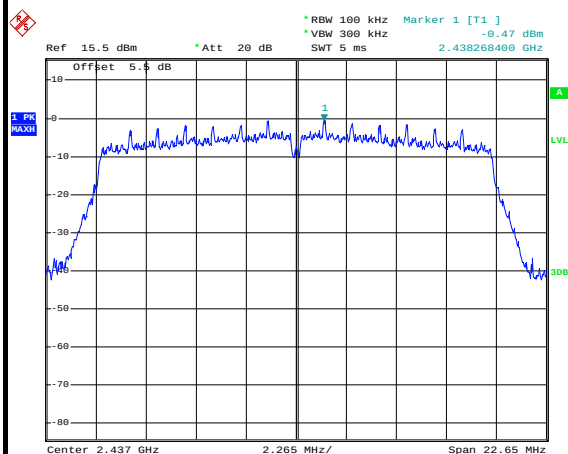
Date: 20.FEB.2015 00:49:50



Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~51%
Test Channel :	06	Test Engineer :	Issac Song

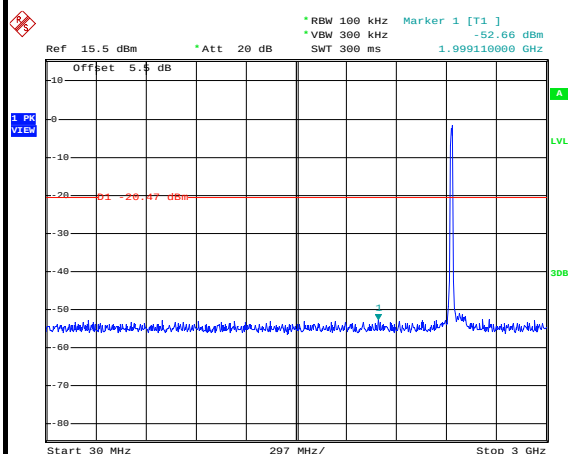
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



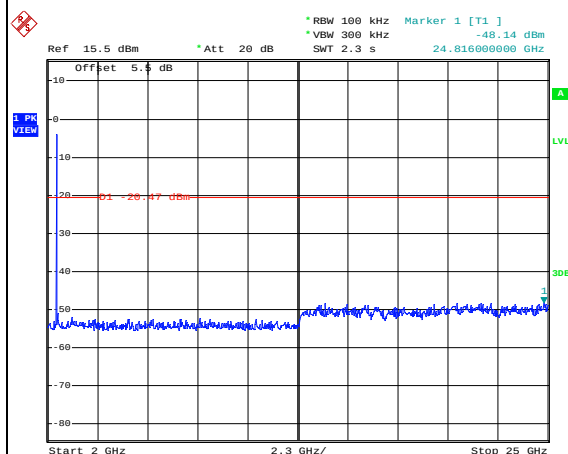
Date: 20.FEB.2015 00:54:32

Spurious Emission 30MHz~3GHz



Date: 20.FEB.2015 00:54:58

Spurious Emission 2GHz~25GHz



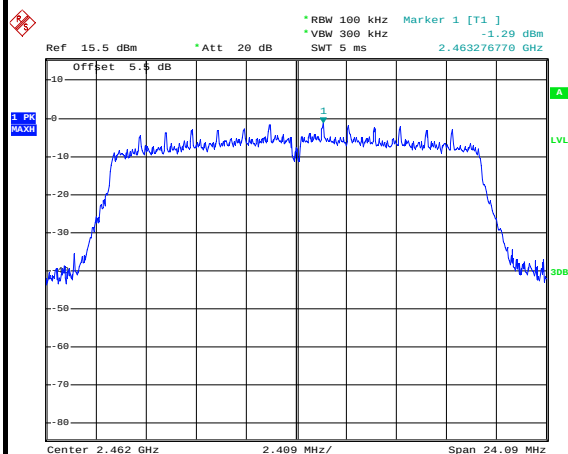
Date: 20.FEB.2015 00:55:16



Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~51%
Test Channel :	11	Test Engineer :	Issac Song

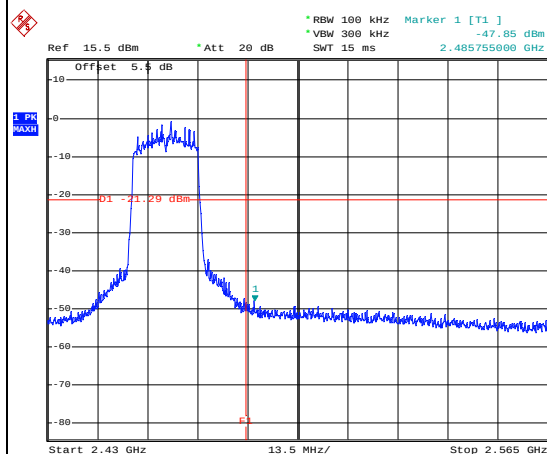
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



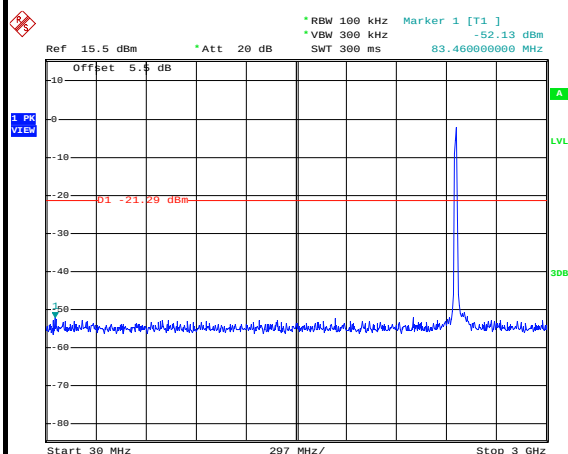
Date: 20.FEB.2015 00:59:34

High Channel Plot



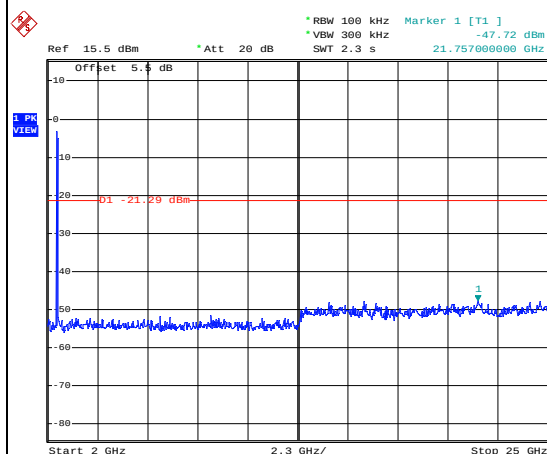
Date: 20.FEB.2015 01:00:14

Spurious Emission 30MHz~3GHz



Date: 20.FEB.2015 01:00:59

Spurious Emission 2GHz~25GHz



Date: 20.FEB.2015 01:01:17

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 v03r02.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

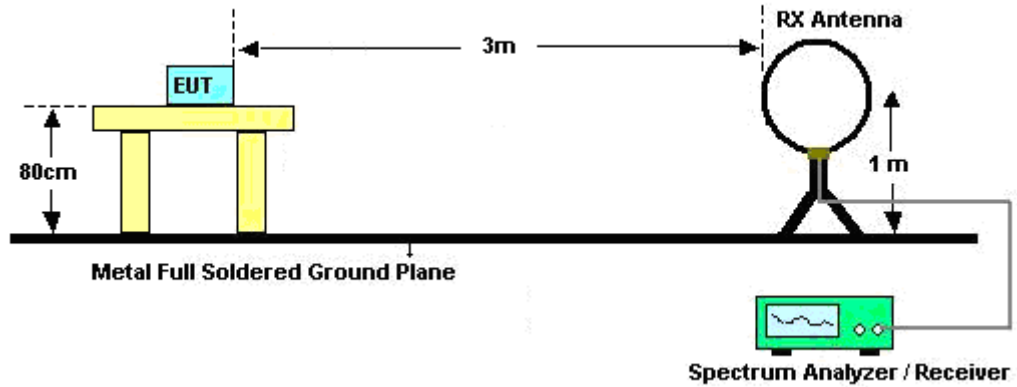
For average measurement:

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

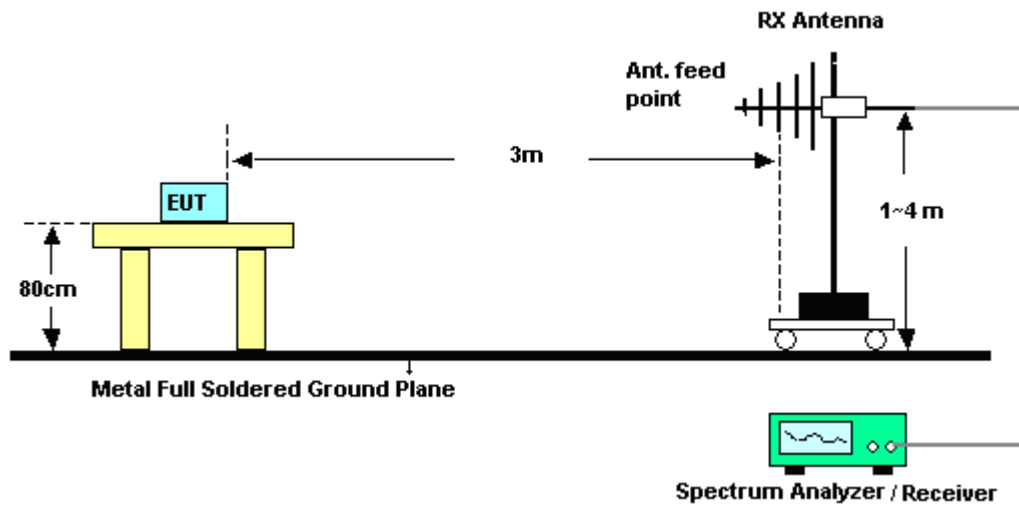
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	98.13	-	-	10Hz
802.11g	89.17	1.40	0.71	1kHz
802.11n HT20	87.77	1.31	0.77	1kHz

3.5.4 Test Setup

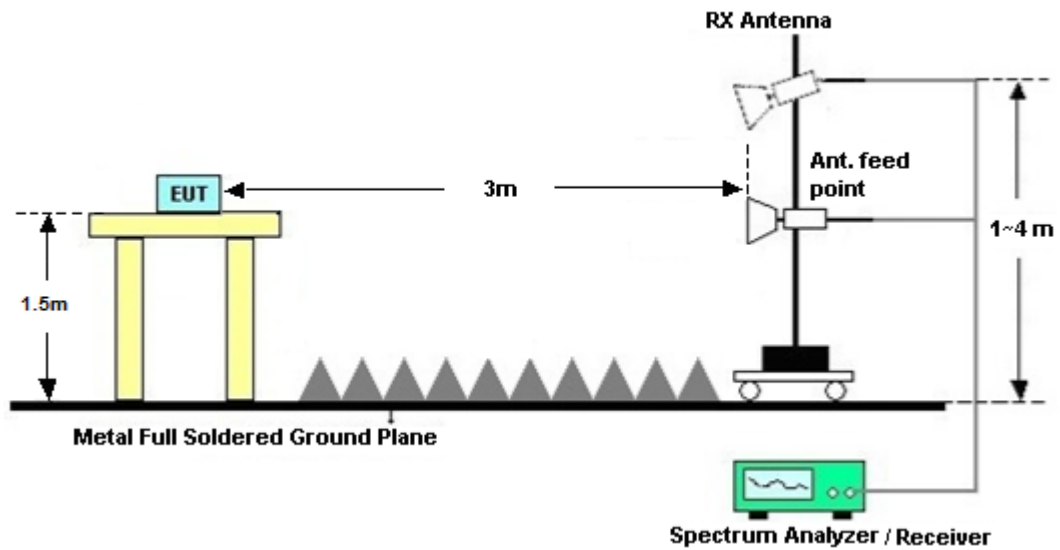
For radiated emissions below 30MHz



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 A.

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

Please refer to Appendix A.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

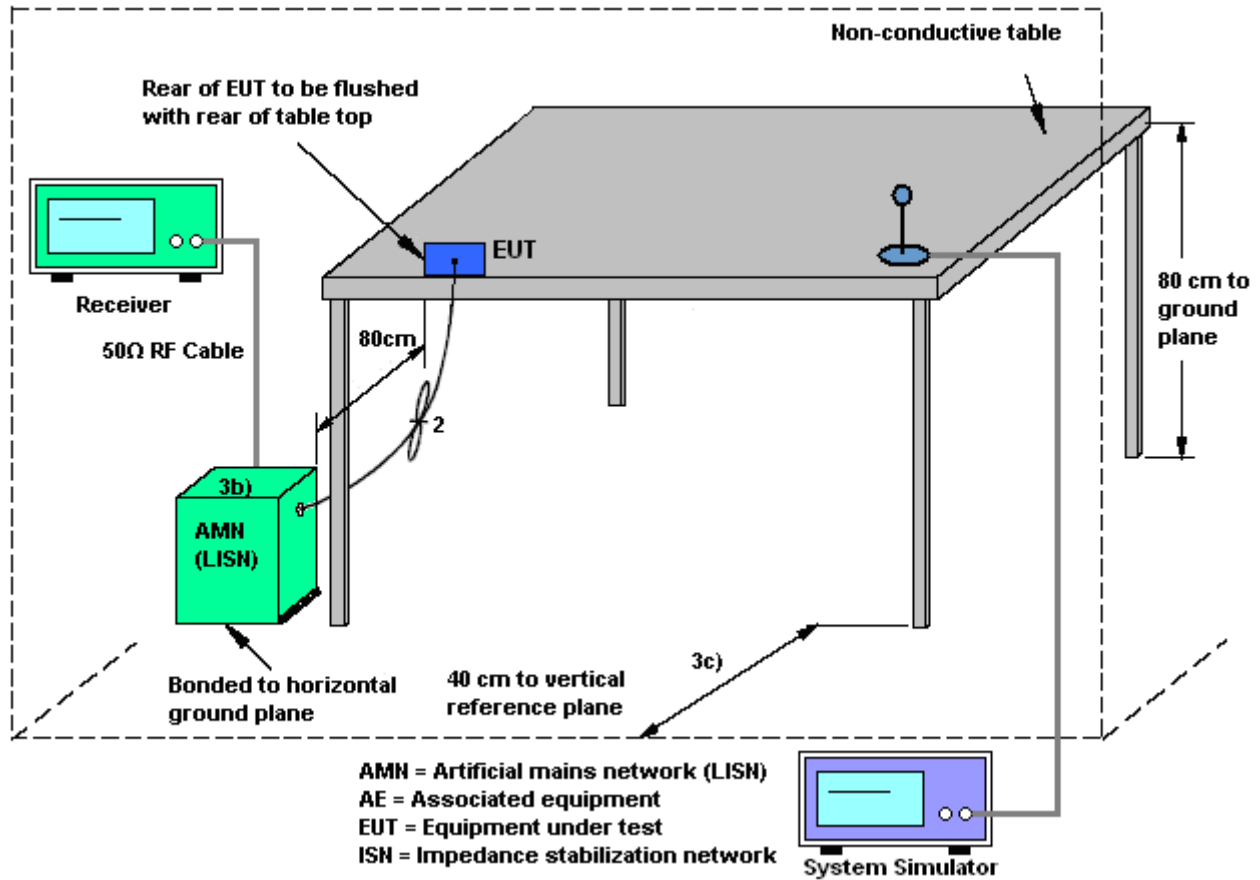
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

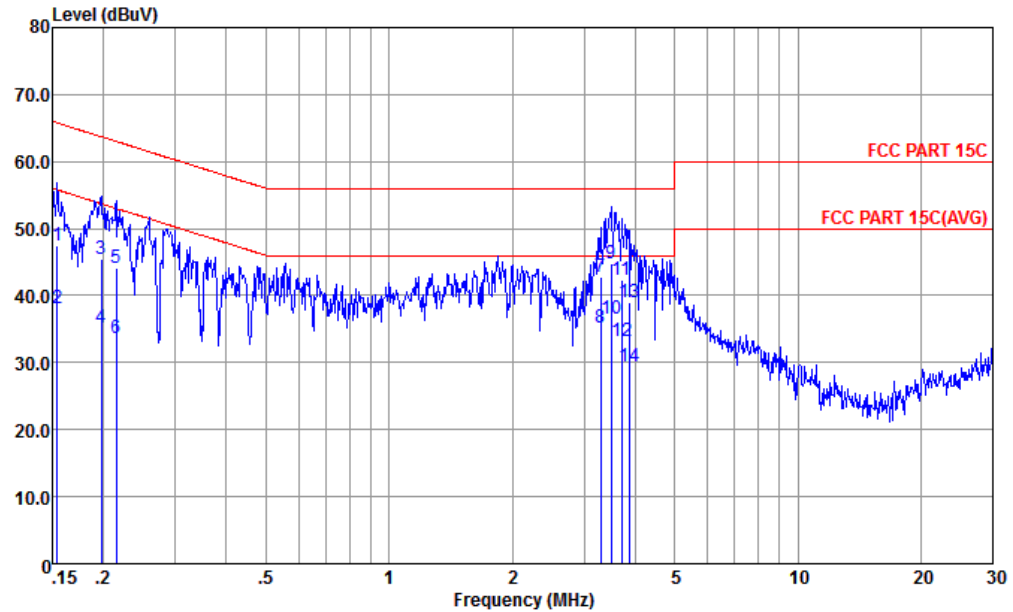
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Eko Guan	Relative Humidity :	30~33%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter 1) + Earphone for Sample 1		

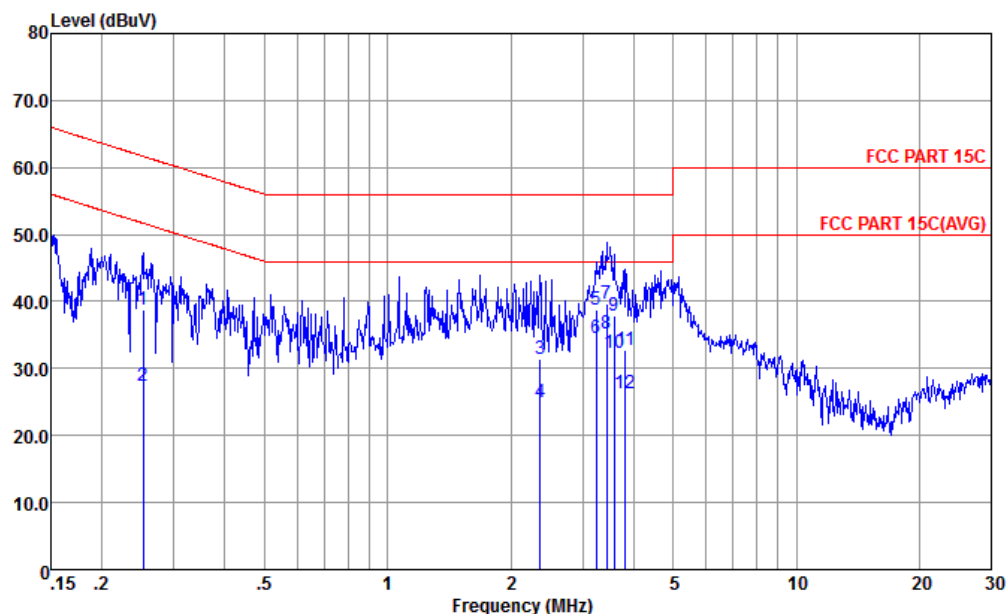


Site : CO01-KS
Condition : FCC PART 15C LISN-L20140306 LINE

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.15	47.57	-18.21	65.78	35.30	1.89	10.38	QP
2	0.15	38.17	-17.61	55.78	25.90	1.89	10.38	Average
3	0.20	45.42	-18.29	63.71	33.90	1.02	10.50	QP
4	0.20	35.12	-18.59	53.71	23.60	1.02	10.50	Average
5	0.22	44.07	-18.94	63.01	32.59	0.97	10.51	QP
6	0.22	33.57	-19.44	53.01	22.09	0.97	10.51	Average
7	3.29	42.76	-13.24	56.00	31.80	0.16	10.80	QP
8	3.29	35.16	-10.84	46.00	24.20	0.16	10.80	Average
9	3.49	44.88	-11.12	56.00	33.90	0.17	10.81	QP
10 *	3.49	36.58	-9.42	46.00	25.60	0.17	10.81	Average
11	3.70	42.30	-13.70	56.00	31.30	0.18	10.82	QP
12	3.70	33.20	-12.80	46.00	22.20	0.18	10.82	Average
13	3.86	39.11	-16.89	56.00	28.10	0.18	10.83	QP
14	3.86	29.41	-16.59	46.00	18.40	0.18	10.83	Average



Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Eko Guan	Relative Humidity :	30~33%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter 1) + Earphone for Sample 1		



Site : CO01-KS
Condition : FCC PART 15C LISN-N20140306 NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.25	38.72	-22.97	61.69	27.30	0.89	10.53	QP
2	0.25	27.52	-24.17	51.69	16.10	0.89	10.53	Average
3	2.36	31.53	-24.47	56.00	20.70	0.11	10.72	QP
4	2.36	25.03	-20.97	46.00	14.20	0.11	10.72	Average
5	3.24	38.76	-17.24	56.00	27.80	0.16	10.80	QP
6	3.24	34.56	-11.44	46.00	23.60	0.16	10.80	Average
7	3.44	39.58	-16.42	56.00	28.60	0.17	10.81	QP
8 *	3.44	35.18	-10.82	46.00	24.20	0.17	10.81	Average
9	3.58	37.79	-18.21	56.00	26.80	0.17	10.82	QP
10	3.58	32.29	-13.71	46.00	21.30	0.17	10.82	Average
11	3.82	32.81	-23.19	56.00	21.80	0.18	10.83	QP
12	3.82	26.21	-19.79	46.00	15.20	0.18	10.83	Average

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Oct. 28, 2014	Feb. 16, 2015~ Feb. 20, 2015	Oct. 27, 2015	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	30MHz~40GHz	Jan. 23, 2015	Feb. 16, 2015~ Feb. 20, 2015	Jan. 22, 2016	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 23, 2015	Feb. 16, 2015~ Feb. 20, 2015	Jan. 22, 2016	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Oct. 25, 2014	Mar. 09, 2015	Oct. 24, 2015	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	101399	9kHz~30GHz	May 04, 2014	Mar. 09, 2015	May 03, 2015	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 13, 2014	Mar. 09, 2015	Nov. 12, 2015	Radiation (03CH01-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	25Mhz-2Ghz	Jan. 17, 2015	Mar. 09, 2015	Jan. 16, 2016	Radiation (03CH01-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 17, 2015	Mar. 09, 2015	Jan. 16, 2016	Radiation (03CH01-KS)
Active Horn Antenna	com-power	AHA-118	701030	1GHz~18GHz	Nov. 08, 2014	Mar. 09, 2015	Nov. 07, 2015	Radiation (03CH01-KS)
SHF-EHF Horn	com-power	AH-840	101070	18Ghz-40Ghz	Sep. 04, 2014	Mar. 09, 2015	Sep. 03, 2015	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161069	1MHz~1GHz /32dB	May 04, 2014	Mar. 09, 2015	May 03, 2015	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A023 71	1GHz~26.5GHz	Oct. 28, 2014	Mar. 09, 2015	Oct. 27, 2015	Radiation (03CH01-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Mar. 09, 2015	NCR	Radiation (03CH01-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Mar. 09, 2015	NCR	Radiation (03CH01-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Mar. 09, 2015	NCR	Radiation (03CH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 04, 2014	Feb. 13, 2015	May 03, 2015	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 25, 2014	Feb. 13, 2015	Oct. 24, 2015	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 25, 2014	Feb. 13, 2015	Oct. 24, 2015	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 25, 2014	Feb. 13, 2015	Oct. 24, 2015	Conduction (CO01-KS)



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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.5 dB
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Appendix A. Radiated Spurious Emission

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preampl	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		2343.03	48.95	-25.05	74	47.92	31.25	6.12	36.34	175	85	P	H
		2377.95	34.26	-19.74	54	32.97	31.28	6.17	36.16	175	85	A	H
	*	2413.36	94.4	-	-	92.89	31.31	6.22	36.02	175	85	P	H
	*	2413.611	88.51	-	-	87	31.31	6.22	36.02	175	85	A	H
		2359.14	49.15	-24.85	74	48.02	31.26	6.12	36.25	181	163	P	V
		2348.43	33.9	-20.1	54	32.87	31.25	6.12	36.34	181	163	A	V
	*	2410.604	87.26	-	-	85.75	31.31	6.22	36.02	181	163	P	V
	*	2413.193	81.37	-	-	79.86	31.31	6.22	36.02	181	163	A	V
802.11b CH 06 2437MHz	*	2438.41	93.2	-	-	91.55	31.34	6.22	35.91	242	228	P	H
	*	2438.577	87.34	-	-	85.69	31.34	6.22	35.91	242	228	A	H
	*	2438.493	91.57	-	-	89.92	31.34	6.22	35.91	312	309	P	V
	*	2438.493	85.75	-	-	84.1	31.34	6.22	35.91	312	309	A	V
802.11b CH 11 2462MHz	*	2463.46	94.07	-	-	92.28	31.36	6.28	35.85	150	91	P	H
	*	2463.543	88.23	-	-	86.44	31.36	6.28	35.85	150	91	A	H
		2484.48	49.47	-24.53	74	47.56	31.37	6.33	35.79	150	91	P	H
		2491.72	34.79	-19.21	54	32.81	31.39	6.33	35.74	150	91	A	H
	*	2462.041	93.75	-	-	91.96	31.36	6.28	35.85	317	125	P	V
	*	2463.209	87.72	-	-	85.93	31.36	6.28	35.85	317	125	A	V
		2485.16	49.15	-24.85	74	47.24	31.37	6.33	35.79	317	125	P	V
		2484.52	34.46	-19.54	54	32.55	31.37	6.33	35.79	317	25	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C 2.4GHz 2400~2483.5MHz
WIFI 802.11b (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		4824	49.23	-24.77	74	42.26	34.89	8.73	36.65	199	43	P	H
		4824	48.79	-25.21	74	41.82	34.89	8.73	36.65	176	53	P	V
802.11b CH 06 2437MHz		4875	46.99	-27.01	74	40.15	34.92	8.76	36.84	178	65	P	H
		7311	47.39	-26.61	74	39.85	35.56	10.84	38.86	174	302	P	H
		4875	46.61	-27.39	74	39.77	34.92	8.76	36.84	196	68	P	V
		7311	45.95	-28.05	74	38.41	35.56	10.84	38.86	162	58	P	V
802.11b CH 11 2462MHz		4923	48.45	-25.55	74	41.74	34.95	8.79	37.03	185	256	P	H
		7386	46.58	-27.42	74	39.3	35.58	10.89	39.19	189	61	P	H
		4923	47.5	-26.5	74	40.79	34.95	8.79	37.03	254	326	P	V
		7386	46.32	-27.68	74	39.04	35.58	10.89	39.19	206	57	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C 2.4GHz 2400~2483.5MHz
WIFI 802.11g (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2389.65	53.07	-20.93	74	51.68	31.3	6.17	36.08	150	115	P	H
		2389.83	36.46	-17.54	54	35.07	31.3	6.17	36.08	150	115	A	H
	*	2412.608	96.14	-	-	94.63	31.31	6.22	36.02	150	115	P	H
	*	2412.608	85.22	-	-	83.71	31.31	6.22	36.02	150	115	A	H
		2389.92	53.76	-20.24	74	52.37	31.3	6.17	36.08	150	93	P	V
		2390	37	-17	54	35.61	31.3	6.17	36.08	150	93	A	V
	*	2413.277	96.54	-	-	95.03	31.31	6.22	36.02	150	93	P	V
	*	2412.608	85.53	-	-	84.02	31.31	6.22	36.02	150	93	A	V
802.11g CH 06 2437MHz	*	2438.66	96.88	-	-	95.17	31.34	6.28	35.91	113	131	P	H
	*	2437.992	85.7	-	-	84.05	31.34	6.22	35.91	113	131	A	H
	*	2438.41	95.39	-	-	93.74	31.34	6.22	35.91	105	100	P	V
	*	2437.575	84.22	-	-	82.57	31.34	6.22	35.91	105	100	A	V
802.11g CH 11 2462MHz	*	2461.79	96.43	-	-	94.64	31.36	6.28	35.85	152	122	P	H
	*	2462.375	85.25	-	-	83.46	31.36	6.28	35.85	152	122	A	H
		2483.52	63.57	-10.43	74	61.66	31.37	6.33	35.79	152	122	P	H
		2483.52	40.86	-13.14	54	38.95	31.37	6.33	35.79	152	122	A	H
	*	2462.041	94.32	-	-	92.53	31.36	6.28	35.85	166	105	P	V
	*	2460.371	82.86	-	-	81.07	31.36	6.28	35.85	166	105	A	V
		2483.6	63.5	-10.5	74	61.59	31.37	6.33	35.79	166	105	P	V
		2483.52	40.86	-13.14	54	38.95	31.37	6.33	35.79	166	105	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		4824	47.9	-26.1	74	40.93	34.89	8.73	36.65	212	180	P	H
		4824	47.55	-26.45	74	40.58	34.89	8.73	36.65	196	120	P	V
802.11g CH 06 2437MHz		4875	45.47	-28.53	74	38.63	34.92	8.76	36.84	230	12	P	H
		7311	45.35	-28.65	74	37.81	35.56	10.84	38.86	163	24	P	H
		4875	49.1	-24.9	74	42.26	34.92	8.76	36.84	233	89	P	V
		7311	46.47	-27.53	74	38.93	35.56	10.84	38.86	165	98	P	V
802.11g CH 11 2462MHz		4923	47.79	-26.21	74	41.08	34.95	8.79	37.03	166	180	P	H
		7386	47.14	-26.86	74	39.86	35.58	10.89	39.19	159	334	P	H
		4923	48.26	-25.74	74	41.55	34.95	8.79	37.03	184	256	P	V
		7386	47.05	-26.95	74	39.77	35.58	10.89	39.19	218	23	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C 2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 01 2412MHz		2390	54.11	-19.89	74	52.72	31.3	6.17	36.08	152	116	P	H
		2390	36.3	-17.7	54	34.91	31.3	6.17	36.08	152	116	A	H
	*	2414.529	94.69	-	-	93.18	31.31	6.22	36.02	152	116	P	H
	*	2412.692	83.39	-	-	81.88	31.31	6.22	36.02	152	116	A	H
		2389.56	54.71	-19.29	74	53.32	31.3	6.17	36.08	152	103	P	V
		2390	36.85	-17.15	54	35.46	31.3	6.17	36.08	152	103	A	V
	*	2414.613	95.54	-	-	94.03	31.31	6.22	36.02	152	103	P	V
	*	2413.11	84.07	-	-	82.56	31.31	6.22	36.02	152	103	A	V
802.11n HT20 CH 06 2437MHz	*	2440.247	92.13	-	-	90.42	31.34	6.28	35.91	221	127	P	H
	*	2437.491	81.22	-	-	79.57	31.34	6.22	35.91	221	127	A	H
	*	2437.575	92.71	-	-	91.06	31.34	6.22	35.91	186	104	P	V
	*	2437.491	80.85	-	-	79.2	31.34	6.22	35.91	186	104	A	V
802.11n HT20 CH 11 2462MHz	*	2464.545	95.57	-	-	93.78	31.36	6.28	35.85	152	129	P	H
	*	2462.792	84.17	-	-	82.38	31.36	6.28	35.85	152	129	A	H
		2485.08	61.4	-12.6	74	59.49	31.37	6.33	35.79	152	129	P	H
		2483.52	37.83	-16.17	54	35.92	31.37	6.33	35.79	152	129	A	H
	*	2465.715	95.61	-	-	93.82	31.36	6.28	35.85	201	91	P	V
	*	2463.042	84.11	-	-	82.32	31.36	6.28	35.85	201	91	A	V
		2484.16	62.47	-11.53	74	60.56	31.37	6.33	35.79	201	91	P	V
		2483.6	38.04	-15.96	54	36.13	31.37	6.33	35.79	201	91	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11g LF		56.19	24.14	-15.86	40	48.81	7.14	0.79	32.6	-	-	P	H
		97.9	28.82	-14.68	43.5	49.32	11.08	1.04	32.62	195	355	P	H
		115.36	27.99	-15.51	43.5	47.98	11.42	1.23	32.64	-	-	P	H
		170.65	25.84	-17.66	43.5	45.99	10.92	1.44	32.51	-	-	P	H
		186.17	24.45	-19.05	43.5	45.15	10.32	1.44	32.46	-	-	P	H
		354.95	23.75	-22.25	46	38.8	15.15	2.15	32.35	-	-	P	H
	!	30	35.32	-4.68	40	47.99	19.2	0.79	32.66	164	21	P	V
		39.7	30.99	-9.01	40	48.5	14.3	0.79	32.6	-	-	P	V
		56.19	31.42	-8.58	40	56.09	7.14	0.79	32.6	-	-	P	V
		115.36	20.83	-22.67	43.5	40.82	11.42	1.23	32.64	-	-	P	V
		167.74	17.24	-26.26	43.5	37.29	11.03	1.44	32.52	-	-	P	V
		189.08	16.6	-26.9	43.5	37.25	10.21	1.61	32.47	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency per 15.209(c).
!	Test result is 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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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