FCC/IC RF Test Report

APPLICANT	**:**	**Thistle L.L.C.**
EQUIPMENT	**:**	**Electronic Display Device**
MODEL NAME	**:**	**WP63GW**
FCC ID	**:**	**2ABO9-0725**
IC	**:**	**11675A-0610**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247** **IC RSS-210 issue 8**
CLASSIFICATION	**:**	**(DTS) Digital Transmission System**

The testing completed on Apr. 29, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and the testing has shown the tested sample to be 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR421013-01	Rev. 01	Initial issue of report	May 12, 2014

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	≥ 0.5MHz	Pass	-
3.1	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-210 A8.4	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges	≤ 20dBc	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 0.51 dB at 2486.290 MHz
3.6	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 4.50 dB at 0.510 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Thistle L.L.C.
Corey Pankowski
8383 Greenway Boulevard
Middleton, Wisconsin 53562

1.2 Feature of Equipment Under Test

Product Feature	
Equipment	Electronic Display Device
Model Name	WP63GW
FCC ID	2ABO9-0725
IC	11675A-0610
EUT supports Radios application	WLAN 11b/g/n (HT20)

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

1.3 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 19.45 dBm (0.0881 W) 802.11g : 22.28 dBm (0.1690 W) 802.11n HT20 : 22.39 dBm (0.1734 W)
99% Occupied Bandwidth	802.11b : 14.45MHz 802.11g : 18.55MHz 802.11n HT20 : 19.35MHz
Antenna Type	Fixed Internal Antenna type with gain 1.66 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.4 Modification of EUT

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

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.			
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978			
Test Site No.	**Sporton Site No.**			**IC Registration No.**
	TH02-HY	CO05-HY	03CH08-HY	4086B-2

1.6 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 v03r01
- ANSI C63.4-2003
- 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 (Z plane) were recorded in this report.

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

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

2.1 Carrier Frequency Channel

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

2.2 Pre-Scanned RF Power

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

2.4GHz 802.11b mode				
Data Rate (MHz)	**1M bps**	**2M bps**	**5.5M bps**	**11M bps**
Peak Power (dBm)	**19.45**	19.33	19.41	19.40

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)	**22.28**	22.09	22.02	22.14	22.26	22.13	22.15	22.22

2.4GHz 802.11n HT20 mode								
Data Rate (MHz)	**MCS0**	**MCS1**	**MCS2**	**MCS3**	**MCS4**	**MCS5**	**MCS6**	**MCS7**
Peak Power (dBm)	**22.39**	22.18	21.93	22.07	22.31	22.20	22.34	22.32

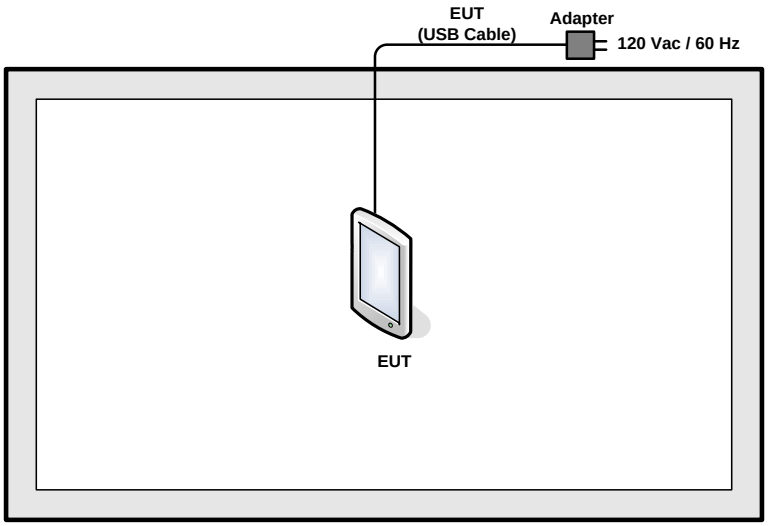
2.3 Test Mode

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

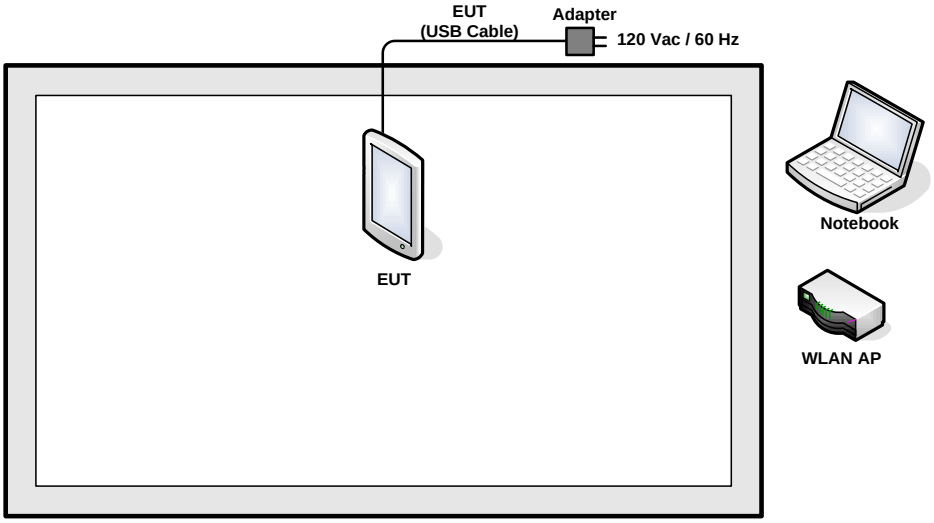
Test Cases				
	Test Items	**Mode**	**Data Rate**	**Test Channel**
Conducted TCs	**6dB and 99% BW Power Spectral Density**	**802.11b**	**1 Mbps**	**1/6/11**
		802.11g	**6 Mbps**	**1/6/11**
		802.11n HT20	**MCS0**	**1/6/11**
	Output Power	**802.11b**	**1 Mbps**	**1/6/11**
		802.11g	**6 Mbps**	**1/6/10/11**
		802.11n HT20	**MCS0**	**1/2/6/10/11**
	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**	**1/6/10/11**
		802.11n HT20	**MCS0**	**1/2/6/10/11**
	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 : WLAN Link + USB Cable (Charging from Adapter)			

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.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Adapter	Foxlink	PE98ED	Verification	N/A	N/A

2.6 EUT Operation Test Setup

The programmed RF utility “WiFi FCC Compliance” is installed in EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

2.7 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

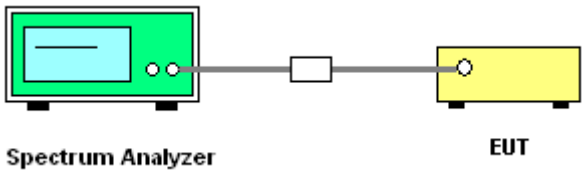
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

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

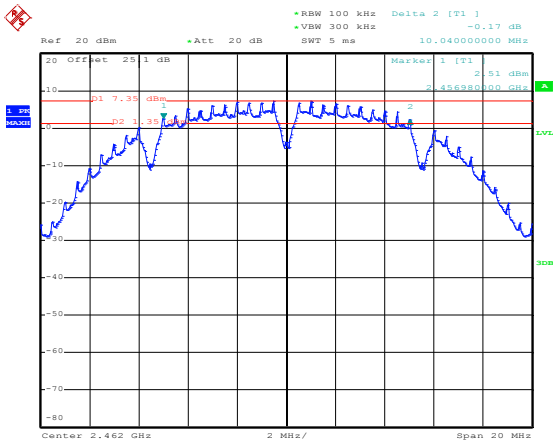
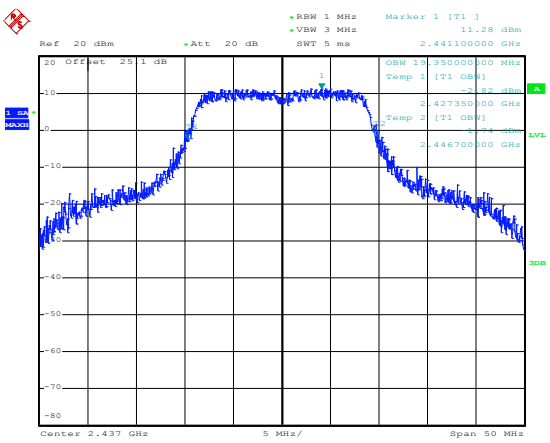
3.1.4 Test Setup



3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Test Band :	2.4GHz	Temperature :	21~26℃
Test Engineer :	Stuart Lin and Kenny Chen	Relative Humidity :	45~54%

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	14.40	10.08	0.5	Pass
11b	1Mbps	1	6	2437	14.45	10.10	0.5	Pass
11b	1Mbps	1	11	2462	14.45	10.04	0.5	Pass
11g	6Mbps	1	1	2412	18.25	16.32	0.5	Pass
11g	6Mbps	1	6	2437	18.55	16.32	0.5	Pass
11g	6Mbps	1	11	2462	18.25	16.30	0.5	Pass
HT20	MCS0	1	1	2412	19.05	17.52	0.5	Pass
HT20	MCS0	1	6	2437	19.35	17.52	0.5	Pass
HT20	MCS0	1	11	2462	19.10	17.54	0.5	Pass

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	
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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.

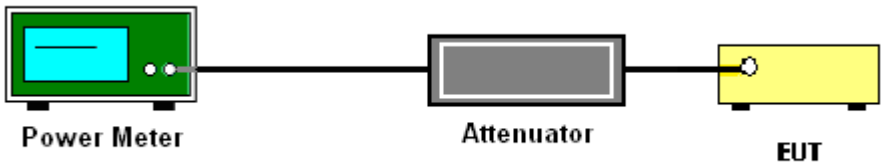
3.2.2 Measuring Instruments

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 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 :	21~26℃
Test Engineer :	Stuart Lin and Kenny Chen	Relative Humidity :	45~54%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	19.45	30	1.66	Pass
11b	1Mbps	1	6	2437	19.29	30	1.66	Pass
11b	1Mbps	1	11	2462	19.07	30	1.66	Pass
11g	6Mbps	1	1	2412	20.96	30	1.66	Pass
11g	6Mbps	1	6	2437	22.28	30	1.66	Pass
11g	6Mbps	1	10	2457	21.44	30	1.66	Pass
11g	6Mbps	1	11	2462	18.23	30	1.66	Pass
HT20	MCS0	1	1	2412	20.15	30	1.66	Pass
HT20	MCS0	1	2	2417	22.14	30	1.66	Pass
HT20	MCS0	1	6	2437	22.39	30	1.66	Pass
HT20	MCS0	1	10	2457	21.01	30	1.66	Pass
HT20	MCS0	1	11	2462	17.91	30	1.66	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 :	21~26℃
Test Engineer :	Stuart Lin and Kenny Chen	Relative Humidity :	45~54%

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	0.00	17.03	30	1.66	Pass
11b	1Mbps	1	6	2437	0.00	16.99	30	1.66	Pass
11b	1Mbps	1	11	2462	0.00	16.97	30	1.66	Pass
11g	6Mbps	1	1	2412	0.06	12.81	30	1.66	Pass
11g	6Mbps	1	6	2437	0.06	15.11	30	1.66	Pass
11g	6Mbps	1	10	2457	0.06	14.28	30	1.66	Pass
11g	6Mbps	1	11	2462	0.06	9.14	30	1.66	Pass
HT20	MCS0	1	1	2412	0.07	11.38	30	1.66	Pass
HT20	MCS0	1	2	2417	0.07	14.59	30	1.66	Pass
HT20	MCS0	1	6	2437	0.07	15.10	30	1.66	Pass
HT20	MCS0	1	10	2457	0.07	13.89	30	1.66	Pass
HT20	MCS0	1	11	2462	0.07	8.53	30	1.66	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 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

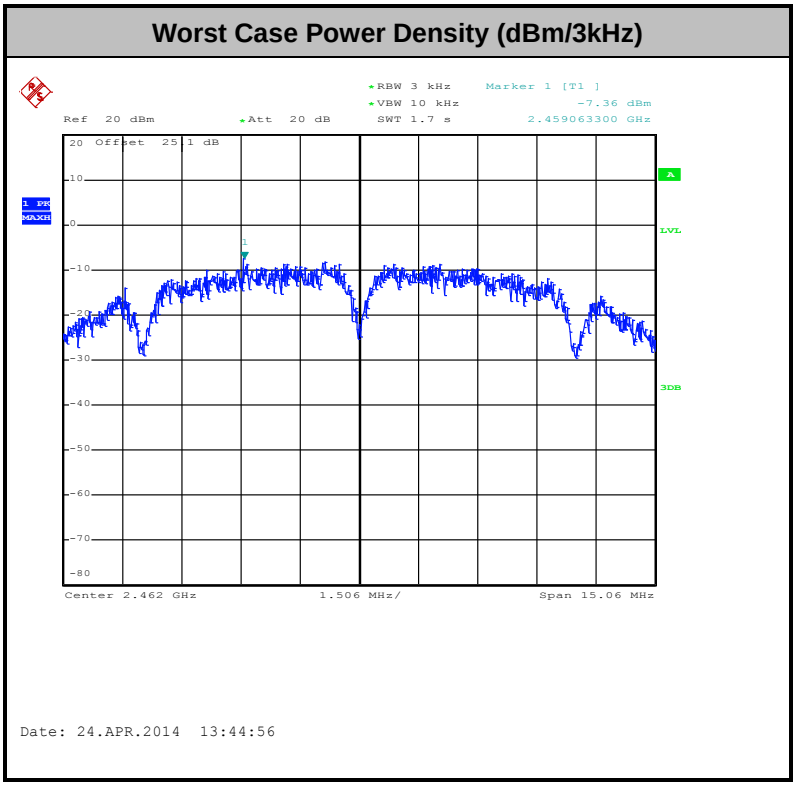
3.3.5 Test Result of Power Spectral Density

Test Mode :	2.4GHz	Temperature :	21~26℃
Test Engineer :	Stuart Lin and Kenny Chen	Relative Humidity :	45~54%

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	-7.40	8	1.66	Pass
11b	1Mbps	1	6	2437	-8.00	8	1.66	Pass
11b	1Mbps	1	11	2462	-7.36	8	1.66	Pass
11g	6Mbps	1	1	2412	-13.41	8	1.66	Pass
11g	6Mbps	1	6	2437	-10.33	8	1.66	Pass
11g	6Mbps	1	11	2462	-16.47	8	1.66	Pass
HT20	MCS0	1	1	2412	-14.63	8	1.66	Pass
HT20	MCS0	1	6	2437	-11.44	8	1.66	Pass
HT20	MCS0	1	11	2462	-17.31	8	1.66	Pass

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

Worst Case Power Density (dBm/3kHz)



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

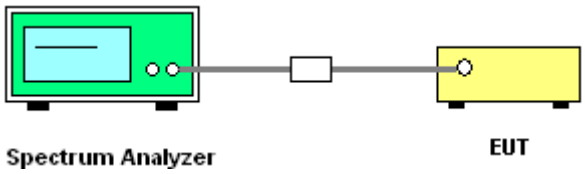
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

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

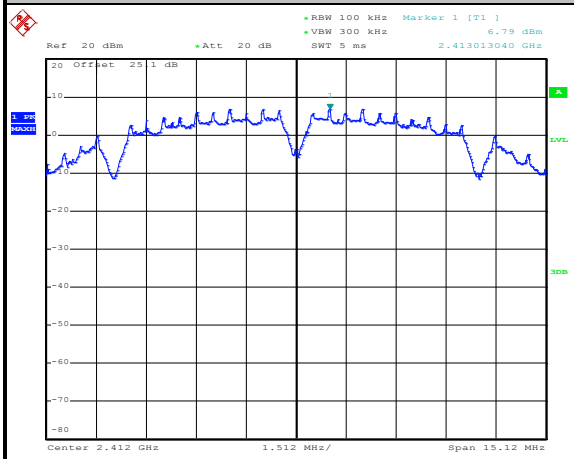


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	**Temperature :**	21~26℃
Test Band :	2.4GHz Low	**Relative Humidity :**	45~54%
Test Channel :	01	**Test Engineer :**	Stuart Lin and Kenny Chen

WLAN 802.11b Channel 01

100kHz PSD reference Level



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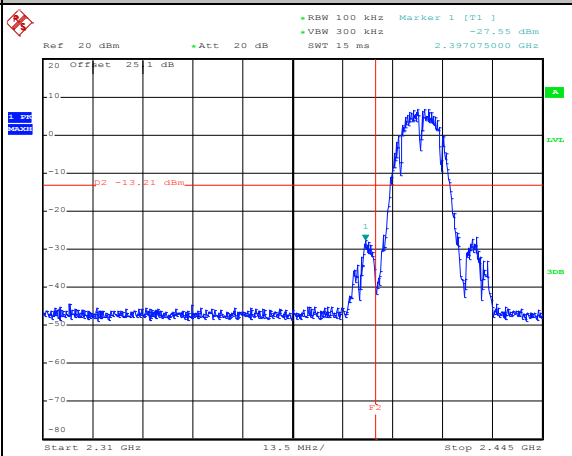
Low Channel Plot



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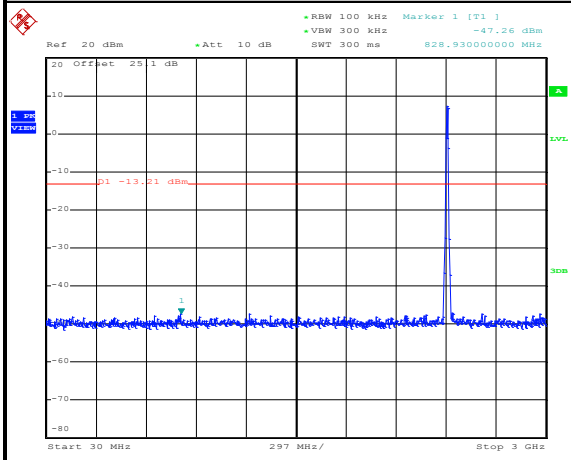
Spurious Emission 30MHz~3GHz



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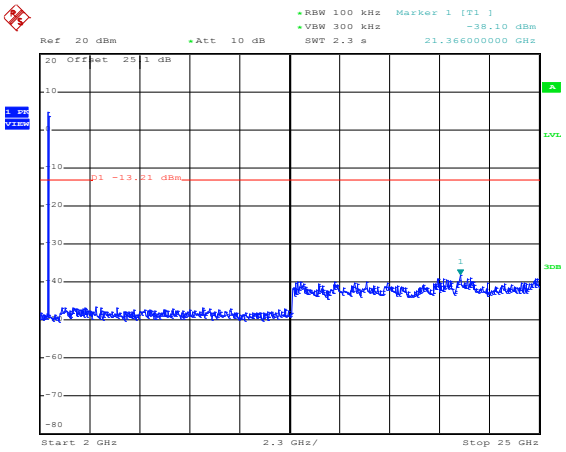
Spurious Emission 2GHz~25GHz



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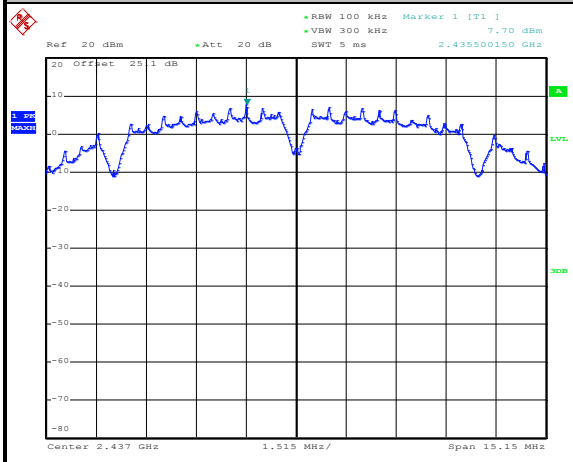
Test Mode :	802.11b	Temperature :	21~26℃
Test Band :	2.4GHz Mid.	Relative Humidity :	45~54%
Test Channel :	06	Test Engineer :	Stuart Lin and Kenny Chen

WLAN 802.11b Channel 06

100kHz PSD reference Level



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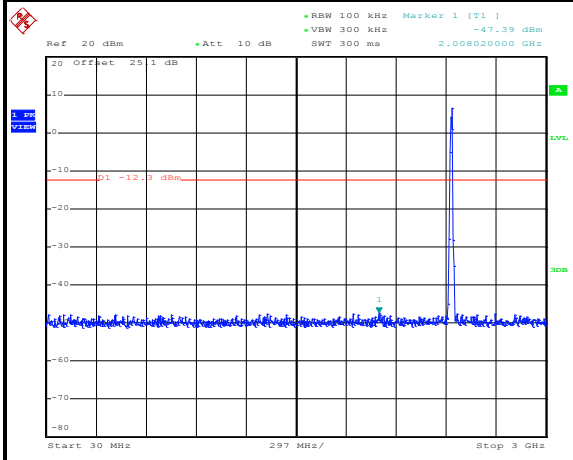
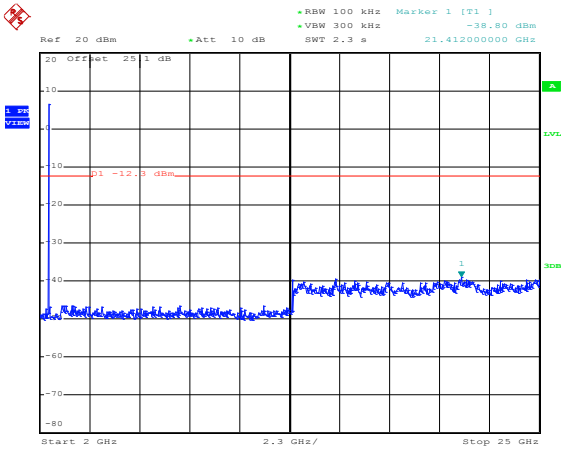
Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 13:41:24

Spurious Emission 2GHz~25GHz

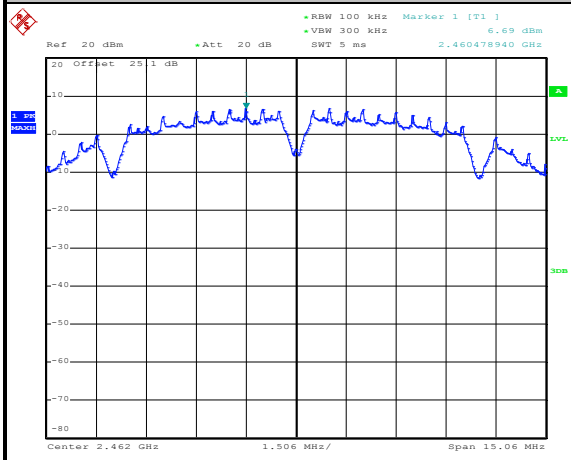


Date: 24.APR.2014 13:41:42

Test Mode :	802.11b	Temperature :	21~26℃
Test Band :	2.4GHz High	Relative Humidity :	45~54%
Test Channel :	11	Test Engineer :	Stuart Lin and Kenny Chen

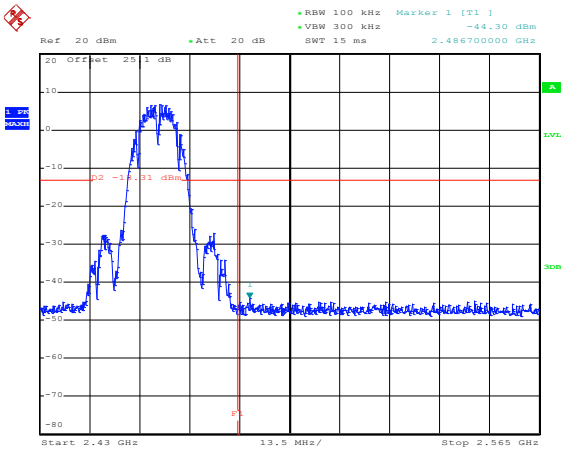
WLAN 802.11b Channel 11

100kHz PSD reference Level



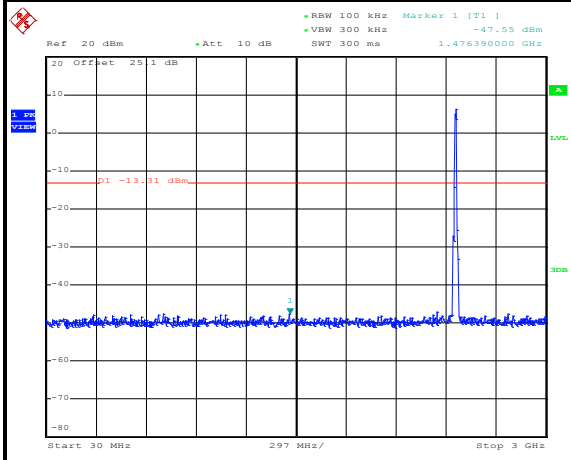
Date: 24.APR.2014 13:45:05

High Channel Plot



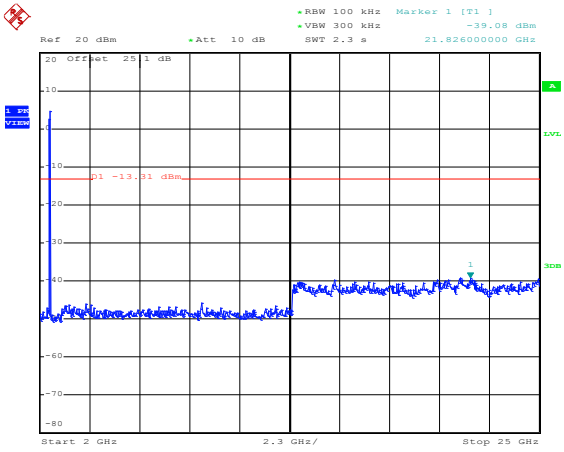
Date: 24.APR.2014 13:45:19

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 13:45:38

Spurious Emission 2GHz~25GHz

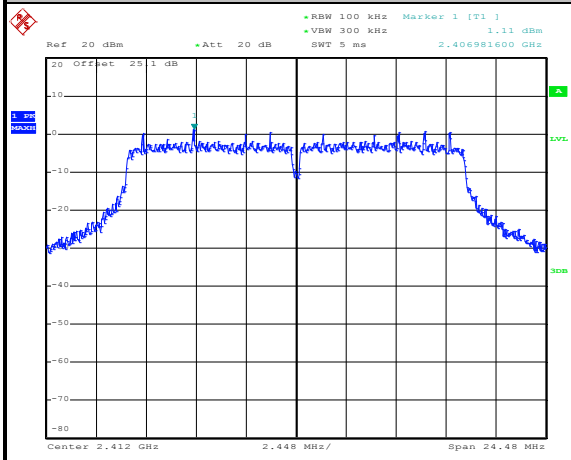


Date: 24.APR.2014 13:45:57

Test Mode :	802.11g	Temperature :	21~26℃
Test Band :	2.4GHz Low	Relative Humidity :	45~54%
Test Channel :	01	Test Engineer :	Stuart Lin and Kenny Chen

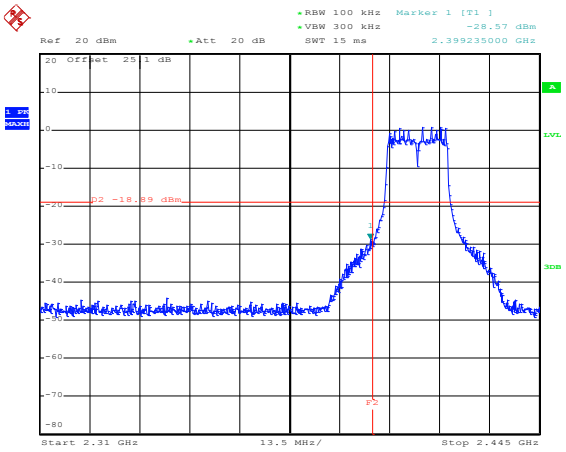
WLAN 802.11g Channel 01

100kHz PSD reference Level



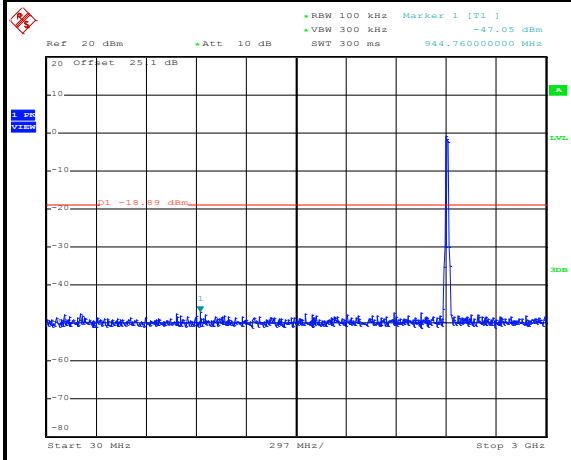
Date: 24.APR.2014 13:58:29

Low Channel Plot



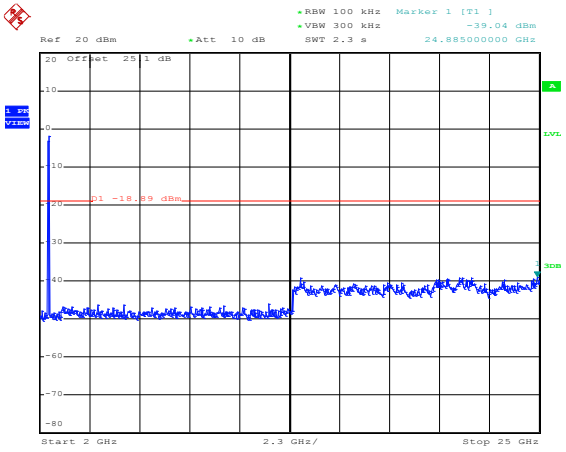
Date: 24.APR.2014 13:59:49

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 13:59:02

Spurious Emission 2GHz~25GHz

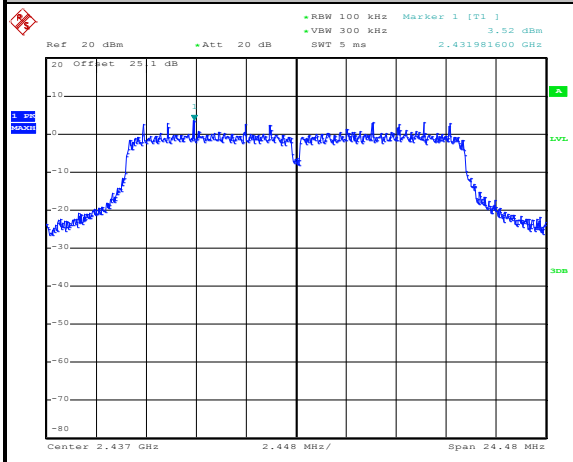


Date: 24.APR.2014 13:59:20

Test Mode :	802.11g	Temperature :	21~26℃
Test Band :	2.4GHz Mid.	Relative Humidity :	45~54%
Test Channel :	06	Test Engineer :	Stuart Lin and Kenny Chen

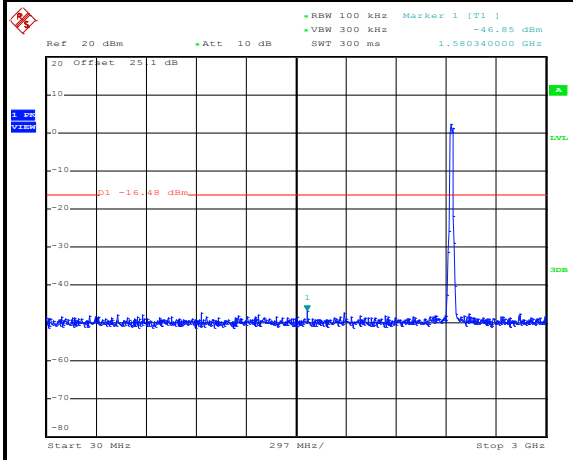
WLAN 802.11g Channel 06

100kHz PSD reference Level



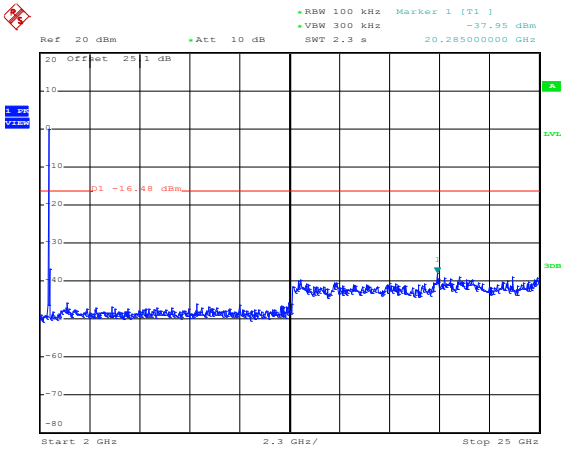
Date: 24.APR.2014 13:55:20

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 14:15:37

Spurious Emission 2GHz~25GHz

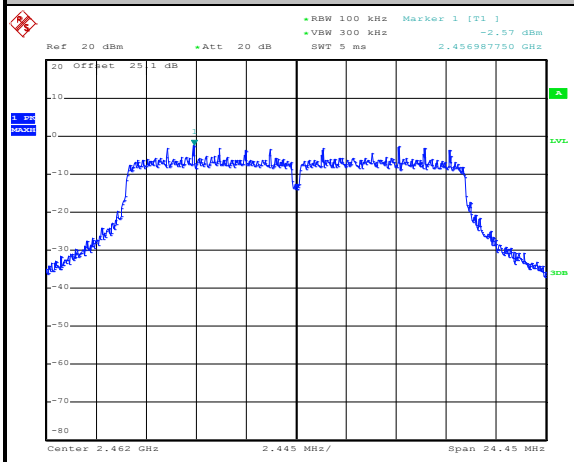


Date: 24.APR.2014 14:15:56

Test Mode :	802.11g	Temperature :	21~26℃
Test Band :	2.4GHz High	Relative Humidity :	45~54%
Test Channel :	11	Test Engineer :	Stuart Lin and Kenny Chen

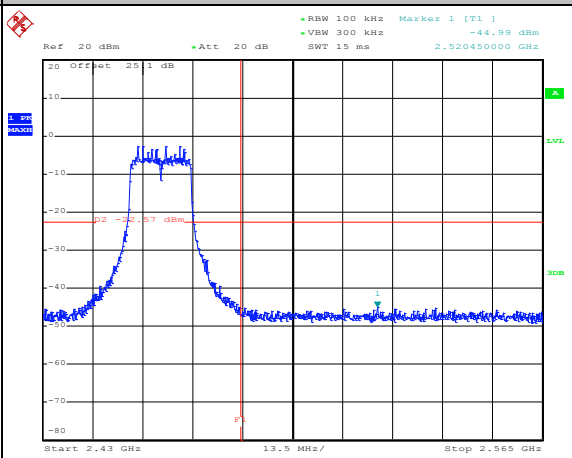
WLAN 802.11g Channel 11

100kHz PSD reference Level



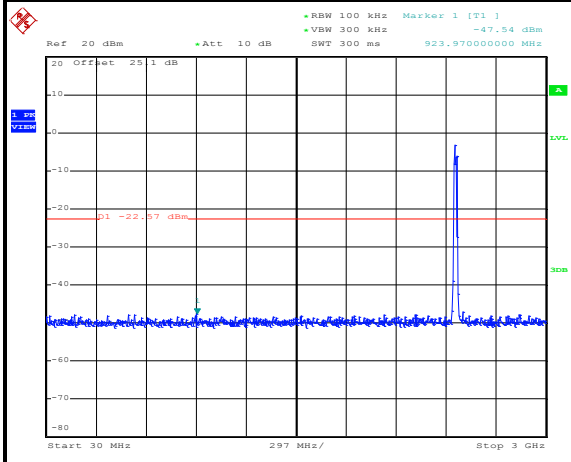
Date: 24.APR.2014 13:49:23

High Channel Plot



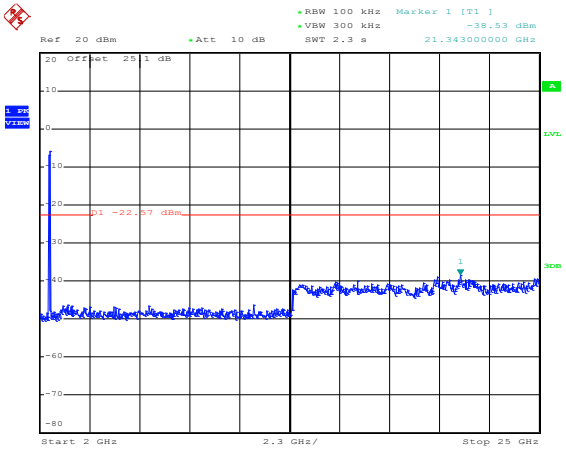
Date: 24.APR.2014 14:01:18

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 13:49:56

Spurious Emission 2GHz~25GHz

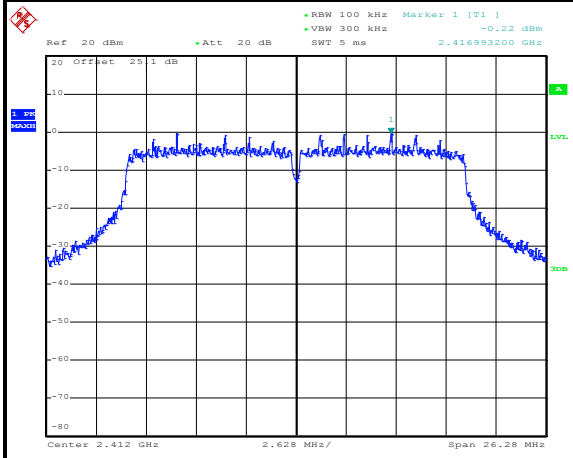


Date: 24.APR.2014 13:50:14

Test Mode :	802.11n HT20	Temperature :	21~26℃
Test Band :	2.4GHz Low	Relative Humidity :	45~54%
Test Channel :	01	Test Engineer :	Stuart Lin and Kenny Chen

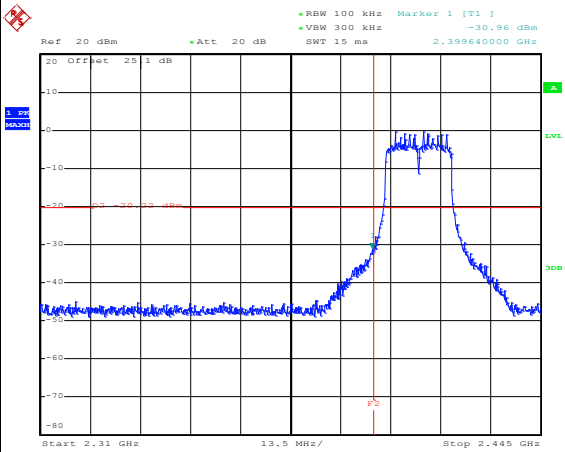
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



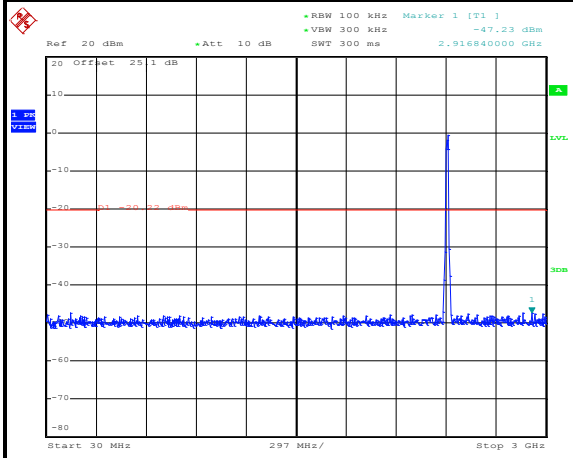
Date: 24.APR.2014 14:05:13

Low Channel Plot



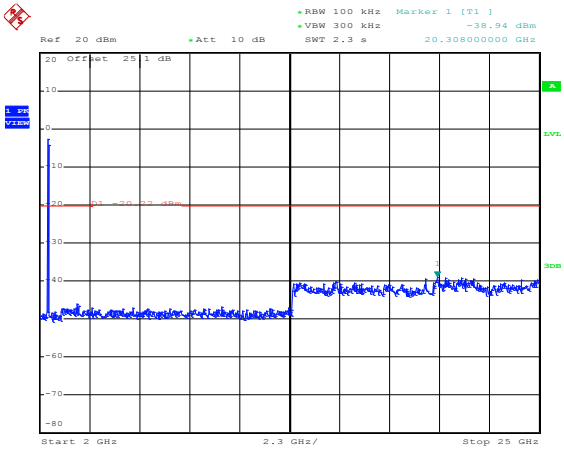
Date: 24.APR.2014 14:05:27

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 14:05:46

Spurious Emission 2GHz~25GHz

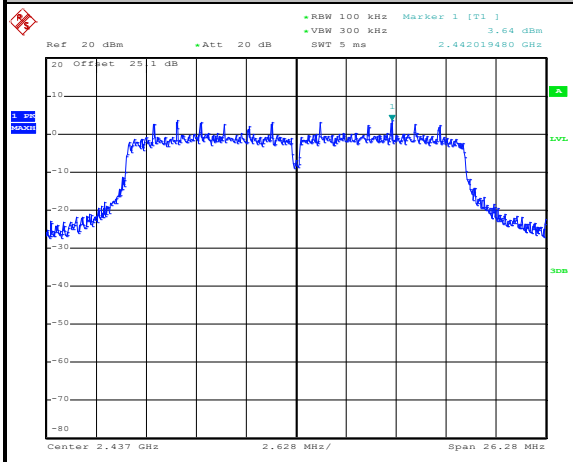


Date: 24.APR.2014 14:06:05

Test Mode :	802.11n HT20	Temperature :	21~26℃
Test Band :	2.4GHz Mid.	Relative Humidity :	45~54%
Test Channel :	06	Test Engineer :	Stuart Lin and Kenny Chen

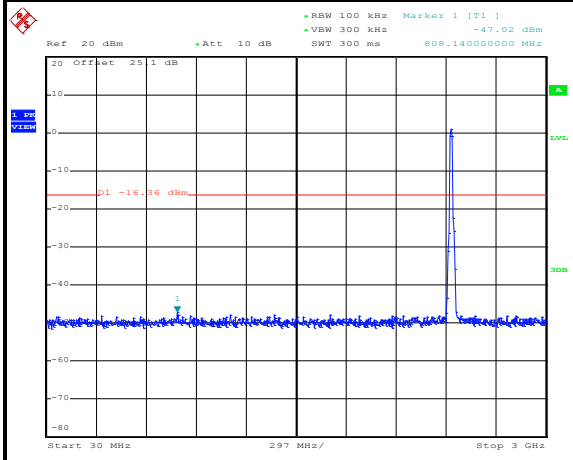
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



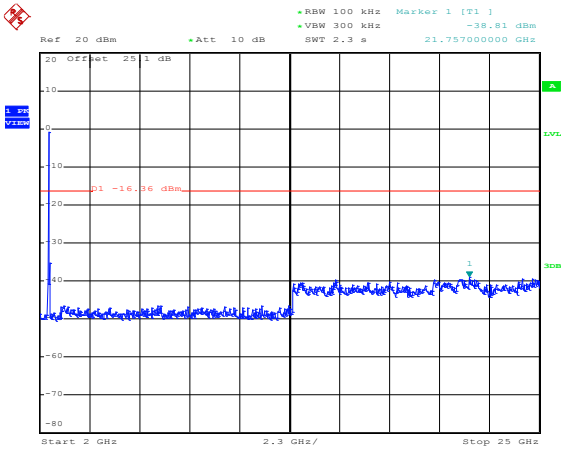
Date: 24.APR.2014 14:08:55

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 14:09:15

Spurious Emission 2GHz~25GHz

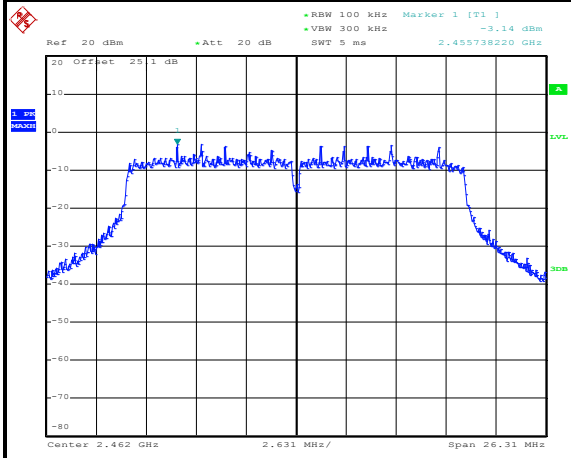


Date: 24.APR.2014 14:09:34

Test Mode :	802.11n HT20	Temperature :	21~26℃
Test Band :	2.4GHz High	Relative Humidity :	45~54%
Test Channel :	11	Test Engineer :	Stuart Lin and Kenny Chen

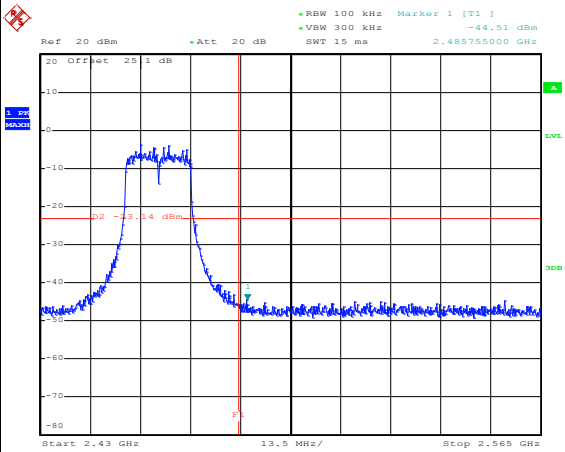
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



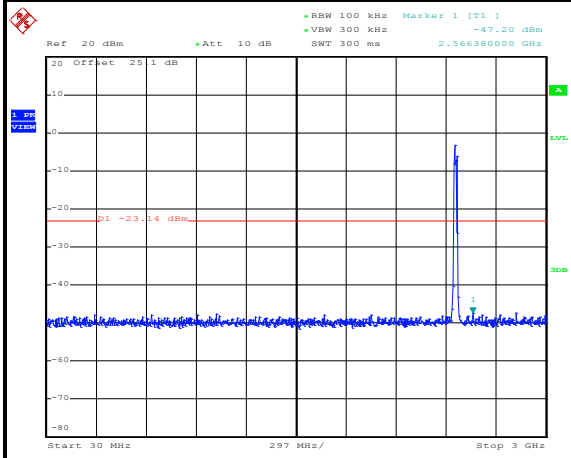
Date: 24.APR.2014 14:12:29

High Channel Plot



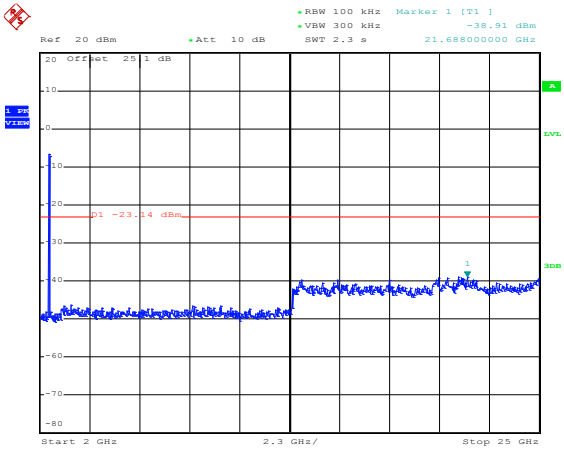
Date: 24.APR.2014 14:12:42

Spurious Emission 30MHz~3GHz



Date: 24.APR.2014 14:13:02

Spurious Emission 2GHz~25GHz



Date: 24.APR.2014 14:13:20

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.

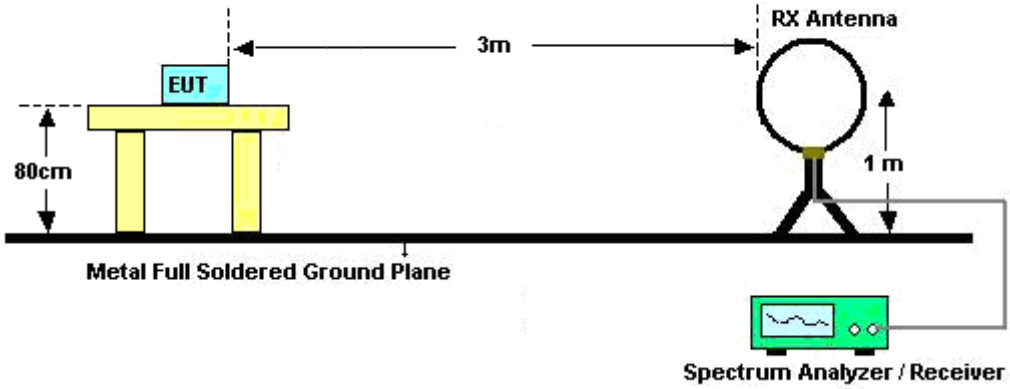
3.5.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
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 ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

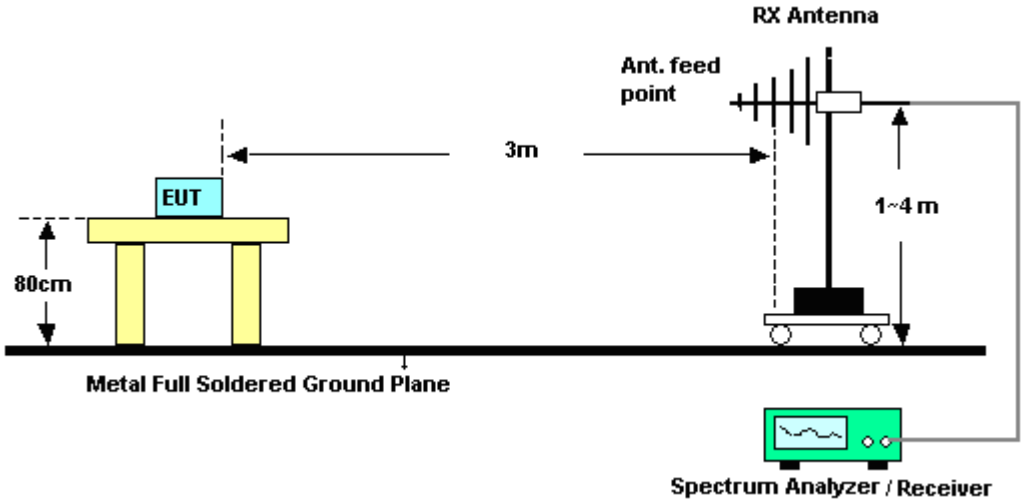
Band	Duty Cycle(%)	T(μs)	1/T(kHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	98.54	-	-	10Hz
2.4GHz 802.11n HT20	98.44	-	-	10Hz

3.5.4 Test Setup

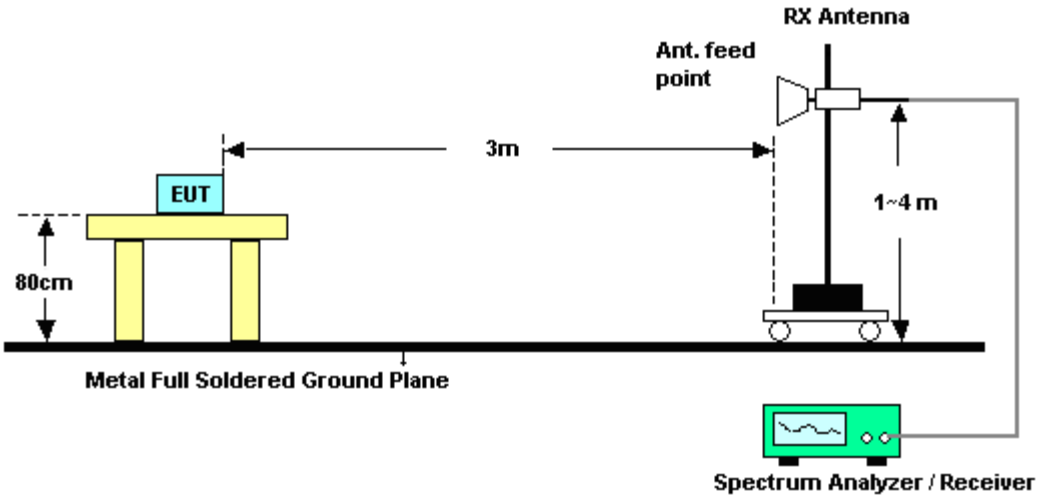
For radiated emissions below 30MHz



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

Test Mode :	802.11b	Temperature :	23~24°C
Test Band :	Low	Relative Humidity :	50~51%
Test Channel :	01	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2383.89	61.36	-12.64	74	55.7	32.26	7.55	34.15	100	358	Peak
2387.31	48.87	-5.13	54	43.18	32.29	7.55	34.15	100	358	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
2382.9	61	-13	74	55.34	32.26	7.55	34.15	109	296	Peak
2386.86	48.21	-5.79	54	42.52	32.29	7.55	34.15	109	296	Average

Test Mode :	802.11b	Temperature :	23~24°C
Test Band :	High	Relative Humidity :	50~51%
Test Channel :	11	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2483.59	63.16	-10.84	74	57.2	32.47	7.71	34.22	101	357	Peak
2483.5	52.26	-1.74	54	46.3	32.47	7.71	34.22	101	357	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
2483.65	62.85	-11.15	74	56.89	32.47	7.71	34.22	106	296	Peak
2483.5	52.13	-1.87	54	46.17	32.47	7.71	34.22	106	296	Average

Test Mode :	802.11g	Temperature :	23~24°C
Test Band :	Low	Relative Humidity :	50~51%
Test Channel :	01	Test Engineer :	Ivan Chiang and Kyle Jhuang

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	72.51	-1.49	74	66.84	32.29	7.55	34.17	100	358	Peak
2390	53.16	-0.84	54	47.49	32.29	7.55	34.17	100	358	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
2389.83	71.36	-2.64	74	65.69	32.29	7.55	34.17	131	292	Peak
2390	51.64	-2.36	54	45.97	32.29	7.55	34.17	131	292	Average

Test Mode :	802.11g	Temperature :	23~24°C
Test Band :	High	Relative Humidity :	50~51%
Test Channel :	10	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2456	99.35	-	-	93.46	32.43	7.67	34.21	100	124	Average
2456	111.43	-	-	105.54	32.43	7.67	34.21	100	124	Peak
2484.25	72.32	-1.68	74	66.36	32.47	7.71	34.22	100	124	Peak
2483.5	49.22	-4.78	54	43.26	32.47	7.71	34.22	100	124	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
2456	100.31	-	-	94.42	32.43	7.67	34.21	104	228	Average
2456	112.16	-	-	106.27	32.43	7.67	34.21	104	228	Peak
2484.19	72.49	-1.51	74	66.53	32.47	7.71	34.22	104	228	Peak
2483.5	50.9	-3.1	54	44.94	32.47	7.71	34.22	104	228	Average

Test Mode :	802.11g	Temperature :	23~24°C
Test Band :	High	Relative Humidity :	50~51%
Test Channel :	11	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2483.59	73.37	-0.63	74	67.41	32.47	7.71	34.22	100	358	Peak
2483.5	51.2	-2.8	54	45.24	32.47	7.71	34.22	100	358	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
2484.25	71.09	-2.91	74	65.13	32.47	7.71	34.22	105	295	Peak
2483.5	50.93	-3.07	54	44.97	32.47	7.71	34.22	105	295	Average

Test Mode :	802.11n HT20	Temperature :	23~24°C
Test Band :	Low	Relative Humidity :	50~51%
Test Channel :	01	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2389.38	71.44	-2.56	74	65.75	32.29	7.55	34.15	100	357	Peak
2390	53.03	-0.97	54	47.36	32.29	7.55	34.17	100	357	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	71.49	-2.51	74	65.8	32.29	7.55	34.15	108	297	Peak
2390	51.86	-2.14	54	46.19	32.29	7.55	34.17	108	297	Average

Test Mode :	802.11n HT20	Temperature :	23~24°C
Test Band :	Low	Relative Humidity :	50~51%
Test Channel :	02	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2387.13	73.37	-0.63	74	67.68	32.29	7.55	34.15	100	136	Peak
2390	50.64	-3.36	54	44.97	32.29	7.55	34.17	100	136	Average
2419	101.24	-	-	95.51	32.33	7.59	34.19	100	136	Average
2419	111.84	-	-	106.11	32.33	7.59	34.19	100	136	Peak

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
2387.85	69.85	-4.15	74	64.16	32.29	7.55	34.15	133	14	Peak
2390	49.81	-4.19	54	44.14	32.29	7.55	34.17	133	14	Average
2415	101.02	-	-	95.27	32.33	7.59	34.17	133	14	Average
2415	113.63	-	-	107.88	32.33	7.59	34.17	133	14	Peak

Test Mode :	802.11n HT20	Temperature :	23~24°C
Test Band :	High	Relative Humidity :	50~51%
Test Channel :	10	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2458	100.38	-	-	94.49	32.43	7.67	34.21	100	132	Average
2458	112.37	-	-	106.48	32.43	7.67	34.21	100	132	Peak
2486.29	73.49	-0.51	74	67.53	32.47	7.71	34.22	100	132	Peak
2483.5	50.53	-3.47	54	44.57	32.47	7.71	34.22	100	132	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
2458	98.53	-	-	92.64	32.43	7.67	34.21	102	225	Average
2458	110.52	-	-	104.63	32.43	7.67	34.21	102	225	Peak
2489.44	72.71	-1.29	74	66.72	32.5	7.71	34.22	102	225	Peak
2483.5	51.41	-2.59	54	45.45	32.47	7.71	34.22	102	225	Average

Test Mode :	802.11n HT20	Temperature :	23~24°C
Test Band :	High	Relative Humidity :	50~51%
Test Channel :	11	Test Engineer :	Ivan Chiang and Kyle Jhuang

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
2483.59	73.08	-0.92	74	67.12	32.47	7.71	34.22	100	356	Peak
2483.5	50.75	-3.25	54	44.79	32.47	7.71	34.22	100	356	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
2483.53	72.67	-1.33	74	66.71	32.47	7.71	34.22	106	296	Peak
2483.5	50.87	-3.13	54	44.91	32.47	7.71	34.22	106	296	Average

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

Note: Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

Test Mode :	802.11b	**Temperature :**	23~24°C
Test Channel :	01	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2414 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
2414	108.15	-	-	102.4	32.33	7.59	34.17	100	358	Average
2414	113.32	-	-	107.57	32.33	7.59	34.17	100	358	Peak
4824	43.81	-10.19	54	59.28	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11b	**Temperature :**	23~24°C
Test Channel :	01	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2412 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
2412	106.16	-	-	100.41	32.33	7.59	34.17	109	296	Average
2412	111.09	-	-	105.34	32.33	7.59	34.17	109	296	Peak
4824	45.62	-8.38	54	61.09	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11b	**Temperature :**	23~24°C
Test Channel :	06	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2439 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
2439	108.18	-	-	102.34	32.4	7.63	34.19	100	354	Average
2439	113.19	-	-	107.35	32.4	7.63	34.19	100	354	Peak
4875	44.44	-9.56	54	59.77	34.93	8.61	58.87	100	0	Peak
7311	45.81	-8.19	54	54.69	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11b	**Temperature :**	23~24°C
Test Channel :	06	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2439 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
2439	107.01	-	-	101.17	32.4	7.63	34.19	105	283	Average
2439	111.9	-	-	106.06	32.4	7.63	34.19	105	283	Peak
4875	46.43	-7.57	54	61.76	34.93	8.61	58.87	100	0	Peak
7311	43.96	-10.04	54	52.84	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11b	**Temperature :**	23~24°C
Test Channel :	11	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**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
87.78	30.93	-9.07	40	51.88	8.38	1.09	30.42	100	313	Peak
144.21	29.71	-13.79	43.5	47.81	10.87	1.4	30.37	-	-	Peak
269.22	31.81	-14.19	46	47.41	12.7	1.91	30.21	-	-	Peak
377.7	25.93	-20.07	46	38.81	14.91	2.24	30.03	-	-	Peak
603.1	24.96	-21.04	46	33.12	18.6	2.84	29.6	-	-	Peak
753.6	23.74	-22.26	46	30.25	19.76	3.16	29.43	-	-	Peak
2462	108.83	-	-	102.94	32.43	7.67	34.21	101	357	Average
2462	113.87	-	-	107.98	32.43	7.67	34.21	101	357	Peak
4923	47.81	-6.19	54	62.99	34.96	8.66	58.8	100	0	Peak
7386	45.67	-8.33	54	54.64	36.62	13.02	58.61	100	0	Peak

Test Mode :	802.11b	**Temperature :**	23~24°C
Test Channel :	11	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**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
38.64	34.85	-5.15	40	50.33	14.1	0.73	30.31	-	-	Peak
86.97	35.79	-4.21	40	56.9	8.22	1.09	30.42	133	100	Peak
261.39	24.24	-21.76	46	39.09	13.5	1.87	30.22	-	-	Peak
458.2	21.17	-24.83	46	31.63	16.96	2.47	29.89	-	-	Peak
622.7	24.87	-21.13	46	32.71	18.85	2.88	29.57	-	-	Peak
898.5	25.67	-20.33	46	30.77	20.54	3.49	29.13	-	-	Peak
2462	107.54	-	-	101.65	32.43	7.67	34.21	106	296	Average
2462	112.73	-	-	106.84	32.43	7.67	34.21	106	296	Peak
4926	49.9	-4.1	54	65.06	34.96	8.68	58.8	100	0	Peak
7386	45.12	-8.88	54	54.09	36.62	13.02	58.61	100	0	Peak

Test Mode :	802.11g	**Temperature :**	23~24°C
Test Channel :	01	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2410 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
2410	98.25	-	-	92.5	32.33	7.59	34.17	100	358	Average
2410	110.34	-	-	104.59	32.33	7.59	34.17	100	358	Peak
4822	42.98	-11.02	54	58.45	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11g	**Temperature :**	23~24°C
Test Channel :	01	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2414 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
2414	97.35	-	-	91.6	32.33	7.59	34.17	131	292	Average
2414	109.19	-	-	103.44	32.33	7.59	34.17	131	292	Peak
4822	42.24	-11.76	54	57.71	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11g	**Temperature :**	23~24°C
Test Channel :	06	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2439 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
2439	102.42	-	-	96.58	32.4	7.63	34.19	100	356	Average
2439	114.33	-	-	108.49	32.4	7.63	34.19	100	356	Peak
4876	43.08	-10.92	54	58.39	34.93	8.63	58.87	100	0	Peak
7311	46.6	-7.4	54	55.48	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11g	**Temperature :**	23~24°C
Test Channel :	06	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2435 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
2435	100.17	-	-	94.37	32.36	7.63	34.19	107	296	Average
2435	111.99	-	-	106.19	32.36	7.63	34.19	107	296	Peak
4875	43.76	-10.24	54	59.09	34.93	8.61	58.87	100	0	Peak
7311	43.8	-10.2	54	52.68	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11g	**Temperature :**	23~24°C
Test Channel :	11	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2460 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
89.13	32.3	-11.2	43.5	53.08	8.54	1.1	30.42	117	42	Peak
133.68	30.76	-12.74	43.5	48.05	11.74	1.35	30.38	-	-	Peak
273.54	31.71	-14.29	46	47.25	12.74	1.92	30.2	-	-	Peak
381.9	26.31	-19.69	46	39.02	15.06	2.26	30.03	-	-	Peak
793.5	24.83	-21.17	46	31.08	19.9	3.24	29.39	-	-	Peak
949.6	25.64	-20.36	46	30.25	20.8	3.57	28.98	-	-	Peak
2460	97.27	-	-	91.38	32.43	7.67	34.21	100	358	Average
2460	108.99	-	-	103.1	32.43	7.67	34.21	100	358	Peak
4923	41.93	-12.07	54	57.11	34.96	8.66	58.8	100	0	Peak
7386	45.15	-8.85	54	54.12	36.62	13.02	58.61	100	0	Peak

Test Mode :	802.11g	**Temperature :**	23~24°C
Test Channel :	11	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2460 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
38.64	35.19	-4.81	40	50.67	14.1	0.73	30.31	128	261	Peak
87.24	32.89	-7.11	40	54	8.22	1.09	30.42	-	-	Peak
119.1	28.29	-15.21	43.5	45.28	12.12	1.28	30.39	-	-	Peak
389.6	21.71	-24.29	46	34.15	15.3	2.28	30.02	-	-	Peak
593.3	23.71	-22.29	46	31.9	18.6	2.82	29.61	-	-	Peak
836.9	24.36	-21.64	46	30.17	20.14	3.34	29.29	-	-	Peak
2460	95.38	-	-	89.49	32.43	7.67	34.21	105	295	Average
2460	107.43	-	-	101.54	32.43	7.67	34.21	105	295	Peak
4923	46.75	-7.25	54	61.93	34.96	8.66	58.8	100	0	Peak
7386	43.87	-10.13	54	52.84	36.62	13.02	58.61	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	23~24°C
Test Channel :	01	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	Polarization :	Horizontal
Remark :	1. 2410 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
2410	92.32	-	-	86.57	32.33	7.59	34.17	100	357	Average
2410	109.74	-	-	103.99	32.33	7.59	34.17	100	357	Peak
4824	40.83	-13.17	54	56.3	34.9	8.57	58.94	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	23~24°C
Test Channel :	01	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	Polarization :	Vertical
Remark :	1. 2410 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
2410	90.98	-	-	85.23	32.33	7.59	34.17	108	297	Average
2410	108.33	-	-	102.58	32.33	7.59	34.17	108	297	Peak
4824	40.69	-13.31	54	56.16	34.9	8.57	58.94	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	23~24°C
Test Channel :	06	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2439 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
2439	100.92	-	-	95.08	32.4	7.63	34.19	100	354	Average
2439	112.78	-	-	106.94	32.4	7.63	34.19	100	354	Peak
4875	42.66	-11.34	54	57.99	34.93	8.61	58.87	100	0	Peak
7311	45.77	-8.23	54	54.65	36.64	12.94	58.46	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	23~24°C
Test Channel :	06	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2435 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
2435	99.16	-	-	93.36	32.36	7.63	34.19	106	284	Average
2435	111.16	-	-	105.36	32.36	7.63	34.19	106	284	Peak
4872	44.6	-9.4	54	59.93	34.93	8.61	58.87	100	0	Peak
7311	42.88	-11.12	54	51.76	36.64	12.94	58.46	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	23~24°C
Test Channel :	11	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2460 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
2460	95.12	-	-	89.23	32.43	7.67	34.21	100	356	Average
2460	106.99	-	-	101.1	32.43	7.67	34.21	100	356	Peak
4923	39.96	-14.04	54	55.14	34.96	8.66	58.8	100	0	Peak
7386	43.29	-10.71	54	52.26	36.62	13.02	58.61	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	23~24°C
Test Channel :	11	**Relative Humidity :**	50~51%
Test Engineer :	Ivan Chiang and Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2464 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
2464	94.32	-	-	88.43	32.43	7.67	34.21	106	296	Average
2464	106.45	-	-	100.56	32.43	7.67	34.21	106	296	Peak
4923	40.98	-13.02	54	56.16	34.96	8.66	58.8	100	0	Peak
7386	44.16	-9.84	54	53.13	36.62	13.02	58.61	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 (dBμV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

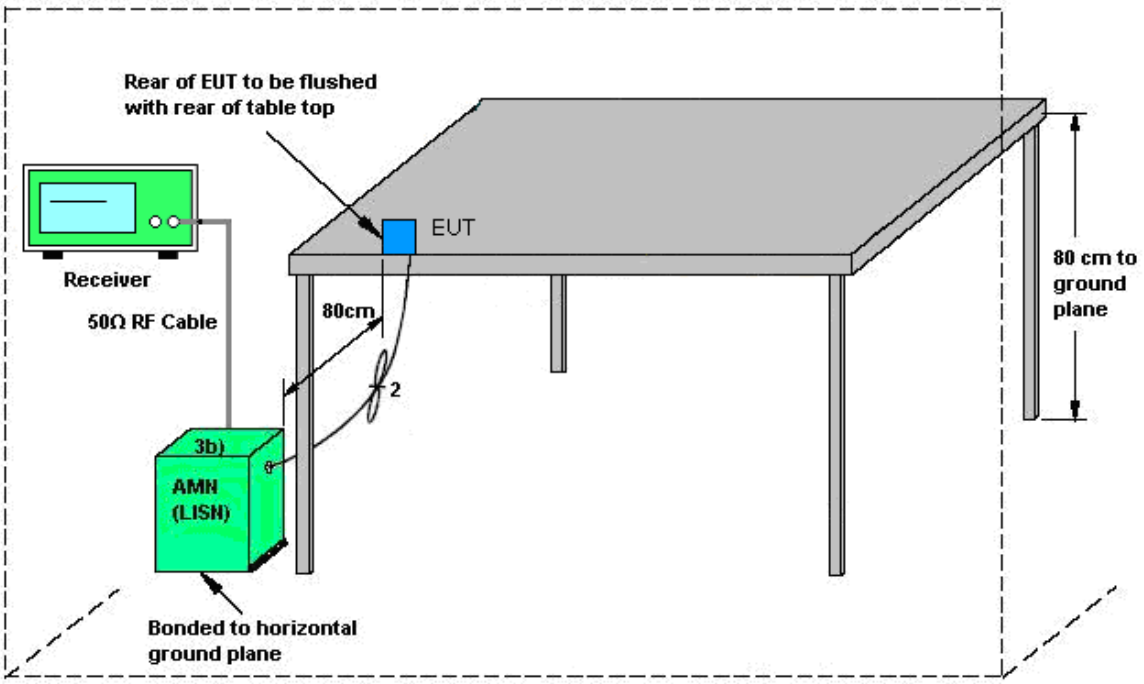
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

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

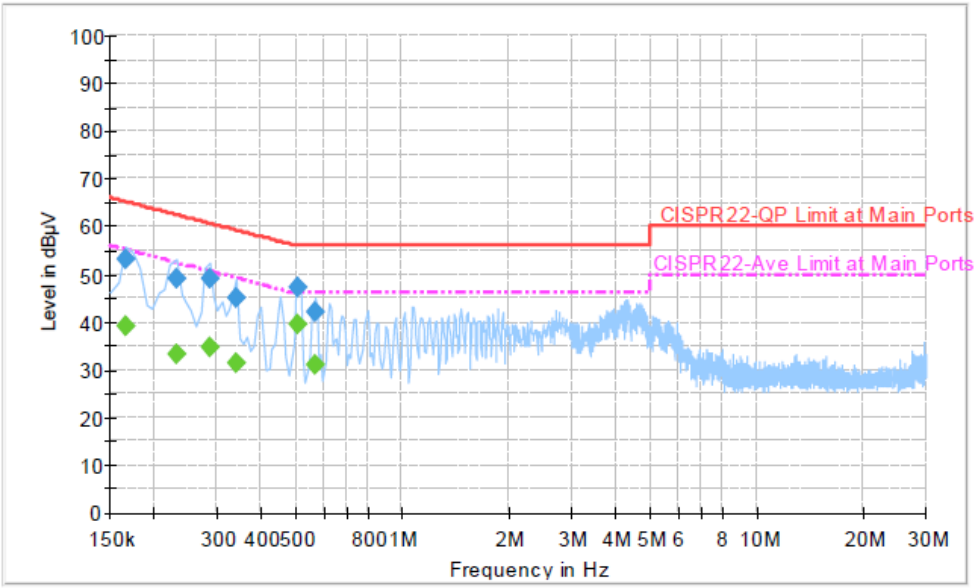
3.6.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	**Temperature :**	20~22℃
Test Engineer :	Cosmo Xu	**Relative Humidity :**	40~42%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN Link + USB Cable (Charging from Adapter)		



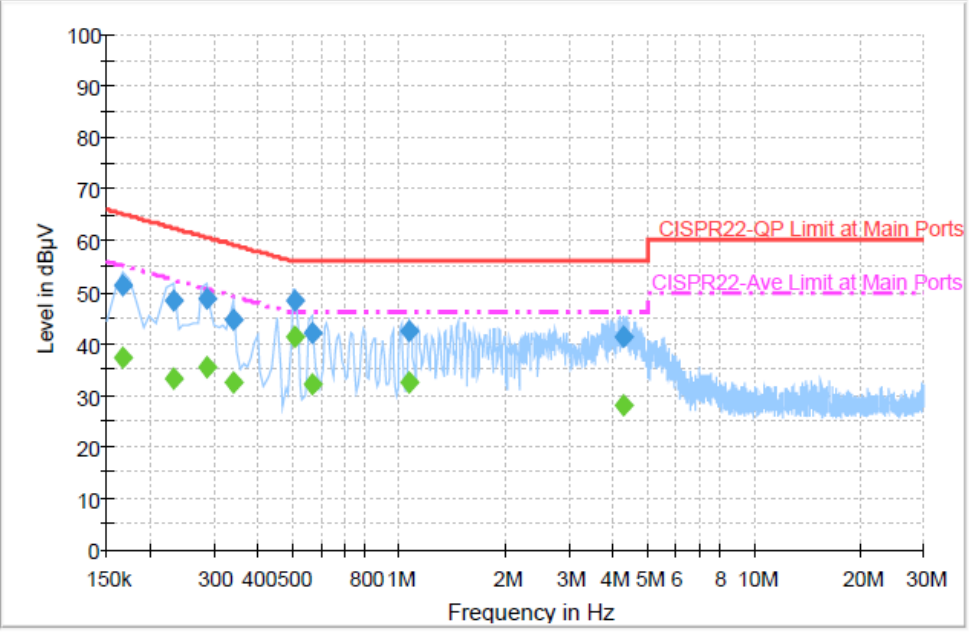
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	53.3	Off	L1	19.3	11.9	65.2
0.230000	49.1	Off	L1	19.4	13.3	62.4
0.286000	49.1	Off	L1	19.4	11.5	60.6
0.342000	45.1	Off	L1	19.4	14.1	59.2
0.510000	47.1	Off	L1	19.4	8.9	56.0
0.566000	42.0	Off	L1	19.3	14.0	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	39.0	Off	L1	19.3	16.2	55.2
0.230000	33.2	Off	L1	19.4	19.2	52.4
0.286000	34.7	Off	L1	19.4	15.9	50.6
0.342000	31.4	Off	L1	19.4	17.8	49.2
0.510000	39.6	Off	L1	19.4	6.4	46.0
0.566000	31.1	Off	L1	19.3	14.9	46.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Cosmo Xu	Relative Humidity :	40~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Link + USB Cable (Charging from Adapter)		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	51.4	Off	N	19.3	13.8	65.2
0.230000	48.3	Off	N	19.4	14.1	62.4
0.286000	48.7	Off	N	19.4	11.9	60.6
0.342000	44.7	Off	N	19.4	14.5	59.2
0.510000	48.3	Off	N	19.4	7.7	56.0
0.566000	42.1	Off	N	19.3	13.9	56.0
1.070000	42.4	Off	N	19.5	13.6	56.0
4.270000	41.4	Off	N	19.6	14.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	37.3	Off	N	19.3	17.9	55.2
0.230000	33.3	Off	N	19.4	19.1	52.4
0.286000	35.6	Off	N	19.4	15.0	50.6
0.342000	32.3	Off	N	19.4	16.9	49.2
0.510000	41.5	Off	N	19.4	4.5	46.0
0.566000	32.1	Off	N	19.3	13.9	46.0
1.070000	32.5	Off	N	19.5	13.5	46.0
4.270000	28.2	Off	N	19.6	17.8	46.0

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	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 07, 2013	Apr. 21, 2014 ~ Apr. 24, 2014	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 17, 2013	Apr. 21, 2014 ~ Apr. 24, 2014	Aug. 16, 2014	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 17, 2013	Apr. 21, 2014 ~ Apr. 24, 2014	Aug. 16, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 15, 2013	Apr. 25, 2014	Nov. 14, 2014	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2013	Apr. 25, 2014	Dec. 11, 2014	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 04, 2013	Apr. 25, 2014	Dec. 03, 2014	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 25, 2014	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz – 26.5GHz	Jan. 15, 2014	Apr. 22, 2014 ~ Apr. 29, 2014	Jan. 14, 2015	Radiation (03CH08-HY)
Bilog Antenna	Teseq GmbH	CBL6112D	35379	30MHz~2GHz	Oct. 10, 2013	Apr. 22, 2014 ~ Apr. 29, 2014	Oct. 09, 2014	Radiation (03CH08-HY)
Horn Antenna	ESCO	3117	000143261	1GHz~18GHz	Jan. 16, 2014	Apr. 22, 2014 ~ Apr. 29, 2014	Jan. 15, 2015	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz~40GHz	Oct. 03, 2013	Apr. 22, 2014 ~ Apr. 29, 2014	Oct. 02, 2014	Radiation (03CH08-HY)
Amplifier	SONOMA	310N	187231	9kHz~1GHz	May 15, 2013	Apr. 22, 2014 ~ Apr. 29, 2014	May 14, 2014	Radiation (03CH08-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	1GHz~18GHz	Jul. 09, 2013	Apr. 22, 2014 ~ Apr. 29, 2014	Jul. 08, 2014	Radiation (03CH08-HY)
Pre Amplifier	Agilent	8449B	3008A02665	1GHz~26.5GHz	Sep. 04, 2013	Apr. 22, 2014 ~ Apr. 29, 2014	Sep. 03, 2014	Radiation (03CH08-HY)
Turn Table	Chaintek	Chaintek 3000	N/A	0~360 Degree	N/A	Apr. 22, 2014 ~ Apr. 29, 2014	N/A	Radiation (03CH08-HY)
Antenna Mast	MF	MFA520BS	N/A	1m~4m	N/A	Apr. 22, 2014 ~ Apr. 29, 2014	N/A	Radiation (03CH08-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MHz	Jul. 03, 2012	Apr. 22, 2014 ~ Apr. 29, 2014	Jul. 03, 2014	Radiation (03CH08-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.30**