

FCC RF Test Report

APPLICANT : VeriFone, Inc.
EQUIPMENT : Point of Sale Terminal
BRAND NAME : VeriFone
MODEL NAME : VX690 3G-BT-WiFi
FCC ID : B32VX6903GBTWIFI
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Apr. 11, 2014 and testing was completed on Apr. 28, 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

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FCC ID : B32VX6903GBTWIFI

Page Number : 1 of 77

Report Issued Date : May 13, 2014

Report Version : Rev. 01



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR441115C	Rev. 01	Initial issue of report	May 13, 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	$\geq 0.5\text{MHz}$	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 0.92 dB at 2483.620 MHz
3.6	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 1.00 dB at 13.558 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

VeriFone, Inc.

1400 West Stanford Ranch Road Suite 200 Rocklin CA 95765 USA

1.2 Manufacturer

Inventec Appliances (Pudong) Co., Ltd.

No. 789 Pu Xing Road, Shanghai, PRC

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Point of Sale Terminal
Brand Name	VeriFone
Model Name	VX690 3G-BT-WiFi
FCC ID	B32VX6903GBTWIFI
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/RFID WLAN 11a/b/g/n (HT20) Bluetooth v4.0 EDR/LE
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz 802.11a/n: 5745~5825MHz.
Maximum (Peak) Output Power to Antenna	<2412 MHz ~ 2462 MHz> 802.11b : 17.44 dBm (0.0555 W) 802.11g : 22.29 dBm (0.1694 W) 802.11n HT20 : 22.19 dBm (0.1656 W) <5745 MHz ~ 5825 MHz> 802.11a : 18.15 dBm (0.0653 W) 802.11n HT20 : 18.16 dBm (0.0655 W)
99% Occupied Bandwidth	<2412 MHz ~ 2462 MHz> 802.11b : 12.15MHz 802.11g : 17.05MHz 802.11n HT20 : 17.95MHz <5745 MHz ~ 5825 MHz> 802.11a : 17.15MHz 802.11n HT20 : 18.10MHz
Antenna Type	802.11b/g/n : PIFA Antenna type with gain 1.18 dBi 802.11a/n : PIFA Antenna type with gain 2.70 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 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 1 st 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.		
	TH02-HY	CO05-HY	03CH07-HY

1.7 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

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane for 2.4GHz and Z plane for 5GHz) 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	-	-

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4	149	5745	159	5795
	151	5755	161	5805
	153	5765	165	5825
	157	5785	-	-

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)	17.44	17.43	17.43	17.43

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)	22.29	22.20	22.08	21.96	21.96	22.09	21.93	21.99

2.4GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	22.19	21.80	21.89	21.56	21.56	21.79	21.77	21.82

5GHz 802.11a mode								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	18.15	17.96	17.86	17.92	17.72	17.99	18.12	17.63

5GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	18.16	18.07	18.02	18.01	17.91	17.79	18.02	17.99

2.3 Test Mode

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

<2.4GHz>

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

<5GHz>

Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	6dB and 99% BW Power Spectral Density	802.11a	6 Mbps	149/157/165
		802.11n HT20	MCS0	149/157/165
	Output Power	802.11a	6 Mbps	149/157/165
		802.11n HT20	MCS0	149/157/165
	Conducted Band Edge	802.11a	6 Mbps	149/165
		802.11n HT20	MCS0	149/165
	Conducted Spurious Emission	802.11a	6 Mbps	149/157/165
		802.11n HT20	MCS0	149/157/165
	Radiated TCs	Radiated Band Edge	802.11a	6 Mbps
			802.11n HT20	MCS0
		Radiated Spurious Emission	802.11a	6 Mbps
			802.11n HT20	MCS0

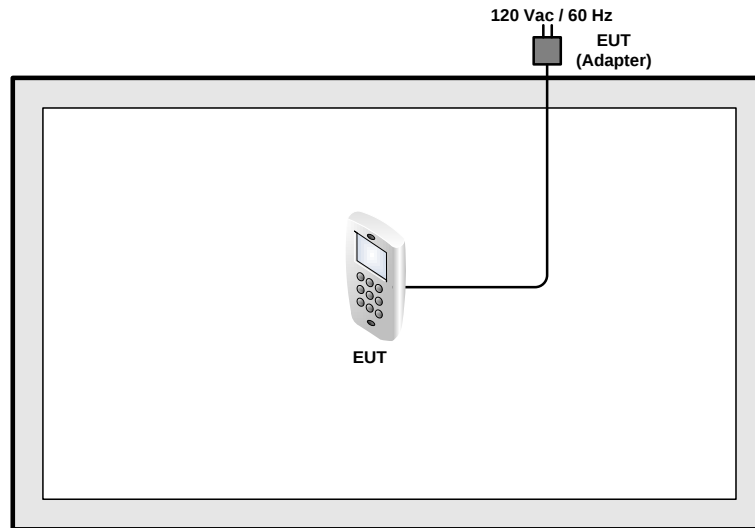
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)
	Mode 2 : GSM850 (GPRS class 8) Idle + WLAN (2.4GHz) Link + TC + TF + Battery 1 + Adapter 1
	Mode 3 : GSM850 (GPRS class 8) Idle + WLAN (5GHz) Link + TC + TF + Battery 1 + Adapter 1

Remark:

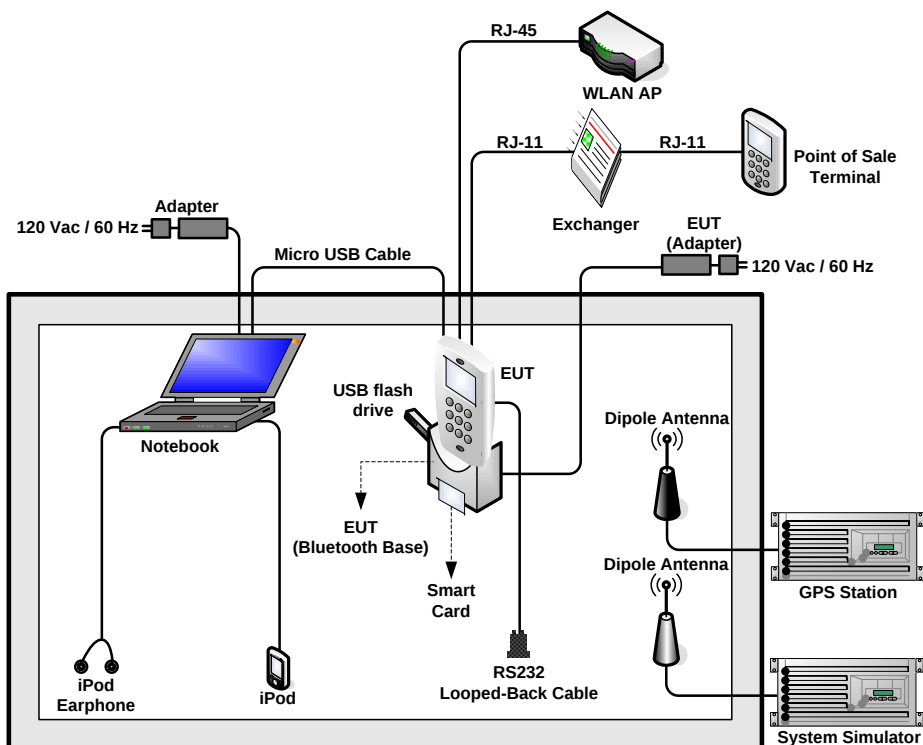
1. The worst case of conducted emission is mode 1; only the test data of it was reported.
2. TC stands for Test Configuration, and consists of Smart Card, SD Card, and Printer.
3. TF stands for Test Function, and consists of MSR On and RFID On.
4. "Linking with USB Flash Drive" means data application transferred mode between EUT and USB Flash Drive.
5. "Link with Notebook" means data application transferred mode between EUT and Notebook.

2.4 Connection Diagram of Test System

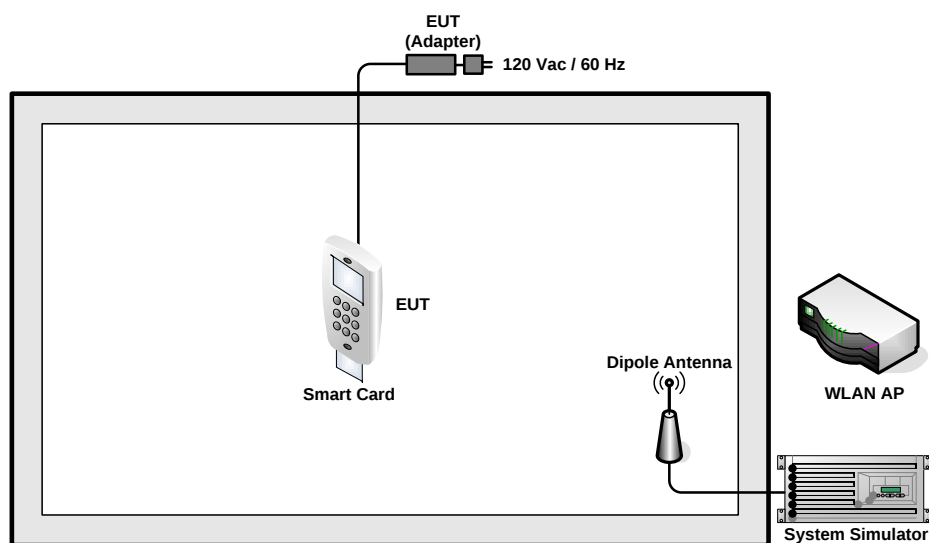
<WLAN Tx Mode>



<EUT with USB Cable (Link with Notebook) Mode>



<EUT with Adapter Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	Unshielded, 3.0 m	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Point of Sale Terminal	VeriFone	VX520	FCC DoC	Unshielded, 3.0 m	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	Exchange	Sun Moon Star	SMS-4 PLUS	N/A	N/A	Unshielded, 1.6 m
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
8.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
9.	USB flash drive	SP	Touch T01	FCC DoC	N/A	N/A
10.	Smart Card	N/A	N/A	N/A	N/A	N/A
11.	MSR Card	N/A	N/A	N/A	N/A	N/A
12.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.6 EUT Operation Test Setup

The programmed RF utility “WiFi Tx Test”, 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.

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

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

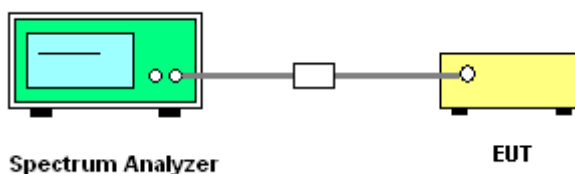
3.1.2 Measuring Instruments

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

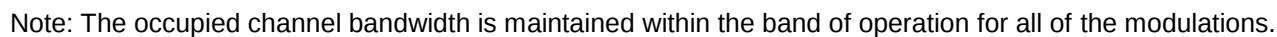


3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Test Band :	2.4GHz + 5GHz band 4	Temperature :	24~26℃
Test Engineer :	Bill Kuo	Relative Humidity :	45~49%

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	12.15	7.06	0.5	Pass
11b	1Mbps	1	6	2437	12.15	7.04	0.5	Pass
11b	1Mbps	1	11	2462	12.05	7.04	0.5	Pass
11g	6Mbps	1	1	2412	17.05	15.08	0.5	Pass
11g	6Mbps	1	6	2437	17.00	15.12	0.5	Pass
11g	6Mbps	1	11	2462	17.00	15.12	0.5	Pass
HT20	MCS0	1	1	2412	17.95	15.08	0.5	Pass
HT20	MCS0	1	6	2437	17.95	15.12	0.5	Pass
HT20	MCS0	1	11	2462	17.90	15.08	0.5	Pass

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	99% Bandwidth (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
11a	6Mbps	1	149	5745	17.10	15.64	0.5	Pass
11a	6Mbps	1	157	5785	17.15	15.12	0.5	Pass
11a	6Mbps	1	165	5825	17.10	15.44	0.5	Pass
HT20	MCS0	1	149	5745	18.05	17.00	0.5	Pass
HT20	MCS0	1	157	5785	18.10	17.04	0.5	Pass
HT20	MCS0	1	165	5825	18.10	17.04	0.5	Pass



3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz and 5725-5850MHz, 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.

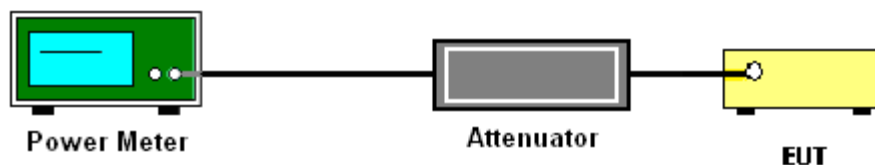
3.2.2 Measuring Instruments

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 + 5GHz band 4	Temperature :	24~26℃
Test Engineer :	Bill Kuo	Relative Humidity :	45~49%

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	17.23	30	1.18	Pass
11b	1Mbps	1	6	2437	17.24	30	1.18	Pass
11b	1Mbps	1	11	2462	17.44	30	1.18	Pass
11g	6Mbps	1	1	2412	22.13	30	1.18	Pass
11g	6Mbps	1	6	2437	22.20	30	1.18	Pass
11g	6Mbps	1	11	2462	22.29	30	1.18	Pass
HT20	MCS0	1	1	2412	21.74	30	1.18	Pass
HT20	MCS0	1	6	2437	22.19	30	1.18	Pass
HT20	MCS0	1	11	2462	21.82	30	1.18	Pass

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11a	6Mbps	1	149	5745	18.14	30	2.70	Pass
11a	6Mbps	1	157	5785	18.02	30	2.70	Pass
11a	6Mbps	1	165	5825	18.15	30	2.70	Pass
HT20	MCS0	1	149	5745	18.06	30	2.70	Pass
HT20	MCS0	1	157	5785	17.88	30	2.70	Pass
HT20	MCS0	1	165	5825	18.16	30	2.70	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 + 5GHz band 4	Temperature :	24~26℃
Test Engineer :	Bill Kuo	Relative Humidity :	45~49%

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	14.12	30	1.18	Pass
11b	1Mbps	1	6	2437	0.00	14.15	30	1.18	Pass
11b	1Mbps	1	11	2462	0.00	14.34	30	1.18	Pass
11g	6Mbps	1	1	2412	0.10	12.05	30	1.18	Pass
11g	6Mbps	1	6	2437	0.10	12.14	30	1.18	Pass
11g	6Mbps	1	11	2462	0.10	12.22	30	1.18	Pass
HT20	MCS0	1	1	2412	0.10	11.42	30	1.18	Pass
HT20	MCS0	1	6	2437	0.10	11.63	30	1.18	Pass
HT20	MCS0	1	11	2462	0.10	11.62	30	1.18	Pass

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	Duty Factor (dB)	Average Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11a	6Mbps	1	149	5745	0.10	8.73	30	2.70	Pass
11a	6Mbps	1	157	5785	0.10	8.70	30	2.70	Pass
11a	6Mbps	1	165	5825	0.10	9.13	30	2.70	Pass
HT20	MCS0	1	149	5745	0.12	9.41	30	2.70	Pass
HT20	MCS0	1	157	5785	0.12	9.23	30	2.70	Pass
HT20	MCS0	1	165	5825	0.12	9.64	30	2.70	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.

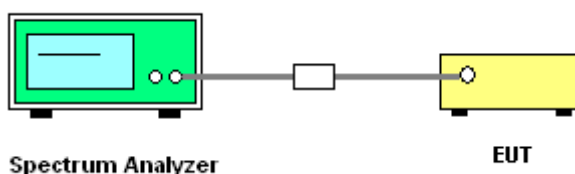
3.3.2 Measuring Instruments

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



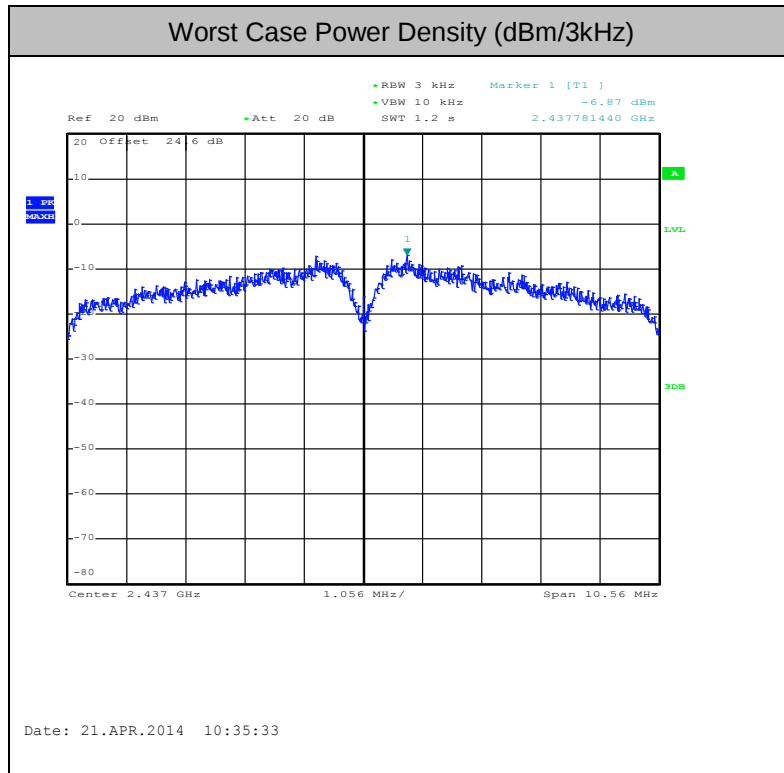
3.3.5 Test Result of Power Spectral Density

Test Mode :	2.4GHz + 5GHz band 4	Temperature :	24~26℃
Test Engineer :	Bill Kuo	Relative Humidity :	45~49%

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	-7.83	8	1.18	Pass
11b	1Mbps	1	6	2437	-6.87	8	1.18	Pass
11b	1Mbps	1	11	2462	-7.27	8	1.18	Pass
11g	6Mbps	1	1	2412	-11.89	8	1.18	Pass
11g	6Mbps	1	6	2437	-12.17	8	1.18	Pass
11g	6Mbps	1	11	2462	-10.71	8	1.18	Pass
HT20	MCS0	1	1	2412	-13.66	8	1.18	Pass
HT20	MCS0	1	6	2437	-12.72	8	1.18	Pass
HT20	MCS0	1	11	2462	-12.40	8	1.18	Pass

Mod.	Data Rate	N _{TX}	Channel	Freq. (MHz)	Peak Power Density (dBm/3kHz)	Max. Limits (dBm/3kHz)	DG (dBi)	Pass/Fail
11a	6Mbps	1	149	5745	-15.37	8	2.70	Pass
11a	6Mbps	1	157	5785	-13.98	8	2.70	Pass
11a	6Mbps	1	165	5825	-15.22	8	2.70	Pass
HT20	MCS0	1	149	5745	-14.84	8	2.70	Pass
HT20	MCS0	1	157	5785	-13.77	8	2.70	Pass
HT20	MCS0	1	165	5825	-13.73	8	2.70	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).

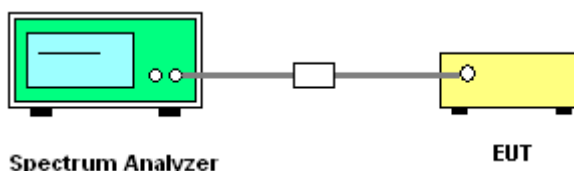
3.4.2 Measuring Instruments

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 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.

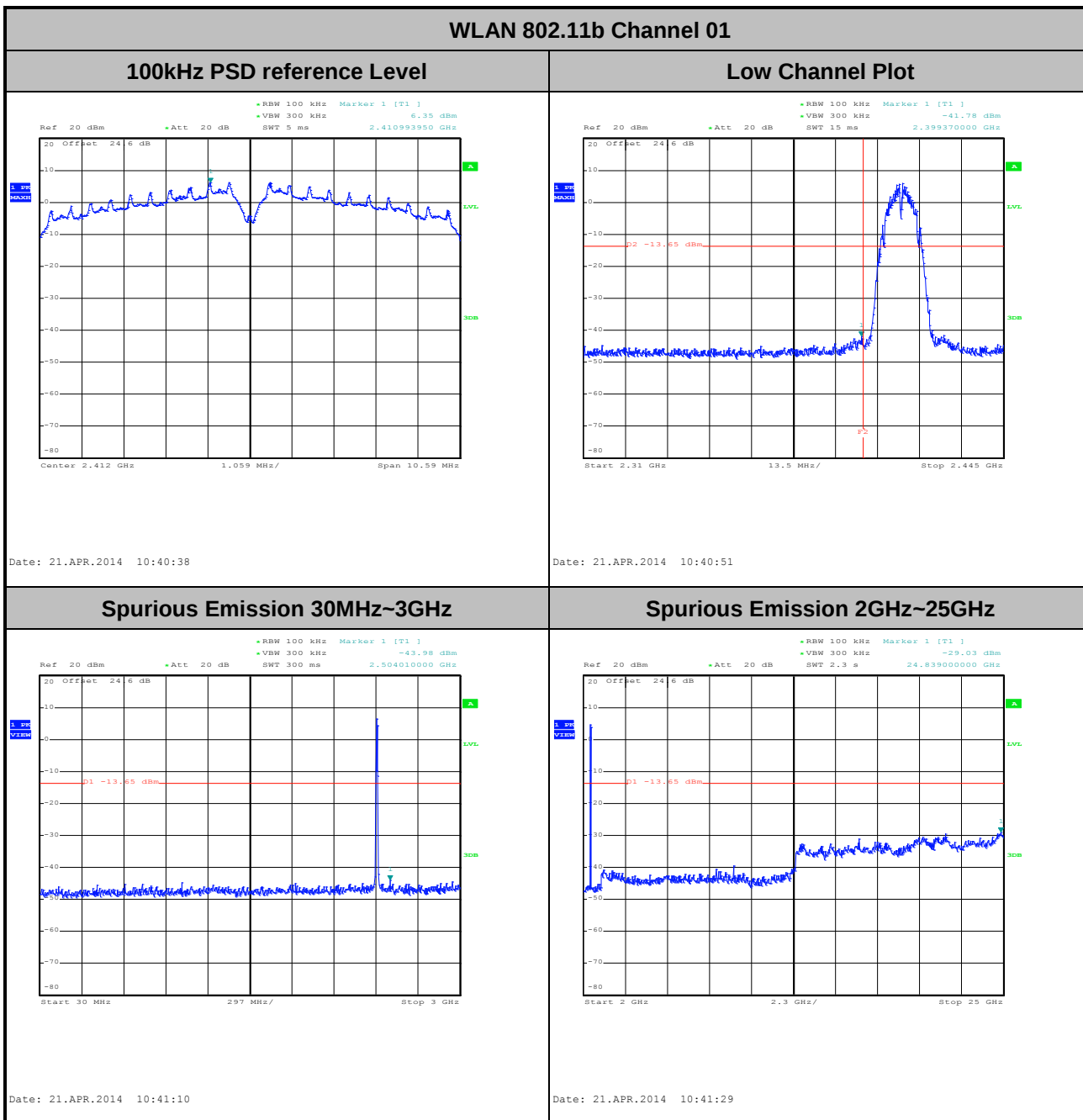
3.4.4 Test Setup





3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	45~49%
Test Channel :	01	Test Engineer :	Bill Kuo

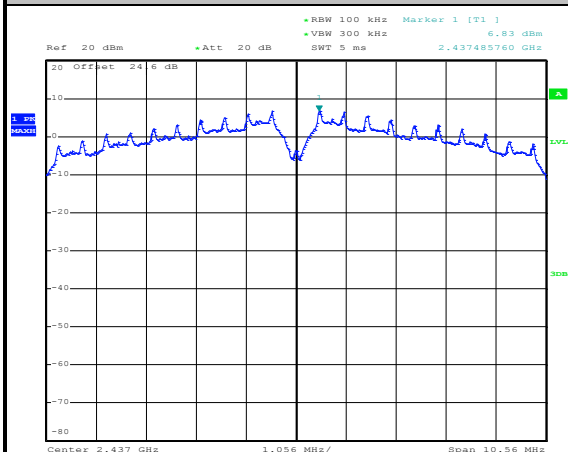




Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	45~49%
Test Channel :	06	Test Engineer :	Bill Kuo

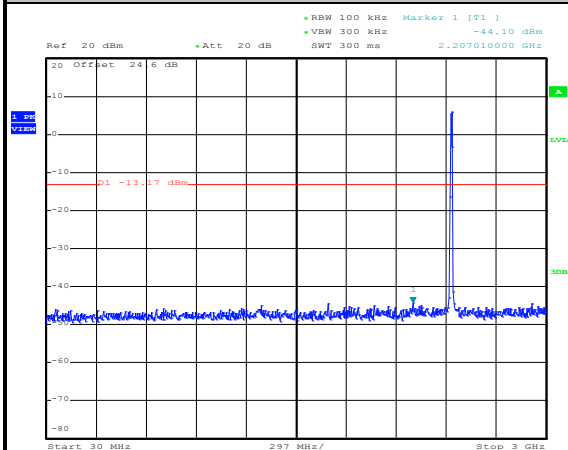
WLAN 802.11b Channel 06

100kHz PSD reference Level



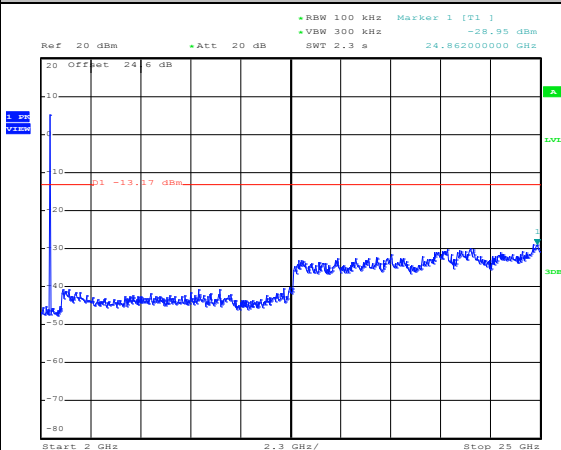
Date: 21.APR.2014 10:35:42

Spurious Emission 30MHz~3GHz



Date: 21.APR.2014 10:36:01

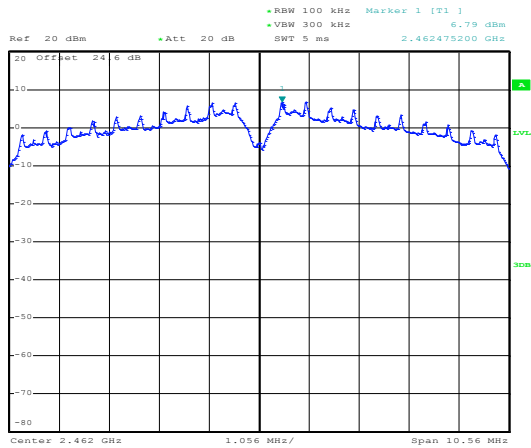
Spurious Emission 2GHz~25GHz



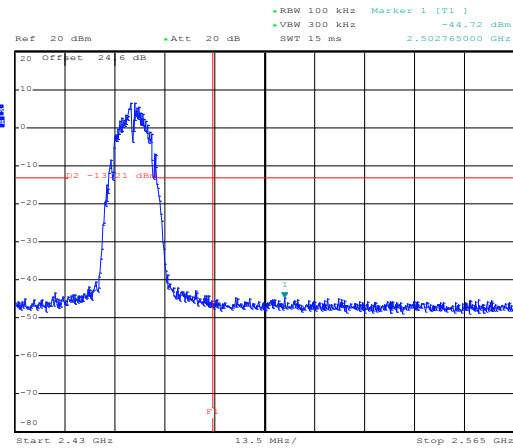
Date: 21.APR.2014 10:36:20



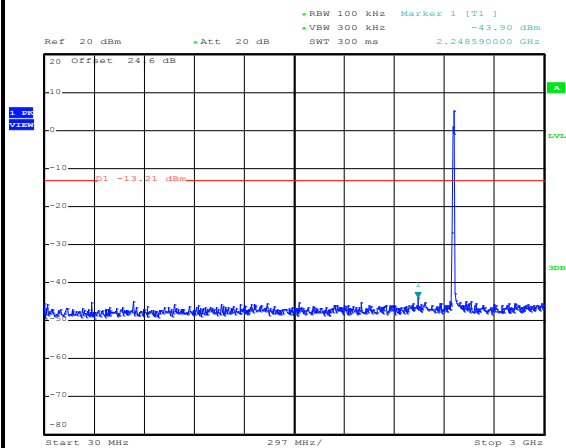
Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	45~49%
Test Channel :	11	Test Engineer :	Bill Kuo

WLAN 802.11b Channel 11**100kHz PSD reference Level**

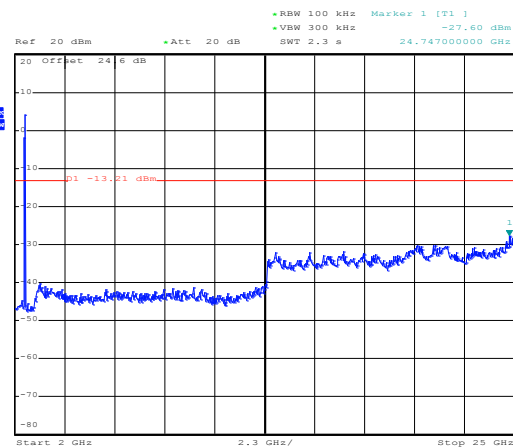
Date: 21.APR.2014 10:46:13

High Channel Plot

Date: 21.APR.2014 10:46:26

Spurious Emission 30MHz~3GHz

Date: 21.APR.2014 10:46:45

Spurious Emission 2GHz~25GHz

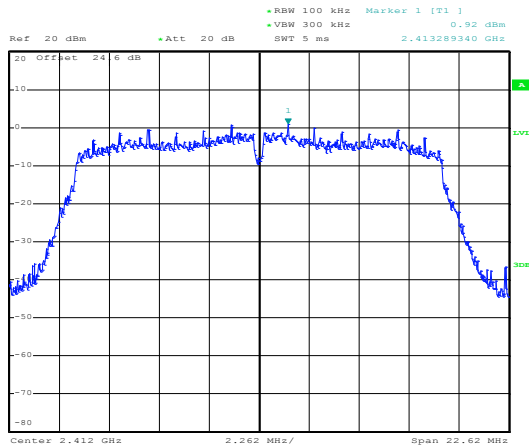
Date: 21.APR.2014 10:47:04



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	45~49%
Test Channel :	01	Test Engineer :	Bill Kuo

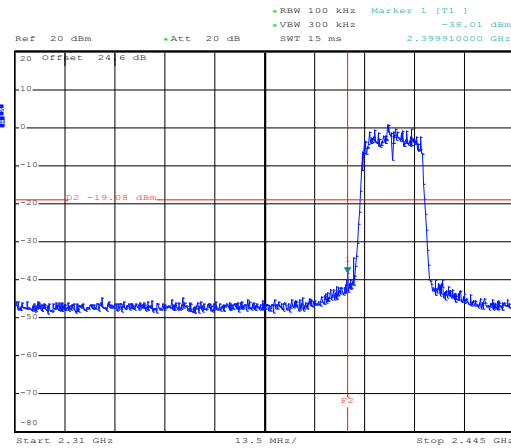
WLAN 802.11g Channel 01

100kHz PSD reference Level



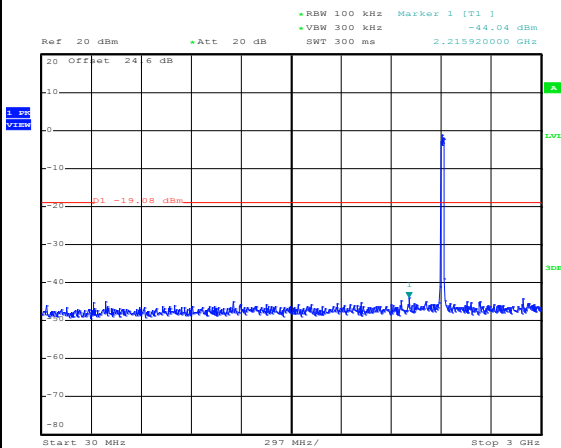
Date: 21.APR.2014 10:52:38

Low Channel Plot



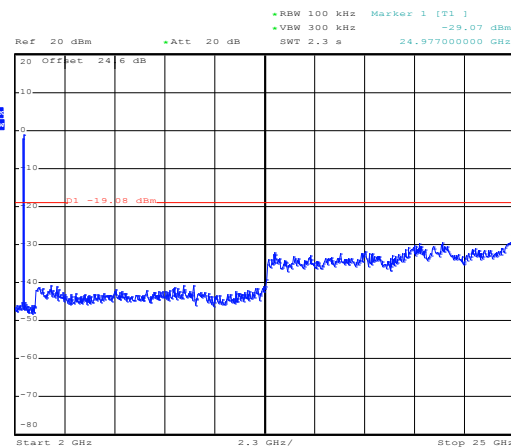
Date: 21.APR.2014 10:52:52

Spurious Emission 30MHz~3GHz



Date: 21.APR.2014 10:53:11

Spurious Emission 2GHz~25GHz



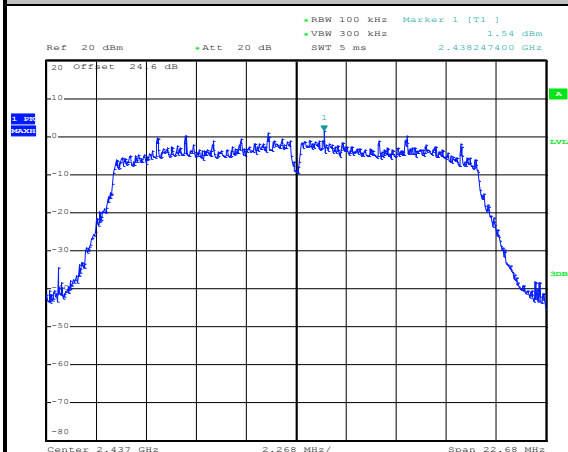
Date: 21.APR.2014 10:53:29



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	45~49%
Test Channel :	06	Test Engineer :	Bill Kuo

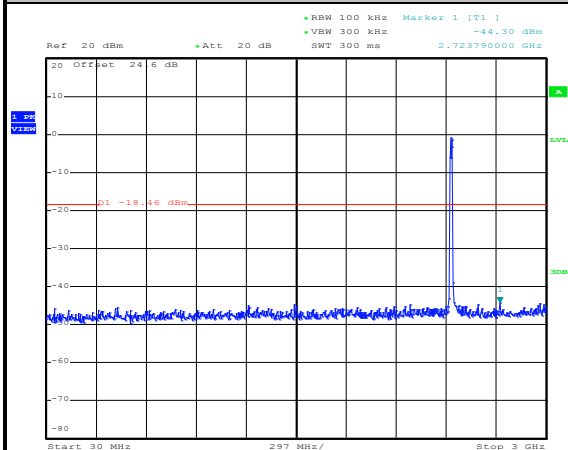
WLAN 802.11g Channel 06

100kHz PSD reference Level



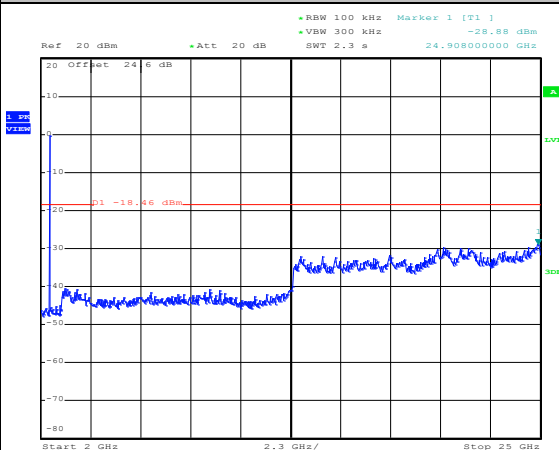
Date: 21.APR.2014 10:57:39

Spurious Emission 30MHz~3GHz



Date: 21.APR.2014 10:57:58

Spurious Emission 2GHz~25GHz



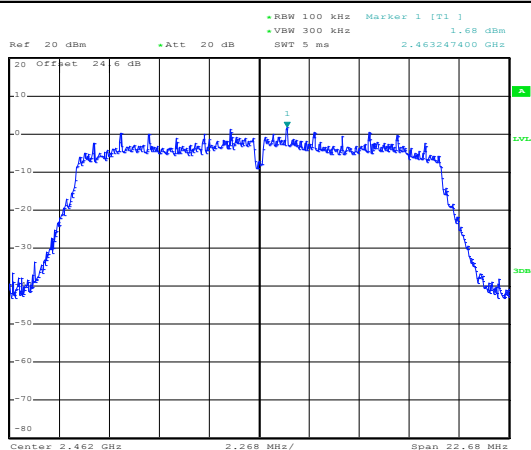
Date: 21.APR.2014 10:58:17



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	45~49%
Test Channel :	11	Test Engineer :	Bill Kuo

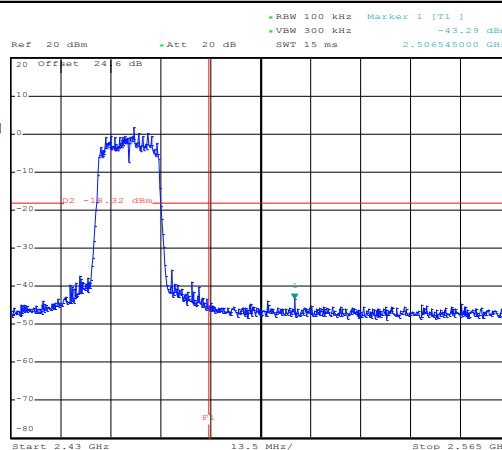
WLAN 802.11g Channel 11

100kHz PSD reference Level



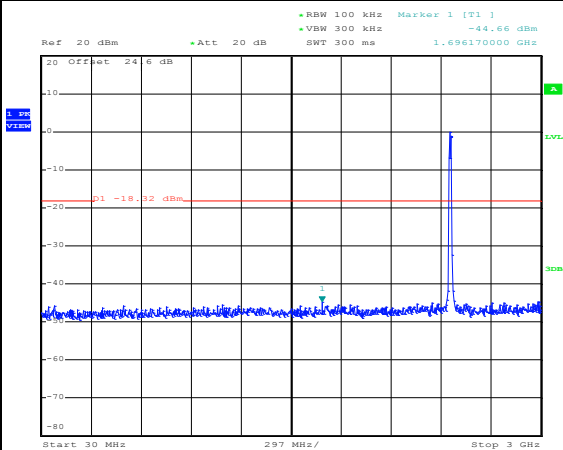
Date: 21.APR.2014 11:01:11

High Channel Plot



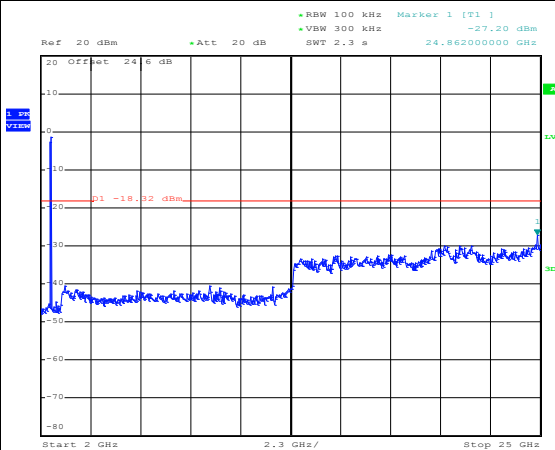
Date: 21.APR.2014 11:01:25

Spurious Emission 30MHz~3GHz



Date: 21.APR.2014 11:01:44

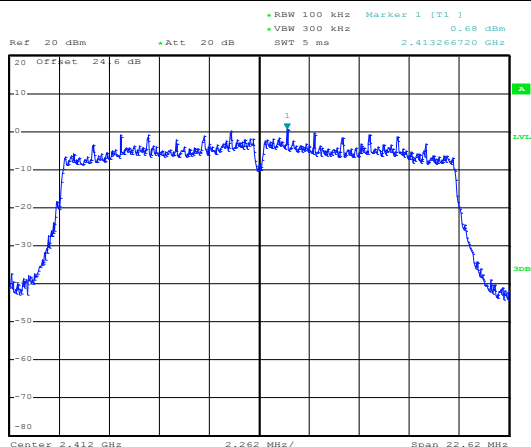
Spurious Emission 2GHz~25GHz



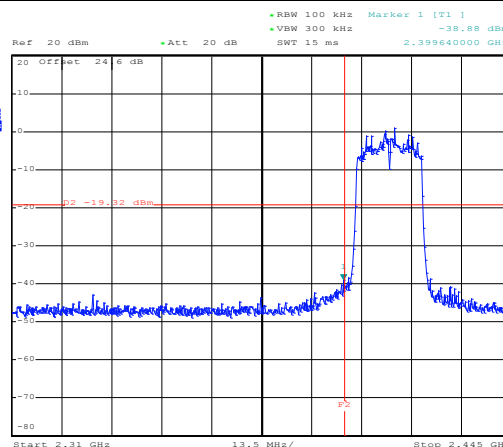
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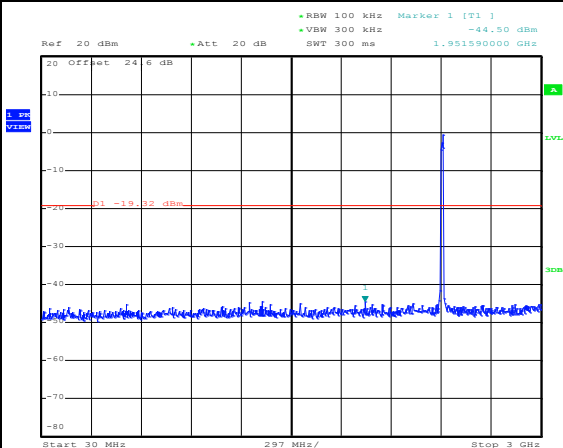
Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	45~49%
Test Channel :	01	Test Engineer :	Bill Kuo

WLAN 802.11n HT20 Channel 01**100kHz PSD reference Level**

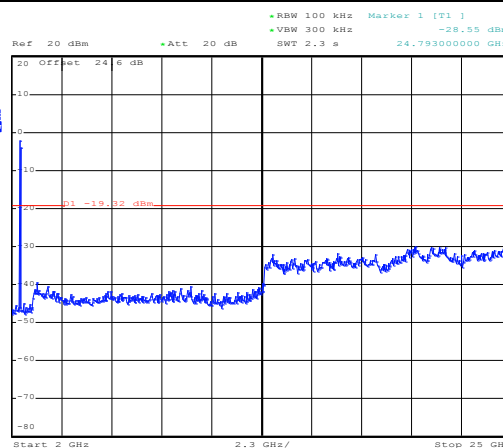
Date: 21.APR.2014 11:07:05

Low Channel Plot

Date: 21.APR.2014 11:07:19

Spurious Emission 30MHz~3GHz

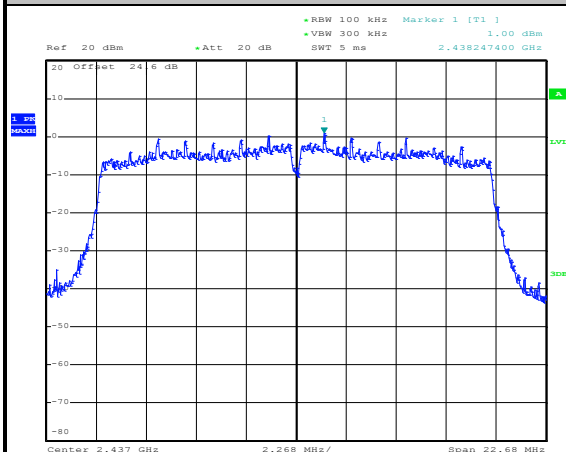
Date: 21.APR.2014 11:07:38

Spurious Emission 2GHz~25GHz

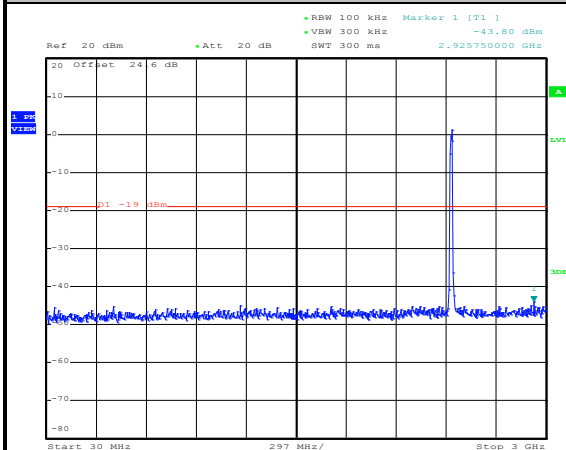
Date: 21.APR.2014 11:07:56



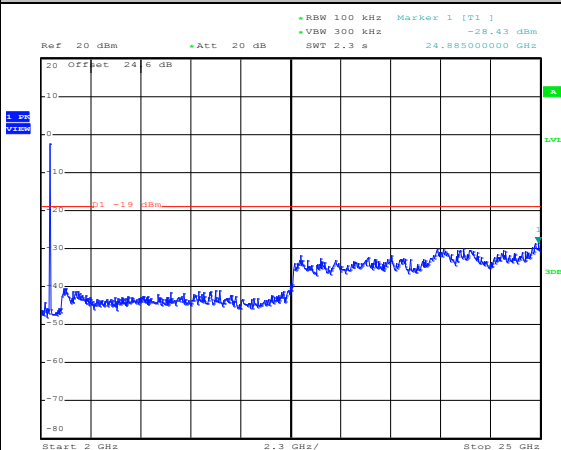
Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	45~49%
Test Channel :	06	Test Engineer :	Bill Kuo

WLAN 802.11n HT20 Channel 06**100kHz PSD reference Level**

Date: 21.APR.2014 11:15:12

Spurious Emission 30MHz~3GHz

Date: 21.APR.2014 11:15:31

Spurious Emission 2GHz~25GHz

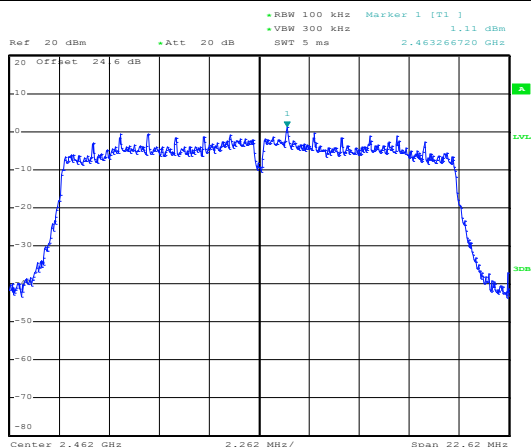
Date: 21.APR.2014 11:15:50



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	45~49%
Test Channel :	11	Test Engineer :	Bill Kuo

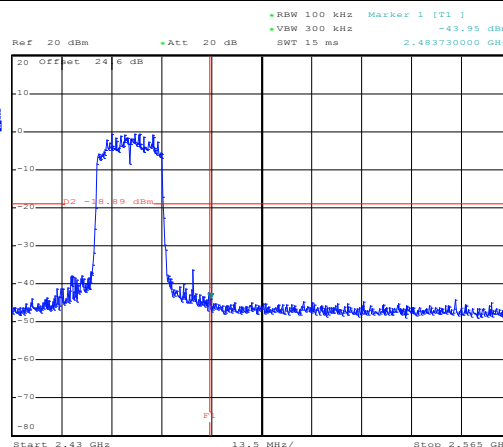
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



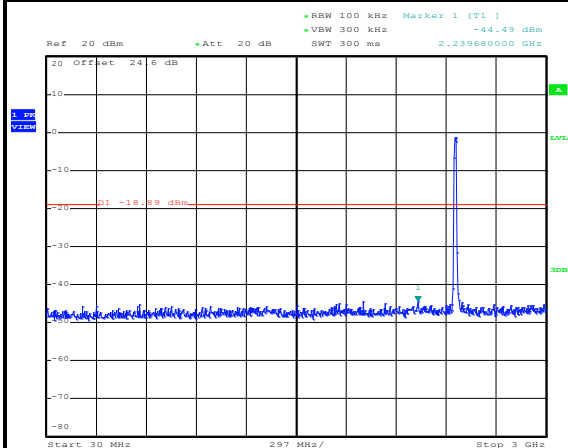
Date: 21.APR.2014 11:20:13

High Channel Plot



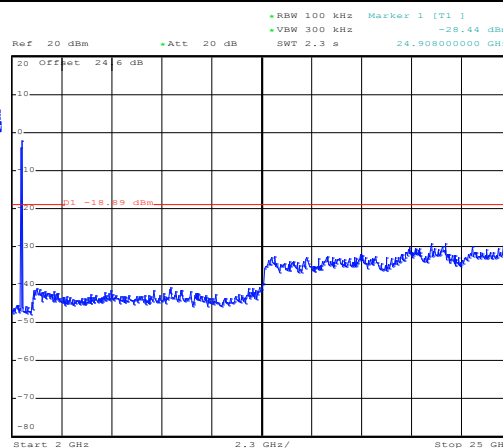
Date: 21.APR.2014 11:20:27

Spurious Emission 30MHz~3GHz



Date: 21.APR.2014 11:20:46

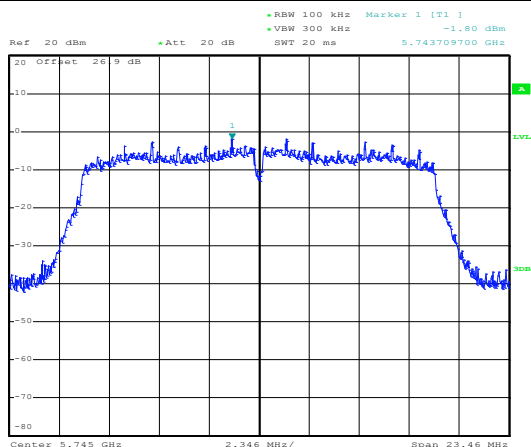
Spurious Emission 2GHz~25GHz



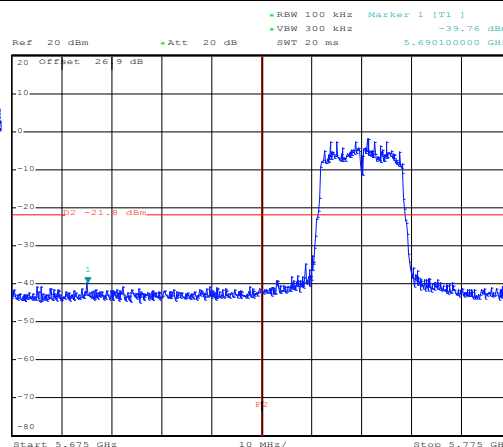
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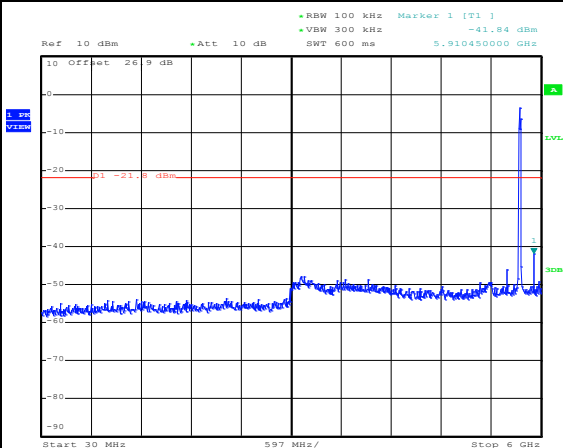
Test Mode :	802.11a	Temperature :	24~26°C
Test Band :	5GHz Low	Relative Humidity :	45~49%
Test Channel :	149	Test Engineer :	Bill Kuo

WLAN 802.11a Channel 149**100kHz PSD reference Level**

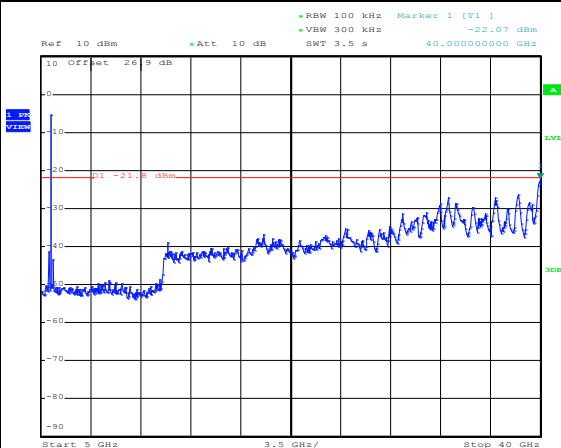
Date: 21.APR.2014 11:30:42

Low Channel Plot

Date: 21.APR.2014 11:30:56

Spurious Emission 30MHz~6GHz

Date: 21.APR.2014 11:39:50

Spurious Emission 5GHz~40GHz

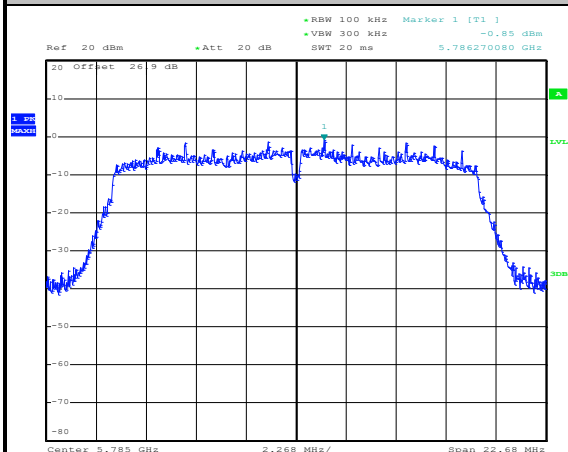
Date: 21.APR.2014 11:40:08



Test Mode :	802.11a	Temperature :	24~26°C
Test Band :	5GHz Mid	Relative Humidity :	45~49%
Test Channel :	157	Test Engineer :	Bill Kuo

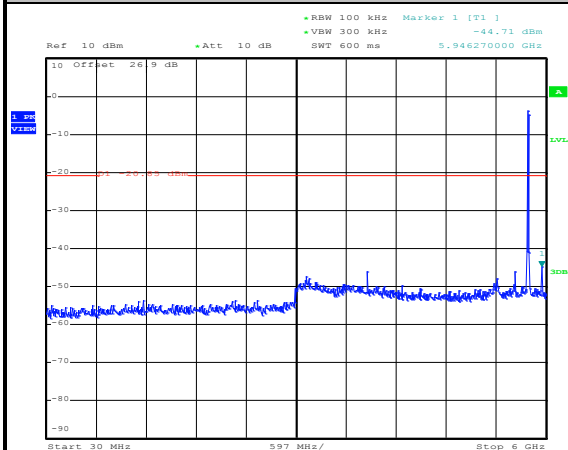
WLAN 802.11a Channel 157

100kHz PSD reference Level



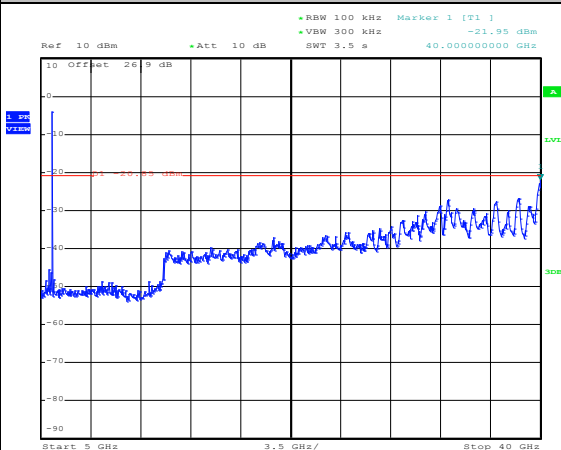
Date: 21.APR.2014 11:57:28

Spurious Emission 30MHz~6GHz



Date: 21.APR.2014 11:57:47

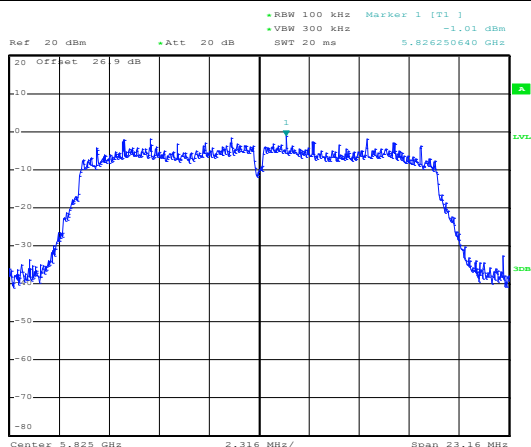
Spurious Emission 5GHz~40GHz



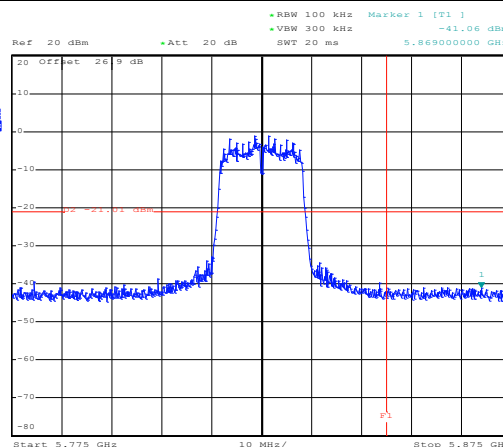
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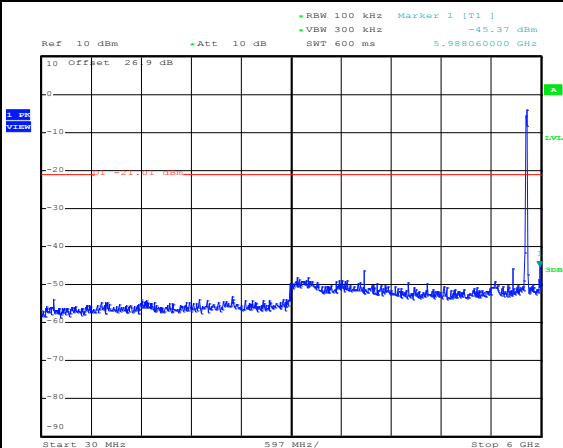
Test Mode :	802.11a	Temperature :	24~26°C
Test Band :	5GHz High	Relative Humidity :	45~49%
Test Channel :	165	Test Engineer :	Bill Kuo

WLAN 802.11a Channel 165**100kHz PSD reference Level**

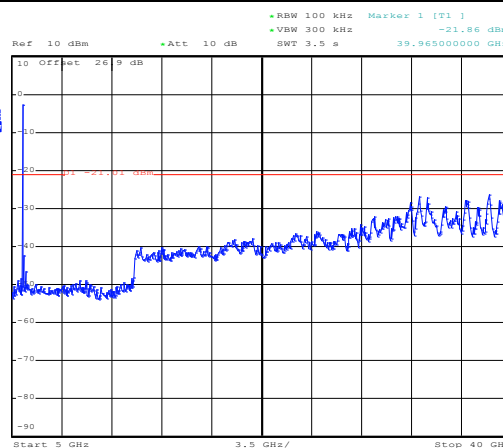
Date: 21.APR.2014 12:03:14

High Channel Plot

Date: 21.APR.2014 12:03:28

Spurious Emission 30MHz~6GHz

Date: 21.APR.2014 12:03:47

Spurious Emission 5GHz~40GHz

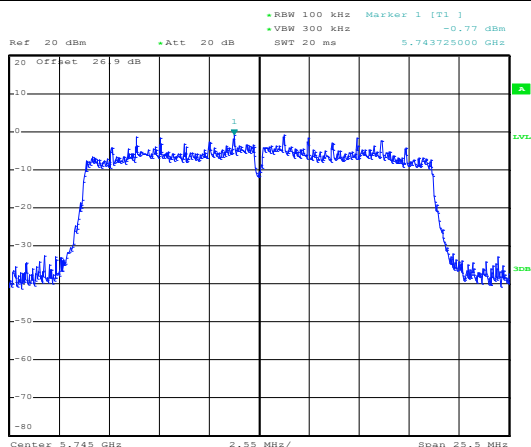
Date: 21.APR.2014 12:04:05



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	5GHz Low	Relative Humidity :	45~49%
Test Channel :	149	Test Engineer :	Bill Kuo

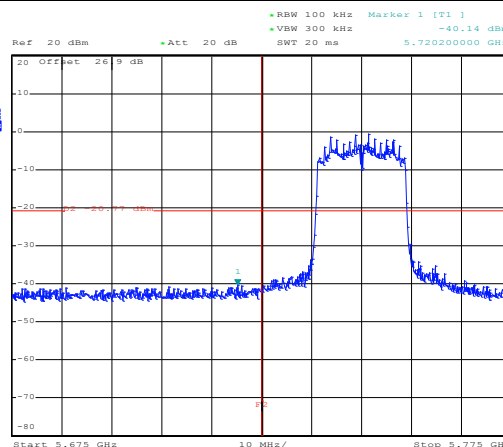
WLAN 802.11n HT20 Channel 149

100kHz PSD reference Level



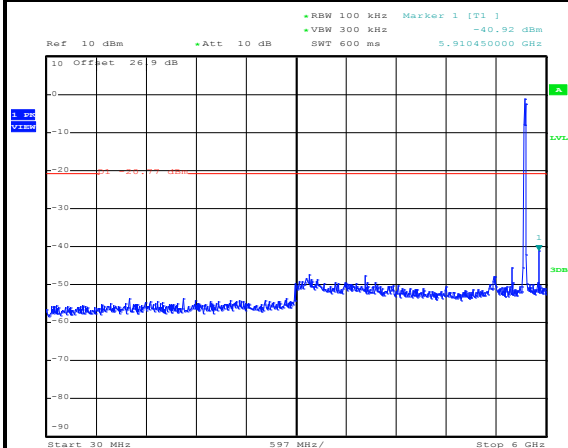
Date: 21.APR.2014 12:11:14

Low Channel Plot



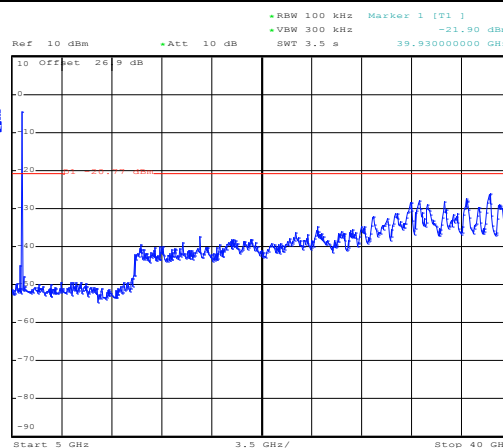
Date: 21.APR.2014 12:11:28

Spurious Emission 30MHz~6GHz



Date: 21.APR.2014 12:13:52

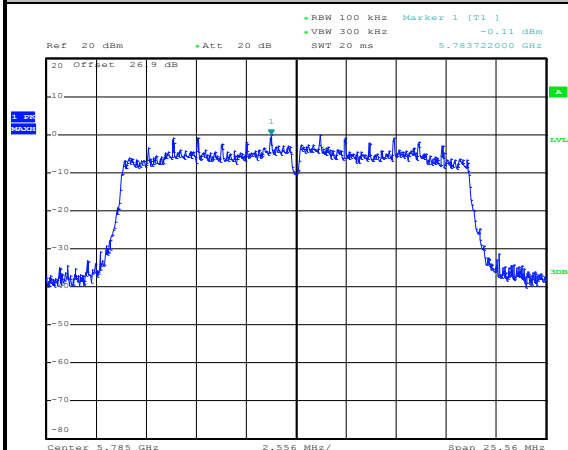
Spurious Emission 5GHz~40GHz



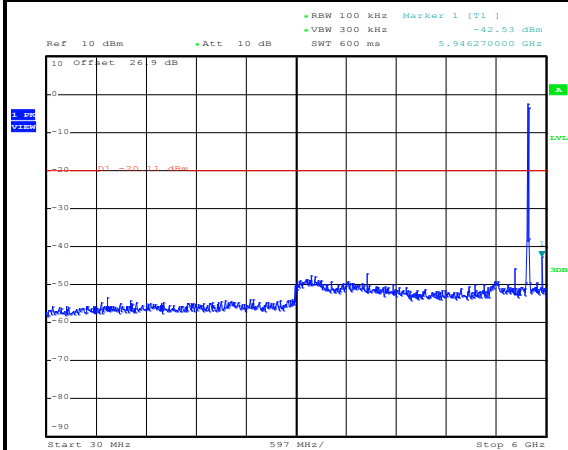
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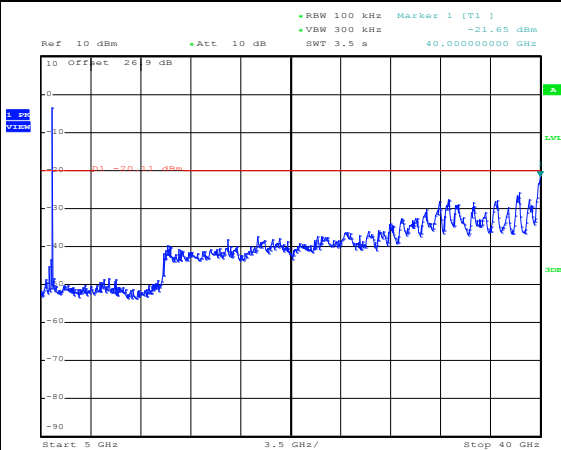
Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	5GHz Mid	Relative Humidity :	45~49%
Test Channel :	157	Test Engineer :	Bill Kuo

WLAN 802.11n HT20 Channel 157**100kHz PSD reference Level**

Date: 21.APR.2014 12:17:58

Spurious Emission 30MHz~6GHz

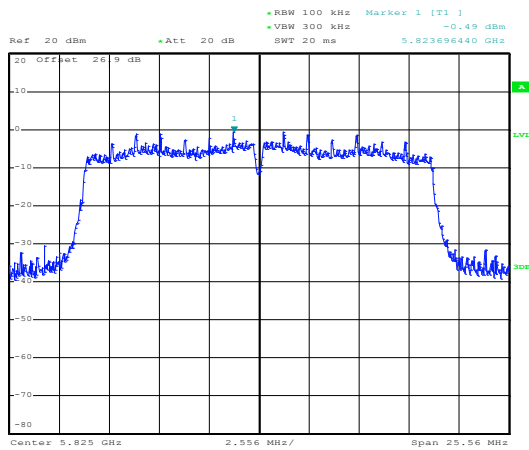
Date: 21.APR.2014 12:23:51

Spurious Emission 5GHz~40GHz

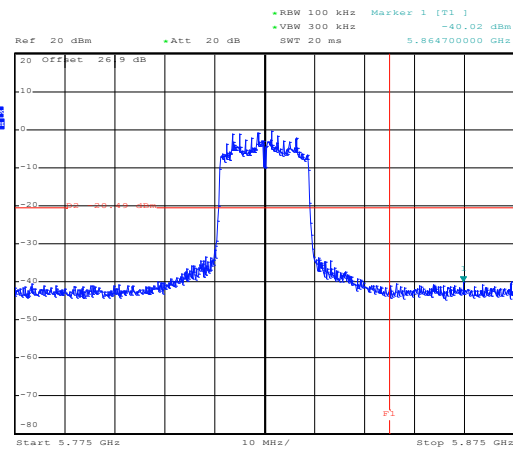
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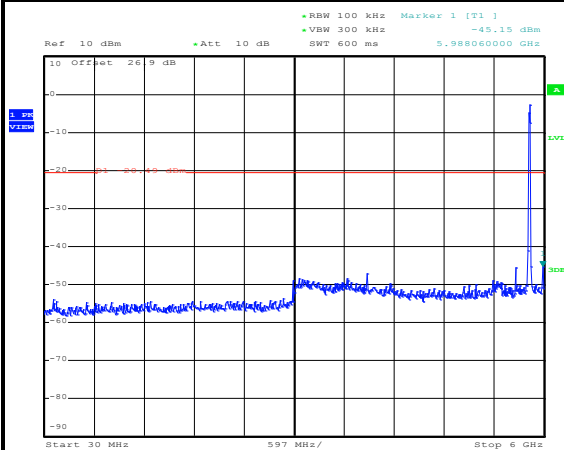
Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	5GHz High	Relative Humidity :	45~49%
Test Channel :	165	Test Engineer :	Bill Kuo

WLAN 802.11n HT20 Channel 165**100kHz PSD reference Level**

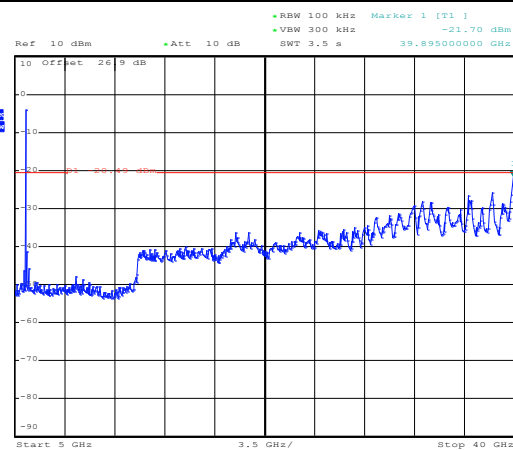
Date: 21.APR.2014 12:27:29

High Channel Plot

Date: 21.APR.2014 12:27:43

Spurious Emission 30MHz~6GHz

Date: 21.APR.2014 12:28:02

Spurious Emission 5GHz~40GHz

Date: 21.APR.2014 12:28:21

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; $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

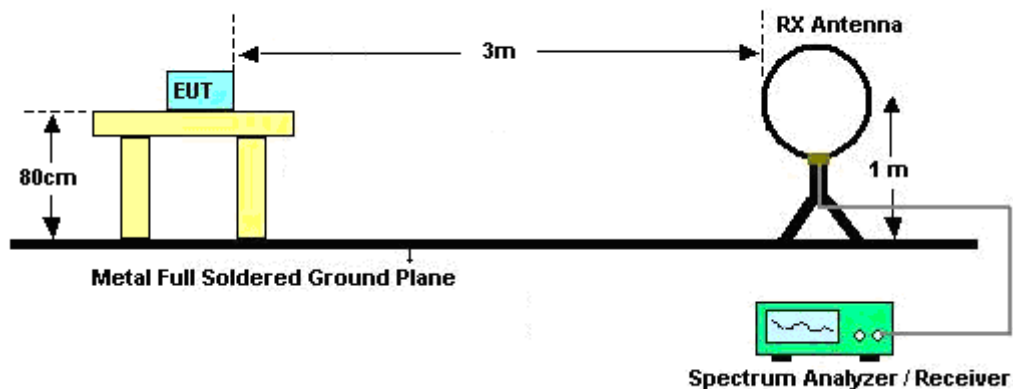
For average measurement:

 - $VBW = 10$ 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.

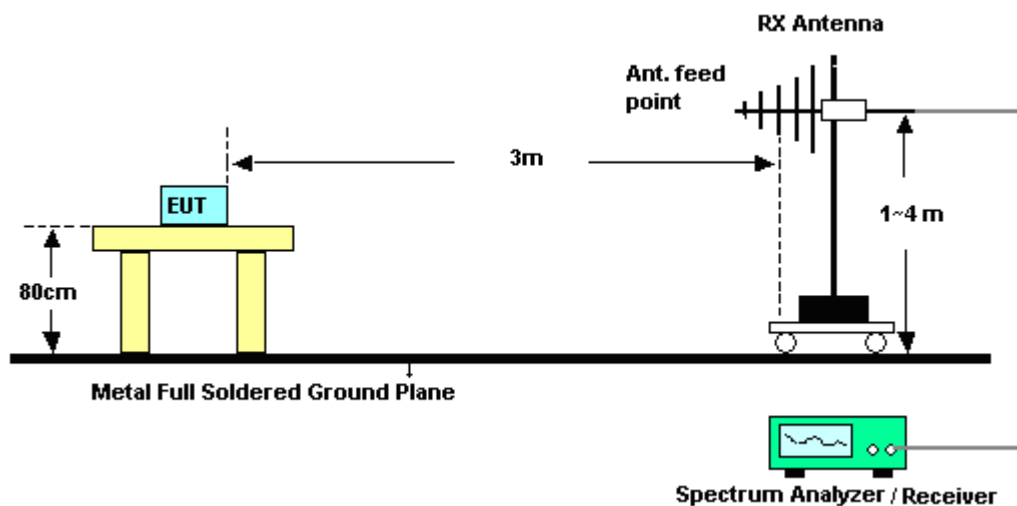
Band	Duty Cycle(%)	T(μ s)	1/T(kHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	97.83	1440.00	0.69	1kHz
2.4GHz 802.11n HT20	97.67	1344.00	0.74	1kHz
802.11a	97.81	1432.00	0.70	1kHz
5GHz 802.11n HT20	97.38	1338.00	0.75	1kHz

3.5.4 Test Setup

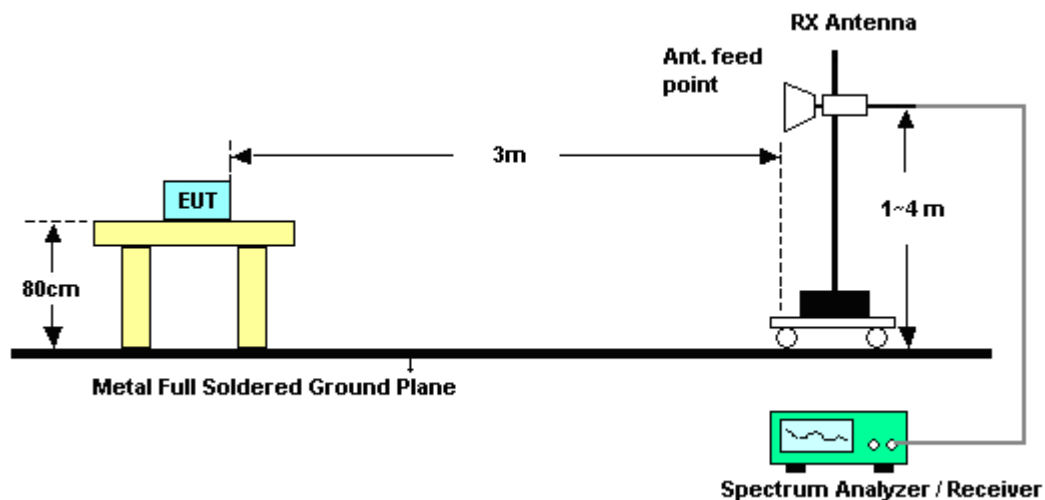
For radiated emissions below 30MHz



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

Test Mode :	802.11b	Temperature :	21~23°C
Test Band :	Low	Relative Humidity :	45~48%
Test Channel :	01	Test Engineer :	Stan Hsieh

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
2387.67	61.94	-12.06	74	57	32.3	6.91	34.27	110	308	Peak
2387.4	49.42	-4.58	54	44.48	32.3	6.91	34.27	110	308	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
2375.25	59.65	-14.35	74	54.76	32.28	6.88	34.27	104	242	Peak
2374.71	45.98	-8.02	54	41.09	32.28	6.88	34.27	104	242	Average

Test Mode :	802.11b	Temperature :	21~23°C
Test Band :	High	Relative Humidity :	45~48%
Test Channel :	11	Test Engineer :	Stan Hsieh

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.1	63.52	-10.48	74	58.51	32.38	7.06	34.43	108	300	Peak
2487.94	50.94	-3.06	54	45.91	32.4	7.06	34.43	108	300	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
2499.04	60.66	-13.34	74	55.68	32.4	7.06	34.48	100	243	Peak
2488	47.3	-6.7	54	42.27	32.4	7.06	34.43	100	243	Average



Test Mode :	802.11g	Temperature :	21~23°C
Test Band :	Low	Relative Humidity :	45~48%
Test Channel :	01	Test Engineer :	Stan Hsieh

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	69.15	-4.85	74	64.24	32.3	6.91	34.3	109	309	Peak
2389.74	51.34	-2.66	54	46.4	32.3	6.91	34.27	109	309	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
2388.75	60.79	-13.21	74	55.85	32.3	6.91	34.27	133	276	Peak
2390	46.74	-7.26	54	41.83	32.3	6.91	34.3	133	276	Average

Test Mode :	802.11g	Temperature :	21~23°C
Test Band :	High	Relative Humidity :	45~48%
Test Channel :	11	Test Engineer :	Stan Hsieh

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
2483.77	70.55	-3.45	74	65.54	32.38	7.06	34.43	108	312	Peak
2483.62	53.08	-0.92	54	48.07	32.38	7.06	34.43	108	312	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
2486.32	60.82	-13.18	74	55.81	32.38	7.06	34.43	100	243	Peak
2491.21	46.9	-7.1	54	41.87	32.4	7.06	34.43	100	243	Average



Test Mode :	802.11n HT20	Temperature :	21~23°C
Test Band :	Low	Relative Humidity :	45~48%
Test Channel :	01	Test Engineer :	Stan Hsieh

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
2389.2	66.78	-7.22	74	61.84	32.3	6.91	34.27	110	308	Peak
2390	51.34	-2.66	54	46.43	32.3	6.91	34.3	110	308	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2390	59.22	-14.78	74	54.31	32.3	6.91	34.3	124	271	Peak
2389.65	46.05	-7.95	54	41.11	32.3	6.91	34.27	124	271	Average

Test Mode :	802.11n HT20	Temperature :	21~23°C
Test Band :	High	Relative Humidity :	45~48%
Test Channel :	11	Test Engineer :	Stan Hsieh

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.67	70.59	-3.41	74	65.58	32.38	7.06	34.43	106	312	Peak
2483.5	52.53	-1.47	54	47.52	32.38	7.06	34.43	106	312	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
2484.31	61.93	-12.07	74	56.92	32.38	7.06	34.43	100	255	Peak
2483.71	46.45	-7.55	54	41.44	32.38	7.06	34.43	100	255	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 :	21~23°C
Test Channel :	01	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
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	108.8	-	-	103.84	32.31	6.95	34.3	110	308	Average
2412	112.86	-	-	107.9	32.31	6.95	34.3	110	308	Peak
3618	47.03	-26.97	74	65.97	32.75	7.41	59.1	100	0	Peak
4824	43.27	-30.73	74	59.46	33.97	8.77	58.93	100	0	Peak

Test Mode :	802.11b	Temperature :	21~23°C
Test Channel :	01	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	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	103.31	-	-	98.35	32.31	6.95	34.3	104	242	Average
2412	107.31	-	-	102.35	32.31	6.95	34.3	104	242	Peak
3618	47.9	-26.1	74	66.84	32.75	7.41	59.1	100	0	Peak
4824	47.02	-26.98	74	63.21	33.97	8.77	58.93	100	0	Peak

Test Mode :	802.11b	Temperature :	21~23°C
Test Channel :	06	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 2438 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
2438	108.68	-	-	103.69	32.35	6.99	34.35	110	333	Average
2438	112.73	-	-	107.74	32.35	6.99	34.35	110	333	Peak
3654	47.35	-26.65	74	66.31	32.76	7.45	59.17	100	0	Peak
4875	42.6	-31.4	74	58.66	33.95	8.82	58.83	100	0	Peak
7311	43.69	-30.31	74	54.97	35.54	10.91	57.73	100	0	Peak

Test Mode :	802.11b	Temperature :	21~23°C
Test Channel :	06	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 2438 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
2438	103.75	-	-	98.76	32.35	6.99	34.35	128	242	Average
2438	107.84	-	-	102.85	32.35	6.99	34.35	128	242	Peak
3654	48.7	-25.3	74	67.66	32.76	7.45	59.17	100	0	Peak
4875	45.66	-28.34	74	61.72	33.95	8.82	58.83	100	0	Peak
7311	43.51	-30.49	74	54.79	35.54	10.91	57.73	100	0	Peak

Test Mode :	802.11b	Temperature :	21~23°C
Test Channel :	11	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	108.39	-	-	103.39	32.37	7.02	34.39	108	300	Average
2462	112.37	-	-	107.37	32.37	7.02	34.39	108	300	Peak
3693	46.24	-27.76	74	65.21	32.78	7.48	59.23	100	0	Peak
4926	43.35	-30.65	74	59.25	33.93	8.9	58.73	100	0	Peak
7386	44.41	-29.59	74	55.7	35.52	10.99	57.8	100	0	Peak

Test Mode :	802.11b	Temperature :	21~23°C
Test Channel :	11	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	104.65	-	-	99.65	32.37	7.02	34.39	100	243	Average
2462	108.68	-	-	103.68	32.37	7.02	34.39	100	243	Peak
3693	46.24	-27.76	74	65.21	32.78	7.48	59.23	100	0	Peak
4926	46.51	-27.49	74	62.41	33.93	8.9	58.73	100	0	Peak
7386	43.9	-30.1	74	55.19	35.52	10.99	57.8	100	0	Peak

Test Mode :	802.11g	Temperature :	21~23°C
Test Channel :	01	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	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	103.07	-	-	98.11	32.31	6.95	34.3	109	309	Average
2414	112.47	-	-	107.51	32.31	6.95	34.3	109	309	Peak
3615	45.39	-28.61	74	64.33	32.75	7.41	59.1	100	0	Peak
4824	41.47	-32.53	74	57.66	33.97	8.77	58.93	100	0	Peak

Test Mode :	802.11g	Temperature :	21~23°C
Test Channel :	01	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	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	96.28	-	-	91.32	32.31	6.95	34.3	133	276	Average
2414	105.5	-	-	100.54	32.31	6.95	34.3	133	276	Peak
3618	45.9	-28.1	74	64.84	32.75	7.41	59.1	100	0	Peak
4830	43.81	-30.19	74	59.97	33.97	8.8	58.93	100	0	Peak

Test Mode :	802.11g	Temperature :	21~23°C
Test Channel :	06	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 2438 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
2438	102.34	-	-	97.35	32.35	6.99	34.35	107	308	Average
2438	111.01	-	-	106.02	32.35	6.99	34.35	107	308	Peak
3654	44.82	-29.18	74	63.78	32.76	7.45	59.17	100	0	Peak
4875	39.48	-34.52	74	55.54	33.95	8.82	58.83	100	0	Peak
7311	42.57	-31.43	74	53.85	35.54	10.91	57.73	100	0	Peak

Test Mode :	802.11g	Temperature :	21~23°C
Test Channel :	06	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 2440 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
2440	97.15	-	-	92.16	32.35	6.99	34.35	128	241	Average
2440	106.07	-	-	101.08	32.35	6.99	34.35	128	241	Peak
3654	45.58	-28.42	74	64.54	32.76	7.45	59.17	100	0	Peak
4875	41.91	-32.09	74	57.97	33.95	8.82	58.83	100	0	Peak
7311	42.86	-31.14	74	54.14	35.54	10.91	57.73	100	0	Peak

Test Mode :	802.11g	Temperature :	21~23°C
Test Channel :	11	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
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
36.75	17.76	-22.24	40	33.1	15.32	0.6	31.26	-	-	Peak
118.83	20.13	-23.37	43.5	38.79	11.35	1.1	31.11	-	-	Peak
169.05	13.64	-29.86	43.5	33.8	9.72	1.23	31.11	-	-	Peak
331.5	14.67	-31.33	46	29.96	13.85	1.86	31	-	-	Peak
603.8	21.53	-24.47	46	29.7	19.72	2.7	30.59	-	-	Peak
911.8	25.88	-20.12	46	29.24	23.59	3.37	30.32	100	2	Peak
2464	103.13	-	-	98.13	32.37	7.02	34.39	108	312	Average
2464	112.23	-	-	107.23	32.37	7.02	34.39	108	312	Peak
3687	43.72	-30.28	74	62.69	32.78	7.48	59.23	100	0	Peak
4923	40.31	-33.69	74	56.24	33.93	8.87	58.73	100	0	Peak
7386	42.52	-31.48	74	53.81	35.52	10.99	57.8	100	0	Peak



Test Mode :	802.11g	Temperature :	21~23°C
Test Channel :	11	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	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
41.61	24.3	-15.7	40	42.27	12.6	0.63	31.2	-	-	Peak
64.29	25.43	-14.57	40	49.86	6	0.79	31.22	155	320	Peak
119.1	27.28	-16.22	43.5	45.93	11.35	1.1	31.1	-	-	Peak
353.9	15.46	-30.54	46	30	14.52	2.01	31.07	-	-	Peak
494.6	20.71	-25.29	46	30.98	17.95	2.43	30.65	-	-	Peak
716.5	23.76	-22.24	46	29.9	21.28	2.98	30.4	-	-	Peak
2462	97.86	-	-	92.86	32.37	7.02	34.39	100	243	Average
2462	106.93	-	-	101.93	32.37	7.02	34.39	100	243	Peak
3693	43.51	-30.49	74	62.48	32.78	7.48	59.23	100	0	Peak
4929	44.06	-29.94	74	59.96	33.93	8.9	58.73	100	0	Peak
7386	42.26	-31.74	74	53.55	35.52	10.99	57.8	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	01	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
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	102.62	-	-	97.66	32.31	6.95	34.3	110	308	Average
2412	111.82	-	-	106.86	32.31	6.95	34.3	110	308	Peak
3615	44.35	-29.65	74	63.29	32.75	7.41	59.1	100	0	Peak
4824	40	-34	74	56.19	33.97	8.77	58.93	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	01	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	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	96.41	-	-	91.45	32.31	6.95	34.3	124	271	Average
2414	105.71	-	-	100.75	32.31	6.95	34.3	124	271	Peak
3618	44.49	-29.51	74	63.43	32.75	7.41	59.1	100	0	Peak
4824	41.95	-32.05	74	58.14	33.97	8.77	58.93	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	06	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 2440 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
2440	101.64	-	-	96.65	32.35	6.99	34.35	108	311	Average
2440	110.67	-	-	105.68	32.35	6.99	34.35	108	311	Peak
3657	43.74	-30.26	74	62.7	32.76	7.45	59.17	100	0	Peak
4875	40.22	-33.78	74	56.28	33.95	8.82	58.83	100	0	Peak
7311	42.29	-31.71	74	53.57	35.54	10.91	57.73	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	06	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 2440 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
2440	96.65	-	-	91.66	32.35	6.99	34.35	159	249	Average
2440	105.75	-	-	100.76	32.35	6.99	34.35	159	249	Peak
3651	44.19	-29.81	74	63.17	32.76	7.43	59.17	100	0	Peak
4875	40.88	-33.12	74	56.94	33.95	8.82	58.83	100	0	Peak
7311	42.32	-31.68	74	53.6	35.54	10.91	57.73	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	11	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
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	101.8	-	-	96.8	32.37	7.02	34.39	106	312	Average
2464	111.2	-	-	106.2	32.37	7.02	34.39	106	312	Peak
3693	44.13	-29.87	74	63.1	32.78	7.48	59.23	100	0	Peak
4923	40.99	-33.01	74	56.92	33.93	8.87	58.73	100	0	Peak
7386	42.21	-31.79	74	53.5	35.52	10.99	57.8	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	11	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	97.03	-	-	92.03	32.37	7.02	34.39	100	255	Average
2462	106.22	-	-	101.22	32.37	7.02	34.39	100	255	Peak
3693	43.35	-30.65	74	62.32	32.78	7.48	59.23	100	0	Peak
4923	43.12	-30.88	74	59.05	33.93	8.87	58.73	100	0	Peak
7386	43.42	-30.58	74	54.71	35.52	10.99	57.8	100	0	Peak

Test Mode :	802.11a	Temperature :	21~23°C
Test Channel :	149	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 5746 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
5746	95.89	-	-	84.66	35.34	10.06	34.17	104	0	Average
5746	106.03	-	-	94.8	35.34	10.06	34.17	104	0	Peak
11490	47.2	-26.8	74	51.46	38.38	14.33	56.97	100	0	Peak

Test Mode :	802.11a	Temperature :	21~23°C
Test Channel :	149	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 5747 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
5747	88.26	-	-	77.03	35.34	10.06	34.17	170	37	Average
5747	97.66	-	-	86.43	35.34	10.06	34.17	170	37	Peak
11490	46.63	-27.37	74	50.89	38.38	14.33	56.97	100	0	Peak

Test Mode :	802.11a	Temperature :	21~23°C
Test Channel :	157	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 5786 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
5786	94.96	-	-	83.74	35.38	10.07	34.23	103	0	Average
5786	104.72	-	-	93.5	35.38	10.07	34.23	103	0	Peak
11571	45.78	-28.22	74	49.69	38.46	14.41	56.78	100	0	Peak

Test Mode :	802.11a	Temperature :	21~23°C
Test Channel :	157	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 5786 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
5786	88.09	-	-	76.87	35.38	10.07	34.23	166	31	Average
5786	97.3	-	-	86.08	35.38	10.07	34.23	166	31	Peak
11571	46.42	-27.58	74	50.33	38.46	14.41	56.78	100	0	Peak

Test Mode :	802.11a	Temperature :	21~23°C
Test Channel :	165	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 5826 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
32.7	21.6	-18.4	40	35.18	17.24	0.56	31.38	100	358	Peak
120.18	20.91	-22.59	43.5	39.51	11.4	1.1	31.1	-	-	Peak
178.5	13.39	-30.11	43.5	34.05	9.03	1.25	30.94	-	-	Peak
409.2	17.1	-28.9	46	29.61	16.17	2.17	30.85	-	-	Peak
532.4	21.26	-24.74	46	31.1	18.38	2.51	30.73	-	-	Peak
657	23.39	-22.61	46	30.7	20.33	2.85	30.49	-	-	Peak
5826	93.74	-	-	82.5	35.4	10.11	34.27	102	0	Average
5826	103.99	-	-	92.75	35.4	10.11	34.27	102	0	Peak
11649	46.42	-27.58	74	50	38.51	14.52	56.61	100	0	Peak

Test Mode :	802.11a	Temperature :	21~23°C
Test Channel :	165	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 5824 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
41.34	25.04	-14.96	40	43.01	12.6	0.63	31.2	-	-	Peak
68.34	31.78	-8.22	40	55.89	6.32	0.83	31.26	123	32	Peak
119.1	27.35	-16.15	43.5	46	11.35	1.1	31.1	-	-	Peak
391.7	16.57	-29.43	46	29.81	15.58	2.12	30.94	-	-	Peak
507.9	19.8	-26.2	46	29.88	18.08	2.47	30.63	-	-	Peak
857.2	25.42	-20.58	46	29.29	23.23	3.28	30.38	-	-	Peak
5824	87.5	-	-	76.26	35.4	10.11	34.27	189	262	Average
5824	97.07	-	-	85.83	35.4	10.11	34.27	189	262	Peak
11649	47.33	-26.67	74	50.91	38.51	14.52	56.61	100	0	Peak

Test Mode :	5GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	149	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 5746 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
5746	96.81	-	-	85.58	35.34	10.06	34.17	151	0	Average
5746	106.08	-	-	94.85	35.34	10.06	34.17	151	0	Peak
11490	46.54	-27.46	74	50.8	38.38	14.33	56.97	100	0	Peak

Test Mode :	5GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	149	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 5744 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
5744	89.76	-	-	78.53	35.34	10.06	34.17	151	278	Average
5744	99.21	-	-	87.98	35.34	10.06	34.17	151	278	Peak
11490	46.42	-27.58	74	50.68	38.38	14.33	56.97	100	0	Peak

Test Mode :	5GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	157	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 5784 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
5784	96.39	-	-	85.18	35.37	10.07	34.23	151	0	Average
5784	105.58	-	-	94.37	35.37	10.07	34.23	151	0	Peak
11571	46.56	-27.44	74	50.47	38.46	14.41	56.78	100	0	Peak

Test Mode :	5GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	157	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 5786 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
5786	88.45	-	-	77.23	35.38	10.07	34.23	165	29	Average
5786	98.16	-	-	86.94	35.38	10.07	34.23	165	29	Peak
11571	46.29	-27.71	74	50.2	38.46	14.41	56.78	100	0	Peak

Test Mode :	5GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	165	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	1. 5824 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
5824	95.92	-	-	84.68	35.4	10.11	34.27	163	0	Average
5824	106.17	-	-	94.93	35.4	10.11	34.27	163	0	Peak
11649	46.56	-27.44	74	50.14	38.51	14.52	56.61	100	0	Peak

Test Mode :	5GHz 802.11n HT20	Temperature :	21~23°C
Test Channel :	165	Relative Humidity :	45~48%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	1. 5826 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
5826	87.66	-	-	76.42	35.4	10.11	34.27	166	28	Average
5826	97.68	-	-	86.44	35.4	10.11	34.27	166	28	Peak
11649	46.33	-27.67	74	49.91	38.51	14.52	56.61	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 (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.

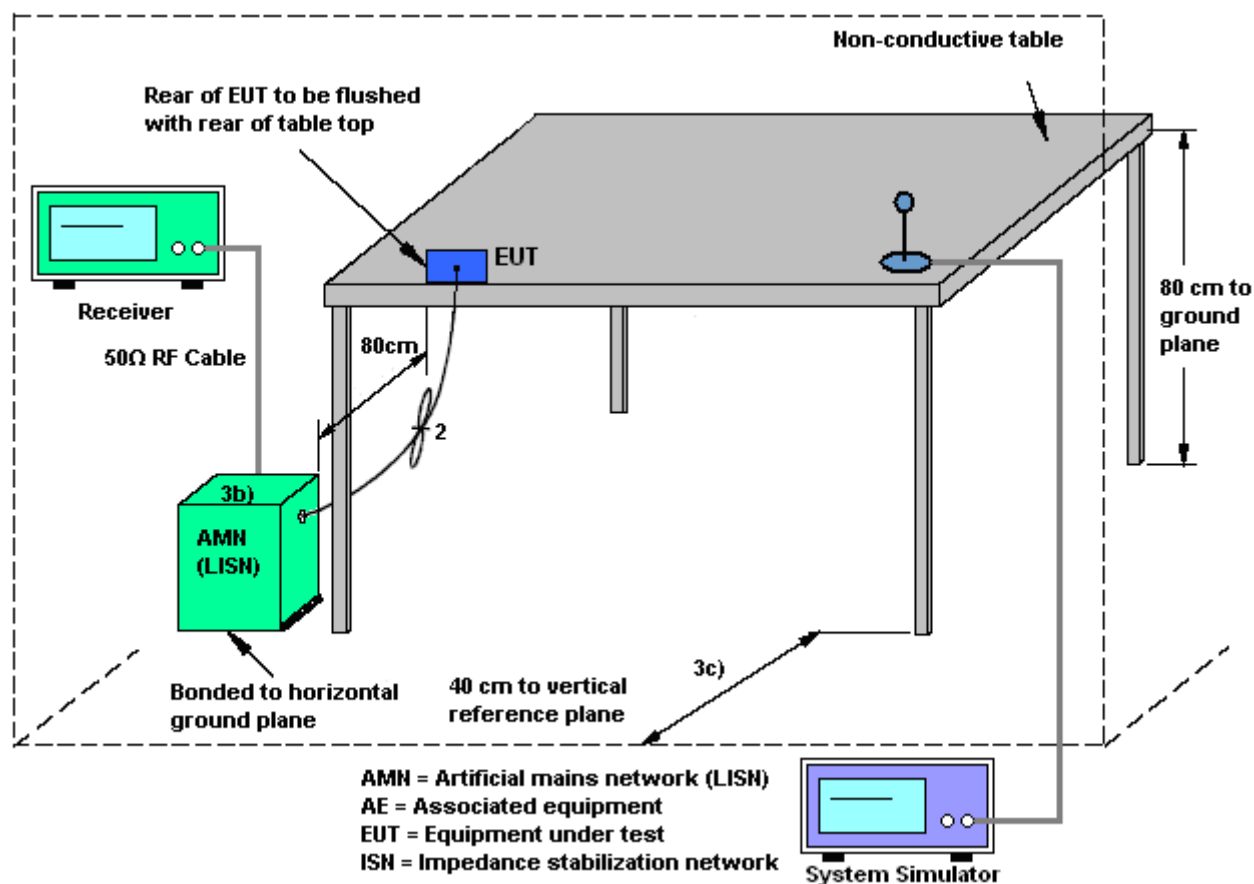
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

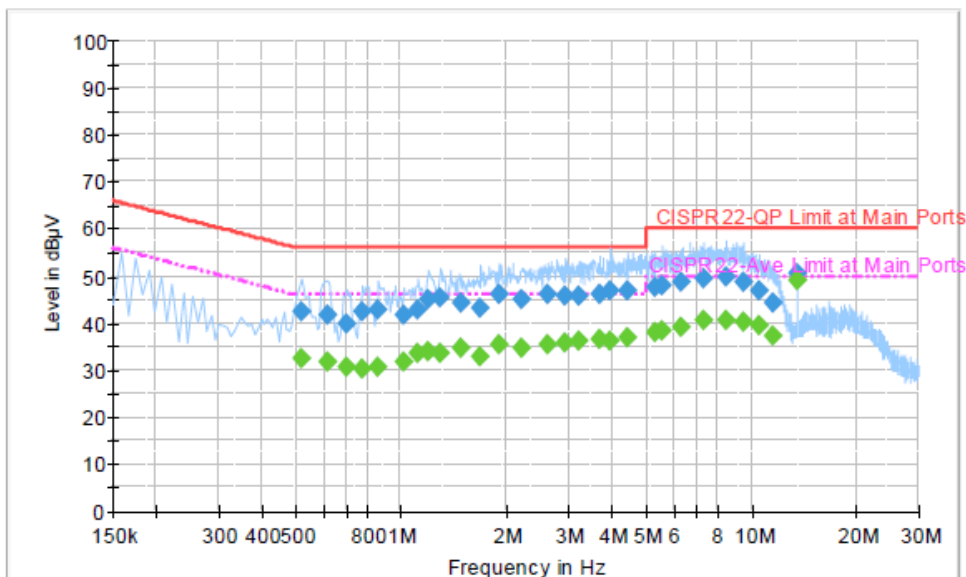
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

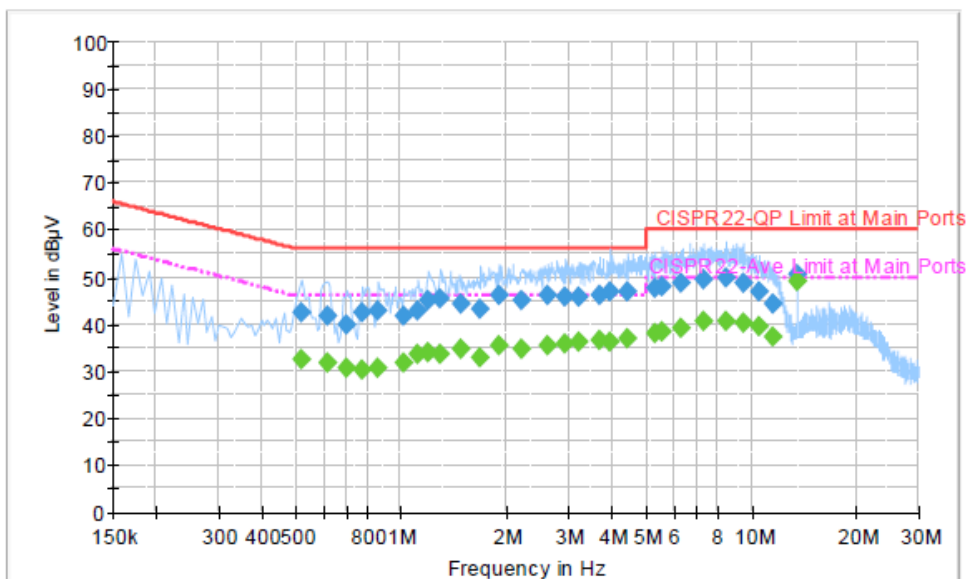
Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		



Final Result : Quasi-Peak

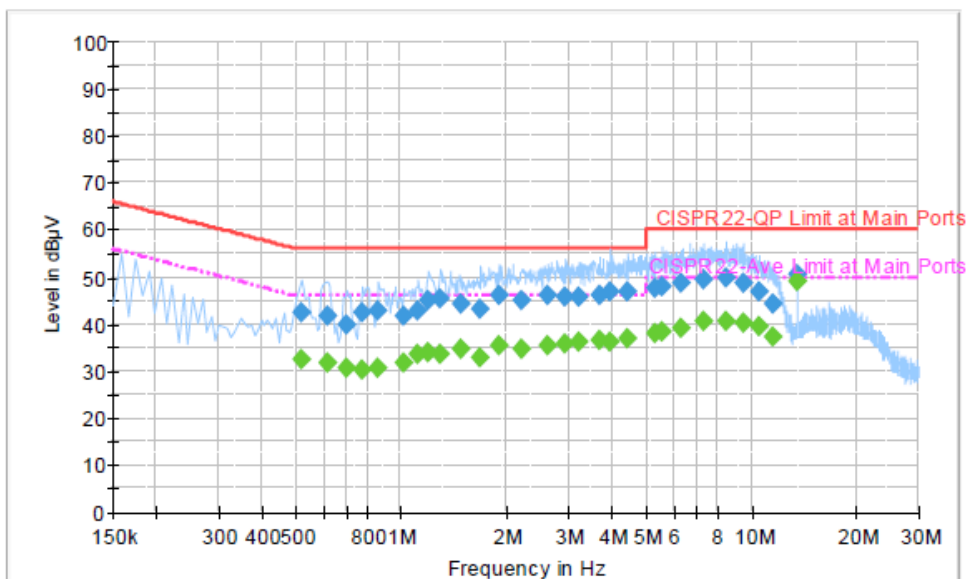
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.518000	42.6	Off	L1	19.3	13.4	56.0
0.614000	41.7	Off	L1	19.4	14.3	56.0
0.702000	39.9	Off	L1	19.5	16.1	56.0
0.774000	42.5	Off	L1	19.4	13.5	56.0
0.862000	42.7	Off	L1	19.5	13.3	56.0
1.014000	41.6	Off	L1	19.5	14.4	56.0
1.118000	42.8	Off	L1	19.5	13.2	56.0
1.198000	45.0	Off	L1	19.6	11.0	56.0
1.294000	45.3	Off	L1	19.5	10.7	56.0
1.486000	44.2	Off	L1	19.5	11.8	56.0
1.686000	43.3	Off	L1	19.5	12.7	56.0
1.894000	46.3	Off	L1	19.6	9.7	56.0
2.214000	45.2	Off	L1	19.6	10.8	56.0
2.614000	46.0	Off	L1	19.6	10.0	56.0
2.950000	45.8	Off	L1	19.6	10.2	56.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Quasi-Peak

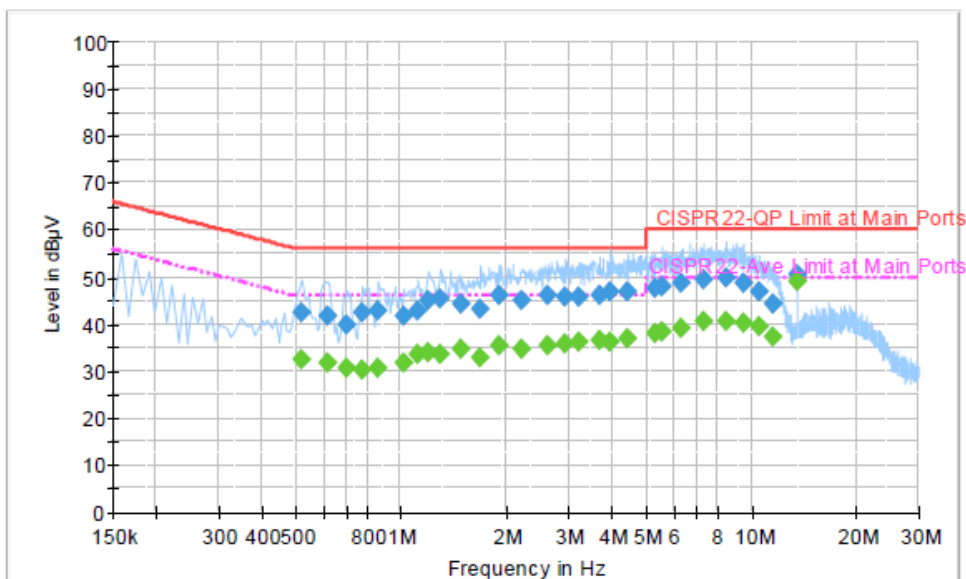
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
3.222000	45.8	Off	L1	19.6	10.2	56.0
3.678000	46.0	Off	L1	19.6	10.0	56.0
3.942000	46.7	Off	L1	19.6	9.3	56.0
4.446000	47.0	Off	L1	19.6	9.0	56.0
5.294000	47.8	Off	L1	19.6	12.2	60.0
5.574000	48.1	Off	L1	19.6	11.9	60.0
6.278000	48.5	Off	L1	19.6	11.5	60.0
7.286000	49.4	Off	L1	19.6	10.6	60.0
8.430000	49.8	Off	L1	19.6	10.2	60.0
9.470000	48.8	Off	L1	19.7	11.2	60.0
10.502000	46.9	Off	L1	19.7	13.1	60.0
11.566000	44.3	Off	L1	19.7	15.7	60.0
13.558000	50.7	Off	L1	19.8	9.3	60.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Average

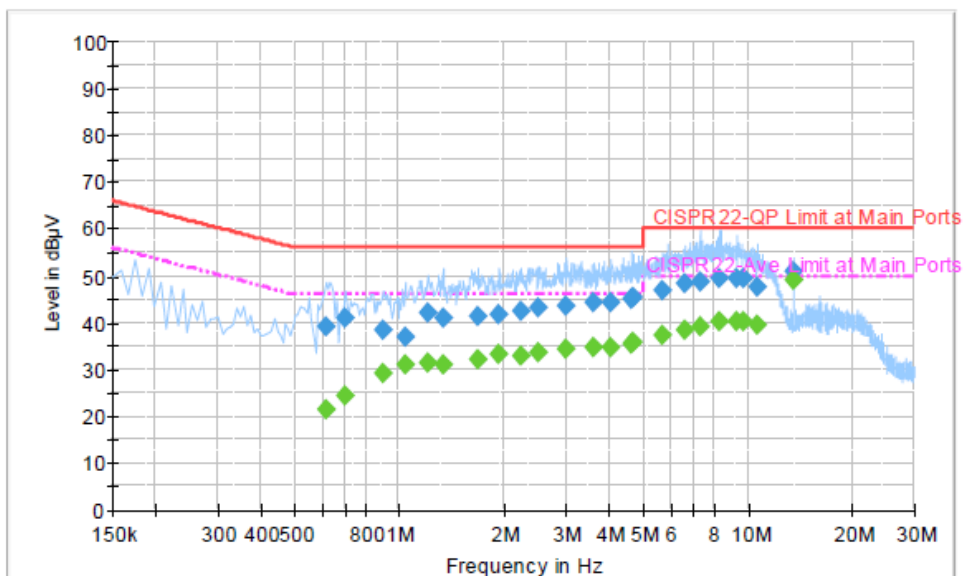
Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.518000	32.3	Off	L1	19.3	13.7	46.0
0.614000	31.7	Off	L1	19.4	14.3	46.0
0.702000	30.7	Off	L1	19.5	15.3	46.0
0.774000	30.1	Off	L1	19.4	15.9	46.0
0.862000	30.7	Off	L1	19.5	15.3	46.0
1.014000	31.7	Off	L1	19.5	14.3	46.0
1.118000	33.5	Off	L1	19.5	12.5	46.0
1.198000	33.8	Off	L1	19.6	12.2	46.0
1.294000	33.7	Off	L1	19.5	12.3	46.0
1.486000	34.9	Off	L1	19.5	11.1	46.0
1.686000	32.7	Off	L1	19.5	13.3	46.0
1.894000	35.6	Off	L1	19.6	10.4	46.0
2.214000	34.9	Off	L1	19.6	11.1	46.0
2.614000	35.3	Off	L1	19.6	10.7	46.0
2.950000	35.8	Off	L1	19.6	10.2	46.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Average

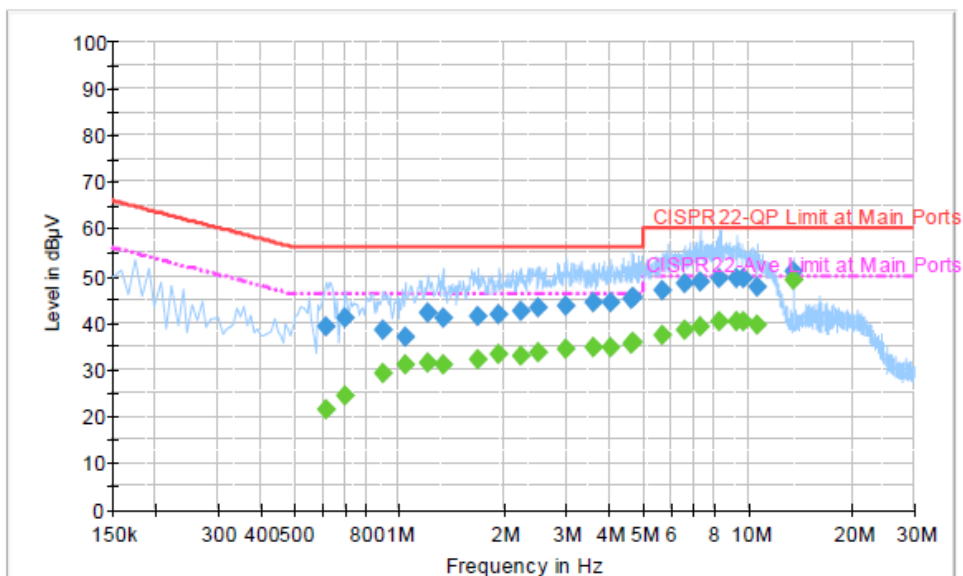
Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
3.222000	36.1	Off	L1	19.6	9.9	46.0
3.678000	36.6	Off	L1	19.6	9.4	46.0
3.942000	36.3	Off	L1	19.6	9.7	46.0
4.446000	36.9	Off	L1	19.6	9.1	46.0
5.294000	37.9	Off	L1	19.6	12.1	50.0
5.574000	38.4	Off	L1	19.6	11.6	50.0
6.278000	39.0	Off	L1	19.6	11.0	50.0
7.286000	40.4	Off	L1	19.6	9.6	50.0
8.430000	40.7	Off	L1	19.6	9.3	50.0
9.470000	40.1	Off	L1	19.7	9.9	50.0
10.502000	39.3	Off	L1	19.7	10.7	50.0
11.566000	37.2	Off	L1	19.7	12.8	50.0
13.558000	49.0	Off	L1	19.8	1.0	50.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Quasi-Peak

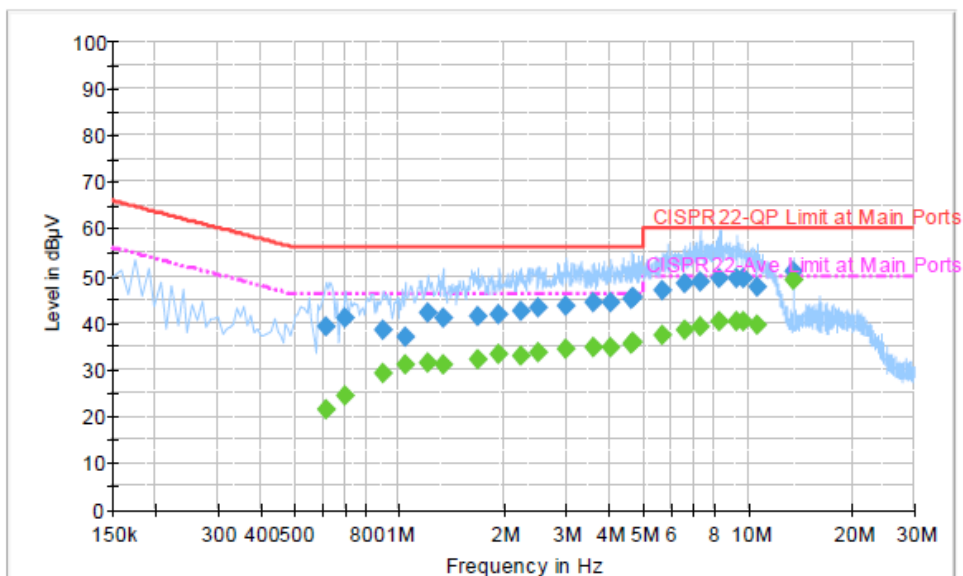
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.614000	39.0	Off	N	19.4	17.0	56.0
0.702000	41.0	Off	N	19.5	15.0	56.0
0.902000	38.3	Off	N	19.5	17.7	56.0
1.038000	36.7	Off	N	19.5	19.3	56.0
1.206000	42.1	Off	N	19.6	13.9	56.0
1.334000	40.8	Off	N	19.5	15.2	56.0
1.678000	41.3	Off	N	19.5	14.7	56.0
1.934000	41.6	Off	N	19.5	14.4	56.0
2.222000	42.5	Off	N	19.6	13.5	56.0
2.510000	43.2	Off	N	19.6	12.8	56.0
3.014000	43.4	Off	N	19.6	12.6	56.0
3.622000	44.2	Off	N	19.6	11.8	56.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Quasi-Peak

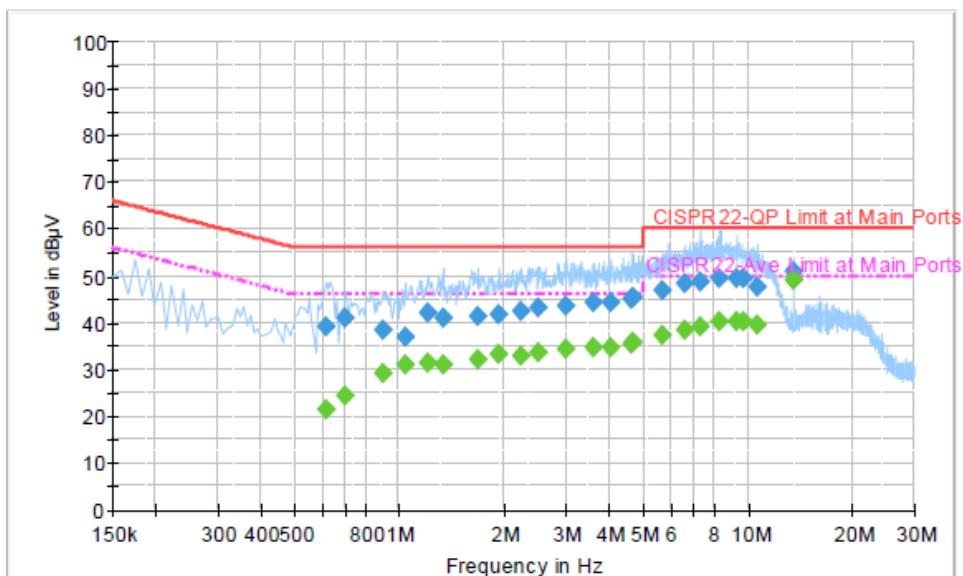
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
4.046000	44.1	Off	N	19.6	11.9	56.0
4.630000	45.1	Off	N	19.7	10.9	56.0
4.686000	45.2	Off	N	19.6	10.8	56.0
5.670000	46.7	Off	N	19.7	13.3	60.0
6.614000	48.5	Off	N	19.7	11.5	60.0
7.262000	48.8	Off	N	19.7	11.2	60.0
8.294000	49.3	Off	N	19.7	10.7	60.0
9.254000	49.6	Off	N	19.7	10.4	60.0
9.670000	49.5	Off	N	19.8	10.5	60.0
10.670000	47.6	Off	N	19.7	12.4	60.0
13.558000	51.0	Off	N	19.9	9.0	60.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.614000	21.4	Off	N	19.4	24.6	46.0
0.702000	24.5	Off	N	19.5	21.5	46.0
0.902000	29.2	Off	N	19.5	16.8	46.0
1.038000	31.1	Off	N	19.5	14.9	46.0
1.206000	31.4	Off	N	19.6	14.6	46.0
1.334000	31.2	Off	N	19.5	14.8	46.0
1.678000	32.3	Off	N	19.5	13.7	46.0
1.934000	33.2	Off	N	19.5	12.8	46.0
2.222000	32.9	Off	N	19.6	13.1	46.0
2.510000	33.6	Off	N	19.6	12.4	46.0
3.014000	34.4	Off	N	19.6	11.6	46.0
3.622000	34.7	Off	N	19.6	11.3	46.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 (GPRS class 8) Idle + Bluetooth Link + TC+ TF + GPS Rx + Battery 2 + Bluetooth Base (Charging from Adapter 1) + USB flash drive + Micro USB Cable (Data Link with notebook) + RJ-45 (Load) + RJ-11 (Load) + RS232 (Load)		


Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
4.046000	34.6	Off	N	19.6	11.4	46.0
4.630000	35.3	Off	N	19.7	10.7	46.0
4.686000	35.8	Off	N	19.6	10.2	46.0
5.670000	37.3	Off	N	19.7	12.7	50.0
6.614000	38.5	Off	N	19.7	11.5	50.0
7.262000	39.2	Off	N	19.7	10.8	50.0
8.294000	40.1	Off	N	19.7	9.9	50.0
9.254000	40.2	Off	N	19.7	9.8	50.0
9.670000	40.1	Off	N	19.8	9.9	50.0
10.670000	39.4	Off	N	19.7	10.6	50.0
13.558000	48.9	Off	N	19.9	1.1	50.0



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. 18, 2014 ~ Apr. 21, 2014	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 17, 2013	Apr. 18, 2014 ~ Apr. 21, 2014	Aug. 16, 2014	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 17, 2013	Apr. 18, 2014 ~ Apr. 21, 2014	Aug. 16, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9 kHz~7 GHz	Sep. 06, 2013	Apr. 24, 2014 ~ Apr. 25, 2014	Sep. 05, 2014	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	101749	10Hz ~ 30GHz	Feb. 10, 2014	Apr. 24, 2014 ~ Apr. 25, 2014	Feb. 09, 2015	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MHz	Jul. 03, 2012	Apr. 24, 2014 ~ Apr. 25, 2014	Jul. 03, 2014	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30 MHz ~ 1 GHz	Oct. 10, 2013	Apr. 24, 2014 ~ Apr. 25, 2014	Oct. 09, 2014	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1 GHz~18 GHz	Aug. 22, 2013	Apr. 24, 2014 ~ Apr. 25, 2014	Aug. 21, 2014	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15 GHz- 40 GHz	Oct. 03, 2013	Apr. 24, 2014 ~ Apr. 25, 2014	Oct. 02, 2014	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10 MHz ~ 1000MHz 32dB GAIN	Mar. 17, 2014	Apr. 24, 2014 ~ Apr. 25, 2014	Mar. 16, 2015	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1 GHz~26.5 GHz	Nov. 29, 2013	Apr. 24, 2014 ~ Apr. 25, 2014	Nov. 28, 2014	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	DC~18 G High Gain	Jul. 09, 2013	Apr. 24, 2014 ~ Apr. 25, 2014	Jul. 08, 2014	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Apr. 24, 2014 ~ Apr. 25, 2014	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Apr. 24, 2014 ~ Apr. 25, 2014	N/A	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 15, 2013	Apr. 23, 2014 ~ Apr. 28, 2014	Nov. 14, 2014	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2013	Apr. 23, 2014 ~ Apr. 28, 2014	Dec. 11, 2014	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 04, 2013	Apr. 23, 2014 ~ Apr. 28, 2014	Dec. 03, 2014	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 23, 2014 ~ Apr. 28, 2014	N/A	Conduction (CO05-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
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.50
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