



FCC RF Test Report

APPLICANT : MitraStar Technology Corporation
EQUIPMENT : TD-LTE Outdoor CPE
BRAND NAME : Huawei; MitraStar
MODEL NAME : B222s-41(Huawei) ;
M4G-301M2W/M4G-301M1W/M4G-301M-12V(MitraStar)
FCC ID : ZMYM4G-301
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Mar. 13, 2012 and completely tested on Apr. 11, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai / Manager



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



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)	A8.4	Power Output	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(d)	A8.5	Frequency Band Edges	$\leq 20\text{dBc}$	Pass	-
3.4	15.247(d)	A8.5	Spurious Emission	< 20 dBc	Pass	-
3.5	15.247(e)	A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Pass	-
3.6	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 5.70 dB at 0.150 MHz
3.7	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.48 dB at 49.170 MHz
3.8	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

MitraStar Technology Corporation

No. 6, Innovation Road II Hsinchu Science Park, Hsinchu 300

1.2 Manufacturer

MitraStar Technology Corporation

No. 6, Innovation Road II Hsinchu Science Park, Hsinchu 300

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	TD-LTE Outdoor CPE
Brand Name	Huawei; MitraStar
Model Name	B222s-41(Huawei) ; M4G-301M2W/M4G-301M1W/M4G-301M-12V(MitraStar)
FCC ID	ZMYM4G-301
Sample 1	EUT with two RJ-11 Ports
Sample 2	EUT with one RJ-11 Port
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	11
Carrier Frequency of Each Channel	2412+(n-1)*5 MHz; n=1~11
Channel Spacing	5 MHz
Maximum Output Power to Antenna	802.11b : 17.70 dBm (0.0589 W) 802.11g : 15.66 dBm (0.0368 W) 802.11g/n (BW 20MHz) : 14.69 dBm (0.0294 W) 802.11g/n (BW 40MHz) : 14.55 dBm (0.0284 W)
Duty Cycle	802.11b : 100.00% 802.11g : 85.65% 802.11g/n (BW 20MHz) : 85.23% 802.11g/n (BW 40MHz) : 74.01%
Antenna Type	PCB Antenna with gain 3.00 dBi
Type of Modulation	802.11b : DSSS (BPSK / QPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Production Unit

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 Testing Site

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.		FCC/IC Registration No.
	CO05-HY	03CH07-HY	722060/4086B-1

1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01
- ANSI C63.4-2003
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3

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.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	R&S	CMW 500	N/A	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	P20G	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Phone	HTT	HTT-806	N/A	N/A	N/A
4.	Phone	HTT	HTT-198	N/A	N/A	N/A
5.	LTE CPE	MitraStar	M4G-301M2W	N/A	N/A	N/A



2 Test Configuration of Equipment Under Test

2.1 Pre-Scanned RF Power

Preliminary tests were performed in different data rate as below table and the highest power data rates (11b, 11g, 11g/n (BW 20MHz), 11g/n (BW 40MHz) modes) were chosen for full test in the following sections to demonstrate compliance to the FCC limit line.

2.4GHz 802.11b mode								
Data Rate (MHz)	1M bps	2M bps	5.5M bps	11M bps				
Peak Power (dBm)	17.70	17.54	17.46	17.55				
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)	15.66	15.64	15.03	15.04	15.06	14.45	14.05	14.02
2.4GHz 802.11g/n (BW 20MHz) mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	14.69	13.99	13.63	13.59	13.05	12.64	12.57	12.30
Data Rate (MHz)	MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
Peak Power (dBm)	13.87	13.28	12.86	12.55	12.02	11.58	11.39	11.36
2.4GHz 802.11g/n (BW 40MHz) mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	14.55	13.83	13.55	13.33	12.80	12.23	12.11	11.86
Data Rate (MHz)	MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
Peak Power (dBm)	14.04	12.94	12.36	12.18	11.80	11.00	10.99	10.86



2.2 Maximum Peak Conducted Output Power:

Band	2.4GHz 802.11b RF Power (dBm)			2.4GHz 802.11g RF Power (dBm)		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Peak Power	17.52	17.70	17.46	15.66	15.53	15.61

Band	2.4GHz 802.11g/n (BW 20MHz) RF Peak Power (dBm)		
Channel	1	6	11
Frequency (MHz)	2412	2437	2462
Peak Power	14.69	14.50	14.58

Band	2.4GHz 802.11g/n (BW 40MHz) RF Peak Power (dBm)		
Channel	3	6	09
Frequency (MHz)	2422	2437	2452
Peak Power	14.26	14.55	14.54

Remark:

The data rates of WLAN 802.11b/g/n were set in 1Mbps for 802.11b, 6Mbps for 802.11g, MCS0 for 802.11g/n (BW 20MHz), and MCS0 for 802.11g/n (BW 40MHz) for all the test cases due to the highest RF output power.



2.3 Maximum Average Conducted Output Power:

Band	2.4GHz 802.11b RF Power (dBm)			2.4GHz 802.11g RF Power (dBm)		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	14.87	15.12	14.90	9.63	9.47	9.54

Band	2.4GHz 802.11g/n (BW 20MHz) RF Peak Power (dBm)		
Channel	1	6	11
Frequency (MHz)	2412	2437	2462
Average Power	8.27	7.97	8.18

Band	2.4GHz 802.11g/n (BW 40MHz) RF Peak Power (dBm)		
Channel	3	6	09
Frequency (MHz)	2422	2437	2452
Average Power	8.27	8.57	8.54

Remark:

1. The average power, which is used by the test method, AVG2, in DTS Meas. Guidance v01, is reporting only.
2. The EUT is programmed to transmit signals continuously.



2.4 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 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), radiated emission (30 MHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

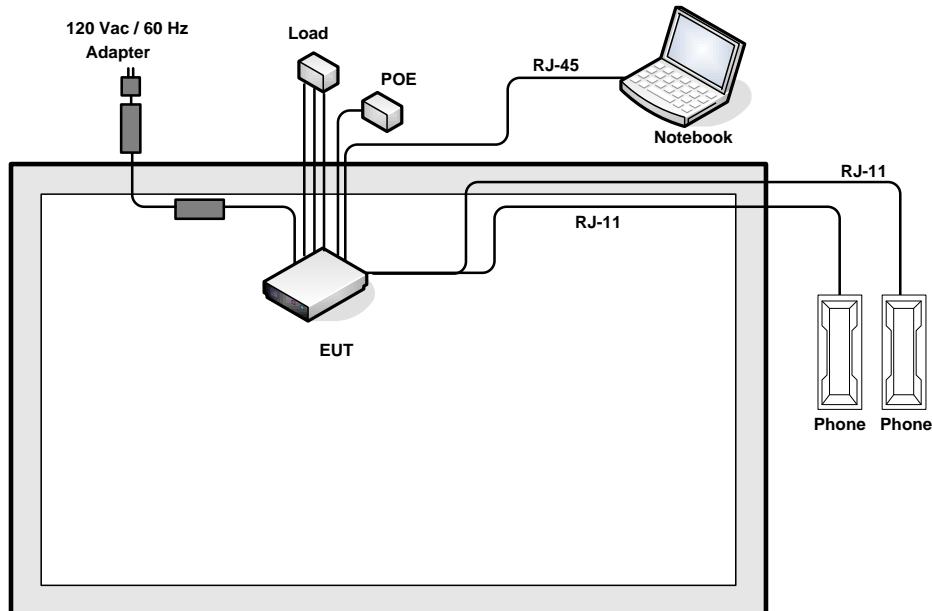
Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

Test Cases		
Test Item	802.11b (Modulation : DSSS)	802.11g/n (Modulation : OFDM)
Conducted TCs	Mode 1 : 802.11b CH01_2412 MHz Mode 2 : 802.11b CH06_2437 MHz Mode 3 : 802.11b CH11_2462 MHz	Mode 4: 802.11g_CH01_2412 MHz Mode 5: 802.11g_CH06_2437 MHz Mode 6: 802.11g_CH11_2462 MHz Mode 7: 802.11g/n (BW 20M)_CH01_2412 MHz Mode 8: 802.11g/n (BW 20M)_CH06_2437 MHz Mode 9: 802.11g/n (BW 20M)_CH11_2462 MHz Mode 10: 802.11g/n (BW 40M)_CH03_2422 MHz Mode 11: 802.11g/n (BW 40M)_CH06_2437 MHz Mode 12: 802.11g/n (BW 40M)_CH09_2452 MHz
Radiated TCs	Mode 1 : 802.11b CH01_2412 MHz for Sample 1 Mode 2 : 802.11b CH06_2437 MHz for Sample 1 Mode 3 : 802.11b CH11_2462 MHz for Sample 1 Mode 4: 802.11b CH11_2462 MHz for Sample 2	Mode 5: 802.11g_CH01_2412 MHz for Sample 1 Mode 6: 802.11g_CH06_2437 MHz for Sample 1 Mode 7: 802.11g_CH11_2462 MHz for Sample 1 Mode 8: 802.11g/n (BW 20M)_CH01_2412 MHz for Sample 1 Mode 9: 802.11g/n (BW 20M)_CH06_2437 MHz for Sample 1 Mode 10: 802.11g/n (BW 20M)_CH11_2462 MHz for Sample 1 Mode 11: 802.11g/n (BW 40M)_CH03_2422 MHz for Sample 1 Mode 12: 802.11g/n (BW 40M)_CH06_2437 MHz for Sample 1 Mode 13: 802.11g/n (BW 40M)_CH09_2452 MHz for Sample 1
AC Conducted Emission	Mode 1 : WLAN Link + LTE Link + RJ-45 (LAN Link) + POE + VOIP + Adapter for Sample 1 Mode 2 : WLAN Link + LTE Link + RJ-45 (LAN Link) + POE + VOIP + Adapter for Sample 2	

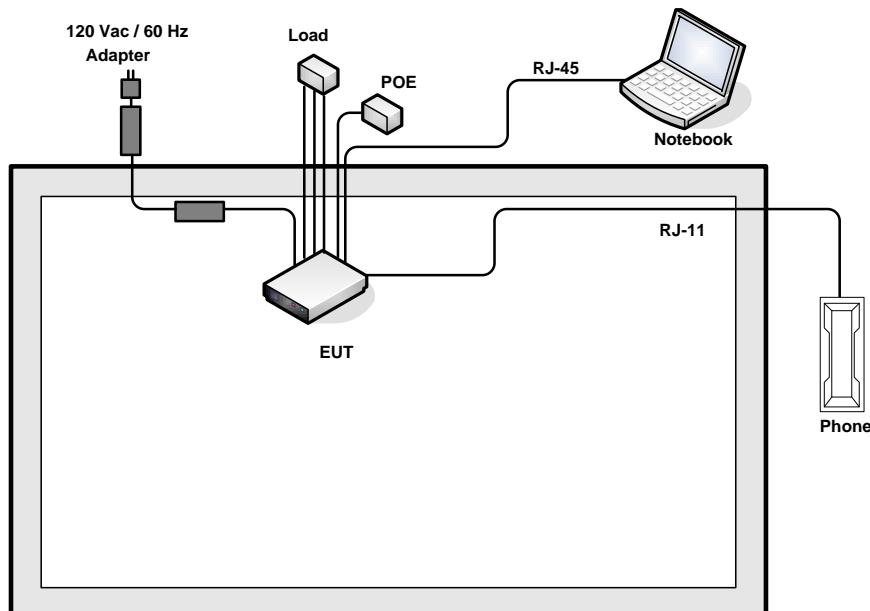
Remark: The worst case of conducted emission is mode 1; only the test data of it was reported.

2.5 Connection Diagram of Test System

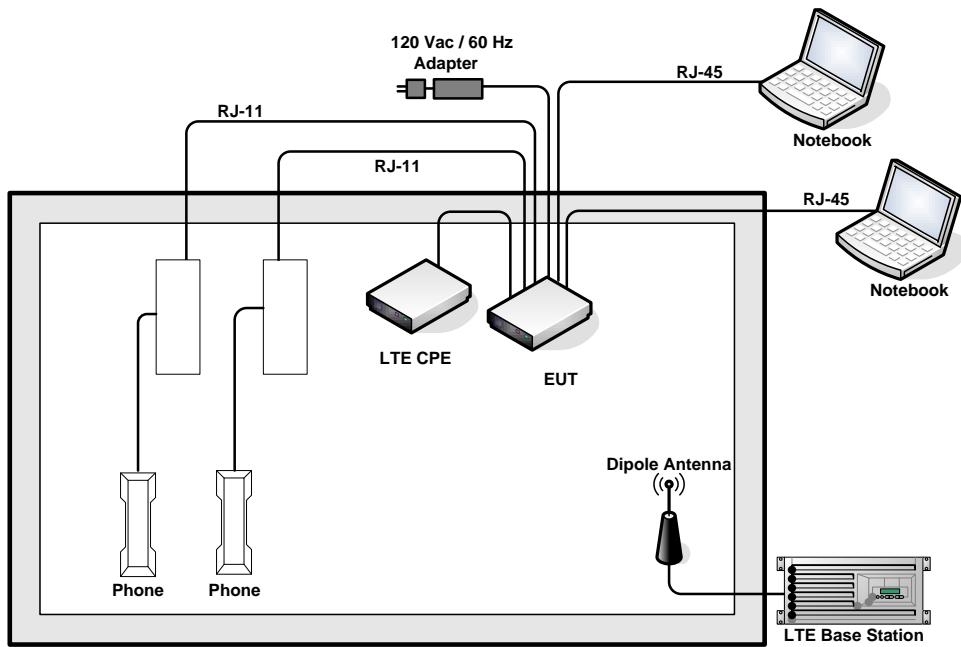
<WLAN Tx Mode for Sample 1>



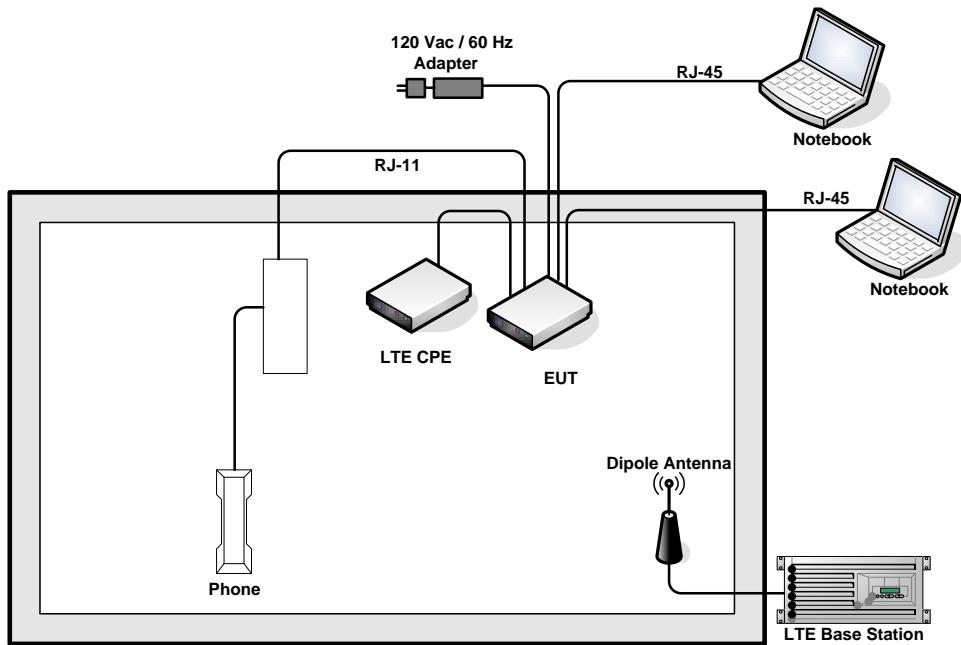
<WLAN Tx Mode for Sample 2>



<AC Conducted Emission for Sample 1>



<AC Conducted Emission for Sample 2>





2.6 RF Utility

The programmed RF utility “RT3x9xQA” which is installed in notebook, 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.

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

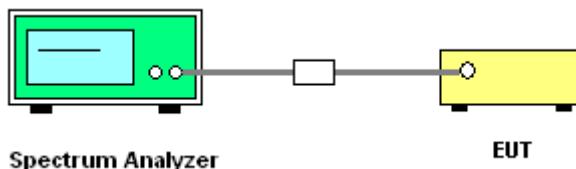
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. The path loss was compensated to the results for each measurement.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 1-5% of the emission bandwidth (EBW). Set the Video bandwidth (VBW) $\geq 3 * \text{RBW}$. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 KHz.
4. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

3.1.4 Test Setup



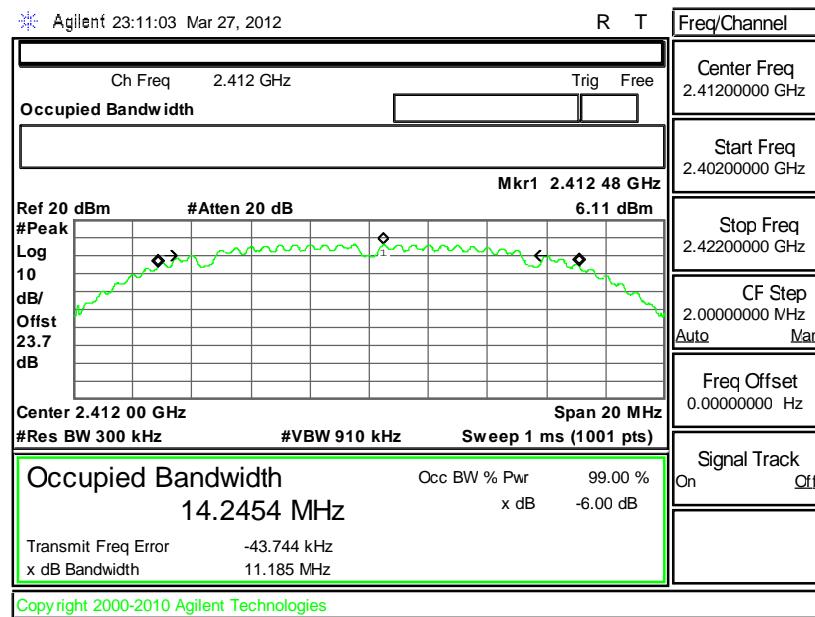


3.1.5 Test Result of 6dB Bandwidth

Test Mode :	Mode 1, 2, 3	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

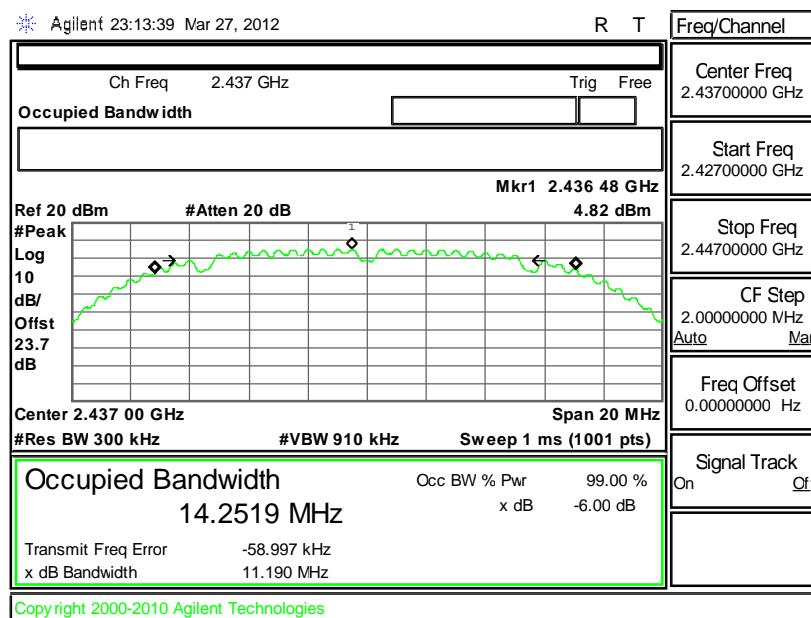
Channel	Frequency (MHz)	802.11b 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	11.185	0.5	Pass
06	2437	11.190	0.5	Pass
11	2462	10.324	0.5	Pass

Mode 1 : 6 dB Bandwidth Plot on 802.11b Channel 01

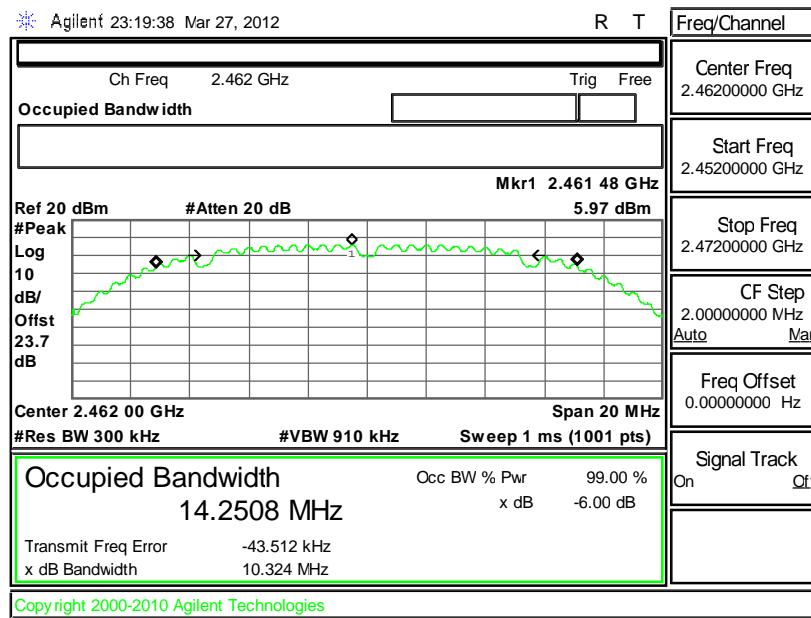




Mode 2 : 6 dB Bandwidth Plot on 802.11b Channel 06



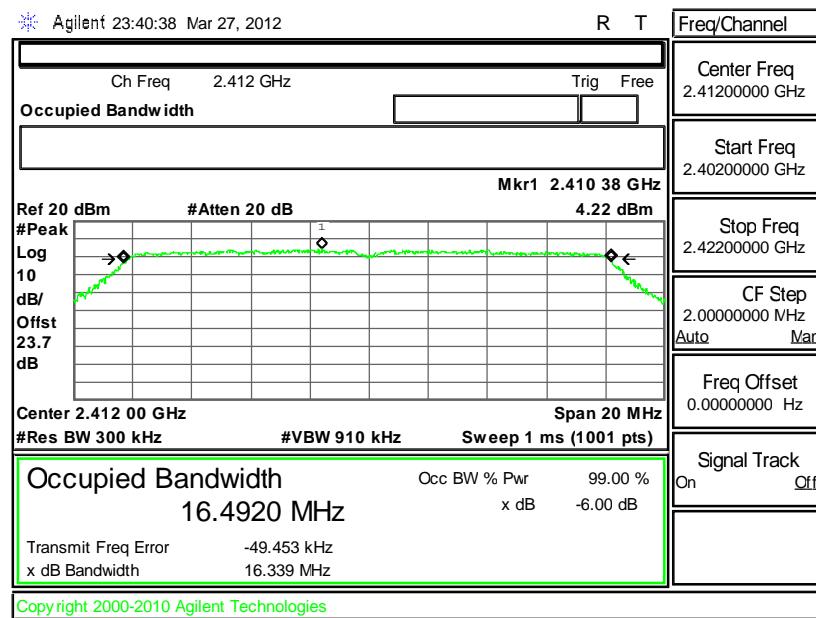
Mode 3 : 6 dB Bandwidth Plot on 802.11b Channel 11





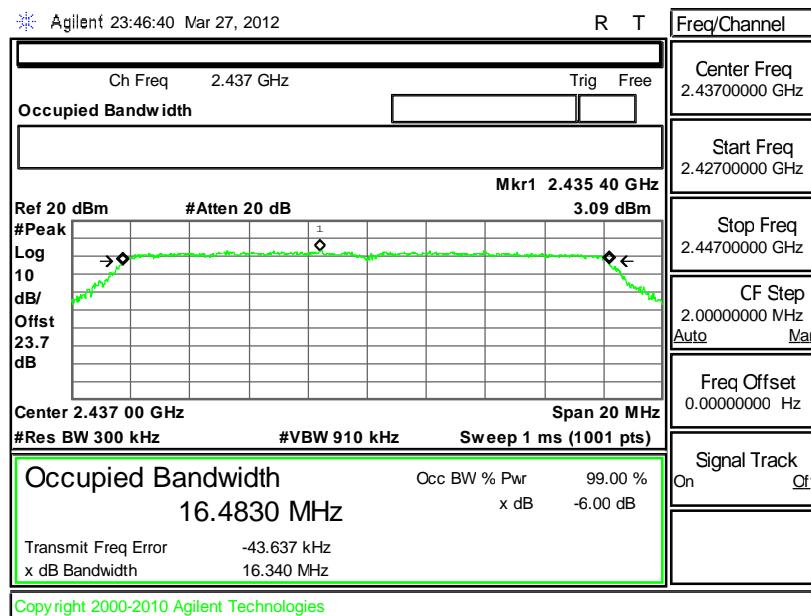
Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	16.339	0.5	Pass
06	2437	16.340	0.5	Pass
11	2462	16.362	0.5	Pass

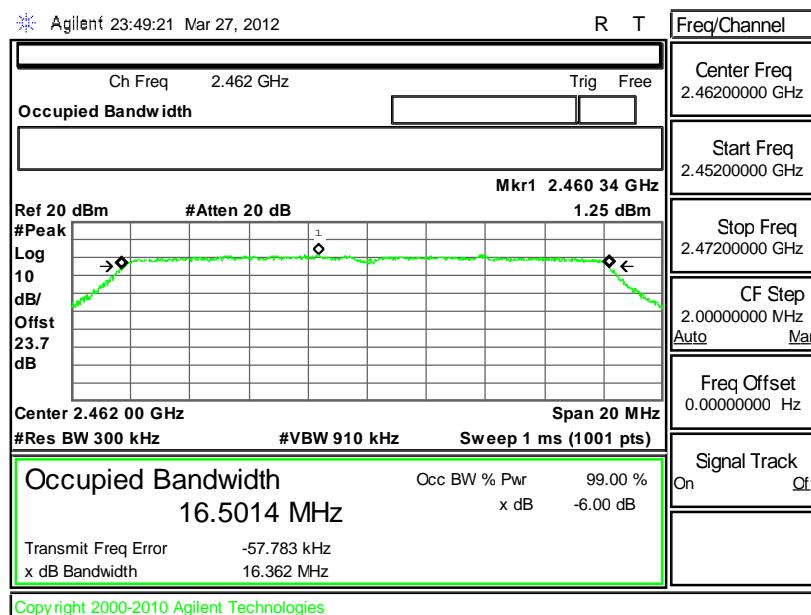
Mode 4 : 6 dB Bandwidth Plot on 802.11g Channel 01



Mode 5 : 6 dB Bandwidth Plot on 802.11g Channel 06



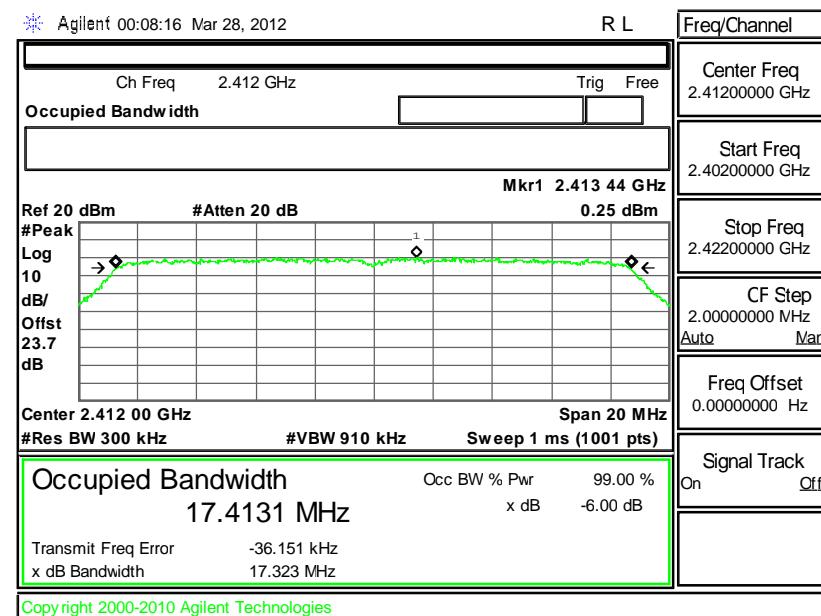
Mode 6 : 6 dB Bandwidth Plot on 802.11g Channel 11





Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

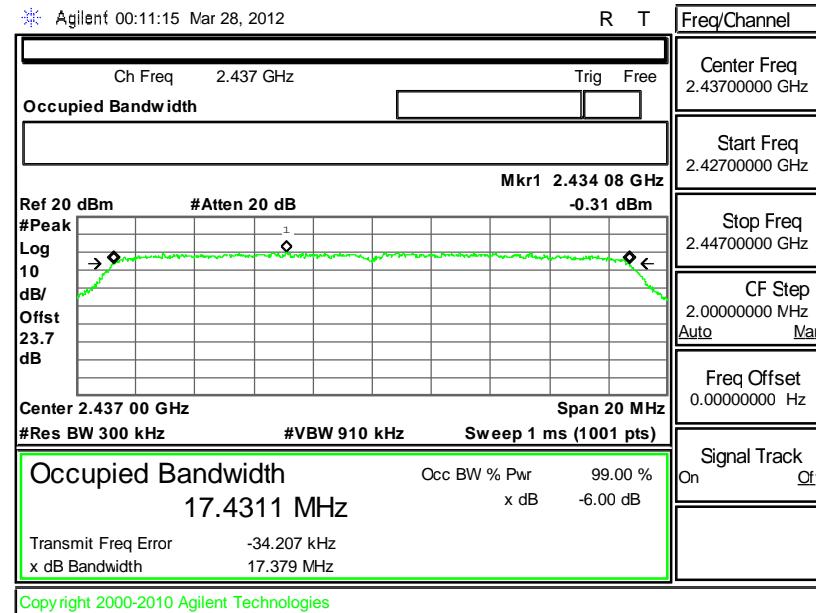
Channel	Frequency (MHz)	802.11g/n (BW 20MHz) 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	17.323	0.5	Pass
06	2437	17.379	0.5	Pass
11	2462	17.290	0.5	Pass

Mode 7 : 6 dB Bandwidth Plot on 802.11g/n(BW 20MHz) Channel**01**



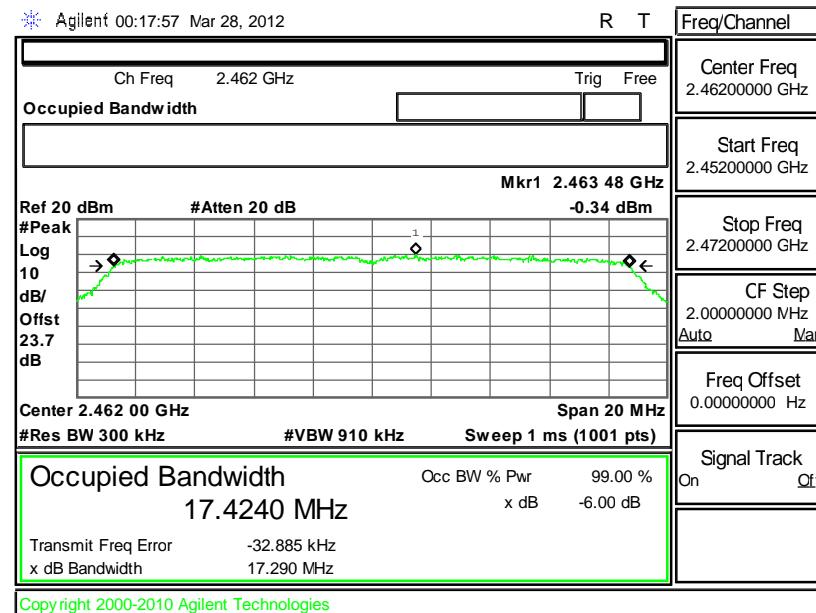
Mode 8 : 6 dB Bandwidth Plot on 802.11g/n(BW 20MHz) Channel

06



Mode 9 : 6 dB Bandwidth Plot on 802.11g/n(BW 20MHz) Channel

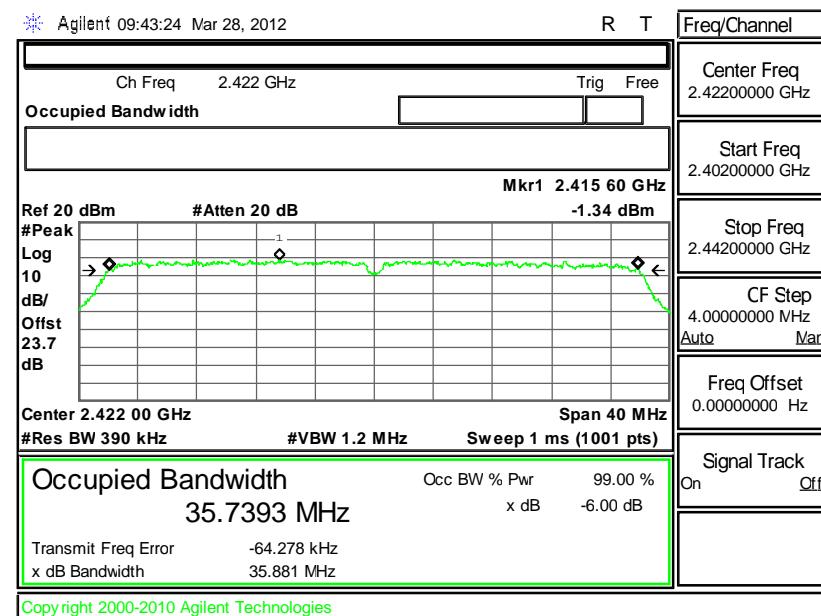
11





Test Mode :	Mode 10, 11, 12	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

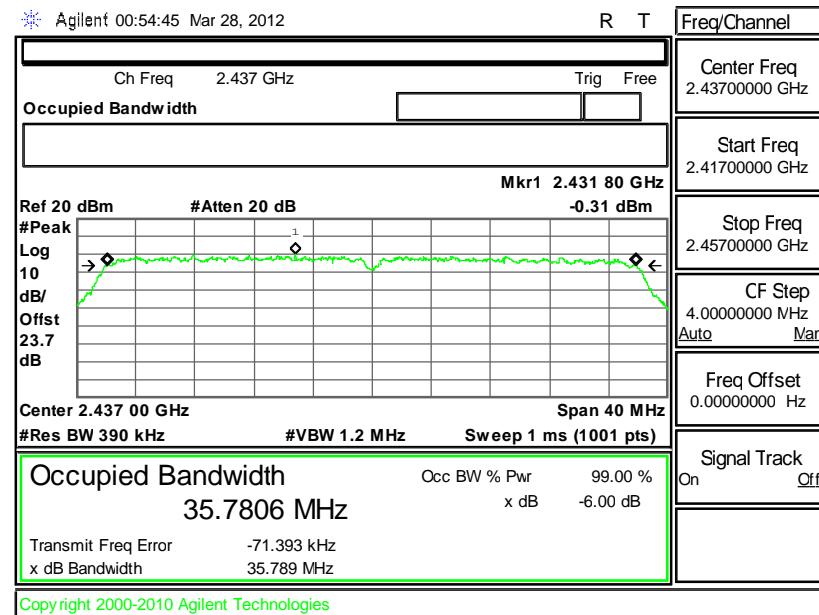
Channel	Frequency (MHz)	802.11g/n (BW 40MHz) 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
03	2422	35.881	0.5	Pass
06	2437	35.789	0.5	Pass
09	2452	35.832	0.5	Pass

Mode 10 : 6 dB Bandwidth Plot on 802.11g/n(BW 40MHz) Channel**03**



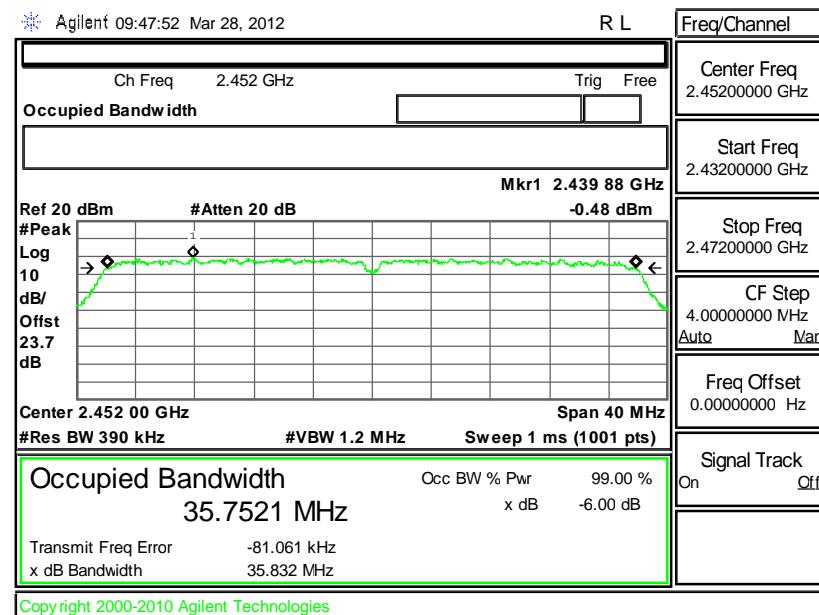
Mode 11 : 6 dB Bandwidth Plot on 802.11g/n(BW 40MHz) Channel

06



Mode 12 : 6 dB Bandwidth Plot on 802.11g/n(BW 40MHz) Channel

09



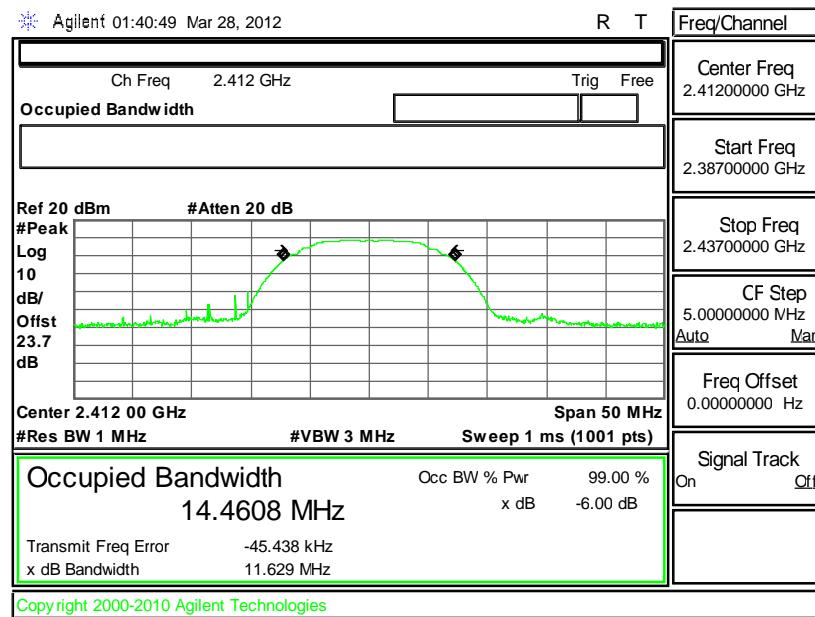


3.1.6 Test Result of 99% Occupied Bandwidth

Test Mode :	Mode 1, 2, 3	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

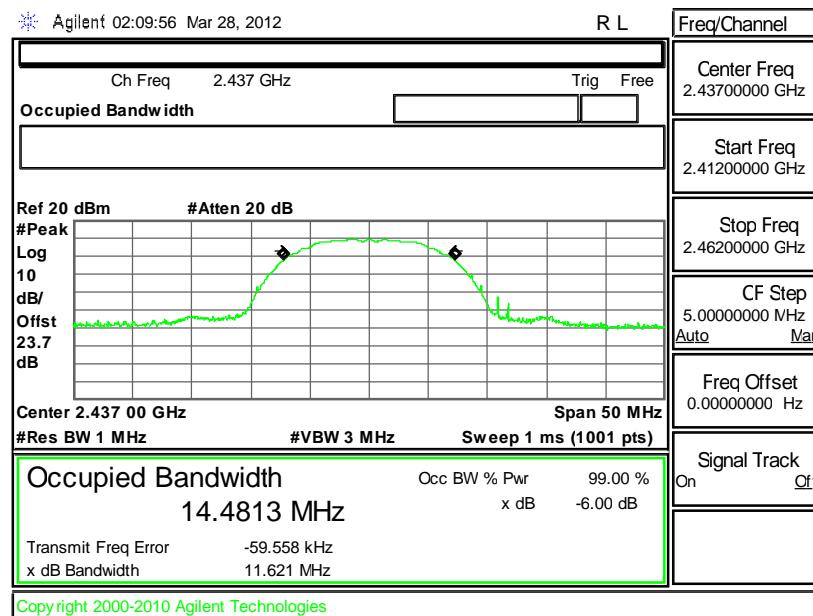
Channel	Frequency (MHz)	802.11b		Pass/Fail
		99% Occupied Bandwidth (MHz)		
01	2412		14.4608	Pass
06	2437		14.4813	Pass
11	2462		14.4856	Pass

Mode 1 : 99% Occupied Bandwidth Plot on 802.11b Channel 01

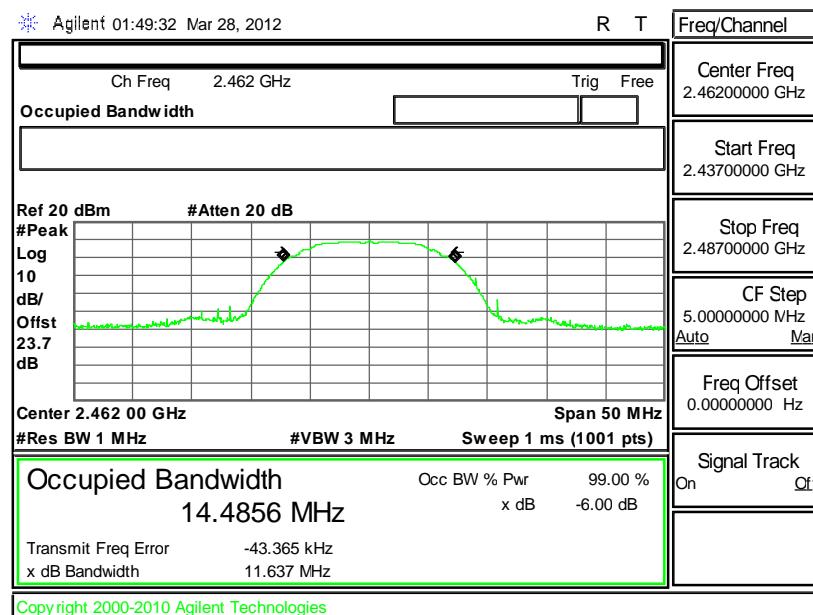




Mode 2 : 99% Occupied Bandwidth Plot on 802.11b Channel 06



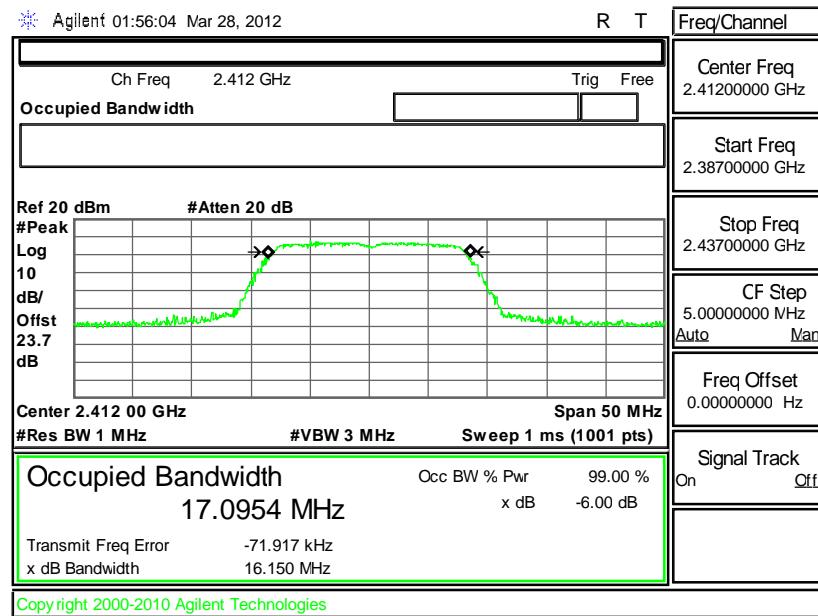
Mode 3 : 99% Occupied Bandwidth Plot on 802.11b Channel 11





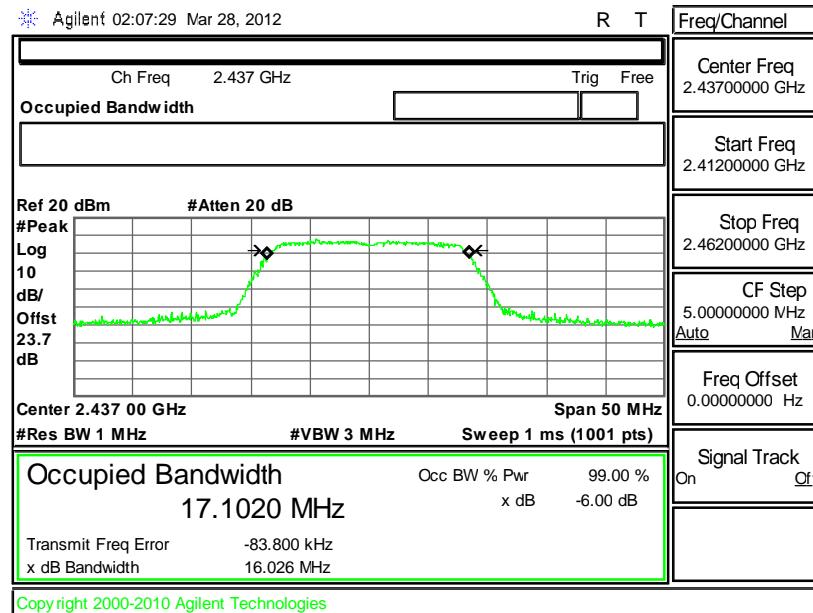
Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g	Pass/Fail
		99% Occupied Bandwidth (MHz)	
01	2412	17.0954	Pass
06	2437	17.1020	Pass
11	2462	17.0586	Pass

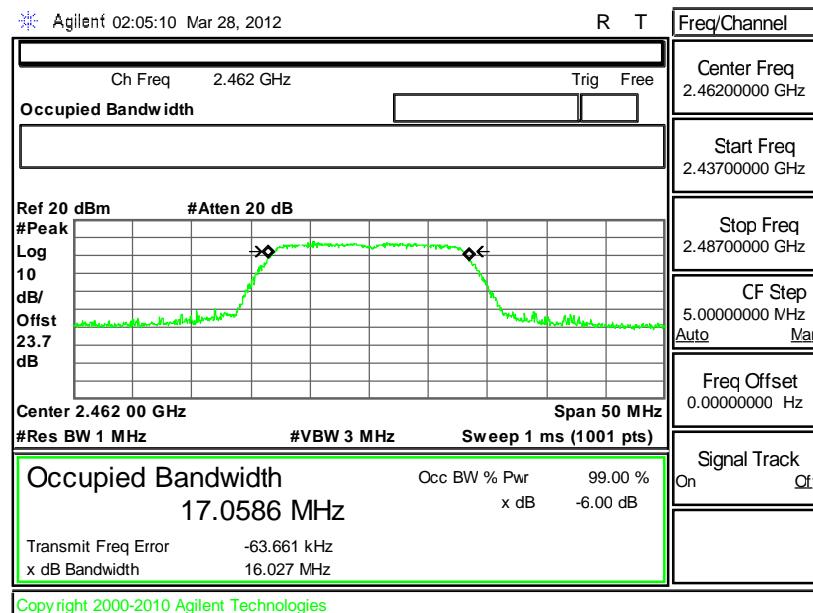
Mode 4 : 99% Occupied Bandwidth Plot on 802.11g Channel 01



Mode 5 : 99% Occupied Bandwidth Plot on 802.11g Channel 06



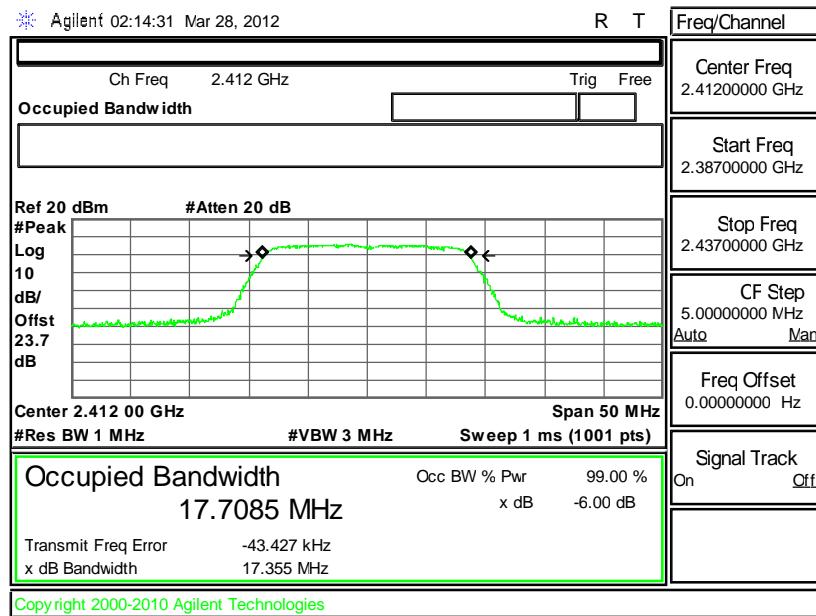
Mode 6 : 99% Occupied Bandwidth Plot on 802.11g Channel 11





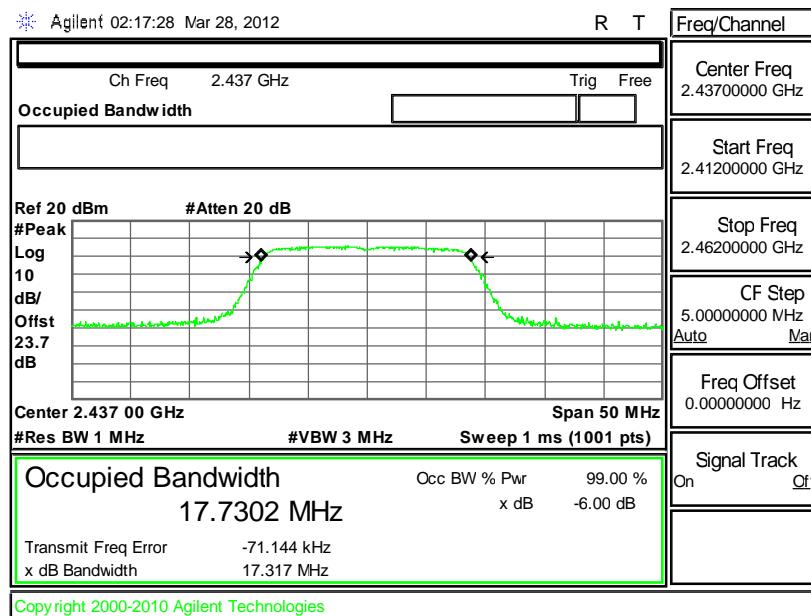
Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g/n (BW 20MHz) 99% Occupied Bandwidth (MHz)	Pass/Fail
01	2412	17.7085	Pass
06	2437	17.7302	Pass
11	2462	17.6987	Pass

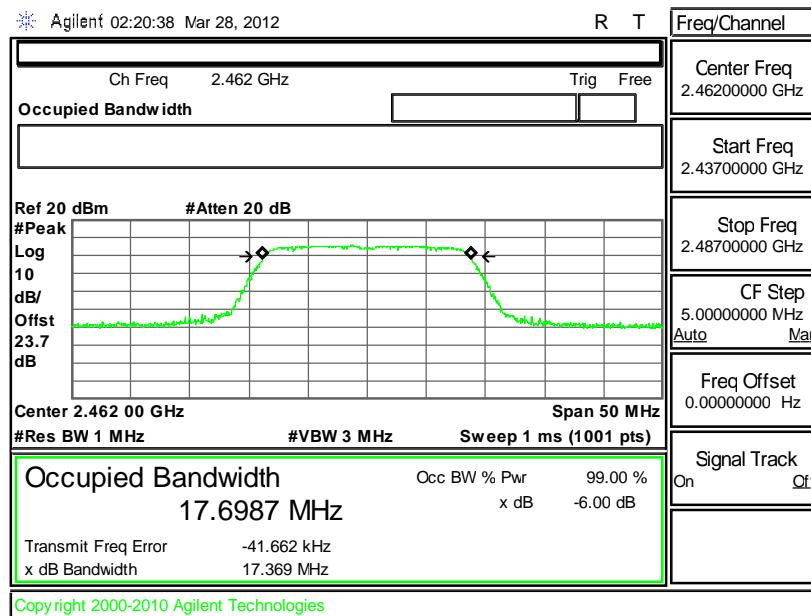
Mode 7 : 99% Occupied Bandwidth Plot on 802.11g/n(BW 20MHz) Channel 01



Mode 8 : 99% Occupied Bandwidth Plot on 802.11g/n(BW 20MHz) Channel 06



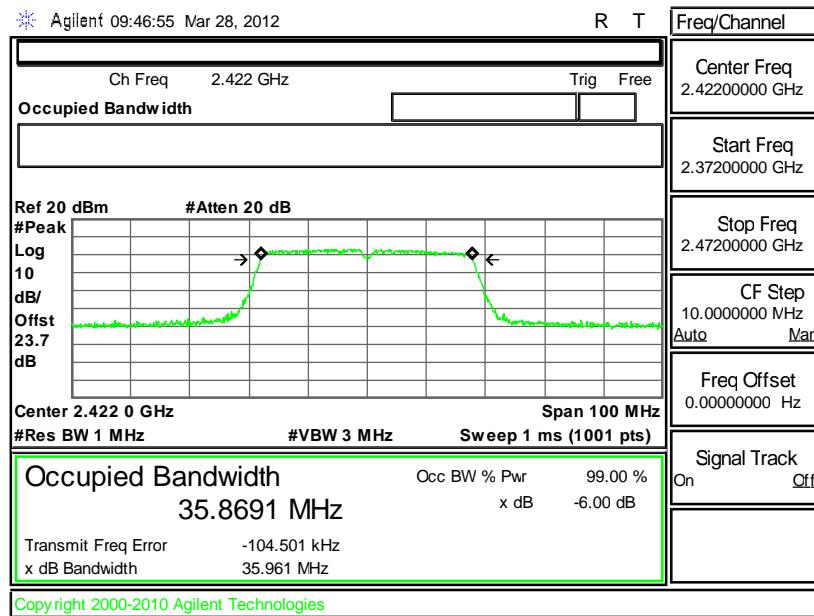
Mode 9 : 99% Occupied Bandwidth Plot on 802.11g/n(BW 20MHz) Channel 11





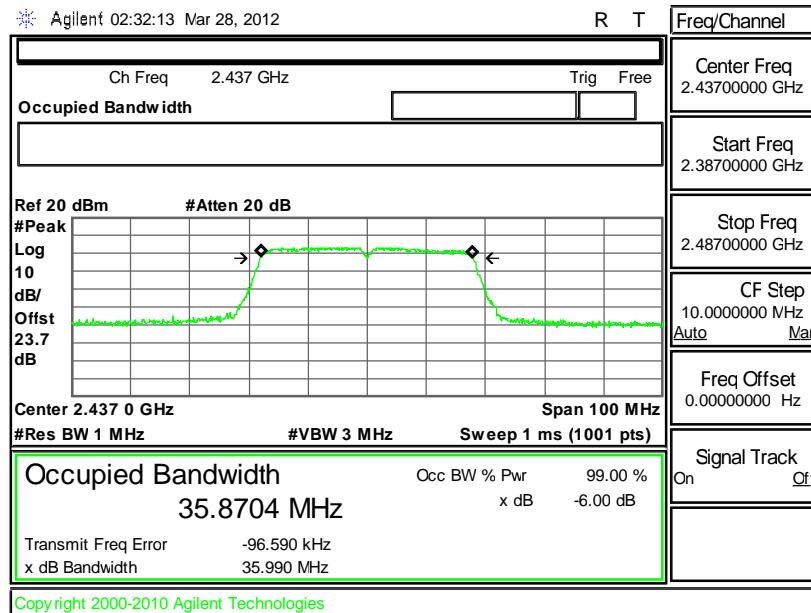
Test Mode :	Mode 10, 11, 12	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g/n (BW 20MHz) 99% Occupied Bandwidth (MHz)	Pass/Fail
03	2422	35.8691	Pass
06	2437	35.8704	Pass
09	2452	35.9037	Pass

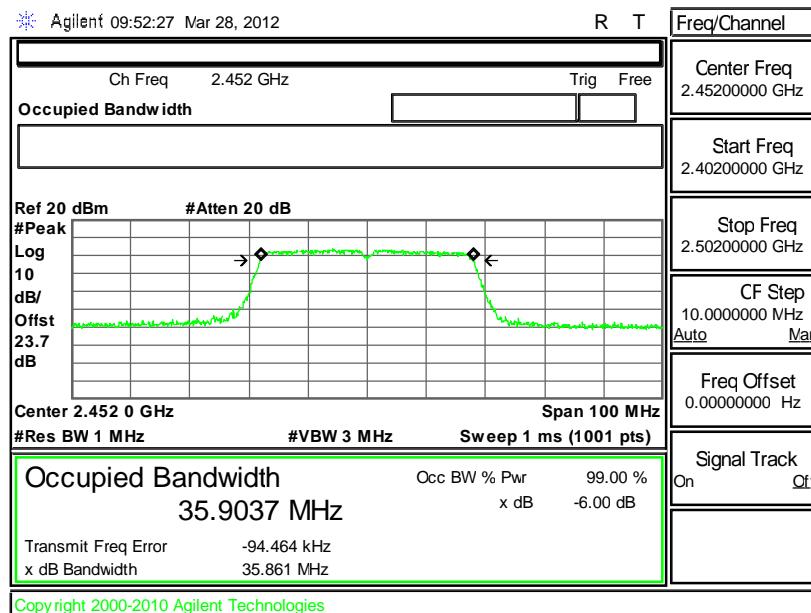
Mode 10 : 99% Occupied Bandwidth Plot on 802.11g/n(BW 40MHz) Channel 03



Mode 11 : 99% Occupied Bandwidth Plot on 802.11g/n(BW 40MHz) Channel 06



Mode 12 : 99% Occupied Bandwidth Plot on 802.11g/n(BW 40MHz) Channel 09



3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

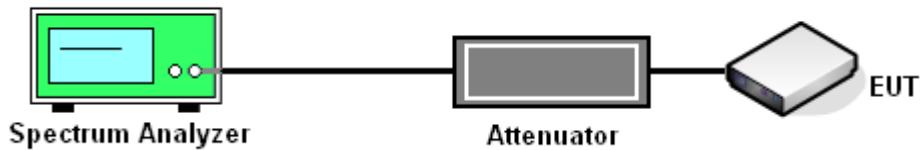
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure PK2 of FCC KDB No. 558074 DTS Meas. Guidance v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. The path loss was compensated to the results for each measurement.
3. The spectrum analyzer's settings are Resolution bandwidth (RBW) = 1MHz, Video bandwidth (VBW) = 3MHz, Peak Detector, auto sweep time, and the frequency span to a value that is 5-30 % greater than the EBW.
4. The spectrum analyzer's integrated band power measurement function is used to measure the peak power and the test results are demonstrated to compliance to the limit line as following plots.

3.2.4 Test Setup



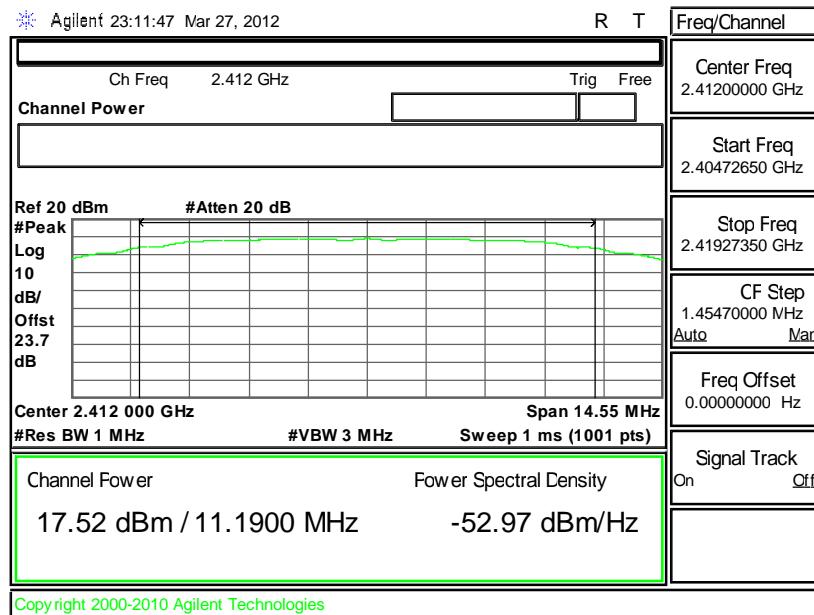


3.2.5 Test Result of Output Power

Test Mode :	Mode 1, 2, 3	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

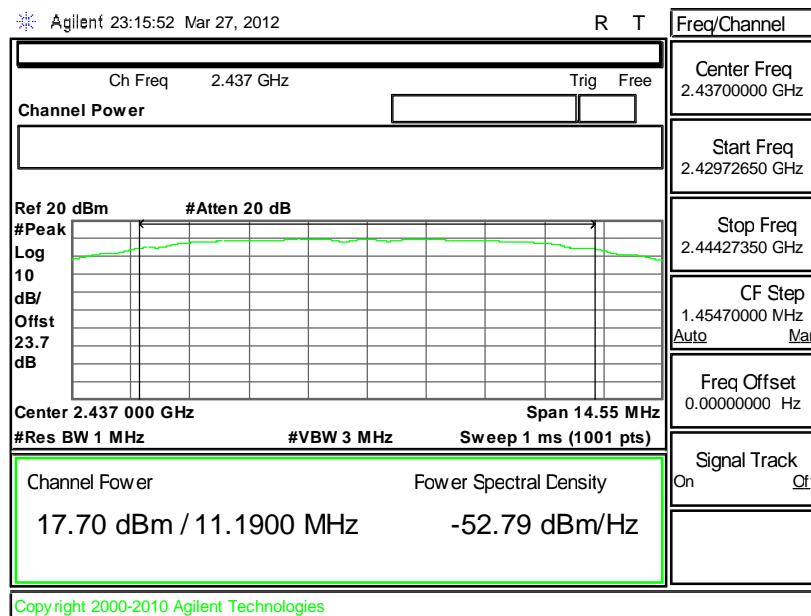
Channel	Frequency (MHz)	802.11b Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	17.52	30	Pass
06	2437	17.70	30	Pass
11	2462	17.46	30	Pass

Mode 1 : Output Power Plot on 802.11b Channel 01

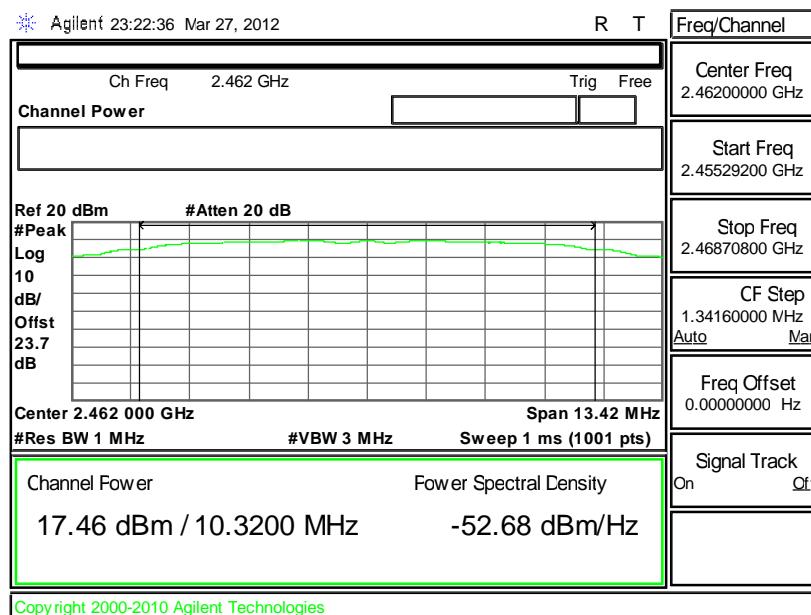




Mode 2 : Output Power Plot on 802.11b Channel 06



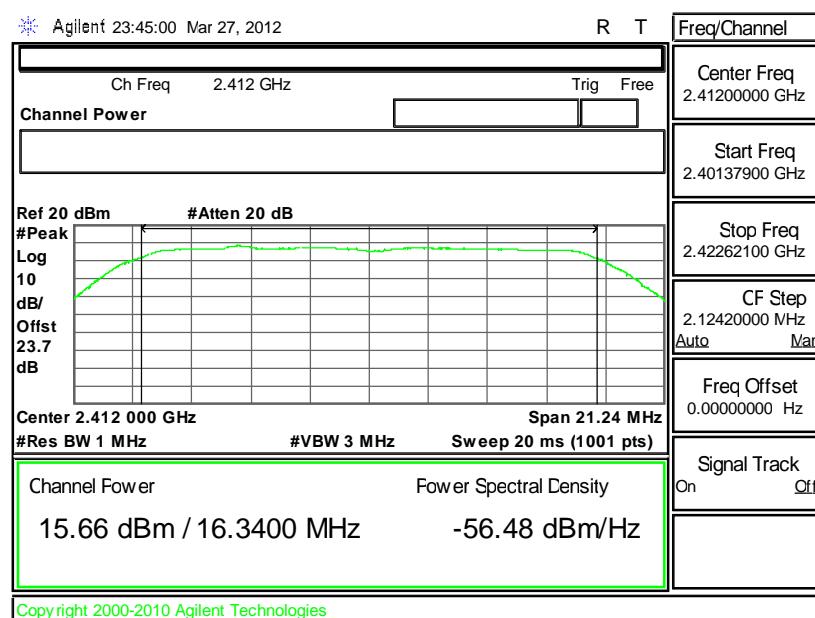
Mode 3 : Output Power Plot on 802.11b Channel 11





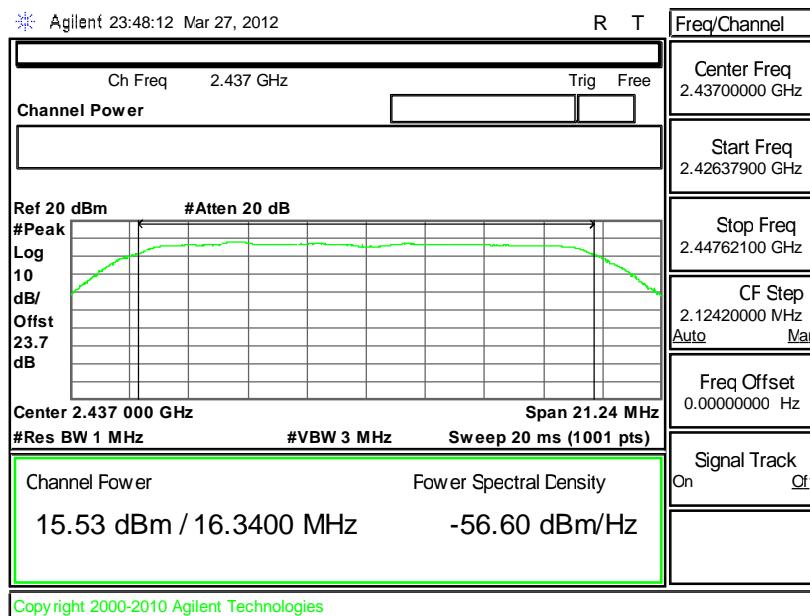
Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	15.66	30	Pass
06	2437	15.53	30	Pass
11	2462	15.61	30	Pass

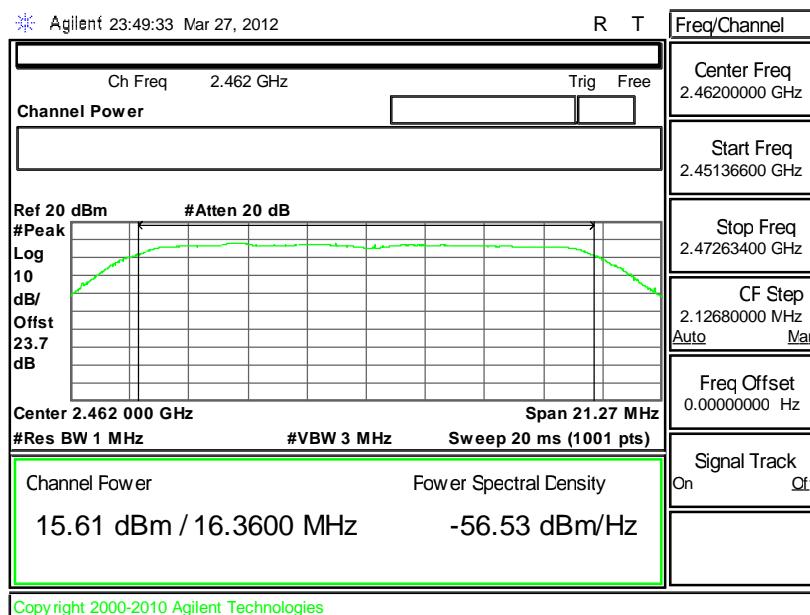
Mode 4 : Output Power Plot on 802.11g Channel 01



Mode 5 : Output Power Plot on 802.11g Channel 06



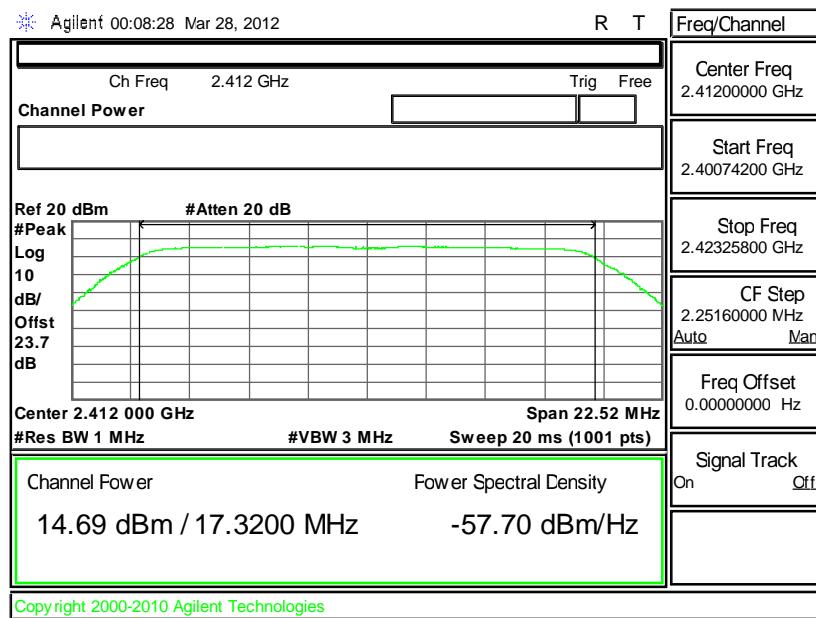
Mode 6 : Output Power Plot on 802.11g Channel 11





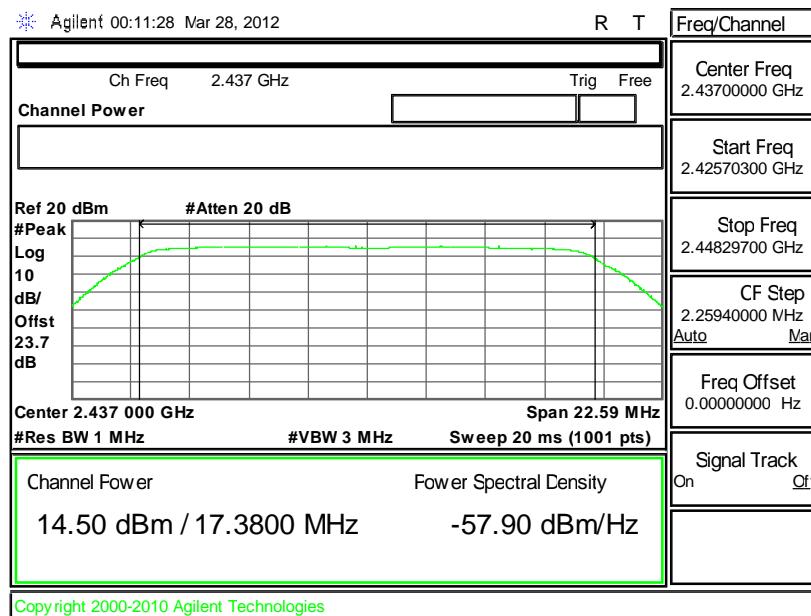
Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g/n (BW 20MHz) Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	14.69	30	Pass
06	2437	14.50	30	Pass
11	2462	14.58	30	Pass

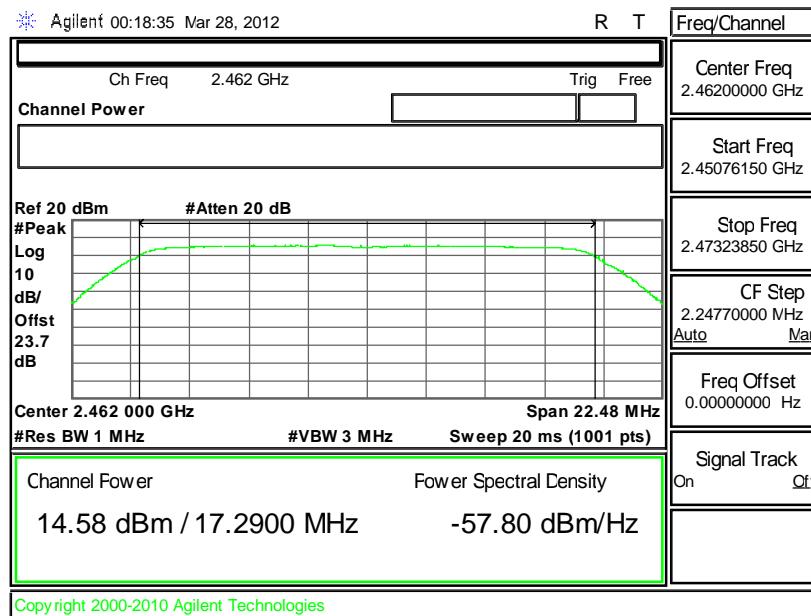
Mode 7: Output Power Plot on 802.11g/n (BW 20MHz) channel 01



Mode 8 : Output Power Plot on 802.11g/n (BW 20MHz) Channel 06



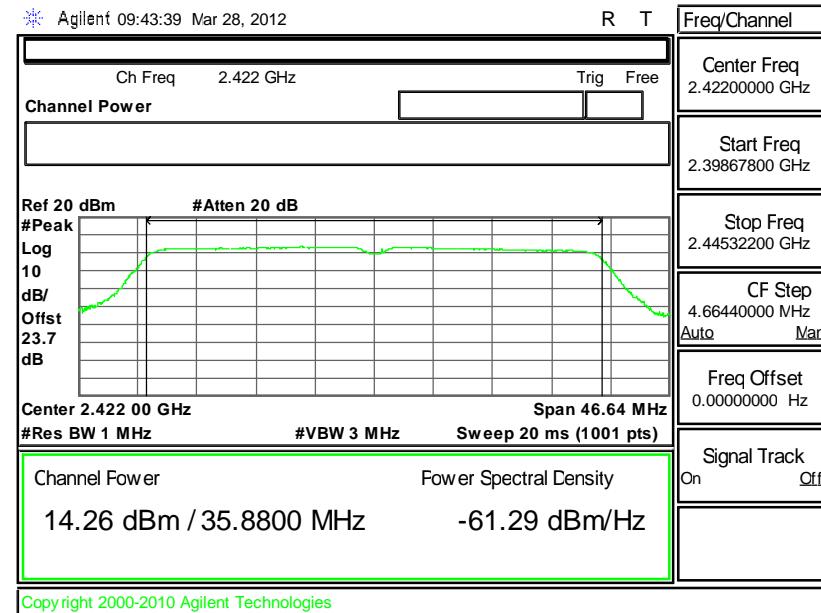
Mode 9 : Output Power Plot on 802.11g/n (BW 20MHz) Channel 11





Test Mode :	Mode 10, 11, 12	Temperature :	24~26
Test Engineer :	Reece Li	Relative Humidity :	50~53

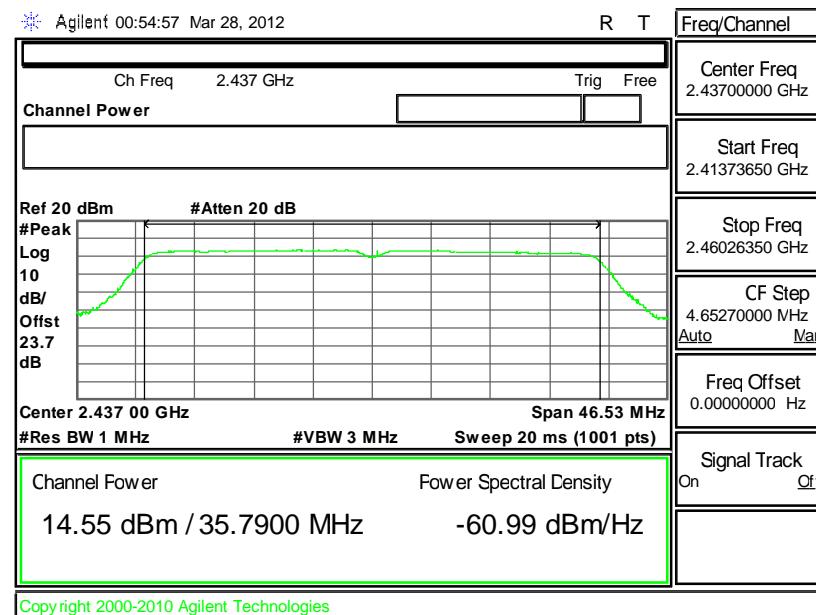
Channel	Frequency (MHz)	802.11g/n (BW 40MHz) Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
03	2422	14.26	30	Pass
06	2437	14.55	30	Pass
09	2452	14.54	30	Pass

Mode 10: Output Power Plot on 802.11g/n (BW 40MHz) channel**03**



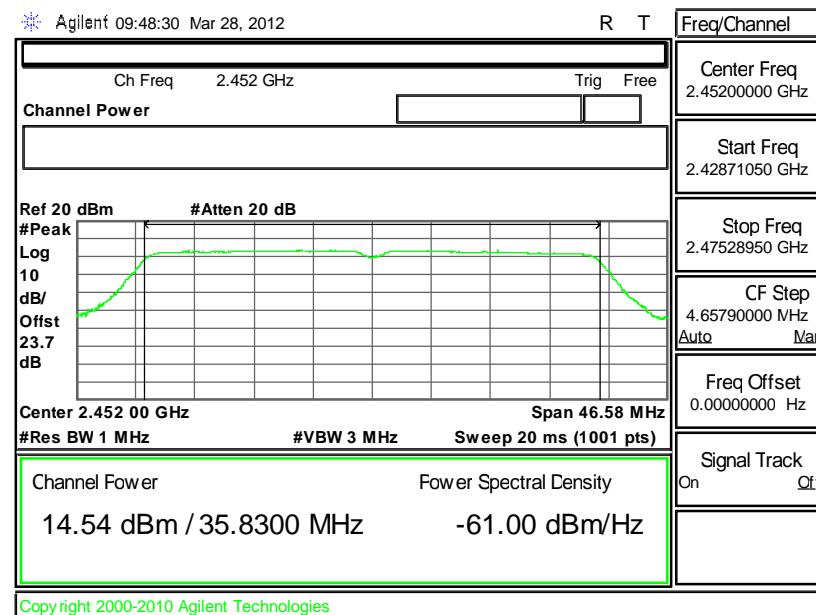
Mode 11: Output Power Plot on 802.11g/n (BW 40MHz) channel

06



Mode 12: Output Power Plot on 802.11g/n (BW 40MHz) channel

09





3.3 Band Edges Measurement

3.3.1 Limit of Band Edges

In any 100 KHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. 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.

3.3.2 Measuring Instruments

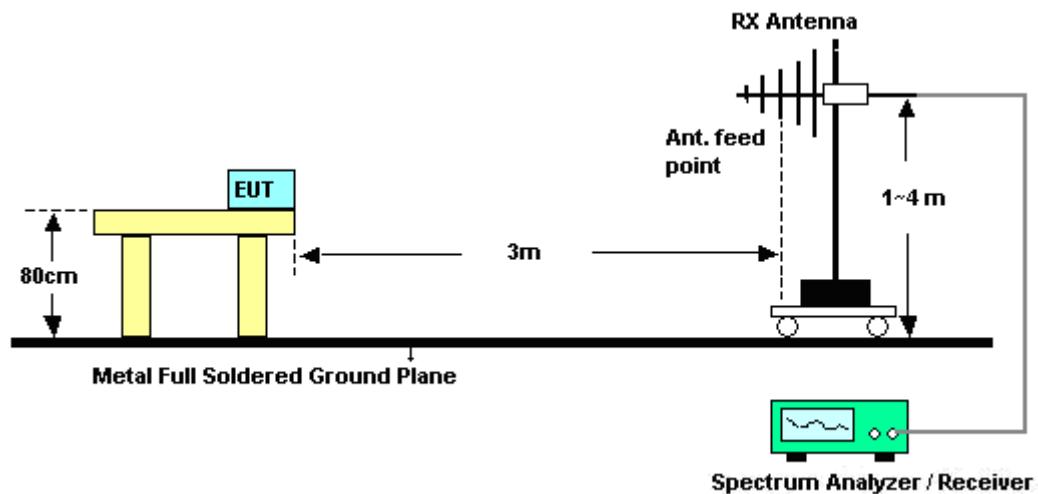
See list of measuring instruments of this test report.

3.3.3 Test Procedures

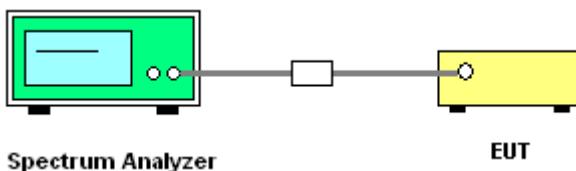
1. The testing follows the guidelines in ANSI C63.4-2003 and the Measurement Procedure of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. Conducted emission test: Set RBW = 100 KHz, Video bandwidth (VBW) \geq RBW. Out of the authorized frequency band emissions must be at least 20 dB lower than the highest emission level within the authorized band as measured with a 100 KHz RBW. 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).
3. Radiated emission test: Apply to band edge emissions that falling on the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep=Auto. If the emission is pulsed, then modify the unit for continuous operation. Use the settings in this paragraph to correct the reading level by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation per 15.35(b) and (c).

3.3.4 Test Setup

<Radiated Band Edges>



<Conducted Band Edges>





3.3.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1			Temperature :		23~24°C		
Test Band :	802.11b			Relative Humidity :		41~42%		
Test Channel :	01			Test Engineer :		Gavin Wu		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2384.86	56.59	-17.41	74	52.49	32.03	6.03	33.96	100	86	Peak
2384.86	43.32	-10.68	54	39.22	32.03	6.03	33.96	100	86	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.42	47.78	-26.22	74	43.65	32.06	6.03	33.96	161	284	Peak
2389.42	34.57	-19.43	54	30.44	32.06	6.03	33.96	161	284	Average

Test Mode :	Mode 3			Temperature :		23~24°C		
Test Band :	802.11b			Relative Humidity :		41~42%		
Test Channel :	11			Test Engineer :		Gavin Wu		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2485.37	53.44	-20.56	74	49.08	32.18	6.18	34	100	93	Peak
2485.37	40.2	-13.8	54	35.84	32.18	6.18	34	100	93	Average

ANTENNA POLARITY : VERTICAL										
Frequency (mz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2486.13	45.33	-28.67	74	40.97	32.18	6.18	34	100	268	Peak
2486.13	34.12	-19.88	54	29.76	32.18	6.18	34	100	268	Average



Test Mode :	Mode 4	Temperature :	23~24°C
Test Band :	802.11b	Relative Humidity :	41~42%
Test Channel :	11	Test Engineer :	Gavin Wu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2488.22	51.43	-22.57	74	47.05	32.2	6.18	34	100	105	Peak
2488.22	43.61	-10.39	54	39.23	32.2	6.18	34	100	105	Average

ANTENNA POLARITY : VERTICAL										
Frequency (mz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.61	49.84	-24.16	74	45.48	32.18	6.18	34	119	332	Peak
2484.61	36.86	-17.14	54	32.5	32.18	6.18	34	119	332	Average



Test Mode :	Mode 5			Temperature :	23~24°C				
Test Band :	802.11g			Relative Humidity :	41~42%				
Test Channel :	01			Test Engineer :	Gavin Wu				

ANTENNA POLARITY : HORIZONTAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2359.02	55.18	-18.82	74	51.13	32.01	5.99	33.95	100	96	Peak
2359.02	42.27	-11.73	54	38.22	32.01	5.99	33.95	100	96	Average

ANTENNA POLARITY : VERTICAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2367.38	47.05	-26.95	74	43	32.01	5.99	33.95	195	285	Peak
2367.38	34.06	-19.94	54	30.01	32.01	5.99	33.95	195	285	Average

Test Mode :	Mode 7			Temperature :	23~24°C				
Test Band :	802.11g			Relative Humidity :	41~42%				
Test Channel :	11			Test Engineer :	Gavin Wu				

ANTENNA POLARITY : HORIZONTAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.42	52.93	-21.07	74	48.57	32.18	6.18	34	100	92	Peak
2484.42	38.91	-15.09	54	34.55	32.18	6.18	34	100	92	Average

ANTENNA POLARITY : VERTICAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2488.22	45.51	-28.49	74	41.13	32.2	6.18	34	167	341	Peak
2488.22	33.04	-20.96	54	28.66	32.2	6.18	34	167	341	Average



Test Mode :	Mode 8			Temperature :		23~24°C			
Test Band :	802.11g/n (BW 20MHz)			Relative Humidity :		41~42%			
Test Channel :	01			Test Engineer :		Gavin Wu			

ANTENNA POLARITY : HORIZONTAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2359.78	57.2	-16.8	74	53.15	32.01	5.99	33.95	100	87	Peak
2359.78	42.58	-11.42	54	38.53	32.01	5.99	33.95	100	87	Average

ANTENNA POLARITY : VERTICAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2381.06	46.94	-27.06	74	42.84	32.03	6.03	33.96	167	280	Peak
2381.06	34.18	-19.82	54	30.08	32.03	6.03	33.96	167	280	Average

Test Mode :	Mode 10			Temperature :		23~24°C			
Test Band :	802.11g/n (BW 20MHz)			Relative Humidity :		41~42%			
Test Channel :	11			Test Engineer :		Gavin Wu			

ANTENNA POLARITY : HORIZONTAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.61	51.86	-22.14	74	47.5	32.18	6.18	34	100	94	Peak
2484.61	38.53	-15.47	54	34.17	32.18	6.18	34	100	94	Average

ANTENNA POLARITY : VERTICAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2491.26	45.99	-28.01	74	41.61	32.2	6.18	34	168	342	Peak
2491.26	33.33	-20.67	54	28.95	32.2	6.18	34	168	342	Average



Test Mode :	Mode 11			Temperature :		23~24°C		
Test Band :	802.11g/n (BW 40MHz)			Relative Humidity :		41~42%		
Test Channel :	03			Test Engineer :		Gavin Wu		

ANTENNA POLARITY : HORIZONTAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2384.86	56.05	-17.95	74	51.95	32.03	6.03	33.96	100	89	Peak
2384.86	40.3	-13.7	54	36.2	32.03	6.03	33.96	100	89	Average

ANTENNA POLARITY : VERTICAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2374.98	45.93	-28.07	74	41.86	32.03	5.99	33.95	128	72	Peak
2374.98	33.14	-20.86	54	29.07	32.03	5.99	33.95	128	72	Average

Test Mode :	Mode 13			Temperature :		23~24°C		
Test Band :	802.11g/n (BW 40MHz)			Relative Humidity :		41~42%		
Test Channel :	09			Test Engineer :		Gavin Wu		

ANTENNA POLARITY : HORIZONTAL

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.61	52.95	-21.05	74	48.59	32.18	6.18	34	100	88	Peak
2484.61	37.24	-16.76	54	32.88	32.18	6.18	34	100	88	Average

ANTENNA POLARITY : VERTICAL

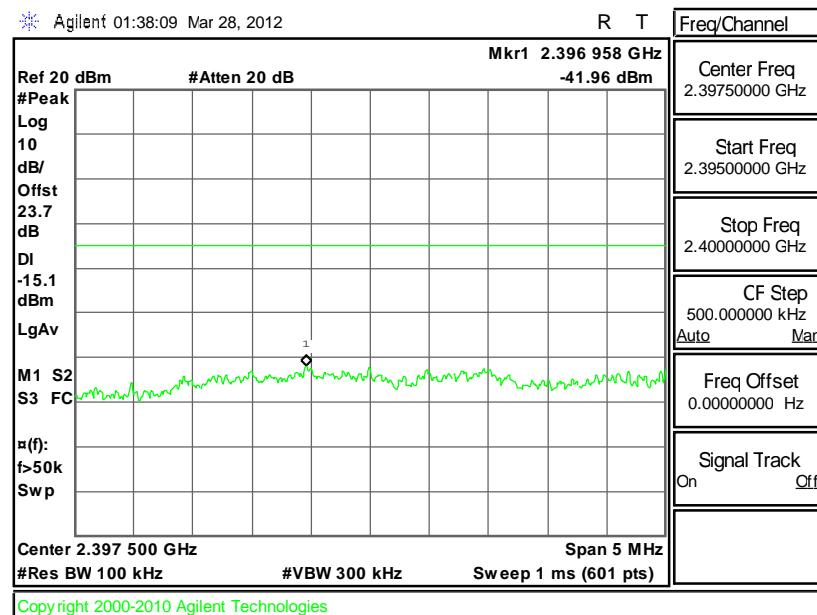
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2485.94	44.57	-29.43	74	40.21	32.18	6.18	34	100	168	Peak
2485.94	32.81	-21.19	54	28.45	32.18	6.18	34	100	168	Average



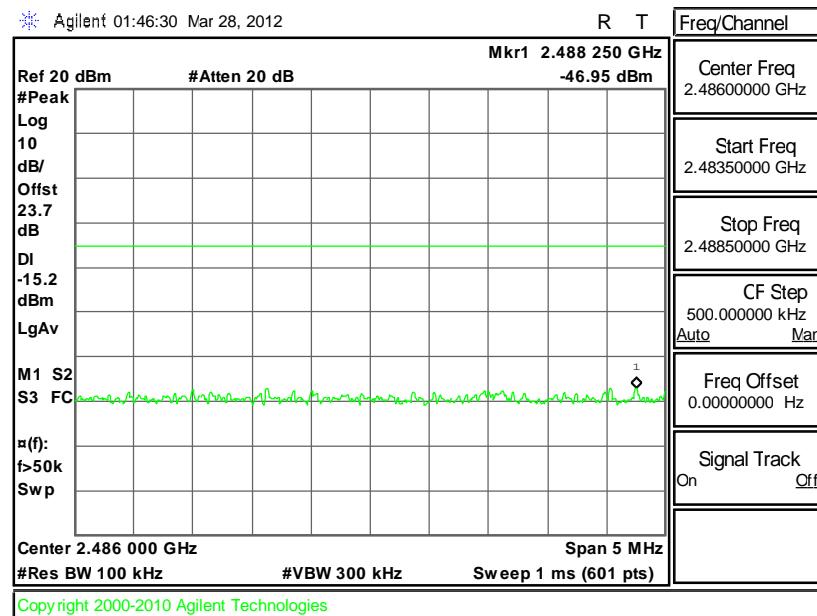
3.3.6 Test Plots of Conducted Band Edges

Test Mode :	Mode 1 and 3	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Reece Li

Low Band Edge Plot on 802.11b Channel 01

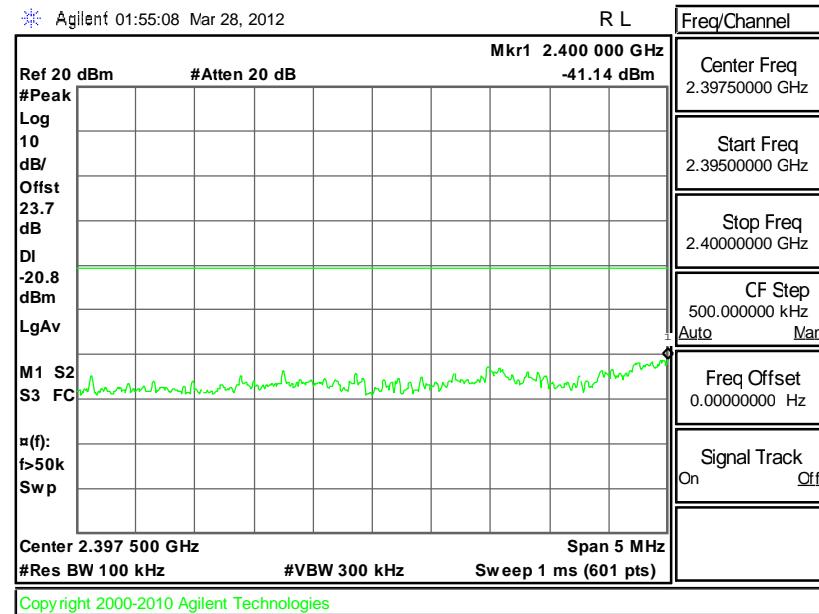
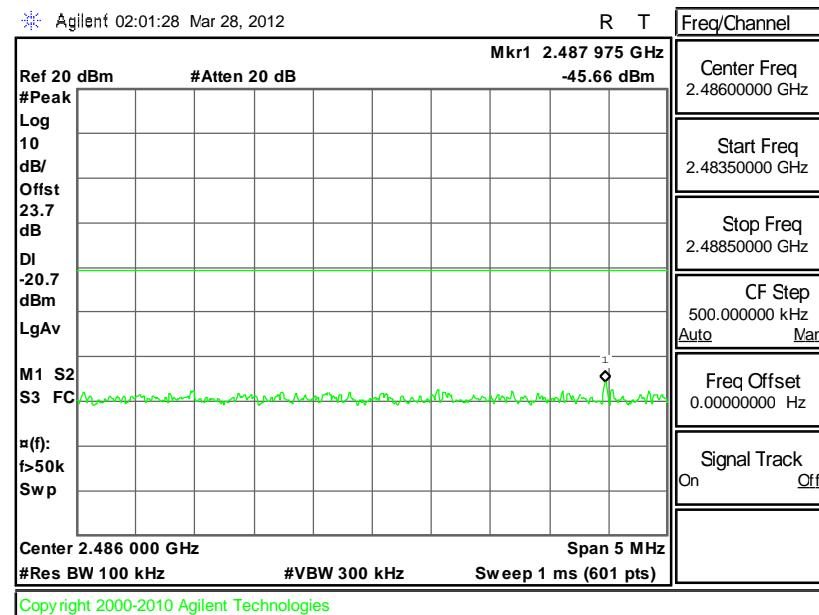


High Band Edge Plot on 802.11b Channel 11



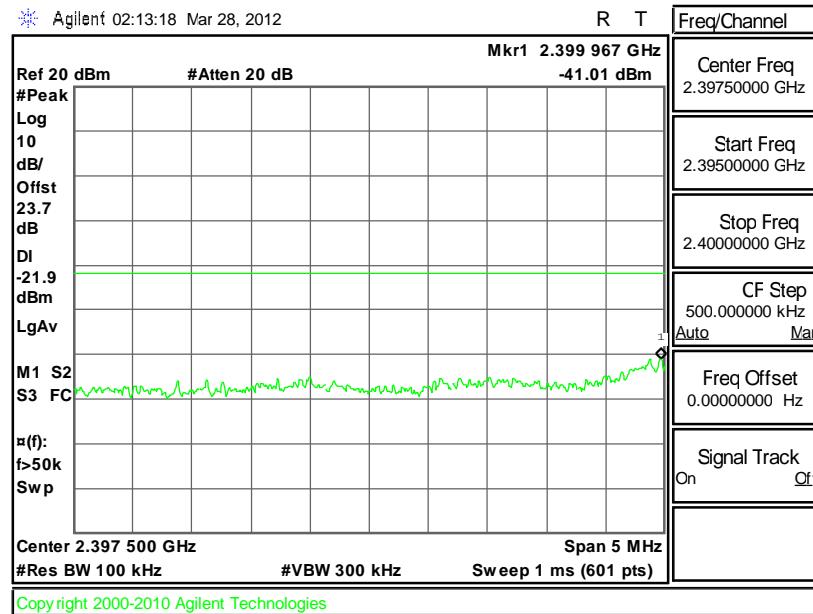
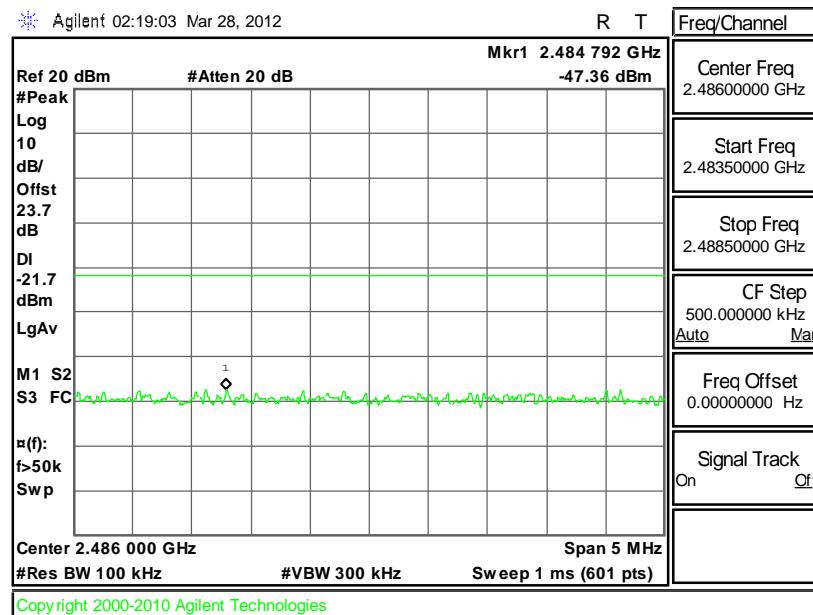


Test Mode :	Mode 4 and 6	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Reece Li

Low Band Edge Plot on 802.11g Channel 01**High Band Edge Plot on 802.11g Channel 11**

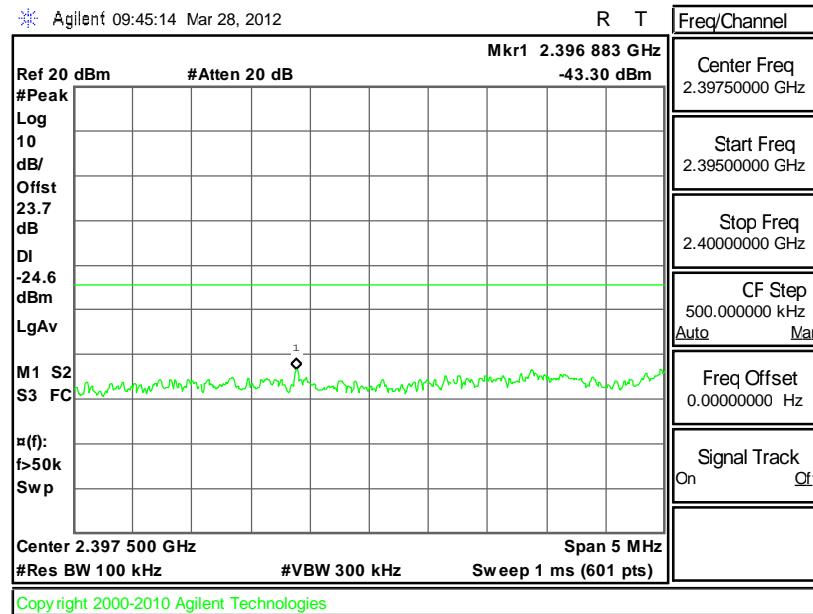
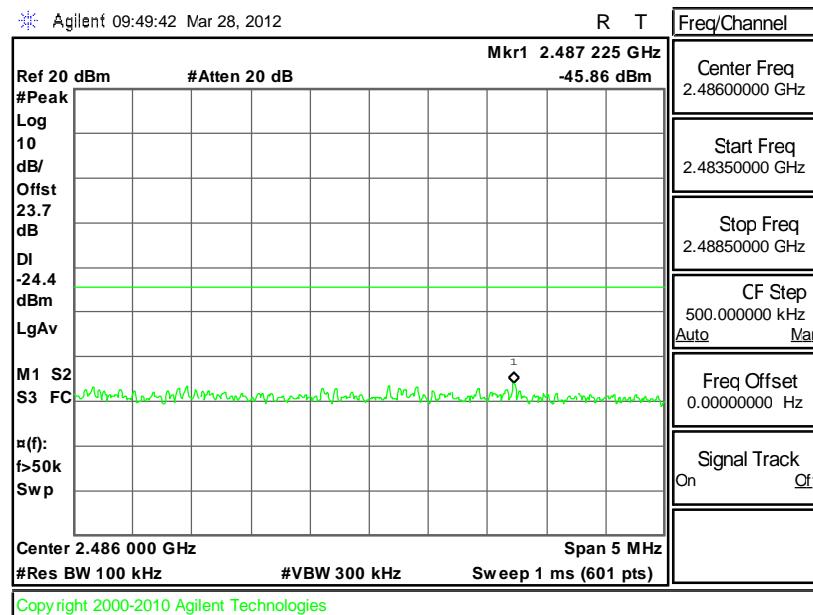


Test Mode :	Mode 7 and 9	Temperature :	24~26°C
Test Band :	802.11g/n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Reece Li

Low Band Edge Plot on 802.11g/n (BW 20MHz) Channel 01**High Band Edge Plot on 802.11g/n (BW 20MHz) Channel 11**



Test Mode :	Mode 10 and 12	Temperature :	24~26°C
Test Band :	802.11g/n (BW 40MHz)	Relative Humidity :	50~53%
Test Channel :	03 and 09	Test Engineer :	Reece Li

Low Band Edge Plot on 802.11g/n (BW 40MHz) Channel 03**High Band Edge Plot on 802.11g/n (BW 40MHz) Channel 09**

3.4 Spurious Emission Measurement

3.4.1 Limit of Spurious Emission Measurement

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

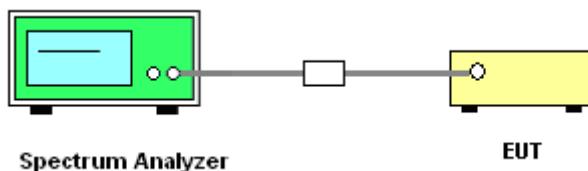
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer via a low loss cable. The path loss was compensated to the results for each measurement.
2. Set RBW = 100 KHz, Video bandwidth (VBW) \geq RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 KHz RBW.

3.4.4 Test Setup

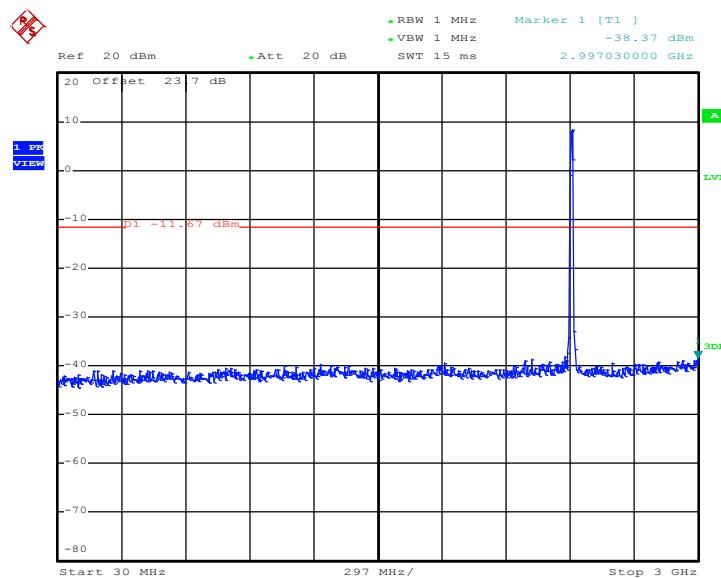




3.4.5 Test Plots of Spurious Emission

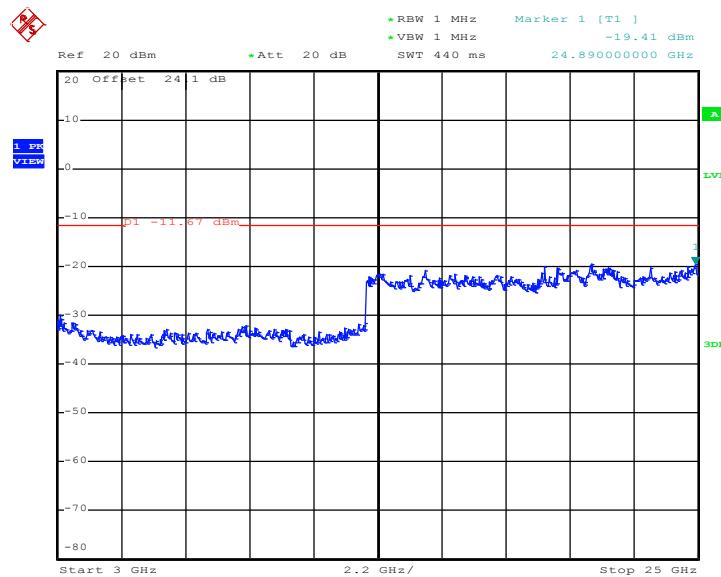
Test Mode :	Mode 1	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 11.APR.2012 16:22:19

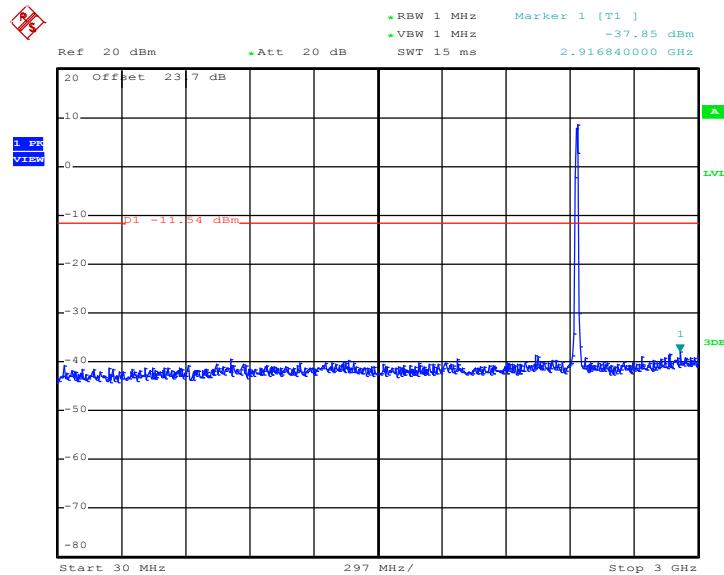
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz



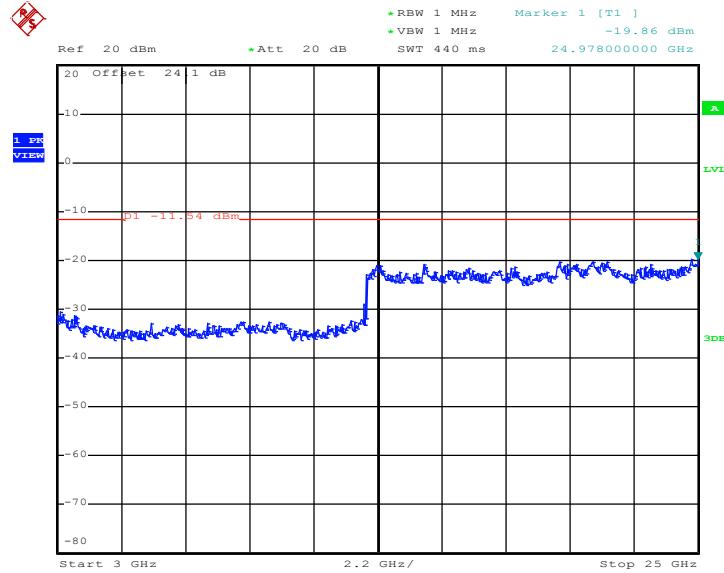
Date: 11.APR.2012 16:22:40



Test Mode :	Mode 2	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

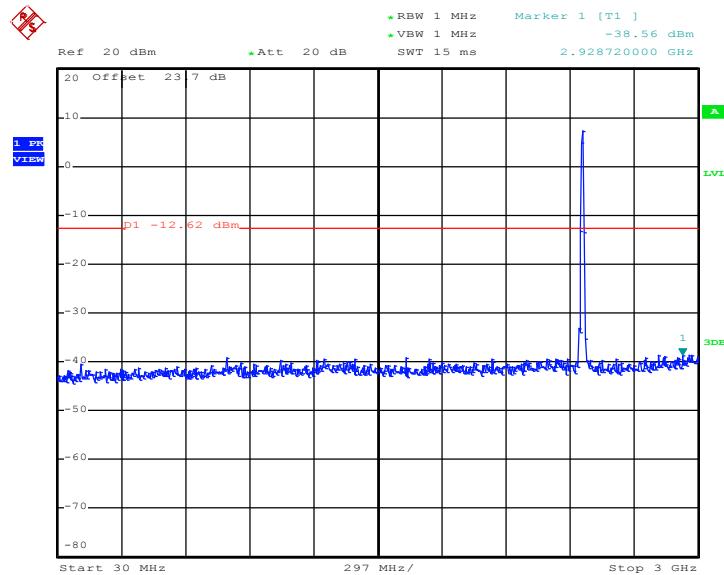
Date: 11.APR.2012 16:25:22

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

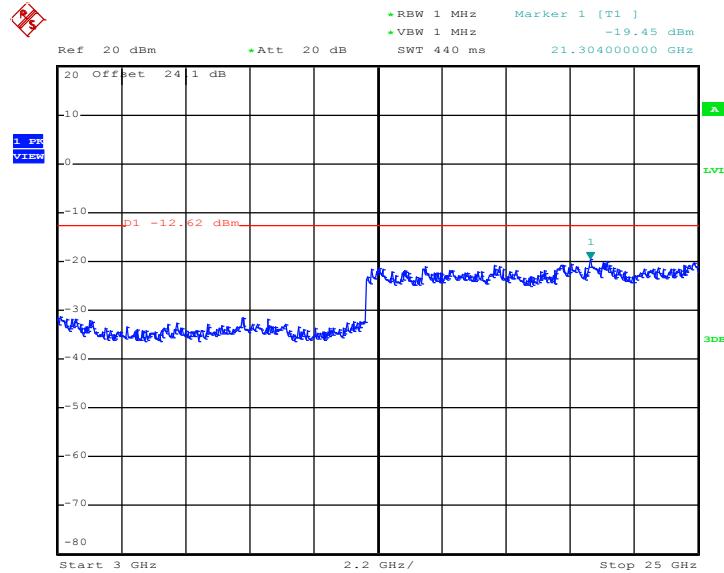
Date: 11.APR.2012 16:25:42



Test Mode :	Mode 3	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

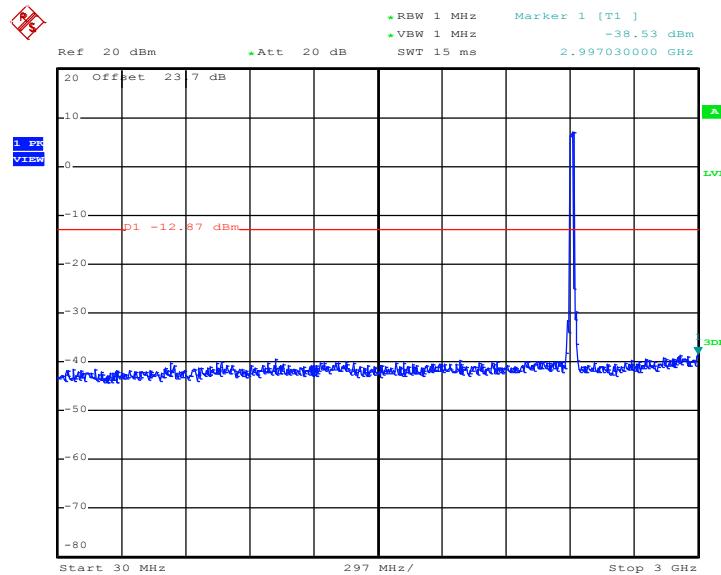
Date: 11.APR.2012 16:23:49

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

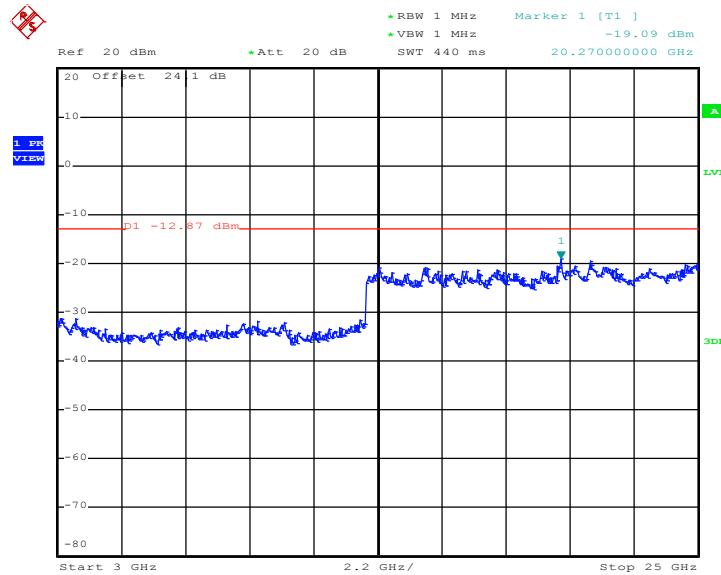
Date: 11.APR.2012 16:24:08



Test Mode :	Mode 4	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

Date: 11.APR.2012 16:52:02

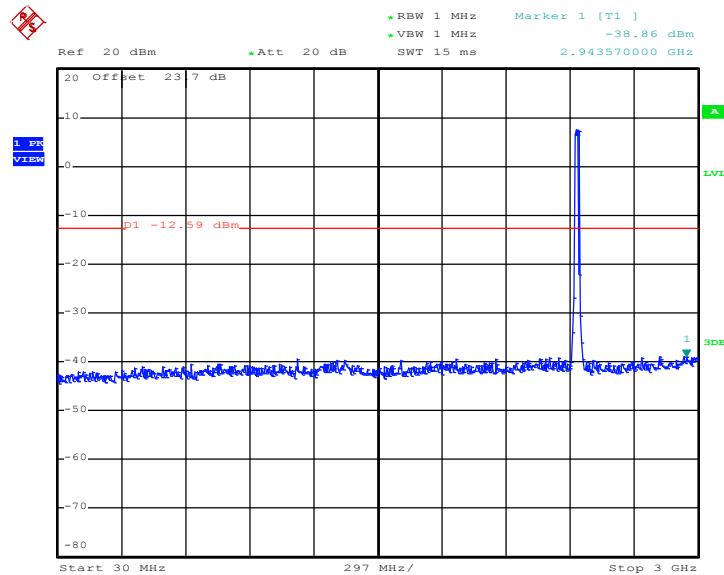
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

Date: 11 APR 2012 16:52:20



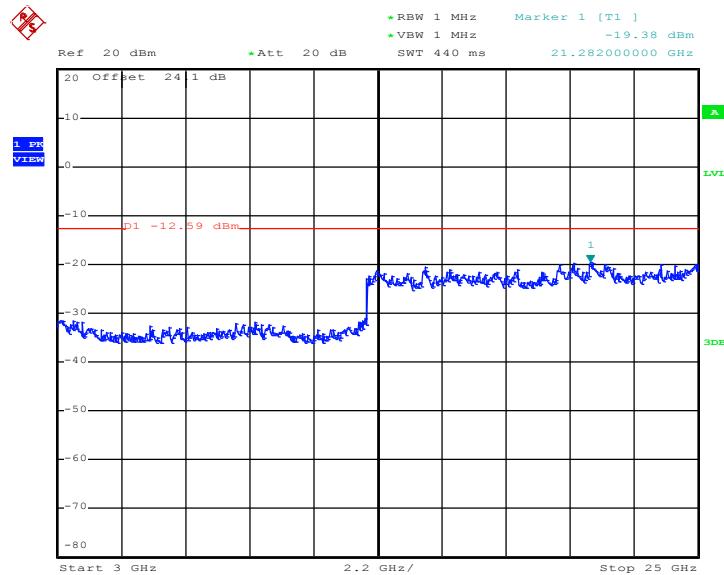
Test Mode :	Mode 5	Temperature :	24~26
Test Band :	802.11g	Relative Humidity :	50~53
Test Channel :	06	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 11.APR.2012 16:50:06

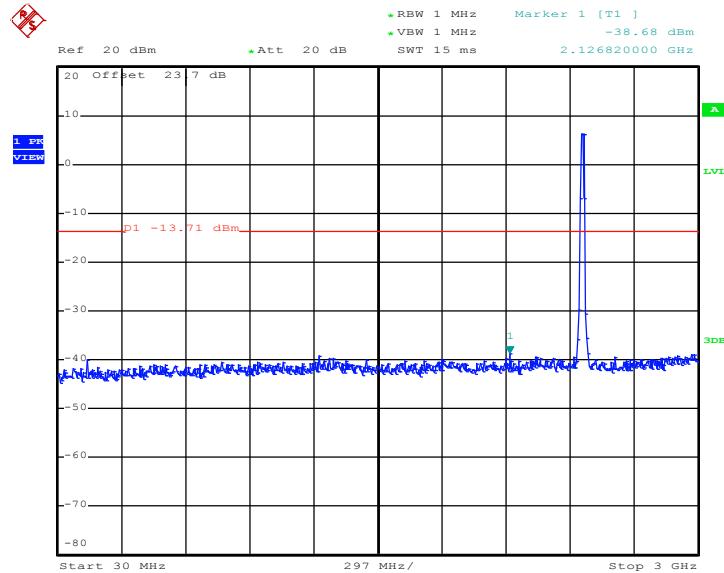
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz



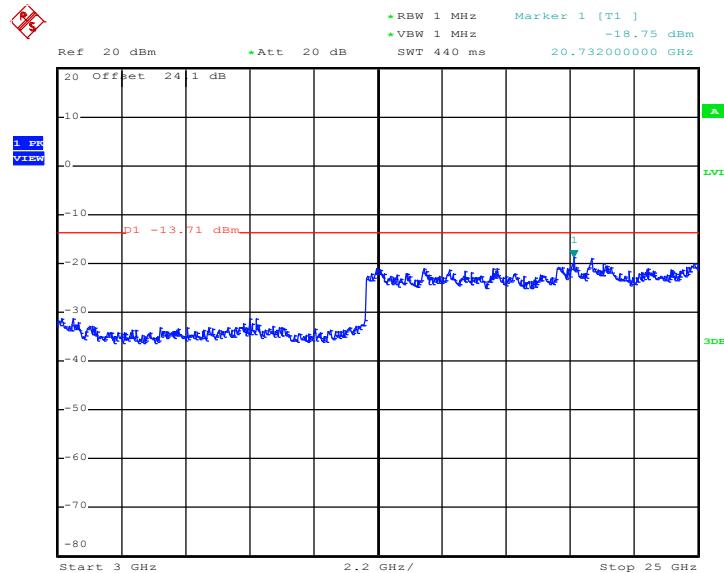
Date: 11.APR.2012 16:50:24



Test Mode :	Mode 6	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

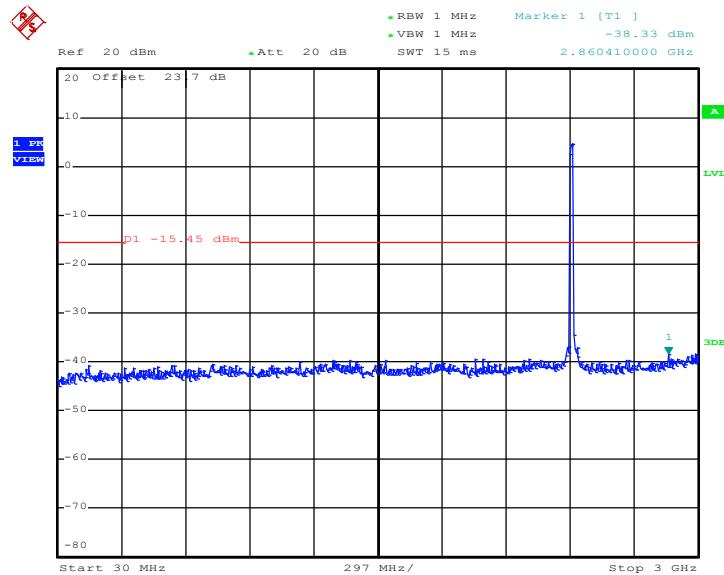
Date: 11.APR.2012 16:51:09

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

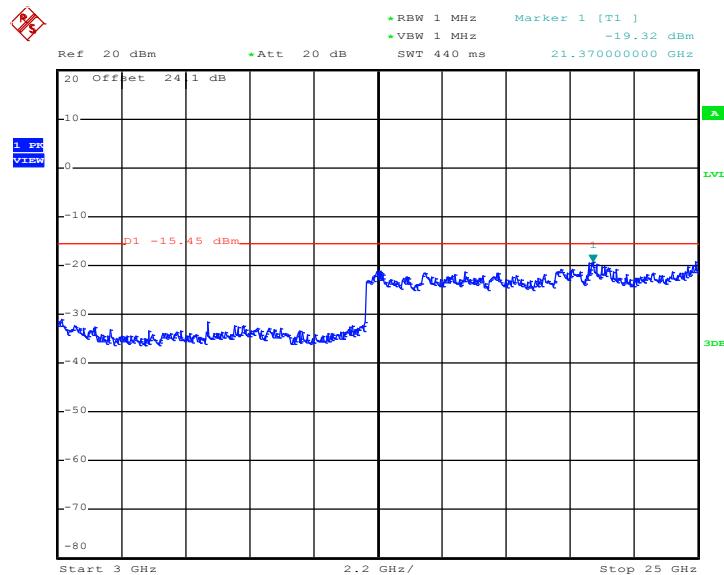
Date: 11.APR.2012 16:51:28



Test Mode :	Mode 7	Temperature :	24~26°C
Test Band :	802.11g/n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

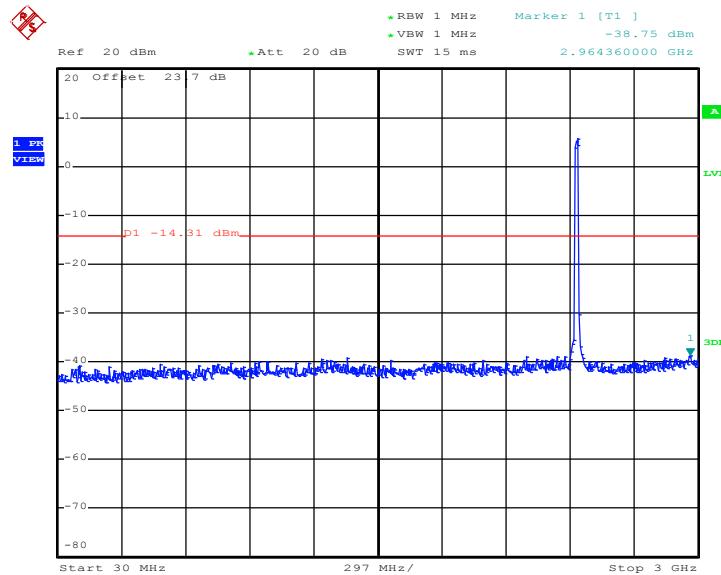
Date: 11.APR.2012 16:54:18

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

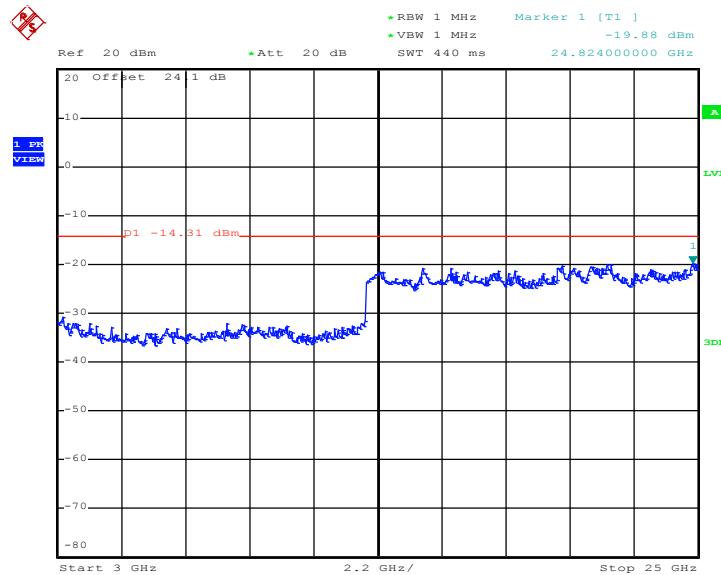
Date: 11.APR.2012 16:54:36



Test Mode :	Mode 8	Temperature :	24~26°C
Test Band :	802.11g/n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

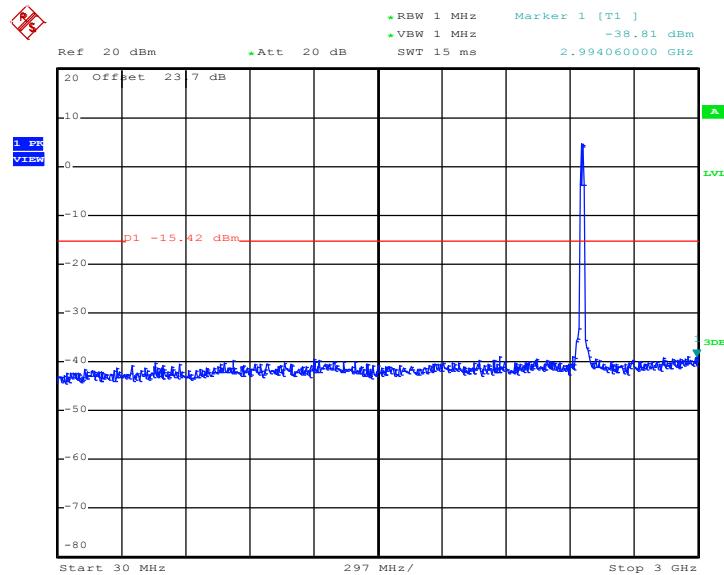
Date: 11.APR.2012 16:55:16

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

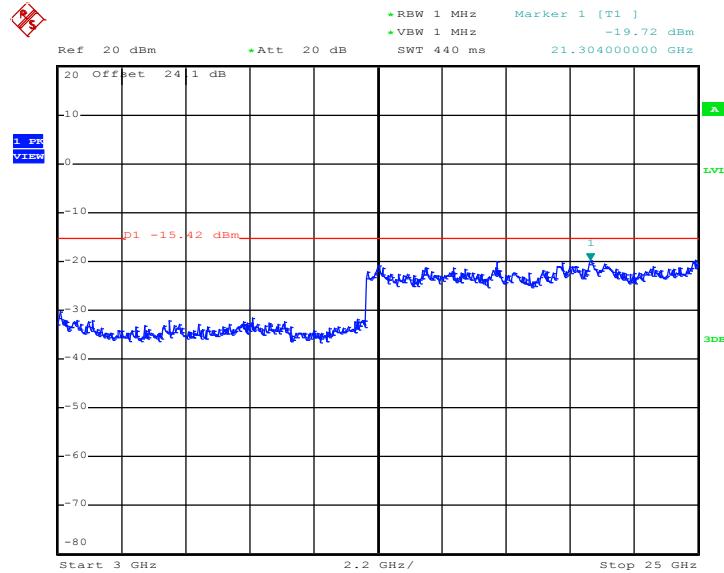
Date: 11.APR.2012 16:55:35



Test Mode :	Mode 9	Temperature :	24~26°C
Test Band :	802.11g/n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

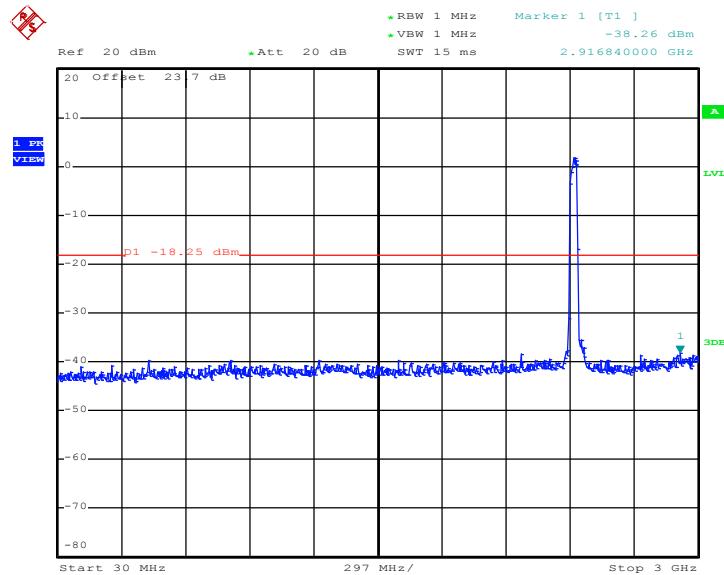
Date: 11.APR.2012 16:56:00

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

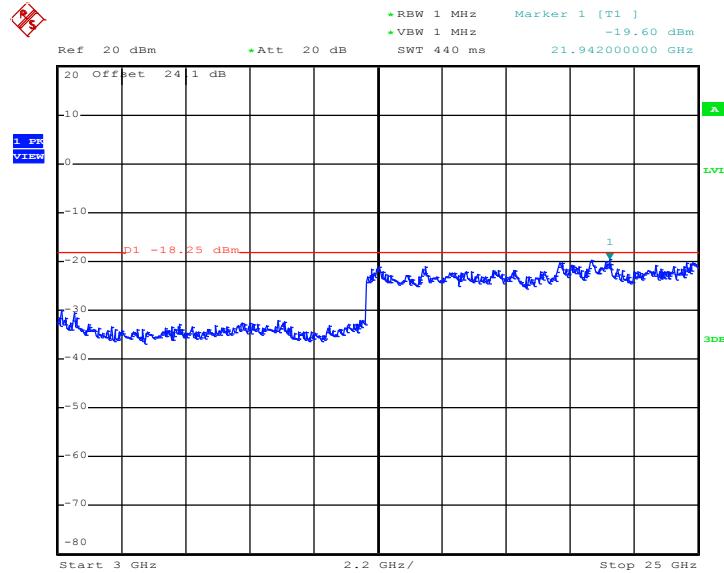
Date: 11.APR.2012 16:56:25



Test Mode :	Mode 10	Temperature :	24~26°C
Test Band :	802.11g/n (BW 40MHz)	Relative Humidity :	50~53%
Test Channel :	03	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

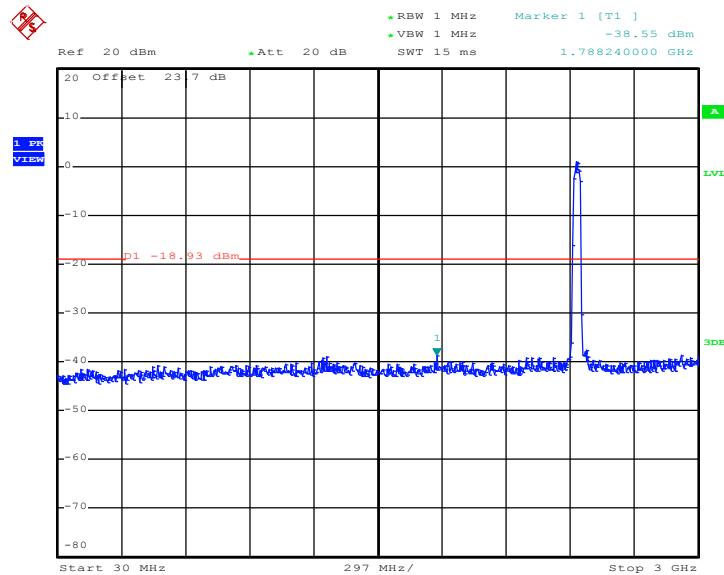
Date: 11.APR.2012 17:12:01

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

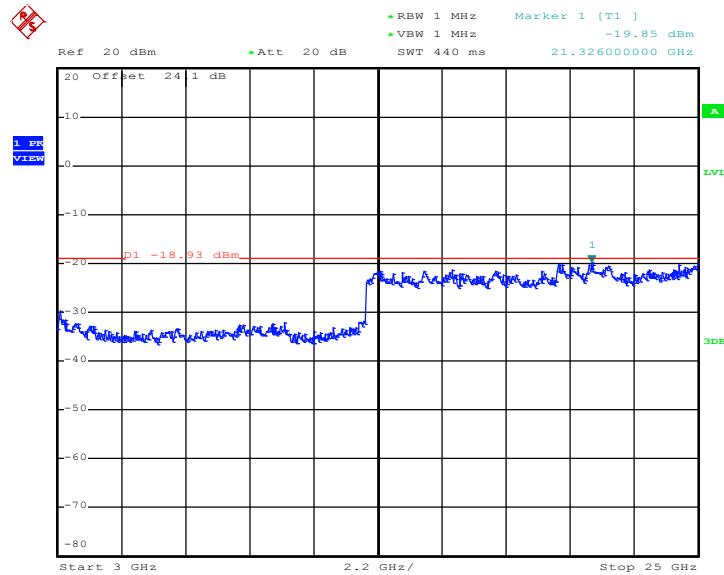
Date: 11.APR.2012 17:12:20



Test Mode :	Mode 11	Temperature :	24~26°C
Test Band :	802.11g/n (BW 40MHz)	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

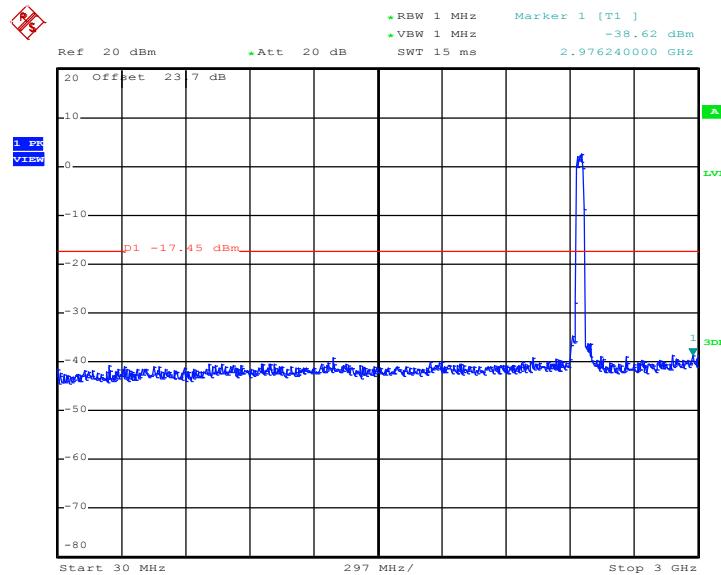
Date: 11.APR.2012 17:14:40

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

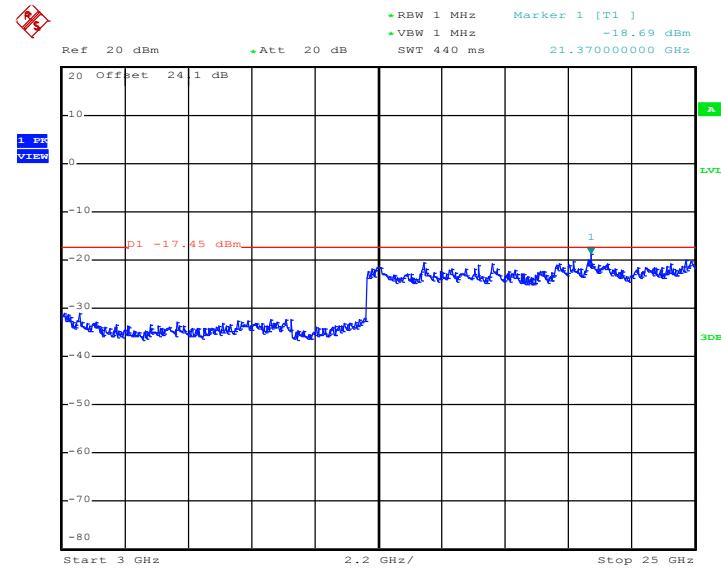
Date: 11.APR.2012 17:14:59



Test Mode :	Mode 12	Temperature :	24~26°C
Test Band :	802.11g/n (BW 40MHz)	Relative Humidity :	50~53%
Test Channel :	09	Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

Date: 11.APR.2012 17:09:12

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

Date: 11.APR.2012 17:09:30

3.5 Power Spectral Density Measurement

3.5.1 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.

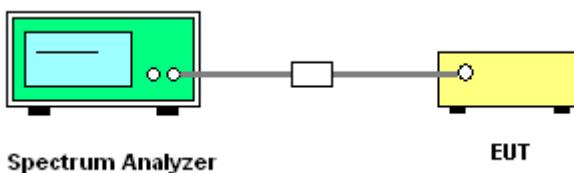
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows Measurement Procedure PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. The path loss was compensated to the results for each measurement.
3. Record the measurement data derived from spectrum analyzer.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 KHz. Video bandwidth (VBW) \geq 300 KHz In order to make an accurate measurement, set the span to 5-30% greater than Emission Bandwidth (EBW)
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 in any 100 kHz band segment within the fundamental EBW.
6. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3 \text{ kHz}/100 \text{ kHz}) = -15.2 \text{ dB}$.

3.5.4 Test Setup





3.5.5 Test Result of Power Spectral Density

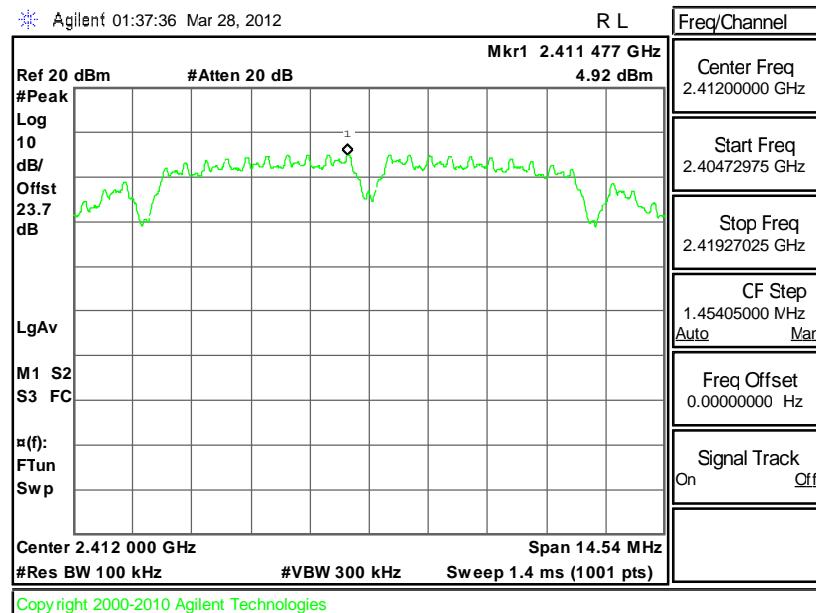
Test Mode :	Mode 1, 2, 3	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Power Density		Max. Limits (dBm)	Pass/Fail
		Measured PSD/100KHz (dBm)	PSD/3KHz (dBm)		
01	2412	4.92	-10.28	8	Pass
06	2437	5.00	-10.20	8	Pass
11	2462	4.84	-10.36	8	Pass

Note:

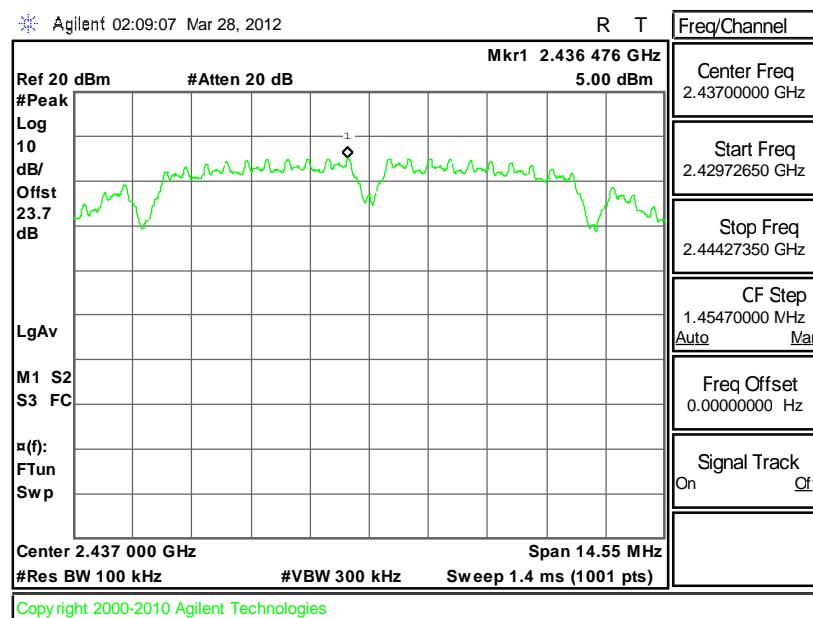
1. Measured power density (dBm) has offset with cable loss.
2. BWCF (dB) = $10 \log (3k/100k) = -15.2 \text{ dB}$
3. Power Density/ 3kHz (dBm)= Measured power density/ 100KHz (dBm) + BWCF (dB)

Mode 1 : PSD Plot on 802.11b Channel 01

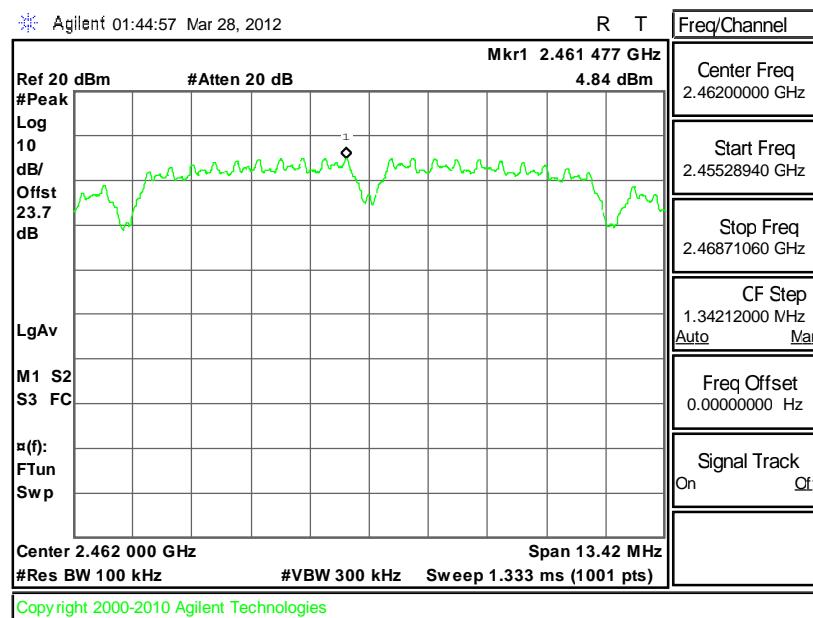




Mode 2 : PSD Plot on 802.11b Channel 06



Mode 3 : PSD Plot on 802.11b Channel 11



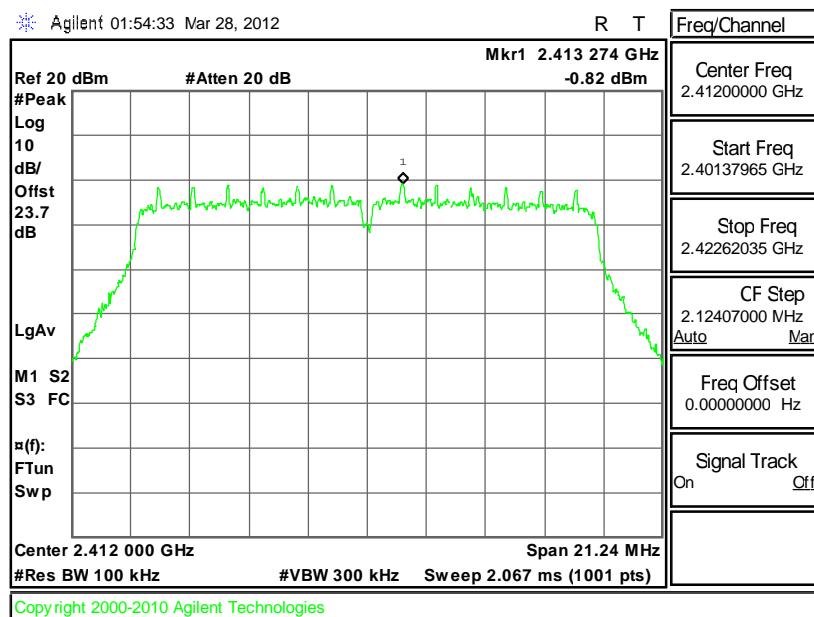


Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g Power Density		Max. Limits (dBm)	Pass/Fail
		Measured PSD/100KHz (dBm)	PSD/3KHz (dBm)		
01	2412	-0.82	-16.02	8	Pass
06	2437	-0.87	-16.07	8	Pass
11	2462	-0.69	-15.89	8	Pass

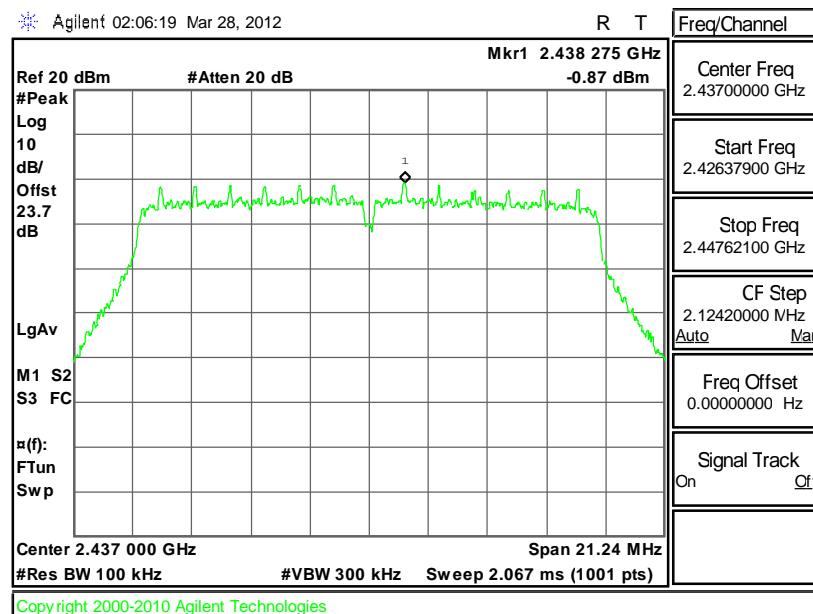
Note:

1. Measured power density (dBm) has offset with cable loss.
2. BWCF (dB) = $10 \log (3k/100k) = -15.2 \text{ dB}$
3. Power Density/ 3KHz (dBm)= Measured power density/ 100KHz (dBm) + BWCF (dB)

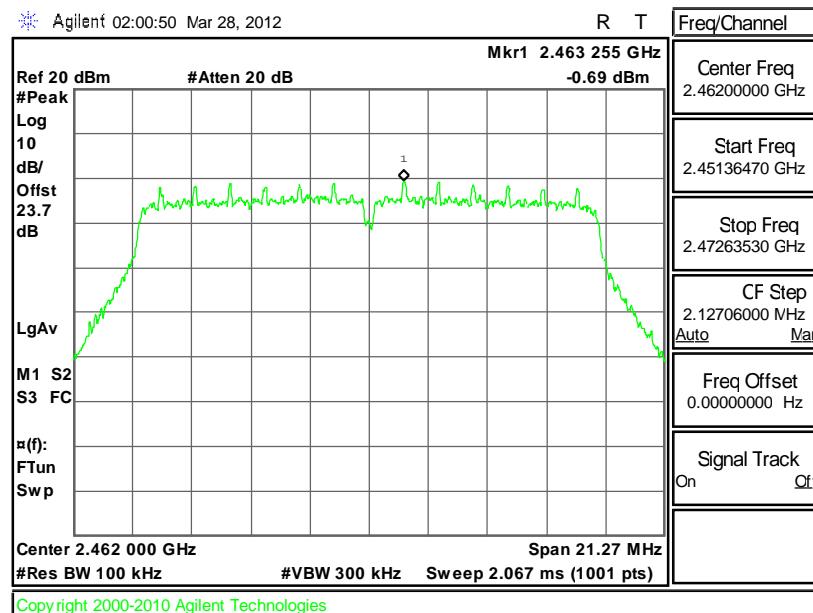
Mode 4 : PSD Plot on 802.11g Channel 01



Mode 5 : PSD Plot on 802.11g Channel 06



Mode 6 : PSD Plot on 802.11g Channel 11



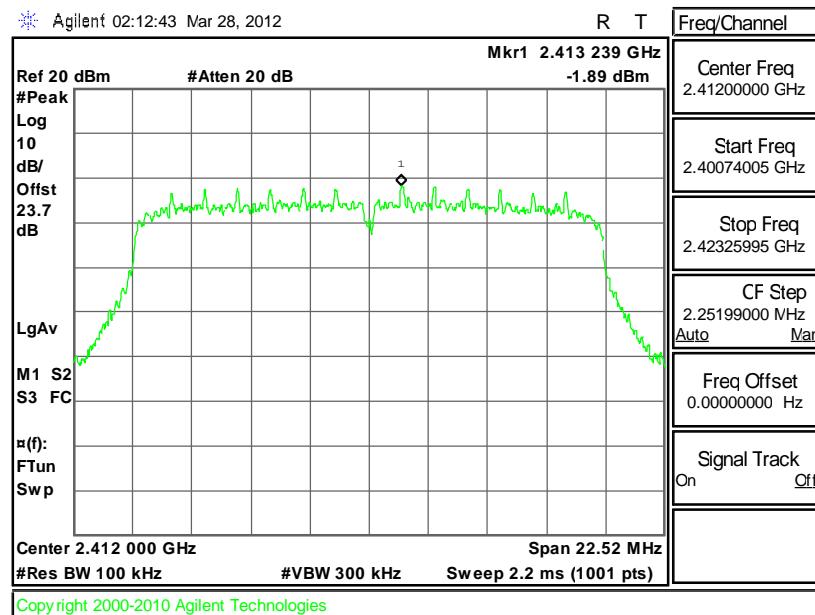


Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g/n (BW 20MHz) Power Density		Max. Limits (dBm)	Pass/Fail
		Measured PSD/100KHz (dBm)	PSD/3KHz (dBm)		
01	2412	-1.89	-17.09	8	Pass
06	2437	-1.79	-16.99	8	Pass
11	2462	-1.72	-16.92	8	Pass

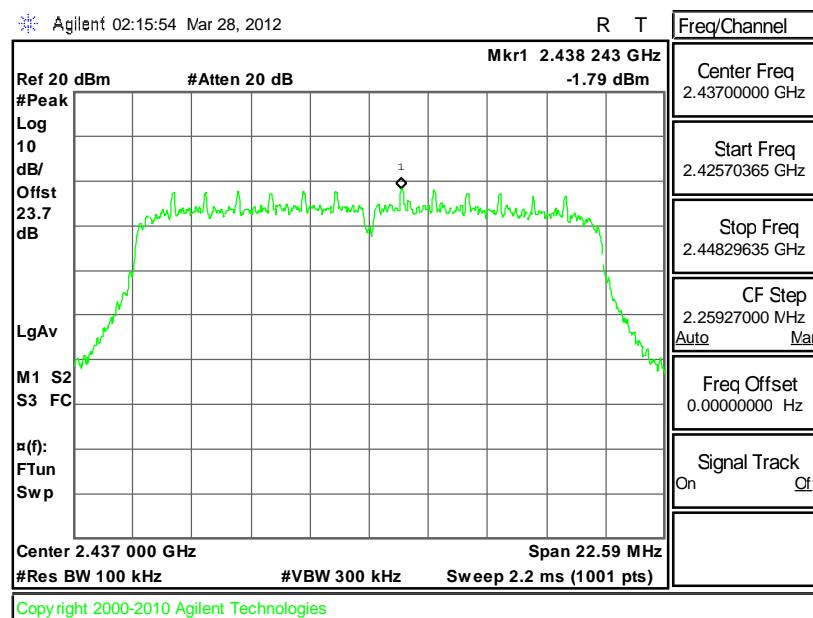
Note:

1. Measured power density (dBm) has offset with cable loss.
2. BWCF (dB) = $10 \log (3k/100k) = -15.2 \text{ dB}$
3. Power Density/ 3KHz (dBm)= Measured power density/ 100KHz (dBm) + BWCF (dB)

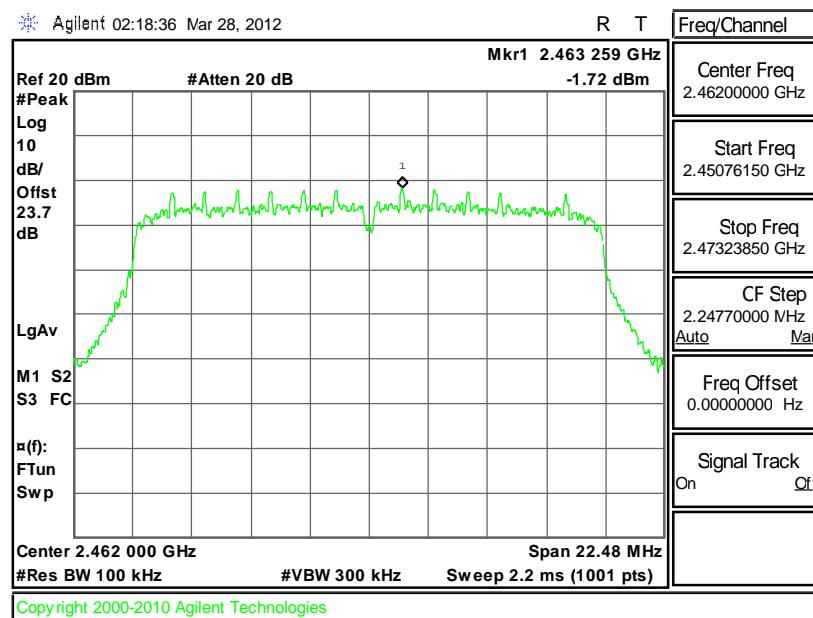
Mode 7 : PSD Plot on 802.11g/n (BW 20MHz) Channel 01



Mode 8 : PSD Plot on 802.11g/n (BW 20MHz) Channel 06



Mode 9 : PSD Plot on 802.11g/n (BW 20MHz) Channel 11



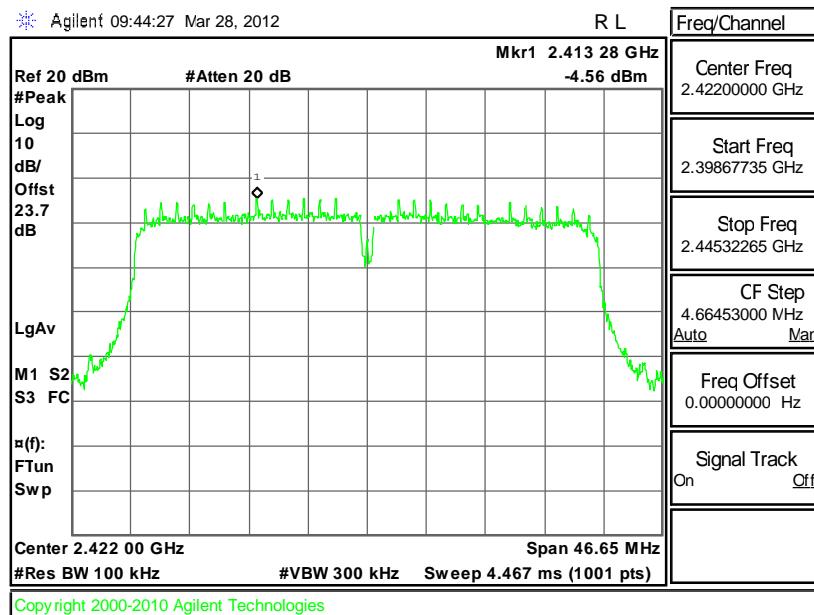


Test Mode :	Mode 10, 11, 12	Temperature :	24~26
Test Engineer :	Reece Li	Relative Humidity :	50~53

Channel	Frequency (MHz)	802.11g/n (BW 40MHz) Power Density		Max. Limits (dBm)	Pass/Fail
		Measured PSD/100KHz (dBm)	PSD/3KHz (dBm)		
03	2422	-4.56	-19.76	8	Pass
06	2437	-4.11	-19.31	8	Pass
09	2452	-4.41	-19.61	8	Pass

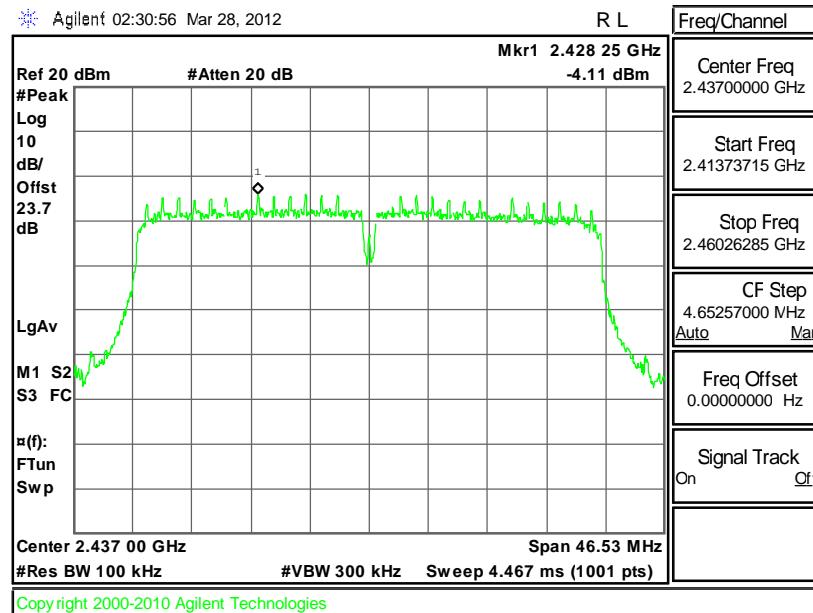
Note:

1. Measured power density (dBm) has offset with cable loss.
2. BWCF (dB) = $10 \log (3k/100k) = -15.2 \text{ dB}$
3. Power Density/ 3KHz (dBm)= Measured power density/ 100KHz (dBm) + BWCF (dB)

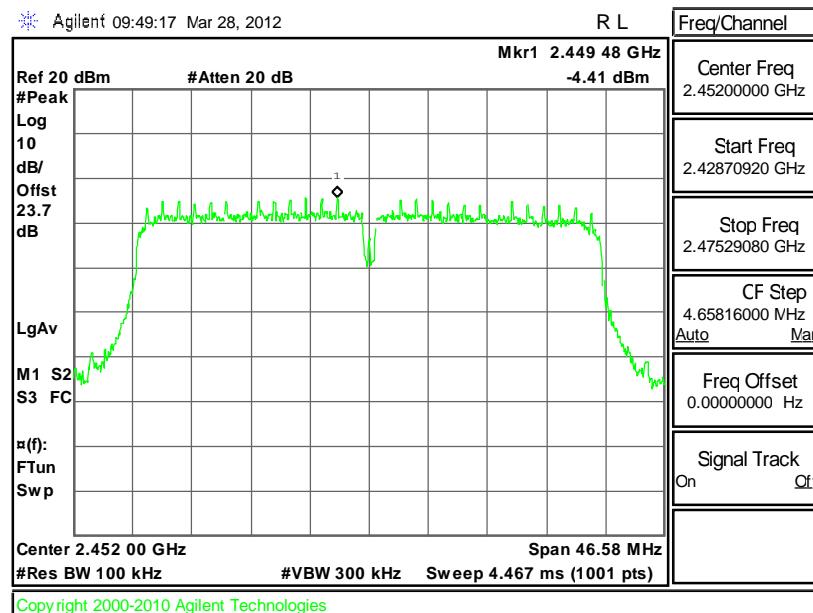
Mode 10 : PSD Plot on 802.11g/n (BW 40MHz) Channel 03



Mode 11 : PSD Plot on 802.11g/n (BW 40MHz) Channel 06



Mode 12 : PSD Plot on 802.11g/n (BW 40MHz) Channel 09





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 (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

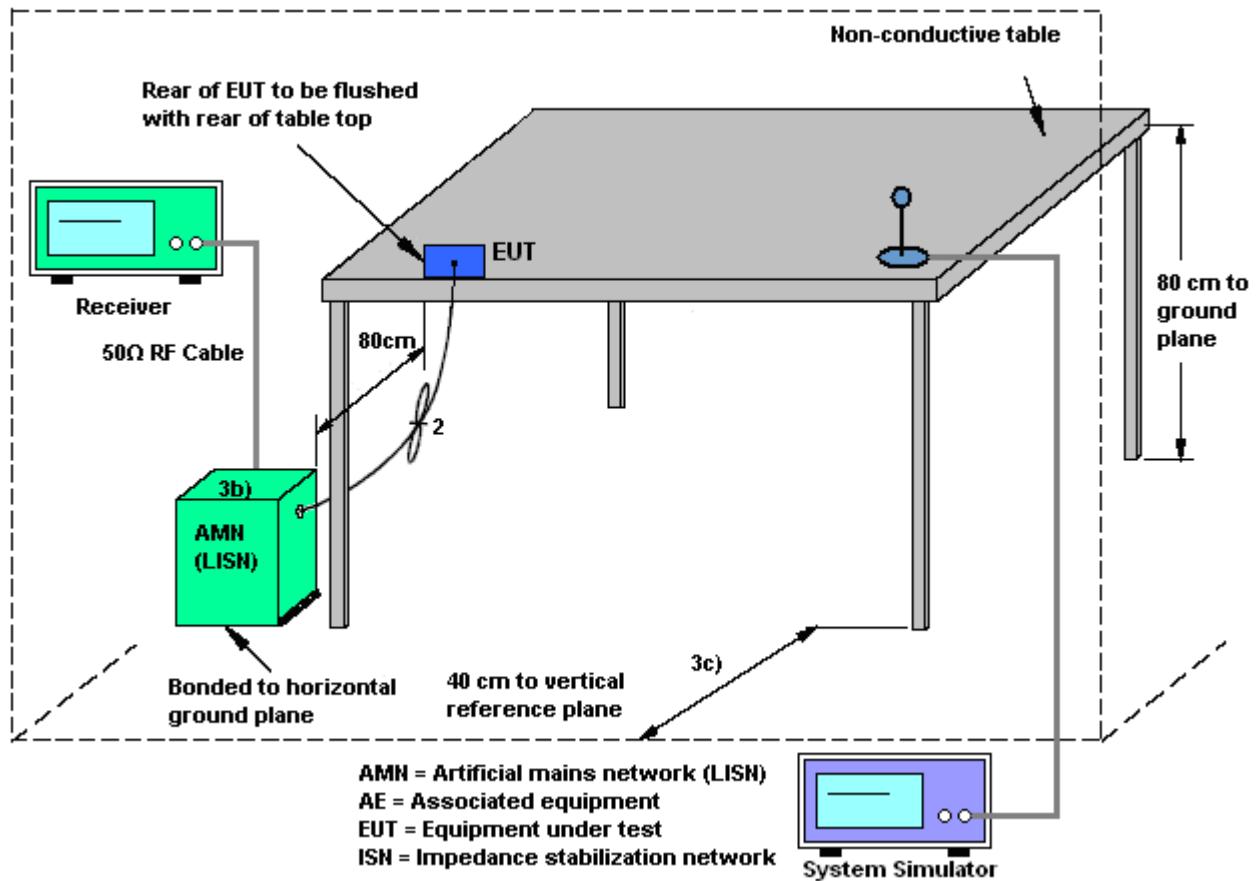
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

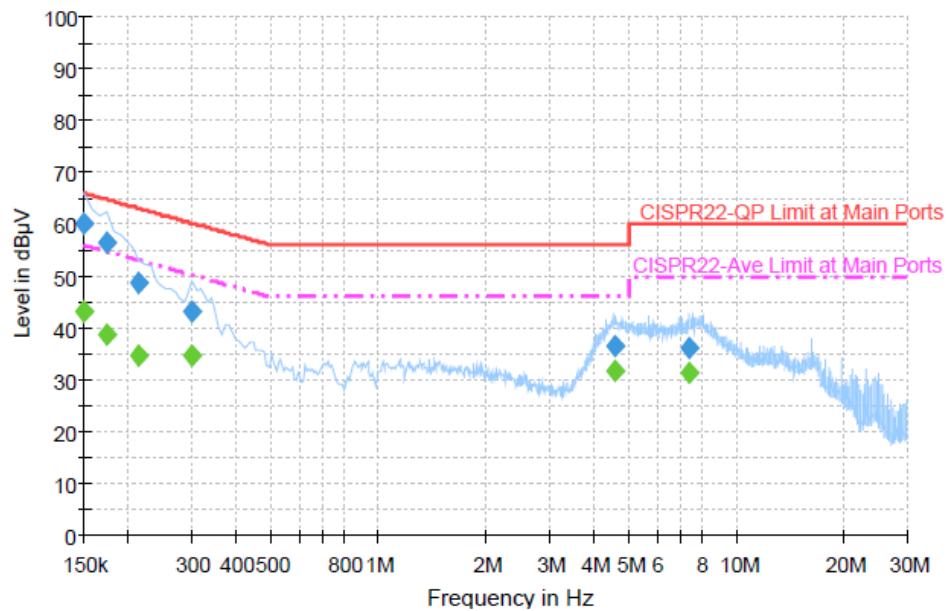
1. The testing follows the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 KHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	48~49%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN Link + LTE Link + RJ-45 (LAN Link) + POE + VOIP + Adapter for Sample 1		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		


Final Result : QuasiPeak

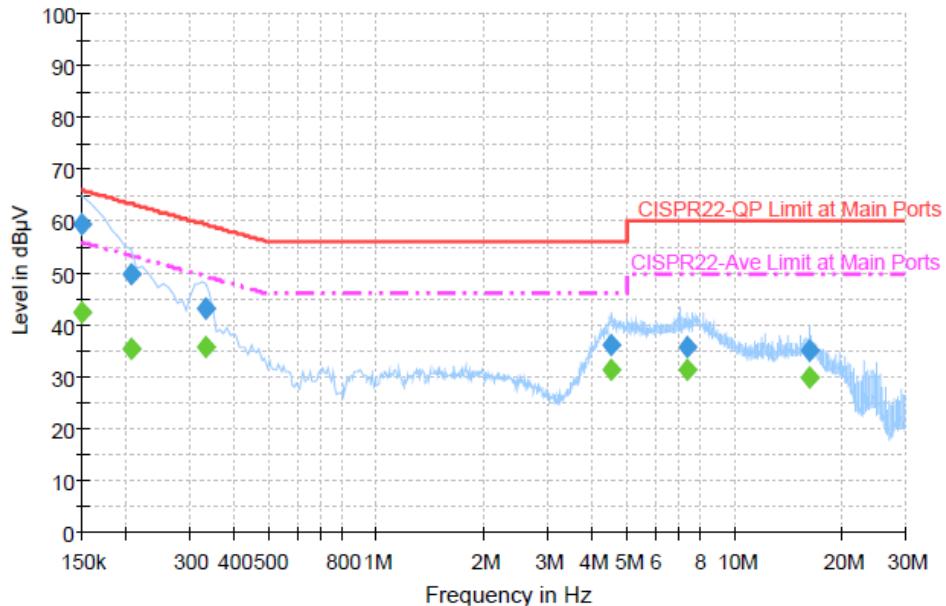
Frequency (MHz)	QuasiPeak (dB μ V)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	60.3	Off	L1	19.4	5.7	66.0
0.174000	56.3	Off	L1	19.4	8.5	64.8
0.214000	48.6	Off	L1	19.4	14.4	63.0
0.302000	43.2	Off	L1	19.4	17.0	60.2
4.598000	36.7	Off	L1	19.5	19.3	56.0
7.414000	36.3	Off	L1	19.5	23.7	60.0

Final Result : Average

Frequency (MHz)	Average (dB μ V)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	43.2	Off	L1	19.4	12.8	56.0
0.174000	38.9	Off	L1	19.4	15.9	54.8
0.214000	34.8	Off	L1	19.4	18.2	53.0
0.302000	34.6	Off	L1	19.4	15.6	50.2
4.598000	31.8	Off	L1	19.5	14.2	46.0
7.414000	31.4	Off	L1	19.5	18.6	50.0



Test Mode :	Mode 1	Temperature :	22~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	48~49%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Link + LTE Link + RJ-45 (LAN Link) + POE + VOIP + Adapter for Sample 1		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dB μ V)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	59.4	Off	N	19.4	6.6	66.0
0.206000	49.7	Off	N	19.4	13.7	63.4
0.334000	43.2	Off	N	19.4	16.2	59.4
4.550000	36.2	Off	N	19.5	19.8	56.0
7.390000	36.0	Off	N	19.6	24.0	60.0
16.166000	34.9	Off	N	19.7	25.1	60.0

Final Result : Average

Frequency (MHz)	Average (dB μ V)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	42.6	Off	N	19.4	13.4	56.0
0.206000	35.5	Off	N	19.4	17.9	53.4
0.334000	35.9	Off	N	19.4	13.5	49.4
4.550000	31.2	Off	N	19.5	14.8	46.0
7.390000	31.3	Off	N	19.6	18.7	50.0
16.166000	29.8	Off	N	19.7	20.2	50.0



3.7 Radiated Emission Measurement

3.7.1 Limit of Radiated Emission

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

3.7.2 Measuring Instruments

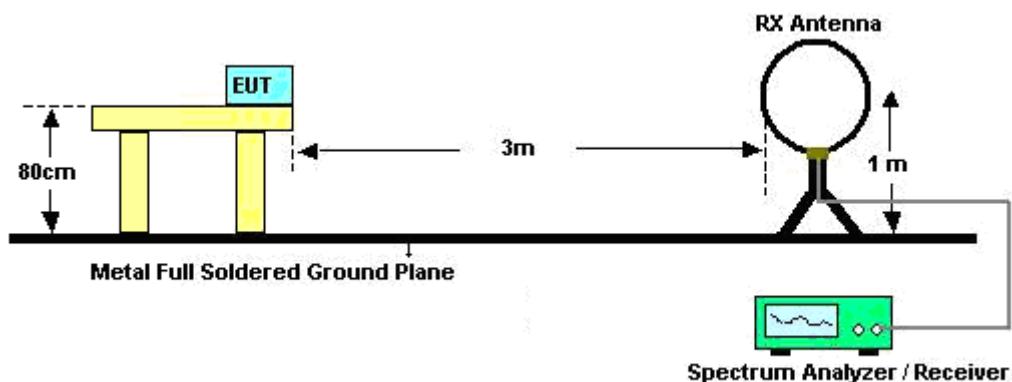
See list of measuring instruments of this test report.

3.7.3 Test Procedures

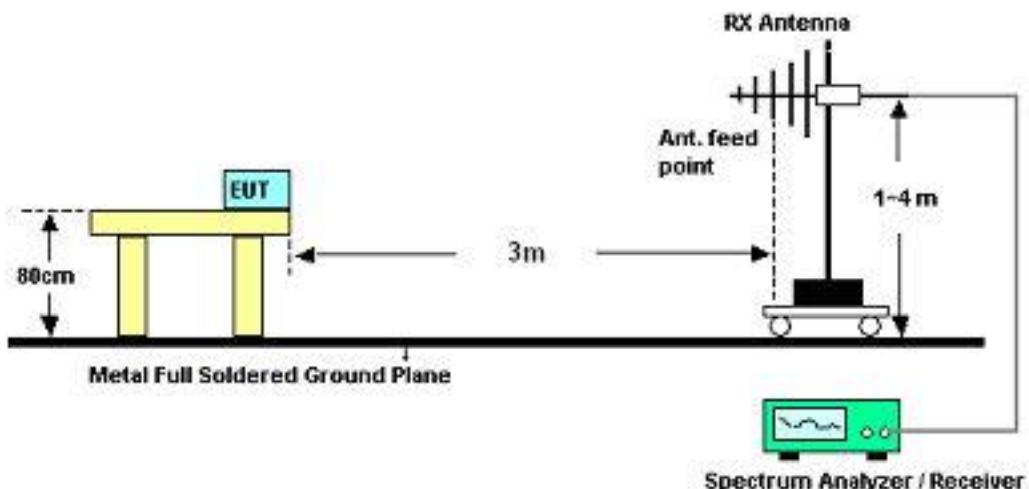
1. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW = 1 MHz for $f \geq 1$ GHz, 100 KHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Measurement above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB per decade from 3m to 1m.
Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB)
2. Maximize the emission by rotating the EUT for three orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines in ANSI C63.4-2003.

3.7.4 Test Setup

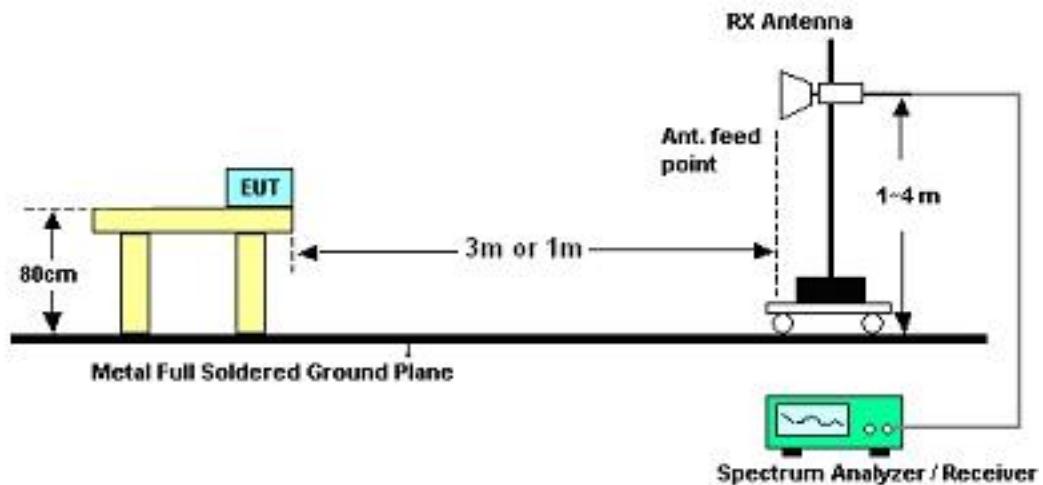
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.7.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

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.

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

Test Mode :	Mode 1			Temperature :		23~24°C				
Test Channel :	01			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2412 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2384.86	56.59	-17.41	74	52.49	32.03	6.03	33.96	100	86	Peak
2384.86	43.32	-10.68	54	39.22	32.03	6.03	33.96	100	86	Average
2412	105.53	-	-	101.35	32.08	6.07	33.97	100	86	Peak
2412	99.9	-	-	95.72	32.08	6.07	33.97	100	86	Average
2494	39.66	-14.34	54	35.28	32.2	6.18	34	100	86	Average
2494	50.49	-23.51	74	46.11	32.2	6.18	34	100	86	Peak

Test Mode :	Mode 1			Temperature :		23~24°C				
Test Channel :	01			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2412 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.42	47.78	-26.22	74	43.65	32.06	6.03	33.96	161	284	Peak
2389.42	34.57	-19.43	54	30.44	32.06	6.03	33.96	161	284	Average
2412	93.02	-	-	88.84	32.08	6.07	33.97	161	284	Peak
2412	88.38	-	-	84.2	32.08	6.07	33.97	161	284	Average
2494	33.86	-20.14	54	29.48	32.2	6.18	34	161	284	Average
2494	45.9	-28.1	74	41.52	32.2	6.18	34	161	284	Peak



Test Mode :	Mode 2			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	54.61	-19.39	74	50.51	32.03	6.03	33.96	100	96	Peak
2382	43.31	-10.69	54	39.21	32.03	6.03	33.96	100	96	Average
2437	99.61	-	-	95.35	32.13	6.11	33.98	100	96	Average
2437	105.56	-	-	101.3	32.13	6.11	33.98	100	96	Peak
2494	51.2	-22.8	74	46.82	32.2	6.18	34	100	96	Peak
2494	39.22	-14.78	54	34.84	32.2	6.18	34	100	96	Average

Test Mode :	Mode 2			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2356	48.12	-25.88	74	44.1	32.01	5.95	33.94	166	277	Peak
2356	35.28	-18.72	54	31.26	32.01	5.95	33.94	166	277	Average
2437	89.88	-	-	85.62	32.13	6.11	33.98	166	277	Average
2437	94.43	-	-	90.17	32.13	6.11	33.98	166	277	Peak
2486	45.39	-28.61	74	41.03	32.18	6.18	34	166	277	Peak
2486	33.03	-20.97	54	28.67	32.18	6.18	34	166	277	Average



Test Mode :	Mode 3	Temperature :	23~24°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	2462 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
47.82	32.94	-7.06	40	54.49	9.3	0.67	31.52	102	164	Peak
137.46	27.51	-15.99	43.5	46.44	11.44	1.19	31.56	-	-	Peak
149.61	25.92	-17.58	43.5	45.05	11.22	1.21	31.56	-	-	Peak
500.2	29.32	-16.68	46	39.84	18.1	2.45	31.07	-	-	Peak
629	29.98	-16.02	46	38.06	20.03	2.78	30.89	-	-	Peak
750.1	31.02	-14.98	46	37.32	21.34	3.06	30.7	-	-	Peak
2382	54.79	-19.21	74	50.69	32.03	6.03	33.96	100	93	Peak
2382	43.64	-10.36	54	39.54	32.03	6.03	33.96	100	93	Average
2462	105.08	-	-	100.78	32.15	6.14	33.99	100	93	Peak
2462	100.14	-	-	95.84	32.15	6.14	33.99	100	93	Average
2485.37	53.44	-20.56	74	49.08	32.18	6.18	34	100	93	Peak
2485.37	40.2	-13.8	54	35.84	32.18	6.18	34	100	93	Average



Test Mode :	Mode 3	Temperature :	23~24°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	2462 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
49.17	34.52	-5.48	40	56.86	8.5	0.69	31.53	111	158	Peak
55.38	33.45	-6.55	40	57.17	7.1	0.73	31.55	-	-	Peak
202.26	30.37	-13.13	43.5	51.22	9.3	1.33	31.48	-	-	Peak
500.2	26.7	-19.3	46	37.22	18.1	2.45	31.07	-	-	Peak
624.1	24.42	-21.58	46	32.57	19.99	2.76	30.9	-	-	Peak
750.1	23.82	-22.18	46	30.12	21.34	3.06	30.7	-	-	Peak
2374	44.97	-29.03	74	40.9	32.03	5.99	33.95	100	268	Peak
2374	33.83	-20.17	54	29.76	32.03	5.99	33.95	100	268	Average
2462	87	-	-	82.7	32.15	6.14	33.99	100	268	Average
2462	91.77	-	-	87.47	32.15	6.14	33.99	100	268	Peak
2486.13	45.33	-28.67	74	40.97	32.18	6.18	34	100	268	Peak
2486.13	34.12	-19.88	54	29.76	32.18	6.18	34	100	268	Average



Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	2462 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
49.17	32.89	-7.11	40	55.23	8.5	0.69	31.53	102	167	Peak
137.46	27.72	-15.78	43.5	46.65	11.44	1.19	31.56	-	-	Peak
166.62	25.54	-17.96	43.5	45.98	9.85	1.23	31.52	-	-	Peak
500.2	27.69	-18.31	46	38.21	18.1	2.45	31.07	-	-	Peak
632.5	27.96	-18.04	46	36	20.06	2.79	30.89	-	-	Peak
738.9	28.1	-17.9	46	34.62	21.18	3.03	30.73	-	-	Peak
2382	54.1	-19.9	74	50	32.03	6.03	33.96	100	105	Peak
2382	43.33	-10.67	54	39.23	32.03	6.03	33.96	100	105	Average
2462	107.65	-	-	103.35	32.15	6.14	33.99	100	105	Peak
2462	102.44	-	-	98.14	32.15	6.14	33.99	100	105	Average
2488.22	51.43	-22.57	74	47.05	32.2	6.18	34	100	105	Peak
2488.22	43.61	-10.39	54	39.23	32.2	6.18	34	100	105	Average
4924	43.35	-30.65	74	59.68	34.1	9.15	59.58	100	0	Peak



Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	11	Relative Humidity :	41~42%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	2462 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
49.17	34.46	-5.54	40	56.8	8.5	0.69	31.53	109	142	Peak
55.38	33.32	-6.68	40	57.04	7.1	0.73	31.55	-	-	Peak
75.09	28.62	-11.38	40	52.37	6.94	0.85	31.54	-	-	Peak
500.2	28.03	-17.97	46	38.55	18.1	2.45	31.07	-	-	Peak
533.8	23.89	-22.11	46	33.72	18.66	2.52	31.01	-	-	Peak
598.9	22.6	-23.4	46	31.07	19.77	2.68	30.92	-	-	Peak
2324	45.04	-28.96	74	41.09	31.96	5.92	33.93	119	332	Peak
2324	33.71	-20.29	54	29.76	31.96	5.92	33.93	119	332	Average
2462	102.34	-	-	98.04	32.15	6.14	33.99	119	332	Peak
2462	97.35	-	-	93.05	32.15	6.14	33.99	119	332	Average
2484.61	49.84	-24.16	74	45.48	32.18	6.18	34	119	332	Peak
2484.61	36.86	-17.14	54	32.5	32.18	6.18	34	119	332	Average
4924	46.25	-27.75	74	62.58	34.1	9.15	59.58	100	0	Peak



Test Mode :	Mode 5	Temperature :	23~24°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2462 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 105.34 dBuV/m - 20dB = 85.34dBuV/m.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2359.02	42.27	-11.73	54	38.22	32.01	5.99	33.95	100	96	Average
2359.02	55.18	-18.82	74	51.13	32.01	5.99	33.95	100	96	Peak
2412	87.32	-	-	83.14	32.08	6.07	33.97	100	96	Average
2412	105.34	-	-	101.16	32.08	6.07	33.97	100	96	Peak
2462	53.15	-32.19	85.34	48.85	32.15	6.14	33.99	100	0	Peak
2494	37.97	-16.03	54	33.59	32.2	6.18	34	100	96	Average
2494	51.22	-22.78	74	46.84	32.2	6.18	34	100	96	Peak

Test Mode :	Mode 5	Temperature :	23~24°C
Test Channel :	01	Relative Humidity :	41~42%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	2412 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2367.38	47.05	-26.95	74	43	32.01	5.99	33.95	195	285	Peak
2367.38	34.06	-19.94	54	30.01	32.01	5.99	33.95	195	285	Average
2412	77.44	-	-	73.26	32.08	6.07	33.97	195	285	Average
2412	93.14	-	-	88.96	32.08	6.07	33.97	195	285	Peak
2500	32.78	-21.22	54	28.4	32.2	6.18	34	195	285	Average
2500	44.3	-29.7	74	39.92	32.2	6.18	34	195	285	Peak



Test Mode :	Mode 6			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	56.73	-17.27	74	52.63	32.03	6.03	33.96	100	87	Peak
2382	43.35	-10.65	54	39.25	32.03	6.03	33.96	100	87	Average
2437	87.17	-	-	82.91	32.13	6.11	33.98	100	87	Average
2437	104.62	-	-	100.36	32.13	6.11	33.98	100	87	Peak
2492	50.62	-23.38	74	46.24	32.2	6.18	34	100	87	Peak
2492	38.69	-15.31	54	34.31	32.2	6.18	34	100	87	Average

Test Mode :	Mode 6			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	46.76	-27.24	74	42.66	32.03	6.03	33.96	165	277	Peak
2382	35.41	-18.59	54	31.31	32.03	6.03	33.96	165	277	Average
2437	77.15	-	-	72.89	32.13	6.11	33.98	165	277	Average
2437	93.39	-	-	89.13	32.13	6.11	33.98	165	277	Peak
2492	44.43	-29.57	74	40.05	32.2	6.18	34	165	277	Peak
2492	33.07	-20.93	54	28.69	32.2	6.18	34	165	277	Average



Test Mode :	Mode 7			Temperature :		23~24°C				
Test Channel :	11			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2462 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2372	53.27	-20.73	74	49.2	32.03	5.99	33.95	100	92	Peak
2372	40.63	-13.37	54	36.56	32.03	5.99	33.95	100	92	Average
2462	105.47	-	-	101.17	32.15	6.14	33.99	100	92	Peak
2462	86.85	-	-	82.55	32.15	6.14	33.99	100	92	Average
2484.42	52.93	-21.07	74	48.57	32.18	6.18	34	100	92	Peak
2484.42	38.91	-15.09	54	34.55	32.18	6.18	34	100	92	Average

Test Mode :	Mode 7			Temperature :		23~24°C				
Test Channel :	11			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2462 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2342	44.67	-29.33	74	40.68	31.98	5.95	33.94	167	341	Peak
2342	33.25	-20.75	54	29.26	31.98	5.95	33.94	167	341	Average
2462	78.58	-	-	74.28	32.15	6.14	33.99	167	341	Average
2462	94.2	-	-	89.9	32.15	6.14	33.99	167	341	Peak
2488.22	45.51	-28.49	74	41.13	32.2	6.18	34	167	341	Peak
2488.22	33.04	-20.96	54	28.66	32.2	6.18	34	167	341	Average



Test Mode :	Mode 8			Temperature :		23~24°C				
Test Channel :	01			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2412 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2359.78	57.2	-16.8	74	53.15	32.01	5.99	33.95	100	87	Peak
2359.78	42.58	-11.42	54	38.53	32.01	5.99	33.95	100	87	Average
2412	101.66	-	-	97.48	32.08	6.07	33.97	100	87	Peak
2412	84	-	-	79.82	32.08	6.07	33.97	100	87	Average
2500	36.82	-17.18	54	32.44	32.2	6.18	34	100	87	Average
2500	49.17	-24.83	74	44.79	32.2	6.18	34	100	87	Peak

Test Mode :	Mode 8			Temperature :		23~24°C				
Test Channel :	01			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2412 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2381.06	46.94	-27.06	74	42.84	32.03	6.03	33.96	167	280	Peak
2381.06	34.18	-19.82	54	30.08	32.03	6.03	33.96	167	280	Average
2412	89.71	-	-	85.53	32.08	6.07	33.97	167	280	Peak
2412	74.06	-	-	69.88	32.08	6.07	33.97	167	280	Average
2486	32.6	-21.4	54	28.24	32.18	6.18	34	167	280	Average
2486	45.64	-28.36	74	41.28	32.18	6.18	34	167	280	Peak



Test Mode :	Mode 9			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	54.32	-19.68	74	50.22	32.03	6.03	33.96	100	106	Peak
2382	42	-12	54	37.9	32.03	6.03	33.96	100	106	Average
2437	100.43	-	-	96.17	32.13	6.11	33.98	100	106	Peak
2437	83.46	-	-	79.2	32.13	6.11	33.98	100	106	Average
2492	50.1	-23.9	74	45.72	32.2	6.18	34	100	106	Peak
2492	38.15	-15.85	54	33.77	32.2	6.18	34	100	106	Average

Test Mode :	Mode 9			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	46	-28	74	41.9	32.03	6.03	33.96	200	279	Peak
2382	34.59	-19.41	54	30.49	32.03	6.03	33.96	200	279	Average
2437	89.47	-	-	85.24	32.1	6.11	33.98	200	279	Peak
2437	74.26	-	-	70	32.13	6.11	33.98	200	279	Average
2500	45.43	-28.57	74	41.05	32.2	6.18	34	200	279	Peak
2500	32.97	-21.03	54	28.59	32.2	6.18	34	200	279	Average



Test Mode :	Mode 10			Temperature :		23~24°C				
Test Channel :	11			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2462 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	54	-20	74	49.9	32.03	6.03	33.96	100	94	Peak
2382	41.09	-12.91	54	36.99	32.03	6.03	33.96	100	94	Average
2462	101.29	-	-	96.99	32.15	6.14	33.99	100	94	Peak
2462	84.19	-	-	79.89	32.15	6.14	33.99	100	94	Average
2484.61	51.86	-22.14	74	47.5	32.18	6.18	34	100	94	Peak
2484.61	38.53	-15.47	54	34.17	32.18	6.18	34	100	94	Average

Test Mode :	Mode 10			Temperature :		23~24°C				
Test Channel :	11			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2462 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2390	45.03	-28.97	74	40.9	32.06	6.03	33.96	168	342	Peak
2390	33.42	-20.58	54	29.29	32.06	6.03	33.96	168	342	Average
2462	75.9	-	-	71.6	32.15	6.14	33.99	168	342	Average
2462	91.88	-	-	87.58	32.15	6.14	33.99	168	342	Peak
2491.26	45.99	-28.01	74	41.61	32.2	6.18	34	168	342	Peak
2491.26	33.33	-20.67	54	28.95	32.2	6.18	34	168	342	Average



Test Mode :	Mode 11			Temperature :		23~24°C				
Test Channel :	03			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2422 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2384.86	56.05	-17.95	74	51.95	32.03	6.03	33.96	100	89	Peak
2384.86	40.3	-13.7	54	36.2	32.03	6.03	33.96	100	89	Average
2422	99.31	-	-	95.11	32.1	6.07	33.97	100	89	Peak
2422	76.59	-	-	72.39	32.1	6.07	33.97	100	89	Average
2494	36.17	-17.83	54	31.79	32.2	6.18	34	100	89	Average
2494	49.27	-24.73	74	44.89	32.2	6.18	34	100	89	Peak

Test Mode :	Mode 11			Temperature :		23~24°C				
Test Channel :	03			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2422 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2374.98	45.93	-28.07	74	41.86	32.03	5.99	33.95	128	72	Peak
2374.98	33.14	-20.86	54	29.07	32.03	5.99	33.95	128	72	Average
2422	88.37	-	-	84.17	32.1	6.07	33.97	128	72	Peak
2422	68.13	-	-	63.93	32.1	6.07	33.97	128	72	Average
2484	32.61	-21.39	54	28.25	32.18	6.18	34	128	72	Average
2484	45.01	-28.99	74	40.65	32.18	6.18	34	128	72	Peak



Test Mode :	Mode 12			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2380	54.53	-19.47	74	50.43	32.03	6.03	33.96	100	88	Peak
2380	39.87	-14.13	54	35.77	32.03	6.03	33.96	100	88	Average
2437	77.01	-	-	72.75	32.13	6.11	33.98	100	88	Average
2437	99.54	-	-	95.28	32.13	6.11	33.98	100	88	Peak
2500	51.36	-22.64	74	46.98	32.2	6.18	34	100	88	Peak
2500	36.25	-17.75	54	31.87	32.2	6.18	34	100	88	Average

Test Mode :	Mode 12			Temperature :		23~24°C				
Test Channel :	06			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2437 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2340	45.66	-28.34	74	41.67	31.98	5.95	33.94	200	283	Peak
2340	33.39	-20.61	54	29.4	31.98	5.95	33.94	200	283	Average
2437	87.24	-	-	83.01	32.1	6.11	33.98	200	283	Peak
2437	67.51	-	-	63.25	32.13	6.11	33.98	200	283	Average
2494	43.67	-30.33	74	39.29	32.2	6.18	34	200	283	Peak
2494	32.25	-21.75	54	27.87	32.2	6.18	34	200	283	Average



Test Mode :	Mode 13			Temperature :		23~24°C				
Test Channel :	09			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Horizontal				
Remark :	2452 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2358	39.89	-14.11	54	35.84	32.01	5.99	33.95	100	88	Average
2358	53.98	-20.02	74	49.93	32.01	5.99	33.95	100	88	Peak
2452	99.74	-	-	95.48	32.13	6.11	33.98	100	88	Peak
2452	76.9	-	-	72.64	32.13	6.11	33.98	100	88	Average
2484.61	52.95	-21.05	74	48.59	32.18	6.18	34	100	88	Peak
2484.61	37.24	-16.76	54	32.88	32.18	6.18	34	100	88	Average

Test Mode :	Mode 13			Temperature :		23~24°C				
Test Channel :	09			Relative Humidity :		41~42%				
Test Engineer :	Gavin Wu			Polarization :		Vertical				
Remark :	2452 MHz is fundamental signal which can be ignored.									

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2358	44.11	-29.89	74	40.06	32.01	5.99	33.95	100	168	Peak
2358	32.95	-21.05	54	28.9	32.01	5.99	33.95	100	168	Average
2452	86.99	-	-	82.73	32.13	6.11	33.98	100	168	Peak
2452	67.17	-	-	62.91	32.13	6.11	33.98	100	168	Average
2485.94	44.57	-29.43	74	40.21	32.18	6.18	34	100	168	Peak
2485.94	32.81	-21.19	54	28.45	32.18	6.18	34	100	168	Average



3.8 Antenna Requirements

3.8.1 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.

3.8.2 Antenna Connected Construction

The antennas type used in this product is PCB Antenna without connector and it is considered to meet antenna requirement.

3.8.3 Antenna Gain

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



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Mar. 27, 2012 ~ Apr. 11, 2012	Jun. 12, 2012	Conducted (TH02-HY)
Spectrum Analyzer	Agilent	E4445A	MY4820287	3Hz~13.2GHz	Nov. 02, 2011	Mar. 27, 2012 ~ Apr. 11, 2012	Nov. 01, 2013	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCS 30	100356	9KHz ~ 2.75GHz	Oct. 27, 2011	Apr. 04, 2012	Oct. 26, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz ~ 30MHz	Dec. 09, 2011	Apr. 04, 2012	Dec. 08, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz ~ 30MHz	Dec. 06, 2011	Apr. 04, 2012	Dec. 05, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Apr. 04, 2012	N/A	Conduction (CO05-HY)
LTE Base Station	Anritsu	MT8820C	6201074414	N/A	Jan. 05, 2012	Apr. 04, 2012	Jan. 04, 2013	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 22, 2011	Apr. 06, 2012 ~ Apr. 07, 2012	Oct. 21, 2012	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP30	101067	9KHz ~ 30GHz	Dec. 06, 2011	Apr. 06, 2012 ~ Apr. 07, 2012	Dec. 05, 2012	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 10, 2011	Apr. 06, 2012 ~ Apr. 07, 2012	Aug. 09, 2012	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz ~ 26.5GHz	Dec. 05, 2011	Apr. 06, 2012 ~ Apr. 07, 2012	Dec. 04, 2012	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Feb. 27, 2012	Apr. 06, 2012 ~ Apr. 07, 2012	Feb. 26, 2013	Radiation (03CH07-HY)
EMI TEST RECEIVER	R&S	ESCI 7	100724	9kHz ~ 7GHz	Aug. 22, 2011	Apr. 06, 2012 ~ Apr. 07, 2012	Aug. 21, 2012	Radiation (03CH07-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 18, 2011	Apr. 06, 2012 ~ Apr. 07, 2012	Jul. 17, 2012	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Apr. 06, 2012 ~ Apr. 07, 2012	Jul. 28, 2012	Radiation (03CH07-HY)



5 Uncertainty of Evaluation

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty $U_c(y)$	1.13		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26		

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty $U_c(y)$	1.27		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54		

**Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)**

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	±0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	±1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	±0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site Imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\log(1-\Gamma_1^*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				



Appendix A. Photographs of EUT

Please refer to Sporton report number EP231333 as below.