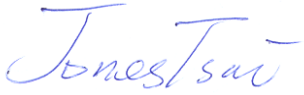
FCC RF Test Report

APPLICANT	:	**LG Electronics Inc.**
EQUIPMENT	:	**WCDMA & LTE Wireless Router with WLAN**
BRAND NAME	:	**LG**
MODEL NAME	:	**CR820**
MARKETING NAME	:	**CR820**
FCC ID	:	**ZNFCR820**
STANDARD	:	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	:	**(DTS) Digital Transmission System**

The product was received on Mar. 04, 2013 and completely tested on Mar. 27, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR330402	Rev. 01	Initial issue of report	Apr. 03, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-210 A8.4	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges	≤ 20dBc	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 2.48 dB at 2489.500 MHz
3.6	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 18.60 dB at 1.078 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

LG Electronics Inc.
60-39, Kasan-dong, Kumchon-gu, Seoul 135-801, Korea

1.2 Manufacturer

LG Electronics Inc.
60-39, Kasan-dong, Kumchon-gu, Seoul 135-801, Korea

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	WCDMA & LTE Wireless Router with WLAN
Brand Name	LG
Model Name	CR820
Marketing Name	CR820
FCC ID	ZNFCR820
EUT supports Radios application	WCDMA/HSPA/LTE/WLAN 11bgn
HW Version	Rev.1.0
SW Version	V08a
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 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum Output Power to Antenna	802.11b : 19.17 dBm (0.0826 W) 802.11g : 21.73 dBm (0.1489 W) 802.11n HT20 : 20.93 dBm (0.1239 W)
99% Occupied Bandwidth	802.11b : 13.10MHz 802.11g : 17.50MHz 802.11n HT20 : 18.25MHz
Antenna Type	802.11b/g/n : PIFA Antenna type with gain -2.64 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Testing Site

Test Site	SPORTON INTERNATIONAL INC.			
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978			
Test Site No.	Sporton Site No.			FCC/IC Registration No.
	TH02-HY	CO05-HY	03CH07-HY	722060/4086B-1

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

1.6 Applied Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02
- ANSI C63.10-2009

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 (X plane) were recorded in this report.

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

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

2.1 Carrier Frequency Channel

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

2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and antenna configurations as following table and the highest power data rates were chosen for full test in the following tables. Final Output Power equals to Measured Output Power adds the duty factor.

2.4GHz 802.11b mode				
Data Rate (MHz)	**1M bps**	**2M bps**	**5.5M bps**	**11M bps**
Peak Power (dBm)	**19.17**	19.11	19.09	19.12

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)	**21.73**	21.64	21.71	21.57	21.68	21.63	21.66	21.61

2.4GHz 802.11n HT20 mode								
Data Rate (MHz)	**MCS0**	**MCS1**	**MCS2**	**MCS3**	**MCS4**	**MCS5**	**MCS6**	**MCS7**
Peak Power (dBm)	**20.93**	20.92	20.81	20.91	20.85	20.79	20.92	20.87

2.3 Test Mode

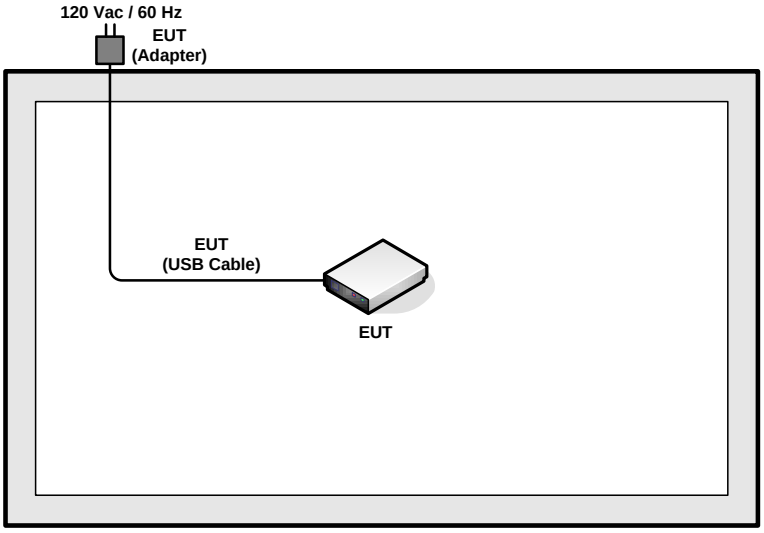
Final results of test modes, data rates and test channels are shown as following table.

<2.4GHz>

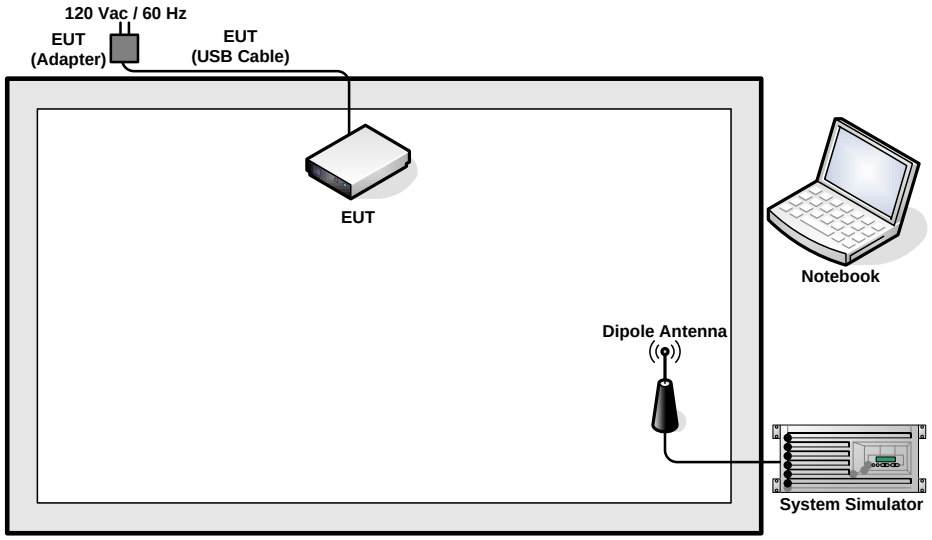
Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	6dB and 99% BW Power Spectral Density	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
	Output Power	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
	Conducted Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	6.5 Mbps	1/11
	Conducted Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
Radiated TCs	Radiated Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	6.5 Mbps	1/11
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
AC Conducted Emission	Mode 1 ： WCDMA Band V Idle + WLAN Link + USB Cable (Charging from Adapter)			

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.6 Description of RF Function Operation Test Setup

For WLAN function, programmed RF utility, “hypertrm.exe” installed in the Notebook make the EUT provides functions like channel selection and power level for continuous transmitting and receiving signals.

2.7 Measurement Results Explanation Example

For all conducted test items:

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

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

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

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

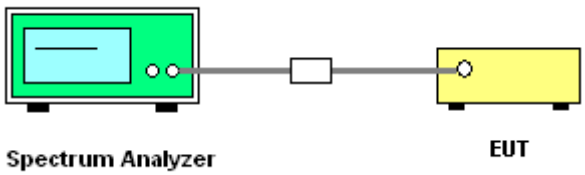
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v02.
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 Bandwidth

Test Mode :	802.11b	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	8.00	0.5	Pass
06	2437	8.04	0.5	Pass
11	2462	8.04	0.5	Pass

Test Mode :	802.11g	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	15.80	0.5	Pass
06	2437	16.32	0.5	Pass
11	2462	15.12	0.5	Pass

Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	16.04	0.5	Pass
06	2437	16.88	0.5	Pass
11	2462	15.44	0.5	Pass

3.1.6 Test Result of 99% Occupied Bandwidth

Test Mode :	802.11b	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b 99% Occupied Bandwidth (MHz)	Pass/Fail
01	2412	13.10	Pass
06	2437	12.95	Pass
11	2462	13.10	Pass

Test Mode :	802.11g	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

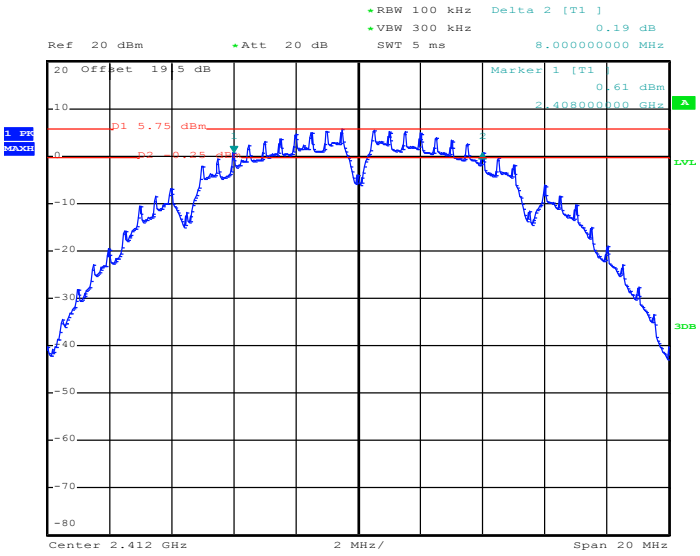
Channel	Frequency (MHz)	802.11g 99% Occupied Bandwidth (MHz)	Pass/Fail
01	2412	17.35	Pass
06	2437	17.50	Pass
11	2462	17.30	Pass

Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 99% Occupied Bandwidth (MHz)	Pass/Fail
01	2412	18.10	Pass
06	2437	18.25	Pass
11	2462	18.10	Pass

3.1.7 Test Result of 6dB Bandwidth Plots

6 dB Bandwidth Plot on 802.11b Channel 01



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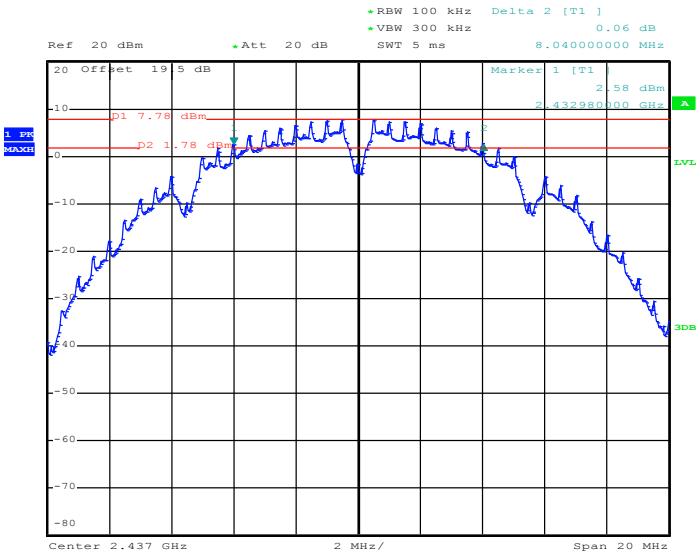
6 dB Bandwidth Plot on 802.11b Channel 06



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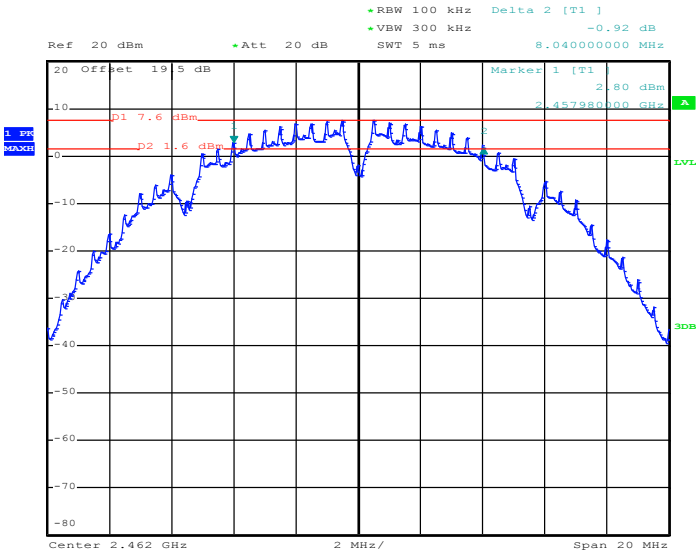
6 dB Bandwidth Plot on 802.11b Channel 11



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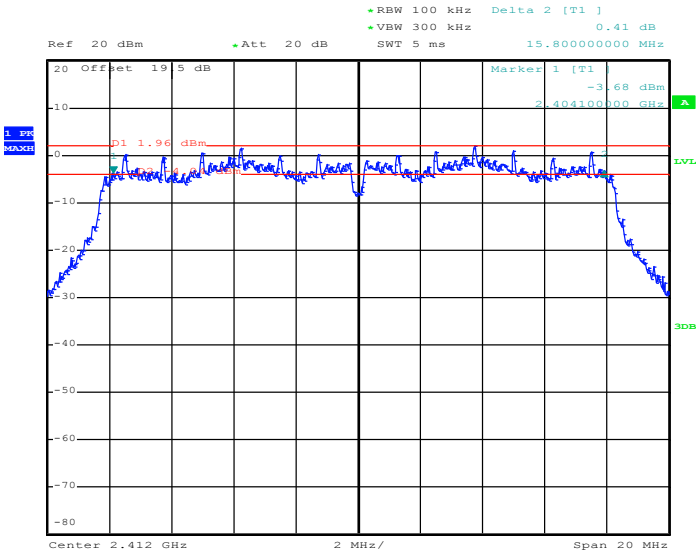
6 dB Bandwidth Plot on 802.11g Channel 01



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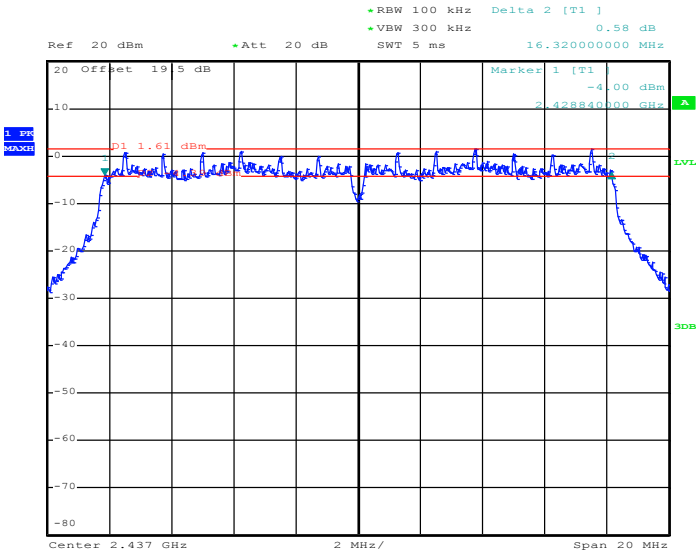
6 dB Bandwidth Plot on 802.11g Channel 06



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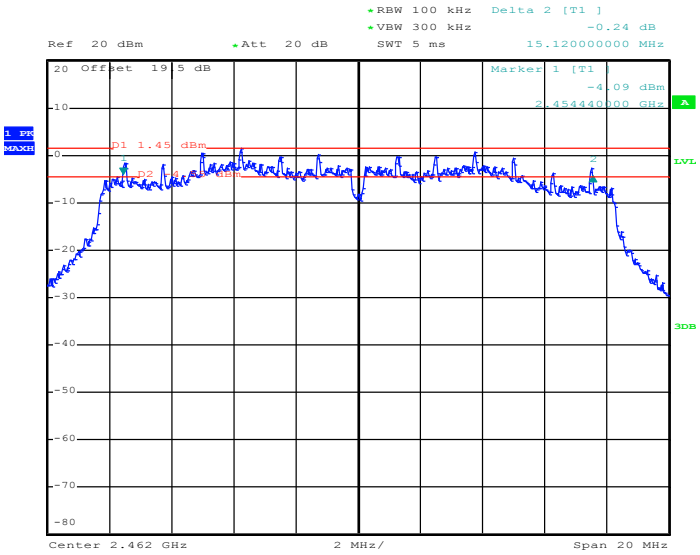
6 dB Bandwidth Plot on 802.11g Channel 11



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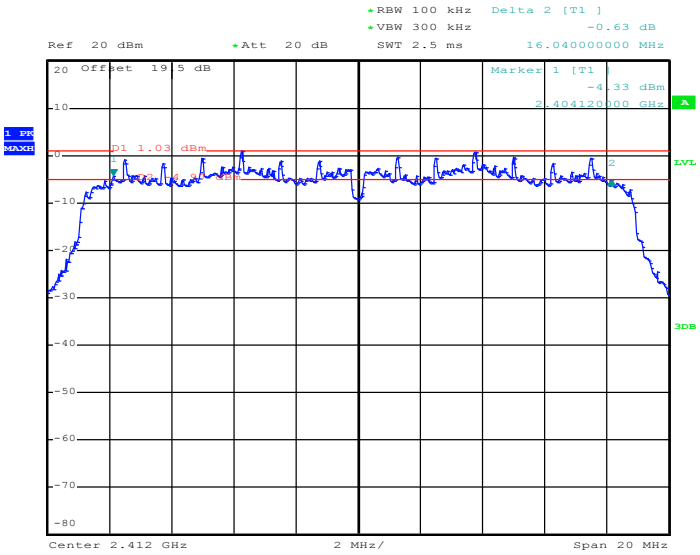
6 dB Bandwidth Plot on 2.4GHz 802.11n HT20 Channel 01



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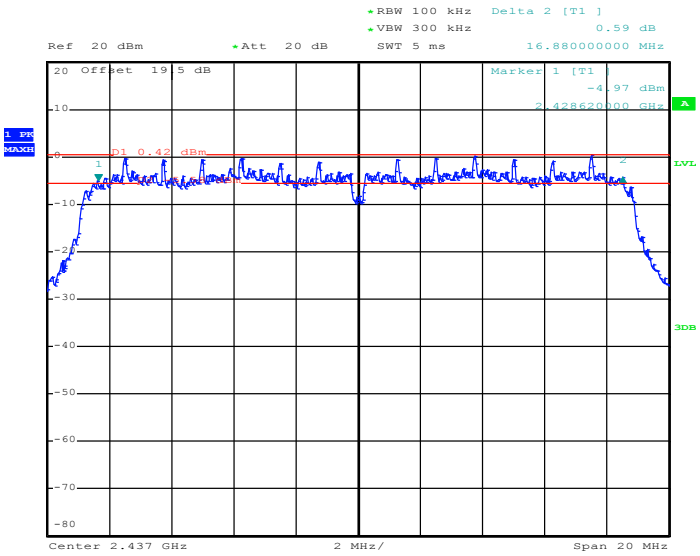
6 dB Bandwidth Plot on 2.4GHz 802.11n HT20 Channel 06



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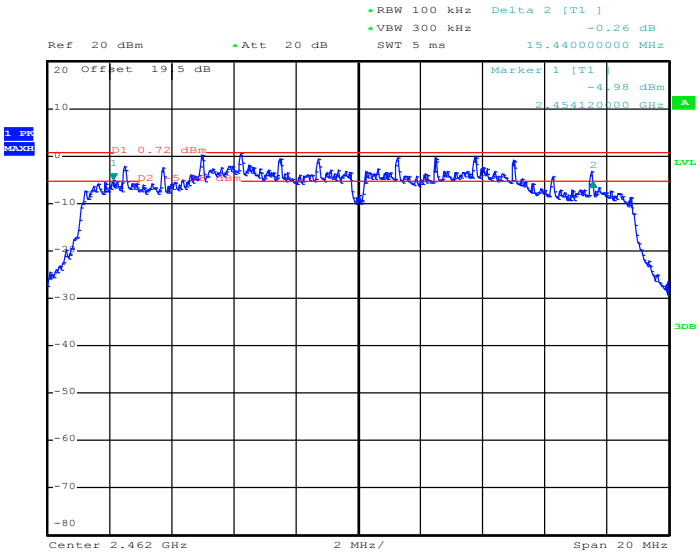
6 dB Bandwidth Plot on 2.4GHz 802.11n HT20 Channel 11



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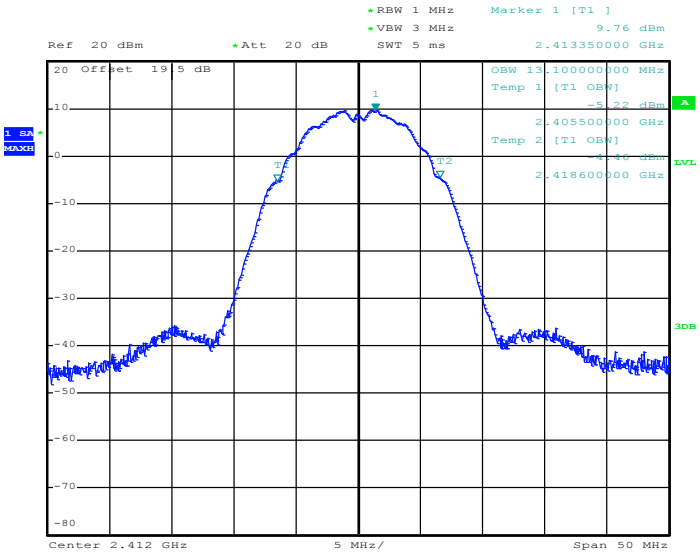
3.1.8 Test Result of 99% Bandwidth Plots

99% Occupied Bandwidth Plot on 802.11b Channel 01



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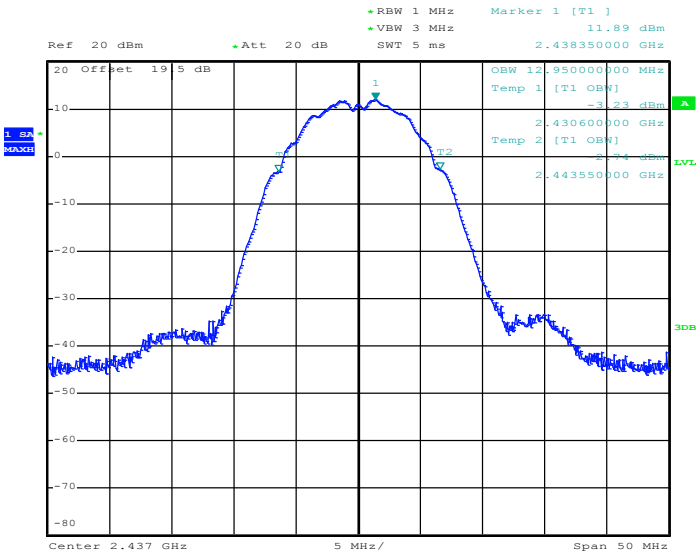
99% Occupied Bandwidth Plot on 802.11b Channel 06



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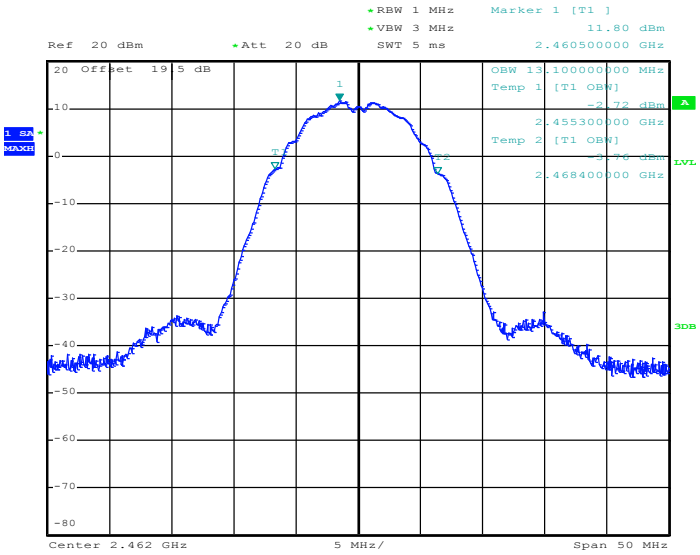
99% Occupied Bandwidth Plot on 802.11b Channel 11



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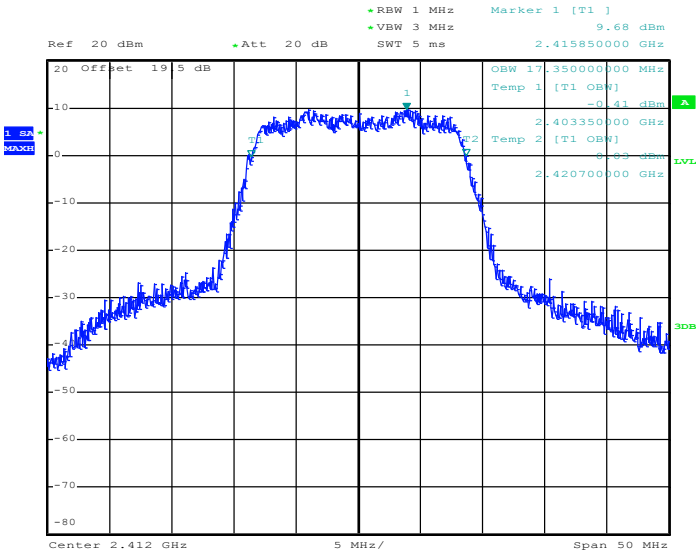
99% Occupied Bandwidth Plot on 802.11g Channel 01



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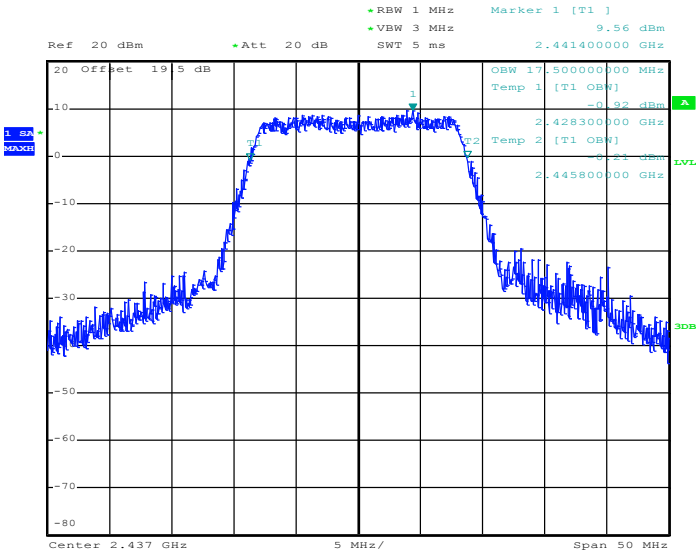
99% Occupied Bandwidth Plot on 802.11g Channel 06



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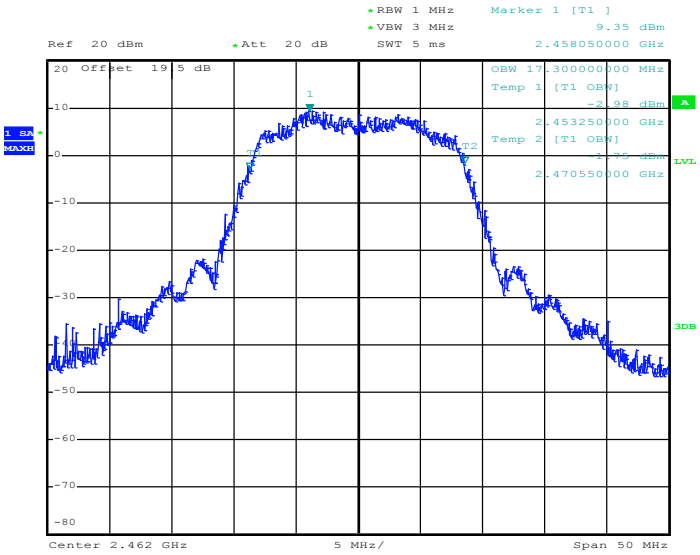
99% Occupied Bandwidth Plot on 802.11g Channel 11



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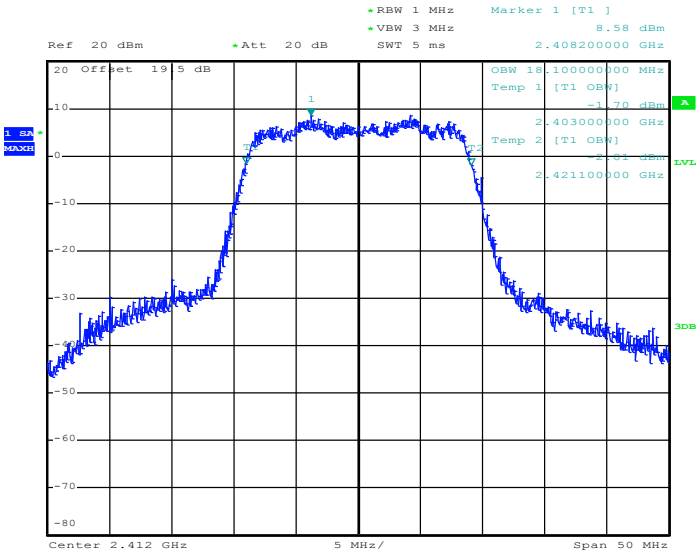
99% Occupied Bandwidth Plot on 2.4GHz 802.11n HT20 Channel 01



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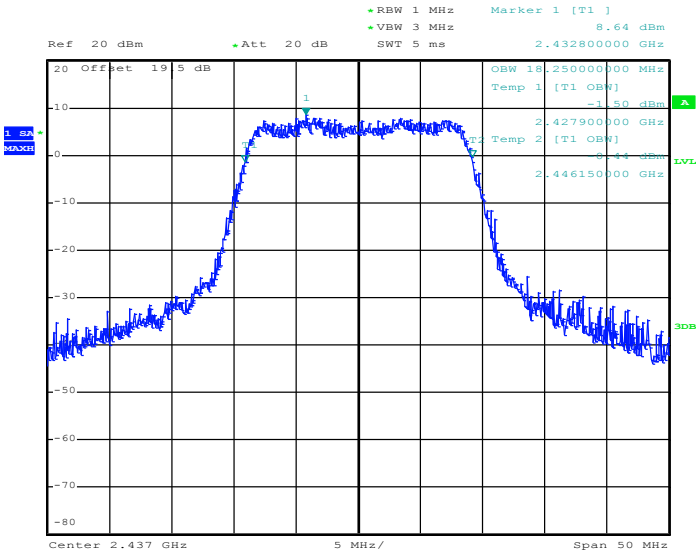
99% Occupied Bandwidth Plot on 2.4GHz 802.11n HT20 Channel 06



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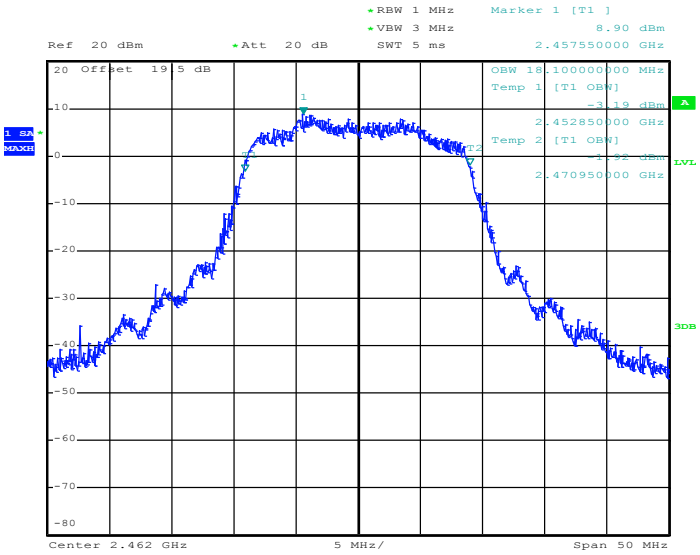
99% Occupied Bandwidth Plot on 2.4GHz 802.11n HT20 Channel 11



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3.2 Output Power Measurement

3.2.1 Limit of Output Power

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

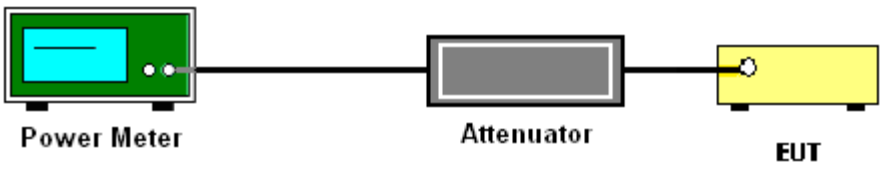
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v02.
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 :	802.11b	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	17.02	30	Pass
06	2437	19.17	30	Pass
11	2462	18.81	30	Pass

Test Mode :	802.11g	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	21.68	30	Pass
06	2437	21.73	30	Pass
11	2462	20.64	30	Pass

Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	20.82	30	Pass
06	2437	20.93	30	Pass
11	2462	20.21	30	Pass

3.2.6 Test Result of Average output Power (Reporting Only)

Test Mode :	802.11b	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%
Duty Cycle:	96.07%	Duty Factor:	0.17dB

Channel	Frequency (MHz)	802.11b Average Output Power (dBm)
01	2412	13.54
06	2437	15.46
11	2462	15.35

Test Mode :	802.11g	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%
Duty Cycle:	95.37%	Duty Factor:	0.21dB

Channel	Frequency (MHz)	802.11g Average Output Power (dBm)
01	2412	11.96
06	2437	11.98
11	2462	11.33

Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%
Duty Cycle:	95.07%	Duty Factor:	0.22dB

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 Average Output Power (dBm)
01	2412	10.93
06	2437	10.97
11	2462	10.71

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3KHz band at any time interval of continuous transmission.

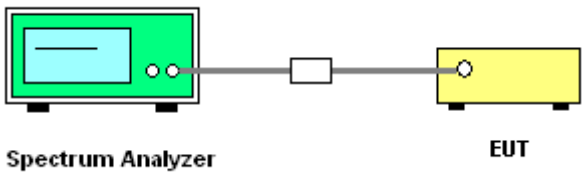
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 9.1 Option 1 of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02
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.
7. The Measured power density (dBm)/ 100KHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Test Mode :	802.11b	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Power Density		Max. Limits (dBm/3kHz)	Pass/Fail
		PSD/100kHz (dBm)	PSD/3kHz (dBm)		
01	2412	5.11	-8.28	8	Pass
06	2437	7.73	-6.86	8	Pass
11	2462	7.31	-6.35	8	Pass

Test Mode :	802.11g	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g Power Density		Max. Limits (dBm/3kHz)	Pass/Fail
		PSD/100kHz (dBm)	PSD/3kHz (dBm)		
01	2412	1.57	-12.32	8	Pass
06	2437	1.16	-13.02	8	Pass
11	2462	0.92	-13.50	8	Pass

Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Engineer :	Jeff Chou	Relative Humidity :	50~53%

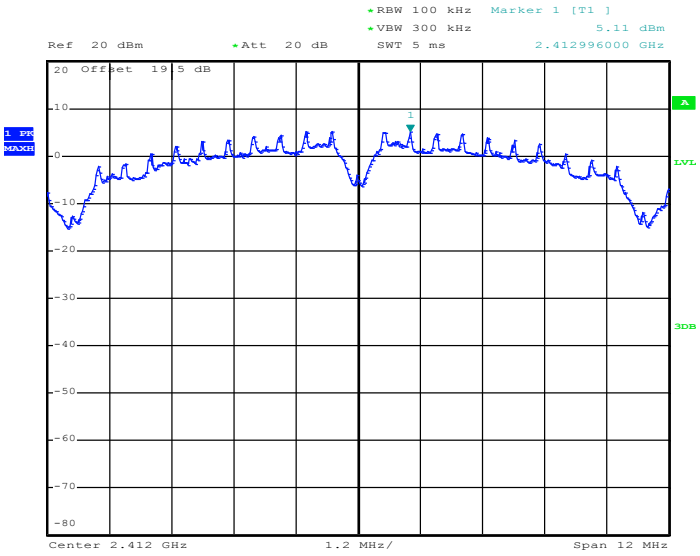
Channel	Frequency (MHz)	2.4GHz 802.11n HT20 Power Density		Max. Limits (dBm/3kHz)	Pass/Fail
		PSD/100kHz (dBm)	PSD/3kHz (dBm)		
01	2412	0.51	-12.52	8	Pass
06	2437	0.13	-14.50	8	Pass
11	2462	-0.11	-13.95	8	Pass

Note:

1. *Measured power density (dBm) has offset with cable loss.*
2. *The Measured power density (dBm)/ 100kHz is reference level and used as 20dBc down for Conducted Band Edges and Conducted Spurious Emission limit line.*

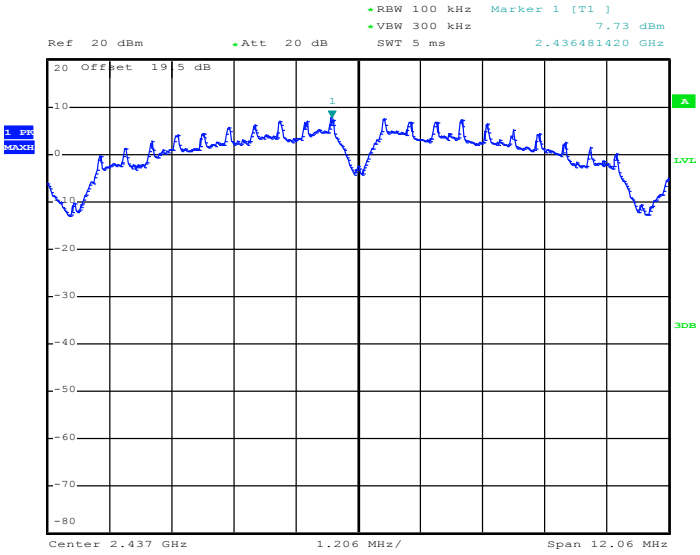
3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on 802.11b Channel 01



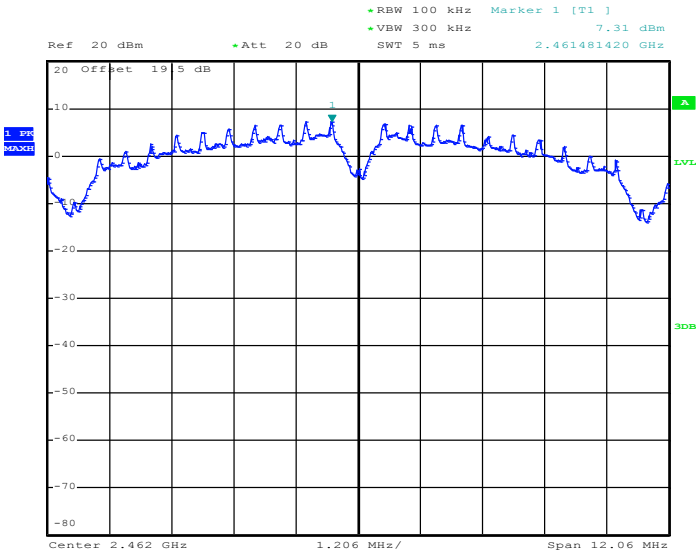
Date: 27.MAR.2013 23:36:14

PSD 100kHz Plot on 802.11b Channel 06



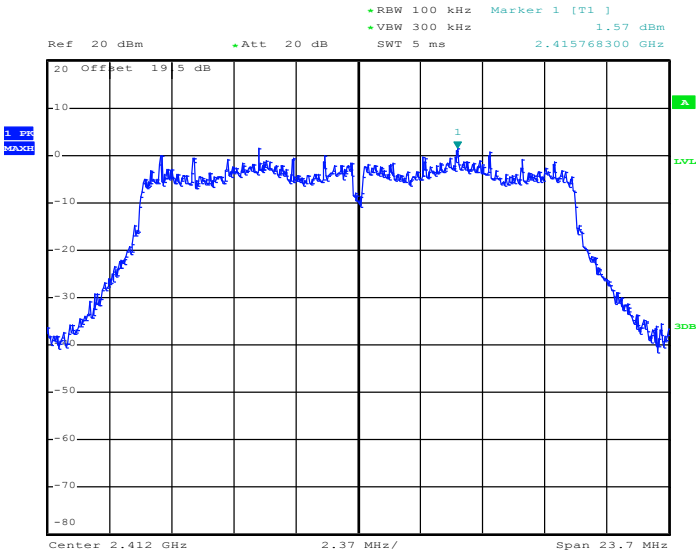
Date: 27.MAR.2013 22:36:05

PSD 100kHz Plot on 802.11b Channel 11



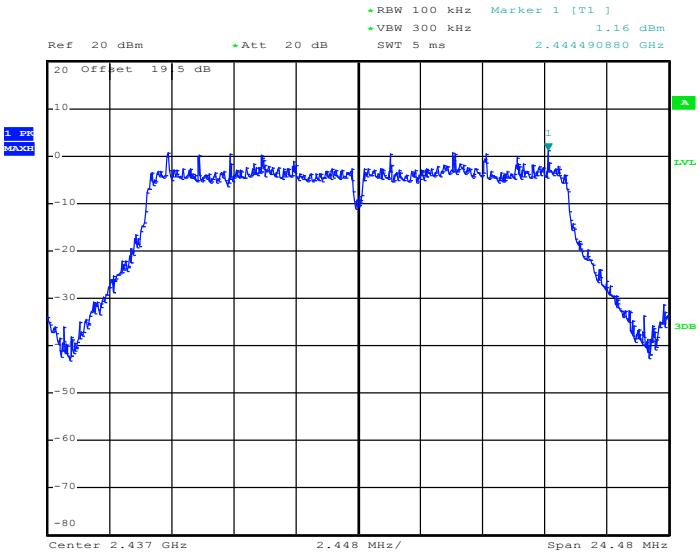
Date: 27.MAR.2013 22:42:36

PSD 100kHz Plot on 802.11g Channel 01



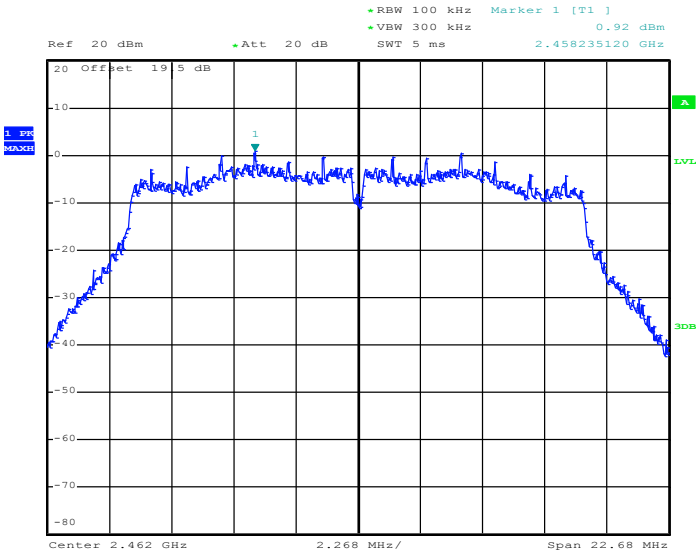
Date: 27.MAR.2013 22:47:55

PSD 100kHz Plot 802.11g Channel 06



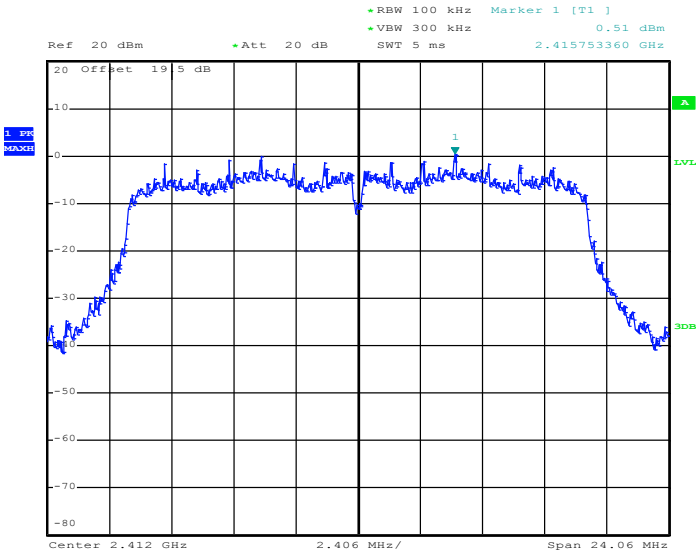
Date: 27.MAR.2013 22:52:33

PSD 100kHz Plot 802.11g Channel 11



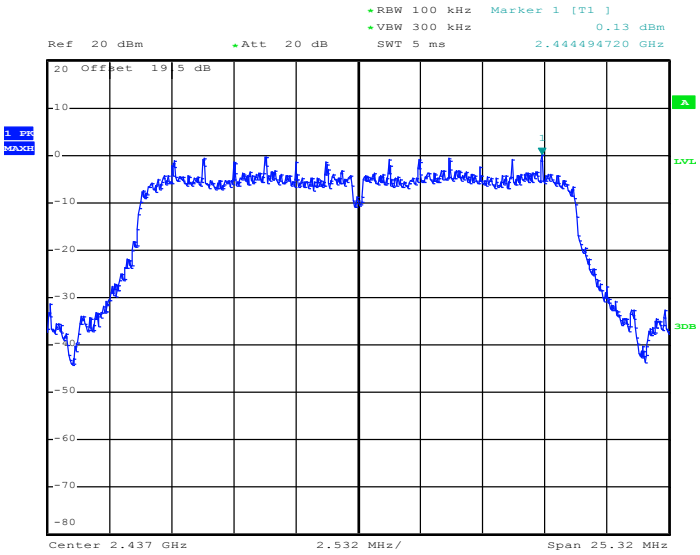
Date: 27.MAR.2013 22:59:38

PSD 100kHz Plot on 2.4GHz 802.11n HT20 Channel 01



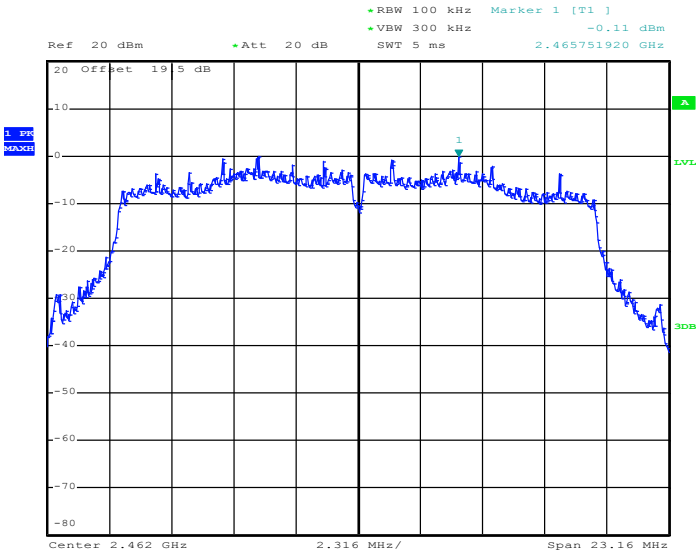
Date: 27.MAR.2013 23:09:05

PSD 100kHz Plot on 2.4GHz 802.11n HT20 Channel 06



Date: 27.MAR.2013 23:16:24

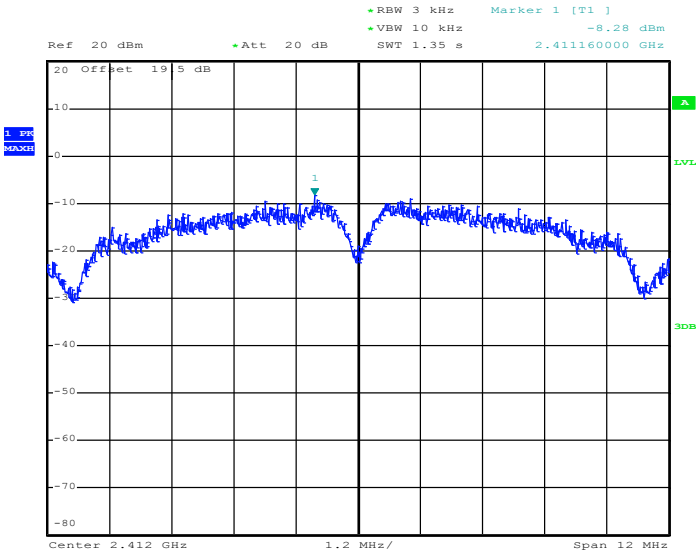
PSD 100kHz Plot on 2.4GHz 802.11n HT20 Channel 11



Date: 27.MAR.2013 23:29:53

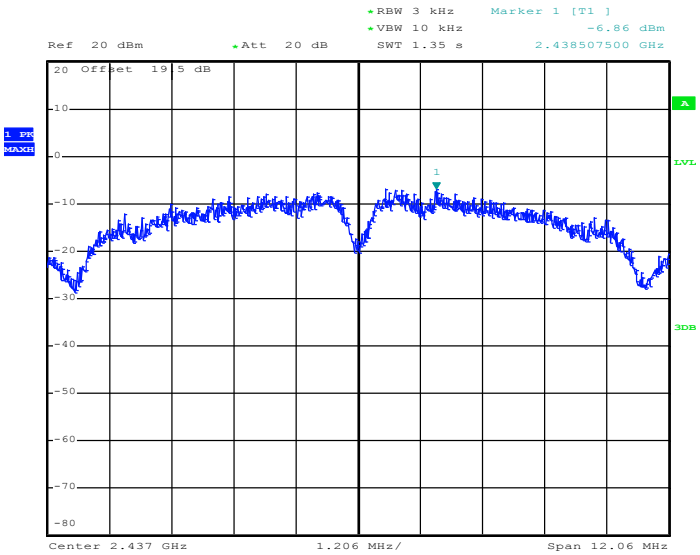
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on 802.11b Channel 01



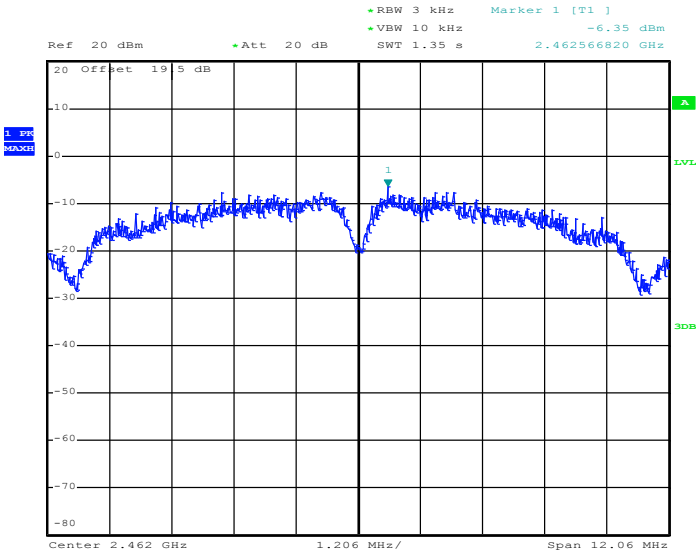
Date: 27.MAR.2013 23:36:03

PSD 3kHz Plot on 802.11b Channel 06



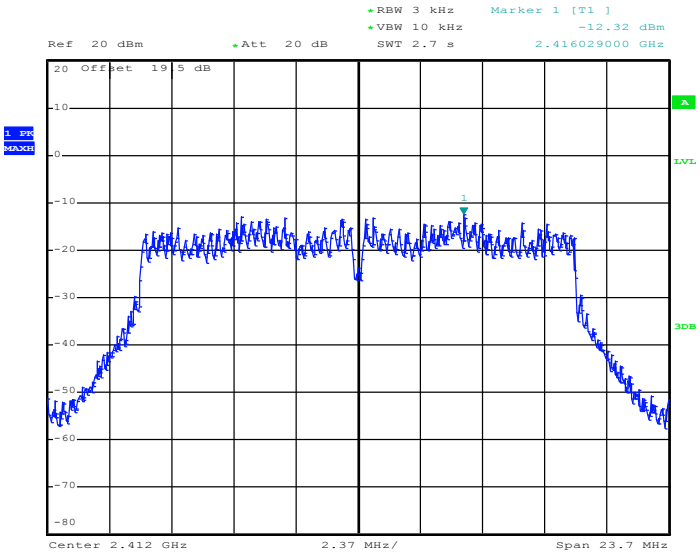
Date: 27.MAR.2013 22:35:54

PSD 3kHz Plot on 802.11b Channel 11



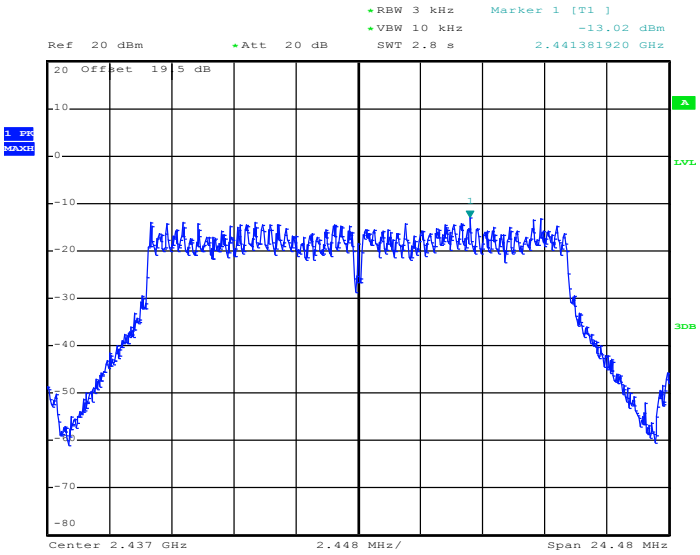
Date: 27.MAR.2013 22:42:10

PSD 3kHz Plot on 802.11g Channel 01



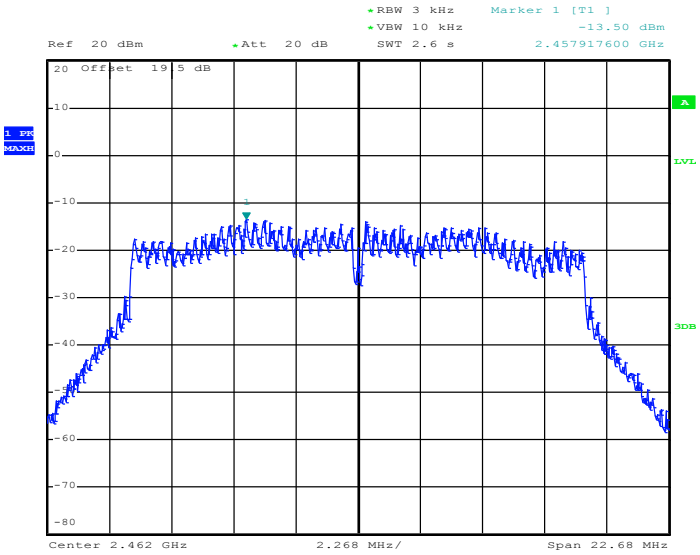
Date: 27.MAR.2013 22:47:45

PSD 3kHz Plot on 802.11g Channel 06



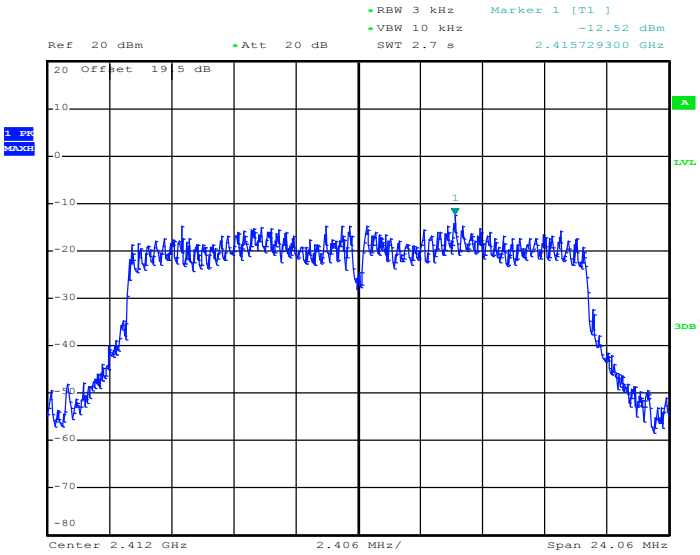
Date: 27.MAR.2013 22:52:23

PSD 3kHz Plot on 802.11g Channel 11



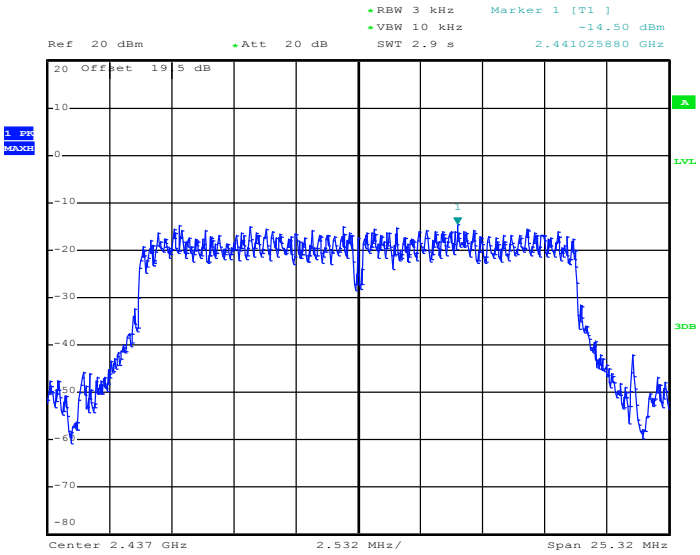
Date: 27.MAR.2013 22:59:28

PSD 3kHz Plot on 2.4GHz 802.11n HT20 Channel 01



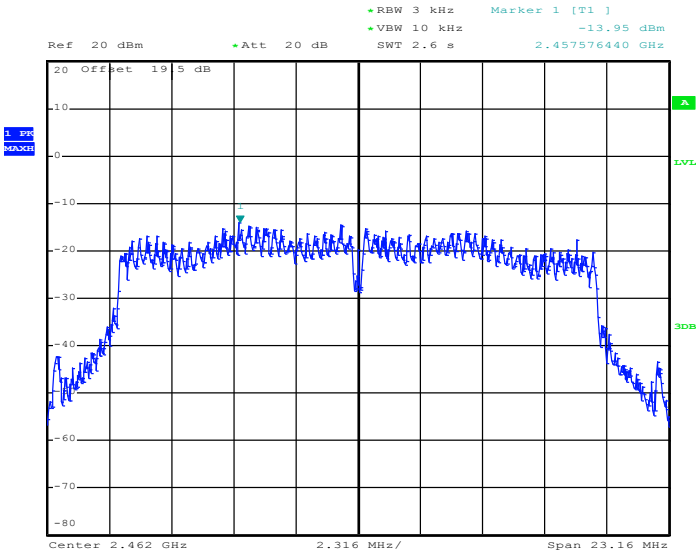
Date: 27.MAR.2013 23:08:49

PSD 3kHz Plot on 2.4GHz 802.11n HT20 Channel 06



Date: 27.MAR.2013 23:16:14

PSD 3kHz Plot on 2.4GHz 802.11n HT20 Channel 11



Date: 27.MAR.2013 23:29:43

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

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

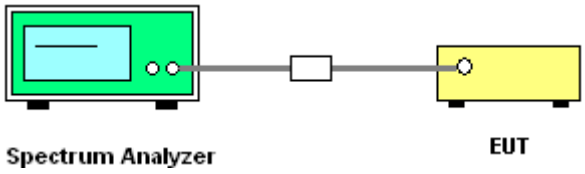
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02.
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.

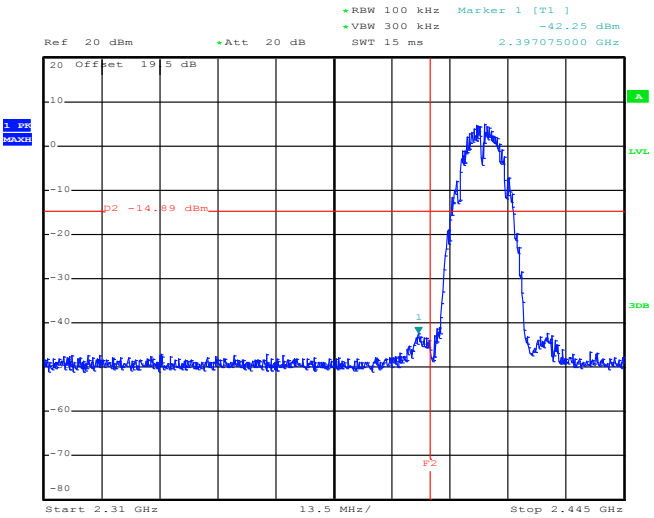
3.4.4 Test Setup



2.4.5 Test Result of Conducted Spurious at Band Edges

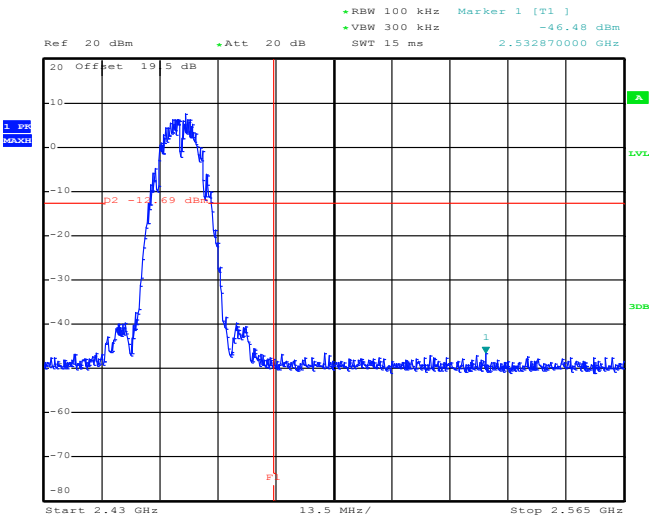
Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	Low and High	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Jeff Chou

Low Band Edge Plot on 802.11b Channel 01



Date: 27.MAR.2013 23:36:46

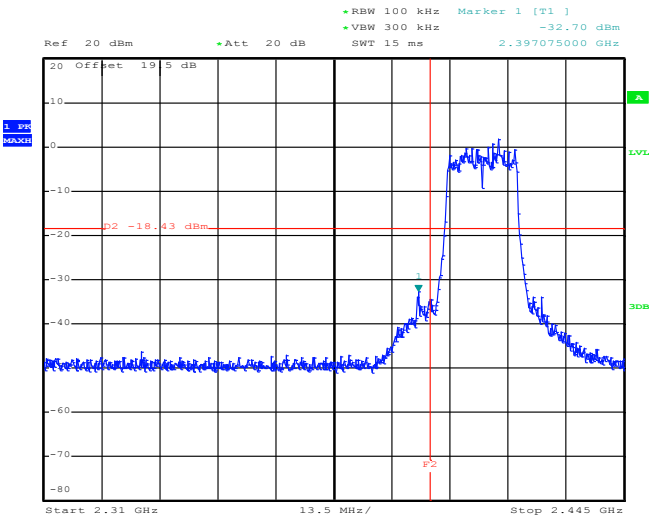
High Band Edge Plot on 802.11b Channel 11



Date: 27.MAR.2013 22:43:08

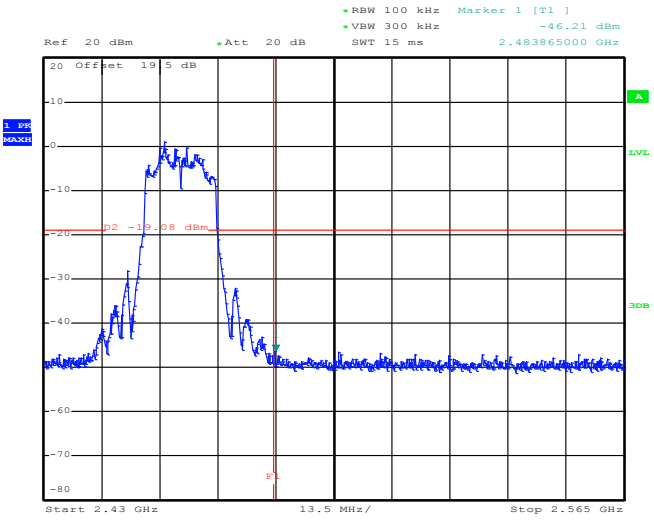
Test Mode :	802.11g	Temperature :	24~26℃
Test Band :	Low and High	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Jeff Chou

Low Band Edge Plot on 802.11g Channel 01



Date: 27.MAR.2013 22:48:10

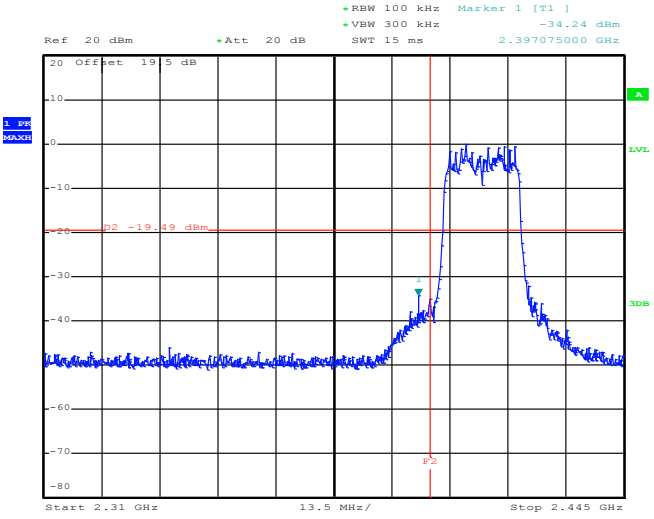
High Band Edge Plot on 802.11g Channel 11



Date: 27.MAR.2013 22:59:54

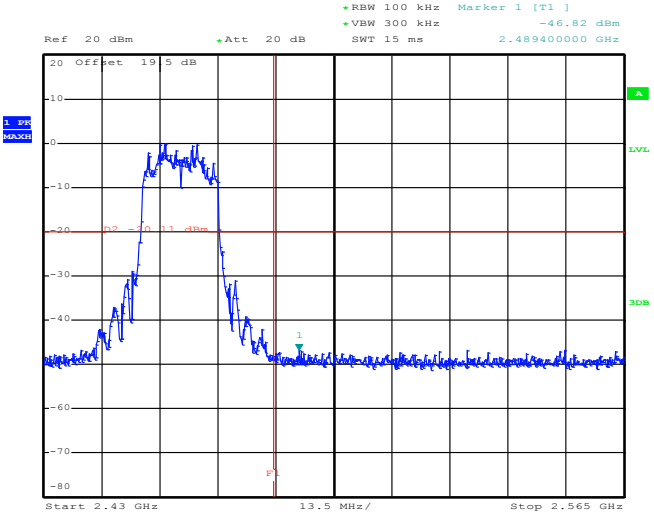
Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Band :	Low and High	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Jeff Chou

Low Band Edge Plot on 2.4GHz 802.11n HT20 Channel 01



Date: 27.MAR.2013 23:10:06

High Band Edge Plot on 2.4GHz 802.11n HT20 Channel 11



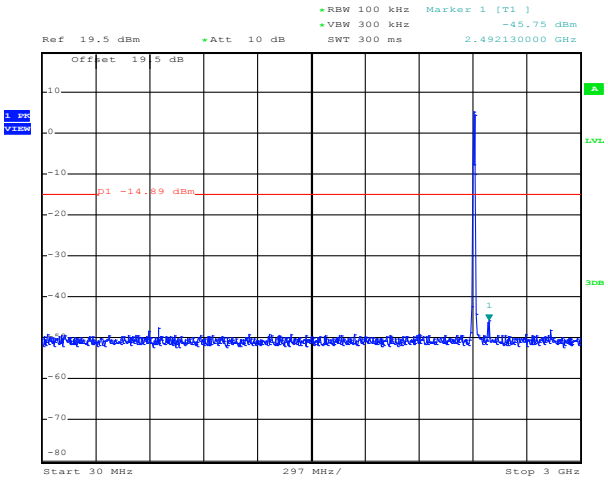
Date: 27.MAR.2013 23:30:11

3.4.6 Test Result of Conducted Spurious Emission

Test Mode :	802.11b	**Temperature :**	24~26℃
Test Band :	30MHz-3GHz and 2G-25GHz	**Relative Humidity :**	50~53%
Test Channel :	01, 06, 11	**Test Engineer :**	Jeff Chou

802.11b 30 MHz~3 GHz

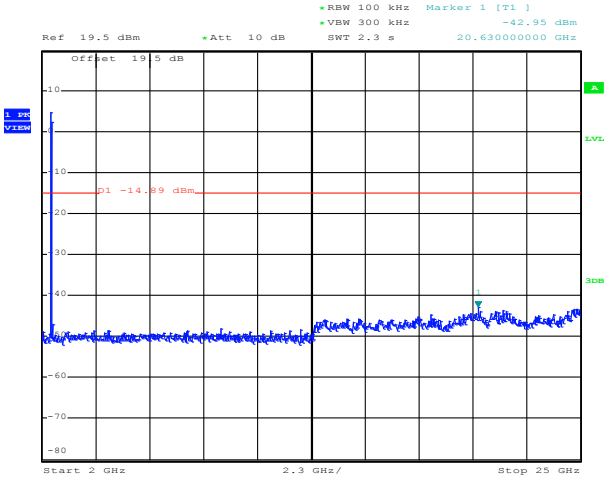
Conducted Spurious Emission Plot on Channel 01



Date: 27.MAR.2013 23:37:08

802.11b 2 GHz~25 GHz

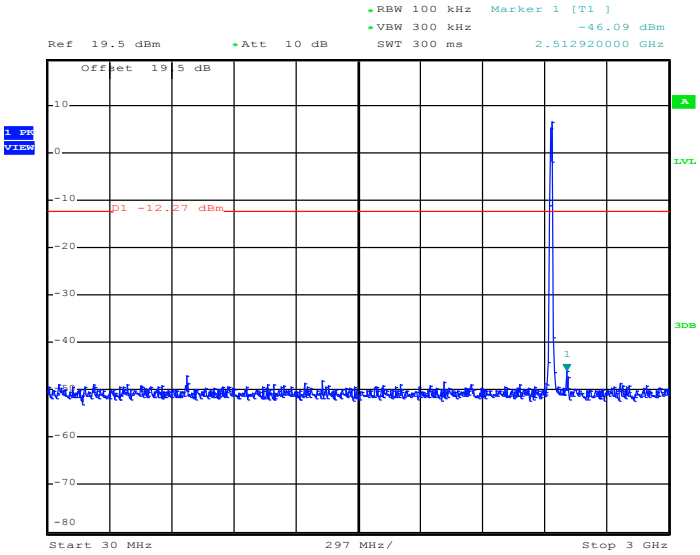
Conducted Spurious Emission Plot on Channel 01



Date: 27.MAR.2013 23:37:26

802.11b 30 MHz~3 GHz

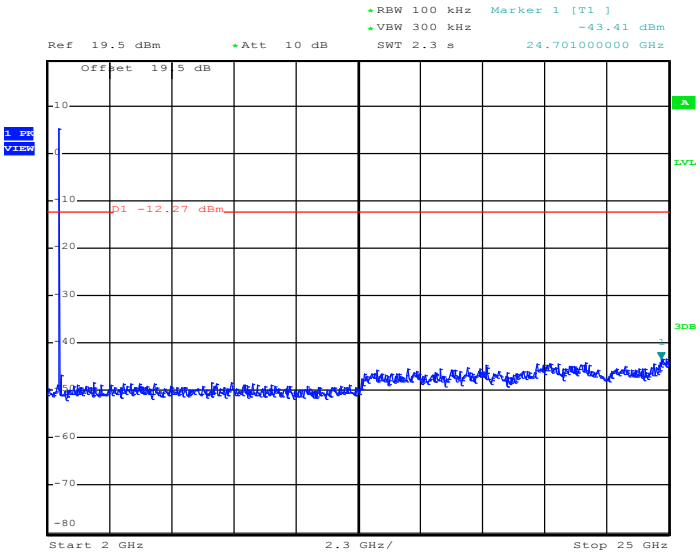
Conducted Spurious Emission Plot on Channel 06



Date: 27.MAR.2013 22:36:27

802.11b 2 GHz~25 GHz

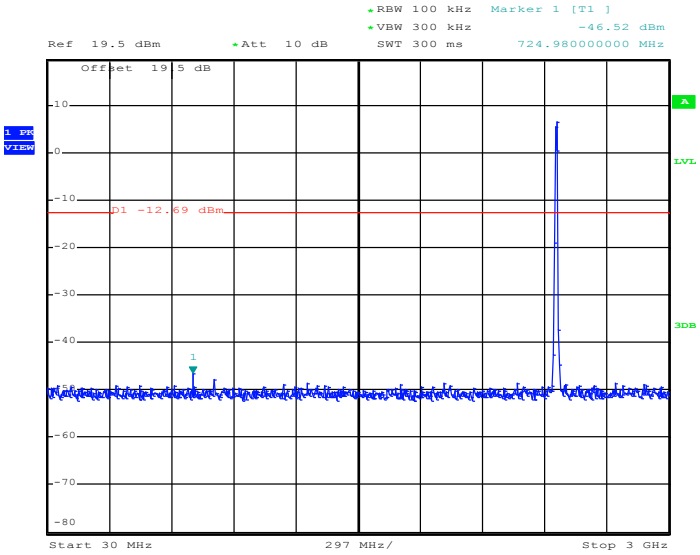
Conducted Spurious Emission Plot on Channel 06



Date: 27.MAR.2013 22:36:45

802.11b 30 MHz~3 GHz

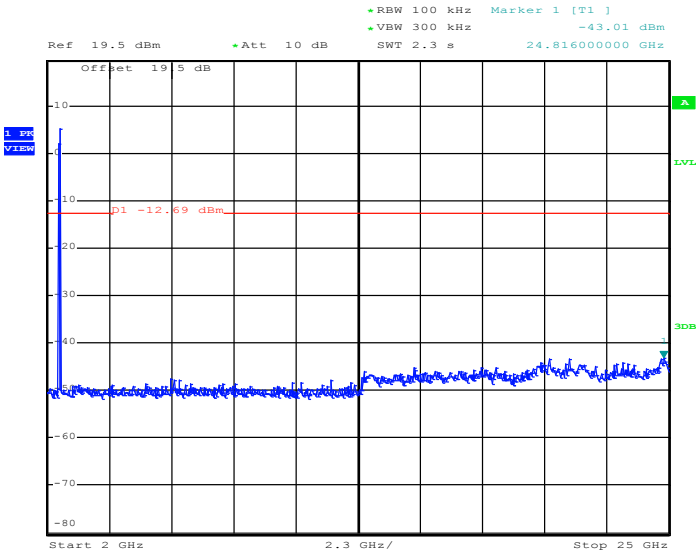
Conducted Spurious Emission Plot on Channel 11



Date: 27.MAR.2013 22:43:38

802.11b 2 GHz~25 GHz

Conducted Spurious Emission Plot on Channel 11

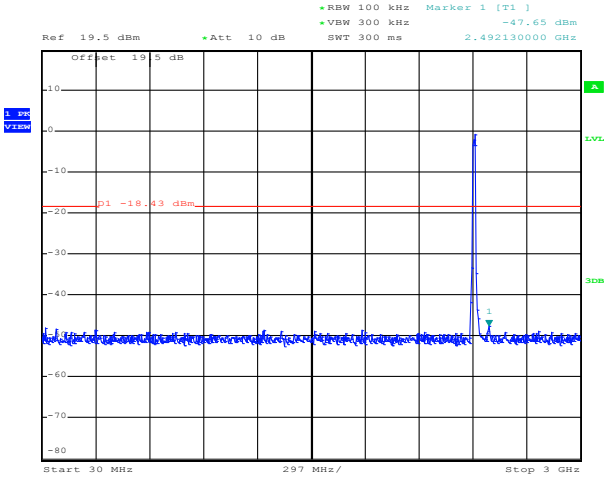


Date: 27.MAR.2013 22:43:57

Test Mode :	802.11g	Temperature :	24~26℃
Test Band :	30MHz-3GHz and 2G-25GHz	Relative Humidity :	50~53%
Test Channel :	01, 06, 11	Test Engineer :	Jeff Chou

802.11g 30 MHz~3 GHz

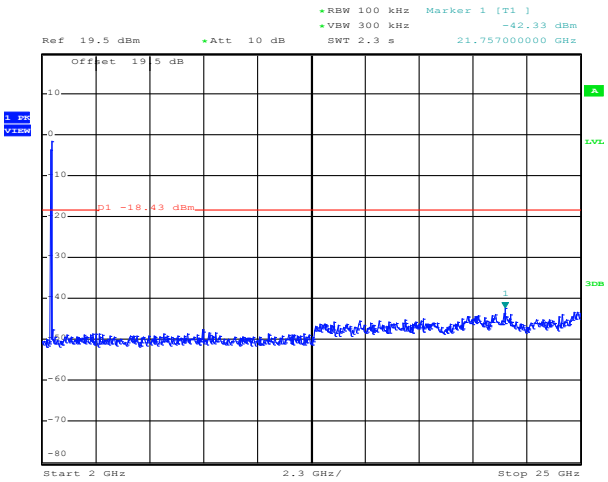
Conducted Spurious Emission Plot on Channel 01



Date: 27.MAR.2013 22:48:31

802.11g 2 GHz~25 GHz

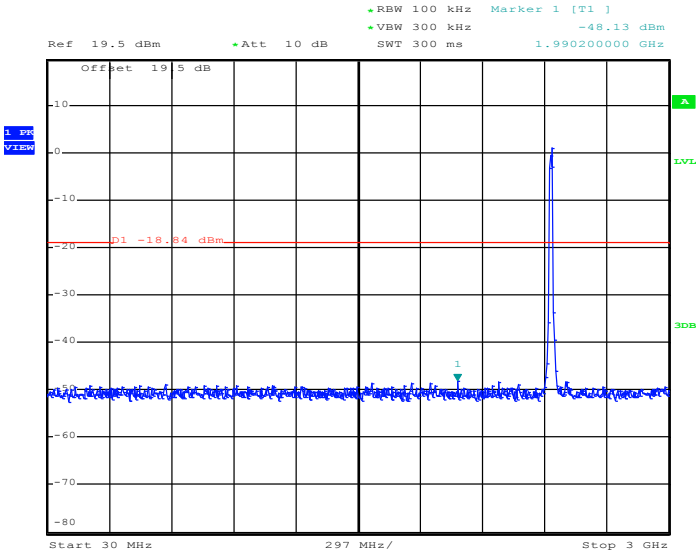
Conducted Spurious Emission Plot on Channel 01



Date: 27.MAR.2013 22:48:50

802.11g 30 MHz~3 GHz

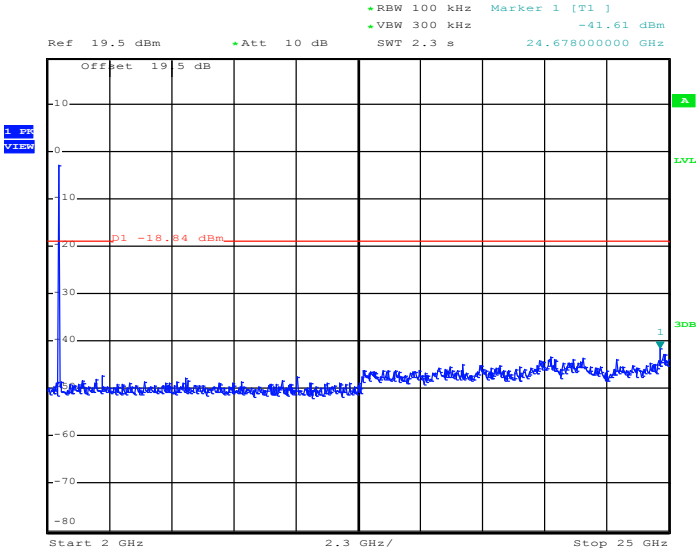
Conducted Spurious Emission Plot on Channel 06



Date: 27.MAR.2013 22:55:18

802.11g 2 GHz~25 GHz

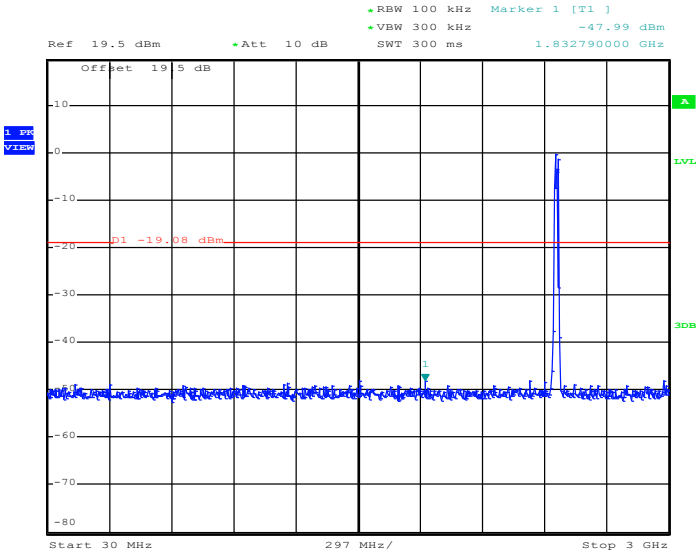
Conducted Spurious Emission Plot on Channel 06



Date: 27.MAR.2013 22:55:37

802.11g 30 MHz~3 GHz

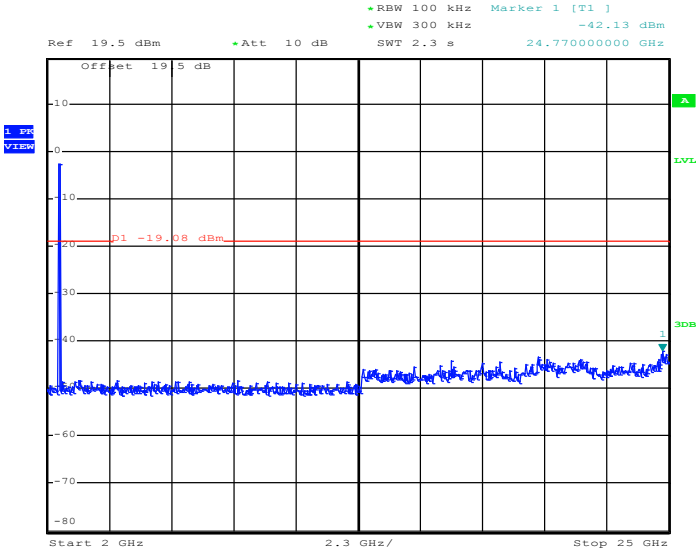
Conducted Spurious Emission Plot on Channel 11



Date: 27.MAR.2013 23:00:24

802.11g 2 GHz~25 GHz

Conducted Spurious Emission Plot on Channel 11

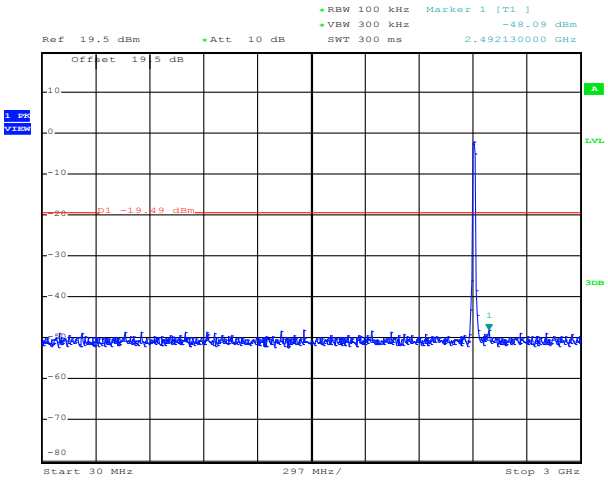


Date: 27.MAR.2013 23:00:42

Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Band :	30MHz-3GHz and 2G-25GHz	Relative Humidity :	50~53%
Test Channel :	01, 06, 11	Test Engineer :	Jeff Chou

2.4GHz 802.11n HT20 30 MHz~3 GHz

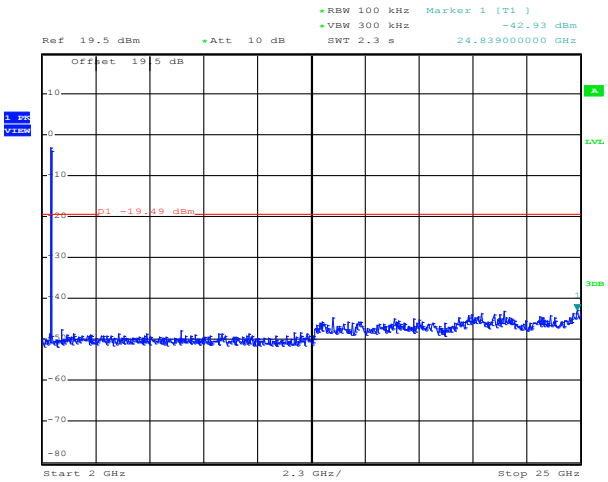
Conducted Spurious Emission Plot on Channel 01



Date: 27.MAR.2013 23:10:33

2.4GHz 802.11n HT20 2 GHz~25 GHz

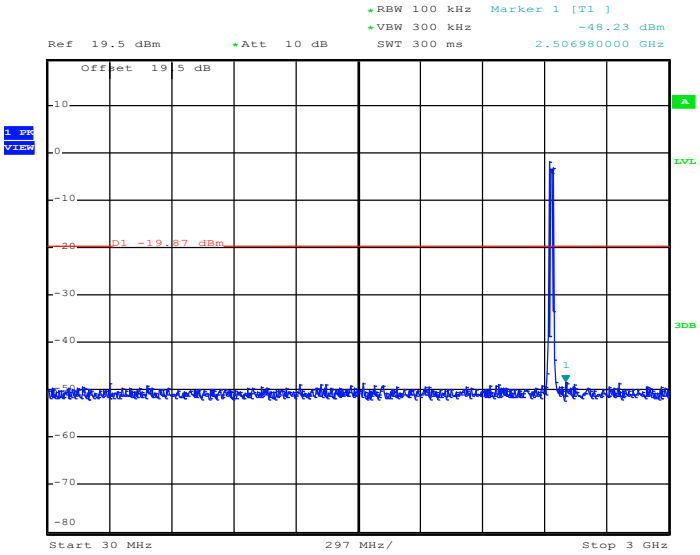
Conducted Spurious Emission Plot on Channel 01



Date: 27.MAR.2013 23:10:52

2.4GHz 802.11n HT20 30 MHz~3 GHz

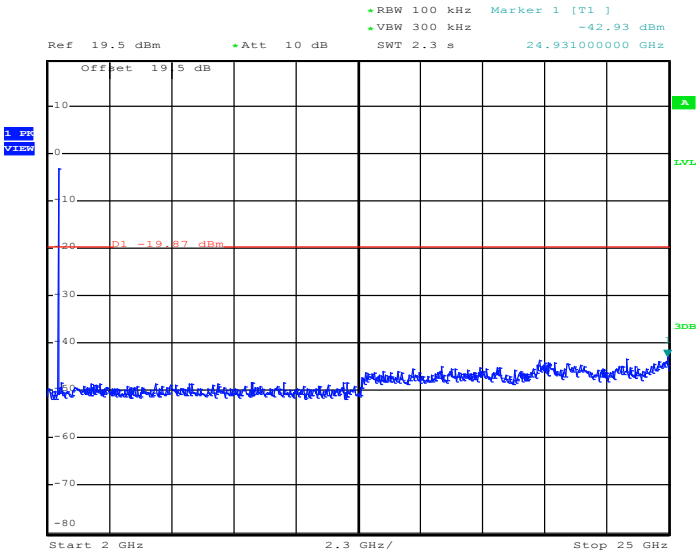
Conducted Spurious Emission Plot on Channel 06



Date: 27.MAR.2013 23:17:19

2.4GHz 802.11n HT20 2 GHz~25 GHz

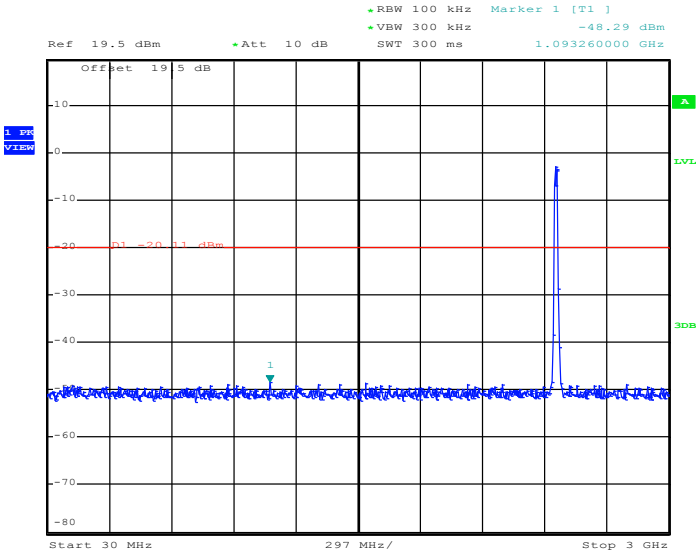
Conducted Spurious Emission Plot on Channel 06



Date: 27.MAR.2013 23:17:37

2.4GHz 802.11n HT20 30 MHz~3 GHz

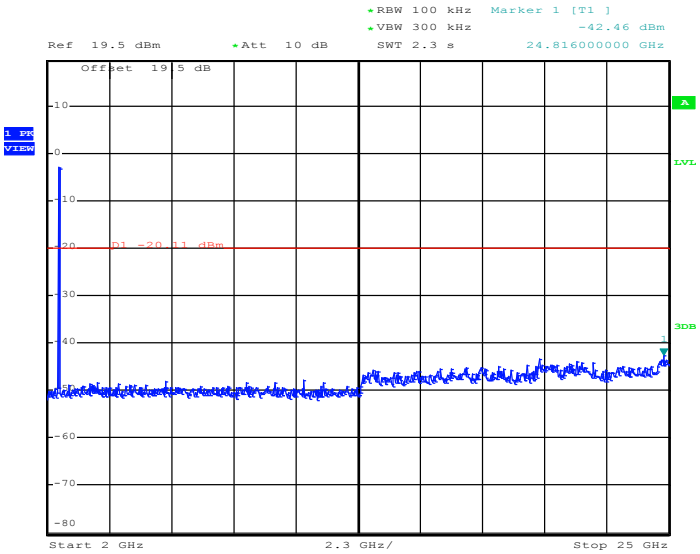
Conducted Spurious Emission Plot on Channel 11



Date: 27.MAR.2013 23:30:33

2.4GHz 802.11n HT20 2 GHz~25 GHz

Conducted Spurious Emission Plot on Channel 11



Date: 27.MAR.2013 23:30:52

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 KHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

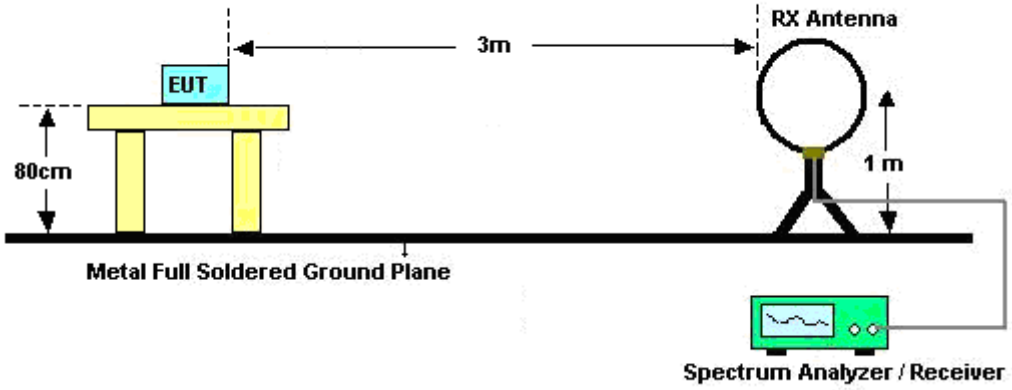
1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	T(μs)	1/T(kHz)	VBW Setting
802.11b	96.07	2394	0.4177	1kHz
802.11g	95.37	2060	0.4854	1kHz
2.4GHz 802.11n HT20	95.07	1930	0.5181	1kHz

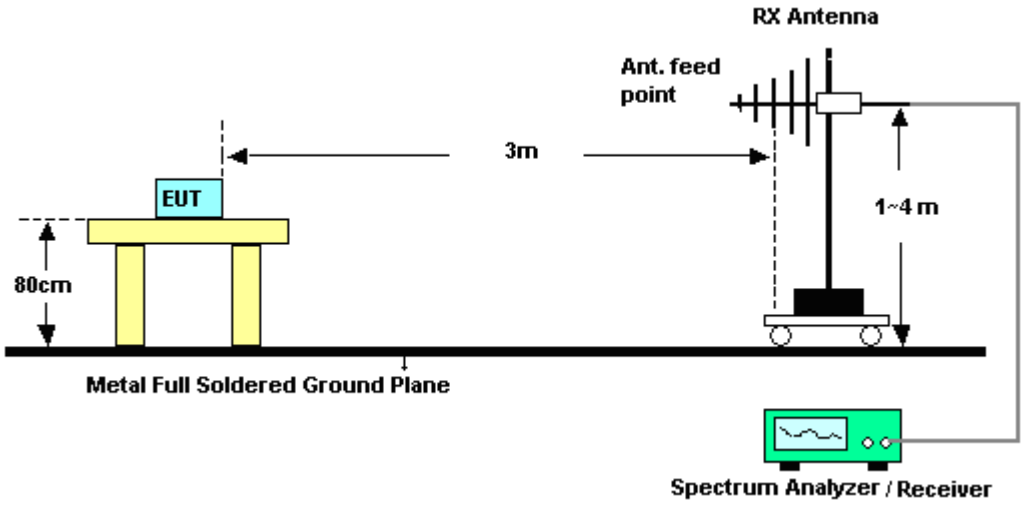
Note: For average measurement with duty cycle < 98%, use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.

3.5.4 Test Setup

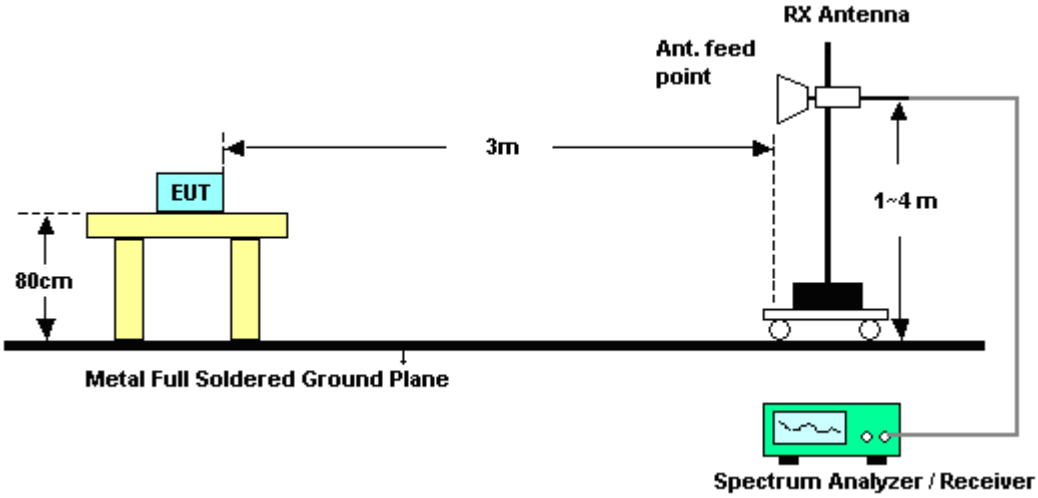
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Band Edges

Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	Low	Relative Humidity :	42~43%
Test Channel :	01	Test Engineer :	Gavin Wu

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
2389.29	56.56	-17.44	74	51.62	32.3	6.91	34.27	137	312	Peak
2389.74	44.15	-9.85	54	39.21	32.3	6.91	34.27	137	312	Average
2490.85	60.21	-13.79	74	55.18	32.4	7.06	34.43	137	312	Peak
2489.5	51.52	-2.48	54	46.49	32.4	7.06	34.43	135	297	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
2319.81	56.34	-17.66	74	51.53	32.23	6.8	34.22	174	110	Peak
2376.78	43.74	-10.26	54	38.85	32.28	6.88	34.27	174	110	Average
2490.22	57	-17	74	51.97	32.4	7.06	34.43	174	110	Peak
2494.75	43.44	-10.56	54	38.46	32.4	7.06	34.48	174	110	Average

Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	42~43%
Test Channel :	11	Test Engineer :	Gavin Wu

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
2485.9	57.36	-16.64	74	52.35	32.38	7.06	34.43	102	63	Peak
2483.56	45.13	-8.87	54	40.12	32.38	7.06	34.43	102	63	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.74	55.93	-18.07	74	50.92	32.38	7.06	34.43	100	65	Peak
2483.77	43.8	-10.2	54	38.79	32.38	7.06	34.43	100	65	Average

Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	Low	Relative Humidity :	42~43%
Test Channel :	01	Test Engineer :	Gavin Wu

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	61.86	-12.14	74	56.95	32.3	6.91	34.3	107	305	Peak
2390	46.65	-7.35	54	41.74	32.3	6.91	34.3	107	305	Average
2493.1	61.22	-12.78	74	56.24	32.4	7.06	34.48	107	305	Peak
2492.65	50.18	-3.82	54	45.2	32.4	7.06	34.48	107	305	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.38	55.81	-18.19	74	50.87	32.3	6.91	34.27	100	69	Peak
2390	43.97	-10.03	54	39.06	32.3	6.91	34.3	100	69	Average
2488.84	57.05	-16.95	74	52.02	32.4	7.06	34.43	100	69	Peak
2484.55	44.42	-9.58	54	39.41	32.38	7.06	34.43	100	69	Average

Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	42~43%
Test Channel :	11	Test Engineer :	Gavin Wu

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
2486.11	60.27	-13.73	74	55.26	32.38	7.06	34.43	104	319	Peak
2484.16	46.32	-7.68	54	41.31	32.38	7.06	34.43	104	319	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	56.01	-17.99	74	51	32.38	7.06	34.43	101	58	Peak
2483.5	43.93	-10.07	54	38.92	32.38	7.06	34.43	101	58	Average

Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	Low	Relative Humidity :	42~43%
Test Channel :	01	Test Engineer :	Gavin Wu

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
2389.92	60.29	-13.71	74	55.38	32.3	6.91	34.3	107	319	Peak
2390	46.62	-7.38	54	41.71	32.3	6.91	34.3	107	319	Average
2494.36	61.04	-12.96	74	56.06	32.4	7.06	34.48	107	319	Peak
2493.04	49.12	-4.88	54	44.14	32.4	7.06	34.48	107	319	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
2321.07	56.66	-17.34	74	51.85	32.23	6.8	34.22	189	70	Peak
2389.92	44	-10	54	39.09	32.3	6.91	34.3	189	70	Average
2492.38	57.26	-16.74	74	52.28	32.4	7.06	34.48	189	70	Peak
2485.09	44.4	-9.6	54	39.39	32.38	7.06	34.43	189	70	Average

Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	42~43%
Test Channel :	11	Test Engineer :	Gavin Wu

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
2484.01	60.76	-13.24	74	55.75	32.38	7.06	34.43	103	314	Peak
2483.8	46.53	-7.47	54	41.52	32.38	7.06	34.43	103	314	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
2484.07	56.06	-17.94	74	51.05	32.38	7.06	34.43	154	68	Peak
2483.83	43.8	-10.2	54	38.79	32.38	7.06	34.43	154	68	Average

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

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 108.21 dBμV/m - 20dB = 88.21 dBμV/m. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
31.89	24.7	-15.3	40	37.46	18.56	0.55	31.87	-	-	Peak
46.2	26.99	-13.01	40	48.32	9.7	0.67	31.7	100	195	Peak
65.64	14.48	-25.52	40	39.22	6.22	0.81	31.77	-	-	Peak
709.5	21.73	-24.27	46	28.52	20.75	2.96	30.5	-	-	Peak
760.6	23.05	-22.95	46	28.92	21.5	3.08	30.45	-	-	Peak
806.8	23.71	-22.29	46	28.59	22.17	3.16	30.21	-	-	Peak
2412	104.31	-	-	99.35	32.31	6.95	34.3	137	312	Average
2412	108.21	-	-	103.25	32.31	6.95	34.3	137	312	Peak
4824	40.82	-33.18	74	55.55	33.97	8.77	57.47	100	0	Peak
7236	41.38	-46.83	88.21	52.98	35.55	10.83	57.98	100	0	Peak

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2411 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
31.89	23.29	-16.71	40	36.05	18.56	0.55	31.87	-	-	Peak
46.2	30.99	-9.01	40	52.32	9.7	0.67	31.7	106	207	Peak
67.8	21.61	-18.39	40	46.31	6.26	0.82	31.78	-	-	Peak
619.9	22.81	-23.19	46	30.56	19.96	2.75	30.46	-	-	Peak
761.3	22.72	-23.28	46	28.57	21.52	3.08	30.45	-	-	Peak
789.3	24.35	-21.65	46	29.53	21.94	3.12	30.24	-	-	Peak
2411	97.46	-	-	92.5	32.31	6.95	34.3	174	110	Average
2411	101.6	-	-	96.64	32.31	6.95	34.3	174	110	Peak
4824	39.47	-34.53	74	56.72	33.97	8.77	59.99	100	0	Peak
7236	39.68	-41.92	81.6	52.69	35.55	10.83	59.39	100	0	Peak

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2436 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
2436	106.17	-	-	101.2	32.33	6.99	34.35	100	56	Average
2436	110.79	-	-	105.82	32.33	6.99	34.35	100	56	Peak
4875	43.54	-30.46	74	58.25	33.95	8.82	57.48	100	0	Peak
7311	41.76	-32.24	74	53.33	35.54	10.91	58.02	100	0	Peak

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2436 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
2436	101.47	-	-	96.5	32.33	6.99	34.35	150	58	Average
2436	105.56	-	-	100.59	32.33	6.99	34.35	150	58	Peak
4875	42.82	-31.18	74	57.53	33.95	8.82	57.48	100	0	Peak
7311	41.21	-32.79	74	52.78	35.54	10.91	58.02	100	0	Peak

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2463 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
2463	105.54	-	-	100.54	32.37	7.02	34.39	102	63	Average
2463	109.87	-	-	104.87	32.37	7.02	34.39	102	63	Peak
4923	41.33	-32.67	74	56.01	33.93	8.87	57.48	100	0	Peak
7386	41.53	-32.47	74	53.1	35.52	10.99	58.08	100	0	Peak

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	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	98.62	-	-	93.62	32.37	7.02	34.39	100	65	Average
2462	102.81	-	-	97.81	32.37	7.02	34.39	100	65	Peak
4923	41.16	-32.84	74	55.84	33.93	8.87	57.48	100	0	Peak
7386	41.28	-32.72	74	52.85	35.52	10.99	58.08	100	0	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2411 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2411	99.89	-	-	94.93	32.31	6.95	34.3	107	305	Average
2411	108.89	-	-	103.93	32.31	6.95	34.3	107	305	Peak
4824	41.39	-32.61	74	56.12	33.97	8.77	57.47	100	0	Peak
7236	40.86	-48.03	88.89	52.46	35.55	10.83	57.98	100	0	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2411 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2411	92.16	-	-	87.2	32.31	6.95	34.3	100	69	Average
2411	101.5	-	-	96.54	32.31	6.95	34.3	100	69	Peak
4824	40.04	-33.96	74	57.29	33.97	8.77	59.99	100	0	Peak
7236	39.73	-41.77	81.5	52.74	35.55	10.83	59.39	100	0	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	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	98.65	-	-	93.66	32.35	6.99	34.35	102	66	Average
2438	107.36	-	-	102.37	32.35	6.99	34.35	102	66	Peak
4875	41.69	-32.31	74	56.4	33.95	8.82	57.48	100	0	Peak
7311	40.72	-33.28	74	52.29	35.54	10.91	58.02	100	0	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	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	90.69	-	-	85.7	32.35	6.99	34.35	198	213	Average
2438	100.48	-	-	95.49	32.35	6.99	34.35	198	213	Peak
4875	39.14	-34.86	74	56.15	33.95	8.82	59.78	100	0	Peak
7311	38.77	-35.23	74	51.77	35.54	10.91	59.45	100	0	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2461 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
2461	99.88	-	-	94.88	32.37	7.02	34.39	104	319	Average
2461	108.79	-	-	103.79	32.37	7.02	34.39	104	319	Peak
4923	42.23	-31.77	74	56.91	33.93	8.87	57.48	100	0	Peak
7386	40.51	-33.49	74	52.08	35.52	10.99	58.08	100	0	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2461 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
2461	91.61	-	-	86.61	32.37	7.02	34.39	101	58	Average
2461	101.1	-	-	96.1	32.37	7.02	34.39	101	58	Peak
4923	39.27	-34.73	74	56.05	33.93	8.87	59.58	100	0	Peak
7386	39.81	-34.19	74	52.82	35.52	10.99	59.52	100	0	Peak

Test Mode :	2.4GHz 802.11n-HT20	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2411 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
32.43	23.89	-16.11	40	37.36	17.84	0.56	31.87	-	-	Peak
45.66	28.69	-11.31	40	49.63	10.1	0.66	31.7	100	190	Peak
65.37	14.3	-25.7	40	39.07	6.2	0.8	31.77	-	-	Peak
661.2	22.13	-23.87	46	29.36	20.29	2.86	30.38	-	-	Peak
694.1	22.73	-23.27	46	29.72	20.55	2.93	30.47	-	-	Peak
801.9	24.69	-21.31	46	29.6	22.12	3.15	30.18	-	-	Peak
2411	99.69	-	-	94.73	32.31	6.95	34.3	107	319	Average
2411	108.96	-	-	104	32.31	6.95	34.3	107	319	Peak
4824	41.23	-32.77	74	55.96	33.97	8.77	57.47	100	0	Peak
7236	41.47	-47.49	88.96	53.07	35.55	10.83	57.98	100	0	Peak

Test Mode :	2.4GHz 802.11n-HT20	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2411 MHz is fundamental signal which can be ignored. 2. 7236 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
31.35	23.94	-16.06	40	35.99	19.28	0.54	31.87	-	-	Peak
47.01	31.97	-8.03	40	53.68	9.3	0.67	31.68	105	217	Peak
65.37	23.01	-16.99	40	47.78	6.2	0.8	31.77	-	-	Peak
690.6	22.49	-23.51	46	29.51	20.52	2.92	30.46	-	-	Peak
773.2	23.05	-22.95	46	28.62	21.69	3.1	30.36	-	-	Peak
814.5	24.39	-21.61	46	29.23	22.25	3.18	30.27	-	-	Peak
2411	90.92	-	-	85.96	32.31	6.95	34.3	189	70	Average
2411	100.1	-	-	95.14	32.31	6.95	34.3	189	70	Peak
4824	38.77	-35.23	74	56.02	33.97	8.77	59.99	100	0	Peak
7236	41.68	-38.42	80.1	54.69	35.55	10.83	59.39	100	0	Peak

Test Mode :	2.4GHz 802.11n-HT20	Temperature :	24~25°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2436 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
2436	99.98	-	-	95.01	32.33	6.99	34.35	106	275	Average
2436	109.58	-	-	104.61	32.33	6.99	34.35	106	275	Peak
4875	40.83	-33.17	74	55.54	33.95	8.82	57.48	100	0	Peak
7311	40.41	-33.59	74	51.98	35.54	10.91	58.02	100	0	Peak

Test Mode :	2.4GHz 802.11n-HT20	Temperature :	24~25°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	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	91.81	-	-	86.82	32.35	6.99	34.35	197	235	Average
2438	101.7	-	-	96.71	32.35	6.99	34.35	197	235	Peak
4875	39.23	-34.77	74	56.24	33.95	8.82	59.78	100	0	Peak
7311	40.09	-33.91	74	53.09	35.54	10.91	59.45	100	0	Peak

Test Mode :	2.4GHz 802.11n-HT20	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2463 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
2463	98.79	-	-	93.79	32.37	7.02	34.39	103	314	Average
2463	108.88	-	-	103.88	32.37	7.02	34.39	103	314	Peak
4923	40.82	-33.18	74	55.5	33.93	8.87	57.48	100	0	Peak
7386	41.83	-32.17	74	53.4	35.52	10.99	58.08	100	0	Peak

Test Mode :	2.4GHz 802.11n-HT20	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2461 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
2461	89.09	-	-	84.09	32.37	7.02	34.39	154	68	Average
2461	98.44	-	-	93.44	32.37	7.02	34.39	154	68	Peak
4923	40.39	-33.61	74	57.17	33.93	8.87	59.58	100	0	Peak
7386	39.99	-34.01	74	53	35.52	10.99	59.52	100	0	Peak

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

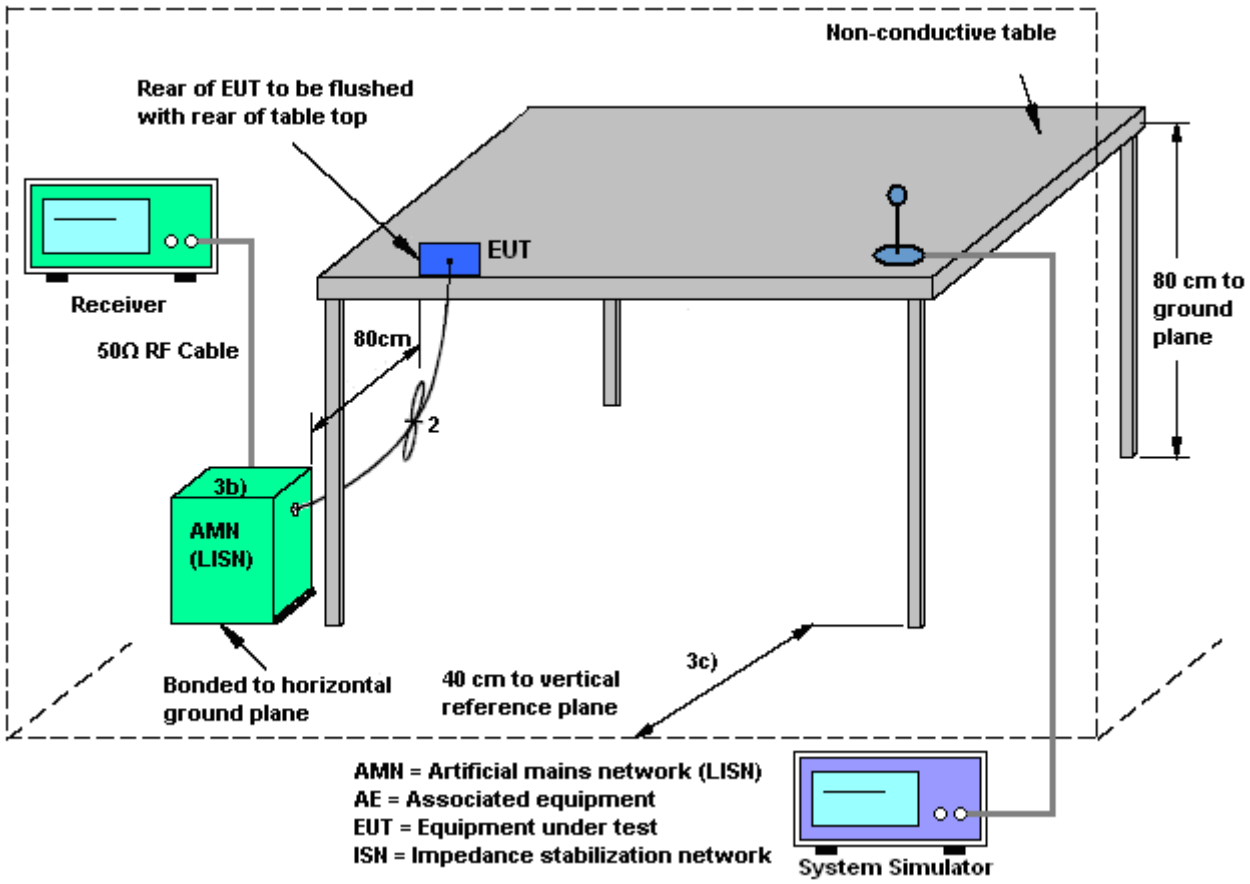
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

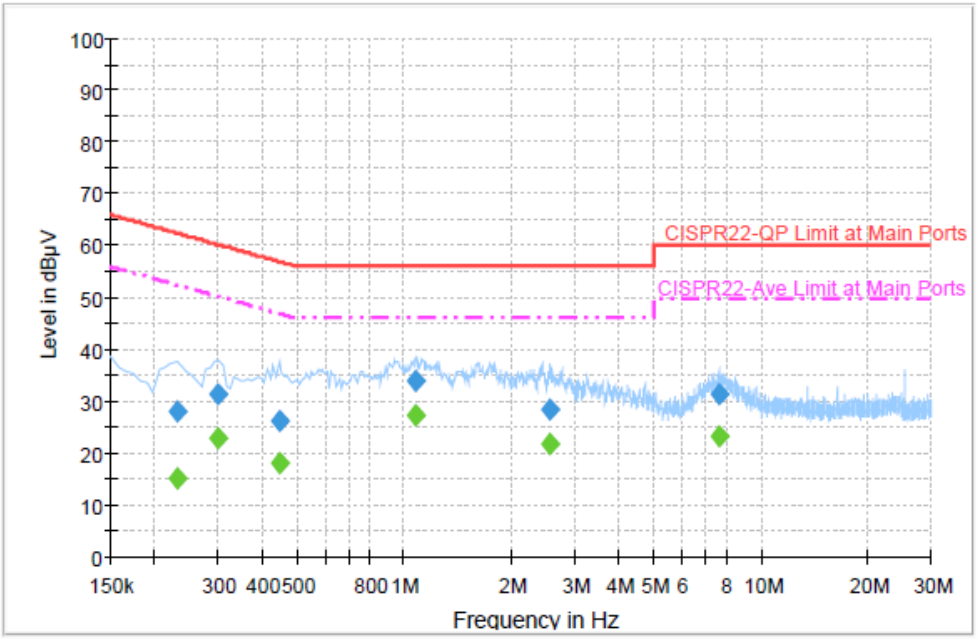
1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band V Idle + WLAN Link + USB Cable (Charging from Adapter)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



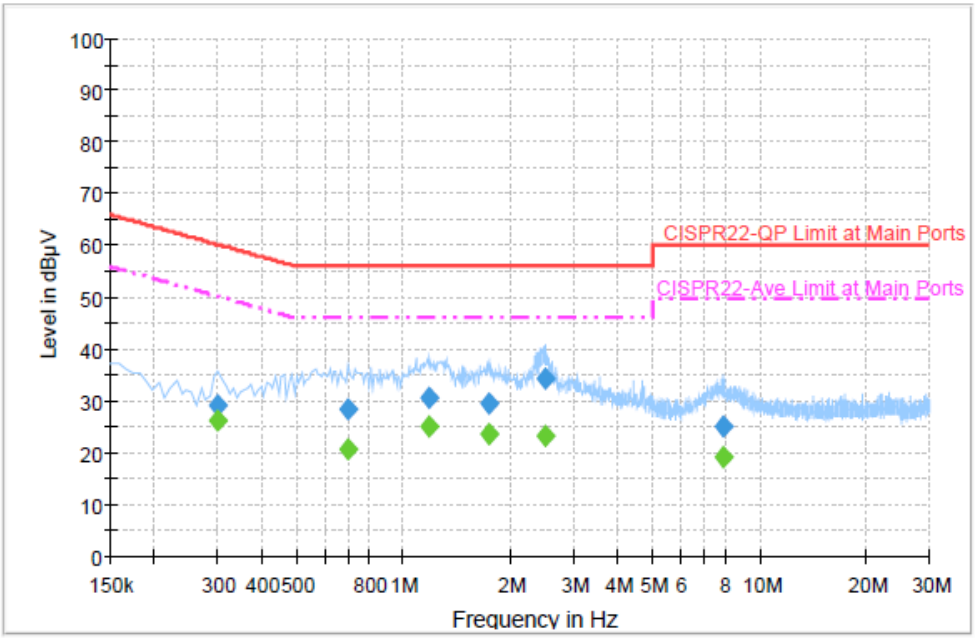
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.230000	28.0	Off	L1	19.5	34.4	62.4
0.302000	31.3	Off	L1	19.3	28.9	60.2
0.446000	26.2	Off	L1	19.4	30.7	56.9
1.078000	33.9	Off	L1	19.5	22.1	56.0
2.574000	28.4	Off	L1	19.6	27.6	56.0
7.606000	31.4	Off	L1	19.7	28.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.230000	15.0	Off	L1	19.5	37.4	52.4
0.302000	23.0	Off	L1	19.3	27.2	50.2
0.446000	18.2	Off	L1	19.4	28.7	46.9
1.078000	27.4	Off	L1	19.5	18.6	46.0
2.574000	21.6	Off	L1	19.6	24.4	46.0
7.606000	23.3	Off	L1	19.7	26.7	50.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band V Idle + WLAN Link + USB Cable (Charging from Adapter)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.302000	29.2	Off	N	19.4	31.0	60.2
0.702000	28.5	Off	N	19.5	27.5	56.0
1.182000	30.6	Off	N	19.5	25.4	56.0
1.734000	29.7	Off	N	19.5	26.3	56.0
2.502000	34.3	Off	N	19.6	21.7	56.0
7.926000	24.9	Off	N	19.7	35.1	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.302000	26.3	Off	N	19.4	23.9	50.2
0.702000	20.8	Off	N	19.5	25.2	46.0
1.182000	25.1	Off	N	19.5	20.9	46.0
1.734000	23.7	Off	N	19.5	22.3	46.0
2.502000	23.3	Off	N	19.6	22.7	46.0
7.926000	19.4	Off	N	19.7	30.6	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 Connected Construction

Non-standard connector used.

3.7.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 06, 2012	Mar. 05, 2013 ~ Mar. 27, 2013	Jun. 05, 2013	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Sep. 08, 2012	Mar. 05, 2013 ~ Mar. 27, 2013	Sep. 07, 2013	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Sep. 08, 2012	Mar. 05, 2013 ~ Mar. 27, 2013	Sep. 07, 2013	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Feb. 05, 2013	Mar. 05, 2013 ~ Mar. 27, 2013	Feb. 04, 2014	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Feb. 05, 2013	Mar. 05, 2013 ~ Mar. 27, 2013	Feb. 04, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9KHz – 2.75GHz	Nov. 13, 2012	Mar. 06, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100081	9KHz ~ 30MHz	Dec. 12, 2012	Mar. 06, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9KHz ~ 30MHz	Dec. 06, 2012	Mar. 06, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Mar. 06, 2013	N/A	Conduction (CO05-HY)
System Simulator	R&S	CMU200	117995	N/A	Jul. 28, 2011	Mar. 06, 2013	Jul. 27, 2013	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Oct. 06, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Oct. 05, 2013	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9KHz ~ 30GHz	Nov. 30, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Nov. 29, 2013	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 22, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Aug. 21, 2013	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Dec. 01, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Nov. 30, 2013	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	159088	1GHz ~ 18GHz	Feb. 27, 2013	Mar. 08, 2013 ~ Mar. 09, 2013	Feb. 26, 2014	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10-1000MHz. 32dB.GAIN	Feb. 26, 2013	Mar. 08, 2013 ~ Mar. 09, 2013	Feb. 25, 2014	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Sep. 03, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Sep. 02, 2013	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz ~ 40GHz	Sep. 28, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Sep. 27, 2013	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9KHz ~ 30MHz	Jul. 03, 2012	Mar. 08, 2013 ~ Mar. 09, 2013	Jul. 02, 2013	Radiation (03CH07-HY)

5 Uncertainty of Evaluation

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**

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

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

Appendix A. Photographs of EUT

Please refer to Sporton report number EP330402 as below.