

FCC RF Test Report

APPLICANT : Cellon Communications Technology Co., Ltd.
EQUIPMENT : WCDMA mobile phone
BRAND NAME : enspire, ekt, Claro, Slider, D-mobile, Digicel, 2degrees
MODEL NAME : C8680, C8680CA, C8680EN, EK-8680, C8680CL, C8680NZ, C8680IS, C8680DM
FCC ID : T38C8680EK
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Feb. 06, 2013 and completely tested on Mar. 21, 2013. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by:



Jones Tsai / Manager



SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR320601B	Rev. 01	Initial issue of report	Mar. 25, 2013

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	-
3.2	15.247(b)	A8.4	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	A8.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	A8.5	Radiated Band Edges	15.209(a) & 15.247(d)	Pass	Under limit 4.34 dB at 2399.000 MHz
			Radiated Spurious Emission			
3.6	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 12.07 dB at 0.390 MHz
3.7	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Cellon Communications Technology Co., Ltd.

13/F, Skyworth C Building, Gaoxin S.Ave1, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China

1.2 Manufacturer

Cellon Communications Technology Co., Ltd.

13/F, Skyworth C Building, Gaoxin S.Ave1, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	WCDMA mobile phone
Brand Name	enspire, ekt, Claro, Slider, D-mobile, Digicel, 2degrees
Model Name	C8680, C8680CA, C8680EN, EK-8680, C8680CL, C8680NZ, C8680IS, C8680DM
FCC ID	T38C8680EK
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/WLAN 11bgn/Bluetooth
HW Version	P3
SW Version	VEON-C8680-00.01
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. All the model names are identical on hardware. The only difference is the label of different branding for different customer.

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2412 MHz ~ 2462 MHz
Number of Channels	11
Carrier Frequency of Each Channel	2412+(n-1)*5 MHz; n=1~11
Maximum Output Power to Antenna	802.11b : 15.89 dBm (0.0388 W) 802.11g : 20.75 dBm (0.1189 W) 802.11n HT20 : 20.56 dBm (0.1138 W)
Antenna Type	PIFA Antenna type with gain 0 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 (KUNSHAN) INC.			
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958			
Test Site No.	Sporton Site No.			FCC/IC Registration No.
	TH01-KS	CO01-KS	03CH01-KS	149928/4086E-1

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 C63.4-2003 and 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.

Channel	Frequency	2.4GHz 802.11b RF Power (dBm)			
		DSSS Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	15.89	15.84	15.01	14.65
CH 06	2437 MHz	15.25	15.23	14.45	14.47
CH 11	2462 MHz	14.98	14.97	14.15	14.15

Channel	Frequency	2.4GHz 802.11g RF Power (dBm)							
		OFDM Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	20.75	20.47	20.43	19.78	20.62	20.44	20.37	19.68
CH 06	2437 MHz	20.60	20.37	20.58	19.88	20.49	20.34	20.2	20.01
CH 11	2462 MHz	20.21	20.11	20.09	19.38	20.46	20.31	19.79	18.78

Channel	Frequency	2.4GHz 802.11n HT20 RF Power (dBm)							
		OFDM Data Rate							
		6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
CH 01	2412 MHz	20.48	20.02	20.47	20.51	20.32	20.12	20.56	19.38
CH 06	2437 MHz	20.01	19.83	20.41	19.03	19.37	19.12	20.04	18.56
CH 11	2462 MHz	20.04	20.01	20.02	19.77	19.72	19.81	19.92	18.39

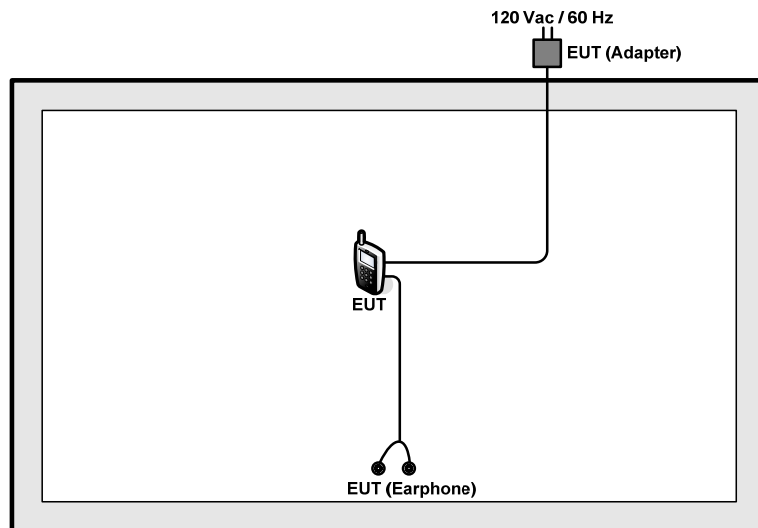
2.3 Test Mode

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

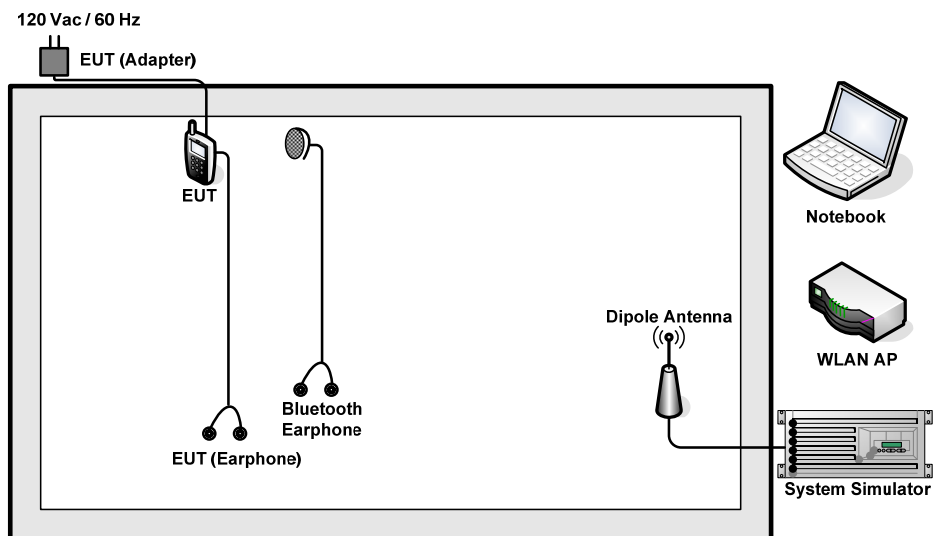
Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	6dB BW Power Spectral Density	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	58.5 Mbps	1/6/11
	Output Power	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	58.5 Mbps	1/6/11
	Conducted Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	58.5 Mbps	1/11
	Conducted Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	58.5 Mbps	1/6/11
Radiated TCs	Radiated Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	58.5 Mbps	1/11
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	58.5 Mbps	1/6/11
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone			

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.	DC Power Supply	GWINSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	VOSTRO1450	PPD-AR5B195	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
5.	Bluetooth Earphone	Nokia	BH-106	QTLBH-106	N/A	N/A

2.6 RF Utility

For WLAN function, key in “* # 254267 #” on the EUT directly. Then, the EUT will get into the engineering modes to contact with WLAN AP for continuous transmitting and receiving signals.

2.7 Measurement Results Explanation Example

For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and 10dB attenuator 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 10dB attenuator factor.

Offset = RF cable loss + attenuator factor.

Following table shows an offset computation example with cable loss 7.5 dB.

Example:

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\
 &= 7.5 + 10 = 17.5 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

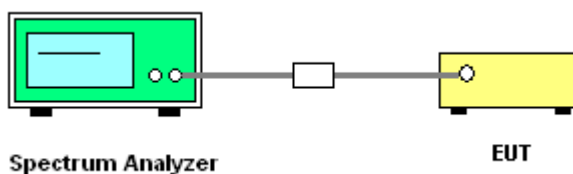
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB 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. Measure and record the results in the test report.

3.1.4 Test Setup

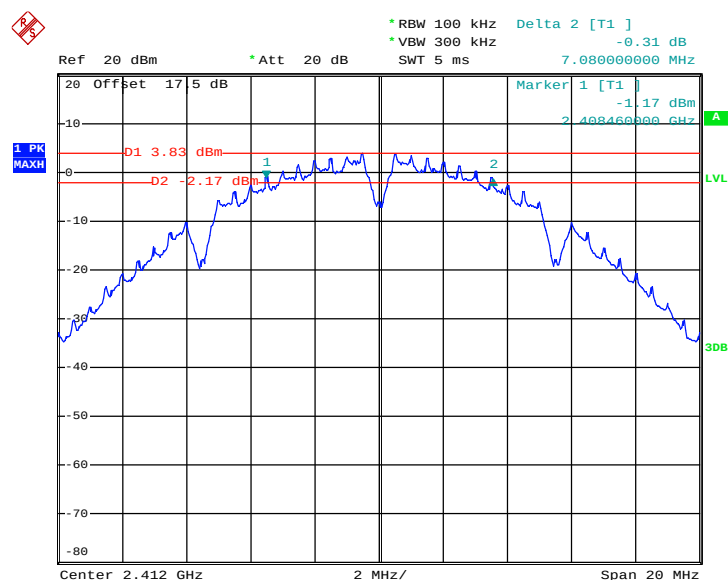


3.1.5 Test Result of 6dB Bandwidth

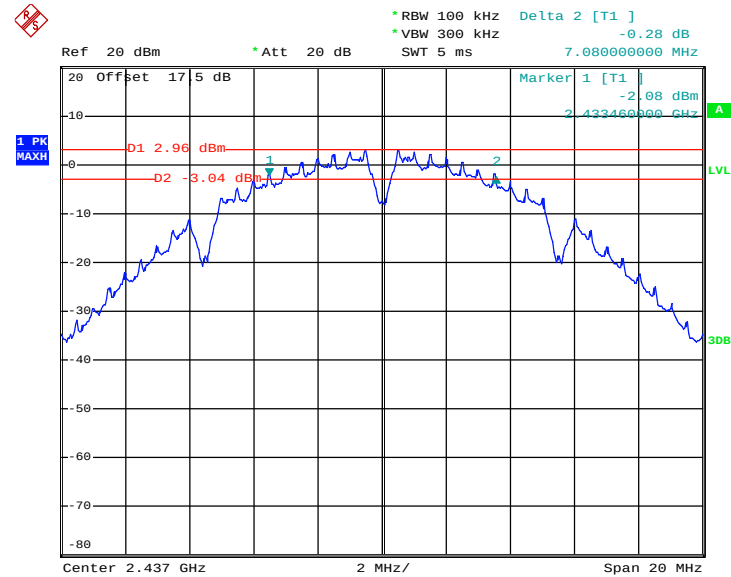
Test Mode :	802.11b	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	802.11b 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	7.08	0.5	Pass
06	2437	7.08	0.5	Pass
11	2462	7.08	0.5	Pass

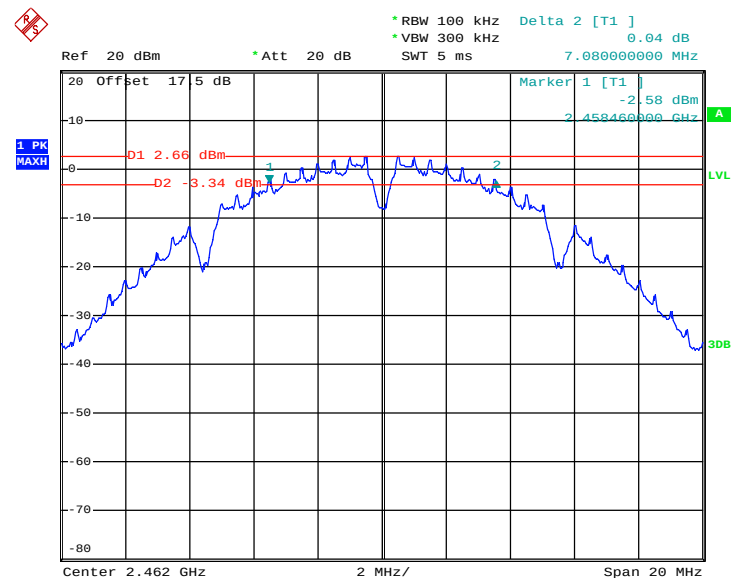
6 dB Bandwidth Plot on 802.11b Channel 01



Date: 2.MAR.2013 15:49:01

6 dB Bandwidth Plot on 802.11b Channel 06


Date: 2.MAR.2013 15:52:21

6 dB Bandwidth Plot on 802.11b Channel 11


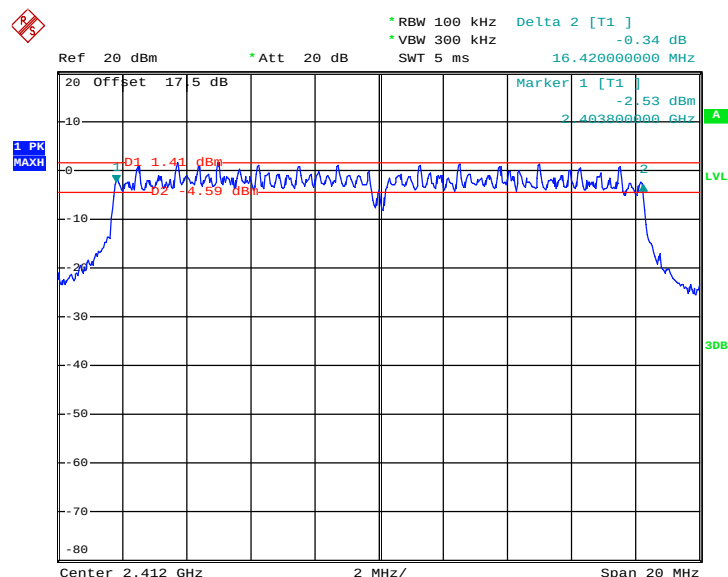
Date: 2.MAR.2013 15:55:27



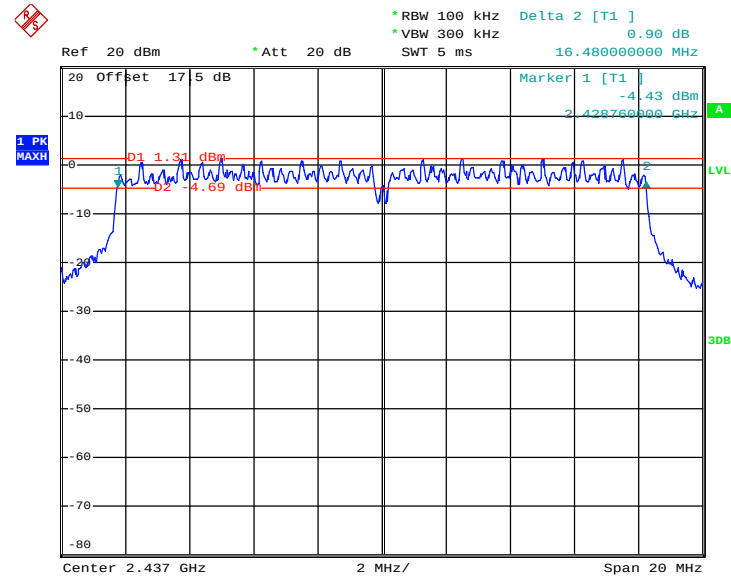
Test Mode :	802.11g	Temperature :	20~21°C
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	802.11g 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	16.42	0.5	Pass
06	2437	16.48	0.5	Pass
11	2462	16.48	0.5	Pass

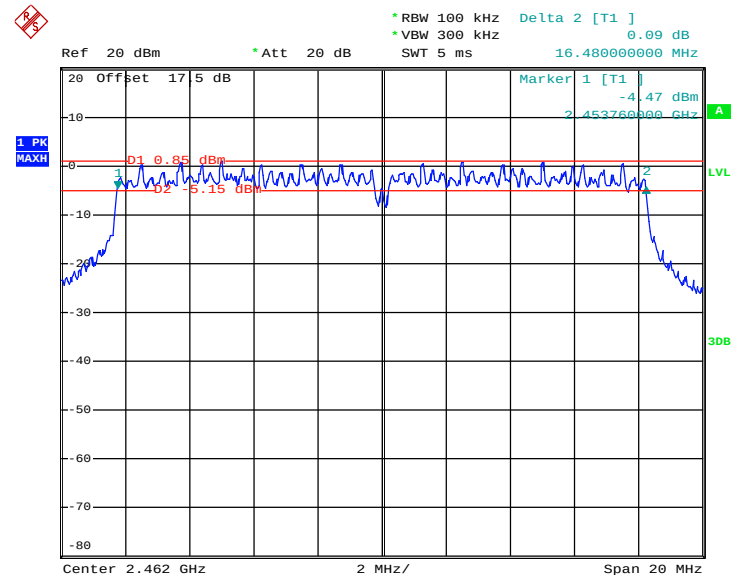
6 dB Bandwidth Plot on 802.11g Channel 01



Date: 23.FEB.2013 16:40:36

6 dB Bandwidth Plot on 802.11g Channel 06


Date: 23.FEB.2013 16:45:08

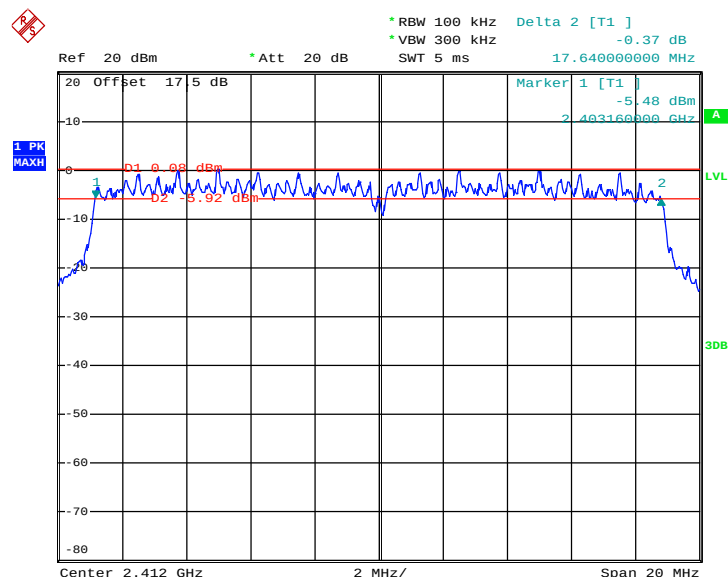
6 dB Bandwidth Plot on 802.11g Channel 11


Date: 23.FEB.2013 16:48:57



Test Mode :	802.11n HT20	Temperature :	20~21°C
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

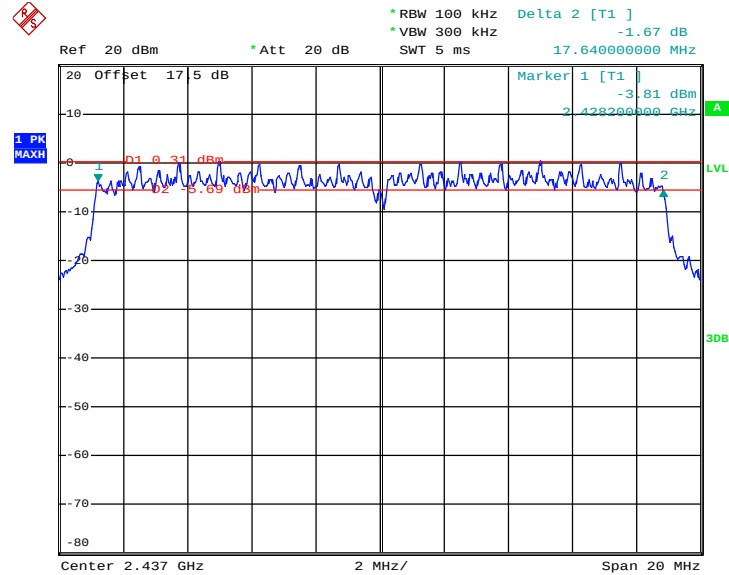
Channel	Frequency (MHz)	2.4GHz 802.11n HT20 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	17.64	0.5	Pass
06	2437	17.64	0.5	Pass
11	2462	17.64	0.5	Pass

6 dB Bandwidth Plot on 802.11n HT20 Channel 01

Date: 23.FEB.2013 16:53:48

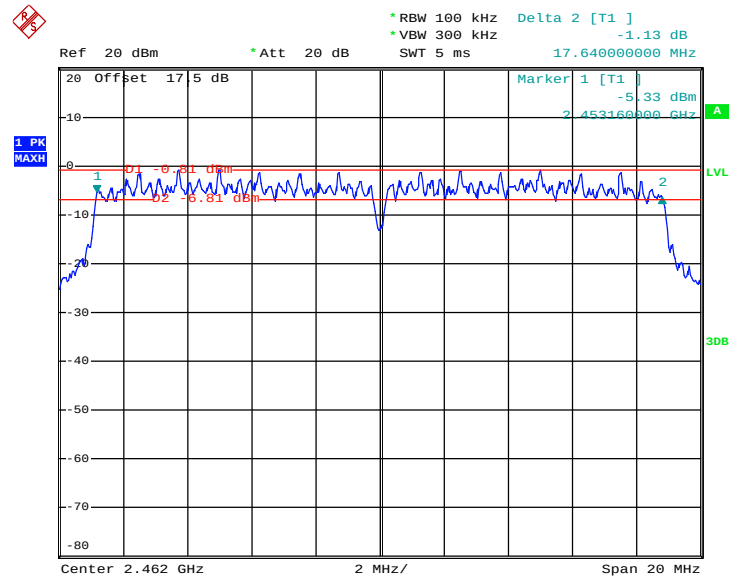


6 dB Bandwidth Plot on 802.11n HT20 Channel 06



Date: 23.FEB.2013 16:57:10

6 dB Bandwidth Plot on 802.11n HT20 Channel 11



Date: 23.FEB.2013 17:00:18

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.

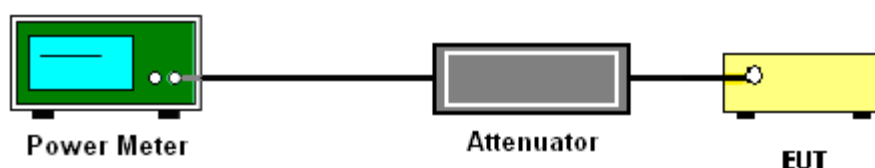
3.2.2 Measuring Instruments

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 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. 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 :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	802.11b Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	15.89	30	Pass
06	2437	15.25	30	Pass
11	2462	14.98	30	Pass

Test Mode :	802.11g	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	802.11g Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	20.75	30	Pass
06	2437	20.60	30	Pass
11	2462	20.21	30	Pass

Test Mode :	802.11n HT20	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	20.56	30	Pass
06	2437	20.04	30	Pass
11	2462	19.92	30	Pass

3.2.6 Test Result of Average output Power (Reporting Only)

Test Mode :	802.11b	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%
Duty Cycle:	100%	Duty Factor:	0dB

Channel	Frequency (MHz)	802.11b Average Output Power (dBm)
01	2412	13.20
06	2437	12.49
11	2462	12.18

Test Mode :	802.11g	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%
Duty Cycle:	94.10%	Duty Factor:	0.26dB

Channel	Frequency (MHz)	802.11g Average Output Power (dBm)
01	2412	11.45
06	2437	11.38
11	2462	10.68

Test Mode :	802.11n HT20	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%
Duty Cycle:	93.75%	Duty Factor:	0.28dB

Channel	Frequency (MHz)	802.11n HT20 Average Output Power (dBm)
01	2412	11.35
06	2437	10.86
11	2462	10.58

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.

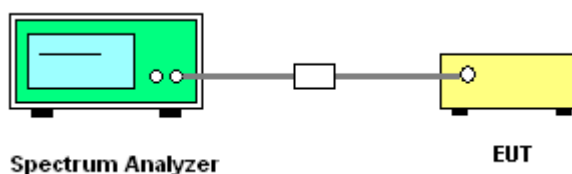
3.3.2 Measuring Instruments

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.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Test Mode :	802.11b	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	802.11b Power Density		Max. Limits (dBm/3KHz)	Pass/Fail
		PSD/100KHz (dBm)	PSD/3KHz (dBm)		
01	2412	3.74	-11.28	8	Pass
06	2437	2.96	-11.66	8	Pass
11	2462	2.63	-12.41	8	Pass

Test Mode :	802.11g	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

Channel	Frequency (MHz)	802.11g Power Density		Max. Limits (dBm/3KHz)	Pass/Fail
		PSD/100KHz (dBm)	PSD/3KHz (dBm)		
01	2412	1.41	-9.66	8	Pass
06	2437	1.29	-9.92	8	Pass
11	2462	0.85	-9.11	8	Pass

Test Mode :	802.11n HT20	Temperature :	20~21℃
Test Engineer :	Zhi Lu	Relative Humidity :	40~41%

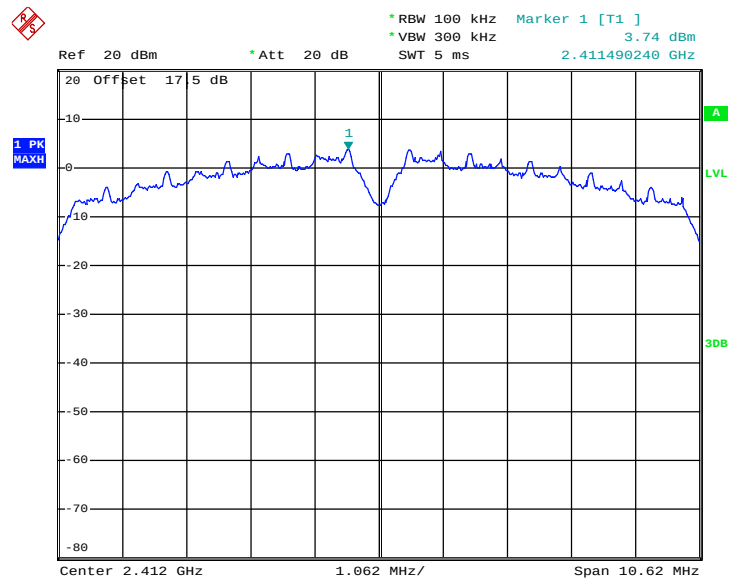
Channel	Frequency (MHz)	802.11n HT20 Power Density		Max. Limits (dBm/3KHz)	Pass/Fail
		PSD/100KHz (dBm)	PSD/3KHz (dBm)		
01	2412	0.03	-9.57	8	Pass
06	2437	0.25	-9.25	8	Pass
11	2462	-0.86	-15.02	8	Pass

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.

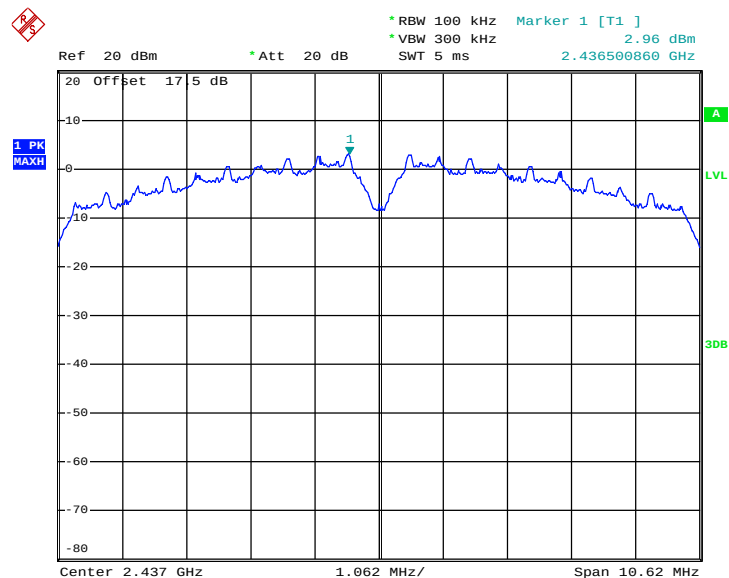
3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on 802.11b Channel 01



Date: 2.MAR.2013 15:49:46

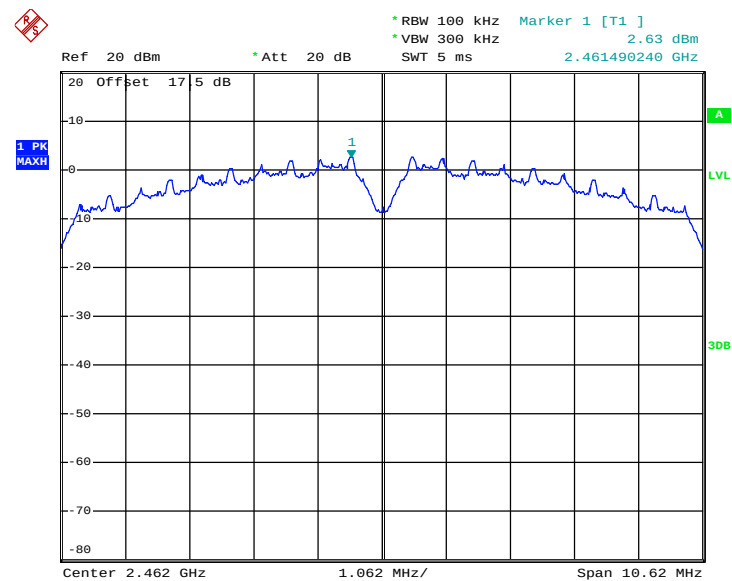
PSD 100kHz Plot on 802.11b Channel 06



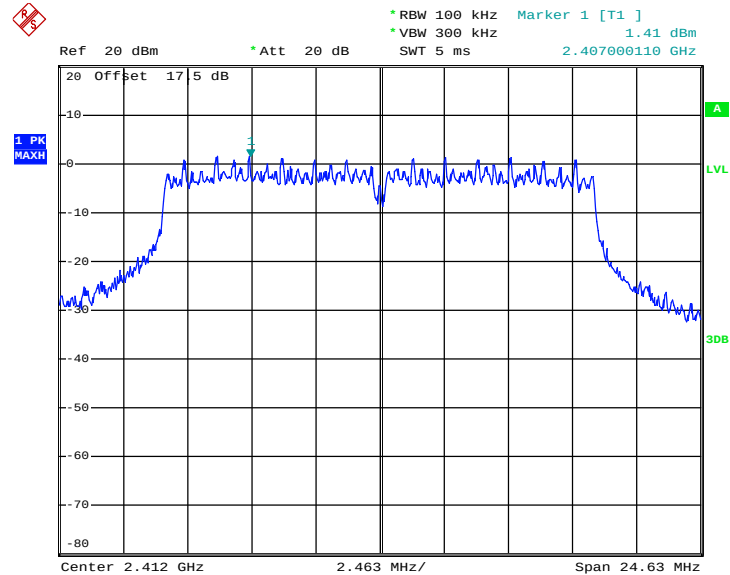
Date: 2.MAR.2013 15:53:04



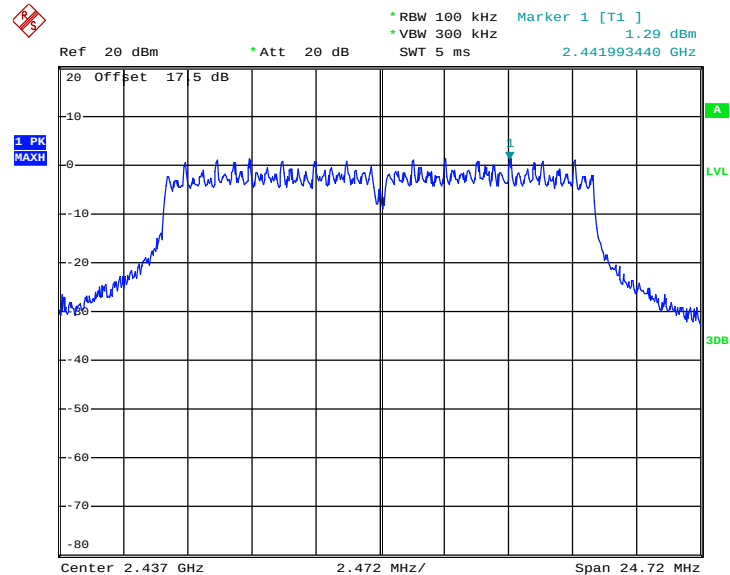
PSD 100kHz Plot on 802.11b Channel 11



Date: 2.MAR.2013 15:56:01

PSD 100kHz Plot on 802.11g Channel 01


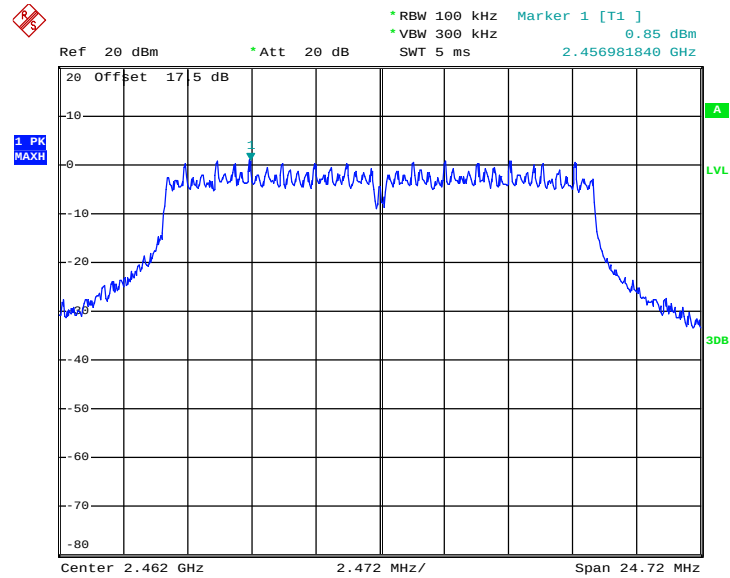
Date: 23.FEB.2013 16:41:43

PSD 100kHz Plot on 802.11g Channel 06


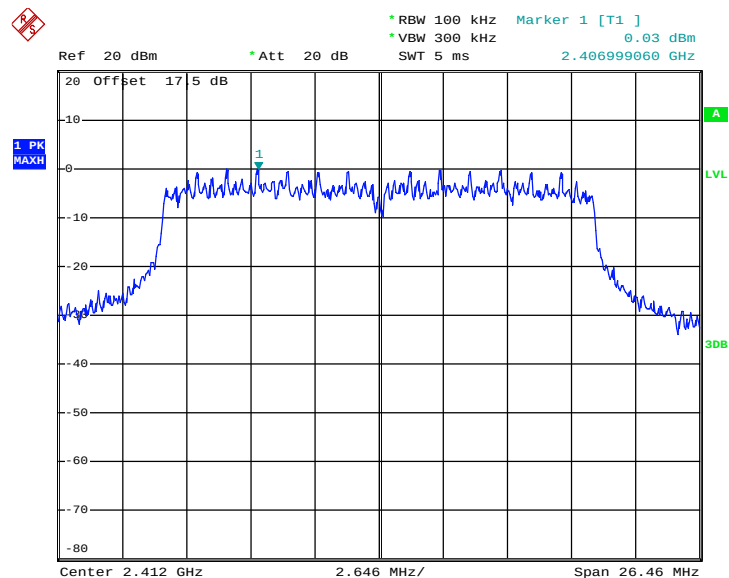
Date: 23.FEB.2013 16:46:38



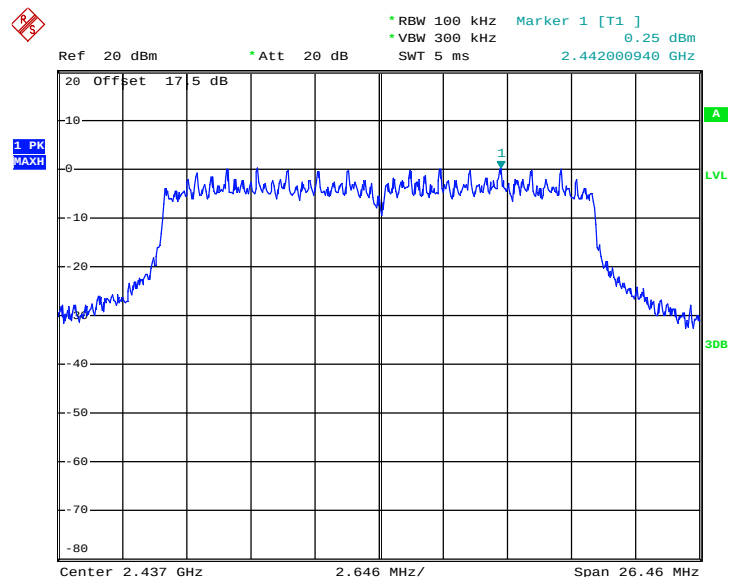
PSD 100kHz Plot on 802.11g Channel 11



Date: 23.FEB.2013 16:49:35

PSD 100kHz Plot on 802.11n HT20 Channel 01


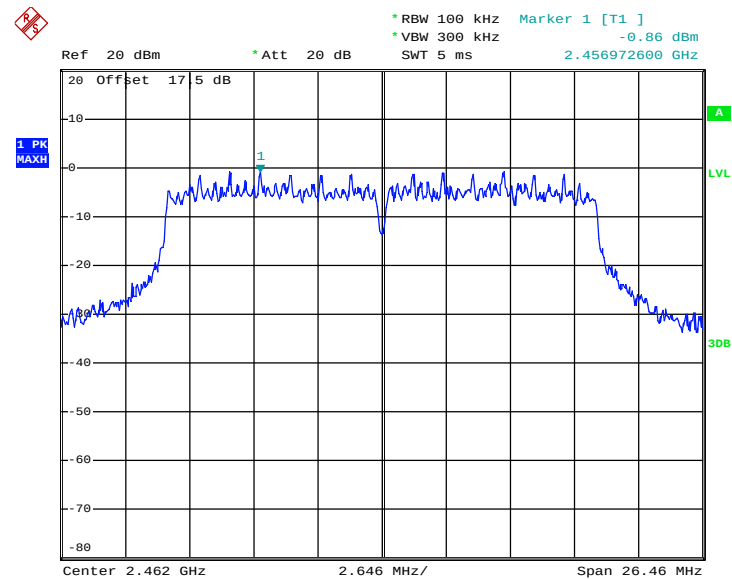
Date: 23.FEB.2013 16:54:50

PSD 100kHz Plot on 802.11n HT20 Channel 06


Date: 23.FEB.2013 16:58:06



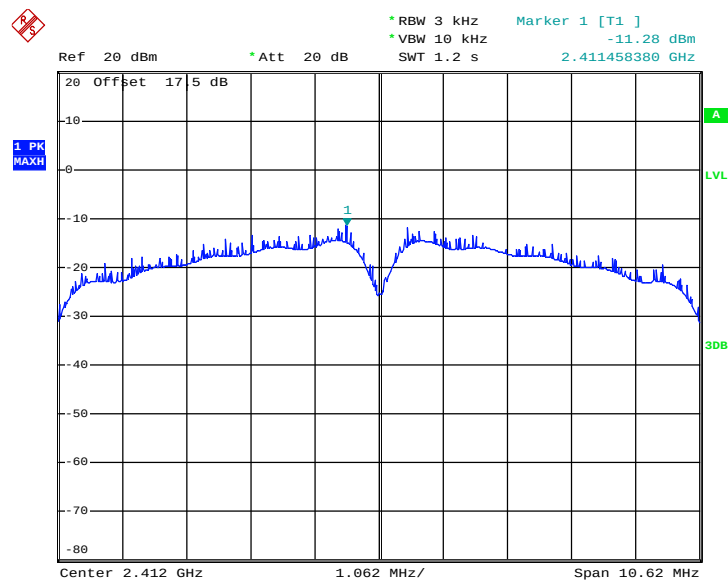
PSD 100kHz Plot on 802.11n HT20 Channel 11



Date: 23.FEB.2013 17:01:01

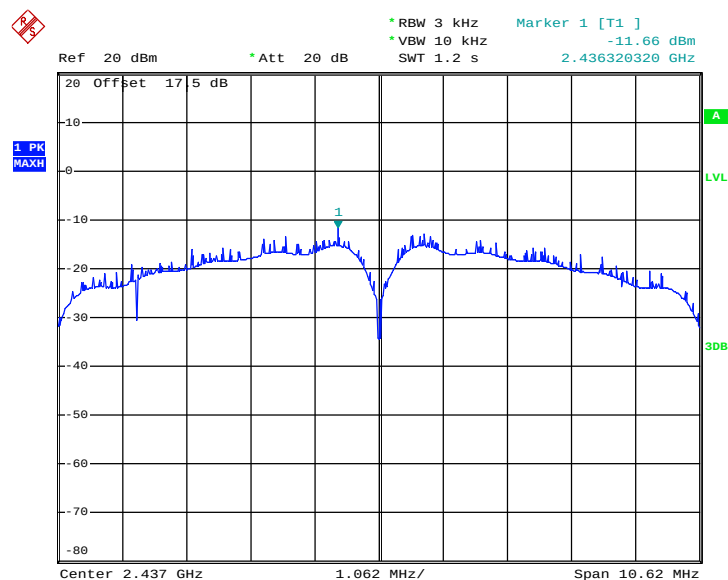
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on 802.11b Channel 01



Date: 2.MAR.2013 15:49:35

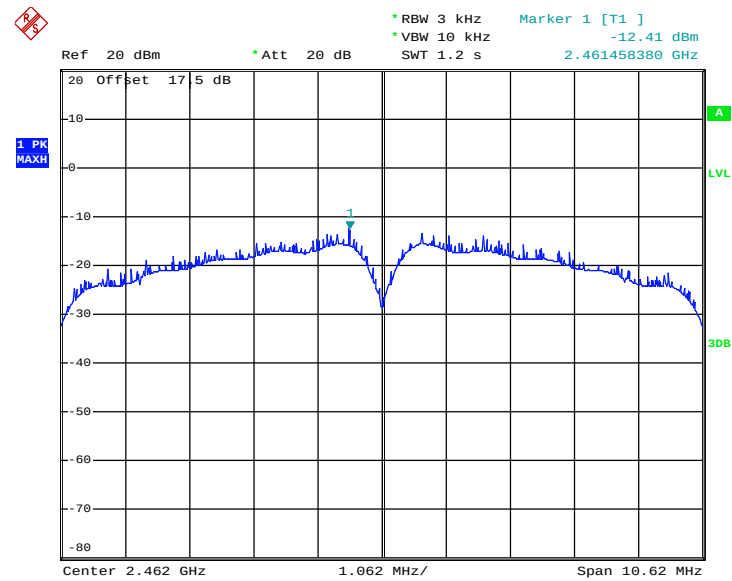
PSD 3kHz Plot on 802.11b Channel 06



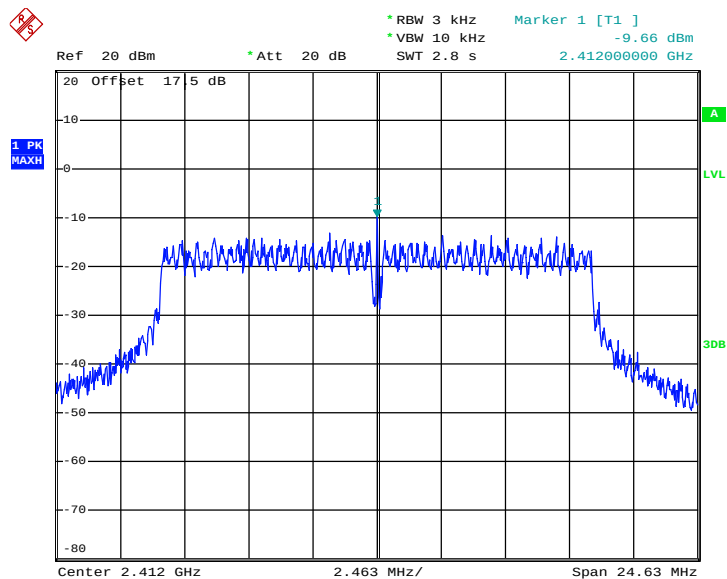
Date: 2.MAR.2013 15:52:45



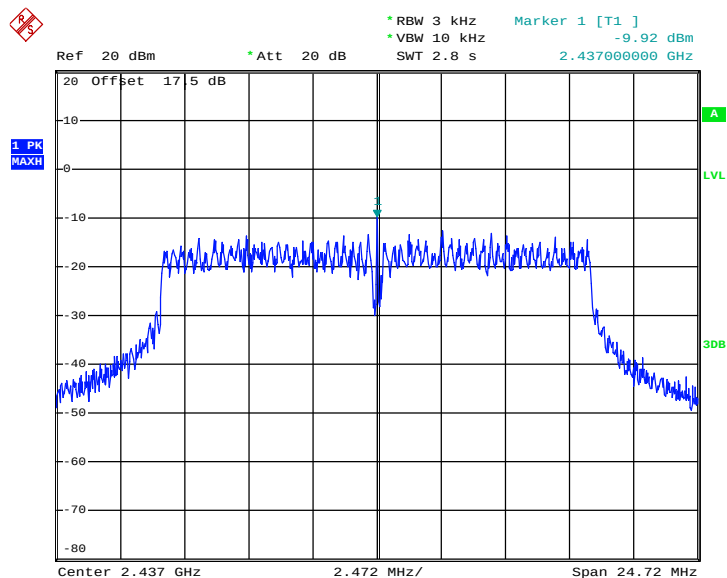
PSD 3kHz Plot on 802.11b Channel 11



Date: 2.MAR.2013 15:55:50

PSD 3kHz Plot on 802.11g Channel 01


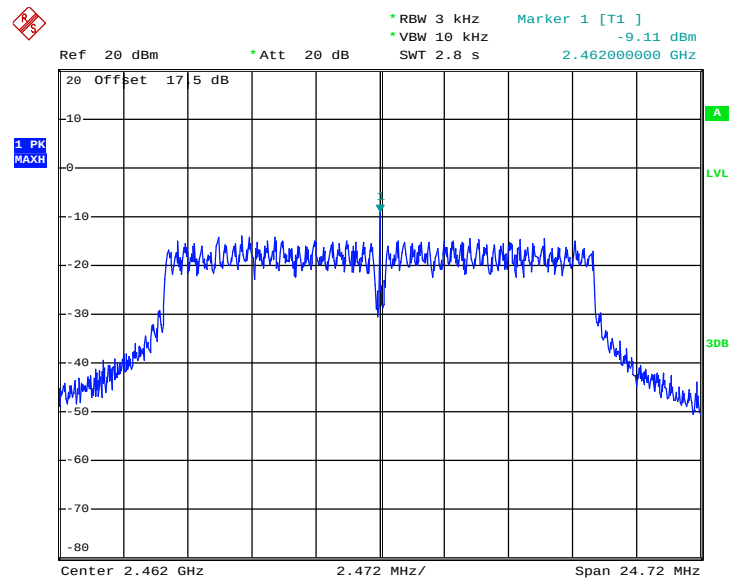
Date: 23.FEB.2013 16:41:30

PSD 3kHz Plot on 802.11g Channel 06


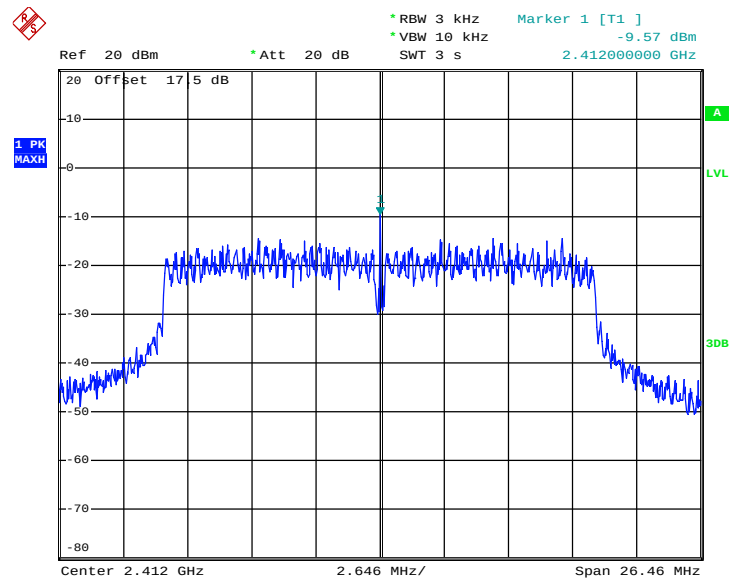
Date: 23.FEB.2013 16:45:34



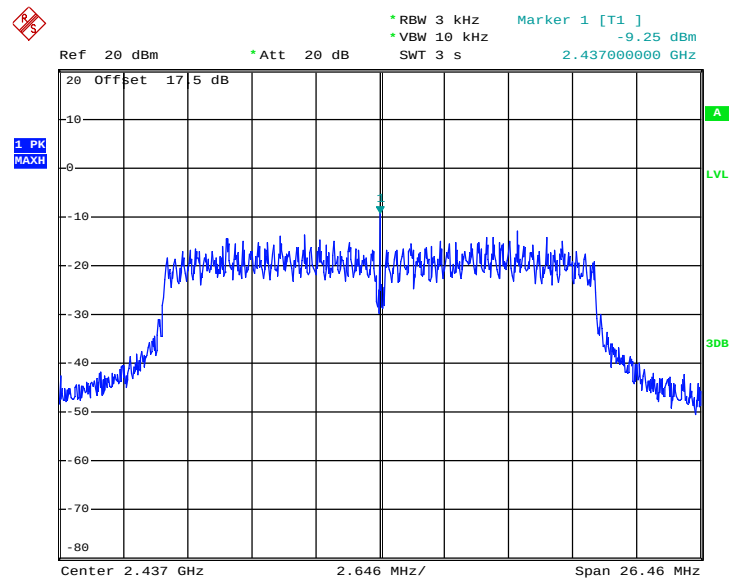
PSD 3kHz Plot on 802.11g Channel 11



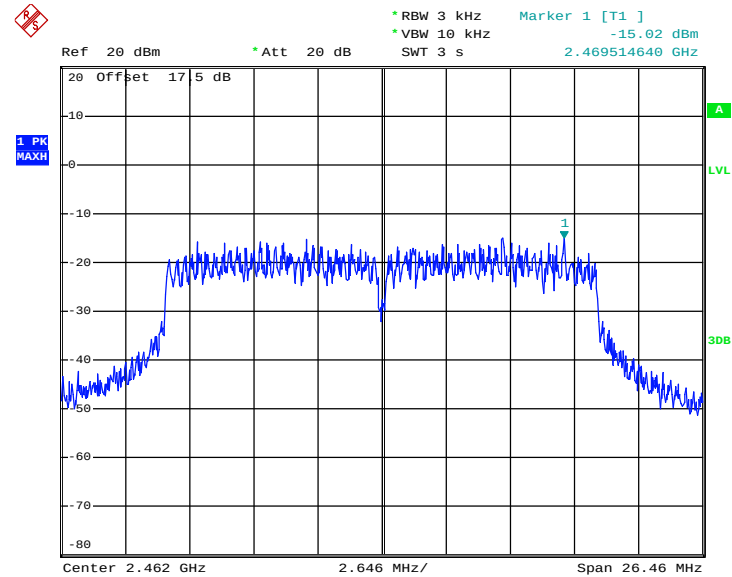
Date: 23.FEB.2013 16:49:24

PSD 3kHz Plot on 802.11n HT20 Channel 01


Date: 23.FEB.2013 16:54:15

PSD 3kHz Plot on 802.11n HT20 Channel 06


Date: 23.FEB.2013 16:57:39

PSD 3kHz Plot on 802.11n HT20 Channel 11


Date: 23.FEB.2013 17:00:45

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).

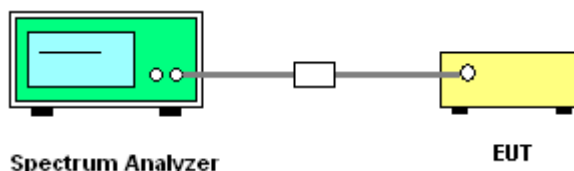
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB 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. 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. The attenuation is set to 30dB, when maximum conducted output power procedure is used.
5. Measure and record the results in the test report.

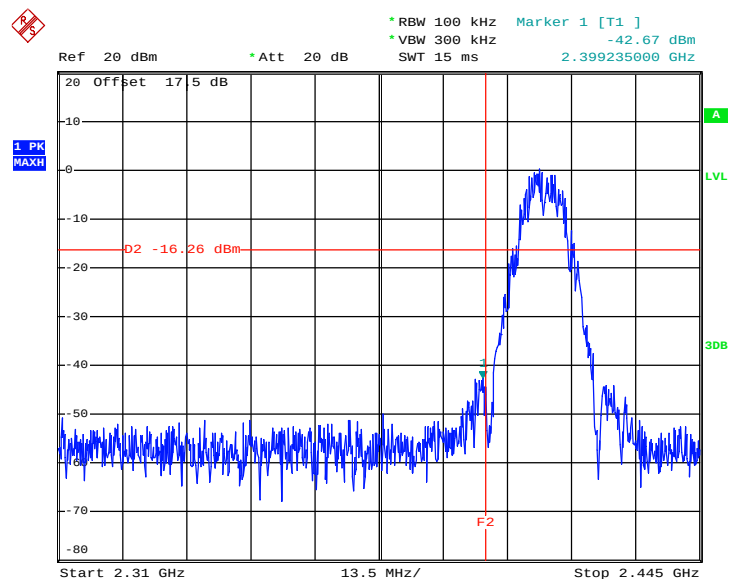
3.4.4 Test Setup



3.4.5 Test Plots of Conducted Band Edges

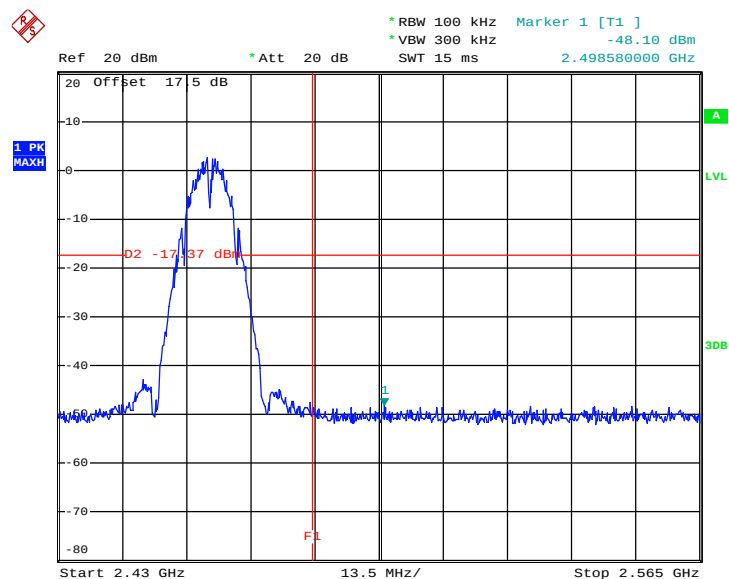
Test Mode :	802.11b	Temperature :	20~21℃
Test Band :	Low and High	Relative Humidity :	40~41%
Test Channel :	01 and 11	Test Engineer :	Zhi Lu

Low Band Edge Plot on 802.11b Channel 01



Date: 2.MAR.2013 15:50:04

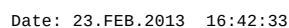
High Band Edge Plot on 802.11b Channel 11



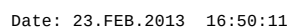
Date: 2.MAR.2013 15:57:06



Low Band Edge Plot on 802.11g Channel 01



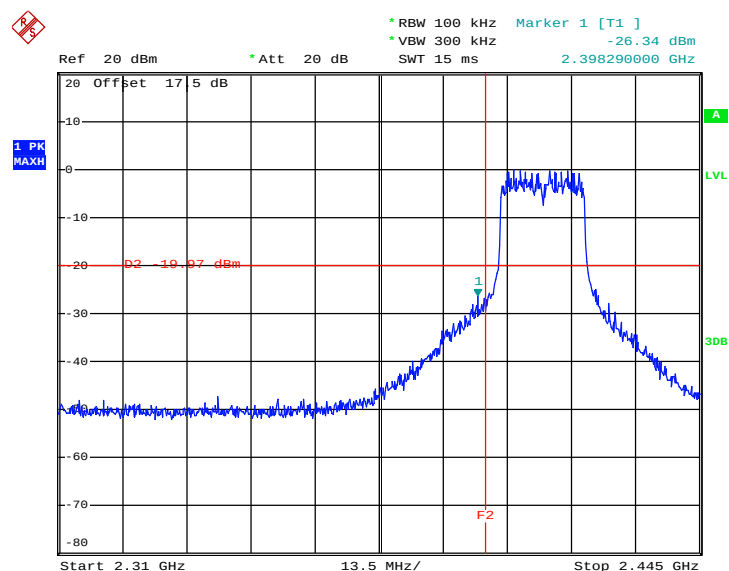
High Band Edge Plot on 802.11g Channel 11





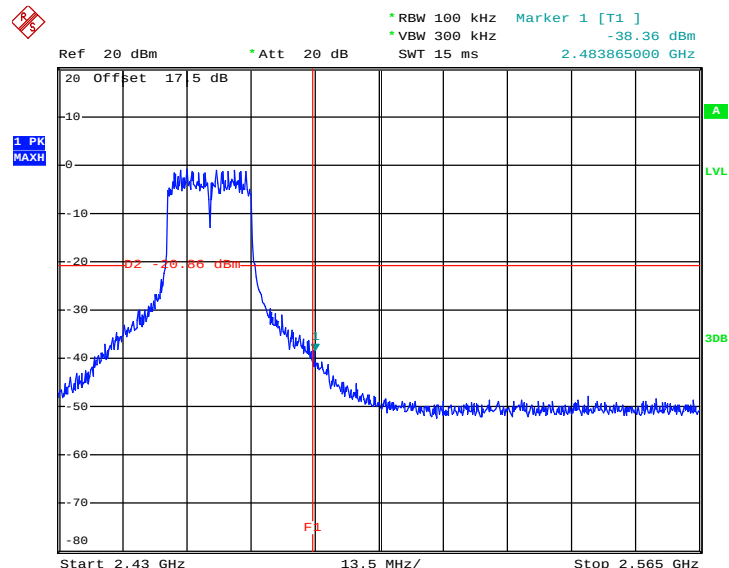
Test Mode :	802.11n HT20	Temperature :	20~21°C
Test Band :	Low and High	Relative Humidity :	40~41%
Test Channel :	01 and 11	Test Engineer :	Zhi Lu

Low Band Edge Plot on 802.11n HT20 Channel 01



Date: 23.FEB.2013 16:55:09

High Band Edge Plot on 802.11n HT20 Channel 11



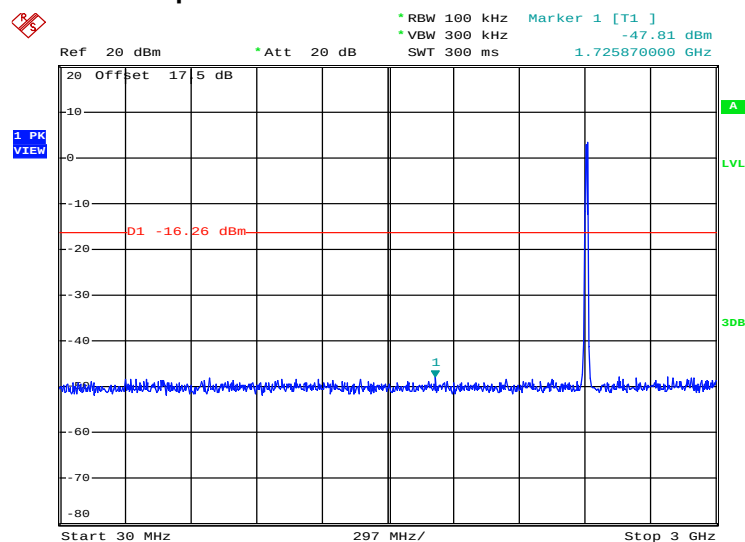
Date: 23.FEB.2013 17:01:22

3.4.6 Test Plots of Spurious Emission

Test Mode :	802.11b	Temperature :	20~21°C
Test Band :	30MHz-3GHz and 2G-25GHz	Relative Humidity :	40~41%
Test Channel :	01, 06, 11	Test Engineer :	Zhi Lu

802.11b 30 MHz~3 GHz

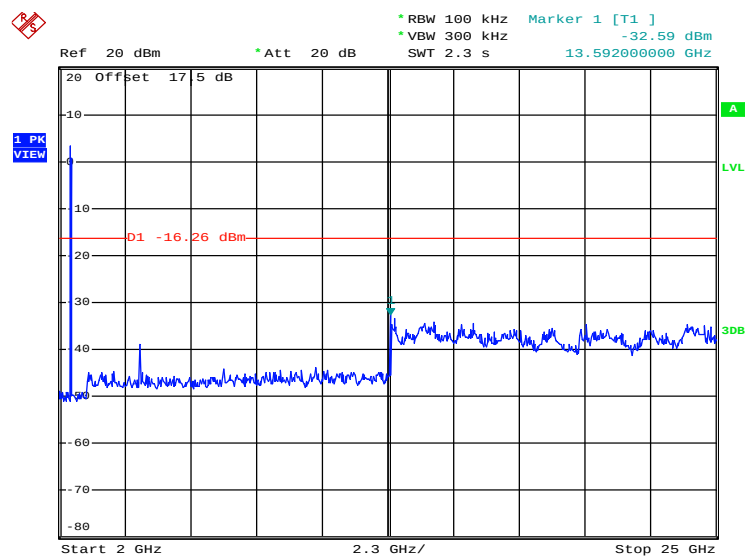
Conducted Spurious Emission Plot on Channel 01



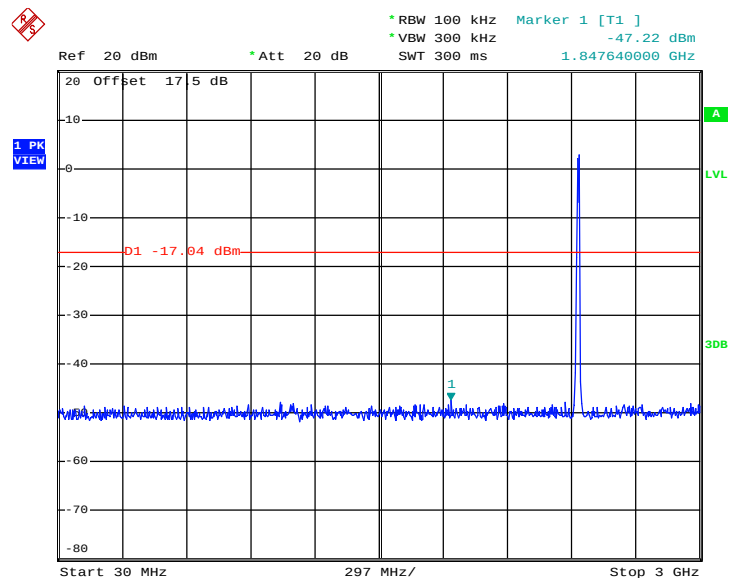
Date: 2.MAR.2013 15:50:32

802.11b 2 GHz~25 GHz

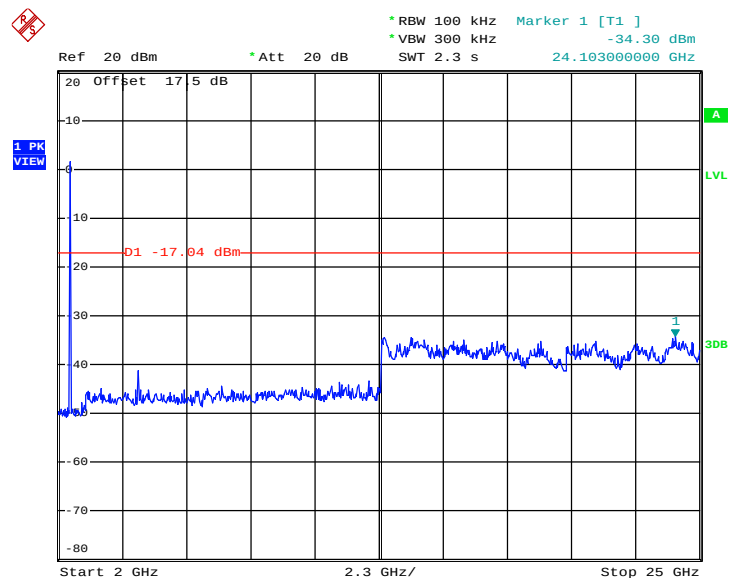
Conducted Spurious Emission Plot on Channel 01



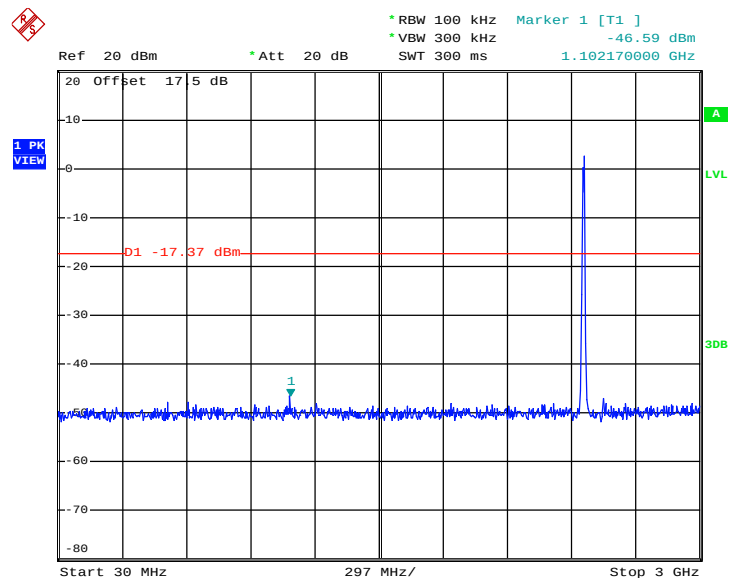
Date: 2.MAR.2013 15:50:51

802.11b 30 MHz~3 GHz
Conducted Spurious Emission Plot on Channel 06


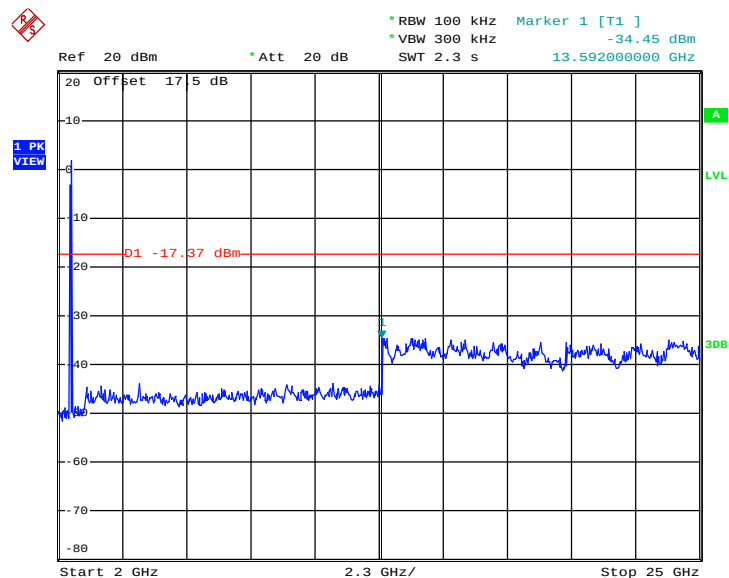
Date: 2.MAR.2013 15:53:27

802.11b 2 GHz~25 GHz
Conducted Spurious Emission Plot on Channel 06


Date: 2.MAR.2013 15:53:45

802.11b 30 MHz~3 GHz
Conducted Spurious Emission Plot on Channel 11


Date: 2.MAR.2013 15:57:30

802.11b 2 GHz~25 GHz
Conducted Spurious Emission Plot on Channel 11


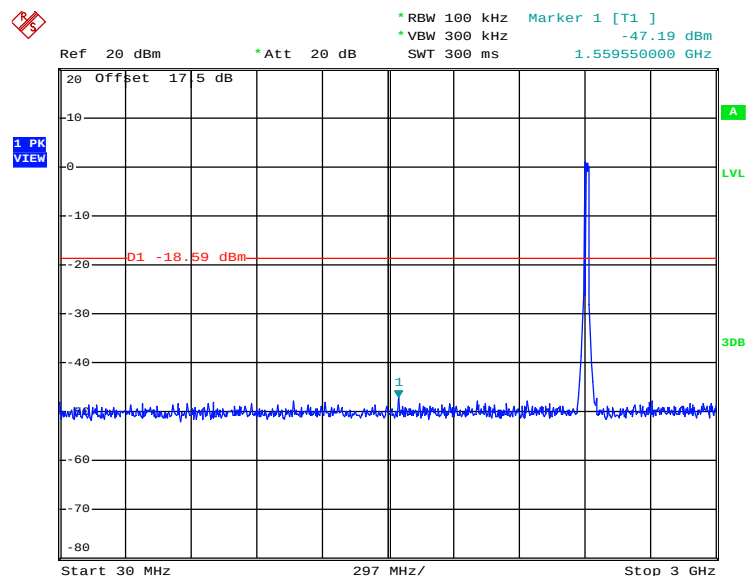
Date: 2.MAR.2013 15:57:48



Test Mode :	802.11g	Temperature :	20~21℃
Test Band :	30MHz-3GHz and 2G-25GHz	Relative Humidity :	40~41%
Test Channel :	01, 06, 11	Test Engineer :	Zhi Lu

802.11g 30 MHz~3 GHz

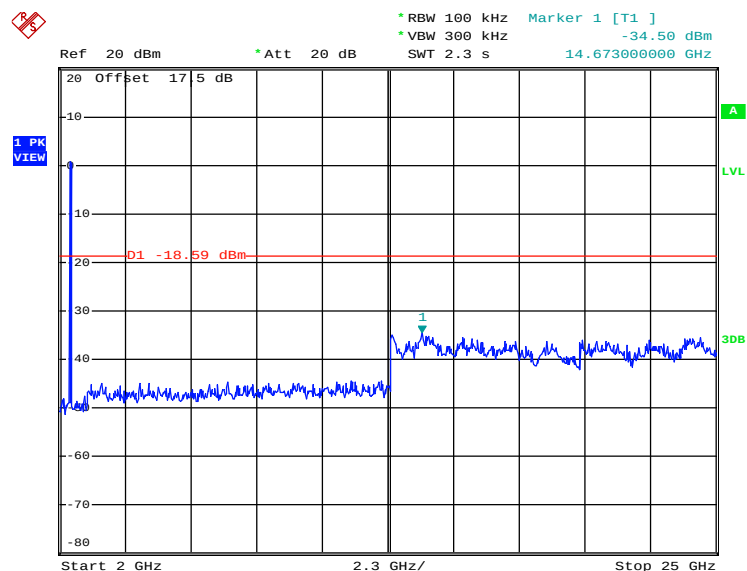
Conducted Spurious Emission Plot on Channel 01



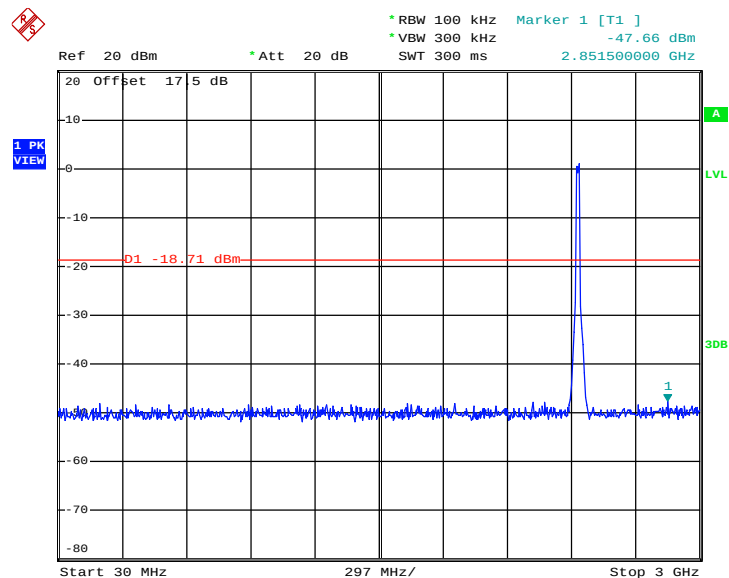
Date: 23.FEB.2013 16:42:54

802.11g 2 GHz~25 GHz

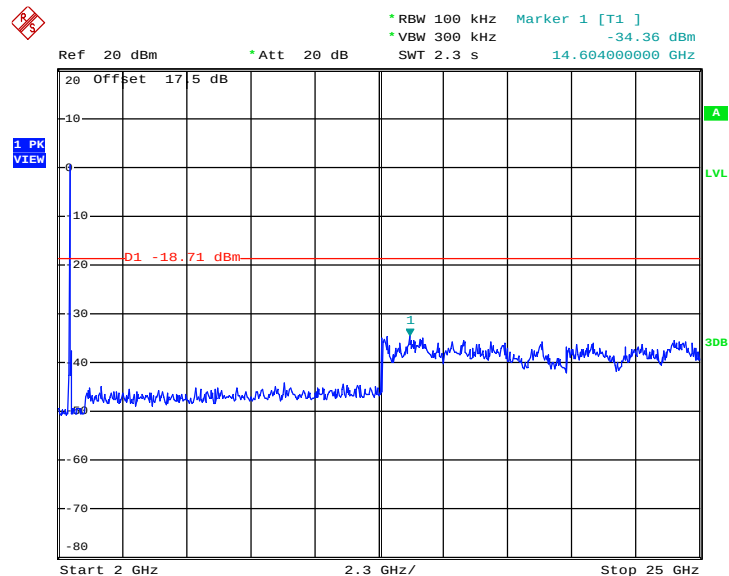
Conducted Spurious Emission Plot on Channel 01



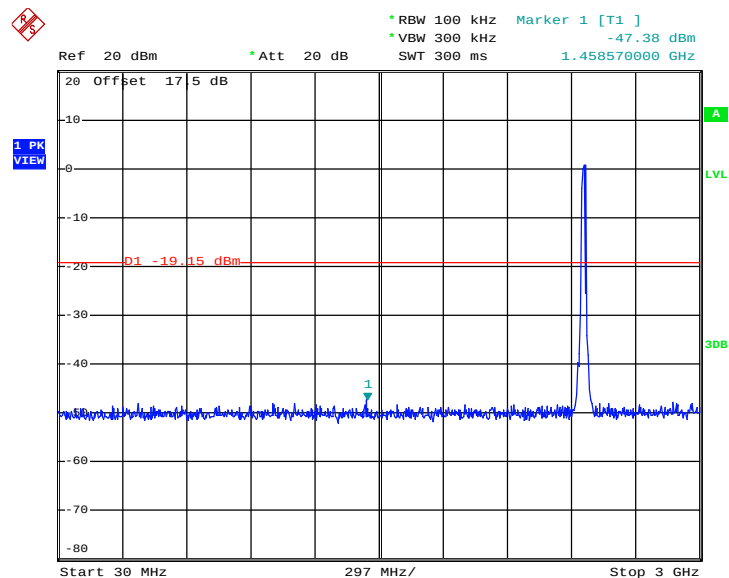
Date: 23.FEB.2013 16:43:13

802.11g 30 MHz~3 GHz
Conducted Spurious Emission Plot on Channel 06


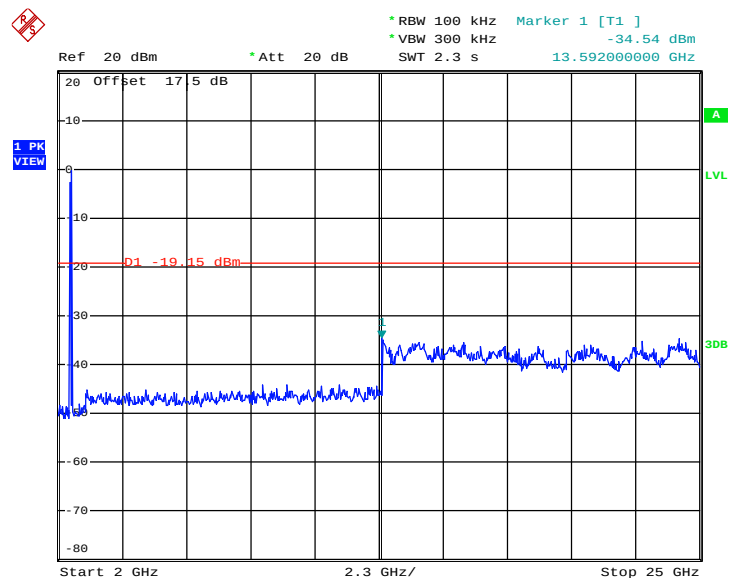
Date: 23.FEB.2013 16:47:05

802.11g 2 GHz~25 GHz
Conducted Spurious Emission Plot on Channel 06


Date: 23.FEB.2013 16:47:24

802.11g 30 MHz~3 GHz
Conducted Spurious Emission Plot on Channel 11


Date: 23.FEB.2013 16:50:36

802.11g 2 GHz~25 GHz
Conducted Spurious Emission Plot on Channel 11


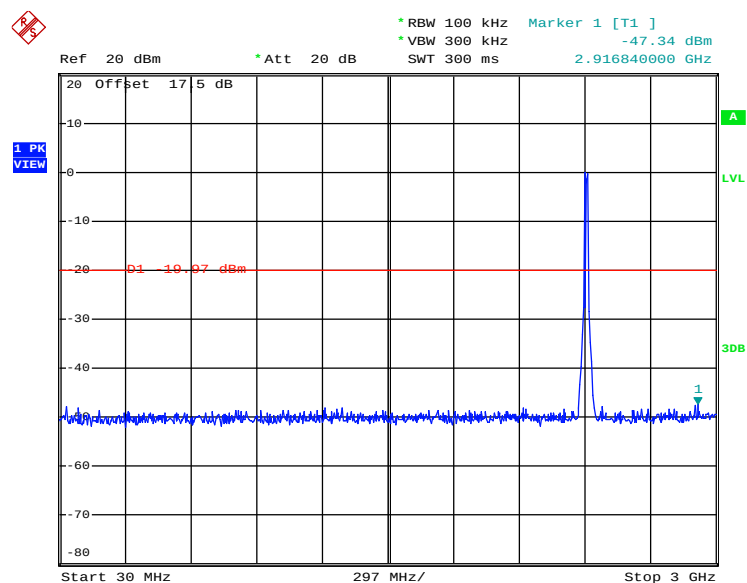
Date: 23.FEB.2013 16:50:54



Test Mode :	802.11n HT20	Temperature :	20~21°C
Test Band :	30MHz-3GHz and 2G-25GHz	Relative Humidity :	40~41%
Test Channel :	01, 06, 11	Test Engineer :	Zhi Lu

802.11n HT20 30 MHz~3 GHz

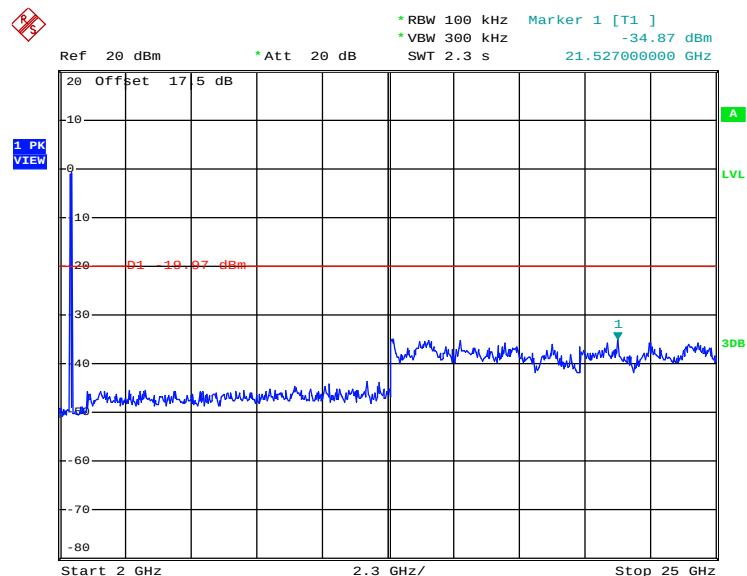
Conducted Spurious Emission Plot on Channel 01



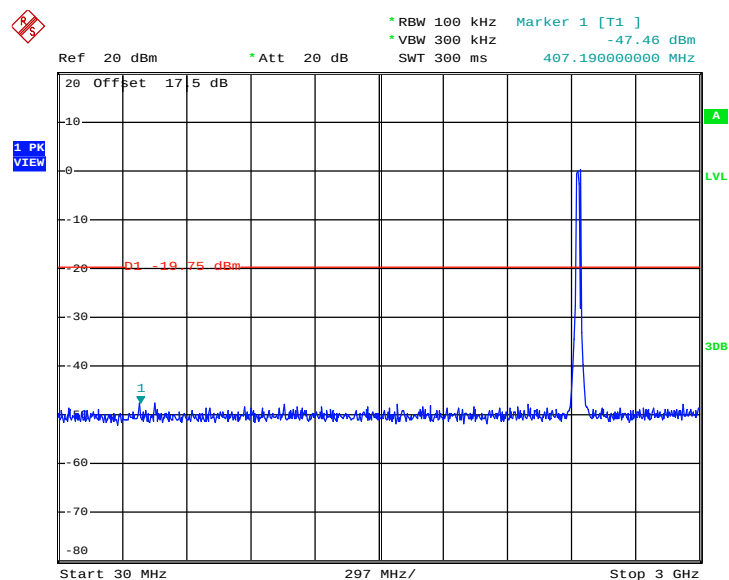
Date: 23.FEB.2013 16:55:32

802.11n HT20 2 GHz~25 GHz

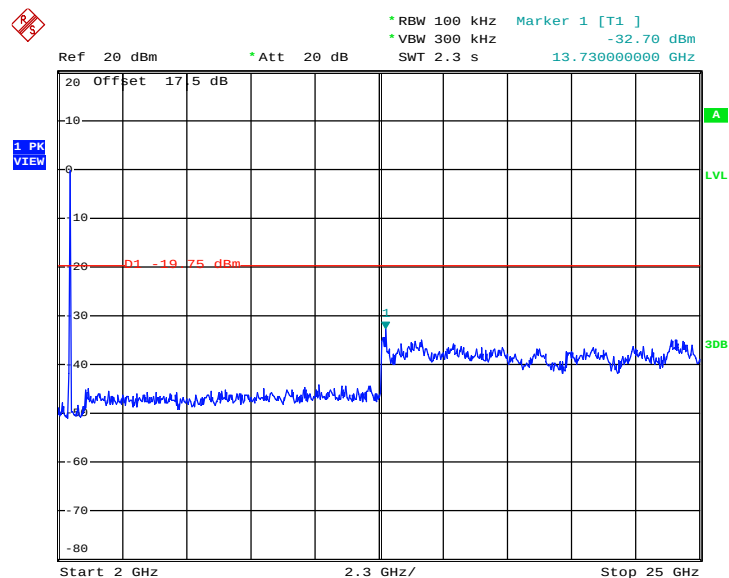
Conducted Spurious Emission Plot on Channel 01



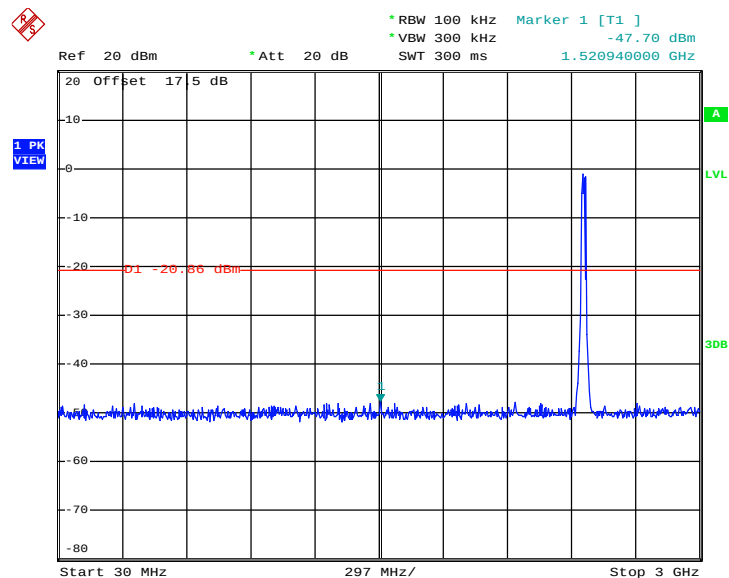
Date: 23.FEB.2013 16:55:50

802.11n HT20 30 MHz~3 GHz
Conducted Spurious Emission Plot on Channel 06


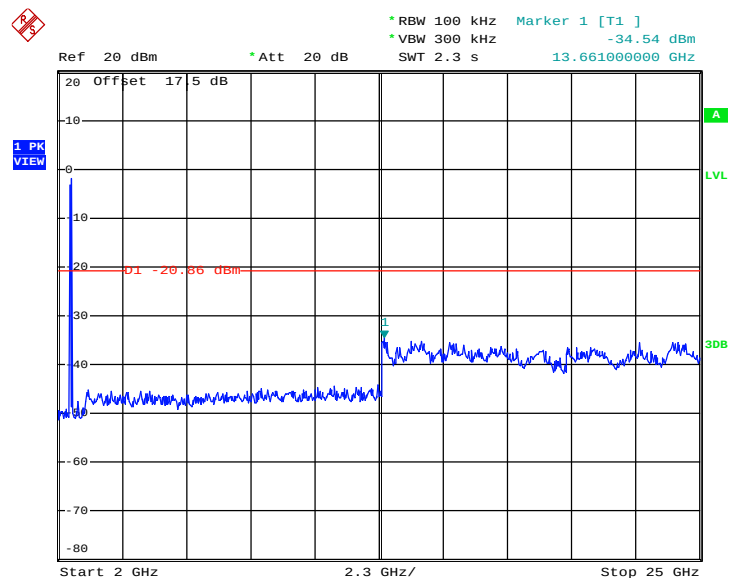
Date: 23.FEB.2013 16:58:28

802.11n HT20 2 GHz~25 GHz
Conducted Spurious Emission Plot on Channel 06


Date: 23.FEB.2013 16:58:47

802.11n HT20 30 MHz~3 GHz
Conducted Spurious Emission Plot on Channel 11


Date: 23.FEB.2013 17:01:48

802.11n HT20 2 GHz~25 GHz
Conducted Spurious Emission Plot on Channel 11


Date: 23.FEB.2013 17:02:07

3.5 Radiated Emission Measurement

3.5.1 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

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

For average measurement:

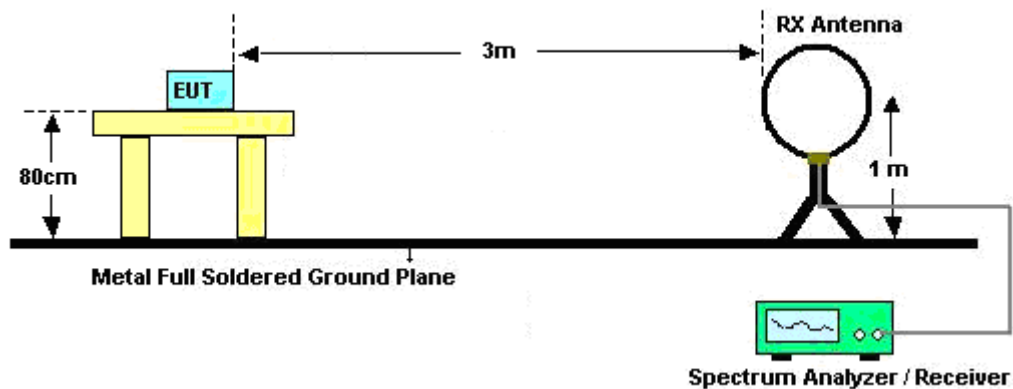
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	T(us)	1/T(KHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	98.10	-	-	10Hz
2.4G 802.11n HT20	89.36	0.252	3.968	10Khz

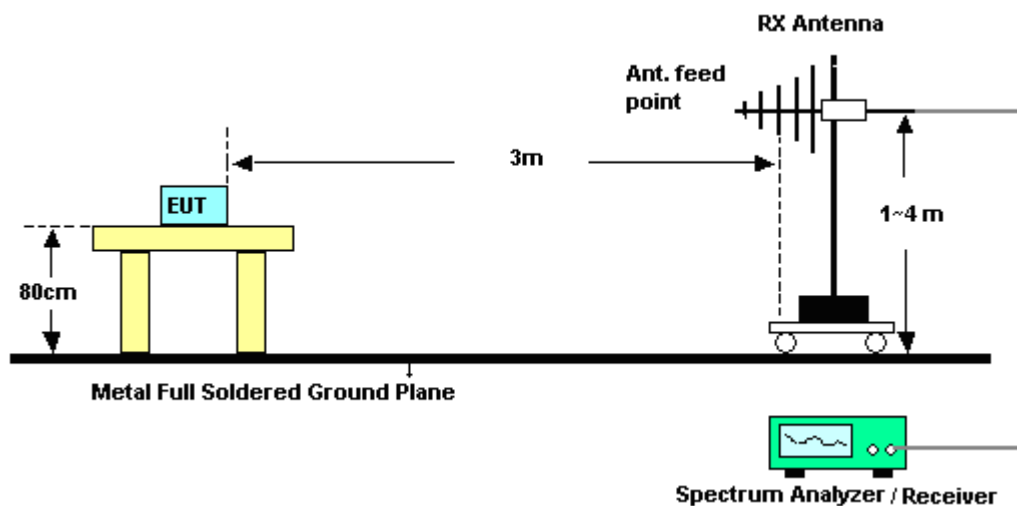
Note: For average measurement with duty cycle < 98%, use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.

3.5.4 Test Setup

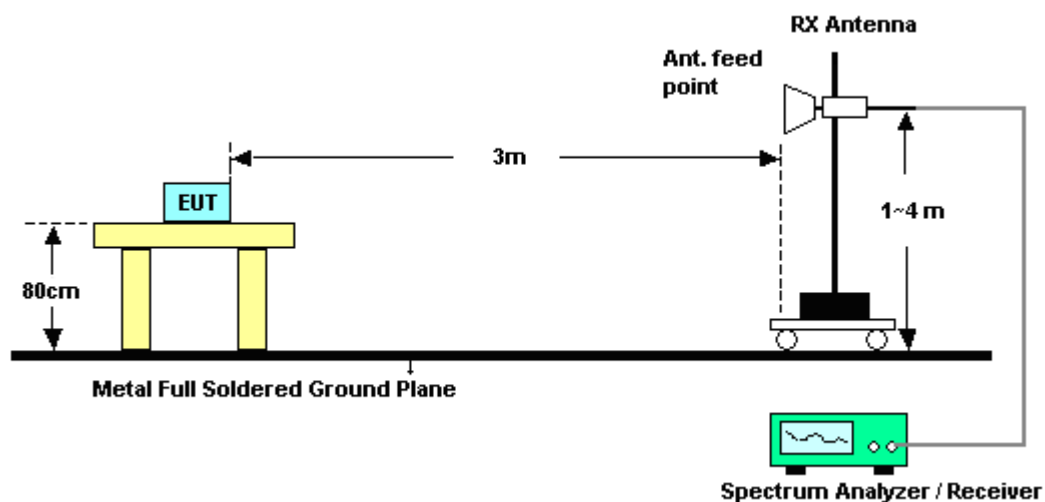
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Emissions (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.

3.5.6 Test Result of Radiated Band Edges

Test Mode :	802.11b	Temperature :	21~22℃
Test Band :	Low	Relative Humidity :	42~43%
Test Channel :	01	Test Engineer :	Steven Hao

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
2389.74	50.57	-23.43	74	47.13	32.85	2.1	31.51	100	280	Peak
2390	39.17	-14.83	54	35.73	32.85	2.1	31.51	100	280	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
2389.29	51	-23	74	47.56	32.85	2.1	31.51	100	323	Peak
2390	37.83	-16.17	54	34.39	32.85	2.1	31.51	133	323	Average

Test Mode :	802.11b	Temperature :	21~22℃
Test Band :	High	Relative Humidity :	42~43%
Test Channel :	11	Test Engineer :	Steven Hao

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
2487.07	50.3	-23.7	74	46.65	33.01	2.15	31.51	120	95	Peak
2483.5	37.93	-16.07	54	34.28	33.01	2.15	31.51	120	95	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
2483.83	51	-23	74	47.35	33.01	2.15	31.51	105	50	Peak
2483.5	37.87	-16.13	54	34.22	33.01	2.15	31.51	105	50	Average



Test Mode :	802.11g	Temperature :	21~22°C
Test Band :	Low	Relative Humidity :	42~43%
Test Channel :	01	Test Engineer :	Steven Hao

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	62.64	-11.36	74	59.2	32.85	2.1	31.51	110	105	Peak
2390	46.42	-7.58	54	42.98	32.85	2.1	31.51	110	105	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2390	57.91	-16.09	74	54.47	32.85	2.1	31.51	105	340	Peak
2390	47.77	-6.23	54	44.33	32.85	2.1	31.51	105	340	Average

Test Mode :	802.11g	Temperature :	21~22°C
Test Band :	High	Relative Humidity :	42~43%
Test Channel :	11	Test Engineer :	Steven Hao

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.56	56.79	-17.21	74	53.14	33.01	2.15	31.51	115	20	Peak
2483.5	41.74	-12.26	54	38.09	33.01	2.15	31.51	115	20	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
2483.68	54.45	-19.55	74	50.8	33.01	2.15	31.51	105	360	Peak
2483.5	40.71	-13.29	54	37.06	33.01	2.15	31.51	105	360	Average



Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Band :	Low	Relative Humidity :	42~43%
Test Channel :	01	Test Engineer :	Steven Hao

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
2389.83	57.8	-16.2	74	54.36	32.85	2.1	31.51	135	129	Peak
2390	43.62	-10.38	54	40.18	32.85	2.1	31.51	135	129	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
2378.65	58.36	-15.64	74	54.96	32.82	2.09	31.51	120	80	Peak
2390	44.24	-9.76	54	40.8	32.85	2.1	31.51	120	80	Average

Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Band :	High	Relative Humidity :	42~43%
Test Channel :	11	Test Engineer :	Steven Hao

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.89	51.4	-22.6	74	47.75	33.01	2.15	31.51	125	89	Peak
2483.59	39.72	-14.28	54	36.07	33.01	2.15	31.51	125	89	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
2483.59	41.24	-12.76	54	37.59	33.01	2.15	31.51	125	89	Peak
2483.59	39.72	-14.28	54	36.07	33.01	2.15	31.51	125	89	Average

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

Note: Below 1GHz for radiated emission measurement, pre-scanned all test modes and only choose the worst case mode was recorded in the report.

Test Mode :	802.11b	Temperature :	21~22°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2399 MHz and 7236 MHz are not within restricted bands, and their limit lines are 20dB below the highest emission level. For example, 100.82 dBuV/m - 20dB = 80.82 dBuV/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
2399	49.47	-31.35	80.82	46.03	32.85	2.1	31.51	100	280	Peak
2412	100.82	-	-	97.34	32.88	2.11	31.51	100	280	Peak
2412	95.95	-	-	92.47	32.88	2.11	31.51	100	280	Average
4824	51.41	-22.59	74	44.71	35.16	3.08	31.54	107	132	Peak
4824	46.89	-7.11	54	40.19	35.16	3.08	31.54	107	132	Average
7236	45.49	-35.33	80.82	37.06	36.16	3.22	30.95	140	89	Peak

Test Mode :	802.11b	Temperature :	21~22°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2399 MHz and 7236 MHz are not within restricted bands, and their limit lines are 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
2399	50.39	-26.13	76.52	46.95	32.85	2.1	31.51	132	324	Peak
2412	96.52	-	-	93.04	32.88	2.11	31.51	132	324	Peak
2412	91.74	-	-	88.26	32.88	2.11	31.51	132	324	Average
4824	51.37	-22.63	74	44.67	35.16	3.08	31.54	100	120	Peak
4824	47.27	-6.73	54	40.57	35.16	3.08	31.54	100	120	Average
7236	46.92	-29.6	76.52	38.49	36.16	3.22	30.95	139	85	Peak

Test Mode :	802.11b	Temperature :	21~22℃
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2437 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
2437	98.67	-	-	95.11	32.94	2.13	31.51	117	106	Peak
2437	94.22	-	-	90.66	32.94	2.13	31.51	117	106	Average
4874	49.49	-24.51	74	42.72	35.18	3.11	31.52	100	25	Peak
7311	52.49	-21.51	74	44.06	36.16	3.22	30.95	100	356	Peak

Test Mode :	802.11b	Temperature :	21~22°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Vertical
Remark :	1. 2437 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
2437	95.69	-	-	92.13	32.94	2.13	31.51	100	69	Peak
2437	91.01	-	-	87.45	32.94	2.13	31.51	100	69	Average
4874	52.04	-21.96	74	45.27	35.18	3.11	31.52	100	225	Peak
7311	53.92	-20.08	74	45.49	36.16	3.22	30.95	100	56	Peak

Test Mode :	802.11b	Temperature :	21~22℃
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	97.22	-	-	93.61	32.98	2.14	31.51	119	100	Peak
2462	92.9	-	-	89.29	32.98	2.14	31.51	119	100	Average
4924	49.63	-24.37	74	42.82	35.18	3.14	31.51	120	350	Peak
4924	39.6	-14.4	54	32.79	35.18	3.14	31.51	120	350	Average
7386	48.21	-25.79	74	39.73	36.23	3.18	30.93	115	35	Peak

Test Mode :	802.11b	Temperature :	21~22°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	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	95.47	-	-	91.86	32.98	2.14	31.51	100	40	Peak
2462	91.27	-	-	87.66	32.98	2.14	31.51	100	40	Average
4924	53.03	-20.97	74	46.22	35.18	3.14	31.51	105	320	Peak
4924	46.43	-7.57	54	39.62	35.18	3.14	31.51	105	320	Average
7386	45.38	-28.62	74	36.9	36.23	3.18	30.93	125	95	Peak

Test Mode :	802.11g	Temperature :	21~22℃
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2399 MHz and 7236 MHz are not within restricted bands, and their limit lines are 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
59.1	30.51	-9.49	40	58.18	5.43	0.47	33.57	112	80	Peak
104.69	32.58	-10.92	43.5	54.46	11.14	0.58	33.6	-	-	Peak
139.61	23.96	-19.54	43.5	45.95	10.89	0.7	33.58	-	-	Peak
197.81	22.17	-21.33	43.5	46.02	8.89	0.81	33.55	-	-	Peak
419.94	20.65	-25.35	46	36.65	16.1	1.16	33.26	-	-	Peak
874.87	25.51	-20.49	46	35.92	20.47	1.69	32.57	-	-	Peak
2399	76.99	-4.34	81.33	73.55	32.85	2.1	31.51	116	100	Peak
2412	101.33	-	-	97.85	32.88	2.11	31.51	116	100	Peak
2412	91.93	-	-	88.45	32.88	2.11	31.51	116	100	Average
4824	55.14	-18.86	74	48.44	35.16	3.08	31.54	110	360	Peak
4824	46.03	-7.97	54	39.33	35.16	3.08	31.54	110	360	Average
7236	45.75	-35.58	81.33	37.32	36.16	3.22	30.95	120	86	Peak

Test Mode :	802.11g	Temperature :	21~22℃
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2399 MHz and 7236 MHz are not within restricted bands, and their limit lines are 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
66.86	25.01	-14.99	40	52.85	5.24	0.5	33.58	-	-	Peak
99.84	33.6	-9.9	43.5	56.15	10.49	0.57	33.61	108	96	Peak
148.34	22.93	-20.57	43.5	45.63	10.15	0.72	33.57	-	-	Peak
239.52	20.66	-25.34	46	41.72	11.5	0.89	33.45	-	-	Peak
380.17	22.07	-23.93	46	38.82	15.45	1.12	33.32	-	-	Peak
720.64	23.82	-22.18	46	35.59	19.53	1.53	32.83	-	-	Peak
2399	70.61	-5	75.61	67.17	32.85	2.1	31.51	100	360	Peak
2412	95.61	-	-	92.13	32.88	2.11	31.51	100	360	Peak
2412	86.01	-	-	82.53	32.88	2.11	31.51	100	360	Average
4824	57.53	-16.47	74	50.83	35.16	3.08	31.54	100	270	Peak
4824	47.2	-6.8	54	40.5	35.16	3.08	31.54	100	270	Average
7236	47.28	-28.33	75.61	38.85	36.16	3.22	30.95	115	60	Peak

Test Mode :	802.11g	Temperature :	21~22℃
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2437 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
2437	99.42	-	-	95.86	32.94	2.13	31.51	114	29	Peak
2437	89.91	-	-	86.35	32.94	2.13	31.51	114	29	Average
4874	54.62	-19.38	74	47.85	35.18	3.11	31.52	111	360	Peak
4874	42.89	-11.11	54	36.12	35.18	3.11	31.52	111	360	Average
7311	45.6	-28.4	74	37.15	36.19	3.2	30.94	115	29	Peak

Test Mode :	802.11g	Temperature :	21~22℃
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Vertical
Remark :	1. 2437 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
2437	94.99	-	-	91.43	32.94	2.13	31.51	100	115	Peak
2437	83.61	-	-	80.05	32.94	2.13	31.51	100	115	Average
4874	54.55	-19.45	74	47.78	35.18	3.11	31.52	100	42	Peak
4874	45.15	-8.85	54	38.38	35.18	3.11	31.52	100	42	Average
7311	45.06	-28.94	74	36.61	36.19	3.2	30.94	100	320	Peak

Test Mode :	802.11g	Temperature :	21~22℃
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	96.73	-	-	93.12	32.98	2.14	31.51	116	13	Peak
2462	86.82	-	-	83.21	32.98	2.14	31.51	116	13	Average
4924	49.47	-24.53	74	42.66	35.18	3.14	31.51	115	82	Peak
4924	39.69	-14.31	54	32.88	35.18	3.14	31.51	115	82	Average
7386	45.85	-28.15	74	37.37	36.23	3.18	30.93	105	88	Peak

Test Mode :	802.11g	Temperature :	21~22°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	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	93.62	-	-	90.01	32.98	2.14	31.51	100	0	Peak
2462	84.6	-	-	80.99	32.98	2.14	31.51	100	0	Average
4924	53.75	-20.25	74	46.94	35.18	3.14	31.51	100	41	Peak
4924	45.07	-8.93	54	38.26	35.18	3.14	31.51	100	41	Average
7386	45.1	-28.9	74	36.62	36.23	3.18	30.93	100	360	Peak

Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2399 MHz and 7236 MHz are not within restricted bands, and their limit lines are 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
2399	70.83	-7.3	78.13	67.39	32.85	2.1	31.51	140	140	Peak
2412	98.13	-	-	94.65	32.88	2.11	31.51	140	140	Peak
2412	87.03	-	-	83.55	32.88	2.11	31.51	140	140	Average
4820	53.08	-20.92	74	46.38	35.16	3.08	31.54	108	320	Peak
4820	45.67	-8.33	54	38.97	35.16	3.08	31.54	108	320	Average
7236	45.09	-33.04	78.13	36.66	36.16	3.22	30.95	108	56	Peak

Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Channel :	01	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. 2399 MHz and 7236 MHz are not within restricted bands, and their limit lines are 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
2399	70.68	-5.1	75.78	67.24	32.85	2.1	31.51	123	79	Peak
2412	95.78	-	-	92.3	32.88	2.11	31.51	123	79	Peak
2412	86.09	-	-	82.61	32.88	2.11	31.51	123	79	Average
4824	54.6	-19.4	74	47.9	35.16	3.08	31.54	108	60	Peak
4824	45.31	-8.69	54	38.61	35.16	3.08	31.54	108	60	Average
7236	43.51	-32.27	75.78	35.08	36.16	3.22	30.95	105	75	Peak

Test Mode :	802.11n HT20	Temperature :	21~22℃
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2437 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
2437	95.1	-	-	91.54	32.94	2.13	31.51	152	91	Peak
2437	84.81	-	-	81.25	32.94	2.13	31.51	152	91	Average
4874	51.61	-22.39	74	44.84	35.18	3.11	31.52	111	75	Peak
4874	42.56	-11.44	54	35.79	35.18	3.11	31.52	111	75	Average
7311	44.79	-29.21	74	36.34	36.19	3.2	30.94	112	36	Peak

Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Channel :	06	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Vertical
Remark :	1. 2437 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
2437	94.44	-	-	90.88	32.94	2.13	31.51	100	81	Peak
2437	83.33	-	-	79.77	32.94	2.13	31.51	100	81	Average
4874	53.18	-20.82	74	46.41	35.18	3.11	31.52	100	320	Peak
4874	41.73	-12.27	54	34.96	35.18	3.11	31.52	100	320	Average
7311	45.6	-28.4	74	37.15	36.19	3.2	30.94	115	74	Peak

Test Mode :	802.11n HT20	Temperature :	21~22℃
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	92.43	-	-	88.82	32.98	2.14	31.51	149	82	Peak
2462	82.43	-	-	78.82	32.98	2.14	31.51	149	82	Average
4924	49.73	-24.27	74	42.92	35.18	3.14	31.51	114	78	Peak
4924	41.59	-12.41	54	34.78	35.18	3.14	31.51	114	78	Average
7386	45.59	-28.41	74	37.11	36.23	3.18	30.93	105	0	Peak

Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Channel :	11	Relative Humidity :	42~43%
Test Engineer :	Steven Hao	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	94.06	-	-	90.45	32.98	2.14	31.51	100	85	Peak
2462	84.05	-	-	80.44	32.98	2.14	31.51	100	85	Average
4924	52.99	-21.01	74	46.18	35.18	3.14	31.51	100	289	Peak
4924	42.68	-11.32	54	35.87	35.18	3.14	31.51	100	289	Average
7386	45.36	-28.64	74	36.88	36.23	3.18	30.93	145	80	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 (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.

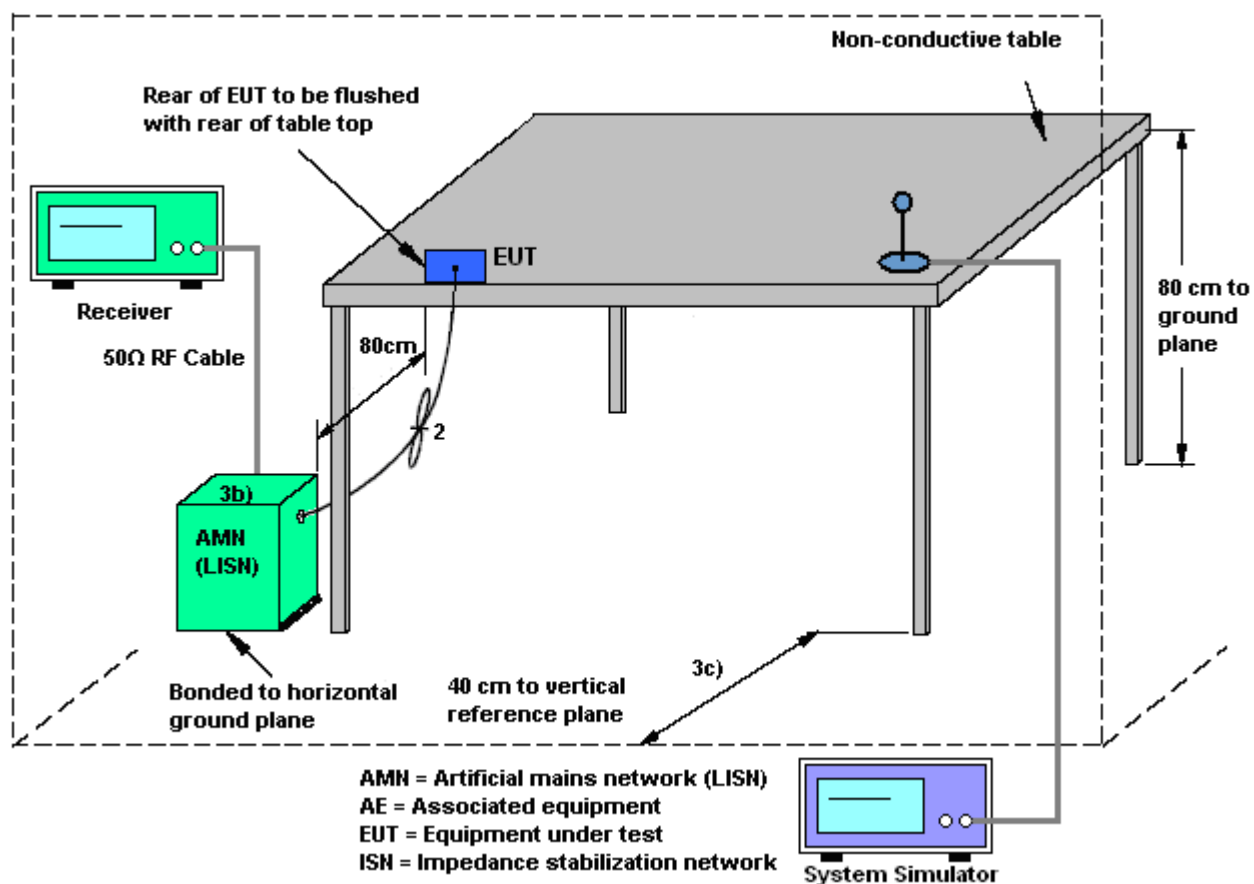
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

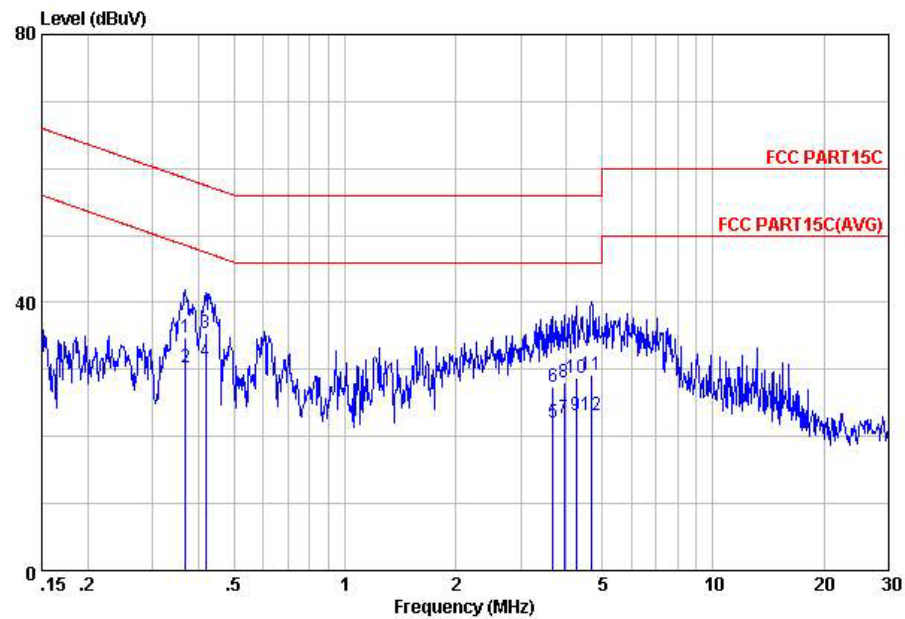
1. The testing follows the guidelines in ANSI C63.4-2003 and ANSI C63.10-2009.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance 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

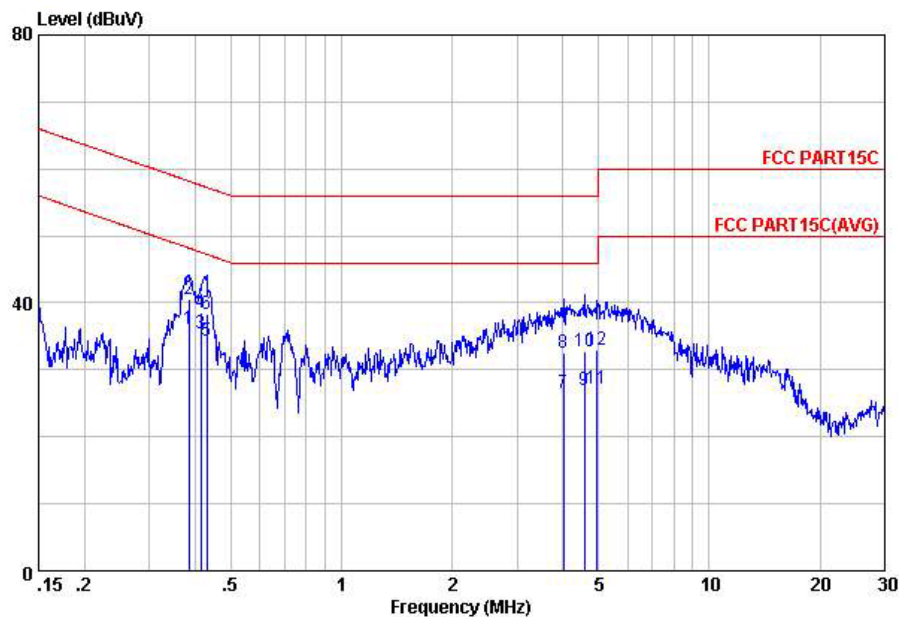
Test Mode :	Mode 1	Temperature :	19~20℃
Test Engineer :	Tom Wang	Relative Humidity :	39~40%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : C001-KS
Condition: FCC PART15C LISN-L20130306 LINE
mode : Mode 1

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.37	34.83	-23.69	58.52	24.20	0.38	10.25	QP
2	0.37	30.33	-18.19	48.52	19.70	0.38	10.25	Average
3	0.42	35.54	-21.92	57.46	25.00	0.29	10.25	QP
4	0.42	31.14	-16.32	47.46	20.60	0.29	10.25	Average
5	3.68	22.00	-24.00	46.00	11.49	0.18	10.33	Average
6	3.68	27.50	-28.50	56.00	16.99	0.18	10.33	QP
7	3.94	22.81	-23.19	46.00	12.30	0.18	10.33	Average
8	3.94	28.01	-27.99	56.00	17.50	0.18	10.33	QP
9	4.25	23.12	-22.88	46.00	12.60	0.19	10.33	Average
10	4.25	28.72	-27.28	56.00	18.20	0.19	10.33	QP
11	4.67	29.13	-26.87	56.00	18.60	0.20	10.33	QP
12	4.67	23.23	-22.77	46.00	12.70	0.20	10.33	Average

Test Mode :	Mode 1	Temperature :	19~20°C
Test Engineer :	Tom Wang	Relative Humidity :	39~40%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : C001-KS
Condition: FCC PART15C LISN-N20130306 NEUTRAL

mode : Mode 1

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.39	36.10	-12.07	48.17	25.42	0.43	10.25	Average
2	0.39	40.50	-17.67	58.17	29.82	0.43	10.25	QP
3	0.41	35.45	-12.10	47.55	24.82	0.38	10.25	Average
4	0.41	38.45	-19.10	57.55	27.82	0.38	10.25	QP
5	0.43	34.32	-12.92	47.24	23.71	0.36	10.25	Average
6	0.43	38.32	-18.92	57.24	27.71	0.36	10.25	QP
7	4.01	26.41	-19.59	46.00	15.90	0.18	10.33	Average
8	4.01	32.51	-23.49	56.00	22.00	0.18	10.33	QP
9	4.57	27.03	-18.97	46.00	16.51	0.19	10.33	Average
10	4.57	32.83	-23.17	56.00	22.31	0.19	10.33	QP
11	4.95	27.13	-18.87	46.00	16.60	0.20	10.33	Average
12	4.95	32.93	-23.07	56.00	22.40	0.20	10.33	QP

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	100319	9kHz~40GHz	Dec. 29, 2012	Feb. 23, 2013~ Mar. 02, 2013	Dec. 28, 2013	Conducted (TH01-KS)
Power Meter	Agilent	E4416A	MY45101555	N/A	Aug. 22, 2012	Feb. 23, 2013~ Mar. 02, 2013	Aug. 21, 2013	Conducted (TH01-KS)
Power Sensor	Agilent	E9327A	MY44421198	N/A	Aug. 22, 2012	Feb. 23, 2013~ Mar. 02, 2013	Aug. 21, 2013	Conducted (TH01-KS)
DC Power Supply	GWINSTEK	GPS-3030D	E1884515	N/A	Aug. 22, 2012	Feb. 23, 2013~ Mar. 02, 2013	Aug. 21, 2013	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	N/A	Dec. 29, 2012	Feb. 23, 2013~ Mar. 02, 2013	Dec. 28, 2013	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Nov. 08, 2012	Mar. 06, 2013	Nov. 07, 2013	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	100400	9kHz~30GHz	Jun. 01, 2012	Mar. 06, 2013	May 31, 2013	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Dec. 07, 2012	Mar. 06, 2013	Dec. 06, 2013	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	860004/ 001	9 kHz~30 MHz	Jul. 03, 2012	Mar. 06, 2013	Jul. 02, 2014	Radiation (03CH01-KS)
Double Ridge Horn Antenna	ETS-Lindgren	1908/7/13	00075957	1GHz~18GHz	Dec. 07, 2012	Mar. 06, 2013	Dec. 06, 2013	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161069	1MHz~1GHz	Jun. 01, 2012	Mar. 06, 2013	May 31, 2013	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Dec. 29, 2012	Mar. 06, 2013	Dec. 28, 2013	Radiation (03CH01-KS)
Active Horn Antenna	com-power	AHA-118	701023	1GHz~18GHz	Nov. 07, 2012	Mar. 06, 2013	Nov. 06, 2013	Radiation (03CH01-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	9170249	15GHz~40GHz	Nov. 23, 2012	Mar. 06, 2013	Nov. 22, 2013	Radiation (03CH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz	Jun. 01, 2012	Mar. 21, 2013	May 31, 2013	Conduction (CO01-KS)
LISN	MessTec	AN3016	60103	9kHz~30MHz	Dec. 29, 2012	Mar. 21, 2013	Dec. 28, 2013	Conduction (CO01-KS)
LISN	MessTec	AN3016	60105	9kHz~30MHz	Dec. 29, 2012	Mar. 21, 2013	Dec. 28, 2013	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	N/A	Nov. 15, 2012	Mar. 21, 2013	Nov. 14, 2013	Conduction (CO01-KS)
System Simulator	R&S	CMU200	837587/066	2G Full-Band	Dec. 29, 2012	Mar. 21, 2013	Dec. 28, 2013	Conduction (CO01-KS)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.72
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP320601 as below.