FCC RF Test Report

APPLICANT	:	ZTE CORPORATION
EQUIPMENT	:	WCDMA/GSM (GPRS) Dual-Mode Digital Mobile Phone
BRAND NAME	:	ZTE
MODEL NAME	:	Z787
FCC ID	:	SRQ-Z787
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was received on Apr. 29, 2014 and testing was completed on May 27, 2014. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and the testing has shown the tested sample to be in compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
2627

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

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APPENDIX A. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR442907C	Rev. 01	Initial issue of report	Jun. 06, 2014
FR442907C	Rev. 02	Update report for revising the software version	Jun. 10, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.02 dB at 2390.000 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.68 dB at 0.570 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

ZTE CORPORATION
ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P. R. China

1.2 Manufacturer

ZTE CORPORATION
ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P. R. China

1.3 Feature of Equipment Under Tkest

Product Feature	
Equipment	WCDMA/GSM (GPRS) Dual-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z787
FCC ID	SRQ-Z787
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/HSPA+(Downlink Only)/ WLAN 2.4GHz 802.11b/g/n HT20/ Bluetooth v3.0 + EDR/Bluetooth v4.0 LE
HW Version	wwtA
SW Version	P821A64V1.0.0B01
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 19.33 dBm (0.0857 W) 802.11g : 21.83 dBm (0.1524 W) 802.11n HT20 : 21.88 dBm (0.1542 W)
Antenna Type	PIFA Antenna with gain -4.00 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Testing Location

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 Registration No.
	TH01-KS	CO01-KS	149928

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: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	FCC Registration No.
	03CH08-HY	TW1022

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

1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01
- ANSI C63.4-2003

Remark:

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

2 Test Configuration of Equipment Under Test

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

WLAN 2.4GHz 802.11b Average Power (dBm)						
Power vs. Channel			Power vs. Data Rate			
Channel	Frequency (MHz)	Data Rate 1Mbps	Channel	2Mbps	5.5Mbps	11Mbps
CH 01	2412 MHz	18.03	CH 06	19.09	19.13	19.12
CH 06	2437 MHz	**19.33**				
CH 11	2462 MHz	18.95				

WLAN 2.4GHz 802.11g Average Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 01	2412 MHz	20.97	CH 11	21.56	21.51	21.65	21.75	21.73	21.71	21.68
CH 06	2437 MHz	21.07								
CH 11	2462 MHz	**21.83**								

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412 MHz	18.33	CH 06	21.14	21.17	21.23	21.18	21.13	21.16	21.15
CH 06	2437 MHz	**21.88**								
CH 11	2462 MHz	21.25								

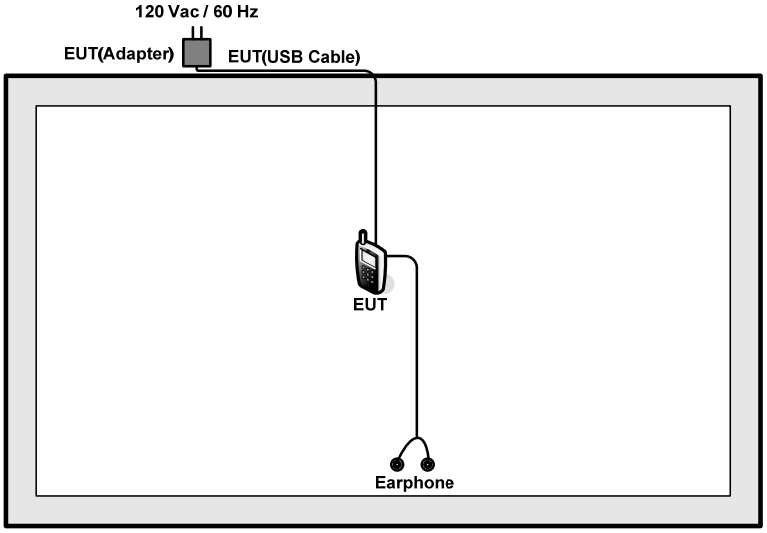
2.3 Test Mode

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

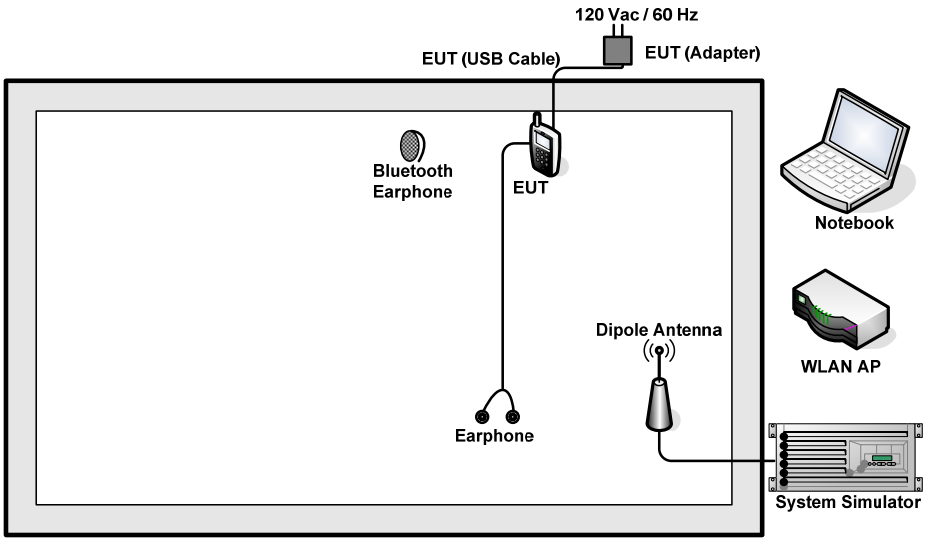
Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	6dB BW Power Spectral Density	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
	Output Power	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
	Conducted Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	MCS0	1/11
	Conducted Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
Radiated TCs	Radiated Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	MCS0	1/11
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	MCS0	1/6/11
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone			
Remark: For radiated TCs, the tests were performed with adapter, earphone and USB cable.				

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.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	PRC4	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Nokia	BH-106	QTLBH-106	N/A	N/A
5.	Earphone	Lenovo	SH100	N/A	Unshielded, 1.2 m	N/A

2.6 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

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 between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 6 dB.

Offset (dB) = RF cable loss (dB) = 6 (dB)

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.

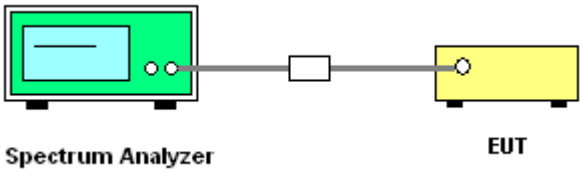
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r01.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. Measure and record the results in the test report.

3.1.4 Test Setup

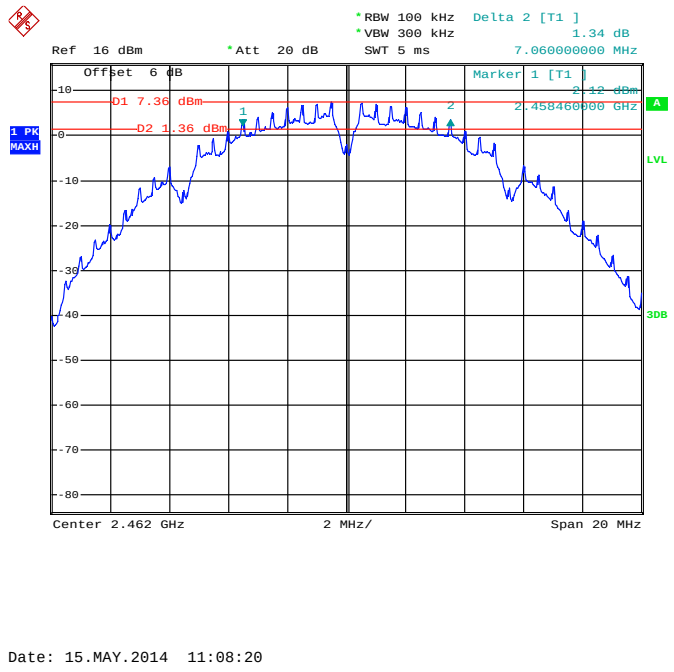


3.1.5 Test Result of 6dB Bandwidth

Test Band :	2.4GHz	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	7.10	0.5	Pass
11b	1Mbps	1	6	2437	7.08	0.5	Pass
11b	1Mbps	1	11	2462	7.06	0.5	Pass
11g	6Mbps	1	1	2412	16.32	0.5	Pass
11g	6Mbps	1	6	2437	16.34	0.5	Pass
11g	6Mbps	1	11	2462	16.32	0.5	Pass
HT20	MCS0	1	1	2412	17.56	0.5	Pass
HT20	MCS0	1	6	2437	17.54	0.5	Pass
HT20	MCS0	1	11	2462	17.58	0.5	Pass

Minimum 6dB Bandwidth



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

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

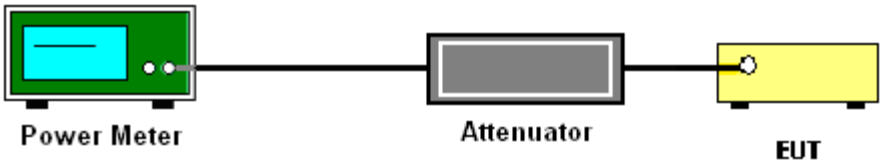
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r01.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Test Mode :	2.4GHz	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	18.03	30	-4.00	Pass
11b	1Mbps	1	6	2437	19.33	30	-4.00	Pass
11b	1Mbps	1	11	2462	18.95	30	-4.00	Pass
11g	6Mbps	1	1	2412	20.97	30	-4.00	Pass
11g	6Mbps	1	6	2437	21.07	30	-4.00	Pass
11g	6Mbps	1	11	2462	21.83	30	-4.00	Pass
HT20	MCS0	1	1	2412	18.33	30	-4.00	Pass
HT20	MCS0	1	6	2437	21.88	30	-4.00	Pass
HT20	MCS0	1	11	2462	21.25	30	-4.00	Pass

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

3.2.6 Test Result of Average output Power (Reporting Only)

Test Mode :	2.4GHz	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	Duty Factor (dB)	Average Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	0.10	15.20	30	-4.00	Pass
11b	1Mbps	1	6	2437	0.10	16.45	30	-4.00	Pass
11b	1Mbps	1	11	2462	0.10	15.45	30	-4.00	Pass
11g	6Mbps	1	1	2412	0.59	9.68	30	-4.00	Pass
11g	6Mbps	1	6	2437	0.59	14.27	30	-4.00	Pass
11g	6Mbps	1	11	2462	0.59	14.45	30	-4.00	Pass
HT20	MCS0	1	1	2412	0.63	9.08	30	-4.00	Pass
HT20	MCS0	1	6	2437	0.63	13.55	30	-4.00	Pass
HT20	MCS0	1	11	2462	0.63	13.42	30	-4.00	Pass

Note: Measured power (dBm) has offset with cable loss and duty factor.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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

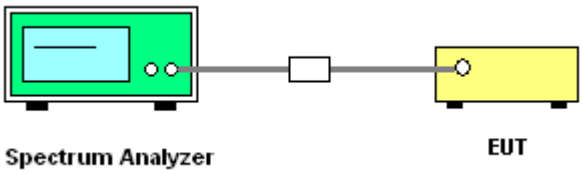
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

3.3.4 Test Setup



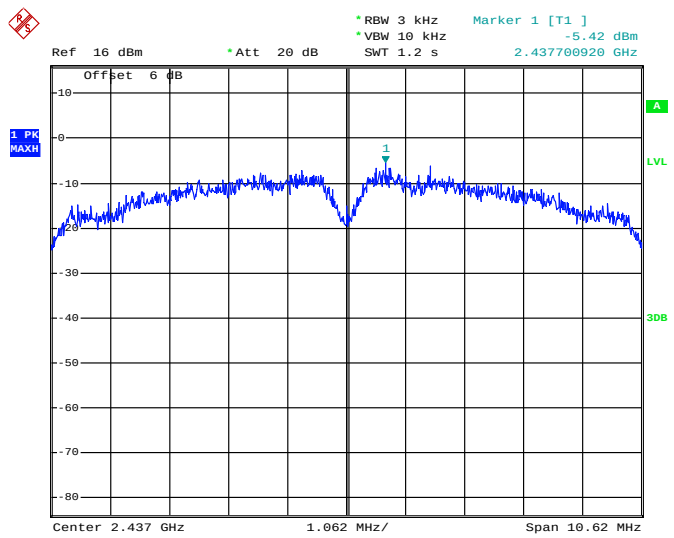
3.3.5 Test Result of Power Spectral Density

Test Mode :	2.4GHz	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	Peak Power Density (dBm/3kHz)	Max. Limits (dBm/3kHz)	DG (dBi)	Pass/Fail
11b	1Mbps	1	1	2412	-6.88	8	-4.00	Pass
11b	1Mbps	1	6	2437	-5.42	8	-4.00	Pass
11b	1Mbps	1	11	2462	-7.48	8	-4.00	Pass
11g	6Mbps	1	1	2412	-14.46	8	-4.00	Pass
11g	6Mbps	1	6	2437	-12.23	8	-4.00	Pass
11g	6Mbps	1	11	2462	-12.39	8	-4.00	Pass
HT20	MCS0	1	1	2412	-16.53	8	-4.00	Pass
HT20	MCS0	1	6	2437	-13.09	8	-4.00	Pass
HT20	MCS0	1	11	2462	-14.45	8	-4.00	Pass

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

Worst Case Power Density (dBm/3kHz)



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3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

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

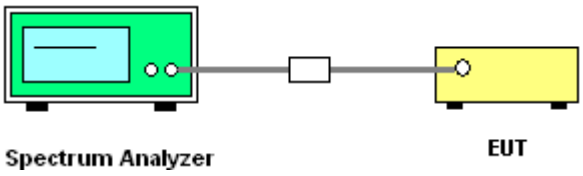
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

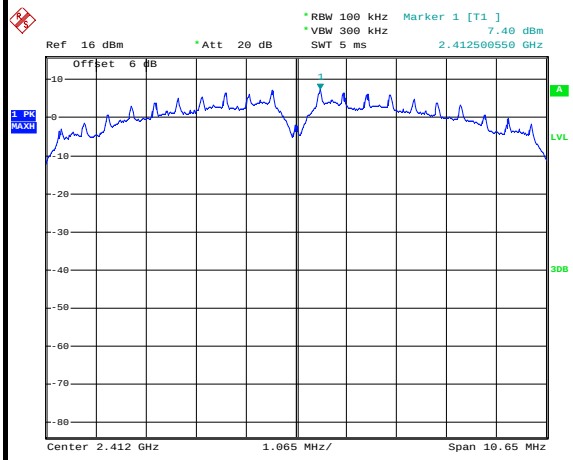


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	**Temperature :**	24~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	49~51%
Test Channel :	01	**Test Engineer :**	Issac Song

WLAN 802.11b Channel 01

100kHz PSD reference Level



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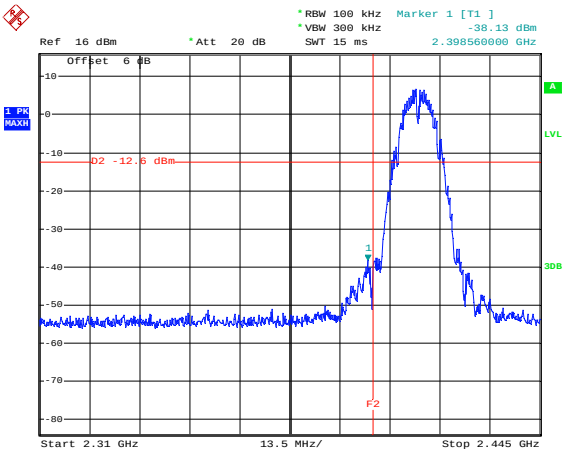
Low Channel Plot



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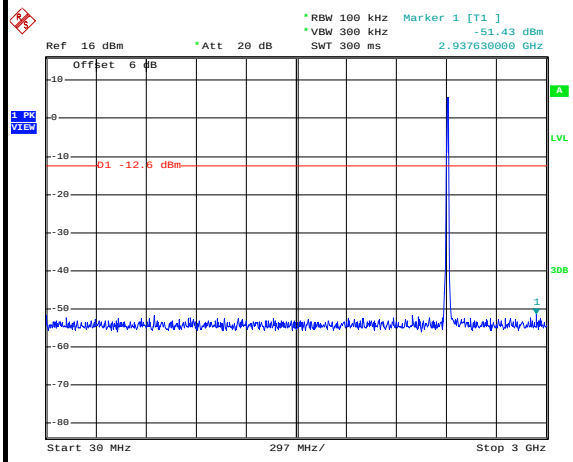
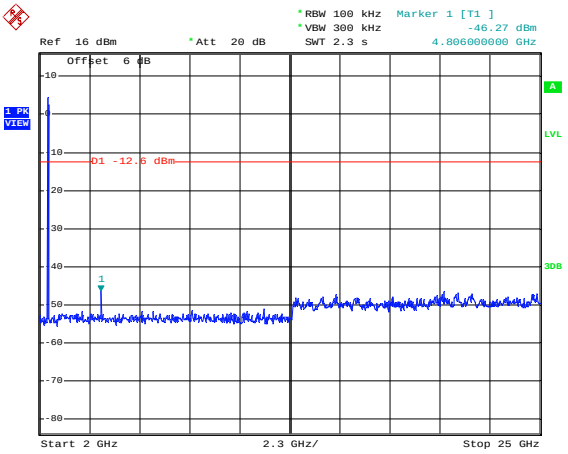
Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 10:59:36

Spurious Emission 2GHz~25GHz

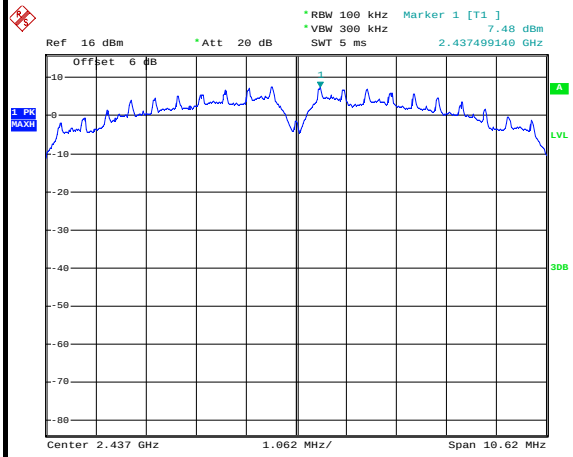


Date: 15.MAY.2014 10:59:55

Test Mode :	802.11b	**Temperature :**	24~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	49~51%
Test Channel :	06	**Test Engineer :**	Issac Song

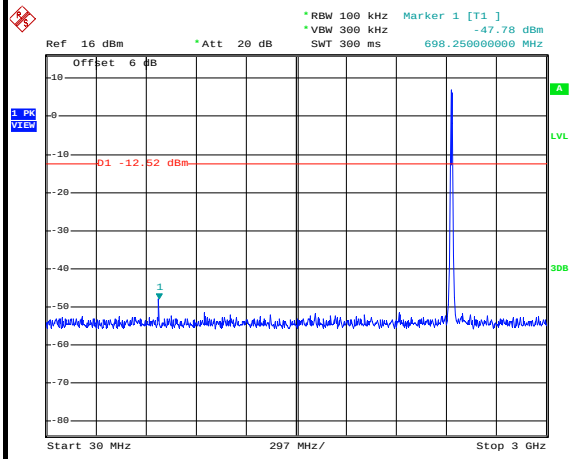
WLAN 802.11b Channel 06

100kHz PSD reference Level



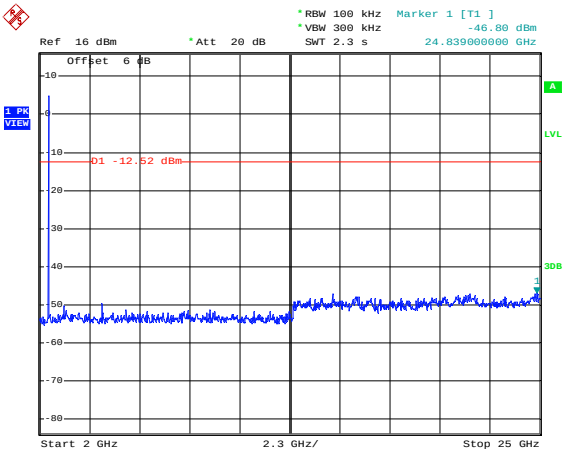
Date: 15.MAY.2014 11:04:43

Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 11:05:03

Spurious Emission 2GHz~25GHz

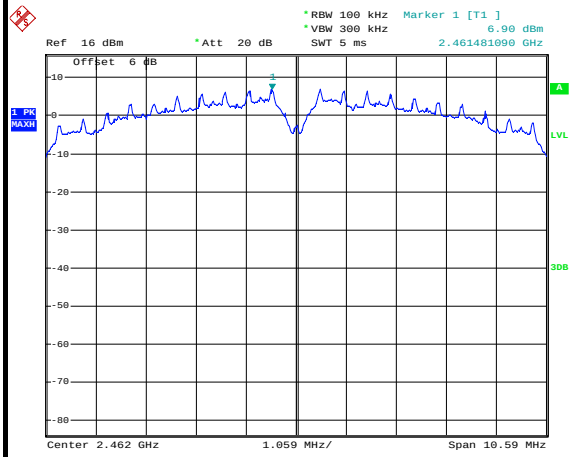


Date: 15.MAY.2014 11:05:22

Test Mode :	802.11b	**Temperature :**	24~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	49~51%
Test Channel :	11	**Test Engineer :**	Issac Song

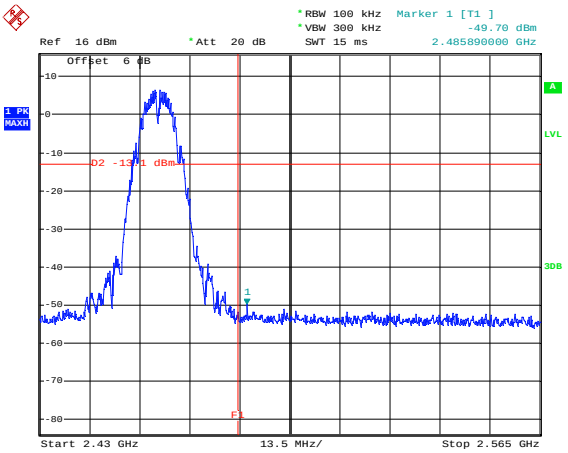
WLAN 802.11b Channel 11

100kHz PSD reference Level



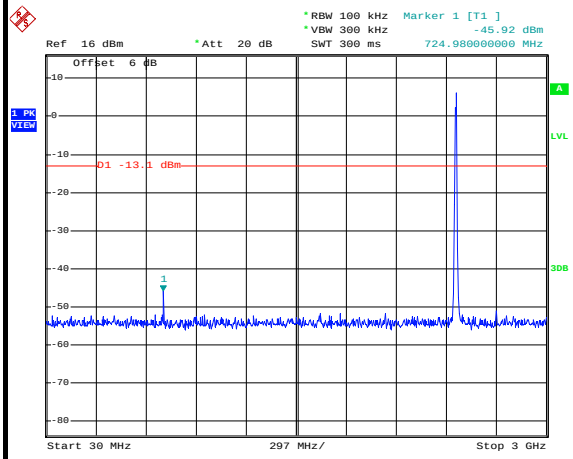
Date: 15.MAY.2014 11:08:50

High Channel Plot



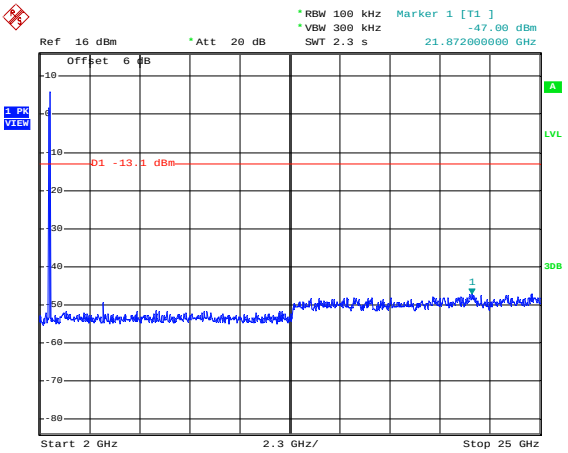
Date: 15.MAY.2014 11:09:04

Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 11:09:23

Spurious Emission 2GHz~25GHz

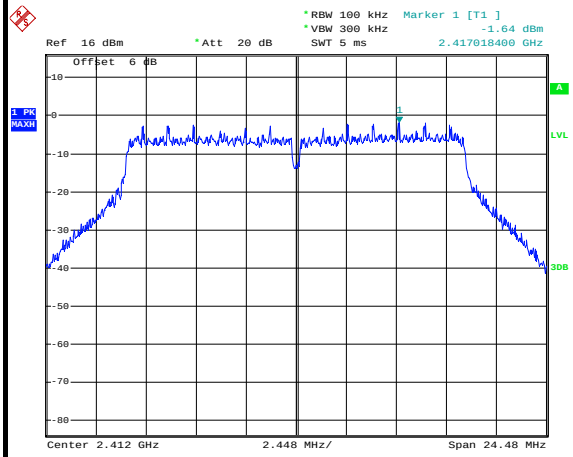


Date: 15.MAY.2014 11:09:42

Test Mode :	802.11g	**Temperature :**	24~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	49~51%
Test Channel :	01	**Test Engineer :**	Issac Song

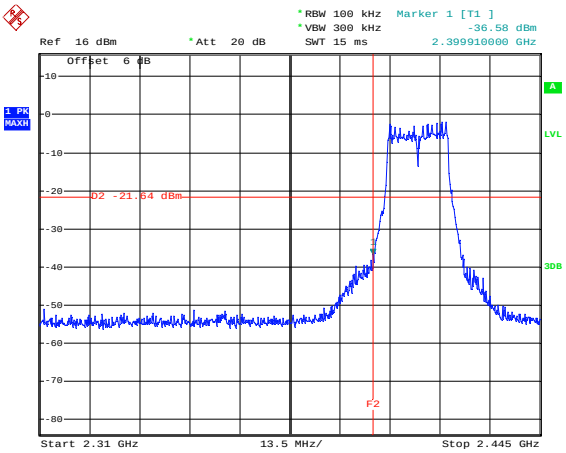
WLAN 802.11g Channel 01

100kHz PSD reference Level



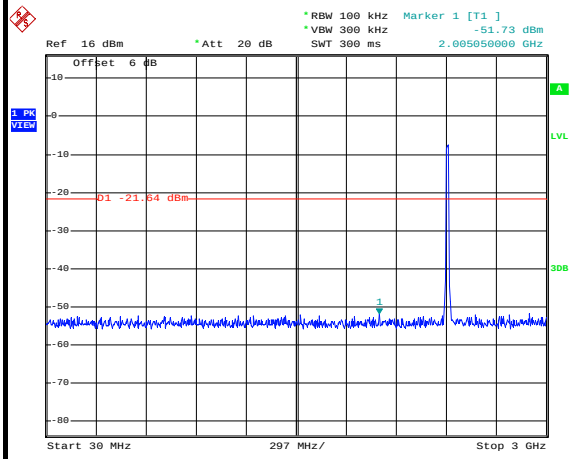
Date: 23.MAY.2014 22:24:02

Low Channel Plot



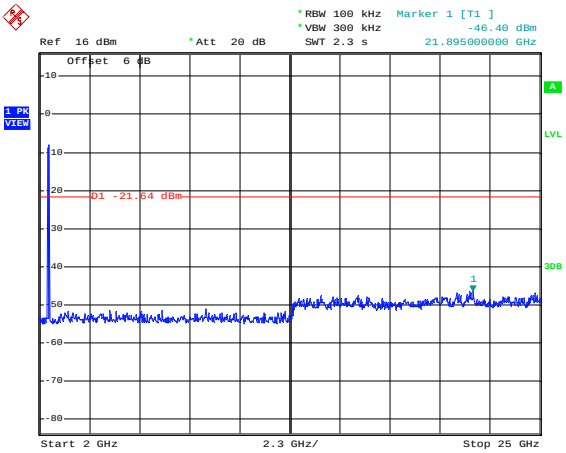
Date: 23.MAY.2014 22:24:16

Spurious Emission 30MHz~3GHz



Date: 27.MAY.2014 20:51:02

Spurious Emission 2GHz~25GHz

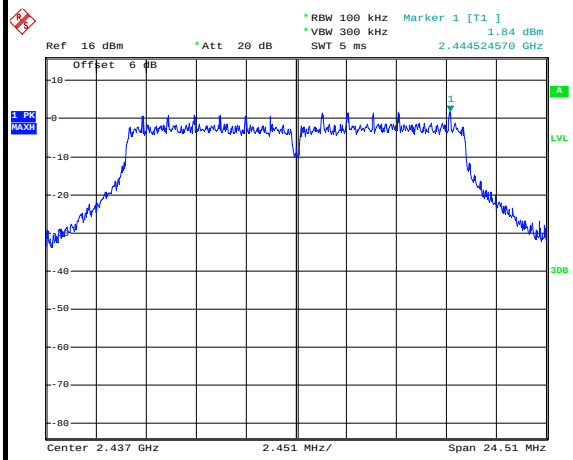


Date: 27.MAY.2014 20:51:20

Test Mode :	802.11g	**Temperature :**	24~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	49~51%
Test Channel :	06	**Test Engineer :**	Issac Song

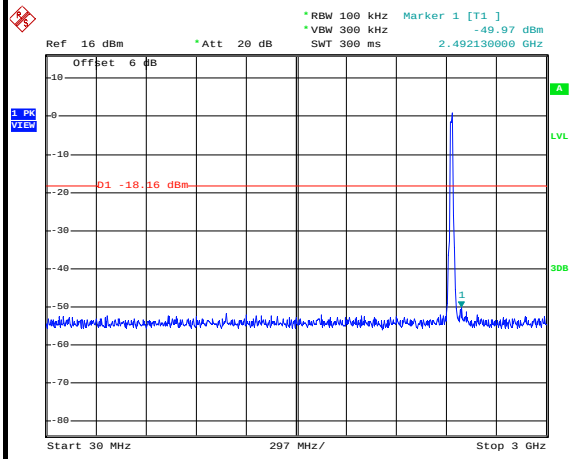
WLAN 802.11g Channel 06

100kHz PSD reference Level



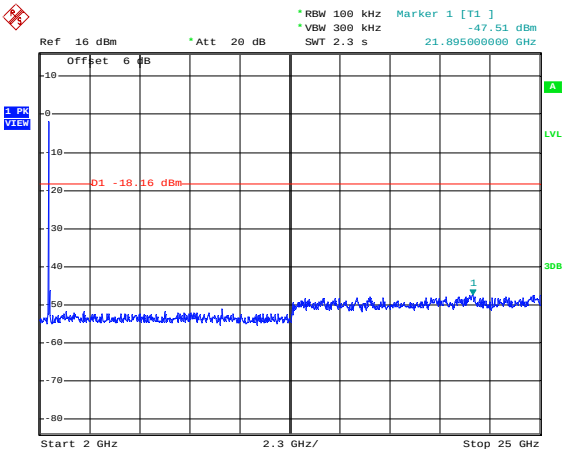
Date: 15.MAY.2014 11:17:22

Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 11:17:42

Spurious Emission 2GHz~25GHz

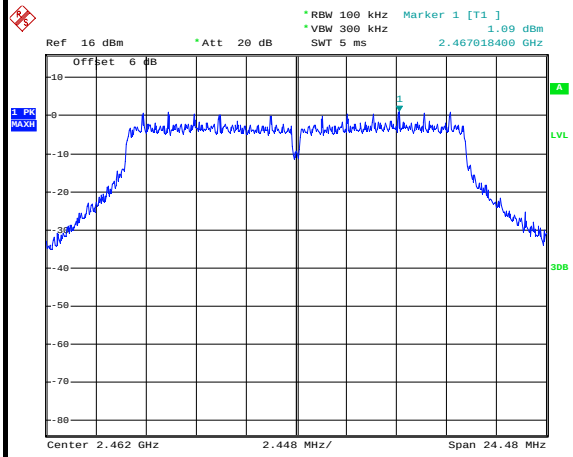


Date: 15.MAY.2014 11:18:01

Test Mode :	802.11g	**Temperature :**	24~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	49~51%
Test Channel :	11	**Test Engineer :**	Issac Song

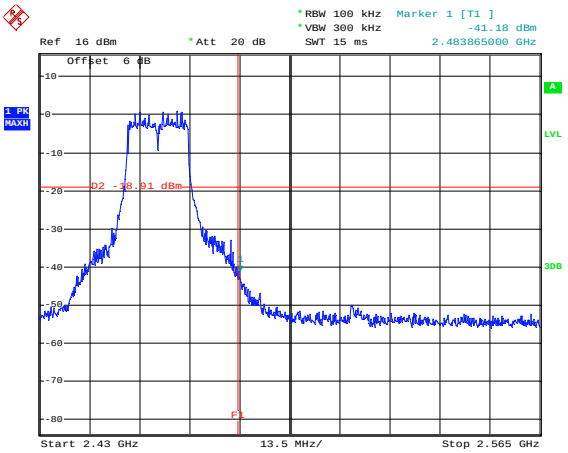
WLAN 802.11g Channel 11

100kHz PSD reference Level



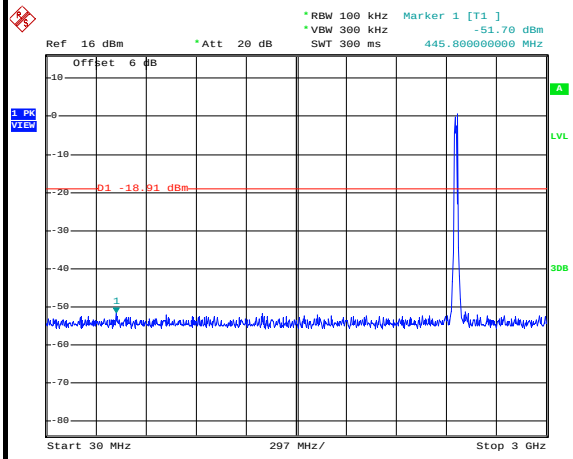
Date: 15.MAY.2014 11:20:37

High Channel Plot



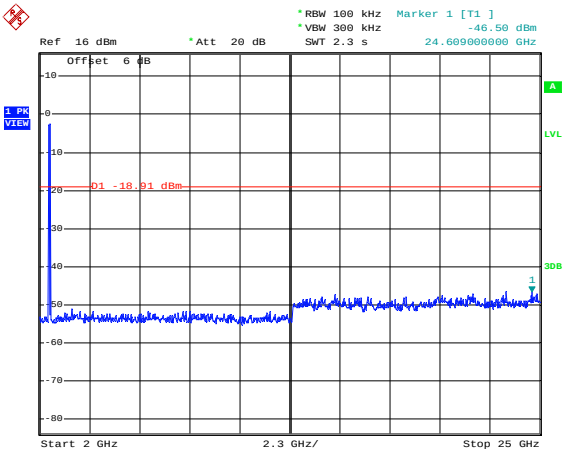
Date: 15.MAY.2014 11:23:44

Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 11:21:11

Spurious Emission 2GHz~25GHz

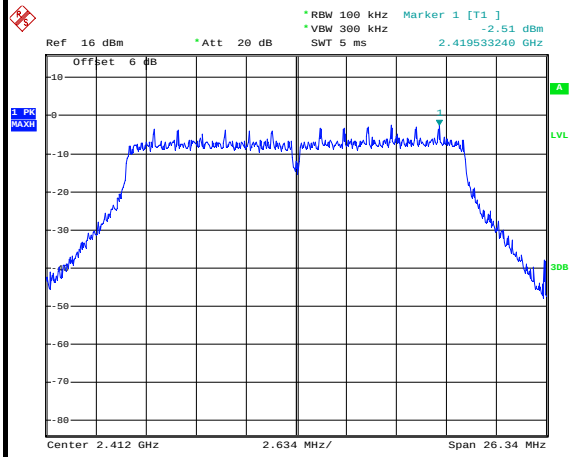


Date: 15.MAY.2014 11:21:29

Test Mode :	802.11n HT20	**Temperature :**	24~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	49~51%
Test Channel :	01	**Test Engineer :**	Issac Song

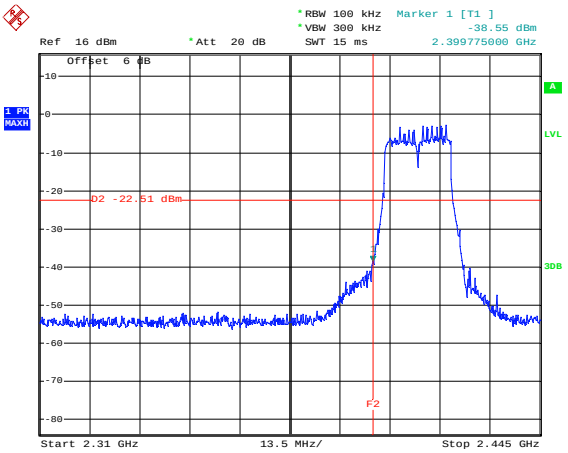
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



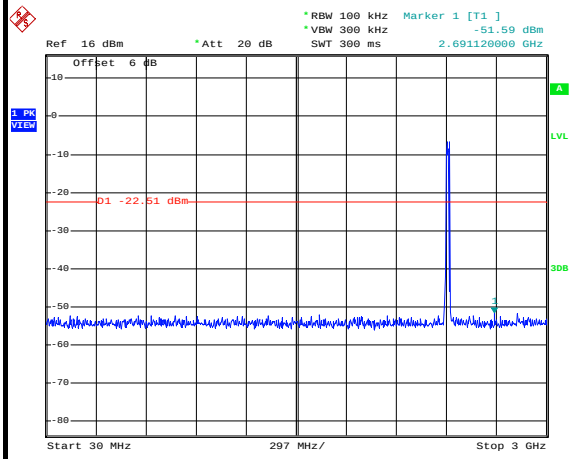
Date: 23.MAY.2014 22:26:32

Low Channel Plot



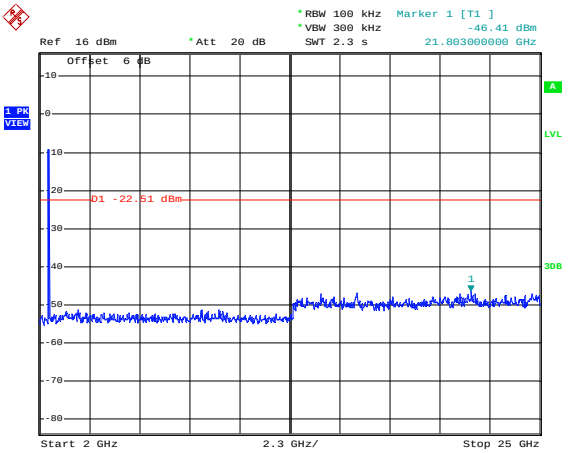
Date: 23.MAY.2014 22:26:46

Spurious Emission 30MHz~3GHz



Date: 27.MAY.2014 20:52:16

Spurious Emission 2GHz~25GHz

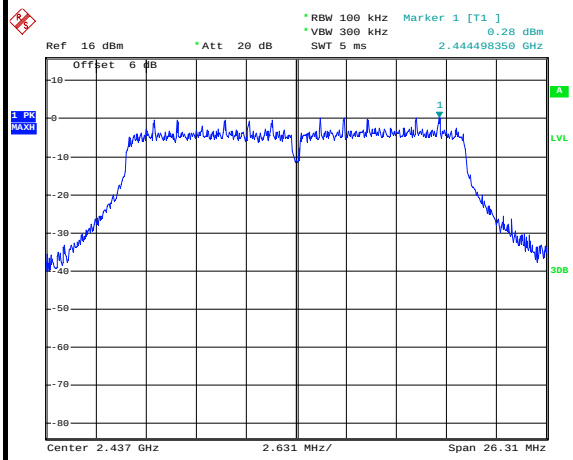


Date: 27.MAY.2014 20:52:34

Test Mode :	802.11n HT20	**Temperature :**	24~25℃
Test Band :	2.4GHz Mid	**Relative Humidity :**	49~51%
Test Channel :	06	**Test Engineer :**	Issac Song

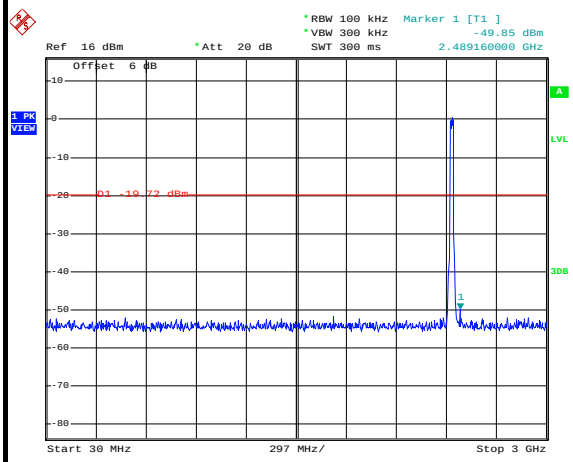
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



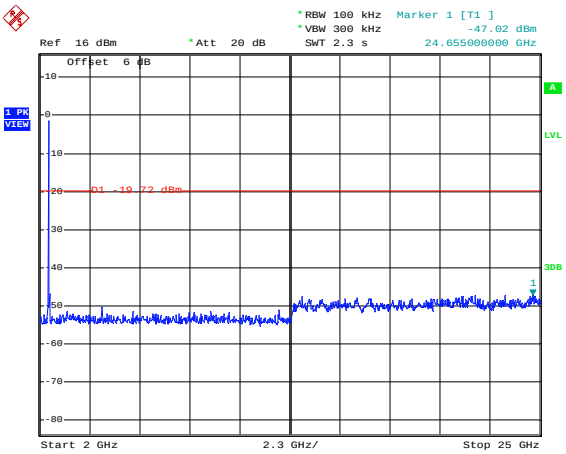
Date: 15.MAY.2014 11:33:24

Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 11:33:44

Spurious Emission 2GHz~25GHz

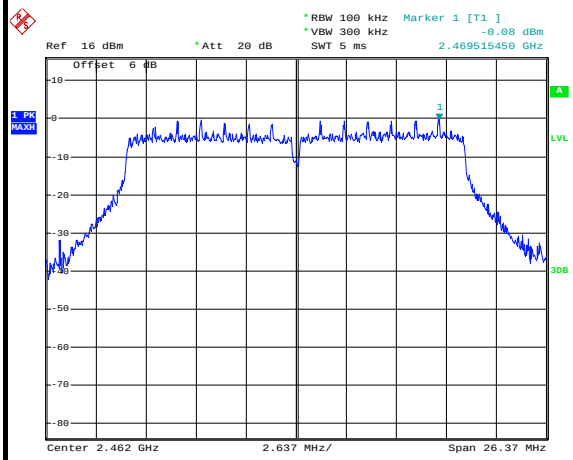


Date: 15.MAY.2014 11:34:03

Test Mode :	802.11n HT20	**Temperature :**	24~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	49~51%
Test Channel :	11	**Test Engineer :**	Issac Song

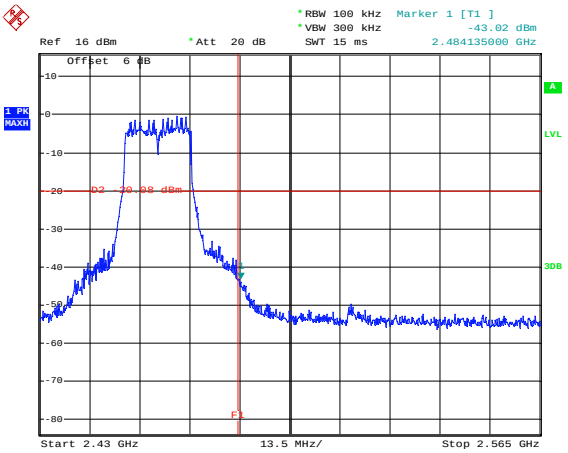
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



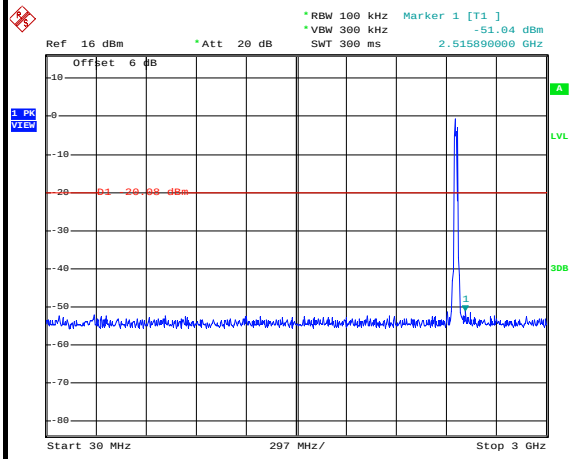
Date: 15.MAY.2014 11:37:39

High Channel Plot



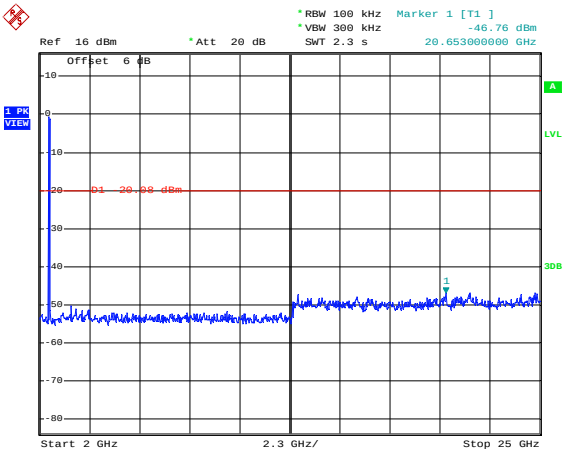
Date: 15.MAY.2014 11:37:53

Spurious Emission 30MHz~3GHz



Date: 15.MAY.2014 11:38:13

Spurious Emission 2GHz~25GHz



Date: 15.MAY.2014 11:38:31

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

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

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

3.5.2 Measuring Instruments

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

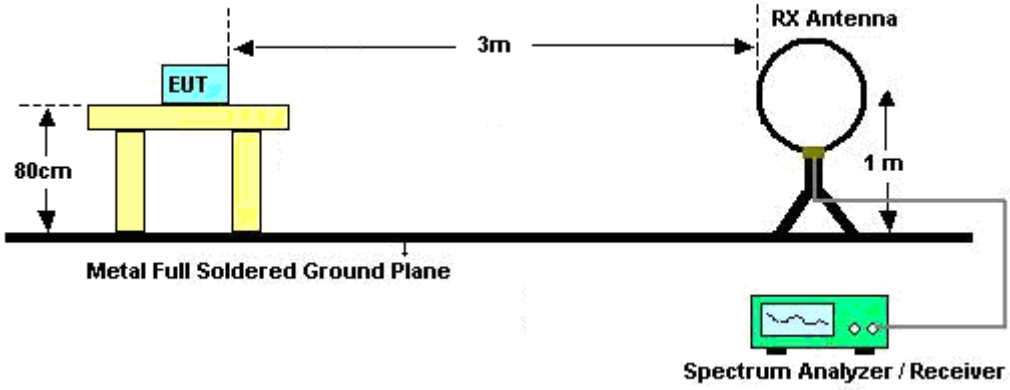
3.5.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

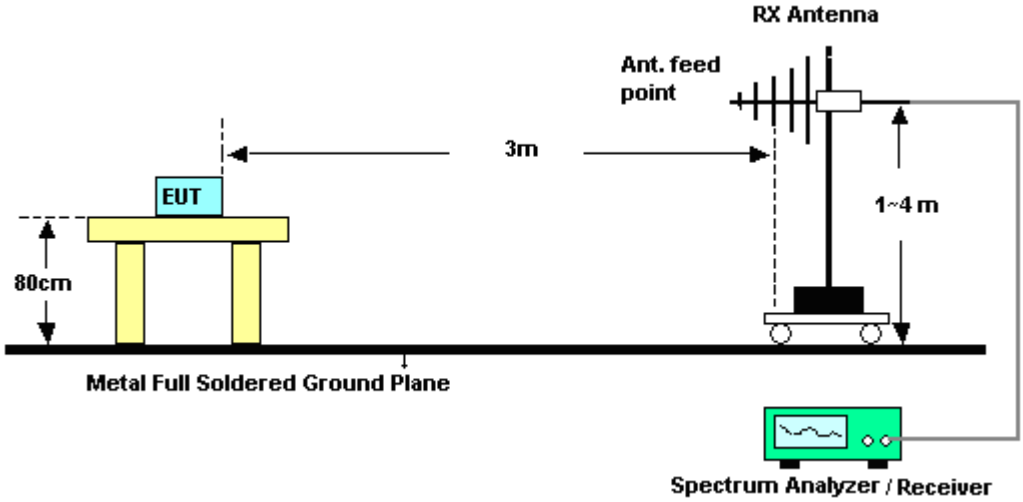
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.63	8.240	0.121	300Hz
802.11g	87.26	1.370	0.730	1kHz
2.4GHz 802.11n HT20	86.43	1.274	0.785	1kHz

3.5.4 Test Setup

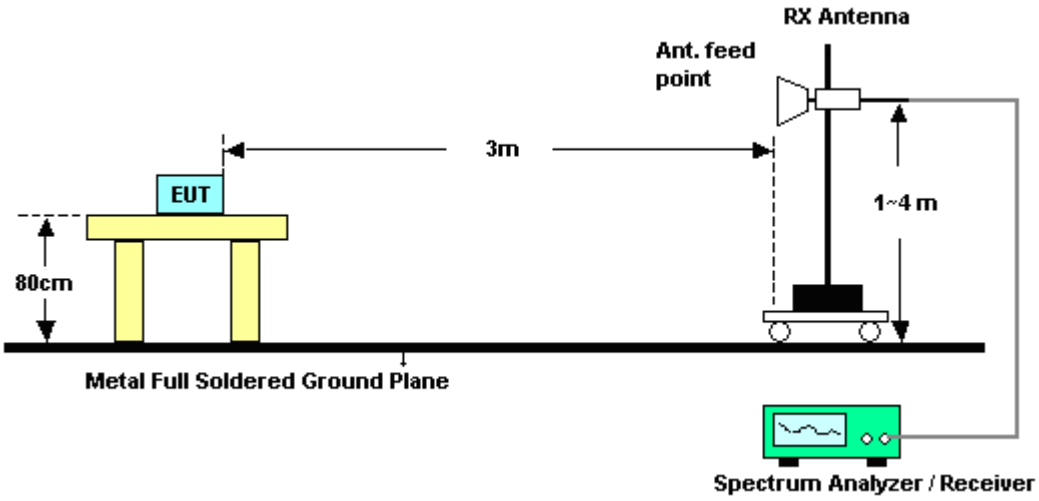
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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

3.5.6 Test Result of Radiated Spurious at Band Edges

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Band :	Low	**Relative Humidity :**	50~52%
Test Channel :	01	**Test Engineer :**	Kyle Jhuang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2388.57	60.94	-13.06	74	55.25	32.29	7.55	34.15	105	33	Peak
2386.86	47.56	-6.44	54	41.87	32.29	7.55	34.15	105	33	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
2349.06	60.41	-13.59	74	54.86	32.19	7.5	34.14	106	106	Peak
2387.22	46.92	-7.08	54	41.23	32.29	7.55	34.15	106	106	Average

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Band :	High	**Relative Humidity :**	50~52%
Test Channel :	11	**Test Engineer :**	Kyle Jhuang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.65	60.32	-13.68	74	54.36	32.47	7.71	34.22	105	42	Peak
2483.62	46.67	-7.33	54	40.71	32.47	7.71	34.22	105	42	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
2495.89	60.86	-13.14	74	54.89	32.5	7.71	34.24	195	123	Peak
2497.42	46.36	-7.64	54	40.39	32.5	7.71	34.24	195	123	Average

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Band :	Low	**Relative Humidity :**	50~52%
Test Channel :	01	**Test Engineer :**	Kyle Jhuang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.56	72.04	-1.96	74	66.35	32.29	7.55	34.15	133	61	Peak
2390	52.12	-1.88	54	46.45	32.29	7.55	34.17	133	61	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
2389.74	70.94	-3.06	74	65.25	32.29	7.55	34.15	167	103	Peak
2390	51.41	-2.59	54	45.74	32.29	7.55	34.17	167	103	Average

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Band :	High	**Relative Humidity :**	50~52%
Test Channel :	11	**Test Engineer :**	Kyle Jhuang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.74	72.02	-1.98	74	66.06	32.47	7.71	34.22	104	48	Peak
2483.5	51.12	-2.88	54	45.16	32.47	7.71	34.22	104	48	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
2483.95	69.6	-4.4	74	63.64	32.47	7.71	34.22	193	118	Peak
2483.59	47.55	-6.45	54	41.59	32.47	7.71	34.22	193	118	Average

Test Mode :	802.11n HT20	**Temperature :**	20~22°C
Test Band :	Low	**Relative Humidity :**	50~52%
Test Channel :	01	**Test Engineer :**	Kyle Jhuang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.83	72.95	-1.05	74	67.28	32.29	7.55	34.17	132	63	Peak
2390	52.98	-1.02	54	47.31	32.29	7.55	34.17	132	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
2389.74	70.63	-3.37	74	64.94	32.29	7.55	34.15	105	107	Peak
2390	52.3	-1.7	54	46.63	32.29	7.55	34.17	105	107	Average

Test Mode :	802.11n HT20	**Temperature :**	20~22°C
Test Band :	High	**Relative Humidity :**	50~52%
Test Channel :	11	**Test Engineer :**	Kyle Jhuang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.19	71.53	-2.47	74	65.57	32.47	7.71	34.22	104	44	Peak
2483.53	52.59	-1.41	54	46.63	32.47	7.71	34.22	104	44	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
2484.01	71.21	-2.79	74	65.25	32.47	7.71	34.22	194	122	Peak
2483.86	51.86	-2.14	54	45.9	32.47	7.71	34.22	194	122	Average

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

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

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Channel :	01	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	100.42	-	-	94.67	32.33	7.59	34.17	105	33	Average
2412	106.15	-	-	100.4	32.33	7.59	34.17	105	33	Peak
4824	42.32	-31.68	74	57.79	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Channel :	01	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	98.02	-	-	92.27	32.33	7.59	34.17	106	106	Average
2412	103.37	-	-	97.62	32.33	7.59	34.17	106	106	Peak
4824	44.25	-29.75	74	59.72	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Channel :	06	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**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	102.07	-	-	96.23	32.4	7.63	34.19	104	42	Average
2437	107.8	-	-	101.96	32.4	7.63	34.19	104	42	Peak
4875	43.45	-30.55	74	58.78	34.93	8.61	58.87	100	0	Peak
7311	43.3	-30.7	74	52.18	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Channel :	06	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**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	100.09	-	-	94.25	32.4	7.63	34.19	194	122	Average
2437	105.63	-	-	99.79	32.4	7.63	34.19	194	122	Peak
4875	46.36	-27.64	74	61.69	34.93	8.61	58.87	100	0	Peak
7311	42.99	-31.01	74	51.87	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Channel :	11	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	97.47	-	-	91.58	32.43	7.67	34.21	105	42	Average
2462	103.38	-	-	97.49	32.43	7.67	34.21	105	42	Peak
4923	41.11	-32.89	74	56.29	34.96	8.66	58.8	100	0	Peak
7386	43.58	-30.42	74	52.55	36.62	13.02	58.61	100	0	Peak

Test Mode :	802.11b	**Temperature :**	20~22°C
Test Channel :	11	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	94.85	-	-	88.96	32.43	7.67	34.21	195	123	Average
2462	100.71	-	-	94.82	32.43	7.67	34.21	195	123	Peak
4923	41.85	-32.15	74	57.03	34.96	8.66	58.8	100	0	Peak
7386	43.3	-30.7	74	52.27	36.62	13.02	58.61	100	0	Peak

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Channel :	01	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	93.76	-	-	88.01	32.33	7.59	34.17	133	61	Average
2412	104.35	-	-	98.6	32.33	7.59	34.17	133	61	Peak
4824	40.2	-33.8	74	55.67	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Channel :	01	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2412	92.82	-	-	87.07	32.33	7.59	34.17	167	103	Average
2412	103.58	-	-	97.83	32.33	7.59	34.17	167	103	Peak
4824	41.5	-32.5	74	56.97	34.9	8.57	58.94	100	0	Peak

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Channel :	06	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**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	99.24	-	-	93.4	32.4	7.63	34.19	105	16	Average
2437	109.67	-	-	103.83	32.4	7.63	34.19	105	16	Peak
4875	40.9	-33.1	74	56.23	34.93	8.61	58.87	100	0	Peak
7311	43.31	-30.69	74	52.19	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Channel :	06	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**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	97.46	-	-	91.62	32.4	7.63	34.19	162	100	Average
2437	107.64	-	-	101.8	32.4	7.63	34.19	162	100	Peak
4875	43.59	-30.41	74	58.92	34.93	8.61	58.87	100	0	Peak
7311	44.64	-29.36	74	53.52	36.64	12.94	58.46	100	0	Peak

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Channel :	11	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	92.72	-	-	86.83	32.43	7.67	34.21	104	48	Average
2462	103.04	-	-	97.15	32.43	7.67	34.21	104	48	Peak
4923	40.46	-33.54	74	55.64	34.96	8.66	58.8	100	0	Peak
7386	44.09	-29.91	74	53.06	36.62	13.02	58.61	100	0	Peak

Test Mode :	802.11g	**Temperature :**	20~22°C
Test Channel :	11	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	90.11	-	-	84.22	32.43	7.67	34.21	193	118	Average
2462	100.41	-	-	94.52	32.43	7.67	34.21	193	118	Peak
4923	40.95	-33.05	74	56.13	34.96	8.66	58.8	100	0	Peak
7386	44.15	-29.85	74	53.12	36.62	13.02	58.61	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	20~22°C
Test Channel :	01	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
81.3	21.24	-18.76	40	43	7.34	1.32	30.42	-	-	Peak
91.83	29.69	-13.81	43.5	49.47	9.22	1.42	30.42	119	102	Peak
223.32	20.92	-25.08	46	39.56	9.47	2.18	30.29	-	-	Peak
529.6	18.34	-27.66	46	27.11	17.6	3.38	29.75	-	-	Peak
685	20.11	-25.89	46	26.89	18.85	3.87	29.5	-	-	Peak
790	21.08	-24.92	46	26.39	19.9	4.18	29.39	-	-	Peak
2412	93.44	-	-	87.69	32.33	7.59	34.17	132	63	Average
2412	103.97	-	-	98.22	32.33	7.59	34.17	132	63	Peak
4824	42.43	-31.57	74	57.9	34.9	8.57	58.94	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	20~22°C
Test Channel :	01	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2412 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
41.07	28.99	-11.01	40	45.59	12.8	0.94	30.34	132	225	Peak
93.18	27.22	-16.28	43.5	46.73	9.48	1.43	30.42	-	-	Peak
243.57	14.5	-31.5	46	30.81	11.66	2.28	30.25	-	-	Peak
435.8	16.99	-29.01	46	27.31	16.55	3.06	29.93	-	-	Peak
649.3	20.46	-25.54	46	27.21	19.01	3.78	29.54	-	-	Peak
869.8	22.23	-23.77	46	26.64	20.4	4.4	29.21	-	-	Peak
2412	90.99	-	-	85.24	32.33	7.59	34.17	105	107	Average
2412	101.32	-	-	95.57	32.33	7.59	34.17	105	107	Peak
4824	44.13	-29.87	74	59.6	34.9	8.57	58.94	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	20~22°C
Test Channel :	06	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**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	98.36	-	-	92.56	32.36	7.63	34.19	104	14	Average
2437	108.53	-	-	102.73	32.36	7.63	34.19	104	14	Peak
4875	39.67	-34.33	74	55	34.93	8.61	58.87	100	0	Peak
7311	42.89	-31.11	74	51.77	36.64	12.94	58.46	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	20~22°C
Test Channel :	06	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**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	95.19	-	-	89.35	32.4	7.63	34.19	135	106	Average
2437	105.49	-	-	99.65	32.4	7.63	34.19	135	106	Peak
4875	42.47	-31.53	74	57.8	34.93	8.61	58.87	100	0	Peak
7311	43.88	-30.12	74	52.76	36.64	12.94	58.46	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	20~22°C
Test Channel :	11	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	93.29	-	-	87.4	32.43	7.67	34.21	104	44	Average
2462	103.32	-	-	97.43	32.43	7.67	34.21	104	44	Peak
4923	40.14	-33.86	74	55.32	34.96	8.66	58.8	100	0	Peak
7386	43.45	-30.55	74	52.42	36.62	13.02	58.61	100	0	Peak

Test Mode :	2.4GHz 802.11n HT20	**Temperature :**	20~22°C
Test Channel :	11	**Relative Humidity :**	50~52%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	90.14	-	-	84.25	32.43	7.67	34.21	194	122	Average
2462	100.57	-	-	94.68	32.43	7.67	34.21	194	122	Peak
4923	41.35	-32.65	74	56.53	34.96	8.66	58.8	100	0	Peak
7386	43.99	-30.01	74	52.96	36.62	13.02	58.61	100	0	Peak

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

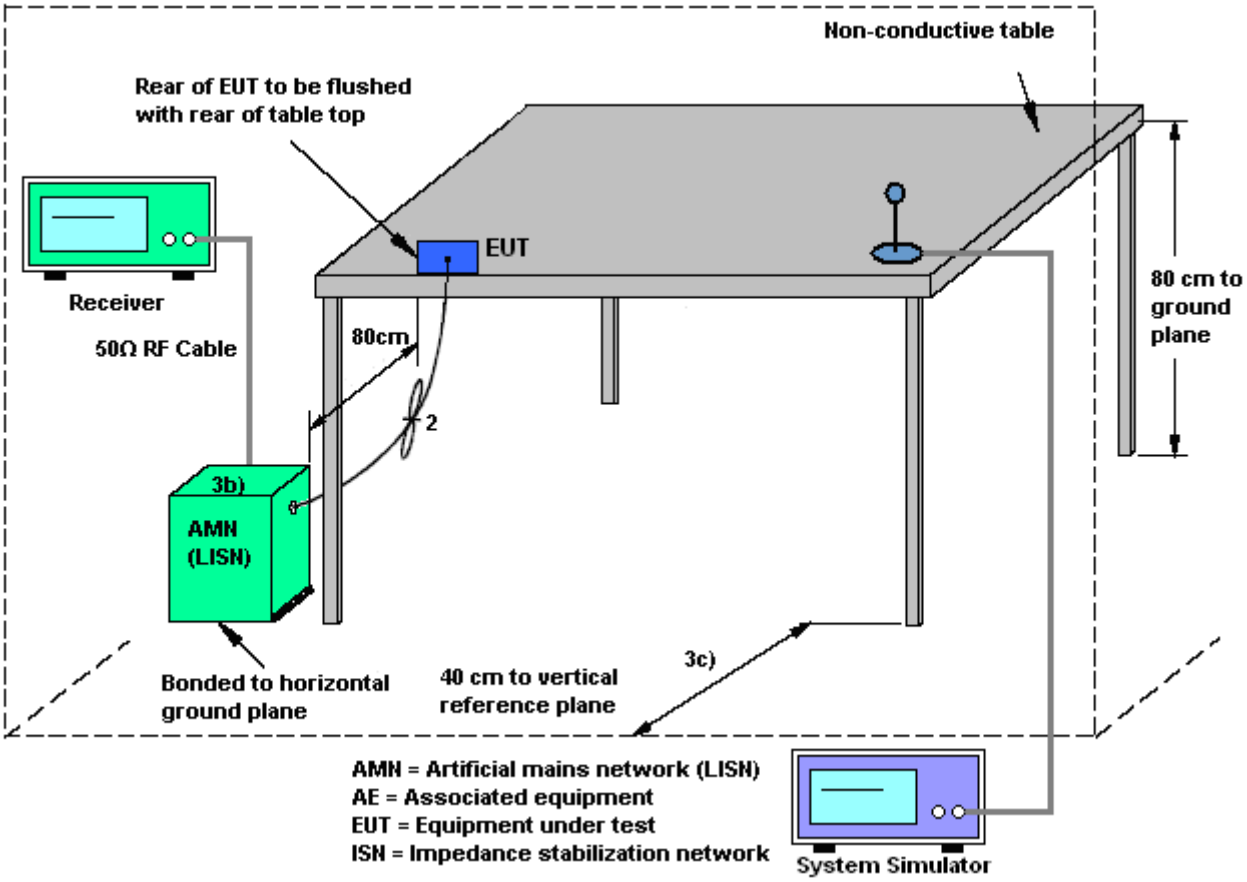
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

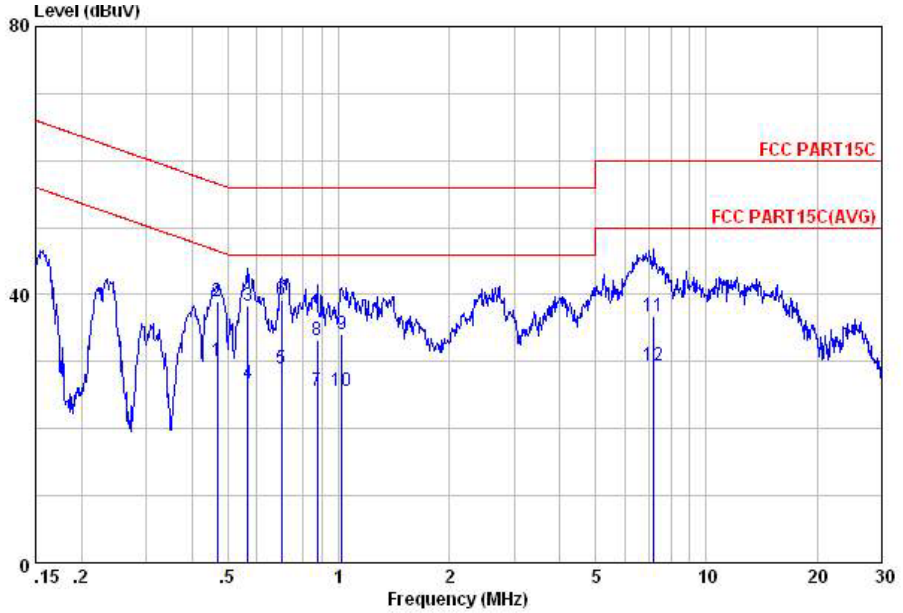
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

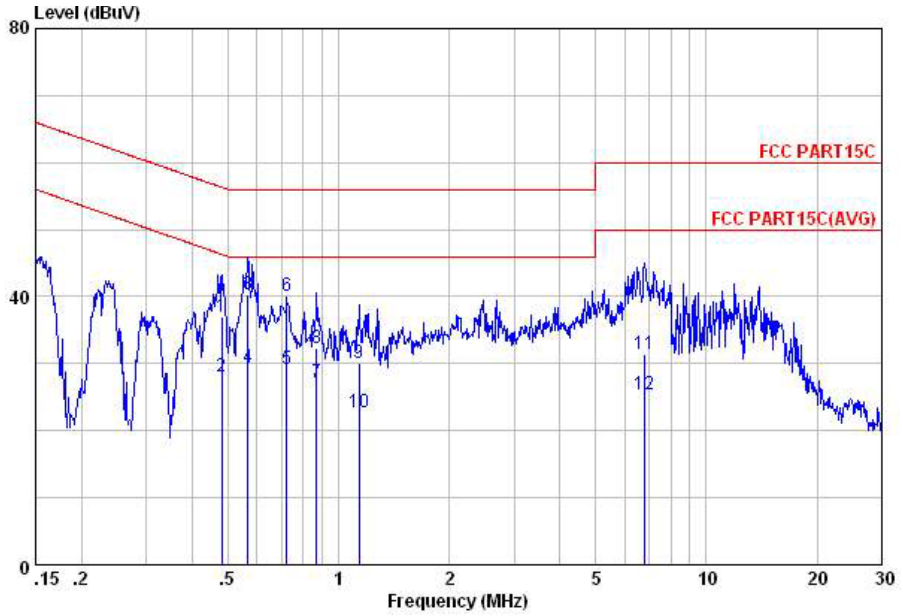
Test Mode :	Mode 1	**Temperature :**	22~24℃
Test Engineer :	Eligah Wang	**Relative Humidity :**	35~37%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone		



Site : C001-KS
Condition: FCC PART15C LISN-L20130306 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.47	30.10	-16.44	46.54	19.60	0.23	10.27	Average
2	0.47	39.10	-17.44	56.54	28.60	0.23	10.27	QP
3	0.57	38.35	-17.65	56.00	27.90	0.20	10.25	QP
4	0.57	26.75	-19.25	46.00	16.30	0.20	10.25	Average
5	0.70	29.01	-16.99	46.00	18.60	0.20	10.21	Average
6	0.70	39.31	-16.69	56.00	28.90	0.20	10.21	QP
7	0.88	25.62	-20.38	46.00	15.30	0.13	10.19	Average
8	0.88	33.12	-22.88	56.00	22.80	0.13	10.19	QP
9	1.02	34.08	-21.92	56.00	23.80	0.10	10.18	QP
10	1.02	25.58	-20.42	46.00	15.30	0.10	10.18	Average
11	7.21	36.83	-23.17	60.00	26.30	0.20	10.33	QP
12	7.21	29.43	-20.57	50.00	18.90	0.20	10.33	Average

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Eligah Wang	Relative Humidity :	35~37%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone		



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

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.48	36.88	-19.44	56.32	26.30	0.31	10.27	QP
2	0.48	27.98	-18.34	46.32	17.40	0.31	10.27	Average
3	0.57	40.32	-15.68	56.00	29.80	0.27	10.25	QP
4	0.57	29.42	-16.58	46.00	18.90	0.27	10.25	Average
5	0.72	29.20	-16.80	46.00	18.80	0.19	10.21	Average
6	0.72	40.00	-16.00	56.00	29.60	0.19	10.21	QP
7	0.87	27.12	-18.88	46.00	16.80	0.13	10.19	Average
8	0.87	32.32	-23.68	56.00	22.00	0.13	10.19	QP
9	1.14	30.18	-25.82	56.00	19.90	0.10	10.18	QP
10	1.14	22.68	-23.32	46.00	12.40	0.10	10.18	Average
11	6.77	31.41	-28.59	60.00	20.90	0.20	10.31	QP
12	6.77	25.41	-24.59	50.00	14.90	0.20	10.31	Average

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Dec. 28, 2013	May 15, 2014~ May 27, 2014	Dec. 27, 2014	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	30MHz~40GHz	Feb. 27, 2014	May 15, 2014~ May 27, 2014	Feb. 26, 2015	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Feb. 27, 2014	May 15, 2014~ May 27, 2014	Feb. 26, 2015	Conducted (TH01-KS)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 15, 2014	May 09, 2014~ May 10, 2014	Jan. 14, 2015	Radiation (03CH08-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MHz	Jul. 03, 2013	May 09, 2014~ May 10, 2014	Jul. 03, 2014	Radiation (03CH08-HY)
Bilog Antenna	Teseq GmbH	CBL6112D	35379	30MHz~2GHz	Oct. 10, 2013	May 09, 2014~ May 10, 2014	Oct. 09, 2014	Radiation (03CH08-HY)
Horn Antenna	ESCO	3117	000143261	1GHz~18GHz	Jan. 16, 2014	May 09, 2014~ May 10, 2014	Jan. 15, 2015	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz~40GHz	Oct. 03, 2013	May 09, 2014~ May 10, 2014	Oct. 02, 2014	Radiation (03CH08-HY)
Amplifier	SONOMA	310N	187231	9kHz~1GHz	May 15, 2013	May 09, 2014~ May 10, 2014	May 14, 2014	Radiation (03CH08-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	1GHz~18GHz	Jul. 09, 2013	May 09, 2014~ May 10, 2014	Jul. 08, 2014	Radiation (03CH08-HY)
Pre Amplifier	Agilent	8449B	3008A02665	1GHz~26.5GHz	Sep. 04, 2013	May 09, 2014~ May 10, 2014	Sep. 03, 2014	Radiation (03CH08-HY)
Turn Table	Chaintek	Chaintek 3000	N/A	0~360 Degree	N/A	May 09, 2014~ May 10, 2014	N/A	Radiation (03CH08-HY)
Antenna Mast	MF	MFA520BS	N/A	1m~4m	N/A	May 09, 2014~ May 10, 2014	N/A	Radiation (03CH08-HY)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz	May 23, 2013	May 08, 2014	May 22, 2014	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Dec. 10, 2013	May 08, 2014	Dec. 09, 2014	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Dec. 10, 2013	May 08, 2014	Dec. 09, 2014	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Nov. 12, 2013	May 08, 2014	Nov. 11, 2014	Conduction (CO01-KS)

5 Uncertainty of Evaluation

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

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

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

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