

# FCC RF Test Report

APPLICANT : Brightstar Corporation  
EQUIPMENT : Smart phone  
BRAND NAME : Avvio  
MODEL NAME : Avvio 787S, Avvio 787  
FCC ID : WVBA787X  
STANDARD : FCC Part 15 Subpart C §15.247  
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Mar. 12, 2015 and testing was completed on Mar. 27, 2015. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been 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 (SHENZHEN) INC., the test report shall not be reproduced except in full.



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Reviewed by: Joseph Lin / Supervisor



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Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL (SHENZHEN) INC.**

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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR531211C	Rev. 01	Initial issue of report	Mar. 27, 2015

## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	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 3.04 dB at 2484.720 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.71 dB at 0.900 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

# 1 General Description

## 1.1 Applicant

Brightstar Corporation

9725 NW 117th Ave., Miami, Florida, FL 33178, United States

## 1.2 Manufacturer

KCMobile Co.,Ltd.

#1305-1, Kolon Digital Tower Villant II , 31, Digital-ro 30-gil, Guro-Gu, Seoul, KOREA ( 152-727)

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart phone
Brand Name	Avvio
Model Name	Avvio 787S, Avvio 787
FCC ID	WVBA787X
EUT supports Radios application	GSM/GPRS/EGPRS(Downlink Only)/WCDMA/HSPA/ WLAN 2.4GHz 802.11b/g/n HT20/HT40/ Bluetooth v3.0 + EDR/Bluetooth v4.0 LE
HW Version	M7206_V1.5
EUT Stage	Production Unit

Remark:

1. 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 subjective to this standard

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 18.03 dBm (0.0635 W) 802.11g : 20.65 dBm (0.1161 W) 802.11n HT20 : 20.59 dBm (0.1146 W) 802.11n HT40 : 20.97 dBm (0.1250 W)
Antenna Type/Gain	802.11b/g/n : PIFA Antenna with gain -0.70 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

<b>Test Site</b>	SPORTON INTERNATIONAL (SHENZHEN) INC.	
<b>Test Site Location</b>	1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	
	TH01-SZ	CO01-SZ

<b>Test Site</b>	SPORTON INTERNATIONAL (KUNSHAN) INC.	
<b>Test Site Location</b>	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Registration No.</b>
	03CH01-KS	149928

**Note:** The test site complies with ANSI C63.4 2009 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 v03r02
- ♦ ANSI C63.10-2013

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table as an alternative in C63.10-2013 through inquiry tracking number 961829.
3. 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 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.

2.4GHz 802.11b RF Output 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 01	17.96	17.85	17.91
CH 06	2437 MHz	17.97				
CH 11	2462 MHz	17.95				

2.4GHz 802.11g RF Output Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps								
CH 01	2412 MHz	20.65	CH 01	20.44	20.46	20.61	20.42	20.56	20.47	20.57
CH 06	2437 MHz	20.61								
CH 11	2462 MHz	20.60								

2.4GHz 802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 01	2412 MHz	20.59	CH 01	20.49	20.36	20.38	20.43	20.36	20.51	20.50
CH 06	2437 MHz	20.53								
CH 11	2462 MHz	20.55								

2.4GHz 802.11n HT40 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 03	2422 MHz	20.47	CH 06	20.65	20.57	20.51	20.67	20.75	20.71	20.73
CH 06	2437 MHz	20.97								
CH 09	2452 MHz	20.58								



## 2.3 Test Mode

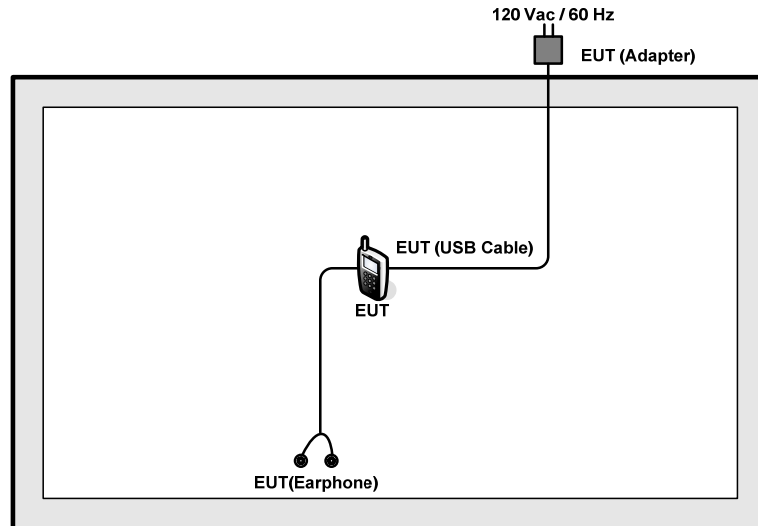
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

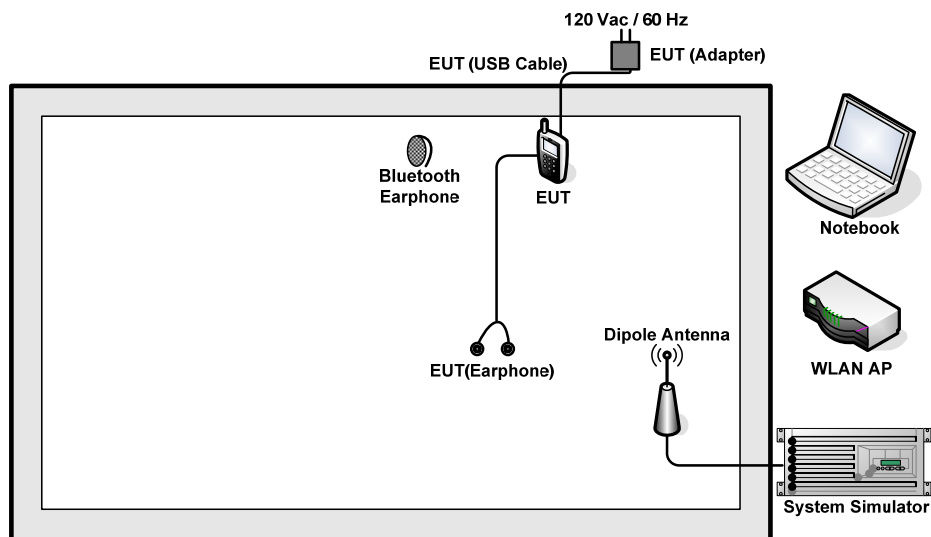
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone
<b>Remark:</b> For radiated test cases, the tests were performance with adapter and USB cable.	

## 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	CMW 500	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-815	KA2IR815A1	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Nokia	BH-108	PYAHS-107W	N/A	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 and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 5.0 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 5.0 + 10 = 15.0 \text{ (dB)}\end{aligned}$$

### 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

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

##### 3.1.3 Test Procedures

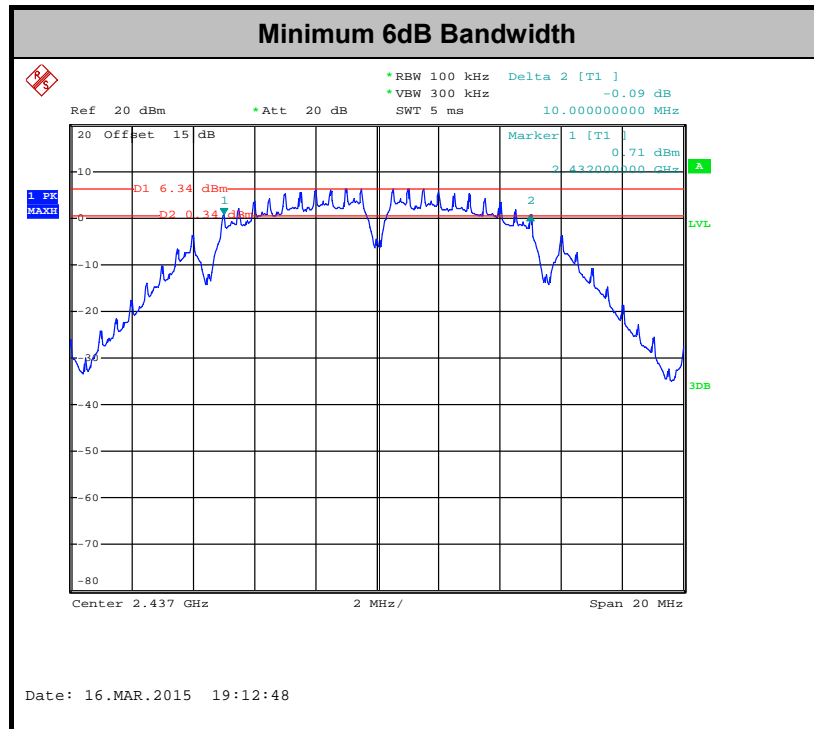
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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

Please refer to Appendix A of this test report.



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 v03r02.
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**

Please refer to Appendix A of this test report.

### **3.2.6 Test Result of Average output Power (Reporting Only)**

Please refer to Appendix A of this test report.



### 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.

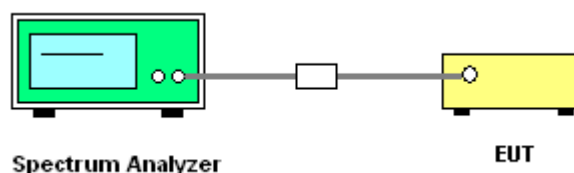
#### 3.3.2 Measuring Instruments

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

#### 3.3.3 Test Procedures

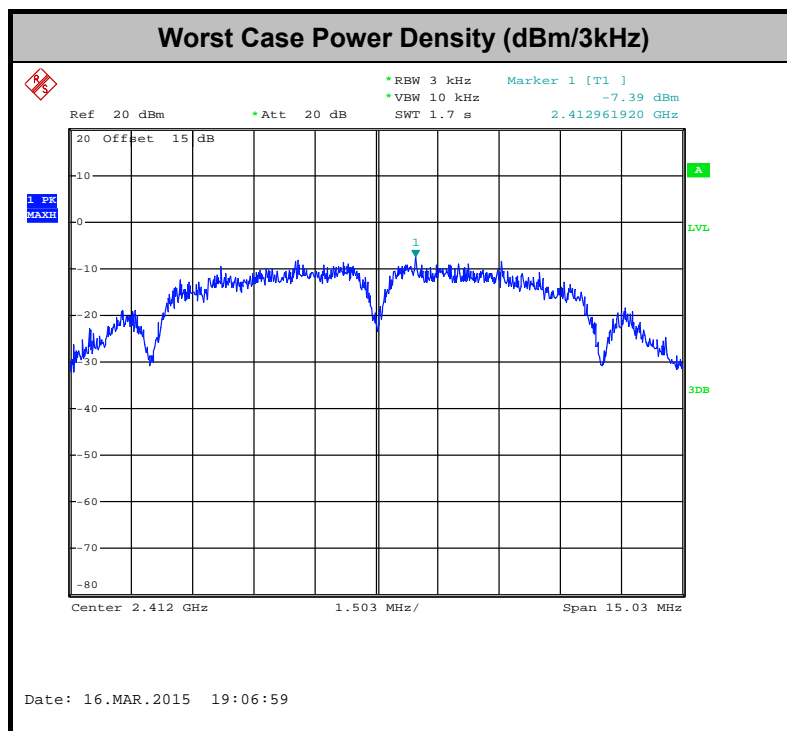
1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum 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

Please refer to Appendix A of this test report.



### 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).

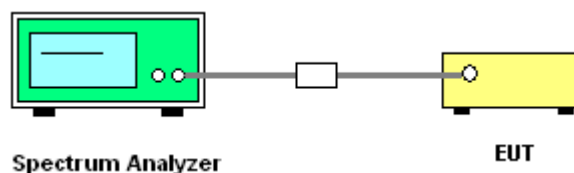
#### 3.4.2 Measuring Instruments

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 v03r02.
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



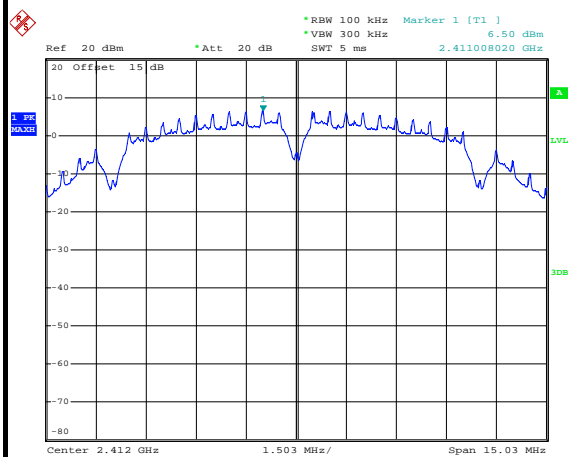


## 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	21~22℃
Test Band :	2.4GHz Low	Relative Humidity :	41~42%
Test Channel :	01	Test Engineer :	Fly Liang

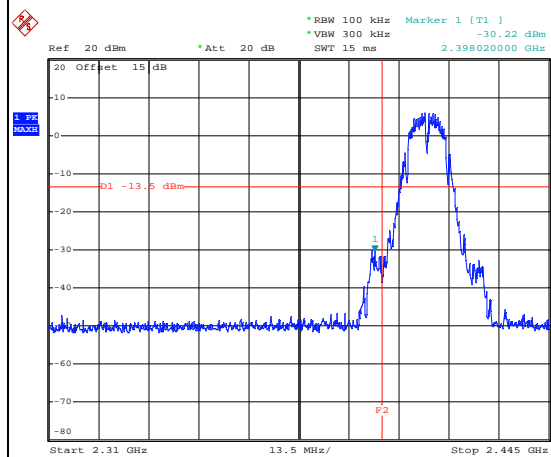
## WLAN 802.11b Channel 01

## 100kHz PSD reference Level



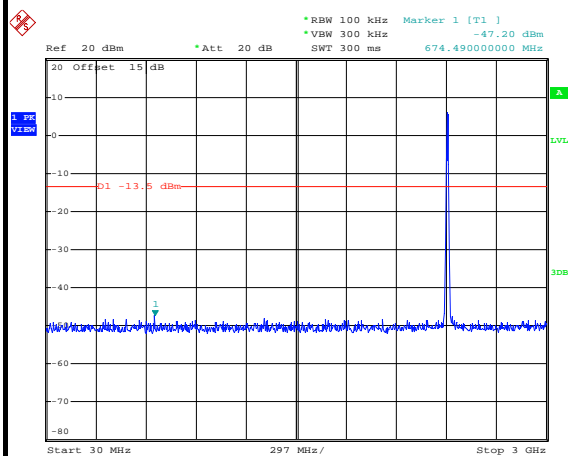
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## Low Channel Plot



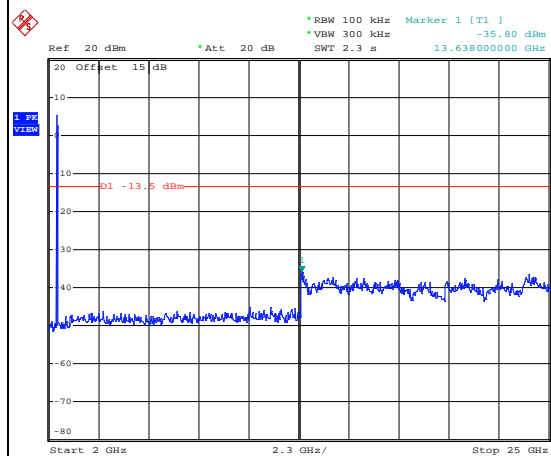
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## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 19:10:37

## Spurious Emission 2GHz~25GHz



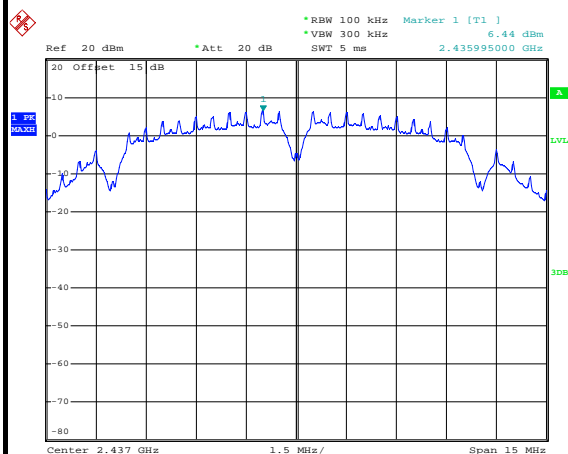
Date: 16.MAR.2015 19:10:55



Test Mode :	802.11b	Temperature :	21~22°C
Test Band :	2.4GHz Mid	Relative Humidity :	41~42%
Test Channel :	06	Test Engineer :	Fly Liang

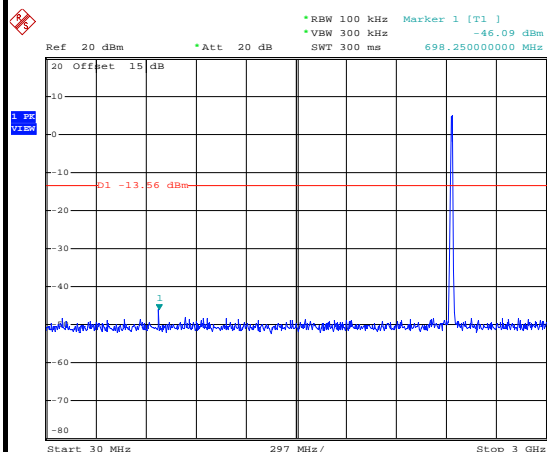
## WLAN 802.11b Channel 06

## 100kHz PSD reference Level



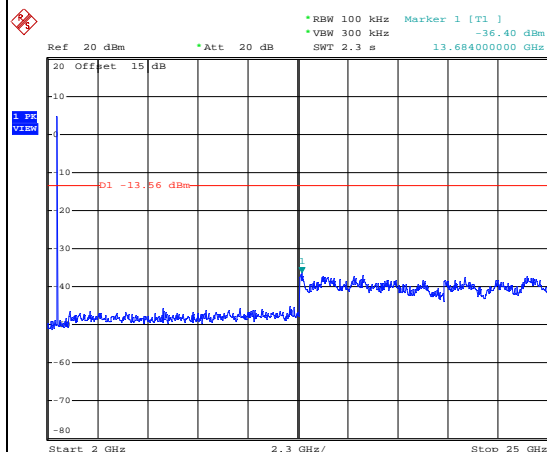
Date: 16.MAR.2015 19:14:38

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 19:16:50

## Spurious Emission 2GHz~25GHz



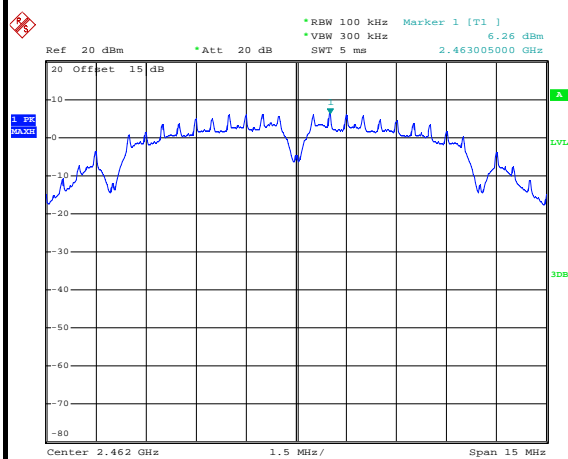
Date: 16.MAR.2015 19:17:08



Test Mode :	802.11b	Temperature :	21~22°C
Test Band :	2.4GHz High	Relative Humidity :	41~42%
Test Channel :	11	Test Engineer :	Fly Liang

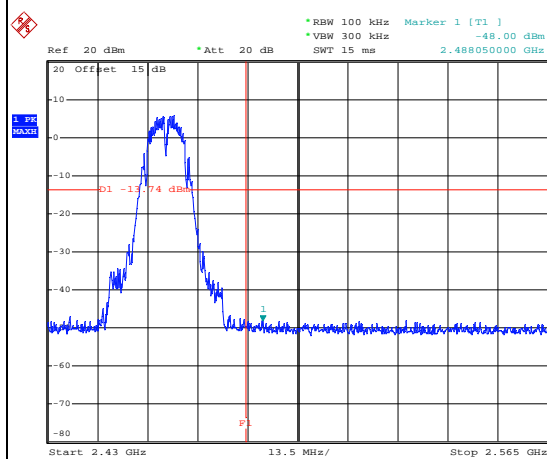
## WLAN 802.11b Channel 11

## 100kHz PSD reference Level



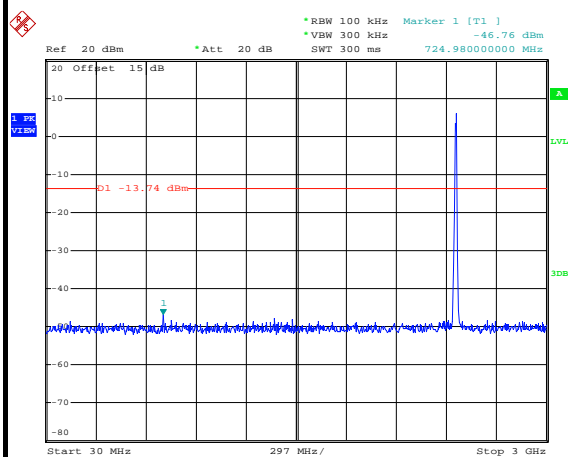
Date: 16.MAR.2015 19:21:09

## High Channel Plot



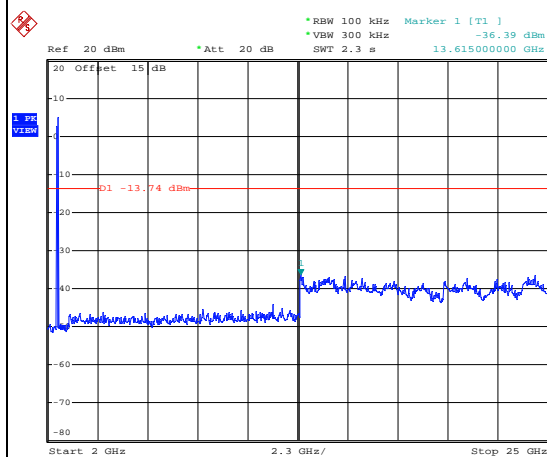
Date: 16.MAR.2015 19:22:14

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 19:22:46

## Spurious Emission 2GHz~25GHz



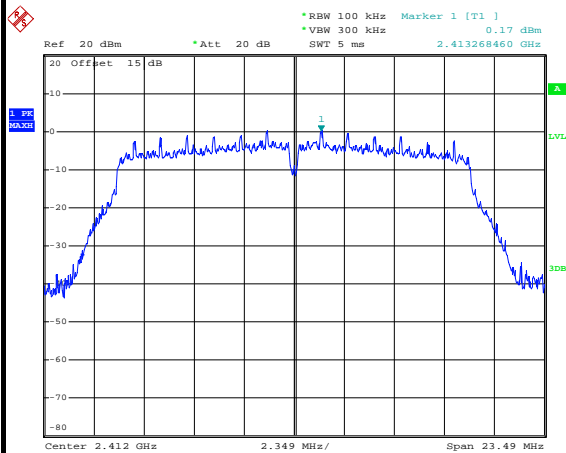
Date: 16.MAR.2015 19:23:04



Test Mode :	802.11g	Temperature :	21~22°C
Test Band :	2.4GHz Low	Relative Humidity :	41~42%
Test Channel :	01	Test Engineer :	Fly Liang

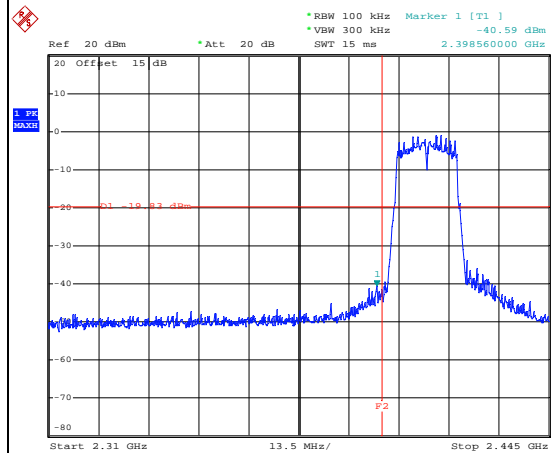
## WLAN 802.11g Channel 01

## 100kHz PSD reference Level



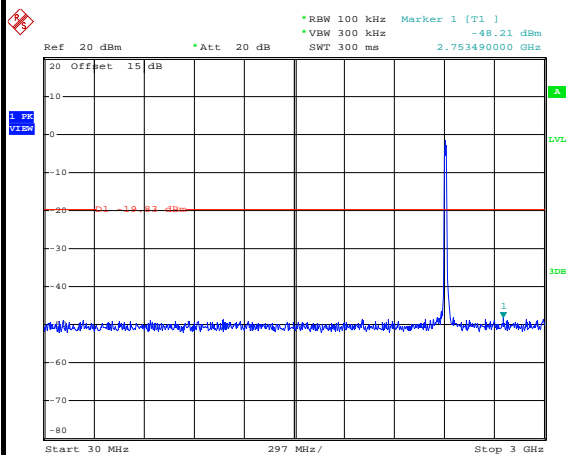
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## Low Channel Plot



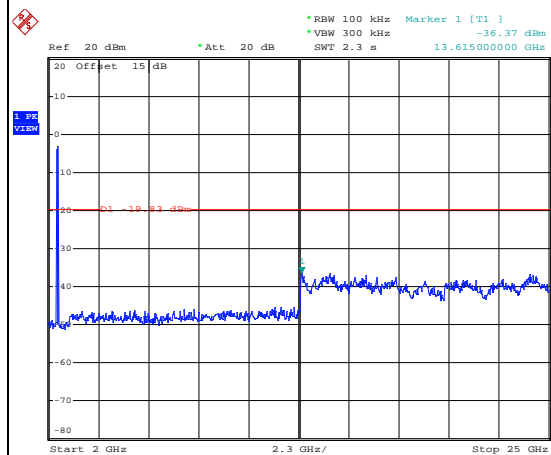
Date: 16.MAR.2015 19:45:56

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 19:46:19

## Spurious Emission 2GHz~25GHz

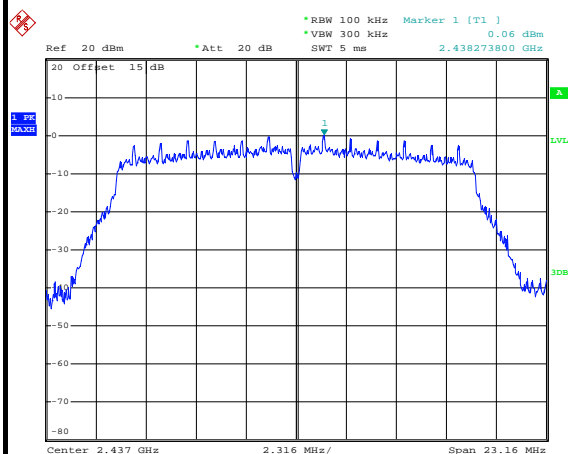


Date: 16.MAR.2015 19:46:37

<b>Test Mode :</b>	802.11g	<b>Temperature :</b>	21~22℃
<b>Test Band :</b>	2.4GHz Mid	<b>Relative Humidity :</b>	41~42%
<b>Test Channel :</b>	06	<b>Test Engineer :</b>	Fly Liang

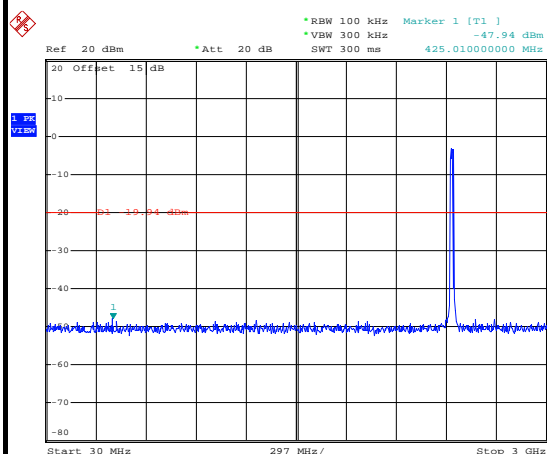
## WLAN 802.11g Channel 06

### 100kHz PSD reference Level



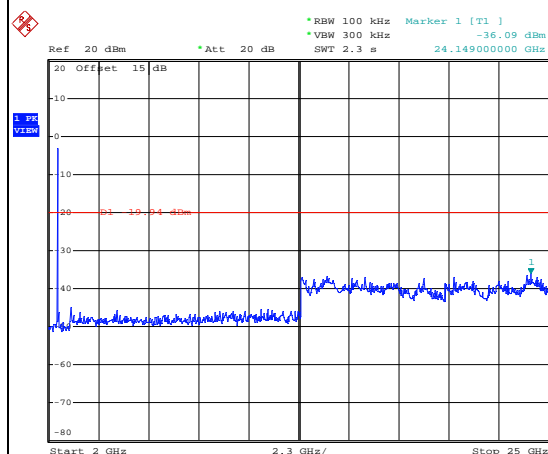
Date: 16.MAR.2015 19:37:17

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 19:39:07

## Spurious Emission 2GHz~25GHz



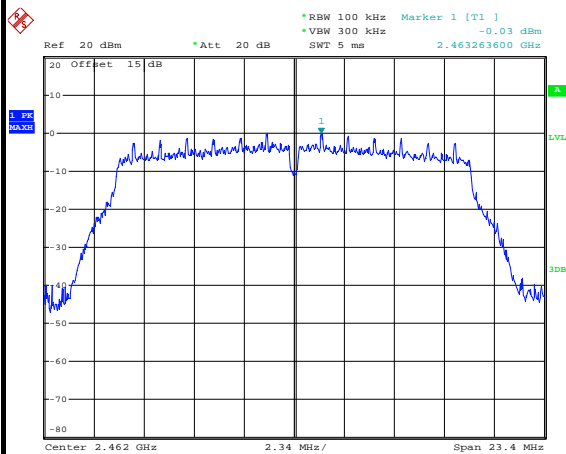
Date: 16.MAR.2015 19:39:25



<b>Test Mode :</b>	802.11g	<b>Temperature :</b>	21~22℃
<b>Test Band :</b>	2.4GHz High	<b>Relative Humidity :</b>	41~42%
<b>Test Channel :</b>	11	<b>Test Engineer :</b>	Fly Liang

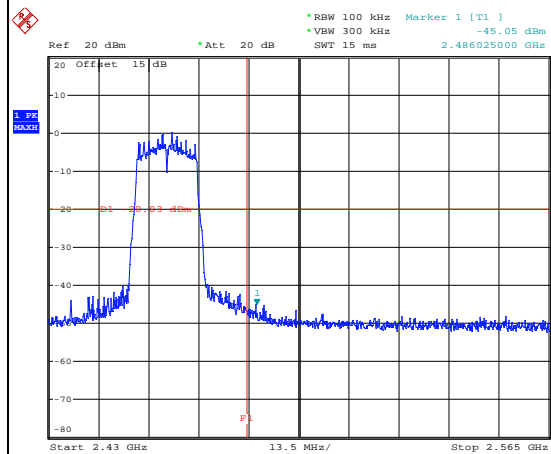
## WLAN 802.11g Channel 11

### 100kHz PSD reference Level



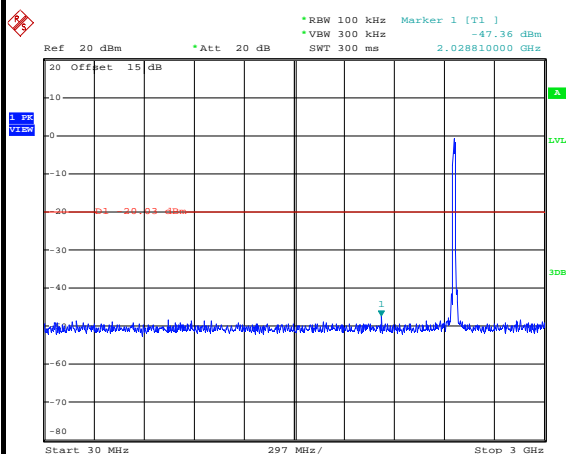
Date: 16.MAR.2015 19:27:39

### High Channel Plot



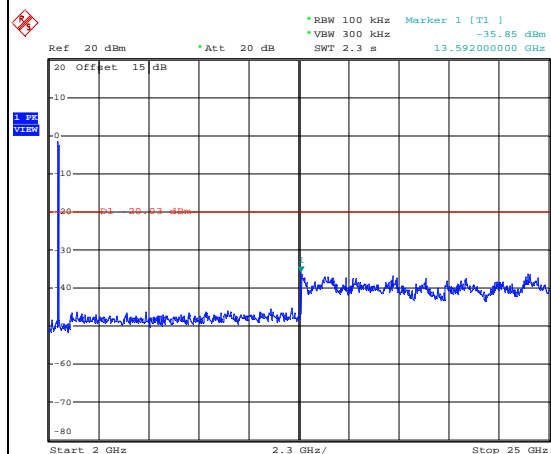
Date: 16.MAR.2015 19:28:16

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 19:29:29

## Spurious Emission 2GHz~25GHz



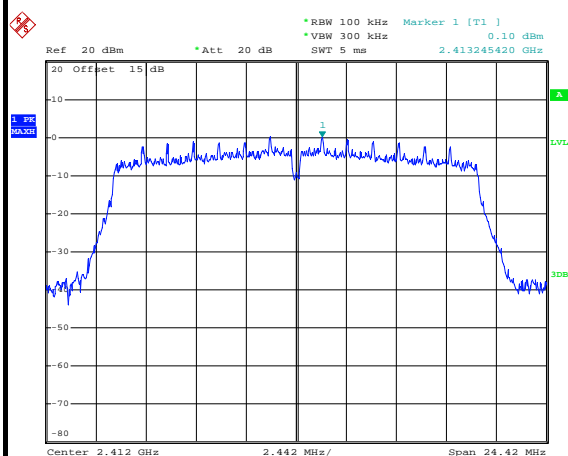
Date: 16.MAR.2015 19:29:47



Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Band :	2.4GHz Low	Relative Humidity :	41~42%
Test Channel :	01	Test Engineer :	Fly Liang

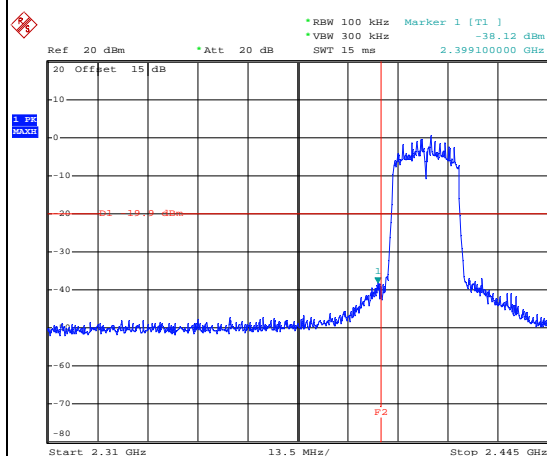
## WLAN 802.11n HT20 Channel 01

## 100kHz PSD reference Level



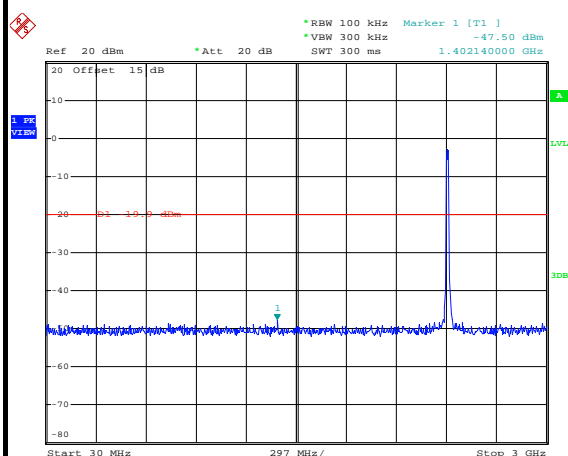
Date: 16.MAR.2015 19:56:21

## Low Channel Plot



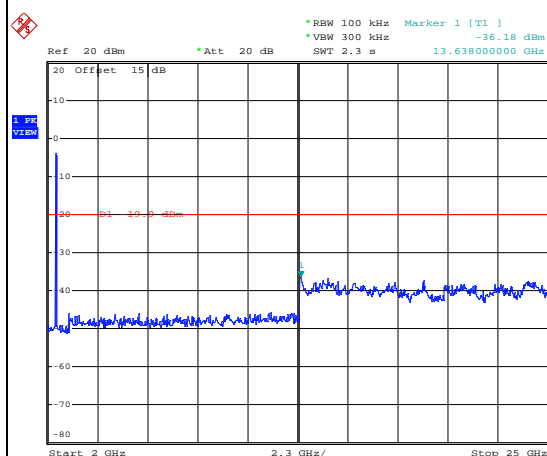
Date: 16.MAR.2015 20:06:06

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 20:00:16

## Spurious Emission 2GHz~25GHz



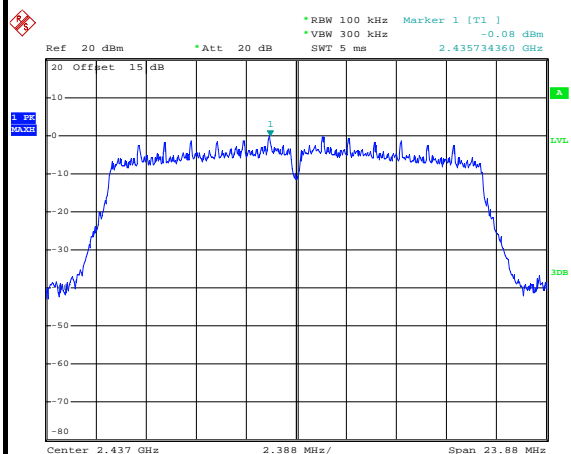
Date: 16.MAR.2015 20:00:34



Test Mode :	802.11n HT20	Temperature :	21~22°C
Test Band :	2.4GHz Mid	Relative Humidity :	41~42%
Test Channel :	06	Test Engineer :	Fly Liang

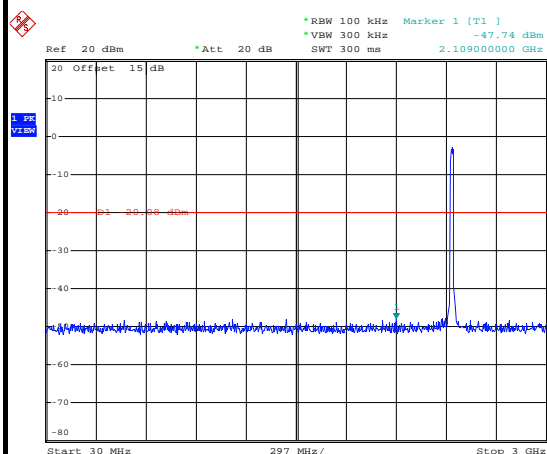
## WLAN 802.11n HT20 Channel 06

## 100kHz PSD reference Level



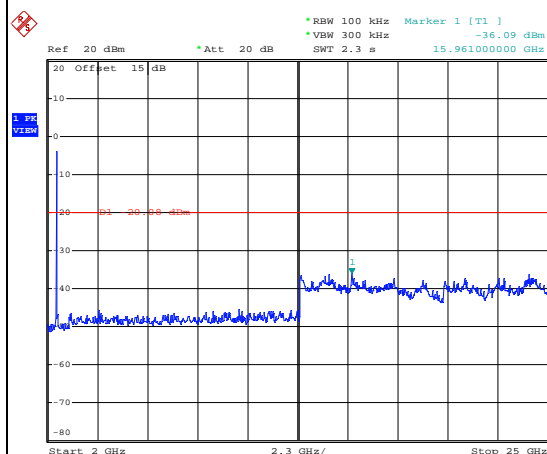
Date: 16.MAR.2015 20:12:19

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 20:14:08

## Spurious Emission 2GHz~25GHz

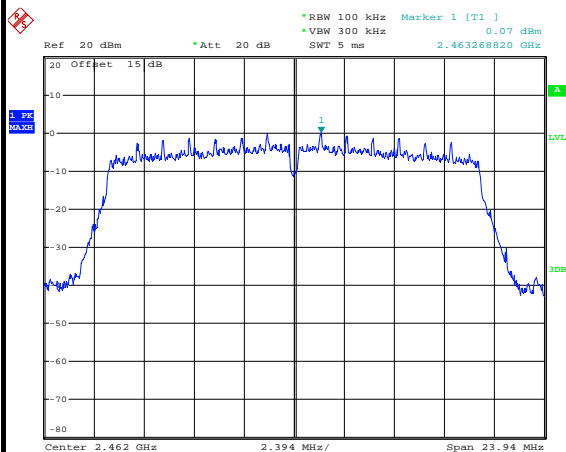


Date: 16.MAR.2015 20:14:25

<b>Test Mode :</b>	802.11n HT20	<b>Temperature :</b>	21~22℃
<b>Test Band :</b>	2.4GHz High	<b>Relative Humidity :</b>	41~42%
<b>Test Channel :</b>	11	<b>Test Engineer :</b>	Fly Liang

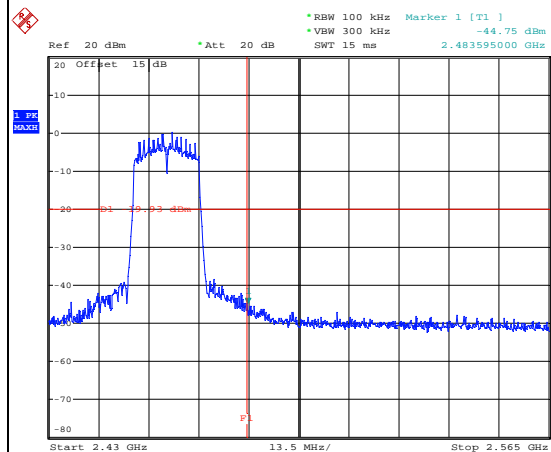
## WLAN 802.11n HT20 Channel 11

### 100kHz PSD reference Level



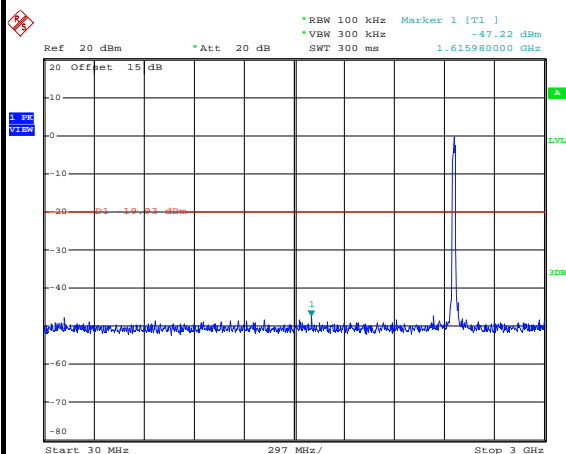
Date: 16.MAR.2015 20:20:57

## High Channel Plot



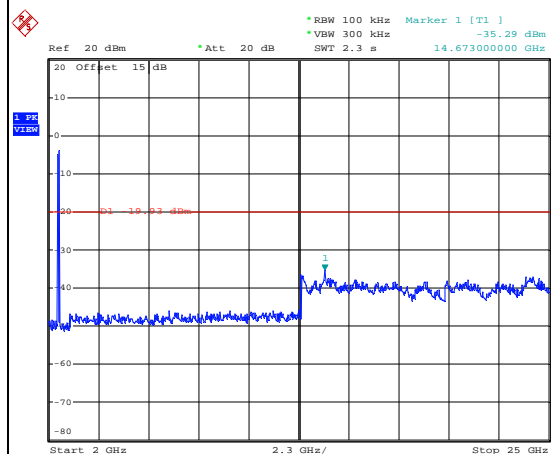
Date: 16.MAR.2015 20:21:39

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 20:22:42

## Spurious Emission 2GHz~25GHz



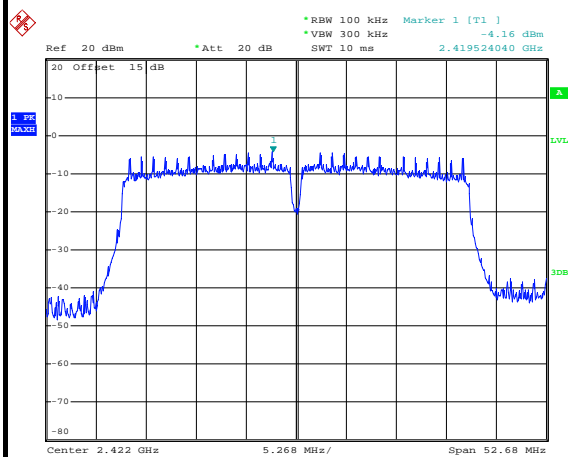
Date: 16.MAR.2015 20:22:59



Test Mode :	802.11n HT40	Temperature :	21~22°C
Test Band :	2.4GHz Low	Relative Humidity :	41~42%
Test Channel :	03	Test Engineer :	Fly Liang

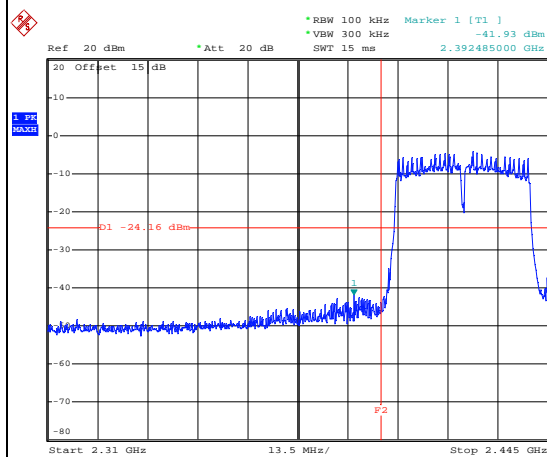
## WLAN 802.11n HT40 Channel 03

## 100kHz PSD reference Level



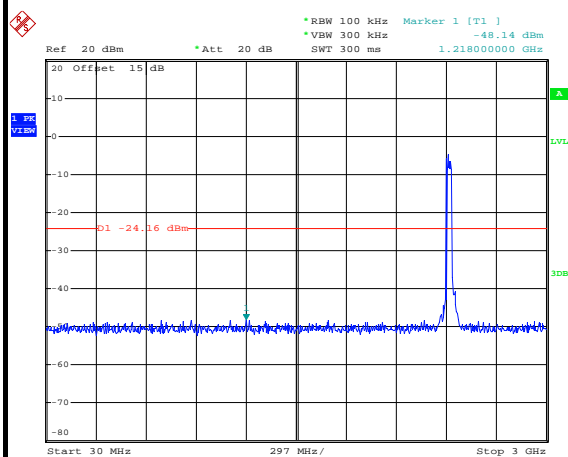
Date: 16.MAR.2015 20:26:38

## Low Channel Plot



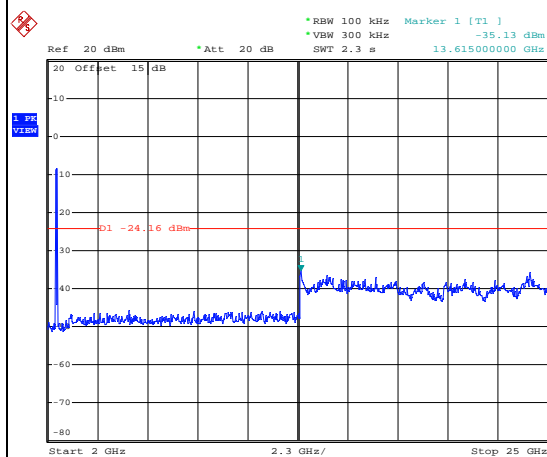
Date: 16.MAR.2015 20:28:00

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 20:31:05

## Spurious Emission 2GHz~25GHz



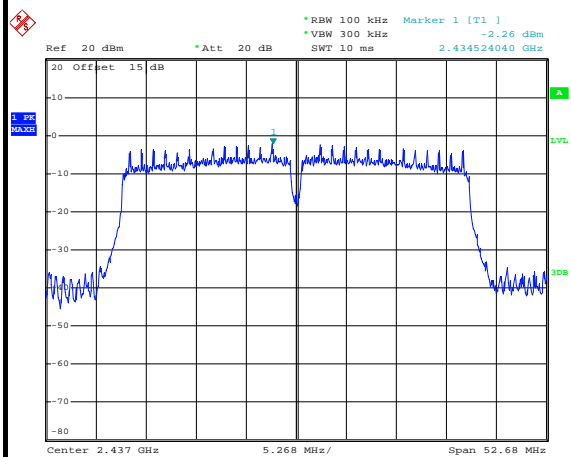
Date: 16.MAR.2015 20:31:23



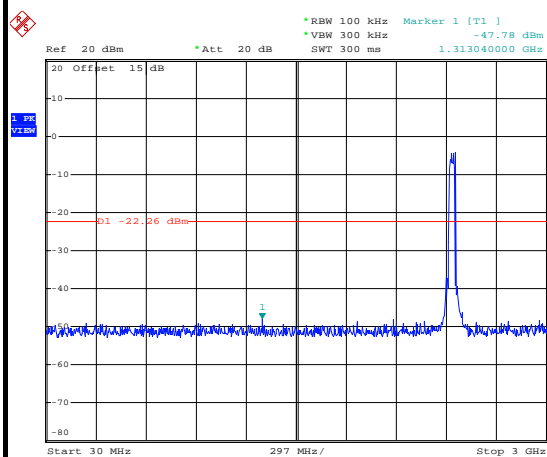
Test Mode :	802.11n HT40	Temperature :	21~22°C
Test Band :	2.4GHz Mid	Relative Humidity :	41~42%
Test Channel :	06	Test Engineer :	Fly Liang

## WLAN 802.11n HT40 Channel 06

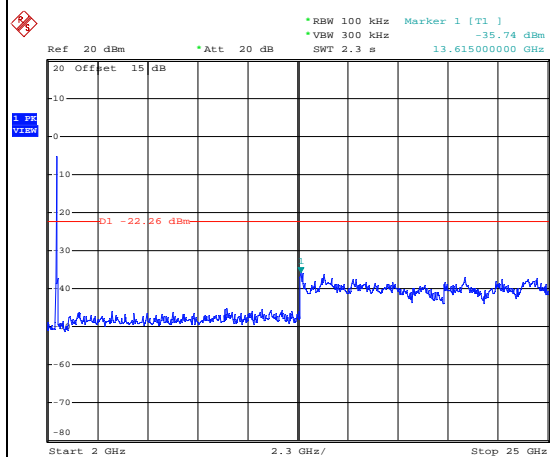
## 100kHz PSD reference Level



## Spurious Emission 30MHz~3GHz



## Spurious Emission 2GHz~25GHz

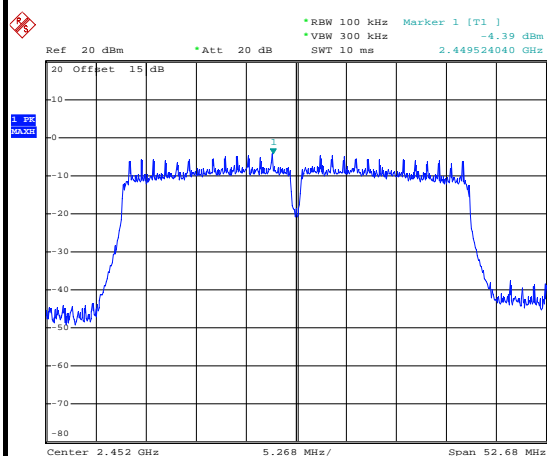




Test Mode :	802.11n HT40	Temperature :	21~22°C
Test Band :	2.4GHz High	Relative Humidity :	41~42%
Test Channel :	09	Test Engineer :	Fly Liang

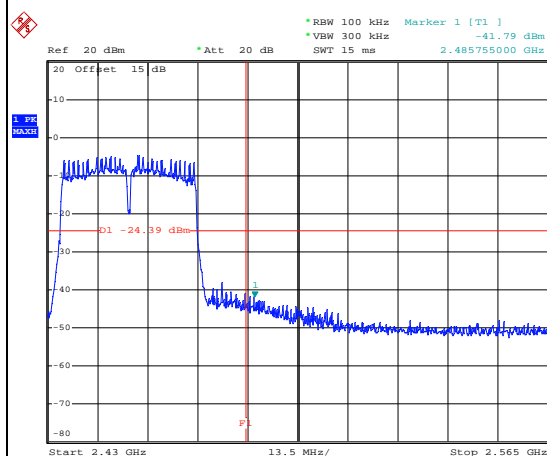
## WLAN 802.11n HT40 Channel 09

## 100kHz PSD reference Level



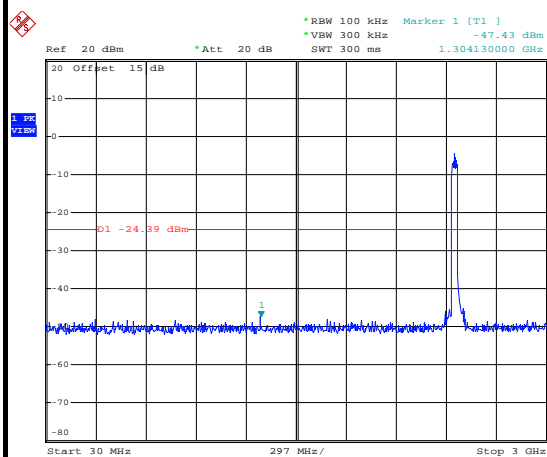
Date: 16.MAR.2015 20:45:39

## High Channel Plot



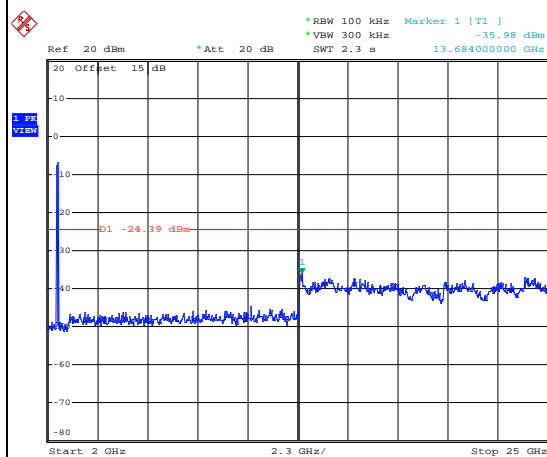
Date: 16.MAR.2015 20:46:13

## Spurious Emission 30MHz~3GHz



Date: 16.MAR.2015 20:48:05

## Spurious Emission 2GHz~25GHz



Date: 16.MAR.2015 20:48:23

### 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 v03r02.
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 for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively 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.

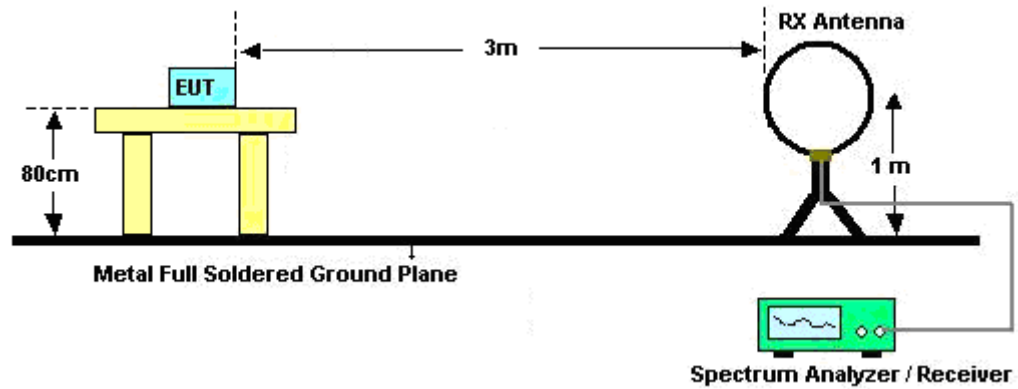
For average measurement:

  - 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.

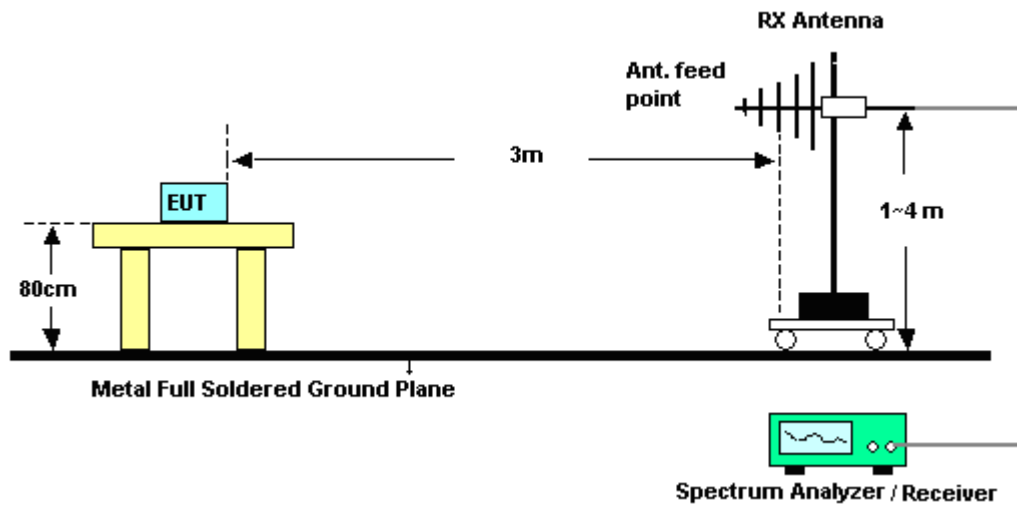
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.89	8.42	0.12	300Hz
802.11g	89.30	1.39	0.72	1kHz
2.4GHz 802.11n HT20	88.00	1.30	0.77	1kHz
2.4GHz 802.11n HT40	78.13	0.64	1.56	3kHz

### 3.5.4 Test Setup

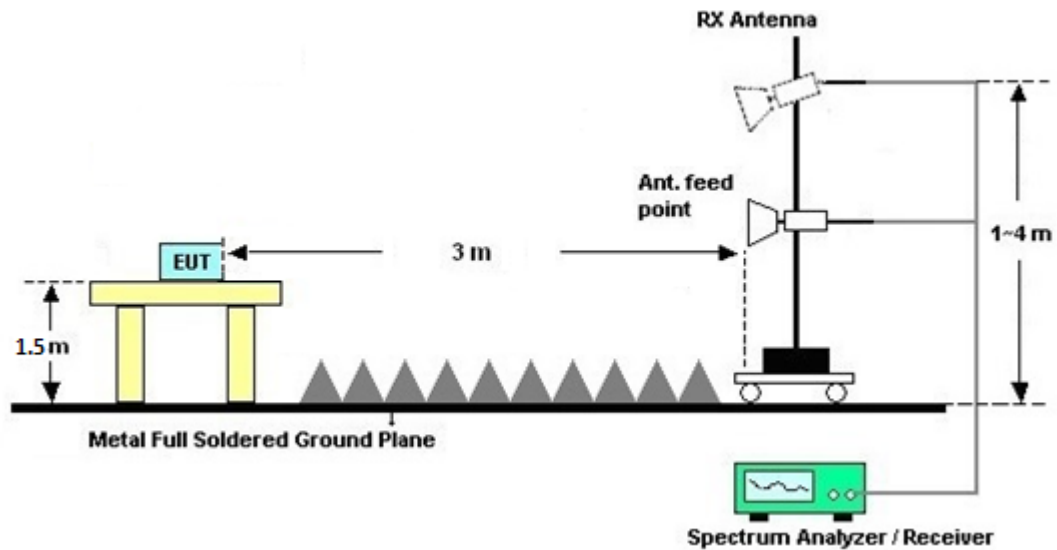
For radiated emissions below 30MHz



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

Please refer to Appendix B.

### 3.5.7 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)

Please refer to Appendix B.

## 3.6 AC Conducted Emission Measurement

### 3.6.1 Limit of AC Conducted Emission

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

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

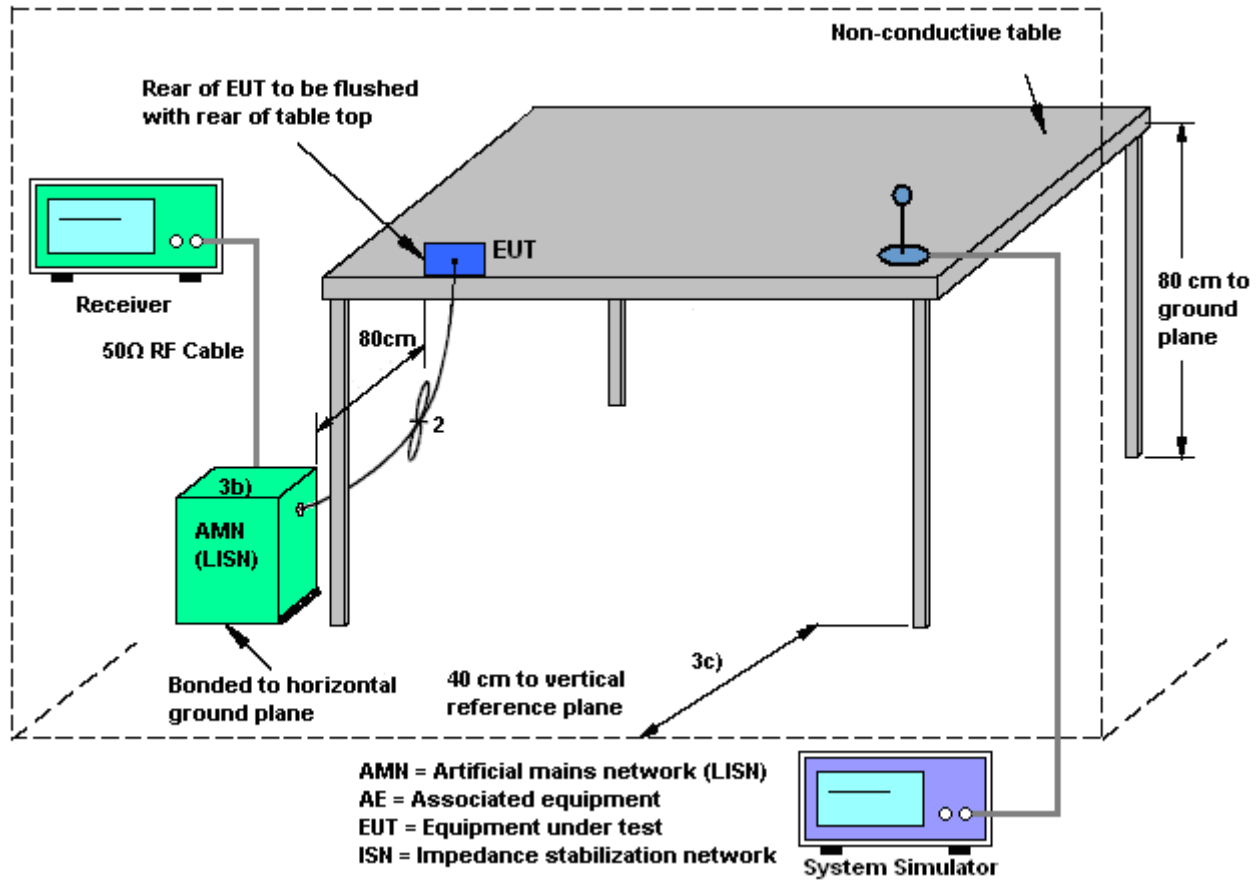
### 3.6.2 Measuring Instruments

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

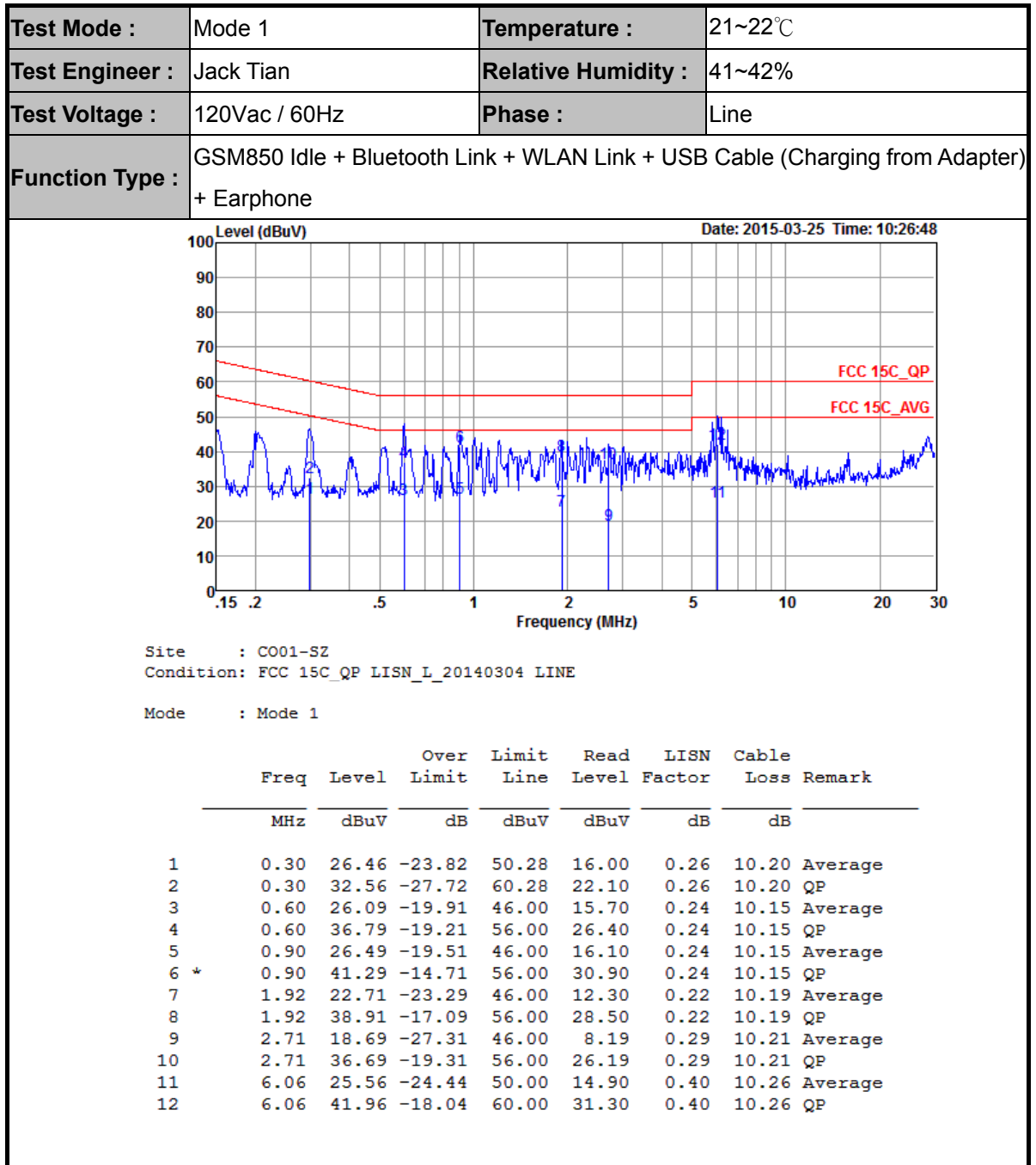
### 3.6.3 Test Procedures

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

### 3.6.4 Test Setup

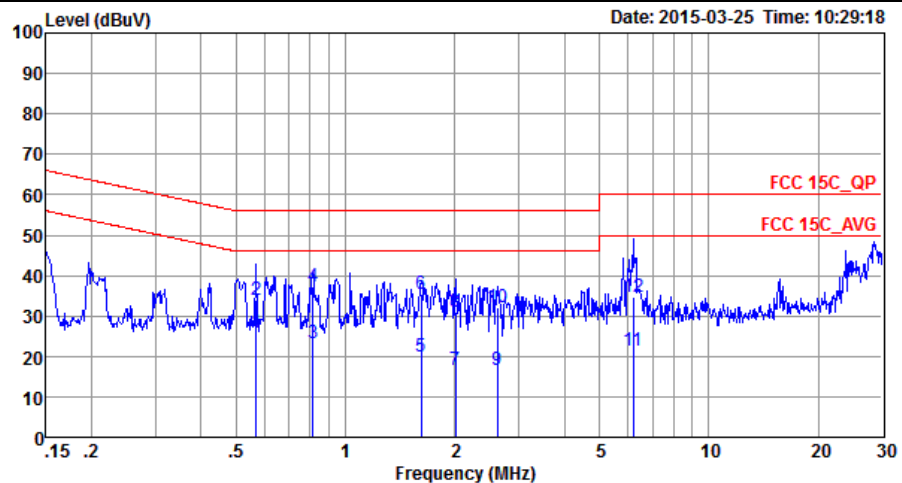


### 3.6.5 Test Result of AC Conducted Emission





Test Mode :	Mode 1	Temperature :	21~22℃
Test Engineer :	Jack Tian	Relative Humidity :	41~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter) + Earphone		



Site : C001-SZ  
Condition: FCC 15C\_QP LISN\_N\_20140304 NEUTRAL

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.57	25.80	-20.20	46.00	15.30	0.35	10.15	Average
2	0.57	33.80	-22.20	56.00	23.30	0.35	10.15	QP
3	0.81	23.33	-22.67	46.00	12.90	0.28	10.15	Average
4 *	0.81	37.43	-18.57	56.00	27.00	0.28	10.15	QP
5	1.62	19.93	-26.07	46.00	9.39	0.36	10.18	Average
6	1.62	35.43	-20.57	56.00	24.89	0.36	10.18	QP
7	2.01	16.56	-29.44	46.00	6.00	0.37	10.19	Average
8	2.01	30.86	-25.14	56.00	20.30	0.37	10.19	QP
9	2.62	16.61	-29.39	46.00	6.00	0.41	10.20	Average
10	2.62	32.21	-23.79	56.00	21.60	0.41	10.20	QP
11	6.19	21.32	-28.68	50.00	10.60	0.46	10.26	Average
12	6.19	34.82	-25.18	60.00	24.10	0.46	10.26	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 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	FSP30	101400	9kHz~30GHz	Jan. 28, 2015	Mar. 16, 2015	Jan. 27, 2016	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	10Hz~40GHz	Jan. 28, 2015	Mar. 16, 2015	Jan. 27, 2016	Conducted (TH01-SZ)
Power Sensor	Anritsu	MA2411B	1207253	0.3GHz~40GHz	Jan. 28, 2015	Mar. 16, 2015	Jan. 27, 2016	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Oct. 25, 2014	Mar. 27, 2015	Oct. 24, 2015	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	101399	9kHz~30GHz	May 04, 2014	Mar. 27, 2015	May 03, 2015	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 13, 2014	Mar. 27, 2015	Nov. 12, 2015	Radiation (03CH01-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	25Mhz-2Ghz	Jan. 17, 2015	Mar. 27, 2015	Jan. 16, 2016	Radiation (03CH01-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 17, 2015	Mar. 27, 2015	Jan. 16, 2016	Radiation (03CH01-KS)
Active Horn Antenna	com-power	AHA-118	701030	1GHz~18GHz	Nov. 08, 2014	Mar. 27, 2015	Nov. 07, 2015	Radiation (03CH01-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Sep. 04, 2014	Mar. 27, 2015	Sep. 03, 2015	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161069	1MHz~1GHz /32dB	May 04, 2014	Mar. 27, 2015	May 03, 2015	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02371	1GHz~26.5GHz	Oct. 28, 2014	Mar. 27, 2015	Oct. 27, 2015	Radiation (03CH01-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Mar. 27, 2015	NCR	Radiation (03CH01-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Mar. 27, 2015	NCR	Radiation (03CH01-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Mar. 27, 2015	NCR	Radiation (03CH01-KS)
EMI TEST Receiver	R&S	ESCI7	100768	9kHz~3GHz	May 04, 2014	Mar. 25, 2015	May 03, 2015	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Feb. 02, 2015	Mar. 25, 2015	Feb. 01, 2016	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Feb. 02, 2015	Mar. 25, 2015	Feb. 01, 2016	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Sep. 29, 2014	Mar. 25, 2015	Sep. 28, 2015	Conduction (CO01-SZ)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.3dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.5dB
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Report Number : FR531211C

Test Engineer:	Mygai Mo	Temperature:	24~26	°C
Test Date:	2015/3/16	Relative Humidity:	50~53	%

**TEST RESULTS DATA**  
**6dB and 99% Occupied Bandwidth**

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	13.05	10.02	0.50	Pass
11b	1Mbps	1	6	2437	12.90	10.00	0.50	Pass
11b	1Mbps	1	11	2462	12.75	10.00	0.50	Pass
11g	6Mbps	1	1	2412	17.40	15.66	0.50	Pass
11g	6Mbps	1	6	2437	17.40	15.44	0.50	Pass
11g	6Mbps	1	11	2462	17.30	15.60	0.50	Pass
HT20	MCS0	1	1	2412	18.15	16.28	0.50	Pass
HT20	MCS0	1	6	2437	18.20	15.92	0.50	Pass
HT20	MCS0	1	11	2462	18.10	15.96	0.50	Pass
HT40	MCS0	1	3	2422	36.20	35.12	0.50	Pass
HT40	MCS0	1	6	2437	36.20	35.12	0.50	Pass
HT40	MCS0	1	9	2452	36.30	35.12	0.50	Pass

**TEST RESULTS DATA**  
**Peak Power Table**

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	18.03	30.00	-0.70	17.33	36.00	Pass
11b	1Mbps	1	6	2437	17.97	30.00	-0.70	17.27	36.00	Pass
11b	1Mbps	1	11	2462	17.95	30.00	-0.70	17.25	36.00	Pass
11g	6Mbps	1	1	2412	20.65	30.00	-0.70	19.95	36.00	Pass
11g	6Mbps	1	6	2437	20.61	30.00	-0.70	19.91	36.00	Pass
11g	6Mbps	1	11	2462	20.60	30.00	-0.70	19.90	36.00	Pass
HT20	MCS0	1	1	2412	20.59	30.00	-0.70	19.89	36.00	Pass
HT20	MCS0	1	6	2437	20.53	30.00	-0.70	19.83	36.00	Pass
HT20	MCS0	1	11	2462	20.55	30.00	-0.70	19.85	36.00	Pass
HT40	MCS0	1	3	2422	20.47	30.00	-0.70	19.77	36.00	Pass
HT40	MCS0	1	6	2437	20.97	30.00	-0.70	20.27	36.00	Pass
HT40	MCS0	1	9	2452	20.58	30.00	-0.70	19.88	36.00	Pass

**TEST RESULTS DATA**  
**Average Power Table**  
**(Reporting Only)**

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.09	15.41
11b	1Mbps	1	6	2437	0.09	15.30
11b	1Mbps	1	11	2462	0.09	15.21
11g	6Mbps	1	1	2412	0.49	10.73
11g	6Mbps	1	6	2437	0.49	10.58
11g	6Mbps	1	11	2462	0.49	10.54
HT20	MCS0	1	1	2412	0.55	10.76
HT20	MCS0	1	6	2437	0.55	10.62
HT20	MCS0	1	11	2462	0.55	10.40
HT40	MCS0	1	3	2422	1.07	9.53
HT40	MCS0	1	6	2437	1.07	11.37
HT40	MCS0	1	9	2452	1.07	9.42

**TEST RESULTS DATA**  
**Peak Power Density**

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-7.39	-0.70	8.00	Pass
11b	1Mbps	1	6	2437	-7.42	-0.70	8.00	Pass
11b	1Mbps	1	11	2462	-7.74	-0.70	8.00	Pass
11g	6Mbps	1	1	2412	-14.31	-0.70	8.00	Pass
11g	6Mbps	1	6	2437	-13.34	-0.70	8.00	Pass
11g	6Mbps	1	11	2462	-14.31	-0.70	8.00	Pass
HT20	MCS0	1	1	2412	-14.01	-0.70	8.00	Pass
HT20	MCS0	1	6	2437	-14.11	-0.70	8.00	Pass
HT20	MCS0	1	11	2462	-14.49	-0.70	8.00	Pass
HT40	MCS0	1	3	2422	-19.48	-0.70	8.00	Pass
HT40	MCS0	1	6	2437	-16.42	-0.70	8.00	Pass
HT40	MCS0	1	9	2452	-19.70	-0.70	8.00	Pass



## Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b CH 01 2412MHz		2371.56	55.83	-18.17	74	52.74	31.28	6.17	34.36	190	347	P	H
		2389.2	38.03	-15.97	54	34.91	31.3	6.17	34.35	190	347	A	H
	*	2410.688	103.06	-	-	99.87	31.31	6.22	34.34	190	347	P	H
	*	2413.611	97.65	-	-	94.46	31.31	6.22	34.34	190	347	A	H
		2379.3	49.97	-24.03	74	46.88	31.28	6.17	34.36	151	102	P	V
		2389.29	35.29	-18.71	54	32.17	31.3	6.17	34.35	151	102	A	V
	*	2410.604	96.54	-	-	93.35	31.31	6.22	34.34	151	102	P	V
	*	2410.354	91.41	-	-	88.22	31.31	6.22	34.34	151	102	A	V
802.11b CH 06 2437MHz	*	2435.571	102.66	-	-	99.44	31.33	6.22	34.33	161	275	P	H
	*	2435.237	97.58	-	-	94.36	31.33	6.22	34.33	161	275	A	H
	*	2438.41	95.33	-	-	92.09	31.34	6.22	34.32	150	104	P	V
	*	2438.577	90.14	-	-	86.9	31.34	6.22	34.32	150	104	A	V
802.11b CH 11 2462MHz	*	2460.621	102.22	-	-	98.89	31.36	6.28	34.31	154	80	P	H
	*	2460.287	97.13	-	-	93.8	31.36	6.28	34.31	154	80	A	H
		2488.24	51.38	-22.62	74	47.95	31.39	6.33	34.29	154	80	P	H
		2487.6	39.15	-14.85	54	35.72	31.39	6.33	34.29	154	80	A	H
	*	2460.621	96.4	-	-	93.07	31.36	6.28	34.31	150	259	P	V
	*	2460.204	91.39	-	-	88.06	31.36	6.28	34.31	150	259	A	V
		2487.68	48.99	-25.01	74	45.56	31.39	6.33	34.29	150	259	P	V
		2487.68	35.82	-18.18	54	32.39	31.39	6.33	34.29	150	259	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												





## 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	46.89	-27.11	74	36.42	34.89	8.73	33.15	150	24	P	H
		4824	47.45	-26.55	74	36.98	34.89	8.73	33.15	150	247	P	V
802.11b CH 06 2437MHz		4875	47.34	-26.66	74	36.8	34.92	8.76	33.14	157	240	P	H
		7311	45.64	-28.36	74	33.46	35.56	10.84	34.22	150	97	P	H
		4875	44.87	-29.13	74	34.33	34.92	8.76	33.14	150	154	P	V
		7311	46.09	-27.91	74	33.91	35.56	10.84	34.22	158	15	P	V
802.11b CH 11 2462MHz		4923	57.04	-16.96	74	46.42	34.95	8.79	33.12	156	93	P	H
	!	4923	49.52	-4.48	54	38.9	34.95	8.79	33.12	156	93	A	H
		7386	45.81	-28.19	74	33.95	35.58	10.89	34.61	150	0	P	H
		4923	55.73	-18.27	74	45.11	34.95	8.79	33.12	150	269	P	V
		4923	46.38	-7.62	54	35.76	34.95	8.79	33.12	150	269	A	V
		7386	44.19	-29.81	74	32.33	35.58	10.89	34.61	150	245	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**2.4GHz 2400~2483.5MHz**  
**WIFI 802.11g (Band Edge @ 3m)**

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11g CH 01 2412MHz		2389.74	62.94	-11.06	74	59.82	31.3	6.17	34.35	248	298	P	H
		2389.92	39.79	-14.21	54	36.67	31.3	6.17	34.35	248	298	A	H
	*	2408.935	100.17	-	-	96.98	31.31	6.22	34.34	248	298	P	H
	*	2412.024	88.87	-	-	85.68	31.31	6.22	34.34	248	298	A	H
		2389.83	56.41	-17.59	74	53.29	31.3	6.17	34.35	150	143	P	V
		2389.65	36.53	-17.47	54	33.41	31.3	6.17	34.35	150	143	A	V
	*	2413.861	96.22	-	-	93.03	31.31	6.22	34.34	150	143	P	V
	*	2412.775	85.06	-	-	81.87	31.31	6.22	34.34	150	143	A	V
802.11g CH 06 2437MHz	*	2435.237	100.13	-	-	96.91	31.33	6.22	34.33	161	273	P	H
	*	2434.903	88.5	-	-	85.28	31.33	6.22	34.33	161	273	A	H
	*	2438.159	95.08	-	-	91.84	31.34	6.22	34.32	154	150	P	V
	*	2435.237	84.16	-	-	80.94	31.33	6.22	34.33	154	150	A	V
802.11g CH 11 2462MHz	*	2462.291	100.77	-	-	97.44	31.36	6.28	34.31	157	264	P	H
	*	2459.786	89.82	-	-	86.49	31.36	6.28	34.31	157	264	A	H
		2483.52	64.36	-9.64	74	60.96	31.37	6.33	34.3	157	264	P	H
		2483.52	40.42	-13.58	54	37.02	31.37	6.33	34.3	157	264	A	H
	*	2460.454	96.32	-	-	92.99	31.36	6.28	34.31	151	154	P	V
	*	2460.12	85.19	-	-	81.86	31.36	6.28	34.31	151	154	A	V
		2484.24	59.98	-14.02	74	56.58	31.37	6.33	34.3	151	154	P	V
		2483.68	37.33	-16.67	54	33.93	31.37	6.33	34.3	151	154	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

## WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11g CH 01 2412MHz		4824	46.9	-27.1	74	36.43	34.89	8.73	33.15	150	45	P	H
		4824	46.49	-27.51	74	36.02	34.89	8.73	33.15	152	78	P	V
802.11g CH 06 2437MHz		4875	46.59	-27.41	74	36.05	34.92	8.76	33.14	150	245	P	H
		7311	46.41	-27.59	74	34.23	35.56	10.84	34.22	150	158	P	H
		4875	45.6	-28.4	74	35.06	34.92	8.76	33.14	150	110	P	V
		7311	46.23	-27.77	74	34.05	35.56	10.84	34.22	150	89	P	V
802.11g CH 11 2462MHz		4923	46.65	-27.35	74	36.03	34.95	8.79	33.12	150	127	P	H
		7386	46.24	-27.76	74	34.38	35.58	10.89	34.61	150	0	P	H
		4923	47.21	-26.79	74	36.59	34.95	8.79	33.12	150	147	P	V
		7386	45.5	-28.5	74	33.64	35.58	10.89	34.61	150	211	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 01 2412MHz		2389.38	65.62	-8.38	74	62.5	31.3	6.17	34.35	100	338	P	H
		2390	41.22	-12.78	54	38.1	31.3	6.17	34.35	100	338	A	H
	*	2413.778	100.19	-	-	97	31.31	6.22	34.34	100	338	P	H
	*	2412.525	88.83	-	-	85.64	31.31	6.22	34.34	100	338	A	H
		2388.84	66.67	-7.33	74	63.55	31.3	6.17	34.35	140	232	P	V
		2389.92	41.79	-12.21	54	38.67	31.3	6.17	34.35	140	232	A	V
	*	2413.611	100.88	-	-	97.69	31.31	6.22	34.34	140	232	P	V
	*	2410.104	89.5	-	-	86.31	31.31	6.22	34.34	140	232	A	V
802.11n HT20 CH 06 2437MHz	*	2433.734	103.34	-	-	100.12	31.33	6.22	34.33	100	305	P	H
	*	2434.653	91.93	-	-	88.71	31.33	6.22	34.33	100	305	A	H
	*	2433.734	103.12	-	-	99.9	31.33	6.22	34.33	200	245	P	V
	*	2435.154	91.78	-	-	88.56	31.33	6.22	34.33	200	245	A	V
802.11n HT20 CH 11 2462MHz	*	2460.037	100.97	-	-	97.64	31.36	6.28	34.31	106	313	P	H
	*	2460.12	89.62	-	-	86.29	31.36	6.28	34.31	106	313	A	H
	!	2484.72	70.96	-3.04	74	67.56	31.37	6.33	34.3	106	313	P	H
		2483.52	45.48	-8.52	54	42.08	31.37	6.33	34.3	106	313	A	H
	*	2460.037	102.45	-	-	99.12	31.36	6.28	34.31	133	256	P	V
	*	2460.204	90.97	-	-	87.64	31.36	6.28	34.31	133	256	A	V
	!	2484.16	69.72	-4.28	74	66.32	31.37	6.33	34.3	133	256	P	V
		2483.52	43.26	-10.74	54	39.86	31.37	6.33	34.3	133	256	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**2.4GHz 2400~2483.5MHz**  
**WIFI 802.11n HT20 (Harmonic @ 3m)**

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	45.4	-28.6	74	34.93	34.89	8.73	33.15	100	120	P	H
		4824	44.8	-29.2	74	34.33	34.89	8.73	33.15	100	200	P	V
802.11n HT20 CH 06 2437MHz		4875	47.49	-26.51	74	36.95	34.92	8.76	33.14	100	211	P	H
		7311	44.93	-29.07	74	32.75	35.56	10.84	34.22	100	287	P	H
		4875	46.31	-27.69	74	35.77	34.92	8.76	33.14	100	168	P	V
		7311	46.19	-27.81	74	34.01	35.56	10.84	34.22	100	290	P	V
802.11n HT20 CH 11 2462MHz		4923	47.92	-26.08	74	37.3	34.95	8.79	33.12	100	124	P	H
		7386	46.62	-27.38	74	34.76	35.58	10.89	34.61	100	110	P	H
		4923	45.83	-28.17	74	35.21	34.95	8.79	33.12	100	287	P	V
		7386	43.36	-30.64	74	31.5	35.58	10.89	34.61	100	87	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT40 CH 03 2422MHz		2388.57	64.84	-9.16	74	61.72	31.3	6.17	34.35	239	45	P	H
		2389.29	42.31	-11.69	54	39.19	31.3	6.17	34.35	239	45	A	H
	*	2424.382	97.02	-	-	93.8	31.33	6.22	34.33	239	45	P	H
	*	2424.299	85.88	-	-	82.66	31.33	6.22	34.33	239	45	A	H
		2488.8	52.58	-21.42	74	49.15	31.39	6.33	34.29	239	45	P	H
		2485.6	36.22	-17.78	54	32.82	31.37	6.33	34.3	239	45	A	H
		2389.02	65.69	-8.31	74	62.57	31.3	6.17	34.35	133	98	P	V
		2389.02	43.04	-10.96	54	39.92	31.3	6.17	34.35	133	98	A	V
	*	2425.301	97.78	-	-	94.56	31.33	6.22	34.33	133	98	P	V
	*	2427.221	86.53	-	-	83.31	31.33	6.22	34.33	133	98	A	V
		2486.44	52.5	-21.5	74	49.1	31.37	6.33	34.3	133	98	P	V
		2484.32	36.21	-17.79	54	32.81	31.37	6.33	34.3	133	98	A	V
802.11n HT40 CH 06 2437MHz		2388.48	65.53	-8.47	74	62.41	31.3	6.17	34.35	173	25	P	H
		2390	46.22	-7.78	54	43.1	31.3	6.17	34.35	173	25	A	H
	*	2428.64	100.06	-	-	96.84	31.33	6.22	34.33	173	25	P	H
	*	2430.311	88.83	-	-	85.61	31.33	6.22	34.33	173	25	A	H
		2483.52	61.23	-12.77	74	57.83	31.37	6.33	34.3	173	25	P	H
		2483.56	40.31	-13.69	54	36.91	31.37	6.33	34.3	173	25	A	H
		2387.85	62.23	-11.77	74	59.11	31.3	6.17	34.35	165	107	P	V
		2389.56	43.33	-10.67	54	40.21	31.3	6.17	34.35	165	107	A	V
	*	2433.65	99.58	-	-	96.36	31.33	6.22	34.33	165	107	P	V
	*	2431.229	88.55	-	-	85.33	31.33	6.22	34.33	165	107	A	V
		2483.6	60.89	-13.11	74	57.49	31.37	6.33	34.3	165	107	P	V
		2484.68	40.13	-13.87	54	36.73	31.37	6.33	34.3	165	107	A	V



<b>802.11n</b> <b>HT40</b> <b>CH 09</b> <b>2452MHz</b>		2381.37	54.63	-19.37	74	51.54	31.28	6.17	34.36	100	0	P	H
		2388.12	36.73	-17.27	54	33.61	31.3	6.17	34.35	100	0	A	H
	*	2445.925	95.36	-	-	92.06	31.34	6.28	34.32	100	0	P	H
	*	2445.508	84.08	-	-	80.78	31.34	6.28	34.32	100	0	A	H
		2483.6	63.12	-10.88	74	59.72	31.37	6.33	34.3	100	0	P	H
		2483.68	38.45	-15.55	54	35.05	31.37	6.33	34.3	100	0	A	H
		2381.73	55.28	-18.72	74	52.19	31.28	6.17	34.36	154	95	P	V
		2378.85	36.97	-17.03	54	33.88	31.28	6.17	34.36	154	95	A	V
	*	2445.842	96.73	-	-	93.43	31.34	6.28	34.32	154	95	P	V
	*	2445.174	85.6	-	-	82.3	31.34	6.28	34.32	154	95	A	V
		2483.64	64.39	-9.61	74	60.99	31.37	6.33	34.3	154	95	P	V
		2483.56	39.26	-14.74	54	35.86	31.37	6.33	34.3	154	95	A	V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**2.4GHz 2400~2483.5MHz**  
**WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n		4845	47.38	-26.62	74	36.89	34.9	8.73	33.14	142	310	P	H
HT40		7266	47.24	-26.76	74	34.93	35.56	10.81	34.06	128	264	P	H
CH 03		4845	48.07	-25.93	74	37.58	34.9	8.73	33.14	100	219	P	V
2422MHz		7266	47	-27	74	34.69	35.56	10.81	34.06	100	0	P	V
802.11n		4875	48.63	-25.37	74	38.09	34.92	8.76	33.14	162	103	P	H
HT40		7311	46.33	-27.67	74	34.15	35.56	10.84	34.22	166	0	P	H
CH 06		4875	47.16	-26.84	74	36.62	34.92	8.76	33.14	100	305	P	V
2437MHz		7311	45.47	-28.53	74	33.29	35.56	10.84	34.22	167	265	P	V
802.11n		4905	48.44	-25.56	74	37.84	34.94	8.79	33.13	154	203	P	H
HT40		7356	46.4	-27.6	74	34.42	35.57	10.86	34.45	155	203	P	H
CH 09		4904	47.14	-26.86	74	36.54	34.94	8.79	33.13	100	246	P	V
2452MHz		7356	45.72	-28.28	74	33.74	35.57	10.86	34.45	100	60	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												





## Emission below 1GHz

## 2.4GHz WIFI 802.11b (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	(dBμV)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
2.4GHz 802.11b LF		182.29	26.11	-17.39	43.5	46.66	10.47	1.44	32.46	-	-	P	H
		338.46	27.64	-18.36	46	43.44	14.54	2.02	32.36	-	-	P	H
		369.5	30.65	-15.35	46	45.25	15.59	2.15	32.34	-	-	P	H
		490.75	36.48	-9.52	46	49.02	17.14	2.51	32.19	118	24	P	H
		591.63	33.5	-12.5	46	43.87	18.82	2.83	32.02	-	-	P	H
		739.07	32.09	-13.91	46	40.85	20.16	3.12	32.04	-	-	P	H
		30.97	28.38	-11.62	40	41.54	18.71	0.79	32.66	-	-	P	V
		369.5	27.98	-18.02	46	42.58	15.59	2.15	32.34	-	-	P	V
		487.84	36.09	-9.91	46	48.62	17.15	2.51	32.19	163	21	P	V
		589.69	35.99	-10.01	46	46.36	18.82	2.83	32.02	-	-	P	V
		656.62	35.09	-10.91	46	44.69	19.48	2.92	32	-	-	P	V
		723.55	34.13	-11.87	46	42.92	20.09	3.12	32	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Emission below 1GHz****2.4GHz WIFI 802.11g (LF)**

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	(dBμV)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
2.4GHz 802.11g LF		110.51	26.95	-16.55	43.5	46.98	11.38	1.23	32.64	-	-	P	H
		179.38	25.65	-17.85	43.5	46.1	10.58	1.44	32.47	-	-	P	H
		364.65	24.53	-21.47	46	39.29	15.44	2.15	32.35	-	-	P	H
		489.78	38.42	-7.58	46	50.96	17.14	2.51	32.19	104	226	P	H
		591.63	34.03	-11.97	46	44.4	18.82	2.83	32.02	-	-	P	H
		788.54	31.14	-14.86	46	39.43	20.28	3.32	31.89	-	-	P	H
		30.97	28.28	-11.72	40	41.44	18.71	0.79	32.66	-	-	P	V
		45.52	25.94	-14.06	40	46.56	11.25	0.79	32.66	-	-	P	V
		485.9	37.82	-8.18	46	50.33	17.16	2.51	32.18	116	58	P	V
		588.72	34.09	-11.91	46	44.46	18.82	2.83	32.02	-	-	P	V
		656.62	32.97	-13.03	46	42.57	19.48	2.92	32	-	-	P	V
		716.76	34.2	-11.8	46	42.99	20.07	3.12	31.98	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



## Emission below 1GHz

## 2.4GHz WIFI 802.11n HT20 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	(dBμV)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
2.4GHz 802.11n HT20 LF		115.36	19.46	-24.04	43.5	39.45	11.42	1.23	32.64	-	-	P	H
		218.18	25.07	-20.93	46	45.31	10.64	1.61	32.49	-	-	P	H
		366.59	31.48	-14.52	46	46.18	15.5	2.15	32.35	-	-	P	H
		490.75	36.82	-9.18	46	49.36	17.14	2.51	32.19	224	163	P	H
		595.51	34.96	-11.04	46	45.34	18.81	2.83	32.02	-	-	P	H
		787.57	33.22	-12.78	46	41.52	20.27	3.32	31.89	-	-	P	H
		30.97	25.06	-14.94	40	38.22	18.71	0.79	32.66	-	-	P	V
		368.53	29.81	-16.19	46	44.44	15.56	2.15	32.34	-	-	P	V
		485.9	36.53	-9.47	46	49.04	17.16	2.51	32.18	113	24	P	V
		582.9	35.96	-10.04	46	46.32	18.83	2.83	32.02	-	-	P	V
		658.56	35.11	-10.89	46	44.69	19.5	2.92	32	-	-	P	V
		731.31	33.23	-12.77	46	42	20.13	3.12	32.02	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



## Emission below 1GHz

## 2.4GHz WIFI 802.11n HT40 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
2.4GHz 802.11n HT40 LF		115.36	21.33	-22.17	43.5	41.32	11.42	1.23	32.64	-	-	P	H
		219.15	23.22	-22.78	46	43.43	10.68	1.61	32.5	-	-	P	H
		368.53	27.43	-18.57	46	42.06	15.56	2.15	32.34	-	-	P	H
		489.78	39.8	-6.2	46	52.34	17.14	2.51	32.19	187	221	P	H
		590.66	36.36	-9.64	46	46.73	18.82	2.83	32.02	-	-	P	H
		773.02	32.65	-13.35	46	41.08	20.25	3.24	31.92	-	-	P	H
		31.94	29.12	-10.88	40	42.76	18.22	0.79	32.65	-	-	P	V
		45.52	28.14	-11.86	40	48.76	11.25	0.79	32.66	-	-	P	V
		487.84	37.42	-8.58	46	49.95	17.15	2.51	32.19	162	224	P	V
		583.87	36.8	-9.2	46	47.16	18.83	2.83	32.02	-	-	P	V
		662.44	36.29	-9.71	46	45.67	19.55	3.05	31.98	-	-	P	V
		730.34	33.64	-12.36	46	42.42	20.12	3.12	32.02	-	-	P	V
Remark	1. No other spurious found.												
	2. All results are PASS against limit line.												

## Note symbol

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.