



# FCC RF Test Report

**APPLICANT** : BLU Products, Inc.  
**EQUIPMENT** : Mobile phone  
**BRAND NAME** : BLU  
**MODEL NAME** : ENERGY X LTE  
**FCC ID** : YHLBLUEGXLTE  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was received on Dec. 22, 2015 and testing was completed on Dec. 29, 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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Prepared by: Andy Yeh / Manager

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Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL (SHENZHEN) INC.**

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Nanshan District, Shenzhen, Guangdong, P. R. China**



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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5D2213C	Rev. 01	Initial issue of report	Jan. 22, 2016

## SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-247 5.2(1)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 6.6	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-247 A5.4(4)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-247 5.2(2)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	RSS-247 5.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-247 5.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.45 dB at 36.790 MHz
3.6	15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 4.46 dB at 0.480 MHz
3.7	15.203 & 15.247(b)	N/A	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

**BLU Products, Inc.**

10814 NW 33rd St # 100 Doral, FL 33172

## 1.2 Manufacturer

**BLU Products, Inc.**

10814 NW 33rd St # 100 Doral, FL 33172

## 1.3 Product Feature of Equipment Under Test

Product Feature	
<b>Equipment</b>	Mobile phone
<b>Brand Name</b>	BLU
<b>Model Name</b>	ENERGY X LTE
<b>FCC ID</b>	YHLBLUEGXLTE
<b>EUT supports Radios application</b>	GSM/GPRS/EGPRS/WCDMA/HSPA/HSPA+/DC-HSDPA/LTE/ WLAN2.4GHz 802.11b/g/n HT20/HT40/ Bluetooth v3.0+EDR/Bluetooth v4.0 LE
<b>IMEI Code</b>	Conducted:354147042002676/354147042037672 Radiation: 354147042002643/354147042037649 Conduction: 354147042002668/354147042037664
<b>HW Version</b>	ENERGY X LTE_Mainboard_P2
<b>SW Version</b>	ENERGY X LTE_0202_V5237
<b>EUT Stage</b>	Pre-Production

**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

Standards-related Product Specification	
<b>Tx/Rx Channel Frequency Range</b>	2412 MHz ~ 2462 MHz
<b>Maximum (Peak) Output Power to Antenna</b>	802.11b : 16.40 dBm (0.0437 W) 802.11g : 19.41 dBm (0.0873 W) 802.11n HT20 : 19.48 dBm (0.0887 W) 802.11n HT40 : 20.52 dBm (0.1127 W)
<b>99% Occupied Bandwidth</b>	802.11b : 13.25MHz 802.11g : 17.95MHz 802.11n HT20 : 18.65MHz 802.11n HT40 : 36.50MHz
<b>Antenna Type / Gain</b>	Fixed internal Antenna with gain 0.1 dBi
<b>Type of Modulation</b>	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 (SHENZHEN) INC.	
<b>Test Site Location</b>	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC/IC Registration No.</b>
	03CH01-SZ	831040/4086F

**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 v03r03
- ♦ ANSI C63.10-2013
- ♦ IC RSS-247 Issue 1
- ♦ IC RSS-Gen Issue 4

### **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 (Z 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.

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	16.40	CH 01	16.28	16.13	16.36
CH 06	2437 MHz	16.01				
CH 11	2462 MHz	15.93				

2.4GHz 802.11g RF Output 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	18.79	CH 06	19.37	19.36	19.33	19.34	19.38	19.40	19.39
CH 06	2437 MHz	19.41								
CH 11	2462 MHz	18.98								

2.4GHz 802.11n HT20 RF Output 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	18.80	CH 06	19.31	19.27	19.28	19.39	19.44	19.46	19.47
CH 06	2437 MHz	19.48								
CH 11	2462 MHz	18.72								

2.4GHz 802.11n HT40 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 03	2422 MHz	18.14	CH 06	19.81	19.76	19.74	19.79	20.47	20.49	20.46
CH 06	2437 MHz	20.52								
CH 09	2452 MHz	18.22								

## 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.

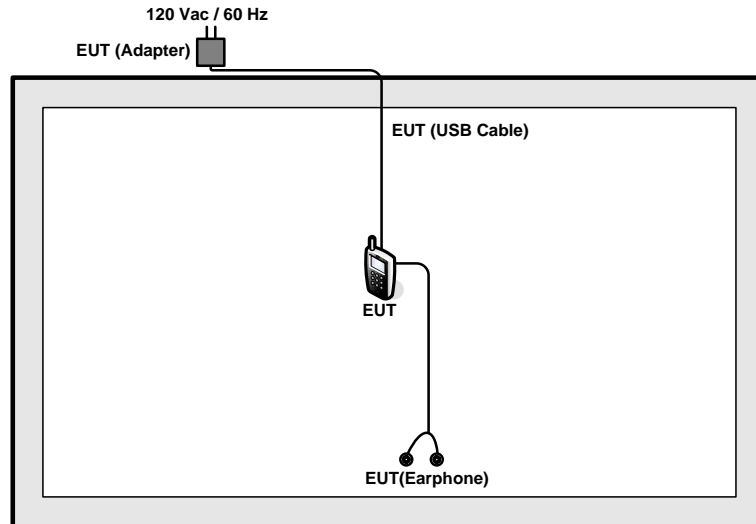
<2.4GHz>

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

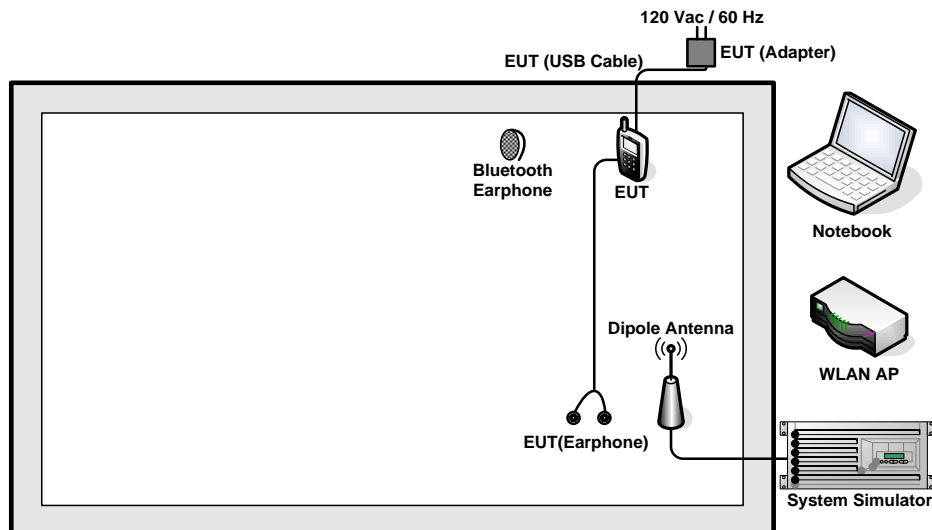
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter) + SIM1
Remark: For Radiated TCs, the tests were performed with adapter, earphone and USB cable.	

## 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	Anritus	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	E540	FCC DoC	N/A	shielded cable DC O/P 1.8 m unshielded AC I/P cable 1.2 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 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 5 + 10 = 15(\text{dB})\end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 99%Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

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

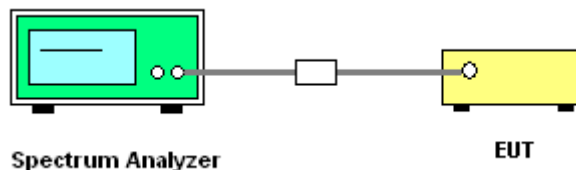
##### 3.1.2 Measuring Instruments

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 v03r03.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

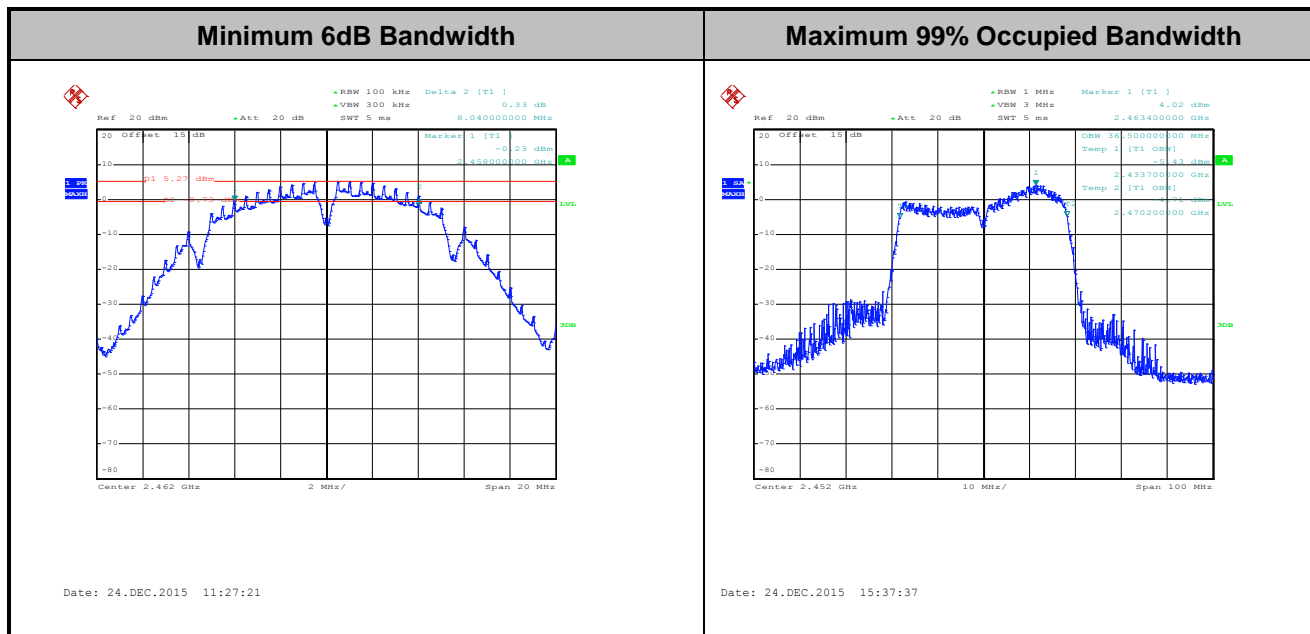
##### 3.1.4 Test Setup





### 3.1.5 Test Result of 6dB and 99% Occupied 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 v03r03 section 9.1.2 PKPM1 Peak power meter method.
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.

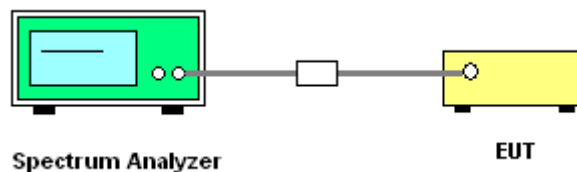
#### 3.3.2 Measuring Instruments

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 v03r03
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.

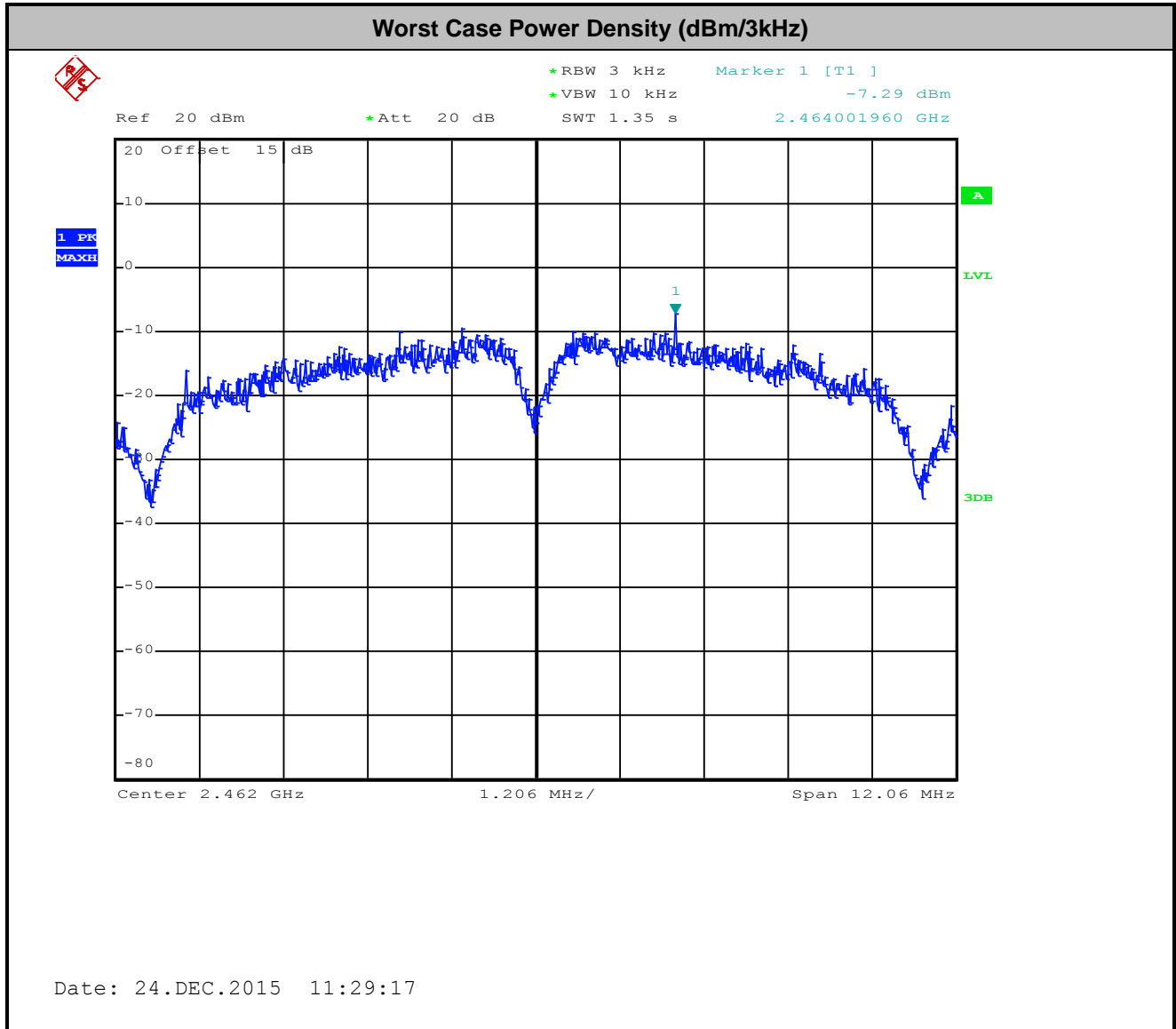
#### 3.3.4 Test Setup





### 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).

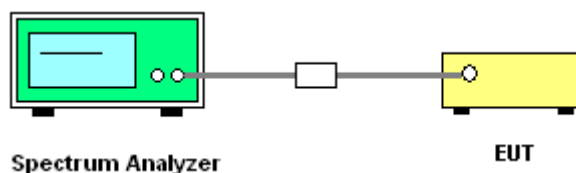
### **3.4.2 Measuring Instruments**

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 v03r03.
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.

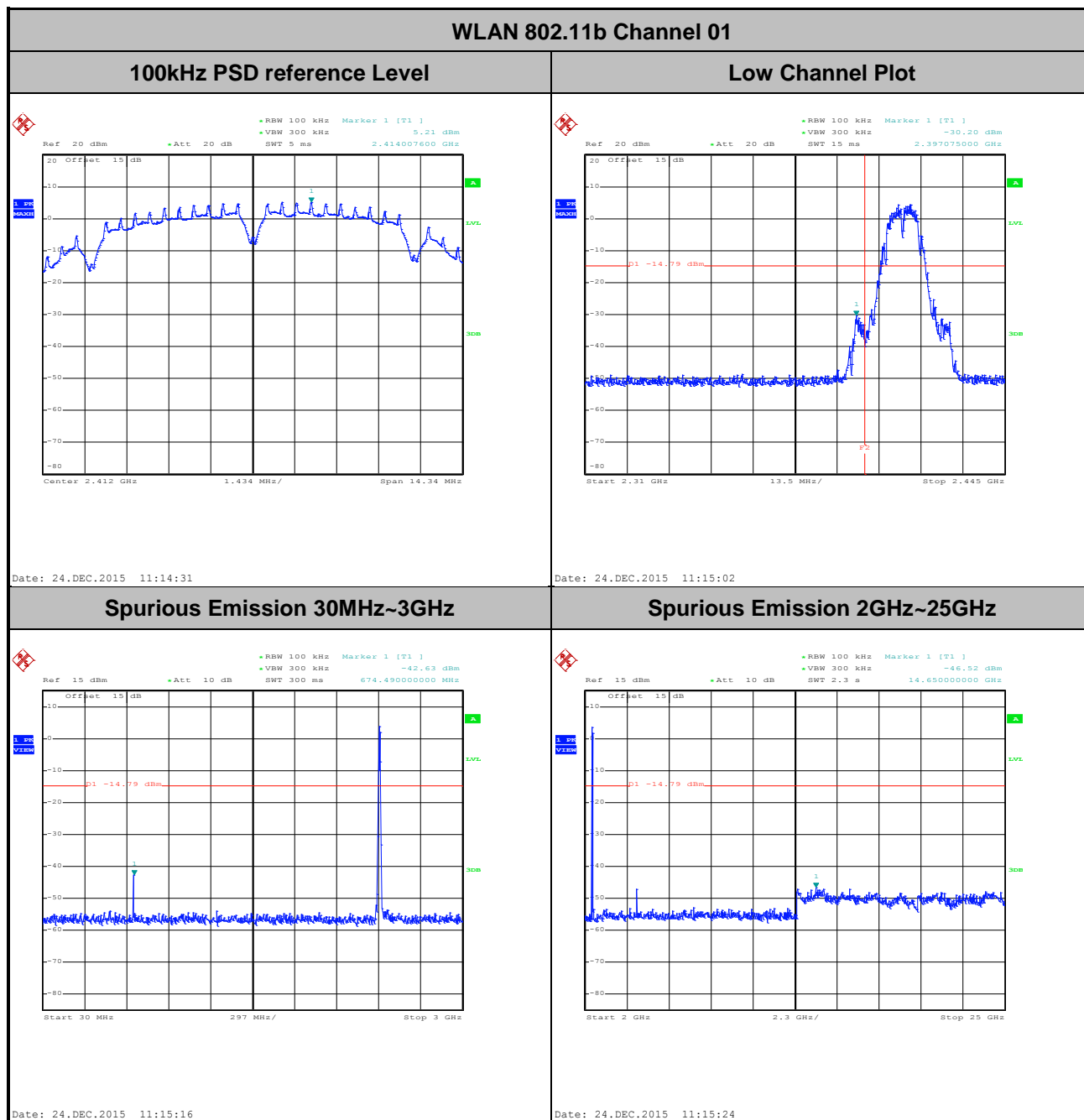
### **3.4.4 Test Setup**





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

Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Mygai Mo

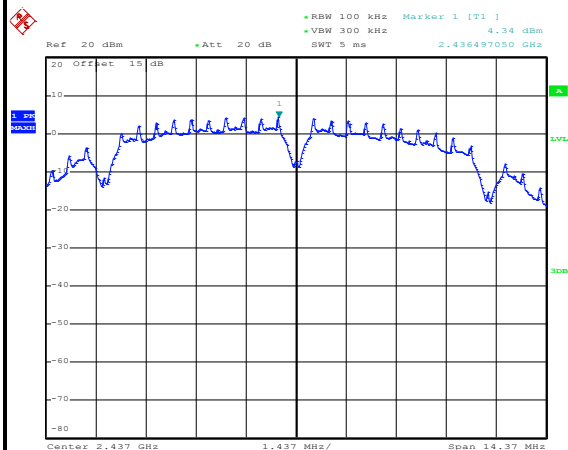




Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Mygai Mo

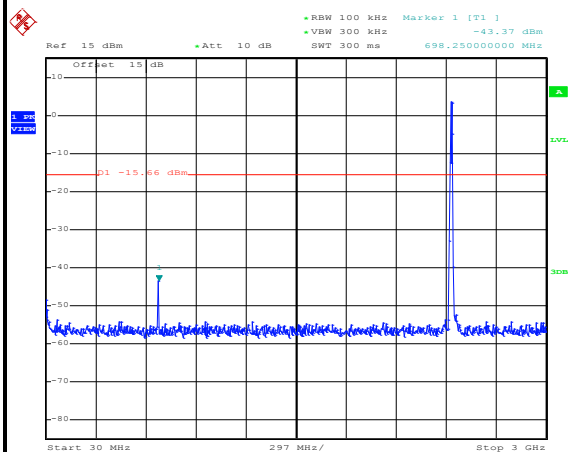
## WLAN 802.11b Channel 06

## 100kHz PSD reference Level



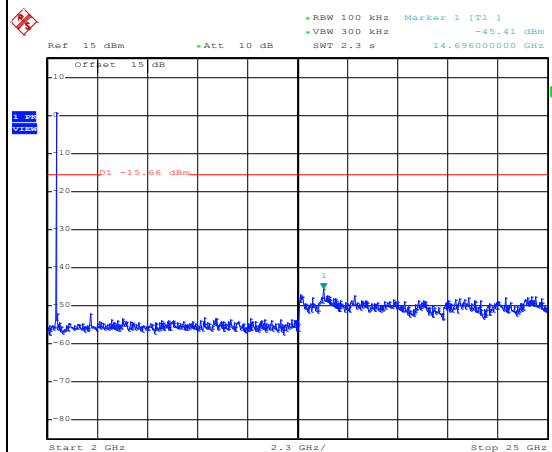
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## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 11:21:36

## Spurious Emission 2GHz~25GHz



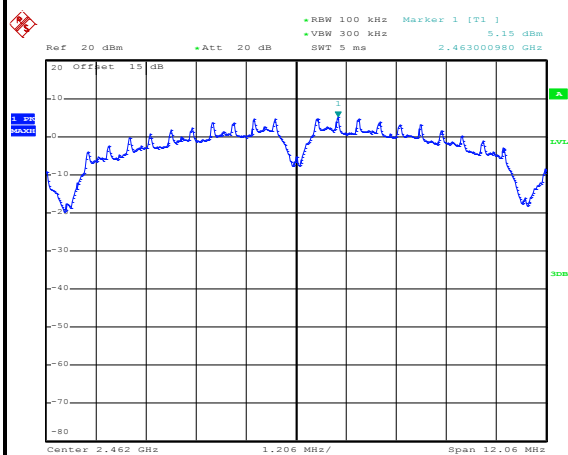
Date: 24.DEC.2015 11:21:44



Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Mygai Mo

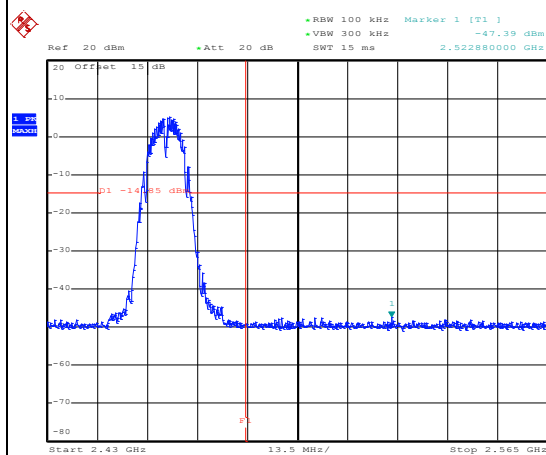
## WLAN 802.11b Channel 11

## 100kHz PSD reference Level



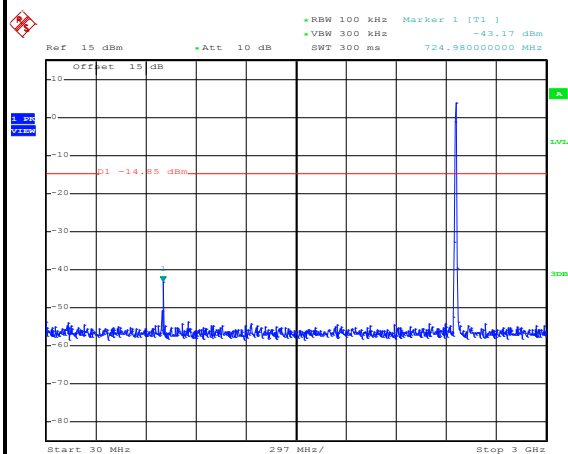
Date: 24.DEC.2015 11:29:31

## High Channel Plot



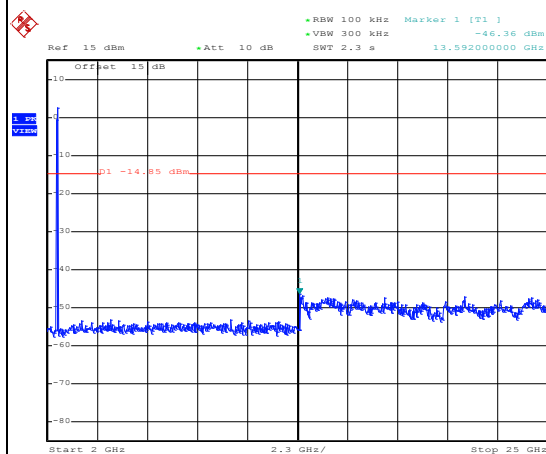
Date: 24.DEC.2015 11:31:59

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 11:32:11

## Spurious Emission 2GHz~25GHz



Date: 24.DEC.2015 11:32:20

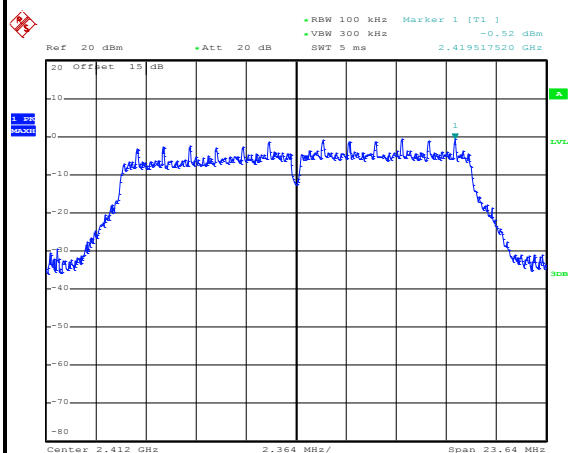




Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Mygai Mo

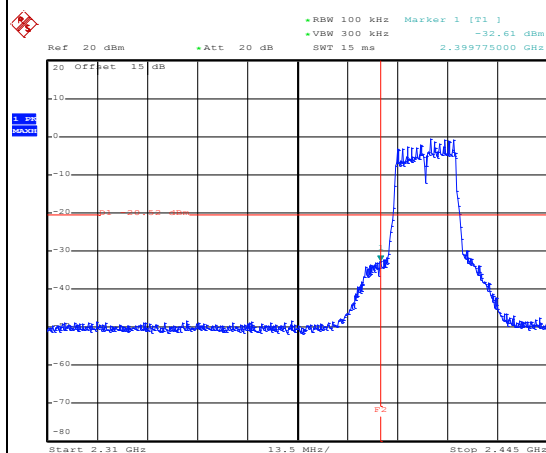
## WLAN 802.11g Channel 01

## 100kHz PSD reference Level



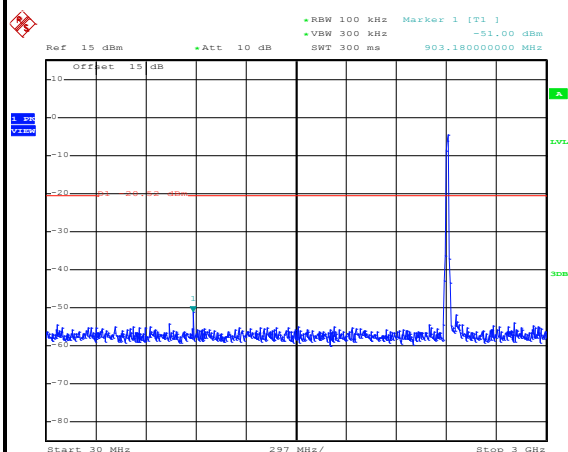
Date: 24.DEC.2015 13:48:36

## Low Channel Plot



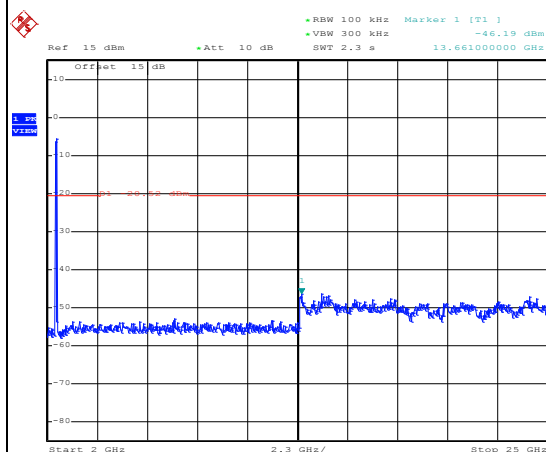
Date: 24.DEC.2015 23:40:50

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 13:59:53

## Spurious Emission 2GHz~25GHz



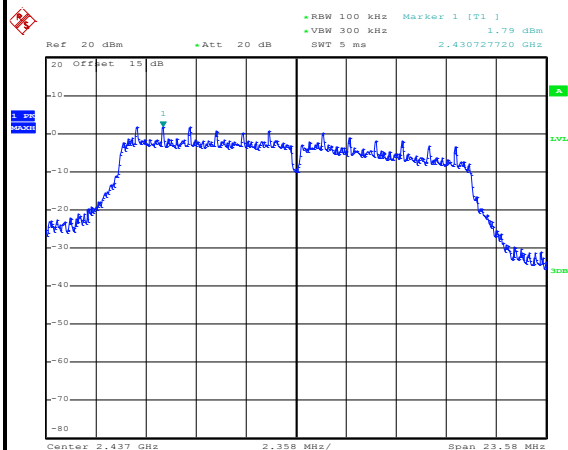
Date: 24.DEC.2015 13:55:18



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Mygai Mo

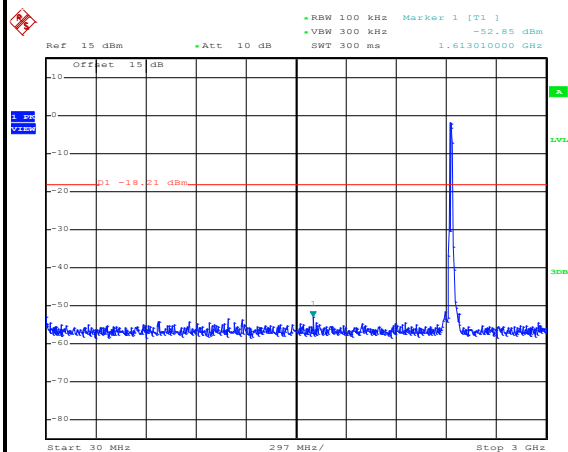
## WLAN 802.11g Channel 06

## 100kHz PSD reference Level



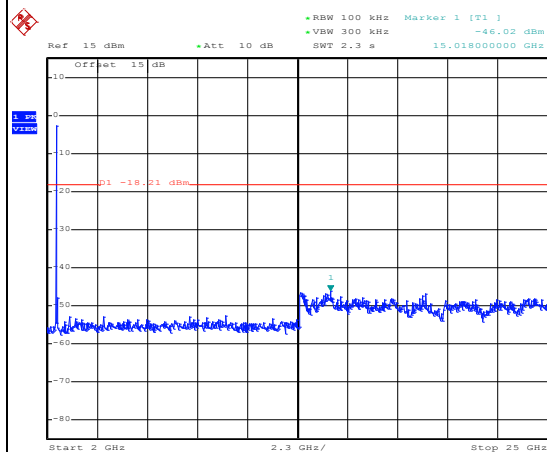
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## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 14:08:51

## Spurious Emission 2GHz~25GHz



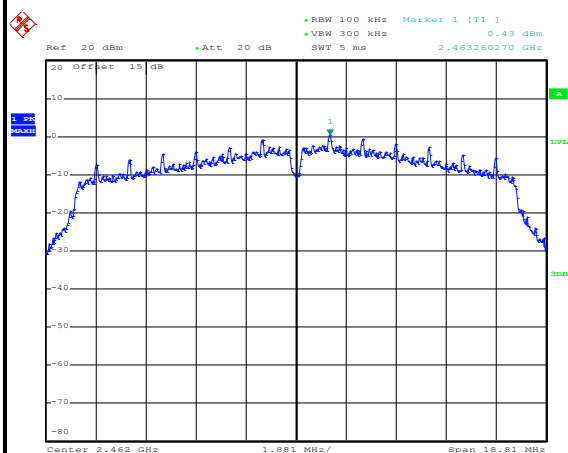
Date: 24.DEC.2015 14:09:00



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Mygai Mo

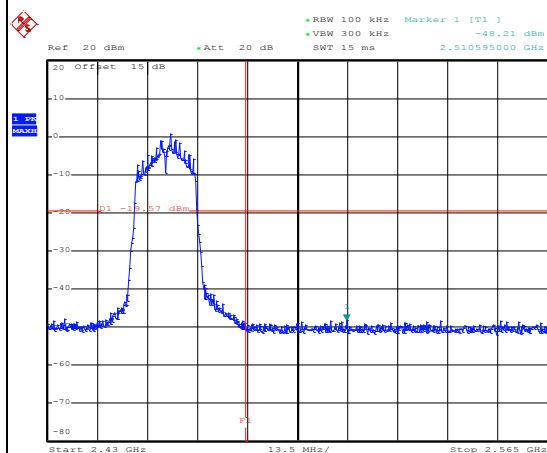
## WLAN 802.11g Channel 11

## 100kHz PSD reference Level



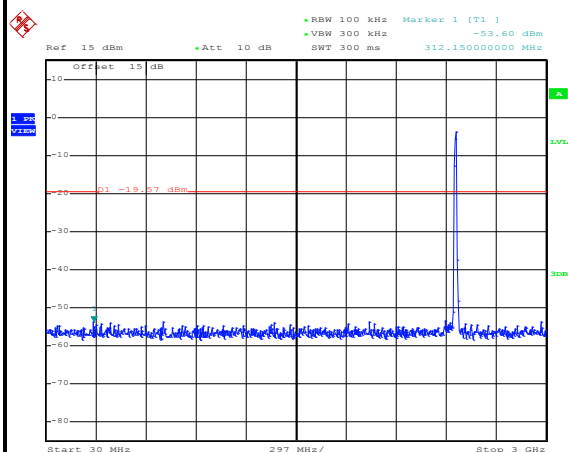
Date: 24.DEC.2015 14:29:37

## High Channel Plot



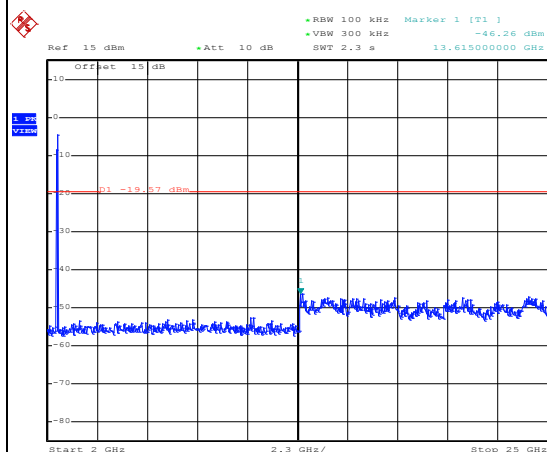
Date: 24.DEC.2015 14:30:06

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 14:31:26

## Spurious Emission 2GHz~25GHz



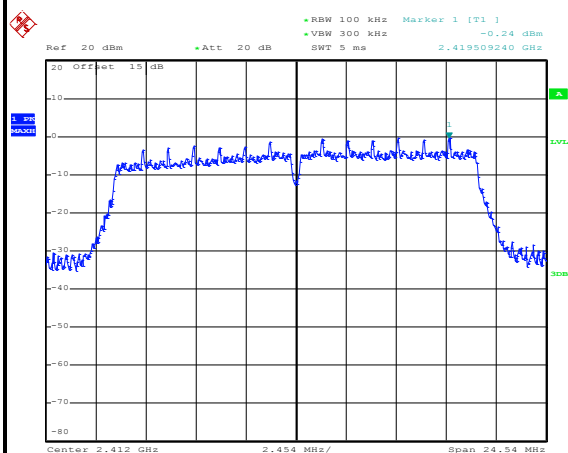
Date: 24.DEC.2015 14:31:34



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Mygai Mo

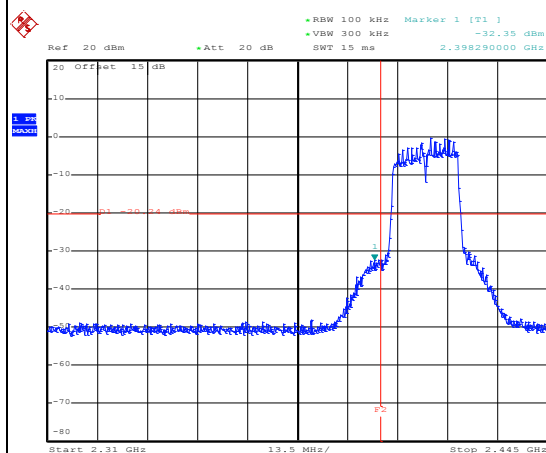
## WLAN 802.11n HT20 Channel 01

## 100kHz PSD reference Level



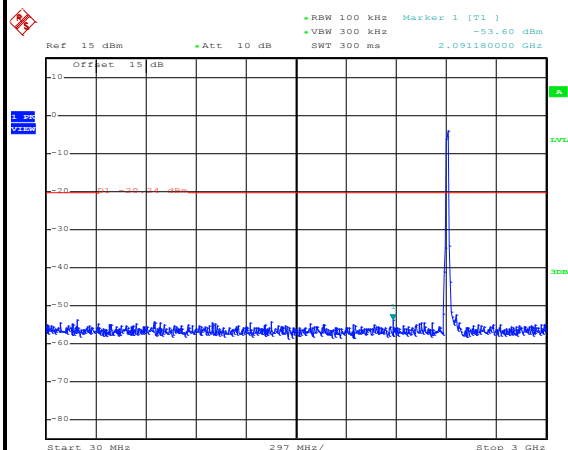
Date: 24.DEC.2015 14:43:27

## Low Channel Plot



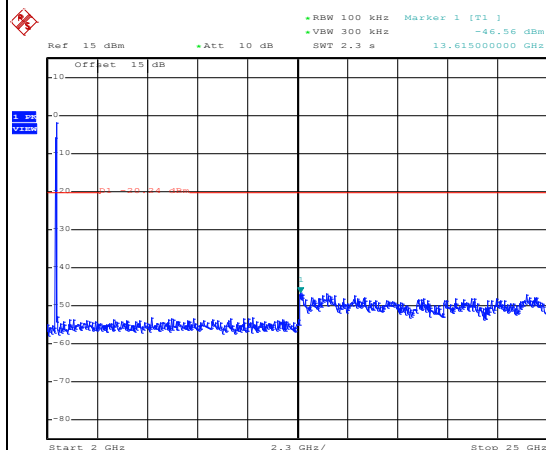
Date: 24.DEC.2015 14:43:50

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 14:44:03

## Spurious Emission 2GHz~25GHz



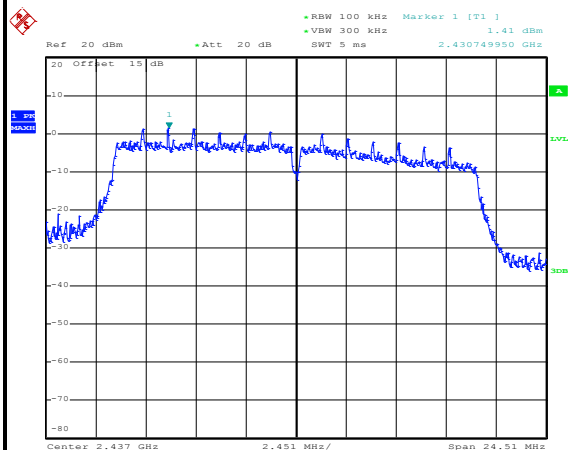
Date: 24.DEC.2015 14:44:12



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Mygai Mo

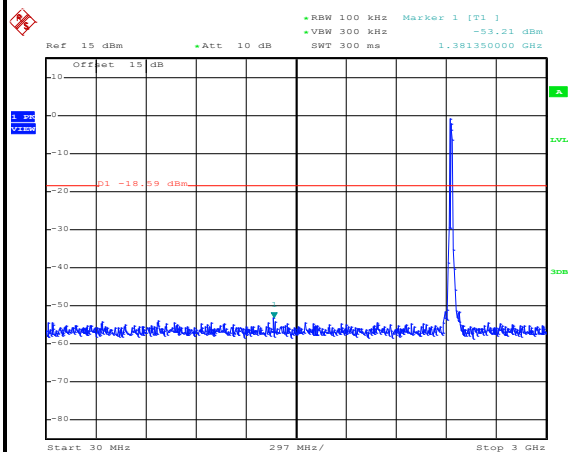
## WLAN 802.11n HT20 Channel 06

## 100kHz PSD reference Level



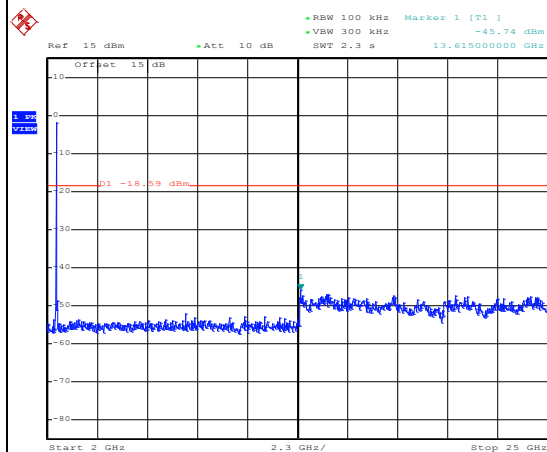
Date: 24.DEC.2015 14:49:25

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 14:50:18

## Spurious Emission 2GHz~25GHz



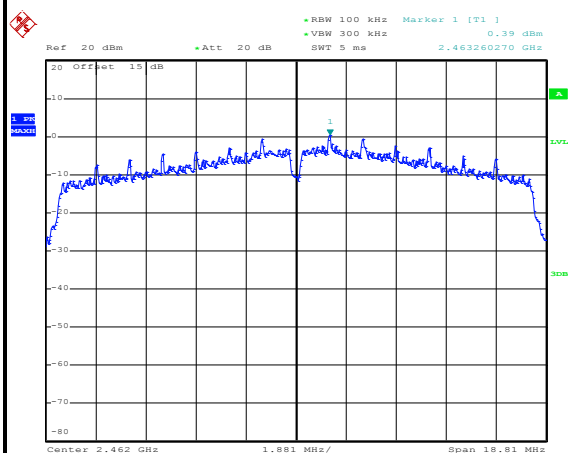
Date: 24.DEC.2015 14:50:26



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Mygai Mo

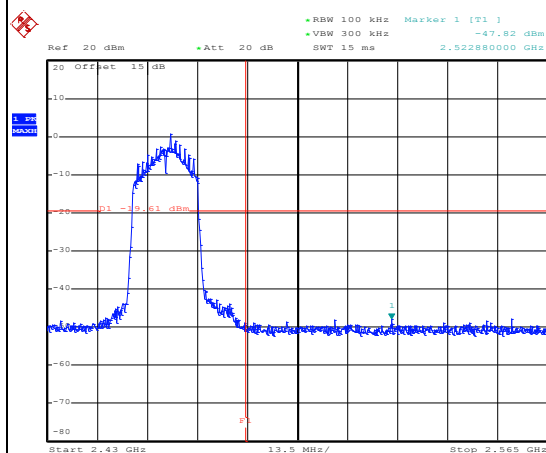
## WLAN 802.11n HT20 Channel 11

## 100kHz PSD reference Level



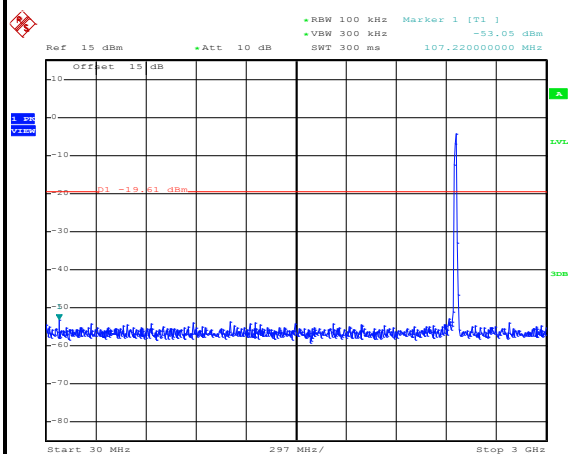
Date: 24.DEC.2015 15:05:39

## High Channel Plot



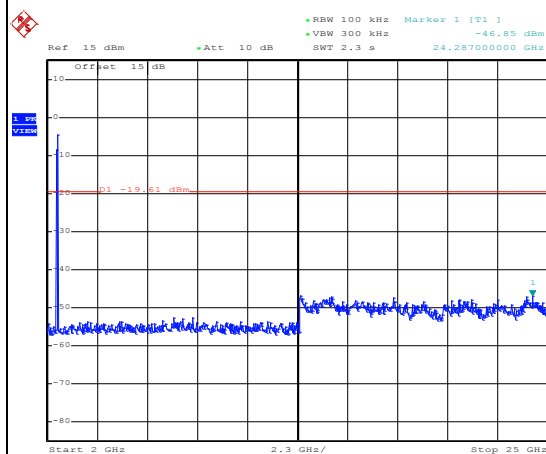
Date: 24.DEC.2015 15:06:39

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 15:07:14

## Spurious Emission 2GHz~25GHz



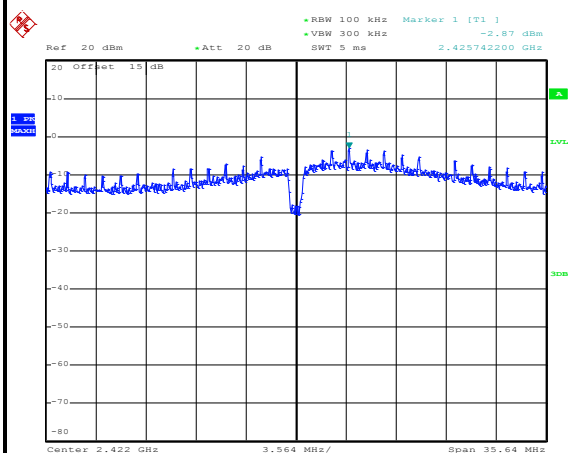
Date: 24.DEC.2015 15:07:22



Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	03	Test Engineer :	Mygai Mo

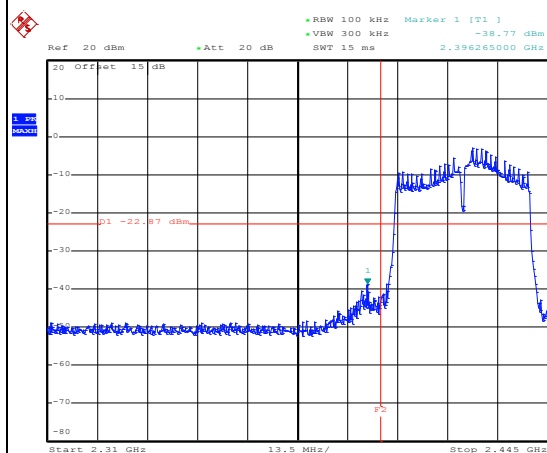
## WLAN 802.11n HT40 Channel 03

## 100kHz PSD reference Level



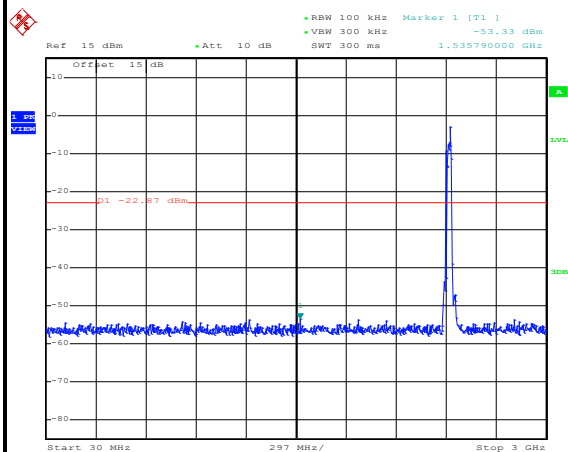
Date: 24.DEC.2015 15:18:29

## Low Channel Plot



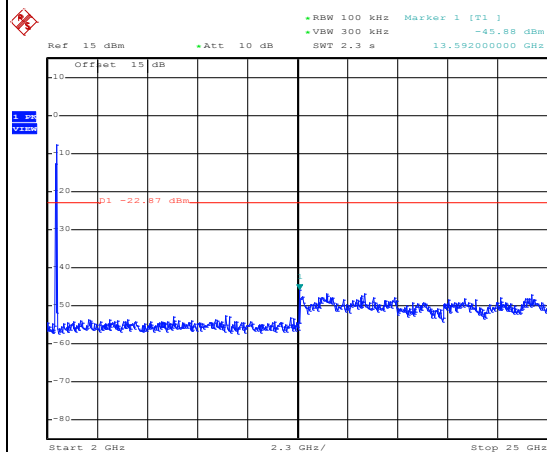
Date: 24.DEC.2015 15:18:47

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 15:24:47

## Spurious Emission 2GHz~25GHz



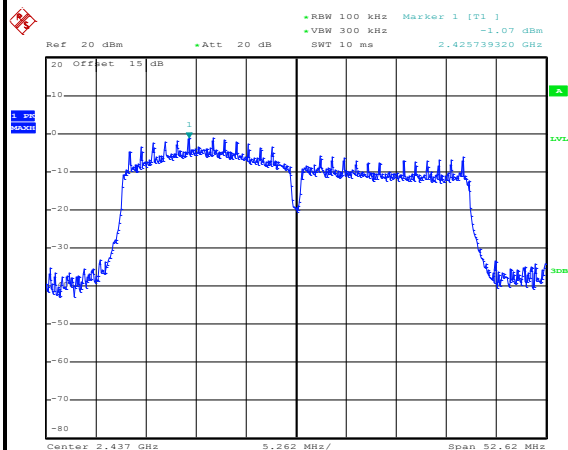
Date: 24.DEC.2015 15:22:40



Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Mygai Mo

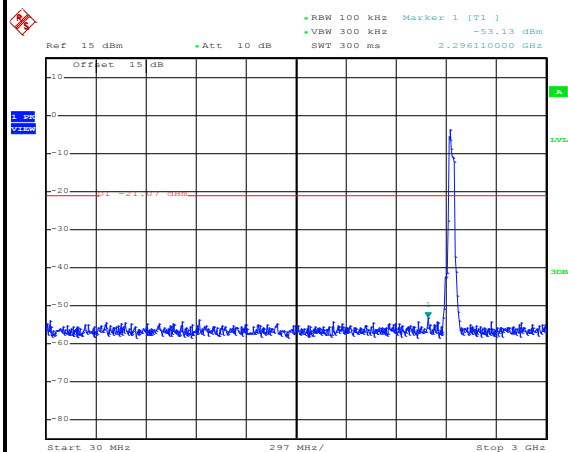
## WLAN 802.11n HT40 Channel 06

## 100kHz PSD reference Level



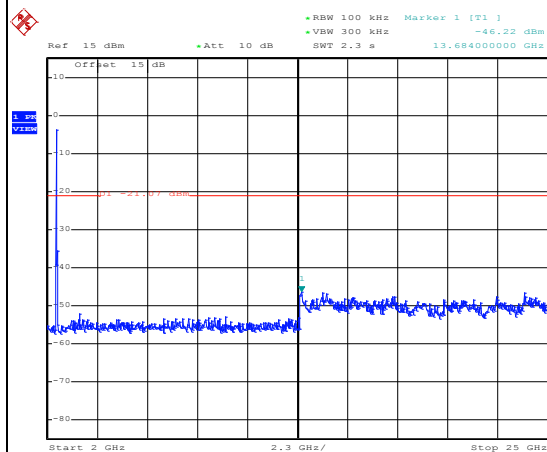
Date: 24.DEC.2015 15:31:15

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 15:31:26

## Spurious Emission 2GHz~25GHz



Date: 24.DEC.2015 15:31:35

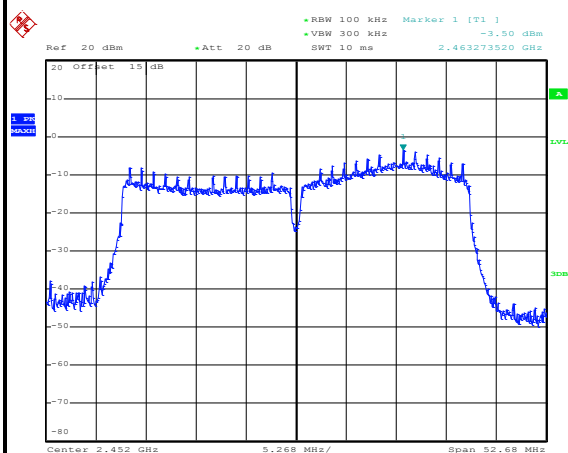




Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	09	Test Engineer :	Mygai Mo

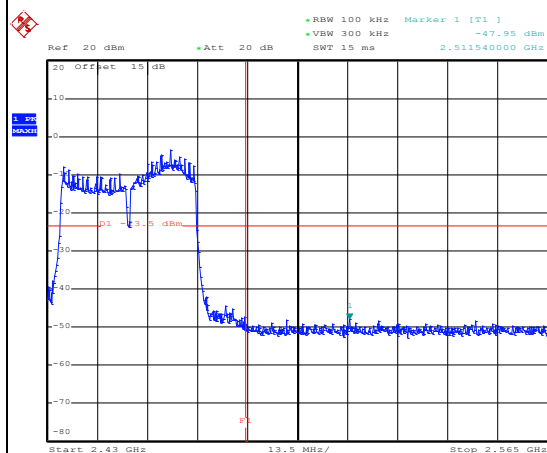
## WLAN 802.11n HT40 Channel 09

## 100kHz PSD reference Level



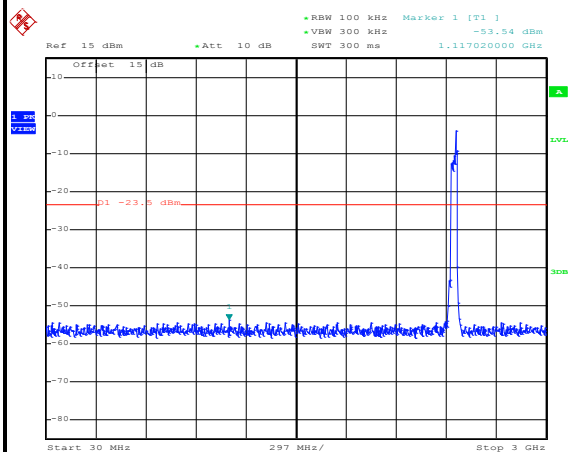
Date: 24.DEC.2015 15:36:02

## High Channel Plot



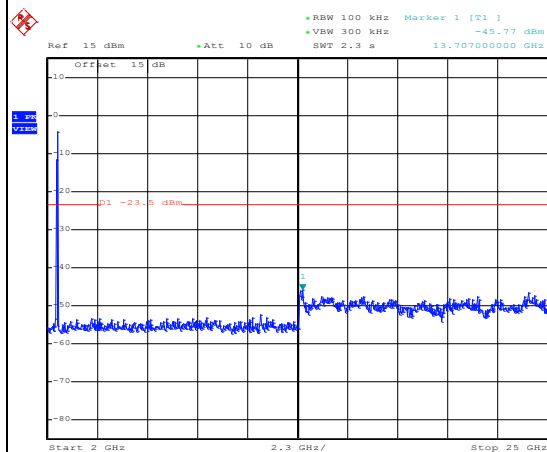
Date: 24.DEC.2015 15:36:19

## Spurious Emission 30MHz~3GHz



Date: 24.DEC.2015 15:37:11

## Spurious Emission 2GHz~25GHz



Date: 24.DEC.2015 15:37:19

### 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 v03r03.
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  $f < 1 \text{ GHz}$ ; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1 \text{ GHz}$  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.

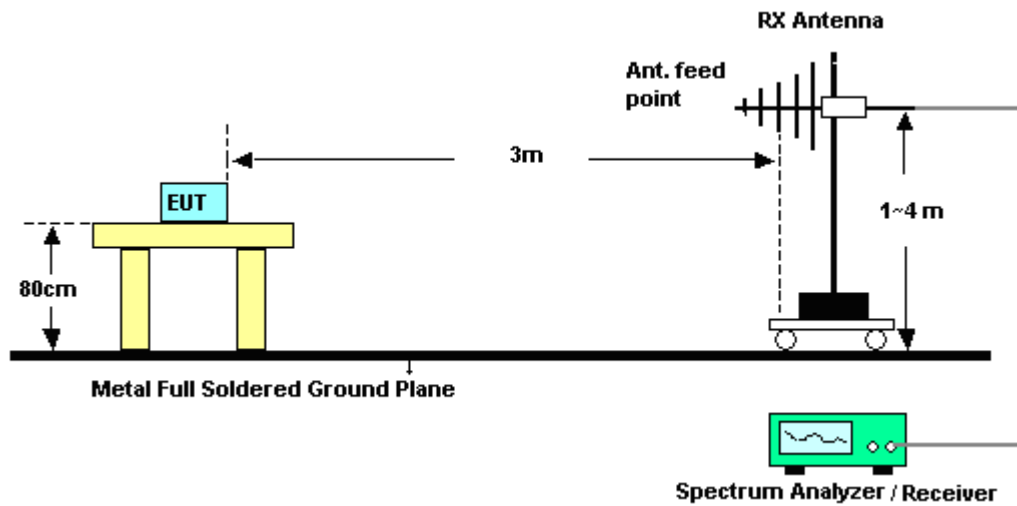
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.33	8.39	0.12	300Hz
802.11g	88.95	1.4	0.71	1kHz
2.4GHz 802.11n HT20	88.50	1.3	0.77	1kHz
2.4GHz 802.11n HT40	79.22	0.65	1.53	3kHz

### 3.5.4 Test Setup

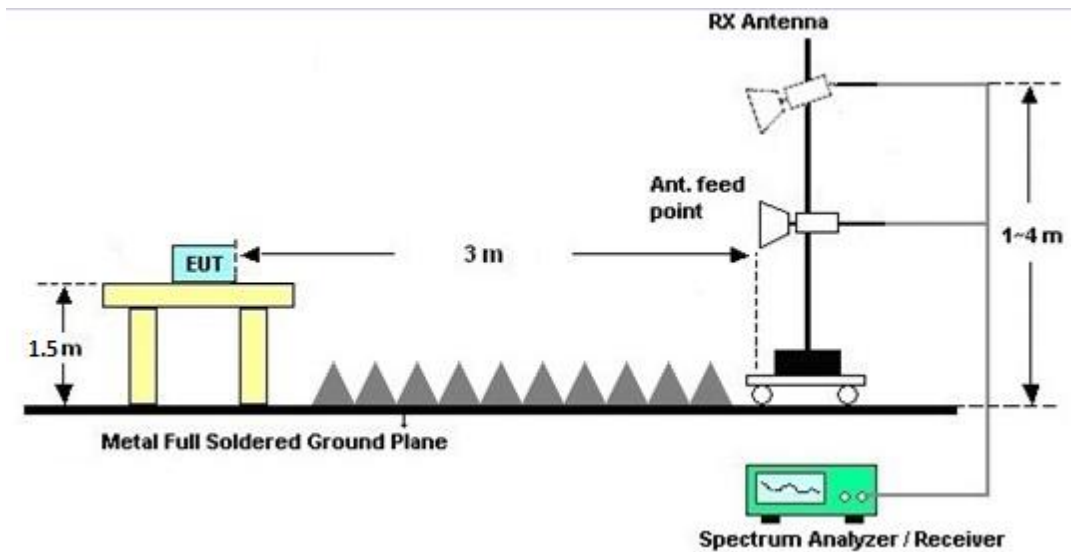
For radiated emissions below 30MHz



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.

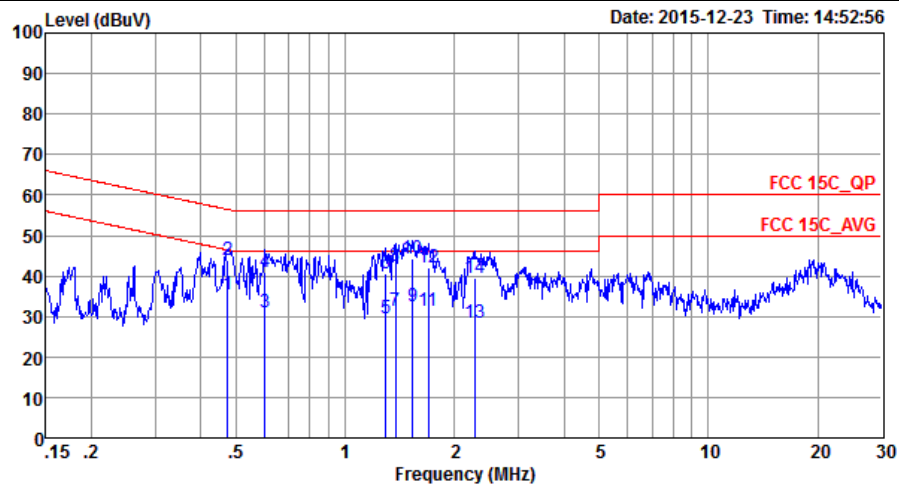
### 3.6.4 Test Setup





## 3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Jacky Yang	Relative Humidity :	41~43%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter) + SIM1		



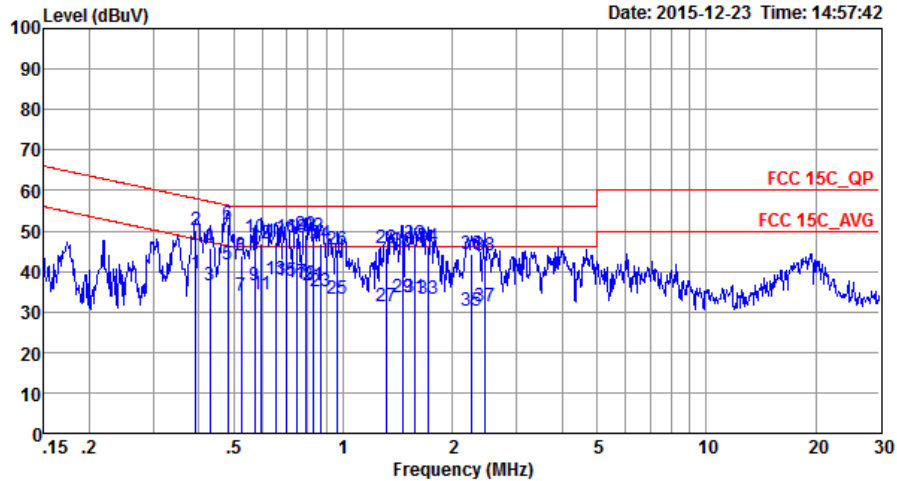
Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_L\_20150304 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.47	35.60	-10.85	46.45	24.80	0.64	10.16	Average
2	0.47	43.80	-12.65	56.45	33.00	0.64	10.16	QP
3	0.60	31.05	-14.95	46.00	20.30	0.60	10.15	Average
4	0.60	40.95	-15.05	56.00	30.20	0.60	10.15	QP
5	1.30	29.56	-16.44	46.00	18.91	0.49	10.16	Average
6	1.30	40.76	-15.24	56.00	30.11	0.49	10.16	QP
7	1.37	31.35	-14.65	46.00	20.69	0.49	10.17	Average
8	1.37	42.35	-13.65	56.00	31.69	0.49	10.17	QP
9	1.54	32.35	-13.65	46.00	21.70	0.48	10.17	Average
10	1.54	44.25	-11.75	56.00	33.60	0.48	10.17	QP
11	1.70	31.35	-14.65	46.00	20.70	0.47	10.18	Average
12	1.70	42.15	-13.85	56.00	31.50	0.47	10.18	QP
13	2.27	28.38	-17.62	46.00	17.69	0.49	10.20	Average
14	2.27	39.48	-16.52	56.00	28.79	0.49	10.20	QP





Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Jacky Yang	Relative Humidity :	41~43%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter) + SIM1		

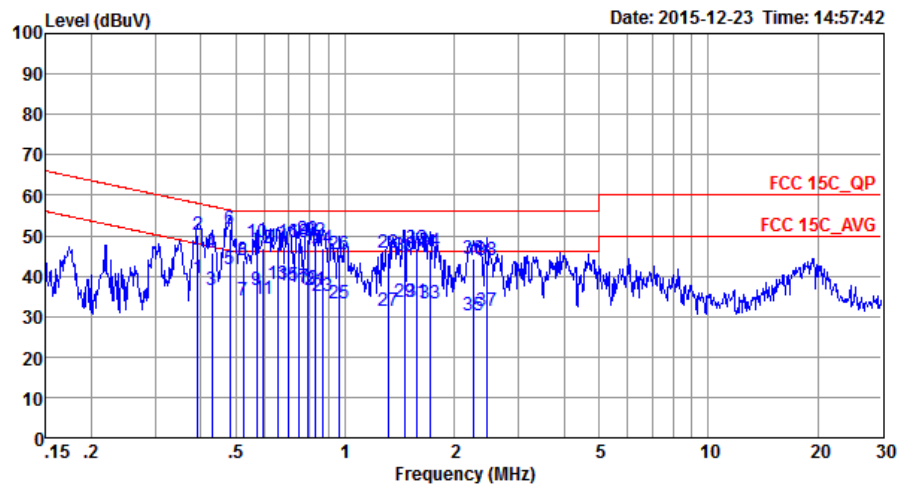


Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_N\_20150304 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.39	39.43	-8.56	47.99	28.71	0.55	10.17	Average
2	0.39	50.03	-7.96	57.99	39.31	0.55	10.17	QP
3	0.43	36.43	-10.81	47.24	25.70	0.57	10.16	Average
4	0.43	45.93	-11.31	57.24	35.20	0.57	10.16	QP
5 *	0.48	41.86	-4.46	46.32	31.10	0.60	10.16	Average
6	0.48	51.56	-4.76	56.32	40.80	0.60	10.16	QP
7	0.52	33.96	-12.04	46.00	23.21	0.60	10.15	Average
8	0.52	43.86	-12.14	56.00	33.11	0.60	10.15	QP
9	0.57	36.64	-9.36	46.00	25.90	0.59	10.15	Average
10	0.57	48.34	-7.66	56.00	37.60	0.59	10.15	QP
11	0.59	34.43	-11.57	46.00	23.70	0.58	10.15	Average
12	0.59	47.03	-8.97	56.00	36.30	0.58	10.15	QP
13	0.65	38.01	-7.99	46.00	27.30	0.56	10.15	Average
14	0.65	47.31	-8.69	56.00	36.60	0.56	10.15	QP
15	0.70	37.60	-8.40	46.00	26.90	0.55	10.15	Average
16	0.70	48.30	-7.70	56.00	37.60	0.55	10.15	QP
17	0.74	37.20	-8.80	46.00	26.50	0.55	10.15	Average
18	0.74	48.40	-7.60	56.00	37.70	0.55	10.15	QP
19	0.79	36.80	-9.20	46.00	26.10	0.55	10.15	Average
20	0.79	49.00	-7.00	56.00	38.30	0.55	10.15	QP
21	0.83	36.70	-9.30	46.00	26.00	0.55	10.15	Average
22	0.83	48.60	-7.40	56.00	37.90	0.55	10.15	QP
23	0.87	34.91	-11.09	46.00	24.20	0.56	10.15	Average
24	0.87	46.71	-9.29	56.00	36.00	0.56	10.15	QP
25	0.96	33.21	-12.79	46.00	22.50	0.56	10.15	Average
26	0.96	45.21	-10.79	56.00	34.50	0.56	10.15	QP
27	1.32	31.53	-14.47	46.00	20.80	0.56	10.17	Average
28	1.32	45.73	-10.27	56.00	35.00	0.56	10.17	QP
29	1.46	33.44	-12.56	46.00	22.70	0.57	10.17	Average



Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Jacky Yang	Relative Humidity :	41~43%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter) + SIM1		



Site : C001-SZ  
Condition: FCC 15C QP LISN N 20150304 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
30	1.46	45.04	-10.96	56.00	34.30	0.57	10.17	QP
31	1.57	33.44	-12.56	46.00	22.69	0.57	10.18	Average
32	1.57	47.04	-8.96	56.00	36.29	0.57	10.18	QP
33	1.72	33.05	-12.95	46.00	22.30	0.57	10.18	Average
34	1.72	46.15	-9.85	56.00	35.40	0.57	10.18	QP
35	2.25	30.28	-15.72	46.00	19.50	0.58	10.20	Average
36	2.25	44.18	-11.82	56.00	33.40	0.58	10.20	QP
37	2.46	31.29	-14.71	46.00	20.50	0.59	10.20	Average
38	2.46	43.89	-12.11	56.00	33.10	0.59	10.20	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	Dec. 24, 2015	Jan. 27, 2016	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 28, 2015	Dec. 24, 2015	Jan. 27, 2016	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 28, 2015	Dec. 24, 2015	Jan. 27, 2016	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent Technologies	N9038A	MY52260185	20Hz~26.5GHz	May 26, 2015	Dec. 29, 2015	May 25, 2016	Radiation (03CH01-SZ)
Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz;Max 30dBm	Jun. 07, 2015	Dec. 29, 2015	Jun. 06, 2016	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 06, 2015	Dec. 29, 2015	May 05, 2016	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	23188	30MHz~2GHz	Oct. 17, 2015	Dec. 29, 2015	Oct. 16, 2016	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS Lindgren	3117	00119436	1GHz~18GHz	Oct. 17, 2015	Dec. 29, 2015	Oct. 16, 2016	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Aug. 19, 2015	Dec. 29, 2015	Aug. 18, 2016	Radiation (03CH01-SZ)
Amplifier	ADVANTEST	BB525C	E9007003	9kHz~3000MHz / 30 dB	Jan. 28, 2015	Dec. 29, 2015	Jan. 27, 2016	Radiation (03CH01-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 28, 2015	Dec. 29, 2015	Jan. 27, 2016	Radiation (03CH01-SZ)
Amplifier	Yiai	AV3860B	04030	2GHz~26.5GHz	May 05, 2015	Dec. 29, 2015	May 04, 2016	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Dec. 29, 2015	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Dec. 29, 2015	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Dec. 29, 2015	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESCI7	100724	9kHz~3GHz;	Jan. 28, 2015	Dec. 23, 2015	Jan. 27, 2016	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	103892	9kHz~30MHz	Feb. 02, 2015	Dec. 23, 2015	Feb. 01, 2016	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	AN3016	16850	9kHz~30MHz	Feb. 02, 2015	Dec. 23, 2015	Feb. 01, 2016	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Aug. 07, 2015	Dec. 23, 2015	Aug. 06, 2016	Conduction (CO01-SZ)
Pulse Limiter	COM-POWER	LIT-153 Transient Limiter	53139	150kHz~30MHz	Oct. 20, 2015	Dec. 23, 2015	Oct. 19, 2016	Conduction (CO01-SZ)

NCR: No Calibration Required



## 5 Uncertainty of Evaluation

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

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.8 dB
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## **Appendix A. Conducted Test Results**

**A1 - DTS Part**

Test Engineer:	Mygai Mo	Temperature:	24~26	°C
Test Date:	2015/12/24	Relative Humidity:	50~53	%

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

2.4GHz Band								
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	13.25	9.56	0.50	Pass
11b	1Mbps	1	6	2437	13.15	9.58	0.50	Pass
11b	1Mbps	1	11	2462	11.80	8.04	0.50	Pass
11g	6Mbps	1	1	2412	17.90	15.76	0.50	Pass
11g	6Mbps	1	6	2437	17.95	15.72	0.50	Pass
11g	6Mbps	1	11	2462	16.75	12.52	0.50	Pass
HT20	MCS0	1	1	2412	18.65	16.36	0.50	Pass
HT20	MCS0	1	6	2437	18.65	16.34	0.50	Pass
HT20	MCS0	1	11	2462	17.55	12.54	0.50	Pass
HT40	MCS0	1	3	2422	35.90	23.76	0.50	Pass
HT40	MCS0	1	6	2437	36.20	35.08	0.50	Pass
HT40	MCS0	1	9	2452	36.50	35.12	0.50	Pass



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

2.4GHz Band										
Mod.	Data Rate	N <sub>TX</sub>	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	16.40	30.00	0.10	16.50	36.00	Pass
11b	1Mbps	1	6	2437	16.01	30.00	0.10	16.11	36.00	Pass
11b	1Mbps	1	11	2462	15.93	30.00	0.10	16.03	36.00	Pass
11g	6Mbps	1	1	2412	18.79	30.00	0.10	18.89	36.00	Pass
11g	6Mbps	1	6	2437	19.41	30.00	0.10	19.51	36.00	Pass
11g	6Mbps	1	11	2462	18.98	30.00	0.10	19.08	36.00	Pass
HT20	MCS0	1	1	2412	18.80	30.00	0.10	18.90	36.00	Pass
HT20	MCS0	1	6	2437	19.48	30.00	0.10	19.58	36.00	Pass
HT20	MCS0	1	11	2462	18.72	30.00	0.10	18.82	36.00	Pass
HT40	MCS0	1	3	2422	18.14	30.00	0.10	18.24	36.00	Pass
HT40	MCS0	1	6	2437	20.52	30.00	0.10	20.62	36.00	Pass
HT40	MCS0	1	9	2452	18.22	30.00	0.10	18.32	36.00	Pass

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

2.4GHz Band						
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.12	13.76
11b	1Mbps	1	6	2437	0.12	13.41
11b	1Mbps	1	11	2462	0.12	13.06
11g	6Mbps	1	1	2412	0.51	9.76
11g	6Mbps	1	6	2437	0.51	11.41
11g	6Mbps	1	11	2462	0.51	9.20
HT20	MCS0	1	1	2412	0.53	9.88
HT20	MCS0	1	6	2437	0.53	11.55
HT20	MCS0	1	11	2462	0.53	9.13
HT40	MCS0	1	3	2422	1.01	8.14
HT40	MCS0	1	6	2437	1.01	10.82
HT40	MCS0	1	9	2452	1.01	7.25

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

2.4GHz Band								
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-8.41	0.10	8.00	Pass
11b	1Mbps	1	6	2437	-9.53	0.10	8.00	Pass
11b	1Mbps	1	11	2462	-7.29	0.10	8.00	Pass
11g	6Mbps	1	1	2412	-15.35	0.10	8.00	Pass
11g	6Mbps	1	6	2437	-12.59	0.10	8.00	Pass
11g	6Mbps	1	11	2462	-13.99	0.10	8.00	Pass
HT20	MCS0	1	1	2412	-13.80	0.10	8.00	Pass
HT20	MCS0	1	6	2437	-13.67	0.10	8.00	Pass
HT20	MCS0	1	11	2462	-15.29	0.10	8.00	Pass
HT40	MCS0	1	3	2422	-18.33	0.10	8.00	Pass
HT40	MCS0	1	6	2437	-16.08	0.10	8.00	Pass
HT40	MCS0	1	9	2452	-19.09	0.10	8.00	Pass



## Appendix B. Radiated Spurious Emission

### 15C 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		2328.18	46.68	-27.32	74	38.39	32.53	5.03	29.27	219	143	P	H
		2387.22	36.5	-17.5	54	28.14	32.6	5.1	29.34	219	143	A	H
	*	2412	100.75	-	-	92.42	32.61	5.1	29.38	219	143	P	H
	*	2412	98.53	-	-	90.2	32.61	5.1	29.38	219	143	A	H
		2386.05	49.1	-24.9	74	40.74	32.6	5.1	29.34	176	132	P	V
		2387.4	39.18	-14.82	54	30.82	32.6	5.1	29.34	176	132	A	V
	*	2412	104.31	-	-	95.98	32.61	5.1	29.38	176	132	P	V
	*	2412	102.31	-	-	93.98	32.61	5.1	29.38	176	132	A	V
802.11b CH 06 2437MHz		2327.01	47.11	-26.89	74	38.82	32.53	5.03	29.27	243	143	P	H
		2390	35.37	-18.63	54	27.05	32.6	5.1	29.38	243	143	A	H
	*	2437	101.29	-	-	92.85	32.65	5.14	29.35	243	143	P	H
	*	2437	99.08	-	-	90.64	32.65	5.14	29.35	243	143	A	H
		2484.92	46.79	-27.21	74	38.21	32.68	5.21	29.31	243	143	P	H
		2484.28	36.01	-17.99	54	27.43	32.68	5.21	29.31	243	143	A	H
		2387.67	46.81	-27.19	74	38.45	32.6	5.1	29.34	155	132	P	V
		2387.58	36.27	-17.73	54	27.91	32.6	5.1	29.34	155	132	A	V
	*	2437	104.38	-	-	95.94	32.65	5.14	29.35	155	132	P	V
	*	2437	102.26	-	-	93.82	32.65	5.14	29.35	155	132	A	V
		2483.84	47.99	-26.01	74	39.41	32.68	5.21	29.31	155	132	P	V
		2483.52	37.32	-16.68	54	28.74	32.68	5.21	29.31	155	132	A	V



<b>802.11b CH 11 2462MHz</b>	*	2462	99.27	-	-	90.76	32.67	5.17	29.33	219	141	P	H
	*	2462	97.03	-	-	88.52	32.67	5.17	29.33	219	141	A	H
		2483.92	47.47	-26.53	74	38.89	32.68	5.21	29.31	219	141	P	H
		2483.52	36.87	-17.13	54	28.29	32.68	5.21	29.31	219	141	A	H
	*	2462	103.38	-	-	94.87	32.67	5.17	29.33	232	132	P	V
	*	2462	101.35	-	-	92.84	32.67	5.17	29.33	232	132	A	V
		2483.8	48.98	-25.02	74	40.4	32.68	5.21	29.31	232	132	P	V
		2483.52	39.08	-14.92	54	30.5	32.68	5.21	29.31	232	132	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Harmonic @ 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		4824	44.13	-29.87	74	60.67	34.4	7.45	58.39	185	255	P	H
		4824	45.1	-28.9	74	61.64	34.4	7.45	58.39	185	255	P	V
802.11b CH 06 2437MHz		4874	45.31	-28.69	74	62.04	34.43	7.5	58.66	165	106	P	H
		7311	45.89	-28.11	74	58.58	36.22	9.71	58.62	174	100	P	H
		4874	43.89	-30.11	74	60.62	34.43	7.5	58.66	165	106	P	V
		7311	46.2	-27.8	74	58.89	36.22	9.71	58.62	174	100	P	V
802.11b CH 11 2462MHz		4924	45.5	-28.5	74	62.04	34.46	7.52	58.52	150	285	P	H
		7386	46.39	-27.61	74	58.88	36.26	9.79	58.54	155	274	P	H
		4924	44.39	-29.61	74	60.93	34.46	7.52	58.52	150	285	P	V
		7386	45.94	-28.06	74	58.43	36.26	9.79	58.54	155	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**15C 2.4GHz 2400~2483.5MHz**  
**WIFI 802.11g (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)
<b>802.11g CH 01 2412MHz</b>		2389.83	49	-25	74	40.68	32.6	5.1	29.38	218	142	P	H
		2389.92	37.95	-16.05	54	29.63	32.6	5.1	29.38	218	142	A	H
	*	2412	100.28	-	-	91.95	32.61	5.1	29.38	218	142	P	H
	*	2412	92.65	-	-	84.32	32.61	5.1	29.38	218	142	A	H
		2389.83	53.46	-20.54	74	45.14	32.6	5.1	29.38	177	133	P	V
		2389.74	40.14	-13.86	54	31.78	32.6	5.1	29.34	177	133	A	V
	*	2412	103.4	-	-	95.07	32.61	5.1	29.38	177	133	P	V
	*	2412	95.29	-	-	86.96	32.61	5.1	29.38	177	133	A	V
<b>802.11g CH 06 2437MHz</b>		2389.11	48.21	-25.79	74	39.85	32.6	5.1	29.34	245	143	P	H
		2389.47	37.07	-16.93	54	28.71	32.6	5.1	29.34	245	143	A	H
	*	2437	102.27	-	-	93.83	32.65	5.14	29.35	245	143	P	H
	*	2437	94.6	-	-	86.16	32.65	5.14	29.35	245	143	A	H
		2484.44	48.33	-25.67	74	39.75	32.68	5.21	29.31	245	143	P	H
		2483.56	38.3	-15.7	54	29.72	32.68	5.21	29.31	245	143	A	H
		2388.39	48.43	-25.57	74	40.07	32.6	5.1	29.34	156	133	P	V
		2389.74	38.55	-15.45	54	30.19	32.6	5.1	29.34	156	133	A	V
	*	2437	104.7	-	-	96.26	32.65	5.14	29.35	156	133	P	V
	*	2437	97.1	-	-	88.66	32.65	5.14	29.35	156	133	A	V
		2483.56	50.81	-23.19	74	42.23	32.68	5.21	29.31	156	133	P	V
		2483.56	40.95	-13.05	54	32.37	32.68	5.21	29.31	156	133	A	V



<b>802.11g CH 11 2462MHz</b>	*	2462	99.51	-	-	91	32.67	5.17	29.33	218	144	P	H
	*	2462	90.92	-	-	82.41	32.67	5.17	29.33	218	144	A	H
		2483.64	52.39	-21.61	74	43.81	32.68	5.21	29.31	218	144	P	H
		2483.52	38.64	-15.36	54	30.06	32.68	5.21	29.31	218	144	A	H
	*	2462	101.38	-	-	92.87	32.67	5.17	29.33	150	131	P	V
	*	2462	93.71	-	-	85.2	32.67	5.17	29.33	150	131	A	V
		2483.8	57.12	-16.88	74	48.54	32.68	5.21	29.31	150	131	P	V
		2483.52	42.77	-11.23	54	34.19	32.68	5.21	29.31	150	131	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												





## 15C 2.4GHz 2400~2483.5MHz

## WIFI 802.11g (Harmonic @ 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)
802.11g CH 01 2412MHz		4824	44.72	-29.28	74	61.26	34.4	7.45	58.39	185	255	P	H
		4824	44.99	-29.01	74	61.53	34.4	7.45	58.39	185	255	P	V
802.11g CH 06 2437MHz		4874	43.55	-30.45	74	60.28	34.43	7.5	58.66	165	106	P	H
		7311	46.18	-27.82	74	58.87	36.22	9.71	58.62	174	100	P	H
		4874	43.21	-30.79	74	59.94	34.43	7.5	58.66	165	106	P	V
		7311	45.71	-28.29	74	58.4	36.22	9.71	58.62	174	100	P	V
802.11g CH 11 2462MHz		4924	44.85	-29.15	74	61.39	34.46	7.52	58.52	150	285	P	H
		7386	45.66	-28.34	74	58.15	36.26	9.79	58.54	155	274	P	H
		4924	43.65	-30.35	74	60.19	34.46	7.52	58.52	150	285	P	V
		7386	45.81	-28.19	74	58.3	36.26	9.79	58.54	155	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT20 (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)
802.11n HT20 CH 01 2412MHz		2389.56	54.94	-19.06	74	46.58	32.6	5.1	29.34	229	143	P	H
		2389.92	40.95	-13.05	54	32.63	32.6	5.1	29.38	229	143	A	H
	*	2412	101.19	-	-	92.86	32.61	5.1	29.38	229	143	P	H
	*	2412	93.31	-	-	84.98	32.61	5.1	29.38	229	143	A	H
		2389.83	53.49	-20.51	74	45.17	32.6	5.1	29.38	176	133	P	V
		2389.83	40.57	-13.43	54	32.25	32.6	5.1	29.38	176	133	A	V
	*	2412	103.58	-	-	95.25	32.61	5.1	29.38	176	133	P	V
	*	2412	94.71	-	-	86.38	32.61	5.1	29.38	176	133	A	V
802.11n HT20 CH 06 2437MHz		2387.31	48	-26	74	39.64	32.6	5.1	29.34	245	144	P	H
		2389.56	37.11	-16.89	54	28.75	32.6	5.1	29.34	245	144	A	H
	*	2437	103.02	-	-	94.58	32.65	5.14	29.35	245	144	P	H
	*	2437	94.37	-	-	85.93	32.65	5.14	29.35	245	144	A	H
		2484.4	48.59	-25.41	74	40.01	32.68	5.21	29.31	245	144	P	H
		2483.72	38.13	-15.87	54	29.55	32.68	5.21	29.31	245	144	A	H
		2389.74	48.49	-25.51	74	40.13	32.6	5.1	29.34	155	132	P	V
		2388.57	38.5	-15.5	54	30.14	32.6	5.1	29.34	155	132	A	V
	*	2437	104.71	-	-	96.27	32.65	5.14	29.35	155	132	P	V
	*	2437	96.74	-	-	88.3	32.65	5.14	29.35	155	132	A	V
		2483.56	50.37	-23.63	74	41.79	32.68	5.21	29.31	155	132	P	V
		2483.76	40.94	-13.06	54	32.36	32.68	5.21	29.31	155	132	A	V



<b>802.11n</b> <b>HT20</b> <b>CH 11</b> <b>2462MHz</b>	*	2462	99.49	-	-	90.98	32.67	5.17	29.33	218	142	P	H
	*	2462	91.72	-	-	83.21	32.67	5.17	29.33	218	142	A	H
		2483.72	51.9	-22.1	74	43.32	32.68	5.21	29.31	218	142	P	H
		2483.52	40.33	-13.67	54	31.75	32.68	5.21	29.31	218	142	A	H
	*	2462	102.05	-	-	93.54	32.67	5.17	29.33	150	132	P	V
	*	2462	93.58	-	-	85.07	32.67	5.17	29.33	150	132	A	V
		2483.76	58.56	-15.44	74	49.98	32.68	5.21	29.31	150	132	P	V
		2483.52	44.18	-9.82	54	35.6	32.68	5.21	29.31	150	132	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT20 (Harmonic @ 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)
802.11n HT20 CH 01 2412MHz		4824	44.34	-29.66	74	60.88	34.4	7.45	58.39	185	255	P	H
		4824	44.62	-29.38	74	61.16	34.4	7.45	58.39	185	255	P	V
802.11n HT20 CH 06 2437MHz		4874	44.33	-29.67	74	61.06	34.43	7.5	58.66	165	106	P	H
		7311	45.3	-28.7	74	57.99	36.22	9.71	58.62	174	100	P	H
		4874	42.97	-31.03	74	59.7	34.43	7.5	58.66	165	106	P	V
		7311	45.87	-28.13	74	58.56	36.22	9.71	58.62	174	100	P	V
802.11n HT20 CH 11 2462MHz		4924	44.18	-29.82	74	60.72	34.46	7.52	58.52	150	285	P	H
		7386	46.18	-27.82	74	58.67	36.26	9.79	58.54	155	274	P	H
		4924	43.31	-30.69	74	59.85	34.46	7.52	58.52	150	285	P	V
		7386	45.89	-28.11	74	58.38	36.26	9.79	58.54	155	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT40 (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)
802.11n HT40 CH 03 2422MHz		2388.57	60.33	-13.67	74	51.97	32.6	5.1	29.34	229	143	P	H
		2389.92	43.46	-10.54	54	35.14	32.6	5.1	29.38	229	143	A	H
	*	2422	95.11	-	-	86.69	32.63	5.14	29.35	229	143	P	H
	*	2422	87.51	-	-	79.09	32.63	5.14	29.35	229	143	A	H
		2484.4	47.25	-26.75	74	38.67	32.68	5.21	29.31	229	143	P	H
		2484.32	37.61	-16.39	54	29.03	32.68	5.21	29.31	229	143	A	H
		2388.3	62.45	-11.55	74	54.09	32.6	5.1	29.34	176	133	P	V
		2388.21	45.28	-8.72	54	36.92	32.6	5.1	29.34	176	133	A	V
	*	2422	98.51	-	-	90.09	32.63	5.14	29.35	176	133	P	V
	*	2422	90.08	-	-	81.66	32.63	5.14	29.35	176	133	A	V
		2483.68	48.29	-25.71	74	39.71	32.68	5.21	29.31	176	133	P	V
		2483.72	39.06	-14.94	54	30.48	32.68	5.21	29.31	176	133	A	V
802.11n HT40 CH 06 2437MHz		2389.56	54.18	-19.82	74	45.82	32.6	5.1	29.34	250	143	P	H
		2389.83	41.95	-12.05	54	33.63	32.6	5.1	29.38	250	143	A	H
	*	2437	100.26	-	-	91.82	32.65	5.14	29.35	250	143	P	H
	*	2437	92.39	-	-	83.95	32.65	5.14	29.35	250	143	A	H
		2483.64	54.04	-19.96	74	45.46	32.68	5.21	29.31	250	143	P	H
		2483.52	40.63	-13.37	54	32.05	32.68	5.21	29.31	250	143	A	H
		2389.29	54.42	-19.58	74	46.06	32.6	5.1	29.34	226	354	P	V
		2389.56	41.81	-12.19	54	33.45	32.6	5.1	29.34	226	354	A	V
	*	2437	103.44	-	-	95	32.65	5.14	29.35	226	354	P	V
	*	2437	94.54	-	-	86.1	32.65	5.14	29.35	226	354	A	V
		2484.28	54.19	-19.81	74	45.61	32.68	5.21	29.31	226	354	P	V
		2483.64	42.79	-11.21	54	34.21	32.68	5.21	29.31	226	354	A	V



<b>802.11n</b> <b>HT40</b> <b>CH 09</b> <b>2452MHz</b>		2389.38	47.44	-26.56	74	39.08	32.6	5.1	29.34	250	144	P	H
		2389.47	37.62	-16.38	54	29.26	32.6	5.1	29.34	250	144	A	H
	*	2452	96.7	-	-	88.21	32.65	5.17	29.33	250	144	P	H
	*	2452	88.86	-	-	80.37	32.65	5.17	29.33	250	144	A	H
		2483.8	55.43	-18.57	74	46.85	32.68	5.21	29.31	250	144	P	H
		2483.68	39.86	-14.14	54	31.28	32.68	5.21	29.31	250	144	A	H
		2340.06	47.02	-26.98	74	38.76	32.54	5.03	29.31	157	133	P	V
		2388.12	37.56	-16.44	54	29.2	32.6	5.1	29.34	157	133	A	V
	*	2452	99.06	-	-	90.57	32.65	5.17	29.33	157	133	P	V
	*	2452	91.14	-	-	82.65	32.65	5.17	29.33	157	133	A	V
		2483.6	60.28	-13.72	74	51.7	32.68	5.21	29.31	157	133	P	V
		2483.92	43.04	-10.96	54	34.46	32.68	5.21	29.31	157	133	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT40 (Harmonic @ 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)
802.11n		4844	44.79	-29.21	74	61.38	34.41	7.48	58.48	150	350	P	H
HT40		7266	45.93	-28.07	74	58.63	36.21	9.62	58.53	200	360	P	H
CH 03		4844	44.34	-29.66	74	60.93	34.41	7.48	58.48	150	350	P	V
2422MHz		7266	46.4	-27.6	74	59.1	36.21	9.62	58.53	200	360	P	V
802.11n		4874	43.96	-30.04	74	60.69	34.43	7.5	58.66	165	230	P	H
HT40		7311	45.4	-28.6	74	58.09	36.22	9.71	58.62	186	323	P	H
CH 06		4874	44.84	-29.16	74	61.57	34.43	7.5	58.66	165	230	P	V
2437MHz		7311	46.85	-27.15	74	59.54	36.22	9.71	58.62	186	323	P	V
802.11n		4904	43.66	-30.34	74	60.33	34.45	7.52	58.64	150	360	P	H
HT40		7356	45.54	-28.46	74	58.12	36.24	9.75	58.57	165	335	P	H
CH 09		4904	43.25	-30.75	74	59.92	34.45	7.52	58.64	150	360	P	V
2452MHz		7356	45.8	-28.2	74	58.38	36.24	9.75	58.57	165	335	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**15C 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)
<b>2.4GHz</b> <b>802.11n</b> <b>HT40</b> <b>LF</b>		35.82	27.78	-12.22	40	30.45	22.54	0.82	26.03	200	305	P	H
		159.01	26.23	-17.27	43.5	37.53	12.28	1.89	25.47			P	H
		348.16	25.8	-20.2	46	33.6	14.73	2.88	25.41			P	H
		492.69	25.01	-20.99	46	28.61	19.09	3.61	26.3			P	H
		634.31	27.53	-18.47	46	29.7	19.9	4.35	26.42			P	H
		780.78	31.3	-14.7	46	30.54	22.07	4.9	26.21			P	H
		36.79	36.55	-3.45	40	39.72	22.03	0.83	26.03	150	200	P	V
		158.04	23.88	-19.62	43.5	35.11	12.36	1.88	25.47			P	V
		343.31	21.41	-24.59	46	29.26	14.67	2.86	25.38			P	V
		521.79	25.54	-20.46	46	28.74	19.46	3.7	26.36			P	V
		644.01	27.83	-18.17	46	29.9	19.96	4.38	26.41			P	V
		859.35	30.71	-15.29	46	29.47	21.97	5.26	25.99			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 per 15.209(c).
!	Test result is <b>over limit</b> line.
P/A	<b>P</b> eak or <b>A</b> verage
H/V	<b>H</b> orizontal or <b>V</b> ertical



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+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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”.**