



# FCC RF Test Report

**APPLICANT** : Shanghai Sunmi Science and Technology Co., Ltd.  
**EQUIPMENT** : Wireless data ordering system  
**BRAND NAME** : SUNMI  
**MODEL NAME** : W5910  
**FCC ID** : 2AH25M1  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was received on Jul. 27, 2016 and testing was completed on Sep. 15, 2016. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL (KUNSHAN) INC.**

**NO. 3-2, PINGXIANG ROAD, KUNSHAN, JIANGSU PROVINCE, P. R. CHINA**



## TABLE OF CONTENTS

<b>REVISION HISTORY .....</b>	<b>3</b>
<b>SUMMARY OF TEST RESULT .....</b>	<b>4</b>
<b>1 GENERAL DESCRIPTION .....</b>	<b>5</b>
1.1 Applicant .....	5
1.2 Manufacturer .....	5
1.3 Product Feature of Equipment Under Test .....	5
1.4 Product Specification of Equipment Under Test .....	5
1.5 Modification of EUT .....	6
1.6 Testing Location .....	6
1.7 Applicable Standards .....	6
<b>2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST .....</b>	<b>7</b>
2.1 Carrier Frequency and Channel .....	7
2.2 Test Mode .....	8
2.3 Connection Diagram of Test System .....	9
2.4 Support Unit used in test configuration and system .....	10
2.5 EUT Operation Test Setup .....	10
2.6 Measurement Results Explanation Example .....	11
<b>3 TEST RESULT .....</b>	<b>12</b>
3.1 6dB Bandwidth Measurement .....	12
3.2 Output Power Measurement .....	14
3.3 Power Spectral Density Measurement .....	15
3.4 Conducted Band Edges and Spurious Emission Measurement .....	17
3.5 Radiated Band Edges and Spurious Emission Measurement .....	30
3.6 AC Conducted Emission Measurement .....	34
3.7 Antenna Requirements .....	38
<b>4 LIST OF MEASURING EQUIPMENT .....</b>	<b>39</b>
<b>5 UNCERTAINTY OF EVALUATION .....</b>	<b>40</b>
<b>APPENDIX A. CONDUCTED TEST RESULTS</b>	
<b>APPENDIX B. RADIATED TEST RESULTS</b>	
<b>APPENDIX C. DUTY CYCLE PLOTS</b>	
<b>APPENDIX D. SETUP PHOTOGRAPHS</b>	



## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR672716C	Rev. 01	Initial issue of report	Oct. 18, 2016



## 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	-
3.1	-	99% Bandwidth	-	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 4.94 dB at 2484.530 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 20.91 dB at 0.647 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

Shanghai Sunmi Science and Technology Co., Ltd.

Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China

## 1.2 Manufacturer

Shanghai Longcheer Technology Co., Ltd.

Building 1, No.401, Caobao Rd, Xuhui District, Shanghai, P. R. China

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Wireless data ordering system
Brand Name	SUNMI
Model Name	W5910
FCC ID	2AH25M1
EUT supports Radios application	GPRS/EGPRS/ WCDMA/HSPA/HSPA+(16QAM uplink is not supported)/ WLAN2.4GHz 802.11b/g/n HT20/HT40/ Bluetooth v3.0+ EDR/Bluetooth v4.0 LE
IMEI Code	Conducted:865843024536382 Radiation:865843024542067 Conduction:865843024542240
HW Version	LWDM591
SW Version	LWDJ610
EUT Stage	Identical Prototype

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

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	802.11b : 18.79 dBm (0.0757 W) 802.11g : 22.04 dBm (0.1600 W) 802.11n HT20 : 21.32 dBm (0.1355 W) 802.11n HT40 : 22.26 dBm (0.1683 W)
Antenna Type / Gain	PIFA Antenna with gain -4.5 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 (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>	
	TH01-KS	CO01-KS

<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 Registration No.</b>
	03CH02-SZ	566869

**Note:** The test site complies with ANSI C63.4 2014 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 v03r05
- ♦ 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. 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 (Y plane) were recorded in this report.

### 2.1 Carrier Frequency and 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 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

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 : GPRS850 Idle + Bluetooth Link + WLAN Link + Adaptor with Cradle + Earphone

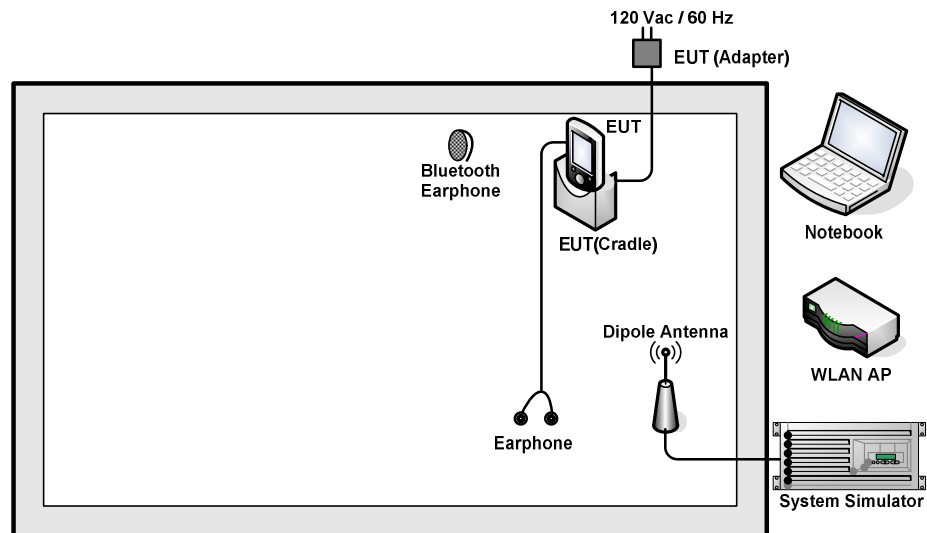


## 2.3 Connection Diagram of Test System

### <WLAN Tx Mode>



### <AC Conducted Emission Mode>



## 2.4 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	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH-308	N/A	N/A	N/A
5.	Earphone	Lenovo	LH102	N/A	Unshielded, 1.2m	N/A

## 2.5 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.



## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

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

Example :

The spectrum analyzer offset is derived from RF cable loss.

*Offset = RF cable loss.*

Following shows an offset computation example with cable loss 5.5 dB

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} \\ &= 5.5 \text{ (dB)}\end{aligned}$$

### 3 Test Result

#### 3.1 6dB Bandwidth Measurement

##### 3.1.1 Limit of 6dB Bandwidth

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

##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

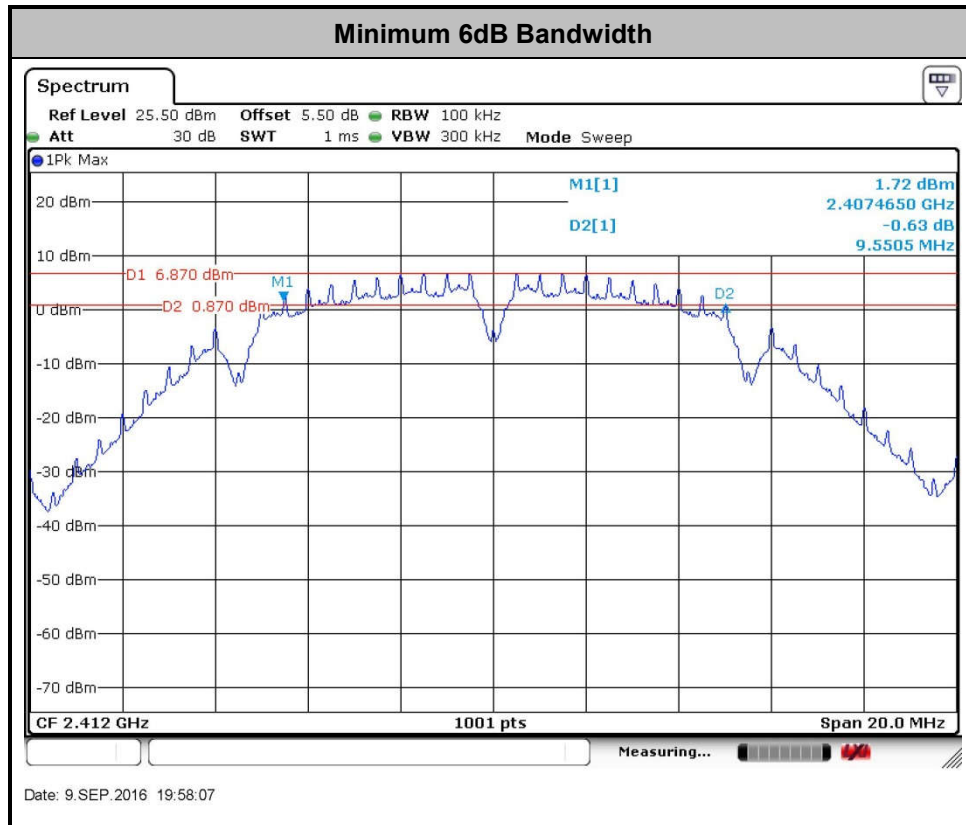
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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 Occupied Bandwidth

Please refer to Appendix A.



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 v03r05 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.

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

Please refer to Appendix A.

### 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 v03r05
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.

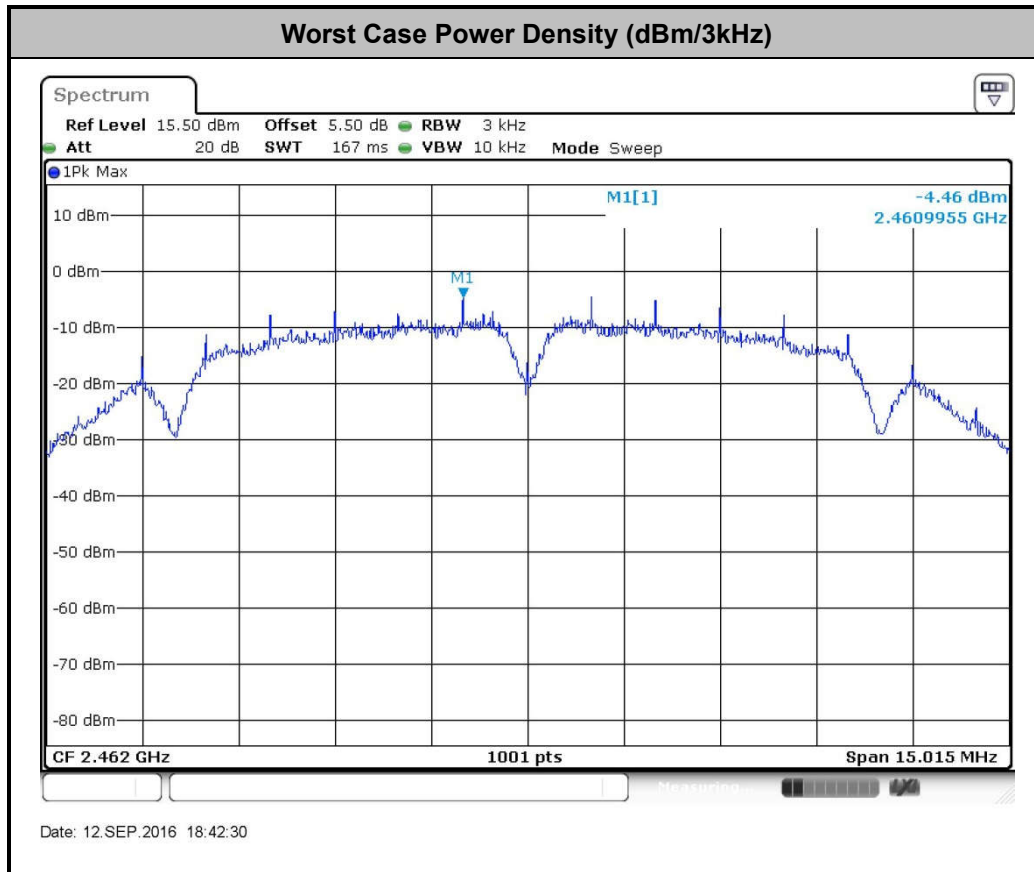
#### 3.3.4 Test Setup





### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.





### **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 v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

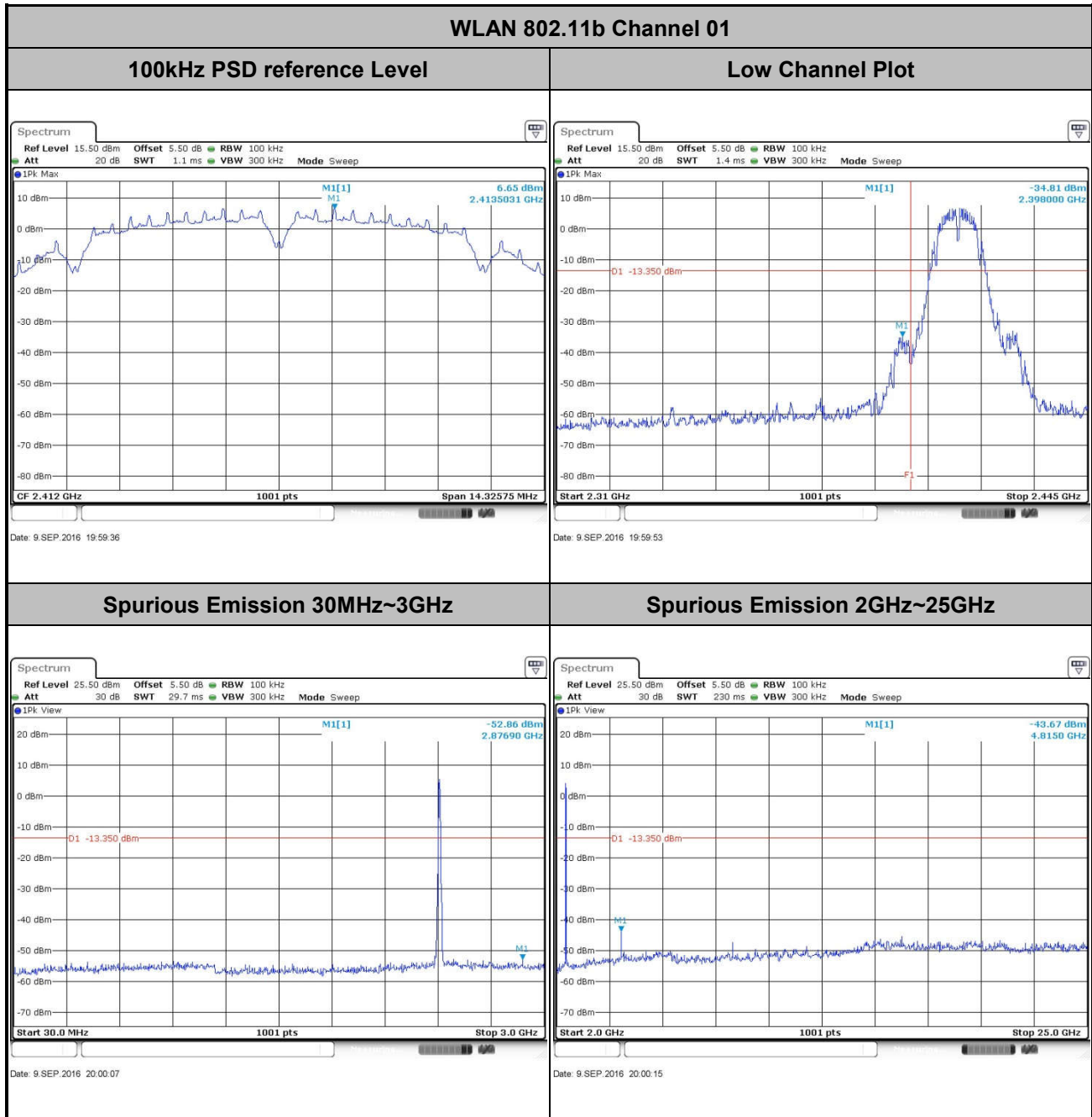
#### **3.4.4 Test Setup**





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

Test Mode :	802.11b	Temperature :	24~25℃
Test Band :	2.4GHz Low	Relative Humidity :	50~55%
Test Channel :	01	Test Engineer :	Silent Hai

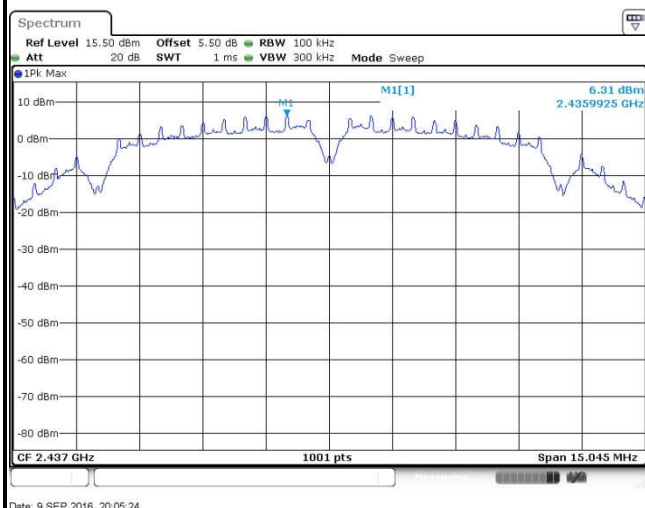




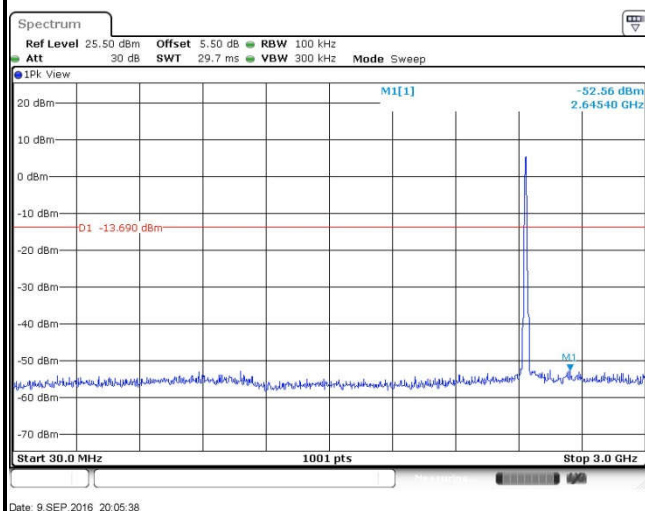
Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~55%
Test Channel :	06	Test Engineer :	Silent Hai

## WLAN 802.11b Channel 06

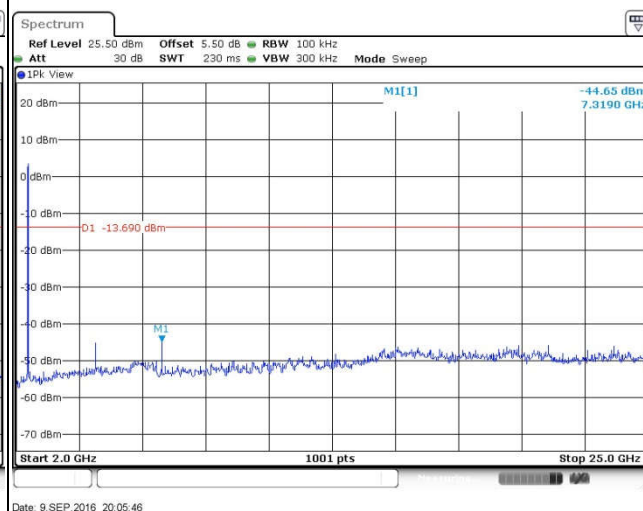
## 100kHz PSD reference Level



## Spurious Emission 30MHz~3GHz

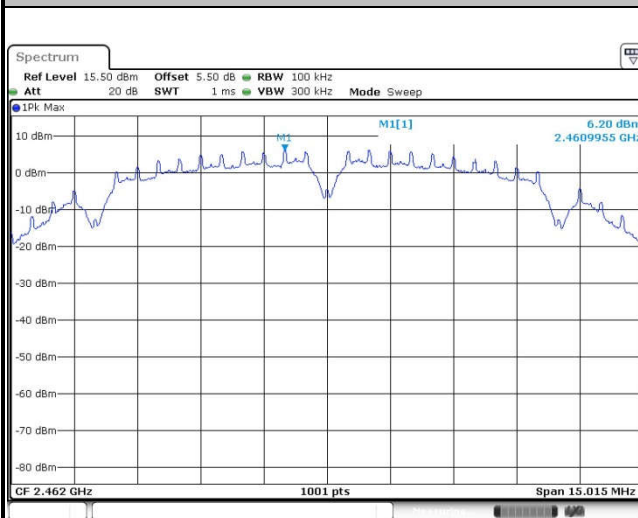


## Spurious Emission 2GHz~25GHz

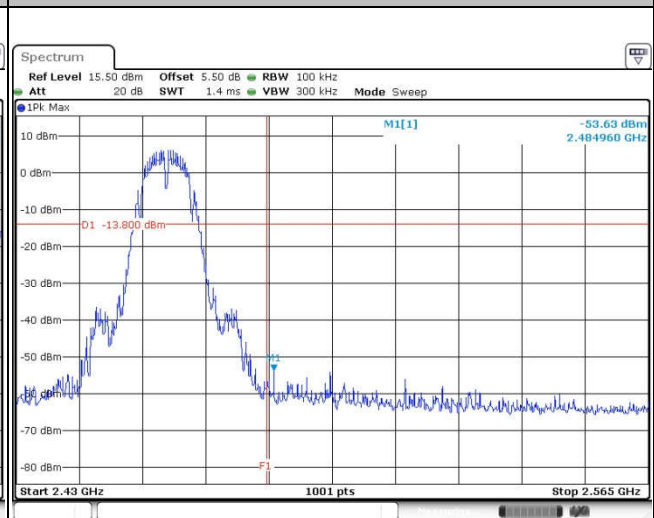




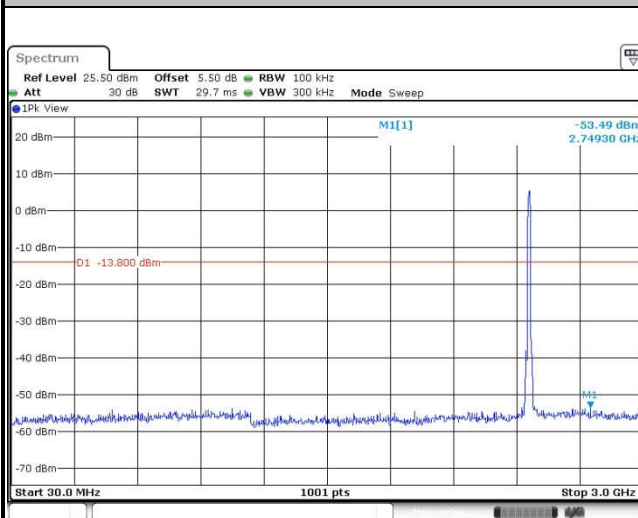
Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	50~55%
Test Channel :	11	Test Engineer :	Silent Hai

**WLAN 802.11b Channel 11****100kHz PSD reference Level**

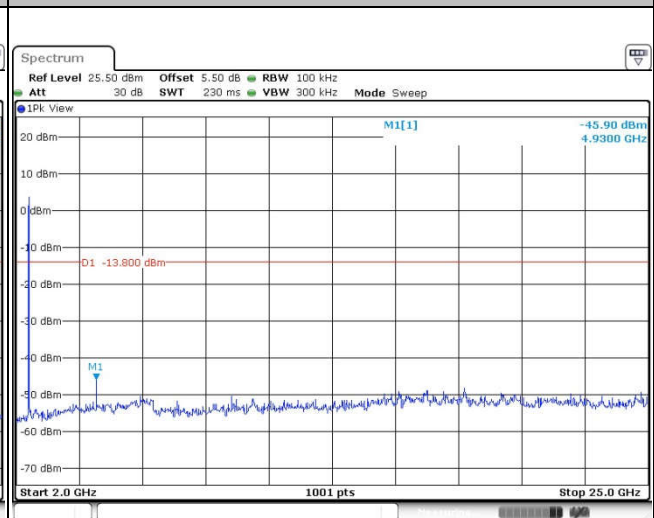
Date: 12 SEP. 2016 18:42:44

**High Channel Plot**

Date: 12 SEP. 2016 18:43:11

**Spurious Emission 30MHz~3GHz**

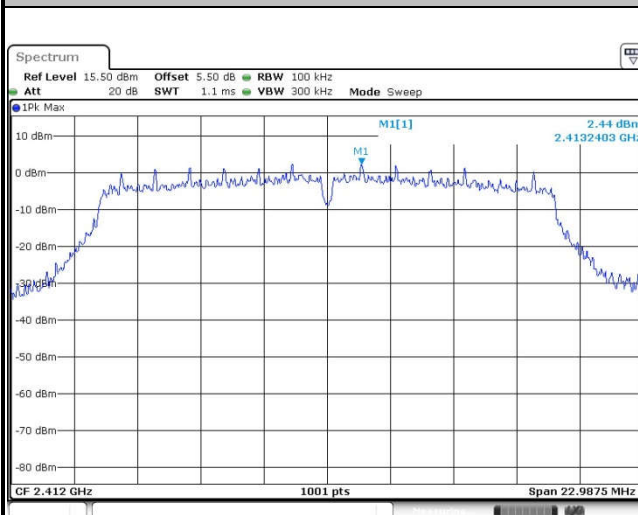
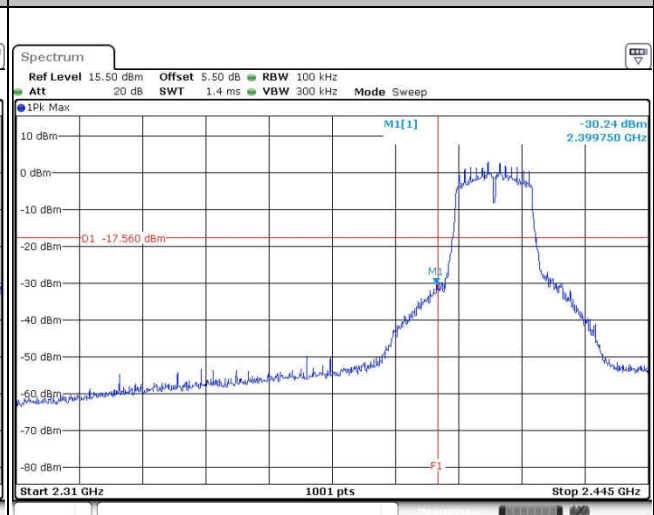
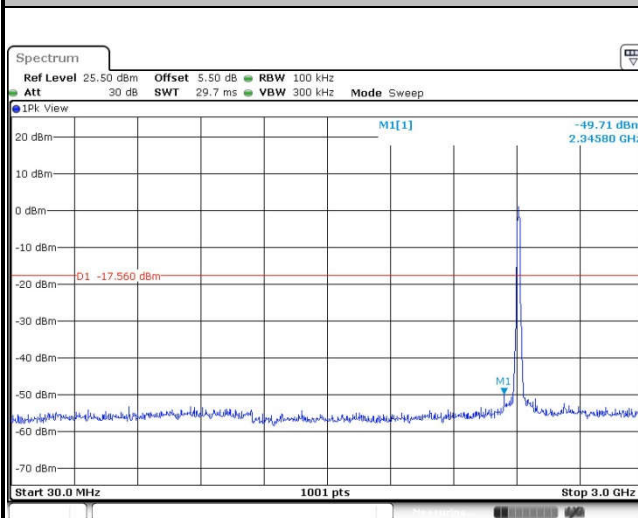
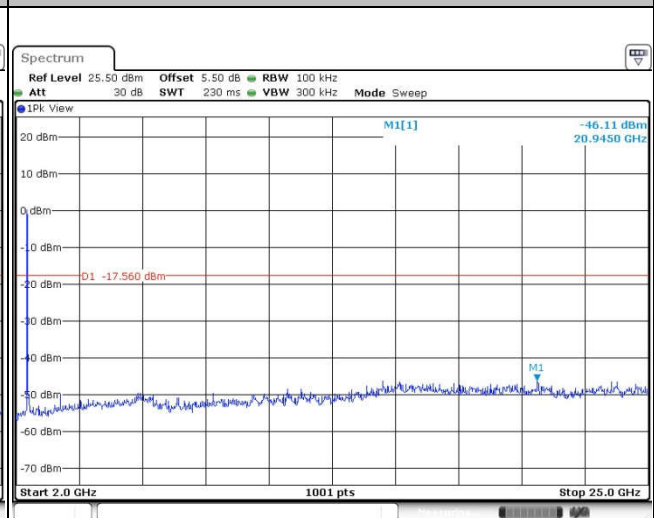
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**Spurious Emission 2GHz~25GHz**

Date: 12 SEP. 2016 18:43:30

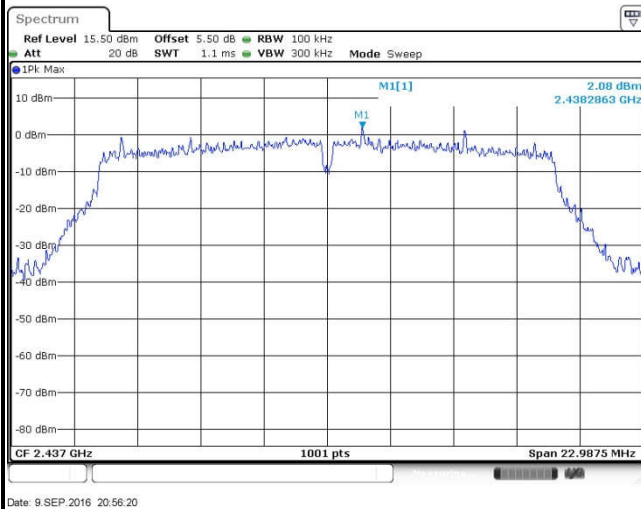
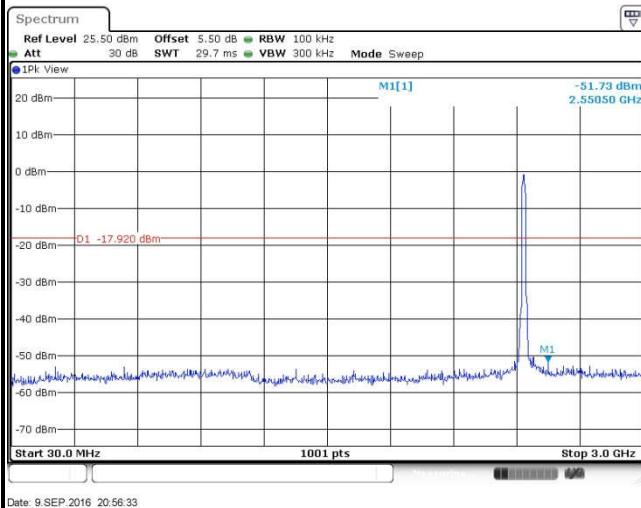
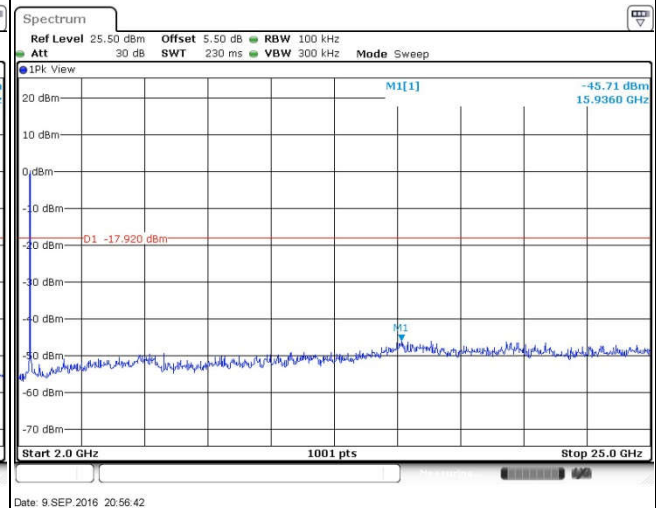


Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	50~55%
Test Channel :	01	Test Engineer :	Silent Hai

**WLAN 802.11g Channel 01****100kHz PSD reference Level****Low Channel Plot****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**

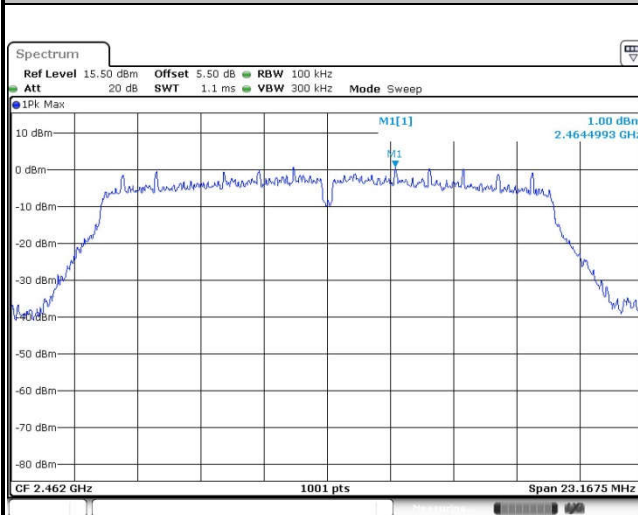
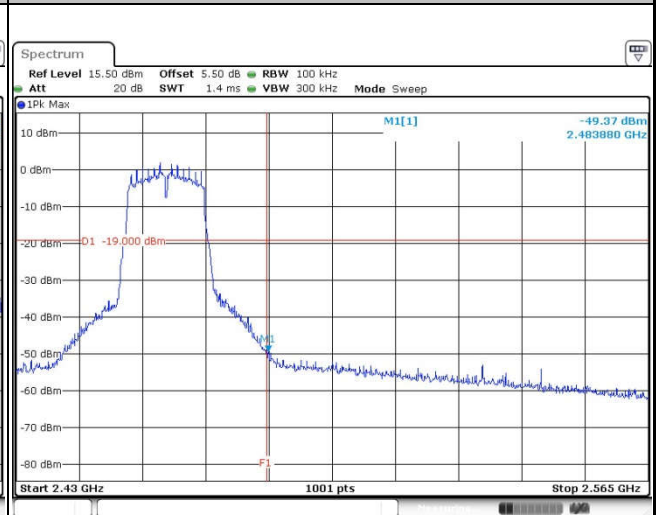
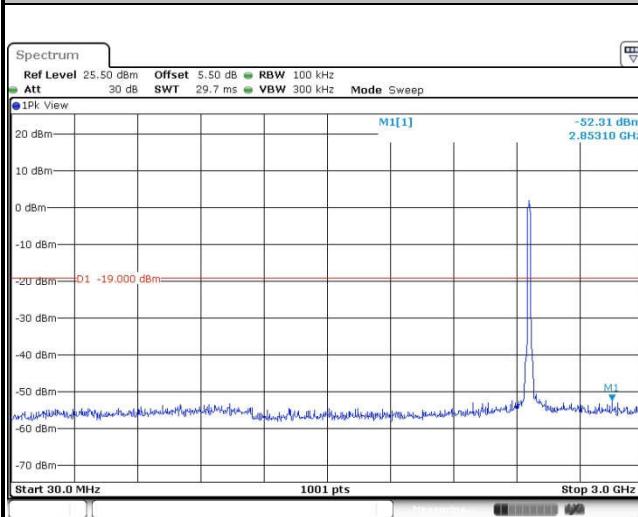
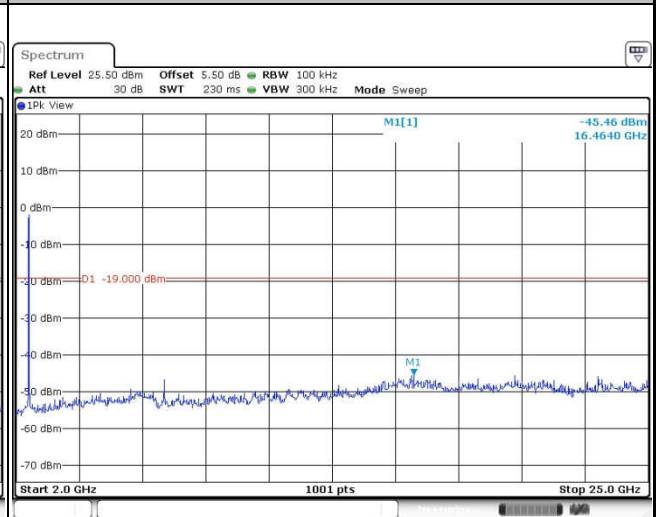


<b>Test Mode :</b>	802.11g	<b>Temperature :</b>	24~25°C
<b>Test Band :</b>	2.4GHz Mid	<b>Relative Humidity :</b>	50~55%
<b>Test Channel :</b>	06	<b>Test Engineer :</b>	Silent Hai

**WLAN 802.11g Channel 06****100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**

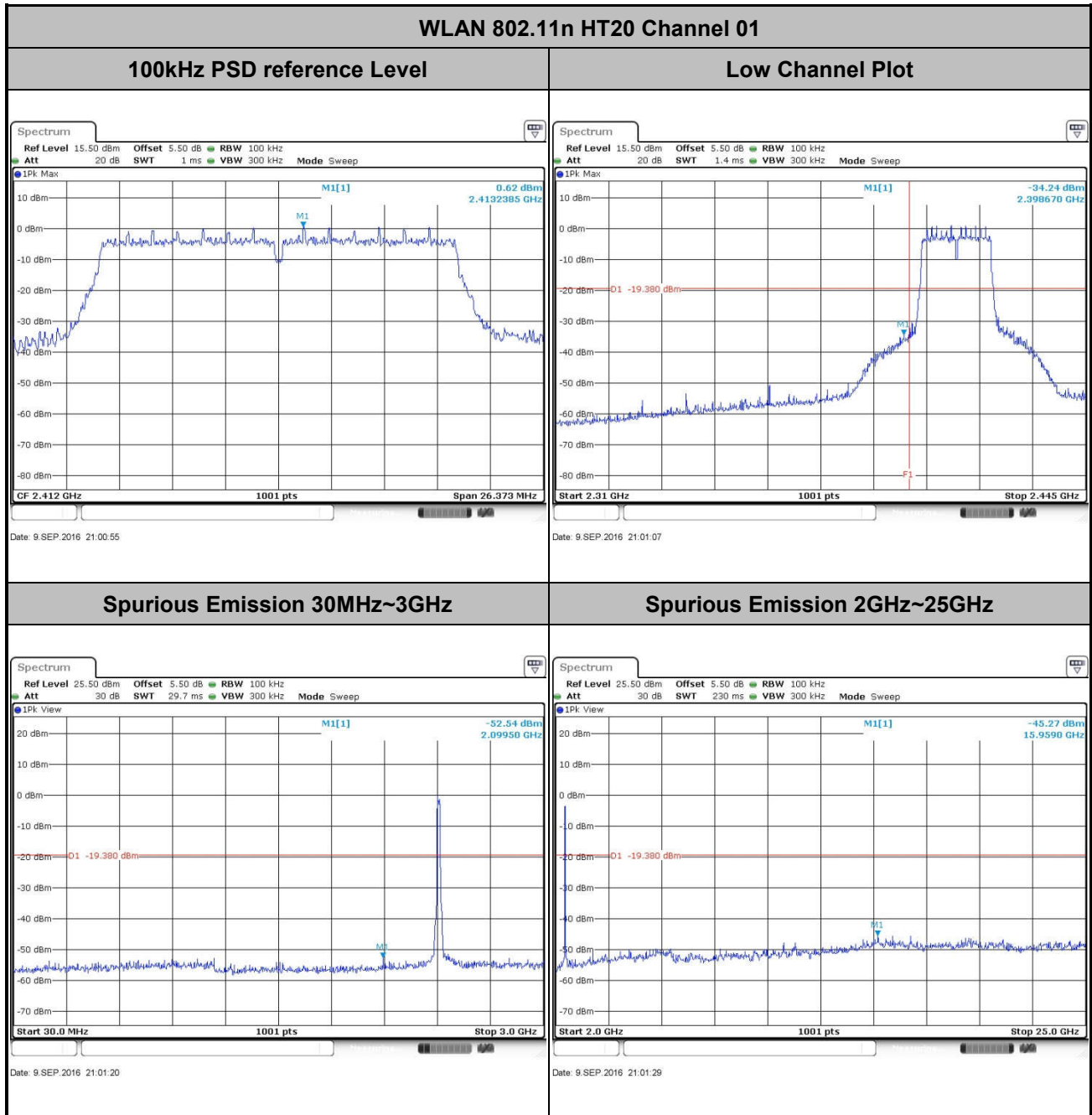


Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	50~55%
Test Channel :	11	Test Engineer :	Silent Hai

**WLAN 802.11g Channel 11****100kHz PSD reference Level****High Channel Plot****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



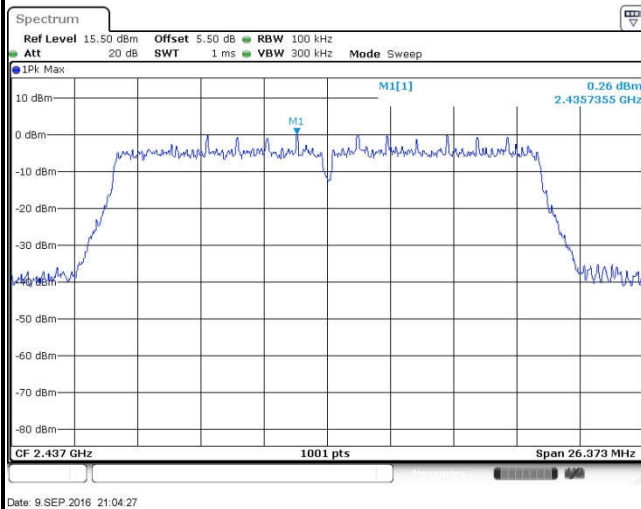
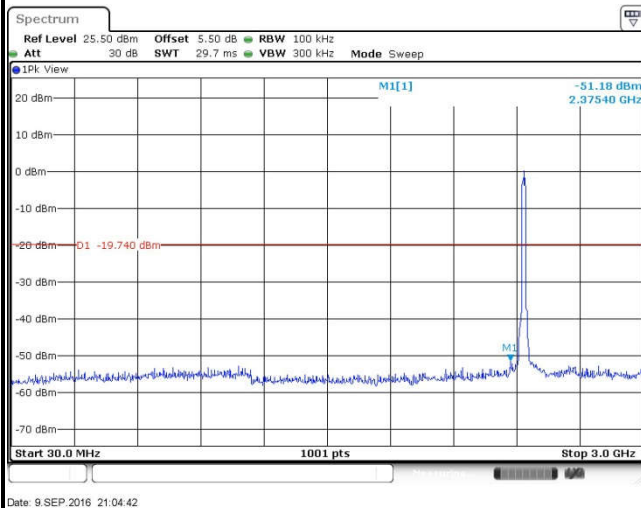
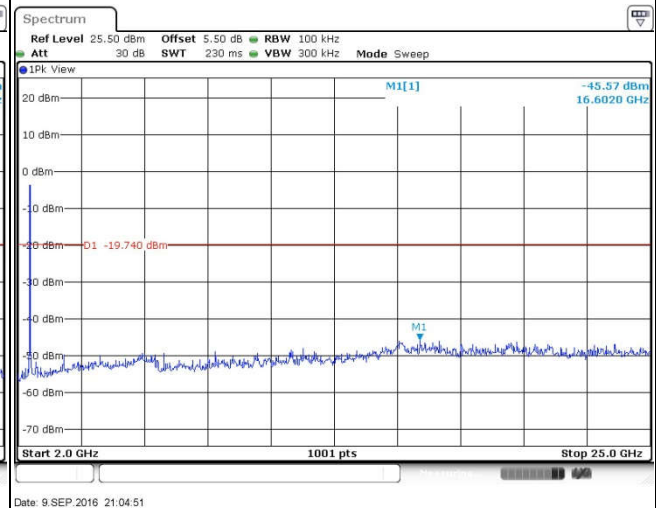
Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	50~55%
Test Channel :	01	Test Engineer :	Silent Hai







<b>Test Mode :</b>	802.11n HT20	<b>Temperature :</b>	24~25°C
<b>Test Band :</b>	2.4GHz Mid	<b>Relative Humidity :</b>	50~55%
<b>Test Channel :</b>	06	<b>Test Engineer :</b>	Silent Hai

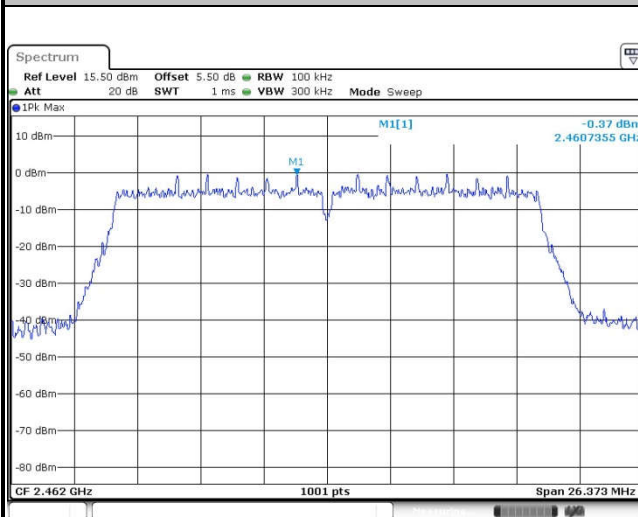
**WLAN 802.11n HT20 Channel 06****100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



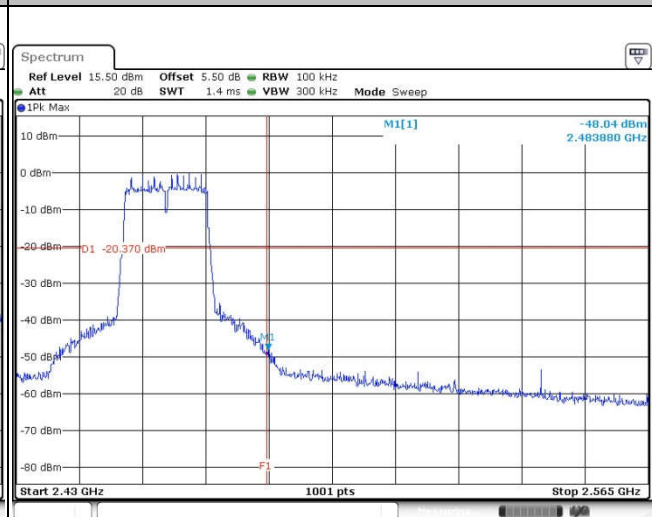
Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	50~55%
Test Channel :	11	Test Engineer :	Silent Hai

## WLAN 802.11n HT20 Channel 11

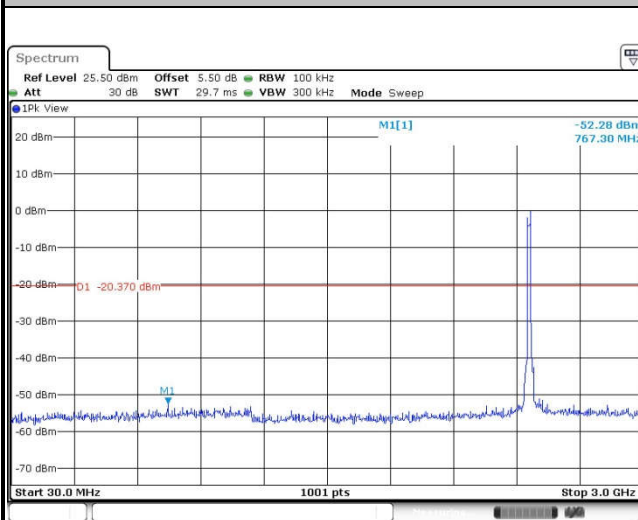
## 100kHz PSD reference Level



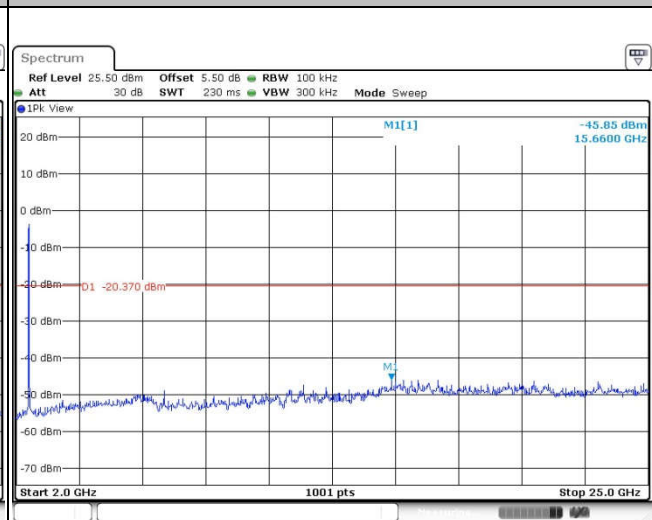
## High Channel Plot



## Spurious Emission 30MHz~3GHz

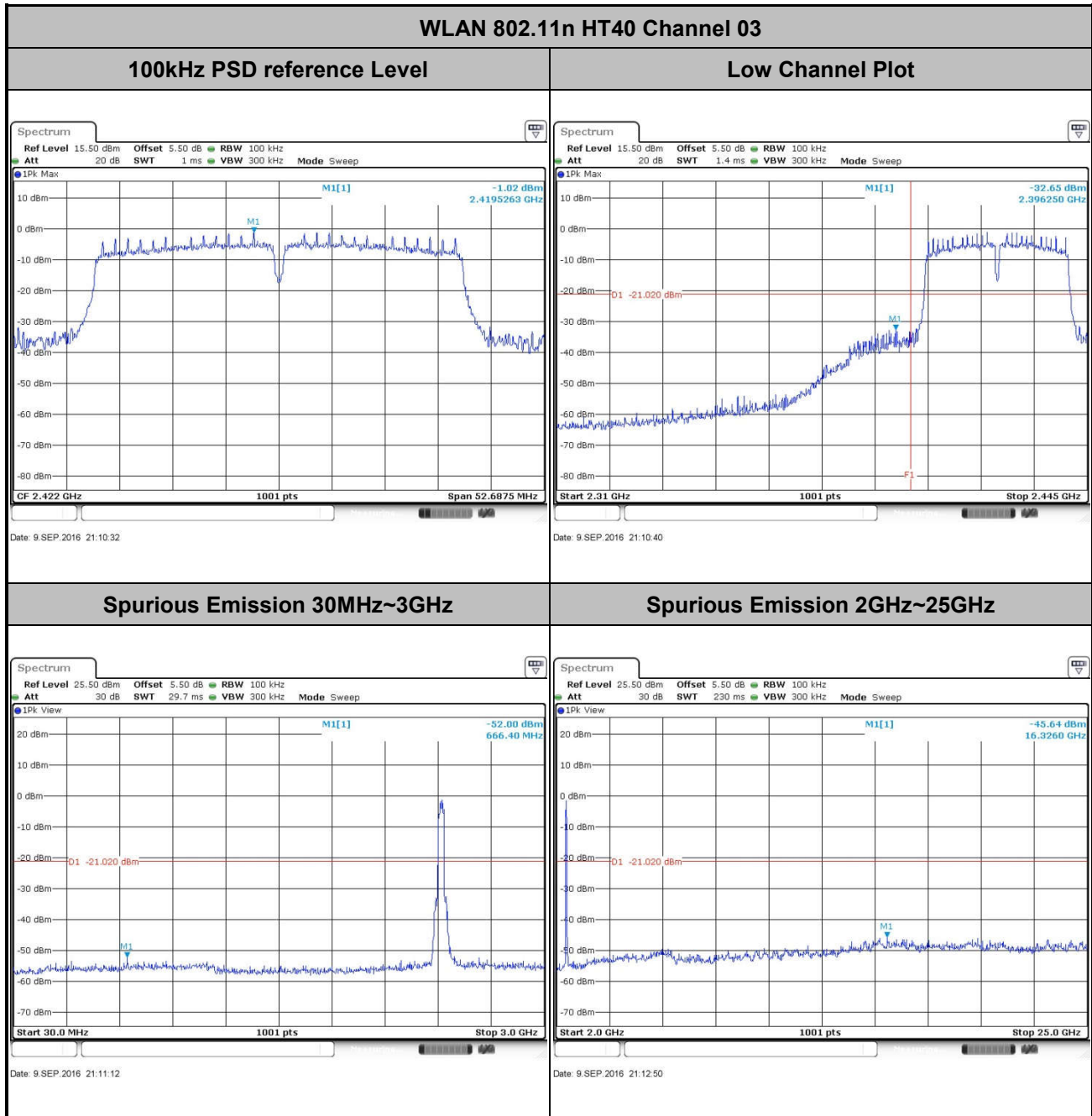


## Spurious Emission 2GHz~25GHz



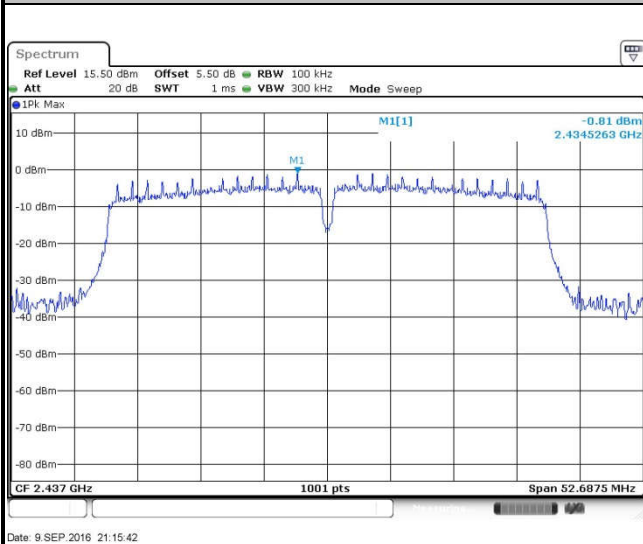
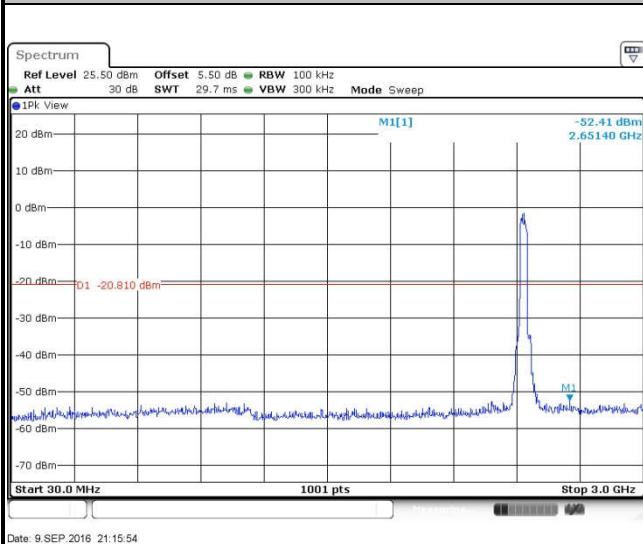
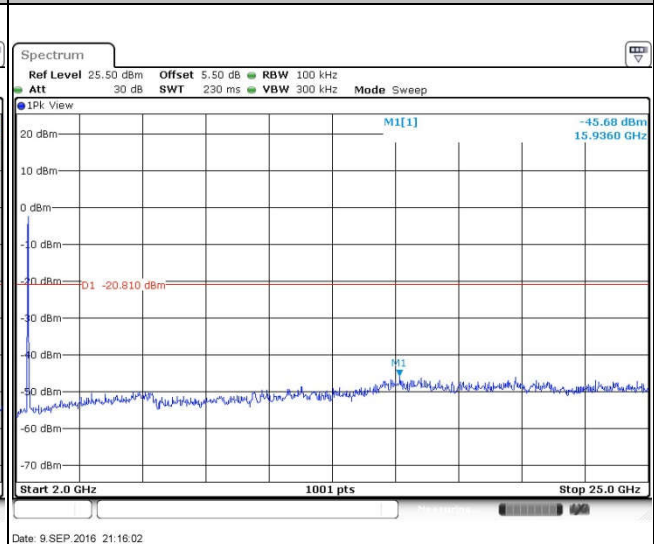


<b>Test Mode :</b>	802.11n HT40	<b>Temperature :</b>	24~25°C
<b>Test Band :</b>	2.4GHz Low	<b>Relative Humidity :</b>	50~55%
<b>Test Channel :</b>	03	<b>Test Engineer :</b>	Silent Hai



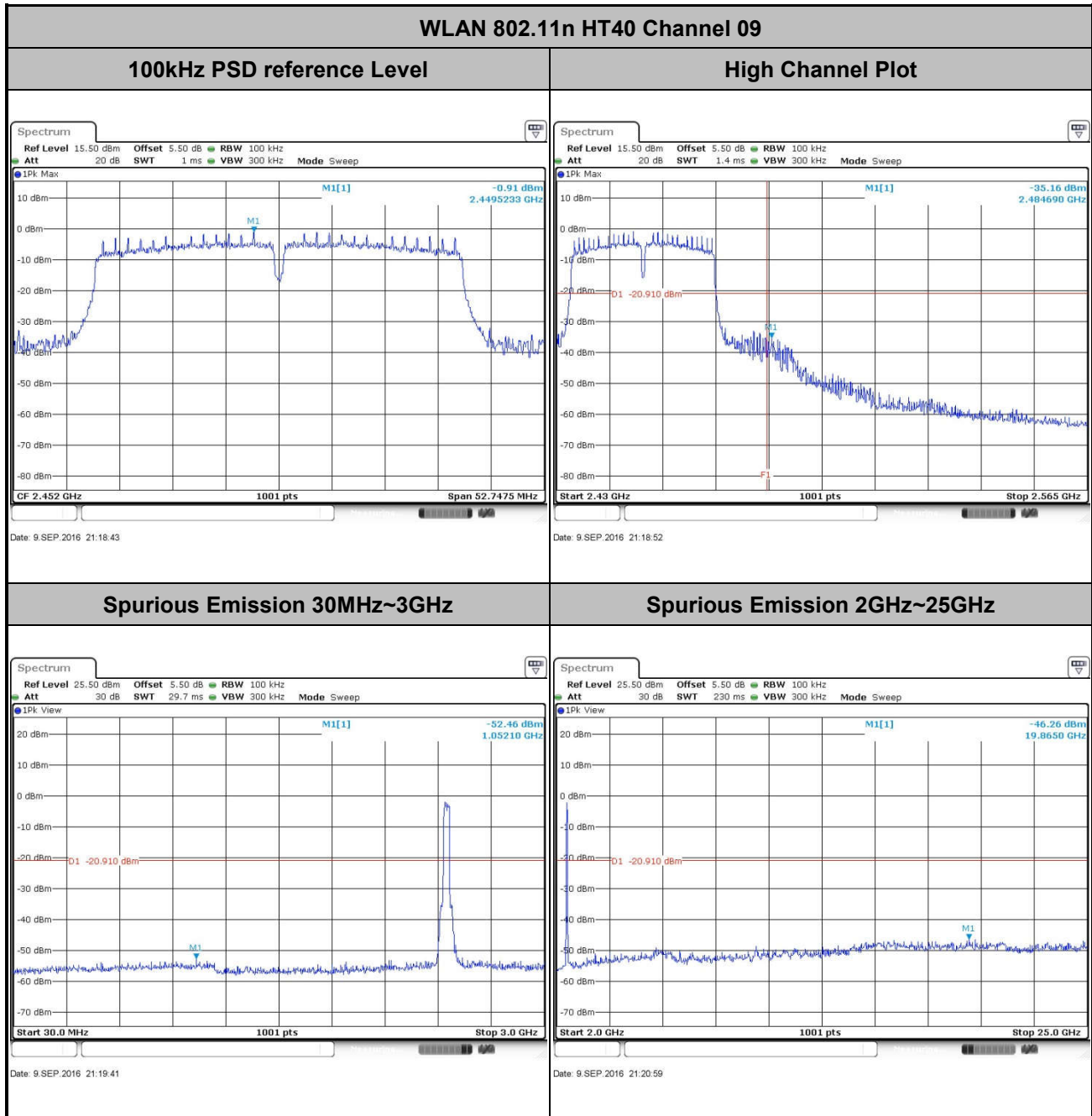


<b>Test Mode :</b>	802.11n HT40	<b>Temperature :</b>	24~25°C
<b>Test Band :</b>	2.4GHz Mid	<b>Relative Humidity :</b>	50~55%
<b>Test Channel :</b>	06	<b>Test Engineer :</b>	Silent Hai

**WLAN 802.11n HT40 Channel 06****100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



<b>Test Mode :</b>	802.11n HT40	<b>Temperature :</b>	24~25°C
<b>Test Band :</b>	2.4GHz High	<b>Relative Humidity :</b>	50~55%
<b>Test Channel :</b>	09	<b>Test Engineer :</b>	Silent Hai





### **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.

<b>Frequency (MHz)</b>	<b>Field Strength (microvolts/meter)</b>	<b>Measurement Distance (meters)</b>
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

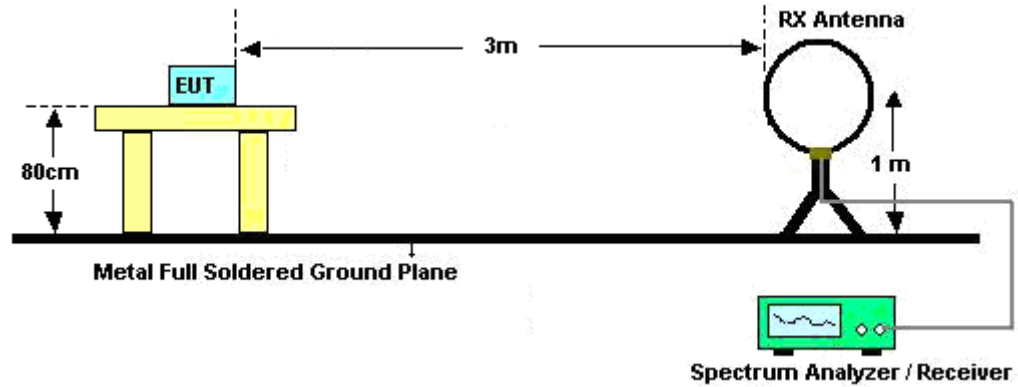
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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:

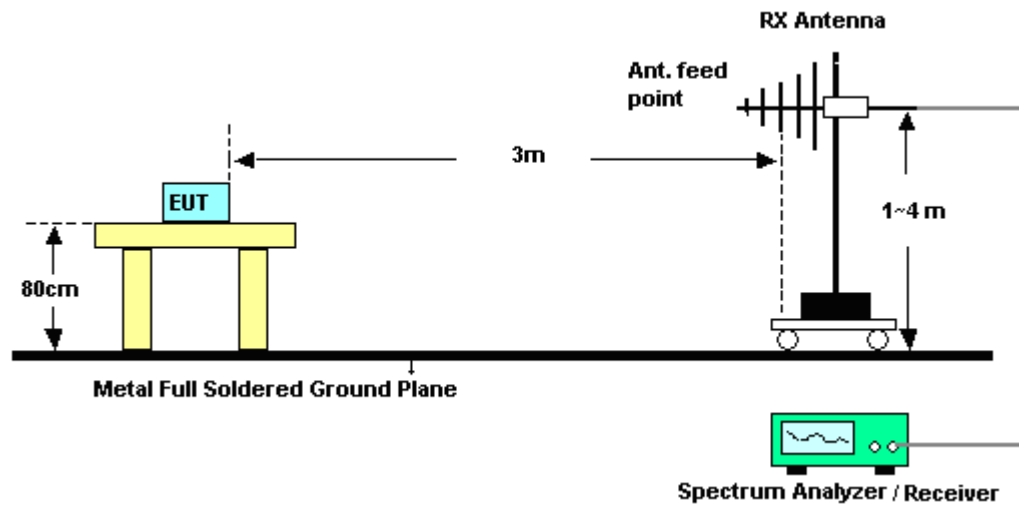
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.5.4 Test Setup

For radiated emissions below 30MHz

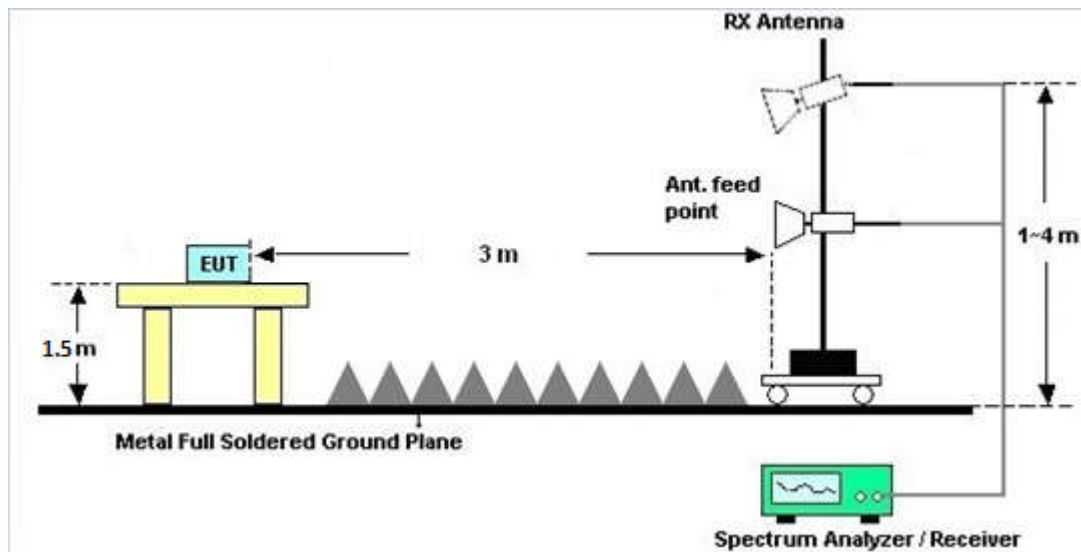


For radiated emissions from 30MHz to 1GHz





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 Duty Cycle

Please refer to Appendix C.

### 3.5.8 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.

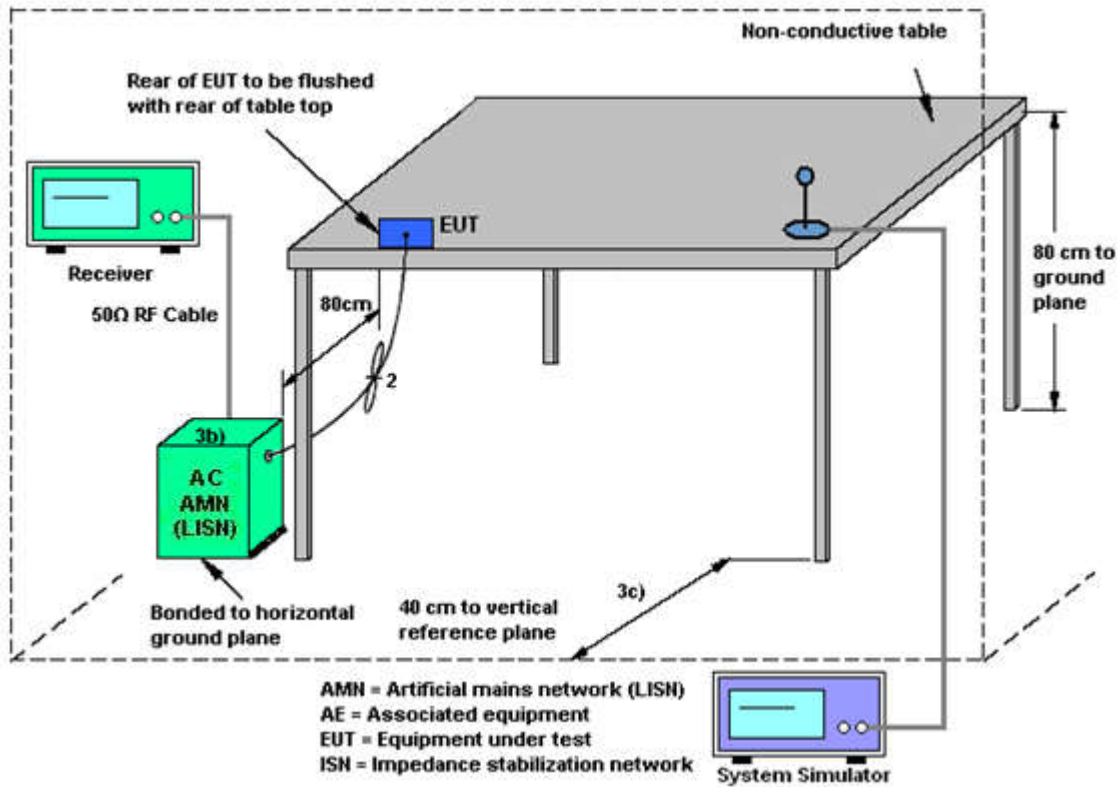
### **3.6.2 Measuring Instruments**

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

### **3.6.3 Test Procedures**

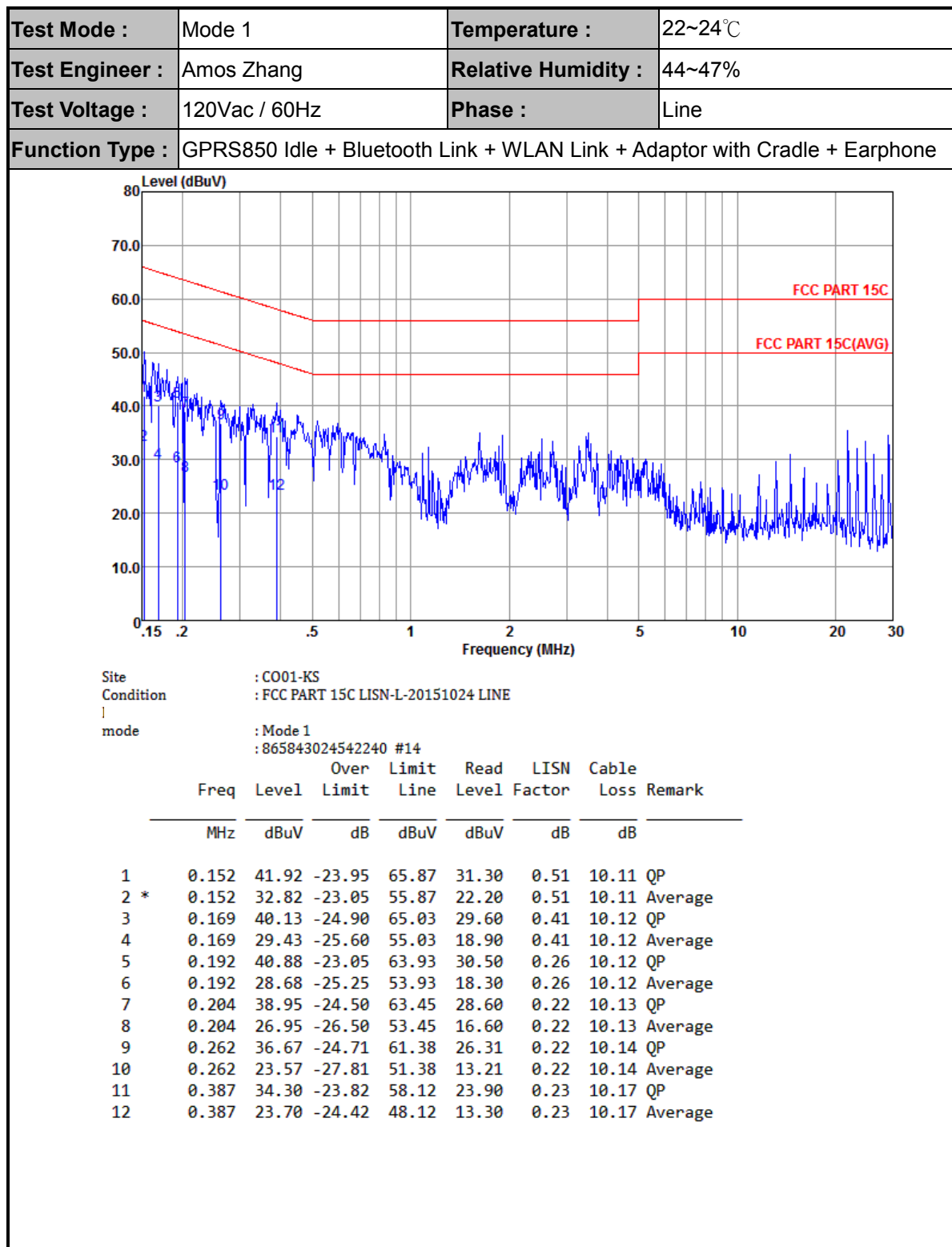
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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



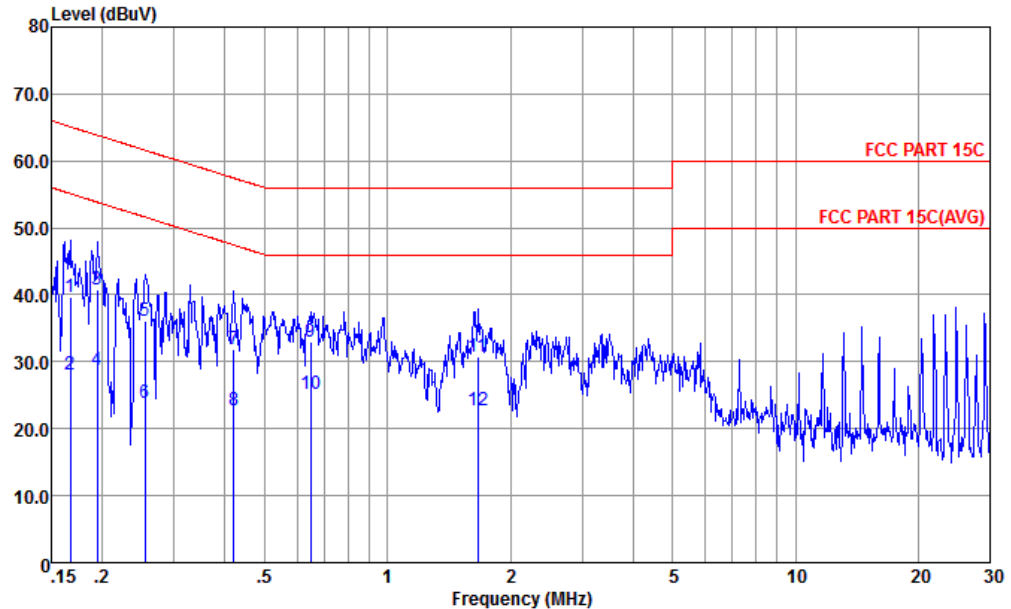


## 3.6.5 Test Result of AC Conducted Emission





Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	44~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GPRS850 Idle + Bluetooth Link + WLAN Link + Adaptor with Cradle + Earphone		



Site : CO01-KS  
Condition : FCC PART 15C LISN-N-20151024 NEUTRAL

mode : Mode 1  
: 865843024542240 #14

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV		dB	dBuV	dB	dB	
1	0.167	39.72	-25.40	65.12	29.30	0.30	10.12	QP
2	0.167	28.02	-27.10	55.12	17.60	0.30	10.12	Average
3	0.194	40.73	-23.11	63.84	30.30	0.31	10.12	QP
4	0.194	28.73	-25.11	53.84	18.30	0.31	10.12	Average
5	0.255	36.06	-25.54	61.60	25.61	0.31	10.14	QP
6	0.255	23.76	-27.84	51.60	13.31	0.31	10.14	Average
7	0.419	31.79	-25.67	57.46	21.30	0.32	10.17	QP
8	0.419	22.69	-24.77	47.46	12.20	0.32	10.17	Average
9	0.647	33.09	-22.91	56.00	22.60	0.34	10.15	QP
10 *	0.647	25.09	-20.91	46.00	14.60	0.34	10.15	Average
11	1.662	30.72	-25.28	56.00	20.20	0.38	10.14	QP
12	1.662	22.82	-23.18	46.00	12.30	0.38	10.14	Average



## **3.7 Antenna Requirements**

### **3.7.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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	FSV40	101040	10Hz~40GHz	Aug. 09, 2016	Sep. 09, 2016~ Sep. 12, 2016	Aug. 08, 2017	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 20, 2016	Sep. 09, 2016~ Sep. 12, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 20, 2016	Sep. 09, 2016~ Sep. 12, 2016	Jan. 19, 2017	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz; Max 30dBm	Oct. 20, 2015	Sep. 15, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
Spectrum Analyzer	R&S	FSV40	101041	10kHz~40GHz; Max 30dBm	Oct. 20, 2015	Sep. 15, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 07, 2016	Sep. 15, 2016	May 06, 2017	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	May 21, 2016	Sep. 15, 2016	May 20, 2017	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1285	1GHz~18GHz	Jan. 11, 2016	Sep. 15, 2016	Jan. 10, 2017	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul.16.2016	Sep. 15, 2016	Jul.15.2017	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug. 10, 2016	Sep. 15, 2016	Aug. 09, 2017	Radiation (03CH02-SZ)
Amplifier	HP	8447F	3113A04622	9kHz ~1300MHz / 30 dB	Jul. 16, 2016	Sep. 15, 2016	Jul. 15, 2017	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10 P-R	1943528	1GHz~18GHz	Oct. 20, 2015	Sep. 15, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
Amplifier	Agilent	8449B	3008A01023	1GHz~26.5GHz	Oct. 20, 2015	Sep. 15, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002470	N/A	NCR	Sep. 15, 2016	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Sep. 15, 2016	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Sep. 15, 2016	NCR	Radiation (03CH02-SZ)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 29, 2016	Aug. 29, 2016	Apr. 28, 2017	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Aug. 29, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Aug. 29, 2016	Oct. 23, 2016	Conduction (CO01-KS)

NCR: No Calibration Required

## 5 Uncertainty of Evaluation

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

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.0dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.1dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.1dB
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## **Appendix A. Conducted Test Results**

**A1 - DTS Part**

Test Engineer:	Silent Hai	Temperature:	24~25	°C
Test Date:	Sep. 09, 2016~Sep. 12, 2016	Relative Humidity:	50~55	%

**TEST RESULTS DATA**  
**6dB Occupied Bandwidth**

2.4GHz Band							
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	9.55	0.50	Pass
11b	1Mbps	1	6	2437	10.03	0.50	Pass
11b	1Mbps	1	11	2462	10.01	0.50	Pass
11g	6Mbps	1	1	2412	15.33	0.50	Pass
11g	6Mbps	1	6	2437	15.33	0.50	Pass
11g	6Mbps	1	11	2462	15.45	0.50	Pass
HT20	MCS0	1	1	2412	17.58	0.50	Pass
HT20	MCS0	1	6	2437	17.58	0.50	Pass
HT20	MCS0	1	11	2462	17.58	0.50	Pass
HT40	MCS0	1	3	2422	35.13	0.50	Pass
HT40	MCS0	1	6	2437	35.13	0.50	Pass
HT40	MCS0	1	9	2452	35.17	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	18.79	30.00	-4.50	14.29	36.00	Pass
11b	1Mbps	1	6	2437	18.56	30.00	-4.50	14.06	36.00	Pass
11b	1Mbps	1	11	2462	18.10	30.00	-4.50	13.60	36.00	Pass
11g	6Mbps	1	1	2412	21.92	30.00	-4.50	17.42	36.00	Pass
11g	6Mbps	1	6	2437	22.04	30.00	-4.50	17.54	36.00	Pass
11g	6Mbps	1	11	2462	21.27	30.00	-4.50	16.77	36.00	Pass
HT20	MCS0	1	1	2412	21.32	30.00	-4.50	16.82	36.00	Pass
HT20	MCS0	1	6	2437	21.23	30.00	-4.50	16.73	36.00	Pass
HT20	MCS0	1	11	2462	20.86	30.00	-4.50	16.36	36.00	Pass
HT40	MCS0	1	3	2422	22.26	30.00	-4.50	17.76	36.00	Pass
HT40	MCS0	1	6	2437	22.06	30.00	-4.50	17.56	36.00	Pass
HT40	MCS0	1	9	2452	22.16	30.00	-4.50	17.66	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	0.02	15.89
11b	1Mbps	1	6	2437	0.02	15.60
11b	1Mbps	1	11	2462	0.02	15.13
11g	6Mbps	1	1	2412	0.12	13.41
11g	6Mbps	1	6	2437	0.12	13.54
11g	6Mbps	1	11	2462	0.12	12.23
HT20	MCS0	1	1	2412	0.12	11.99
HT20	MCS0	1	6	2437	0.12	11.71
HT20	MCS0	1	11	2462	0.12	11.03
HT40	MCS0	1	3	2422	0.23	13.36
HT40	MCS0	1	6	2437	0.23	12.79
HT40	MCS0	1	9	2452	0.23	12.85

**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	-7.38	-4.50	8.00	Pass
11b	1Mbps	1	6	2437	-8.95	-4.50	8.00	Pass
11b	1Mbps	1	11	2462	-4.46	-4.50	8.00	Pass
11g	6Mbps	1	1	2412	-10.60	-4.50	8.00	Pass
11g	6Mbps	1	6	2437	-11.21	-4.50	8.00	Pass
11g	6Mbps	1	11	2462	-11.86	-4.50	8.00	Pass
HT20	MCS0	1	1	2412	-14.08	-4.50	8.00	Pass
HT20	MCS0	1	6	2437	-14.03	-4.50	8.00	Pass
HT20	MCS0	1	11	2462	-14.79	-4.50	8.00	Pass
HT40	MCS0	1	3	2422	-14.95	-4.50	8.00	Pass
HT40	MCS0	1	6	2437	-15.85	-4.50	8.00	Pass
HT40	MCS0	1	9	2452	-15.07	-4.50	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.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
802.11b CH 01 2412MHz		2381.715	42.93	-31.07	74	46.49	25.96	3.81	33.33	213	39	P	H
		2389.905	34.2	-19.8	54	37.72	25.99	3.81	33.32	213	39	A	H
		2412	99.4	-	-	102.85	26.03	3.84	33.32	213	39	P	H
		2412	96.3	-	-	99.75	26.03	3.84	33.32	213	39	A	H
		2365.965	41.42	-32.58	74	45.06	25.92	3.77	33.33	150	99	P	V
		2389.905	31.18	-22.82	54	34.7	25.99	3.81	33.32	150	99	A	V
		2412	94.75	-	-	98.2	26.03	3.84	33.32	150	99	P	V
		2412	91.65	-	-	95.1	26.03	3.84	33.32	150	99	A	V
802.11b CH 06 2437MHz		2386.16	41.37	-32.63	74	44.9	25.99	3.81	33.33	211	39	P	H
		2380.28	32.31	-21.69	54	35.87	25.96	3.81	33.33	211	39	A	H
		2437	99.95	-	-	103.32	26.1	3.84	33.31	211	39	P	H
		2437	97.01	-	-	100.38	26.1	3.84	33.31	211	39	A	H
		2494.05	43.26	-30.74	74	46.45	26.2	3.91	33.3	211	39	P	H
		2494.4	35.52	-18.48	54	38.71	26.2	3.91	33.3	211	39	A	H
		2383.36	39.92	-34.08	74	43.48	25.96	3.81	33.33	150	101	P	V
		2380.28	30.02	-23.98	54	33.58	25.96	3.81	33.33	150	101	A	V
		2437	95.65	-	-	99.02	26.1	3.84	33.31	150	101	P	V
		2437	92.54	-	-	95.91	26.1	3.84	33.31	150	101	A	V
		2493.14	41.8	-32.2	74	44.99	26.2	3.91	33.3	150	101	P	V
		2494.33	31.51	-22.49	54	34.7	26.2	3.91	33.3	150	101	A	V



<b>802.11b CH 11 2462MHz</b>		2462	101.89	-	-	105.19	26.13	3.88	33.31	212	37	P	H
		2462	98.48	-	-	101.78	26.13	3.88	33.31	212	37	A	H
		2484.48	45.5	-28.5	74	48.76	26.17	3.88	33.31	212	37	P	H
		2484.08	36.48	-17.52	54	39.74	26.17	3.88	33.31	212	37	A	H
		2462	96.4	-	-	99.7	26.13	3.88	33.31	163	109	P	V
		2462	93.29	-	-	96.59	26.13	3.88	33.31	163	109	A	V
		2495.84	41.87	-32.13	74	45.06	26.2	3.91	33.3	163	109	P	V
		2484.04	31.84	-22.16	54	35.1	26.17	3.88	33.31	163	109	A	V
<b>Remark</b>	<ol style="list-style-type: none"><li>1. No other spurious found.</li><li>2. All results are PASS against Peak and Average limit line.</li></ol>												





## 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Harmonic @ 3m)

WIFI	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	46.81	-27.19	74	67	30.49	5.92	56.6	250	0	P	H
		4824	44.64	-29.36	74	64.83	30.49	5.92	56.6	250	0	P	V
802.11b CH 06 2437MHz		4874	44.01	-29.99	74	64.36	30.58	5.98	56.91	250	0	P	H
		7311	43.94	-30.06	74	60.62	34.4	6.92	58	150	0	P	H
		4874	44.2	-29.8	74	64.55	30.58	5.98	56.91	250	0	P	V
		7311	43.53	-30.47	74	60.21	34.4	6.92	58	150	0	P	V
802.11b CH 11 2462MHz		4924	44.39	-29.61	74	63.76	30.68	6.03	56.08	250	0	P	H
		7386	42.23	-31.77	74	58.52	34.79	6.93	58.01	150	0	P	H
		4924	43.26	-30.74	74	62.63	30.68	6.03	56.08	250	0	P	V
		7386	44.54	-29.46	74	60.83	34.79	6.93	58.01	150	0	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	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		2389.38	55.57	-18.43	74	59.1	25.99	3.81	33.33	191	35	P	H
		2390	42.25	-11.75	54	45.77	25.99	3.81	33.32	191	35	A	H
		2412	100.35	-	-	103.8	26.03	3.84	33.32	191	35	P	H
		2412	92.65	-	-	96.1	26.03	3.84	33.32	191	35	A	H
		2389.59	51.57	-22.43	74	55.1	25.99	3.81	33.33	150	124	P	V
		2389.905	38.72	-15.28	54	42.24	25.99	3.81	33.32	150	124	A	V
		2412	96.73	-	-	100.18	26.03	3.84	33.32	150	124	P	V
		2412	89.07	-	-	92.52	26.03	3.84	33.32	150	124	A	V
802.11g CH 06 2437MHz		2383.5	44.65	-29.35	74	48.21	25.96	3.81	33.33	185	40	P	H
		2385.88	35.15	-18.85	54	38.68	25.99	3.81	33.33	185	40	A	H
		2437	100.43	-	-	103.8	26.1	3.84	33.31	185	40	P	H
		2437	92.7	-	-	96.07	26.1	3.84	33.31	185	40	A	H
		2485.44	47.54	-26.46	74	50.8	26.17	3.88	33.31	185	40	P	H
		2483.62	37.48	-16.52	54	40.74	26.17	3.88	33.31	185	40	A	H
		2380.14	41.26	-32.74	74	44.82	25.96	3.81	33.33	150	118	P	V
		2356.76	32.16	-21.84	54	35.8	25.92	3.77	33.33	150	118	A	V
		2437	96.76	-	-	100.13	26.1	3.84	33.31	150	118	P	V
		2437	89.37	-	-	92.74	26.1	3.84	33.31	150	118	A	V
		2483.83	43.33	-30.67	74	46.59	26.17	3.88	33.31	150	118	P	V
		2483.76	33.41	-20.59	54	36.67	26.17	3.88	33.31	150	118	A	V



<b>802.11g CH 11 2462MHz</b>		2462	99.9	-	-	103.2	26.13	3.88	33.31	180	38	P	H
		2462	92.24	-	-	95.54	26.13	3.88	33.31	180	38	A	H
		2484.2	53.73	-20.27	74	56.99	26.17	3.88	33.31	180	38	P	H
		2483.72	41.12	-12.88	54	44.38	26.17	3.88	33.31	180	38	A	H
		2462	96.41	-	-	99.71	26.13	3.88	33.31	162	130	P	V
		2462	88.75	-	-	92.05	26.13	3.88	33.31	162	130	A	V
		2483.96	49.65	-24.35	74	52.91	26.17	3.88	33.31	162	130	P	V
		2483.52	37.08	-16.92	54	40.34	26.17	3.88	33.31	162	130	A	V
<b>Remark</b>	<ol style="list-style-type: none"><li>1. No other spurious found.</li><li>2. All results are PASS against Peak and Average limit line.</li></ol>												

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

WIFI	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	42.34	-31.66	74	62.53	30.49	5.92	56.6	250	0	P	H
		4824	41.79	-32.21	74	61.98	30.49	5.92	56.6	250	0	P	V
802.11g CH 06 2437MHz		4874	42.39	-31.61	74	62.74	30.58	5.98	56.91	150	360	P	H
		7311	44.92	-29.08	74	61.6	34.4	6.92	58	174	100	P	H
		4874	41.79	-32.21	74	62.14	30.58	5.98	56.91	250	0	P	V
		7311	44.65	-29.35	74	61.33	34.4	6.92	58	150	0	P	V
802.11g CH 11 2462MHz		4924	41.44	-32.56	74	60.81	30.68	6.03	56.08	250	0	P	H
		7386	42.1	-31.9	74	58.39	34.79	6.93	58.01	150	0	P	H
		4924	42.43	-31.57	74	61.8	30.68	6.03	56.08	250	0	P	V
		7386	43.49	-30.51	74	59.78	34.79	6.93	58.01	150	0	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	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		2389.905	53.51	-20.49	74	57.03	25.99	3.81	33.32	188	36	P	H
		2390	41.54	-12.46	54	45.06	25.99	3.81	33.32	188	36	A	H
		2412	97.96	-	-	101.41	26.03	3.84	33.32	188	36	P	H
		2412	90.17	-	-	93.62	26.03	3.84	33.32	188	36	A	H
		2389.695	49.73	-24.27	74	53.26	25.99	3.81	33.33	150	112	P	V
		2390	38.02	-15.98	54	41.54	25.99	3.81	33.32	150	112	A	V
		2412	94.05	-	-	97.5	26.03	3.84	33.32	150	112	P	V
		2412	86.36	-	-	89.81	26.03	3.84	33.32	150	112	A	V
802.11n HT20 CH 06 2437MHz		2381.54	43.98	-30.02	74	47.54	25.96	3.81	33.33	211	35	P	H
		2389.94	34.11	-19.89	54	37.63	25.99	3.81	33.32	211	35	A	H
		2437	97.94	-	-	101.31	26.1	3.84	33.31	211	35	P	H
		2437	90.23	-	-	93.6	26.1	3.84	33.31	211	35	A	H
		2489.08	46.11	-27.89	74	49.31	26.2	3.91	33.31	211	35	P	H
		2483.55	36.32	-17.68	54	39.58	26.17	3.88	33.31	211	35	A	H
		2370.62	41.61	-32.39	74	45.17	25.96	3.81	33.33	150	119	P	V
		2389.1	31.97	-22.03	54	35.5	25.99	3.81	33.33	150	119	A	V
		2437	94.38	-	-	97.75	26.1	3.84	33.31	150	119	P	V
		2437	86.73	-	-	90.1	26.1	3.84	33.31	150	119	A	V
		2491.04	42.94	-31.06	74	46.14	26.2	3.91	33.31	150	119	P	V
		2485.58	33.09	-20.91	54	36.35	26.17	3.88	33.31	150	119	A	V



<b>802.11n</b> <b>HT20</b> <b>CH 11</b> <b>2462MHz</b>		2462	98.79	-	-	102.09	26.13	3.88	33.31	158	35	P	H
		2462	91.06	-	-	94.36	26.13	3.88	33.31	158	35	A	H
		2483.52	56.72	-17.28	74	59.98	26.17	3.88	33.31	158	35	P	H
		2483.52	42.29	-11.71	54	45.55	26.17	3.88	33.31	158	35	A	H
		2462	95.31	-	-	98.61	26.13	3.88	33.31	160	95	P	V
		2462	87.65	-	-	90.95	26.13	3.88	33.31	160	95	A	V
		2484.52	50.82	-23.18	74	54.08	26.17	3.88	33.31	160	95	P	V
		2483.52	38.23	-15.77	54	41.49	26.17	3.88	33.31	160	95	A	V
<b>Remark</b>	<ol style="list-style-type: none"><li>1. No other spurious found.</li><li>2. All results are PASS against Peak and Average limit line.</li></ol>												



## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI	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	41.63	-32.37	74	61.82	30.49	5.92	56.6	250	0	P	H
		4824	41.37	-32.63	74	61.56	30.49	5.92	56.6	250	0	P	V
802.11n HT20 CH 06 2437MHz		4874	41.01	-32.99	74	61.36	30.58	5.98	56.91	250	0	P	H
		7311	43.92	-30.08	74	60.6	34.4	6.92	58	150	0	P	H
		4874	41.44	-32.56	74	61.79	30.58	5.98	56.91	250	0	P	V
		7311	45.33	-28.67	74	62.01	34.4	6.92	58	150	0	P	V
802.11n HT20 CH 11 2462MHz		4924	42.22	-31.78	74	61.59	30.68	6.03	56.08	250	0	P	H
		7386	42.37	-31.63	74	58.66	34.79	6.93	58.01	150	0	P	H
		4924	42.62	-31.38	74	61.99	30.68	6.03	56.08	250	0	P	V
		7386	43.69	-30.31	74	59.98	34.79	6.93	58.01	150	0	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	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		2389.24	62.04	-11.96	74	65.57	25.99	3.81	33.33	244	41	P	H
		2389.52	48.55	-5.45	54	52.08	25.99	3.81	33.33	244	41	A	H
		2422	94.47	-	-	97.88	26.06	3.84	33.31	244	41	P	H
		2422	87.12	-	-	90.53	26.06	3.84	33.31	244	41	A	H
		2489.85	48.38	-25.62	74	51.58	26.2	3.91	33.31	244	41	P	H
		2490.48	34.76	-19.24	54	37.96	26.2	3.91	33.31	244	41	A	H
		2388.26	60.14	-13.86	74	63.67	25.99	3.81	33.33	150	137	P	V
		2389.8	46.52	-7.48	54	50.04	25.99	3.81	33.32	150	137	A	V
		2422	92.63	-	-	96.04	26.06	3.84	33.31	150	137	P	V
		2422	84.59	-	-	88	26.06	3.84	33.31	150	137	A	V
		2489.92	46.14	-27.86	74	49.34	26.2	3.91	33.31	150	137	P	V
		2490.69	33.24	-20.76	54	36.44	26.2	3.91	33.31	150	137	A	V
802.11n HT40 CH 06 2437MHz		2388.4	49.91	-24.09	74	53.44	25.99	3.81	33.33	189	40	P	H
		2389.8	38.84	-15.16	54	42.36	25.99	3.81	33.32	189	40	A	H
		2437	96.92	-	-	100.29	26.1	3.84	33.31	189	40	P	H
		2437	89.28	-	-	92.65	26.1	3.84	33.31	189	40	A	H
		2491.04	55.67	-18.33	74	58.87	26.2	3.91	33.31	189	40	P	H
		2485.72	40.59	-13.41	54	43.85	26.17	3.88	33.31	189	40	A	H
		2389.94	46.52	-27.48	74	50.04	25.99	3.81	33.32	150	111	P	V
		2389.38	35.51	-18.49	54	39.04	25.99	3.81	33.33	150	111	A	V
		2437	93.82	-	-	97.19	26.1	3.84	33.31	150	111	P	V
		2437	86.22	-	-	89.59	26.1	3.84	33.31	150	111	A	V
		2490.76	51.2	-22.8	74	54.4	26.2	3.91	33.31	150	111	P	V
		2485.79	36.51	-17.49	54	39.77	26.17	3.88	33.31	150	111	A	V





<b>802.11n</b> <b>HT40</b> <b>CH 09</b> <b>2452MHz</b>		2389.66	42.71	-31.29	74	46.24	25.99	3.81	33.33	150	46	P	H
		2389.94	33.5	-20.5	54	37.02	25.99	3.81	33.32	150	46	A	H
		2452	94.82	-	-	98.15	26.1	3.88	33.31	150	46	P	H
		2452	87.33	-	-	90.66	26.1	3.88	33.31	150	46	A	H
		2483.5	65.81	-8.19	74	69.07	26.17	3.88	33.31	150	46	P	H
		2484.53	49.06	-4.94	54	52.32	26.17	3.88	33.31	150	46	A	H
		2380.7	41.22	-32.78	74	44.78	25.96	3.81	33.33	150	121	P	V
		2386.3	31.98	-22.02	54	35.51	25.99	3.81	33.33	150	121	A	V
		2452	92.4	-	-	95.73	26.1	3.88	33.31	150	121	P	V
		2452	85.13	-	-	88.46	26.1	3.88	33.31	150	121	A	V
		2483.62	61.59	-12.41	74	64.85	26.17	3.88	33.31	150	121	P	V
		2484.39	45.01	-8.99	54	48.27	26.17	3.88	33.31	150	121	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	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		4844	42.55	-31.45	74	62.69	30.52	5.92	56.58	250	0	P	H
HT40		7266	42.38	-31.62	74	59.49	34.25	6.91	58.27	150	0	P	H
CH 03		4844	42.62	-31.38	74	62.76	30.52	5.92	56.58	250	0	P	V
2422MHz		7266	43.2	-30.8	74	60.31	34.25	6.91	58.27	150	0	P	V
802.11n		4874	41.45	-32.55	74	61.8	30.58	5.98	56.91	250	0	P	H
HT40		7311	44.43	-29.57	74	61.11	34.4	6.92	58	150	0	P	H
CH 06		4874	41.58	-32.42	74	61.93	30.58	5.98	56.91	250	0	P	V
2437MHz		7311	43.61	-30.39	74	60.29	34.4	6.92	58	150	0	P	V
802.11n		4904	40.9	-33.1	74	60.58	30.64	6.03	56.35	250	0	P	H
HT40		7356	43.45	-30.55	74	59.85	34.64	6.92	57.96	150	0	P	H
CH 09		4904	40.86	-33.14	74	60.54	30.64	6.03	56.35	250	0	P	V
2452MHz		7356	43.51	-30.49	74	59.91	34.64	6.92	57.96	150	0	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 802.11n HT40 (LF)**

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	(dBμV)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
<b>2.4GHz 802.11n HT40 LF</b>		30	25.08	-14.92	40	31.02	25.1	0.65	31.69	-	-	P	H
		84.32	17.53	-22.47	40	32.55	15.74	0.83	31.59	-	-	P	H
		182.29	18.37	-25.13	43.5	32.33	16.12	1.17	31.25	-	-	P	H
		283.17	22.83	-23.17	46	33.66	18.93	1.37	31.13	-	-	P	H
		836.07	31.09	-14.91	46	32.48	27.61	2.26	31.26	-	-	P	H
		909.79	32.3	-13.7	46	32.8	28.5	2.35	31.35	180	140	P	H
		30	26.54	-13.46	40	32.48	25.1	0.65	31.69	120	150	P	V
		46.49	23.44	-16.56	40	37.49	16.97	0.65	31.67	-	-	P	V
		74.62	24.15	-15.85	40	41.34	13.6	0.83	31.62	-	-	P	V
		290.93	21.12	-24.88	46	31.61	19.2	1.44	31.13	-	-	P	V
		497.54	26.07	-19.93	46	32.46	23.01	1.8	31.2	-	-	P	V
		838.98	31.74	-14.26	46	33.09	27.65	2.26	31.26	-	-	P	V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

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



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		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)

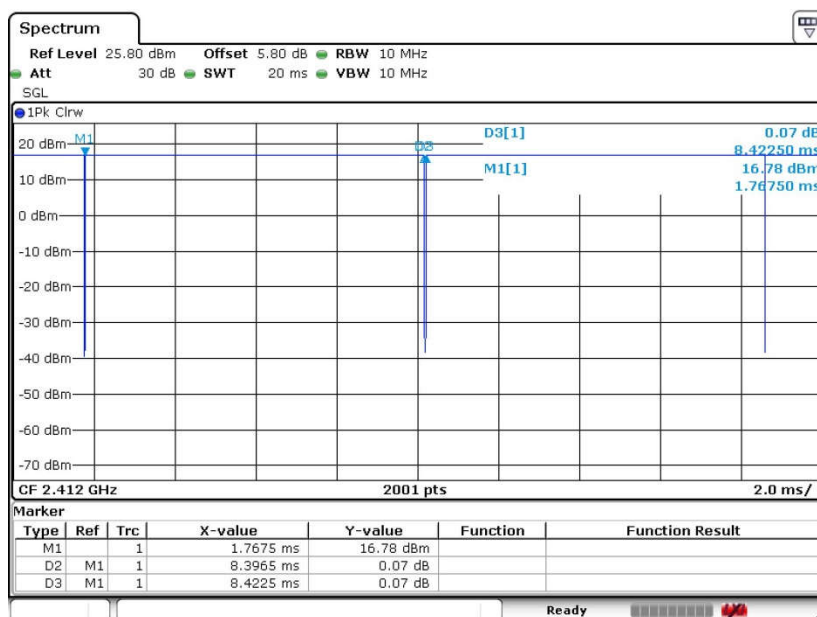
= -10.46(dB)

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

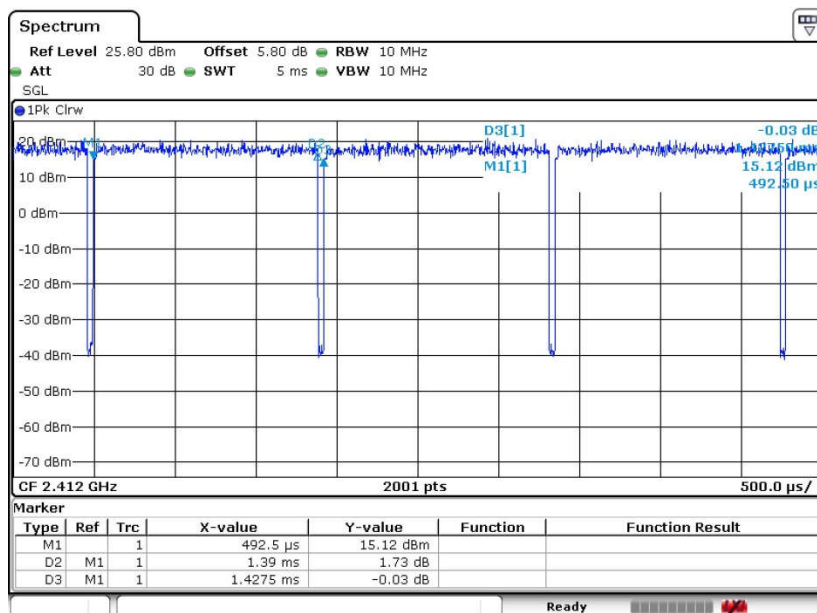
## Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	99.691	-	-	10Hz
802.11g	97.373	1.390	0.719	1kHz
2.4GHz 802.11n HT20	97.378	1.300	0.769	1kHz
2.4GHz 802.11n HT40	94.872	0.648	1.544	3kHz

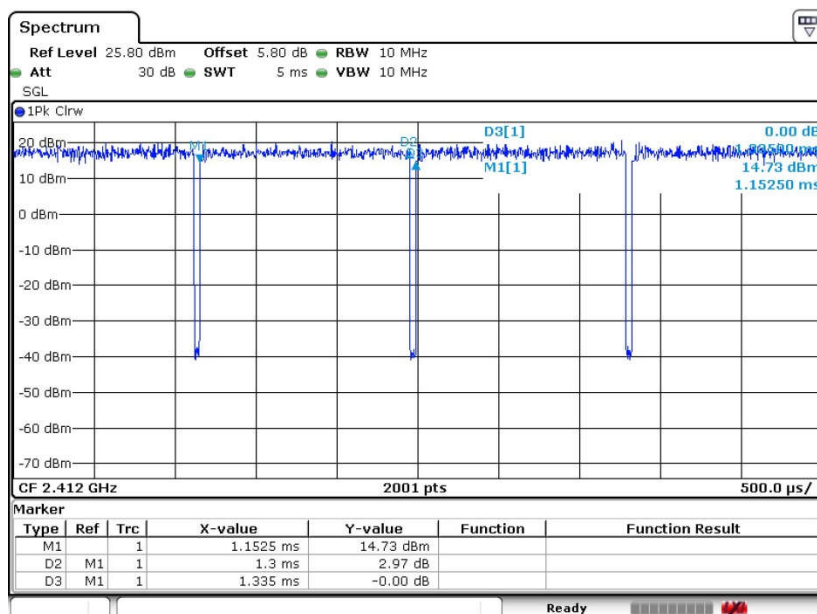
### 802.11b



### 802.11g



### 2.4GHz 802.11n HT20





2.4GHz 802.11n HT40

