



# FCC RF Test Report

**APPLICANT** : Lenovo(Shanghai) Electronics  
Technology Co., Ltd.  
**EQUIPMENT** : Portable Tablet Computer  
**BRAND NAME** : Lenovo  
**MODEL NAME** : Lenovo TB-X704L  
**FCC ID** : O57TBX704L  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was completed on Aug. 14, 2017. 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.



Approved by: Eric Shih / Manager

**Sporton International (Shenzhen) Inc.**

**1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City  
Guangdong Province 518055 China**



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### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 12.07 dB at 949.560 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 16.62 dB at 0.150 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

**Lenovo(Shanghai) Electronics Technology Co., Ltd.**

NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

## 1.2 Manufacturer

**Lenovo PC HK Limited**

23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

## 1.3 Product Feature of Equipment Under Test

Product Feature	
<b>Equipment</b>	Portable Tablet Computer
<b>Brand Name</b>	Lenovo
<b>Model Name</b>	Lenovo TB-X704L
<b>FCC ID</b>	O57TBX704L
<b>EUT supports Radios application</b>	GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/HSPA+ (16QAM uplink is not supported)/LTE/ WLAN2.4GHz 802.11b/g/n HT20/HT40/ WLAN5GHz 802.11a/n HT20/HT40/ WLAN5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0 + EDR/Bluetooth v4.0 LE/ Bluetooth v4.1 LE//Bluetooth v4.2 LE
<b>IMEI Code</b>	Conducted: 86383803000180 Conduction: 86383803007719/86383803003809 Radiation: 863838030007719/863838030003809
<b>HW Version</b>	Lenovo Tablet TB-X704L
<b>SW Version</b>	TB-X704L_RF01_20170331
<b>EUT Stage</b>	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	
<b>Tx/Rx Channel Frequency Range</b>	2412 MHz ~ 2462 MHz
<b>Maximum (Peak) Output Power to antenna</b>	802.11b : 17.46 dBm (0.0557 W) 802.11g : 24.46 dBm (0.2793 W) 802.11n HT20 : 24.64 dBm (0.2911 W) 802.11n HT40 : 23.69 dBm (0.2339 W)
<b>Antenna Type / Gain</b>	PIFA Antenna type with gain 0.79 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

Sporton Lab is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600156-0) and the FCC designation No are CN5018 and CN5019

<b>Test Site</b>	Sporton International (Shenzhen) Inc.		
<b>Test Site Location</b>	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC Test Firm Registration No.</b>
	TH01-SZ	CO01-SZ	251365

<b>Test Site</b>	Sporton International (Shenzhen) Inc.		
<b>Test Site Location</b>	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan District Shenzhen City Guangdong Province 518055 China TEL: +86-755-3320-2398		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC Test Firm Registration No.</b>
	03CH03-SZ		577730

**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 v04
- 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.



## 1.8 Specification of Accessory

Specification of Accessory				
AC Adapter 1	Brand Name	Lenovo (AcBel)	Model Name	C-P35
	Power Rating	I/P: 100-240Vac, 300mA, O/P: 5.2Vdc, 2000mA		
AC Adapter 2	Brand Name	Lenovo (huntkey)	Model Name	C-P35
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5.2Vdc, 2000mA		
Battery 1	Brand Name	Lenovo(SCUD)	Model Name	L16D2P31
	Power Rating	3.85Vdc,7000mAh	Type	Li-ion
Battery 2	Brand Name	Lenovo(Celxpert)	Model Name	L16D2P31
	Power Rating	3.85Vdc,7000mAh	Type	Li-ion
USB Cable 1	Brand Name	Lenovo(LI QI)	Model Name	N/A
	Signal Line Type	1.0 meter, shielded cable, without core		
USB Cable 2	Brand Name	Lenovo(saibao)	Model Name	N/A
	Signal Line Type	1.0 meter, shielded cable, without core		

## 1.9 Component List

**Note:** There are four types of EUT, sample 1, sample 2, sample 3 and sample 4, please refer to the following table for the differences between them. According to the differences, only choose the worse configuration sample 1 and sample 2 to perform test.

Component	Sample 1	Sample 2
CPU	Qualcomm MSM-8953-2-857NSP-TR-01-0-AB	Qualcomm MSM-8953-2-857NSP-TR-01-0-AB
BT/WIFI Module	Qualcomm WCN-3680B-0-79BWLNSP-TR-05-1	Qualcomm WCN-3680B-0-79BWLNSP-TR-05-1
RAM/EMMC	4G+64G Samsung KMRC10014M-B809 MCP_64GB-eMMC_32Gb-LPDDR3	4G+64G Hynix H9TQ52ACLTMCUR-KUM MCP_64GB-eMMC_32Gb-LPDDR3
Camera front	Hua quan: G7P2-A6500FHQ	Hua quan: G7P2-A6500FHQ
Camera rear	Q Tech: FX219BH	film: L8856A10
LCD	BOE: TV101WUM-NL1	INX: P101KDA-AF0
Battery	SCUD L16D2P31 3.85V/7000mAh	Celxpert L16D2P31 3.85V/7000mAh

Component	Sample 3	Sample 4
CPU	Qualcomm MSM-8953-2-857NSP-TR-01-0-AB	Qualcomm MSM-8953-2-857NSP-TR-01-0-AB
BT/WIFI Module	Qualcomm WCN-3680B-0-79BWLNSP-TR-05-1	Qualcomm WCN-3680B-0-79BWLNSP-TR-05-1
RAM/EMMC	3G+16G Samsung KMRE1000BM-B512 MCP_16GB-eMMC_24Gb-LPDDR3	3G+16G Hynix H9TQ17ADFTACUR-KUM MCP_EMMC-16 GB_LPDDR3-3 GB
Camera front	Hua quan: G7P2-A6500FHQ	Hua quan: G7P2-A6500FHQ
Camera rear	Q Tech: FX219BH	film: L8856A10
LCD	BOE: TV101WUM-NL1	INX: P101KDA-AF0
Battery	SCUD L16D2P31 3.85V/7000mAh	Celxpert L16D2P31 3.85V/7000mAh



## 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

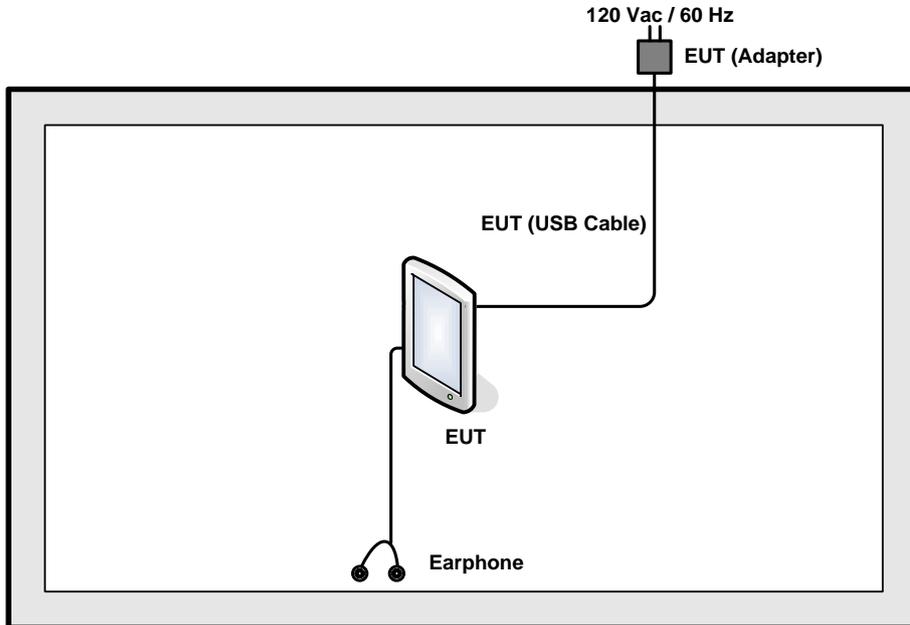
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

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

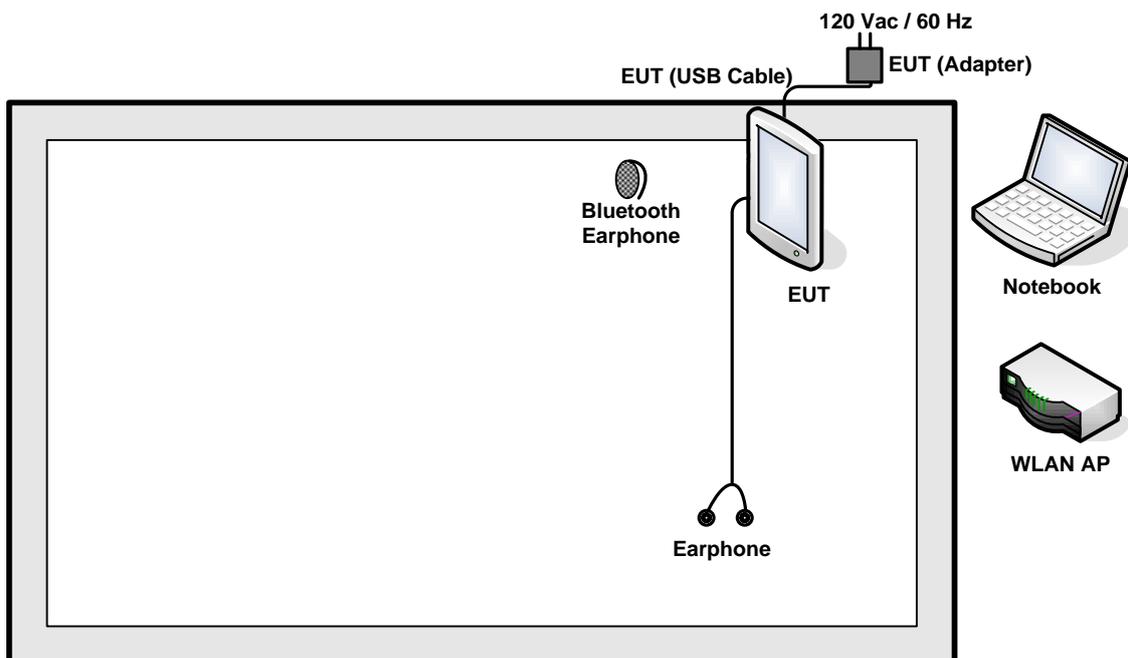
Test Cases	
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable 1 (Charging from Adapter 1 ) for Sample 1 Mode 2 : Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable 2 (Charging from Adapter 2 ) for Sample 2
<b>Remark:</b> For Radiated Test Cases, The tests were performed with Adapter 1, Earphone, and USB Cable 1	

## 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.	Bluetooth Earphone	NOKIA	BH-108	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-865L	KA2IR865LA1	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	E450	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Earphone	Lenovo	SH100	N/A	Unshielded,1.2m	N/A

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously 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 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 Bandwidth Measurement

##### 3.1.1 Limit of 6dB Bandwidth

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

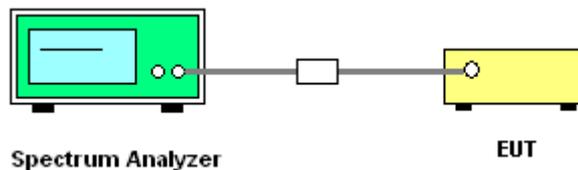
##### 3.1.2 Measuring Instruments

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 v04.
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.

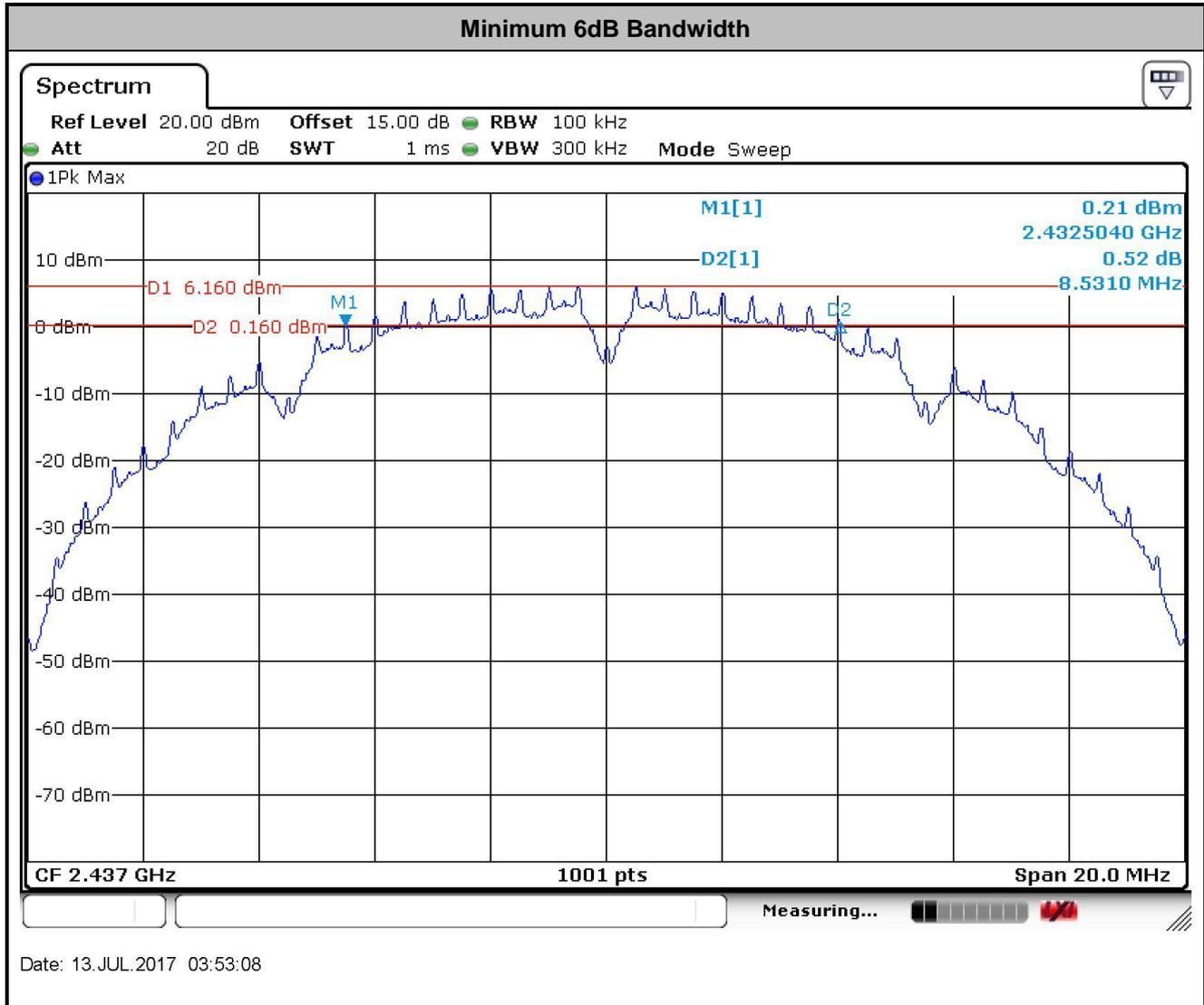
##### 3.1.4 Test Setup





### 3.1.5 Test Result of 6dB Occupied Bandwidth

Please refer to Appendix A.



## 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.

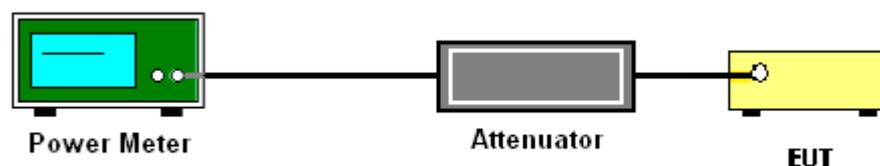
### 3.2.2 Measuring Instruments

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 v04 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.

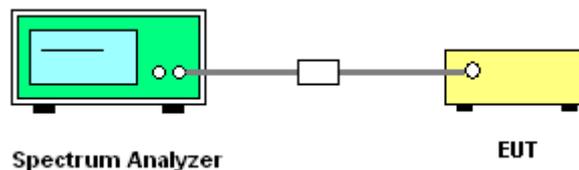
#### 3.3.2 Measuring Instruments

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 v04
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.

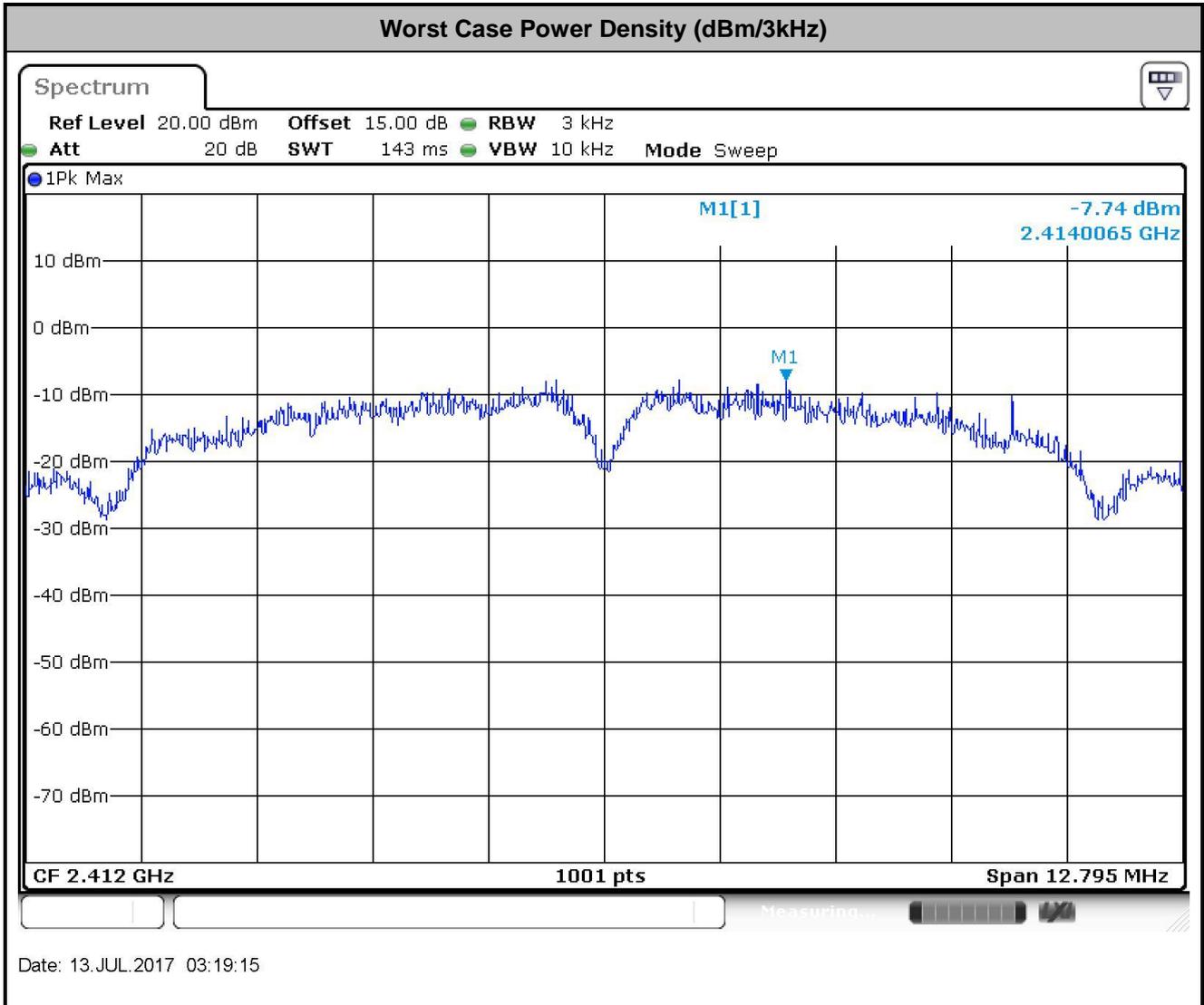
#### 3.3.4 Test Setup





### 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.

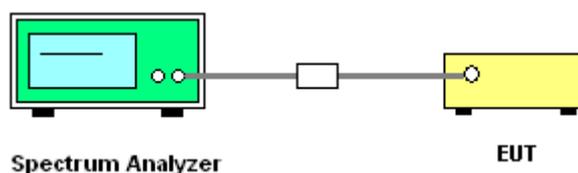
### 3.4.2 Measuring Instruments

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 v04.
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.
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.

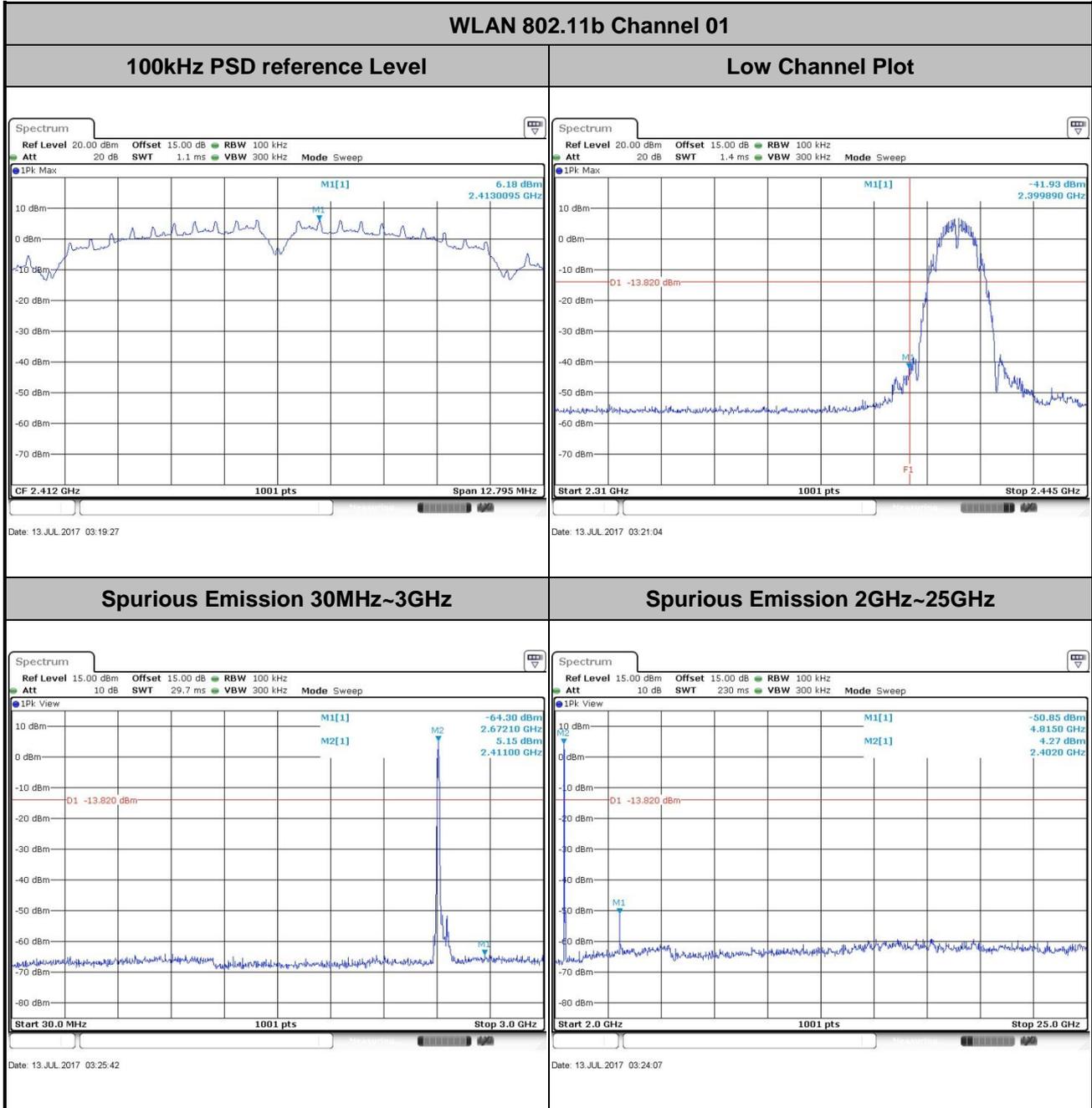
### 3.4.4 Test Setup





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

Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Bruce Huang



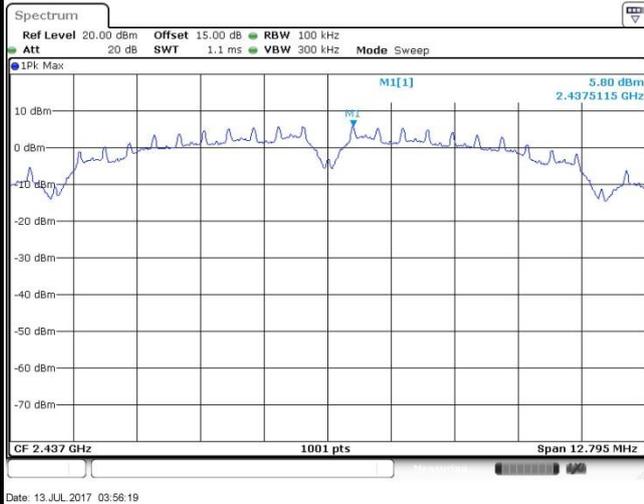


Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

WLAN 802.11b Channel 06

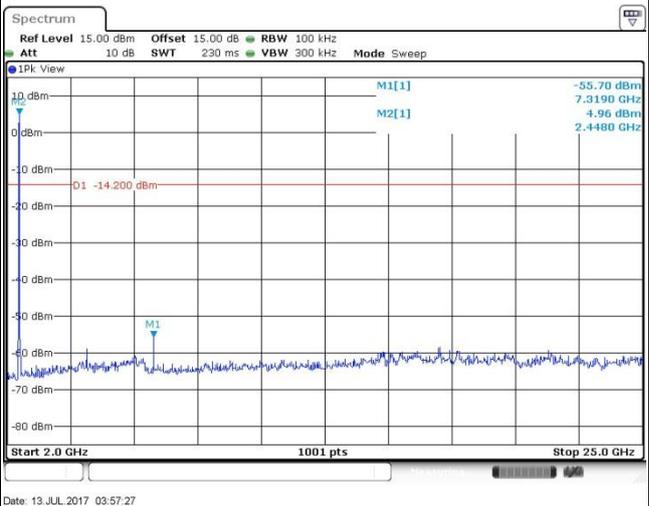
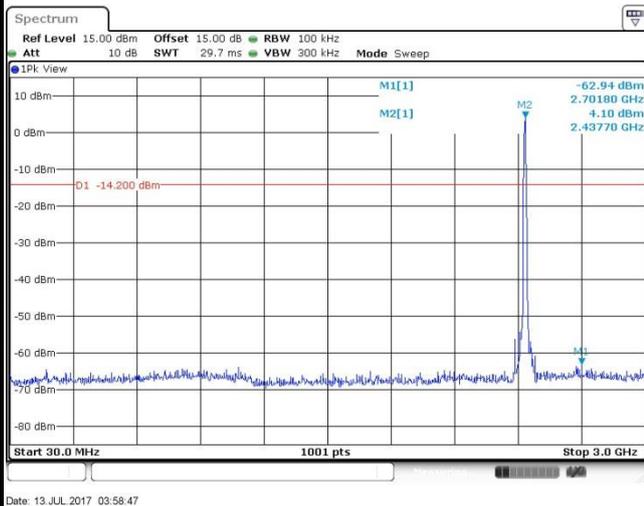
100kHz PSD reference Level

Mid Channel Plot



Spurious Emission 30MHz~3GHz

Spurious Emission 2GHz~25GHz

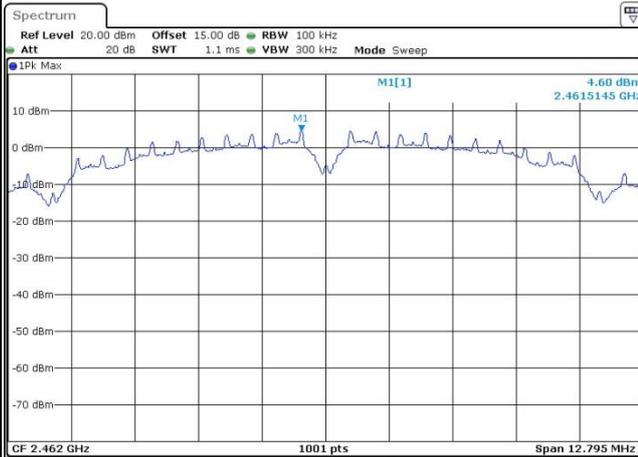




Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Bruce Huang

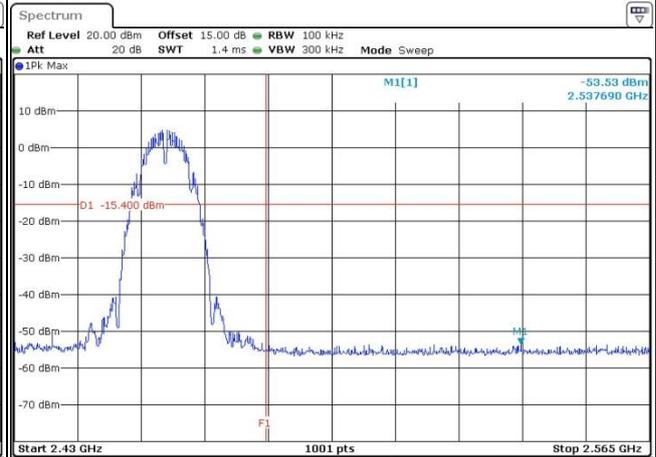
WLAN 802.11b Channel 11

100kHz PSD reference Level



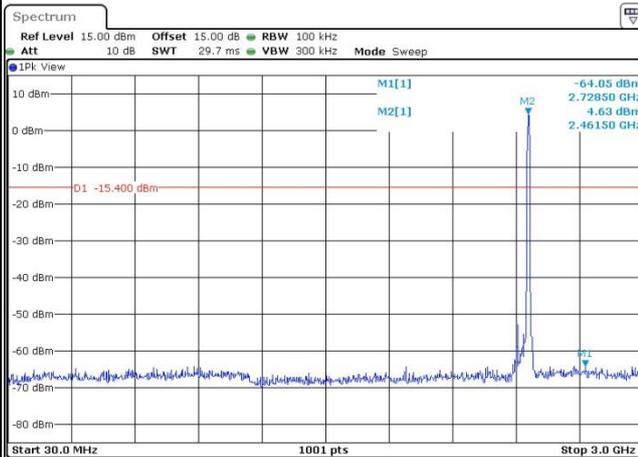
Date: 13 JUL 2017 04:09:07

High Channel Plot



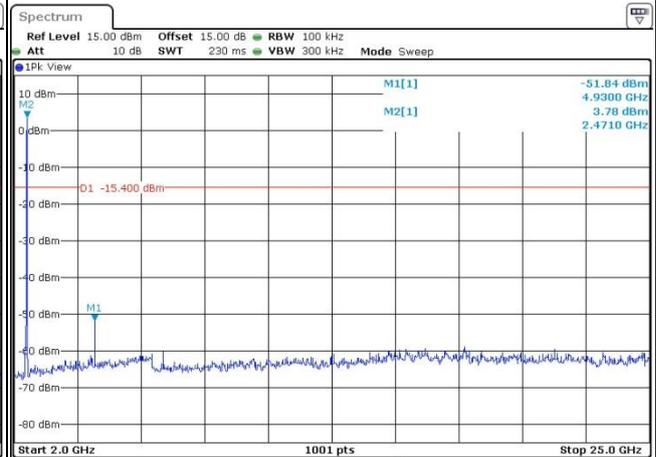
Date: 13 JUL 2017 04:09:32

Spurious Emission 30MHz~3GHz



Date: 13 JUL 2017 04:37:53

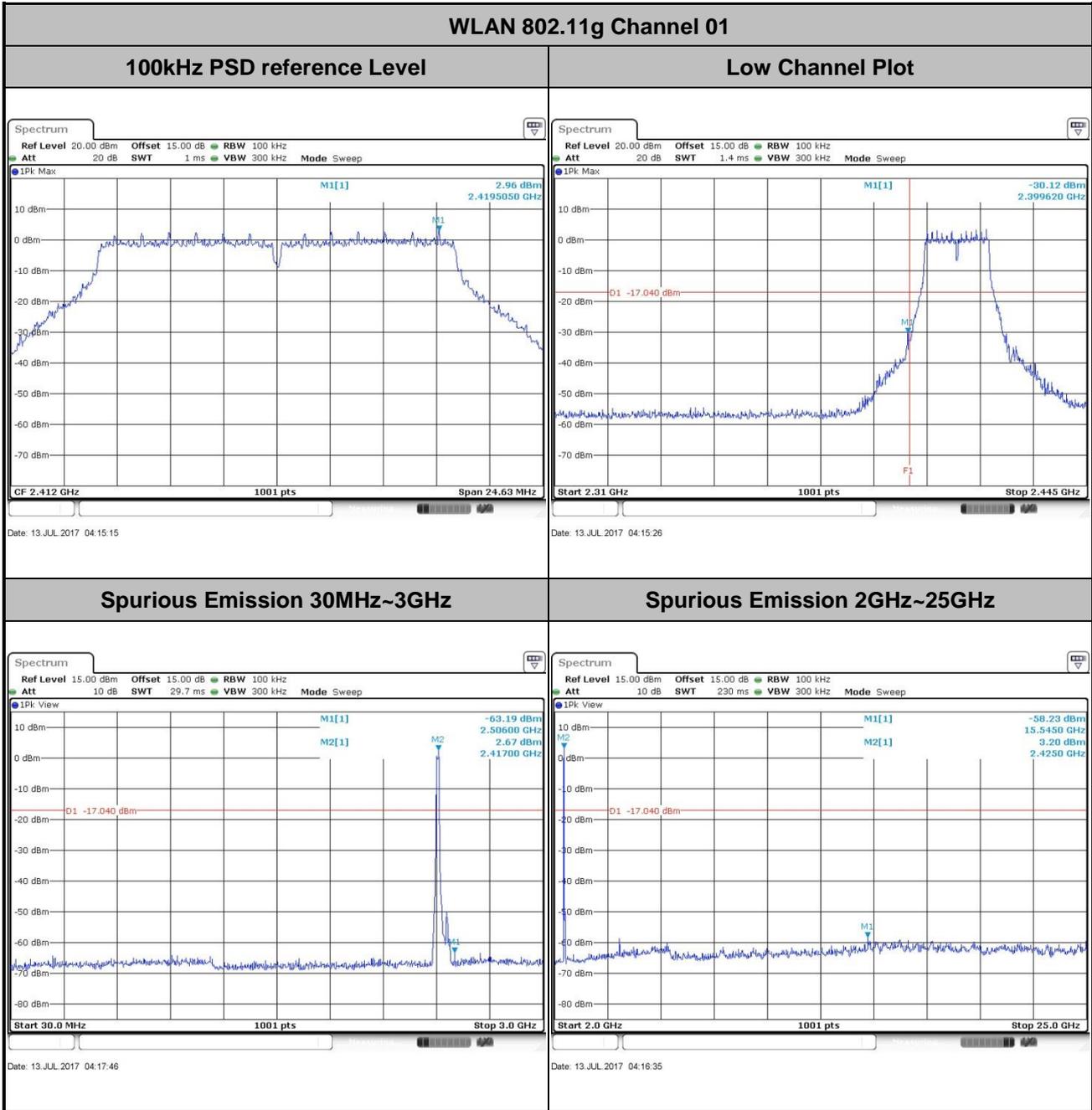
Spurious Emission 2GHz~25GHz



Date: 13 JUL 2017 04:36:24



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



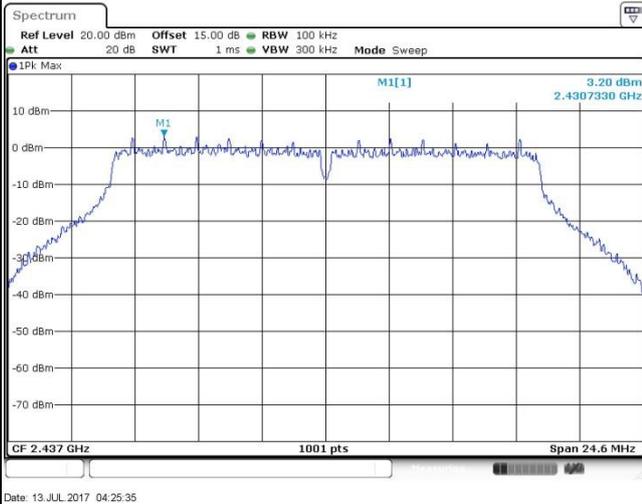


Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

WLAN 802.11g Channel 06

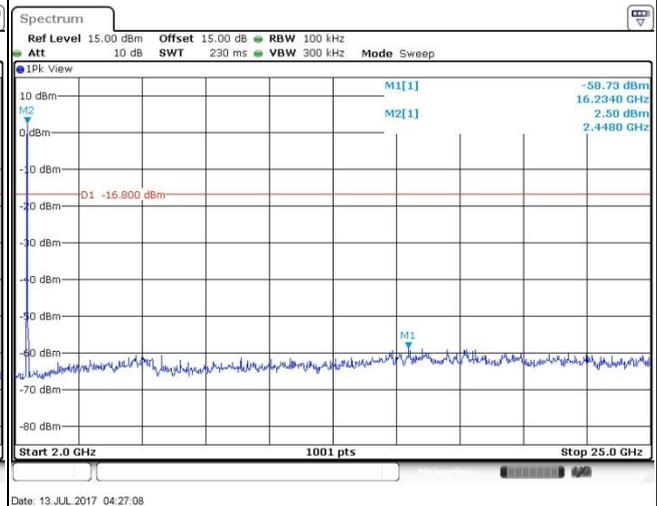
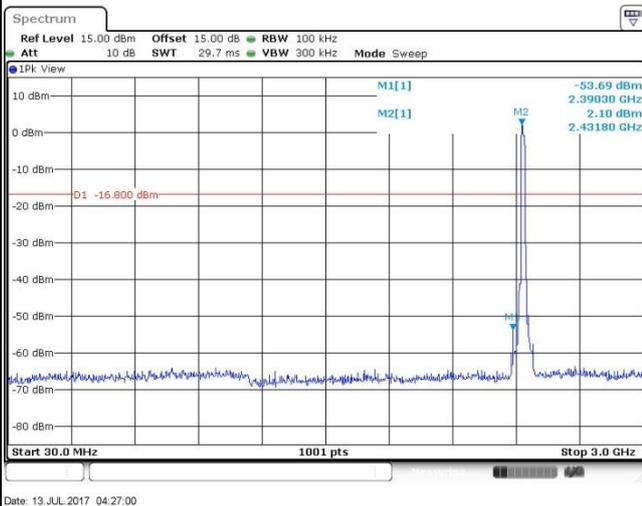
100kHz PSD reference Level

Mid Channel Plot



Spurious Emission 30MHz~3GHz

Spurious Emission 2GHz~25GHz

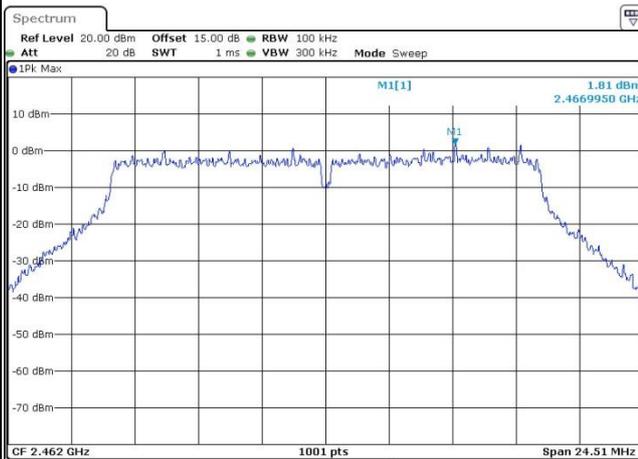




Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Bruce Huang

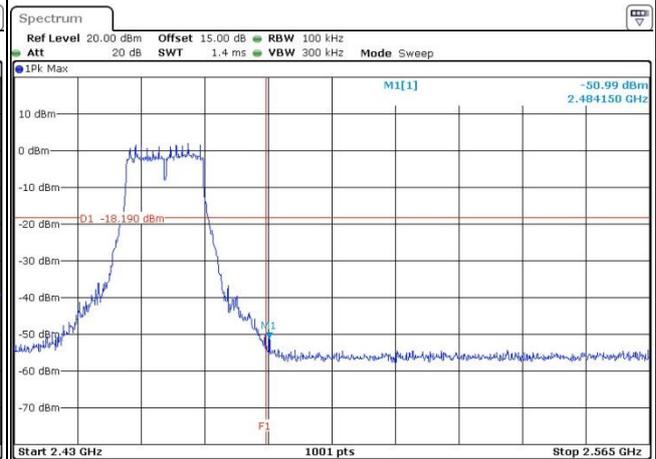
WLAN 802.11g Channel 11

100kHz PSD reference Level



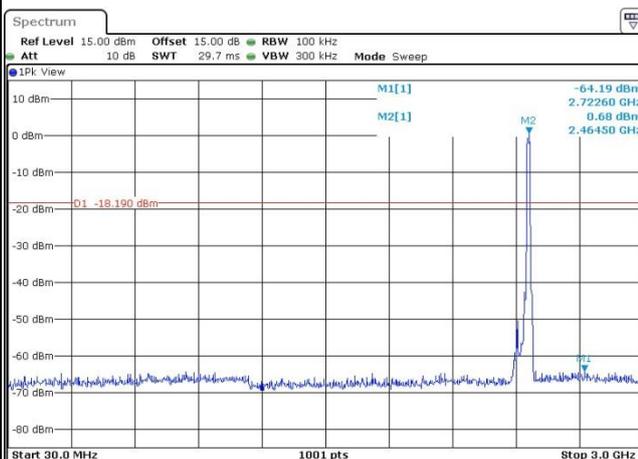
Date: 13.JUL.2017 04:31:54

High Channel Plot



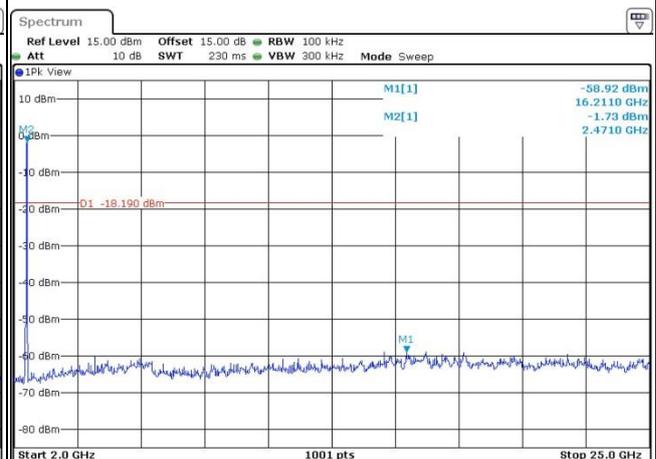
Date: 13.JUL.2017 04:32:18

Spurious Emission 30MHz~3GHz



Date: 13.JUL.2017 04:34:00

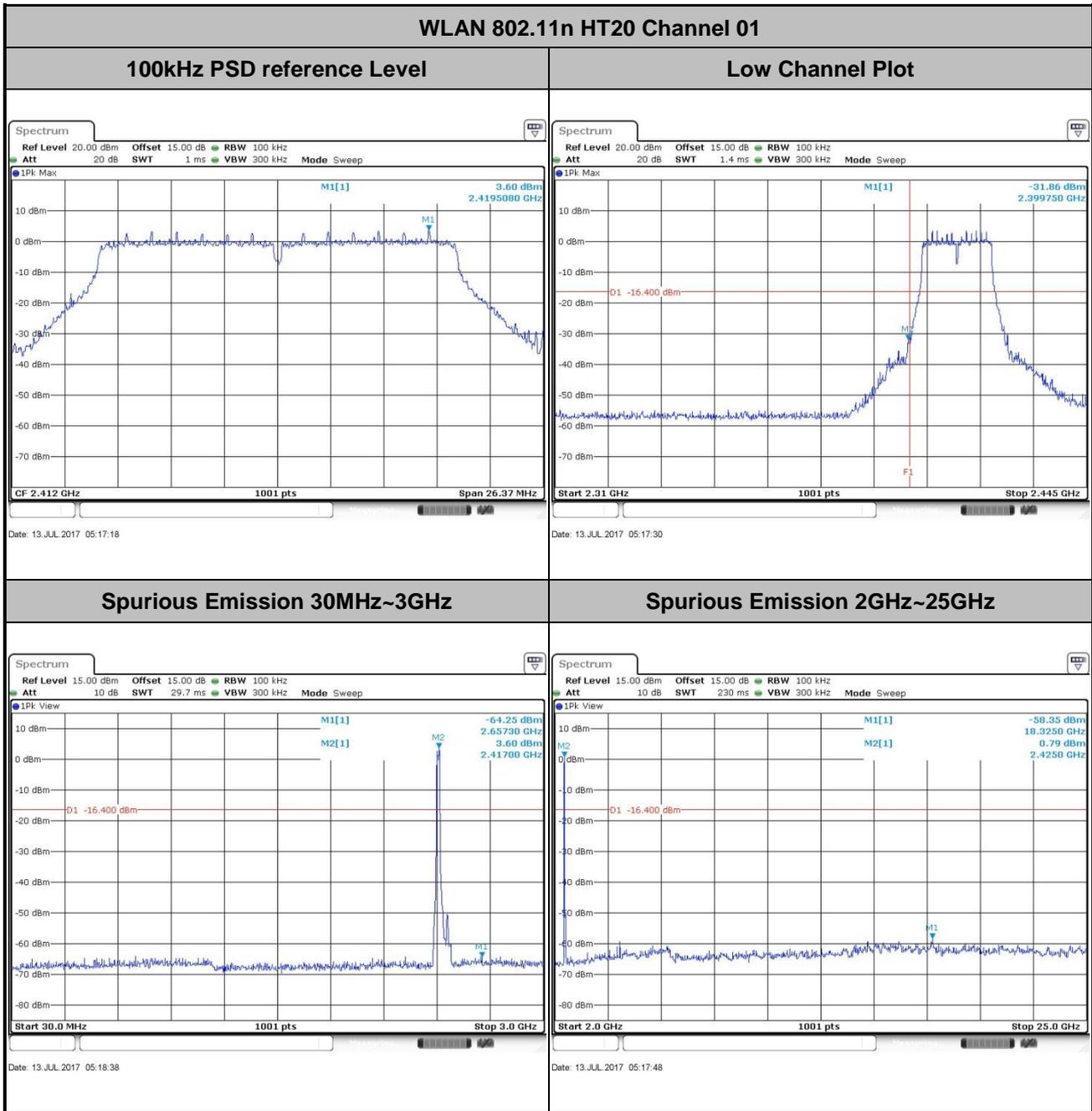
Spurious Emission 2GHz~25GHz



Date: 13.JUL.2017 04:32:39



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



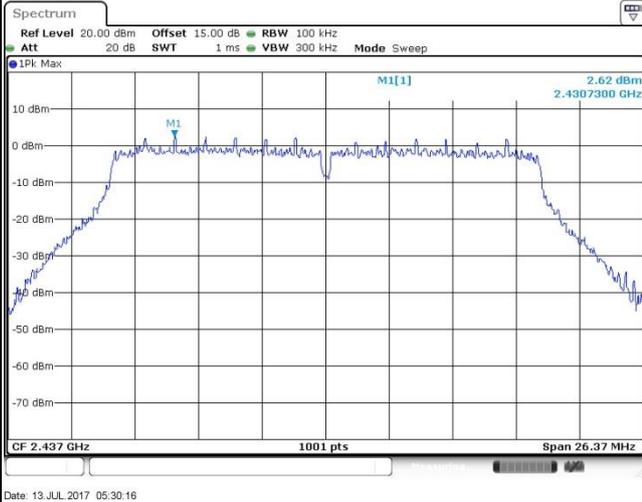


Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

WLAN 802.11n HT20 Channel 06

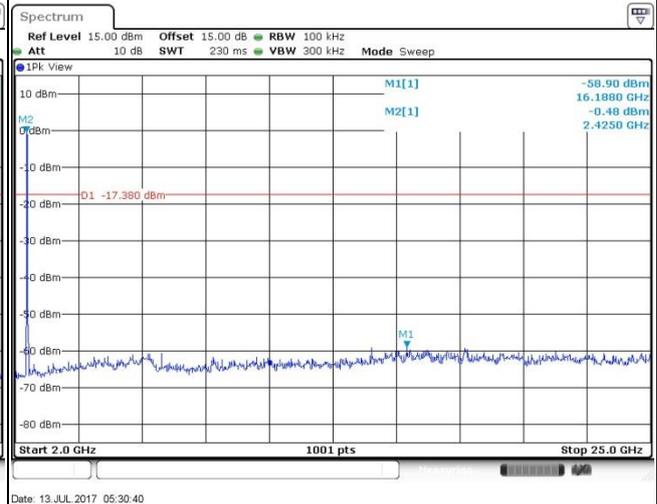
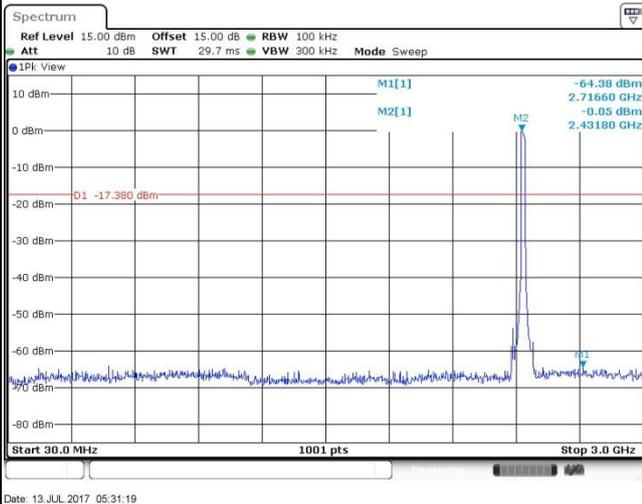
100kHz PSD reference Level

Mid Channel Plot



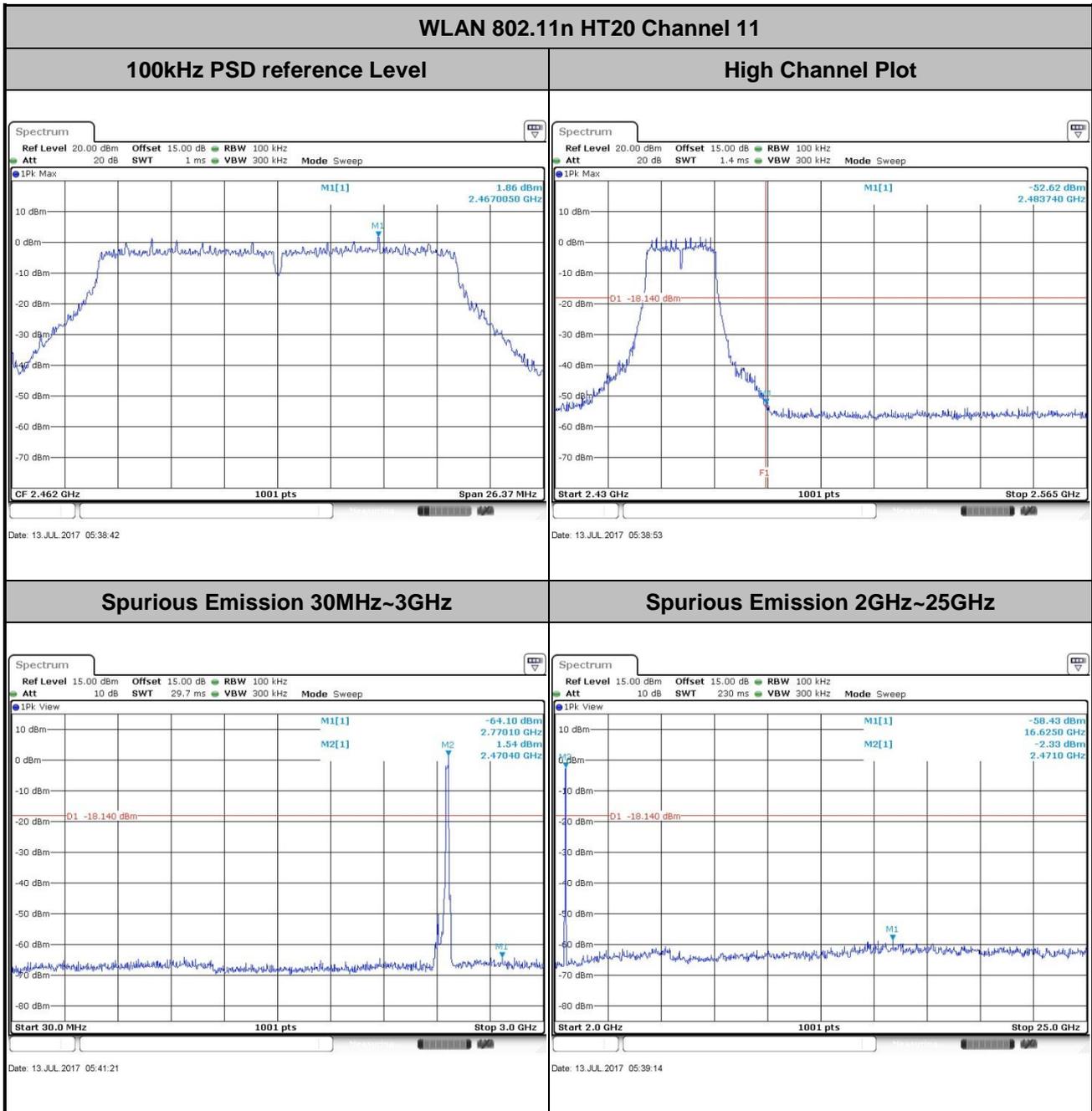
Spurious Emission 30MHz~3GHz

Spurious Emission 2GHz~25GHz



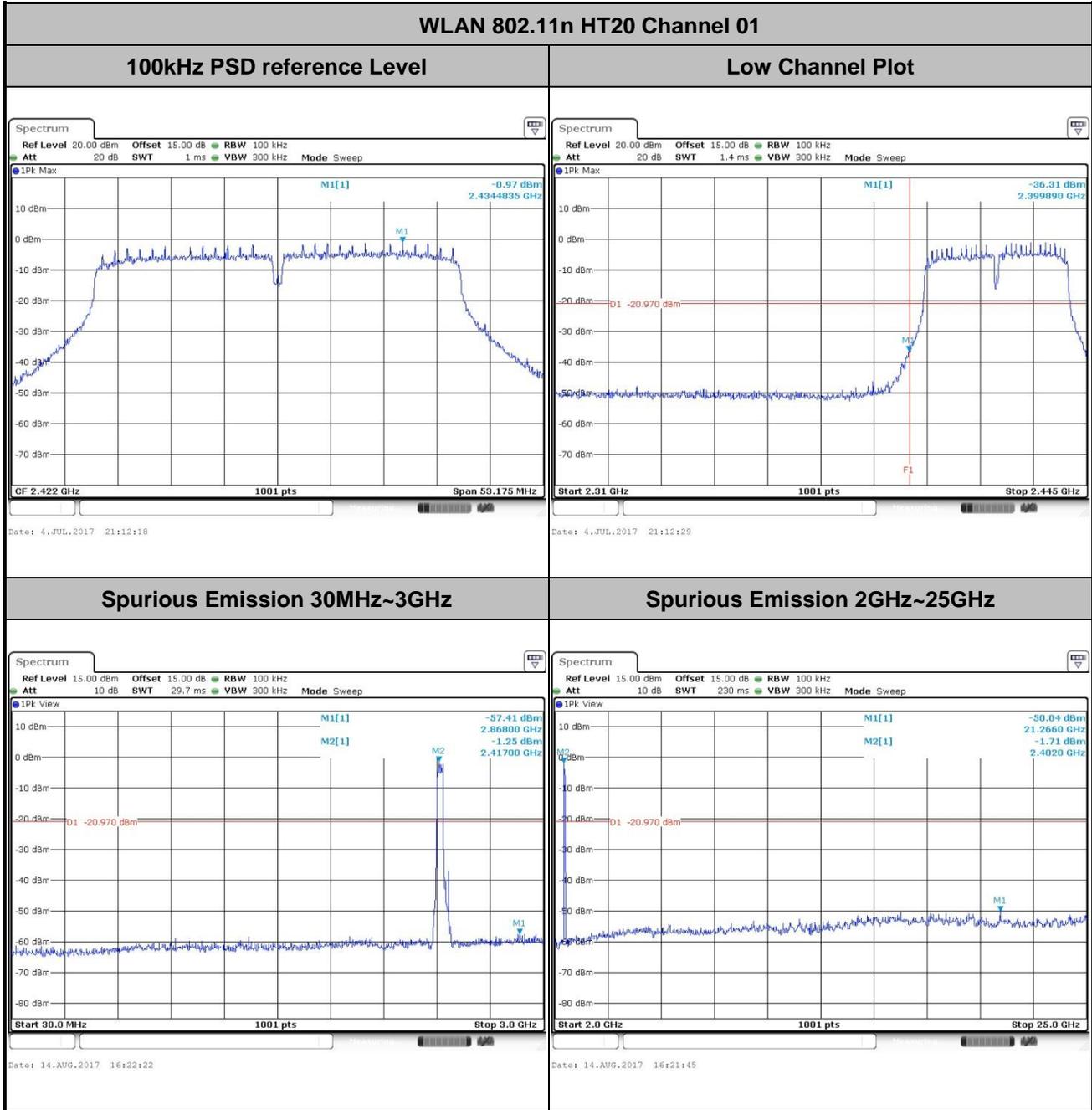


Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Bruce Huang





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



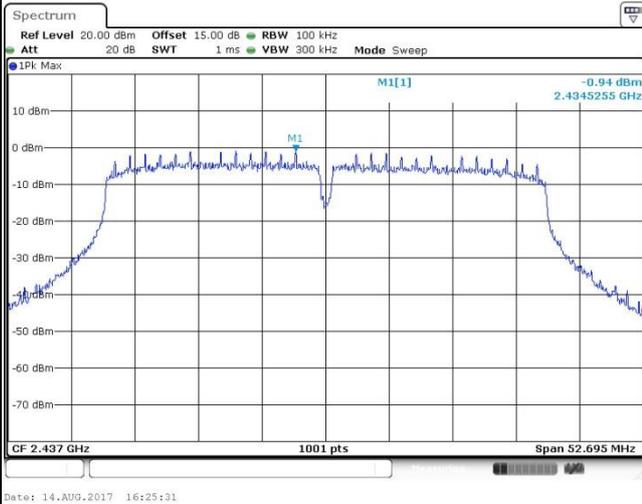


Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

WLAN 802.11n HT20 Channel 06

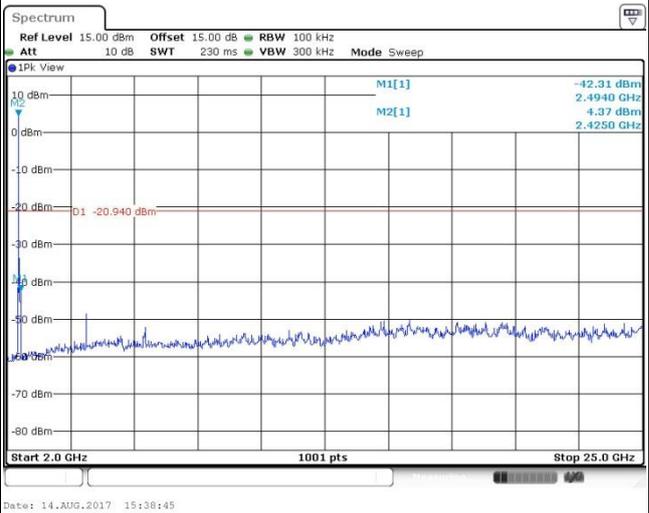
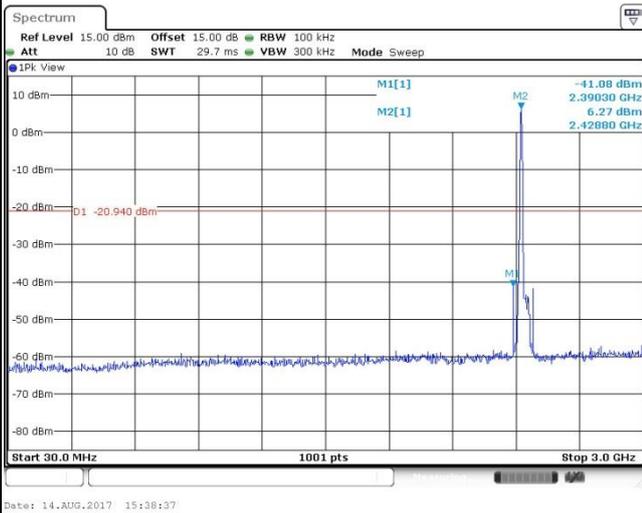
100kHz PSD reference Level

Mid Channel Plot



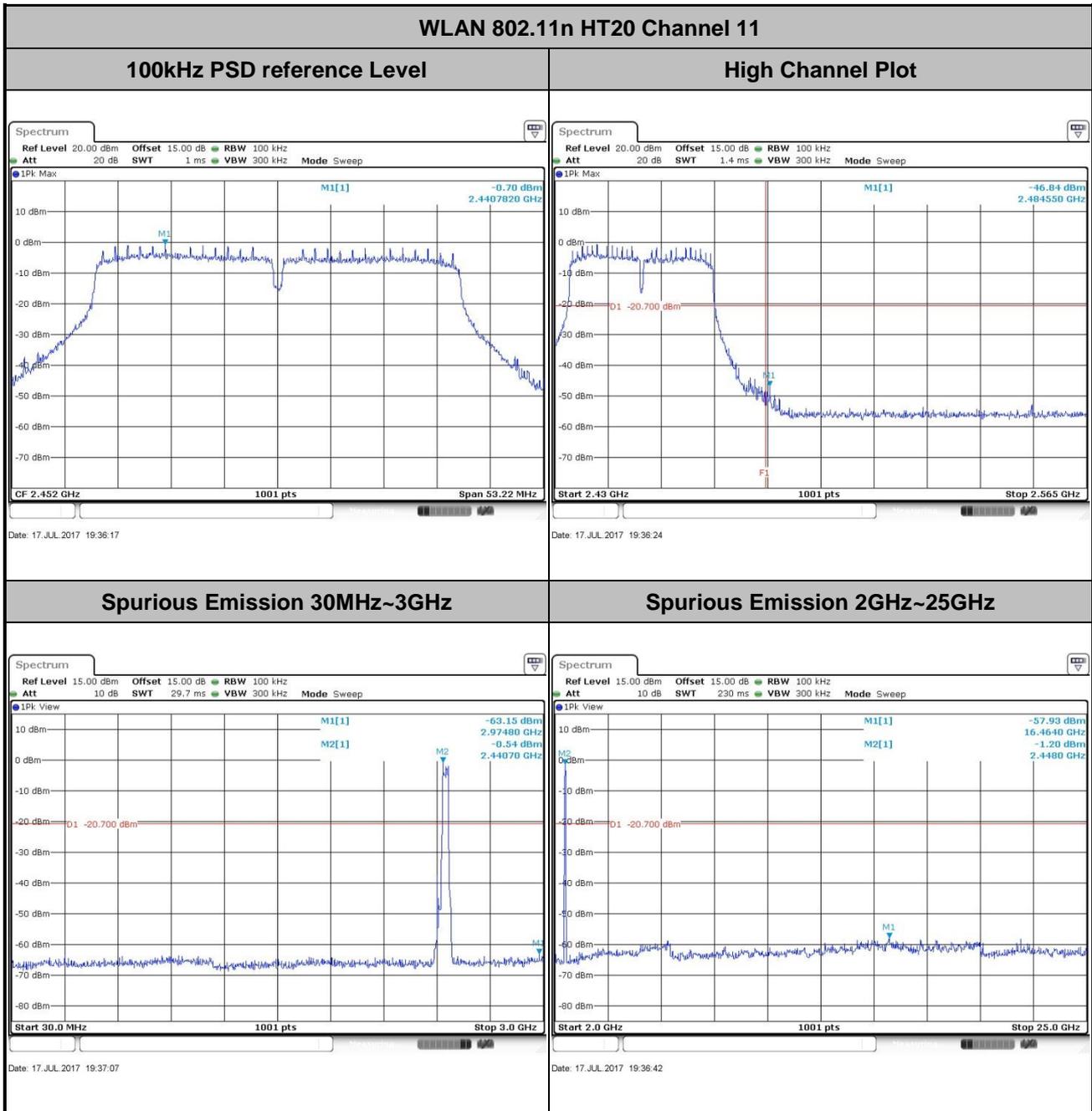
Spurious Emission 30MHz~3GHz

Spurious Emission 2GHz~25GHz





Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	9	Test Engineer :	Bruce Huang





### 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 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.

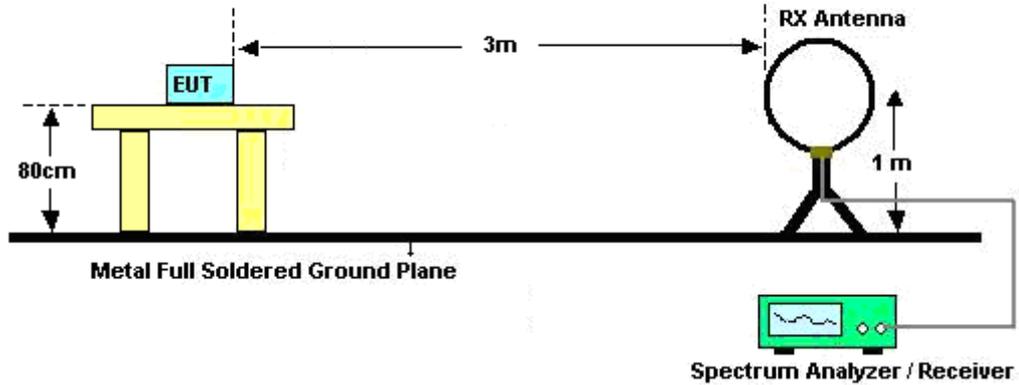


### 3.5.3 Test Procedures

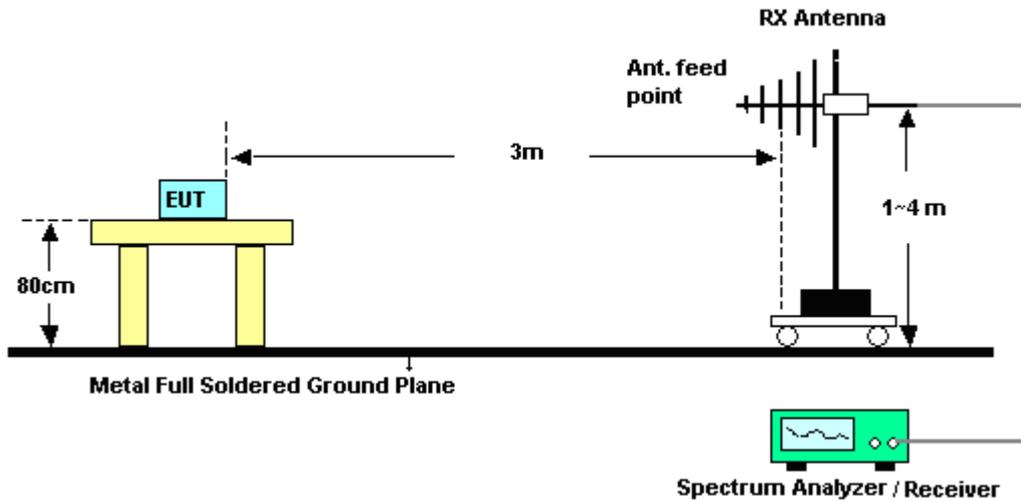
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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

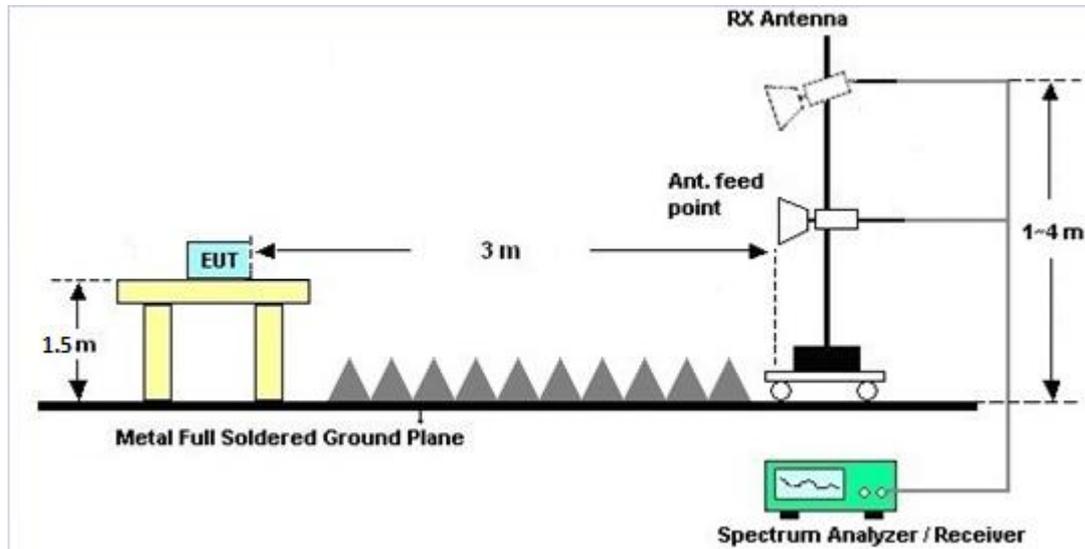
For radiated emissions below 30MHz



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 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 (dBµV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

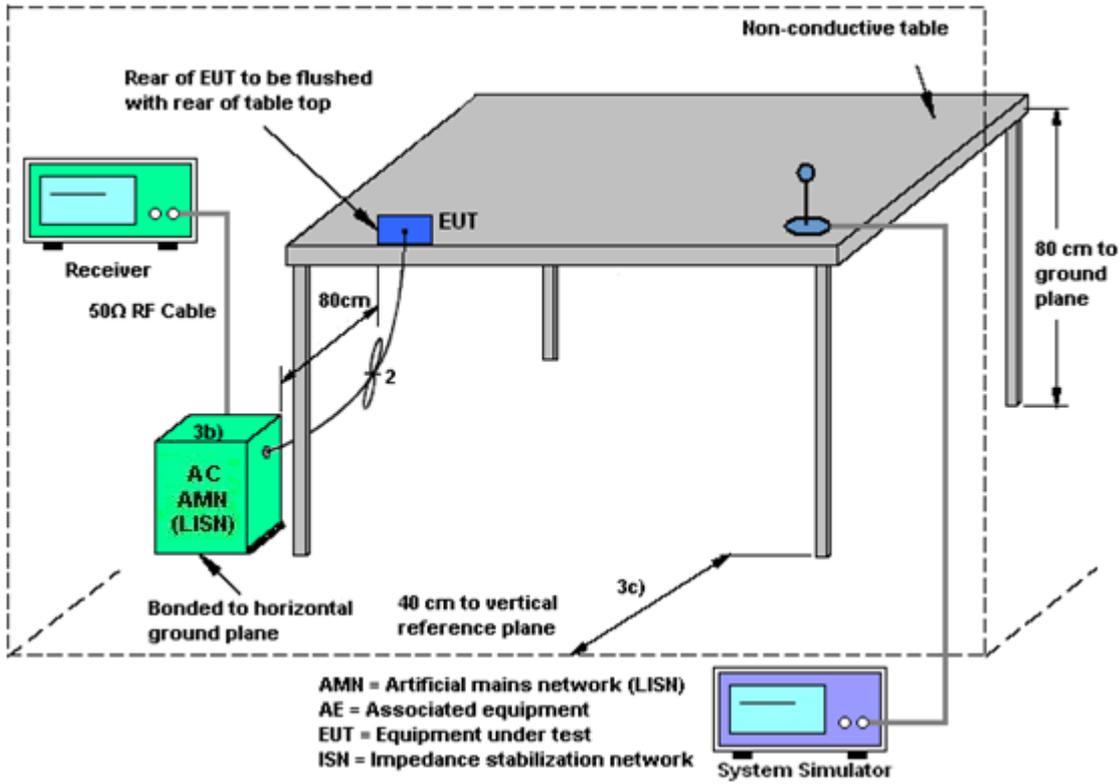
#### 3.6.2 Measuring Instruments

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

#### 3.6.3 Test Procedures

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

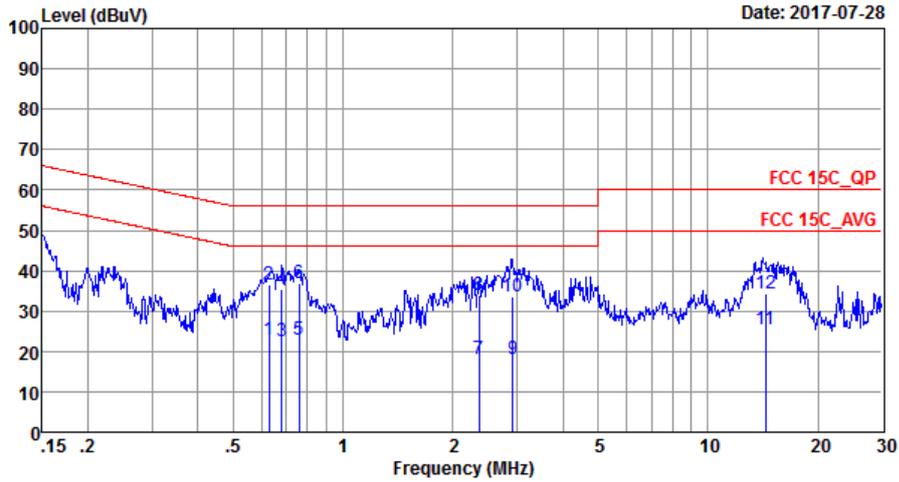
### 3.6.4 Test Setup





3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	Temperature :	24~25°C
Test Engineer :	HaoHai Ye	Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable 2 (Charging from Adapter 2 ) for Sample 2		

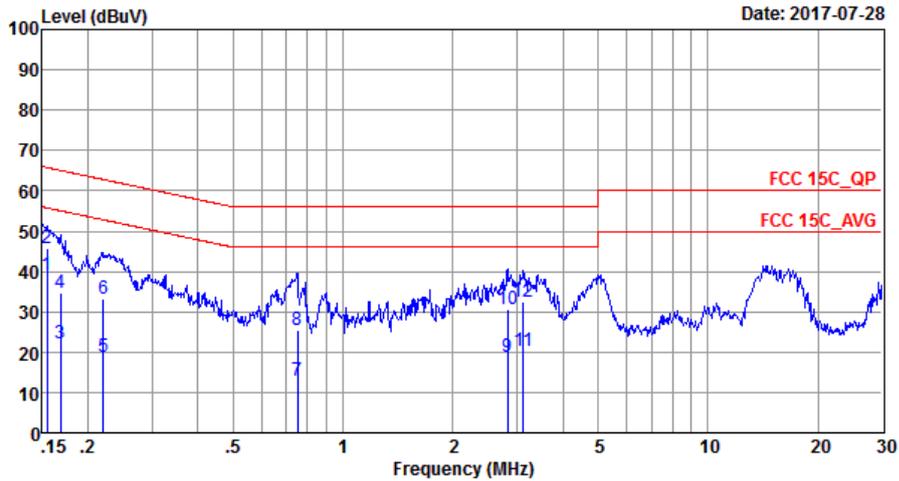


Site : C001-SZ  
 Condition: FCC 15C\_QP LISN\_20170301\_L LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.63	22.99	-23.01	46.00	12.80	0.02	10.17	Average
2	0.63	36.39	-19.61	56.00	26.20	0.02	10.17	QP
3	0.68	22.39	-23.61	46.00	12.20	0.02	10.17	Average
4	0.68	35.49	-20.51	56.00	25.30	0.02	10.17	QP
5	0.76	22.89	-23.11	46.00	12.70	0.03	10.16	Average
6 *	0.76	36.79	-19.21	56.00	26.60	0.03	10.16	QP
7	2.36	18.21	-27.79	46.00	7.90	0.13	10.18	Average
8	2.36	33.81	-22.19	56.00	23.50	0.13	10.18	QP
9	2.92	17.97	-28.03	46.00	7.60	0.16	10.21	Average
10	2.92	33.57	-22.43	56.00	23.20	0.16	10.21	QP
11	14.36	25.41	-24.59	50.00	14.60	0.49	10.32	Average
12	14.36	34.31	-25.69	60.00	23.50	0.49	10.32	QP



Test Mode :	Mode 2	Temperature :	24~25°C
Test Engineer :	HaoHai Ye	Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable 2 (Charging from Adapter 2 ) for Sample 2		



Site : CO01-SZ  
 Condition: FCC 15C\_QP LISN\_20170301\_N NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.15	39.12	-16.62	55.74	28.70	0.03	10.39	Average
2	0.15	45.62	-20.12	65.74	35.20	0.03	10.39	QP
3	0.17	22.06	-32.97	55.03	11.70	0.03	10.33	Average
4	0.17	34.86	-30.17	65.03	24.50	0.03	10.33	QP
5	0.22	18.75	-34.04	52.79	8.50	0.03	10.22	Average
6	0.22	33.25	-29.54	62.79	23.00	0.03	10.22	QP
7	0.75	12.99	-33.01	46.00	2.80	0.03	10.16	Average
8	0.75	25.49	-30.51	56.00	15.30	0.03	10.16	QP
9	2.82	18.64	-27.36	46.00	8.41	0.03	10.20	Average
10	2.82	30.54	-25.46	56.00	20.31	0.03	10.20	QP
11	3.12	20.25	-25.75	46.00	10.00	0.03	10.22	Average
12	3.12	32.65	-23.35	56.00	22.40	0.03	10.22	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 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	101078	9kHz~40GHz	Apr. 20, 2017	Jul. 13 2017~ Aug. 14, 2017	Apr. 19, 2018	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 06, 2017	Jul. 13, 2017~ Aug. 14, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 06, 2017	Jul. 13, 2017~ Aug. 14, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY544500 83	20Hz~8.4GHz	Apr. 20, 2017	Jul. 19, 2017~ Jul. 20, 2017	Apr. 19, 2018	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 46	10Hz~44GHz;	Apr. 20, 2017	Jul. 19, 2017~ Jul. 20, 2017	Apr. 19, 2018	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2017	Jul. 19, 2017~ Jul. 20, 2017	May 13, 2018	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	May 14, 2017	Jul. 19, 2017~ Jul. 20, 2017	May 13, 2018	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-135 5	1GHz~18GHz	Jul. 09, 2017	Jul. 19, 2017~ Jul. 20, 2017	Jul. 08, 2018	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Jun. 16, 2017	Jul. 19, 2017~ Jul. 20, 2017	Jun. 15, 2018	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 11, 2016	Jul. 19, 2017~ Jul. 20, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101 800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	Jul. 19, 2017~ Jul. 20, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY395013 02	500MHz~26.5G Hz	Jan. 06, 2017	Jul. 19, 2017~ Jul. 20, 2017	Jan. 05, 2018	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-H G	1988315	18GHz~40GHz	Jul. 28, 2016	Jul. 19, 2017~ Jul. 20, 2017	Jul. 27, 2017	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001 985	N/A	NCR	Jul. 19, 2017~ Jul. 20, 2017	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jul. 19, 2017~ Jul. 20, 2017	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jul. 19, 2017~ Jul. 20, 2017	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jan. 06, 2017	Jul. 28, 2017	Jan. 05, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Jan. 05, 2017	Jul. 28, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103892	9kHz~30MHz	Jan. 05, 2017	Jul. 28, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000 891	100Vac~250Vac	Jul. 19, 2017	Jul. 28, 2017	Jul. 18, 2018	Conduction (CO01-SZ)
Pulse Limiter	COM-POWER	LIT-153 Transient Limiter	53139	150kHz~30MHz	Oct. 11, 2016	Jul. 28, 2017	Oct. 10, 2017	Conduction (CO01-SZ)
RF Cable	Woken	B0720#0001	CO01SZ00 07	150kHz~30MHz	Oct. 08, 2016	Jul. 28, 2017	Oct. 07, 2017	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% ( $U = 2Uc(y)$ )	2.5dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.1dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.0dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.0dB
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## Appendix A. Conducted Test Results

**A1 - DTS Part**

Test Engineer:	Bruce Huang	Temperature:	24~26	°C
Test Date:	2017/7/13~2017/8/14	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	13.29	8.53	0.50	Pass
11b	1Mbps	1	6	2437	13.14	8.53	0.50	Pass
11b	1Mbps	1	11	2462	13.29	8.53	0.50	Pass
11g	6Mbps	1	1	2412	18.48	16.42	0.50	Pass
11g	6Mbps	1	6	2437	18.33	16.40	0.50	Pass
11g	6Mbps	1	11	2462	18.38	16.34	0.50	Pass
HT20	MCS0	1	1	2412	19.08	17.58	0.50	Pass
HT20	MCS0	1	6	2437	19.18	17.58	0.50	Pass
HT20	MCS0	1	11	2462	19.08	17.58	0.50	Pass
HT40	MCS0	1	3	2422	36.36	35.45	0.50	Pass
HT40	MCS0	1	6	2437	36.46	35.13	0.50	Pass
HT40	MCS0	1	9	2452	36.56	35.48	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	17.46	30.00	0.79	18.25	36.00	Pass
11b	1Mbps	1	6	2437	16.90	30.00	0.79	17.69	36.00	Pass
11b	1Mbps	1	11	2462	15.83	30.00	0.79	16.62	36.00	Pass
11g	6Mbps	1	1	2412	24.46	30.00	0.79	25.25	36.00	Pass
11g	6Mbps	1	6	2437	24.38	30.00	0.79	25.17	36.00	Pass
11g	6Mbps	1	11	2462	22.96	30.00	0.79	23.75	36.00	Pass
HT20	MCS0	1	1	2412	24.64	30.00	0.79	25.43	36.00	Pass
HT20	MCS0	1	6	2437	23.94	30.00	0.79	24.73	36.00	Pass
HT20	MCS0	1	11	2462	22.67	30.00	0.79	23.46	36.00	Pass
HT40	MCS0	1	3	2422	23.69	30.00	0.79	24.48	36.00	Pass
HT40	MCS0	1	6	2437	22.80	30.00	0.79	23.59	36.00	Pass
HT40	MCS0	1	9	2452	23.24	30.00	0.79	24.03	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	0.00	14.83
11b	1Mbps	1	6	2437	0.00	14.22
11b	1Mbps	1	11	2462	0.00	13.03
11g	6Mbps	1	1	2412	0.58	14.72
11g	6Mbps	1	6	2437	0.58	14.22
11g	6Mbps	1	11	2462	0.58	13.02
HT20	MCS0	1	1	2412	0.64	14.82
HT20	MCS0	1	6	2437	0.64	14.46
HT20	MCS0	1	11	2462	0.64	13.16
HT40	MCS0	1	3	2422	0.65	13.26
HT40	MCS0	1	6	2437	0.65	12.65
HT40	MCS0	1	9	2452	0.65	11.90

**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	-7.74	0.79	8.00	Pass
11b	1Mbps	1	6	2437	-8.32	0.79	8.00	Pass
11b	1Mbps	1	11	2462	-9.83	0.79	8.00	Pass
11g	6Mbps	1	1	2412	-10.54	0.79	8.00	Pass
11g	6Mbps	1	6	2437	-10.30	0.79	8.00	Pass
11g	6Mbps	1	11	2462	-13.18	0.79	8.00	Pass
HT20	MCS0	1	1	2412	-9.55	0.79	8.00	Pass
HT20	MCS0	1	6	2437	-10.32	0.79	8.00	Pass
HT20	MCS0	1	11	2462	-13.08	0.79	8.00	Pass
HT40	MCS0	1	3	2422	-14.79	0.79	8.00	Pass
HT40	MCS0	1	6	2437	-15.33	0.79	8.00	Pass
HT40	MCS0	1	9	2452	-15.20	0.79	8.00	Pass



## Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
802.11b CH 01 2412MHz		2389.275	48.75	-25.25	74	50.4	27.51	5.06	34.22	220	166	P	H
		2389.695	37.09	-16.91	54	38.74	27.51	5.06	34.22	220	166	A	H
	*	2412	95.08	-	-	96.65	27.57	5.06	34.2	220	166	P	H
	*	2412	92.06	-	-	93.63	27.57	5.06	34.2	220	166	A	H
		2352.525	48.12	-25.88	74	49.96	27.38	5.02	34.24	324	259	P	V
		2389.695	37.13	-16.87	54	38.78	27.51	5.06	34.22	324	259	A	V
	*	2412	97.56	-	-	99.13	27.57	5.06	34.2	324	259	P	V
	*	2412	94.55	-	-	96.12	27.57	5.06	34.2	324	259	A	V
802.11b CH 06 2437MHz		2380.14	47.81	-26.19	74	49.57	27.44	5.02	34.22	100	15	P	H
		2389.66	37.1	-16.9	54	38.75	27.51	5.06	34.22	100	15	A	H
	*	2437	94.44	-	-	95.8	27.7	5.12	34.18	100	15	P	H
	*	2437	91.32	-	-	92.68	27.7	5.12	34.18	100	15	A	H
		2488.03	48.63	-25.37	74	49.67	27.9	5.19	34.13	100	15	P	H
		2491.04	37.63	-16.37	54	38.67	27.9	5.19	34.13	100	15	A	H
		2363.34	47.42	-26.58	74	49.26	27.38	5.02	34.24	287	251	P	V
		2389.94	37.12	-16.88	54	38.75	27.51	5.06	34.2	287	251	A	V
	*	2437	96.54	-	-	97.9	27.7	5.12	34.18	287	251	P	V
	*	2437	93.39	-	-	94.75	27.7	5.12	34.18	287	251	A	V
		2489.85	48.42	-25.58	74	49.46	27.9	5.19	34.13	287	251	P	V
	2499.37	37.61	-16.39	54	38.63	27.9	5.19	34.11	287	251	A	V	



802.11b CH 11 2462MHz	*	2462	96.02	-	-	97.28	27.77	5.12	34.15	210	164	P	H
	*	2462	92.84	-	-	94.1	27.77	5.12	34.15	210	164	A	H
		2484.12	48.32	-25.68	74	49.43	27.83	5.19	34.13	210	164	P	H
		2486.12	37.72	-16.28	54	38.83	27.83	5.19	34.13	210	164	A	H
	*	2462	95.68	-	-	96.94	27.77	5.12	34.15	336	105	P	V
	*	2462	92.62	-	-	93.88	27.77	5.12	34.15	336	105	A	V
		2484.24	48.2	-25.8	74	49.31	27.83	5.19	34.13	336	105	P	V
		2487.04	37.69	-16.31	54	38.8	27.83	5.19	34.13	336	105	A	V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> </ol>												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11b CH 01 2412MHz		4824	40.56	-33.44	74	58.72	31.59	8.59	58.34	152	360	P	H
		4824	39.4	-34.6	74	57.56	31.59	8.59	58.34	152	360	P	V
802.11b CH 06 2437MHz		4874	40.25	-33.75	74	58.27	31.71	8.6	58.33	153	360	P	H
		7311	46.08	-27.92	74	58.97	36.27	10.24	59.4	153	360	P	H
		4874	38.5	-35.5	74	56.52	31.71	8.6	58.33	153	360	P	V
		7311	46	-28	74	58.89	36.27	10.24	59.4	153	360	P	V
802.11b CH 11 2462MHz		4924	41.5	-32.5	74	59.36	31.83	8.64	58.33	152	360	P	H
		7386	45.41	-28.59	74	58.27	36.38	10.2	59.44	152	360	P	H
		4924	41.59	-32.41	74	59.45	31.83	8.64	58.33	152	360	P	V
		7386	46.07	-27.93	74	58.93	36.38	10.2	59.44	152	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11g CH 01 2412MHz		2349.585	47.82	-26.18	74	49.73	27.31	5.02	34.24	217	160	P	H
		2389.905	38.24	-15.76	54	39.87	27.51	5.06	34.2	217	160	A	H
	*	2412	96.16	-	-	97.73	27.57	5.06	34.2	217	160	P	H
	*	2412	88.57	-	-	90.14	27.57	5.06	34.2	217	160	A	H
		2389.905	47.99	-26.01	74	49.62	27.51	5.06	34.2	321	258	P	V
		2390	38.59	-15.41	54	40.22	27.51	5.06	34.2	321	258	A	V
	*	2412	98.04	-	-	99.59	27.57	5.06	34.18	321	258	P	V
	*	2412	90.4	-	-	91.97	27.57	5.06	34.2	321	258	A	V
802.11g CH 06 2437MHz		2334.92	47.73	-26.27	74	49.7	27.31	4.98	34.26	136	19	P	H
		2371.46	37.98	-16.02	54	39.74	27.44	5.02	34.22	136	19	A	H
	*	2437	94.08	-	-	95.44	27.7	5.12	34.18	136	19	P	H
	*	2437	86.42	-	-	87.78	27.7	5.12	34.18	136	19	A	H
		2494.12	48.51	-25.49	74	49.53	27.9	5.19	34.11	136	19	P	H
		2492.23	38.65	-15.35	54	39.67	27.9	5.19	34.11	136	19	A	H
		2388.26	48.02	-25.98	74	49.67	27.51	5.06	34.22	292	253	P	V
		2387.14	38.12	-15.88	54	39.77	27.51	5.06	34.22	292	253	A	V
	*	2437	96.82	-	-	98.18	27.7	5.12	34.18	292	253	P	V
	*	2437	89.15	-	-	90.51	27.7	5.12	34.18	292	253	A	V
		2493.14	48.04	-25.96	74	49.06	27.9	5.19	34.11	292	253	P	V
		2496.43	38.66	-15.34	54	39.68	27.9	5.19	34.11	292	253	A	V



802.11g CH 11 2462MHz	*	2462	95.94	-	-	97.2	27.77	5.12	34.15	238	165	P	H
	*	2462	88.16	-	-	89.42	27.77	5.12	34.15	238	165	A	H
		2484	48.56	-25.44	74	49.67	27.83	5.19	34.13	238	165	P	H
		2483.56	39.02	-14.98	54	40.13	27.83	5.19	34.13	238	165	A	H
	*	2462	95.41	-	-	96.67	27.77	5.12	34.15	264	110	P	V
	*	2462	87.46	-	-	88.72	27.77	5.12	34.15	264	110	A	V
		2495.72	49.42	-24.58	74	50.44	27.9	5.19	34.11	264	110	P	V
		2483.72	39	-15	54	40.11	27.83	5.19	34.13	264	110	A	V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> </ol>												



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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11g CH 01 2412MHz		4824	40.44	-33.56	74	58.6	31.59	8.59	58.34	152	360	P	H
		4824	39.94	-34.06	74	58.1	31.59	8.59	58.34	152	360	P	V
802.11g CH 06 2437MHz		4874	39.41	-34.59	74	57.43	31.71	8.6	58.33	152	360	P	H
		7311	45.88	-28.12	74	58.77	36.27	10.24	59.4	152	360	P	H
		4874	40.6	-33.4	74	58.62	31.71	8.6	58.33	152	360	P	V
		7311	45.25	-28.75	74	58.14	36.27	10.24	59.4	152	360	P	V
802.11g CH 11 2462MHz		4924	39.74	-34.26	74	57.6	31.83	8.64	58.33	152	360	P	H
		7386	45.42	-28.58	74	58.28	36.38	10.2	59.44	152	360	P	H
		4924	39.38	-34.62	74	57.24	31.83	8.64	58.33	152	360	P	V
		7386	45.22	-28.78	74	58.08	36.38	10.2	59.44	152	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 01 2412MHz		2380.665	48.05	-25.95	74	49.81	27.44	5.02	34.22	145	225	P	H
		2389.59	38.16	-15.84	54	39.81	27.51	5.06	34.22	145	225	A	H
	*	2412	94.51	-	-	96.08	27.57	5.06	34.2	145	225	P	H
	*	2412	86.76	-	-	88.33	27.57	5.06	34.2	145	225	A	H
		2336.88	47.97	-26.03	74	49.94	27.31	4.98	34.26	313	254	P	V
		2389.905	38.98	-15.02	54	40.61	27.51	5.06	34.2	313	254	A	V
	*	2412	98.3	-	-	99.87	27.57	5.06	34.2	313	254	P	V
	*	2412	90.24	-	-	91.81	27.57	5.06	34.2	313	254	A	V
802.11n HT20 CH 06 2437MHz		2383.78	48.31	-25.69	74	50.07	27.44	5.02	34.22	241	168	P	H
		2368.52	38.02	-15.98	54	39.78	27.44	5.02	34.22	241	168	A	H
	*	2437	95.22	-	-	96.58	27.7	5.12	34.18	241	168	P	H
	*	2437	87.36	-	-	88.72	27.7	5.12	34.18	241	168	A	H
		2497.62	48.32	-25.68	74	49.34	27.9	5.19	34.11	241	168	P	H
		2488.66	38.65	-15.35	54	39.69	27.9	5.19	34.13	241	168	A	H
		2389.8	48.42	-25.58	74	50.05	27.51	5.06	34.2	288	252	P	V
		2385.32	38.1	-15.9	54	39.82	27.44	5.06	34.22	288	252	A	V
	*	2437	96.59	-	-	97.95	27.7	5.12	34.18	288	252	P	V
	*	2437	89.04	-	-	90.4	27.7	5.12	34.18	288	252	A	V
		2489.64	48.5	-25.5	74	49.54	27.9	5.19	34.13	288	252	P	V
	2486.14	38.64	-15.36	54	39.75	27.83	5.19	34.13	288	252	A	V	



<b>802.11n</b> <b>HT20</b> <b>CH 11</b> <b>2462MHz</b>	*	2462	95.54	-	-	96.8	27.77	5.12	34.15	232	163	P	H
	*	2462	87.72	-	-	88.98	27.77	5.12	34.15	232	163	A	H
		2484	49.6	-24.4	74	50.71	27.83	5.19	34.13	232	163	P	H
		2483.84	39.51	-14.49	54	40.62	27.83	5.19	34.13	232	163	A	H
	*	2462	97.24	-	-	98.5	27.77	5.12	34.15	316	256	P	V
	*	2462	89.51	-	-	90.77	27.77	5.12	34.15	316	256	A	V
		2485.72	48.92	-25.08	74	50.03	27.83	5.19	34.13	316	256	P	V
		2483.64	39.46	-14.54	54	40.57	27.83	5.19	34.13	316	256	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 HT20 (Harmonic @ 3m)**

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 01 2412MHz		4824	40.23	-33.77	74	58.39	31.59	8.59	58.34	153	360	P	H
		4824	38.69	-35.31	74	56.85	31.59	8.59	58.34	153	360	P	V
802.11n HT20 CH 06 2437MHz		4874	39.57	-34.43	74	57.59	31.71	8.6	58.33	152	360	P	H
		7311	45.86	-28.14	74	58.75	36.27	10.24	59.4	152	360	P	H
		4874	39.16	-34.84	74	57.18	31.71	8.6	58.33	152	360	P	V
		7311	45.84	-28.16	74	58.73	36.27	10.24	59.4	152	360	P	V
802.11n HT20 CH 11 2462MHz		4924	40.54	-33.46	74	58.4	31.83	8.64	58.33	153	360	P	H
		7386	45.4	-28.6	74	58.26	36.38	10.2	59.44	153	360	P	H
		4924	40.68	-33.32	74	58.54	31.83	8.64	58.33	153	360	P	V
		7386	45.36	-28.64	74	58.22	36.38	10.2	59.44	153	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT40 CH 03 2422MHz		2389.8	48.3	-25.7	74	49.93	27.51	5.06	34.2	247	163	P	H
		2389.8	38.94	-15.06	54	40.57	27.51	5.06	34.2	247	163	A	H
	*	2422	93.12	-	-	94.6	27.64	5.06	34.18	247	163	P	H
	*	2422	84.66	-	-	86.14	27.64	5.06	34.18	247	163	A	H
		2497.62	48.35	-25.65	74	49.37	27.9	5.19	34.11	247	163	P	H
		2485.93	38.52	-15.48	54	39.63	27.83	5.19	34.13	247	163	A	H
		2389.38	50.81	-23.19	74	52.46	27.51	5.06	34.22	327	256	P	V
		2389.94	40.46	-13.54	54	42.09	27.51	5.06	34.2	327	256	A	V
	*	2422	96.88	-	-	98.36	27.64	5.06	34.18	327	256	P	V
	*	2422	89	-	-	90.48	27.64	5.06	34.18	327	256	A	V
		2484.74	49.33	-24.67	74	50.44	27.83	5.19	34.13	327	256	P	V
		2483.69	38.91	-15.09	54	40.02	27.83	5.19	34.13	327	256	A	V
802.11n HT40 CH 06 2437MHz		2375.8	48.14	-25.86	74	49.9	27.44	5.02	34.22	266	161	P	H
		2373.98	37.96	-16.04	54	39.72	27.44	5.02	34.22	266	161	A	H
	*	2437	91.97	-	-	93.33	27.7	5.12	34.18	266	161	P	H
	*	2437	84.11	-	-	85.47	27.7	5.12	34.18	266	161	A	H
		2492.23	48.77	-25.23	74	49.79	27.9	5.19	34.11	266	161	P	H
		2496.85	38.72	-15.28	54	39.74	27.9	5.19	34.11	266	161	A	H
		2357.46	48.28	-25.72	74	50.12	27.38	5.02	34.24	285	255	P	V
		2388.68	38.33	-15.67	54	39.98	27.51	5.06	34.22	285	255	A	V
	*	2437	95.86	-	-	97.22	27.7	5.12	34.18	285	255	P	V
	*	2437	88.02	-	-	89.38	27.7	5.12	34.18	285	255	A	V
		2492.65	48.75	-25.25	74	49.77	27.9	5.19	34.11	285	255	P	V
		2485.58	39.01	-14.99	54	40.12	27.83	5.19	34.13	285	255	A	V



<b>802.11n</b>  <b>HT40</b>  <b>CH 09</b>  <b>2452MHz</b>		2339.12	47.87	-26.13	74	49.82	27.31	4.98	34.24	121	14	P	H
		2374.12	38.01	-15.99	54	39.77	27.44	5.02	34.22	121	14	A	H
	*	2452	91.76	-	-	93.09	27.7	5.12	34.15	121	14	P	H
	*	2452	83.92	-	-	85.25	27.7	5.12	34.15	121	14	A	H
		2483.97	49.08	-24.92	74	50.19	27.83	5.19	34.13	121	14	P	H
		2483.5	39.74	-14.26	54	40.85	27.83	5.19	34.13	121	14	A	H
		2350.88	47.95	-26.05	74	49.86	27.31	5.02	34.24	312	259	P	V
		2329.04	37.94	-16.06	54	39.98	27.24	4.98	34.26	312	259	A	V
	*	2452	97.28	-	-	98.61	27.7	5.12	34.15	312	259	P	V
	*	2452	87.37	-	-	88.7	27.7	5.12	34.15	312	259	A	V
		2483.5	51.58	-22.42	74	52.69	27.83	5.19	34.13	312	259	P	V
		2483.5	40.85	-13.15	54	41.96	27.83	5.19	34.13	312	259	A	V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



802.11n HT40 CH 09 2452MHz		2385.32	48.62	-25.38	74	50.34	27.44	5.06	34.22	213	154	P	H
		2376.5	38.38	-15.62	54	40.14	27.44	5.02	34.22	213	154	A	H
	*	2452	92.92	-	-	94.25	27.7	5.12	34.15	213	154	P	H
	*	2452	85.14	-	-	86.47	27.7	5.12	34.15	213	154	A	H
		2483.9	48.82	-25.18	74	49.93	27.83	5.19	34.13	213	154	P	H
		2483.5	39.84	-14.16	54	40.95	27.83	5.19	34.13	213	154	A	H
		2341.22	47.93	-26.07	74	49.88	27.31	4.98	34.24	334	88	P	V
		2388.26	38.3	-15.7	54	39.95	27.51	5.06	34.22	334	88	A	V
	*	2452	94.32	-	-	95.65	27.7	5.12	34.15	334	88	P	V
	*	2452	86.8	-	-	88.13	27.7	5.12	34.15	334	88	A	V
		2483.5	49	-25	74	50.11	27.83	5.19	34.13	334	88	P	V
		2483.5	39.82	-14.18	54	40.93	27.83	5.19	34.13	334	88	A	V



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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT40 CH 03 2422MHz		4844	39.19	-34.81	74	57.3	31.63	8.6	58.34	152	360	P	H
		7266	44.96	-29.04	74	57.86	36.23	10.25	59.38	152	360	P	H
		4844	38.75	-35.25	74	56.86	31.63	8.6	58.34	152	360	P	V
		7266	44.73	-29.27	74	57.63	36.23	10.25	59.38	152	360	P	V
802.11n HT40 CH 06 2437MHz		4874	39.32	-34.68	74	57.34	31.71	8.6	58.33	152	360	P	H
		7311	45.25	-28.75	74	58.14	36.27	10.24	59.4	152	360	P	H
		4874	39.01	-34.99	74	57.03	31.71	8.6	58.33	152	360	P	V
		7311	45.88	-28.12	74	58.77	36.27	10.24	59.4	152	360	P	V
802.11n HT40 CH 09 2452MHz		4804	44.88	-29.12	74	63.09	31.54	8.59	58.34	152	360	P	H
		7356	44.88	-29.12	74	57.76	36.33	10.22	59.43	152	360	P	H
		4904	39.4	-34.6	74	57.32	31.79	8.62	58.33	152	360	P	V
		7356	45.73	-28.27	74	58.61	36.33	10.22	59.43	152	360	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.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
2.4GHz 802.11n HT40 LF		38.73	27.69	-12.31	40	36.11	22.92	0.65	31.99	150	20	P	H
		94.02	25	-18.5	43.5	37.56	18.2	1	31.76	-	-	P	H
		239.52	20.44	-25.56	46	32.71	17.49	1.62	31.38	-	-	P	H
		407.33	28.11	-17.89	46	31.38	25.83	2.14	31.24	-	-	P	H
		611.03	28.1	-17.9	46	31.47	25.14	2.7	31.21	-	-	P	H
		787.57	31.42	-14.58	46	32.17	27.38	3.07	31.2	-	-	P	H
		47.46	26.23	-13.77	40	39.6	17.9	0.7	31.97	-	-	P	V
		142.52	19.68	-23.82	43.5	32.04	17.95	1.24	31.55	-	-	P	V
		401.51	28.18	-17.82	46	31.34	25.96	2.13	31.25	-	-	P	V
		549.92	27.63	-18.37	46	31.3	25	2.54	31.21	-	-	P	V
		704.15	30.16	-15.84	46	30.87	27.67	2.87	31.25	-	-	P	V
	949.56	33.93	-12.07	46	32.34	29.4	3.39	31.2	155	60	P	V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



**Note symbol**

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



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

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

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

**For Peak Limit @ 2390MHz:**

- 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)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

- 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)
- 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”.

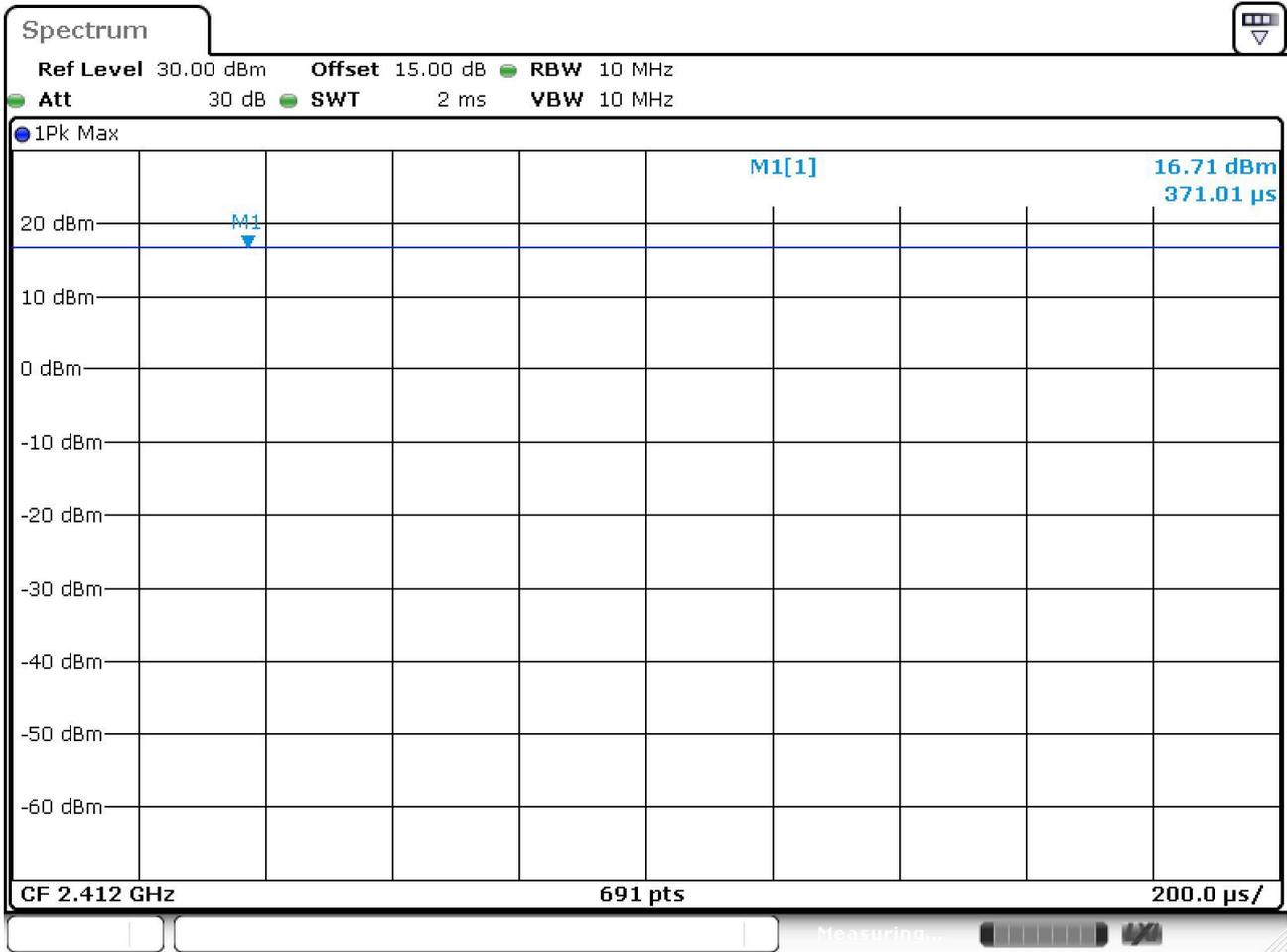


### Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(KHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	87.43	1.361	0.735	1KHz
802.11n HT20	86.26	1.274	0.785	1KHz
802.11n HT40	86.18	1.274	0.785	1KHz



802.11b





802.11g

