



# FCC RF Test Report

**APPLICANT** : PAX Technology Limited  
**EQUIPMENT** : Mobile Payment Terminal  
**BRAND NAME** : PAX  
**MODEL NAME** : D190  
**FCC ID** : V5PD190LTE  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was received on Jun. 18, 2019 and testing was completed on Jul. 08, 2019. 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.

Derreck Chen

Reviewed by: Derreck Chen / Supervisor



Approved by: Eric Shih / Manager

**Sportun International (ShenZhen) Inc.**

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

**People's Republic of China**



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## REVISION HISTORY



## 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 4.23 dB at 2389.700 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 3.07 dB at 0.460 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



## 1 General Description

### 1.1 Applicant

**PAX Technology Limited**

Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong

### 1.2 Manufacturer

**PAX Computer Technology (Shenzhen) Co., Ltd.**

4/F, No.3 Building, Software Park, Second Central Science-Tech Road, High-Tech industrial Park, Shenzhen, Guangdong, P.R.C.

### 1.3 Product Feature of Equipment Under Test

Product Feature	
<b>Equipment</b>	Mobile Payment Terminal
<b>Brand Name</b>	PAX
<b>Model Name</b>	D190
<b>FCC ID</b>	V5PD190LTE
<b>EUT supports Radios application</b>	GSM/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
<b>IMEI Code</b>	Conducted: 868197030036813 Conduction: 868197030032408 Radiation: N/A
<b>HW Version</b>	D190-xxx-xxx-xxxx
<b>SW Version</b>	V0.0.0.1
<b>EUT Stage</b>	Production Unit

**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 Output Power to antenna</b>	802.11b : 16.10 dBm (0.0407 W) 802.11g : 15.30 dBm (0.0339 W) 802.11n HT20 : 14.30 dBm (0.0269 W)
<b>99% Occupied Bandwidth</b>	802.11b : 11.84MHz 802.11g : 16.78MHz 802.11n HT20 : 17.73MHz
<b>Antenna Type / Gain</b>	FPC Antenna with gain -0.60 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

Sportun International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

<b>Test Firm</b>	Sportun International (Shenzhen) Inc.		
<b>Test Site Location</b>	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		

<b>Test Site No.</b>	<b>Sportun Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	CO01-SZ TH01-SZ	CN1256	421272

<b>Test Firm</b>	Sportun International (Shenzhen) Inc.		
<b>Test Site Location</b>	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
<b>Test Site No.</b>	<b>Sportun Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	03CH02-SZ	CN1256	421272



## 1.7 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- 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

- a. 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: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

### 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 modes are considering the modulation and worse data rates as below table.

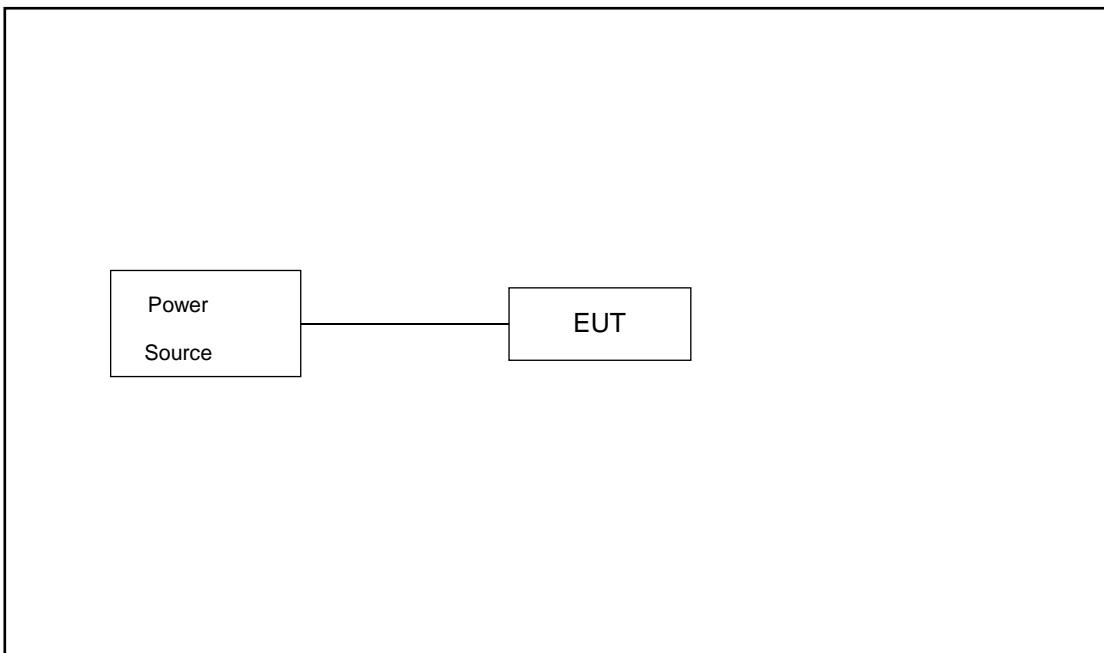
Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0

Test Cases	
AC Conducted Emission	Mode 1 :GSM850 Idle + Bluetooth Link + WLAN Link (2.4G) + Battery + USB Cable(Charging from Adapter)
Remark: For Radiated Test Cases, The tests were performed with Adapter and USB cable.	

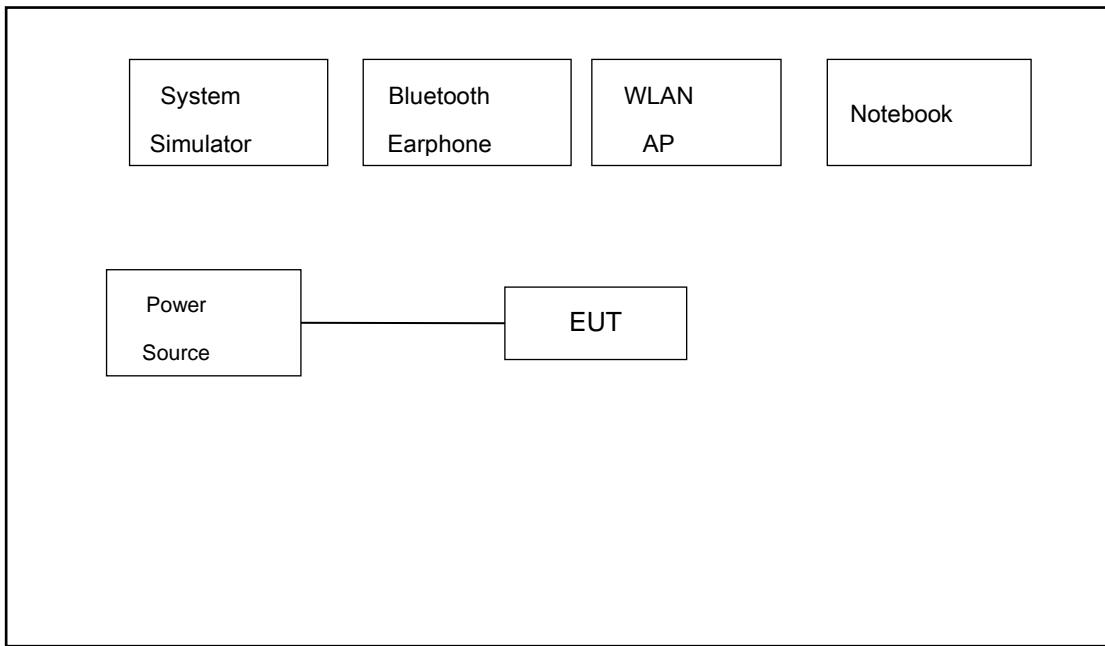


## 2.3 Connection Diagram of Test System

For Radiation



For Conducted Emission





## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8m
2.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Samsung	EO-MG900	N/A	N/A	N/A

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an 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 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.

$$\text{Offset} = \text{RF cable loss} + \text{attenuator factor}.$$

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

$$\text{Offset(dB)} = \text{RF cable loss(dB)} + \text{attenuator factor(dB)}.$$

$$= 5.0 + 10 = 15.0 \text{ (dB)}$$



### 3 Test Result

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

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

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

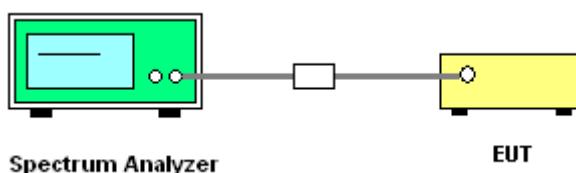
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 300 kHz and set the Video bandwidth (VBW) = 1MHz.
6. Measure and record the results in the test report.

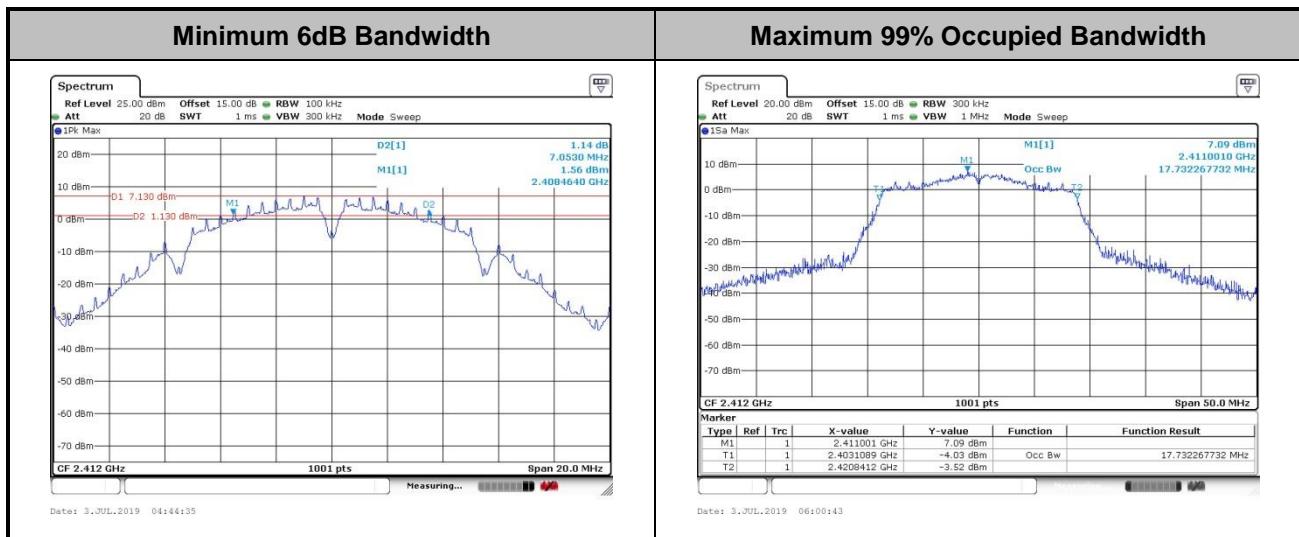
##### 3.1.4 Test Setup





### 3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.



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 output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the 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.

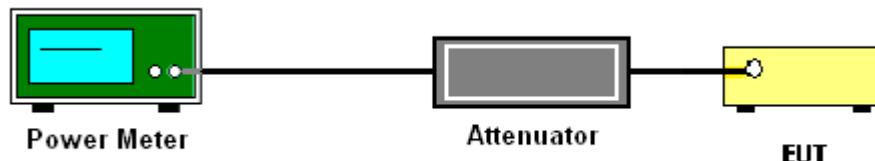
### 3.2.2 Measuring Instruments

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 ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G 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 Average output Power

Please refer to Appendix A.



### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The 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

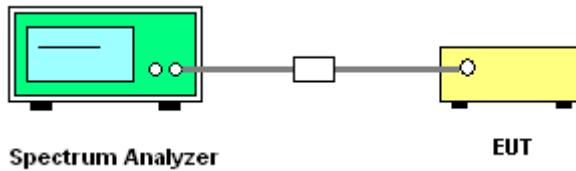
The measuring equipment is listed in the section 4 of this test report.

#### 3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
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.

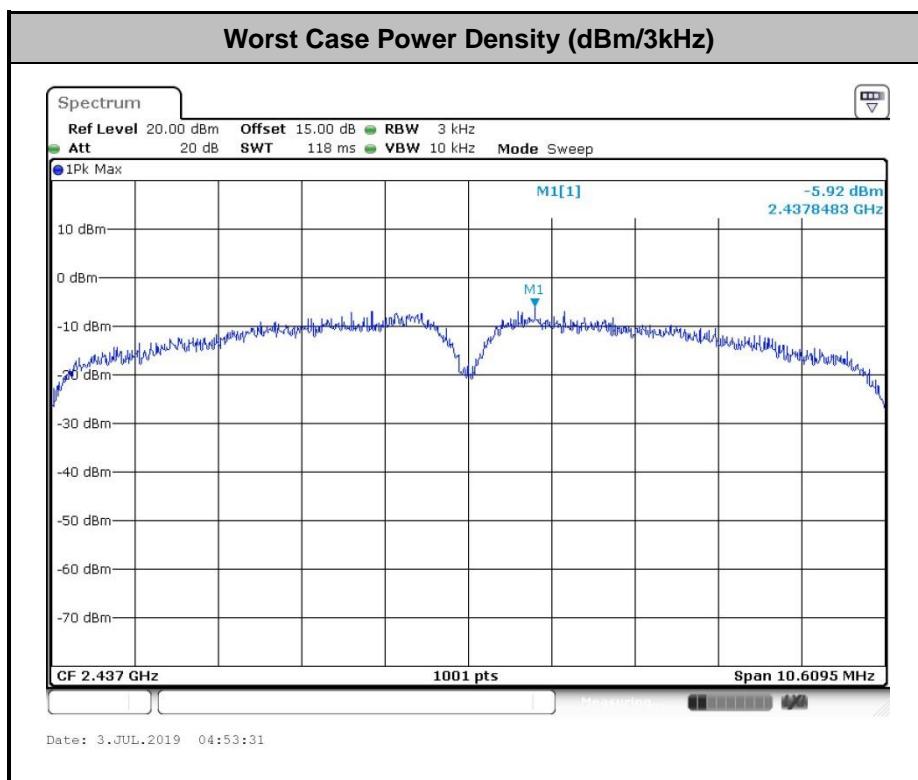


### 3.3.4 Test Setup



### 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.

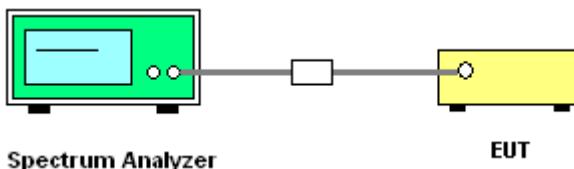
### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.13
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

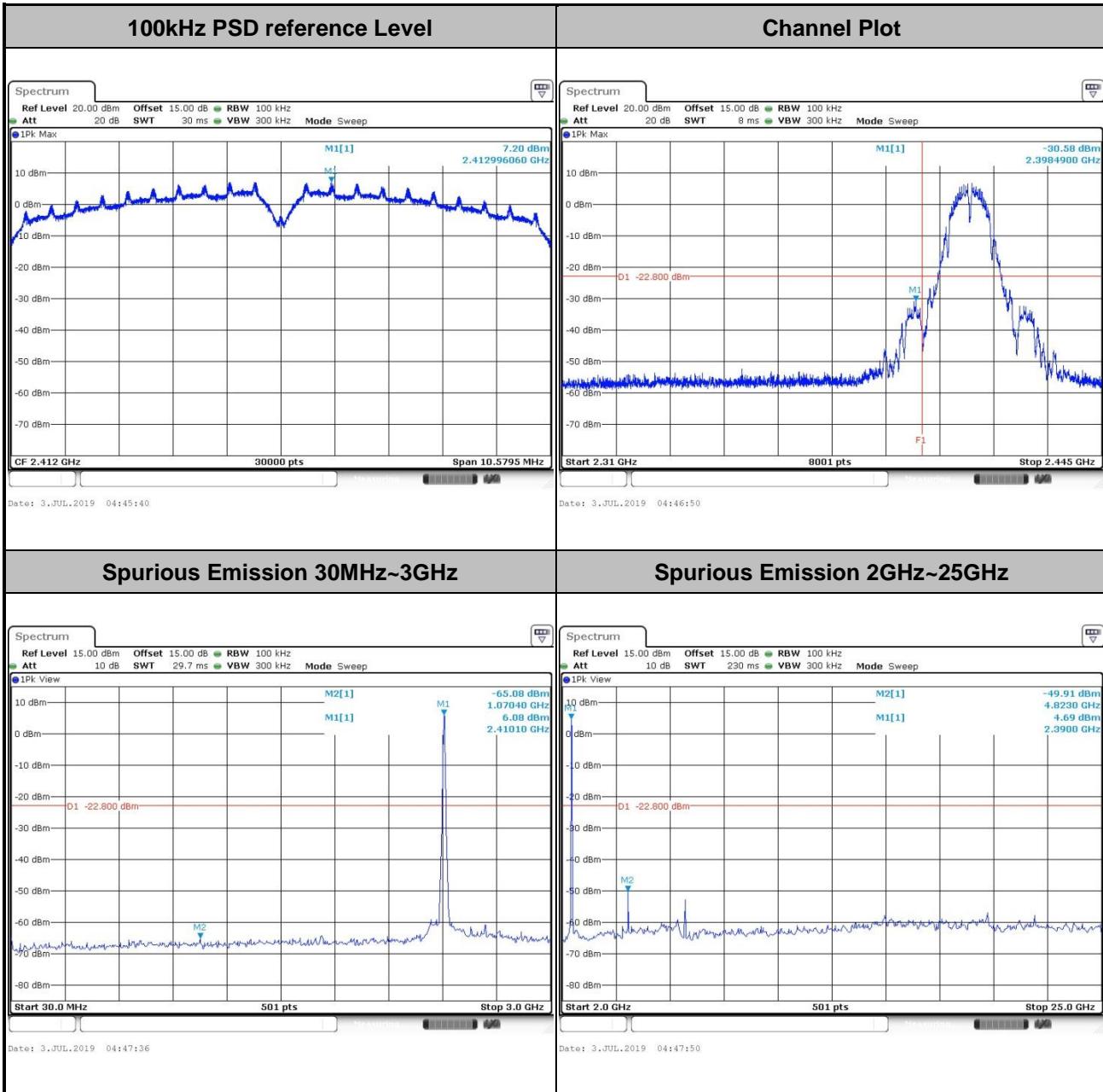




### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

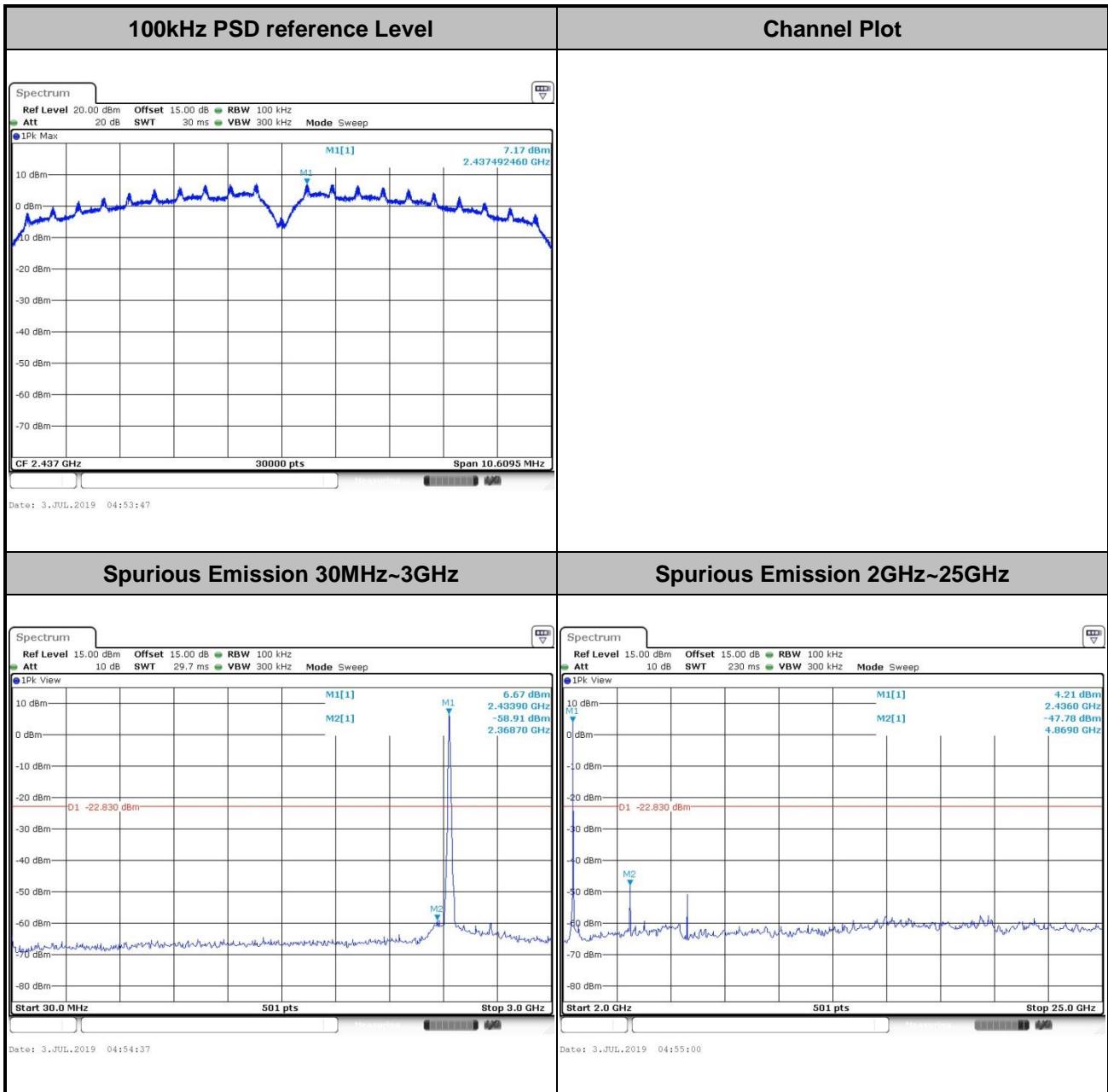
Test Engineer :	Hayden Chen	Temperature :	24~26°C
		Relative Humidity :	50~53%

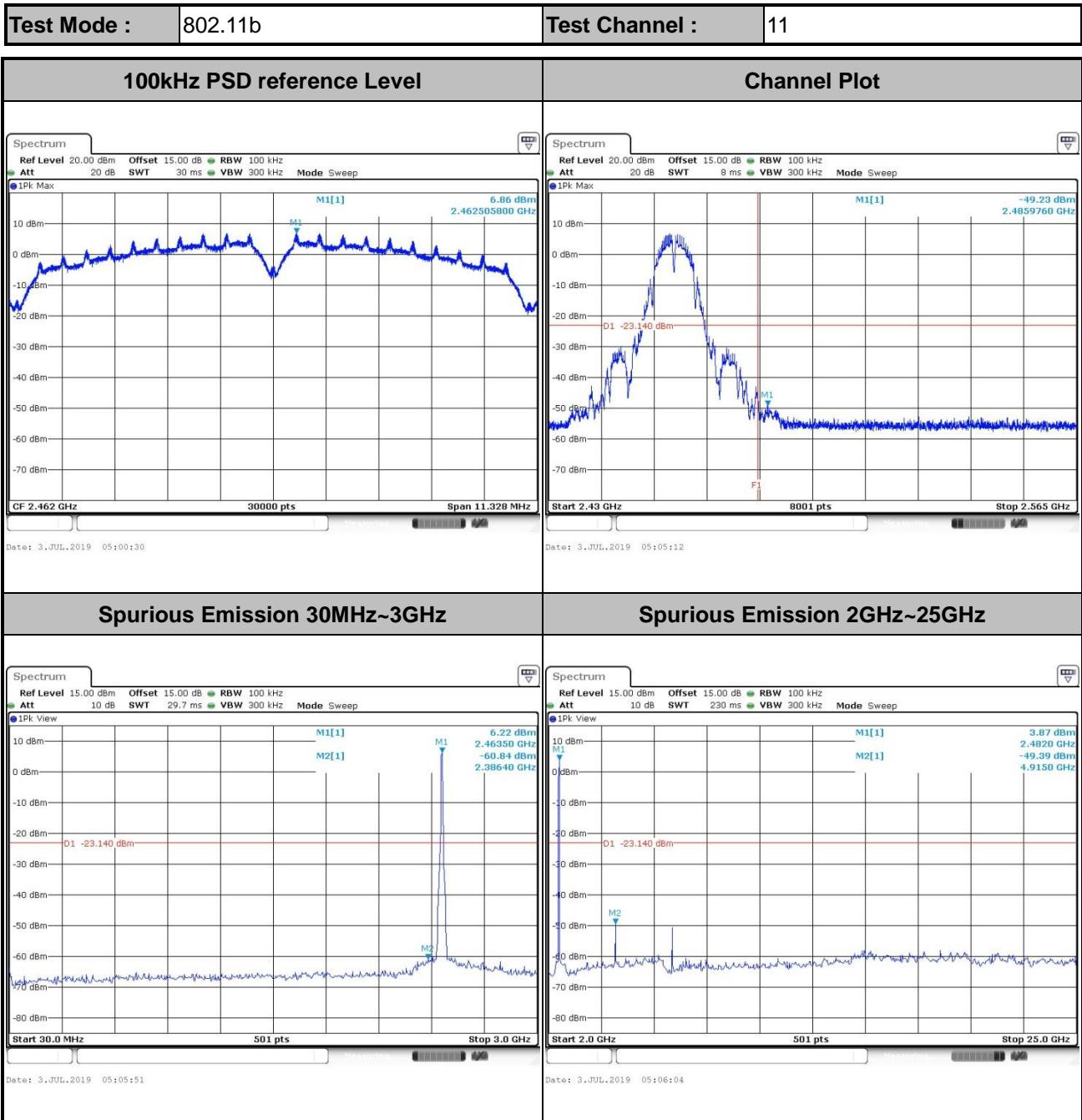
Test Mode :	802.11b	Test Channel :	01
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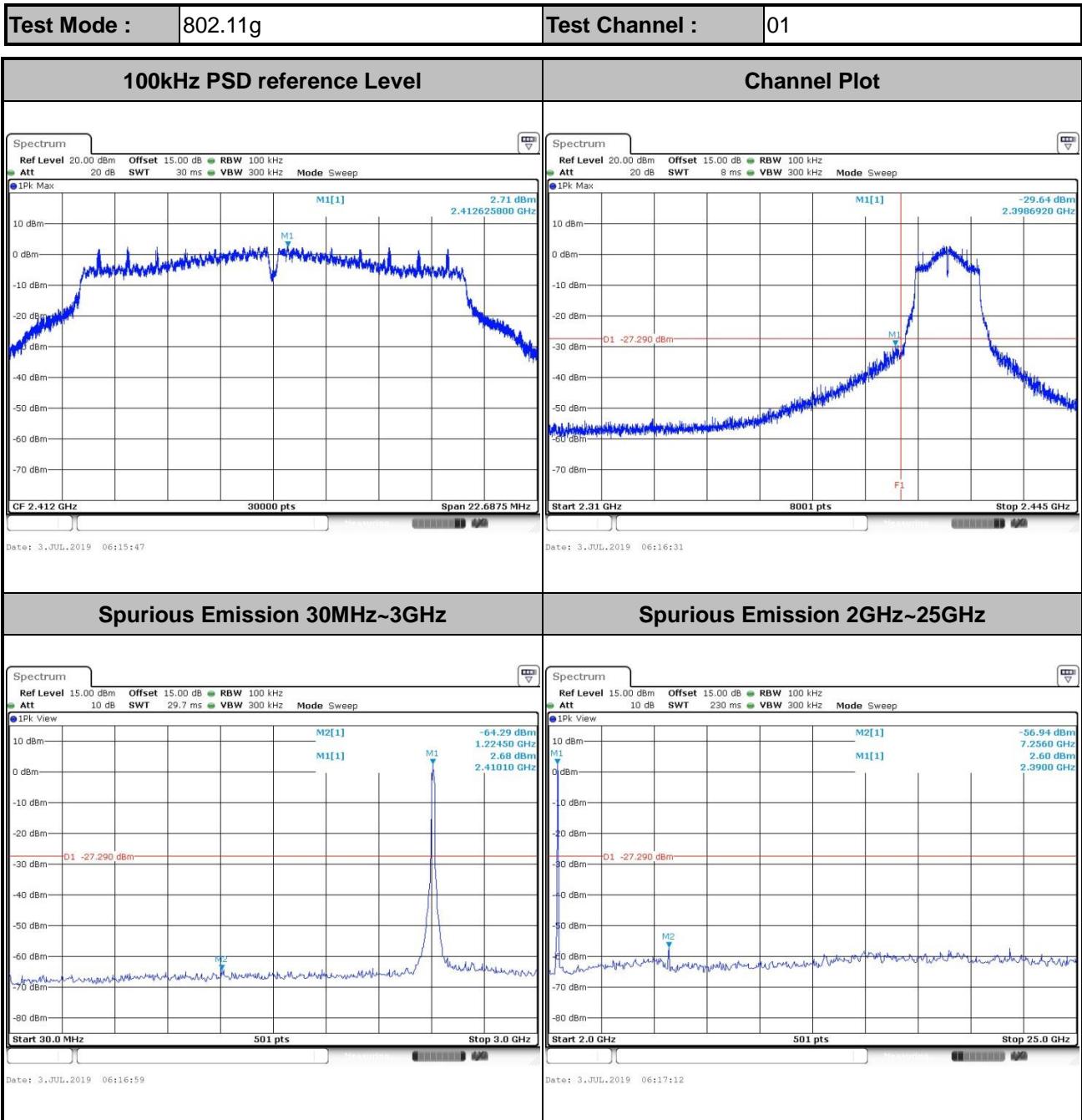




Test Mode :	802.11b	Test Channel :	06
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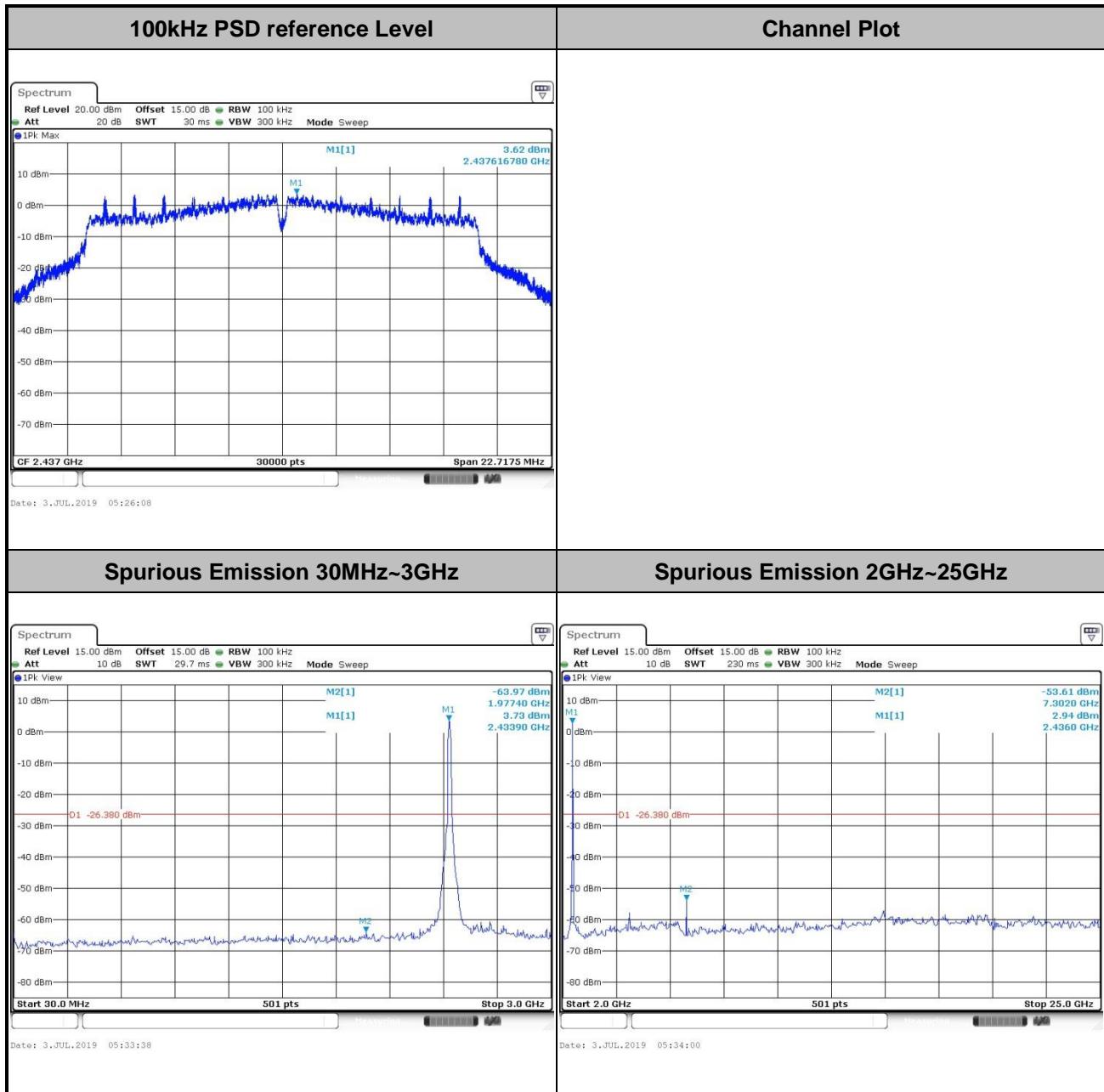


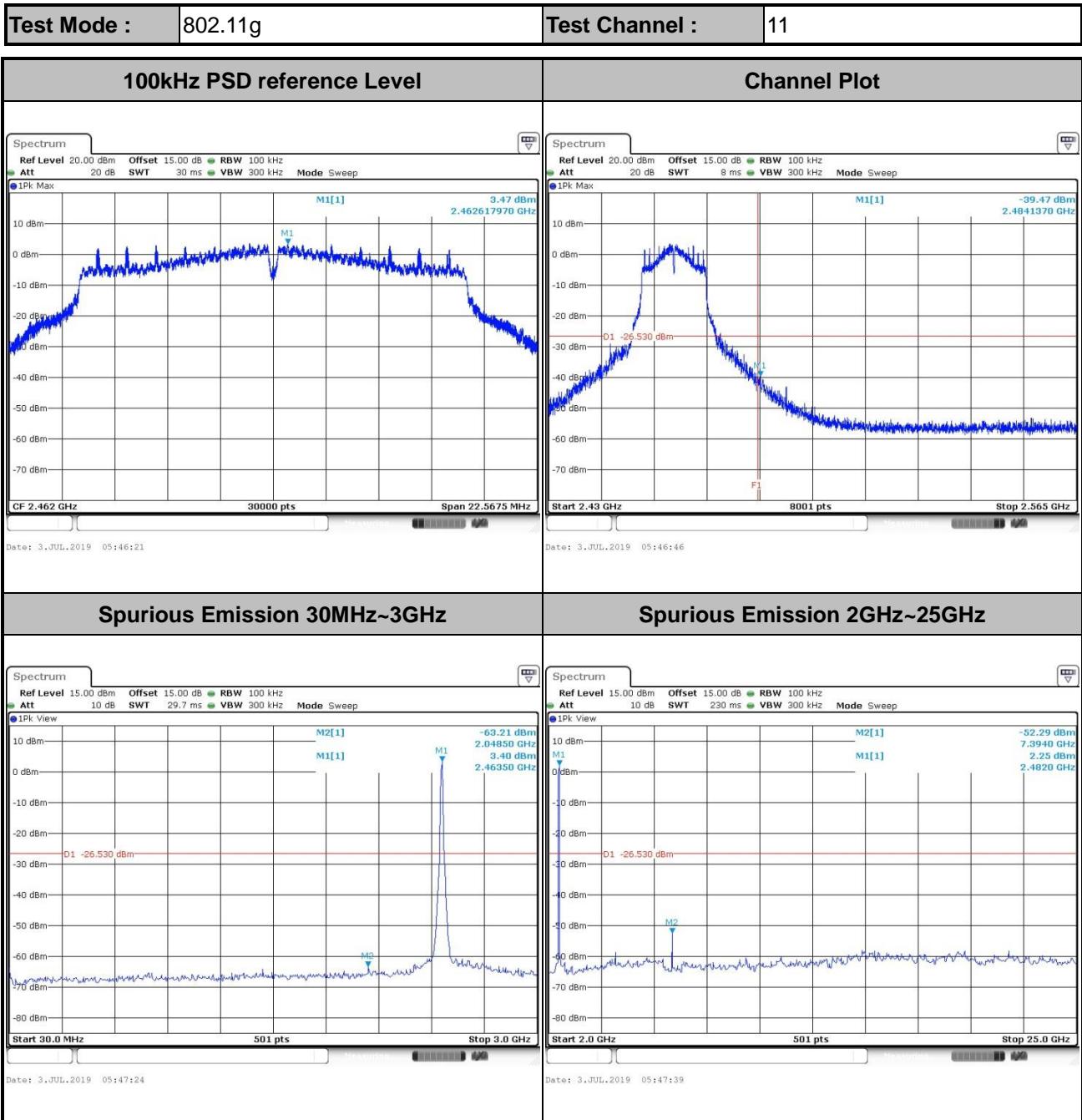


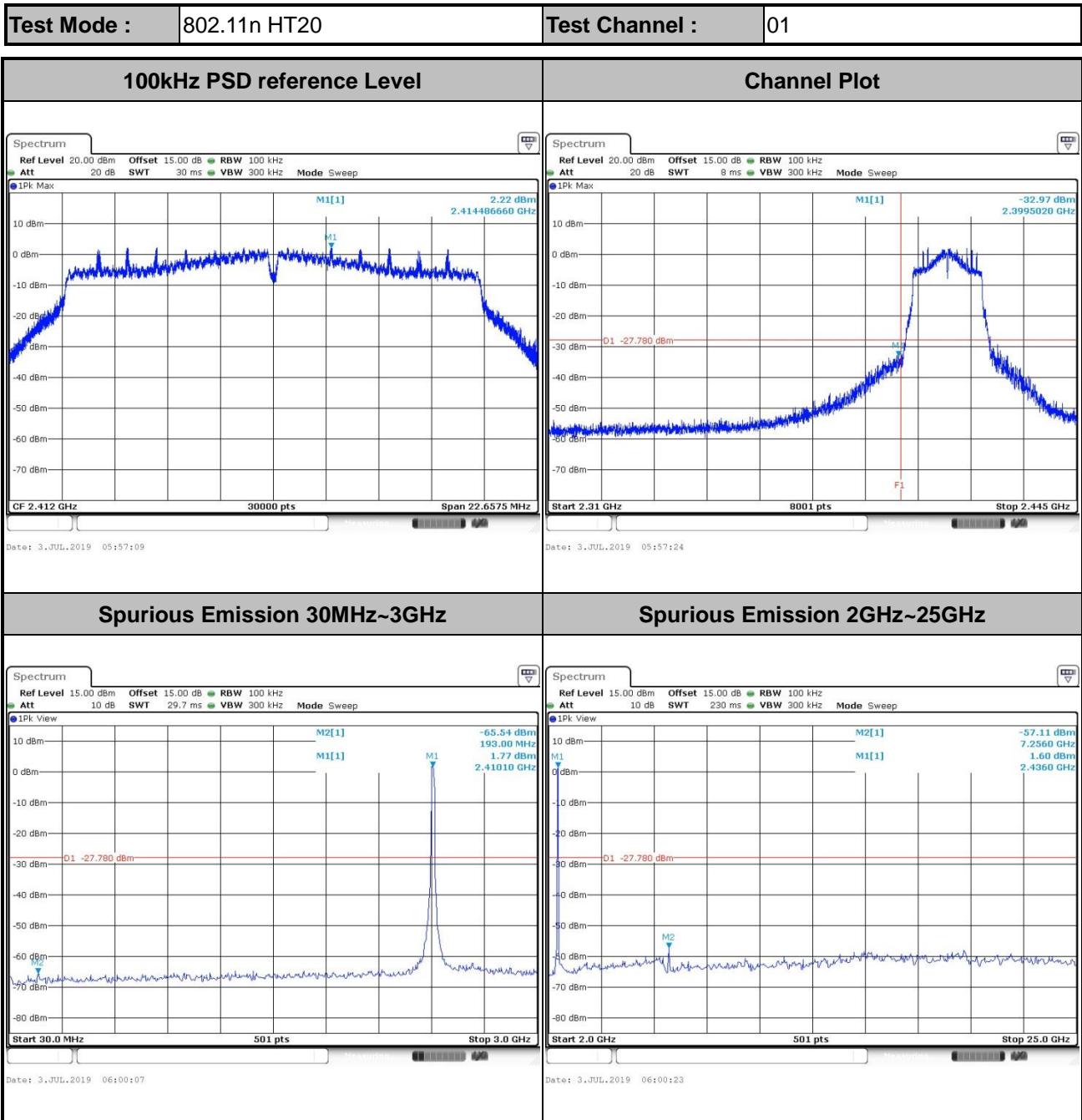




Test Mode :	802.11g	Test Channel :	06
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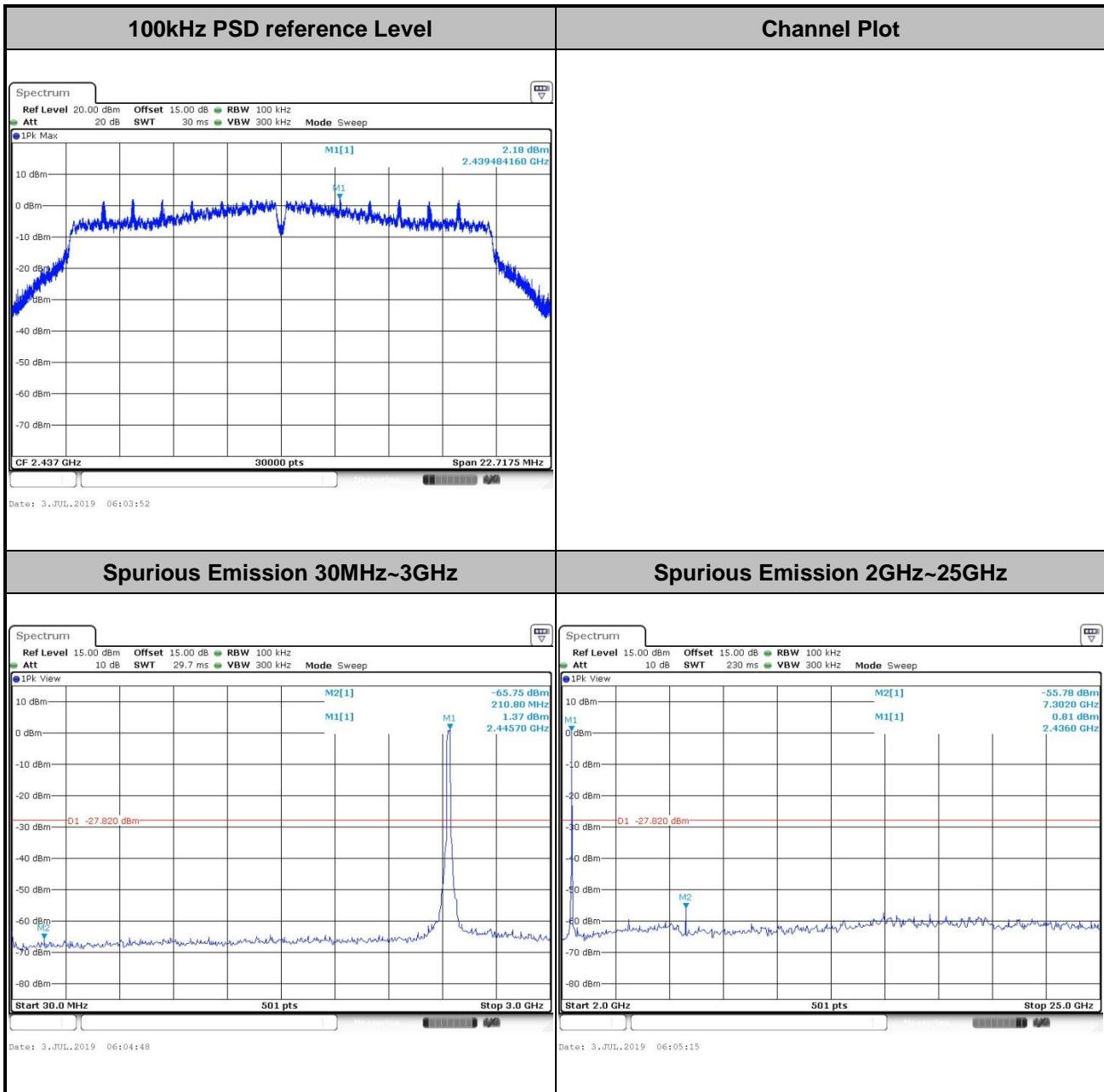


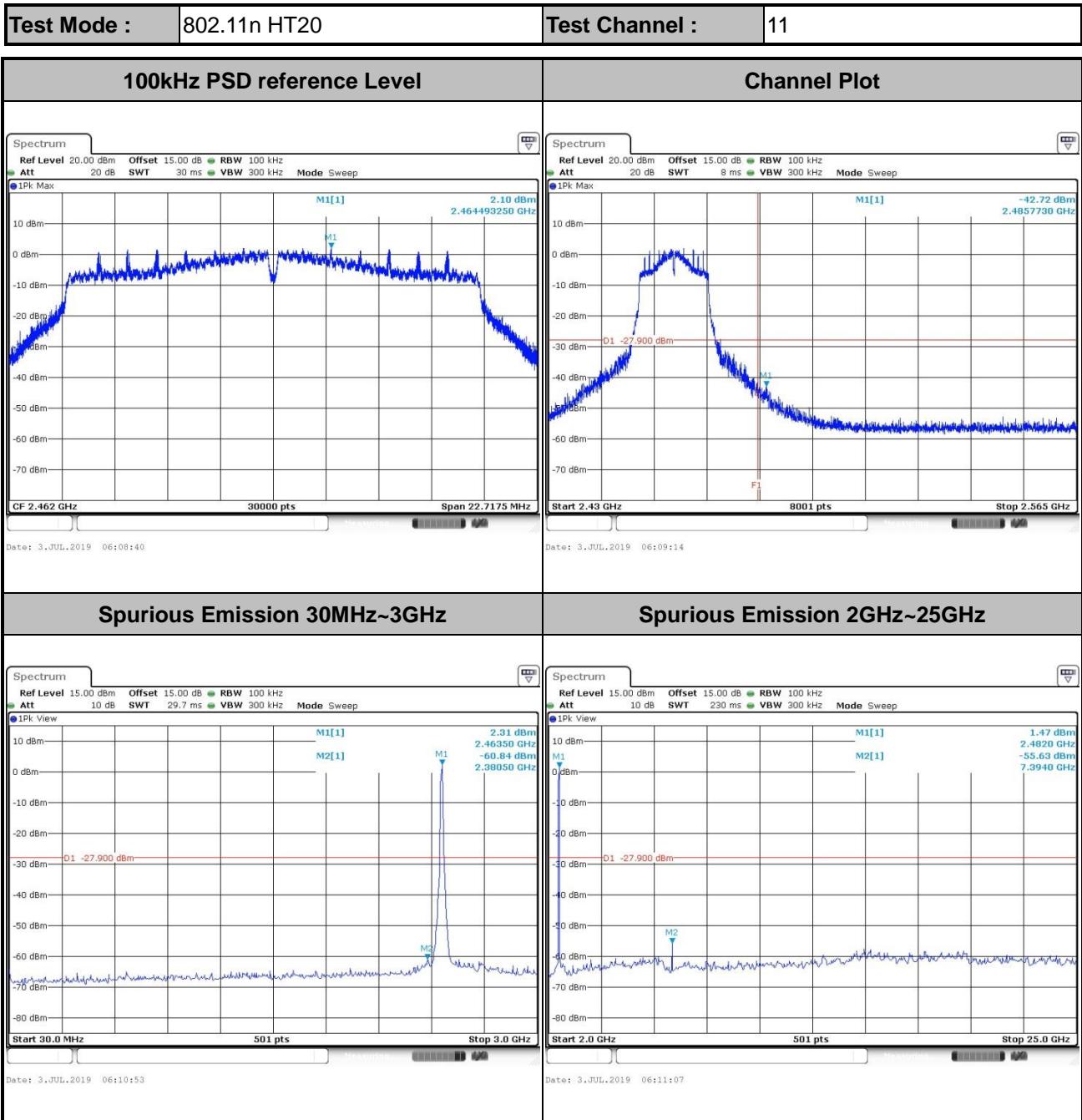






Test Mode :	802.11n HT20	Test Channel :	06
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## 3.5 Radiated Band Edges and Spurious Emission Measurement

### 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

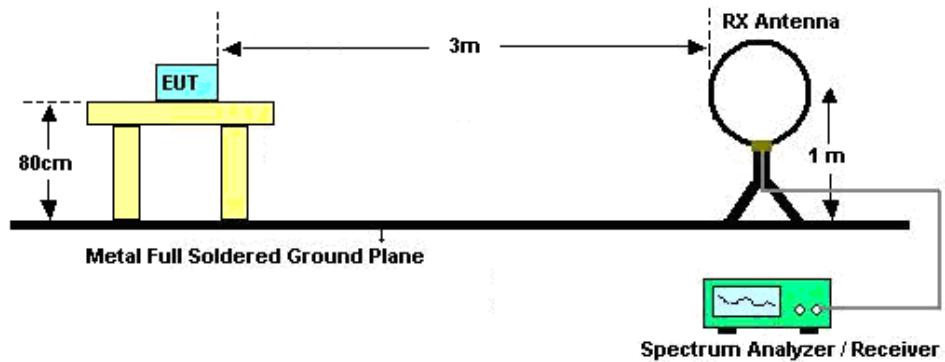
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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 testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. 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:

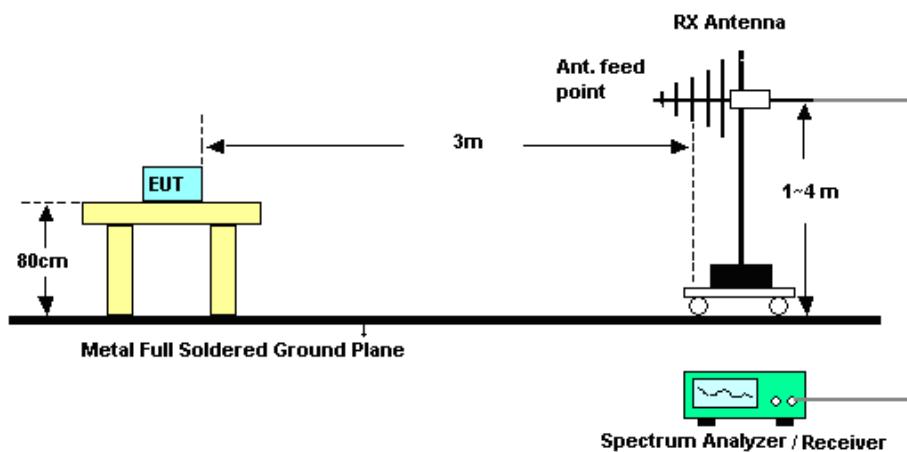
  - VBW = 10 Hz, when duty cycle is no less than 98 percent.
  - $VBW \geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.5.4 Test Setup

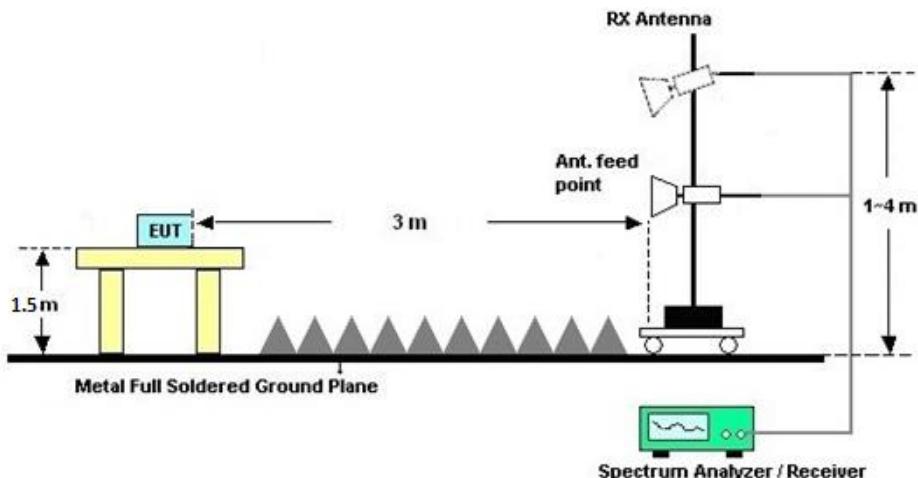
For radiated emissions below 30MHz



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.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

### 3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C.



## 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.

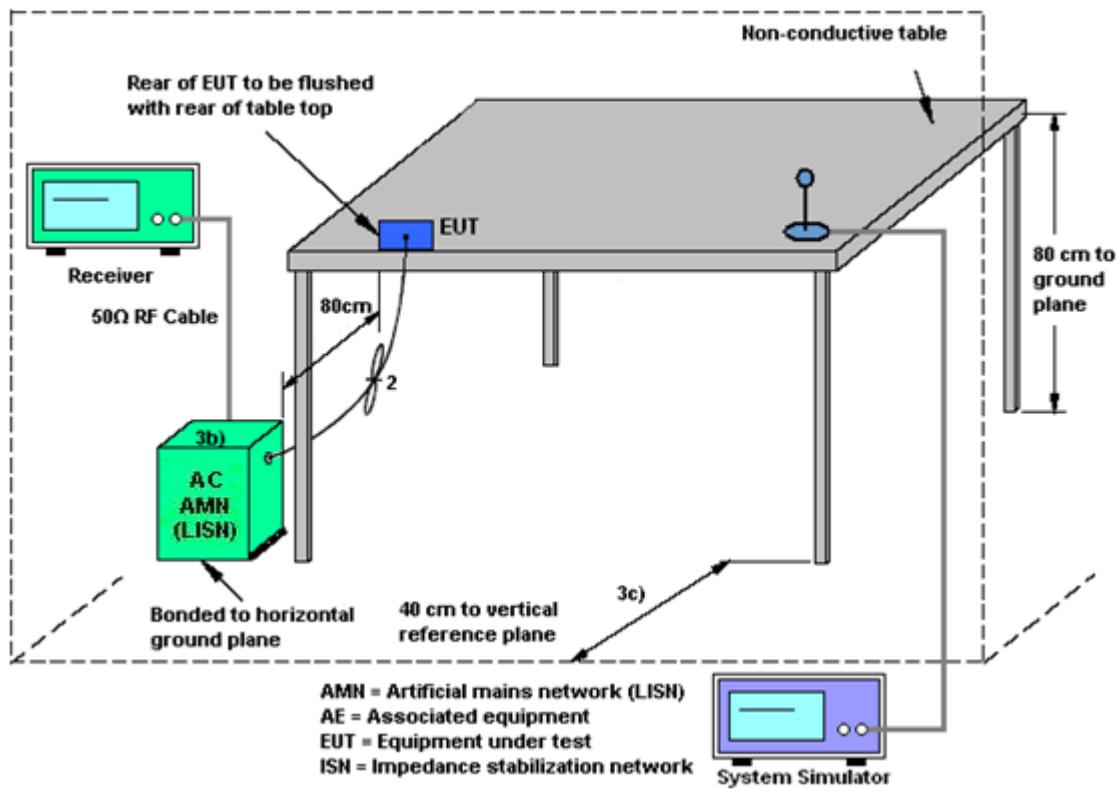
### 3.6.2 Measuring Instruments

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

Please refer to Appendix B.



## 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 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	10Hz~40GHz	Apr. 18, 2019	Jul. 03, 2019	Apr. 17, 2020	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 22, 2018	Jul. 03, 2019	Dec. 21, 2019	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 22, 2018	Jul. 03, 2019	Dec. 21, 2019	Conducted (TH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Apr. 19, 2019	Jul. 02, 2019~ Jul. 08, 2019	Apr. 18, 2020	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 29, 2019	Jul. 02, 2019~ Jul. 08, 2019	May 28, 2020	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	Apr. 19, 2019	Jul. 02, 2019~ Jul. 08, 2019	Apr. 18, 2020	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-128 5	1GHz~18GHz	Jan. 07, 2019	Jul. 02, 2019~ Jul. 08, 2019	Jan. 06, 2020	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 16, 2018	Jul. 02, 2019~ Jul. 08, 2019	Jul. 15, 2019	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Mar. 30, 2019	Jul. 02, 2019~ Jul. 08, 2019	Mar. 29, 2020	Radiation (03CH02-SZ)
LF Amplifier	Burgeon	BPA-530	102211	0.01~3000Mhz	Oct. 18, 2018	Jul. 02, 2019~ Jul. 08, 2019	Oct. 17, 2019	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	AMF-7D-0010-1800-30-10P-R	1707137	1GHz~18GHz	Oct. 20, 2018	Jul. 02, 2019~ Jul. 08, 2019	Oct. 19, 2019	Radiation (03CH02-SZ)
Amplifier	Agilent	8449B	3008A010 23	1GHz~26.5GHz	Oct. 18, 2018	Jul. 02, 2019~ Jul. 08, 2019	Oct. 17, 2019	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002 470	N/A	NCR	Jul. 02, 2019~ Jul. 08, 2019	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Jul. 02, 2019~ Jul. 08, 2019	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Jul. 02, 2019~ Jul. 08, 2019	NCR	Radiation (03CH02-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 23, 2018	Jun. 21, 2019	Dec. 22, 2019	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Oct. 18, 2018	Jun. 21, 2019	Oct. 17, 2019	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Dec. 23, 2018	Jun. 21, 2019	Dec. 22, 2019	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000 891	100Vac~250Vac	Jul. 18, 2018	Jun. 21, 2019	Jul. 17, 2019	Conduction (CO01-SZ)

NCR: No Calibration Required



## 5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	2.6 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	5.1 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	5.0 dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	4.4 dB
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## Appendix A. Conducted Test Results

**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	Hayden Chen	Temperature:	21~25	°C
Test Date:	2019/7/3	Relative Humidity:	51~54	%

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

2.4GHz Band										
Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2		
11b	1Mbps	1	1	2412	11.84	-	7.05	-	0.50	Pass
11b	1Mbps	1	6	2437	11.84	-	7.07	-	0.50	Pass
11b	1Mbps	1	11	2462	11.84	-	7.55	-	0.50	Pass
11g	6Mbps	1	1	2412	16.73	-	15.13	-	0.50	Pass
11g	6Mbps	1	6	2437	16.78	-	15.15	-	0.50	Pass
11g	6Mbps	1	11	2462	16.53	-	15.05	-	0.50	Pass
HT20	MCS0	1	1	2412	17.73	-	15.11	-	0.50	Pass
HT20	MCS0	1	6	2437	17.73	-	15.15	-	0.50	Pass
HT20	MCS0	1	11	2462	17.58	-	15.15	-	0.50	Pass

**TEST RESULTS DATA**  
**Average Output Power**

2.4GHz Band																
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	16.10	-	-	30.00	-	-0.60	-	15.50	-	36.00	-	Pass
11b	1Mbps	1	6	2437	15.80	-		30.00	-	-0.60	-	15.20	-	36.00	-	Pass
11b	1Mbps	1	11	2462	15.60	-		30.00	-	-0.60	-	15.00	-	36.00	-	Pass
11g	6Mbps	1	1	2412	14.80	-		30.00	-	-0.60	-	14.20	-	36.00	-	Pass
11g	6Mbps	1	6	2437	15.30	-		30.00	-	-0.60	-	14.70	-	36.00	-	Pass
11g	6Mbps	1	11	2462	13.20	-		30.00	-	-0.60	-	12.60	-	36.00	-	Pass
HT20	MCS0	1	1	2412	14.30	-		30.00	-	-0.60	-	13.70	-	36.00	-	Pass
HT20	MCS0	1	6	2437	14.00	-		30.00	-	-0.60	-	13.40	-	36.00	-	Pass
HT20	MCS0	1	11	2462	13.70	-		30.00	-	-0.60	-	13.10	-	36.00	-	Pass

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

**TEST RESULTS DATA**  
**Power Spectral Density**

2.4GHz Band												
Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	-6.91	-	-	-0.60	-	8.00	-	Pass
11b	1Mbps	1	6	2437	-5.92	-	-	-0.60	-	8.00	-	Pass
11b	1Mbps	1	11	2462	-6.79	-	-	-0.60	-	8.00	-	Pass
11g	6Mbps	1	1	2412	-8.42	-	-	-0.60	-	8.00	-	Pass
11g	6Mbps	1	6	2437	-7.45	-	-	-0.60	-	8.00	-	Pass
11g	6Mbps	1	11	2462	-7.36	-	-	-0.60	-	8.00	-	Pass
HT20	MCS0	1	1	2412	-9.45	-	-	-0.60	-	8.00	-	Pass
HT20	MCS0	1	6	2437	-9.82	-	-	-0.60	-	8.00	-	Pass
HT20	MCS0	1	11	2462	-10.33	-	-	-0.60	-	8.00	-	Pass

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



## **Appendix B. AC Conducted Emission Test Results**

Test Engineer :	Bear Xiong	Temperature :	22~25°C
Test Voltage :	120Vac / 60Hz	Relative Humidity :	50~55%
Phase :	Line		

Level (dBuV)

Date: 2019-06-21

Frequency (MHz)

Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_20180719\_L LINE

IMEI : 868197030032408

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	44.69	-11.18	55.87	34.50	0.03	10.16	Average
2	0.15	59.09	-6.78	65.87	48.90	0.03	10.16	QP
3	0.20	37.79	-15.66	53.45	27.60	0.03	10.16	Average
4	0.20	52.99	-10.46	63.45	42.80	0.03	10.16	QP
5	0.26	38.50	-13.06	51.56	28.30	0.03	10.17	Average
6	0.26	48.00	-13.56	61.56	37.80	0.03	10.17	QP
7	0.31	33.80	-16.04	49.84	23.60	0.03	10.17	Average
8	0.31	47.50	-12.34	59.84	37.30	0.03	10.17	QP
9	0.37	40.50	-8.11	48.61	30.30	0.03	10.17	Average
10	0.37	48.30	-10.31	58.61	38.10	0.03	10.17	QP
11 *	0.46	43.60	-3.07	46.67	33.41	0.02	10.17	Average
12	0.46	50.80	-5.87	56.67	40.61	0.02	10.17	QP
13	0.51	37.99	-8.01	46.00	27.80	0.02	10.17	Average
14	0.51	48.49	-7.51	56.00	38.30	0.02	10.17	QP
15	0.63	36.00	-10.00	46.00	25.80	0.02	10.18	Average
16	0.63	46.80	-9.20	56.00	36.60	0.02	10.18	QP
17	0.92	32.54	-13.46	46.00	22.30	0.06	10.18	Average
18	0.92	42.64	-13.36	56.00	32.40	0.06	10.18	QP
19	1.52	35.18	-10.82	46.00	24.90	0.09	10.19	Average
20	1.52	43.38	-12.62	56.00	33.10	0.09	10.19	QP
21	3.49	35.07	-10.93	46.00	24.70	0.17	10.20	Average
22	3.49	43.17	-12.83	56.00	32.80	0.17	10.20	QP



<b>Test Engineer :</b>	Bear Xiong	<b>Temperature :</b>	22~25°C
<b>Test Voltage :</b>	120Vac / 60Hz	<b>Relative Humidity :</b>	50~55%
<b>Phase :</b>	Neutral		

Level (dBuV)

Date: 2019-06-21

Site : C001-SZ  
Condition: FCC 15C\_QP LISN\_20180719\_N NEUTRAL

IMEI	FCC 15C Test Data							
	Freq	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.15	44.19	-11.63	55.82	34.00	0.03	10.16 Average	
2	0.15	57.09	-8.73	65.82	46.90	0.03	10.16 QP	
3	0.21	35.59	-17.77	53.36	25.40	0.03	10.16 Average	
4	0.21	52.49	-10.87	63.36	42.30	0.03	10.16 QP	
5	0.26	40.80	-10.67	51.47	30.60	0.03	10.17 Average	
6	0.26	51.10	-10.37	61.47	40.90	0.03	10.17 QP	
7	0.36	37.30	-11.53	48.83	27.11	0.02	10.17 Average	
8	0.36	48.40	-10.43	58.83	38.21	0.02	10.17 QP	
9	0.46	42.69	-4.07	46.76	32.50	0.02	10.17 Average	
10 *	0.46	52.79	-3.97	56.76	42.60	0.02	10.17 QP	
11	0.63	35.70	-10.30	46.00	25.50	0.02	10.18 Average	
12	0.63	46.70	-9.30	56.00	36.50	0.02	10.18 QP	
13	0.79	31.41	-14.59	46.00	21.20	0.03	10.18 Average	
14	0.79	45.11	-10.89	56.00	34.90	0.03	10.18 QP	
15	0.95	32.52	-13.48	46.00	22.29	0.05	10.18 Average	
16	0.95	43.52	-12.48	56.00	33.29	0.05	10.18 QP	
17	1.34	33.63	-12.37	46.00	23.40	0.05	10.18 Average	
18	1.34	43.33	-12.67	56.00	33.10	0.05	10.18 QP	
19	1.76	32.34	-13.66	46.00	22.10	0.05	10.19 Average	
20	1.76	40.94	-15.06	56.00	30.70	0.05	10.19 QP	
21	3.35	31.94	-14.06	46.00	21.70	0.04	10.20 Average	
22	3.35	40.24	-15.76	56.00	30.00	0.04	10.20 QP	



## Appendix C. 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		2389.59	47.02	-26.98	74	46.15	27.07	6.6	32.8	160	210	P	H
		2390	38.07	-15.93	54	37.18	27.07	6.6	32.78	160	210	A	H
	*	2412	99.81	-	-	98.87	27.12	6.6	32.78	160	210	P	H
	*	2412	96.77	-	-	95.83	27.12	6.6	32.78	160	210	A	H
		2388.96	48.58	-25.42	74	47.71	27.07	6.6	32.8	160	274	P	V
		2390	40.23	-13.77	54	39.34	27.07	6.6	32.78	160	274	A	V
	*	2412	103.56	-	-	102.62	27.12	6.6	32.78	160	274	P	V
	*	2412	100.47	-	-	99.53	27.12	6.6	32.78	160	274	A	V
802.11b CH 06 2437MHz		2388.96	45.95	-28.05	74	45.08	27.07	6.6	32.8	160	210	P	H
		2389.8	35.55	-18.45	54	34.66	27.07	6.6	32.78	160	210	A	H
	*	2437	100.45	-	-	99.38	27.2	6.63	32.76	160	210	P	H
	*	2437	97.32	-	-	96.25	27.2	6.63	32.76	160	210	A	H
		2493.56	47.66	-26.34	74	46.3	27.33	6.73	32.7	160	210	P	H
		2483.55	36.2	-17.8	54	34.93	27.29	6.7	32.72	160	210	A	H
		2332.96	47.08	-26.92	74	46.51	26.91	6.5	32.84	160	268	P	V
		2387.28	36.15	-17.85	54	35.31	27.07	6.57	32.8	160	268	A	V
	*	2437	103.92	-	-	102.85	27.2	6.63	32.76	160	268	P	V
	*	2437	100.9	-	-	99.83	27.2	6.63	32.76	160	268	A	V
		2496.22	47.22	-26.78	74	45.86	27.33	6.73	32.7	160	268	P	V
		2484.67	36.77	-17.23	54	35.5	27.29	6.7	32.72	160	268	A	V



<b>802.11b CH 11 2462MHz</b>	*	2462	100.63	-	-	99.46	27.24	6.67	32.74	160	209	P	H
	*	2462	97.49	-	-	96.32	27.24	6.67	32.74	160	209	A	H
		2483.52	49.88	-24.12	74	48.61	27.29	6.7	32.72	160	209	P	H
		2483.52	43.18	-10.82	54	41.91	27.29	6.7	32.72	160	209	A	H
	*	2462	103.05	-	-	101.88	27.24	6.67	32.74	160	268	P	V
	*	2462	99.95	-	-	98.78	27.24	6.67	32.74	160	268	A	V
		2483.6	52.11	-21.89	74	50.84	27.29	6.7	32.72	160	268	P	V
		2483.52	45.73	-8.27	54	44.46	27.29	6.7	32.72	160	268	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 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
<b>802.11b CH 01 2412MHz</b>		4824	42.75	-31.25	74	59.55	31.03	9.65	57.48	185	255	P	H
		4824	42.85	-31.15	74	59.65	31.03	9.65	57.48	185	255	P	V
<b>802.11b CH 06 2437MHz</b>		4874	44.6	-29.4	74	61.35	31.06	9.71	57.52	165	106	P	H
		7311	50.23	-23.77	74	61.22	35.92	12.01	58.92	174	100	P	H
		4874	44.08	-29.92	74	60.83	31.06	9.71	57.52	165	106	P	V
		7311	53.53	-20.47	74	64.52	35.92	12.01	58.92	174	100	P	V
		7311	42.55	-11.45	54	53.54	35.92	12.01	58.92	174	100	A	V
<b>802.11b CH 11 2462MHz</b>		4926	47.26	-26.74	74	64.07	35.01	6.6	58.42	100	0	P	H
		7386	41.03	-32.97	74	54.59	36.44	8.31	58.31	100	0	P	H
		4923	40.41	-33.59	74	57.23	35.01	6.59	58.42	100	0	P	V
		7386	41.93	-32.07	74	55.49	36.44	8.31	58.31	100	0	P	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 802.11g (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	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		2389.7	58.88	-15.12	74	58.01	27.07	6.6	32.8	197	220	P	H
		2389.8	46.4	-7.6	54	45.51	27.07	6.6	32.78	197	220	A	H
	*	2412	101.68	-	-	100.74	27.12	6.6	32.78	197	220	P	H
	*	2412	94.16	-	-	93.22	27.12	6.6	32.78	197	220	A	H
		2389.91	62.57	-11.43	74	61.68	27.07	6.6	32.78	206	267	P	V
		2389.7	48.5	-5.5	54	47.63	27.07	6.6	32.8	206	267	A	V
	*	2412	105.46	-	-	104.52	27.12	6.6	32.78	206	267	P	V
	*	2412	97.18	-	-	96.24	27.12	6.6	32.78	206	267	A	V
802.11g CH 06 2437MHz		2389.66	46.4	-27.6	74	45.53	27.07	6.6	32.8	132	147	P	H
		2389.66	36.74	-17.26	54	35.87	27.07	6.6	32.8	132	147	A	H
	*	2437	100.86	-	-	99.79	27.2	6.63	32.76	132	147	P	H
	*	2437	93.63	-	-	92.56	27.2	6.63	32.76	132	147	A	H
		2483.5	47.64	-26.36	74	46.37	27.29	6.7	32.72	132	147	P	H
		2483.62	38.13	-15.87	54	36.86	27.29	6.7	32.72	132	147	A	H
		2386.86	48.73	-25.27	74	47.89	27.07	6.57	32.8	161	274	P	V
		2389.38	39.18	-14.82	54	38.31	27.07	6.6	32.8	161	274	A	V
	*	2437	107.3	-	-	106.23	27.2	6.63	32.76	161	274	P	V
	*	2437	99.94	-	-	98.87	27.2	6.63	32.76	161	274	A	V
		2486.42	51.51	-22.49	74	50.24	27.29	6.7	32.72	161	274	P	V
		2484.25	41.04	-12.96	54	39.77	27.29	6.7	32.72	161	274	A	V



802.11g CH 11 2462MHz	*	2462	100.39	-	-	99.22	27.24	6.67	32.74	144	150	P	H
	*	2462	92.53	-	-	91.36	27.24	6.67	32.74	144	150	A	H
		2483.64	56.9	-17.1	74	55.63	27.29	6.7	32.72	144	150	P	H
		2483.6	43.7	-10.3	54	42.43	27.29	6.7	32.72	144	150	A	H
	*	2462	105.92	-	-	104.75	27.24	6.67	32.74	138	271	P	V
	*	2462	98.88	-	-	97.71	27.24	6.67	32.74	138	271	A	V
		2485.92	63.97	-10.03	74	62.7	27.29	6.7	32.72	138	271	P	V
		2483.52	49.32	-4.68	54	48.05	27.29	6.7	32.72	138	271	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 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak (P/A)	Avg. (H/V)
<b>802.11g CH 01 2412MHz</b>		4824	42.05	-31.95	74	58.85	31.03	9.65	57.48	185	255	P	H
		4824	41.52	-32.48	74	58.32	31.03	9.65	57.48	185	255	P	V
<b>802.11g CH 06 2437MHz</b>		4874	42.39	-31.61	74	59.14	31.06	9.71	57.52	165	106	P	H
		7311	48.26	-25.74	74	59.25	35.92	12.01	58.92	174	100	P	H
		4874	41.94	-32.06	74	58.69	31.06	9.71	57.52	165	106	P	V
		7311	44.37	-9.63	54	55.36	35.92	12.01	58.92	174	100	A	V
<b>802.11g CH 11 2462MHz</b>		4924	42.89	-31.11	74	59.57	31.1	9.77	57.55	150	285	P	H
		7386	48.9	-25.1	74	59.63	36.15	12.08	58.96	155	274	P	H
		7386	53.67	-20.33	74	64.4	36.15	12.08	58.96	155	274	P	V
		7386	41.64	-12.36	54	52.37	36.15	12.08	58.96	155	274	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 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)(H/V)	Pol.
802.11n HT20 CH 01 2412MHz		2389.07	59.86	-14.14	74	58.99	27.07	6.6	32.8	161	209	P	H
		2389.91	46.72	-7.28	54	45.83	27.07	6.6	32.78	161	209	A	H
	*	2412	100.81	-	-	99.87	27.12	6.6	32.78	161	209	P	H
	*	2412	93.71	-	-	92.77	27.12	6.6	32.78	161	209	A	H
		2388.54	61.88	-12.12	74	61.01	27.07	6.6	32.8	161	270	P	V
		2389.7	49.77	-4.23	54	48.9	27.07	6.6	32.8	161	270	A	V
	*	2412	104.5	-	-	103.56	27.12	6.6	32.78	161	270	P	V
	*	2412	96.9	-	-	95.96	27.12	6.6	32.78	161	270	A	V
802.11n HT20 CH 06 2437MHz		2366.98	46.35	-27.65	74	45.59	26.99	6.57	32.8	180	207	P	H
		2389.8	36.87	-17.13	54	35.98	27.07	6.6	32.78	180	207	A	H
	*	2437	101.99	-	-	100.92	27.2	6.63	32.76	180	207	P	H
	*	2437	94.67	-	-	93.6	27.2	6.63	32.76	180	207	A	H
		2485.58	47.89	-26.11	74	46.62	27.29	6.7	32.72	180	207	P	H
		2484.46	37.21	-16.79	54	35.94	27.29	6.7	32.72	180	207	A	H
		2362.08	46.62	-27.38	74	45.92	26.99	6.53	32.82	172	272	P	V
		2389.94	37.42	-16.58	54	36.53	27.07	6.6	32.78	172	272	A	V
	*	2437	104.79	-	-	103.72	27.2	6.63	32.76	172	272	P	V
	*	2437	97.43	-	-	96.36	27.2	6.63	32.76	172	272	A	V
		2484.11	51.61	-22.39	74	50.34	27.29	6.7	32.72	172	272	P	V
		2484.39	38.75	-15.25	54	37.48	27.29	6.7	32.72	172	272	A	V



	*	2462	101.58	-	-	100.41	27.24	6.67	32.74	161	209	P	H
	*	2462	94.27	-	-	93.1	27.24	6.67	32.74	161	209	A	H
802.11n		2484.88	59.72	-14.28	74	58.45	27.29	6.7	32.72	161	209	P	H
HT20		2483.6	45.24	-8.76	54	43.97	27.29	6.7	32.72	161	209	A	H
CH 11	*	2462	104.29	-	-	103.12	27.24	6.67	32.74	160	297	P	V
2462MHz	*	2462	97.14	-	-	95.97	27.24	6.67	32.74	160	297	A	V
		2484.16	63.65	-10.35	74	62.38	27.29	6.7	32.72	160	297	P	V
		2483.52	47.82	-6.18	54	46.55	27.29	6.7	32.72	160	297	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak (P/A)	Avg. (H/V)
<b>802.11n HT20 CH 01 2412MHz</b>		4824	42.42	-31.58	74	59.22	31.03	9.65	57.48	185	255	P	H
		4824	42.71	-31.29	74	59.51	31.03	9.65	57.48	185	255	P	V
<b>802.11n HT20 CH 06 2437MHz</b>		4874	42.91	-31.09	74	59.66	31.06	9.71	57.52	165	106	P	H
		7311	49.59	-24.41	74	60.58	35.92	12.01	58.92	174	100	P	H
		4874	44.42	-29.58	74	61.17	31.06	9.71	57.52	165	106	P	V
		7311	54.33	-19.67	74	65.32	35.92	12.01	58.92	174	100	P	V
		7311	42.04	-11.96	54	53.03	35.92	12.01	58.92	174	100	A	V
<b>802.11n HT20 CH 11 2462MHz</b>		4924	43.26	-30.74	74	59.94	31.1	9.77	57.55	150	360	P	H
		7386	48.77	-25.23	74	59.5	36.15	12.08	58.96	165	335	P	H
		4924	43.49	-30.51	74	60.17	31.1	9.77	57.55	150	360	P	V
		7386	53.63	-20.37	74	64.36	36.15	12.08	58.96	165	335	P	V
		7386	42.64	-11.36	54	53.37	36.15	12.08	58.96	165	335	A	V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## Emission below 1GHz

## 2.4GHz WIFI 802.11n HT20 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
2.4GHz 802.11n HT20 LF		30.97	27.16	-12.84	40	34.76	24.33	0.57	32.5	-	-	P	H
		57.16	24.87	-15.13	40	44.03	12.52	0.77	32.45	-	-	P	H
		82.38	22.6	-17.4	40	39.98	13.68	0.94	32	-	-	P	H
		270.56	37.61	-8.39	46	48.09	19.67	1.73	31.88	174	141	P	H
		333.61	28.29	-17.71	46	38.01	20.22	1.93	31.87	-	-	P	H
		385.99	33.86	-12.14	46	42.04	21.47	2.08	31.73	-	-	P	H
		30	34.26	-5.74	40	41.4	24.8	0.56	32.5	-	-	P	V
		57.16	34.72	-5.28	40	53.88	12.52	0.77	32.45	187	45	P	V
		82.38	32.94	-7.06	40	50.32	13.68	0.94	32	-	-	P	V
		176.47	28.81	-14.69	43.5	44.04	15.27	1.35	31.85	-	-	P	V
	Remark	262.8	31.11	-14.89	46	41.06	20.2	1.7	31.85	-	-	P	V
		388.9	26.34	-19.66	46	34.43	21.54	2.09	31.72	-	-	P	V

**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 or Average</b>
H/V	<b>Horizontal or 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 )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

$$1. \text{ Level(dB}\mu\text{V/m)} =$$

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dB}\mu\text{V)} - \text{Preamp Factor(dB)}$$

$$2. \text{ Over Limit(dB)} = \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

#### For Peak Limit @ 2390MHz:

$$1. \text{ Level(dB}\mu\text{V/m)}$$

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dB}\mu\text{V)} - \text{Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 54.51(\text{dB}\mu\text{V}) - 35.86 (\text{dB})$$

$$= 55.45 (\text{dB}\mu\text{V/m})$$

$$2. \text{ Over Limit(dB)}$$

$$= \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

$$= 55.45(\text{dB}\mu\text{V/m}) - 74(\text{dB}\mu\text{V/m})$$

$$= -18.55(\text{dB})$$

#### For Average Limit @ 2390MHz:

$$1. \text{ Level(dB}\mu\text{V/m)}$$

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dB}\mu\text{V)} - \text{Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 42.6(\text{dB}\mu\text{V}) - 35.86 (\text{dB})$$

$$= 43.54 (\text{dB}\mu\text{V/m})$$

$$2. \text{ Over Limit(dB)}$$

$$= \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

$$= 43.54(\text{dB}\mu\text{V/m}) - 54(\text{dB}\mu\text{V/m})$$

$$= -10.46(\text{dB})$$

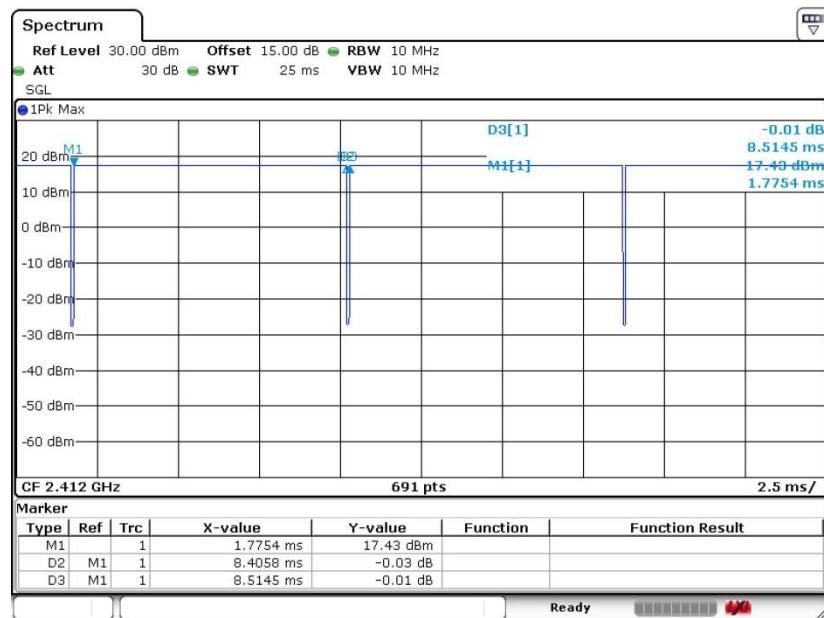
Both peak and average measured complies with the limit line, so test result is "PASS".



## Appendix D. Duty Cycle Plots

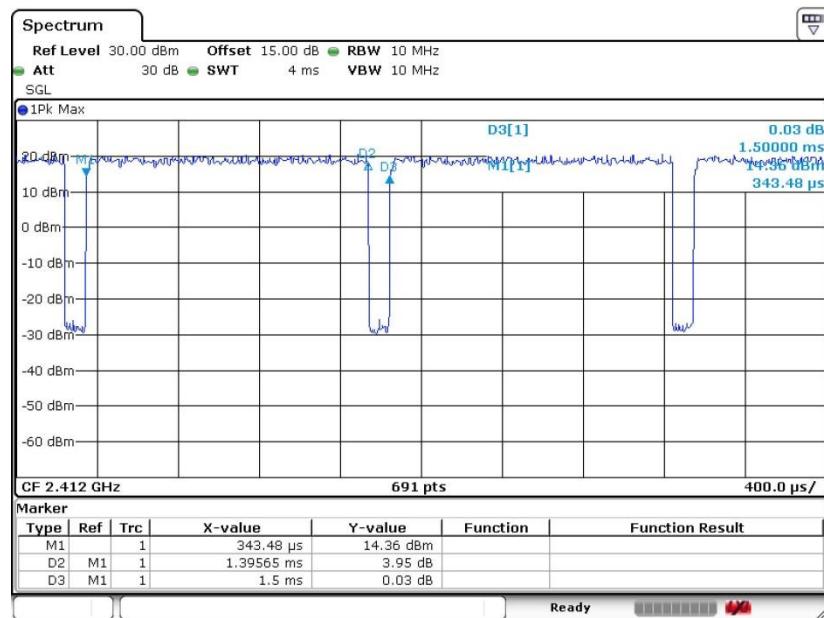
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	98.72	-	-	10Hz
802.11g	93.04	1.396	0.717	1kHz
802.11n HT20	92.62	1.309	0.764	1kHz

### 802.11b





## 802.11g



## 802.11n HT20

