



FCC RF Test Report

APPLICANT : OnePlus Technology (shenzhen) Co., Ltd
EQUIPMENT : Smart Phone
BRAND NAME : ONEPLUS
MODEL NAME : GM1915
FCC ID : 2ABZ2-GM1915
STANDARD : FCC Part 15 Subpart E § 15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure

The product was received on Dec. 25, 2018 and testing was completed on Feb. 27, 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.

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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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR8D2514-01F	Rev. 01	Initial issue of report	Mar. 21, 2019



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) & 15.209(a)	Pass	Under limit 12.93 dB at 17475.000 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.34 dB at 13.550 MHz
3.6	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.7	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

OnePlus Technology (shenzhen) Co., Ltd

18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen

1.2 Manufacturer

OnePlus Technology (shenzhen) Co., Ltd

18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart Phone
Brand Name	ONEPLUS
Model Name	GM1915
FCC ID	2ABZ2-GM1915
EUT supports Radios application	CDMA/EV-DO/GSM/GPRS/EGPRS/WCDMA/HSPA/ DC-HSDPA/HSPA+/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ac VHT20/VHT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC/GNSS
IMEI Code	Conducted: 864737040224984 Conduction: 864737040223374 Radiation: 864737040224034
HW Version	13
SW Version	9.5.1.GM31CB
EUT Stage	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			
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz		
Maximum Output Power	MIMO<Ant.1+2> <5745 MHz ~ 5825 MHz> 802.11a : 20.39 dBm / 0.1094 W 802.11n HT20 : 20.36 dBm / 0.1086 W 802.11n HT40 : 20.08 dBm / 0.1019 W 802.11ac VHT20: 20.33 dBm / 0.1079 W 802.11ac VHT40: 20.04 dBm / 0.1009 W 802.11ac VHT80: 19.46 dBm / 0.0883 W		
99% Occupied Bandwidth	MIMO<Ant.1+2> 802.11a : 17.68 MHz 802.11n HT20 : 18.88 MHz 802.11n HT40 : 36.56 MHz 802.11ac VHT80 : 75.64 MHz		
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)		
Antenna Type / Gain	<Ant. 1> : PIFA Antenna with gain -3.00 dBi <Ant. 2> : PIFA Antenna with gain -3.00 dBi		
Antenna Function Description		Ant. 1	Ant. 2
	802.11 a/n/ac SISO	-	-
	802.11 a/n/ac MIMO	V	V

Note:

- For 802.11n HT20 / ac VHT20 and 802.11n HT40 / ac VHT40 mode, the whole testing have assessed only 802.11an HT20/ HT40 by referring to their maximum conducted power.
- The 5GHz WLAN can transmit in MIMO antenna mode only and it has no SISO antenna mode.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600156-0).

Test Site	Sporton International (Shenzhen) Inc.		
Test Site Location	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		
Test Site No.	Sporton Site No.	FCC designation No.	FCC Test Firm Registration No.
	TH01-SZ CO01-SZ	CN5018	337463

Test Site	Sporton International (Shenzhen) Inc.		
Test Site Location	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		
Test Site No.	Sporton Site No.	FCC designation No.	FCC Test Firm Registration No.
	03CH04-SZ	CN5019	577730

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 E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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)
5745-5825 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155 [#]	5775	165	5825

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "[#]" were 802.11ac VHT80.

2.2 Test Mode

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

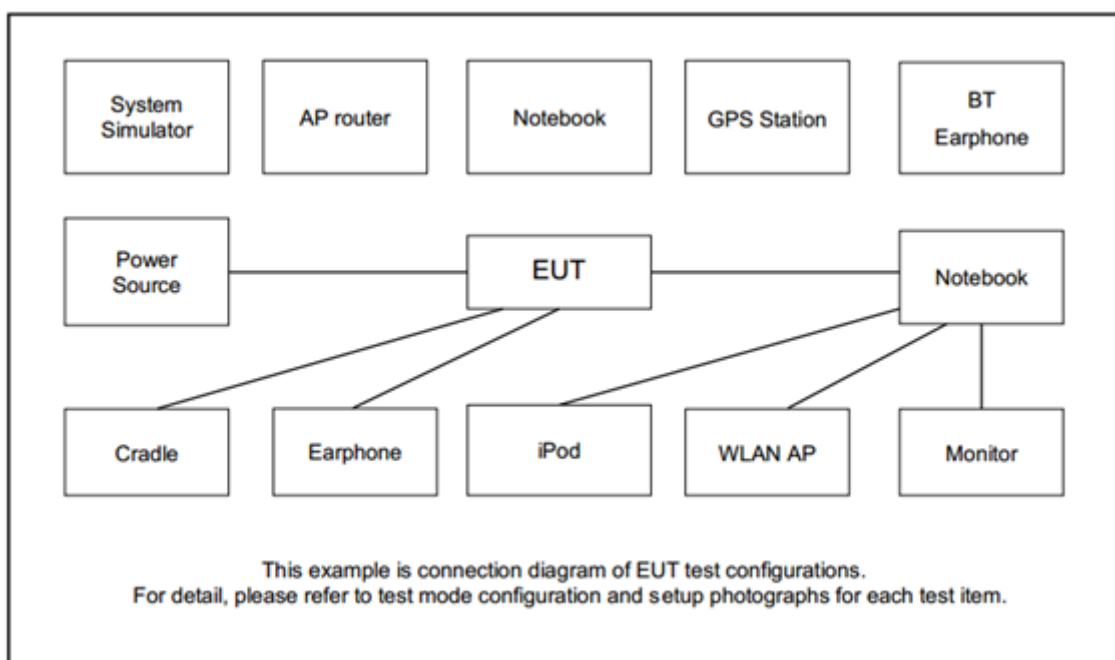
MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0

AC Conducted Emission	Mode 1 : GSM 850 Idle + Bluetooth Link + WLAN Link (5G) + USB Cable (Charging from Adapter)
Remark: For Radiated Test Cases, The tests were performed with Adapter and USB Cable.	

Ch. #		Band IV : 5745-5825 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	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 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 6.6 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 6.6 + 10 = 16.6 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

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

26dB and 99% Occupied bandwidth are reporting only.

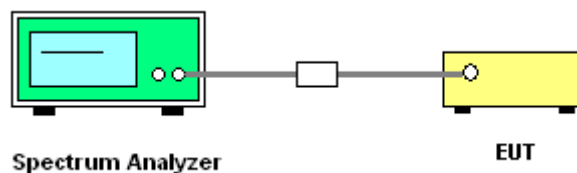
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

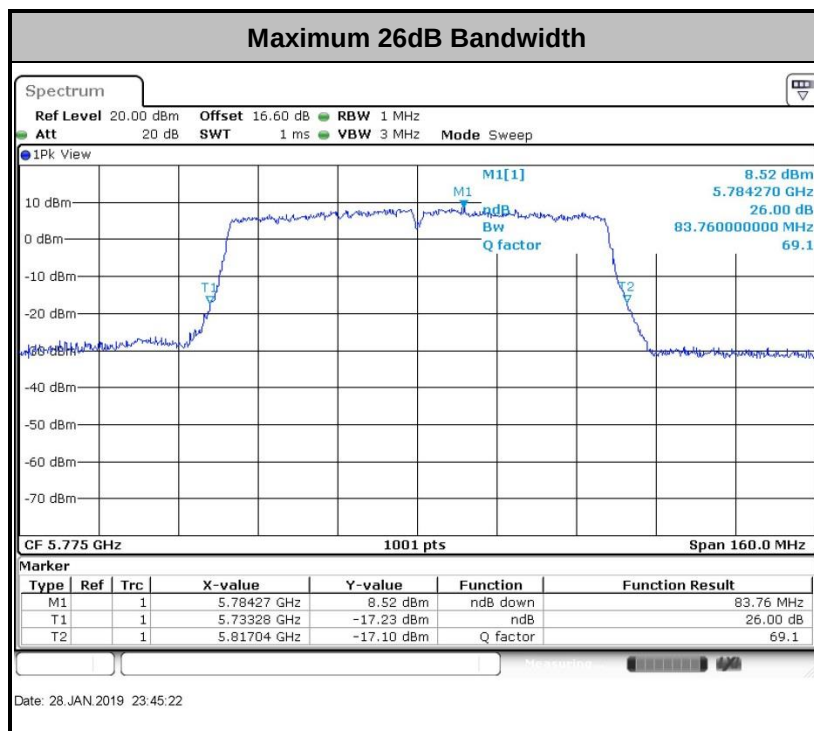
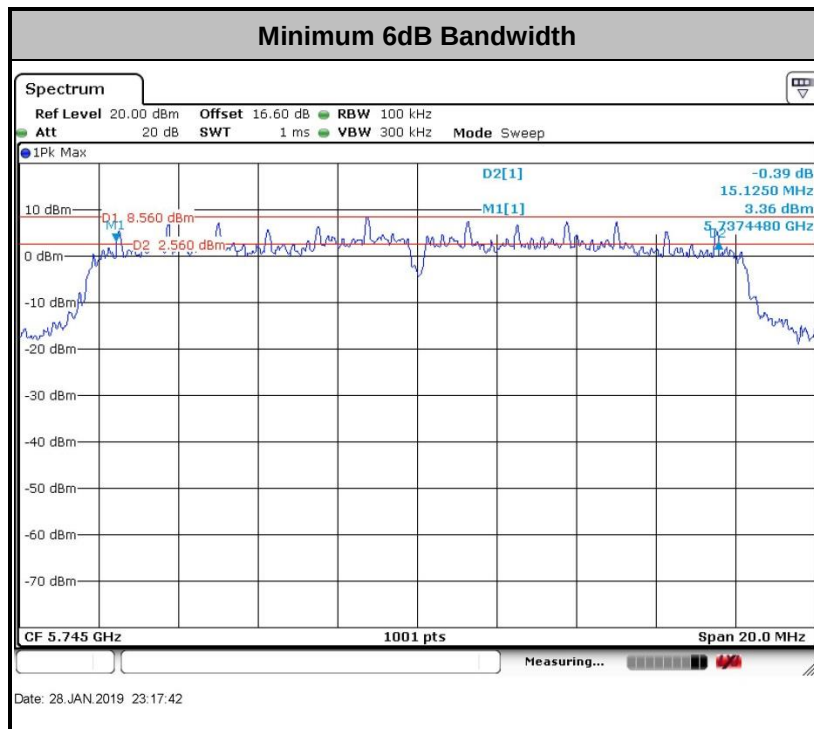
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

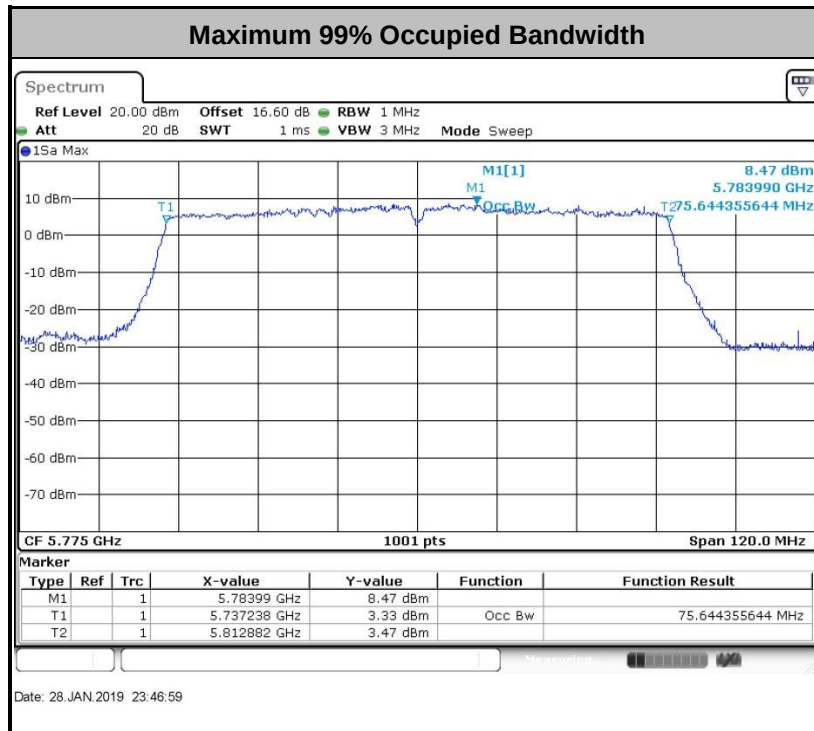
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.





Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Measuring Instruments

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

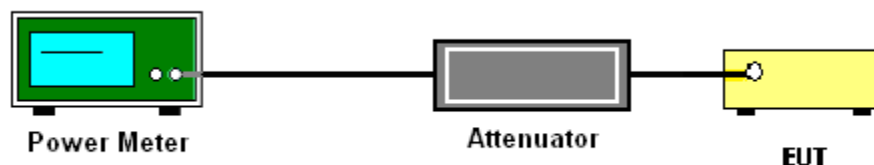
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, $10 \log(1/x)$, where x is the duty cycle.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.



3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section F) Maximum power spectral density.

Method SA-2

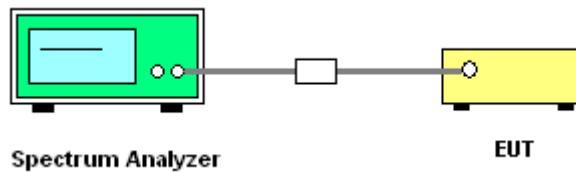
(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
 - Set span to encompass the entire emission bandwidth (EBW) of the signal.
 - Set RBW = 300 kHz.
 - Set VBW $\geq$ 1 MHz.
 - Number of points in sweep $\geq$ 2 Span / RBW.
 - Sweep time = auto.
 - Detector = RMS
 - Trace average at least 100 traces in power averaging mode.
 - Add $10 \log(500\text{kHz}/\text{RBW})$ to the test result.
 - Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add $10 \log(1/0.25) = 6$ dB if the duty cycle is 25 percent.
-
1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
 2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
 3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Method (c): Measure and add $10 \log(N_{\text{ANT}})$ dB.

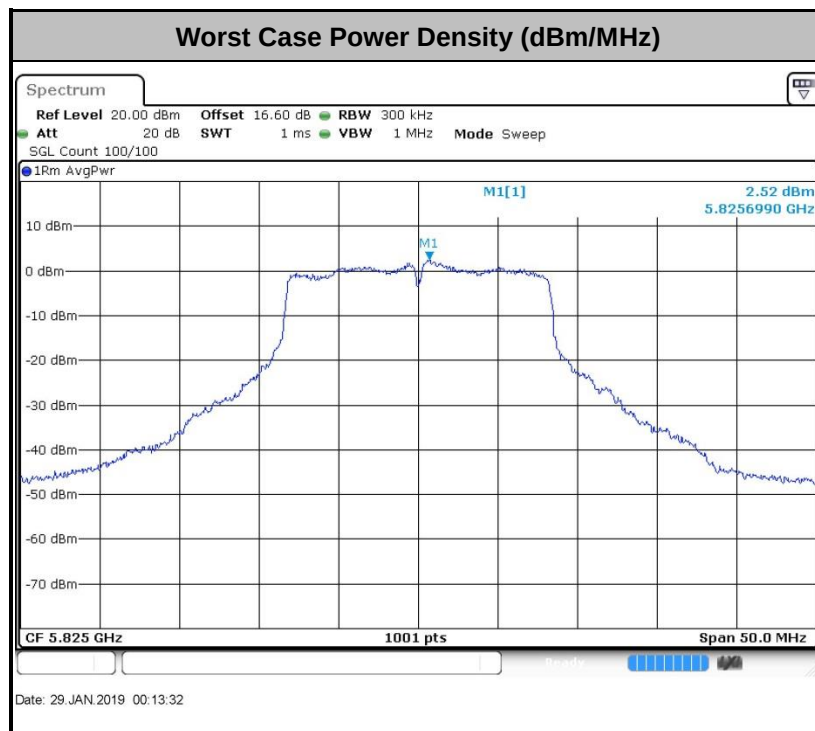
With this technique, spectrum measurements are performed at each output of the device, but rather than summing the spectra or the spectral peaks across the outputs, the quantity $10 \log(N_{\text{ANT}})$ dB is added to each spectrum value before comparing to the emission limit. The addition of $10 \log(N_{\text{ANT}})$ dB serves to apportion the emission limit among the N_{ANT} outputs so that each output is permitted to contribute no more than $1/N_{\text{ANT}}^{\text{th}}$ of the PSD limit.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



3.4 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.4.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

- (2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

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



EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.2

Note: The following formula is used to convert the EIRP to field strength.

$$\text{EIRP} = E_{\text{Meas}} + 20\log(d_{\text{Meas}}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

3.4.2 Measuring Instruments

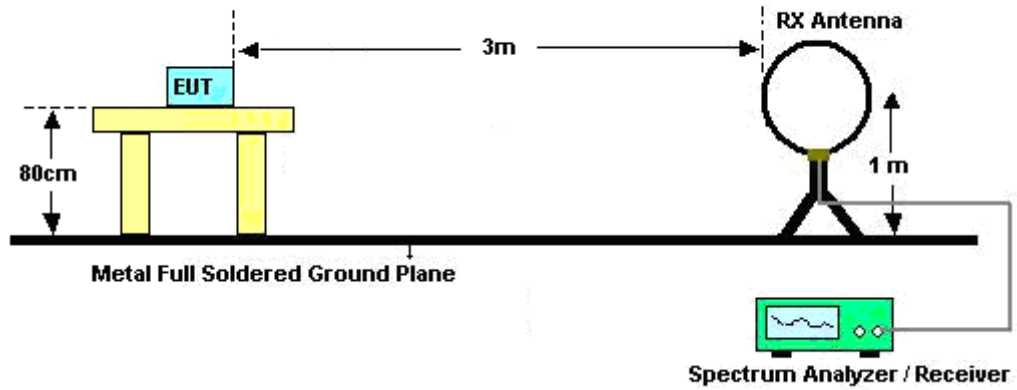
The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

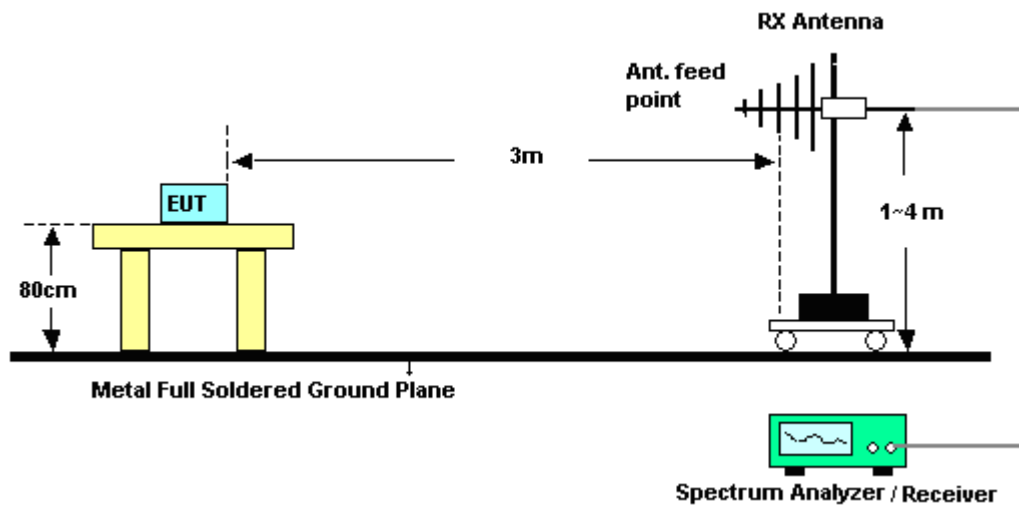
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW $\geq$ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
 - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - 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.
2. 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.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
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.

3.4.4 Test Setup

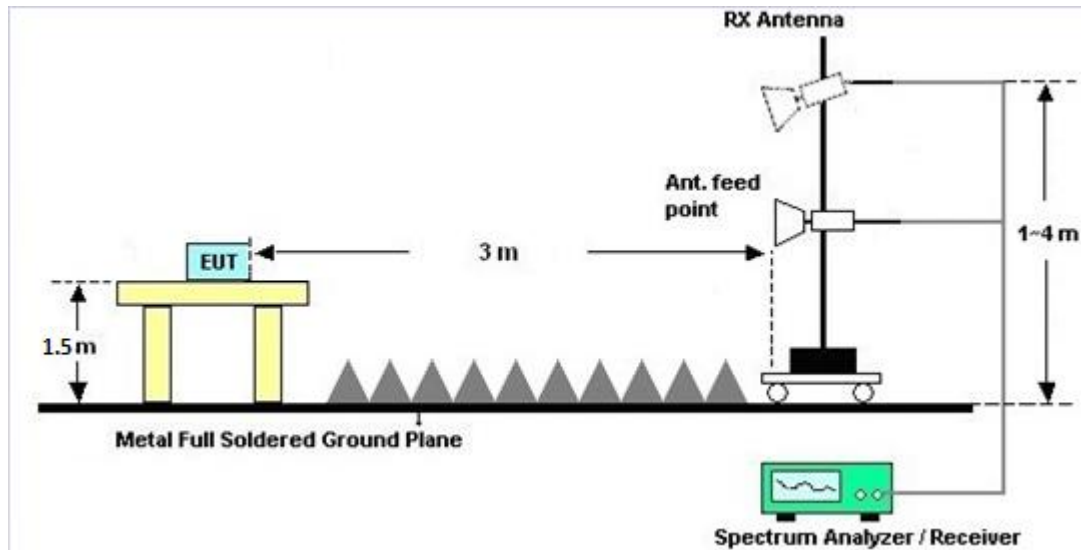
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

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.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C.

3.4.7 Duty Cycle

Please refer to Appendix D.

3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

3.5 AC Conducted Emission Measurement

3.5.1 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 μ 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.

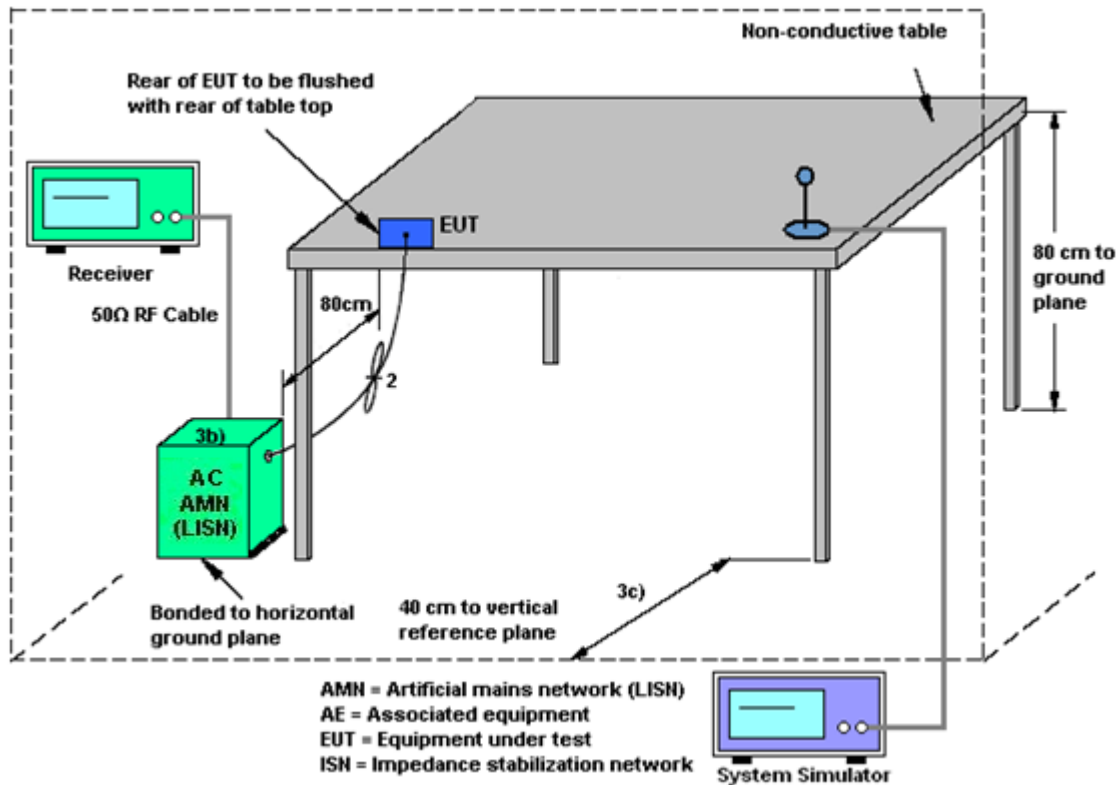
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room 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 with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Automatically Discontinue Transmission

3.6.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

3.6.2 Measuring Instruments

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

3.6.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

<CDD Modes>						
	Ant. 1	Ant. 2	DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	(dBi)	(dBi)	(dBi)	(dBi)	(dB)	(dB)
Band IV	-3.00	-3.00	-3.00	0.01	0.00	0.00

$Power\ Limit\ Reduction = DG(Power) - 6dBi, (min = 0)$

$PSD\ Limit\ Reduction = DG(PSD) - 6dBi, (min = 0)$



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. 19, 2018	Jan. 28, 2019~ Jan. 29, 2019	Apr. 18, 2019	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 22, 2018	Jan. 28, 2019~ Jan. 29, 2019	Dec. 21, 2019	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 22, 2018	Jan. 28, 2019~ Jan. 29, 2019	Dec. 21, 2019	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Apr. 19, 2018	Feb. 11, 2019~ Feb. 27, 2019	Apr. 18, 2019	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Apr. 19, 2018	Feb. 11, 2019~ Feb. 27, 2019	Apr. 18, 2019	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2018	Feb. 11, 2019~ Feb. 27, 2019	May 13, 2019	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Aug. 28, 2018	Feb. 11, 2019~ Feb. 27, 2019	Aug. 27, 2019	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	Feb. 04, 2019	Feb. 11, 2019~ Feb. 27, 2019	Feb. 03, 2020	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Apr. 20, 2018	Feb. 11, 2019~ Feb. 27, 2019	Apr. 19, 2019	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz~3000MHz	Oct. 18, 2018	Feb. 11, 2019~ Feb. 27, 2019	Oct. 17, 2019	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1989346	1GHz~18GHz	Jul. 30, 2018	Feb. 11, 2019~ Feb. 27, 2019	Jul. 29, 2019	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1988315	18GHz~40GHz	Jul. 26, 2018	Feb. 11, 2019~ Feb. 27, 2019	Jul. 25, 2019	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY53270156	500MHz~26.5GHz	Apr. 19, 2018	Feb. 11, 2019~ Feb. 27, 2019	Apr. 18, 2019	Radiation (03CH04-SZ)
AC Power Source	Chroma	61601	N/A	N/A	NCR	Feb. 11, 2019~ Feb. 27, 2019	NCR	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Feb. 11, 2019~ Feb. 27, 2019	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Feb. 11, 2019~ Feb. 27, 2019	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 23, 2018	Jan. 24, 2019	Dec. 22, 2019	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Oct. 18, 2018	Jan. 24, 2019	Oct. 17, 2019	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Dec. 23, 2018	Jan. 24, 2019	Dec. 22, 2019	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 18, 2018	Jan. 24, 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)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.6dB
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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% ($U = 2Uc(y)$)	4.8dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

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

Test Engineer:	Jensen Wu	Temperature:	21~25	°C
Test Date:	2019/1/28~2019/1/29	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 26dB EBW and 99% OBW

Band IV													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	17.58	17.53	23.78	22.78	15.13	15.13	0.5		Pass
11a	6Mbps	2	157	5785	17.58	17.53	23.88	23.08	15.49	15.13	0.5		Pass
11a	6Mbps	2	165	5825	17.68	17.48	23.93	22.68	15.52	15.13	0.5		Pass
HT20	MCS0	2	149	5745	18.88	18.68	25.52	24.38	15.13	15.13	0.5		Pass
HT20	MCS0	2	157	5785	18.88	18.68	25.48	24.13	15.15	15.13	0.5		Pass
HT20	MCS0	2	165	5825	18.88	18.78	25.33	24.58	16.30	15.13	0.5		Pass
HT40	MCS0	2	151	5755	36.46	36.56	41.63	42.08	35.17	35.13	0.5		Pass
HT40	MCS0	2	159	5795	36.46	36.56	41.72	41.99	35.13	35.13	0.5		Pass
VHT80	MCS0	2	155	5775	75.64	75.40	83.76	82.64	75.05	75.13	0.5		Pass

TEST RESULTS DATA
Average Power Table

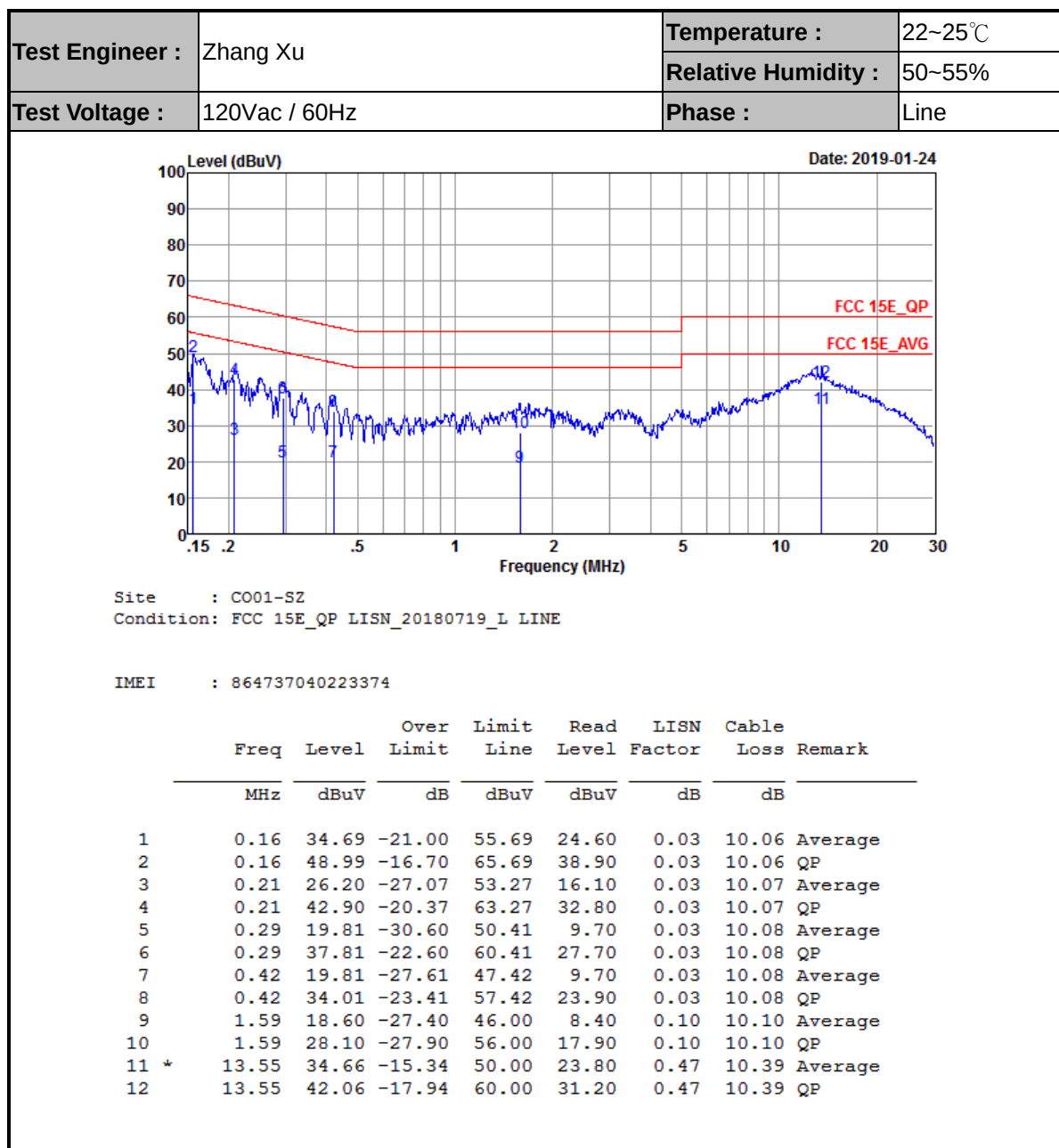
Band IV															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)			Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	2	149	5745	0.08	0.09	17.66	16.91	20.31	30.00		-3.00		Pass	
11a	6Mbps	2	157	5785	0.08	0.09	17.55	16.96	20.27	30.00		-3.00		Pass	
11a	6Mbps	2	165	5825	0.08	0.09	17.73	16.99	20.39	30.00		-3.00		Pass	
HT20	MCS0	2	149	5745	0.08	0.08	17.57	16.87	20.25	30.00		-3.00		Pass	
HT20	MCS0	2	157	5785	0.08	0.08	17.63	16.93	20.31	30.00		-3.00		Pass	
HT20	MCS0	2	165	5825	0.08	0.08	17.70	16.97	20.36	30.00		-3.00		Pass	
HT40	MCS0	2	151	5755	0.16	0.17	17.18	16.83	20.02	30.00		-3.00		Pass	
HT40	MCS0	2	159	5795	0.16	0.17	17.28	16.84	20.08	30.00		-3.00		Pass	
VHT20	MCS0	2	149	5745	0.19	0.16	17.54	16.82	20.21	30.00		-3.00		Pass	
VHT20	MCS0	2	157	5785	0.19	0.16	17.61	16.88	20.27	30.00		-3.00		Pass	
VHT20	MCS0	2	165	5825	0.19	0.16	17.69	16.91	20.33	30.00		-3.00		Pass	
VHT40	MCS0	2	151	5755	0.30	0.32	17.15	16.81	19.99	30.00		-3.00		Pass	
VHT40	MCS0	2	159	5795	0.30	0.32	17.22	16.83	20.04	30.00		-3.00		Pass	
VHT80	MCS0	2	155	5775	0.57	0.60	16.73	16.15	19.46	30.00		-3.00		Pass	

TEST RESULTS DATA
Power Spectral Density

Band IV																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	0.08	0.09	2.22					7.46	30.00	0.01		Pass
11a	6Mbps	2	157	5785	0.08	0.09	2.22					7.75	30.00	0.01		Pass
11a	6Mbps	2	165	5825	0.08	0.09	2.22					7.84	30.00	0.01		Pass
HT20	MCS0	2	149	5745	0.08	0.08	2.22					6.69	30.00	0.01		Pass
HT20	MCS0	2	157	5785	0.08	0.08	2.22					7.06	30.00	0.01		Pass
HT20	MCS0	2	165	5825	0.08	0.08	2.22					6.35	30.00	0.01		Pass
HT40	MCS0	2	151	5755	0.16	0.17	2.22					3.87	30.00	0.01		Pass
HT40	MCS0	2	159	5795	0.16	0.17	2.22					3.95	30.00	0.01		Pass
VHT80	MCS0	2	155	5775	0.57	0.60	2.22					0.15	30.00	0.01		Pass

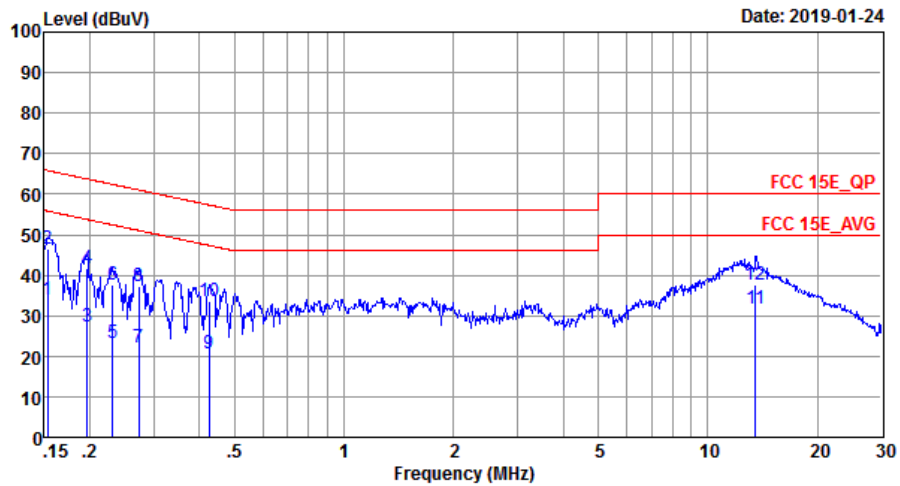


Appendix B. AC Conducted Emission Test Results





Test Engineer :	Zhang Xu	Temperature :	22~25℃
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : C001-SZ
Condition: FCC 15E_QP LISN_20180719_N NEUTRAL

IMEI : 864737040223374

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	34.09	-21.73	55.82	24.00	0.03	10.06	Average
2	0.15	46.59	-19.23	65.82	36.50	0.03	10.06	QP
3	0.20	27.30	-26.46	53.76	17.20	0.03	10.07	Average
4	0.20	41.80	-21.96	63.76	31.70	0.03	10.07	QP
5	0.23	23.20	-29.19	52.39	13.10	0.03	10.07	Average
6	0.23	37.70	-24.69	62.39	27.60	0.03	10.07	QP
7	0.27	22.21	-28.82	51.03	12.10	0.03	10.08	Average
8	0.27	37.11	-23.92	61.03	27.00	0.03	10.08	QP
9	0.43	20.60	-26.73	47.33	10.50	0.02	10.08	Average
10	0.43	33.70	-23.63	57.33	23.60	0.02	10.08	QP
11 *	13.55	31.68	-18.32	50.00	21.00	0.29	10.39	Average
12	13.55	37.68	-22.32	60.00	27.00	0.29	10.39	QP



Appendix C. Radiated Spurious Emission

Band 4 - 5725~5850MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 149 5745MHz		5632.6	49.1	-19.1	68.2	38.02	32.25	10.43	31.6	100	354	P	H
		5693.4	50.24	-50.09	100.33	39	32.34	10.5	31.6	100	354	P	H
		5717.8	52.16	-58.02	110.18	40.84	32.4	10.52	31.6	100	354	P	H
		5725	64.71	-57.49	122.2	53.39	32.4	10.52	31.6	100	354	P	H
	*	5745	107.24	-	-	95.86	32.43	10.55	31.6	100	354	P	H
	*	5745	101.17	-	-	89.79	32.43	10.55	31.6	100	354	A	H
		5644	49.7	-18.5	68.2	38.6	32.25	10.45	31.6	100	31	P	V
		5694.4	50.59	-50.48	101.07	39.35	32.34	10.5	31.6	100	31	P	V
		5718	52.16	-58.08	110.24	40.84	32.4	10.52	31.6	100	31	P	V
		5723.8	58.11	-61.35	119.46	46.79	32.4	10.52	31.6	100	31	P	V
	*	5745	106.71	-	-	95.33	32.43	10.55	31.6	100	31	P	V
	*	5745	99.83	-	-	88.45	32.43	10.55	31.6	100	31	A	V



WIFI Ant. 1+2	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)
802.11a CH 157 5785MHz		5647.4	48.96	-19.24	68.2	37.86	32.25	10.45	31.6	137	348	P	H
		5690	49.54	-48.29	97.83	38.3	32.34	10.5	31.6	137	348	P	H
		5719.6	49.69	-61	110.69	38.37	32.4	10.52	31.6	137	348	P	H
		5721.8	48.69	-66.21	114.9	37.37	32.4	10.52	31.6	137	348	P	H
	*	5785	106.68	-	-	95.21	32.5	10.57	31.6	137	348	P	H
	*	5785	99.36	-	-	87.89	32.5	10.57	31.6	137	348	A	H
		5852.6	49.61	-66.66	116.27	37.95	32.62	10.64	31.6	137	348	P	H
		5857.6	50.42	-59.65	110.07	38.73	32.65	10.64	31.6	137	348	P	H
		5877.6	49.51	-53.76	103.27	37.77	32.68	10.66	31.6	137	348	P	H
		5948	50.44	-17.76	68.2	38.5	32.81	10.73	31.6	137	348	P	H
		5625.4	48.55	-19.65	68.2	37.5	32.22	10.43	31.6	130	14	P	V
		5674.6	48.73	-37.71	86.44	37.54	32.31	10.48	31.6	130	14	P	V
		5702.4	49.66	-56.21	105.87	38.39	32.37	10.5	31.6	130	14	P	V
		5723.2	48.28	-69.82	118.1	36.96	32.4	10.52	31.6	130	14	P	V
	*	5785	104.88	-	-	93.41	32.5	10.57	31.6	130	14	P	V
	*	5785	98.56	-	-	87.09	32.5	10.57	31.6	130	14	A	V
		5854.2	48.36	-64.26	112.62	36.67	32.65	10.64	31.6	130	14	P	V
		5856.2	49.62	-60.84	110.46	37.93	32.65	10.64	31.6	130	14	P	V
		5922.4	49.06	-21.06	70.12	37.18	32.78	10.7	31.6	130	14	P	V
		5939	49.75	-18.45	68.2	37.81	32.81	10.73	31.6	130	14	P	V



WIFI Ant. 1+2	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)
802.11a CH 165 5825MHz	*	5825	106.94	-	-	95.34	32.59	10.61	31.6	133	351	P	H
	*	5825	99.66	-	-	88.06	32.59	10.61	31.6	133	351	A	H
		5850	52.86	-69.34	122.2	41.2	32.62	10.64	31.6	133	351	P	H
		5858	50.11	-59.85	109.96	38.42	32.65	10.64	31.6	133	351	P	H
		5875.2	49.73	-55.32	105.05	37.99	32.68	10.66	31.6	133	351	P	H
		5934.8	48.99	-19.21	68.2	37.11	32.78	10.7	31.6	133	351	P	H
	*	5825	105.47	-	-	93.87	32.59	10.61	31.6	133	29	P	V
	*	5825	98.05	-	-	86.45	32.59	10.61	31.6	133	29	A	V
		5850.6	53.79	-67.04	120.83	42.13	32.62	10.64	31.6	133	29	P	V
		5855.6	52.93	-57.7	110.63	41.24	32.65	10.64	31.6	133	29	P	V
		5908.4	49.4	-31.05	80.45	37.58	32.74	10.68	31.6	133	29	P	V
		5945.2	48.68	-19.52	68.2	36.74	32.81	10.73	31.6	133	29	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 1+2	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)
802.11a CH 149 5745MHz		11490	50.33	-23.67	74	52.72	40.1	15.27	57.76	160	360	P	H
		17235	52.69	-15.51	68.2	51.08	41.58	18	57.97	170	240	P	H
		11490	47.93	-26.07	74	50.32	40.1	15.27	57.76	175	360	P	V
		17235	52.72	-15.48	68.2	51.11	41.58	18	57.97	170	360	P	V
802.11a CH 157 5785MHz		11570	50.67	-23.33	74	52.99	40.04	15.31	57.67	175	198	P	H
		17355	53.2	-15	68.2	50.86	42.07	18.07	57.8	189	185	P	H
		11570	50.44	-23.56	74	52.76	40.04	15.31	57.67	175	198	P	V
		17355	53.89	-14.31	68.2	51.55	42.07	18.07	57.8	189	185	P	V
802.11a CH 165 5825MHz		11650	50.26	-23.74	74	52.52	39.99	15.34	57.59	156	347	P	H
		17475	55.27	-12.93	68.2	52.2	42.56	18.15	57.64	150	360	P	H
		11650	50.32	-23.68	74	52.58	39.99	15.34	57.59	156	347	P	V
		17475	54.29	-13.91	68.2	51.22	42.56	18.15	57.64	150	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	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 149 5745MHz		5608.6	48.17	-20.03	68.2	37.17	32.19	10.41	31.6	100	354	P	H
		5691	50.74	-47.82	98.56	39.5	32.34	10.5	31.6	100	354	P	H
		5720	57.98	-52.82	110.8	46.66	32.4	10.52	31.6	100	354	P	H
		5724.8	64.94	-56.8	121.74	53.62	32.4	10.52	31.6	100	354	P	H
	*	5745	107.3	-	-	95.92	32.43	10.55	31.6	100	354	P	H
	*	5745	99.48	-	-	88.1	32.43	10.55	31.6	100	354	A	H
		5611.6	48.66	-19.54	68.2	37.66	32.19	10.41	31.6	122	33	P	V
		5698.4	51.45	-52.57	104.02	40.21	32.34	10.5	31.6	122	33	P	V
		5720	55.54	-55.26	110.8	44.22	32.4	10.52	31.6	122	33	P	V
		5723.8	57.83	-61.63	119.46	46.51	32.4	10.52	31.6	122	33	P	V
	*	5745	103.77	-	-	92.39	32.43	10.55	31.6	122	33	P	V
	*	5745	97.28	-	-	85.9	32.43	10.55	31.6	122	33	A	V



WIFI Ant. 1+2	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 157 5785MHz		5644	48.9	-19.3	68.2	37.8	32.25	10.45	31.6	100	360	P	H
		5667.6	48.71	-32.55	81.26	37.52	32.31	10.48	31.6	100	360	P	H
		5710	48.73	-59.27	108	37.46	32.37	10.5	31.6	100	360	P	H
		5723.2	48.68	-69.42	118.1	37.36	32.4	10.52	31.6	100	360	P	H
	*	5785	106.06	-	-	94.59	32.5	10.57	31.6	100	360	P	H
	*	5785	98.62	-	-	87.15	32.5	10.57	31.6	100	360	A	H
		5853.4	49.2	-65.25	114.45	37.54	32.62	10.64	31.6	100	360	P	H
		5856.6	49.04	-61.31	110.35	37.35	32.65	10.64	31.6	100	360	P	H
		5923	48.11	-21.56	69.67	36.23	32.78	10.7	31.6	100	360	P	H
		5925	50.05	-18.15	68.2	38.17	32.78	10.7	31.6	100	360	P	H
		5642	48.77	-19.43	68.2	37.67	32.25	10.45	31.6	100	33	P	V
		5695	48.63	-52.88	101.51	37.39	32.34	10.5	31.6	100	33	P	V
		5710.8	49.04	-59.19	108.23	37.77	32.37	10.5	31.6	100	33	P	V
		5723.6	49.28	-69.73	119.01	37.96	32.4	10.52	31.6	100	33	P	V
	*	5785	105.47	-	-	94	32.5	10.57	31.6	100	33	P	V
	*	5785	97.86	-	-	86.39	32.5	10.57	31.6	100	33	A	V
		5852.8	49.27	-66.55	115.82	37.61	32.62	10.64	31.6	100	33	P	V
		5860.6	50.09	-59.14	109.23	38.4	32.65	10.64	31.6	100	33	P	V
		5904.6	48.74	-34.52	83.26	36.92	32.74	10.68	31.6	100	33	P	V
		5950	50.03	-18.17	68.2	38.09	32.81	10.73	31.6	100	33	P	V



WIFI Ant. 1+2	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 165 5825MHz	*	5785	106.66	-	-	95.19	32.5	10.57	31.6	124	16	P	H
	*	5785	99.05	-	-	87.58	32.5	10.57	31.6	124	16	A	H
		5850.6	49.32	-71.51	120.83	37.66	32.62	10.64	31.6	124	16	P	H
		5870.6	48.95	-57.48	106.43	37.21	32.68	10.66	31.6	124	16	P	H
		5884.2	49.48	-48.89	98.37	37.74	32.68	10.66	31.6	124	16	P	H
		5932.6	48.83	-19.37	68.2	36.95	32.78	10.7	31.6	124	16	P	H
	*	5785	105.77	-	-	94.3	32.5	10.57	31.6	100	30	P	V
	*	5785	99.36	-	-	87.89	32.5	10.57	31.6	100	30	A	V
		5853.4	48.85	-65.6	114.45	37.19	32.62	10.64	31.6	100	30	P	V
		5857.8	49.5	-60.51	110.01	37.81	32.65	10.64	31.6	100	30	P	V
		5924.8	48.91	-19.44	68.35	37.03	32.78	10.7	31.6	100	30	P	V
		5925	48.89	-19.31	68.2	37.01	32.78	10.7	31.6	100	30	P	V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



25~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	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		11490	50.96	-23.04	74	53.35	40.1	15.27	57.76	160	360	P	H
HT20		17235	53.05	-15.15	68.2	51.44	41.58	18	57.97	170	360	P	H
CH 149		11490	50.66	-23.34	74	53.05	40.1	15.27	57.76	160	360	P	V
5745MHz		17235	52.22	-15.98	68.2	50.61	41.58	18	57.97	170	360	P	V
802.11n		11570	50.57	-23.43	74	52.89	40.04	15.31	57.67	175	198	P	H
HT20		17355	52.22	-15.98	68.2	49.88	42.07	18.07	57.8	189	185	P	H
CH 157		11570	50.42	-23.58	74	52.74	40.04	15.31	57.67	175	198	P	V
5785MHz		17355	52.95	-15.25	68.2	50.61	42.07	18.07	57.8	189	185	P	V
802.11n		11650	50.32	-23.68	74	52.58	39.99	15.34	57.59	156	347	P	H
HT20		17475	54.34	-13.86	68.2	51.27	42.56	18.15	57.64	150	360	P	H
CH 165		11650	49.91	-24.09	74	52.17	39.99	15.34	57.59	156	347	P	V
5825MHz		17475	54.57	-13.63	68.2	51.5	42.56	18.15	57.64	150	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	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 151 5755MHz		5606.6	48.52	-19.68	68.2	37.52	32.19	10.41	31.6	192	347	P	H
		5695	52.37	-49.14	101.51	41.13	32.34	10.5	31.6	192	347	P	H
		5719	70.66	-39.86	110.52	59.34	32.4	10.52	31.6	192	347	P	H
		5723.8	67.42	-52.04	119.46	56.1	32.4	10.52	31.6	192	347	P	H
	*	5755	104.31	-	-	92.89	32.47	10.55	31.6	192	347	P	H
	*	5755	97.91	-	-	86.49	32.47	10.55	31.6	192	347	A	H
		5853.4	47.93	-66.52	114.45	36.27	32.62	10.64	31.6	192	347	P	H
		5860.8	49.39	-59.78	109.17	37.7	32.65	10.64	31.6	192	347	P	H
		5877	48.43	-55.28	103.71	36.69	32.68	10.66	31.6	192	347	P	H
		5931.6	48.2	-20	68.2	36.32	32.78	10.7	31.6	192	347	P	H
		5640.6	48.63	-19.57	68.2	37.53	32.25	10.45	31.6	140	31	P	V
		5697.4	49.85	-53.43	103.28	38.61	32.34	10.5	31.6	140	31	P	V
		5718.2	65.75	-44.55	110.3	54.43	32.4	10.52	31.6	140	31	P	V
		5724.4	66.68	-54.15	120.83	55.36	32.4	10.52	31.6	140	31	P	V
	*	5755	100.53	-	-	89.11	32.47	10.55	31.6	140	31	P	V
	*	5755	94.57	-	-	83.15	32.47	10.55	31.6	140	31	A	V
		5853.6	49.16	-64.83	113.99	37.47	32.65	10.64	31.6	140	31	P	V
		5869.6	47.88	-58.83	106.71	36.17	32.65	10.66	31.6	140	31	P	V
		5917.8	48.72	-24.79	73.51	36.88	32.74	10.7	31.6	140	31	P	V
		5929	49.28	-18.92	68.2	37.4	32.78	10.7	31.6	140	31	P	V



WIFI Ant. 1+2	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 159 5795MHz		5649.4	48.31	-19.89	68.2	37.21	32.25	10.45	31.6	134	353	P	H
		5697	48.67	-54.32	102.99	37.43	32.34	10.5	31.6	134	353	P	H
		5717.4	49.21	-60.86	110.07	37.92	32.37	10.52	31.6	134	353	P	H
		5723.8	48.71	-70.75	119.46	37.39	32.4	10.52	31.6	134	353	P	H
	*	5795	103.08	-	-	91.56	32.53	10.59	31.6	134	353	P	H
	*	5795	96.08	-	-	84.56	32.53	10.59	31.6	134	353	A	H
		5852	52.65	-64.99	117.64	40.99	32.62	10.64	31.6	134	353	P	H
		5858.6	51.06	-58.73	109.79	39.37	32.65	10.64	31.6	134	353	P	H
		5895.4	49.54	-40.53	90.07	37.75	32.71	10.68	31.6	134	353	P	H
		5926.4	48.6	-19.6	68.2	36.72	32.78	10.7	31.6	134	353	P	H
		5638.4	48.26	-19.94	68.2	37.16	32.25	10.45	31.6	134	21	P	V
		5700	48.36	-56.84	105.2	37.12	32.34	10.5	31.6	134	21	P	V
		5714.2	49.03	-60.15	109.18	37.74	32.37	10.52	31.6	134	21	P	V
		5724	49.1	-70.82	119.92	37.78	32.4	10.52	31.6	134	21	P	V
	*	5795	101.21	-	-	89.69	32.53	10.59	31.6	134	21	P	V
	*	5795	94.64	-	-	83.12	32.53	10.59	31.6	134	21	A	V
		5851.2	50.97	-68.49	119.46	39.31	32.62	10.64	31.6	134	21	P	V
		5855.2	49.92	-60.82	110.74	38.23	32.65	10.64	31.6	134	21	P	V
		5877	49.58	-54.13	103.71	37.84	32.68	10.66	31.6	134	21	P	V
		5949.8	48.41	-19.79	68.2	36.47	32.81	10.73	31.6	134	21	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2	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 151 5755MHz		11510	50.87	-23.13	74	53.24	40.1	15.27	57.74	160	360	P	H
		17265	52.58	-15.62	68.2	50.76	41.72	18.02	57.92	170	360	P	H
		11510	50.88	-23.12	74	53.25	40.1	15.27	57.74	160	360	P	V
		17265	52.7	-15.5	68.2	50.88	41.72	18.02	57.92	170	360	P	V
802.11n HT40 CH 159 5795MHz		11590	50.11	-23.89	74	52.41	40.03	15.32	57.65	170	300	P	H
		17385	52.43	-15.77	68.2	49.89	42.21	18.08	57.75	150	200	P	H
		11590	50.31	-23.69	74	52.61	40.03	15.32	57.65	170	300	P	V
		17385	52.37	-15.83	68.2	49.83	42.21	18.08	57.75	150	200	P	V
Remark		1. No other spurious found. 2. All results are PASS against Peak and Average limit line.											



Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1+2	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)
802.11ac VHT80 CH 155 5775MHz		5604.6	48.44	-19.76	68.2	37.44	32.19	10.41	31.6	259	345	P	H
		5694.8	61.34	-40.03	101.37	50.1	32.34	10.5	31.6	259	345	P	H
		5711.2	65.45	-42.89	108.34	54.18	32.37	10.5	31.6	259	345	P	H
		5720.8	66.38	-46.24	112.62	55.06	32.4	10.52	31.6	259	345	P	H
	*	5775	99.08	-	-	87.61	32.5	10.57	31.6	259	345	P	H
	*	5775	92.58	-	-	81.11	32.5	10.57	31.6	259	345	A	H
		5850.2	55.43	-66.31	121.74	43.77	32.62	10.64	31.6	259	345	P	H
		5855.6	54.2	-56.43	110.63	42.51	32.65	10.64	31.6	259	345	P	H
		5875.2	50.77	-54.28	105.05	39.03	32.68	10.66	31.6	259	345	P	H
		5942.8	49.89	-18.31	68.2	37.95	32.81	10.73	31.6	259	345	P	H
		5628.6	48.16	-20.04	68.2	37.11	32.22	10.43	31.6	198	25	P	V
		5699.2	59.31	-45.3	104.61	48.07	32.34	10.5	31.6	198	25	P	V
		5720	64.51	-46.29	110.8	53.19	32.4	10.52	31.6	198	25	P	V
		5721	64.37	-48.71	113.08	53.05	32.4	10.52	31.6	198	25	P	V
	*	5775	97.91	-	-	86.44	32.5	10.57	31.6	198	25	P	V
	*	5775	91.58	-	-	80.11	32.5	10.57	31.6	198	25	A	V
		5852.4	53.78	-62.95	116.73	42.12	32.62	10.64	31.6	198	25	P	V
		5862.2	53.01	-55.77	108.78	41.32	32.65	10.64	31.6	198	25	P	V
		5898.2	49.19	-38.8	87.99	37.4	32.71	10.68	31.6	198	25	P	V
		5930.8	49.6	-18.6	68.2	37.72	32.78	10.7	31.6	198	25	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1+2	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)
802.11ac		11550	50.78	-23.22	74	53.1	40.06	15.3	57.68	160	360	P	H
VHT80		17325	53.83	-14.37	68.2	51.69	41.93	18.06	57.85	170	360	P	H
CH 155		11550	50.14	-23.86	74	52.46	40.06	15.3	57.68	160	360	P	V
5775MHz		17325	52.53	-15.67	68.2	50.39	41.93	18.06	57.85	170	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

5GHz WIFI 802.11a (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11a LF		30	22.97	-17.03	40	29.89	24.8	0.25	31.97	100	144	P	H
		128.94	20.27	-23.23	43.5	33.27	17.44	1.18	31.62	-	-	P	H
		272.5	23.91	-22.09	46	33.84	19.53	1.77	31.23	-	-	P	H
		327.79	24.33	-21.67	46	33.47	20.08	1.99	31.21	-	-	P	H
		479.11	27.71	-18.29	46	33.13	23.46	2.38	31.26	-	-	P	H
		982.54	32.77	-21.23	54	30.25	30.32	3.53	31.33	-	-	P	H
		30	26.28	-13.72	40	33.2	24.8	0.25	31.97	100	211	P	V
		64.92	21.73	-18.27	40	40.63	12.2	0.8	31.9	-	-	P	V
		180.35	22.5	-21	43.5	37.51	15	1.41	31.42	-	-	P	V
		650.8	28.57	-17.43	46	30.73	26.25	2.82	31.23	-	-	P	V
		830.25	30.72	-15.28	46	30.04	28.65	3.21	31.18	-	-	P	V
		997.09	32.75	-21.25	54	29.98	30.55	3.55	31.33	-	-	P	V
Remark		1. No other spurious found.											
		2. All results are PASS against limit line.											



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	P eak or A verage
H/V	H orizontal or V ertical



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

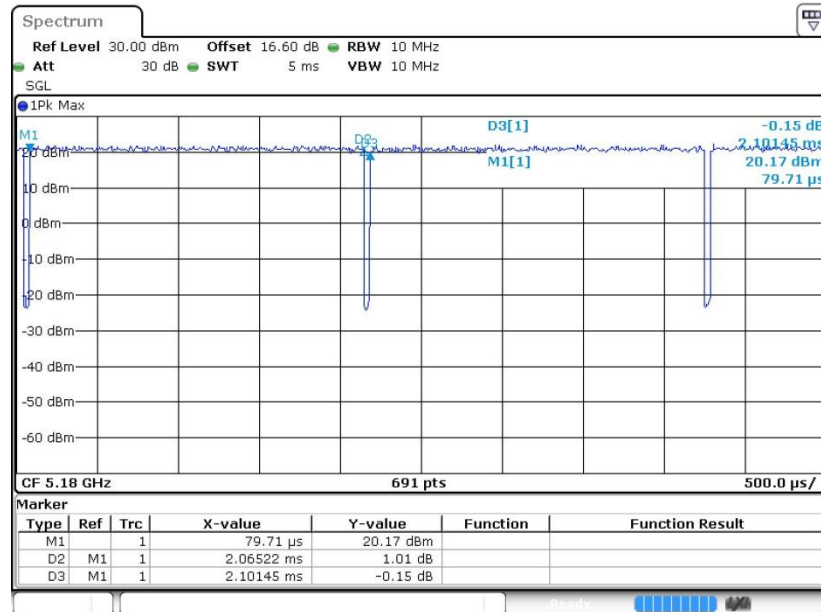
Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11a	98.28	-	-	10Hz
1+2	802.11n HT20	98.16	-	-	10Hz
1+2	802.11n HT40	96.32	0.949	1.053	3KHz
1+2	802.11acVHT80	87.66	0.257	3.887	10KHZ

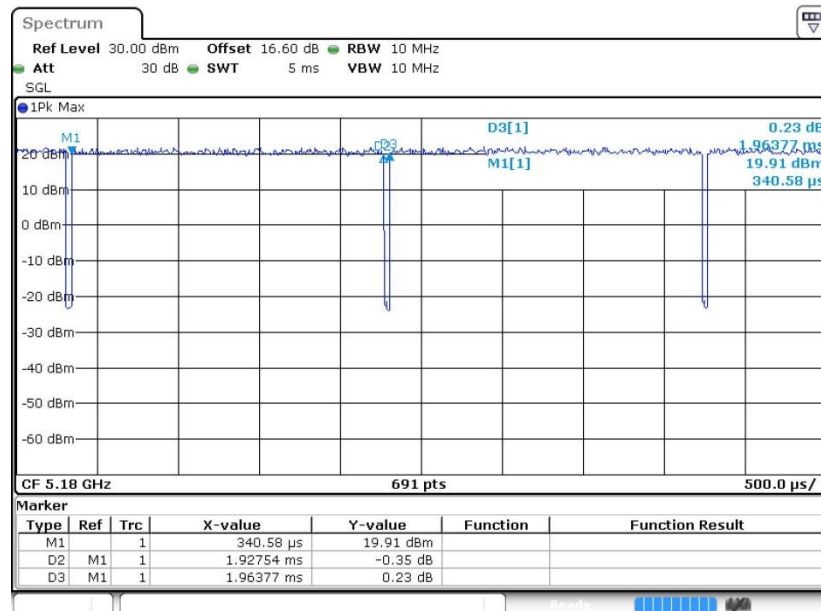


Ant.1+2

802.11a

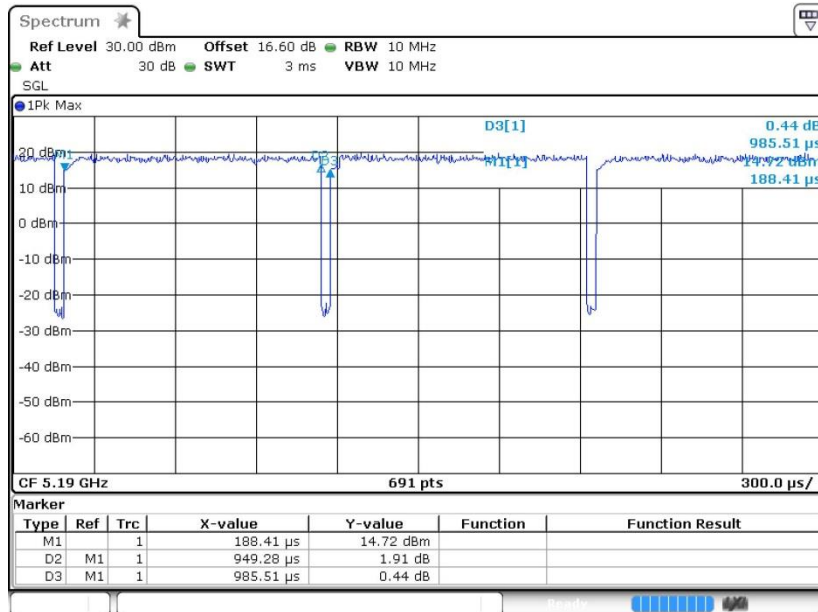


802.11n HT20





802.11n HT40



802.11ac VHT80

