



FCC RF Test Report

APPLICANT : LITE-ON Technology Corp.
EQUIPMENT : 802.11 a/b/g/n/ac 2T2R+BT V4.2LE combo module
BRAND NAME : LITE-ON
MODEL NAME : WCBN3510A
FCC ID : PPQ-WCBN3510A
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure

The product was installed into Lenovo Smart Display (Brand Name: Lenovo, Model Name: Lenovo SD-X501F) during test.

The product was received on Feb. 26, 2018 and testing was completed on Apr. 25, 2018. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Approved by: James Huang / Manager



Sporton International (Kunshan) Inc.

***No. 1098, Pengxi North Road, Kunshan Economic Development Zone,
Jiangsu Province 215335, China***



TABLE OF CONTENTS

1	GENERAL DESCRIPTION	5
1.1	Applicant	5
1.2	Manufacturer	5
1.3	Product Feature of Equipment Under Test	5
1.4	Product Specification of Equipment Under Test	6
1.5	Component List	6
1.6	Modification of EUT	7
1.7	Testing Location	7
1.8	Applicable Standards	7
2	TEST CONFIGURATION OF EQUIPMENT UNDER TEST	9
2.1	Carrier Frequency and Channel	9
2.2	Test Mode	10
2.3	Connection Diagram of Test System	11
2.4	Support Unit used in test configuration and system	11
2.5	EUT Operation Test Setup	11
3	TEST RESULT	12
3.1	Maximum Conducted Output Power Measurement	12
3.2	Unwanted Emissions Measurement	13
3.3	AC Conducted Emission Measurement	18
3.4	Automatically Discontinue Transmission	20
3.5	Antenna Requirements	21
4	LIST OF MEASURING EQUIPMENT	22
5	UNCERTAINTY OF EVALUATION	23
APPENDIX A. CONDUCTED TEST RESULTS		
APPENDIX B. AC CONDUCTED EMISSION TEST RESULT		
APPENDIX C. RADIATED SPURIOUS EMISSION		
APPENDIX D. DUTY CYCLE PLOTS		
APPENDIX E. SETUP PHOTOGRAPHS		



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR922206E	Rev. 01	Initial issue of report	Apr. 22, 2019



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	1
3.1	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
-	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	1
3.2	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) & 15.209(a)	Pass	Under limit 3.09 dB at 5634.400 MHz
3.3	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 17.68 dB at 0.155 MHz
3.4	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.5	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-
Remark: 1. All conducted test items were leveraged from module RF report "FR7N1336AN".					

1 General Description

1.1 Applicant

LITE-ON Technology Corp.

Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

1.2 Manufacturer

LITE-ON TECHNOLOGY (Changzhou) CO., LTD

A9 Building, No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone, Changzhou City, Jiangsu Province 213100 China

1.3 Product Feature of Equipment Under Test

Product Feature & Specification	
Equipment	802.11 a/b/g/n/ac 2T2R+BT V4.2LE combo module
Brand Name	LITE-ON
Model Name	WCBN3510A
FCC ID	PPQ-WCBN3510A
EUT supports Radios application	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 v2.1+EDR, Bluetooth v4.2 LE
EUT Stage	Identical Prototype

Host Feature & Specification	
Equipment	Lenovo Smart Display
Brand Name	Lenovo
Model Name	Lenovo SD-X501F
Applicant	Lenovo (Shanghai) Electronics Technology Co., Ltd. NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, Shanghai, 200131 China
Manufacturer	Lenovo PC HK Limited 23/F, Lincoln House, Taikoo Place, 979 King's Road, Quarry Bay Hong Kong

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 : 24.70 dBm / 0.2951 W 802.11n HT20 : 24.60 dBm / 0.2884 W 802.11n HT40 : 24.06 dBm / 0.2547 W 802.11ac VHT20: 24.64 dBm / 0.2911 W 802.11ac VHT40: 24.08 dBm / 0.2559 W 802.11ac VHT80: 21.81 dBm / 0.1517 W		
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 4.05 dBi <Ant. 2> : PIFA Antenna with gain 4.13 dBi		
Antenna Function Description		Ant. 1	Ant. 2
	802.11 a/n/ac SISO	V	V
	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 has assessed only 802.11ac VHT20/ VHT40 by referring to their maximum conducted power.
- For 802.11n/ac SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.

1.5 Component List

Sample 1		
Object	Specifications	Supplier
CPU	APQ-8053-A-792NSP-MT-01-1-AA 3.3V 1.2V SMD NSP 792 14*12.*0.85 TR Qualcomm	Qualcomm
FLASH	KLM4G1FETE-B041001 1.8V 4G SMD FBGA 153 TR	Samsung
DDR	MT52L512M32D2PF-107 WT:B 1.8V 512Mb*32 SMD-V WFBGA178 T&R 2GB 933MHz	Micron
LCD	2081101CH8032018-59F L228.6*W143*H2.5mm ±3.3V 800*1280 DIP-V Tray RoHS	XINYUAN
PANEL	B132366E1 L243.36*W165.76*H0.95mm 2.8V Tray RoHS	MUTTO
Camera	F4E8YAM S5K4E8YX FF:SPY8133B ZIF/MIPI/COB W-1057 V1.0 Box RoHS REACH	Qtech
loudspeaker	2" 6Ω 10W speaker	3nod
PCB	L102*W91*T0.8MM FR-4 0.5OZ UL94 V0 W-1057 MAIN V1.0 RoHS REACH	Hannstar
Module	WCBN3510A QCA9379-3 WIFI and Bluetooth combo W-1013/1014 V01 Tray	Liteon



Sample 2		
Object	Specifications	Supplier
CPU	APQ-8053-A-792NSP-MT-01-1-AA 3.3V 1.2V SMD NSP 792 14*12.*0.85 TR Qualcomm	Qualcomm
FLASH	EMMC04G-M627X02U 1.8V SMD FBGA 153 T&R NAND 15nm Flash	Samsung
DDR	K4E6E304EC-EGCF 1.8V 2GB*32 SMD WFBGA178 11*11.5 T&R	Samsung
LCD	KD101N89-45NI-A001 L228.6*W143*H2.5mm ±3.3V 800*1280 DIP-V Tray RoHS	kingdisplay
PANEL	99101D0017 L243.36*W165.76*H0.95mm 2.8V Tray RoHS	AVC
Camera	L4E8F00 S5K4E8YX FF:SPY8133B /MIPI/COB W-1057 V1.0 Box RoHS	Chicony
loudspeaker	2" 6Ω 10W speaker	3nod
PCB	L102*W91*T0.8MM FR-4 0.5OZ UL94 V0 W-1057 MAIN V1.0 RoHS REACH	Hannstar
Module	WCBN3510A QCA9379-3 WIFI and Bluetooth combo W-1013/1014 V01 Tray	Liteon

1.6 Modification of EUT

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

1.7 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No. is CN5013.

Test Site	Sporton International (Kunshan) Inc.			
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958			
Test Site No.	Sporton Site No.			FCC Test Firm Registration No.
	TH01-KS	03CH03-KS	CO01-KS	630927

Note: The test site complies with ANSI C63.4 2014 requirement.

1.8 Applicable Standards

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

- ♦ FCC 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 (Y plane) cases 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)
5725-5850 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.

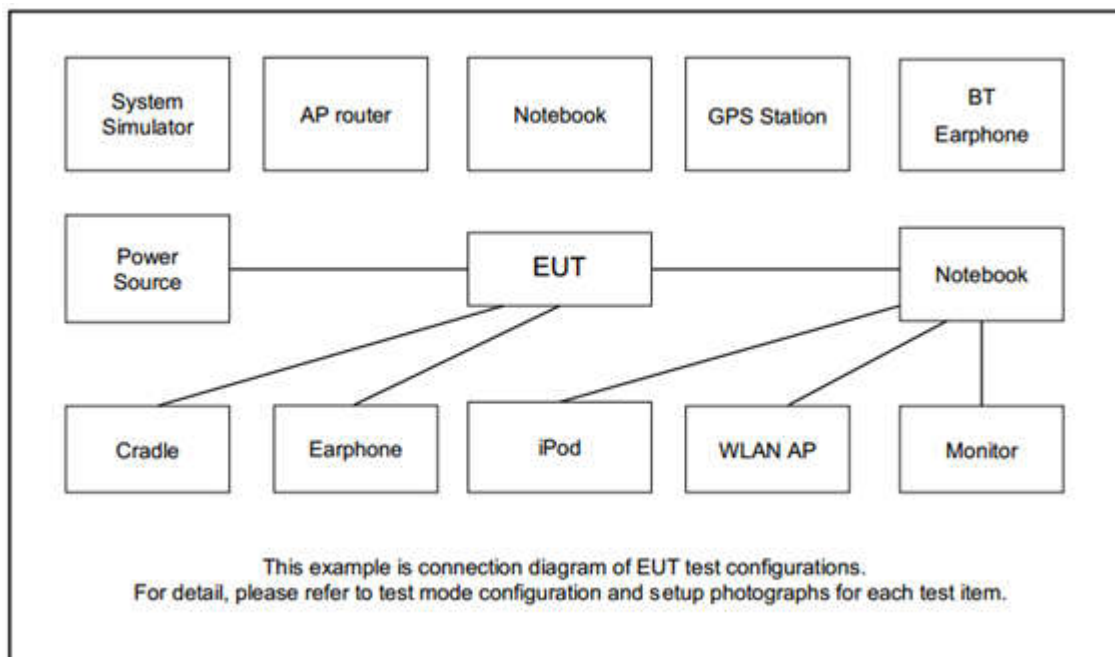
MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20 (Covered by VHT20)	MCS0
802.11n HT40 (Covered by VHT40)	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : Bluetooth Idle + WLAN Link(5G) + Adapter 1 Mode 2 : Bluetooth Idle + WLAN Link(5G) + Adapter 2
Remark: 1. The worst case of conducted emission is mode 2; only the test data of it was reported. 2. For Radiated Test Cases, The tests were performed with Adapter 1.	

Ch. #		Band IV : 5725-5850 MHz			
		802.11a	802.11ac VHT20	802.11ac VHT40	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.	WLAN AP	D-link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
3.	SD Card	Kingston	SDC4/4GB	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.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 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.

3.1.2 Measuring Instruments

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

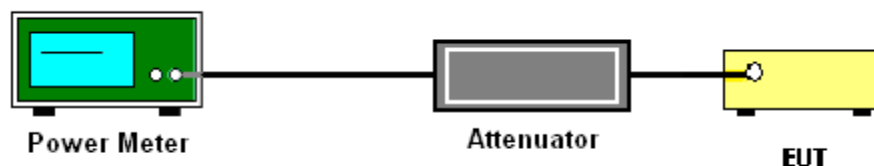
3.1.3 Test Procedures

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.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.2 Unwanted Emissions Measurement

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

3.2.1 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	68.3

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

3.2.2 Measuring Instruments

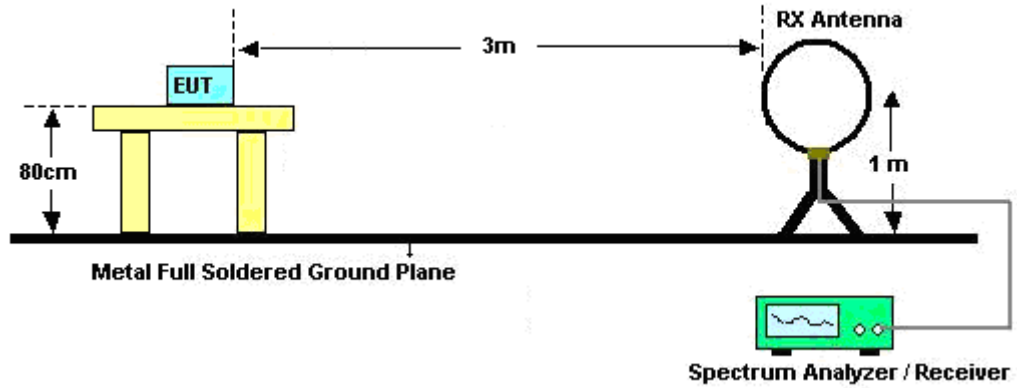
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

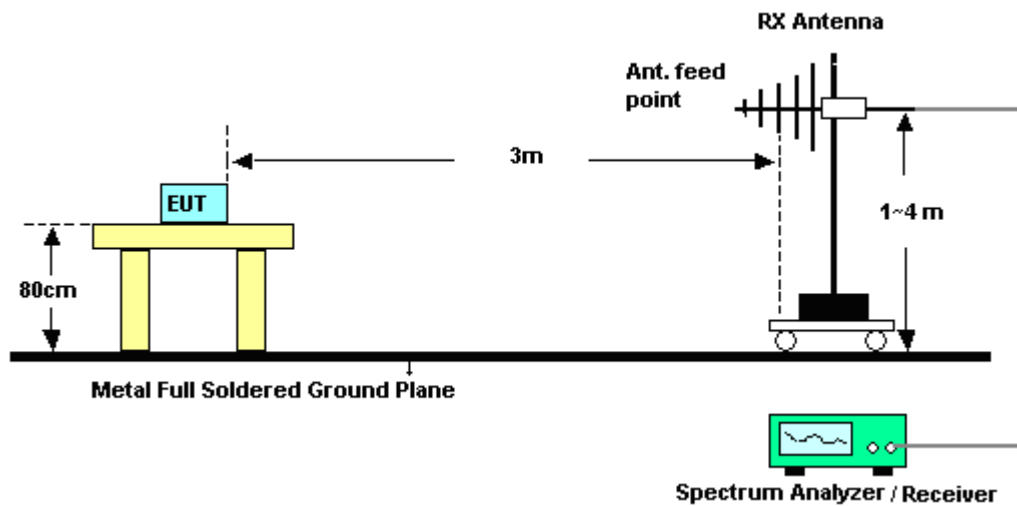
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak 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.

3.2.4 Test Setup

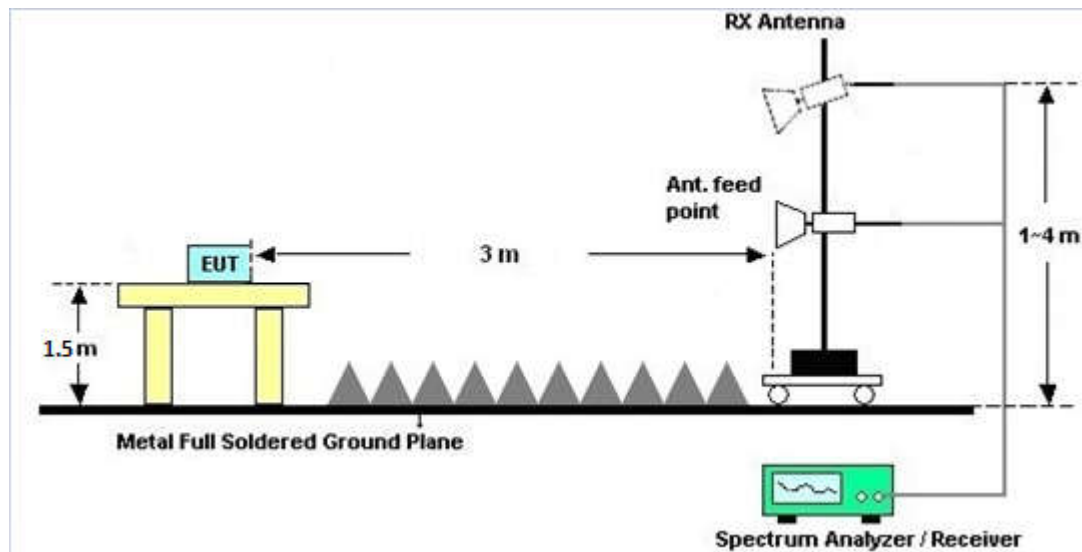
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 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.

3.2.6 Test Result of Radiated Band Edges

Please refer to Appendix C.

3.2.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C.

3.2.9 Test Result of Radiated Spurious Emission (Simultaneous TX)

Please refer to test report (FR822605D)

3.3 AC Conducted Emission Measurement

3.3.1 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.

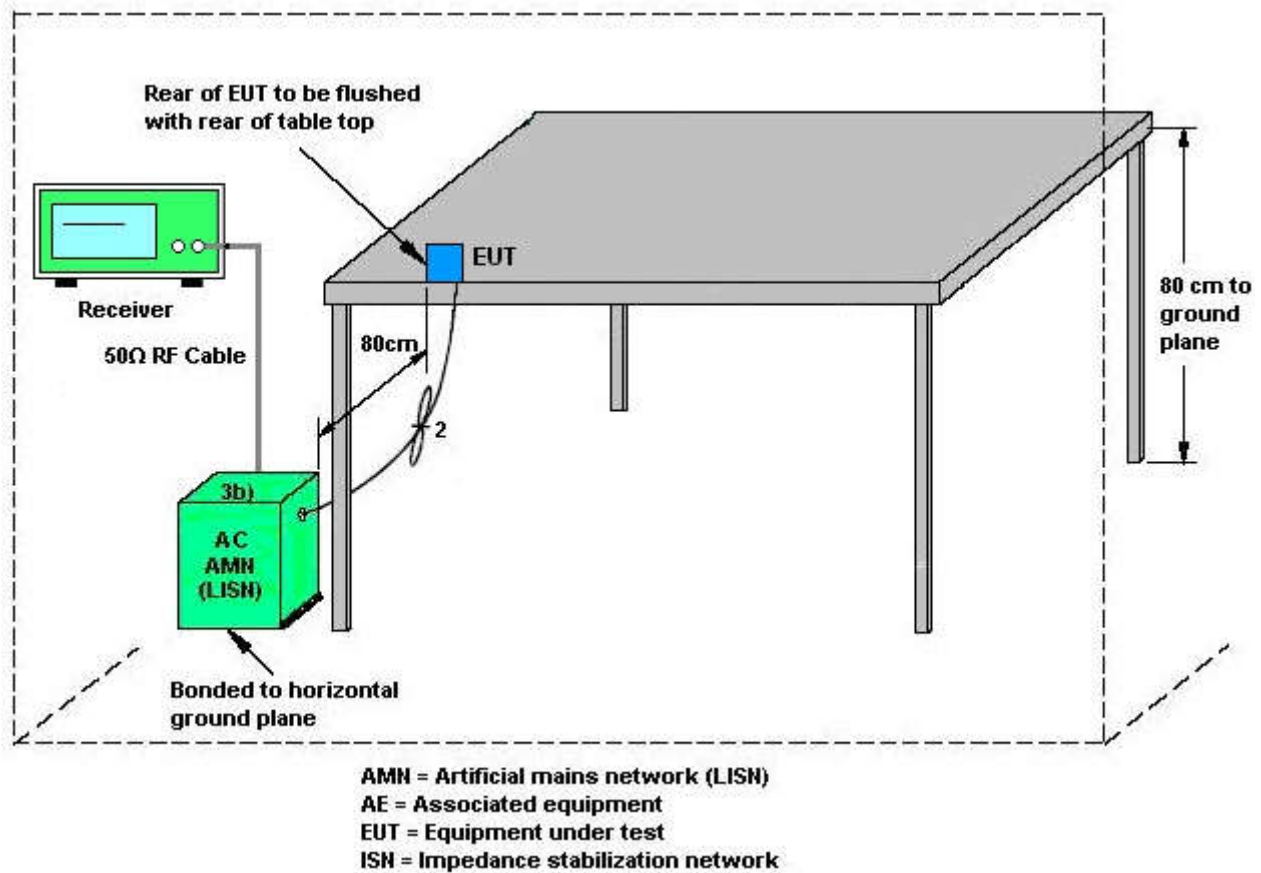
3.3.2 Measuring Instruments

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

3.3.3 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.

3.3.4 Test Setup



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.4 Automatically Discontinue Transmission

3.4.1 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.

3.4.2 Measuring Instruments

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

3.4.3 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.

3.5 Antenna Requirements

3.5.1 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.

3.5.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.5.3 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>						
			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant. 1 (dBi)	Ant. 2 (dBi)				
Band IV	4.05	4.13	4.13	7.10	0.00	1.10

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

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



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 18, 2018	Apr. 25, 2018	Jan. 17, 2019	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 18, 2018	Apr. 25, 2018	Jan. 17, 2019	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 08, 2017	Apr. 25, 2018	Aug. 07, 2018	Conducted (TH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2017	Mar. 30, 2018	Apr. 19, 2018	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	Mar. 30, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	Mar. 30, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	Mar. 30, 2018	Oct. 11, 2018	Conduction (CO01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz; Max 30dBm	Oct. 19, 2017	Apr. 24, 2018	Oct. 18, 2018	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44GHz	Apr. 17, 2018	Apr. 24, 2018	Apr. 16, 2019	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 22, 2017	Apr. 24, 2018	Oct. 21, 2018	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	47610	30MHz~1GHz	Sep. 12, 2017	Apr. 24, 2018	Sep. 11, 2018	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 21, 2018	Apr. 24, 2018	Jan. 20, 2019	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 07, 2018	Apr. 24, 2018	Feb. 06, 2019	Radiation (03CH03-KS)
Amplifier	com-power	PA-103A	161069	1MHz ~1000MHz / 32 dB	Apr. 17, 2018	Apr. 24, 2018	Apr. 16, 2019	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Oct. 12, 2017	Apr. 24, 2018	Oct. 11, 2018	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1Ghz-18Ghz	Apr. 17, 2018	Apr. 24, 2018	Apr. 16, 2019	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 12, 2017	Apr. 24, 2018	Oct. 11, 2018	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Apr. 24, 2018	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Apr. 24, 2018	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Apr. 24, 2018	NCR	Radiation (03CH03-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.3 dB
--	--------

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.5dB
--	-------

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.1dB
--	-------

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.0dB
--	-------

Appendix A. Test Result of Conducted Test Items

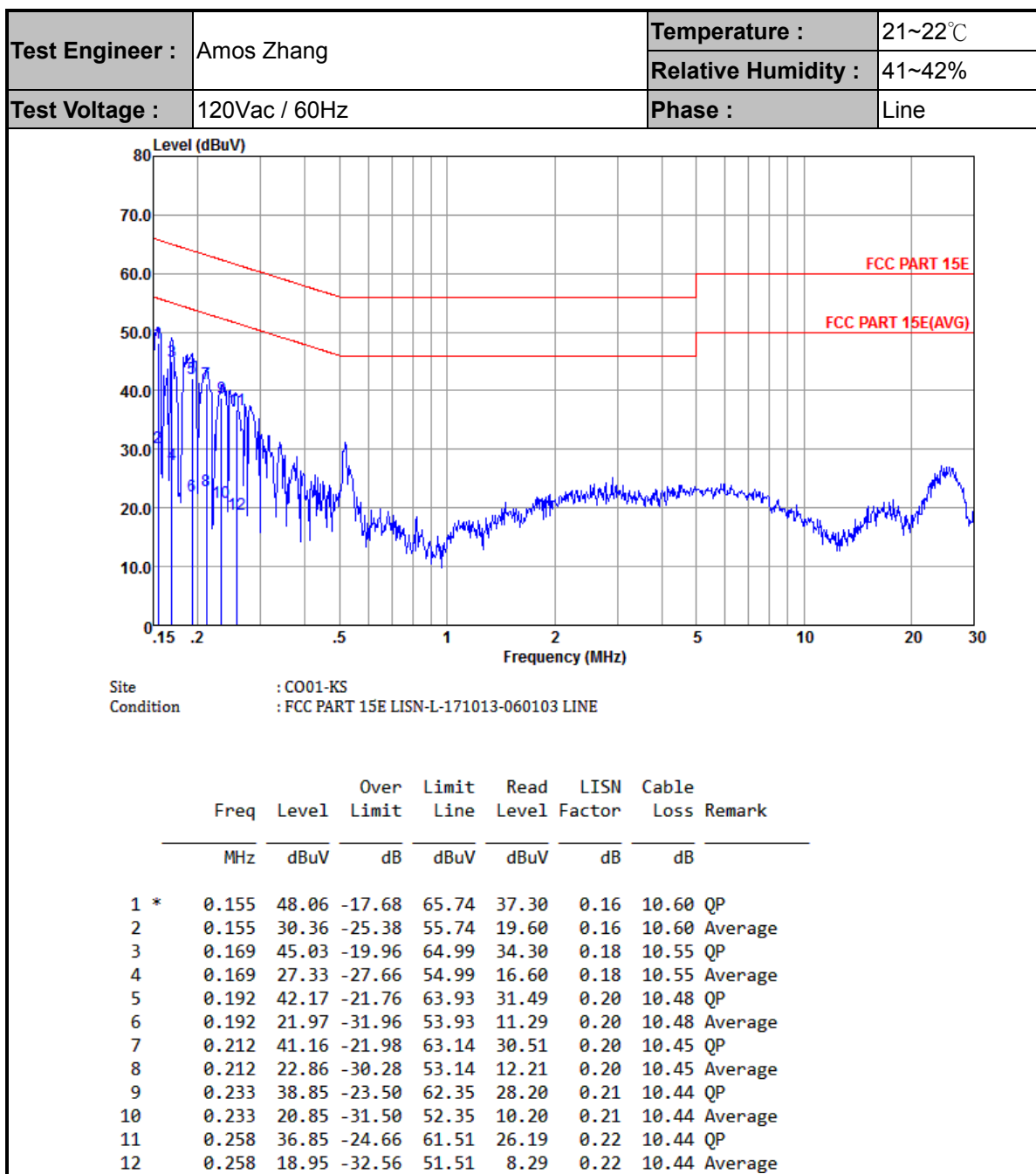
Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2018/4/25	Relative Humidity:	51~55	%

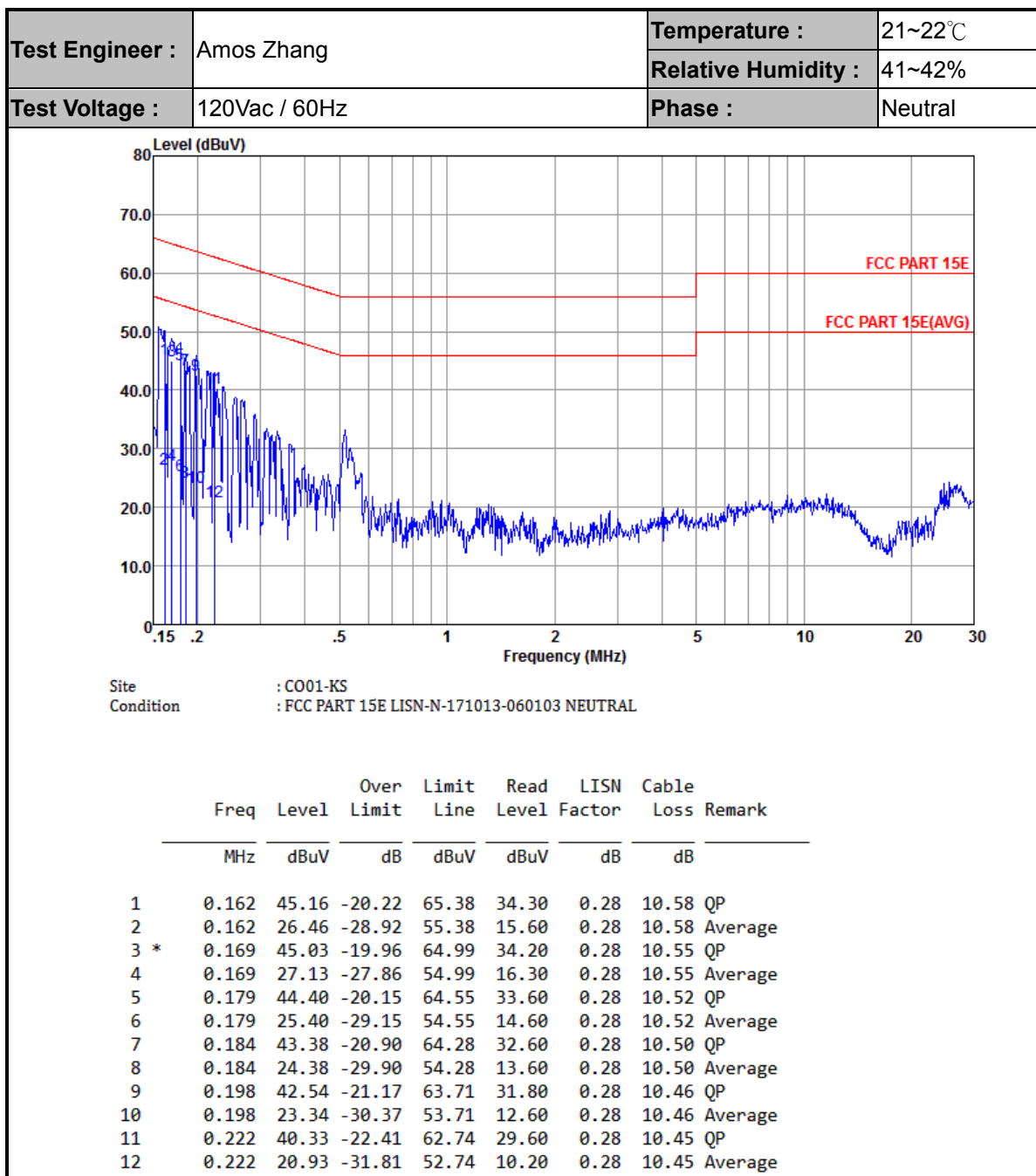
TEST RESULTS DATA
Average Power Table

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	0.20	0.26	21.21	20.84	24.04	30.00		4.13			Pass
11a	6Mbps	2	157	5785	0.20	0.26	21.59	21.13	24.38	30.00		4.13			Pass
11a	6Mbps	2	165	5825	0.20	0.26	21.99	21.35	24.70	30.00		4.13			Pass
HT20	MCS0	2	149	5745	0.25	0.25	20.97	20.61	23.80	30.00		4.13			Pass
HT20	MCS0	2	157	5785	0.25	0.25	21.41	20.97	24.21	30.00		4.13			Pass
HT20	MCS0	2	165	5825	0.25	0.25	21.93	21.21	24.60	30.00		4.13			Pass
HT40	MCS0	2	151	5755	0.49	0.43	20.94	20.74	23.86	30.00		4.13			Pass
HT40	MCS0	2	159	5795	0.49	0.43	21.40	20.66	24.06	30.00		4.13			Pass
VHT20	MCS0	2	149	5745	0.47	0.47	21.02	20.61	23.83	30.00		4.13			Pass
VHT20	MCS0	2	157	5785	0.47	0.47	21.42	21.09	24.27	30.00		4.13			Pass
VHT20	MCS0	2	165	5825	0.47	0.47	21.92	21.30	24.64	30.00		4.13			Pass
VHT40	MCS0	2	151	5755	0.76	0.82	20.88	20.83	23.87	30.00		4.13			Pass
VHT40	MCS0	2	159	5795	0.76	0.82	21.37	20.74	24.08	30.00		4.13			Pass
VHT80	MCS0	2	155	5775	1.52	1.48	18.99	18.61	21.81	30.00		4.13			Pass



Appendix B. AC Conducted Emission Test Results







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	Preamp 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		5648.4	52.4	-15.9	68.3	42.01	35	8.56	33.17	324	13	P	H
		5699.6	55.16	-49.85	105.01	44.81	34.95	8.57	33.17	324	13	P	H
		5719.6	75.54	-35.25	110.79	65.21	34.92	8.58	33.17	324	13	P	H
		5724.8	79.51	-42.33	121.84	69.18	34.92	8.58	33.17	324	13	P	H
		5742	113.1	-	-	102.77	34.91	8.59	33.17	324	13	P	H
		5742	105.59	-	-	95.26	34.91	8.59	33.17	324	13	A	H
		5646	53.36	-14.94	68.3	42.97	35	8.56	33.17	118	96	P	V
		5698	61.54	-42.29	103.83	51.19	34.95	8.57	33.17	118	96	P	V
		5718.8	79.43	-31.13	110.56	69.1	34.92	8.58	33.17	118	96	P	V
		5724	83.18	-36.84	120.02	72.85	34.92	8.58	33.17	118	96	P	V
		5742	116.57	-	-	106.24	34.91	8.59	33.17	118	96	P	V
		5742	110.56	-	-	100.23	34.91	8.59	33.17	118	96	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		5618	52.39	-15.91	68.3	42	35.01	8.56	33.18	153	0	P	H
		5692.4	52.94	-46.76	99.7	42.59	34.95	8.57	33.17	153	0	P	H
		5719.2	52.59	-58.09	110.68	42.26	34.92	8.58	33.17	153	0	P	H
		5723.2	52.74	-65.46	118.2	42.41	34.92	8.58	33.17	153	0	P	H
		5853.6	51.98	-62.11	114.09	41.73	34.8	8.62	33.17	153	0	P	H
		5862.8	52.06	-56.65	108.71	41.81	34.8	8.62	33.17	153	0	P	H
		5885.6	53.09	-44.34	97.43	42.85	34.8	8.62	33.18	153	0	P	H
		5956	51.82	-16.48	68.3	41.58	34.81	8.65	33.22	153	0	P	H
		5788	113.72	-	-	103.43	34.86	8.6	33.17	153	0	P	H
		5788	105.54	-	-	95.25	34.86	8.6	33.17	153	0	A	H
		5628.4	52.8	-15.5	68.3	42.41	35.01	8.56	33.18	103	94	P	V
		5693.6	53.5	-47.08	100.58	43.15	34.95	8.57	33.17	103	94	P	V
		5711.2	53.4	-55.04	108.44	43.05	34.94	8.58	33.17	103	94	P	V
		5724	54.1	-65.92	120.02	43.77	34.92	8.58	33.17	103	94	P	V
		5851.2	52.7	-66.86	119.56	42.44	34.82	8.61	33.17	103	94	P	V
		5856.4	51.93	-58.58	110.51	41.68	34.8	8.62	33.17	103	94	P	V
		5882.8	52.88	-46.63	99.51	42.64	34.8	8.62	33.18	103	94	P	V
		5946.4	51.9	-16.4	68.3	41.66	34.81	8.64	33.21	103	94	P	V
		5788	117.8	-	-	107.51	34.86	8.6	33.17	103	94	P	V
		5788	109.56	-	-	99.27	34.86	8.6	33.17	103	94	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 165 5825MHz		5850	74.35	-47.95	122.3	64.09	34.82	8.61	33.17	153	0	P	H
		5855.2	70.01	-40.83	110.84	59.76	34.8	8.62	33.17	153	0	P	H
		5882	55.4	-44.7	100.1	45.16	34.8	8.62	33.18	153	0	P	H
		5969.6	52.34	-15.96	68.3	42.1	34.81	8.65	33.22	153	0	P	H
		5826	113.62	-	-	103.35	34.83	8.61	33.17	153	0	P	H
		5826	105.36	-	-	95.09	34.83	8.61	33.17	153	0	A	H
		5852	79.68	-38.06	117.74	69.42	34.82	8.61	33.17	131	359	P	V
		5854.8	74.38	-36.98	111.36	64.13	34.8	8.62	33.17	131	359	P	V
		5875.6	59.28	-45.57	104.85	49.04	34.8	8.62	33.18	131	359	P	V
		5925.6	52.7	-15.6	68.3	42.45	34.81	8.64	33.2	131	359	P	V
	!	5822	119.1	-	-	108.83	34.83	8.61	33.17	131	359	P	V
		5822	110.78	-	-	100.51	34.83	8.61	33.17	131	359	A	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	52.71	-21.29	74	53.35	39.29	12.91	52.84	100	360	P	H
		11490	48.93	-5.07	54	49.57	39.29	12.91	52.84	100	360	A	H
		11490	51.89	-22.11	74	52.53	39.29	12.91	52.84	100	360	P	V
		11490	48.01	-5.99	54	48.65	39.29	12.91	52.84	100	360	A	V
802.11a CH 157 5785MHz		11570	54.11	-19.89	74	54.92	39.37	12.84	53.02	100	360	P	H
		11570	48.4	-5.6	54	49.21	39.37	12.84	53.02	100	360	A	H
		11570	52.17	-21.83	74	52.98	39.37	12.84	53.02	100	360	P	V
		11570	47.85	-6.15	54	48.66	39.37	12.84	53.02	100	360	A	V
802.11a CH 165 5825MHz		11650	52.51	-21.49	74	53.45	39.44	12.78	53.16	100	360	P	H
		11650	47.75	-6.25	54	48.69	39.44	12.78	53.16	100	360	A	H
		11650	50.26	-23.74	74	51.2	39.44	12.78	53.16	100	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 802.11ac VHT20 (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 VHT20 CH 149 5745MHz		5617.6	52.25	-16.05	68.3	41.86	35.01	8.56	33.18	147	360	P	H
		5689.2	53.57	-43.77	97.34	43.22	34.95	8.57	33.17	147	360	P	H
		5720	71.75	-39.15	110.9	61.42	34.92	8.58	33.17	147	360	P	H
		5724.8	76.66	-45.18	121.84	66.33	34.92	8.58	33.17	147	360	P	H
		5748	111.6	-	-	101.27	34.91	8.59	33.17	147	360	P	H
		5748	102.75	-	-	92.42	34.91	8.59	33.17	147	360	A	H
		5648.4	53.79	-14.51	68.3	43.4	35	8.56	33.17	132	25	P	V
		5699.2	57.08	-47.63	104.71	46.73	34.95	8.57	33.17	132	25	P	V
		5719.6	78.48	-32.31	110.79	68.15	34.92	8.58	33.17	132	25	P	V
		5724	82.83	-37.19	120.02	72.5	34.92	8.58	33.17	132	25	P	V
		5750	117.52	-	-	107.19	34.91	8.59	33.17	132	25	P	V
		5750	109.61	-	-	99.28	34.91	8.59	33.17	132	25	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)
802.11ac VHT20 CH 157 5785MHz		5617.2	52.12	-16.18	68.3	41.73	35.01	8.56	33.18	147	360	P	H
		5688.8	52.47	-44.57	97.04	42.12	34.95	8.57	33.17	147	360	P	H
		5713.6	52.78	-56.33	109.11	42.43	34.94	8.58	33.17	147	360	P	H
		5721.6	52.26	-62.29	114.55	41.93	34.92	8.58	33.17	147	360	P	H
		5851.2	52.08	-67.48	119.56	41.82	34.82	8.61	33.17	147	360	P	H
		5872.8	51.38	-54.54	105.92	41.14	34.8	8.62	33.18	147	360	P	H
		5878.8	53.15	-49.33	102.48	42.91	34.8	8.62	33.18	147	360	P	H
		5942.8	52.02	-16.28	68.3	41.78	34.81	8.64	33.21	147	360	P	H
		5792	111.54	-	-	101.25	34.86	8.6	33.17	147	360	P	H
		5792	103.27	-	-	92.98	34.86	8.6	33.17	147	360	A	H
		5615.2	52.68	-15.62	68.3	42.28	35.03	8.55	33.18	186	357	P	V
		5689.2	52.81	-44.53	97.34	42.46	34.95	8.57	33.17	186	357	P	V
		5719.2	53.48	-57.2	110.68	43.15	34.92	8.58	33.17	186	357	P	V
		5724.8	51.9	-69.94	121.84	41.57	34.92	8.58	33.17	186	357	P	V
		5852.8	52.08	-63.84	115.92	41.82	34.82	8.61	33.17	186	357	P	V
		5871.2	52.06	-54.3	106.36	41.82	34.8	8.62	33.18	186	357	P	V
		5879.6	52.66	-49.22	101.88	42.42	34.8	8.62	33.18	186	357	P	V
		5956.8	51.56	-16.74	68.3	41.32	34.81	8.65	33.22	186	357	P	V
		5786	112.37	-	-	102.08	34.86	8.6	33.17	186	357	P	V
		5786	103.94	-	-	93.65	34.86	8.6	33.17	186	357	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)
802.11ac VHT20 CH 165 5825MHz		5850.4	73.62	-47.77	121.39	63.36	34.82	8.61	33.17	136	3	P	H
		5857.6	70.17	-40	110.17	59.92	34.8	8.62	33.17	136	3	P	H
		5876	57.38	-47.18	104.56	47.14	34.8	8.62	33.18	136	3	P	H
		5935.2	52.92	-15.38	68.3	42.67	34.81	8.64	33.2	136	3	P	H
		5828	113.14	-	-	102.87	34.83	8.61	33.17	136	3	P	H
		5828	103.88	-	-	93.61	34.83	8.61	33.17	136	3	A	H
		5850.4	77.53	-43.86	121.39	67.27	34.82	8.61	33.17	169	44	P	V
		5858.4	73.3	-36.65	109.95	63.05	34.8	8.62	33.17	169	44	P	V
		5875.6	59.09	-45.76	104.85	48.85	34.8	8.62	33.18	169	44	P	V
		5974.8	52.82	-15.48	68.3	42.59	34.81	8.65	33.23	169	44	P	V
		5822	117.52	-	-	107.25	34.83	8.61	33.17	169	44	P	V
		5822	109.24	-	-	98.97	34.83	8.61	33.17	169	44	A	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 VHT20 (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 VHT20 CH 149 5745MHz		11490	51.81	-22.19	74	52.45	39.29	12.91	52.84	100	360	P	H
		11490	46.57	-7.43	54	47.21	39.29	12.91	52.84	100	360	A	H
		11490	50.17	-23.83	74	50.81	39.29	12.91	52.84	100	360	P	V
802.11ac VHT20 CH 157 5785MHz		11570	53.32	-20.68	74	54.13	39.37	12.84	53.02	100	360	P	H
		11570	48.4	-5.6	54	49.21	39.37	12.84	53.02	100	360	A	H
		11570	51.77	-22.23	74	52.58	39.37	12.84	53.02	100	360	P	V
		11570	47.45	-6.55	54	48.26	39.37	12.84	53.02	100	360	A	V
802.11ac VHT20 CH 165 5825MHz		11650	51.78	-22.22	74	52.72	39.44	12.78	53.16	100	360	P	H
		11650	47.71	-6.29	54	48.65	39.44	12.78	53.16	100	360	A	H
		11650	50.4	-23.6	74	51.34	39.44	12.78	53.16	100	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 802.11ac VHT40 (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 VHT40 CH 151 5755MHz		5608.8	58.4	-9.9	68.3	48	35.03	8.55	33.18	136	4	P	H
		5698.8	72	-32.42	104.42	61.65	34.95	8.57	33.17	136	4	P	H
		5718	80.84	-29.5	110.34	70.51	34.92	8.58	33.17	136	4	P	H
		5723.2	84.57	-33.63	118.2	74.24	34.92	8.58	33.17	136	4	P	H
		5851.6	53.24	-65.41	118.65	42.98	34.82	8.61	33.17	136	4	P	H
		5861.2	61.48	-47.68	109.16	51.23	34.8	8.62	33.17	136	4	P	H
		5907.6	59.76	-21.38	81.14	49.51	34.81	8.63	33.19	136	4	P	H
		5953.6	57.13	-11.17	68.3	46.89	34.81	8.64	33.21	136	4	P	H
		5762	109.15	-	-	98.84	34.89	8.59	33.17	136	4	P	H
		5762	100.41	-	-	90.1	34.89	8.59	33.17	136	4	A	H
		5634.4	65.21	-3.09	68.3	54.82	35	8.56	33.17	100	91	P	V
		5700	76.83	-28.47	105.3	66.48	34.95	8.57	33.17	100	91	P	V
		5719.2	88.04	-22.64	110.68	77.71	34.92	8.58	33.17	100	91	P	V
		5724.8	88	-33.84	121.84	77.67	34.92	8.58	33.17	100	91	P	V
		5850	56.7	-65.6	122.3	46.44	34.82	8.61	33.17	100	91	P	V
		5860.8	61.7	-47.57	109.27	51.45	34.8	8.62	33.17	100	91	P	V
		5915.2	58.43	-17.1	75.53	48.18	34.81	8.63	33.19	100	91	P	V
		5959.2	53.87	-14.43	68.3	43.63	34.81	8.65	33.22	100	91	P	V
		5748	114.58	-	-	104.25	34.91	8.59	33.17	100	91	P	V
		5748	105.07	-	-	94.74	34.91	8.59	33.17	100	91	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)
802.11ac VHT40 CH 159 5795MHz		5647.2	58.01	-10.29	68.3	47.62	35	8.56	33.17	164	81	P	H
		5686.8	59.93	-35.63	95.56	49.58	34.95	8.57	33.17	164	81	P	H
		5718.8	64.14	-46.42	110.56	53.81	34.92	8.58	33.17	164	81	P	H
		5723.6	65.99	-53.12	119.11	55.66	34.92	8.58	33.17	164	81	P	H
		5850	68.19	-54.11	122.3	57.93	34.82	8.61	33.17	164	81	P	H
		5859.2	67.85	-41.87	109.72	57.6	34.8	8.62	33.17	164	81	P	H
		5897.6	61.31	-27.23	88.54	51.06	34.8	8.63	33.18	164	81	P	H
		5929.6	61.46	-6.84	68.3	51.21	34.81	8.64	33.2	164	81	P	H
		5792	109.26	-	-	98.97	34.86	8.6	33.17	164	81	P	H
		5792	100.53	-	-	90.24	34.86	8.6	33.17	164	81	A	H
		5616.8	64.25	-4.05	68.3	53.86	35.01	8.56	33.18	111	94	P	V
		5692.4	68.58	-31.12	99.7	58.23	34.95	8.57	33.17	111	94	P	V
		5716.4	67.29	-42.6	109.89	56.94	34.94	8.58	33.17	111	94	P	V
		5722.8	72.1	-45.18	117.28	61.77	34.92	8.58	33.17	111	94	P	V
		5850	70.81	-51.49	122.3	60.55	34.82	8.61	33.17	111	94	P	V
		5857.6	68.69	-41.48	110.17	58.44	34.8	8.62	33.17	111	94	P	V
		5876	66.52	-38.04	104.56	56.28	34.8	8.62	33.18	111	94	P	V
		5958	60.2	-8.1	68.3	49.96	34.81	8.65	33.22	111	94	P	V
		5800	113.31	-	-	103.02	34.86	8.6	33.17	111	94	P	V
		5800	104.6	-	-	94.31	34.86	8.6	33.17	111	94	A	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 VHT40 (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 VHT40 CH 151 5755MHz		11510	51.54	-22.46	74	52.22	39.3	12.9	52.88	100	360	P	H
		11510	46.54	-7.46	54	47.22	39.3	12.9	52.88	100	360	A	H
		11510	50.36	-23.64	74	51.04	39.3	12.9	52.88	100	360	P	V
802.11ac VHT40 CH 159 5795MHz		11590	51.25	-22.75	74	52.09	39.39	12.82	53.05	100	360	P	H
		11590	47.4	-6.6	54	48.24	39.39	12.82	53.05	100	360	A	H
		11590	50.28	-23.72	74	51.12	39.39	12.82	53.05	100	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 802.11ac 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		5649.6	56.89	-11.41	68.3	46.51	34.98	8.57	33.17	164	78	P	H
		5697.6	69.51	-34.02	103.53	59.16	34.95	8.57	33.17	164	78	P	H
		5718	76.21	-34.13	110.34	65.88	34.92	8.58	33.17	164	78	P	H
		5724	77.21	-42.81	120.02	66.88	34.92	8.58	33.17	164	78	P	H
		5853.2	67.17	-47.83	115	56.91	34.82	8.61	33.17	164	78	P	H
		5855.2	67.27	-43.57	110.84	57.02	34.8	8.62	33.17	164	78	P	H
		5876	61.62	-42.94	104.56	51.38	34.8	8.62	33.18	164	78	P	H
		5937.2	52.37	-15.93	68.3	42.12	34.81	8.64	33.2	164	78	P	H
		5758	105.24	-	-	94.93	34.89	8.59	33.17	164	78	P	H
		5758	97.23	-	-	86.92	34.89	8.59	33.17	164	78	A	H
		5648.8	62.92	-5.38	68.3	52.53	35	8.56	33.17	162	19	P	V
		5698	76.62	-27.21	103.83	66.27	34.95	8.57	33.17	162	19	P	V
		5719.2	84	-26.68	110.68	73.67	34.92	8.58	33.17	162	19	P	V
		5724	83.61	-36.41	120.02	73.28	34.92	8.58	33.17	162	19	P	V
		5854.4	74.23	-38.04	112.27	63.98	34.8	8.62	33.17	162	19	P	V
		5855.6	74.18	-36.55	110.73	63.93	34.8	8.62	33.17	162	19	P	V
		5877.2	65.31	-38.36	103.67	55.07	34.8	8.62	33.18	162	19	P	V
		5924.8	53.98	-14.47	68.45	43.73	34.81	8.64	33.2	162	19	P	V
		5772	111.71	-	-	101.4	34.88	8.6	33.17	162	19	P	V
		5772	103.86	-	-	93.55	34.88	8.6	33.17	162	19	A	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 VHT80 CH 155 5775MHz		11550	50.94	-23.06	74	51.72	39.35	12.85	52.98	100	360	P	H
		11550	49.74	-24.26	74	50.52	39.35	12.85	52.98	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

WIFI 802.11ac VHT40 (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)
802.11ac VHT40 LF		30	26.02	-13.98	40	30.25	26.3	0.57	31.1	100	36	P	H
		74.62	24.5	-15.5	40	40.38	14.6	0.92	31.4	-	-	P	H
		116.33	23.57	-19.93	43.5	35.5	17.64	1.2	30.77	-	-	P	H
		182.29	24.09	-19.41	43.5	37.4	16.26	1.46	31.03	-	-	P	H
		234.67	23.75	-22.25	46	36.04	17.22	1.66	31.17	-	-	P	H
		519.85	24.67	-21.33	46	29.33	24.37	2.53	31.56	-	-	P	H
		32.91	33.75	-6.25	40	40.63	23.55	0.61	31.04	-	-	P	V
		47.46	33.91	-6.09	40	48.99	15.63	0.74	31.45	100	214	P	V
		70.74	30.11	-9.89	40	46.9	13.72	0.89	31.4	-	-	P	V
		95.96	31.39	-12.11	43.5	43.7	17.4	1.07	30.78	-	-	P	V
		179.38	22.76	-20.74	43.5	35.97	16.36	1.45	31.02	-	-	P	V
		650.8	27.93	-18.07	46	29.34	26.31	2.89	30.61	-	-	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)

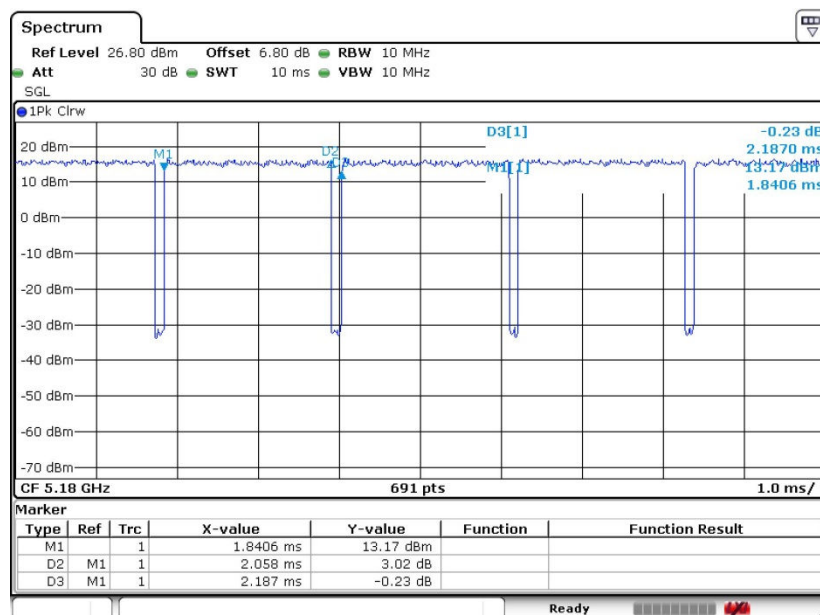
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

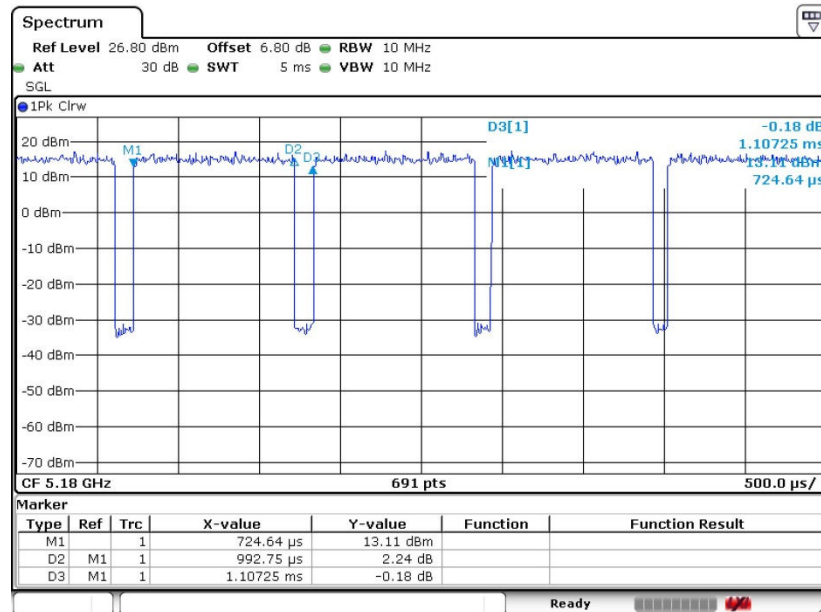
Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11a	94.10	2.058	0.486	1kHz
1+2	802.11ac VHT20	89.66	0.993	1.007	3kHz
1+2	802.11ac VHT40	83.98	0.501	1.994	3kHz
1+2	802.11ac VHT80	71.20	0.258	3.876	10kHz

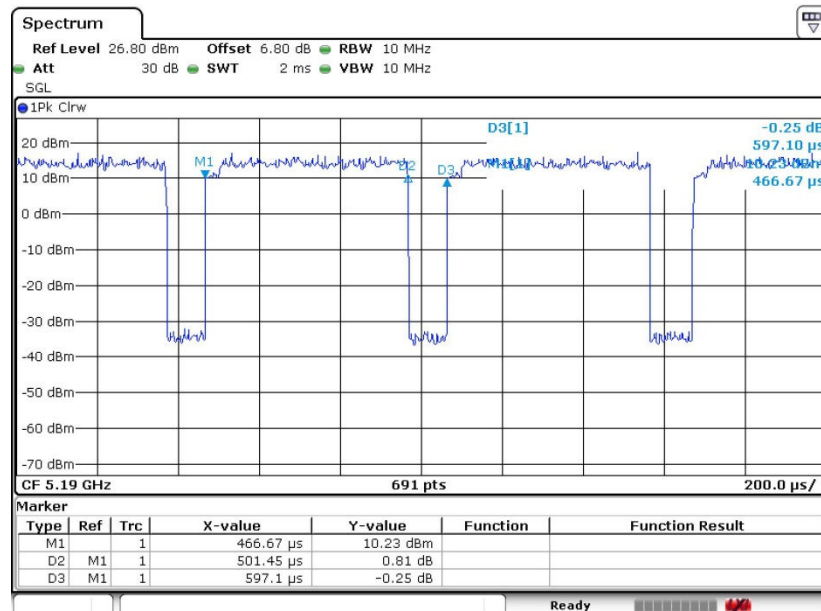
802.11a Ant. 1+2




802.11ac VHT20 Ant. 1+2



802.11ac VHT40 Ant. 1+2



802.11ac VHT80 Ant. 1+2

