FCC RF Test Report

APPLICANT	:	Lenovo(Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT	:	Notebook Computer
BRAND NAME	:	Lenovo
MODEL NAME	:	Lenovo YB-J912L
FCC ID	:	O57YBJ912L
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure

The product were integrated the WWAN module (Brand Name: Fibocom, Model Name: L850-GL, FCC ID: ZMOL850GL) and the BT/WLAN module (Brand Name: Intel®, Model Name: 8265D2W, FCC ID: PD98265D2) during the test.

The product was received on May 21, 2018 and testing was completed on Jun. 16, 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.

James Huang

TESTING
NVLAP LAB CODE 600155-0

Approved by: James Huang / Manager

Sporton International (Kunshan) Inc.
No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR810315-01D	Rev. 01	Initial issue of report	Jun. 29, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	Not Required	-
3.1	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	Pass	Under limit 1.62 dB at 5127.52 MHz
3.2	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 8.46 dB at 0.207 MHz
3.3	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.4	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-
Remark: Not required means after assessing, test items are not necessary to carry out.					

1 General Description

1.1 Applicant

Lenovo(Shanghai) Electronics Technology Co., Ltd.
NO.68 BUILDING, 199 FENJU RD, Pilot Free Trade Zone, 200131, China

1.2 Manufacturer

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

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Notebook Computer
Brand Name	Lenovo
Model Name	Lenovo YB-J912L
FCC ID	O57YBJ912L
EUT supports Radios application	WCDMA/HSPA/HSPA+ (16QAM uplink is not supported)/ DC-HSDPA/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	Lenovo YB-J912L
SW Version	Windows 10
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a variant report for Lenovo YB-J912L. The product equality declaration could be referred to Appendix D. Based on the similarity between current and previous project, only the conduction and the worst cases of RSE from original test report (Sporton Report Number FR810315D and FR810315E) were verified for the differences.

1.4 Product Specification of Equipment Under Test

<table>
<tr><th colspan="2">Standards-related Product Specification</th></tr>
<tr><td>Tx/Rx Frequency Range</td><td>5180 MHz ~ 5240 MHz
5260 MHz ~ 5320 MHz
5500 MHz ~ 5720 MHz
5745 MHz ~ 5825 MHz</td></tr>
<tr><td>Antenna Gain / Gain</td><td>For PC Mode:
<5150 MHz ~ 5250 MHz>
<Ant. 1> : PIFA Antenna with gain 3.90 dBi
<Ant. 2> : PIFA Antenna with gain 4.10 dBi
<5250 MHz ~ 5350 MHz>
<Ant. 1> : PIFA Antenna with gain 2.60 dBi
<Ant. 2> : PIFA Antenna with gain 3.70 dBi
<5470 MHz ~ 5725 MHz>
<Ant. 1> : PIFA Antenna with gain 3.60 dBi
<Ant. 2> : PIFA Antenna with gain 3.60 dBi
<5725 MHz ~ 5850 MHz>
<Ant. 1> : PIFA Antenna with gain 3.60 dBi
<Ant. 2> : PIFA Antenna with gain 3.40 dBi
For Pad Mode:
<5150 MHz ~ 5250 MHz>
<Ant. 1> : PIFA Antenna with gain 3.85 dBi
<Ant. 2> : PIFA Antenna with gain 4.70 dBi
<5250 MHz ~ 5350 MHz>
<Ant. 1> : PIFA Antenna with gain 3.70 dBi
<Ant. 2> : PIFA Antenna with gain 5.00 dBi
<5470 MHz ~ 5725 MHz>
<Ant. 1> : PIFA Antenna with gain 3.90 dBi
<Ant. 2> : PIFA Antenna with gain 4.60 dBi
<5725 MHz ~ 5850 MHz>
<Ant. 1> : PIFA Antenna with gain 3.70 dBi
<Ant. 2> : PIFA Antenna with gain 4.10 dBi</td></tr>
<tr><td>Antenna Function Description</td><td>
<table>
<tr><th></th><th>Chain Port 1</th><th>Chain Port 2</th></tr>
<tr><td>802.11a/n/ac SISO</td><td>V</td><td>V</td></tr>
<tr><td>802.11n/ac MIMO</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>Type of Modulation</td><td>802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)</td></tr>
</table>

1.5 Modification of EUT

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

1.6 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.**
	CO01-KS	03CH04-KS	630927

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

1.7 Applicable Standards

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

- FCC Part 15 Subpart 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 PC and Pad mode in three orthogonal panels, X, Y, Z. The worst 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)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz Band 2 (U-NII-2A)	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58#	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz Band 3 (U-NII-2C)	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

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

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122#	5610	128	5640

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138#	5690	144	5720
	142*	5710		

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

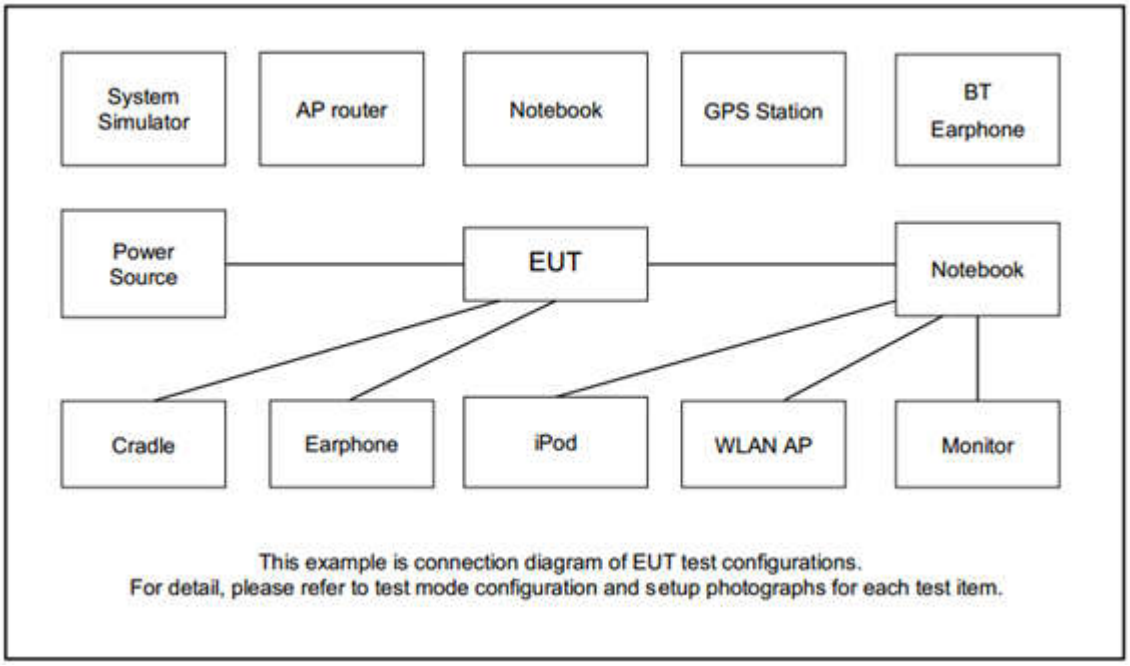
Final test modes are considering the modulation and worse data rates as below table.

MIMO Mode

Modulation	Test Channel	Data Rate
802.11ac VHT80	CH42	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN Link(5G) + Camera + Bluetooth Idle with BT pen + Adaptor 1 with Type C1 in Type C2 + USB Link with U-Disk from Type C1 + Play H Plane

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	8GB	N/A	N/A	N/A
4.	U Disk	SanDisk	SDCZ51-004G	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 Unwanted Emissions Measurement

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

3.1.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

(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

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

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBµV/m)
- 27	68.3

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

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

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

3.1.2 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 G) Unwanted emissions measurement.

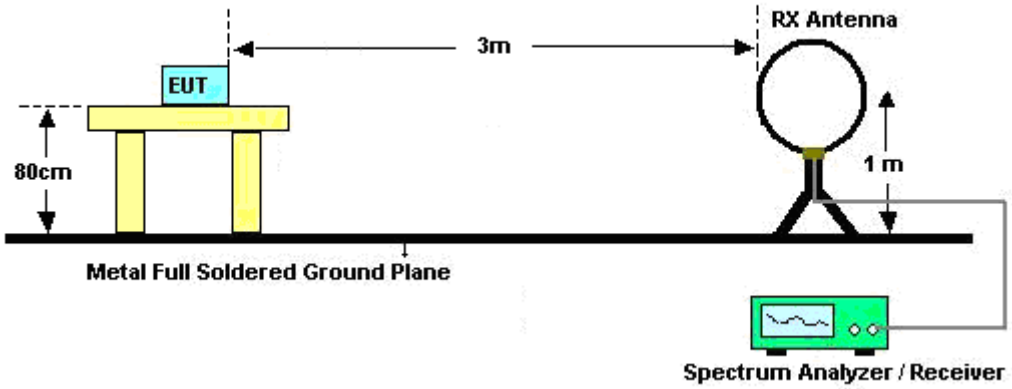
   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

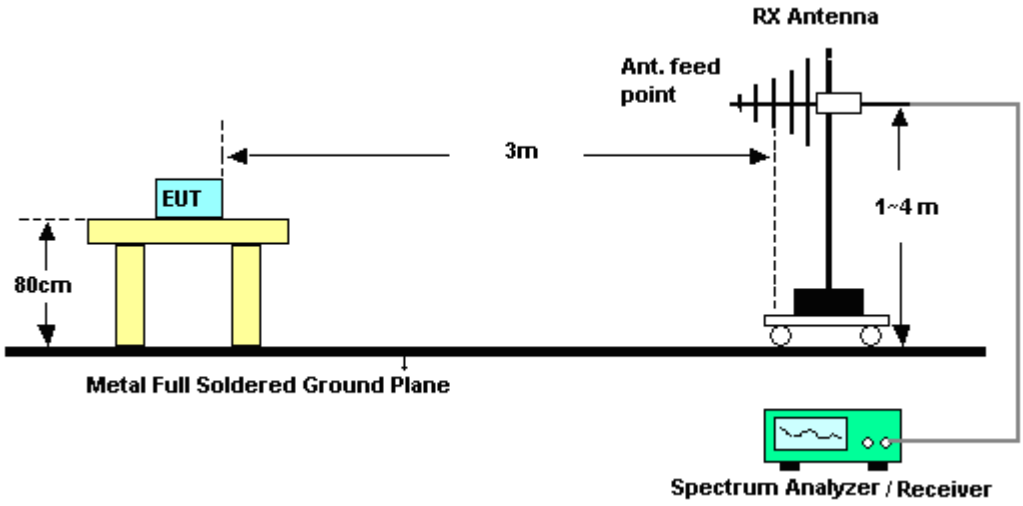
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting 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.

3.1.4 Test Setup

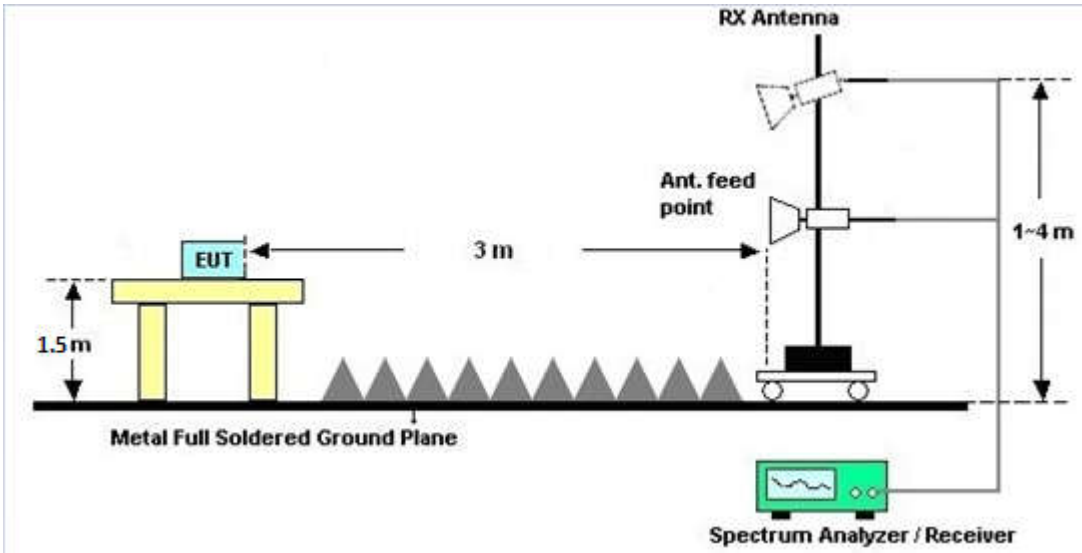
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 Test Results of Radiated Spurious 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.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

3.1.7 Duty Cycle

Please refer to Appendix B.

3.1.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix A.

3.2 AC Conducted Emission Measurement

3.2.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

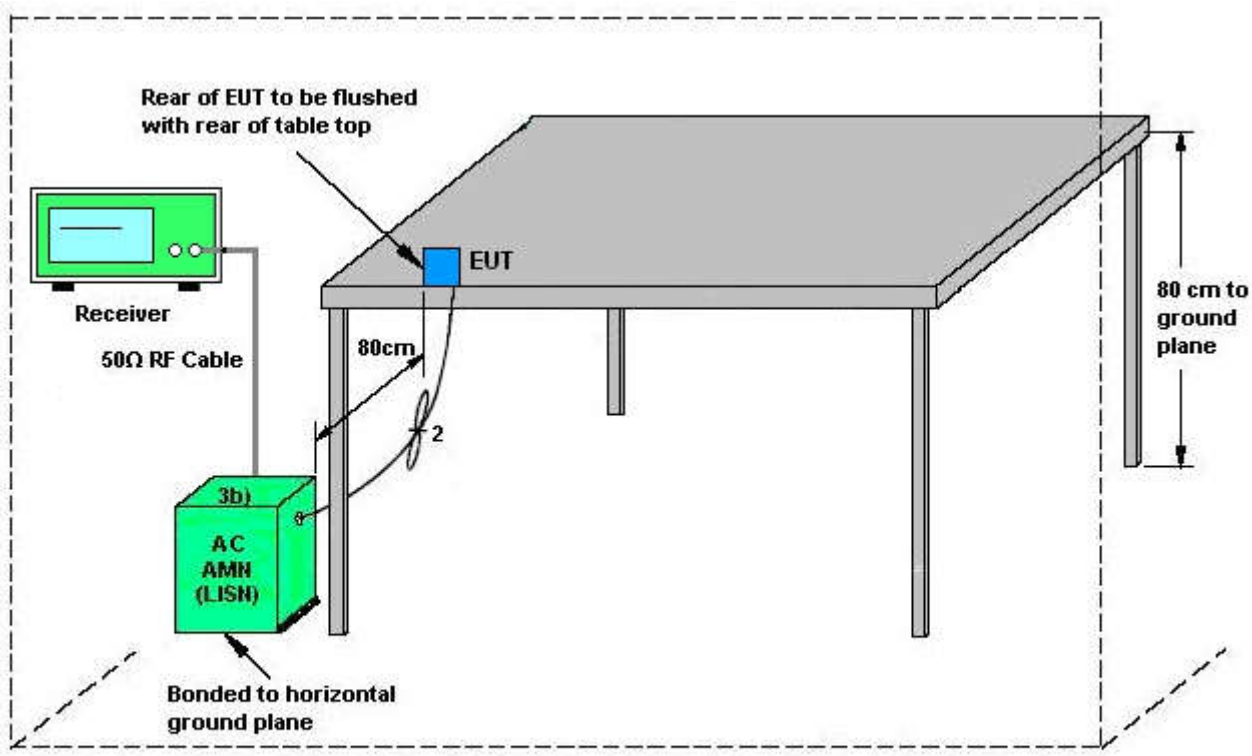
3.2.2 Measuring Instruments

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

3.2.3 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.

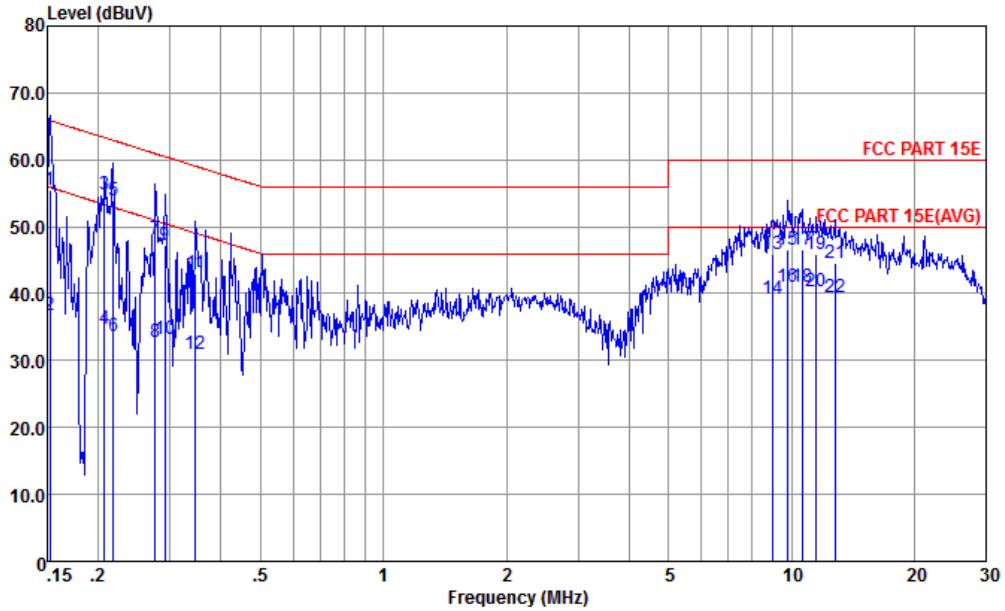
3.2.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.2.5 Test Result of AC Conducted Emission

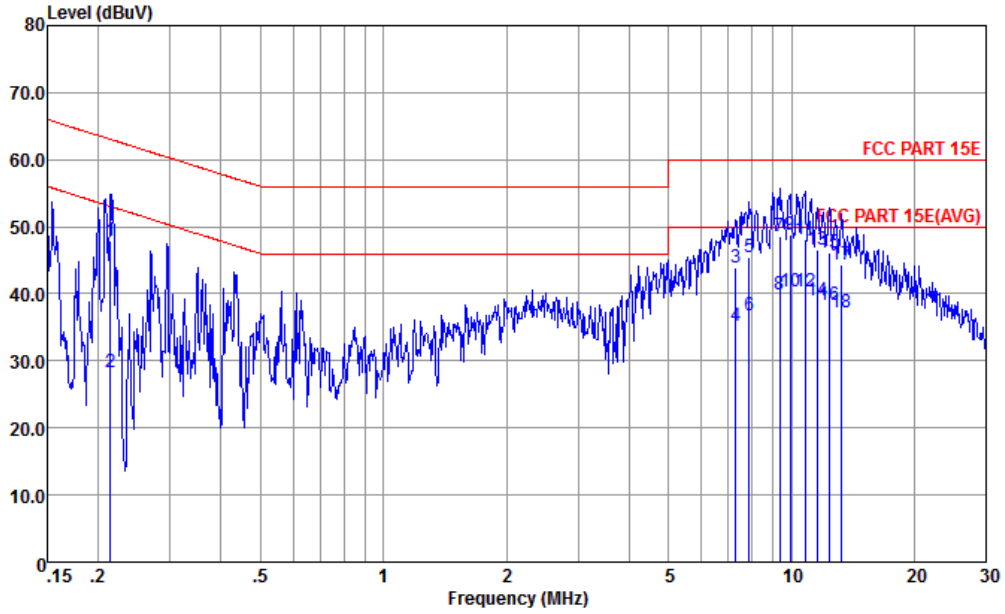
Test Mode :	Mode 1	Temperature :	22.7~23.1℃
Test Engineer :	Amos Zhang	Relative Humidity :	44~46%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link(5G) + Camera + Bluetooth Idle with BT pen + Adaptor 1 with Type C1 in Type C2 + USB Link with U-Disk from Type C1 + Play H Plane		



Site : CO01-KS
Condition : FCC PART 15E LISN-L-171013-060103 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.152	55.57	-10.30	65.87	44.80	0.16	10.61	QP
2		0.152	36.67	-19.20	55.87	25.90	0.16	10.61	Average
3	*	0.207	54.86	-8.46	63.32	44.21	0.20	10.45	QP
4		0.207	34.86	-18.46	53.32	24.21	0.20	10.45	Average
5		0.217	53.96	-8.96	62.92	43.30	0.21	10.45	QP
6		0.217	33.56	-19.36	52.92	22.90	0.21	10.45	Average
7		0.276	48.15	-12.79	60.94	37.50	0.22	10.43	QP
8		0.276	32.85	-18.09	50.94	22.20	0.22	10.43	Average
9		0.291	47.25	-13.25	60.50	36.60	0.22	10.43	QP
10		0.291	33.25	-17.25	50.50	22.60	0.22	10.43	Average
11		0.346	42.95	-16.10	59.05	32.29	0.24	10.42	QP
12		0.346	30.95	-18.10	49.05	20.29	0.24	10.42	Average
13		9.011	45.88	-14.12	60.00	35.20	0.35	10.33	QP
14		9.011	39.28	-10.72	50.00	28.60	0.35	10.33	Average
15		9.809	46.58	-13.42	60.00	35.90	0.35	10.33	QP
16		9.809	40.98	-9.02	50.00	30.30	0.35	10.33	Average
17		10.620	46.48	-13.52	60.00	35.80	0.34	10.34	QP
18		10.620	40.98	-9.02	50.00	30.30	0.34	10.34	Average
19		11.498	45.88	-14.12	60.00	35.20	0.32	10.36	QP
20		11.498	40.28	-9.72	50.00	29.60	0.32	10.36	Average
21		12.784	44.57	-15.43	60.00	33.89	0.30	10.38	QP
22		12.784	39.47	-10.53	50.00	28.79	0.30	10.38	Average

Test Mode :	Mode 1	Temperature :	22.7~23.1℃
Test Engineer :	Amos Zhang	Relative Humidity :	44~46%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link(5G) + Camera + Bluetooth Idle with BT pen + Adaptor 1 with Type C1 in Type C2 + USB Link with U-Disk from Type C1 + Play H Plane		



Site : CO01-KS
Condition : FCC PART 15E LISN-N-171013-060103 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.214	47.93	-15.12	63.05	37.20	0.28	10.45	QP
2	0.214	28.23	-24.82	53.05	17.50	0.28	10.45	Average
3	7.290	43.85	-16.15	60.00	33.20	0.32	10.33	QP
4	7.290	35.15	-14.85	50.00	24.50	0.32	10.33	Average
5	7.893	45.55	-14.45	60.00	34.91	0.31	10.33	QP
6	7.893	36.85	-13.15	50.00	26.21	0.31	10.33	Average
7	9.352	48.54	-11.46	60.00	37.91	0.30	10.33	QP
8	9.352	39.94	-10.06	50.00	29.31	0.30	10.33	Average
9	9.913	48.83	-11.17	60.00	38.20	0.30	10.33	QP
10 *	9.913	40.23	-9.77	50.00	29.60	0.30	10.33	Average
11	10.790	48.23	-11.77	60.00	37.60	0.28	10.35	QP
12	10.790	40.23	-9.77	50.00	29.60	0.28	10.35	Average
13	11.559	46.53	-13.47	60.00	35.90	0.27	10.36	QP
14	11.559	38.93	-11.07	50.00	28.30	0.27	10.36	Average
15	12.384	46.23	-13.77	60.00	35.61	0.25	10.37	QP
16	12.384	38.23	-11.77	50.00	27.61	0.25	10.37	Average
17	13.267	44.43	-15.57	60.00	33.80	0.24	10.39	QP
18	13.267	37.23	-12.77	50.00	26.60	0.24	10.39	Average

3.3 Automatically Discontinue Transmission

3.3.1 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.

3.3.2 Measuring Instruments

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

3.3.3 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.

3.4 Antenna Requirements

3.4.1 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.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

The EUT does not support CDD mode.

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 19, 2018	May 31, 2018	Apr. 18, 2019	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	May 31, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	May 31, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	May 31, 2018	Oct. 11, 2018	Conduction (CO01-KS)
EMI Test Receiver	Keysight	N9038A	MY564000 23	3Hz~8.5GHz;M ax 30dBm	Oct. 19, 2017	Jun. 16, 2018	Oct. 18, 2018	Radiation (03CH04-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY553705 28	10Hz-44GHz	Oct. 10, 2017	Jun. 16, 2018	Oct. 09, 2018	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 22, 2017	Jun. 16, 2018	Oct. 21, 2018	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Jan. 29, 2018	Jun. 16, 2018	Jan. 28, 2019	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1648	1GHz~18GHz	Dec. 16, 2017	Jun. 16, 2018	Dec 15, 2018	Radiation (03CH04-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA1702 49	15GHz~40GHz	Feb. 07, 2018	Jun. 16, 2018	Feb. 06, 2019	Radiation (03CH04-KS)
Amplifier	Burgeon	BPA-530	102219	0.01MHz ~3000MHz	Dec. 16, 2017	Jun. 16, 2018	Dec. 15, 2018	Radiation (03CH04-KS)
Amplifier	MITEQ	TTA1840-35-HG	2014749	18~40GHz	Feb. 08, 2018	Jun. 16, 2018	Feb. 07, 2019	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1Ghz-18Ghz	Apr. 17, 2018	Jun. 16, 2018	Apr. 16, 2019	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY532702 03	500MHz~26.5G Hz	Dec. 16, 2017	Jun. 16, 2018	Dec. 15, 2018	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Jun. 16, 2018	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jun. 16, 2018	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jun. 16, 2018	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.9dB

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

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

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.6dB

Appendix A. Radiated Spurious Emission

Band 1 - 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 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 VHT80 CH 42 5210MHz		5138.24	62.13	-11.87	74	51.99	35.41	7.99	33.26	100	294	P	H
		5127.52	52.38	-1.62	54	42.24	35.41	7.99	33.26	100	294	A	H
	*	5206	101.15	-	-	91.06	35.35	7.99	33.25	100	294	P	H
	*	5206	92.64	-	-	82.55	35.35	7.99	33.25	100	294	A	H
		5362.2	51.63	-22.37	74	41.38	35.22	8.25	33.22	100	294	P	H
		5351.4	43.47	-10.53	54	33.24	35.23	8.22	33.22	100	294	A	H
		5144	60.5	-13.5	74	50.37	35.39	7.99	33.25	299	104	P	V
		5149.44	51.31	-2.69	54	41.18	35.39	7.99	33.25	299	104	A	V
	*	5198	97.33	-	-	87.24	35.35	7.99	33.25	299	104	P	V
	*	5198	91.6	-	-	81.51	35.35	7.99	33.25	299	104	A	V
		5364.36	52.41	-21.59	74	42.16	35.22	8.25	33.22	299	104	P	V
		5358.96	43.35	-10.65	54	33.12	35.23	8.22	33.22	299	104	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

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		10420	43.67	-24.63	68.3	59.22	38.51	12.06	66.12	100	360	P	H
VHT80 CH 42 5210MHz		10420	44.74	-23.56	68.3	60.29	38.51	12.06	66.12	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 VHT80 (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 VHT80 LF		34.85	22.68	-17.32	40	29.21	24.87	0.64	32.04	100	124	P	H
		260.86	16.74	-29.26	46	29.26	17.16	1.78	31.46	-	-	P	H
		405.39	24.39	-21.61	46	27.42	25.57	2.09	30.69	-	-	P	H
		500.45	28.32	-17.68	46	33.35	22.9	2.38	30.31	-	-	P	H
		753.62	26.15	-19.85	46	25.29	26.68	2.81	28.63	-	-	P	H
		981.57	29.04	-24.96	54	23.64	29.14	3.23	26.97	-	-	P	H
		33.88	24.99	-15.01	40	31.53	24.87	0.63	32.04	100	124	P	V
		398.6	23.02	-22.98	46	26.19	25.47	2.07	30.71	-	-	P	V
		500.45	24.31	-21.69	46	29.34	22.9	2.38	30.31	-	-	P	V
		709.97	25.81	-20.19	46	25.42	26.46	2.77	28.84	-	-	P	V
		863.23	27.58	-18.42	46	25.12	27.21	3.06	27.81	-	-	P	V
		966.05	29.14	-24.86	54	24.15	28.82	3.22	27.05	-	-	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 CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. 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)

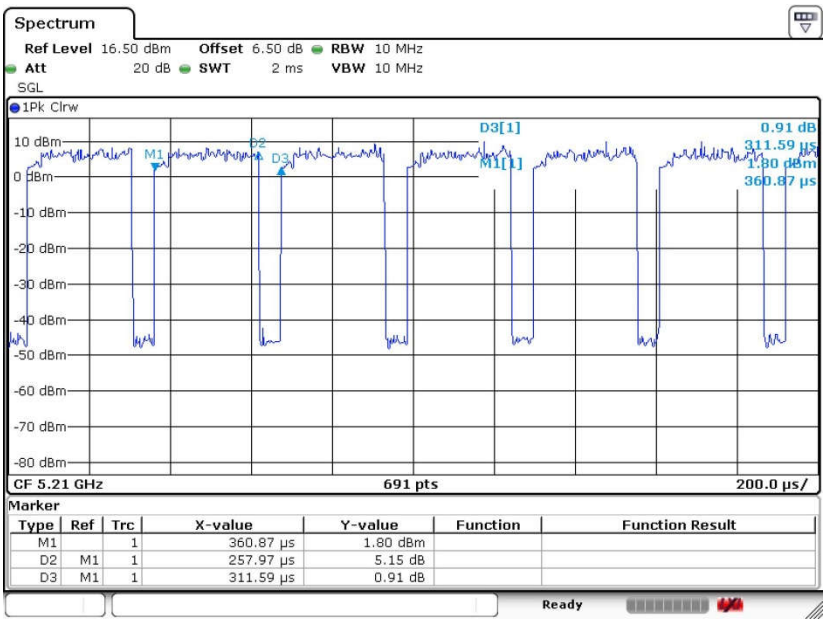
= -10.46(dB)

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

Appendix B. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11ac VHT80	82.79	0.258	3.876	3.9KHz

802.11ac VHT80 Ant.1+2



Appendix D. Product Equality Declaration