FCC RF Test Report

APPLICANT	**:**	**Lenovo(Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	**:**	**Portable Tablet Computer**
BRAND NAME	**:**	**Lenovo**
MODEL NAME	**:**	**Lenovo TB-X704L**
FCC ID	**:**	**O57TBX704L**
STANDARD	**:**	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	**:**	**(NII) Unlicensed National Information Infrastructure**

The product was completed on Jul. 31, 2017. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.
The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.

Eric Shih

Approved by: Eric Shih / Manager

TESTING
NVLAP LAB CODE 600156-0

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
FR771306E	Rev. 01	Initial issue of report	Aug. 21, 2017

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 15.48 dB at 17475.00 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 5.46 dB at 0.15 MHz
3.6	15.407(g)	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

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

1.2 Manufacturer

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

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	Lenovo
Model Name	Lenovo TB-X704L
FCC ID	O57TBX704L
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+ (16QAM uplink is not supported)/LTE/ WLAN 2.4G 802.11b/g/n HT20/HT40/ WLAN 5G 802.11a/n HT20/HT40/ WLAN 5G 802.11ac VHT20/VHT40/VHT80/ Bluetooth V3.0 + EDR/ Bluetooth V4.0 LE/ Bluetooth v4.1 LE / Bluetooth v4.2 LE
IMEI Code	Conducted: 86383803000180 Radiation: 863838030007719 Conduction: 86383803003809
HW Version	Lenovo Tablet TB-X704L
SW Version	TB-X704L_RF01_ 20170331
EUT Stage	Identical Prototype

Remark:
The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	**<5745 MHz ~ 5825 MHz>** 802.11a : 11.48 dBm / 0.0141 W 802.11n HT20 : 11.35 dBm / 0.0136 W 802.11n HT40 : 11.04 dBm / 0.0127 W 802.11ac VHT80: 9.84 dBm / 0.0096 W
99% Occupied Bandwidth	802.11a : 18.73 MHz 802.11n HT20 : 19.48 MHz 802.11n HT40 : 37.06 MHz 802.11ac VHT80 : 74.69 MHz
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Antenna Type / Gain	PIFA Antenna with gain 0.19 dBi

Note: For 802.11n HT20 / ac VHT20 and 802.11n HT40 / ac VHT40 mode, the whole testing has assessed only 802.11an HT20/ HT40 by referring to their maximum conducted power.

1.5 Specification of Accessory

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

1.6 Modification of EUT

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

1.7 Component List

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

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

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

1.8 Testing Location

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

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 Test Firm Registration No.**
	TH01-SZ	CO01-SZ	251365

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 Test Firm Registration No.**
	03CH03-SZ	577730

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

1.9 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 v01r04
- FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01
- 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

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases were recorded in this report.

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

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

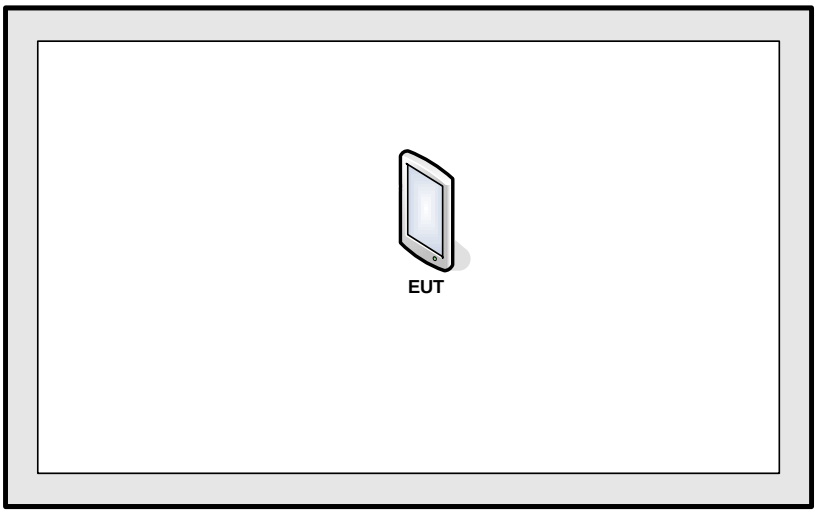
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN Link (5G) + USB Cable 1 (Charging from Adapter 1) + Earphone for Sample 1 Mode 2 : Bluetooth Link + WLAN Link (5G) + USB Cable 2 (Charging from Adapter 2) + Earphone for Sample 2
Remark: The worst case of conducted emission is mode 1; only the test data of it was reported.	

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

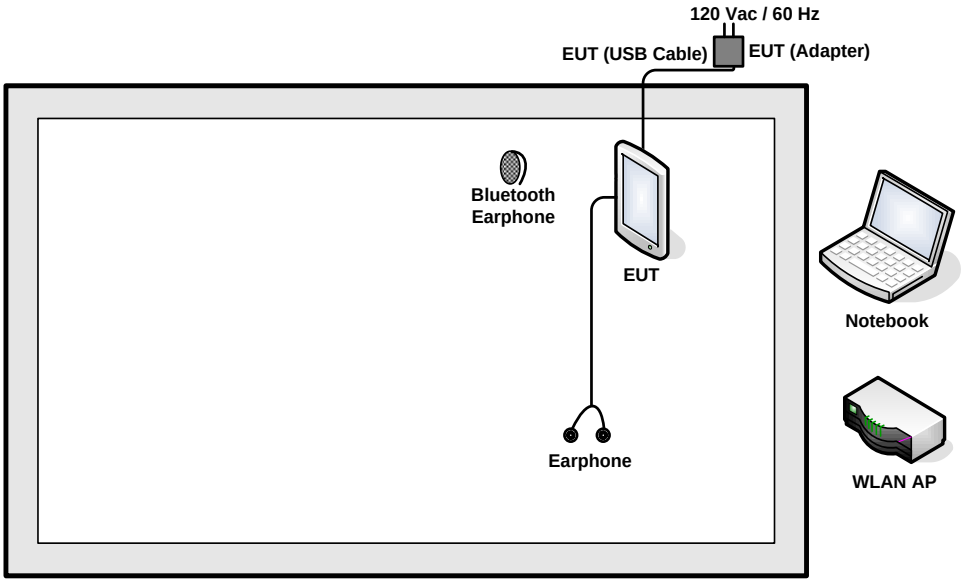
Ch. #		Band IV：5745-5825 MHz
		802.11ac VHT80
L	Low	-
M	Middle	155
H	High	-

2.3 Connection Diagram of Test System

< WLAN Tx Mode >



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-865L	KA2IR865LA1	N/A	Unshielded,1.8m
2.	Notebook	Lenovo	E450	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-108	N/A	N/A	N/A
4.	Earphone	Lenovo	SH100	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 Notebook 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 6.3 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 6.3 + 10 = 16.3 (dB)

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.

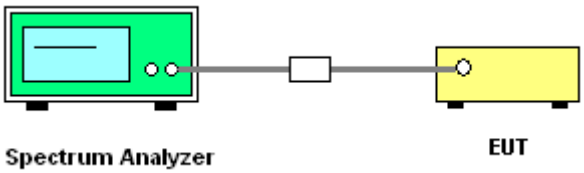
3.1.2 Measuring Instruments

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 v01r04. Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW ≥ 3 x 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.

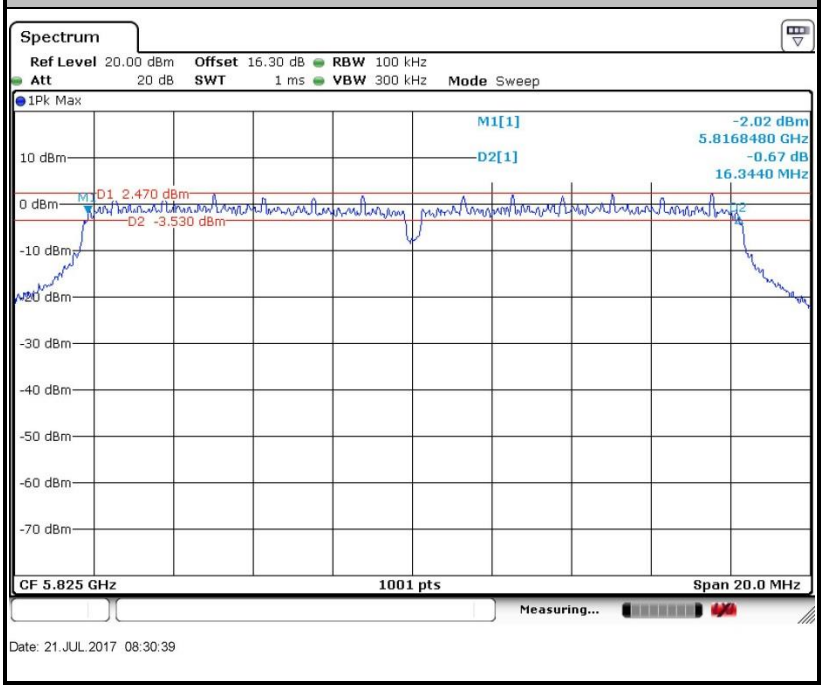
3.1.4 Test Setup



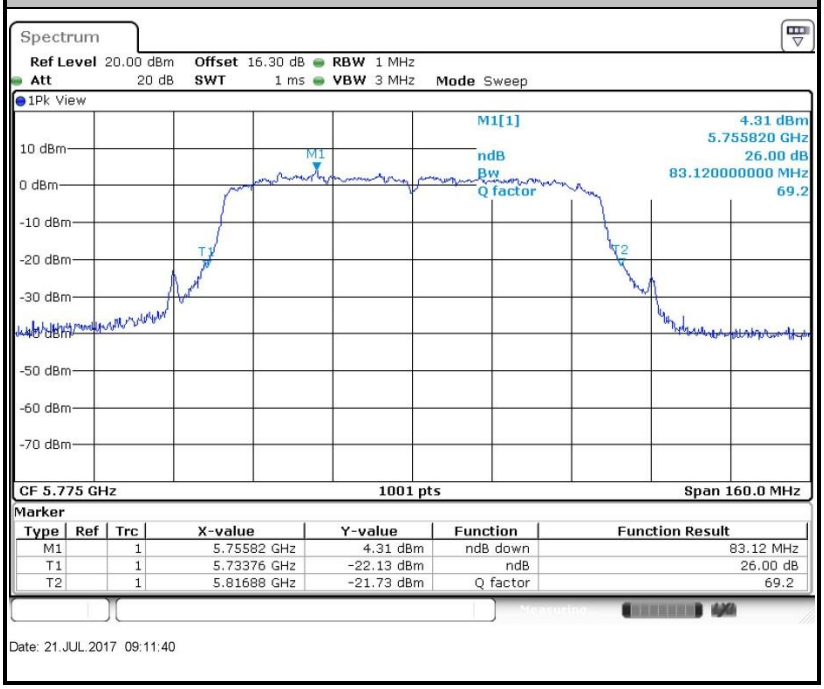
3.1.5 Test Result of 6dB and 26dB and 99% Occupied Bandwidth

Please refer to Appendix A.

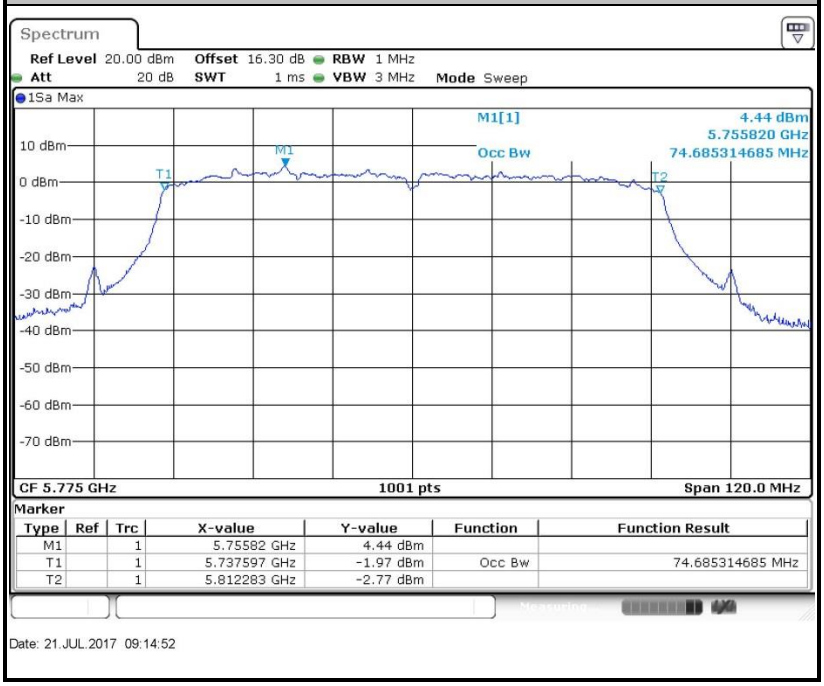
Minimum 6dB Bandwidth



Maximum 26dB Bandwidth



Maximum 99% Occupied Bandwidth



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.

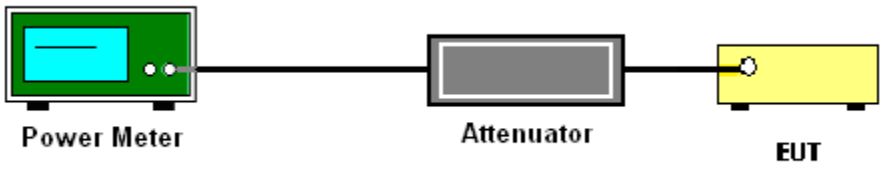
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04.

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 v01r04. Section F) Maximum power spectral density.

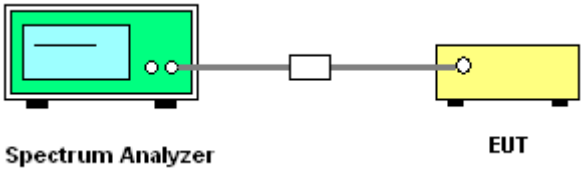
 # Method SA-2 #

(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 ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(500kHz/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.

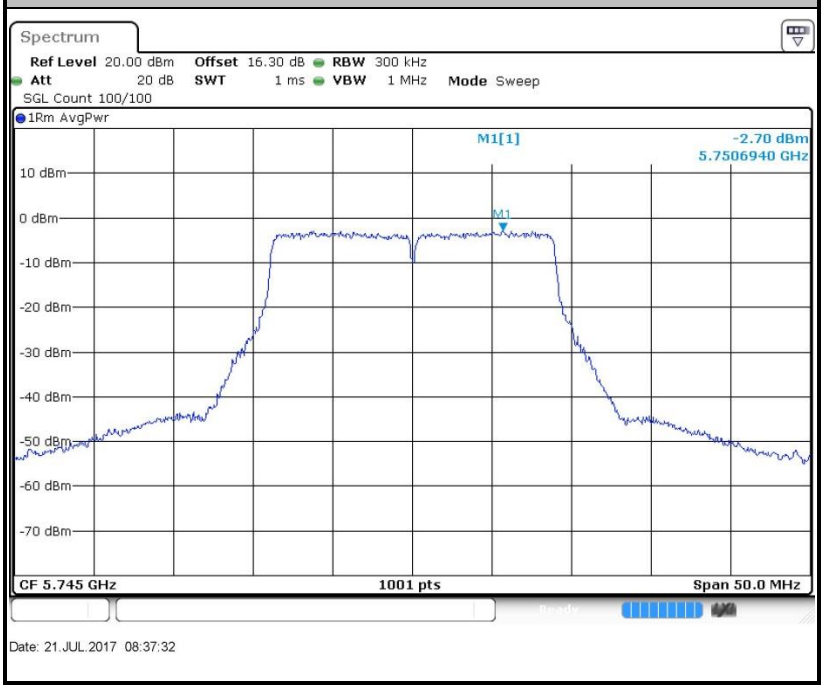
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/300kHz)



3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

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 per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 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)
-17	78.3
- 27	68.3

(3) KDB789033 D02 v01r04 G)2)c)

(i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.[3]

(ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.[4]

Note 3: An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

Note 4: Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

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 v01r04. 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

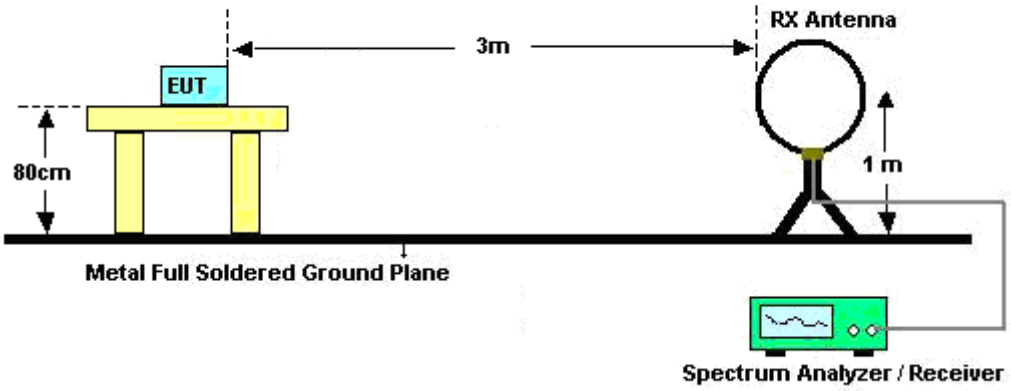
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

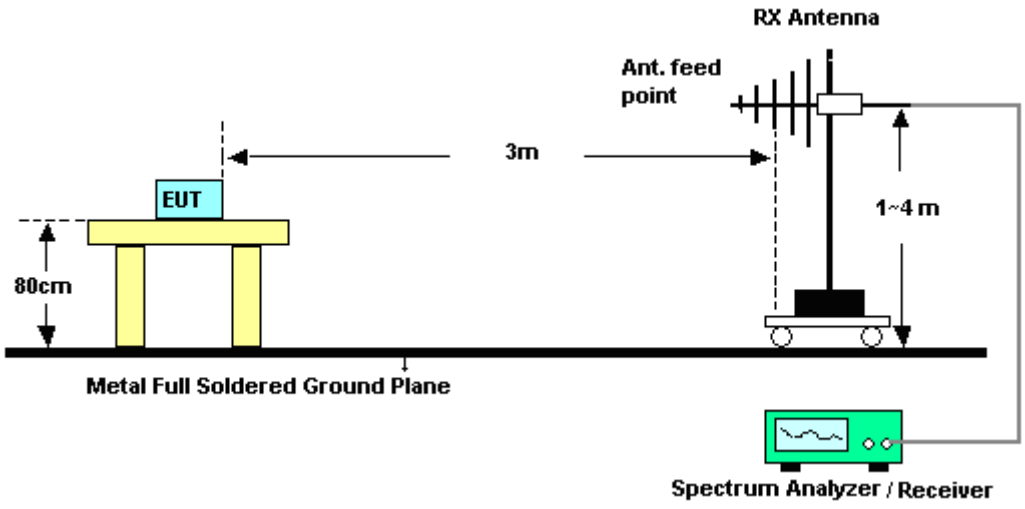
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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.

3.4.4 Test Setup

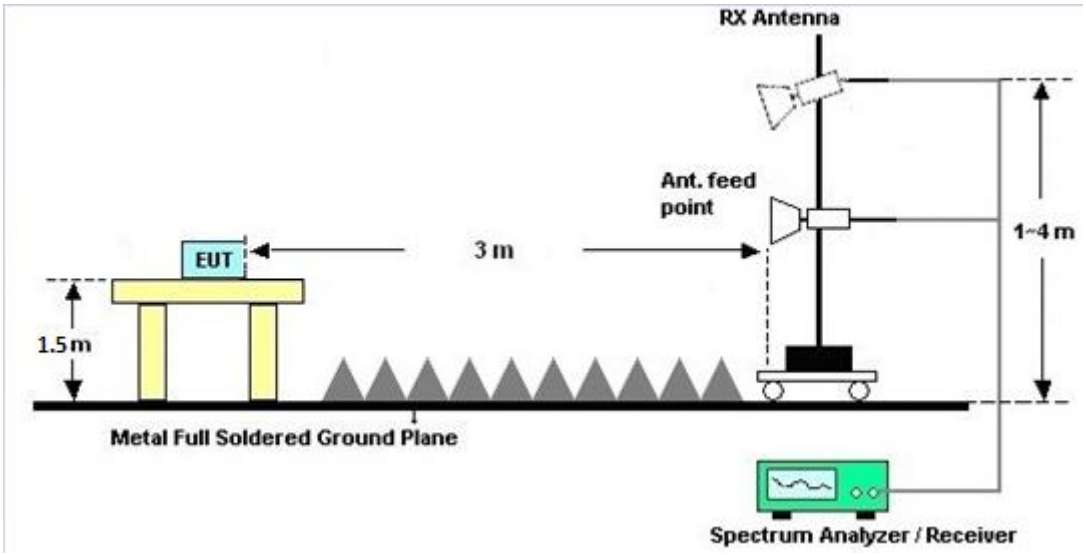
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated 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 per 15.31(o) was not reported.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.4.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.

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 (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.

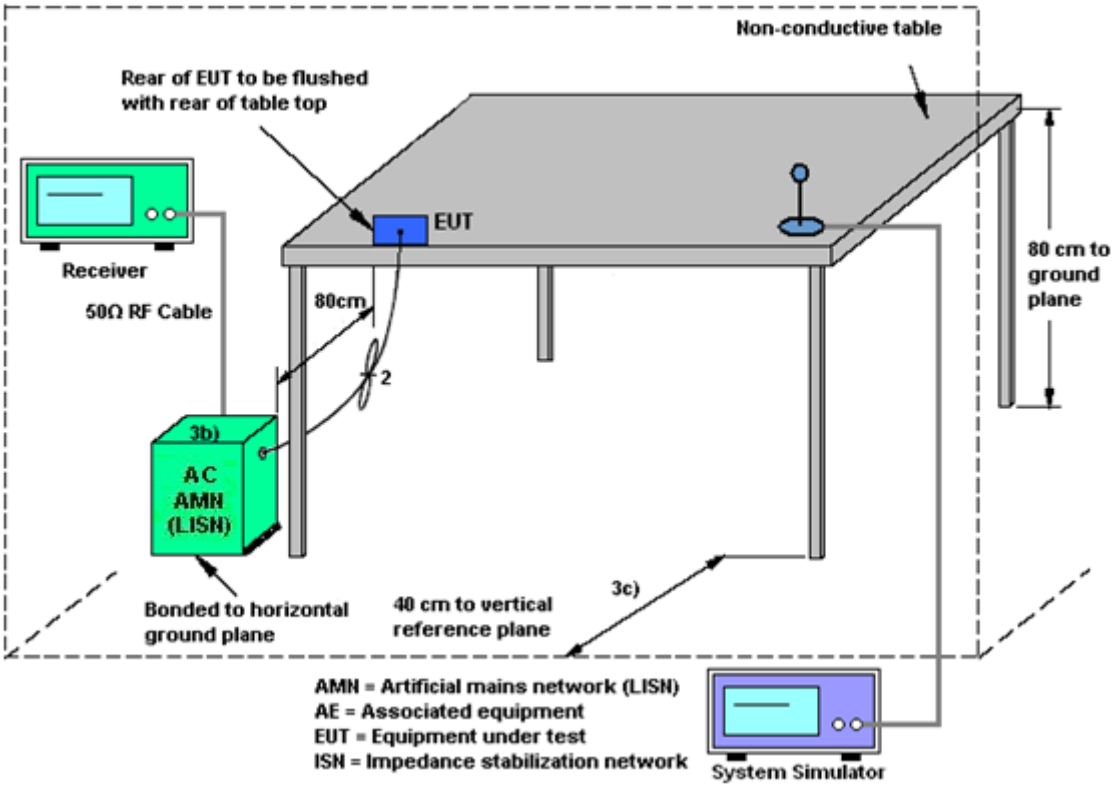
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

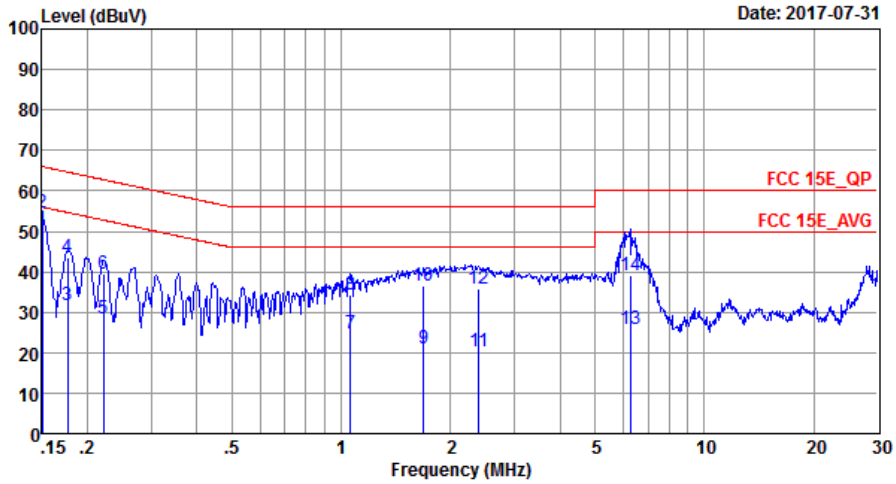
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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

Test Mode :	Mode 1	**Temperature :**	24~25℃
Test Engineer :	HaoHai Ye	**Relative Humidity :**	50~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	Bluetooth Link + WLAN Link (5G) + USB Cable 1 (Charging from Adapter 1) + Earphone for Sample 1		

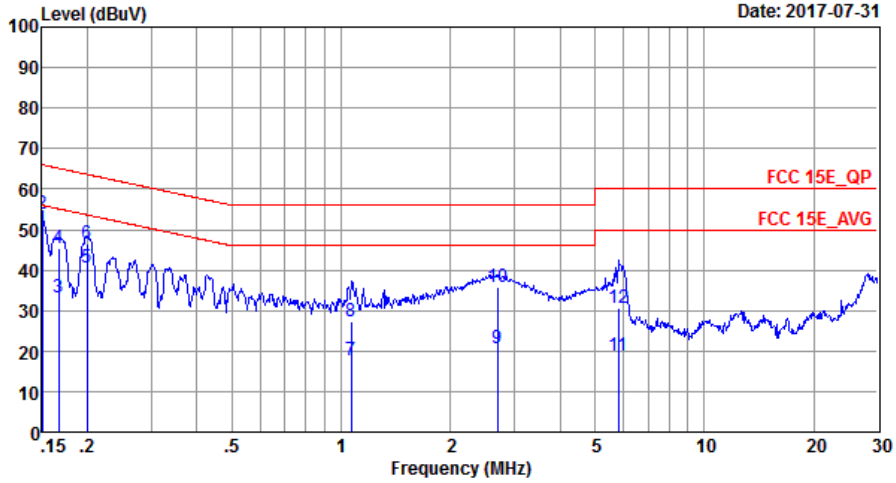


Site : CO01-SZ
Condition: FCC 15E_QP LISN_20170301_L LINE

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.15	50.54	-5.46	56.00	40.10	0.03	10.41	Average
2	0.15	54.44	-11.56	66.00	44.00	0.03	10.41	QP
3	0.18	31.63	-23.01	54.64	21.30	0.03	10.30	Average
4	0.18	43.43	-21.21	64.64	33.10	0.03	10.30	QP
5	0.22	28.25	-24.49	52.74	18.00	0.03	10.22	Average
6	0.22	39.65	-23.09	62.74	29.40	0.03	10.22	QP
7	1.06	24.62	-21.38	46.00	14.40	0.07	10.15	Average
8	1.06	34.32	-21.68	56.00	24.10	0.07	10.15	QP
9	1.69	21.06	-24.94	46.00	10.80	0.10	10.16	Average
10	1.69	36.56	-19.44	56.00	26.30	0.10	10.16	QP
11	2.40	20.32	-25.68	46.00	10.01	0.13	10.18	Average
12	2.40	35.82	-20.18	56.00	25.51	0.13	10.18	QP
13	6.25	25.72	-24.28	50.00	15.19	0.22	10.31	Average
14	6.25	39.22	-20.78	60.00	28.69	0.22	10.31	QP

Test Mode :	Mode 1	**Temperature :**	24~25℃
Test Engineer :	HaoHai Ye	**Relative Humidity :**	50~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	Bluetooth Link + WLAN Link (5G) + USB Cable 1 (Charging from Adapter 1) + Earphone for Sample 1		



Site : CO01-SZ
Condition: FCC 15E_QP LISN_20170301_N NEUTRAL

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.15	50.04	-5.96	56.00	39.60	0.03	10.41	Average
2	0.15	53.74	-12.26	66.00	43.30	0.03	10.41	QP
3	0.17	33.27	-21.85	55.12	22.90	0.03	10.34	Average
4	0.17	45.47	-19.65	65.12	35.10	0.03	10.34	QP
5	0.20	40.65	-12.97	53.62	30.40	0.03	10.22	Average
6	0.20	46.45	-17.17	63.62	36.20	0.03	10.22	QP
7	1.07	17.70	-28.30	46.00	7.50	0.05	10.15	Average
8	1.07	27.40	-28.60	56.00	17.20	0.05	10.15	QP
9	2.69	20.73	-25.27	46.00	10.49	0.04	10.20	Average
10	2.69	35.73	-20.27	56.00	25.49	0.04	10.20	QP
11	5.80	18.77	-31.23	50.00	8.40	0.07	10.30	Average
12	5.80	30.47	-29.53	60.00	20.10	0.07	10.30	QP

3.6 Frequency Stability Measurement

3.6.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

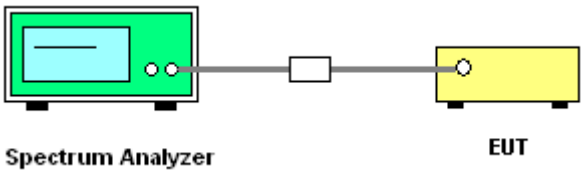
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

3.6.4 Test Setup



3.6.5 Test Result of Frequency Stability

Please refer to Appendix A.

3.7 Automatically Discontinue Transmission

3.7.1 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.

3.7.2 Measuring Instruments

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

3.7.3 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.

3.8 Antenna Requirements

3.8.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,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.

3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.8.3 Antenna Gain

The antenna gain 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
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 06, 2017	Jun. 30, 2017~ Jul. 21, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 06, 2017	Jun. 30, 2017~ Jul. 21, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
DC Power Supply	GWINSTEK	AnritsuGPS-3030D	EM882636	Max 30V	May 12, 2017	Jun. 30, 2017~ Jul. 21, 2017	May 11, 2018	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct.13, 2016	Jun. 30, 2017~ Jul. 21, 2017	Oct. 13, 2017	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 20, 2017	Jun. 30, 2017~ Jul. 23, 2017	Apr. 19, 2018	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 20, 2017	Jun. 30, 2017~ Jul. 23, 2017	Apr. 19, 2018	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2017	Jun. 30, 2017~ Jul. 23, 2017	May 13, 2018	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	May 14, 2017	Jun. 30, 2017~ Jul. 23, 2017	May 13, 2018	Radiation (03CH03-SZ)
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1285	1GHz~18GHz	Jan. 12, 2017	Jun. 30, 2017~ Jul. 23, 2017	Jan. 11, 2018	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug. 10, 2016	Jun. 30, 2017~ Jul. 23, 2017	Aug. 09, 2017	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 11, 2016	Jun. 30, 2017~ Jul. 23, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	Jun. 30, 2017~ Jul. 23, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 06, 2017	Jun. 30, 2017~ Jul. 23, 2017	Jan. 05, 2018	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1988315	18GHz~40GHz	Jun. 27, 2017	Jun. 30, 2017~ Jul. 23, 2017	Jun. 26, 2018	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Jun. 30, 2017~ Jul. 23, 2017	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 30, 2017~ Jul. 23, 2017	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 30, 2017~ Jul. 23, 2017	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jan. 06, 2017	Jul. 31, 2017	Jan. 05, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Jan. 05, 2017	Jul. 31, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103892	9kHz~30MHz	Jan. 05, 2017	Jul. 31, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 19, 2017	Jul. 31, 2017	Jul. 18, 2018	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.5dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB

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

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

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

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

Appendix A. Conducted Test Results

Report Number : FR771306E

Test Engineer:	Wilson Chen	Temperature:	24~26	°C
Test Date:	2017/6/30~2017/7/24	Relative Humidity:	50~53	%

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

Band IV									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)	6 dB Bandwidth (MHz)	6dB Bandwidth min. Limit (MHz)	Pass/Fail
11a	6M bps	1	149	5745	18.68	23.48	16.36	0.5	Pass
11a	6Mbps	1	157	5785	18.73	23.58	16.36	0.5	Pass
11a	6Mbps	1	165	5825	18.68	23.58	16.34	0.5	Pass
HT20	MCS 0	1	149	5745	19.48	23.98	17.58	0.5	Pass
HT20	MCS 0	1	157	5785	19.43	23.78	17.58	0.5	Pass
HT20	MCS 0	1	165	5825	19.03	23.58	17.58	0.5	Pass
HT40	MCS 0	1	151	5755	37.06	44.42	35.13	0.5	Pass
HT40	MCS 0	1	159	5795	37.06	44.78	35.64	0.5	Pass
VHT80	MCS 0	1	155	5775	74.69	83.12	75.05	0.5	Pass

Report Number : FR771306E

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
11a	6M bps	1	149	5745	0.60	11.48	30.00	0.19		Pass
11a	6Mbps	1	157	5785	0.60	11.24	30.00	0.19		Pass
11a	6Mbps	1	165	5825	0.60	11.47	30.00	0.19		Pass
HT20	MCS 0	1	149	5745	0.64	11.17	30.00	0.19		Pass
HT20	MCS 0	1	157	5785	0.64	11.12	30.00	0.19		Pass
HT20	MCS 0	1	165	5825	0.64	11.35	30.00	0.19		Pass
HT40	MCS 0	1	151	5755	1.42	11.04	30.00	0.19		Pass
HT40	MCS 0	1	159	5795	1.42	10.77	30.00	0.19		Pass
VHT20	MCS 0	1	149	5745	0.84	9.20	30.00	0.19		Pass
VHT20	MCS 0	1	157	5785	0.84	8.95	30.00	0.19		Pass
VHT20	MCS 0	1	165	5825	0.84	9.58	30.00	0.19		Pass
VHT40	MCS 0	1	151	5755	1.77	9.23	30.00	0.19		Pass
VHT40	MCS 0	1	159	5795	1.77	9.03	30.00	0.19		Pass
VHT80	MCS 0	1	155	5775	3.15	9.84	30.00	0.19		Pass

Report Number : FR771306E

TEST RESULTS DATA
Power Spectral Density

Band IV										
Mod.	Data Rate	N_{TX}	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
11a	6M bps	1	149	5745	0.60	2.22	0.10	30.00	0.19	Pass
11a	6Mbps	1	157	5785	0.60	2.22	-0.59	30.00	0.19	Pass
11a	6Mbps	1	165	5825	0.60	2.22	-0.13	30.00	0.19	Pass
HT20	MCS 0	1	149	5745	0.64	2.22	0.16	30.00	0.19	Pass
HT20	MCS 0	1	157	5785	0.64	2.22	-0.58	30.00	0.19	Pass
HT20	MCS 0	1	165	5825	0.64	2.22	-0.50	30.00	0.19	Pass
HT40	MCS 0	1	151	5755	1.42	2.22	-3.11	30.00	0.19	Pass
HT40	MCS 0	1	159	5795	1.42	2.22	-3.50	30.00	0.19	Pass
VHT80	MCS 0	1	155	5775	3.15	2.22	-6.63	30.00	0.19	Pass

Report Number : FR771306E

TEST RESULTS DATA
Frequency Stability

Band IV										
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stablility (ppm)	Temperature (˚C)	Voltage (V)	Note
11a	6M bps	1	149	5745	5745.025	0.025	4.35	20	3.5	
11a	6M bps	1	149	5745	5745.025	0.025	4.35	20	4.2	
11a	6M bps	1	149	5745	5745.025	0.025	4.35	20	3.85	
11a	6M bps	1	149	5745	5745.025	0.025	4.35	-30	3.85	
11a	6M bps	1	149	5745	5745.025	0.025	4.35	50	3.85	

Appendix B. 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		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 149 5745MHz		5639.4	48.09	-20.11	68.2	38.26	32.68	9.23	32.08	153	4	P	H
		5698	48.73	-55	103.73	38.59	32.9	9.25	32.01	153	4	P	H
		5711.2	47.69	-60.65	108.34	37.42	32.97	9.28	31.98	153	4	P	H
		5724.8	48.75	-72.99	121.74	38.41	33.04	9.28	31.98	153	4	P	H
	*	5745	96.47	-	-	86	33.11	9.3	31.94	153	4	P	H
	*	5745	90.04	-	-	79.57	33.11	9.3	31.94	153	4	A	H
		5635	48.46	-19.74	68.2	38.63	32.68	9.23	32.08	263	92	P	V
		5691.8	52.64	-46.51	99.15	42.5	32.9	9.25	32.01	263	92	P	V
		5719.2	50.95	-59.63	110.58	40.61	33.04	9.28	31.98	263	92	P	V
		5724.6	56.69	-64.6	121.29	46.35	33.04	9.28	31.98	263	92	P	V
	*	5745	108.25	-	-	97.78	33.11	9.3	31.94	263	92	P	V
	*	5745	101.6	-	-	91.13	33.11	9.3	31.94	263	92	A	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 157 5785MHz		5630	48.27	-19.93	68.2	38.51	32.61	9.23	32.08	100	115	P	H
		5699.6	48.88	-56.03	104.91	38.71	32.9	9.28	32.01	100	115	P	H
		5710.8	47.19	-61.04	108.23	36.92	32.97	9.28	31.98	100	115	P	H
		5721.6	48.31	-66.14	114.45	37.97	33.04	9.28	31.98	100	115	P	H
	*	5785	95.59	-	-	84.87	33.26	9.33	31.87	100	115	P	H
	*	5785	86.4	-	-	75.68	33.26	9.33	31.87	100	115	A	H
		5851.6	49.91	-68.64	118.55	38.8	33.55	9.36	31.8	100	115	P	H
		5861.6	49.2	-59.75	108.95	37.95	33.62	9.39	31.76	100	115	P	H
		5894.8	50.46	-40.05	90.51	38.99	33.77	9.42	31.72	100	115	P	H
		5934.4	49.85	-18.35	68.2	38.14	33.91	9.45	31.65	100	115	P	H
		5629.4	48.43	-19.77	68.2	38.67	32.61	9.23	32.08	100	94	P	V
		5684.8	48.63	-45.36	93.99	38.49	32.9	9.25	32.01	100	94	P	V
		5719.8	49.24	-61.50	110.74	38.9	33.04	9.28	31.98	100	94	P	V
		5720	49.24	-61.56	110.8	38.9	33.04	9.28	31.98	100	94	P	V
	*	5785	108.05	-	-	97.33	33.26	9.33	31.87	100	94	P	V
	*	5785	100.34	-	-	89.62	33.26	9.33	31.87	100	94	A	V
		5853.4	50.48	-63.97	114.45	39.37	33.55	9.36	31.8	100	94	P	V
		5862.2	50.41	-58.37	108.78	39.16	33.62	9.39	31.76	100	94	P	V
		5917.2	50.41	-23.54	73.95	38.84	33.84	9.42	31.69	100	94	P	V
		5934.6	49.79	-18.41	68.2	38.08	33.91	9.45	31.65	100	94	P	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 165 5825MHz	*	5825	99.73	-	-	88.72	33.48	9.36	31.83	269	345	P	H
	*	5825	92.67	-	-	81.66	33.48	9.36	31.83	269	345	A	H
		5852.2	49.63	-67.55	117.18	38.52	33.55	9.36	31.8	269	345	P	H
		5859	49.39	-60.29	109.68	38.14	33.62	9.39	31.76	269	345	P	H
		5876.8	51.2	-52.66	103.86	39.88	33.69	9.39	31.76	269	345	P	H
		5931.8	49.75	-18.45	68.2	38.11	33.91	9.42	31.69	269	345	P	H
	*	5825	108.14	-	-	97.13	33.48	9.36	31.83	100	69	P	V
	*	5825	99.4	-	-	88.39	33.48	9.36	31.83	100	69	A	V
		5850.4	52.11	-69.18	121.29	41	33.55	9.36	31.8	100	69	P	V
		5857.8	50.88	-59.13	110.01	39.63	33.62	9.39	31.76	100	69	P	V
		5877.2	53.15	-50.42	103.57	41.83	33.69	9.39	31.76	100	69	P	V
		5937.2	50.01	-18.19	68.2	38.3	33.91	9.45	31.65	100	69	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	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	47.57	-26.43	74	55.84	39.32	12.04	59.63	160	360	P	H
		17235	48.45	-19.75	68.2	52.06	41.65	14.83	60.09	170	360	P	H
		11490	47.86	-26.14	74	56.13	39.32	12.04	59.63	160	360	P	V
		17235	49.29	-18.91	68.2	52.9	41.65	14.83	60.09	170	360	P	V
802.11a CH 157 5785MHz		11570	47.84	-26.16	74	56.18	39.24	12.07	59.65	175	198	P	H
		17355	49.01	-19.19	68.2	51.84	42.37	14.9	60.1	189	185	P	H
		11570	48.7	-25.3	74	57.04	39.24	12.07	59.65	175	198	P	V
		17355	48.77	-19.43	68.2	51.6	42.37	14.9	60.1	189	185	P	V
802.11a CH 165 5825MHz		11650	49.97	-24.03	74	58.35	39.19	12.1	59.67	156	347	P	H
		17475	51.85	-16.35	68.2	53.92	43.09	14.96	60.12	150	360	P	H
		11650	48.74	-25.26	74	57.12	39.19	12.1	59.67	156	347	P	V
		17475	51.79	-16.41	68.2	53.86	43.09	14.96	60.12	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	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		5647.4	47.75	-20.45	68.2	37.92	32.68	9.23	32.08	229	344	P	H
		5670	48.25	-34.79	83.04	38.23	32.82	9.25	32.05	229	344	P	H
		5718	49.5	-60.74	110.24	39.16	33.04	9.28	31.98	229	344	P	H
		5724.2	50.62	-69.76	120.38	40.28	33.04	9.28	31.98	229	344	P	H
	*	5745	98.21	-	-	87.74	33.11	9.3	31.94	229	344	P	H
	*	5745	91.33	-	-	80.86	33.11	9.3	31.94	229	344	A	H
		5628.8	48.98	-19.22	68.2	39.22	32.61	9.23	32.08	148	74	P	V
		5693.6	55.06	-45.42	100.48	44.92	32.9	9.25	32.01	148	74	P	V
		5718	51.56	-58.68	110.24	41.22	33.04	9.28	31.98	148	74	P	V
		5725	59.39	-62.81	122.2	49.05	33.04	9.28	31.98	148	74	P	V
	*	5745	107.41	-	-	96.94	33.11	9.3	31.94	148	74	P	V
		5745	101.68	-	-	91.21	33.11	9.3	31.94	148	74	A	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 157 5785MHz		5636.8	47.83	-20.37	68.2	38	32.68	9.23	32.08	199	344	P	H
		5671.2	49.61	-34.32	83.93	39.59	32.82	9.25	32.05	199	344	P	H
		5702	48.73	-57.03	105.76	38.49	32.97	9.28	32.01	199	344	P	H
		5723.4	47.46	-71.09	118.55	37.12	33.04	9.28	31.98	199	344	P	H
	*	5785	98.36	-	-	87.64	33.26	9.33	31.87	199	344	P	H
	*	5785	91.52	-	-	80.8	33.26	9.33	31.87	199	344	A	H
		5851.6	49.05	-69.5	118.55	37.94	33.55	9.36	31.8	199	344	P	H
		5868.6	50.08	-56.91	106.99	38.83	33.62	9.39	31.76	199	344	P	H
		5896.2	50.65	-38.82	89.47	39.18	33.77	9.42	31.72	199	344	P	H
		5946	50.56	-17.64	68.2	38.78	33.98	9.45	31.65	199	344	P	H
		5633.8	48.8	-19.4	68.2	38.97	32.68	9.23	32.08	184	86	P	V
		5698.4	48.43	-55.59	104.02	38.29	32.9	9.25	32.01	184	86	P	V
		5705.8	49.54	-57.29	106.83	39.27	32.97	9.28	31.98	184	86	P	V
		5722.6	50.58	-66.15	116.73	40.24	33.04	9.28	31.98	184	86	P	V
	*	5785	110.66	-	-	99.94	33.26	9.33	31.87	184	86	P	V
	*	5785	102.02	-	-	91.3	33.26	9.33	31.87	184	86	A	V
		5853.4	48.92	-65.53	114.45	37.81	33.55	9.36	31.8	184	86	P	V
		5864.4	50.81	-57.36	108.17	39.56	33.62	9.39	31.76	184	86	P	V
		5881.4	51.44	-49.01	100.45	40.12	33.69	9.39	31.76	184	86	P	V
		5935.4	49.64	-18.56	68.2	37.93	33.91	9.45	31.65	184	86	P	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 165 5825MHz	*	5825	97.38	-	-	86.37	33.48	9.36	31.83	222	344	P	H
	*	5825	91.16	-	-	80.15	33.48	9.36	31.83	222	344	A	H
		5853.6	48.4	-65.59	113.99	37.22	33.62	9.36	31.8	222	344	P	H
		5866.6	49.51	-58.04	107.55	38.26	33.62	9.39	31.76	222	344	P	H
		5920.2	51.24	-20.5	71.74	39.67	33.84	9.42	31.69	222	344	P	H
		5930.8	49.25	-18.95	68.2	37.61	33.91	9.42	31.69	222	344	P	H
	*	5825	109.23	-	-	98.22	33.48	9.36	31.83	223	83	P	V
	*	5825	102.26	-	-	91.25	33.48	9.36	31.83	223	83	A	V
		5850.4	52.31	-68.98	121.29	41.2	33.55	9.36	31.8	223	83	P	V
		5874.2	51.37	-54.05	105.42	40.05	33.69	9.39	31.76	223	83	P	V
		5877.8	53.57	-49.55	103.12	42.25	33.69	9.39	31.76	223	83	P	V
		5947.8	51.53	-16.67	68.2	39.75	33.98	9.45	31.65	223	83	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 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11490	48.01	-25.99	74	56.28	39.32	12.04	59.63	160	360	P	H
HT20		17235	48.63	-19.57	68.2	52.24	41.65	14.83	60.09	170	360	P	H
CH 149		11490	47.54	-26.46	74	55.81	39.32	12.04	59.63	160	360	P	V
5745MHz		17235	48.95	-19.25	68.2	52.56	41.65	14.83	60.09	170	360	P	V
802.11n		11570	48.73	-25.27	74	57.07	39.24	12.07	59.65	175	198	P	H
HT20		17355	49.24	-18.96	68.2	52.07	42.37	14.9	60.1	189	185	P	H
CH 157		11570	48.05	-25.95	74	56.39	39.24	12.07	59.65	175	198	P	V
5785MHz		17355	49.88	-18.32	68.2	52.71	42.37	14.9	60.1	189	185	P	V
802.11n		11650	47.72	-26.28	74	56.1	39.19	12.1	59.67	156	347	P	H
HT20		17475	52.72	-15.48	68.2	54.79	43.09	14.96	60.12	150	360	P	H
CH 165		11650	48.92	-25.08	74	57.3	39.19	12.1	59.67	156	347	P	V
5825MHz		17475	51.72	-16.48	68.2	53.79	43.09	14.96	60.12	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	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		5642.8	48.41	-19.79	68.2	38.58	32.68	9.23	32.08	198	141	P	H
		5666.6	48.1	-32.42	80.52	38.08	32.82	9.25	32.05	198	141	P	H
		5719	55.36	-55.16	110.52	45.02	33.04	9.28	31.98	198	141	P	H
		5723.6	53.9	-65.11	119.01	43.56	33.04	9.28	31.98	198	141	P	H
		5755	99.03	-	-	88.48	33.19	9.3	31.94	198	141	P	H
	*	5755	92.3	-	-	81.75	33.19	9.3	31.94	198	141	A	H
		5852.4	49.56	-67.17	116.73	38.45	33.55	9.36	31.8	198	141	P	H
		5864	51.12	-57.16	108.28	39.87	33.62	9.39	31.76	198	141	P	H
		5891.6	50.48	-42.4	92.88	39.04	33.77	9.39	31.72	198	141	P	H
		5935.4	50.1	-18.1	68.2	38.39	33.91	9.45	31.65	198	141	P	H
		5649.6	51.76	-16.44	68.2	41.86	32.75	9.23	32.08	100	141	P	V
		5652.8	52.64	-17.64	70.28	42.74	32.75	9.23	32.08	100	141	P	V
		5717.4	58.89	-51.18	110.07	48.62	32.97	9.28	31.98	100	141	P	V
		5725	60.66	-61.54	122.2	50.32	33.04	9.28	31.98	100	141	P	V
	*	5755	105.15	-	-	94.6	33.19	9.3	31.94	100	141	P	V
	*	5755	99.79	-	-	89.24	33.19	9.3	31.94	100	141	A	V
		5851.6	49.14	-69.41	118.55	38.03	33.55	9.36	31.8	100	141	P	V
		5860.2	52.35	-56.99	109.34	41.1	33.62	9.39	31.76	100	141	P	V
		5906	49.73	-32.49	82.22	38.19	33.84	9.42	31.72	100	141	P	V
		5942	49.02	-19.18	68.2	37.24	33.98	9.45	31.65	100	141	P	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 159 5795MHz		5641.2	49.76	-18.44	68.2	39.93	32.68	9.23	32.08	102	157	P	H
		5658.4	48.08	-26.36	74.44	38.15	32.75	9.23	32.05	102	157	P	H
		5708.4	49.02	-58.53	107.55	38.75	32.97	9.28	31.98	102	157	P	H
		5721.4	47.64	-66.35	113.99	37.3	33.04	9.28	31.98	102	157	P	H
	*	5795	96.65	-	-	85.86	33.33	9.33	31.87	102	157	P	H
	*	5795	89.44	-	-	78.65	33.33	9.33	31.87	102	157	A	H
		5851.6	48.96	-69.59	118.55	37.85	33.55	9.36	31.8	102	157	P	H
		5867.4	50.14	-57.19	107.33	38.89	33.62	9.39	31.76	102	157	P	H
		5907	51.25	-30.23	81.48	39.71	33.84	9.42	31.72	102	157	P	H
		5931.2	49.64	-18.56	68.2	38	33.91	9.42	31.69	102	157	P	H
		5623.2	49.2	-19	68.2	39.48	32.61	9.23	32.12	227	97	P	V
		5623.2	49.2	-19	68.2	39.48	32.61	9.23	32.12	227	97	P	V
		5715.2	50.35	-59.11	109.46	40.08	32.97	9.28	31.98	227	97	P	V
		5724.6	47.74	-73.55	121.29	37.4	33.04	9.28	31.98	227	97	P	V
		5790	105.76	-	-	94.97	33.33	9.33	31.87	227	97	P	V
	*	5790	99	-	-	88.21	33.33	9.33	31.87	227	97	A	V
		5854	50.12	-62.96	113.08	38.94	33.62	9.36	31.8	227	97	P	V
		5864.6	50.18	-57.93	108.11	38.93	33.62	9.39	31.76	227	97	P	V
		5903	51.11	-33.33	84.44	39.64	33.77	9.42	31.72	227	97	P	V
		5929.6	51.02	-17.18	68.2	39.38	33.91	9.42	31.69	227	97	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	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		11510	48.02	-25.98	74	56.31	39.3	12.04	59.63	160	360	P	H
HT40		17265	49.32	-18.88	68.2	52.72	41.85	14.85	60.1	170	360	P	H
CH 151		11510	48.34	-25.66	74	56.63	39.3	12.04	59.63	160	360	P	V
5755MHz		17265	49.37	-18.83	68.2	52.77	41.85	14.85	60.1	170	360	P	V
802.11n		11590	49.61	-24.39	74	57.95	39.23	12.09	59.66	170	300	P	H
HT40		17385	49.41	-18.79	68.2	52.02	42.58	14.92	60.11	150	200	P	H
CH 159		11590	49.07	-24.93	74	57.41	39.23	12.09	59.66	170	300	P	V
5795MHz		17385	49.26	-18.94	68.2	51.87	42.58	14.92	60.11	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	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		5650	48.21	-19.99	68.2	38.31	32.75	9.23	32.08	169	143	P	H
		5669.8	49.08	-33.81	82.89	39.06	32.82	9.25	32.05	169	143	P	H
		5717.8	51.05	-59.13	110.18	40.71	33.04	9.28	31.98	169	143	P	H
		5724.4	51.86	-68.97	120.83	41.52	33.04	9.28	31.98	169	143	P	H
	*	5775	92.52	-	-	81.86	33.26	9.3	31.9	169	143	P	H
		5775	85.55	-	-	74.89	33.26	9.3	31.9	169	143	A	H
		5850	49.18	-73.02	122.2	38.07	33.55	9.36	31.8	169	143	P	H
		5857.2	49.8	-60.38	110.18	38.59	33.62	9.39	31.8	169	143	P	H
		5924.8	50.55	-17.8	68.35	38.91	33.91	9.42	31.69	169	143	P	H
		5939.8	51.16	-17.04	68.2	39.38	33.98	9.45	31.65	169	143	P	H
		5693.8	54.51	-46.12	100.63	44.37	32.9	9.25	32.01	100	130	P	V
		5717.2	56.26	-53.76	110.02	45.99	32.97	9.28	31.98	100	130	P	V
		5724.8	57.88	-63.86	121.74	47.54	33.04	9.28	31.98	100	130	P	V
	*	5775	100.02	-	-	89.36	33.26	9.3	31.9	100	130	P	V
	*	5775	92.78	-	-	82.12	33.26	9.3	31.9	100	130	A	V
		5851.6	51.53	-67.02	118.55	40.42	33.55	9.36	31.8	100	130	P	V
		5862.8	51.7	-56.91	108.61	40.45	33.62	9.39	31.76	100	130	P	V
		5887.6	51.73	-44.12	95.85	40.29	33.77	9.39	31.72	100	130	P	V
		5949.4	50.23	-17.97	68.2	38.45	33.98	9.45	31.65	100	130	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	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	48.06	-25.94	74	56.38	39.26	12.07	59.65	160	360	P	H
VHT80		17325	48.9	-19.3	68.2	51.94	42.16	14.9	60.1	170	360	P	H
CH 155		11550	47.44	-26.56	74	55.76	39.26	12.07	59.65	160	360	P	V
5775MHz		17325	48.79	-19.41	68.2	51.83	42.16	14.9	60.1	170	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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		(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)

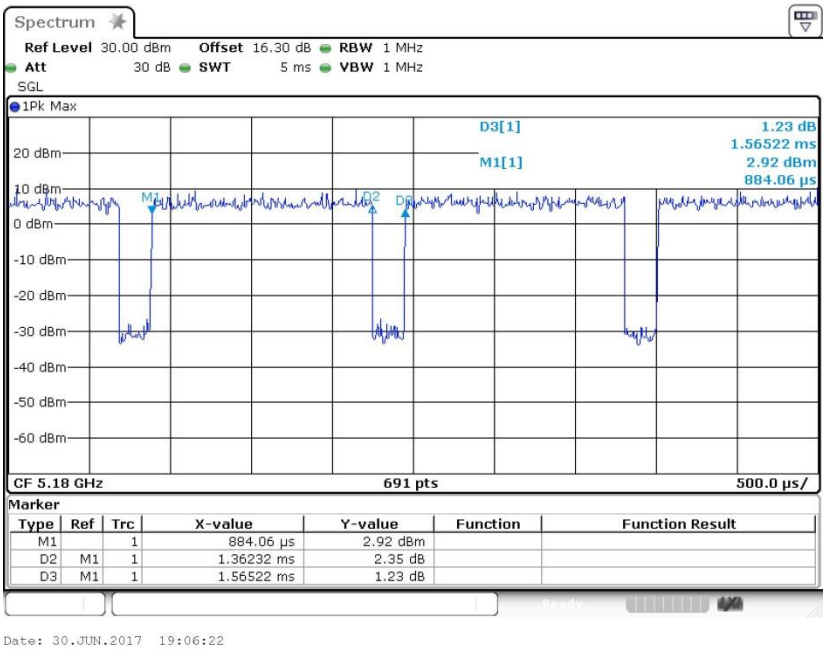
= -10.46(dB)

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

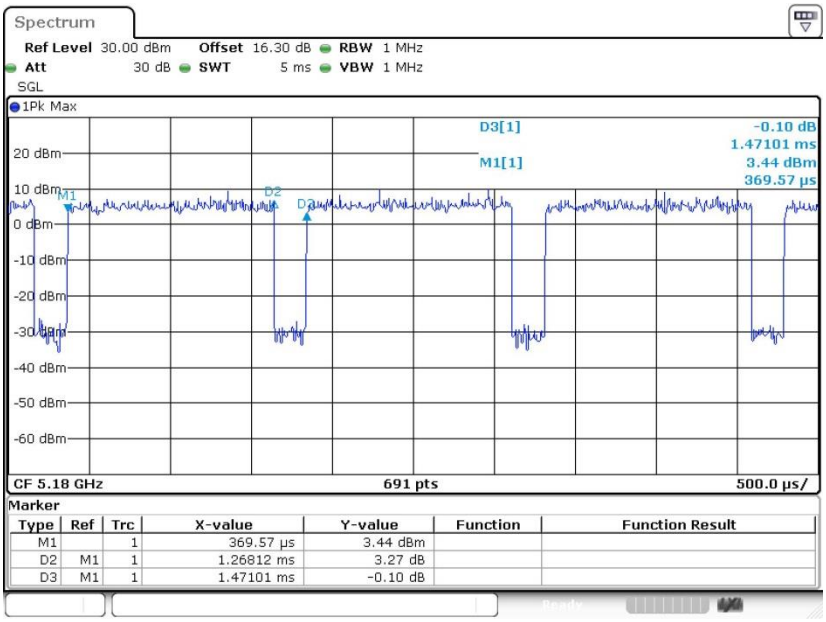
Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	87.04	1.362	0.734	1kHz
802.11n HT20	86.21	1.268	0.789	1kHz
802.11n HT40	72.10	0.603	1.659	3kHz
802.11ac VHT80	48.39	0.217	4.600	10kHz

802.11a



802.11n HT20



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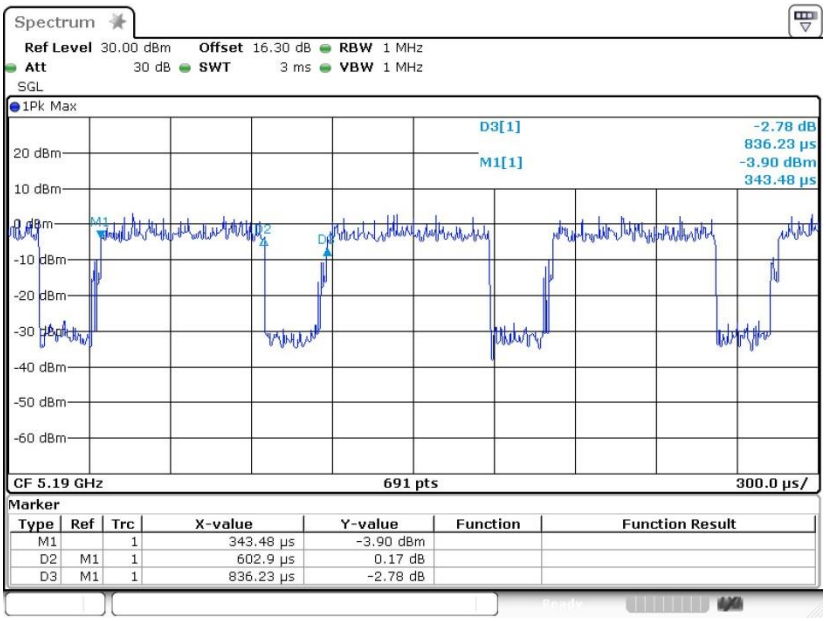
802.11n HT40



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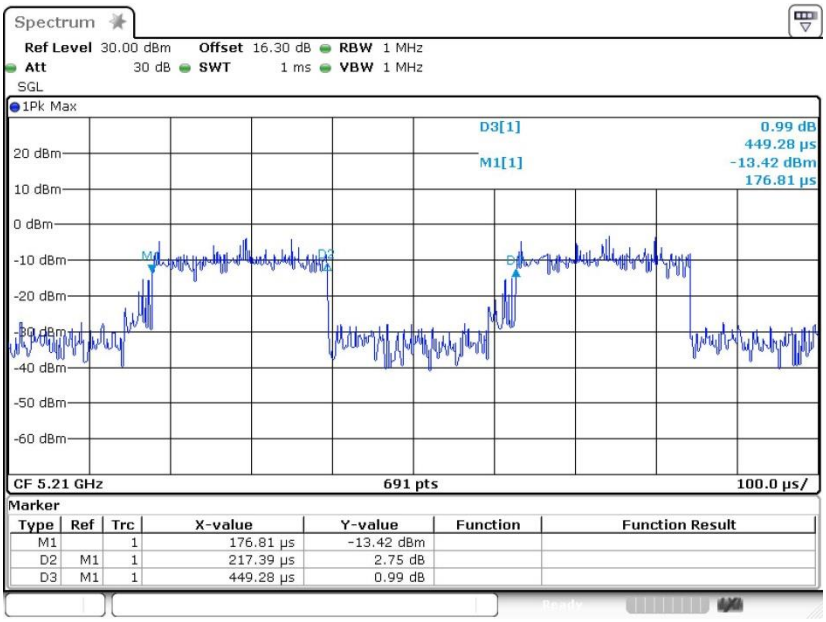
802.11ac VHT80