FCC RF Test Report

APPLICANT	:	**Lenovo(Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	:	**Portable Tablet Computer**
BRAND NAME	:	**Lenovo**
MODEL NAME	:	**Lenovo TB-X704Y**
FCC ID	:	**O57TBX704Y**
STANDARD	:	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	:	**(NII) Unlicensed National Information Infrastructure**

The product was received on Feb. 22, 2017 and testing was completed on Jun. 10, 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.

Prepared by: Eric Shih / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2353

SPORTON International (ShenZhen) INC.
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province, China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR722203-01E	Rev. 01	Initial issue of report	Jun. 26, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	RSS-247 Section 6	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	RSS-247 Section 6	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	RSS-247 Section 6	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	RSS-247 Section 6	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 8.19 dB at 241.460 MHz
3.5	15.207	RSS-Gen 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 7.82 dB at 0.150 MHz
3.6	15.407(g)	-	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	RSS-247 6.4(2)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	N/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-X704Y
FCC ID	O57TBX704Y
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0 + EDR/ v4.0 LE/ v4.1 LE/ v4.2 LE
HW Version	Lenovo Tablet TB-X704Y
SW Version	TB-X704Y_RF01_20170420
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 : 12.74 dBm / 0.0188 W 802.11n HT20 : 12.70 dBm / 0.0186 W 802.11n HT40 : 12.69 dBm / 0.0186 W 802.11ac VHT20: 12.45 dBm / 0.0176 W 802.11ac VHT40: 12.47 dBm / 0.0177 W 802.11ac VHT80: 11.23 dBm / 0.0133 W
99% Occupied Bandwidth	802.11a : 18.68 MHz 802.11n HT20 : 19.28 MHz 802.11n HT40 : 36.76 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 have assessed only 802.11n HT20/ HT40 by referring to their maximum conducted power

.

1.5 Component List

Note: There are two types of EUT, please refer to the following table for the difference between them. According to the difference, we choose sample 1 to perform full test, and sample 2 to verify worst case.

Component	Sample 1	Sample 2
CPU	Qualcomm APQ-8053-1-857NSP-TR-01-0-AB	Qualcomm APQ-8053-1-857NSP-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	2G+16G Samsung KMQE10013M-B318 MCP_16GB+16Gb,LPDDR3	2G+16G Hynix H9TQ17ABJTBCUR-KUM MCP_16GB+16Gb,LPDDR3
LCD	INX: P101KDA-AF0	BOE: TV101WUM-NL1
Battery	SCUD: L16D2P31, 3.85V/7000mAh	Celxpert: L16D2P31, 3.85V/7000mAh
Camera front	Q Tech: F5695AK	AVC: BFL05006
Camera rear	Q Tech: FX219BH	film: L8856A10

1.6 Modification of EUT

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

1.7 Testing Location

Test Site	SPORTON International (ShenZhen) INC.	
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province, China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595	
Test Site No.	**Sporton Site No.**	
	TH01-SZ	CO01-SZ

Test Site	SPORTON International (ShenZhen) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
Test Site No.	**Sporton Site No.**	**FCC/IC Registration No.**
	03CH03-SZ	565805/4086F

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 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 (X plane) 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:

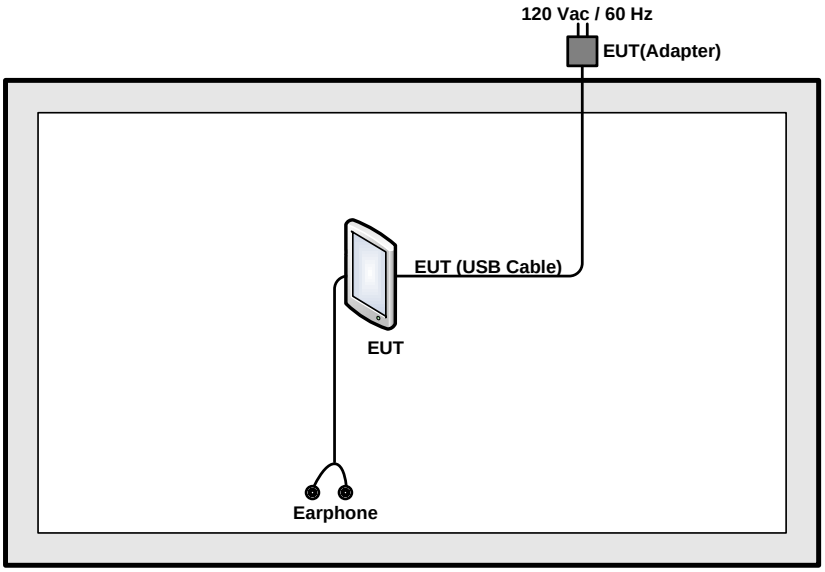
1. For Radiated Test Cases, The tests were performance with Earphone, Adapter and USB Cable.
2. The worst case of conducted emission is mode 2; only the test data of it was reported.

Ch. #		Band IV：5725-5850 MHz		
		802.11a	802.11n HT20	802.11n HT40
L	Low	149	149	151
M	Middle	157	157	-
H	High	165	165	159

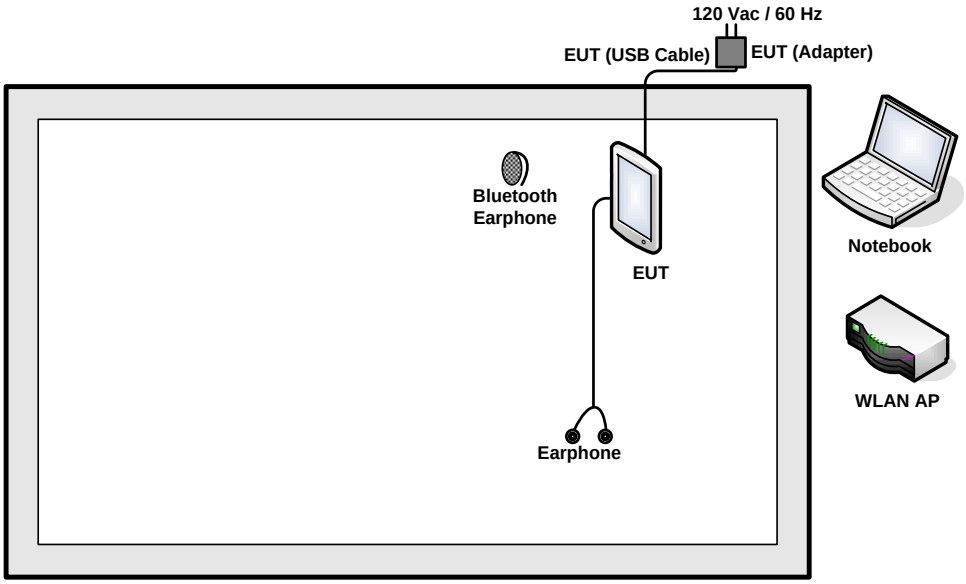
Ch. #		Band IV：5725-5850 MHz
		802.11ac VHT80
L	Low	-
M	Middle	155
H	High	-

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-820L	KA2IR820LA1	N/A	Unshielded, 1.8 m
2.	Notebook	Lenovo	E450	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-108	PYAHS-107W	N/A	N/A
4.	Earphone	Apple	MC690ZP/A	N/A	Unshielded,1.6m	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.

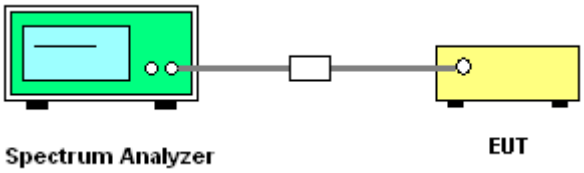
3.1.2 Measuring Instruments

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.

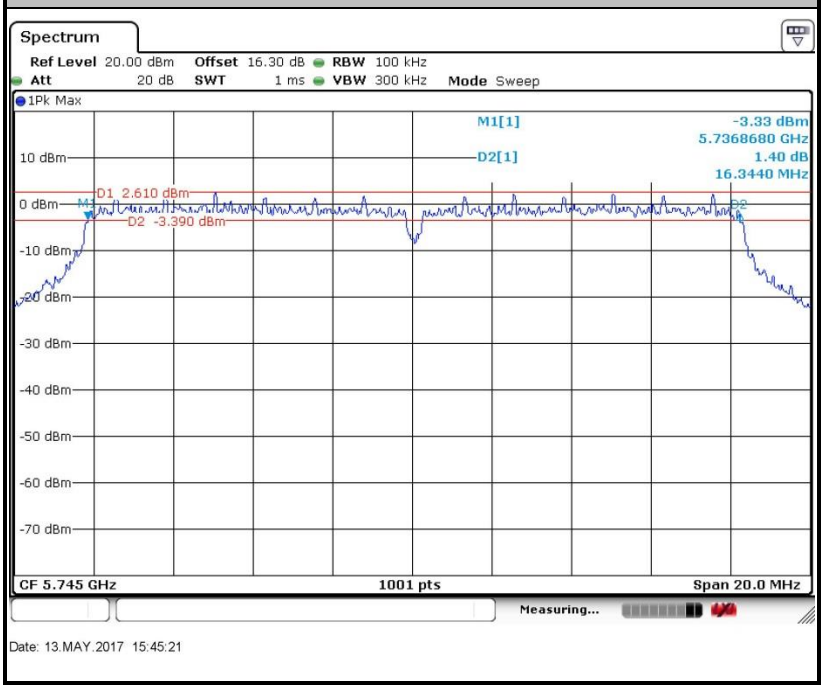
3.1.4 Test Setup



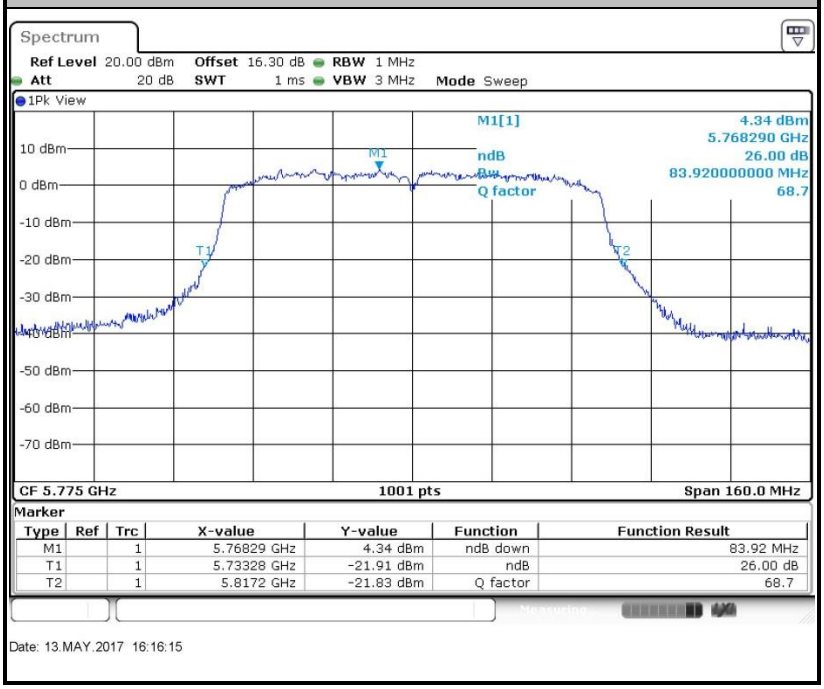
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

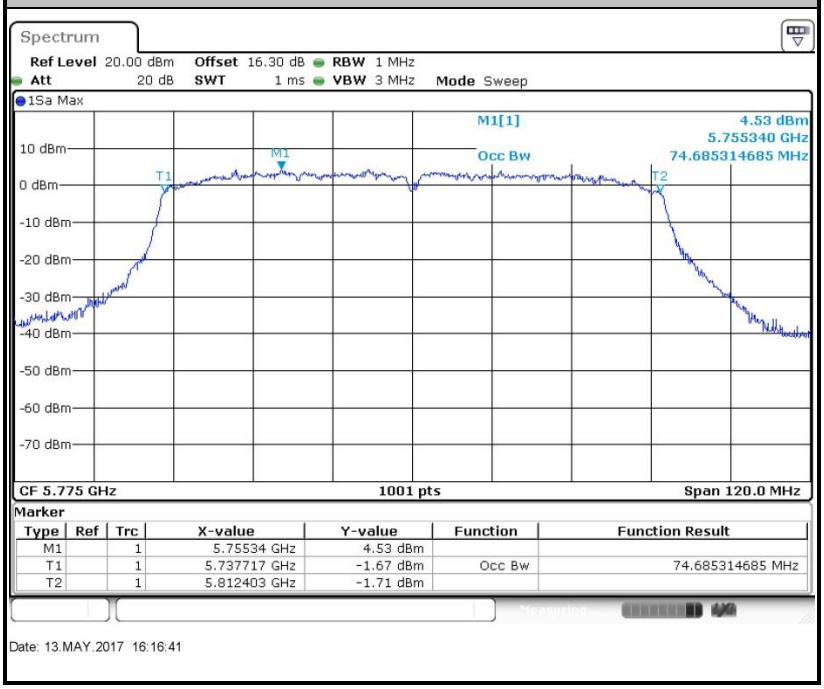
Minimum 6dB Bandwidth



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.

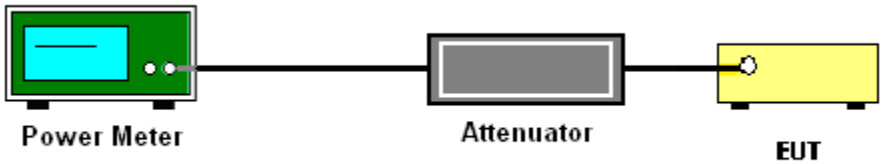
3.2.3 Test Procedures

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.

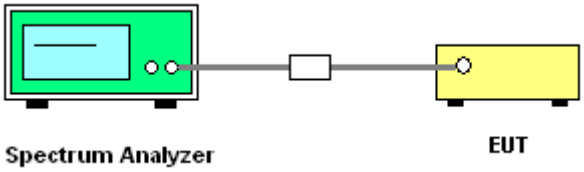
 # Method SA-2 #

(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.

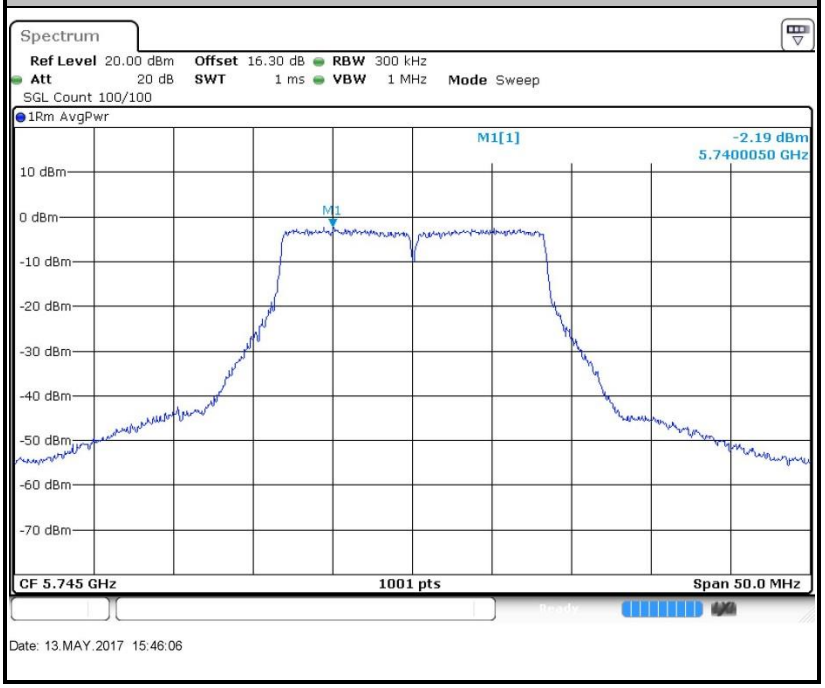
3.3.4 Test Setup



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

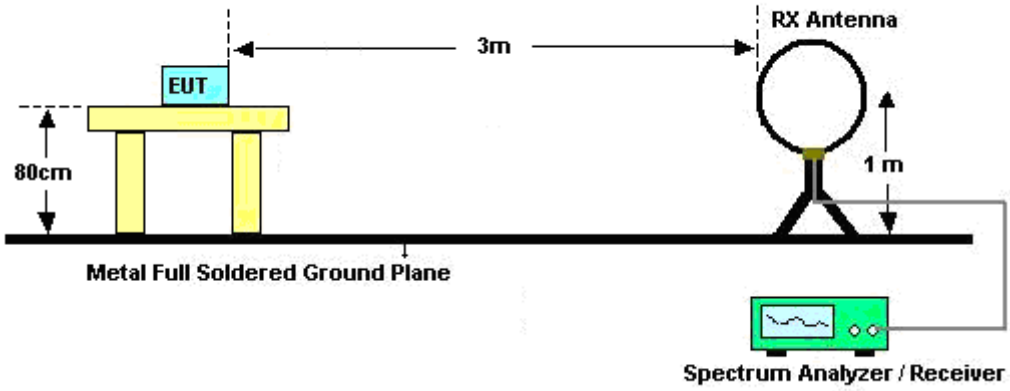
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

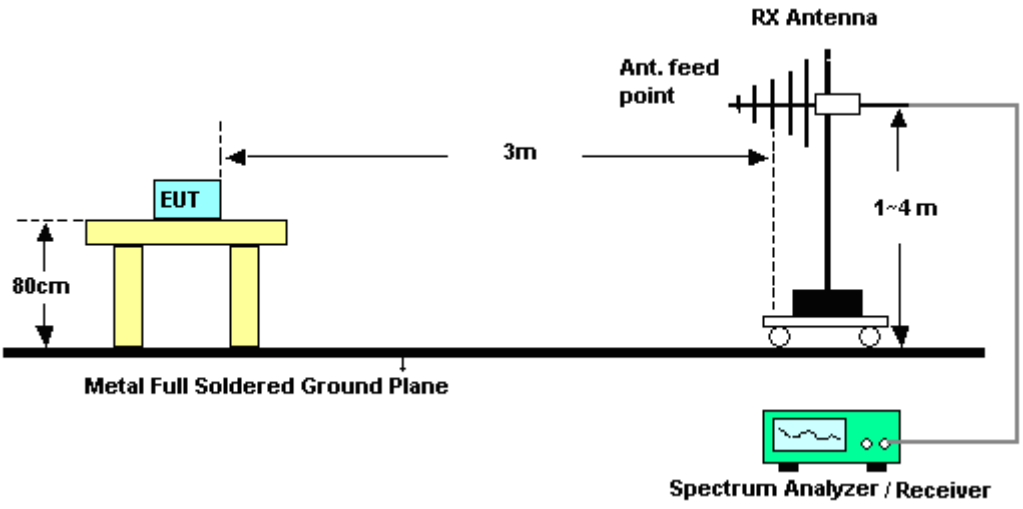
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

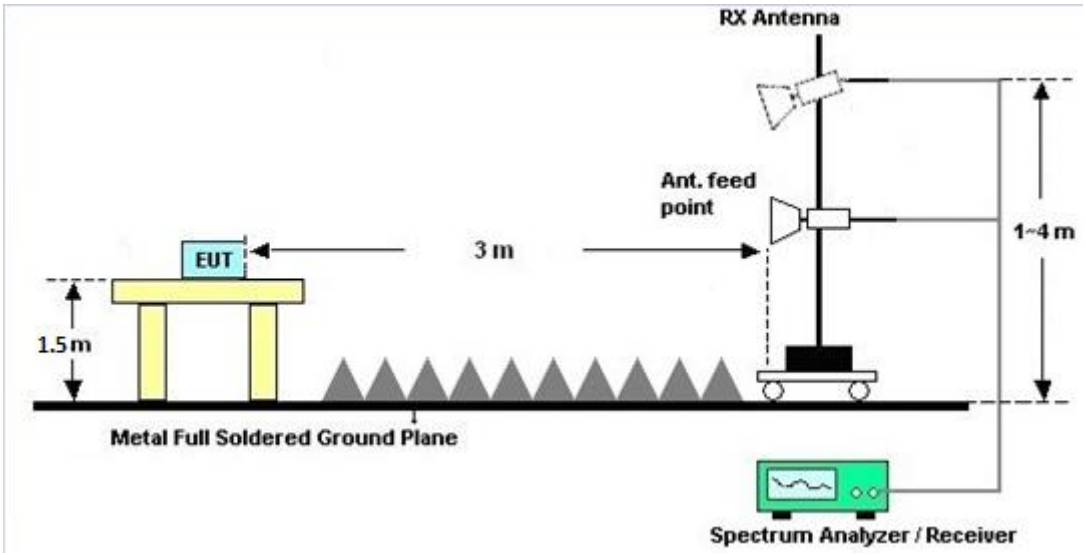
For radiated emissions below 30MHz



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.

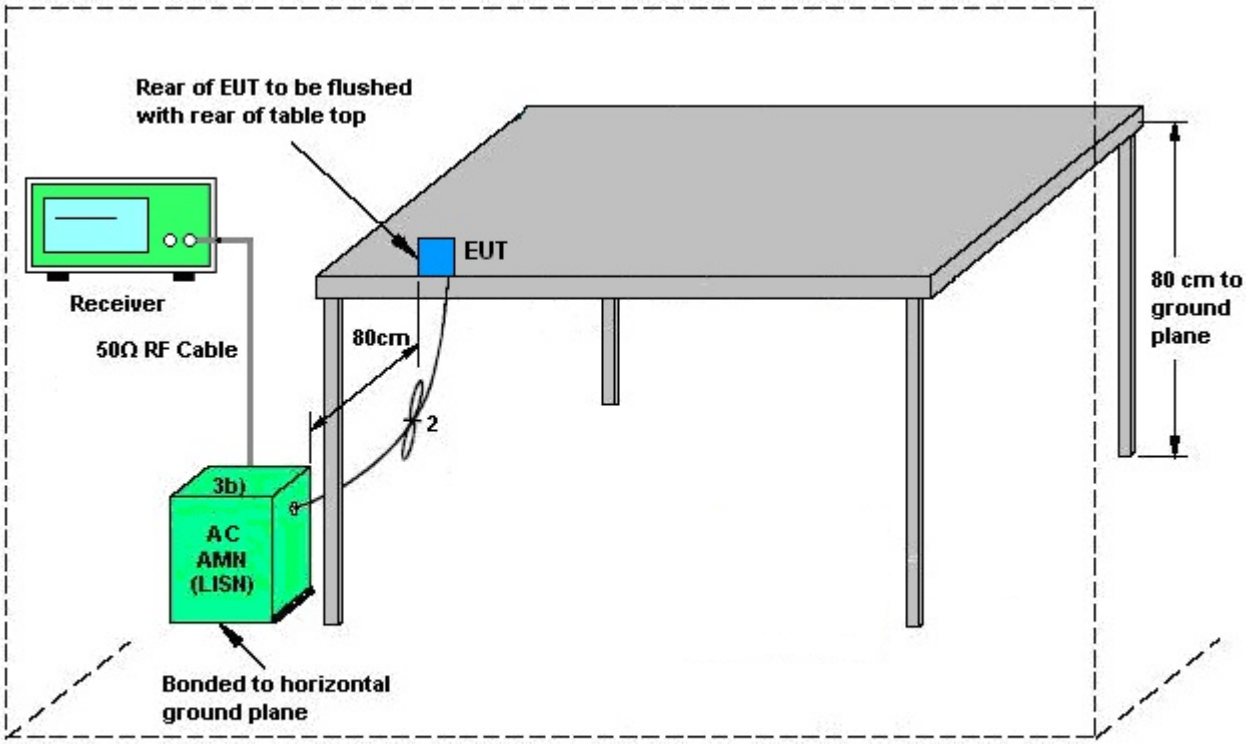
3.5.2 Measuring Instruments

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.

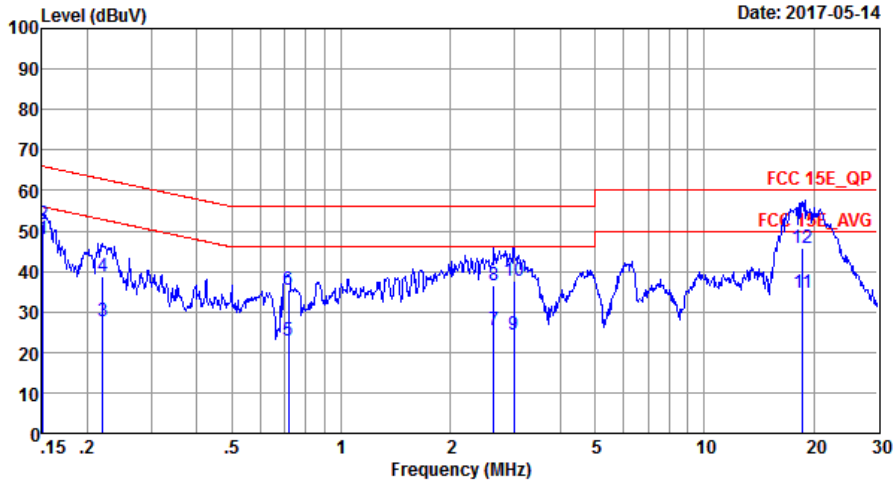
3.5.4 Test Setup



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

3.5.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	**Temperature :**	21~23℃
Test Engineer :	Tao Cheng	**Relative Humidity :**	41~43%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	Bluetooth Link + WLAN Link (5G) + USB Cable 2(Charging from Adapter 2) + Earphone for Sample 2		

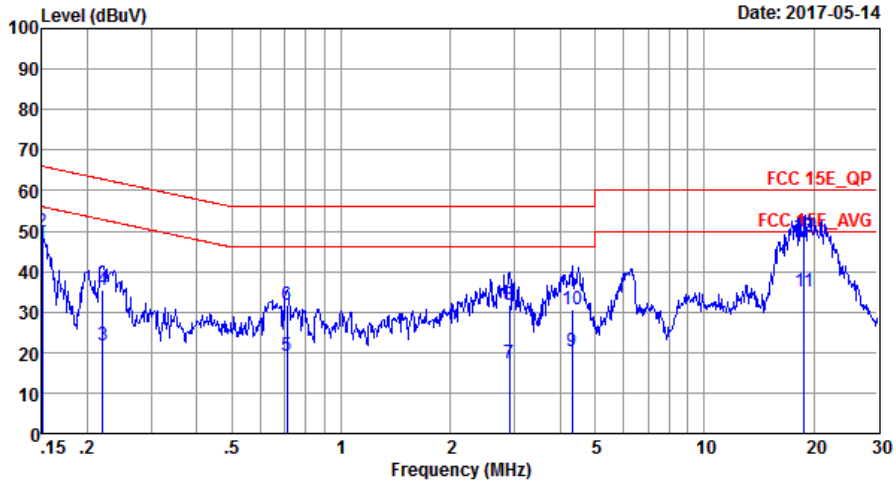


Site : CO01-SZ
Condition: FCC 15E QP LISN 20170301_L LINE

Mode : Mode 2

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.15	48.14	-7.82	55.96	37.70	0.03	10.41	Average
2		0.15	51.74	-14.22	65.96	41.30	0.03	10.41	QP
3		0.22	27.85	-24.94	52.79	17.60	0.03	10.22	Average
4		0.22	38.75	-24.04	62.79	28.50	0.03	10.22	QP
5		0.72	22.79	-23.21	46.00	12.61	0.02	10.16	Average
6		0.72	35.29	-20.71	56.00	25.11	0.02	10.16	QP
7		2.64	25.34	-20.66	46.00	15.00	0.14	10.20	Average
8		2.64	36.44	-19.56	56.00	26.10	0.14	10.20	QP
9		2.99	24.37	-21.63	46.00	14.00	0.16	10.21	Average
10		2.99	37.67	-18.33	56.00	27.30	0.16	10.21	QP
11		18.62	34.77	-15.23	50.00	23.10	1.10	10.57	Average
12		18.62	45.87	-14.13	60.00	34.20	1.10	10.57	QP

Test Mode :	Mode 2	**Temperature :**	21~23℃
Test Engineer :	Tao Cheng	**Relative Humidity :**	41~43%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	Bluetooth Link + WLAN Link (5G) + USB Cable 2(Charging from Adapter 2) + Earphone for Sample 2		



Site : CO01-SZ
Condition: FCC 15E OP LISN 20170301_N NEUTRAL

Mode : Mode 2

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.15	46.34	-9.66	56.00	35.90	0.03	10.41	Average
2	0.15	49.74	-16.26	66.00	39.30	0.03	10.41	QP
3	0.22	21.85	-30.94	52.79	11.60	0.03	10.22	Average
4	0.22	35.35	-27.44	62.79	25.10	0.03	10.22	QP
5	0.71	19.09	-26.91	46.00	8.90	0.02	10.17	Average
6	0.71	31.59	-24.41	56.00	21.40	0.02	10.17	QP
7	2.90	17.24	-28.76	46.00	7.00	0.03	10.21	Average
8	2.90	31.74	-24.26	56.00	21.50	0.03	10.21	QP
9	4.31	20.42	-25.58	46.00	10.10	0.06	10.26	Average
10	4.31	30.52	-25.48	56.00	20.20	0.06	10.26	QP
11	18.82	35.21	-14.79	50.00	24.10	0.53	10.58	Average
12	18.82	48.81	-11.19	60.00	37.70	0.53	10.58	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.

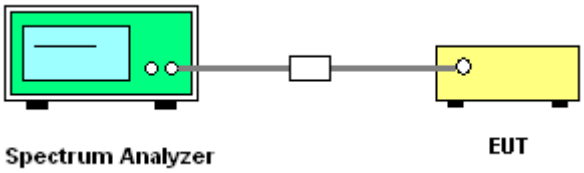
3.6.2 Measuring Instruments

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
Spectrum Analyzer	R&S	FSV40	101078	9kHz~40GHz	Apr. 20. 2017	May 13, 2017	Apr. 19. 2018	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 06, 2017	May 13, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 06, 2017	May 13, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Jul. 16, 2016	May 13, 2017	Jul. 15, 2017	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 20, 2017	Jun. 06, 2017~ Jun. 10, 2017	Apr. 19, 2018	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 20, 2017	Jun. 06, 2017~ Jun. 10, 2017	Apr.19, 2018	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2017	Jun. 06, 2017~ Jun. 10, 2017	May 13, 2018	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	May 14, 2017	Jun. 06, 2017~ Jun. 10, 2017	May 13, 2018	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1285	1GHz~18GHz	Jan. 12, 2017	Jun. 06, 2017~ Jun. 10, 2017	Jan. 11, 2018	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 16. 2016	Jun. 06, 2017~ Jun. 10, 2017	Jul. 15. 2017	Radiation (03CH03-SZ
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug.10, 2016	Jun. 06, 2017~ Jun. 10, 2017	Aug. 09, 2017	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 11, 2016	Jun. 06, 2017~ Jun. 10, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	Jun. 06, 2017~ Jun. 10, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 06, 2017	Jun. 06, 2017~ Jun. 10, 2017	Jan. 05, 2018	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Jun. 06, 2017~ Jun. 10, 2017	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 06, 2017~ Jun. 10, 2017	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 06, 2017~ Jun. 10, 2017	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jan.06, 2017	May 14, 2017	Jan. 05, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Jan.05, 2017	May 14, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103892	9kHz~30MHz	Jan.05, 2017	May 14, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 16, 2016	May 14, 2017	Jul. 15, 2017	Conduction (CO01-SZ)

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))	5.1 dB

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

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

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

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

Appendix A. Conducted Test Results

Report Number : FR72203-01E

Test Engineer:	Wilson Chen	Temperature:	24~26	°C
Test Date:	2017/5/13	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	23.63	16.34	0.5	Pass
11a	6Mbps	1	157	5785	18.43	23.68	16.34	0.5	Pass
11a	6Mbps	1	165	5825	18.53	23.18	16.38	0.5	Pass
HT20	MCS 0	1	149	5745	19.28	23.53	17.60	0.5	Pass
HT20	MCS 0	1	157	5785	19.18	23.83	17.58	0.5	Pass
HT20	MCS 0	1	165	5825	19.18	23.38	17.58	0.5	Pass
HT40	MCS 0	1	151	5755	36.56	44.60	35.13	0.5	Pass
HT40	MCS 0	1	159	5795	36.76	44.33	35.13	0.5	Pass
VHT80	MCS 0	1	155	5775	74.69	83.92	75.05	0.5	Pass

Report Number : FR72203-01E

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	0.58	12.57	30.00	0.19		Pass
11a	6Mbps	1	157	5785	0.58	12.74	30.00	0.19		Pass
11a	6Mbps	1	165	5825	0.58	12.09	30.00	0.19		Pass
HT20	MCS 0	1	149	5745	0.62	12.70	30.00	0.19		Pass
HT20	MCS 0	1	157	5785	0.62	12.34	30.00	0.19		Pass
HT20	MCS 0	1	165	5825	0.62	12.21	30.00	0.19		Pass
HT40	MCS 0	1	151	5755	1.18	12.69	30.00	0.19		Pass
HT40	MCS 0	1	159	5795	1.18	12.63	30.00	0.19		Pass
VHT20	MCS 0	1	149	5745	0.81	12.45	30.00	0.19		Pass
VHT20	MCS 0	1	157	5785	0.81	12.15	30.00	0.19		Pass
VHT20	MCS 0	1	165	5825	0.81	12.21	30.00	0.19		Pass
VHT40	MCS 0	1	151	5755	1.48	12.47	30.00	0.19		Pass
VHT40	MCS 0	1	159	5795	1.48	12.04	30.00	0.19		Pass
VHT80	MCS 0	1	155	5775	2.58	11.23	30.00	0.19		Pass

Report Number : FR72203-01E

TEST RESULTS DATA
Power Spectral Density

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	10log (500kHz /RBW) Factor (dB)	Average Power Density (dBm/500kHz)	Average PSD Limit (dBm/500kHz)	DG (dBi)	Pass/Fail
11a	6M bps	1	149	5745	0.58	2.22	0.61	30.00	0.19	Pass
11a	6Mbps	1	157	5785	0.58	2.22	-0.03	30.00	0.19	Pass
11a	6Mbps	1	165	5825	0.58	2.22	-0.09	30.00	0.19	Pass
HT20	MCS 0	1	149	5745	0.62	2.22	-0.16	30.00	0.19	Pass
HT20	MCS 0	1	157	5785	0.62	2.22	-0.07	30.00	0.19	Pass
HT20	MCS 0	1	165	5825	0.62	2.22	0.05	30.00	0.19	Pass
HT40	MCS 0	1	151	5755	1.18	2.22	-2.36	30.00	0.19	Pass
HT40	MCS 0	1	159	5795	1.18	2.22	-2.61	30.00	0.19	Pass
VHT80	MCS 0	1	155	5775	2.58	2.22	-6.22	30.00	0.19	Pass

Report Number : FR72203-01E

TEST RESULTS DATA
Frequency Stability

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stablility (ppm)	Temperature (℃)	Voltage (V)	Note
11a	6M bps	1	149	5745	5745.025	0.025	4.35	50	3.85	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	-30	3.85	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	20	4.2	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	20	3.5	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	20	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		5646.2	49.24	-18.96	68.2	39.41	32.68	9.23	32.08	163	37	P	H
		5692.4	51.21	-48.39	99.6	41.07	32.9	9.25	32.01	163	37	P	H
		5718	49.26	-60.98	110.24	38.92	33.04	9.28	31.98	163	37	P	H
		5725	54.32	-79.88	134.2	43.98	33.04	9.28	31.98	163	37	P	H
	*	5745	106.36	-	-	95.89	33.11	9.3	31.94	163	37	P	H
	*	5745	97.29	-	-	86.82	33.11	9.3	31.94	163	37	A	H
		5643.4	49.1	-19.1	68.2	39.27	32.68	9.23	32.08	250	113	P	V
		5683.8	48.2	-45.05	93.25	38.06	32.9	9.25	32.01	250	113	P	V
		5710.8	47.58	-60.65	108.23	37.31	32.97	9.28	31.98	250	113	P	V
		5724	47.74	-72.18	119.92	37.4	33.04	9.28	31.98	250	113	P	V
	*	5745	96.95	-	-	86.48	33.11	9.3	31.94	250	113	P	V
	*	5745	87.86	-	-	77.39	33.11	9.3	31.94	250	113	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	161	352	P	H
		5667.4	49.92	-31.19	81.11	39.9	32.82	9.25	32.05	161	352	P	H
		5709.6	48.32	-59.57	107.89	38.05	32.97	9.28	31.98	161	352	P	H
		5724	46.86	-73.06	119.92	36.52	33.04	9.28	31.98	161	352	P	H
	*	5785	106.24	-	-	95.52	33.26	9.33	31.87	161	352	P	H
	*	5785	97.4	-	-	86.68	33.26	9.33	31.87	161	352	A	H
		5850.2	49.34	-72.4	121.74	38.23	33.55	9.36	31.8	161	352	P	H
		5859.4	50.4	-59.17	109.57	39.15	33.62	9.39	31.76	161	352	P	H
		5878.6	50.43	-52.1	102.53	39.11	33.69	9.39	31.76	161	352	P	H
		5945.6	50.24	-17.96	68.2	38.46	33.98	9.45	31.65	161	352	P	H
		5606.6	47.36	-20.84	68.2	37.75	32.53	9.2	32.12	240	47	P	V
		5671	48.03	-35.75	83.78	38.01	32.82	9.25	32.05	240	47	P	V
		5720	48.13	-62.67	110.8	37.79	33.04	9.28	31.98	240	47	P	V
		5720.2	48.15	-63.11	111.26	37.81	33.04	9.28	31.98	240	47	P	V
	*	5785	96.41	-	-	85.69	33.26	9.33	31.87	240	47	P	V
	*	5785	87.9	-	-	77.18	33.26	9.33	31.87	240	47	A	V
		5851.2	47.69	-71.77	119.46	36.58	33.55	9.36	31.8	240	47	P	V
		5859.8	49.69	-59.76	109.45	38.44	33.62	9.39	31.76	240	47	P	V
		5922.6	49.91	-20.06	69.97	38.27	33.91	9.42	31.69	240	47	P	V
		5933.2	50.44	-17.76	68.2	38.8	33.91	9.42	31.69	240	47	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	*	5824	106.31	-	-	95.3	33.48	9.36	31.83	209	356	P	H
	*	5824	96.36	-	-	85.35	33.48	9.36	31.83	209	356	A	H
		5854	51.08	-62	113.08	39.9	33.62	9.36	31.8	209	356	P	H
		5874.6	49.41	-55.9	105.31	38.09	33.69	9.39	31.76	209	356	P	H
		5878.2	52.79	-50.03	102.82	41.47	33.69	9.39	31.76	209	356	P	H
		5946.4	50.4	-17.8	68.2	38.62	33.98	9.45	31.65	209	356	P	H
		5825	99.12	-	-	88.11	33.48	9.36	31.83	250	61	P	V
	*	5825	90.25	-	-	79.24	33.48	9.36	31.83	250	61	A	V
		5851.2	48.61	-70.85	119.46	37.5	33.55	9.36	31.8	250	61	P	V
		5872.8	49.7	-56.12	105.82	38.38	33.69	9.39	31.76	250	61	P	V
		5922.8	49.72	-20.1	69.82	38.08	33.91	9.42	31.69	250	61	P	V
		5943.6	49.18	-19.02	68.2	37.4	33.98	9.45	31.65	250	61	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	49.32	-24.68	74	57.59	39.32	12.04	59.63	160	360	P	H
		17235	51.43	-16.77	68.2	55.04	41.65	14.83	60.09	170	360	P	H
		11490	48.47	-25.53	74	56.74	39.32	12.04	59.63	160	360	P	V
		17235	50.23	-17.97	68.2	53.84	41.65	14.83	60.09	170	360	P	V
802.11a CH 157 5785MHz		11570	47.91	-26.09	74	56.25	39.24	12.07	59.65	175	198	P	H
		17355	51.4	-16.8	68.2	54.23	42.37	14.9	60.1	189	185	P	H
		11570	49.51	-24.49	74	57.85	39.24	12.07	59.65	175	198	P	V
		17355	51.38	-16.82	68.2	54.21	42.37	14.9	60.1	189	185	P	V
802.11a CH 165 5825MHz		11650	48.51	-25.49	74	56.89	39.19	12.1	59.67	156	347	P	H
		17475	53.82	-14.38	68.2	55.89	43.09	14.96	60.12	150	360	P	H
		11650	48.79	-25.21	74	57.17	39.19	12.1	59.67	156	347	P	V
		17475	53.8	-14.4	68.2	55.87	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		5648.8	48	-20.2	68.2	38.17	32.68	9.23	32.08	174	324	P	H
		5693.6	51.59	-48.89	100.48	41.45	32.9	9.25	32.01	174	324	P	H
		5716.6	50.2	-59.65	109.85	39.93	32.97	9.28	31.98	174	324	P	H
		5724.8	56.13	-65.61	121.74	45.79	33.04	9.28	31.98	174	324	P	H
	*	5745	105.17	-	-	94.7	33.11	9.3	31.94	174	324	P	H
	*	5745	97	-	-	86.53	33.11	9.3	31.94	174	324	A	H
		5647.8	48.12	-20.08	68.2	38.29	32.68	9.23	32.08	150	98	P	V
		5678	48.52	-40.44	88.96	38.5	32.82	9.25	32.05	150	98	P	V
		5704	47.21	-59.11	106.32	36.97	32.97	9.28	32.01	150	98	P	V
		5724.8	47.74	-74	121.74	37.4	33.04	9.28	31.98	150	98	P	V
	*	5745	93.7	-	-	83.23	33.11	9.3	31.94	150	98	P	V
	*	5745	85.64	-	-	75.17	33.11	9.3	31.94	150	98	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		5643.6	48.73	-19.47	68.2	38.9	32.68	9.23	32.08	233	360	P	H
		5660.6	48.51	-27.56	76.07	38.56	32.75	9.25	32.05	233	360	P	H
		5705.6	48.31	-58.46	106.77	38.04	32.97	9.28	31.98	233	360	P	H
		5722	48.4	-66.96	115.36	38.06	33.04	9.28	31.98	233	360	P	H
	*	5785	105.44	-	-	94.72	33.26	9.33	31.87	233	360	P	H
	*	5785	96.83	-	-	86.11	33.26	9.33	31.87	233	360	A	H
		5852.6	49.28	-66.99	116.27	38.17	33.55	9.36	31.8	233	360	P	H
		5858.8	49.57	-60.16	109.73	38.32	33.62	9.39	31.76	233	360	P	H
		5910.2	50.78	-28.34	79.12	39.21	33.84	9.42	31.69	233	360	P	H
		5943.4	50.93	-17.27	68.2	39.15	33.98	9.45	31.65	233	360	P	H
		5615.4	48.65	-19.55	68.2	39.04	32.53	9.2	32.12	238	81	P	V
		5666	47.79	-32.29	80.08	37.84	32.75	9.25	32.05	238	81	P	V
		5717.6	47.44	-62.69	110.13	37.1	33.04	9.28	31.98	238	81	P	V
		5724.2	48.96	-71.42	120.38	38.62	33.04	9.28	31.98	238	81	P	V
	*	5785	96.15	-	-	85.43	33.26	9.33	31.87	238	81	P	V
	*	5785	87.96	-	-	77.24	33.26	9.33	31.87	238	81	A	V
		5853.2	47.86	-67.04	114.9	36.75	33.55	9.36	31.8	238	81	P	V
		5872	50.87	-55.17	106.04	39.55	33.69	9.39	31.76	238	81	P	V
		5903.4	50.58	-33.57	84.15	39.11	33.77	9.42	31.72	238	81	P	V
		5947	50.1	-18.1	68.2	38.32	33.98	9.45	31.65	238	81	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	106.1	-	-	95.09	33.48	9.36	31.83	201	360	P	H
	*	5825	97.58	-	-	86.57	33.48	9.36	31.83	201	360	A	H
		5850	52.12	-70.08	122.2	41.01	33.55	9.36	31.8	201	360	P	H
		5855.2	51.14	-59.6	110.74	39.96	33.62	9.36	31.8	201	360	P	H
		5876.8	52.79	-51.07	103.86	41.47	33.69	9.39	31.76	201	360	P	H
		5939.6	51.02	-17.18	68.2	39.24	33.98	9.45	31.65	201	360	P	H
	*	5825	98.45	-	-	87.44	33.48	9.36	31.83	250	72	P	V
	*	5825	89.96	-	-	78.95	33.48	9.36	31.83	250	72	A	V
		5852.8	48.8	-67.02	115.82	37.69	33.55	9.36	31.8	250	72	P	V
		5868.4	49.98	-57.07	107.05	38.73	33.62	9.39	31.76	250	72	P	V
		5877	52.35	-51.36	103.71	41.03	33.69	9.39	31.76	250	72	P	V
		5929.2	49.86	-18.34	68.2	38.22	33.91	9.42	31.69	250	72	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	49.05	-24.95	74	57.32	39.32	12.04	59.63	160	360	P	H
HT20		17235	51	-17.2	68.2	54.61	41.65	14.83	60.09	170	360	P	H
CH 149		11490	50	-24	74	58.27	39.32	12.04	59.63	160	360	P	V
5745MHz		17235	50.74	-17.46	68.2	54.35	41.65	14.83	60.09	170	360	P	V
802.11n		11570	48.38	-25.62	74	56.72	39.24	12.07	59.65	175	198	P	H
HT20		17355	51.41	-16.79	68.2	54.24	42.37	14.9	60.1	189	185	P	H
CH 157		11570	48.93	-25.07	74	57.27	39.24	12.07	59.65	175	198	P	V
5785MHz		17355	51	-17.2	68.2	53.83	42.37	14.9	60.1	189	185	P	V
802.11n		11650	49.01	-24.99	74	57.39	39.19	12.1	59.67	156	347	P	H
HT20		17475	53.68	-14.52	68.2	55.75	43.09	14.96	60.12	150	360	P	H
CH 165		11650	48.41	-25.59	74	56.79	39.19	12.1	59.67	156	347	P	V
5825MHz		17475	53.09	-15.11	68.2	55.16	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		5650	49.53	-18.67	68.2	39.63	32.75	9.23	32.08	150	336	P	H
		5656.8	49.93	-23.32	73.25	40	32.75	9.23	32.05	150	336	P	H
		5718.2	59.29	-51.01	110.3	48.95	33.04	9.28	31.98	150	336	P	H
		5721.6	58.72	-55.73	114.45	48.38	33.04	9.28	31.98	150	336	P	H
	*	5755	104	-	-	93.45	33.19	9.3	31.94	150	336	P	H
	*	5755	96.25	-	-	85.7	33.19	9.3	31.94	150	336	A	H
		5853.6	48.57	-65.42	113.99	37.39	33.62	9.36	31.8	150	336	P	H
		5859	49.37	-60.31	109.68	38.12	33.62	9.39	31.76	150	336	P	H
		5901.4	49.63	-35.99	85.62	38.16	33.77	9.42	31.72	150	336	P	H
		5942.6	49.5	-18.7	68.2	37.72	33.98	9.45	31.65	150	336	P	H
		5632.2	48.93	-19.27	68.2	39.17	32.61	9.23	32.08	175	101	P	V
		5690.8	48.88	-49.54	98.42	38.74	32.9	9.25	32.01	175	101	P	V
		5711.8	48.56	-59.95	108.51	38.29	32.97	9.28	31.98	175	101	P	V
		5720.4	49.31	-62.4	111.71	38.97	33.04	9.28	31.98	175	101	P	V
	*	5755	90.84	-	-	80.29	33.19	9.3	31.94	175	101	P	V
	*	5755	82.55	-	-	72	33.19	9.3	31.94	175	101	A	V
		5851.6	49.39	-69.16	118.55	38.28	33.55	9.36	31.8	175	101	P	V
		5856	50.17	-60.35	110.52	38.96	33.62	9.39	31.8	175	101	P	V
		5907.4	49.34	-31.85	81.19	37.8	33.84	9.42	31.72	175	101	P	V
		5938.2	49.4	-18.8	68.2	37.69	33.91	9.45	31.65	175	101	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		5621.8	49.29	-18.91	68.2	39.57	32.61	9.23	32.12	212	358	P	H
		5692.2	52.39	-47.06	99.45	42.25	32.9	9.25	32.01	212	358	P	H
		5711.6	48.79	-59.66	108.45	38.52	32.97	9.28	31.98	212	358	P	H
		5720.6	47.27	-64.9	112.17	36.93	33.04	9.28	31.98	212	358	P	H
	*	5795	104.17	-	-	93.38	33.33	9.33	31.87	212	358	P	H
	*	5795	95.64	-	-	84.85	33.33	9.33	31.87	212	358	A	H
		5850.2	49.68	-72.06	121.74	38.57	33.55	9.36	31.8	212	358	P	H
		5859.2	50.88	-58.74	109.62	39.63	33.62	9.39	31.76	212	358	P	H
		5903	51.01	-33.43	84.44	39.54	33.77	9.42	31.72	212	358	P	H
		5940	49.92	-18.28	68.2	38.14	33.98	9.45	31.65	212	358	P	H
		5612	47.8	-20.4	68.2	38.19	32.53	9.2	32.12	250	58	P	V
		5685.4	47.94	-46.49	94.43	37.8	32.9	9.25	32.01	250	58	P	V
		5700.8	47.61	-57.81	105.42	37.37	32.97	9.28	32.01	250	58	P	V
		5723.4	47.25	-71.3	118.55	36.91	33.04	9.28	31.98	250	58	P	V
	*	5795	96.77	-	-	85.98	33.33	9.33	31.87	250	58	P	V
	*	5795	87.94	-	-	77.15	33.33	9.33	31.87	250	58	A	V
		5850.4	48.75	-72.54	121.29	37.64	33.55	9.36	31.8	250	58	P	V
		5870	49.14	-57.46	106.6	37.89	33.62	9.39	31.76	250	58	P	V
		5875.8	50.54	-54.07	104.61	39.22	33.69	9.39	31.76	250	58	P	V
		5939.2	49.75	-18.45	68.2	37.97	33.98	9.45	31.65	250	58	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		11570	48.4	-25.6	74	56.74	39.24	12.07	59.65	175	198	P	H
HT40		17355	51.05	-17.15	68.2	53.88	42.37	14.9	60.1	189	185	P	H
CH 151		11570	48.04	-25.96	74	56.38	39.24	12.07	59.65	175	198	P	V
5755MHz		17355	51.79	-16.41	68.2	54.62	42.37	14.9	60.1	189	185	P	V
802.11n		11590	48.77	-25.23	74	57.11	39.23	12.09	59.66	170	300	P	H
HT40		17385	51.32	-16.88	68.2	53.93	42.58	14.92	60.11	150	200	P	H
CH 159		11590	47.99	-26.01	74	56.33	39.23	12.09	59.66	170	300	P	V
5795MHz		17385	51.73	-16.47	68.2	54.34	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		5618.2	48.9	-19.3	68.2	39.21	32.61	9.2	32.12	250	360	P	H
		5699.2	53.18	-51.43	104.61	43.04	32.9	9.25	32.01	250	360	P	H
		5720	54.22	-56.58	110.8	43.88	33.04	9.28	31.98	250	360	P	H
		5722.4	57.21	-59.06	116.27	46.87	33.04	9.28	31.98	250	360	P	H
	*	5775	99.53	-	-	88.87	33.26	9.3	31.9	250	360	P	H
	*	5775	82.69	-	-	72.03	33.26	9.3	31.9	250	360	A	H
		5850.8	51.89	-68.49	120.38	40.78	33.55	9.36	31.8	250	360	P	H
		5858.2	54	-55.9	109.9	42.75	33.62	9.39	31.76	250	360	P	H
		5885.8	50.51	-46.67	97.18	39.15	33.69	9.39	31.72	250	360	P	H
		5939	49.74	-18.46	68.2	37.96	33.98	9.45	31.65	250	360	P	H
		5625	47.26	-20.94	68.2	37.54	32.61	9.23	32.12	250	118	P	V
		5694.4	49.04	-52.03	101.07	38.9	32.9	9.25	32.01	250	118	P	V
		5708.8	47.81	-59.86	107.67	37.54	32.97	9.28	31.98	250	118	P	V
		5724.4	50.03	-70.8	120.83	39.69	33.04	9.28	31.98	250	118	P	V
	*	5775	90.26	-	-	79.6	33.26	9.3	31.9	250	118	P	V
	*	5775	74.37	-	-	63.71	33.26	9.3	31.9	250	118	A	V
		5852.4	50.4	-66.33	116.73	39.29	33.55	9.36	31.8	250	118	P	V
		5857.2	51.78	-58.4	110.18	40.57	33.62	9.39	31.8	250	118	P	V
		5898	49.72	-38.42	88.14	38.25	33.77	9.42	31.72	250	118	P	V
		5928.6	49.34	-18.86	68.2	37.7	33.91	9.42	31.69	250	118	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	48.79	-25.21	74	57.11	39.26	12.07	59.65	160	360	P	H
VHT80		17325	52.32	-15.88	68.2	55.36	42.16	14.9	60.1	170	360	P	H
CH 155		11550	48.67	-25.33	74	56.99	39.26	12.07	59.65	160	360	P	V
5775MHz		17325	50.7	-17.5	68.2	53.74	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.												

Emission below 1GHz

5GHz WIFI 802.11a (LF @ 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)
5GHz 802.11a LF		138.64	28.78	-14.72	43.5	41.08	18.03	1.23	31.56	-	-	P	H
		197.81	35.1	-8.4	43.5	49.28	15.69	1.46	31.33	-	-	P	H
		241.46	37.81	-8.19	46	49.98	17.58	1.63	31.38	164	245	P	H
		379.2	35.36	-10.64	46	40.87	23.69	2.06	31.26	-	-	P	H
		414.12	35.68	-10.32	46	39.07	25.68	2.16	31.23	-	-	P	H
		761.38	36.36	-9.64	46	37.25	27.32	3.01	31.22	-	-	P	H
		166.77	26.23	-17.27	43.5	39.28	17.07	1.33	31.45	-	-	P	V
		241.46	32.83	-13.17	46	45	17.58	1.63	31.38	-	-	P	V
		345.25	32.08	-13.92	46	41.13	20.27	1.96	31.28	-	-	P	V
		415.09	35.16	-10.84	46	38.56	25.66	2.16	31.22	-	-	P	V
		761.38	35.96	-10.04	46	36.85	27.32	3.01	31.22	180	254	P	V
		997.09	34.36	-19.64	54	31.79	30.34	3.47	31.24	-	-	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		(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)

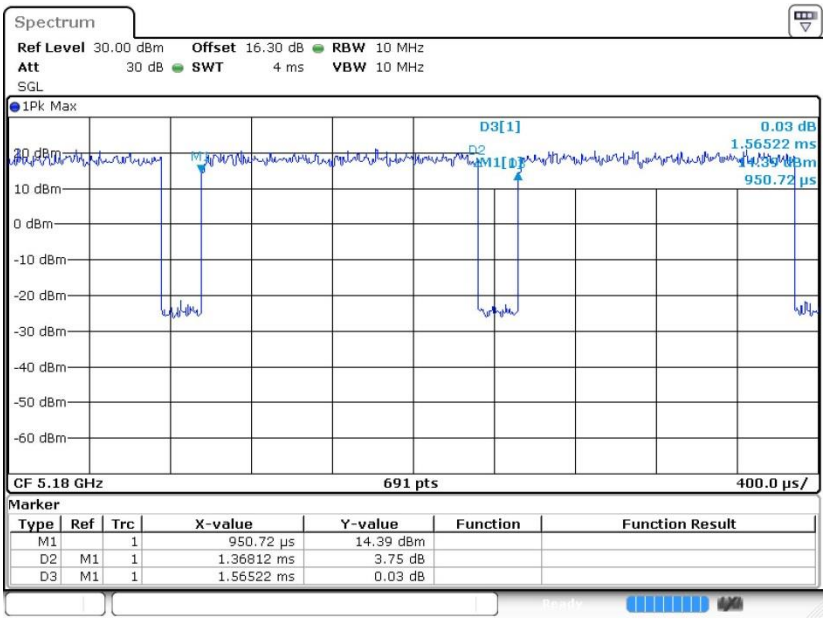
= -10.46(dB)

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	87.41	1.368	0.731	1KHz
802.11n HT20	86.67	1.281	0.781	1KHz
802.11n HT40	76.12	0.638	1.568	3KHz
802.11ac VHT20	83.03	0.978	1.022	3KHz
802.11ac VHT40	71.13	0.493	2.029	3KHz
802.11ac VHT80	55.16	0.248	4.035	10KHz

802.11a



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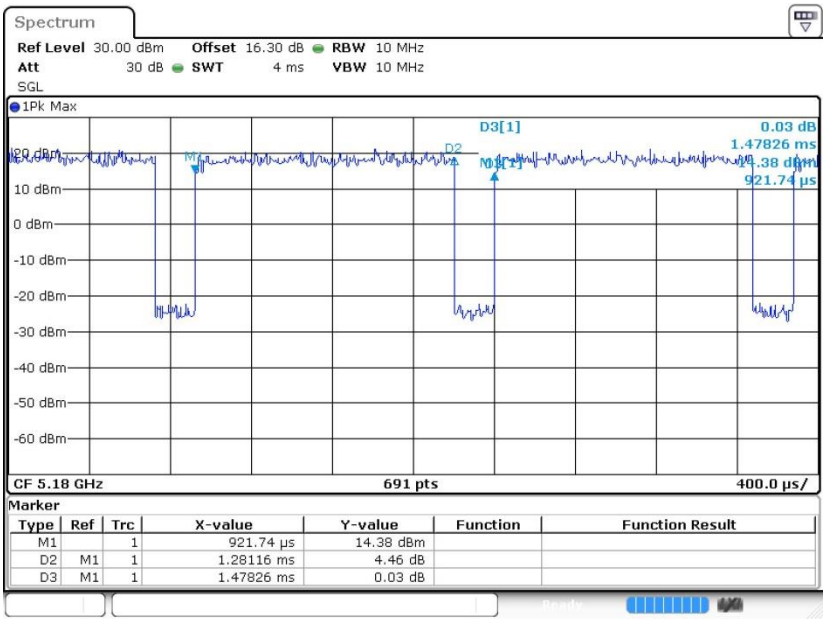
802.11n HT20



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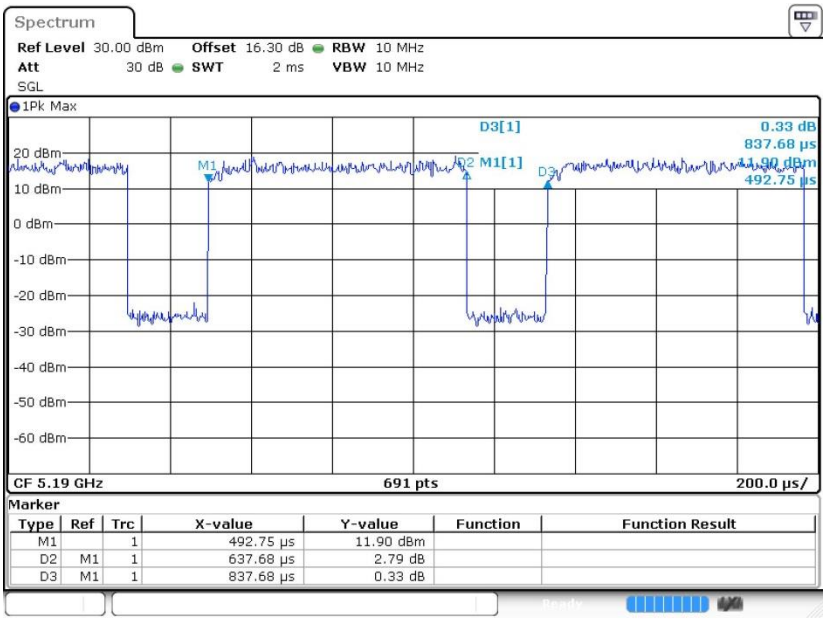
802.11n HT40



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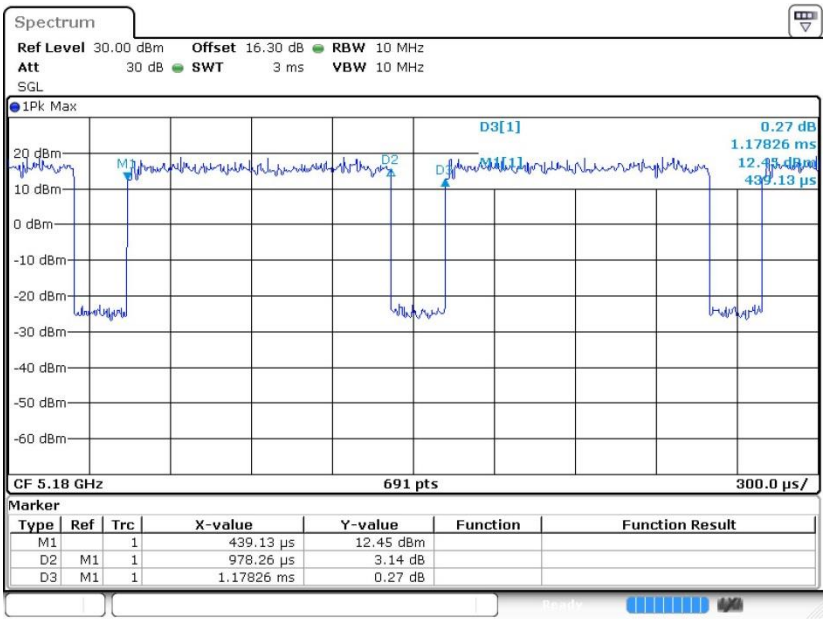
802.11ac VTH20



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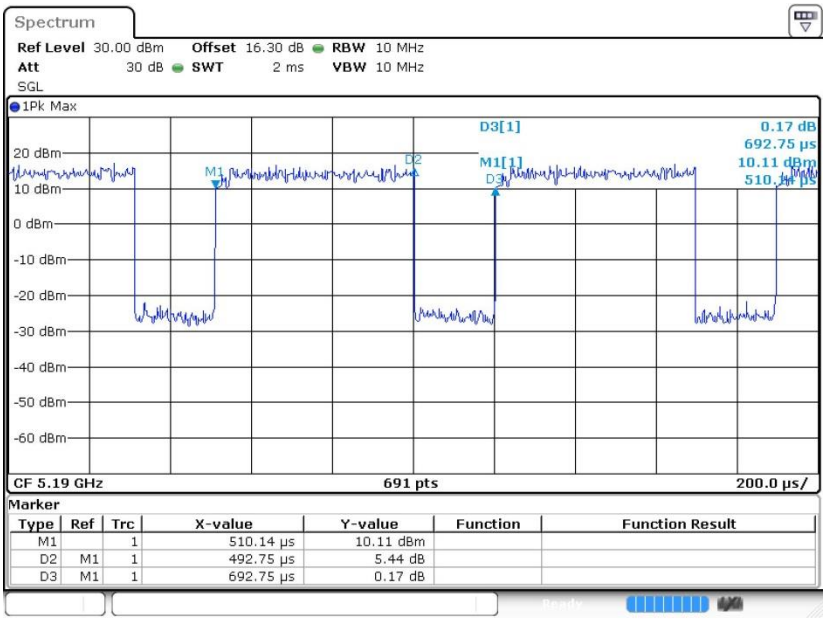

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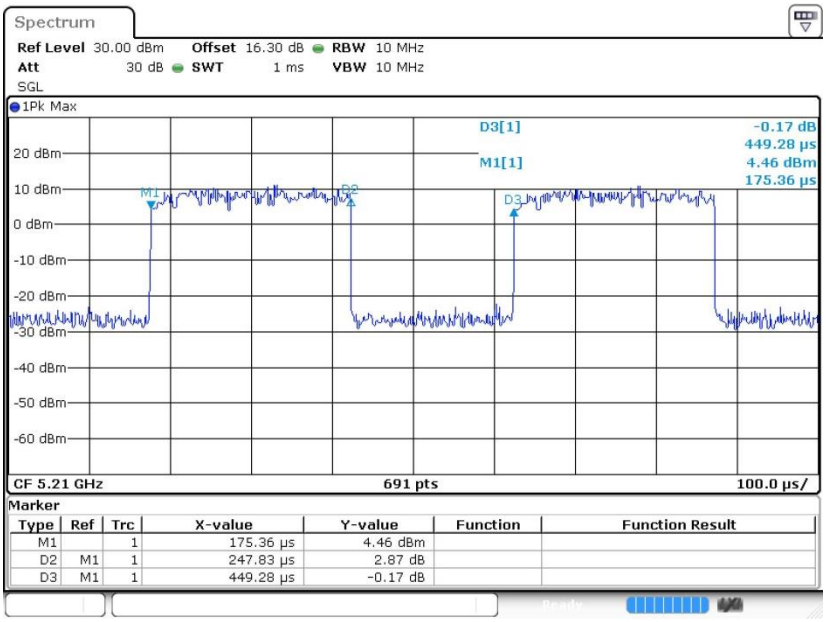

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