



FCC RF Test Report

APPLICANT : Acer Incorporated
EQUIPMENT : Intel Module
BRAND NAME : acer
MODEL NAME : 7265D2W
MARKETING NAME : 7265D2W
FCC ID : HLZ7265D2
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure

The product was integrated the Notebook Computer (Brand Name: acer, Model Name: N17H2, Marketing Name: SP111-32N) during the test.

The product was received on May 05, 2017 and testing was completed on Jun. 06, 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.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR750510E	Rev. 01	Initial issue of report	Jun. 20, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	1
3.1	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
-	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	1
3.2	15.407(b)	Unwanted Emissions	15.407(b) 15.209(a)	Pass	Under limit 3.13 dB at 17355.000 MHz
3.3	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.68 dB at 0.450 MHz
-	15.407(g)	Frequency Stability	Within Operation Band	Pass	1
3.4	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.5	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

Note: 1: All conducted test items were leverage from module RF report which can refer to Report No.

"FCC_7265D2W_UNII_Report".



1 General Description

1.1 Applicant

Acer Incorporated

8F, 88, Sec.1 Xintai 5th Rd., Xizhi, New Taipei City 221, Taiwan, R.O.C

1.2 Manufacturer

Acer Incorporated

8F, 88, Sec.1 Xintai 5th Rd., Xizhi, New Taipei City 221, Taiwan, R.O.C

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Intel Module
Brand Name	acer
Model Name	7265D2W
Marketing Name	7265D2W
FCC ID	HLZ7265D2
EUT supports Radios application	WLAN2.4GHz 802.11b/g/n HT20/HT40 WLAN5GHz 802.11a/n HT20/HT40 WLAN5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0+EDR/ Bluetooth v4.0 LE
HW Version	N/A
SW Version	N/A
EUT Stage	Pre-Production

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>		
		<Ant. 1>		
		802.11a : 14.36 dBm / 0.0273 W		
		802.11n HT20 : 14.35 dBm / 0.0272 W		
		802.11n HT40 : 14.32 dBm / 0.0270 W		
		802.11ac VHT20: 14.20 dBm / 0.0263 W		
		802.11ac VHT40: 14.30 dBm / 0.0269 W		
		802.11ac VHT80: 12.28 dBm / 0.0169 W		
		<Ant. 2>		
		802.11a : 16.31 dBm / 0.0428 W		
802.11n HT20 : 16.21 dBm / 0.0418 W				
802.11n HT40 : 15.67 dBm / 0.0369 W				
802.11ac VHT20: 16.19 dBm / 0.0416 W				
802.11ac VHT40: 15.59 dBm / 0.0362 W				
802.11ac VHT80: 11.04 dBm / 0.0127 W				
MIMO <Ant. 1 + 2>				
802.11n HT20 : 17.00 dBm / 0.0501 W				
802.11n HT40 : 16.94 dBm / 0.0494 W				
802.11ac VHT20: 16.93 dBm / 0.0493 W				
802.11ac VHT40: 16.71 dBm / 0.0469 W				
802.11ac VHT80: 13.68 dBm / 0.0233 W				
Type of Modulation		802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)		
Antenna Type / Gain		<Ant. 1> : PIFA Antenna with gain -0.8 dBi <Ant. 2> : PIFA Antenna with gain -0.7 dBi		
Antenna Function Description				
		802.11 a/n/ac	Ant. 1 V	Ant. 2 V
		802.11 n/ac MIMO	V	V

Note: MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.

Host Feature & Specification	
Equipment Name	Notebook Computer
Brand Name	acer
Model Name	N17H2
Marketing Name	SP111-32N
HW	N8101_MB_V3
SW	15063

1.5 Component list

Remark: There are two types of the host, the details refer the following table. According to the difference, we choose sample 1 to perform full test.

Name	Notebook Computer	
	First Source	Second Source
PCB--MB	N8101_mainboard PCB_V3.0 (EAGLE)	N8101_mainboard PCB_V3.0 (WUZHU)
CPU	N4200 (INTEL)	N3350 (INTEL)
EMMC	128G (SANDISK)	64G (Hynix)
Adapter	Adapter is split type (Delta). The US, EU adapter are the same except pin feet.	Adapter is integrated type (Chicony). The US, EU adapter are the same except pin feet.
Camera	6SF009N2 (LITE-ON)	CNFG023 (Chicony)

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 Registration No.
	03CH03-SZ	565805

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 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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 VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

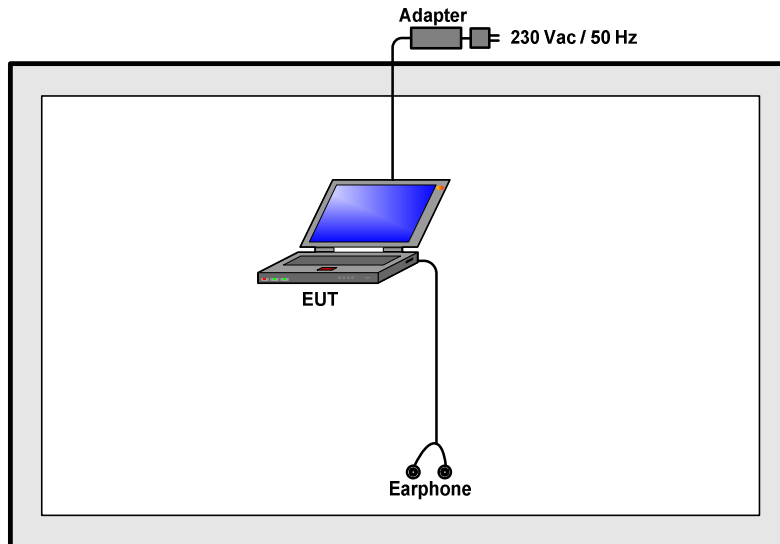
AC Conducted Emission	Mode 1 : WLAN Link (5G band 4) + Bluetooth Link + Adapter 1 + Earphone Mode 2 : WLAN Link (5G band 4) + Bluetooth Link + Adapter 2 + Earphone
Remark: The worst case of conducted emission is mode 2; only the test data of it was reported.	

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

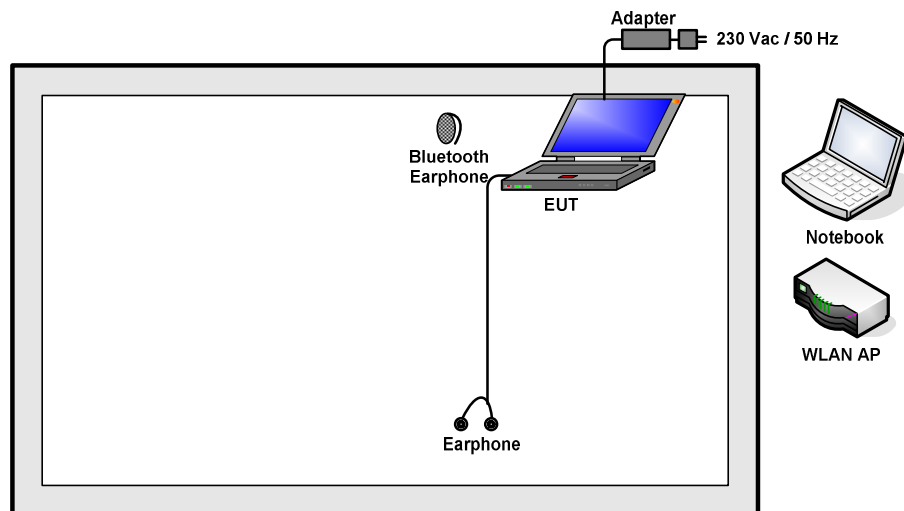
Ch. #		Band IV : 5725-5850 MHz		
		802.11ac VHT20	802.11ac VHT40	802.11ac VHT80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

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, 1.8m
2.	Notebook	Lenovo	E540	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-108	PYAHS-107W	N/A	N/A
4.	iPod Earphone	Apple	MC690ZP/A	FCC DoC	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.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

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

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

3.1.2 Measuring Instruments

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

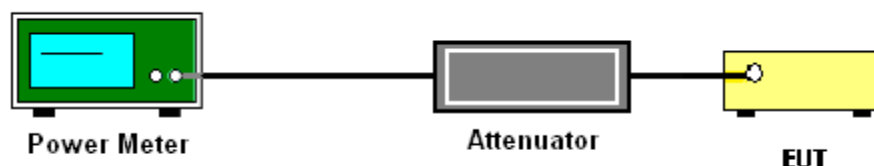
3.1.3 Test Procedures

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

3.1.4 Test Setup





3.1.5 Test Result of Maximum Conducted Output Power

Band IV														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	0.05	0.05	14.36	15.92		30.00	30.00	-0.80	-0.70	Pass
11a	6Mbps	1	157	5785	0.05	0.05	14.05	16.31		30.00	30.00	-0.80	-0.70	Pass
11a	6Mbps	1	165	5825	0.05	0.05	13.78	15.89		30.00	30.00	-0.80	-0.70	Pass
HT20	MCS0	1	149	5745	0.04	0.08	14.07	16.15		30.00	30.00	-0.80	-0.70	Pass
HT20	MCS0	1	157	5785	0.04	0.08	14.35	16.21		30.00	30.00	-0.80	-0.70	Pass
HT20	MCS0	1	165	5825	0.04	0.08	14.32	16.16		30.00	30.00	-0.80	-0.70	Pass
HT40	MCS0	1	151	5755	0.12	0.12	14.32	14.15		30.00	30.00	-0.80	-0.70	Pass
HT40	MCS0	1	159	5795	0.12	0.12	14.19	15.67		30.00	30.00	-0.80	-0.70	Pass
VHT20	MCS0	1	149	5745	0.08	0.06	14.04	16.00		30.00	30.00	-0.80	-0.70	Pass
VHT20	MCS0	1	157	5785	0.08	0.06	14.19	16.19		30.00	30.00	-0.80	-0.70	Pass
VHT20	MCS0	1	165	5825	0.08	0.06	14.20	16.04		30.00	30.00	-0.80	-0.70	Pass
VHT40	MCS0	1	151	5755	0.12	0.12	14.30	13.99		30.00	30.00	-0.80	-0.70	Pass
VHT40	MCS0	1	159	5795	0.12	0.12	14.14	15.59		30.00	30.00	-0.80	-0.70	Pass
VHT80	MCS0	1	155	5775	0.42	0.25	12.28	11.04		30.00	30.00	-0.80	-0.70	Pass
HT20	MCS0	2	149	5745	0.11	0.11	12.74	14.72	16.86	30.00		-0.70		Pass
HT20	MCS0	2	157	5785	0.11	0.11	13.15	14.67	16.99	30.00		-0.70		Pass
HT20	MCS0	2	165	5825	0.11	0.11	12.87	14.87	17.00	30.00		-0.70		Pass
HT40	MCS0	2	151	5755	0.12	0.12	12.27	11.85	15.07	30.00		-0.70		Pass
HT40	MCS0	2	159	5795	0.12	0.12	12.60	14.94	16.94	30.00		-0.70		Pass
VHT20	MCS0	2	149	5745	0.11	0.11	12.28	14.68	16.66	30.00		-0.70		Pass
VHT20	MCS0	2	157	5785	0.11	0.11	13.07	14.26	16.72	30.00		-0.70		Pass
VHT20	MCS0	2	165	5825	0.11	0.11	12.72	14.86	16.93	30.00		-0.70		Pass
VHT40	MCS0	2	151	5755	0.22	0.22	12.27	11.75	15.03	30.00		-0.70		Pass
VHT40	MCS0	2	159	5795	0.22	0.22	12.49	14.64	16.71	30.00		-0.70		Pass
VHT80	MCS0	2	155	5775	0.42	0.45	10.73	10.61	13.68	30.00		-0.70		Pass

3.2 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 Part 15.205.

3.2.1 Limit of Unwanted Emissions

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

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

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

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

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

EIRP (dBm)	Field Strength at 3m (dBμV/m)
-17	78.3
- 27	68.3

(3) KDB789033 D01 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).

3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules 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 $\geq$ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

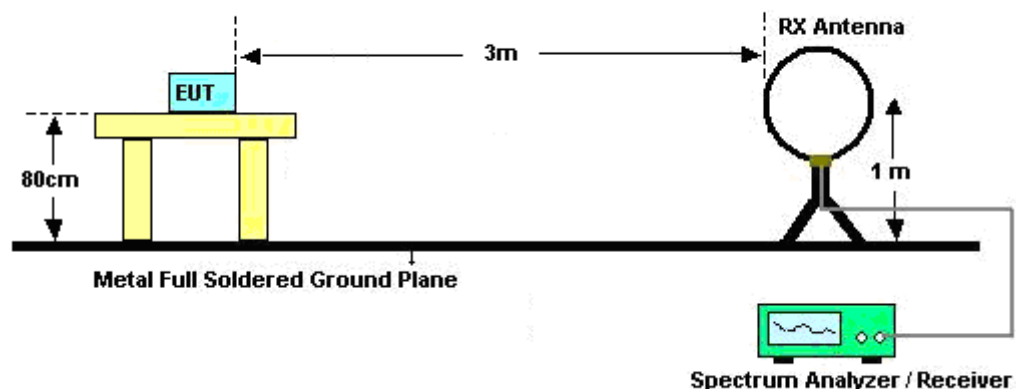
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

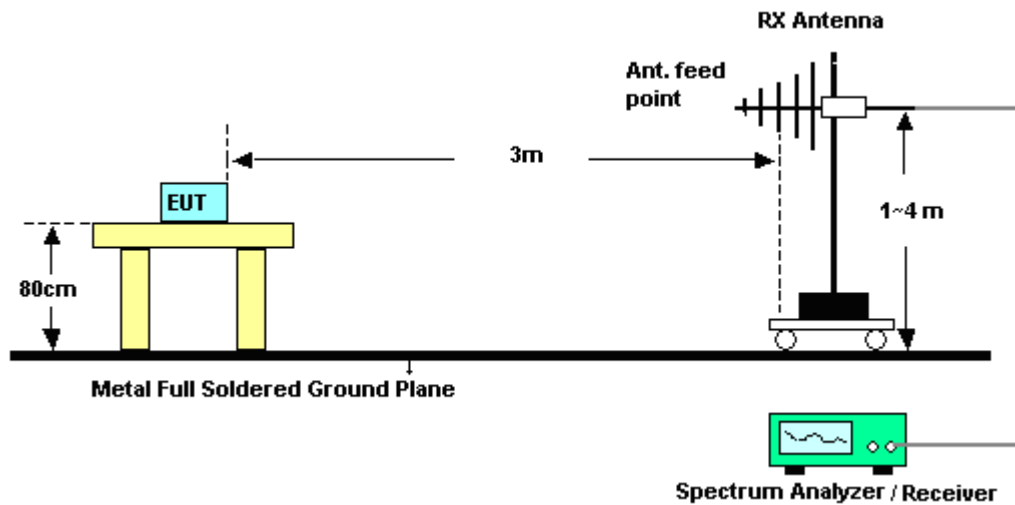
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.2.4 Test Setup

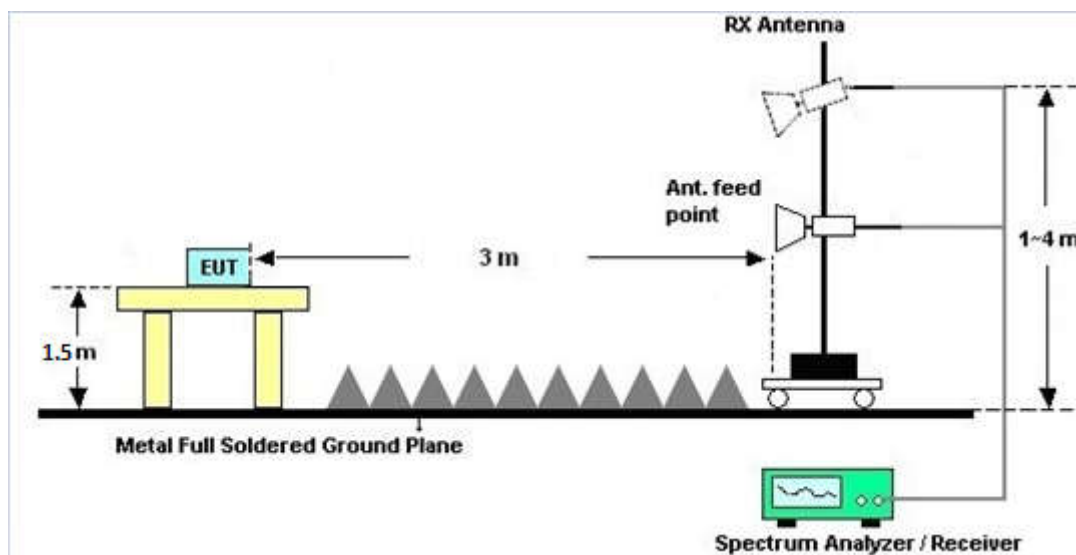
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



**3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

3.2.7 Duty Cycle

Please refer to Appendix B.

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

Please refer to Appendix A.

3.2.9 Test Result of Radiated Spurious Emission (Simultaneous TX)

Please refer to test report (FR750510B).

3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

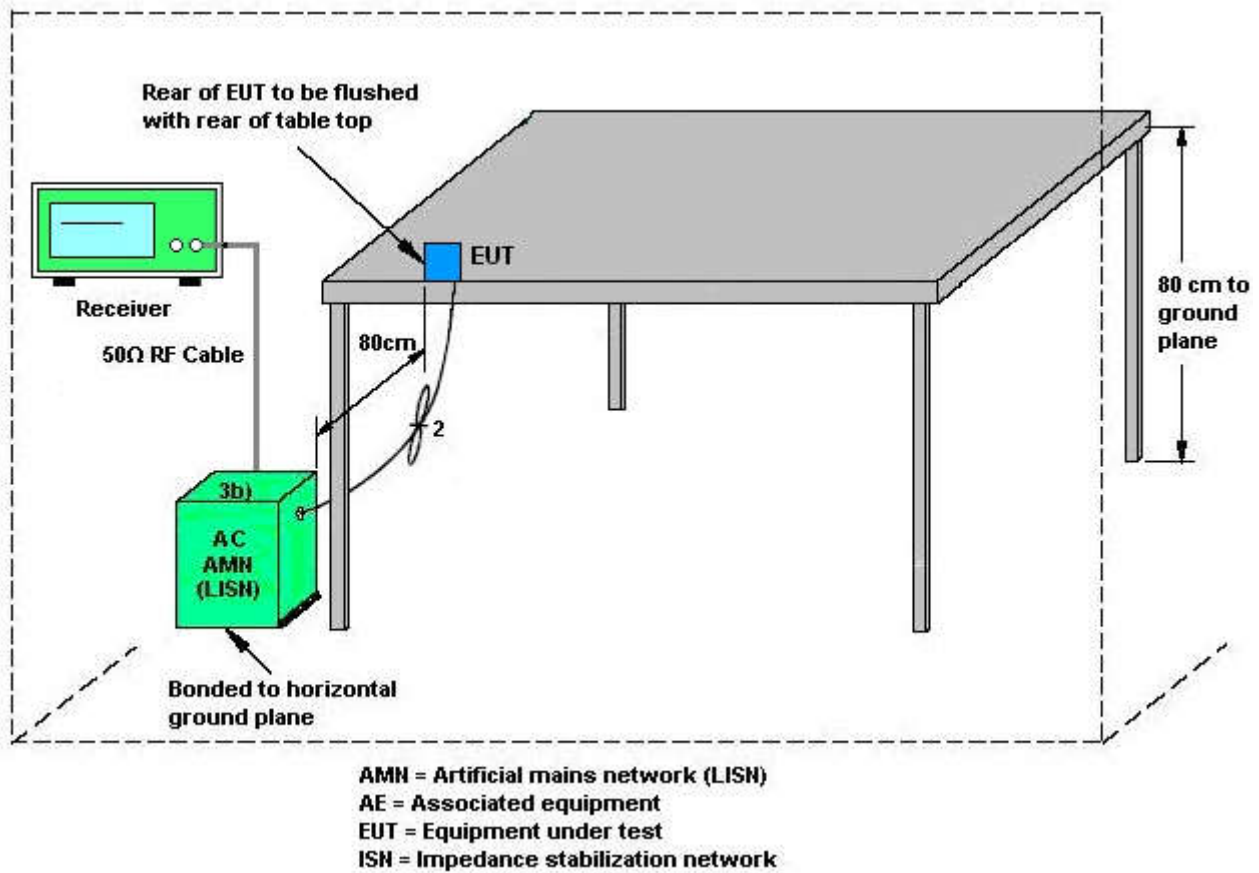
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

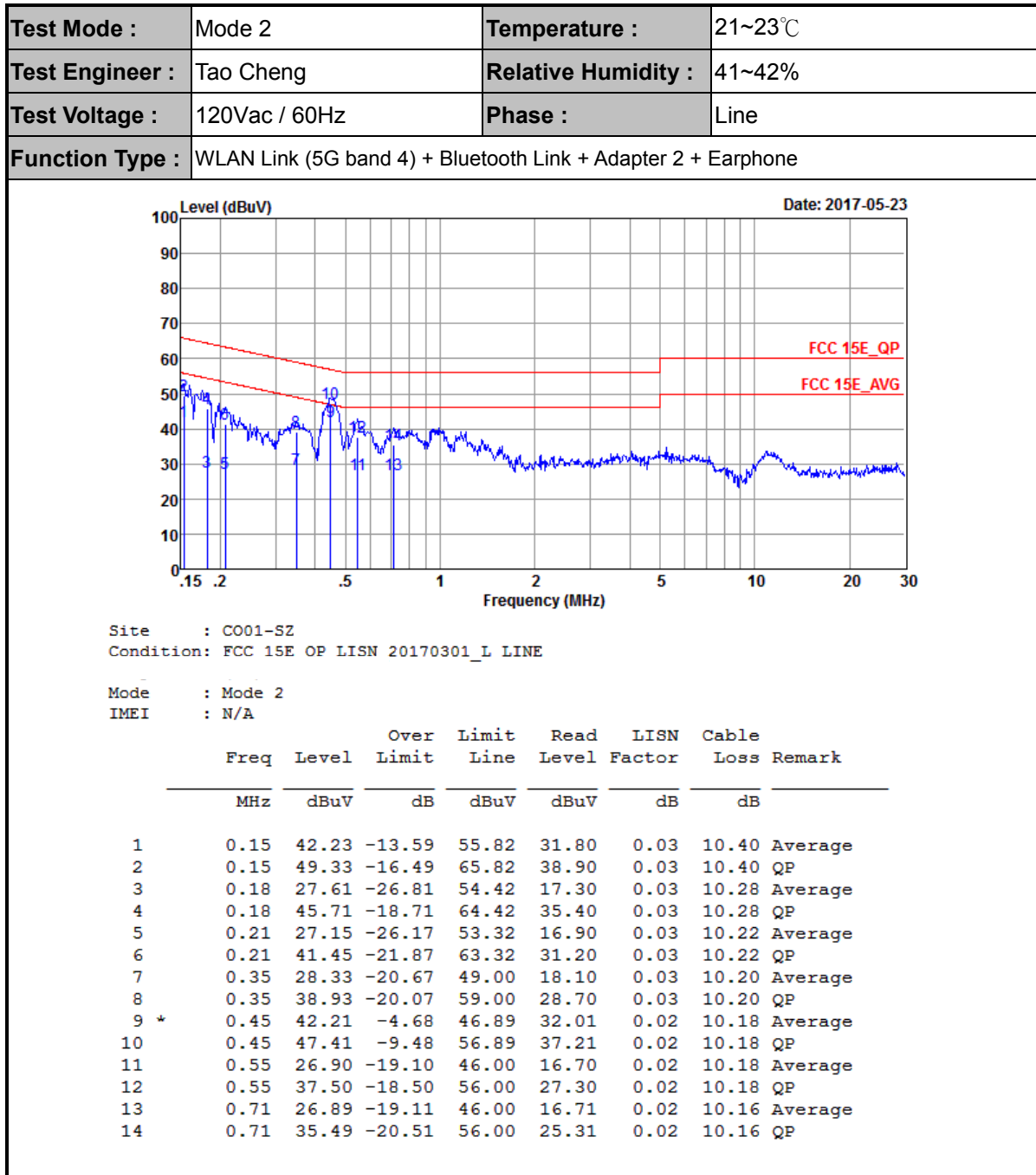
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.3.4 Test Setup



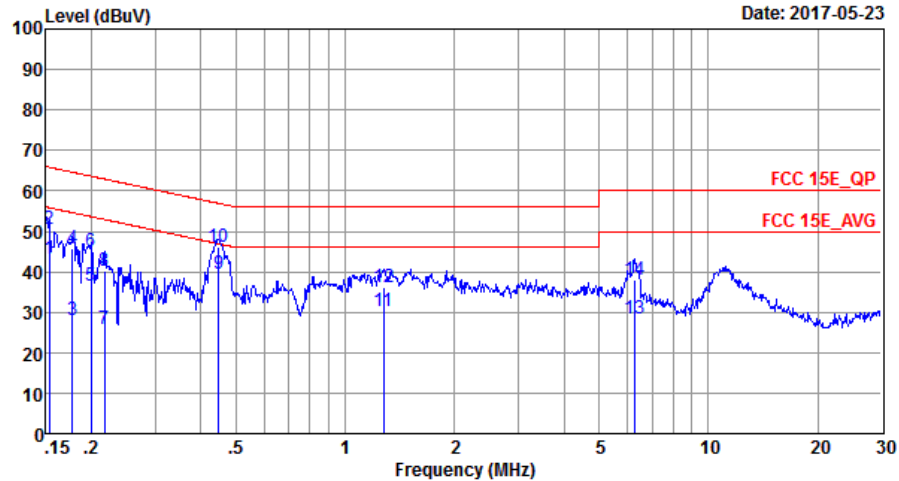


3.3.5 Test Result of AC Conducted Emission





Test Mode :	Mode 2	Temperature :	21~23℃
Test Engineer :	Tao Cheng	Relative Humidity :	41~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Link (5G band 4) + Bluetooth Link + Adapter 2 + Earphone		



Site : CO01-SZ
Condition: FCC 15E QP LISN_20170301_N NEUTRAL

Mode : Mode 2
IMEI : N/A

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.15	43.13	-12.69	55.82	32.70	0.03	10.40	Average
2	0.15	50.53	-15.29	65.82	40.10	0.03	10.40	QP
3	0.18	27.93	-26.66	54.59	17.60	0.03	10.30	Average
4	0.18	45.93	-18.66	64.59	35.60	0.03	10.30	QP
5	0.20	36.55	-17.07	53.62	26.30	0.03	10.22	Average
6	0.20	44.85	-18.77	63.62	34.60	0.03	10.22	QP
7	0.22	25.85	-27.07	52.92	15.60	0.03	10.22	Average
8	0.22	40.35	-22.57	62.92	30.10	0.03	10.22	QP
9 *	0.45	39.60	-7.29	46.89	29.40	0.02	10.18	Average
10	0.45	46.30	-10.59	56.89	36.10	0.02	10.18	QP
11	1.28	30.10	-15.90	46.00	19.90	0.05	10.15	Average
12	1.28	36.10	-19.90	56.00	25.90	0.05	10.15	QP
13	6.29	28.28	-21.72	50.00	17.90	0.07	10.31	Average
14	6.29	38.18	-21.82	60.00	27.80	0.07	10.31	QP



3.4 Automatically Discontinue Transmission

3.4.1 Limit of Automatically Discontinue Transmission

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

3.4.2 Measuring Instruments

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

3.4.3 Test Result of Automatically Discontinue Transmission

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

3.5 Antenna Requirements

3.5.1 Standard Applicable

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

3.5.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.5.3 Antenna Gain

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

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

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

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

For power measurements on IEEE 802.11 devices,

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

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

The EUT supports CDD mode.

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

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

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

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

			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant 1 (dBi)	Ant 2 (dBi)				
Band IV	-0.80	-0.70	-0.70	2.26	0.00	0.00

Power limit reduction = Composite gain – 6dBi, (min = 0)

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, (min = 0)



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	9kHz~40GHz	Apr. 20, 2017	Jun. 02, 2017	Apr.19, 2018	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 06, 2017	Jun. 02, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 06, 2017	Jun. 02, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 20, 2017	Jun. 03, 2017~ Jun. 06, 2017	Apr. 19, 2018	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz	Apr.20, 2017	Jun. 03, 2017~ Jun. 06, 2017	Apr.19, 2018	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2017	Jun. 03, 2017~ Jun. 06, 2017	May 13, 2018	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	May 14, 2017	Jun. 03, 2017~ Jun. 06, 2017	May 13, 2018	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	May 07, 2017	Jun. 03, 2017~ Jun. 06, 2017	May 06, 2018	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Aug. 10, 2016	Jun. 03, 2017~ Jun. 06, 2017	Aug. 09, 2017	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz~3000MHz	Oct. 11, 2016	Jun. 03, 2017~ Jun. 06, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	Jun. 03, 2017~ Jun. 06, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 06, 2017	Jun. 03, 2017~ Jun. 06, 2017	Jan. 05, 2018	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 16, 2016	Jun. 03, 2017~ Jun. 06, 2017	Jul. 15, 2017	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Jun. 03, 2017~ Jun. 06, 2017	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 03, 2017~ Jun. 06, 2017	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 03, 2017~ Jun. 06, 2017	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jan. 06, 2017	May 23, 2017	Jan. 05, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103892	9kHz~30MHz	Jan. 05, 2017	May 23, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103912	9kHz~30MHz	Jan. 05, 2017	May 23, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 16, 2016	May 23, 2017	Jul. 15, 2017	Conduction (CO01-SZ)
Pulse Limiter	COM-POWER	LIT-153 Transient Limiter	53139	150kHz~30MHz	Oct. 11, 2016	May 23, 2017	Oct. 10, 2017	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% ($U = 2Uc(y)$)	2.5 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0 dB
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Appendix A. Radiated Spurious Emission

Band 4 - 5725~5850MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 149 5745MHz		5640.6	51.47	-16.73	68.2	41.64	32.68	9.23	32.08	150	290	P	H
		5700	54.54	-50.66	105.2	44.37	32.9	9.28	32.01	150	290	P	H
		5715	55.91	-53.49	109.4	45.64	32.97	9.28	31.98	150	290	P	H
		5724.2	60.86	-59.52	120.38	50.52	33.04	9.28	31.98	150	290	P	H
	*	5745	108.8	-	-	98.33	33.11	9.3	31.94	150	290	P	H
	*	5745	98.63	-	-	88.16	33.11	9.3	31.94	150	290	A	H
		5632.8	50.62	-17.58	68.2	40.79	32.68	9.23	32.08	150	310	P	V
		5695.4	53.15	-48.66	101.81	43.01	32.9	9.25	32.01	150	310	P	V
		5706	57.03	-49.85	106.88	46.76	32.97	9.28	31.98	150	310	P	V
		5724.4	61.56	-59.27	120.83	51.22	33.04	9.28	31.98	150	310	P	V
	*	5745	107.6	-	-	97.13	33.11	9.3	31.94	150	310	P	V
	*	5745	97.04	-	-	86.57	33.11	9.3	31.94	150	310	A	V



WIFI Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 157 5785MHz		5632.2	50.93	-17.27	68.2	41.17	32.61	9.23	32.08	150	288	P	H
		5671	51.49	-32.29	83.78	41.47	32.82	9.25	32.05	150	288	P	H
		5710.2	53.51	-54.55	108.06	43.24	32.97	9.28	31.98	150	288	P	H
		5721.8	52.9	-62	114.9	42.56	33.04	9.28	31.98	150	288	P	H
	*	5785	108.57	-	-	97.85	33.26	9.33	31.87	150	288	P	H
	*	5785	97.97	-	-	87.25	33.26	9.33	31.87	150	288	A	H
		5851	54.46	-65.46	119.92	43.35	33.55	9.36	31.8	150	288	P	H
		5856.4	54.02	-56.39	110.41	42.81	33.62	9.39	31.8	150	288	P	H
		5885.8	53.67	-43.51	97.18	42.31	33.69	9.39	31.72	150	288	P	H
		5940.2	52.6	-15.6	68.2	40.82	33.98	9.45	31.65	150	288	P	H
		5628.6	50.39	-17.81	68.2	40.63	32.61	9.23	32.08	150	310	P	V
		5661	52.06	-24.31	76.37	42.11	32.75	9.25	32.05	150	310	P	V
		5720	53.44	-57.36	110.8	43.1	33.04	9.28	31.98	150	310	P	V
		5722.4	52.88	-63.39	116.27	42.54	33.04	9.28	31.98	150	310	P	V
	*	5785	107.67	-	-	96.95	33.26	9.33	31.87	150	310	P	V
	*	5785	97.93	-	-	87.21	33.26	9.33	31.87	150	310	A	V
		5854.8	53.21	-58.05	111.26	42.03	33.62	9.36	31.8	150	310	P	V
		5857.4	52.72	-57.41	110.13	41.51	33.62	9.39	31.8	150	310	P	V
		5905.6	52.19	-30.33	82.52	40.65	33.84	9.42	31.72	150	310	P	V
		5942.2	51.22	-16.98	68.2	39.44	33.98	9.45	31.65	150	310	P	V



WIFI Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 165 5825MHz	*	5825	110.82	-	-	99.81	33.48	9.36	31.83	250	298	P	H
	*	5825	100.39	-	-	89.38	33.48	9.36	31.83	250	298	A	H
		5853.6	61.57	-52.42	113.99	50.39	33.62	9.36	31.8	250	298	P	H
		5855.4	59.91	-50.78	110.69	48.73	33.62	9.36	31.8	250	298	P	H
		5877.8	53.8	-49.32	103.12	42.48	33.69	9.39	31.76	250	298	P	H
		5941	52.48	-15.72	68.2	40.7	33.98	9.45	31.65	250	298	P	H
	*	5825	107.03	-	-	96.02	33.48	9.36	31.83	150	310	P	V
	*	5825	97.05	-	-	86.04	33.48	9.36	31.83	150	310	A	V
		5851.6	57.2	-61.35	118.55	46.09	33.55	9.36	31.8	150	310	P	V
		5855.8	54.78	-55.8	110.58	43.57	33.62	9.39	31.8	150	310	P	V
		5877.4	52.85	-50.57	103.42	41.53	33.69	9.39	31.76	150	310	P	V
		5941.8	52.16	-16.04	68.2	40.38	33.98	9.45	31.65	150	310	P	V

**Band 4 5725~5850MHz****WIFI 802.11a (Harmonic @ 3m)**

WIFI Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		11490	50.26	-23.74	74	58.53	39.32	12.04	59.63	250	0	P	H
		17235	50.65	-17.55	68.2	54.26	41.65	14.83	60.09	150	0	P	H
		11490	50.23	-23.77	74	58.5	39.32	12.04	59.63	250	0	P	V
		17235	50.93	-17.27	68.2	54.54	41.65	14.83	60.09	150	0	P	V
802.11a CH 157 5785MHz		11570	50.37	-23.63	74	58.71	39.24	12.07	59.65	250	0	P	H
		17355	49.18	-19.02	68.2	52.01	42.37	14.9	60.1	150	0	P	H
		11570	50.18	-23.82	74	58.52	39.24	12.07	59.65	250	0	P	V
		17355	47.86	-20.34	68.2	50.69	42.37	14.9	60.1	150	0	P	V
802.11a CH 165 5825MHz		11650	48.33	-25.67	74	56.71	39.19	12.1	59.67	250	0	P	H
		17475	49.29	-18.91	68.2	51.36	43.09	14.96	60.12	150	0	P	H
		11650	48.15	-25.85	74	56.53	39.19	12.1	59.67	250	0	P	V
		17475	50.71	-17.49	68.2	52.78	43.09	14.96	60.12	150	0	P	V



Band 4 5725~5850MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 149 5745MHz		5619.2	54.21	-13.99	68.2	44.52	32.61	9.2	32.12	150	306	P	H
		5693.6	58.45	-42.03	100.48	48.31	32.9	9.25	32.01	150	306	P	H
		5719.4	66.11	-44.52	110.63	55.77	33.04	9.28	31.98	150	306	P	H
		5725	77.46	-44.74	122.2	67.12	33.04	9.28	31.98	150	306	P	H
	*	5745	111.15	-	-	100.68	33.11	9.3	31.94	150	306	P	H
	*	5745	101.06	-	-	90.59	33.11	9.3	31.94	150	306	A	H
		5637	54.71	-13.49	68.2	44.88	32.68	9.23	32.08	150	311	P	V
		5700	57.34	-47.86	105.2	47.17	32.9	9.28	32.01	150	311	P	V
		5720	69.54	-41.26	110.8	59.2	33.04	9.28	31.98	150	311	P	V
		5724.2	74.75	-45.63	120.38	64.41	33.04	9.28	31.98	150	311	P	V
		5745	109.91	-	-	99.44	33.11	9.3	31.94	150	311	P	V
	*	5745	110.06	-	-	99.59	33.11	9.3	31.94	150	311	A	V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 157 5785MHz		5625	55.88	-12.32	68.2	46.16	32.61	9.23	32.12	250	296	P	H
		5700	55.58	-49.62	105.2	45.41	32.9	9.28	32.01	250	296	P	H
		5714.8	56.6	-52.75	109.35	46.33	32.97	9.28	31.98	250	296	P	H
		5723.6	57.18	-61.83	119.01	46.84	33.04	9.28	31.98	250	296	P	H
	*	5785	112.84	-	-	102.12	33.26	9.33	31.87	250	296	P	H
	*	5785	102.59	-	-	91.87	33.26	9.33	31.87	250	296	A	H
		5852.8	56.5	-59.32	115.82	45.39	33.55	9.36	31.8	250	296	P	H
		5860.8	56.66	-52.51	109.17	45.41	33.62	9.39	31.76	250	296	P	H
		5893.2	56.32	-35.38	91.7	44.88	33.77	9.39	31.72	250	296	P	H
		5940.8	58.21	-9.99	68.2	46.43	33.98	9.45	31.65	250	296	P	H
		5630.6	52.77	-15.43	68.2	43.01	32.61	9.23	32.08	171	311	P	V
		5672.6	53.27	-31.69	84.96	43.25	32.82	9.25	32.05	171	311	P	V
		5718.8	53.93	-56.53	110.46	43.59	33.04	9.28	31.98	171	311	P	V
		5724.4	54.46	-66.37	120.83	44.12	33.04	9.28	31.98	171	311	P	V
	*	5785	110.1	-	-	99.38	33.26	9.33	31.87	171	311	P	V
	*	5785	100.9	-	-	90.18	33.26	9.33	31.87	171	311	A	V
		5851.8	54.5	-63.6	118.1	43.39	33.55	9.36	31.8	171	311	P	V
		5855.4	55.01	-55.68	110.69	43.83	33.62	9.36	31.8	171	311	P	V
		5908.6	55.49	-24.81	80.3	43.95	33.84	9.42	31.72	171	311	P	V
		5947.6	54.45	-13.75	68.2	42.67	33.98	9.45	31.65	171	311	P	V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 165 5825MHz	*	5825	110.58	-	-	99.57	33.48	9.36	31.83	250	297	P	H
	*	5825	100.25	-	-	89.24	33.48	9.36	31.83	250	297	A	H
		5850.4	62.94	-58.35	121.29	51.83	33.55	9.36	31.8	250	297	P	H
		5856.4	60.6	-49.81	110.41	49.39	33.62	9.39	31.8	250	297	P	H
		5876.2	57.85	-46.46	104.31	46.53	33.69	9.39	31.76	250	297	P	H
		5945	55.61	-12.59	68.2	43.83	33.98	9.45	31.65	250	297	P	H
	*	5825	109.91	-	-	98.9	33.48	9.36	31.83	150	261	P	V
	*	5825	99.7	-	-	88.69	33.48	9.36	31.83	150	261	A	V
		5850	64.67	-57.53	122.2	53.56	33.55	9.36	31.8	150	261	P	V
		5856.6	60.25	-50.1	110.35	49.04	33.62	9.39	31.8	150	261	P	V
		5878	55.54	-47.43	102.97	44.22	33.69	9.39	31.76	150	261	P	V
		5938	54.03	-14.17	68.2	42.32	33.91	9.45	31.65	150	261	P	V



Band 4 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 149 5745MHz		11490	47.39	-26.61	74	55.66	39.32	12.04	59.63	250	0	P	H
		17235	50.23	-17.97	68.2	53.84	41.65	14.83	60.09	150	0	P	H
		11490	47.19	-26.81	74	55.46	39.32	12.04	59.63	250	0	P	V
		17235	49.19	-19.01	68.2	52.8	41.65	14.83	60.09	150	0	P	V
802.11n HT20 CH 157 5785MHz		11570	48.61	-25.39	74	56.95	39.24	12.07	59.65	250	0	P	H
		17355	49.68	-18.52	68.2	52.51	42.37	14.9	60.1	150	0	P	H
		11570	48.14	-25.86	74	56.48	39.24	12.07	59.65	250	0	P	V
		17355	49.96	-18.24	68.2	52.79	42.37	14.9	60.1	150	0	P	V
802.11n HT20 CH 165 5825MHz		11560	47.57	-26.43	74	55.89	39.26	12.07	59.65	250	0	P	H
		17475	49.56	-18.64	68.2	51.63	43.09	14.96	60.12	150	0	P	H
		11650	47.69	-26.31	74	56.07	39.19	12.1	59.67	250	0	P	V
		17475	50.55	-17.65	68.2	52.62	43.09	14.96	60.12	150	0	P	V



Band 4 5725~5850MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 151 5755MHz		5634	50.75	-17.45	68.2	40.92	32.68	9.23	32.08	189	294	P	H
		5699.8	54.1	-50.95	105.05	43.93	32.9	9.28	32.01	189	294	P	H
		5717.2	63.44	-46.58	110.02	53.17	32.97	9.28	31.98	189	294	P	H
		5725	67.86	-54.34	122.2	57.52	33.04	9.28	31.98	189	294	P	H
	*	5755	103.71	-	-	93.16	33.19	9.3	31.94	189	294	P	H
	*	5755	93.42	-	-	82.87	33.19	9.3	31.94	189	294	A	H
		5851.8	53.77	-64.33	118.1	42.66	33.55	9.36	31.8	189	294	P	H
		5865.6	53.23	-54.6	107.83	41.98	33.62	9.39	31.76	189	294	P	H
		5893.8	53.11	-38.14	91.25	41.67	33.77	9.39	31.72	189	294	P	H
		5931	51.25	-16.95	68.2	39.61	33.91	9.42	31.69	189	294	P	H
		5613.4	51.52	-16.68	68.2	41.91	32.53	9.2	32.12	150	321	P	V
		5699.8	54.59	-50.46	105.05	44.42	32.9	9.28	32.01	150	321	P	V
		5718.4	60.48	-49.87	110.35	50.14	33.04	9.28	31.98	150	321	P	V
		5720.8	62.23	-50.39	112.62	51.89	33.04	9.28	31.98	150	321	P	V
	*	5755	101.31	-	-	90.76	33.19	9.3	31.94	150	321	P	V
	*	5755	91.19	-	-	80.64	33.19	9.3	31.94	150	321	A	V
		5850.6	51.24	-69.59	120.83	40.13	33.55	9.36	31.8	150	321	P	V
		5858.6	52.54	-57.25	109.79	41.29	33.62	9.39	31.76	150	321	P	V
		5881	53.08	-47.66	100.74	41.76	33.69	9.39	31.76	150	321	P	V
		5925.8	49.91	-18.29	68.2	38.27	33.91	9.42	31.69	150	321	P	V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 159 5795MHz		5638	52.99	-15.21	68.2	43.16	32.68	9.23	32.08	250	292	P	H
		5683.8	54.56	-38.69	93.25	44.42	32.9	9.25	32.01	250	292	P	H
		5719.8	59.77	-50.97	110.74	49.43	33.04	9.28	31.98	250	292	P	H
		5724	60.16	-59.76	119.92	49.82	33.04	9.28	31.98	250	292	P	H
	*	5795	108.26	-	-	97.47	33.33	9.33	31.87	250	292	P	H
	*	5795	98.04	-	-	87.25	33.33	9.33	31.87	250	292	A	H
		5853	62.75	-52.61	115.36	51.64	33.55	9.36	31.8	250	292	P	H
		5855.2	60.81	-49.93	110.74	49.63	33.62	9.36	31.8	250	292	P	H
		5899.6	59.18	-27.78	86.96	47.71	33.77	9.42	31.72	250	292	P	H
		5944.6	56	-12.2	68.2	44.22	33.98	9.45	31.65	250	292	P	H
		5647	50.95	-17.25	68.2	41.12	32.68	9.23	32.08	150	266	P	V
		5683.2	51.88	-40.92	92.8	41.82	32.82	9.25	32.01	150	266	P	V
		5714.2	55.52	-53.66	109.18	45.25	32.97	9.28	31.98	150	266	P	V
		5723	58.11	-59.53	117.64	47.77	33.04	9.28	31.98	150	266	P	V
	*	5795	105.37	-	-	94.58	33.33	9.33	31.87	150	266	P	V
	*	5795	94.93	-	-	84.14	33.33	9.33	31.87	150	266	A	V
		5853.8	58.17	-55.37	113.54	46.99	33.62	9.36	31.8	150	266	P	V
		5855.4	58.11	-52.58	110.69	46.93	33.62	9.36	31.8	150	266	P	V
		5875.8	54.76	-49.85	104.61	43.44	33.69	9.39	31.76	150	266	P	V
		5938.2	53.21	-14.99	68.2	41.5	33.91	9.45	31.65	150	266	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 151 5755MHz		11510	49.8	-24.2	74	58.09	39.3	12.04	59.63	250	0	P	H
		17265	50.4	-17.8	68.2	53.8	41.85	14.85	60.1	150	0	P	H
		11510	48.53	-25.47	74	56.82	39.3	12.04	59.63	250	0	P	V
		17265	50.26	-17.94	68.2	53.66	41.85	14.85	60.1	150	0	P	V
802.11n HT40 CH 159 5795MHz		11590	47.83	-26.17	74	56.17	39.23	12.09	59.66	250	0	P	H
		17385	49.27	-18.93	68.2	51.88	42.58	14.92	60.11	150	0	P	H
		11590	48.35	-25.65	74	56.69	39.23	12.09	59.66	250	0	P	V
		17385	48.38	-19.82	68.2	50.99	42.58	14.92	60.11	150	0	P	V



Band 4 5725~5850MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 155 5775MHz		5648.4	52.12	-16.08	68.2	42.29	32.68	9.23	32.08	250	294	P	H
		5699.2	59.35	-45.26	104.61	49.21	32.9	9.25	32.01	250	294	P	H
		5712.4	61.6	-47.07	108.67	51.33	32.97	9.28	31.98	250	294	P	H
		5722.2	60.86	-54.96	115.82	50.52	33.04	9.28	31.98	250	294	P	H
	*	5775	98.01	-	-	87.35	33.26	9.3	31.9	250	294	P	H
	*	5775	87.76	-	-	77.1	33.26	9.3	31.9	250	294	A	H
		5850.2	54.07	-67.67	121.74	42.96	33.55	9.36	31.8	250	294	P	H
		5856.4	53.8	-56.61	110.41	42.59	33.62	9.39	31.8	250	294	P	H
		5884	51.21	-47.31	98.52	39.85	33.69	9.39	31.72	250	294	P	H
		5929.2	49.58	-18.62	68.2	37.94	33.91	9.42	31.69	250	294	P	H
		5633.2	48.89	-19.31	68.2	39.06	32.68	9.23	32.08	166	311	P	V
		5700	57.66	-47.54	105.2	47.49	32.9	9.28	32.01	166	311	P	V
		5712.2	60.16	-48.46	108.62	49.89	32.97	9.28	31.98	166	311	P	V
		5723.2	56.94	-61.16	118.1	46.6	33.04	9.28	31.98	166	311	P	V
	*	5775	94.97	-	-	84.31	33.26	9.3	31.9	166	311	P	V
	*	5775	85.53	-	-	74.87	33.26	9.3	31.9	166	311	A	V
		5853.4	52.82	-61.63	114.45	41.71	33.55	9.36	31.8	166	311	P	V
		5863	52.82	-55.74	108.56	41.57	33.62	9.39	31.76	166	311	P	V
		5878.2	50.84	-51.98	102.82	39.52	33.69	9.39	31.76	166	311	P	V
		5948.6	50.49	-17.71	68.2	38.71	33.98	9.45	31.65	166	311	P	V

**Band 4 5725~5850MHz****WIFI 802.11ac VHT80 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac		11550	48.37	-25.63	74	56.69	39.26	12.07	59.65	250	0	P	H
VHT80		17325	48.23	-19.97	68.2	51.27	42.16	14.9	60.1	150	0	P	H
CH 155		11550	47.27	-26.73	74	55.59	39.26	12.07	59.65	250	0	P	V
5775MHz		17325	48.71	-19.49	68.2	51.75	42.16	14.9	60.1	150	0	P	V
Remark	All above test cases are performed on Antenna 2 with adapter 1.												



Verify data

Band 4 5725~5850MHz

WIFI 802.11a (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)
802.11a CH 157 5785MHz		5632.6	50.77	-17.43	68.2	40.94	32.68	9.23	32.08	239	299	P	H
		5654.8	50.44	-21.33	71.77	40.51	32.75	9.23	32.05	239	299	P	H
		5716.2	51.42	-58.32	109.74	41.15	32.97	9.28	31.98	239	299	P	H
		5723.4	50.54	-68.01	118.55	40.2	33.04	9.28	31.98	239	299	P	H
	*	5785	106.52	-	-	95.8	33.26	9.33	31.87	239	299	P	H
	*	5785	96.86	-	-	86.14	33.26	9.33	31.87	239	299	A	H
		5850.2	52.17	-69.57	121.74	41.06	33.55	9.36	31.8	239	299	P	H
		5855.6	53.86	-56.77	110.63	42.65	33.62	9.39	31.8	239	299	P	H
		5880.4	54.85	-46.34	101.19	43.53	33.69	9.39	31.76	239	299	P	H
		5946.4	54.3	-13.9	68.2	42.52	33.98	9.45	31.65	239	299	P	H
		5632.6	50.77	-17.43	68.2	40.94	32.68	9.23	32.08	239	299	P	H
		5654.8	50.44	-21.33	71.77	40.51	32.75	9.23	32.05	239	299	P	H
		5630.2	50.37	-17.83	68.2	40.61	32.61	9.23	32.08	250	360	P	V
		5667.4	50.42	-30.69	81.11	40.4	32.82	9.25	32.05	250	360	P	V
	*	5706	49.99	-56.89	106.88	39.72	32.97	9.28	31.98	250	360	P	V
		5723.6	49.56	-69.45	119.01	39.22	33.04	9.28	31.98	250	360	P	V
		5785	102.15	-	-	91.43	33.26	9.33	31.87	250	360	P	V
		5785	92.14	-	-	81.42	33.26	9.33	31.87	250	360	A	V
		5850.4	50.56	-70.73	121.29	39.45	33.55	9.36	31.8	250	360	P	V
		5874	51.91	-53.57	105.48	40.59	33.69	9.39	31.76	250	360	P	V
		5896.2	52.3	-37.17	89.47	40.83	33.77	9.42	31.72	250	360	P	V
		5941.2	51.69	-16.51	68.2	39.91	33.98	9.45	31.65	250	360	P	V



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 157 5785MHz		11570	47.99	-26.01	74	56.33	39.24	12.07	59.65	250	0	P	H
		17355	56.74	-17.26	74	59.57	42.37	14.9	60.1	150	0	P	H
		17355	47.49	-6.51	54	50.32	42.37	14.9	60.1	150	0	A	H
		11570	47.39	-26.61	74	55.73	39.24	12.07	59.65	250	0	P	V
		17355	58.51	-15.49	74	61.34	42.37	14.9	60.1	150	0	P	V
		17355	50.87	-3.13	54	53.7	42.37	14.9	60.1	150	0	A	V
Remark	This test case is performed on Antenna 1 from worst case of Antenna 2.												



Band 4 5725~5850MHz
WIFI 802.11a (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)
802.11a CH 157 5785MHz		5642.4	50.56	-17.64	68.2	40.73	32.68	9.23	32.08	238	290	P	H
		5693.4	51.51	-48.82	100.33	41.37	32.9	9.25	32.01	238	290	P	H
		5712.2	51.37	-57.25	108.62	41.1	32.97	9.28	31.98	238	290	P	H
		5721.8	52.52	-62.38	114.9	42.18	33.04	9.28	31.98	238	290	P	H
	*	5785	108.48	-	-	97.76	33.26	9.33	31.87	238	290	P	H
	*	5785	99.19	-	-	88.47	33.26	9.33	31.87	238	290	A	H
		5854	52.51	-60.57	113.08	41.33	33.62	9.36	31.8	238	290	P	H
		5858.8	52.99	-56.74	109.73	41.74	33.62	9.39	31.76	238	290	P	H
		5919.4	52.77	-19.56	72.33	41.2	33.84	9.42	31.69	238	290	P	H
		5935.8	51.76	-16.44	68.2	40.05	33.91	9.45	31.65	238	290	P	H
		5628.4	50.43	-17.77	68.2	40.67	32.61	9.23	32.08	150	300	P	V
		5696	51.21	-51.04	102.25	41.07	32.9	9.25	32.01	150	300	P	V
	*	5714.6	51.8	-57.49	109.29	41.53	32.97	9.28	31.98	150	300	P	V
		5720.6	51.03	-61.14	112.17	40.69	33.04	9.28	31.98	150	300	P	V
		5785	106.85	-	-	96.13	33.26	9.33	31.87	150	300	P	V
		5785	99.2	-	-	88.48	33.26	9.33	31.87	150	300	A	V
		5854.6	51.79	-59.92	111.71	40.61	33.62	9.36	31.8	150	300	P	V
		5860.2	53.54	-55.8	109.34	42.29	33.62	9.39	31.76	150	300	P	V
		5876.6	52.3	-51.71	104.01	40.98	33.69	9.39	31.76	150	300	P	V
		5928	51.25	-16.95	68.2	39.61	33.91	9.42	31.69	150	300	P	V

**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 157 5785MHz		11570	48.88	-25.12	74	57.22	39.24	12.07	59.65	175	198	P	H
		17355	55.51	-12.69	68.2	58.34	42.37	14.9	60.1	189	185	P	H
		17355	46.67	-7.33	54	49.5	42.37	14.9	60.1	189	185	A	H
		11570	48.07	-25.93	74	56.41	39.24	12.07	59.65	175	198	P	V
		17355	55.36	-12.84	68.2	58.19	42.37	14.9	60.1	189	185	P	V
		17355	45.75	-8.25	54	48.58	42.37	14.9	60.1	189	185	A	V
Remark	This test case is performed with adapter 2 from worst cases of adapter 1.												



Emission below 1GHz

5GHz WIFI 802.11a (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11a LF		30.97	26.66	-13.34	40	31.81	26.28	0.57	32	124	142	P	H
		108.57	24.68	-18.82	43.5	36.69	18.63	1.07	31.71	-	-	-	H
		165.8	25.11	-18.39	43.5	38.12	17.11	1.33	31.45	-	-	-	H
		412.18	31.94	-14.06	46	35.29	25.73	2.15	31.23	-	-	-	H
		705.12	30.99	-15.01	46	31.71	27.66	2.87	31.25	-	-	-	H
		999.03	34.54	-19.46	54	31.92	30.38	3.48	31.24	-	-	-	H
		30	31.31	-8.69	40	36.05	26.7	0.56	32	120	50	P	V
		62.01	28.28	-11.72	40	46.53	12.84	0.81	31.9	-	-	-	V
		167.74	23.59	-19.91	43.5	36.68	17.02	1.34	31.45	-	-	-	V
		359.8	30.77	-15.23	46	38.53	21.5	2.01	31.27	-	-	-	V
		600.36	34.65	-11.35	46	38.08	25.1	2.68	31.21	-	-	-	V
		647.89	34.79	-11.21	46	37.96	25.29	2.77	31.23	-	-	-	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

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



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

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

1. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

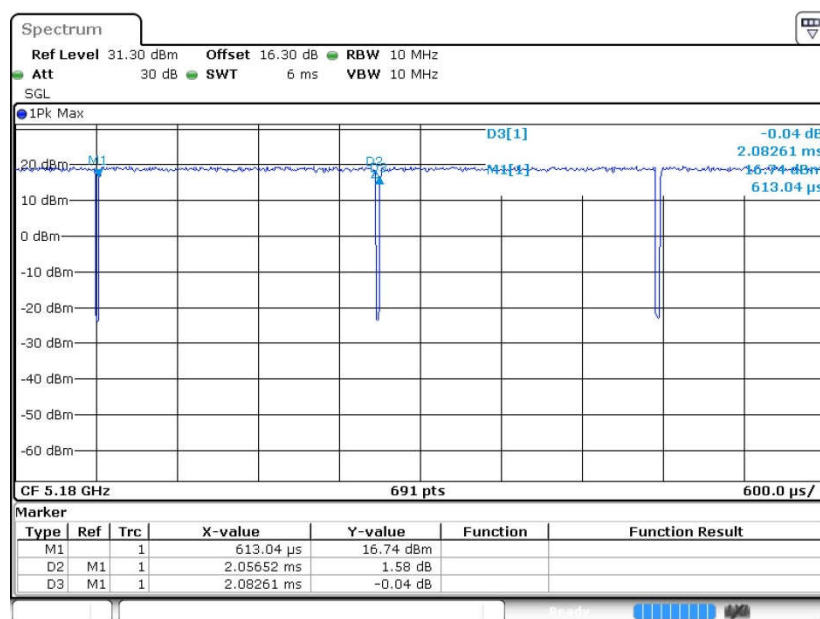
= -10.46(dB)

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

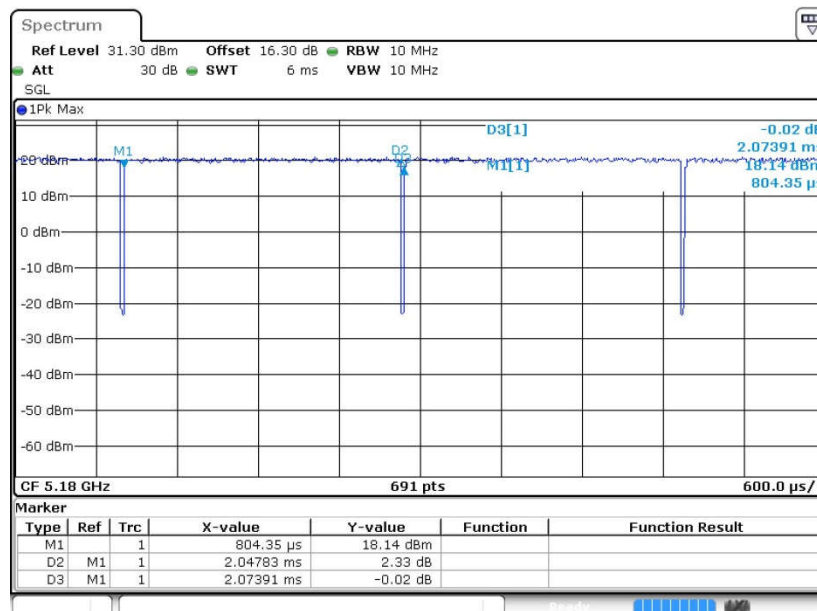
Appendix B. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1	802.11a	98.74	-	-	10Hz
2	802.11a	98.74	-	-	10Hz
1+2	802.11n HT20	97.43	0.987	1.013	3KHz
1+2	802.11n HT40	97.30	0.939	1.065	3KHz
1+2	802.11ac VHT20	97.43	0.987	1.013	3KHz
1+2	802.11ac VHT40	94.99	0.494	2.024	3KHz
1+2	802.11ac VHT80	90.77	0.257	3.891	10KHz

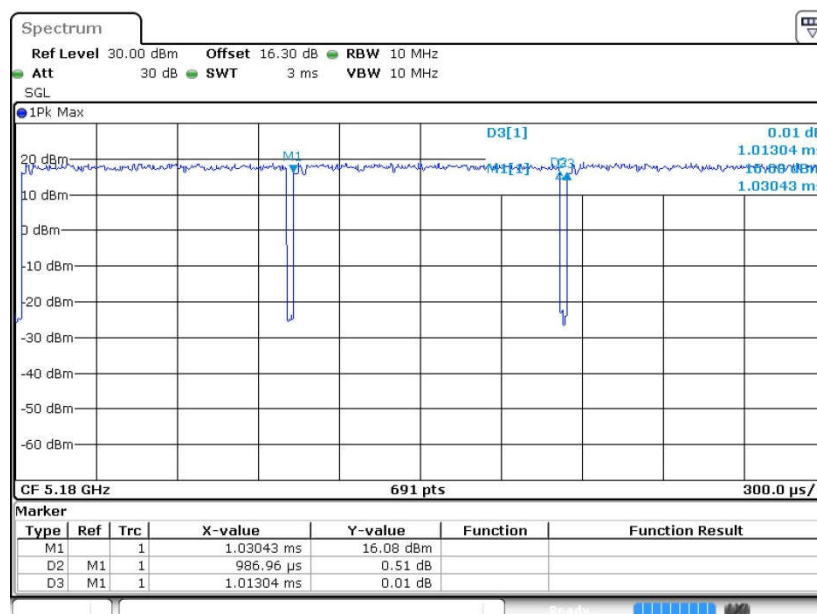
802.11a for Ant.1



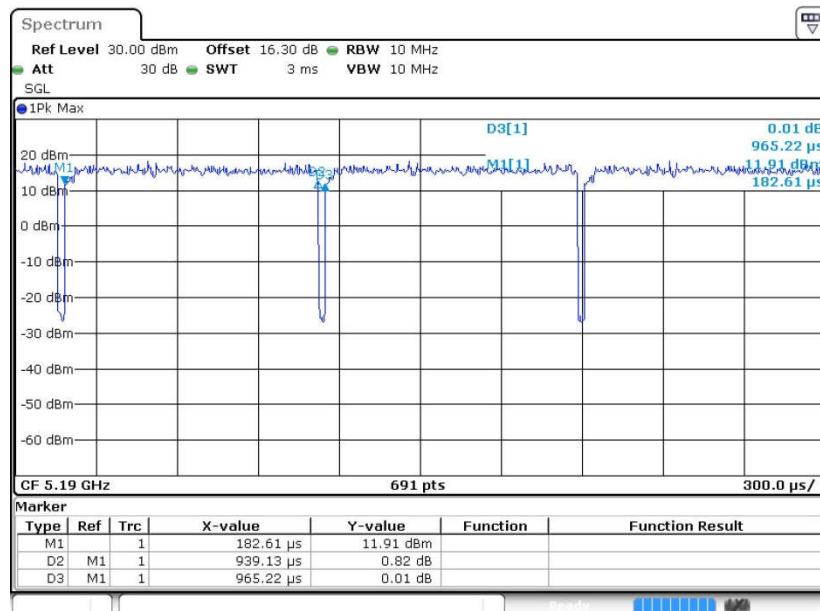
802.11a for Ant.2



802.11n HT20 for Ant.1+2

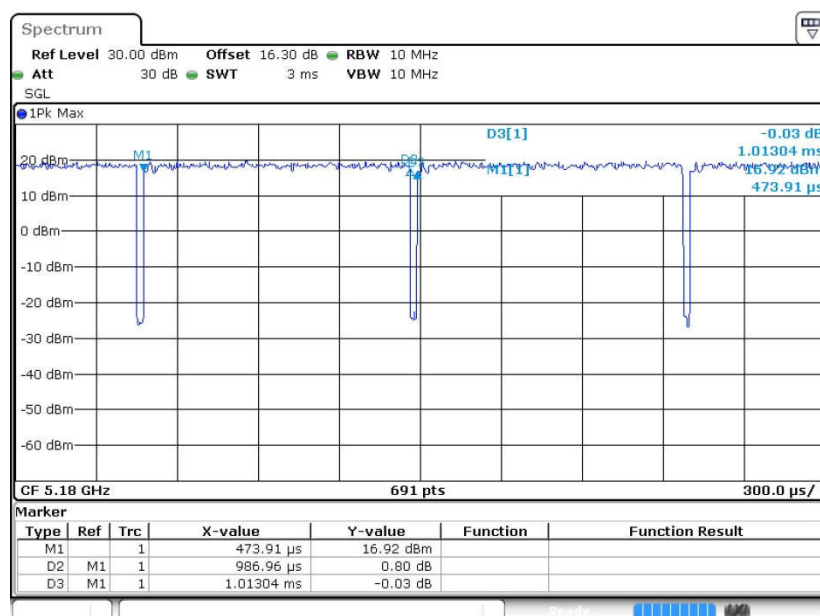


802.11n HT40 for Ant.1+2

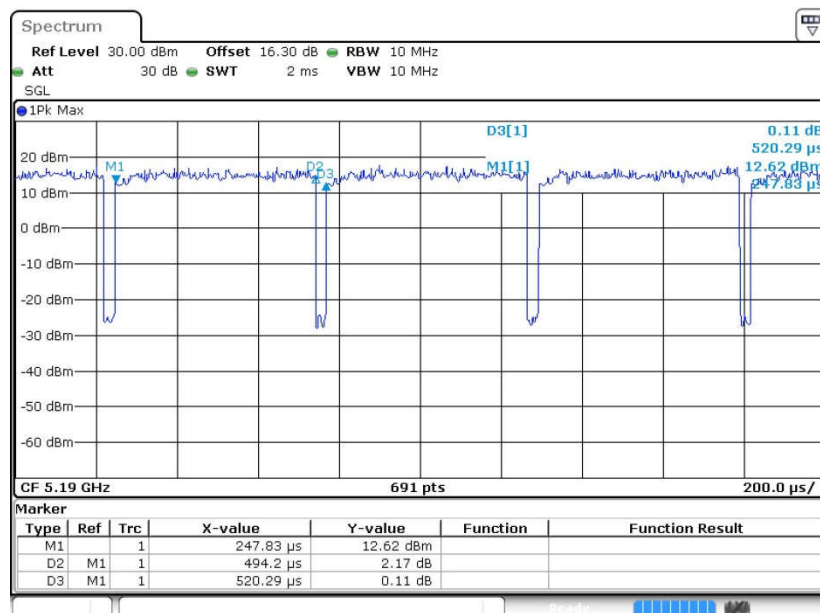


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802.11ac VHT20 for Ant.1+2



802.11ac VHT40 for Ant.1+2



802.11ac VHT80 for Ant.1+2

