FCC RF Test Report

APPLICANT	**:**	**Bullitt Group**
EQUIPMENT	**:**	**Rugged Smart Phone**
BRAND NAME	**:**	**CAT**
MODEL NAME	**:**	**S48c**
FCC ID	**:**	**ZL5S48C**
STANDARD	**:**	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	**:**	**(NII) Unlicensed National Information Infrastructure**

The product was received on Jun. 06, 2018 and testing was completed on Jun. 29, 2018. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Eric Shih

NVLAP TESTING
NVLAP LAB CODE 600156-0

Approved by: Eric Shih / Manager

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR850804-02F	Rev. 01	Initial issue of report	Jul. 06, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 6.44 dB at 40.670 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 20.70 dB at 0.650 MHz
3.6	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.7	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Bullitt Group
One Valpy, Valpy Street, Reading, Berkshire, England RG1 1AR

1.2 Product Feature of Equipment Under Test

Product Feature	
Equipment	Rugged Smart Phone
Brand Name	CAT
Model Name	S48c
FCC ID	ZL5S48C
EUT supports Radios application	CDMA/EV-DO/GSM/GPRS/EGPRS/WCDMA/HSPA/ DC-HSDPA/HSPA+/LTE/NFC/ WLAN 2.4GHz 802.11b/g/n HT20/HT40/ WLAN 5GHz 802.11a/n HT20/HT40/ WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
IMEI Code	Conducted: 358016090012455 Conduction: 358016090005806 Radiation: 358016090009337
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.

1.3 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 : 15.16 dBm / 0.0328 W 802.11n HT20 : 14.99 dBm / 0.0316 W 802.11n HT40 : 14.77 dBm / 0.0300 W 802.11ac VHT20: 14.95 dBm / 0.0313 W 802.11ac VHT40: 14.75 dBm / 0.0299 W 802.11ac VHT80: 15.08 dBm / 0.0322 W
99% Occupied Bandwidth	802.11a : 17.68 MHz 802.11an HT20 : 18.93 MHz 802.11an HT40 : 36.66 MHz 802.11ac VHT80 : 75.76 MHz
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Antenna Type	IFA Antenna
Antenna Gain	-2.40 dBi

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

1.4 Modification of EUT

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

1.5 Testing Location

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

Test Site	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595		
Test Site No.	**Sporton Site No.**		**FCC Test Firm Registration No.**
	TH01-SZ	CO01-SZ	251365

Test Site	Sporton International (Shenzhen) Inc.	
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan District Shenzhen City Guangdong Province 518055 China TEL: +86-755-3320-2398	
Test Site No.	**Sporton Site No.**	**FCC Test Firm Registration No.**
	03CH02-SZ	577730

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

1.6 Applicable Standards

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

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

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

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
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

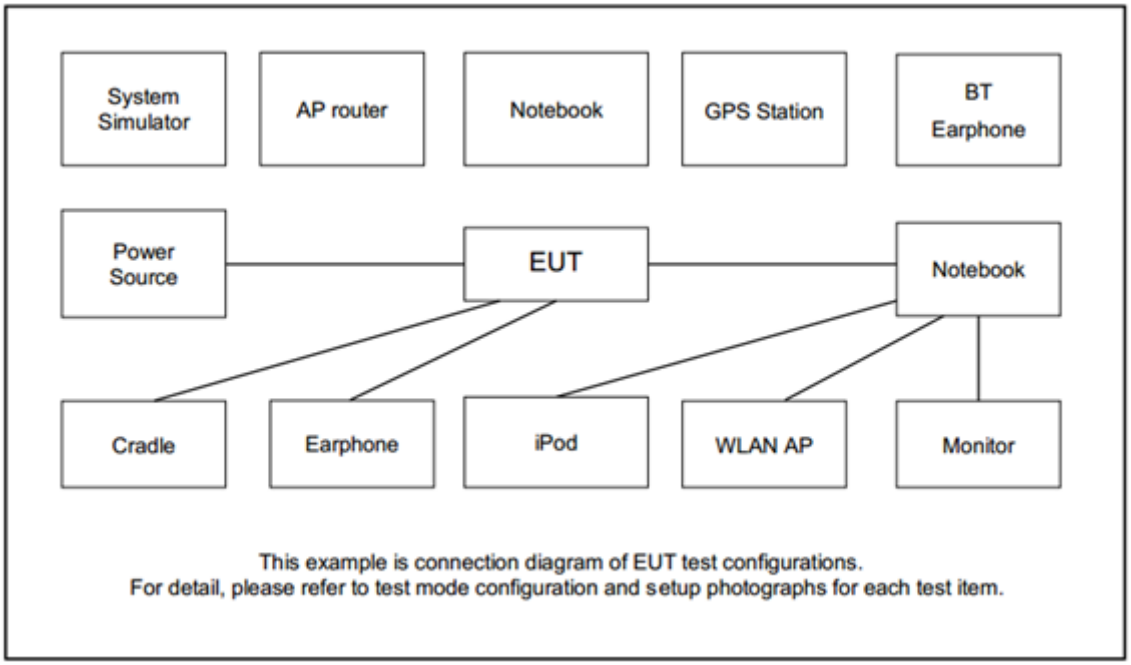
Final test modes are considering the modulation and worse data rates as below table.

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

AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link(5GHz) + Camera(Rear) + USB Cable (Charging from Adapter) + Earphone
Remark: For Radiated Test Cases, The tests were performed with Adapter, Earphone and USB Cable.	

Ch. #		Band IV：5745-5825 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Bluetooth Earphone	Samsung	EO-MG900	PYAHS-107W	N/A	N/A
3.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Earphone	Apple	DCAY1V-A9007ZJW3-000	N/A	Shielded,1.0m	N/A
6.	Earphone	Apple	MC690ZP/A	N/A	Shielded,1.0m	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

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 6.6 dB and 10dB attenuator.

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

= 6.6 + 10 = 16.6 (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.

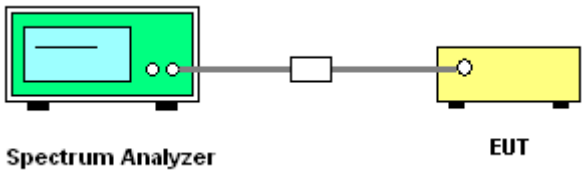
3.1.2 Measuring Instruments

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 v02r01. 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.

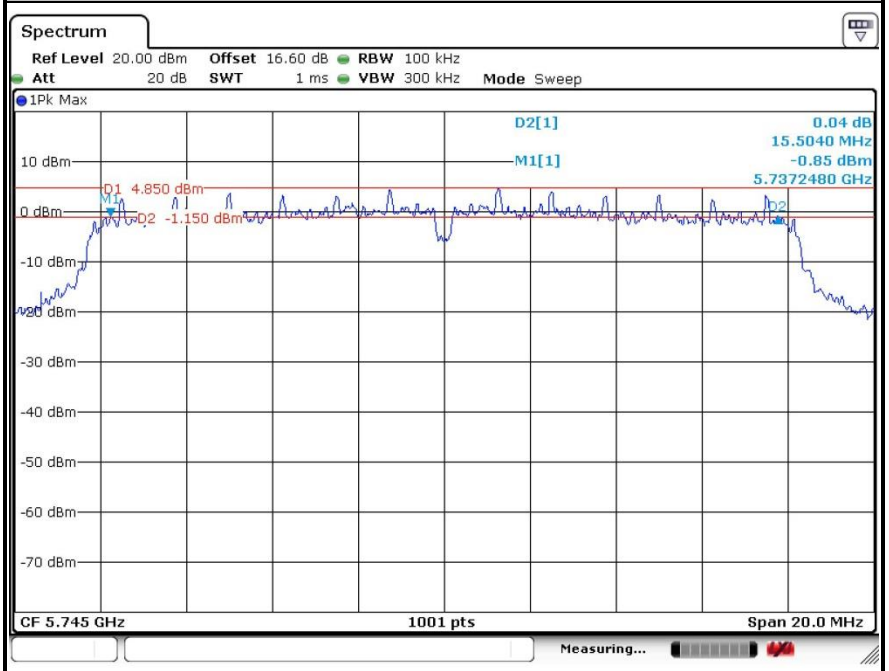
3.1.4 Test Setup



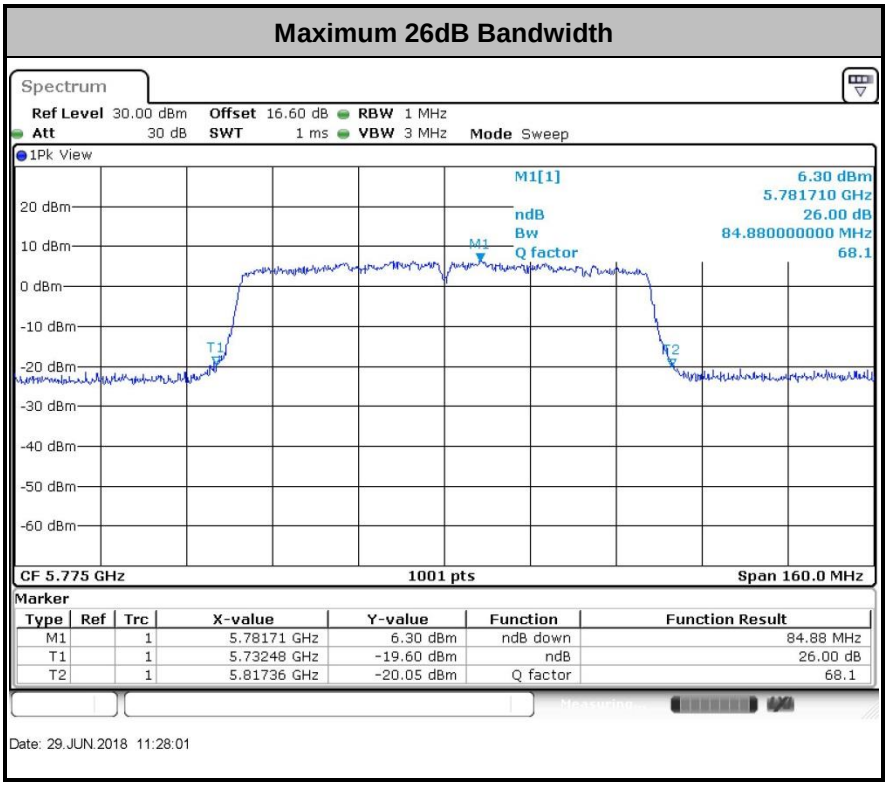
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

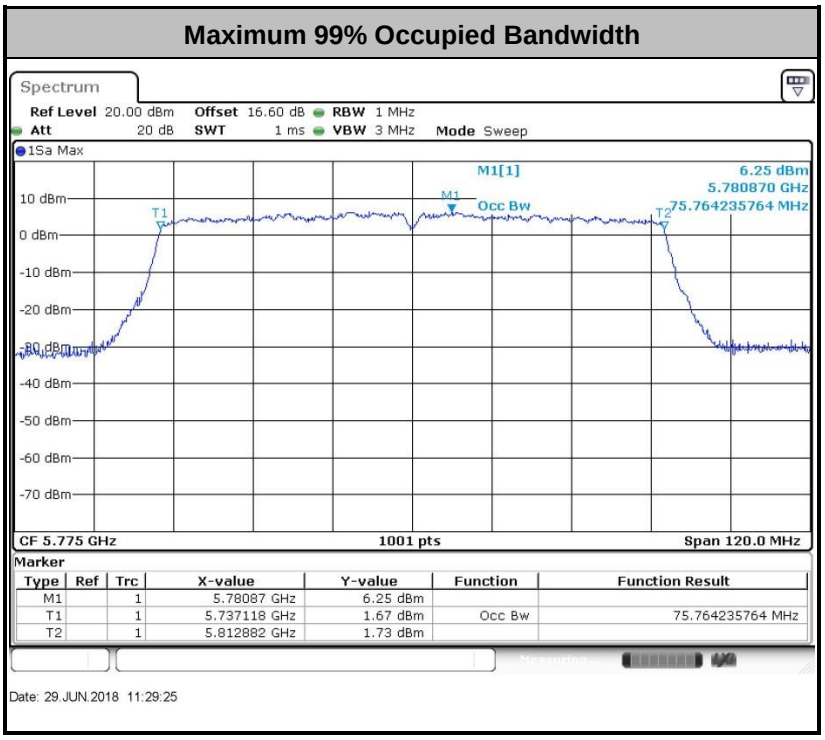
Minimum 6dB Bandwidth



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.

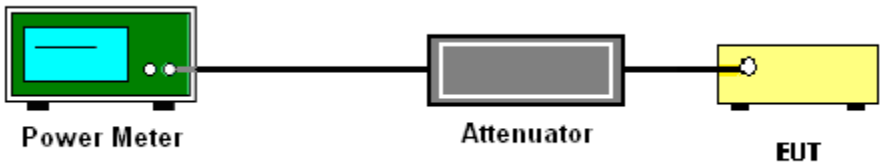
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

3.2.4 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 v02r01. Section F) Maximum power spectral density.

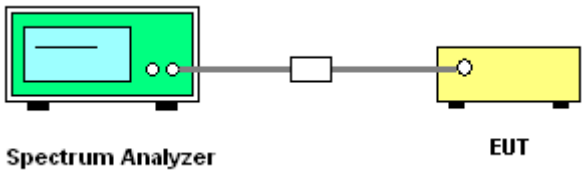
 # Method SA-2 #

(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.

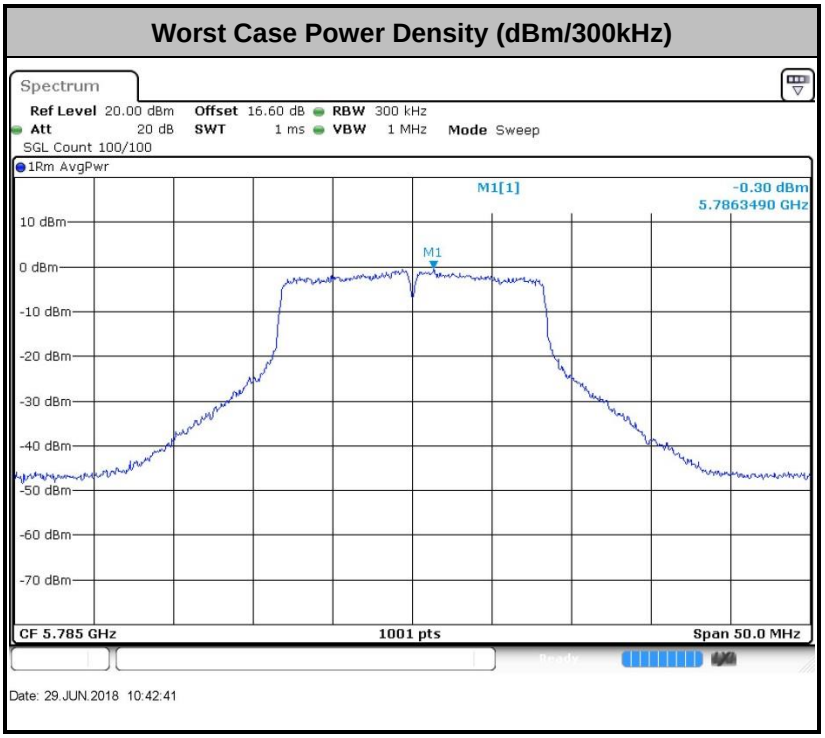
3.3.4 Test Setup



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

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 shall comply with the general field strength limits as below table,

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

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.2

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

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

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

3.4.2 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 v02r01. Section G) Unwanted emissions measurement.

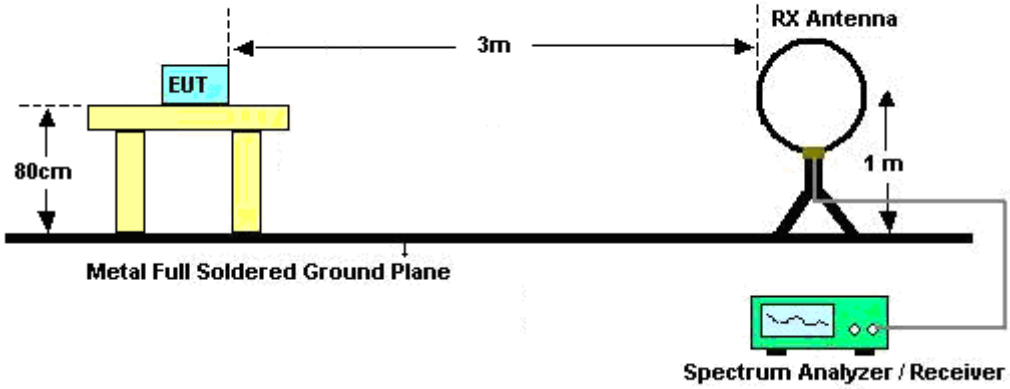
   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

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

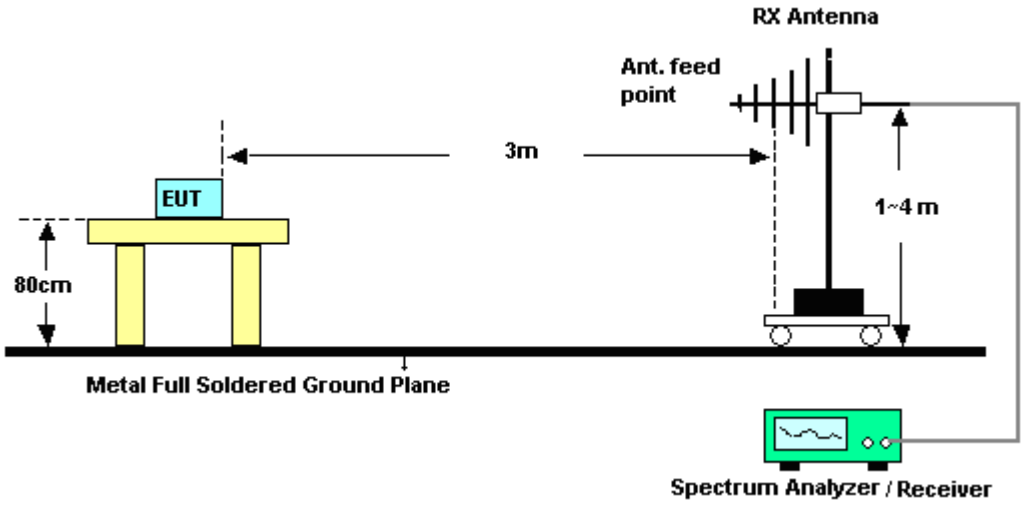
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

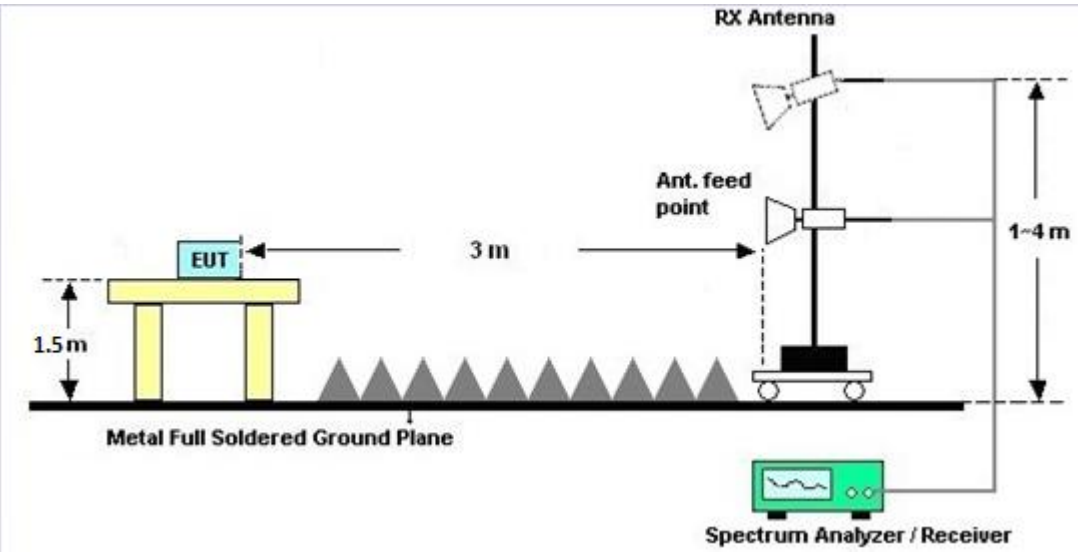
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

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

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C.

3.4.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

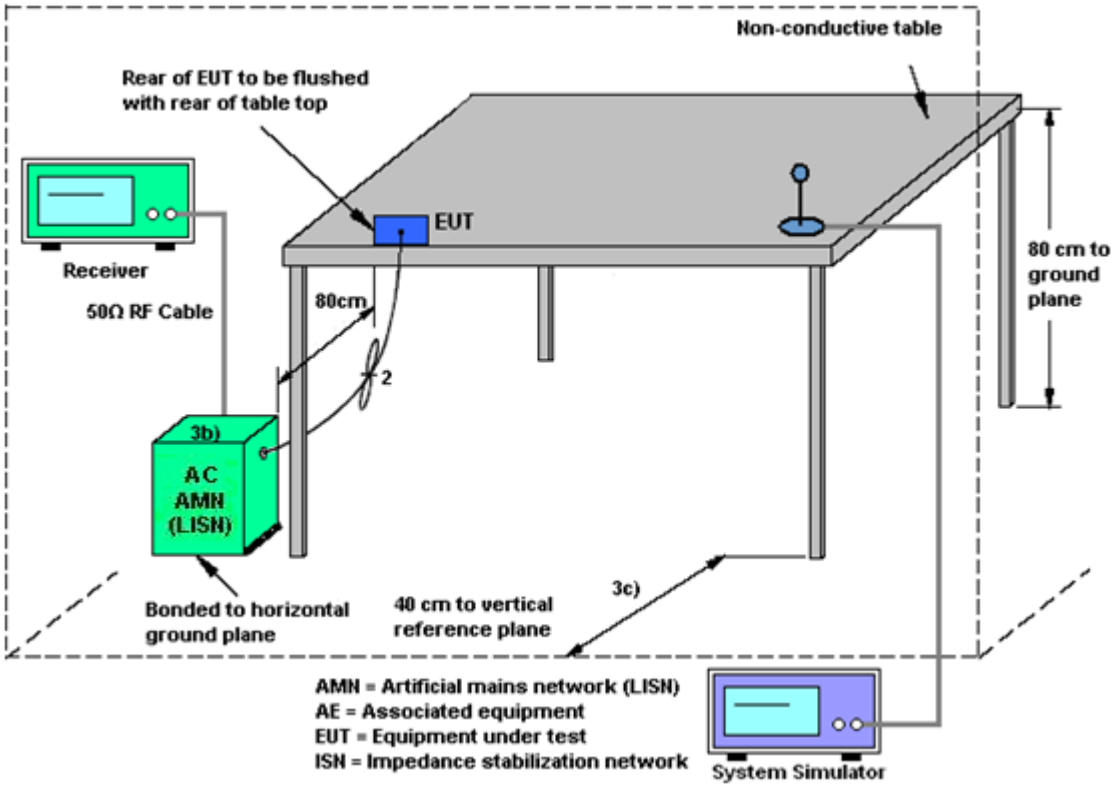
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Automatically Discontinue Transmission

3.6.1 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.

3.6.2 Measuring Instruments

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

3.6.3 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.

3.7 Antenna Requirements

3.7.1 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.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 19, 2018	Jun. 29, 2018	Apr. 18, 2019	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 26, 2017	Jun. 29, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 26, 2017	Jun. 29, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H20140818803	-40~+150°C	Jul. 20, 2017	Jun. 29, 2018	Jul. 19, 2018	Conducted (TH01-SZ)
Spectrum Analyzer	R&S	FSV40	101041	10kHz~40GHz; Max 30dBm	Oct. 19, 2017	Jun. 10, 2018	Oct. 18, 2018	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2018	Jun. 10, 2018	May 13, 2019	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	May 10, 2018	Jun. 10, 2018	May 09, 2019	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1285	1GHz~18GHz	Dec. 13, 2017	Jun. 10, 2018	Dec. 12, 2018	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 21, 2017	Jun. 10, 2018	Jul. 20, 2018	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Mar. 30, 2018	Jun. 10, 2018	Mar. 29, 2019	Radiation (03CH02-SZ)
LF Amplifier	Burgeon	BPA-530	102211	0.01~3000Mhz	Oct. 19, 2017	Jun. 10, 2018	Oct. 18, 2018	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1707137	1GHz~18GHz	Oct. 19, 2017	Jun. 10, 2018	Oct. 18, 2018	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002470	N/A	NCR	Jun. 10, 2018	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Jun. 10, 2018	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Jun. 10, 2018	NCR	Radiation (03CH02-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 26, 2017	Jun. 19, 2018	Dec. 25, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Dec. 26, 2017	Jun. 19, 2018	Dec. 25, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103892	9kHz~30MHz	Nov. 01, 2017	Jun. 19, 2018	Oct. 31, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 19, 2017	Jun. 19, 2018	Jul. 18, 2018	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.6dB**

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

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

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.4dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Sam Zheng	Temperature:	24~25	°C
Test Date:	2018/6/29	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	17.48	23.98	15.50	0.5	Pass
11a	6Mbps	1	157	5785	17.68	24.08	15.64	0.5	Pass
11a	6Mbps	1	165	5825	17.63	23.28	15.52	0.5	Pass
HT20	MCS 0	1	149	5745	18.78	25.13	16.52	0.5	Pass
HT20	MCS 0	1	157	5785	18.93	25.43	16.76	0.5	Pass
HT20	MCS 0	1	165	5825	18.73	24.78	16.76	0.5	Pass
HT40	MCS 0	1	151	5755	36.66	42.26	35.49	0.5	Pass
HT40	MCS 0	1	159	5795	36.56	42.26	35.33	0.5	Pass
VHT80	MCS 0	1	155	5775	75.76	84.88	75.13	0.5	Pass

TEST RESULTS DATA
Average Power Table

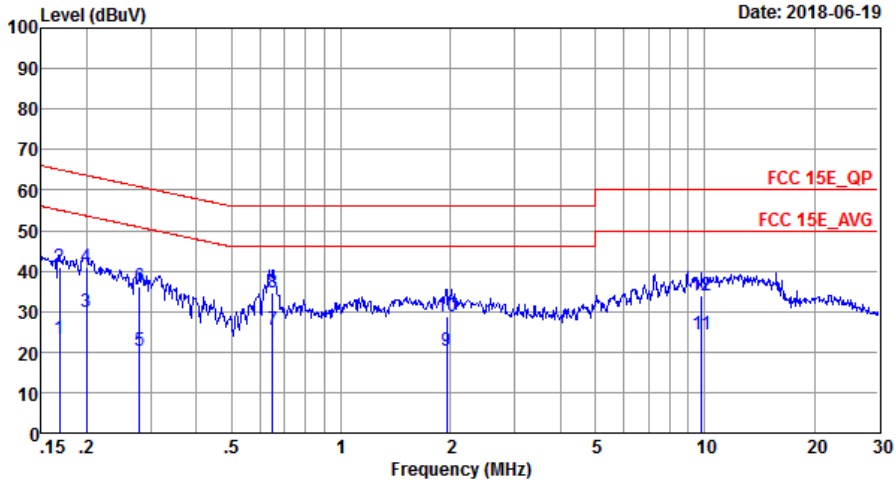
Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)		Pass/Fail
11a	6M bps	1	149	5745	0.22	15.16	30.00	-2.40		Pass
11a	6Mbps	1	157	5785	0.22	15.10	30.00	-2.40		Pass
11a	6Mbps	1	165	5825	0.22	14.86	30.00	-2.40		Pass
HT20	MCS 0	1	149	5745	0.24	14.99	30.00	-2.40		Pass
HT20	MCS 0	1	157	5785	0.24	14.96	30.00	-2.40		Pass
HT20	MCS 0	1	165	5825	0.24	14.70	30.00	-2.40		Pass
HT40	MCS 0	1	151	5755	0.44	14.74	30.00	-2.40		Pass
HT40	MCS 0	1	159	5795	0.44	14.77	30.00	-2.40		Pass
VHT20	MCS 0	1	149	5745	0.22	14.95	30.00	-2.40		Pass
VHT20	MCS 0	1	157	5785	0.22	14.94	30.00	-2.40		Pass
VHT20	MCS 0	1	165	5825	0.22	14.68	30.00	-2.40		Pass
VHT40	MCS 0	1	151	5755	0.46	14.73	30.00	-2.40		Pass
VHT40	MCS 0	1	159	5795	0.46	14.75	30.00	-2.40		Pass
VHT80	MCS 0	1	155	5775	0.83	15.08	30.00	-2.40		Pass

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	0.22	2.22	2.02	30.00	-2.40	Pass
11a	6Mbps	1	157	5785	0.22	2.22	2.14	30.00	-2.40	Pass
11a	6Mbps	1	165	5825	0.22	2.22	1.49	30.00	-2.40	Pass
HT20	MCS 0	1	149	5745	0.24	2.22	1.75	30.00	-2.40	Pass
HT20	MCS 0	1	157	5785	0.24	2.22	1.25	30.00	-2.40	Pass
HT20	MCS 0	1	165	5825	0.24	2.22	0.92	30.00	-2.40	Pass
HT40	MCS 0	1	151	5755	0.44	2.22	-2.07	30.00	-2.40	Pass
HT40	MCS 0	1	159	5795	0.44	2.22	-2.31	30.00	-2.40	Pass
VHT80	MCS 0	1	155	5775	0.83	2.22	-4.69	30.00	-2.40	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	ZhangXu	Temperature :	22~25℃
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line

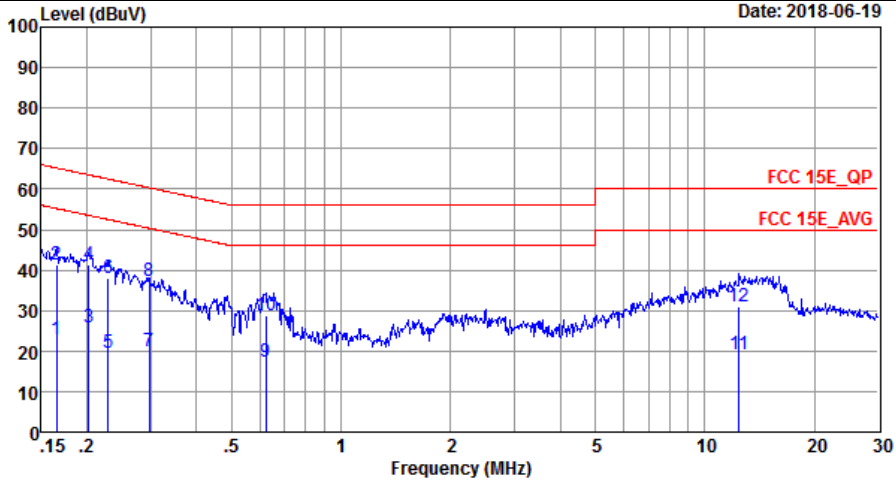


Site : CO01-SZ
Condition: FCC 15E_QP LISN_20170907_L LINE

Mode : Mode 1
IMEI : 358016090005806

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
				dB	dBuV	dBuV	dB	dB	
1		0.17	23.30	-31.73	55.03	13.20	0.03	10.07	Average
2		0.17	41.10	-23.93	65.03	31.00	0.03	10.07	QP
3		0.20	30.00	-23.62	53.62	19.90	0.03	10.07	Average
4		0.20	40.80	-22.82	63.62	30.70	0.03	10.07	QP
5		0.28	20.31	-30.54	50.85	10.20	0.03	10.08	Average
6		0.28	36.01	-24.84	60.85	25.90	0.03	10.08	QP
7	*	0.65	25.30	-20.70	46.00	15.20	0.02	10.08	Average
8		0.65	34.80	-21.20	56.00	24.70	0.02	10.08	QP
9		1.95	20.32	-25.68	46.00	10.10	0.11	10.11	Average
10		1.95	28.62	-27.38	56.00	18.40	0.11	10.11	QP
11		9.81	24.49	-25.51	50.00	13.81	0.35	10.33	Average
12		9.81	33.79	-26.21	60.00	23.11	0.35	10.33	QP

Test Engineer :	ZhangXu	**Temperature :**	22~25℃
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral



Site : CO01-SZ
Condition: FCC 15E_QP LISN_20170907_N NEUTRAL

Mode : Mode 1
IMEI : 358016090005806

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.17	22.90	-32.31	55.21	12.80	0.03	10.07	Average
2		0.17	41.19	-24.02	65.21	31.09	0.03	10.07	QP
3		0.20	25.80	-27.69	53.49	15.70	0.03	10.07	Average
4	*	0.20	41.20	-22.29	63.49	31.10	0.03	10.07	QP
5		0.23	19.60	-32.88	52.48	9.50	0.03	10.07	Average
6		0.23	37.90	-24.58	62.48	27.80	0.03	10.07	QP
7		0.30	19.91	-30.41	50.32	9.80	0.03	10.08	Average
8		0.30	37.21	-23.11	60.32	27.10	0.03	10.08	QP
9		0.62	17.20	-28.80	46.00	7.10	0.02	10.08	Average
10		0.62	28.90	-27.10	56.00	18.80	0.02	10.08	QP
11		12.45	19.23	-30.77	50.00	8.61	0.25	10.37	Average
12		12.45	30.93	-29.07	60.00	20.31	0.25	10.37	QP

Appendix C. Radiated Spurious Emission

Test Engineer :	Reid Huang	**Temperature :**	24~25°C
		Relative Humidity :	48~49%

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.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 149 5745MHz		5629	48.42	-19.78	68.2	37.52	32.22	10.28	31.6	240	300	P	H
		5695.8	49.27	-52.83	102.1	38.2	32.34	10.33	31.6	240	300	P	H
		5718	49.27	-60.97	110.24	38.12	32.4	10.35	31.6	240	300	P	H
		5725	52.49	-69.71	122.2	41.34	32.4	10.35	31.6	240	300	P	H
	*	5745	102.71	-	-	91.52	32.43	10.36	31.6	240	300	P	H
	*	5745	96.19	-	-	85	32.43	10.36	31.6	240	300	A	H
		5646.8	47.73	-20.47	68.2	36.78	32.25	10.3	31.6	259	160	P	V
		5674	48.68	-37.32	86	37.66	32.31	10.31	31.6	259	160	P	V
		5714.4	48.94	-60.29	109.23	37.83	32.37	10.34	31.6	259	160	P	V
		5724.4	47.06	-73.77	120.83	35.91	32.4	10.35	31.6	259	160	P	V
	*	5745	96.6	-	-	85.41	32.43	10.36	31.6	259	160	P	V
	*	5745	89.85	-	-	78.66	32.43	10.36	31.6	259	160	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		5625.4	47.73	-20.47	68.2	36.84	32.22	10.27	31.6	252	285	P	H
		5656	48.55	-24.11	72.66	37.57	32.28	10.3	31.6	252	285	P	H
		5707.8	49.72	-57.67	107.39	38.61	32.37	10.34	31.6	252	285	P	H
		5722.6	48.21	-68.52	116.73	37.06	32.4	10.35	31.6	252	285	P	H
	*	5785	102.79	-	-	91.51	32.5	10.38	31.6	252	285	P	H
	*	5785	96.49	-	-	85.21	32.5	10.38	31.6	252	285	A	H
		5850.8	47.98	-72.4	120.38	36.55	32.62	10.41	31.6	252	285	P	H
		5867.8	48.84	-58.37	107.21	37.37	32.65	10.42	31.6	252	285	P	H
		5898.2	50.17	-37.82	87.99	38.6	32.71	10.46	31.6	252	285	P	H
		5929.4	49.84	-18.36	68.2	38.17	32.78	10.49	31.6	252	285	P	H
		5612.8	47.65	-20.55	68.2	36.79	32.19	10.27	31.6	250	170	P	V
		5663.2	49.05	-28.95	78	38.07	32.28	10.3	31.6	250	170	P	V
		5702.2	48.24	-57.58	105.82	37.13	32.37	10.34	31.6	250	170	P	V
		5720	46.84	-63.96	110.8	35.69	32.4	10.35	31.6	250	170	P	V
	*	5785	97.49	-	-	86.21	32.5	10.38	31.6	250	170	P	V
	*	5785	90.83	-	-	79.55	32.5	10.38	31.6	250	170	A	V
		5852	48.67	-68.97	117.64	37.24	32.62	10.41	31.6	250	170	P	V
		5871.2	48.03	-58.23	106.26	36.53	32.68	10.42	31.6	250	170	P	V
		5881	49.76	-50.98	100.74	38.24	32.68	10.44	31.6	250	170	P	V
		5945.6	48.94	-19.26	68.2	37.22	32.81	10.51	31.6	250	170	P	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 165 5825MHz	*	5825	102.15	-	-	90.76	32.59	10.4	31.6	252	285	P	H
	*	5825	96.5	-	-	85.11	32.59	10.4	31.6	252	285	A	H
		5851.8	49.69	-68.41	118.1	38.26	32.62	10.41	31.6	252	285	P	H
		5857	51.2	-59.04	110.24	39.74	32.65	10.41	31.6	252	285	P	H
		5922.2	49.52	-20.74	70.26	37.85	32.78	10.49	31.6	252	285	P	H
		5950	48.27	-19.93	68.2	36.55	32.81	10.51	31.6	252	285	P	H
	*	5825	96.18	-	-	84.79	32.59	10.4	31.6	247	173	P	V
	*	5825	90.26	-	-	78.87	32.59	10.4	31.6	247	173	A	V
		5851	47.75	-72.17	119.92	36.32	32.62	10.41	31.6	247	173	P	V
		5865.4	48.02	-59.87	107.89	36.55	32.65	10.42	31.6	247	173	P	V
		5924	49.12	-19.82	68.94	37.45	32.78	10.49	31.6	247	173	P	V
		5947.2	49.13	-19.07	68.2	37.41	32.81	10.51	31.6	247	173	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	50.59	-23.41	74	50.96	40.1	14.89	55.36	160	360	P	H
		17235	59.6	-8.6	68.2	45.34	41.58	29.17	56.49	170	360	P	H
		11490	50.83	-23.17	74	51.2	40.1	14.89	55.36	160	360	P	V
		17235	59.52	-8.68	68.2	45.26	41.58	29.17	56.49	170	360	P	V
802.11a CH 157 5785MHz		11570	50.82	-23.18	74	51.05	40.04	14.97	55.24	175	198	P	H
		17355	59.02	-9.18	68.2	46.61	42.07	26.92	56.58	189	185	P	H
		11570	50.27	-23.73	74	50.5	40.04	14.97	55.24	175	198	P	V
		17355	59.54	-8.66	68.2	47.13	42.07	26.92	56.58	189	185	P	V
802.11a CH 165 5825MHz		11650	50.13	-23.87	74	50.1	39.99	15.17	55.13	156	347	P	H
		17475	59.23	-8.97	68.2	48.08	42.56	25.27	56.68	150	360	P	H
		11650	50.09	-23.91	74	50.06	39.99	15.17	55.13	156	347	P	V
		17475	59.91	-8.29	68.2	48.76	42.56	25.27	56.68	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)
		5620.2	48.92	-19.28	68.2	38.03	32.22	10.27	31.6	248	285	P	H
		5651	49.5	-19.44	68.94	38.52	32.28	10.3	31.6	248	285	P	H
		5706.2	51.12	-55.82	106.94	40.01	32.37	10.34	31.6	248	285	P	H
		5722.4	50.06	-66.21	116.27	38.91	32.4	10.35	31.6	248	285	P	H
802.11n	*	5745	103.09	-	-	91.9	32.43	10.36	31.6	248	285	P	H
HT20	*	5745	96.63	-	-	85.44	32.43	10.36	31.6	248	285	A	H
CH 149		5618.8	48.43	-19.77	68.2	37.54	32.22	10.27	31.6	247	173	P	V
5745MHz		5690.8	48.85	-49.57	98.42	37.78	32.34	10.33	31.6	247	173	P	V
		5707.6	48.68	-58.65	107.33	37.57	32.37	10.34	31.6	247	173	P	V
		5721.6	47.03	-67.42	114.45	35.88	32.4	10.35	31.6	247	173	P	V
	*	5745	96.7	-	-	85.51	32.43	10.36	31.6	247	173	P	V
	*	5745	89.96	-	-	78.77	32.43	10.36	31.6	247	173	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)
		5619.4	47.5	-20.7	68.2	36.61	32.22	10.27	31.6	253	274	P	H
		5650.2	48.7	-19.65	68.35	37.72	32.28	10.3	31.6	253	274	P	H
		5709.4	49.03	-58.8	107.83	37.92	32.37	10.34	31.6	253	274	P	H
		5722.2	47.11	-68.71	115.82	35.96	32.4	10.35	31.6	253	274	P	H
	*	5785	103.12	-	-	91.84	32.5	10.38	31.6	253	274	P	H
	*	5785	96.61	-	-	85.33	32.5	10.38	31.6	253	274	A	H
		5853.2	48.21	-66.69	114.9	36.78	32.62	10.41	31.6	253	274	P	H
		5867.4	48.86	-58.47	107.33	37.39	32.65	10.42	31.6	253	274	P	H
802.11n		5920	48.96	-22.93	71.89	37.33	32.74	10.49	31.6	253	274	P	H
HT20		5928.8	49.46	-18.74	68.2	37.79	32.78	10.49	31.6	253	274	P	H
CH 157		5648	48.62	-19.58	68.2	37.67	32.25	10.3	31.6	263	167	P	V
5785MHz		5654.6	48.66	-22.96	71.62	37.68	32.28	10.3	31.6	263	167	P	V
		5703.2	47.06	-59.04	106.1	35.95	32.37	10.34	31.6	263	167	P	V
		5724.4	49.95	-70.88	120.83	38.8	32.4	10.35	31.6	263	167	P	V
	*	5785	96.65	-	-	85.37	32.5	10.38	31.6	263	167	P	V
	*	5785	89.83	-	-	78.55	32.5	10.38	31.6	263	167	A	V
		5854.6	47.78	-63.93	111.71	36.32	32.65	10.41	31.6	263	167	P	V
		5855.8	48.96	-61.62	110.58	37.5	32.65	10.41	31.6	263	167	P	V
		5904.6	48.65	-34.61	83.26	37.05	32.74	10.46	31.6	263	167	P	V
		5933.4	50.22	-17.98	68.2	38.53	32.78	10.51	31.6	263	167	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	102.48	-	-	91.09	32.59	10.4	31.6	258	276	P	H
	*	5825	95.94	-	-	84.55	32.59	10.4	31.6	258	276	A	H
		5851	47.91	-72.01	119.92	36.48	32.62	10.41	31.6	258	276	P	H
		5856.6	50.38	-59.97	110.35	38.92	32.65	10.41	31.6	258	276	P	H
		5880.2	51.13	-50.21	101.34	39.61	32.68	10.44	31.6	258	276	P	H
		5944.6	49.02	-19.18	68.2	37.3	32.81	10.51	31.6	258	276	P	H
	*	5825	96.32	-	-	84.93	32.59	10.4	31.6	263	167	P	V
	*	5825	89.94	-	-	78.55	32.59	10.4	31.6	263	167	A	V
		5851.2	47.86	-71.6	119.46	36.43	32.62	10.41	31.6	263	167	P	V
		5864	49.51	-58.77	108.28	38.04	32.65	10.42	31.6	263	167	P	V
		5892	49.79	-42.79	92.58	38.24	32.71	10.44	31.6	263	167	P	V
		5936.8	50.52	-17.68	68.2	38.83	32.78	10.51	31.6	263	167	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	50.12	-23.88	74	50.49	40.1	14.89	55.36	160	360	P	H
HT20		17235	59.95	-8.25	68.2	45.69	41.58	29.17	56.49	170	360	P	H
CH 149		11490	50.46	-23.54	74	50.83	40.1	14.89	55.36	160	360	P	V
5745MHz		17235	59.55	-8.65	68.2	45.29	41.58	29.17	56.49	170	360	P	V
802.11n		11570	50.61	-23.39	74	50.84	40.04	14.97	55.24	175	198	P	H
HT20		17355	59.89	-8.31	68.2	47.48	42.07	26.92	56.58	189	185	P	H
CH 157		11570	50.49	-23.51	74	50.72	40.04	14.97	55.24	175	198	P	V
5785MHz		17355	59.63	-8.57	68.2	47.22	42.07	26.92	56.58	189	185	P	V
802.11n		11650	49.77	-24.23	74	49.74	39.99	15.17	55.13	156	347	P	H
HT20		17475	59.49	-8.71	68.2	48.34	42.56	25.27	56.68	150	360	P	H
CH 165		11650	49.74	-24.26	74	49.71	39.99	15.17	55.13	156	347	P	V
5825MHz		17475	60.08	-8.12	68.2	48.93	42.56	25.27	56.68	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)
		5650	50.01	-18.19	68.2	39.03	32.28	10.3	31.6	253	276	P	H
		5693.4	50.48	-49.85	100.33	39.41	32.34	10.33	31.6	253	276	P	H
		5707.6	51.27	-56.06	107.33	40.16	32.37	10.34	31.6	253	276	P	H
		5720.8	51.45	-61.17	112.62	40.3	32.4	10.35	31.6	253	276	P	H
	*	5755	102.09	-	-	90.85	32.47	10.37	31.6	253	276	P	H
	*	5755	92.68	-	-	81.44	32.47	10.37	31.6	253	276	A	H
		5851	49.14	-70.78	119.92	37.71	32.62	10.41	31.6	253	276	P	H
		5871	49.2	-57.12	106.32	37.7	32.68	10.42	31.6	253	276	P	H
802.11n		5876.6	49.86	-54.15	104.01	38.36	32.68	10.42	31.6	253	276	P	H
HT40		5938.6	48.48	-19.72	68.2	36.76	32.81	10.51	31.6	253	276	P	H
CH 151		5618.6	48.24	-19.96	68.2	37.35	32.22	10.27	31.6	249	173	P	V
5755MHz		5698.6	48.78	-55.39	104.17	37.71	32.34	10.33	31.6	249	173	P	V
		5716.6	49.26	-60.59	109.85	38.15	32.37	10.34	31.6	249	173	P	V
		5724	48.49	-71.43	119.92	37.34	32.4	10.35	31.6	249	173	P	V
	*	5755	94.73	-	-	83.49	32.47	10.37	31.6	249	173	P	V
	*	5755	86.79	-	-	75.55	32.47	10.37	31.6	249	173	A	V
		5852	47.56	-70.08	117.64	36.13	32.62	10.41	31.6	249	173	P	V
		5867.2	49.29	-58.09	107.38	37.82	32.65	10.42	31.6	249	173	P	V
		5880.6	50.09	-50.95	101.04	38.57	32.68	10.44	31.6	249	173	P	V
		5939.6	47.93	-20.27	68.2	36.21	32.81	10.51	31.6	249	173	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		5631.8	48.75	-19.45	68.2	37.85	32.22	10.28	31.6	250	284	P	H
		5684.6	49.1	-44.74	93.84	38.03	32.34	10.33	31.6	250	284	P	H
		5711.2	49.27	-59.07	108.34	38.16	32.37	10.34	31.6	250	284	P	H
		5725	48.66	-73.54	122.2	37.51	32.4	10.35	31.6	250	284	P	H
	*	5795	102.58	-	-	91.26	32.53	10.39	31.6	250	284	P	H
	*	5795	93.12	-	-	81.8	32.53	10.39	31.6	250	284	A	H
		5852.4	48.81	-67.92	116.73	37.38	32.62	10.41	31.6	250	284	P	H
		5865.4	49.73	-58.16	107.89	38.26	32.65	10.42	31.6	250	284	P	H
		5878	49.9	-53.07	102.97	38.4	32.68	10.42	31.6	250	284	P	H
		5933.6	49.23	-18.97	68.2	37.54	32.78	10.51	31.6	250	284	P	H
		5635.4	48.08	-20.12	68.2	37.15	32.25	10.28	31.6	249	173	P	V
		5663.8	47.32	-31.12	78.44	36.33	32.28	10.31	31.6	249	173	P	V
		5716.2	47.47	-62.27	109.74	36.36	32.37	10.34	31.6	249	173	P	V
		5724.4	47.55	-73.28	120.83	36.4	32.4	10.35	31.6	249	173	P	V
	*	5795	94.16	-	-	82.84	32.53	10.39	31.6	249	173	P	V
	*	5795	86.32	-	-	75	32.53	10.39	31.6	249	173	A	V
		5854.6	47.59	-64.12	111.71	36.13	32.65	10.41	31.6	249	173	P	V
		5868.2	48.8	-58.3	107.1	37.33	32.65	10.42	31.6	249	173	P	V
		5908.4	49.31	-31.14	80.45	37.71	32.74	10.46	31.6	249	173	P	V
		5926.8	49.63	-18.57	68.2	37.96	32.78	10.49	31.6	249	173	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11510	50.57	-23.43	74	50.91	40.1	14.9	55.34	160	360	P	H
HT40		17265	60.2	-8	68.2	46.69	41.72	28.31	56.52	170	360	P	H
CH 151		11510	50.66	-23.34	74	51	40.1	14.9	55.34	160	360	P	V
5755MHz		17265	59.27	-8.93	68.2	45.76	41.72	28.31	56.52	170	360	P	V
802.11n		11590	50.38	-23.62	74	50.58	40.03	14.98	55.21	170	300	P	H
HT40		17385	59.27	-8.93	68.2	47.3	42.21	26.37	56.61	150	200	P	H
CH 159		11590	49.89	-24.11	74	50.09	40.03	14.98	55.21	170	300	P	V
5795MHz		17385	59.38	-8.82	68.2	47.41	42.21	26.37	56.61	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)
		5648.6	49.52	-18.68	68.2	38.57	32.25	10.3	31.6	252	287	P	H
		5682.8	51.56	-40.95	92.51	40.52	32.31	10.33	31.6	252	287	P	H
		5705.8	56.11	-50.72	106.83	45	32.37	10.34	31.6	252	287	P	H
		5724.2	51.59	-68.79	120.38	40.44	32.4	10.35	31.6	252	287	P	H
	*	5775	98.19	-	-	86.91	32.5	10.38	31.6	252	287	P	H
	*	5775	90.28	-	-	79	32.5	10.38	31.6	252	287	A	H
		5851.4	53.72	-65.29	119.01	42.29	32.62	10.41	31.6	252	287	P	H
		5856.4	51.82	-58.59	110.41	40.36	32.65	10.41	31.6	252	287	P	H
802.11ac		5876	51.11	-53.35	104.46	39.61	32.68	10.42	31.6	252	287	P	H
VHT80		5942.6	49.17	-19.03	68.2	37.45	32.81	10.51	31.6	252	287	P	H
CH 155		5635.8	48.42	-19.78	68.2	37.49	32.25	10.28	31.6	246	149	P	V
5775MHz		5695	48.52	-52.99	101.51	37.45	32.34	10.33	31.6	246	149	P	V
		5718.2	49.05	-61.25	110.3	37.9	32.4	10.35	31.6	246	149	P	V
		5724.2	46.59	-73.79	120.38	35.44	32.4	10.35	31.6	246	149	P	V
	*	5775	92.38	-	-	81.1	32.5	10.38	31.6	246	149	P	V
	*	5775	84.78	-	-	73.5	32.5	10.38	31.6	246	149	A	V
		5850.2	49.6	-72.14	121.74	38.17	32.62	10.41	31.6	246	149	P	V
		5866.8	50.01	-57.48	107.49	38.54	32.65	10.42	31.6	246	149	P	V
		5894.8	49.15	-41.36	90.51	37.6	32.71	10.44	31.6	246	149	P	V
		5946	48.58	-19.62	68.2	36.86	32.81	10.51	31.6	246	149	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	50.52	-23.48	74	50.77	40.06	14.95	55.26	160	360	P	H
VHT80		17325	59.88	-8.32	68.2	47.04	41.93	27.47	56.56	170	360	P	H
CH 155		11550	49.93	-24.07	74	50.18	40.06	14.95	55.26	160	360	P	V
5775MHz		17325	59.72	-8.48	68.2	46.88	41.93	27.47	56.56	170	360	P	V

Band 4 5725~5850MHz

Emission below 1GHz

5GHz WIFI 802.11n HT40 (LF @ 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)
5GHz 802.11n HT40 LF		31.94	26.85	-13.15	40	31.8	26.38	0.27	31.6	120	112	P	H
		89.17	23.57	-19.93	43.5	36.83	17.48	0.76	31.5	-	-	P	H
		160.95	28.86	-14.64	43.5	40.58	18.25	1.38	31.35	-	-	P	H
		260.86	26.04	-19.96	46	37.21	17.95	1.9	31.02	-	-	P	H
		581.93	28.02	-17.98	46	31.24	25.03	2.95	31.2	-	-	P	H
		790.48	31.87	-14.13	46	30.64	28.95	3.58	31.3	-	-	P	H
		40.67	33.56	-6.44	40	42.69	22.18	0.39	31.7	100	120	P	V
		89.17	28.08	-15.42	43.5	41.34	17.48	0.76	31.5	-	-	P	V
		159.01	26.98	-16.52	43.5	38.65	18.32	1.37	31.36	-	-	P	V
		191.02	24.86	-18.64	43.5	37.26	17.28	1.56	31.24	-	-	P	V
		443.22	27.6	-18.4	46	31	25.15	2.55	31.1	-	-	P	V
		986.42	31.53	-22.47	54	28.66	30.17	4.14	31.44	-	-	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)

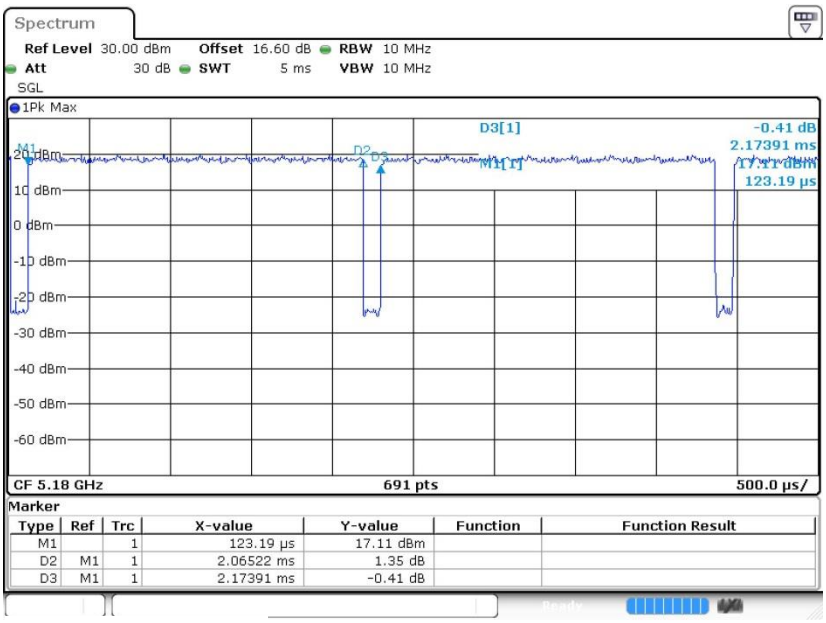
= -10.46(dB)

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

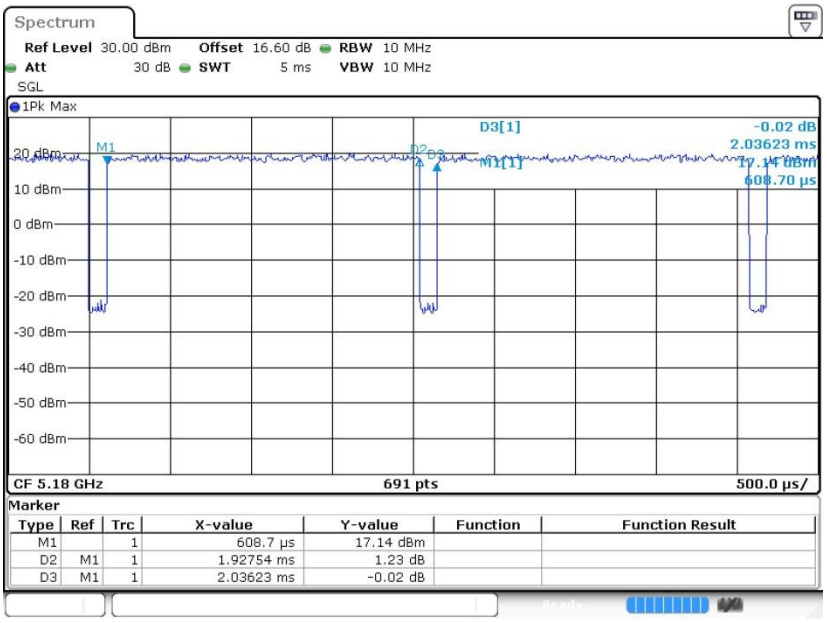
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	95.00	2.065	0.484	1KHz
802.11n HT20	94.66	1.928	0.519	1KHz
802.11n HT40	90.37	0.952	1.050	3KHz
802.11ac VHT80	82.64	0.462	2.165	3KHz

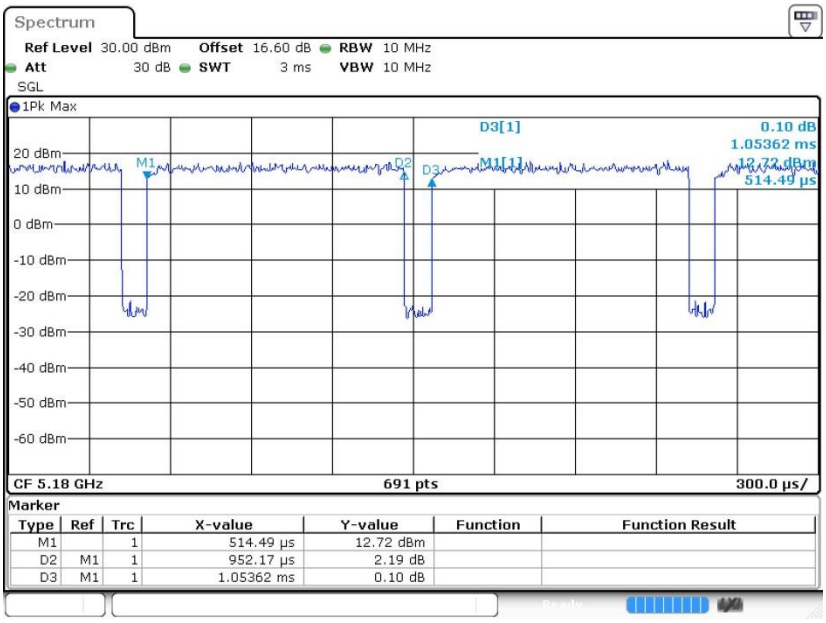
802.11a



802.11an HT20



802.11an HT40



802.11ac VHT80