FCC RF Test Report

APPLICANT	:	**Bullitt Group**
EQUIPMENT	:	**Rugged Smart Phone**
BRAND NAME	:	**CAT**
MODEL NAME	:	**S42**
FCC ID	:	**ZL5S42**
STANDARD	:	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	:	**(NII) Unlicensed National Information Infrastructure**

The product was received on May 22, 2020 and testing was completed on Jun. 20, 2020. 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.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager

ACCREDITED Cert #5145.01

Sporton International (ShenZhen) Inc.
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR052014-01F	Rev. 01	Initial issue of report	Jul. 10, 2020

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 4.43 dB at 40.670 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.22 dB at 0.500 MHz
3.6	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.7	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

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

1.2 Manufacturer

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

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Rugged Smart Phone
Brand Name	CAT
Model Name	S42
FCC ID	ZL5S42
EUT supports Radios application	GSM/WCDMA/LTE/NFC WLAN 2.4GHz 802.11 b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE FM Receiver / GNSS
IMEI Code	Conducted: N/A Conduction : 359145660001926/359145660005927 Radiation : 359145660002965/359145660006966
HW Version	V1.0
SW Version	LTE_C01091.10_NE_S42G_0.030.00
EUT Stage	Production Unit

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

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	**<5745 MHz ~ 5825 MHz>** 802.11a : 14.72 dBm / 0.0296 W 802.11n HT20 : 14.56 dBm / 0.0286 W 802.11n HT40 : 13.41 dBm / 0.0219 W 802.11ac VHT20: 14.50 dBm / 0.0282 W 802.11ac VHT40: 13.36 dBm / 0.0217 W 802.11ac VHT80: 12.30 dBm / 0.0170 W
99% Occupied Bandwidth	802.11a : 16.98 MHz 802.11n HT20 : 17.88 MHz 802.11n 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 / Gain	IFA Antenna with gain -1.00 dBi

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

1.5 Modification of EUT

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

1.6 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH01-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 Applicable Standards

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

- 47 CFR 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 (X 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.

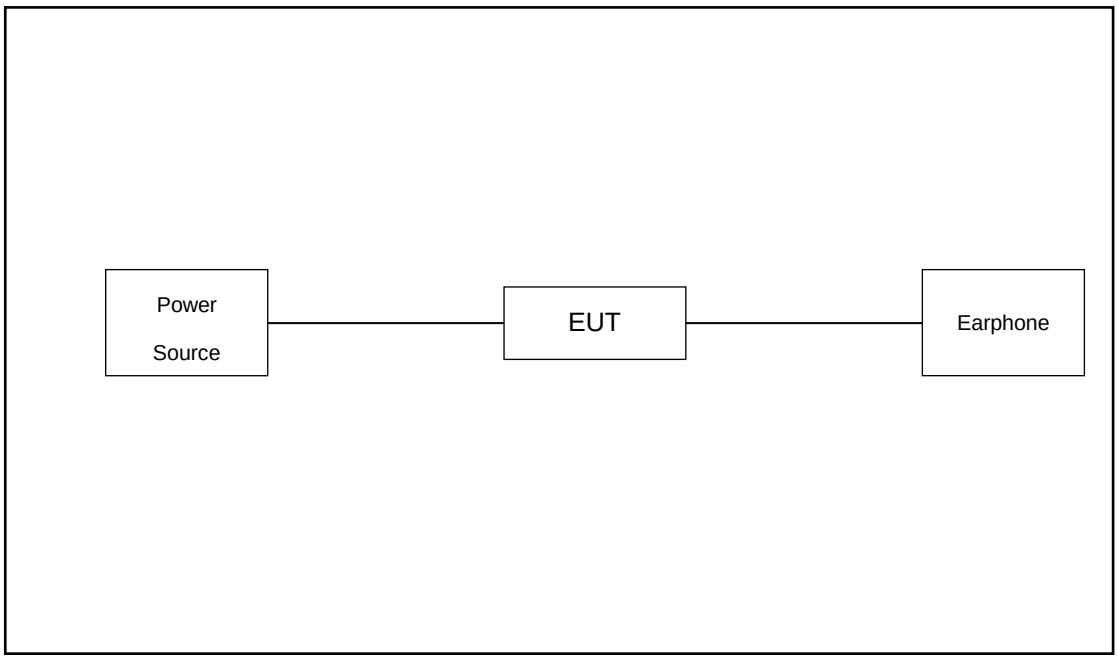
Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0

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

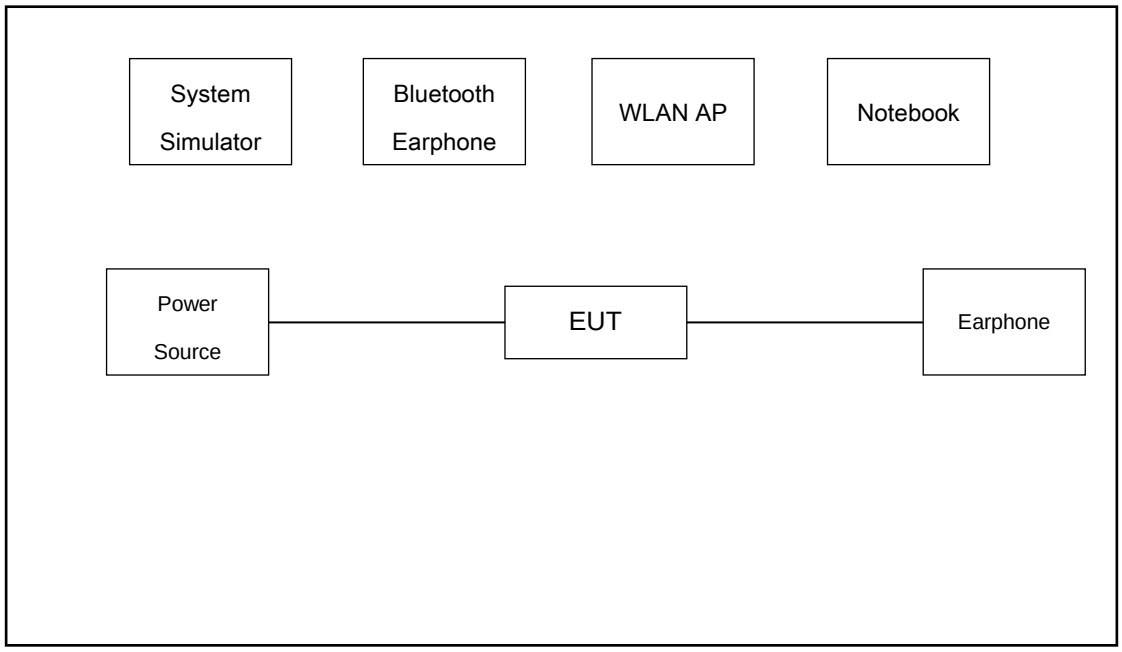
Ch. #		Band IV : 5745-5825 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

2.3 Connection Diagram of Test System

For Radiation



For Conducted Emission



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.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8m
3.	Bluetooth Earphone	Samsung	EO-MG900	N/A	N/A	N/A
4.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

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 5.1 dB and 20dB attenuator.

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

= 5.1 + 20 = 25.1(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.

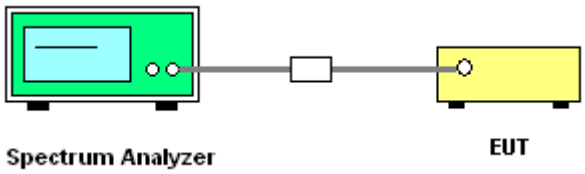
3.1.2 Measuring Instruments

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.

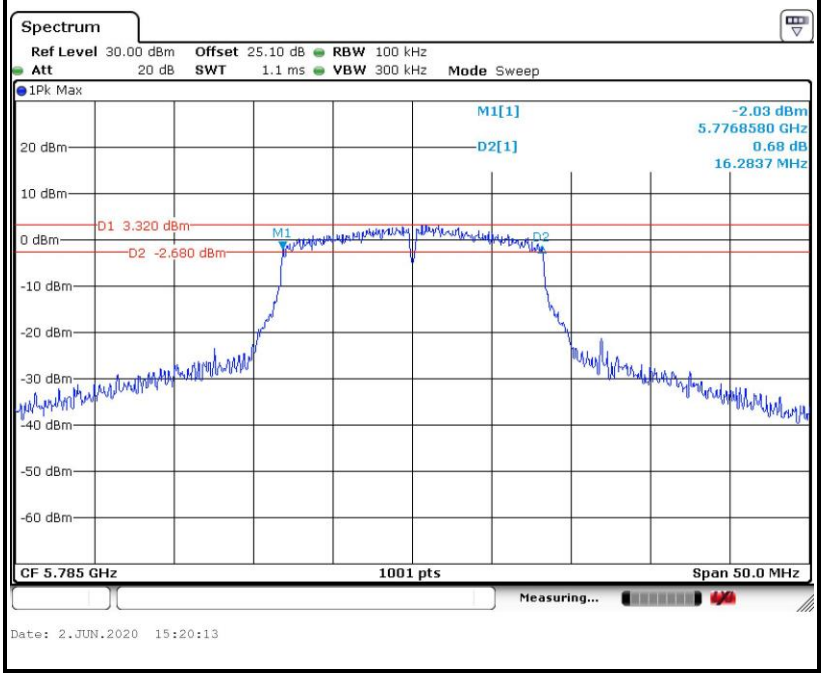
3.1.4 Test Setup



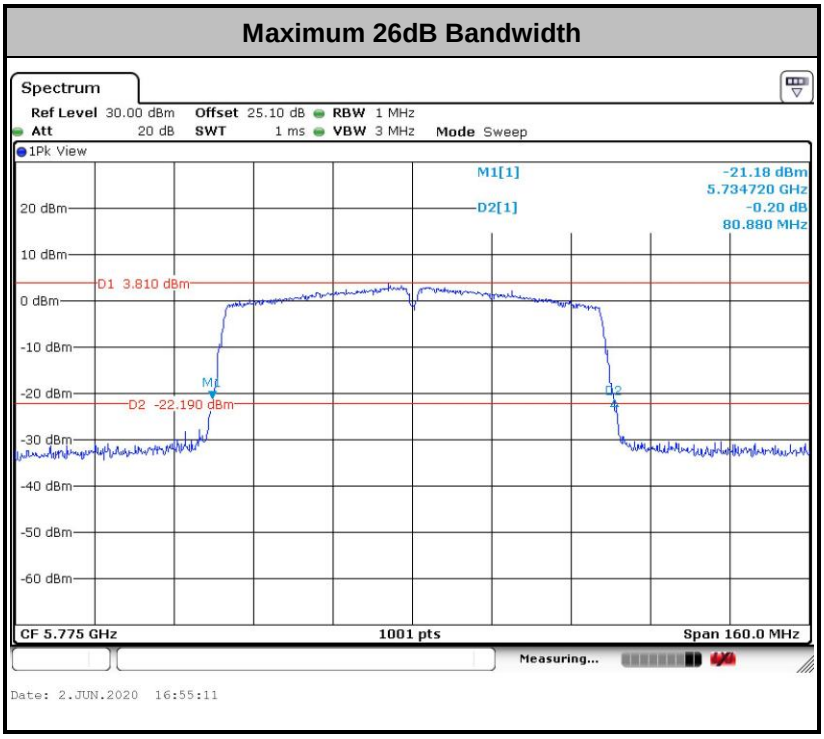
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

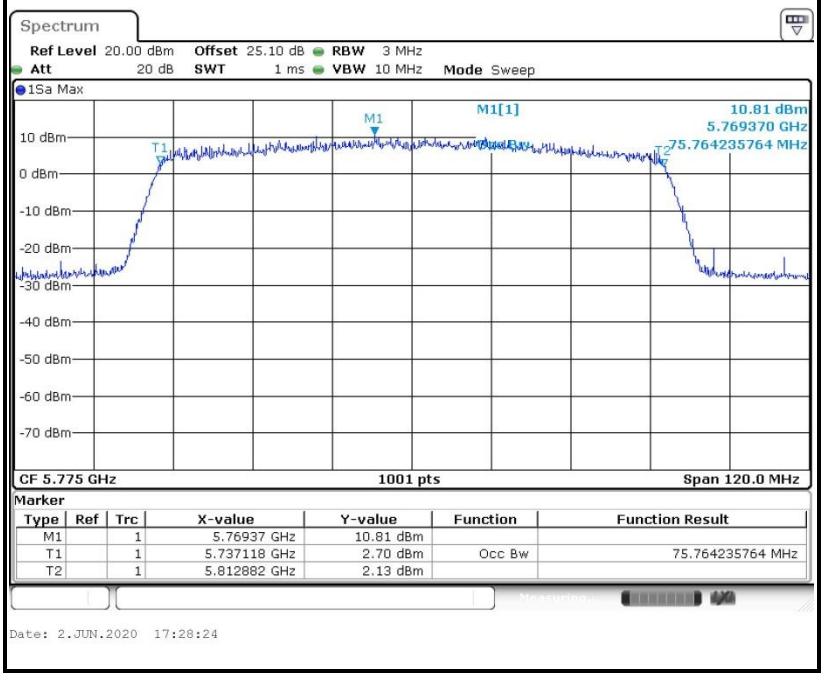
Minimum 6dB Bandwidth



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.

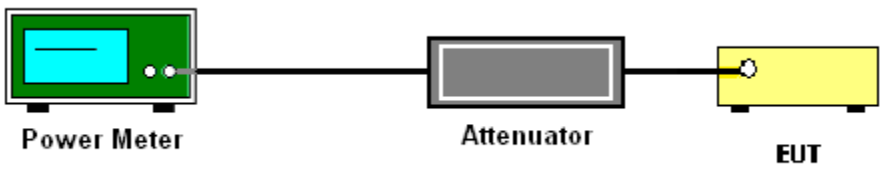
3.2.3 Test Procedures

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.

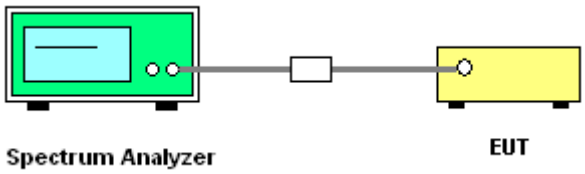
 # Method SA-2 #

(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.

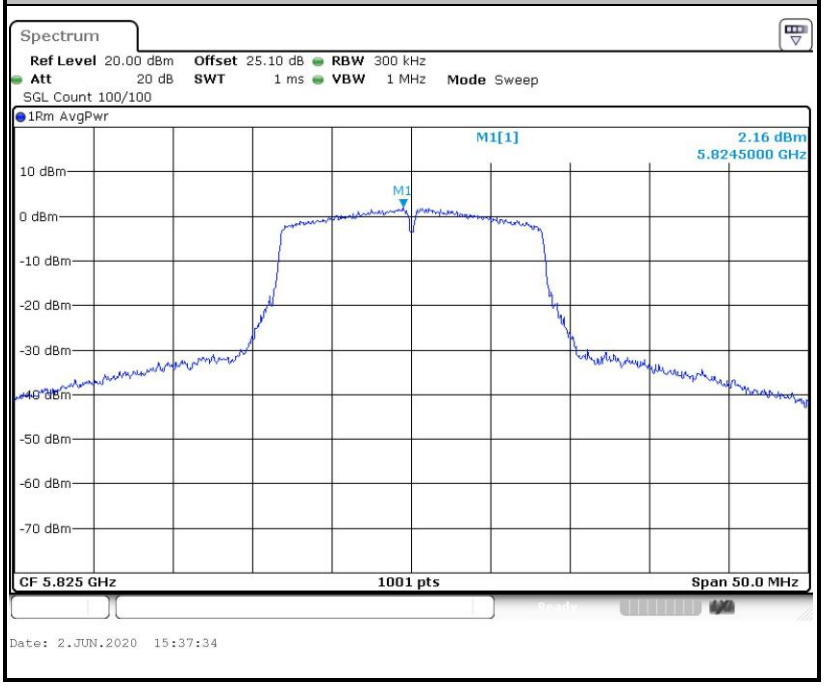
3.3.4 Test Setup



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	68.3

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

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

where

EIRP is the equivalent isotropically radiated power, in dBm

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

d_{Meas} is the measurement distance, in m

3.4.2 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

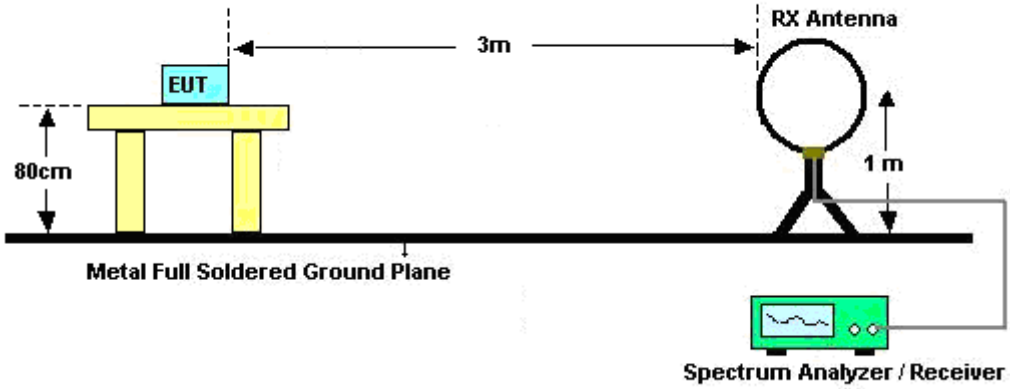
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

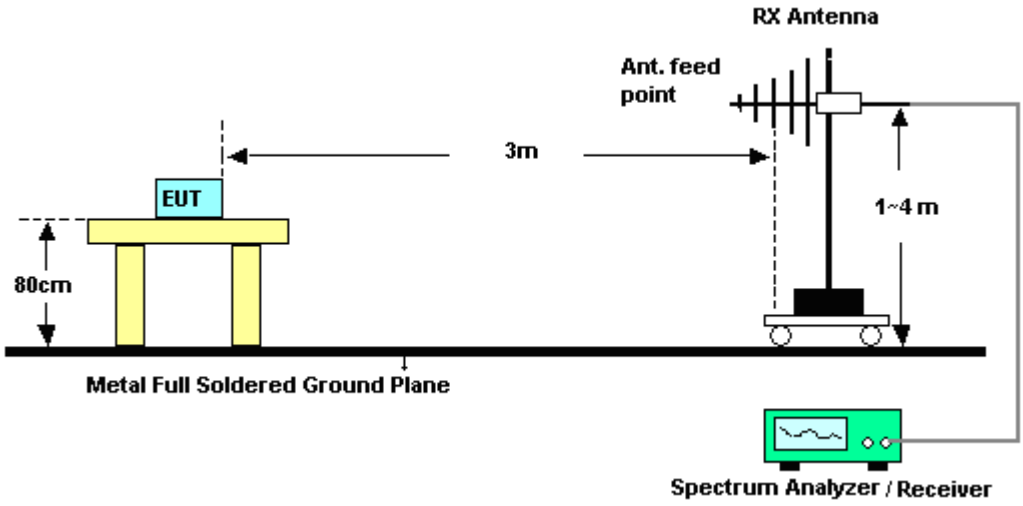
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

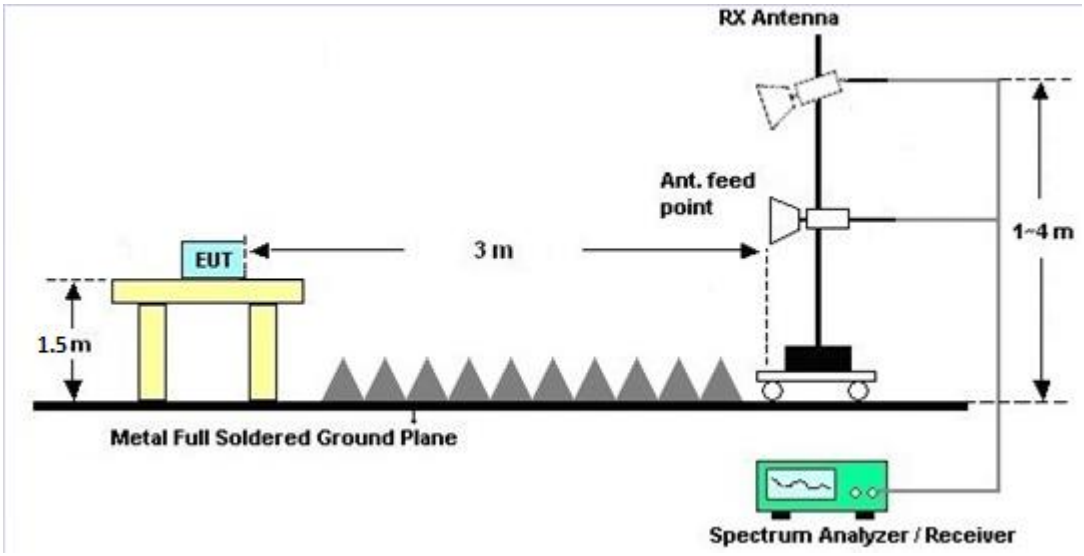
For radiated emissions below 30MHz



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.

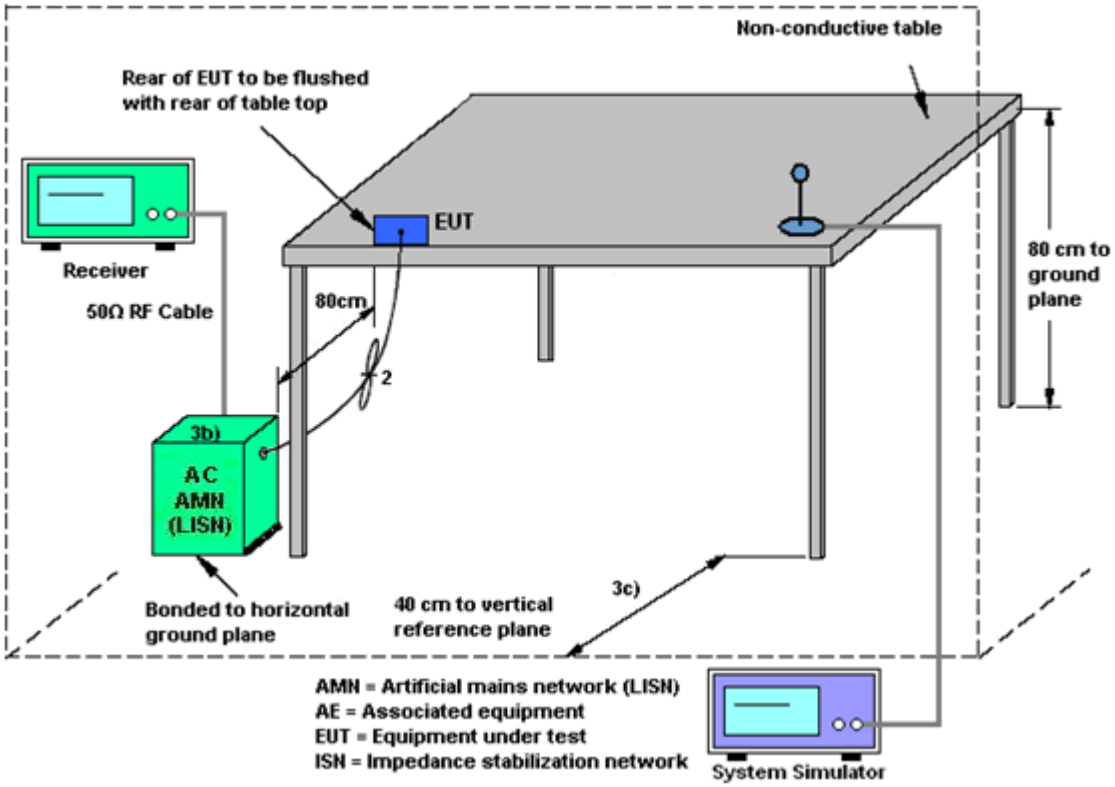
3.5.2 Measuring Instruments

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. 16, 2020	Jun. 02, 2020	Apr. 15, 2021	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 26, 2019	Jun. 02, 2020	Dec. 25, 2020	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 26, 2019	Jun. 02, 2020	Dec. 25, 2020	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Jul. 22, 2019	Jun. 20, 2020	Jul. 21, 2020	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Apr. 17, 2020	Jun. 20, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 28, 2020	Jun. 20, 2020	May 27, 2021	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Jul. 19, 2019	Jun. 20, 2020	Jul. 18, 2020	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	Apr. 01, 2020	Jun. 20, 2020	Mar. 31, 2021	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 17, 2020	Jun. 20, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 17, 2020	Jun. 20, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 18, 2019	Jun. 20, 2020	Oct. 17, 2020	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270104	0.5GHz~26.5Ghz	Dec. 27, 2019	Jun. 20, 2020	Dec. 26, 2020	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 22, 2019	Jun. 20, 2020	Jul. 21, 2020	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Jun. 20, 2020	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 20, 2020	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 20, 2020	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 26, 2019	Jun. 02, 2020	Dec. 25, 2020	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Oct. 17, 2019	Jun. 02, 2020	Oct. 16, 2020	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2019	Jun. 02, 2020	Oct. 16, 2020	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 23, 2019	Jun. 02, 2020	Jul. 22, 2020	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.7dB**

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))	**4.3dB**

Appendix A. Conducted Test Results

Report Number : FR052014-01F

Test Engineer:	Zeng Meng Hui	Temperature:	21~25	°C
Test Date:	2020/6/2	Relative Humidity:	51~54	%

Report Number : FR052014-01F

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	16.98	35.91	16.33	0.5	Pass
11a	6Mbps	1	157	5785	16.98	38.96	16.28	0.5	Pass
11a	6Mbps	1	165	5825	16.98	36.51	16.33	0.5	Pass
HT20	MCS 0	1	149	5745	17.88	28.67	17.58	0.5	Pass
HT20	MCS 0	1	157	5785	17.88	29.27	17.53	0.5	Pass
HT20	MCS 0	1	165	5825	17.88	30.62	17.53	0.5	Pass
HT40	MCS 0	1	151	5755	36.56	41.45	35.78	0.5	Pass
HT40	MCS 0	1	159	5795	36.66	41.45	36.05	0.5	Pass
VHT80	MCS 0	1	155	5775	75.76	80.88	76.24	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	0.00	14.60	30.00	-1.00	Pass
11a	6Mbps	1	157	5785	0.00	14.40	30.00	-1.00	Pass
11a	6Mbps	1	165	5825	0.00	14.72	30.00	-1.00	Pass
HT20	MCS 0	1	149	5745	0.00	14.29	30.00	-1.00	Pass
HT20	MCS 0	1	157	5785	0.00	14.53	30.00	-1.00	Pass
HT20	MCS 0	1	165	5825	0.00	14.56	30.00	-1.00	Pass
HT40	MCS 0	1	151	5755	0.00	13.33	30.00	-1.00	Pass
HT40	MCS 0	1	159	5795	0.00	13.41	30.00	-1.00	Pass
VHT20	MCS 0	1	149	5745	0.00	14.23	30.00	-1.00	Pass
VHT20	MCS 0	1	157	5785	0.00	14.50	30.00	-1.00	Pass
VHT20	MCS 0	1	165	5825	0.00	14.49	30.00	-1.00	Pass
VHT40	MCS 0	1	151	5755	0.00	13.30	30.00	-1.00	Pass
VHT40	MCS 0	1	159	5795	0.00	13.36	30.00	-1.00	Pass
VHT80	MCS 0	1	155	5775	0.00	12.30	30.00	-1.00	Pass

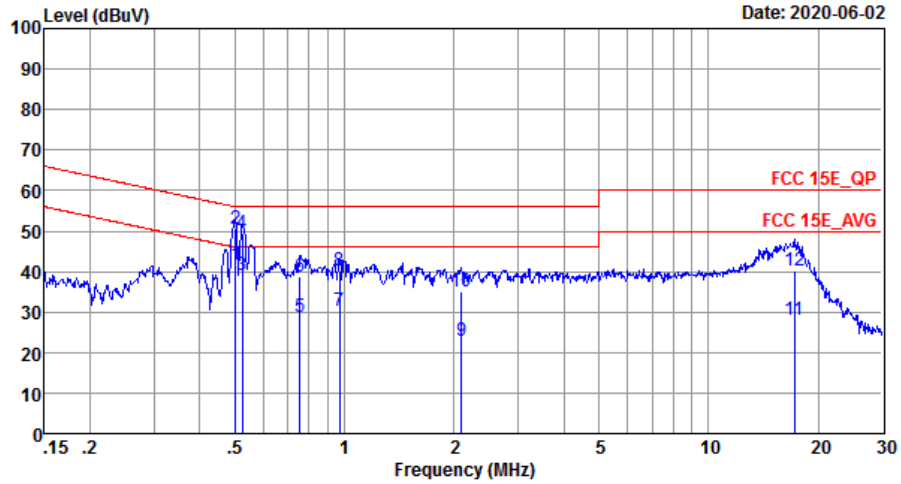
Report Number : FR052014-01F

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	0.00	2.22	4.01	30.00	-1.00	Pass
11a	6Mbps	1	157	5785	0.00	2.22	3.82	30.00	-1.00	Pass
11a	6Mbps	1	165	5825	0.00	2.22	4.38	30.00	-1.00	Pass
HT20	MCS 0	1	149	5745	0.00	2.22	2.98	30.00	-1.00	Pass
HT20	MCS 0	1	157	5785	0.00	2.22	3.43	30.00	-1.00	Pass
HT20	MCS 0	1	165	5825	0.00	2.22	3.53	30.00	-1.00	Pass
HT40	MCS 0	1	151	5755	0.00	2.22	-1.83	30.00	-1.00	Pass
HT40	MCS 0	1	159	5795	0.00	2.22	-1.62	30.00	-1.00	Pass
VHT80	MCS 0	1	155	5775	0.00	2.22	-7.73	30.00	-1.00	Pass

Appendix B. AC Conducted Emission Test Results

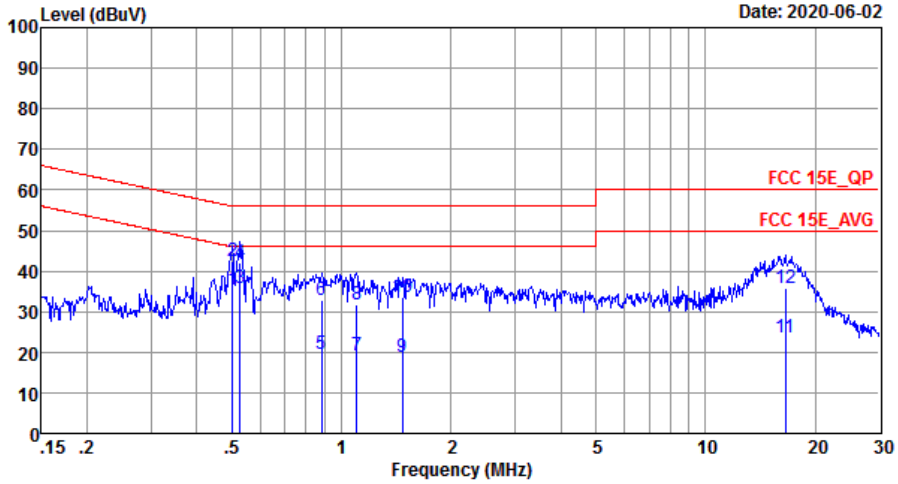
Test Engineer :	Doom Wu	Temperature :	22~25℃
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line



Site : CO01-SZ
Condition: FCC 15E QP LISN 20190719 L LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.50	41.78	-4.22	46.00	31.70	0.02	10.06	Average
2		0.50	50.58	-5.42	56.00	40.50	0.02	10.06	QP
3		0.52	39.28	-6.72	46.00	29.20	0.02	10.06	Average
4		0.52	49.58	-6.42	56.00	39.50	0.02	10.06	QP
5		0.75	28.70	-17.30	46.00	18.60	0.03	10.07	Average
6		0.75	38.70	-17.30	56.00	28.60	0.03	10.07	QP
7		0.97	30.32	-15.68	46.00	20.20	0.07	10.05	Average
8		0.97	40.22	-15.78	56.00	30.10	0.07	10.05	QP
9		2.10	22.77	-23.23	46.00	12.60	0.12	10.05	Average
10		2.10	35.17	-20.83	56.00	25.00	0.12	10.05	QP
11		17.20	28.17	-21.83	50.00	17.00	0.88	10.29	Average
12		17.20	40.17	-19.83	60.00	29.00	0.88	10.29	QP

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



Site : CO01-SZ
Condition: FCC 15E_QP LISN_20190719_N NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.50	35.28	-10.72	46.00	25.20	0.02	10.06	Average
2		0.50	42.38	-13.62	56.00	32.30	0.02	10.06	QP
3	*	0.53	35.78	-10.22	46.00	25.70	0.02	10.06	Average
4		0.53	42.08	-13.92	56.00	32.00	0.02	10.06	QP
5		0.88	19.60	-26.40	46.00	9.50	0.04	10.06	Average
6		0.88	32.80	-23.20	56.00	22.70	0.04	10.06	QP
7		1.10	19.10	-26.90	46.00	9.00	0.05	10.05	Average
8		1.10	31.80	-24.20	56.00	21.70	0.05	10.05	QP
9		1.47	18.90	-27.10	46.00	8.80	0.05	10.05	Average
10		1.47	33.50	-22.50	56.00	23.40	0.05	10.05	QP
11		16.57	23.51	-26.49	50.00	12.80	0.42	10.29	Average
12		16.57	35.91	-24.09	60.00	25.20	0.42	10.29	QP

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

Appendix C. Radiated Spurious Emission

Band 4 - 5725~5850MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 149 5745MHz		5621.4	54.34	-13.96	68.3	38.59	35.14	13.71	33.1	100	11	P	H
		5698.2	60.6	-43.28	103.88	44.57	35.28	13.85	33.1	100	11	P	H
		5719.4	68.84	-41.79	110.63	52.68	35.35	13.91	33.1	100	11	P	H
		5724.8	73.5	-48.24	121.74	57.34	35.35	13.91	33.1	100	11	P	H
	*	5745	105.85	-	-	89.59	35.38	13.98	33.1	100	11	P	H
		5745	100.85	-	-	84.59	35.38	13.98	33.1	100	11	A	H
		5635.8	54.71	-13.59	68.3	38.85	35.18	13.78	33.1	148	256	P	V
		5696.8	57.9	-44.95	102.85	41.87	35.28	13.85	33.1	148	256	P	V
		5716.6	66.98	-42.87	109.85	50.86	35.31	13.91	33.1	148	256	P	V
		5724	72.77	-47.15	119.92	56.61	35.35	13.91	33.1	148	256	P	V
	*	5745	104.55	-	-	88.29	35.38	13.98	33.1	148	256	P	V
		5745	98.52	-	-	82.26	35.38	13.98	33.1	148	256	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		5646	54.57	-13.73	68.3	38.71	35.18	13.78	33.1	104	34	P	H
		5686.8	55.4	-40.09	95.49	39.37	35.28	13.85	33.1	104	34	P	H
		5719	57.74	-52.78	110.52	41.58	35.35	13.91	33.1	104	34	P	H
		5725	57.19	-65.01	122.2	41.03	35.35	13.91	33.1	104	34	P	H
	*	5785	106.67	-	-	90.27	35.45	14.05	33.1	104	34	P	H
		5785	100.92	-	-	84.52	35.45	14.05	33.1	104	34	A	H
		5854.8	55.1	-56.16	111.26	38.45	35.62	14.13	33.1	104	34	P	H
		5862.2	56.22	-52.56	108.78	39.5	35.62	14.2	33.1	104	34	P	H
		5918.4	56.69	-16.46	73.15	39.78	35.73	14.28	33.1	104	34	P	H
		5941.6	54.82	-13.48	68.3	37.77	35.8	14.35	33.1	104	34	P	H
		5615	54.24	-14.06	68.3	38.52	35.11	13.71	33.1	146	255	P	V
		5698.8	55.19	-49.13	104.32	39.16	35.28	13.85	33.1	146	255	P	V
		5703.8	55.13	-51.14	106.27	39.01	35.31	13.91	33.1	146	255	P	V
		5724	55.73	-64.19	119.92	39.57	35.35	13.91	33.1	146	255	P	V
	*	5785	103.5	-	-	87.1	35.45	14.05	33.1	146	255	P	V
		5785	97.09	-	-	80.69	35.45	14.05	33.1	146	255	A	V
		5851.8	54.36	-63.74	118.1	37.74	35.59	14.13	33.1	146	255	P	V
		5870.6	54.39	-52.04	106.43	37.63	35.66	14.2	33.1	146	255	P	V
		5916.4	55.16	-19.46	74.62	38.25	35.73	14.28	33.1	146	255	P	V
		5943.2	55.12	-13.18	68.3	38.07	35.8	14.35	33.1	146	255	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	106.94	-	-	90.35	35.56	14.13	33.1	119	11	P	H
		5825	101.27	-	-	84.68	35.56	14.13	33.1	119	11	A	H
		5850	68.82	-53.38	122.2	52.2	35.59	14.13	33.1	119	11	P	H
		5860.6	64.51	-44.72	109.23	47.79	35.62	14.2	33.1	119	11	P	H
		5877	57.16	-46.56	103.72	40.4	35.66	14.2	33.1	119	11	P	H
		5926.4	55.4	-12.9	68.3	38.46	35.76	14.28	33.1	119	11	P	H
	*	5825	105.05	-	-	88.46	35.56	14.13	33.1	126	242	P	V
		5825	97.94	-	-	81.35	35.56	14.13	33.1	126	242	A	V
		5853.2	67.27	-47.63	114.9	50.65	35.59	14.13	33.1	126	242	P	V
		5855	63.15	-47.65	110.8	46.5	35.62	14.13	33.1	126	242	P	V
		5884.4	56.18	-42.06	98.24	39.42	35.66	14.2	33.1	126	242	P	V
		5948.8	55.33	-12.97	68.3	38.28	35.8	14.35	33.1	126	242	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	48.67	-25.33	74	46.78	38.88	20.77	57.76	192	264	P	H
		17235	49.23	-19.07	68.3	40.94	41.61	24.65	57.97	182	341	P	H
		11490	48.31	-25.69	74	46.42	38.88	20.77	57.76	192	264	P	V
		17235	49.72	-18.58	68.3	41.43	41.61	24.65	57.97	182	341	P	V
802.11a CH 157 5785MHz		11570	49.05	-24.95	74	46.91	39.02	20.79	57.67	171	294	P	H
		17355	49.31	-18.99	68.3	40.8	41.56	24.75	57.8	128	247	P	H
		11570	49.18	-24.82	74	47.04	39.02	20.79	57.67	171	294	P	V
		17355	49.38	-18.92	68.3	40.87	41.56	24.75	57.8	128	247	P	V
802.11a CH 165 5825MHz		11650	48.52	-25.48	74	46.15	39.15	20.81	57.59	188	116	P	H
		17475	48.02	-20.28	68.3	39.3	41.51	24.85	57.64	161	177	P	H
		11650	48.44	-25.56	74	46.07	39.15	20.81	57.59	188	116	P	V
		17475	49.16	-19.14	68.3	40.44	41.51	24.85	57.64	161	177	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)
		5629.4	55.93	-12.37	68.3	40.11	35.14	13.78	33.1	116	10	P	H
		5699.2	60.22	-44.39	104.61	44.19	35.28	13.85	33.1	116	10	P	H
		5718.4	71.87	-38.48	110.35	55.71	35.35	13.91	33.1	116	10	P	H
		5723.4	75.44	-43.11	118.55	59.28	35.35	13.91	33.1	116	10	P	H
802.11n	*	5745	106.56	-	-	90.3	35.38	13.98	33.1	116	10	P	H
HT20		5745	100.52	-	-	84.26	35.38	13.98	33.1	116	10	A	H
CH 149		5645	54.65	-13.65	68.3	38.79	35.18	13.78	33.1	113	246	P	V
5745MHz		5699.4	59.54	-45.22	104.76	43.51	35.28	13.85	33.1	113	246	P	V
		5718.6	65.56	-44.85	110.41	49.4	35.35	13.91	33.1	113	246	P	V
		5723.8	72.36	-47.1	119.46	56.2	35.35	13.91	33.1	113	246	P	V
	*	5745	104.47	-	-	88.21	35.38	13.98	33.1	113	246	P	V
		5745	98.52	-	-	82.26	35.38	13.98	33.1	113	246	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)
		5623	55.06	-13.24	68.3	39.24	35.14	13.78	33.1	116	32	P	H
		5683.8	56.22	-37.06	93.28	40.19	35.28	13.85	33.1	116	32	P	H
		5713.4	57.19	-51.76	108.95	41.07	35.31	13.91	33.1	116	32	P	H
		5721.6	57.81	-56.64	114.45	41.65	35.35	13.91	33.1	116	32	P	H
	*	5785	106.24	-	-	89.84	35.45	14.05	33.1	116	32	P	H
		5785	98.76	-	-	82.36	35.45	14.05	33.1	116	32	A	H
		5852.2	56.43	-60.75	117.18	39.81	35.59	14.13	33.1	116	32	P	H
		5860.2	57.48	-51.86	109.34	40.76	35.62	14.2	33.1	116	32	P	H
802.11n		5915	55.85	-19.81	75.66	38.94	35.73	14.28	33.1	116	32	P	H
HT20		5938.8	55.26	-13.04	68.3	38.21	35.8	14.35	33.1	116	32	P	H
CH 157		5604.6	53.5	-14.8	68.3	37.78	35.11	13.71	33.1	104	259	P	V
5785MHz		5670.4	54.24	-29.15	83.39	38.25	35.24	13.85	33.1	104	259	P	V
		5711	54.71	-53.57	108.28	38.59	35.31	13.91	33.1	104	259	P	V
		5724.4	55.28	-65.55	120.83	39.12	35.35	13.91	33.1	104	259	P	V
	*	5785	102.92	-	-	86.52	35.45	14.05	33.1	104	259	P	V
		5785	97.05	-	-	80.65	35.45	14.05	33.1	104	259	A	V
		5851.2	54.19	-65.27	119.46	37.57	35.59	14.13	33.1	104	259	P	V
		5861	55.61	-53.51	109.12	38.89	35.62	14.2	33.1	104	259	P	V
		5902	55.34	-29.9	85.24	38.47	35.69	14.28	33.1	104	259	P	V
		5932.2	55.36	-12.94	68.3	38.42	35.76	14.28	33.1	104	259	P	V

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 165 5825MHz	*	5825	106.53	-	-	89.94	35.56	14.13	33.1	104	31	P	H
		5825	100.84	-	-	84.25	35.56	14.13	33.1	104	31	A	H
		5850.4	71.18	-50.11	121.29	54.56	35.59	14.13	33.1	104	31	P	H
		5857.8	68.93	-41.08	110.01	52.21	35.62	14.2	33.1	104	31	P	H
		5879.4	58.8	-43.14	101.94	42.04	35.66	14.2	33.1	104	31	P	H
		5936.6	54.71	-13.59	68.3	37.7	35.76	14.35	33.1	104	31	P	H
	*	5825	104.1	-	-	87.51	35.56	14.13	33.1	133	258	P	V
		5825	97.84	-	-	81.25	35.56	14.13	33.1	133	258	A	V
		5850.4	68.65	-52.64	121.29	52.03	35.59	14.13	33.1	133	258	P	V
		5857	65.68	-44.56	110.24	48.96	35.62	14.2	33.1	133	258	P	V
		5878.4	55.95	-46.73	102.68	39.19	35.66	14.2	33.1	133	258	P	V
		5942.6	54.9	-13.4	68.3	37.85	35.8	14.35	33.1	133	258	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11490	48.9	-25.1	74	47.01	38.88	20.77	57.76	192	264	P	H
HT20		17235	49.37	-18.93	68.3	41.08	41.61	24.65	57.97	182	341	P	H
CH 149		11490	48.39	-25.61	74	46.5	38.88	20.77	57.76	192	264	P	V
5745MHz		17235	49.41	-18.89	68.3	41.12	41.61	24.65	57.97	182	341	P	V
802.11n		11570	48.84	-25.16	74	46.7	39.02	20.79	57.67	171	294	P	H
HT20		17355	49.46	-18.84	68.3	40.95	41.56	24.75	57.8	128	247	P	H
CH 157		11570	49.65	-24.35	74	47.51	39.02	20.79	57.67	171	294	P	V
5785MHz		17355	49.19	-19.11	68.3	40.68	41.56	24.75	57.8	128	247	P	V
802.11n		11650	48.28	-25.72	74	45.91	39.15	20.81	57.59	188	116	P	H
HT20		17475	49.46	-18.84	68.3	40.74	41.51	24.85	57.64	161	177	P	H
CH 165		11650	48.55	-25.45	74	46.18	39.15	20.81	57.59	188	116	P	V
5825MHz		17475	49.58	-18.72	68.3	40.86	41.51	24.85	57.64	161	177	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)
		5644.8	55.16	-13.14	68.3	39.3	35.18	13.78	33.1	100	27	P	H
		5698.2	64.79	-39.09	103.88	48.76	35.28	13.85	33.1	100	27	P	H
		5717.2	72.96	-37.06	110.02	56.84	35.31	13.91	33.1	100	27	P	H
		5721.2	74.38	-39.16	113.54	58.22	35.35	13.91	33.1	100	27	P	H
	*	5755	103.11	-	-	86.81	35.42	13.98	33.1	100	27	P	H
		5755	95.66	-	-	79.36	35.42	13.98	33.1	100	27	A	H
		5851	54.02	-65.9	119.92	37.4	35.59	14.13	33.1	100	27	P	H
		5855.2	55.68	-55.06	110.74	39.03	35.62	14.13	33.1	100	27	P	H
802.11n		5919.6	55.38	-16.89	72.27	38.47	35.73	14.28	33.1	100	27	P	H
HT40		5936.8	54.82	-13.48	68.3	37.81	35.76	14.35	33.1	100	27	P	H
CH 151		5646.8	54.66	-13.64	68.3	38.8	35.18	13.78	33.1	131	259	P	V
5755MHz		5700	59.74	-45.46	105.2	43.65	35.28	13.91	33.1	131	259	P	V
		5719.6	69.46	-41.23	110.69	53.3	35.35	13.91	33.1	131	259	P	V
		5721.4	70.12	-43.87	113.99	53.96	35.35	13.91	33.1	131	259	P	V
	*	5755	100.78	-	-	84.48	35.42	13.98	33.1	131	259	P	V
		5755	93.95	-	-	77.65	35.42	13.98	33.1	131	259	A	V
		5852.4	53.23	-63.5	116.73	36.61	35.59	14.13	33.1	131	259	P	V
		5869	54.8	-52.08	106.88	38.08	35.62	14.2	33.1	131	259	P	V
		5884	54.61	-43.92	98.53	37.85	35.66	14.2	33.1	131	259	P	V
		5931	54.28	-14.02	68.3	37.34	35.76	14.28	33.1	131	259	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)
		5638.8	54.35	-13.95	68.3	38.49	35.18	13.78	33.1	100	10	P	H
		5696.2	56.94	-45.47	102.41	40.91	35.28	13.85	33.1	100	10	P	H
		5710.4	58.05	-50.06	108.11	41.93	35.31	13.91	33.1	100	10	P	H
		5720.8	60.67	-51.95	112.62	44.51	35.35	13.91	33.1	100	10	P	H
	*	5795	104.05	-	-	87.61	35.49	14.05	33.1	100	10	P	H
		5795	98.09	-	-	81.65	35.49	14.05	33.1	100	10	A	H
		5851.2	60.57	-58.89	119.46	43.95	35.59	14.13	33.1	100	10	P	H
		5855.6	58.24	-52.39	110.63	41.52	35.62	14.2	33.1	100	10	P	H
802.11n		5896.2	55.26	-34.26	89.52	38.39	35.69	14.28	33.1	100	10	P	H
HT40		5932.6	54.73	-13.57	68.3	37.79	35.76	14.28	33.1	100	10	P	H
CH 159		5636.6	53.73	-14.57	68.3	37.87	35.18	13.78	33.1	124	262	P	V
5795MHz		5685	55.42	-38.74	94.16	39.39	35.28	13.85	33.1	124	262	P	V
		5719.4	57.95	-52.68	110.63	41.79	35.35	13.91	33.1	124	262	P	V
		5724.8	58.71	-63.03	121.74	42.55	35.35	13.91	33.1	124	262	P	V
	*	5795	100.52	-	-	84.08	35.49	14.05	33.1	124	262	P	V
		5795	94.7	-	-	78.26	35.49	14.05	33.1	124	262	A	V
		5852.8	57.76	-58.06	115.82	41.14	35.59	14.13	33.1	124	262	P	V
		5858.6	57.58	-52.21	109.79	40.86	35.62	14.2	33.1	124	262	P	V
		5896	55.18	-34.48	89.66	38.31	35.69	14.28	33.1	124	262	P	V
		5926.6	55.02	-13.28	68.3	38.08	35.76	14.28	33.1	124	262	P	V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.

Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11510	48.4	-25.6	74	46.47	38.9	20.77	57.74	177	221	P	H
HT40		17265	49	-19.3	68.3	40.65	41.59	24.68	57.92	105	281	P	H
CH 151		11510	48.59	-25.41	74	46.66	38.9	20.77	57.74	177	221	P	V
5755MHz		17265	49.49	-18.81	68.3	41.14	41.59	24.68	57.92	105	281	P	V
802.11n		11590	48.88	-25.12	74	46.67	39.06	20.8	57.65	185	194	P	H
HT40		17385	49.63	-18.67	68.3	41.05	41.55	24.78	57.75	173	260	P	H
CH 159		11590	48.34	-25.66	74	46.13	39.06	20.8	57.65	185	194	P	V
5795MHz		17385	49.14	-19.16	68.3	40.56	41.55	24.78	57.75	173	260	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)
		5641.6	56.1	-12.2	68.3	40.24	35.18	13.78	33.1	113	26	P	H
		5698	64.48	-39.25	103.73	48.45	35.28	13.85	33.1	113	26	P	H
		5712.2	67.59	-41.03	108.62	51.47	35.31	13.91	33.1	113	26	P	H
		5722.2	66.35	-49.47	115.82	50.19	35.35	13.91	33.1	113	26	P	H
	*	5775	100.74	-	-	84.41	35.45	13.98	33.1	113	26	P	H
		5775	94.02	-	-	77.69	35.45	13.98	33.1	113	26	A	H
		5850.2	59.29	-62.45	121.74	42.67	35.59	14.13	33.1	113	26	P	H
		5855.4	57.76	-52.93	110.69	41.11	35.62	14.13	33.1	113	26	P	H
802.11ac		5879.2	54.95	-47.14	102.09	38.19	35.66	14.2	33.1	113	26	P	H
VHT80		5941.6	54.18	-14.12	68.3	37.13	35.8	14.35	33.1	113	26	P	H
CH 155		5631	54.45	-13.85	68.3	38.63	35.14	13.78	33.1	115	263	P	V
5775MHz		5698.8	58.14	-46.18	104.32	42.11	35.28	13.85	33.1	115	263	P	V
		5710.4	62.65	-45.46	108.11	46.53	35.31	13.91	33.1	115	263	P	V
		5723.2	58.56	-59.54	118.1	42.4	35.35	13.91	33.1	115	263	P	V
	*	5775	95.16	-	-	78.83	35.45	13.98	33.1	115	263	P	V
		5775	88.69	-	-	72.36	35.45	13.98	33.1	115	263	A	V
		5853.4	55.95	-58.5	114.45	39.33	35.59	14.13	33.1	115	263	P	V
		5855	57.06	-53.74	110.8	40.41	35.62	14.13	33.1	115	263	P	V
		5876	54.78	-49.68	104.46	38.02	35.66	14.2	33.1	115	263	P	V
		5938.4	54.19	-14.11	68.3	37.18	35.76	14.35	33.1	115	263	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	49.75	-24.25	74	47.65	38.99	20.79	57.68	160	360	P	H
VHT80		17325	49.01	-19.29	68.3	40.54	41.57	24.75	57.85	170	360	P	H
CH 155		11550	48.2	-25.8	74	46.1	38.99	20.79	57.68	160	360	P	V
5775MHz		17325	49.84	-18.46	68.3	41.37	41.57	24.75	57.85	170	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

5GHz WIFI 802.11ac VHT80 (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11ac VHT80 LF		30	26.34	-13.66	40	31.73	24.9	1.01	31.3	-	-	P	H
		111.48	31.32	-12.18	43.5	43.06	17.9	1.92	31.56	128	299	P	H
		157.07	26.28	-17.22	43.5	39	16.38	2.28	31.38	-	-	P	H
		502.39	28.2	-17.8	46	31.57	23.8	4.04	31.21	-	-	P	H
		751.68	31.88	-14.12	46	31.85	26.2	4.94	31.11	-	-	P	H
		925.31	32.39	-13.61	46	31.54	26.78	5.48	31.41	-	-	P	H
		40.67	35.57	-4.43	40	46.75	19.1	1.17	31.45	166	245	P	V
		84.32	29	-11	40	44.98	13.9	1.67	31.55	-	-	P	V
		160.95	27.53	-15.97	43.5	40.43	16.17	2.31	31.38	-	-	P	V
		501.42	28.11	-17.89	46	31.49	23.8	4.03	31.21	-	-	P	V
		675.05	29.6	-16.4	46	31.13	25.35	4.66	31.54	-	-	P	V
		876.81	31.3	-14.7	46	30.75	26.69	5.31	31.45	-	-	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)

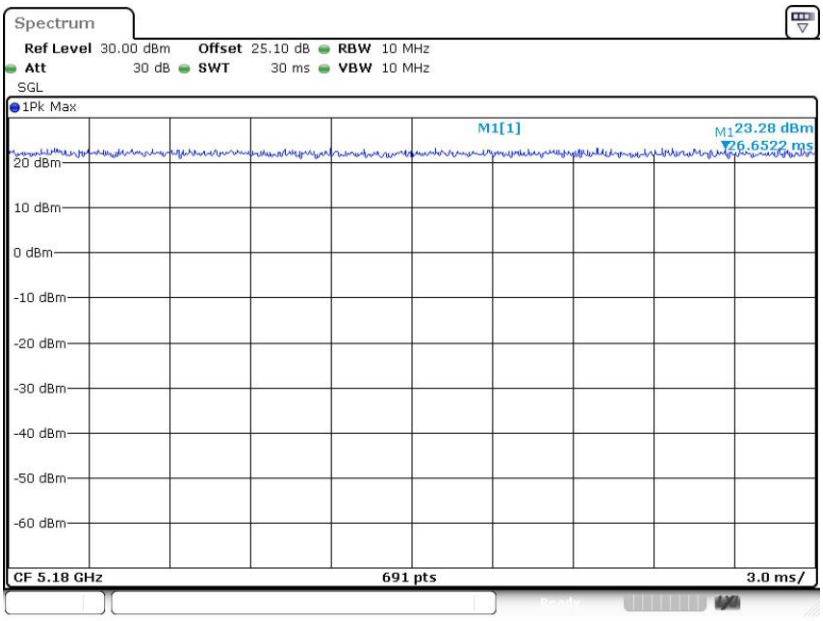
= -10.46(dB)

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

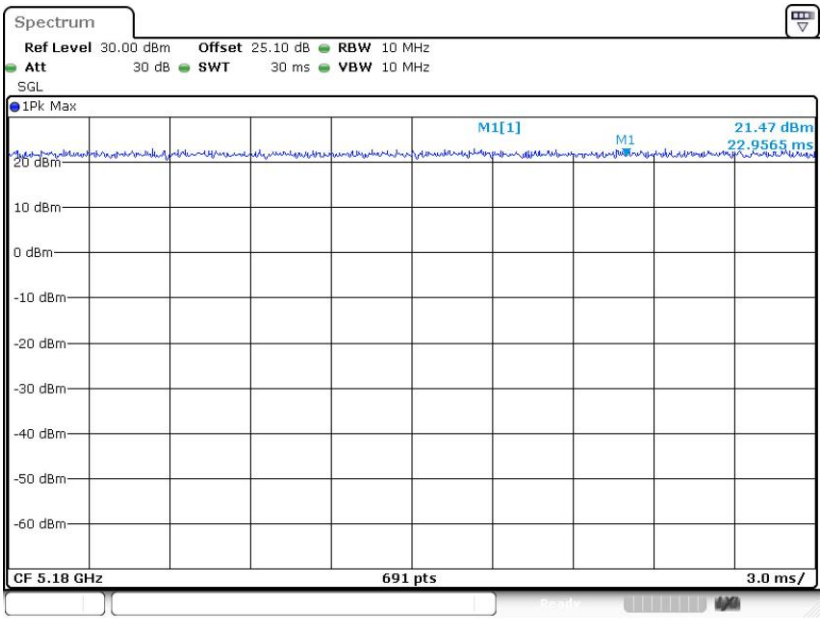
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	100	-	-	10Hz
802.11n HT20	100	-	-	10Hz
802.11n HT40	100	-	-	10Hz
802.11ac VHT80	100	-	-	10Hz

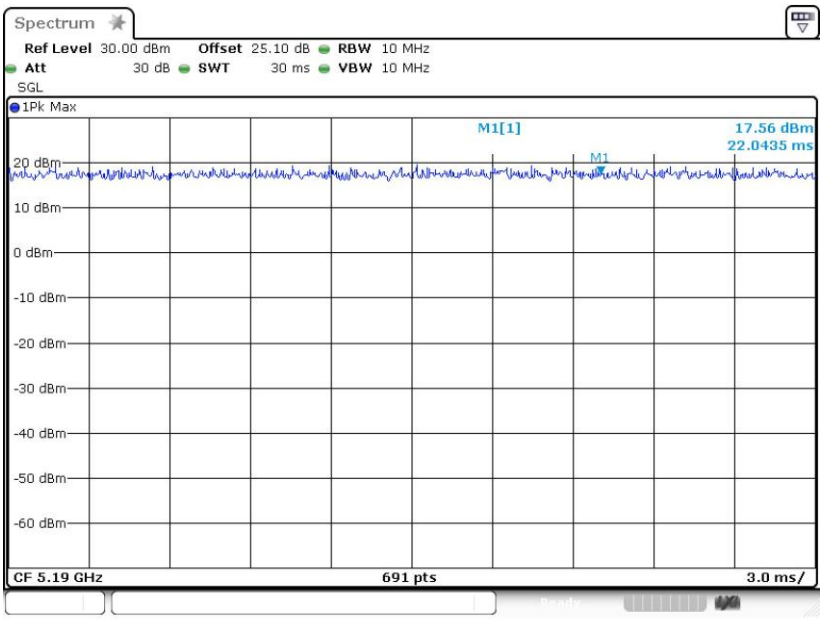
802.11a



802.11n HT20



802.11n HT40



802.11ac VHT80