FCC RF Test Report

APPLICANT	:	ZTE CORPORATION
EQUIPMENT	:	LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone
BRAND NAME	:	ZTE
MODEL NAME	:	Z988
FCC ID	:	SRQ-Z988
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure

The product testing was completed on Nov. 03, 2015. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

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Approved by: Jones Tsai / Manager

Testing Laboratory 2627

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TABLE OF CONTENTS

REVISION HISTORY **3**

SUMMARY OF TEST RESULT **4**

1 GENERAL DESCRIPTION **5**

1.1 Applicant 5
1.2 Manufacturer 5
1.3 Feature of Equipment Under Test 5
1.4 Product Specification of Equipment Under Test 6
1.5 Modification of EUT 7
1.6 Testing Location 7
1.7 Applicable Standards 7

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST **8**

2.1 Carrier Frequency Channel 8
2.2 Pre-Scanned RF Power 9
2.3 Test Mode 11
2.4 Connection Diagram of Test System 13
2.5 Support Unit used in test configuration and system 14
2.6 EUT Operation Test Setup 14
2.7 Measurement Results Explanation Example 15

3 TEST RESULT **16**

3.1 26dB & 99% Occupied Bandwidth Measurement 16
3.2 Maximum Conducted Output Power Measurement 18
3.3 Power Spectral Density Measurement 20
3.4 Unwanted Radiated Emission Measurement 23
3.5 AC Conducted Emission Measurement 27
3.6 Frequency Stability Measurement 31
3.7 Automatically Discontinue Transmission 32
3.8 Antenna Requirements 33

4 LIST OF MEASURING EQUIPMENTS **34**

5 UNCERTAINTY OF EVALUATION **35**

APPENDIX A. CONDUCTED TEST RESULTS

APPENDIX B. RADIATED TEST RESULTS

APPENDIX C. SETUP PHOTOGRAPHS

APPENDIX D. PRODUCT EQUALITY DECLARATION

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5O2302D	Rev. 01	This is a variant product of Z962BL. The product equality declaration could be referred to Appendix D. The test result is not affected, all the test cases were performed on original report which can be referred to Sporton Report Number FR5O2205D (Model name: Z962BL; FCC ID: SRQ-Z962BL).	Jan. 05, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	2.1049 15.403(i)	26dB & 99% Bandwidth	-	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	FCC ≤24 dBm (depend on band)	Pass	-
3.3	15.407(a)	Power Spectral Density	FCC ≤11 dBm (depend on band)	Pass	-
3.4	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass	Under limit 1.28 dB at 5149.700 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 10.43 dB at 0.890 MHz
3.6	15.407(g)	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

ZTE CORPORATION
ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

1.2 Manufacturer

ZTE CORPORATION
ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z988
FCC ID	SRQ-Z988
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/ HSPA+(16QAM uplink is not supported)/LTE WLAN2.4GHz 802.11b/g/n HT20 WLAN5GHz 802.11a/n HT20 WLAN5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v2.1+EDR/Bluetooth v4.1 LE
IMEI Code	Conducted: 868661020002150 Radiation: 868661020001368 Conduction: 868661020002184
HW Version	Z988HWV1.0
SW Version	Z988V1.0.0B01
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

Product Specification subjective to this standard	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz
Maximum Output Power to Antenna	802.11a : 13.21 dBm / 0.0209 W 802.11n HT20 : 10.35 dBm / 0.0108 W 802.11ac VHT20 : 10.45 dBm / 0.0111 W 802.11ac VHT40 : 9.74 dBm / 0.0094 W 802.11ac VHT80 : 9.84 dBm / 0.0096 W
99% Occupied Bandwidth	802.11a : 19.08 MHz 802.11n HT20 : 19.43 MHz 802.11ac VHT20: 19.38 MHz 802.11ac VHT40 : 36.96 MHz 802.11ac VHT80 : 75.12 MHz
Antenna Type / Gain	IFA Antenna with gain 0.30 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

1.5 Modification of EUT

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

1.6 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.			
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958			
Test Site No.	Sporton Site No.			FCC Registration No.
	TH01-KS	03CH03-KS	CO01-KS	306251

Note: The test site complies with ANSI C63.4 2009 requirement.

1.7 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 v01
- ANSI C63.10-2013

Remark:

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

2 Test Configuration of Equipment Under Test

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

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5180-5240 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38	**5190**	**46**	**5230**
	40	5200	48	5240
	42	5210		

2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test in the following tables. Final Output Power equals to Measured Output Power adds the duty factor.

5GHz 802.11a RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index 6Mbps	Channel	9M bps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 36	5180	**13.21**	CH 36	13.09	13.06	12.76	12.64	12.79	12.83	12.72
CH 44	5220	12.79								
CH 48	5240	12.80								

5GHz 802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 36	5180	**10.35**	CH 36	10.30	10.20	10.09	10.15	10.01	10.12	10.03
CH 44	5220	10.08								
CH 48	5240	10.05								

WLAN 5GHz 802.11ac VHT20 Average Power (dBm)											
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
CH 36	5180	**10.45**	CH 36	10.42	10.37	10.38	10.33	10.44	10.39	10.43	10.40
CH 44	5220	10.27									
CH 48	5240	10.23									

WLAN 5GHz 802.11ac VHT40 Average Power (dBm)												
Power vs. Channel			Power vs. Data Rate									
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
CH 38	5190	9.74	CH 38	9.49	9.62	9.46	9.52	9.57	9.73	9.56	9.60	9.70
CH 46	5230	9.48										

WLAN 5GHz 802.11ac VHT80 Average Power (dBm)												
Power vs. Channel			Power vs. Data Rate									
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
CH 42	5210	9.84	CH 42	9.64	9.75	9.58	9.68	9.74	9.69	9.73	9.71	9.81

2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

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

Ch. #		Band I：5180-5240 MHz
		802.11a
L	Low	36
M	Middle	44
H	High	48

Ch. #		Band I：5180-5240 MHz
		802.11n HT20
L	Low	36
M	Middle	44
H	High	48

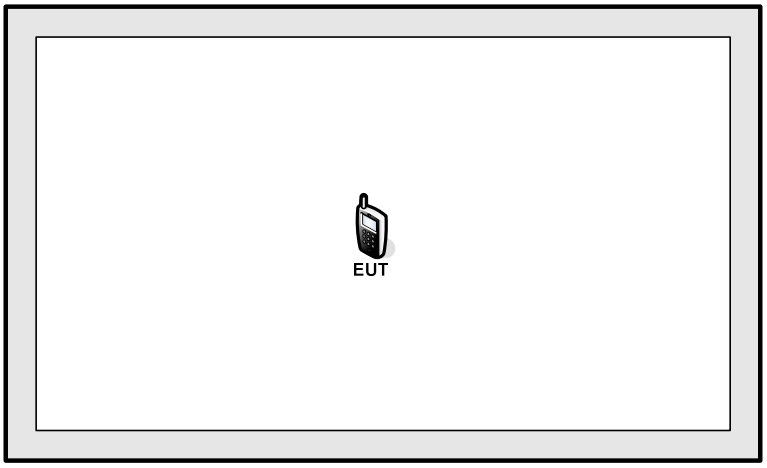
Ch. #		Band I：5180-5240 MHz
		802.11ac VHT20
L	Low	36
M	Middle	44
H	High	48

Ch. #		Band I：5180-5240 MHz
		802.11ac VHT40
L	Low	38
M	Middle	-
H	High	46

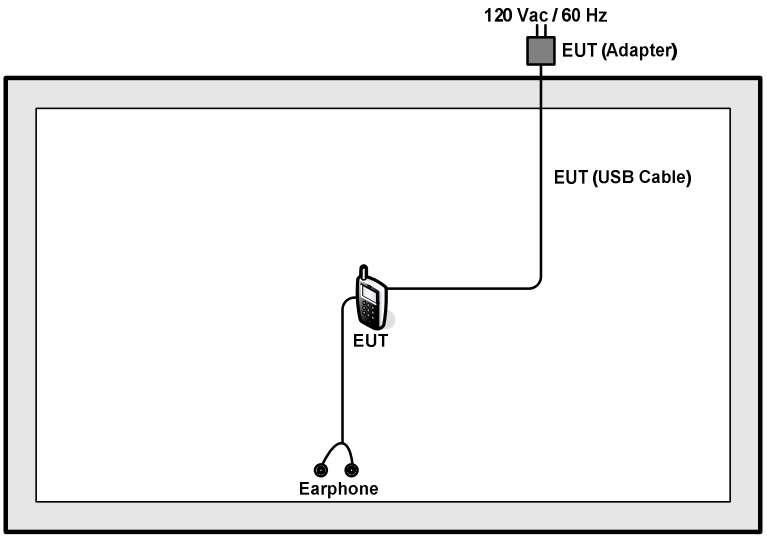
Ch. #		Band I：5180-5240 MHz
		802.11ac VHT80
L	Low	-
M	Middle	42
H	High	-

2.4 Connection Diagram of Test System

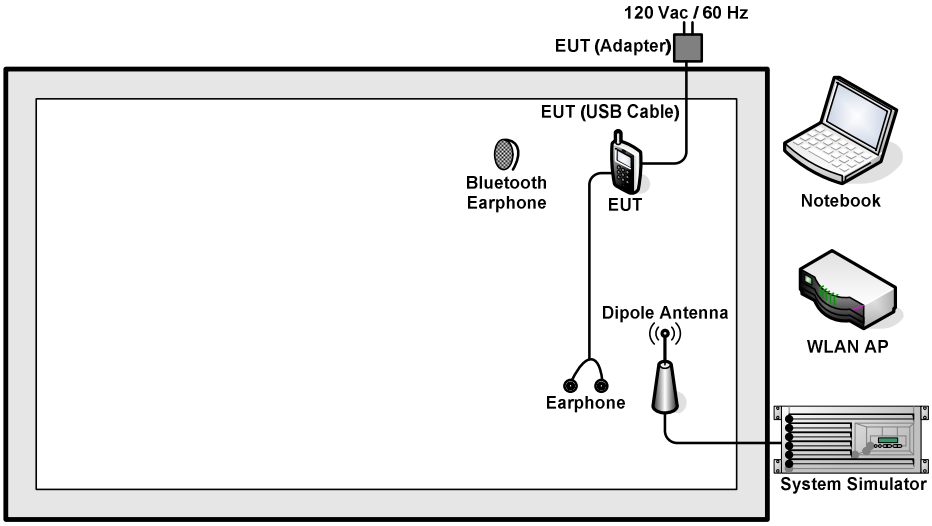
<WLAN5GHz 802.11a/WLAN5GHz 802.11ac VHT80 Tx Mode>



<WLAN5GHz 802.11n HT20/WLAN5GHz 802.11ac VHT20/VHT40 Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
2.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
5.	Earphone	Lenovo	LH102	N/A	Unshielded, 1.2 m	N/A

2.6 EUT Operation Test Setup

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

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

2.7 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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.
Offset = RF cable loss.
Following shows an offset computation example with cable loss 7.0 dB.

Offset (dB) = RF cable loss(dB).
= 7.0 (dB)

3 Test Result

3.1 26dB & 99% Occupied Bandwidth Measurement

3.1.1 Description of 26dB & 99% Occupied Bandwidth

This section is for reporting purpose only.

There is no restriction limits for bandwidth.

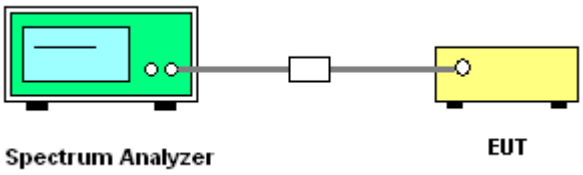
3.1.2 Measuring Instruments

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 v01. Section C) Emission bandwidth
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1MHz and set the Video bandwidth (VBW) ≥ 3 * RBW.
8. Measure and record the results in the test report.

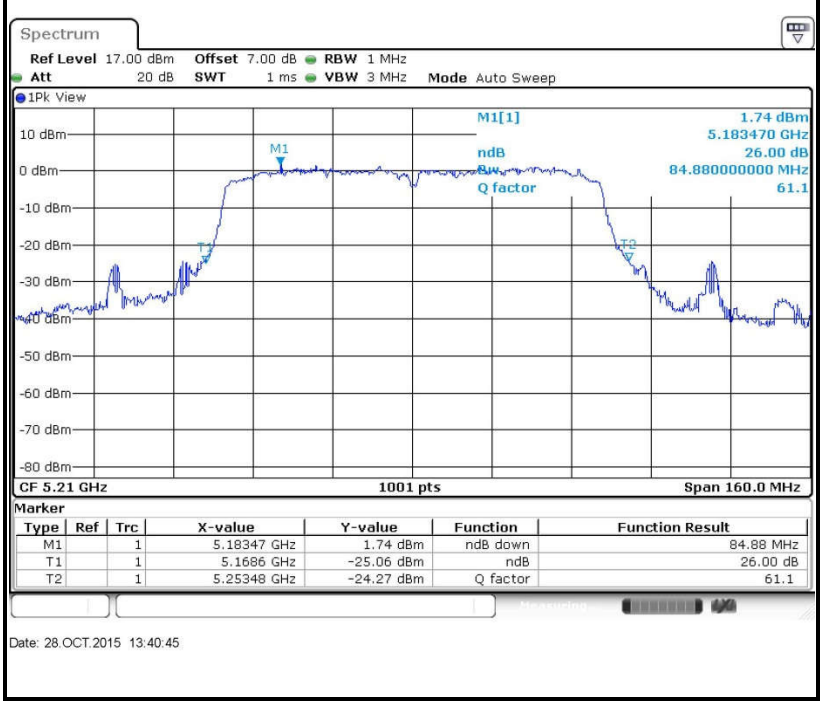
3.1.4 Test Setup



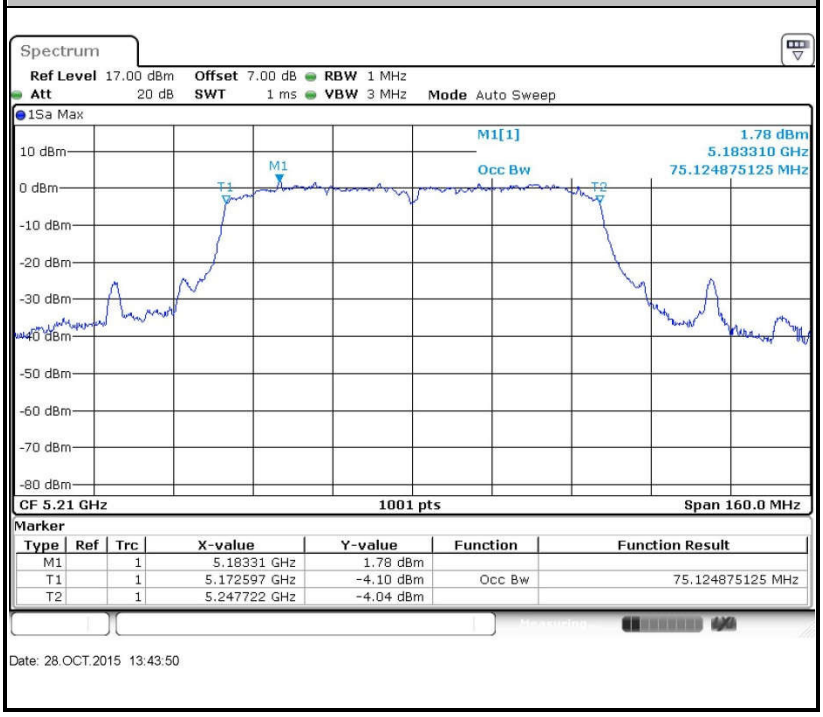
3.1.5 Test Result of 26dB & 99% Occupied Bandwidth Plots

Please refer to Appendix A.

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

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.

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.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

3.2.2 Measuring Instruments

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

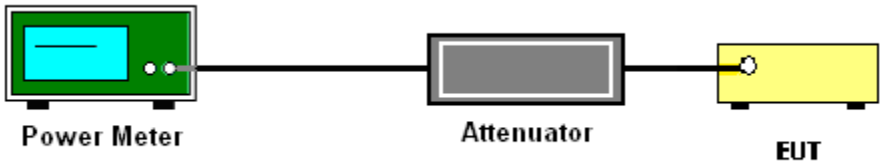
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

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

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz 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

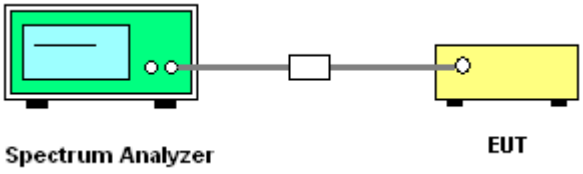
The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
Section F) Maximum power spectral density.

 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
   - Measure the duty cycle.
   - Set span to encompass the entire emission bandwidth (EBW) of the signal.
   - Set RBW = 1 MHz.
   - Set VBW ≥ 3 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(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.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

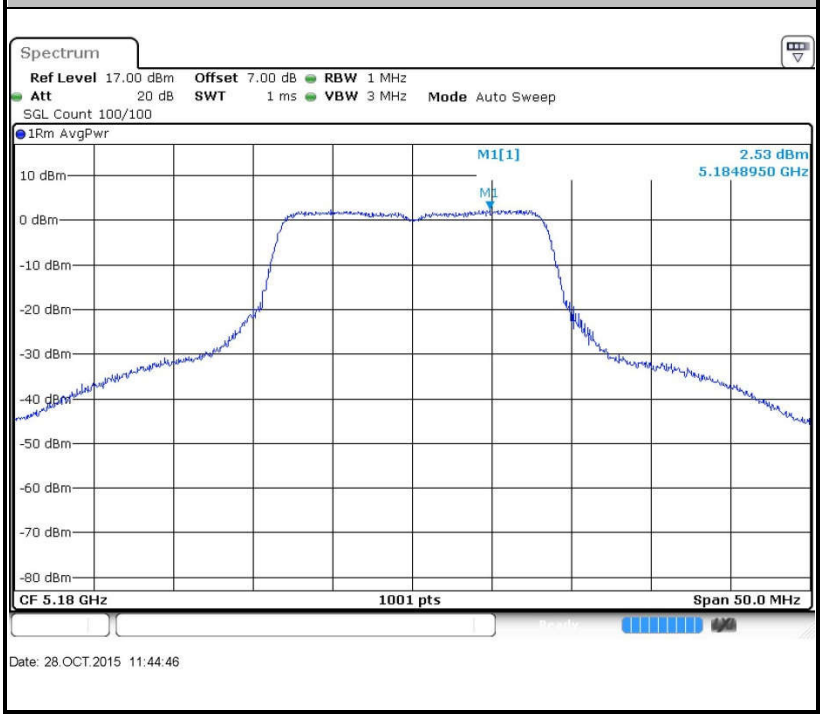
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Spectral Density(dBm/MHz)



Note: Average Power Density (dB) = Measured value+ Duty Factor

3.4 Unwanted Radiated Emission Measurement

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

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

(2) Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table

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

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

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

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

(3) KDB789033 v01 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

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 v01. 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

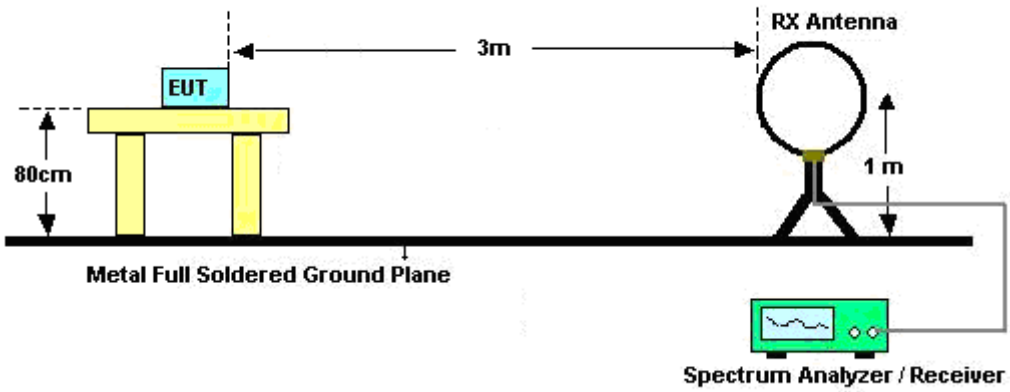
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	87.037	1.362	0.734	1kHz
802.11n HT20	86.615	1.275	0.784	1kHz
802.11n VHT20	83.107	0.977	1.024	3kHz
802.11n VHT40	71.009	0.490	2.041	3kHz
802.11n VHT80	55.484	0.249	4.012	10kHz

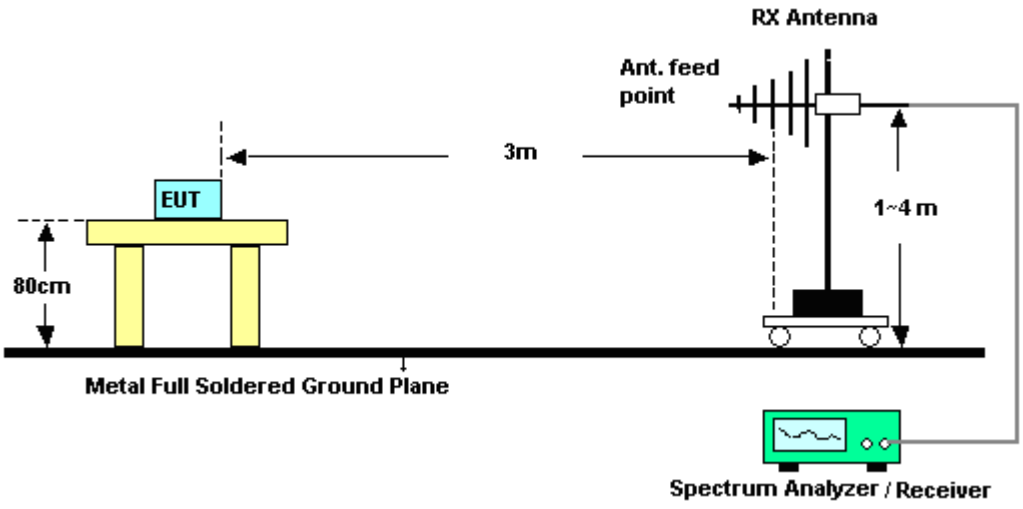
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

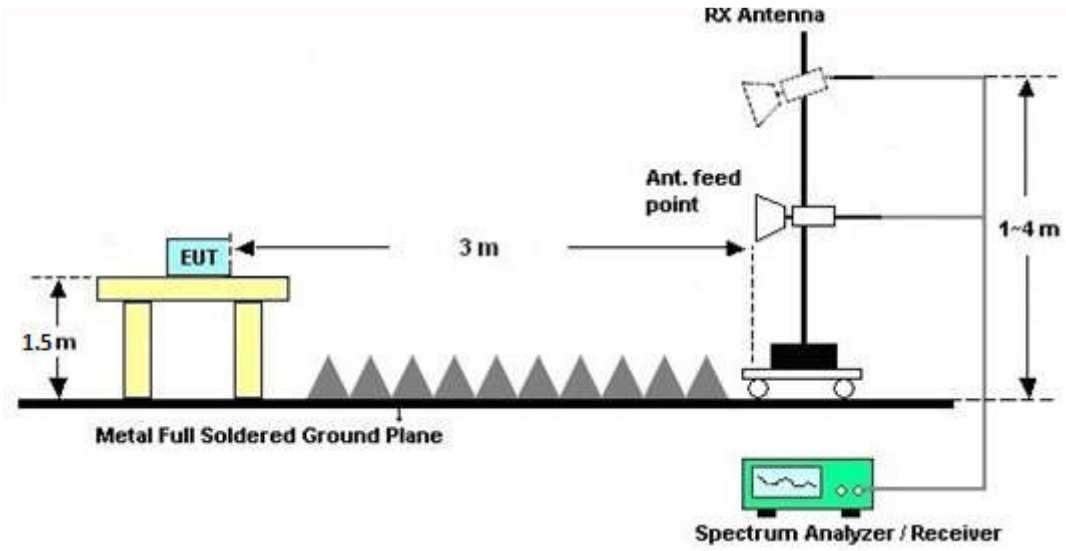
For radiated emissions below 30MHz



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 per 15.31(o) was not reported.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix B.

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

Please refer to Appendix B.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

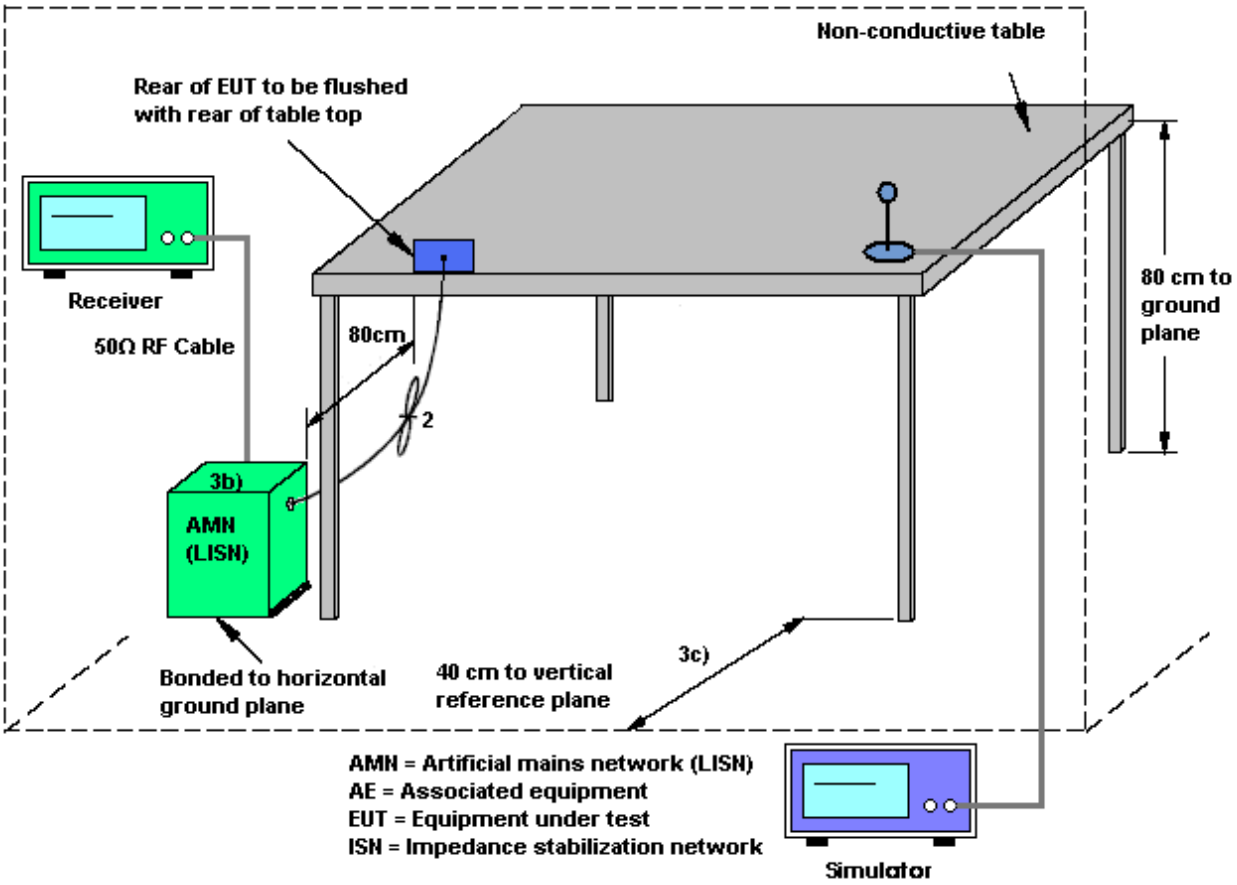
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

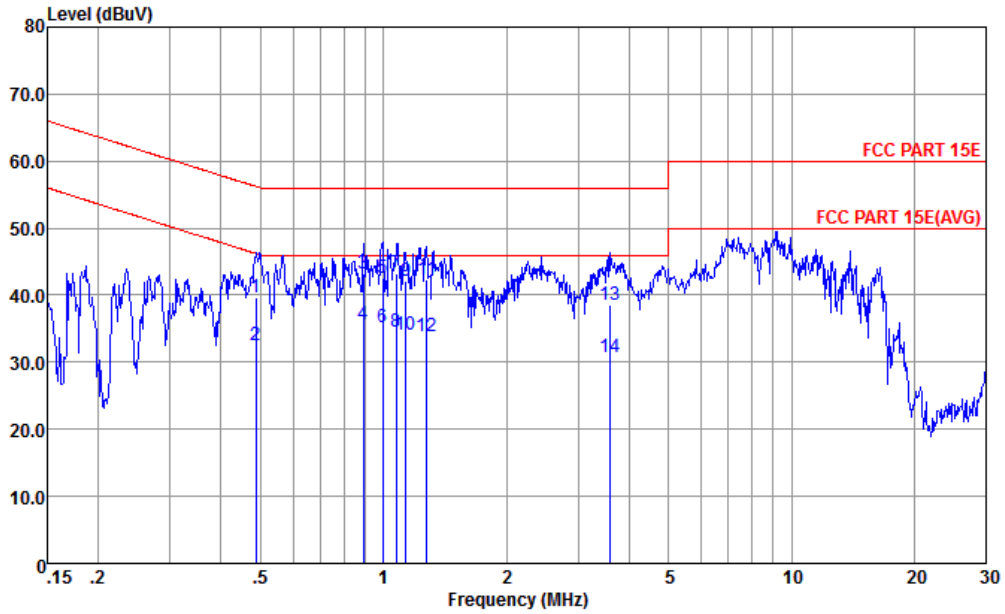
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.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

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	**Temperature :**	22~24℃
Test Engineer :	Amos Zhang	**Relative Humidity :**	43~45%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN (5GHz) Link + Earphone + USB Cable (Charging from Adapter)		

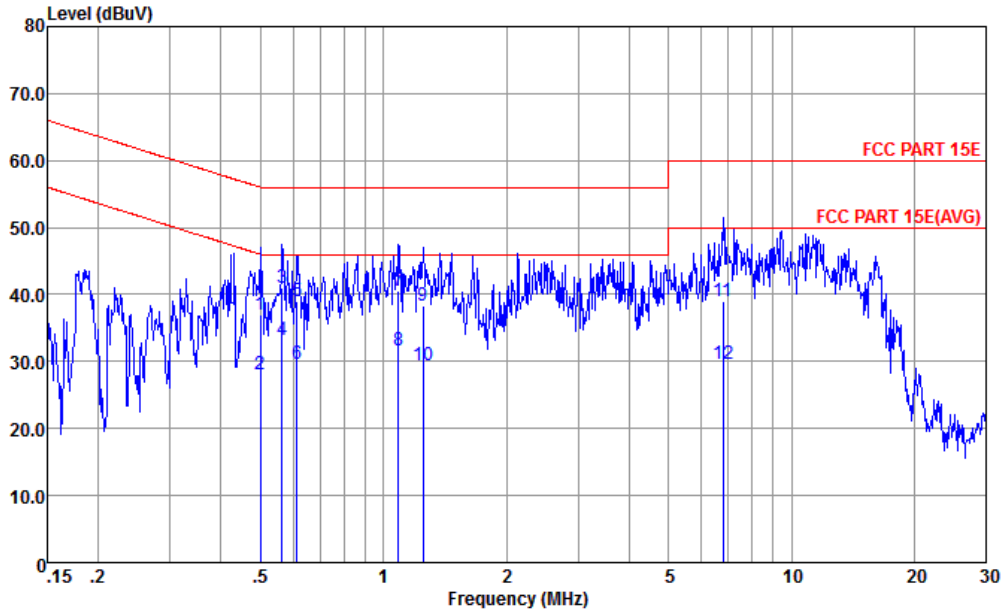


Site : CO01-KS
Condition : FCC PART 15E LISN-L20141025 LINE

mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.49	39.78	-16.45	56.23	29.41	0.21	10.16	QP
2	0.49	32.48	-13.75	46.23	22.11	0.21	10.16	Average
3	0.89	43.17	-12.83	56.00	32.91	0.12	10.14	QP
4 *	0.89	35.57	-10.43	46.00	25.31	0.12	10.14	Average
5	0.99	42.54	-13.46	56.00	32.30	0.10	10.14	QP
6	0.99	35.14	-10.86	46.00	24.90	0.10	10.14	Average
7	1.08	43.14	-12.86	56.00	32.90	0.10	10.14	QP
8	1.08	34.54	-11.46	46.00	24.30	0.10	10.14	Average
9	1.14	42.14	-13.86	56.00	31.90	0.10	10.14	QP
10	1.14	34.14	-11.86	46.00	23.90	0.10	10.14	Average
11	1.28	42.44	-13.56	56.00	32.20	0.10	10.14	QP
12	1.28	33.84	-12.16	46.00	23.60	0.10	10.14	Average
13	3.60	38.63	-17.37	56.00	28.30	0.17	10.16	QP
14	3.60	30.83	-15.17	46.00	20.50	0.17	10.16	Average

Test Mode :	Mode 1	**Temperature :**	22~24℃
Test Engineer :	Amos Zhang	**Relative Humidity :**	43~45%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN (5GHz) Link + Earphone + USB Cable (Charging from Adapter)		



Site : CO01-KS
Condition : FCC PART 15E LISN-N20141025 NEUTRAL

mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.50	37.06	-18.95	56.01	26.60	0.30	10.16	QP
2	0.50	28.16	-17.85	46.01	17.70	0.30	10.16	Average
3	0.56	41.03	-14.97	56.00	30.60	0.27	10.16	QP
4 *	0.56	33.23	-12.77	46.00	22.80	0.27	10.16	Average
5	0.61	38.89	-17.11	56.00	28.50	0.23	10.16	QP
6	0.61	29.59	-16.41	46.00	19.20	0.23	10.16	Average
7	1.09	40.64	-15.36	56.00	30.40	0.10	10.14	QP
8	1.09	31.54	-14.46	46.00	21.30	0.10	10.14	Average
9	1.25	38.34	-17.66	56.00	28.10	0.10	10.14	QP
10	1.25	29.44	-16.56	46.00	19.20	0.10	10.14	Average
11	6.81	39.01	-20.99	60.00	28.60	0.20	10.21	QP
12	6.81	29.61	-20.39	50.00	19.20	0.20	10.21	Average

3.6 Frequency Stability Measurement

3.6.1 Limit of Frequency Stability

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

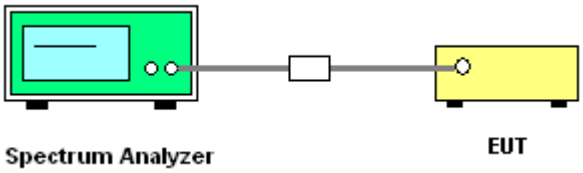
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

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

3.6.4 Test Setup



3.6.5 Test Result of Frequency Stability

Please refer to Appendix A.

3.7 Automatically Discontinue Transmission

3.7.1 Limit of Automatically Discontinue Transmission

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

3.7.2 Measuring Instruments

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

3.7.3 Test Result of Automatically Discontinue Transmission

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

3.8 Antenna Requirements

3.8.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.8.3 Antenna Gain

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

4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	9kHz~30GHz	May. 04, 2015	Oct. 28, 2015	May. 03, 2016	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	30MHz~40GHz	Jan. 23, 2015	Oct. 28, 2015	Jan. 22, 2016	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 23, 2015	Oct. 28, 2015	Jan. 22, 2016	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 24, 2015	Oct. 28, 2015	Oct. 23, 2016	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Oct. 24, 2015	Oct. 31, 2015	Oct. 23, 2016	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44GHz	Jun. 05, 2015	Oct. 31, 2015	Jun. 04, 2016	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 13, 2014	Oct. 31, 2015	Nov. 12, 2015	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz-2GHz	Jun. 25, 2015	Oct. 31, 2015	Jun. 24, 2016	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120 D	9120D-1356	1GHz~18GHz	Jun. 25, 2015	Oct. 31, 2015	Jun. 24, 2016	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz ~40GHz	Mar. 03, 2015	Oct. 31, 2015	Mar. 02, 2016	Radiation (03CH03-KS)
Amplifier	Burgeon	BPA-530	102212	0.01MHz-3000MHz	Aug. 10, 2015	Oct. 31, 2015	Aug. 09, 2016	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Aug. 27, 2015	Oct. 31, 2015	Aug. 26, 2016	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	1889560	1GHz-18GHz	Aug. 10, 2015	Oct. 31, 2015	Aug. 09, 2016	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 24, 2015	Oct. 31, 2015	Oct. 23, 2016	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 31, 2015	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 31, 2015	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 31, 2015	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 04, 2015	Nov. 03, 2015	May 03, 2016	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Nov. 03, 2015	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Nov. 03, 2015	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Nov. 03, 2015	Oct. 23, 2016	Conduction (CO01-KS)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.3 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.5 dB

Appendix A. Conducted Test Results

Report Number : FR5O2302D

Test Engineer:	Issac song	Temperature:	24~25	°C
Test Date:	2015/10/28	Relative Humidity:	49~51	%

Report Number : FR5O2302D

TEST RESULTS DATA
26dB and 99% OBW

Band I										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)	IC 99% Bandwidth Power Limit (dBm)	IC 99% Bandwidth EIRP Limit (dBm)		
11a	6Mbps	1	36	5180	18.93	23.98	-	22.77		
11a	6Mbps	1	44	5220	19.08	23.68	-	22.81		
11a	6Mbps	1	48	5240	18.73	23.88	-	22.73		
HT20	MCS0	1	36	5180	19.18	23.73	-	22.83		
HT20	MCS0	1	44	5220	19.33	23.88	-	22.86		
HT20	MCS0	1	48	5240	19.43	23.78	-	22.88		
VHT20	MCS0	1	36	5180	19.23	23.88	-	22.84		
VHT20	MCS0	1	44	5220	19.38	23.98	-	22.87		
VHT20	MCS0	1	48	5240	19.28	23.98	-	22.85		
VHT40	MCS0	1	38	5190	36.96	44.33	-	23.01		
VHT40	MCS0	1	46	5230	36.86	45.05	-	23.01		
VHT80	MCS0	1	42	5210	75.12	84.88	-	23.01		

Report Number : FR5O2302D

TEST RESULTS DATA
Average Power Table

FCC Band I										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)		Pass/Fail
11a	6Mbps	1	36	5180	0.60	13.21	24.00	0.30		Pass
11a	6Mbps	1	44	5220	0.60	12.79	24.00	0.30		Pass
11a	6Mbps	1	48	5240	0.60	12.80	24.00	0.30		Pass
HT20	MCS0	1	36	5180	0.62	10.35	24.00	0.30		Pass
HT20	MCS0	1	44	5220	0.62	10.08	24.00	0.30		Pass
HT20	MCS0	1	48	5240	0.62	10.05	24.00	0.30		Pass
VHT20	MCS0	1	36	5180	0.80	10.45	24.00	0.30		Pass
VHT20	MCS0	1	44	5220	0.80	10.27	24.00	0.30		Pass
VHT20	MCS0	1	48	5240	0.80	10.23	24.00	0.30		Pass
VHT40	MCS0	1	38	5190	1.49	9.74	24.00	0.30		Pass
VHT40	MCS0	1	46	5230	1.49	9.48	24.00	0.30		Pass
VHT80	MCS0	1	42	5210	2.56	9.84	24.00	0.30		Pass

Report Number : FR5O2302D

TEST RESULTS DATA
Power Spectral Density

FCC Band I										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Power Density (dBm/MHz)	Average PSD Limit (dBm/MHz)	DG (dBi)	-	Pass/Fail
11a	6Mbps	1	36	5180	0.60	3.13	11.00	0.30		Pass
11a	6Mbps	1	44	5220	0.60	2.79	11.00	0.30		Pass
11a	6Mbps	1	48	5240	0.60	2.72	11.00	0.30		Pass
HT20	MCS0	1	36	5180	0.62	-0.28	11.00	0.30		Pass
HT20	MCS0	1	44	5220	0.62	-0.38	11.00	0.30		Pass
HT20	MCS0	1	48	5240	0.62	-0.63	11.00	0.30		Pass
VHT20	MCS0	1	36	5180	0.80	0.08	11.00	0.30		Pass
VHT20	MCS0	1	44	5220	0.80	-0.61	11.00	0.30		Pass
VHT20	MCS0	1	48	5240	0.80	-0.31	11.00	0.30		Pass
VHT40	MCS0	1	38	5190	1.49	-4.20	11.00	0.30		Pass
VHT40	MCS0	1	46	5230	1.49	-3.34	11.00	0.30		Pass
VHT80	MCS0	1	42	5210	2.56	-6.13	11.00	0.30		Pass

Report Number : FR5O2302D

TEST RESULTS DATA
Frequency Stability

Band I										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stablility (ppm)	Temperature (°C)	Voltage (V)	Note
11a	6Mbps	1	36	5180	5180.050	0.050	9.65	20	3.6	
11a	6Mbps	1	36	5180	5180.050	0.050	9.65	20	4.35	
11a	6Mbps	1	36	5180	5180.050	0.050	9.65	20	3.8	
11a	6Mbps	1	36	5180	5180.050	0.050	9.65	-30	3.8	
11a	6Mbps	1	36	5180	5180.050	0.050	9.65	50	3.8	

Appendix B. Radiated Test Results

Band 1 - 5150~5250MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 36 5180MHz	*	5178	94.66	-	-	91.15	31.85	8.17	36.51	100	30	P	H
	*	5184	87.75	-	-	84.24	31.85	8.17	36.51	100	30	A	H
		5148.9	47.05	-26.95	74	43.61	31.84	8.13	36.53	100	30	P	H
		5149.6	38.41	-15.59	54	34.97	31.84	8.13	36.53	100	30	A	H
	*	5186	104.02	-	-	100.51	31.85	8.17	36.51	100	321	P	V
	*	5184	96.56	-	-	93.05	31.85	8.17	36.51	100	321	A	V
		5149.85	58.11	-15.89	74	54.67	31.84	8.13	36.53	100	321	P	V
		5149.75	44.93	-9.07	54	41.49	31.84	8.13	36.53	100	321	A	V
802.11a CH 44 5220MHz	*	5226	95.66	-	-	92.08	31.87	8.21	36.5	271	324	P	H
	*	5212	89.78	-	-	86.22	31.86	8.2	36.5	271	324	A	H
	*	5226	102.32	-	-	98.74	31.87	8.21	36.5	100	360	P	V
	*	5216	95.63	-	-	92.07	31.86	8.2	36.5	100	360	A	V
802.11a CH 48 5240MHz	*	5242	96.75			93.15	31.88	8.22	36.5	100	62	P	H
	*	5244	89.77			86.17	31.88	8.22	36.5	100	62	A	H
		5396.45	46.1	-27.9	74	42.35	31.92	8.33	36.5	100	62	P	H
		5397.15	36.72	-17.28	54	32.97	31.92	8.33	36.5	100	62	A	H
	*	5246	104.63			101.03	31.88	8.22	36.5	101	309	P	V
	*	5244	97.22			93.62	31.88	8.22	36.5	101	309	A	V
		5397.25	45.68	-28.32	74	41.93	31.92	8.33	36.5	101	309	P	V
		5365.85	36.86	-17.14	54	33.14	31.91	8.31	36.5	101	309	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

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 36 5180MHz		10359	48.89	-25.11	74	36.61	38.02	11.59	37.33	300	0	P	H
		10359	48.84	-25.16	74	36.56	38.02	11.59	37.33	100	360	P	V
802.11a CH 44 5220MHz		10440	49.03	-24.97	74	36.65	38.06	11.63	37.31	300	360	P	H
		10440	49.39	-24.61	74	37.01	38.06	11.63	37.31	100	360	P	V
802.11a CH 48 5240MHz		10479	46.94	-27.06	74	34.48	38.09	11.67	37.3	130	118	P	H
		10479	47.79	-26.21	74	35.33	38.09	11.67	37.3	159	246	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 36 5180MHz	*	5184	97.36	-	-	93.85	31.85	8.17	36.51	100	253	P	H
	*	5188	90.44	-	-	86.93	31.85	8.17	36.51	100	253	A	H
		5149.8	48.74	-25.26	74	45.3	31.84	8.13	36.53	100	253	P	H
		5128.35	39.9	-14.1	54	36.49	31.84	8.11	36.54	100	253	A	H
	*	5186	99.57	-	-	96.06	31.85	8.17	36.51	100	236	P	V
	*	5186	93.05	-	-	89.54	31.85	8.17	36.51	100	236	A	V
		5149.15	50.15	-23.85	74	46.71	31.84	8.13	36.53	100	236	P	V
		5128.35	41.58	-12.42	54	38.17	31.84	8.11	36.54	100	236	A	V
802.11n HT20 CH 44 5220MHz	*	5224	95.32	-	-	91.76	31.86	8.2	36.5	100	212	P	H
	*	5214	88.94	-	-	85.38	31.86	8.2	36.5	100	212	A	H
	*	5222	99.37	-	-	95.81	31.86	8.2	36.5	100	303	P	V
	*	5216	92.75	-	-	89.19	31.86	8.2	36.5	100	303	A	V
802.11n HT20 CH 48 5240MHz	*	5236	95	-	-	91.42	31.87	8.21	36.5	186	260	P	H
	*	5236	88.36	-	-	84.78	31.87	8.21	36.5	186	260	A	H
		5351.3	45.91	-28.09	74	42.21	31.91	8.29	36.5	186	260	P	H
		5393.8	36.45	-17.55	54	32.71	31.92	8.32	36.5	186	260	A	H
	*	5246	100.07	-	-	96.47	31.88	8.22	36.5	123	306	P	V
	*	5244	92.65	-	-	89.05	31.88	8.22	36.5	123	306	A	V
		5352.5	45.42	-28.58	74	41.72	31.91	8.29	36.5	123	306	P	V
		5365.25	36.58	-17.42	54	32.86	31.91	8.31	36.5	123	306	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

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 HT20 CH 36 5180MHz		10359	49.39	-24.61	74	37.11	38.02	11.59	37.33	300	0	P	H
		10360	48.97	-25.03	74	36.69	38.02	11.59	37.33	100	360	P	V
802.11n HT20 CH 44 5220MHz		10440	48.28	-25.72	74	35.9	38.06	11.63	37.31	300	360	P	H
		10440	49.12	-24.88	74	36.74	38.06	11.63	37.31	100	360	P	V
802.11n HT20 CH 48 5240MHz		10480	49.27	-24.73	74	36.81	38.09	11.67	37.3	300	0	P	H
		10480	48.75	-25.25	74	36.29	38.09	11.67	37.3	100	331	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT20 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 36 5180MHz	*	5182	100.62	-	-	97.11	31.85	8.17	36.51	100	249	P	H
	*	5184	93.76	-	-	90.25	31.85	8.17	36.51	100	249	A	H
		5143	52.28	-21.72	74	48.84	31.84	8.13	36.53	100	249	P	H
		5128.05	42.27	-11.73	54	38.86	31.84	8.11	36.54	100	249	A	H
	*	5182	96.11	-	-	92.6	31.85	8.17	36.51	300	298	P	V
	*	5188	89.91	-	-	86.4	31.85	8.17	36.51	300	298	A	V
		5148.2	48.69	-25.31	74	45.25	31.84	8.13	36.53	300	298	P	V
		5128.05	39.52	-14.48	54	36.11	31.84	8.11	36.54	300	298	A	V
802.11ac VHT20 CH 44 5220MHz	*	5214	98.26	-	-	94.7	31.86	8.2	36.5	104	262	P	H
	*	5216	91.36	-	-	87.8	31.86	8.2	36.5	104	262	A	H
	*	5216	95.19	-	-	91.63	31.86	8.2	36.5	104	9	P	V
	*	5224	88.98	-	-	85.42	31.86	8.2	36.5	104	9	A	V
802.11ac VHT20 CH 48 5240MHz	*	5246	98.18	-	-	94.58	31.88	8.22	36.5	106	263	P	H
	*	5248	91.02	-	-	87.42	31.88	8.22	36.5	106	263	A	H
		5385.55	45.26	-28.74	74	41.52	31.92	8.32	36.5	106	263	P	H
		5396.75	37.06	-16.94	54	33.31	31.92	8.33	36.5	106	263	A	H
	*	5248	94.26	-	-	90.66	31.88	8.22	36.5	100	360	P	V
	*	5246	87.53	-	-	83.93	31.88	8.22	36.5	100	360	A	V
		5397.4	45.11	-28.89	74	41.36	31.92	8.33	36.5	100	360	P	V
		5381.75	36.84	-17.16	54	33.1	31.92	8.32	36.5	100	360	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT20 (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 VHT20 CH 36 5180MHz		10359	49.45	-24.55	74	37.17	38.02	11.59	37.33	100	360	P	H
		10359	49.18	-24.82	74	36.9	38.02	11.59	37.33	300	360	P	V
802.11ac VHT20 CH 44 5220MHz		10440	49.67	-24.33	74	37.29	38.06	11.63	37.31	121	281	P	H
		10440	49.75	-24.25	74	37.37	38.06	11.63	37.31	100	300	P	V
802.11ac VHT20 CH 48 5240MHz		10479	49.58	-24.42	74	37.12	38.09	11.67	37.3	112	267	P	H
		10479	49.18	-24.82	74	36.72	38.09	11.67	37.3	102	297	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT40 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT40 CH 38 5190MHz	*	5188	99.21			95.7	31.85	8.17	36.51	119	252	P	H
	*	5202	92.6			89.05	31.86	8.19	36.5	119	252	A	H
		5147.65	61.11	-12.89	74	57.67	31.84	8.13	36.53	119	252	P	H
	!	5149	49.54	-4.46	54	46.1	31.84	8.13	36.53	119	252	A	H
	*	5200	92.75			89.2	31.86	8.19	36.5	280	255	P	V
	*	5202	86.15			82.6	31.86	8.19	36.5	280	255	A	V
		5147.4	53.78	-20.22	74	50.34	31.84	8.13	36.53	280	255	P	V
		5148.9	43.21	-10.79	54	39.77	31.84	8.13	36.53	280	255	A	V
802.11ac VHT40 CH 46 5230MHz	*	5238	97.71	-	-	94.13	31.87	8.21	36.5	100	249	P	H
	*	5242	90.78	-	-	87.18	31.88	8.22	36.5	100	249	A	H
		5370.45	45.63	-28.37	74	41.91	31.91	8.31	36.5	100	249	P	H
		5358.55	37.14	-16.86	54	33.44	31.91	8.29	36.5	100	249	A	H
	*	5242	92.25	-	-	88.65	31.88	8.22	36.5	270	248	P	V
	*	5218	85.05	-	-	81.49	31.86	8.2	36.5	270	248	A	V
		5372.15	45.41	-28.59	74	41.69	31.91	8.31	36.5	270	248	P	V
		5392.15	36.84	-17.16	54	33.1	31.92	8.32	36.5	270	248	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT40 (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 VHT40 CH 38 5190MHz		10380	49.1	-24.9	74	36.8	38.03	11.6	37.33	300	0	P	H
		10380	48.21	-25.79	74	35.91	38.03	11.6	37.33	100	360	P	V
802.11ac VHT40 CH 46 5230MHz		10460	48.39	-25.61	74	35.99	38.07	11.64	37.31	300	0	P	H
		10460	48.45	-25.55	74	36.05	38.07	11.64	37.31	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 42 5210MHz	*	5224	95.52	-	-	91.96	31.86	8.2	36.5	100	133	P	H
	*	5230	88.5	-	-	84.92	31.87	8.21	36.5	100	133	A	H
		5149.8	66.72	-7.28	74	63.28	31.84	8.13	36.53	100	133	P	H
	!	5149.7	52.72	-1.28	54	49.28	31.84	8.13	36.53	100	133	A	H
		5368.5	45.38	-28.62	74	41.66	31.91	8.31	36.5	100	133	P	H
		5390.9	38.26	-15.74	54	34.52	31.92	8.32	36.5	100	133	A	H
	*	5224	89.51	-	-	85.95	31.86	8.2	36.5	100	196	P	V
	*	5224	81.98	-	-	78.42	31.86	8.2	36.5	100	196	A	V
		5149.5	58.93	-15.07	74	55.49	31.84	8.13	36.53	100	196	P	V
		5149.55	44.93	-9.07	54	41.49	31.84	8.13	36.53	100	196	A	V
		5367.45	45.57	-28.43	74	41.85	31.91	8.31	36.5	100	196	P	V
		5354.7	38.02	-15.98	54	34.32	31.91	8.29	36.5	100	196	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

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 VHT80 CH 42 5210MHz		10419	49.29	-24.71	74	36.94	38.05	11.62	37.32	300	0	P	H
		10419	50.19	-23.81	74	37.84	38.05	11.62	37.32	300	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

WIFI 802.11ac VHT80 (LF @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 LF		30	18.6	-21.4	40	30.45	18.6	0.65	31.1	128	319	P	H
		152.22	16.23	-27.27	43.5	31.46	13.68	1.49	30.4	-	-	P	H
		323.91	19.52	-26.48	46	32.53	15.33	2.21	30.55	-	-	P	H
		431.58	20.46	-25.54	46	31.2	17.25	2.58	30.57	-	-	P	H
		515.97	21.22	-24.78	46	30.36	18.39	2.84	30.37	-	-	P	H
		733.25	24.26	-21.74	46	30.63	20.67	3.43	30.47	-	-	P	H
		35.82	16.34	-23.66	40	29.36	17.16	0.72	30.9	-	-	P	V
		180.35	16.52	-26.98	43.5	33.37	11.92	1.63	30.4	-	-	P	V
		252.13	21.13	-24.87	46	36.61	13.27	1.75	30.5	-	-	P	V
		288.02	23.68	-22.32	46	37.64	14.5	2.04	30.5	-	-	P	V
		323.91	24.78	-21.22	46	37.79	15.33	2.21	30.55	131	281	P	V
		964.11	27.41	-26.59	54	30.27	23.66	4.01	30.53	-	-	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. Product Equality Declaration

ZTE CORPORATION

Product Change Description

As the applicant of the below model, [ZTE Corporation] declares that the product,

[Z988]

[ZTE Corporation]

is the variant of the initial certified product,

[Z962BL]

[ZTE Corporation]

[Project Number:15ZTE134]

SOFTWARE MODIFICATIONS:

Protocol Stack changes: NO
MMS/STK changes: NO
JAVA changes: NO
Other changes detailed: Yes, different application for different carrier. And Z988 is Android M OS. And Z988 support different bands via software. Please refer to band changes below.
Z988 supports WiFi hotspots .

HARDWARE MODIFICATION:

Band changes: Yes, but please notice, all of the band changes are enable or diabled via software, no hardware different between them.
Z962BL supports
GSM 850/900/1800/1900MHz+UMTS 850/AWS/1900+LTE B2/B4/B5/B17
Z988 supports
GSM 850/900/1800/1900MHz+UMTS 850/1900/2100MHz+LTE B2/B4/B5/B12
But Z988 doesn't support diversity on UMTS BAND I.
Power Amplifier changes: NO

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Antenna changes: NO
PCB Layout changes: NO
Components on PCB changes: NO
LCD changes: NO
Speaker changes: NO
Camera changes: NO
Vibrator changes: NO
Bluetooth changes: NO
FM changes: NO
Other changes: NO

MECHANICAL MODIFICATIONS:

Use new metal front/back cover or keypad: NO
Mechanical shell changes: NO
Other changes detailed: NO

ACCESSORY MODIFICATIONS:

Battery changes:NO
AC Adaptor changes: Yes
Z962BL with charger:STC-A515A-Z
Z988 with charger:STC-A5915A-Z
Earphone changes:NO

APPROVED BY:
Min zhang

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