FCC RF Test Report

APPLICANT	:	ZTE CORPORATION
EQUIPMENT	:	LTE uFi
BRAND NAME	:	ZTE
MODEL NAME	:	MF97B_T
FCC ID	:	SRQ-MF97B-T
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure

The product was completed and tested on Mar. 07, 2016. 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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Testing Laboratory 2627

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APPENDIX A. SETUP PHOTOGRAPHS

APPENDIX B. PRODUCT EQUALITY DECLARATION

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR4O2101-02D	Rev. 01	This is a variant product of MF97B_T. The product change description could be referred to Appendix B. The test cases were performed on original report which can be referred to Sporton Report Number FR4O2101D with FCC ID: SRQ-MF97B. Based on the original test report, only the radiated spurious emissions were full tested for the differences.	Mar. 16, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	2.1049 15.403(i)	99% Bandwidth	-	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤11 dBm	Pass	-
3.4	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass	Under limit 1.46 dB at 5149.700 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.81 dB at 0.170 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	
Equipment	LTE uFi
Brand Name	ZTE
Model Name	MF97B_T
FCC ID	SRQ-MF97B-T
EUT supports Radios application	WCDMA/HSPA/DC-HSDPA /HSPA+(16QAM uplink is not supported)/LTE/ WLAN 2.4GHz 802. 11b/g/n HT20/HT40/ WLAN 5GHz 802. 11n HT20/HT40/ Bluetooth v2.1 + EDR/Bluetooth v4.0 LE
HW Version	d96C
SW Version	SPRO2BV1.0.0B01
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	5180 MHz ~ 5240 MHz
Maximum Output Power	802.11n HT20 : 17.35 dBm / 0.0543 W 802.11n HT40 : 15.00 dBm / 0.0316 W
Maximum 99% Occupied Bandwidth	802.11n HT20 : 19.25 MHz 802.11n HT40 : 37.00 MHz
Antenna Type / Gain	Chain Port 0 : IFA Antenna with gain 2.7 dBi Chain Port 1 : IFA Antenna with gain 2.7 dBi
Type of Modulation	802.11n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Function Description	

	Chain Port 0	Chain Port 1
802.11n SISO	V	V
802.11n MIMO	V	V

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.**	
	TH01-KS	CO01-KS

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-3320-2398	
Test Site No.	**Sporton Site No.**	**FCC Registration No.**
	03CH01-SZ	831040

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 v01r01
- FCC KDB 662911 D01 Multiple Transmitter Output 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

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 (Z plane) 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 and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38	**5190**	**46**	**5230**
	40	5200	48	5240

Note: The above Frequency and Channel in boldface were 802.11n HT40.

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.

WLAN 5GHz 802.11n-HT20 Output Power (dBm)											
Power vs. Channel				Power vs. Data Rate							
Channel	Frequency (MHz)	Chain Port	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 36	5180	0	15.30	CH 48	15.15	15.09	15.37	15.38	15.53	15.45	15.50
CH 44	5220	0	15.39								
CH 48	5240	0	**15.53**								
CH 36	5180	1	**12.70**	CH 36	12.34	12.47	12.56	12.67	12.59	12.65	12.65
CH 44	5220	1	11.85								
CH 48	5240	1	11.97								
CH 36	5180	0+1(0)	15.19	CH 48	15.44	15.49	15.27	15.40	15.11	15.08	15.15
CH 44	5220	0+1(0)	15.53								
CH 48	5240	0+1(0)	**15.65**								
CH 36	5180	0+1(1)	12.40	CH 48	12.18	11.92	12.31	12.15	12.17	11.93	11.96
CH 44	5220	0+1(1)	11.99								
CH 48	5240	0+1(1)	**12.45**								
CH 36	5180	0+1	17.03	CH 48	17.12	17.07	17.05	17.08	16.89	16.79	16.85
CH 44	5220	0+1	17.12								
CH 48	5240	0+1	**17.35**								

WLAN 5GHz 802.11n-HT40 Output Power (dBm)											
Power vs. Channel				Power vs. Data Rate							
Channel	Frequency (MHz)	Chain Port	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 38	5190	0	13.44	CH 46	13.46	13.55	13.67	13.85	13.65	13.65	13.66
CH 46	5230	0	**13.89**								
CH 38	5190	1	**10.76**	CH 38	10.28	10.39	10.68	10.64	10.71	10.63	10.67
CH 46	5230	1	10.48								
CH 38	5190	0+1(0)	**13.27**	CH 38	12.99	12.98	13.00	13.00	13.02	12.92	12.97
CH 46	5230	0+1(0)	13.13								
CH 38	5190	0+1(1)	**10.16**	CH 38	10.01	9.82	9.79	10.10	9.96	10.02	10.00
CH 46	5230	0+1(1)	9.91								
CH 38	5190	0+1	**15.00**	CH 38	14.76	14.69	14.70	14.79	14.76	14.72	14.74
CH 46	5230	0+1	14.82								

Note: Chain Port 0+1 is a calculated result from sum of the power Chain Port 0+1(0) and Chain Port 0+1(1).

2.3 Test Mode

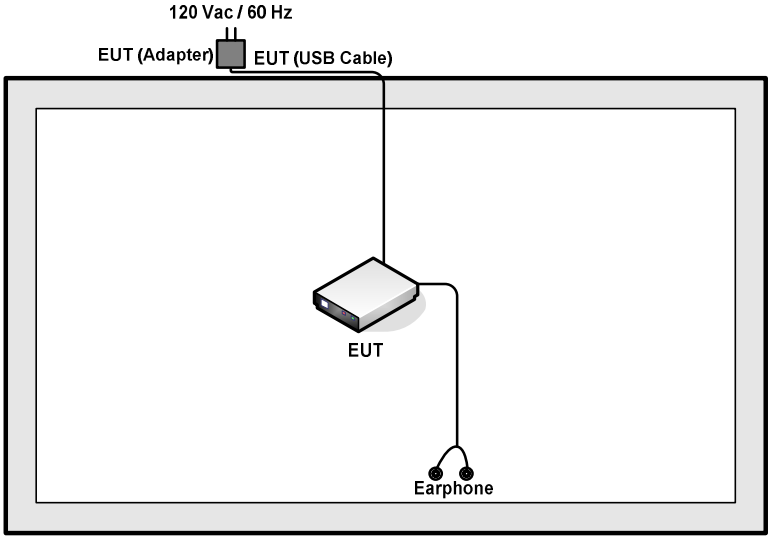
Final results of test modes, data rates and test channels are shown as following table.

Test Cases				
	Test Items	Mode	Data rate	Test Channel
Conducted TCs	99% BW Power Spectral Density	802.11n HT20	MCS0	L/M/H
		802.11n HT40	MCS0	L/H
	Output Power	802.11n HT20	MCS0	L/M/H
		802.11n HT40	MCS0	L/H
	Frequency Stability	802.11n HT20	6 Mbps	L
Radiated TCs	Radiated Band Edge	802.11n HT20	MCS0	L/H
		802.11n HT40	MCS0	L/H
	Radiated Spurious Emission	802.11n HT20	MCS0	L/M/H
		802.11n HT40	MCS0	L/H
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN (5G) Link + Earphone + USB Cable (Charging from Adapter)			
Remark: For radiated TCs, the tests were performed with adapter, earphone and USB cable.				

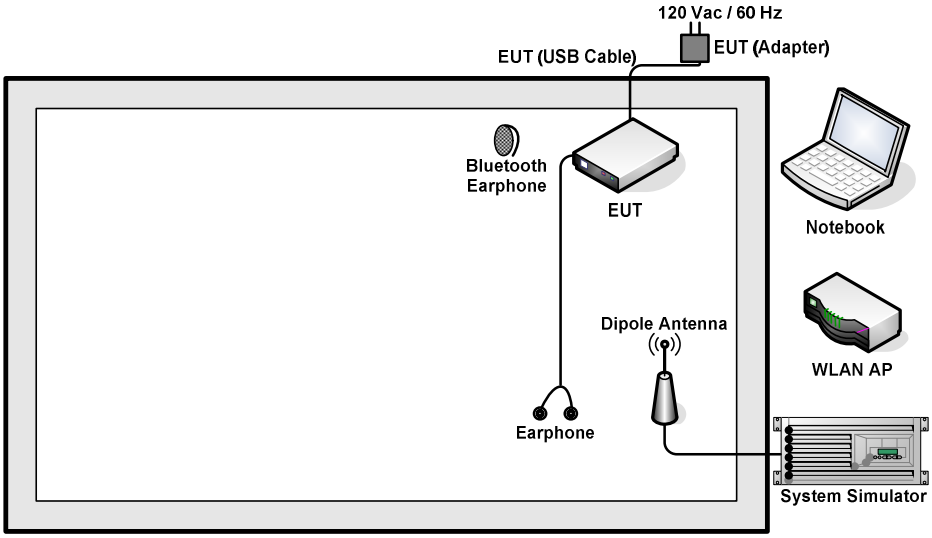
Ch. #		Band I : 5150-5250 MHz	
		802.11n HT20	802.11n HT40
L	Low	36	38
M	Middle	44	-
H	High	48	46

2.4 Connection Diagram of Test System

<WLAN 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.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
3.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
4.	Notebook	Lenovo	G480	PRC4	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
5.	Earphone	Lenovo	SH100	N/A	Unshielded, 1.2 m	N/A
6.	Earphone	Apple	MC690ZP/A	N/A	Shielded, 1.0 m	N/A
7.	DC Power Supply	GWINSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m

2.6 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.

2.7 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 7.5 dB.

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

= 7.5 (dB)

3 Test Result

3.1 99% Bandwidth Measurement

3.1.1 Description of 99% Occupied Bandwidth

This section is for reporting purpose only.

There is no restriction limits for bandwidth.

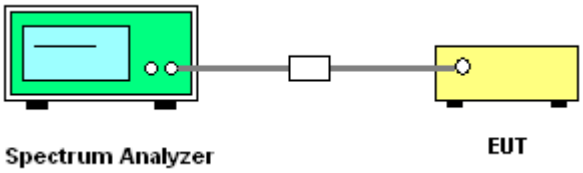
3.1.2 Measuring Instruments

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 v01r01. 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

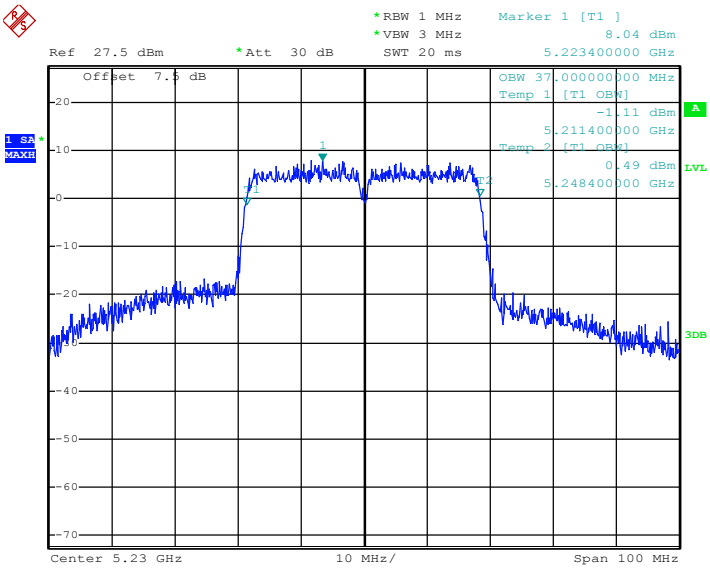


3.1.5 Test Result of 99% Occupied Bandwidth

Test Band :	5GHz band 1	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	99% Bandwidth (MHz)		99% Bandwidth EIRP Limit (dBm)	
					Chain Port 0	Chain Port 1	Chain Port 0	Chain Port 1
HT20	MCS0	1	36	5180	19.05	-	22.80	-
HT20	MCS0	1	44	5220	19.05	-	22.80	-
HT20	MCS0	1	48	5240	19.05	-	22.80	-
HT40	MCS0	1	38	5190	36.60	-	23.01	-
HT40	MCS0	1	46	5230	36.80	-	23.01	-
HT20	MCS0	2	36	5180	19.20	18.95	22.78	
HT20	MCS0	2	44	5220	19.00	18.90	22.76	
HT20	MCS0	2	48	5240	19.25	18.90	22.76	
HT40	MCS0	2	38	5190	36.70	36.70	23.01	
HT40	MCS0	2	46	5230	37.00	36.70	23.01	

Maximum 99% Occupied Bandwidth



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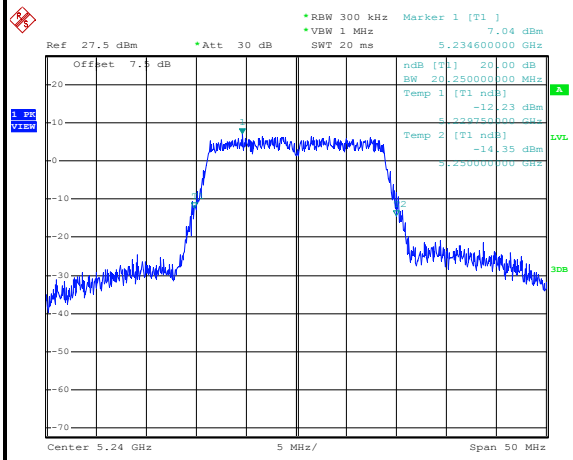
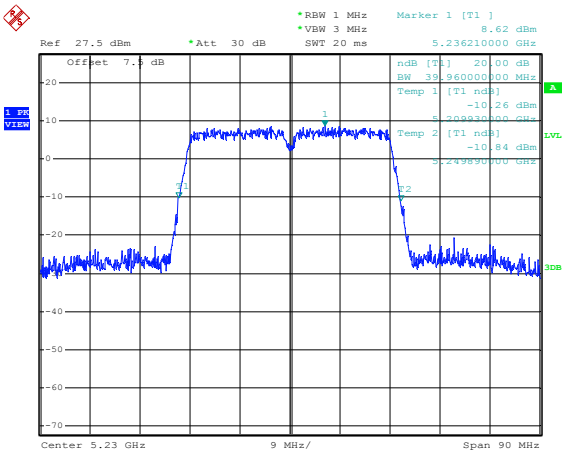
3.1.6 Test Result of 20dB Occupied Bandwidth

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	20dB Bandwidth (MHz)		20dB Bandwidth Upper Frequency (FH) (MHz)		Upper Limit Line (MHz)	Pass/Fail
					Chain Port 0	Chain Port 1	Chain Port 0	Chain Port 1		
HT20	MCS0	1	48	5240	20.25	-	5250.00	-	5250	Pass
HT40	MCS0	1	46	5230	39.96	-	5249.89	-		Pass
HT20	MCS0	2	48	5240	19.75	-	5249.90	-		Pass
HT40	MCS0	2	46	5230	39.87		5249.98			Pass

Number of TX = 1, Chain Port 0

20dB Occupied Bandwidth	
802.11n HT20 CH48 5240MHz	802.11n HT40 CH46 5230MHz
	
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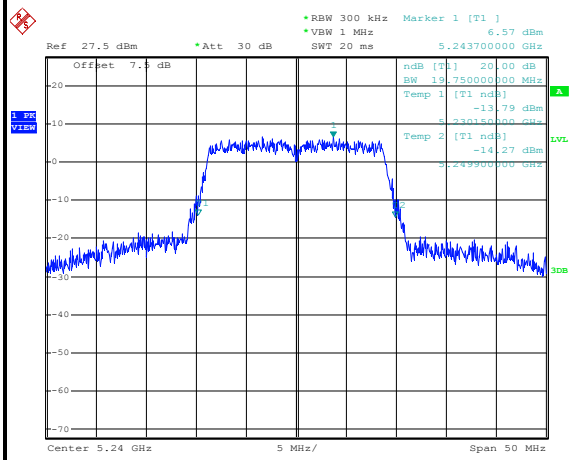
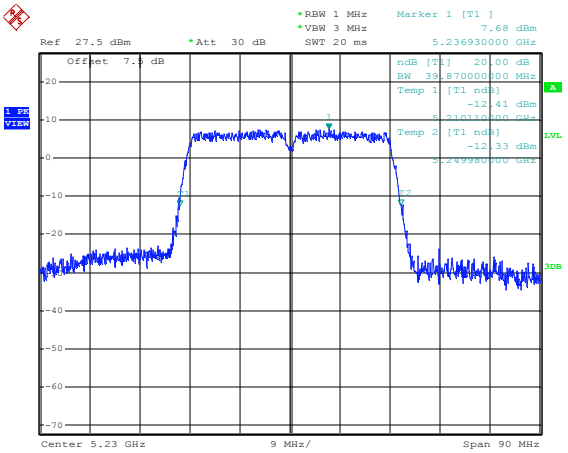
Number of TX = 2, Chain Port 0

20dB Occupied Bandwidth	
802.11n HT20 CH48 5240MHz	802.11n HT40 CH46 5230MHz
	
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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.

3.2.2 Measuring Instruments

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

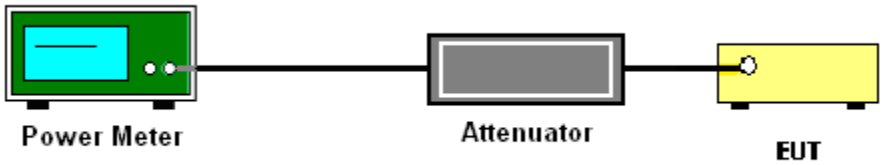
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r01.

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

Test Band :	5GHz band 1	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Power Limit (dBm)		DG (dBi)		Pass /Fail
					Chain Port 0	Chain Port 1	Chain Port 0	Chain Port 1	Sum Power	Chain Port 0	Chain Port 1	Chain Port 0	Chain Port 1	
HT20	MCS0	1	36	5180	0.32	0.31	15.30	12.70	-	24.00	24.00	2.70	2.70	Pass
HT20	MCS0	1	44	5220	0.32	0.31	15.39	11.85		24.00	24.00	2.70	2.70	Pass
HT20	MCS0	1	48	5240	0.32	0.31	15.53	11.97		24.00	24.00	2.70	2.70	Pass
HT40	MCS0	1	38	5190	0.60	0.61	13.44	10.76		24.00	24.00	2.70	2.70	Pass
HT40	MCS0	1	46	5230	0.60	0.61	13.89	10.48		24.00	24.00	2.70	2.70	Pass
HT20	MCS0	2	36	5180	0.31	0.31	15.19	12.40	17.03	24.00		2.70		Pass
HT20	MCS0	2	44	5220	0.31	0.31	15.53	11.99	17.12	24.00		2.70		Pass
HT20	MCS0	2	48	5240	0.31	0.31	15.65	12.45	17.35	24.00		2.70		Pass
HT40	MCS0	2	38	5190	0.60	0.65	13.27	10.16	15.00	24.00		2.70		Pass
HT40	MCS0	2	46	5230	0.60	0.65	13.13	9.91	14.82	24.00		2.70		Pass

Note:

1. Final Output Power equals to Measured Output Power adds the duty factor.
2. Sum Power is a calculated result from sum of the Chain Port 0+1(0) and Chain Port 0+1(1)

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 #

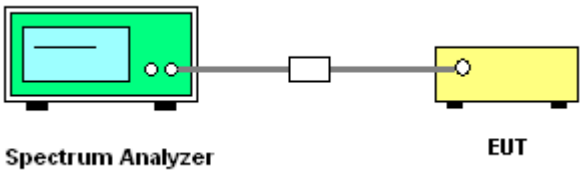
(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r01.
   - 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.
4. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

   Method (1): Measure and sum the spectra across the outputs.

   The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

3.3.4 Test Setup



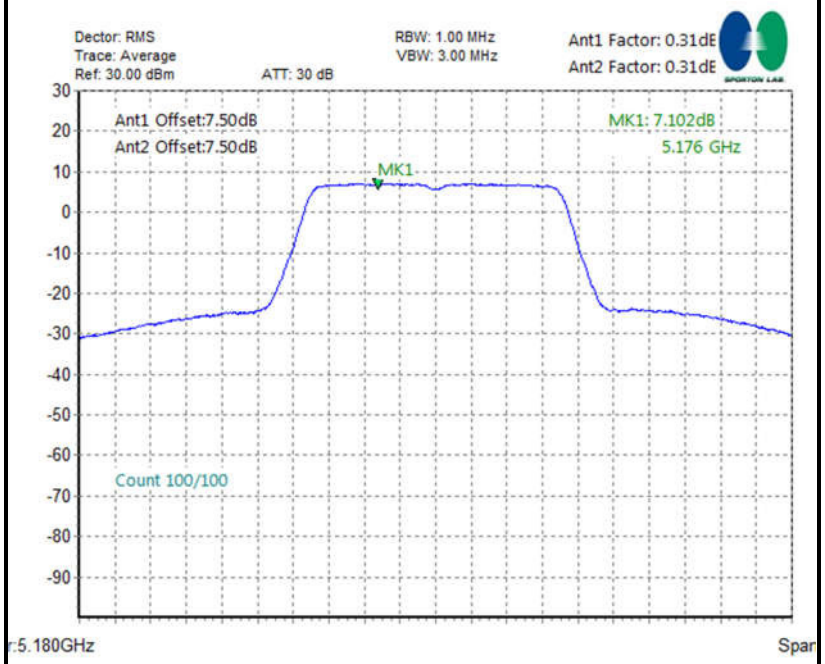
3.3.5 Test Result of Power Spectral Density

Test Band :	5GHz band 1	Temperature :	24~25℃
Test Engineer :	Issac Song	Relative Humidity :	49~51%

Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Power Density (dBm/MHz)			Average PSD Limit (dBm)		DG (dBi)		Pass /Fail
					Chain Port 0	Chain Port 1	Chain Port 0	Chain Port 1	Sum Power	Chain Port 0	Chain Port 1	Chain Port 0	Chain Port 1	
HT20	MCS0	1	36	5180	0.32	0.31	5.74	-	-	11.00	11.00	2.70	2.70	Pass
HT20	MCS0	1	44	5220	0.32	0.31	5.99	-		11.00	11.00	2.70	2.70	Pass
HT20	MCS0	1	48	5240	0.32	0.31	6.45	-		11.00	11.00	2.70	2.70	Pass
HT40	MCS0	1	38	5190	0.60	0.61	0.75	-		11.00	11.00	2.70	2.70	Pass
HT40	MCS0	1	46	5230	0.60	0.61	1.15	-		11.00	11.00	2.70	2.70	Pass
HT20	MCS0	2	36	5180	0.31	0.31	-		7.10	11.00		5.71		Pass
HT20	MCS0	2	44	5220	0.31	0.31			6.93	11.00		5.71		Pass
HT20	MCS0	2	48	5240	0.31	0.31			7.08	11.00		5.71		Pass
HT40	MCS0	2	38	5190	0.60	0.65			1.78	11.00		5.71		Pass
HT40	MCS0	2	46	5230	0.60	0.65			1.95	11.00		5.71		Pass

Note: Sum PSD is a bin-by-bin combined result of Chain Port 0+1(0) and Chain Port 0+1(1).

Worst Case Power Density (dBm/MHz)



3.4 Unwanted Emissions Measurement

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

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 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 v01r01. 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.

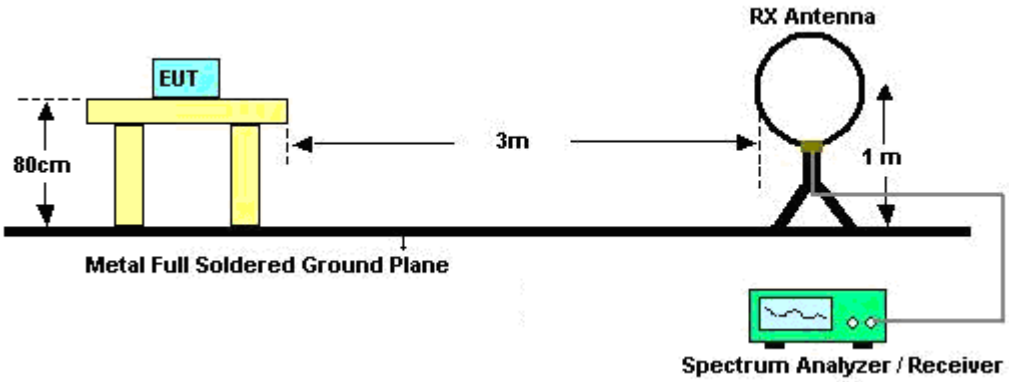
Chain Port	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
0+1	802.11n HT20	93.056	1.340	0.746	1kHz
0+1	802.11n HT40	87.080	0.674	1.484	3kHz

2. The EUT was placed on a rotatable table top 0.8 meter 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.

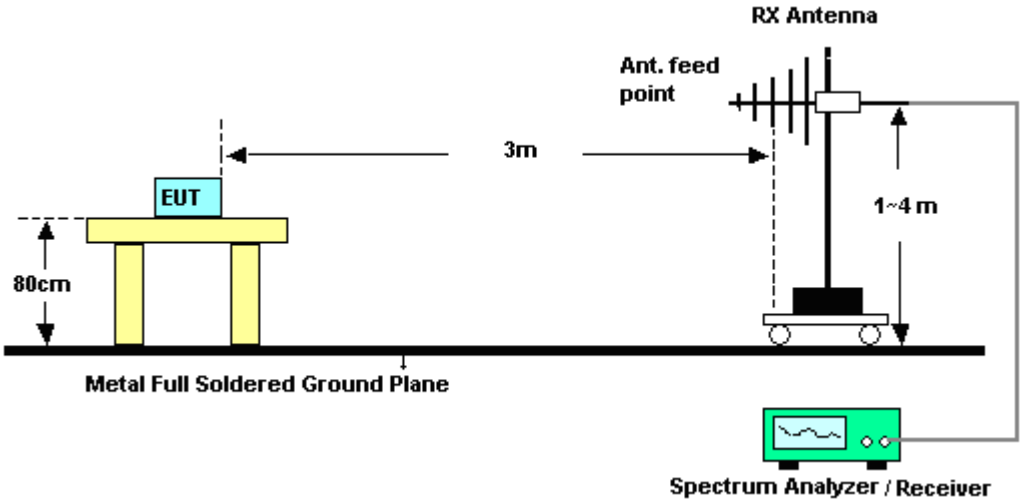
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

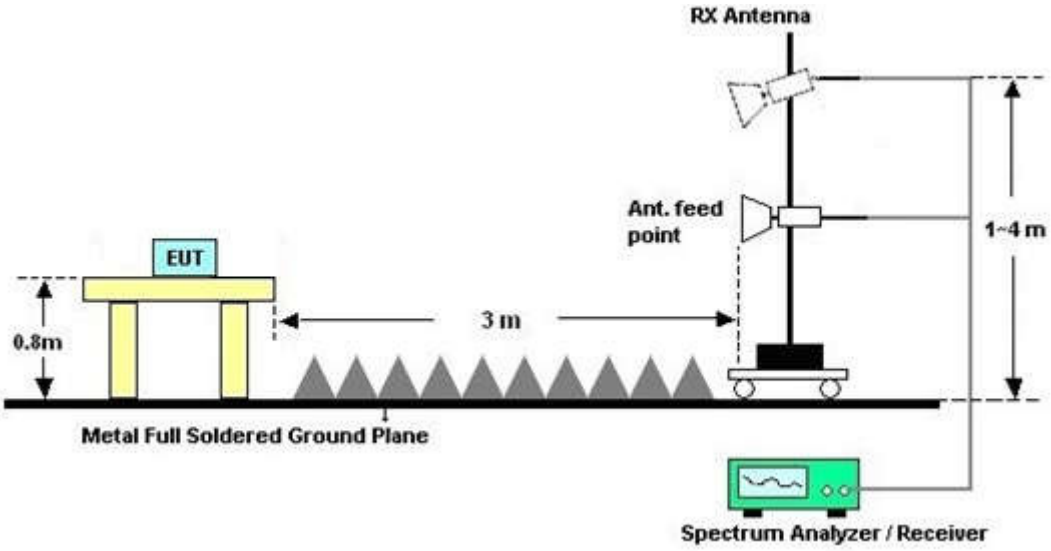
For radiated emissions below 30MHz



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

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5148.65	61.63	-12.37	74	56.73	31.5	7.07	33.67	210	304	Peak
5147.75	49.71	-4.29	54	44.81	31.5	7.07	33.67	210	304	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5149.85	58.01	-15.99	74	53.11	31.5	7.07	33.67	233	276	Peak
5149.7	48.2	-5.8	54	43.3	31.5	7.07	33.67	233	276	Average

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	48	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5128.25	47.93	-26.07	74	43.07	31.48	7.07	33.69	201	304	Peak
5120.75	39.97	-14.03	54	35.15	31.45	7.06	33.69	201	304	Average
5351.21	47.73	-26.27	74	42.35	31.79	7.12	33.53	201	304	Peak
5456.81	40.98	-13.02	54	35.35	31.93	7.17	33.47	201	304	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5146.4	46.6	-27.4	74	41.7	31.5	7.07	33.67	230	75	Peak
5138	39.03	-14.97	54	34.17	31.48	7.07	33.69	230	75	Average
5450.1	47.07	-26.93	74	41.44	31.93	7.17	33.47	230	75	Peak
5450.54	40.47	-13.53	54	34.84	31.93	7.17	33.47	230	75	Average

Test Mode :	802.11n HT40-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	38	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5142.8	59.51	-14.49	74	54.63	31.5	7.07	33.69	210	304	Peak
5149.7	52.54	-1.46	54	47.64	31.5	7.07	33.67	210	304	Average
5402.58	46.56	-27.44	74	41.07	31.86	7.13	33.5	210	304	Peak
5394.77	39.26	-14.74	54	33.79	31.86	7.13	33.52	210	304	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5148.05	57.62	-16.38	74	52.72	31.5	7.07	33.67	247	275	Peak
5148.5	48.4	-5.6	54	43.5	31.5	7.07	33.67	247	275	Average
5418.75	45.98	-28.02	74	40.45	31.88	7.15	33.5	247	275	Peak
5437.23	38.18	-15.82	54	32.6	31.91	7.15	33.48	247	275	Average

Test Mode :	802.11n HT40-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	46	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5150	49.87	-24.13	74	44.97	31.5	7.07	33.67	201	304	Peak
5149.55	41.15	-12.85	54	36.25	31.5	7.07	33.67	201	304	Average
5446.69	45.51	-28.49	74	39.89	31.93	7.17	33.48	201	304	Peak
5350	38.9	-15.1	54	33.52	31.79	7.12	33.53	201	304	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5048.3	46.85	-27.15	74	42.17	31.36	7.06	33.74	230	275	Peak
5149.4	39.63	-14.37	54	34.73	31.5	7.07	33.67	230	275	Average
5448.23	46.11	-27.89	74	40.49	31.93	7.17	33.48	230	275	Peak
5382.56	38.56	-15.44	54	33.12	31.83	7.13	33.52	230	275	Average

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

Note: Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Horizontal
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10360 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5180	107.43	-	-	102.45	31.55	7.08	33.65	210	304	Peak
5180	99.34	-	-	94.36	31.55	7.08	33.65	210	304	Average
10360	45.16	-23.14	68.3	55.47	38.62	10.07	59	250	0	Peak
15540	47.82	-26.18	74	56.2	38.54	12.77	59.69	150	0	Peak

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Vertical
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10360 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5180	104.33	-	-	99.35	31.55	7.08	33.65	233	276	Peak
5180	96.81	-	-	91.83	31.55	7.08	33.65	233	276	Average
10360	45.07	-23.23	68.3	55.38	38.62	10.07	59	250	0	Peak
15540	47.3	-26.7	74	55.68	38.54	12.77	59.69	150	0	Peak

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	44	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Horizontal
Remark :	1. 5220 MHz is fundamental signal which can be ignored. 2. 10440 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5220	107.27	-	-	102.22	31.6	7.09	33.64	201	304	Peak
5220	98.36	-	-	93.31	31.6	7.09	33.64	201	304	Average
10440	57.01	-11.29	68.3	67.18	38.72	10.13	59.02	150	125	Peak
15660	44.43	-29.57	74	53.08	38.17	12.93	59.75	150	0	Peak

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	44	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Vertical
Remark :	1. 5220 MHz is fundamental signal which can be ignored. 2. 10440 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5220	104.31	-	-	99.26	31.6	7.09	33.64	231	276	Peak
5220	95.5	-	-	90.45	31.6	7.09	33.64	231	276	Average
10440	55.81	-12.49	68.3	65.98	38.72	10.13	59.02	250	0	Peak
15660	49.14	-24.86	74	57.79	38.17	12.93	59.75	150	0	Peak

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	48	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Horizontal
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10480 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5240	108.02	-	-	102.93	31.62	7.09	33.62	201	304	Peak
5240	98.84	-	-	93.75	31.62	7.09	33.62	201	304	Average
10480	48.43	-19.87	68.3	58.52	38.79	10.15	59.03	250	0	Peak
15720	48.4	-25.6	74	57.2	37.96	13.03	59.79	150	0	Peak

Test Mode :	802.11n HT20-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	48	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Vertical
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10480 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5240	105.84	-	-	100.75	31.62	7.09	33.62	230	75	Peak
5240	96.14	-	-	91.05	31.62	7.09	33.62	230	75	Average
10480	50.16	-18.14	68.3	60.25	38.79	10.15	59.03	250	0	Peak
15720	48.84	-25.16	74	57.64	37.96	13.03	59.79	150	0	Peak

Test Mode :	802.11n HT40-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	38	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Horizontal
Remark :	1. 5190 MHz is fundamental signal which can be ignored. 2. 10380 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
81.41	27.57	-12.43	40	48.48	9.62	1.14	31.67	-	-	Peak
198.78	27.66	-15.84	43.5	47.22	10.12	1.57	31.25	-	-	Peak
298.69	37.29	-8.71	46	52.92	13.76	1.94	31.33	100	360	Peak
399.57	29.9	-16.1	46	42.52	16.5	2.12	31.24	-	-	Peak
714.82	30.85	-15.15	46	39.72	19.6	2.75	31.22	-	-	Peak
799.21	27.92	-18.08	46	36.06	20.19	2.91	31.24	-	-	Peak
5190	102.98	-	-	98	31.55	7.08	33.65	210	304	Peak
5190	93.38	-	-	88.4	31.55	7.08	33.65	210	304	Average
10380	49.61	-18.69	68.3	59.87	38.65	10.1	59.01	250	0	Peak
15570	47.25	-26.75	74	55.7	38.44	12.82	59.71	150	0	Peak

Test Mode :	802.11n HT40-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	38	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Vertical
Remark :	1. 5190 MHz is fundamental signal which can be ignored. 2. 10380 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30.97	26.63	-13.37	40	39.74	17.67	1	31.78	100	360	Peak
111.48	17.69	-25.81	43.5	35.81	12.04	1.38	31.54	-	-	Peak
198.78	19.83	-23.67	43.5	39.39	10.12	1.57	31.25	-	-	Peak
299.66	24.2	-21.8	46	39.79	13.8	1.94	31.33	-	-	Peak
497.54	24.61	-21.39	46	35.49	17.86	2.41	31.15	-	-	Peak
599.39	23.81	-22.19	46	33.69	18.79	2.57	31.24	-	-	Peak
5190	99.63	-	-	94.65	31.55	7.08	33.65	247	275	Peak
5190	90.8	-	-	85.82	31.55	7.08	33.65	247	275	Average
10380	49.72	-18.58	68.3	59.98	38.65	10.1	59.01	250	0	Peak
15570	47.04	-26.96	74	55.49	38.44	12.82	59.71	150	0	Peak

Test Mode :	802.11n HT40-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	46	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Horizontal
Remark :	1. 5230 MHz is fundamental signal which can be ignored. 2. 10460 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5230	102.09	-	-	97	31.62	7.09	33.62	201	304	Peak
5230	92.86	-	-	87.77	31.62	7.09	33.62	201	304	Average
10460	50.11	-18.19	68.3	60.25	38.74	10.15	59.03	250	0	Peak
15690	49.53	-24.47	74	58.26	38.06	12.98	59.77	150	0	Peak

Test Mode :	802.11n HT40-Chain Port 0+1	**Temperature :**	21~22°C
Test Channel :	46	**Relative Humidity :**	42~43%
Test Engineer :	Jack Wang	**Polarization :**	Vertical
Remark :	1. 5230 MHz is fundamental signal which can be ignored. 2. 10460 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5230	99.05	-	-	93.96	31.62	7.09	33.62	230	275	Peak
5230	89.96	-	-	84.87	31.62	7.09	33.62	230	275	Average
10460	50.4	-17.9	68.3	60.54	38.74	10.15	59.03	250	0	Peak
15690	46	-28	74	54.73	38.06	12.98	59.77	150	0	Peak

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.

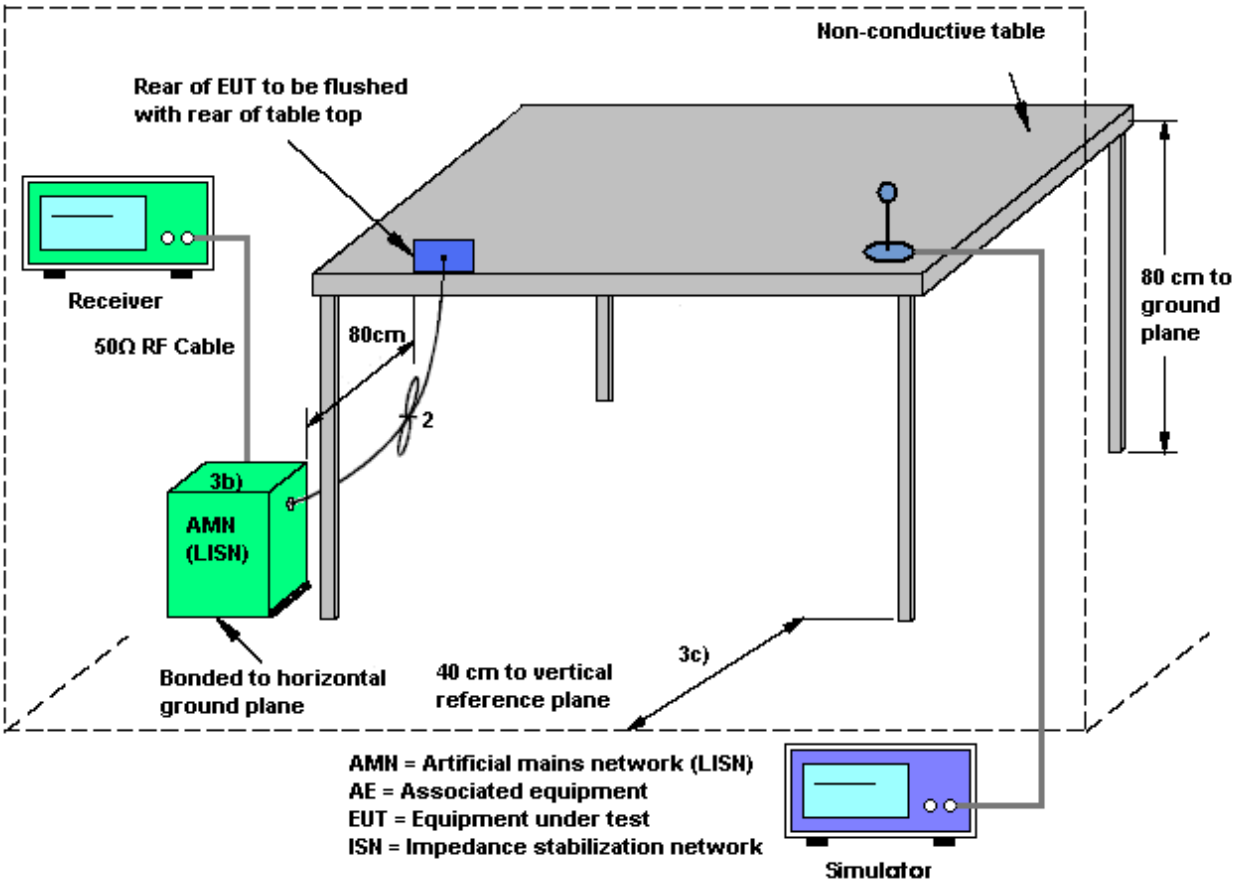
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

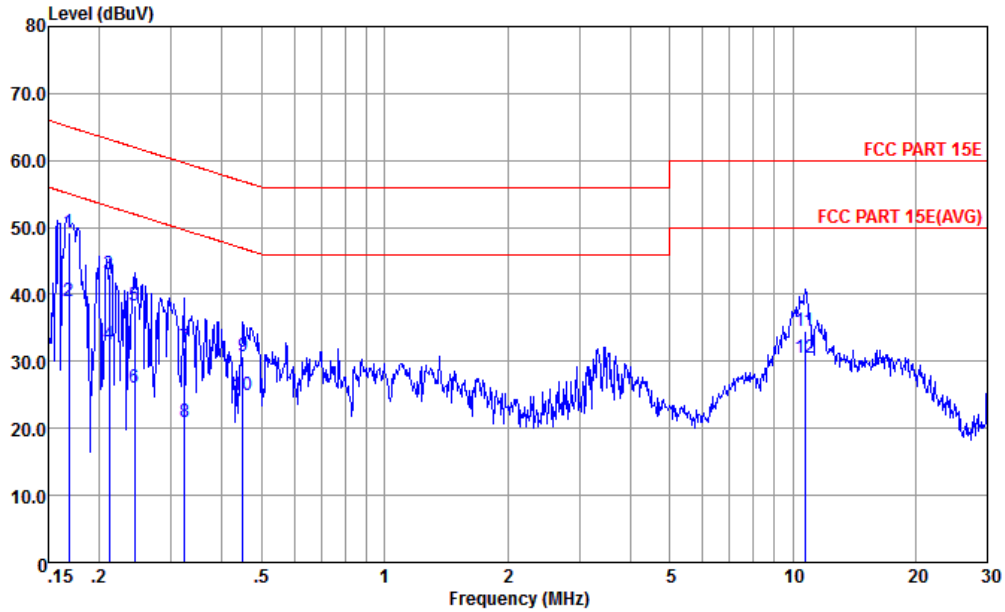
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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

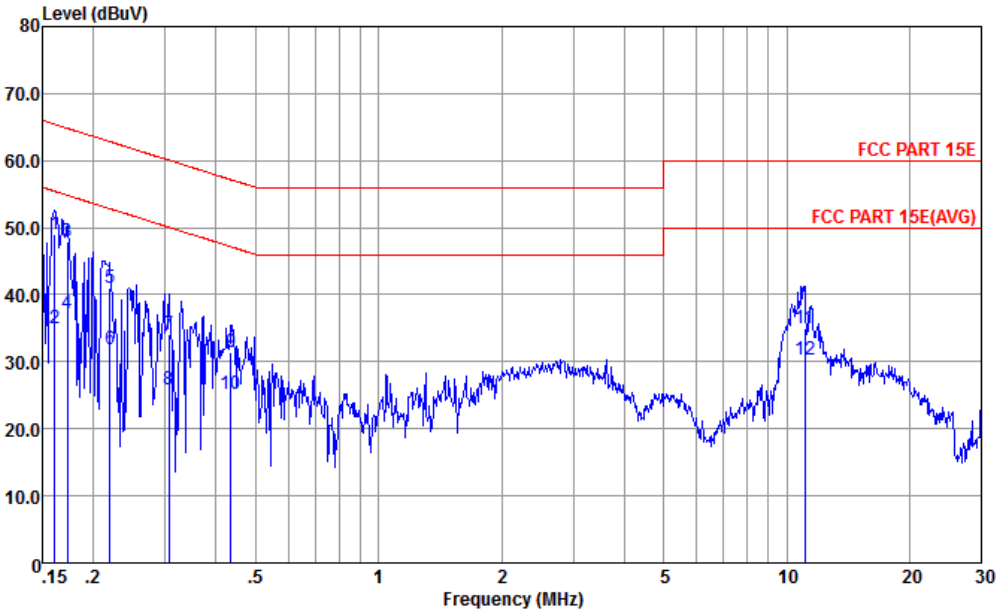
Test Mode :	Mode 1	**Temperature :**	22~24℃
Test Engineer :	Eligah Wang	**Relative Humidity :**	41~42%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN (5G) Link + Earphone + USB Cable (Charging from Adapter)		



Site : CO01-KS
Condition : FCC PART 15E LISN-L20140306 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.17	49.22	-15.81	65.03	37.20	1.60	10.42	QP
2	0.17	39.02	-16.01	55.03	27.00	1.60	10.42	Average
3	0.21	42.98	-20.16	63.14	31.50	0.97	10.51	QP
4	0.21	32.58	-20.56	53.14	21.10	0.97	10.51	Average
5	0.24	38.22	-23.73	61.95	26.81	0.89	10.52	QP
6	0.24	26.02	-25.93	51.95	14.61	0.89	10.52	Average
7	0.32	32.04	-27.58	59.62	20.90	0.55	10.59	QP
8	0.32	21.04	-28.58	49.62	9.90	0.55	10.59	Average
9	0.45	30.67	-26.22	56.89	19.80	0.25	10.62	QP
10	0.45	24.97	-21.92	46.89	14.10	0.25	10.62	Average
11	10.73	34.56	-25.44	60.00	23.40	0.20	10.96	QP
12	10.73	30.46	-19.54	50.00	19.30	0.20	10.96	Average

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Eligah Wang	Relative Humidity :	41~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN (5G) Link + Earphone + USB Cable (Charging from Adapter)		



Site : CO01-KS
Condition : FCC PART 15E LISN-N20140306 NEUTRAL

	Freq MHz	Level dBuV	Over Limit dB	Limit Line dBuV	Read Level dBuV	LISN Factor dB	Cable Loss dB	Remark
1 *	0.16	48.92	-16.51	65.43	36.80	1.73	10.39	QP
2	0.16	35.02	-20.41	55.43	22.90	1.73	10.39	Average
3	0.17	47.99	-16.82	64.81	36.10	1.45	10.44	QP
4	0.17	37.28	-17.53	54.81	25.39	1.45	10.44	Average
5	0.22	40.97	-21.86	62.83	29.50	0.96	10.51	QP
6	0.22	31.77	-21.06	52.83	20.30	0.96	10.51	Average
7	0.31	34.18	-25.88	60.06	22.90	0.70	10.58	QP
8	0.31	25.88	-24.18	50.06	14.60	0.70	10.58	Average
9	0.44	31.48	-25.67	57.15	20.50	0.36	10.62	QP
10	0.44	25.18	-21.97	47.15	14.20	0.36	10.62	Average
11	11.08	35.08	-24.92	60.00	23.89	0.22	10.97	QP
12	11.08	30.38	-19.62	50.00	19.19	0.22	10.97	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.

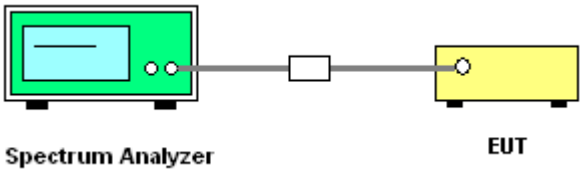
3.6.2 Measuring Instruments

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

Test Band :	5GHz band 1	Test Engineer :	Issac Song

Mod.	Data Rate	NTX	Channel	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stability (ppm)	Temperature (˚C)	Voltage (V)
HT20	MCS0	1	36	5180	5180.050	0.050	9.65	20	3.5
HT20	MCS0	1	36	5180	5180.050	0.050	9.65	20	4.2
HT20	MCS0	1	36	5180	5180.050	0.050	9.65	20	3.8
HT20	MCS0	1	36	5180	5180.050	0.050	9.65	-30	3.8
HT20	MCS0	1	36	5180	5180.050	0.050	9.65	50	3.8

Note: Center Frequency = (Low Frequency + High Frequency) / 2.

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

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

$$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

The EUT supports CDD mode.

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

The directional gain “DG” is calculated as following table.

	Chain Port 0 (dBi)	Chain Port 1 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band I	2.70	2.70	2.70	5.71	0.00	0.00

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Oct. 28, 2014	Oct. 29, 2014	Oct. 27, 2015	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV30	101338	9kHz~30GHz	May 04, 2014	Oct. 29, 2014	May 03, 2015	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	30MHz~40GHz	Feb. 27, 2014	Oct. 29, 2014	Feb. 26, 2015	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Feb. 27, 2014	Oct. 29, 2014	Feb. 26, 2015	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 25, 2014	Oct. 29, 2014	Oct. 24, 2015	Conducted (TH01-KS)
EMI Test Receiver&SA	Agilent Technologies	N9038A	MY52260185	20Hz~26.5GHz	May 26, 2015	Mar. 07, 2016	May 25, 2016	Radiation (03CH01-SZ)
Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz;Max 30dBm	Jun. 07, 2015	Mar. 07, 2016	Jun. 06, 2016	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 06, 2015	Mar. 07, 2016	May 05, 2016	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	23188	30MHz-2GHz	Oct. 17, 2015	Mar. 07, 2016	Oct. 16, 2016	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1285	1GHz~18GHz	Jan. 11, 2016	Mar. 07, 2016	Jan. 10, 2017	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 18. 2015	Mar. 07, 2016	Jul. 17. 2016	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug. 19, 2015	Mar. 07, 2016	Aug. 18, 2016	Radiation (03CH01-SZ)
Amplifier	HP	8447F	3113A04622	9kHz ~1300MHz / 30 dB	Aug. 07, 2015	Mar. 07, 2016	Aug. 06, 2016	Radiation (03CH01-SZ)
Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1889561	1GHz~18GHz	Oct. 20, 2015	Mar. 07, 2016	Oct. 19, 2016	Radiation (03CH01-SZ)
Amplifier	Yiai	AV3860B	04030	2GHz~26.5GHz	May 05, 2015	Mar. 07, 2016	May 04, 2016	Radiation (03CH01-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 12, 2016	Mar. 07, 2016	Jan. 11, 2017	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Mar. 07, 2016	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Mar. 07, 2016	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Mar. 07, 2016	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 04, 2014	Jan. 07, 2015	May 03, 2015	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 25, 2014	Jan. 07, 2015	Oct. 24, 2015	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 25, 2014	Jan. 07, 2015	Oct. 24, 2015	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 25, 2014	Jan. 07, 2015	Oct. 24, 2015	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))	4.8 dB

Appendix B. Product Equality Declaration

ZTE CORPORATION

Product Change Description

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

[MF97B_T]

[ZTE Corporation]

is the variant of the initial certified product,

[MF97B]

[ZTE Corporation]

[Project Number: 14ZTE147]

SOFTWARE MODIFICATIONS:

Protocol Stack changes: NO
MMS/STK changes: NO
JAVA changes: NO
Other changes detailed: YES, merged applications and mandatory requirements that new carrier needed and ZTE updated software to disable/enable bands as below.
MF97B for AT&T
E-UTRA CA: CA_4A-17A/CA_2A-17A/CA_4A-29A/CA_2A-29A
E-UTRA FDD: Band 2/Band 4/Band 5/Band 17/Band 29
UMTS FDD: Band I/Band II/Band V
WiFi: 802.11 a/ac/b/g/n/MIMO

MF97B_T for TMO
E-UTRA CA: **CA B4A_B12A**
E-UTRA FDD: Band 2/Band 4/Band 5/**Band12**
UMTS FDD: Band II/**Band IV**/Band V
WiFi: 802.11 b/g/n

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HARDWARE MODIFICATION:

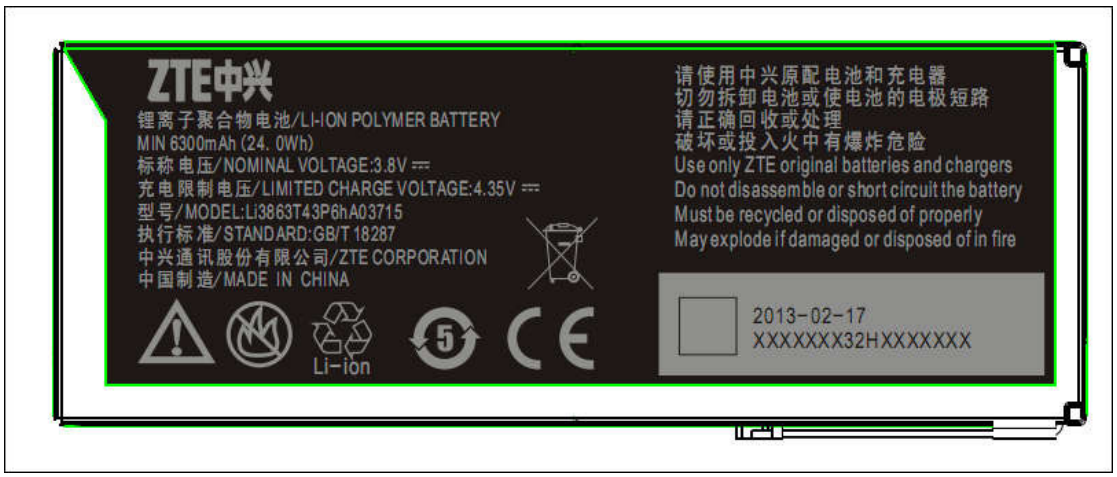
Band changes: NO
Power Amplifier changes: NO
Antenna changes: **YES, new antenna for WiFi/Bluetooth.**
PCB Layout changes: NO
Components on PCB changes: NO
LCD changes: NO
Speaker changes: NO
Camera changes: NO
Vibrator changes: NO
Bluetooth changes: NO
FM changes: NO
Other changes: NO

MECHANICAL MODIFICATIONS:

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

ACCESSORY MODIFICATIONS:

Battery changes: **YES, new battery.**
Please refer to below photo.
Original



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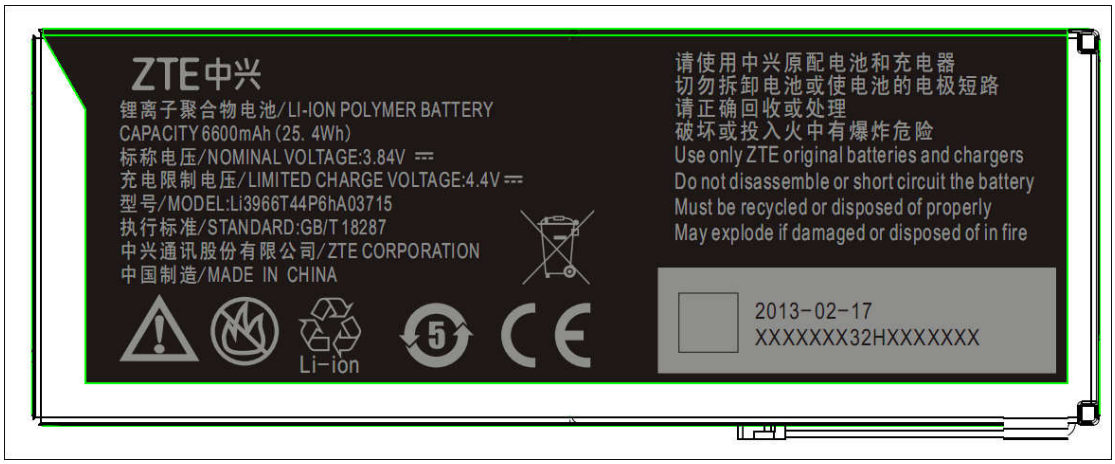

AC Adaptor changes: NO
Earphone changes: NO

Min Zhang

APPROVED BY: Min Zhang

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