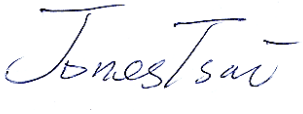
FCC RF Test Report

APPLICANT	:	ZTE CORPORATION
EQUIPMENT	:	LTE uFi
BRAND NAME	:	ZTE
MODEL NAME	:	MF923
FCC ID	:	SRQ-MF923
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure

The product was received on Jun. 05, 2014 and testing was completed on Aug. 20, 2014. 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.

Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. C.

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APPENDIX A. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR460508B	Rev. 01	Initial issue of report	Aug. 25, 2014

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	≤ 17, 24, 30 dBm (depend on band)	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 4, 11, 17 dBm (depend on band)	Pass	-
3.4	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass	Under limit 1.96 dB at 5150.000 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 7.88 dB at 0.430 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	MF923
FCC ID	SRQ-MF923
EUT supports Radios application	WCDMA/HSPA/HSPA+(Downlink Only)/DC-HSDPA/LTE WLAN2.4GHz 802.11b/g/n HT20/HT40 WLAN5GHz 802.11a/n HT20/HT40
HW Version	xx4A
SW Version	MF923V0.6
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

<table>
<tr><th colspan="2">Product Specification subjective to this standard</th></tr>
<tr><td>Tx/Rx Channel Frequency Range</td><td>5180 MHz ~ 5240 MHz</td></tr>
<tr><td>Maximum Output Power</td><td>802.11a: 10.69 dBm / 0.0117 W
802.11n HT20 : 13.88 dBm / 0.0244 W
802.11n HT40 : 14.20 dBm / 0.0263 W</td></tr>
<tr><td>99% Occupied Bandwidth</td><td>802.11a : 17.13 MHz
802.11n HT20 : 18.18 MHz
802.11n HT40 : 36.77 MHz</td></tr>
<tr><td>Antenna Type</td><td>Chain Port 0 : IFA Antenna with gain 2.00 dBi
Chain Port 1 : IFA Antenna with gain 2.00 dBi</td></tr>
<tr><td>Type of Modulation</td><td>802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)</td></tr>
<tr><td>Antenna Function Description</td><td>
<table>
<tr><td></td><td>Chain Port 0</td><td>Chain Port 1</td></tr>
<tr><td>802.11 a</td><td>V</td><td>V</td></tr>
<tr><td>802.11 n SISO</td><td>V</td><td>V</td></tr>
<tr><td>802.11 n MIMO</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
</table>

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. C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958			
Test Site No.	**Sporton Site No.**			**FCC Registration No.**
	TH01-KS	03CH01-KS	CO01-KS	149928

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
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.4-2003

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 (X 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.

5GHz 802.11a Average Power (dBm)										
Data Rate (MHz)	CH	6Mbps	CH	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
Chain Port 0	36	10.48	48	10.26	10.11	10.16	10.21	10.21	10.24	10.26
	44	10.49								
	48	**10.53**								
Chain Port 1	36	**10.69**	36	10.60	10.57	10.67	10.66	10.64	10.53	10.63
	44	10.27								
	48	10.01								

5GHz 802.11n HT20 Average Power (dBm)										
Data Rate (MHz)	CH	MCS0	CH	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Chain Port 0	36	**10.40**	36	10.38	10.36	10.24	10.36	10.35	10.34	10.29
	44	10.26								
	48	10.34								
Chain Port 1	36	**10.69**	36	10.50	10.25	10.24	10.18	10.38	10.34	10.29
	44	10.32								
	48	10.21								
Data Rate (MHz)	**CH**	**MCS8**	**CH**	**MCS 9**	**MCS 10**	**MCS 11**	**MCS 12**	**MCS 13**	**MCS 14**	**MCS 15**
Chain Port 0+1(0)	36	10.82	36	10.58	10.76	10.81	10.78	10.75	10.71	10.77
	44	10.77								
	48	10.58								
Chain Port 0+1(1)	36	10.92	36	10.69	10.79	10.74	10.72	10.85	10.65	10.84
	44	10.24								
	48	10.17								
Chain Port 0+1	36	**13.88**	36	13.80	13.79	13.79	13.76	13.81	13.79	13.87
	44	13.52								
	48	13.39								

5GHz 802.11n HT40 Average Power (dBm)										
Data Rate (MHz)	CH	MCS0	CH	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Chain Port 0	38	**10.18**	38	9.89	10.09	9.69	9.88	9.87	9.90	10.14
	46	9.85								
Chain Port 1	38	**10.64**	38	10.18	10.35	10.56	10.61	10.57	10.63	10.57
	46	10.44								
Data Rate (MHz)	CH	MCS8	CH	MCS 9	MCS 10	MCS 11	MCS 12	MCS 13	MCS 14	MCS 15
Chain Port 0+1(0)	38	10.87	46	10.88	10.92	10.85	11.07	11.09	10.98	10.80
	46	11.10								
Chain Port 0+1(1)	38	11.20	46	10.86	10.87	10.84	11.12	11.02	11.15	10.62
	46	11.28								
Chain Port 0+1	38	14.05	46	13.88	13.91	13.85	14.11	14.08	14.08	13.72
	46	**14.20**								

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

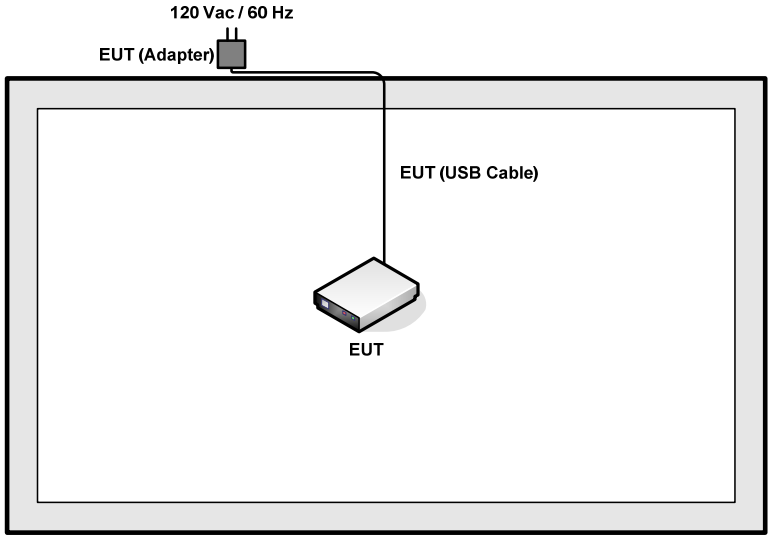
Final results of test modes, data rates and test channels are shown as following table.

Test Cases				
	Test Items	Mode	Data rate	Test Channel
Conducted TCs	99% BW Power Spectral Density	802.11a	6 Mbps	L/M/H
		802.11n HT20	MCS0/ MCS8	L/M/H
		802.11n HT40	MCS0/ MCS8	L/M/H
	20dB Occupied Bandwidth	802.11a	6 Mbps	H
		802.11n HT20	MCS0/ MCS8	H
		802.11n HT40	MCS0/ MCS8	H
	Output Power	802.11a	6 Mbps	L/M/H
		802.11n HT20	MCS0/ MCS8	L/M/H
		802.11n HT40	MCS0/ MCS8	L/M/H
	Frequency Stability	802.11a	6 Mbps	L
Radiated TCs	Radiated Band Edge	802.11a	6 Mbps	L/H
		802.11n HT20	MCS8	L/H
		802.11n HT40	MCS8	L/H
	Radiated Spurious Emission	802.11a	6 Mbps	L/M/H
		802.11n HT20	MCS8	L/M/H
		802.11n HT40	MCS8	L/M/H
AC Conducted Emission	Mode 1 : WCDMA Band V Idle + WLAN(5G) Link + USB Cable (Charging from Adapter)			

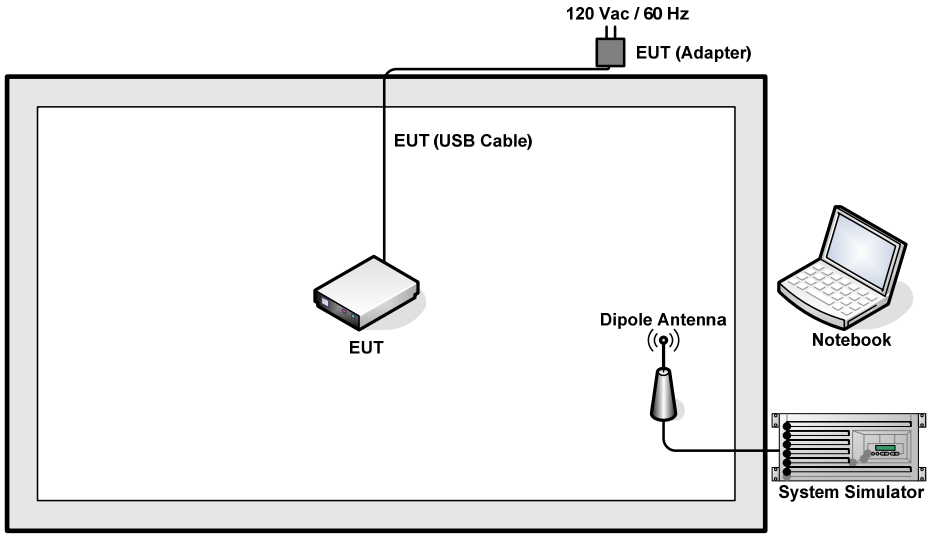
Ch. #		Band I：5150-5250 MHz		
		802.11a	802.11n HT20	802.11n HT40
L	Low	36	36	38
M	Middle	44	44	-
H	High	48	48	46

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.	DC Power Supply	GWINSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m
3.	Notebook	Acer	MS2204	QDS-BRCM1018	N/A	AC I/P: Unshielded, 0.9 m DC O/P: Shielded, 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 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 and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6.3 dB and 10dB attenuator.

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

= 6.3 + 10 = 16.3 (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.

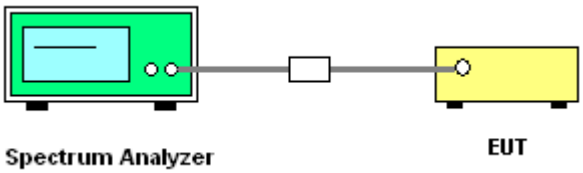
3.1.2 Measuring Instruments

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 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. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1MHz and set the Video bandwidth (VBW) ≥ 3 * RBW.
7. Measure and record the results in the test report.

3.1.4 Test Setup

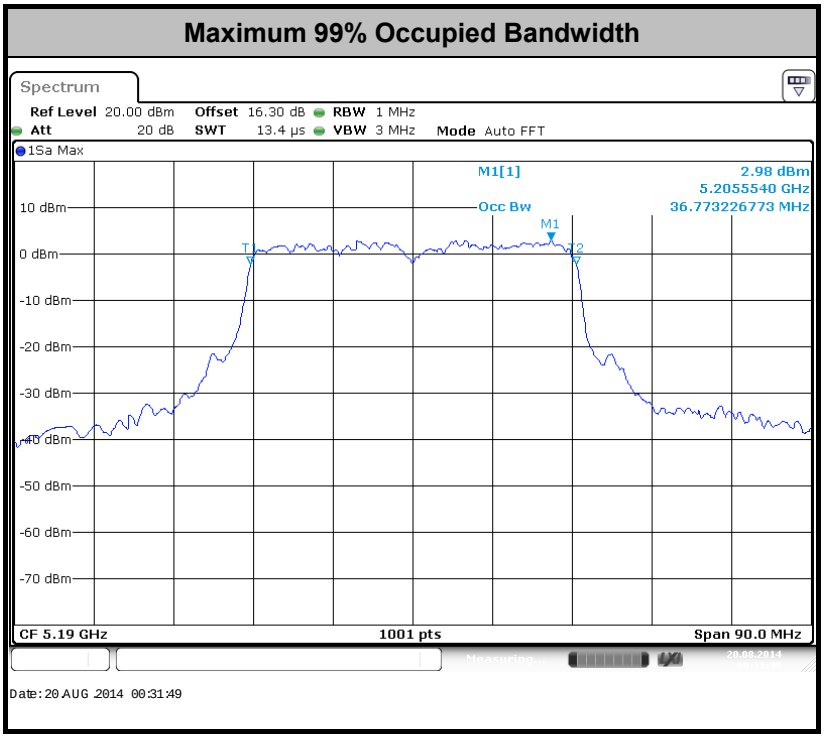


3.1.5 Test Result of 99% Occupied Bandwidth

Test Band :	5GHz band 1	Temperature :	23~24℃
Test Engineer :	Adoms Li	Relative Humidity :	47~18%

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
11a	6Mbps	1	36	5180	-	17.13	-	22.34
11a	6Mbps	1	44	5220	-	17.03	-	22.31
11a	6Mbps	1	48	5240	-	17.03	-	22.31
HT20	MCS0	1	36	5180	-	17.68	-	22.47
HT20	MCS0	1	44	5220	-	17.78	-	22.50
HT20	MCS0	1	48	5240	-	17.93	-	22.54
HT40	MCS0	1	38	5190	-	36.50	-	23.01
HT40	MCS0	1	46	5230	-	36.59	-	23.01
HT20	MCS8	2	36	5180	18.08	17.98	22.55	
HT20	MCS8	2	44	5220	18.18	17.88	22.52	
HT20	MCS8	2	48	5240	17.83	17.83	22.51	
HT40	MCS8	2	38	5190	36.68	36.77	23.01	
HT40	MCS8	2	46	5230	36.59	36.50	23.01	

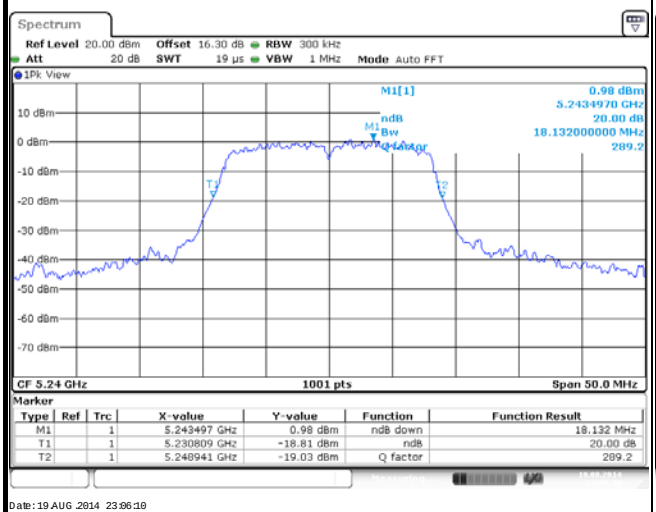
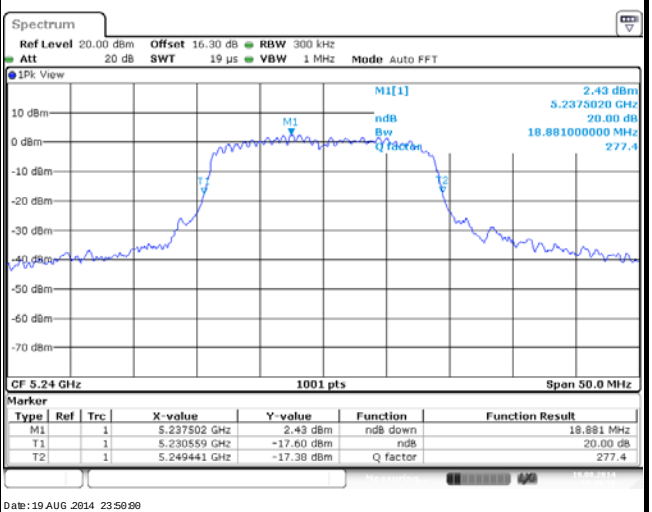
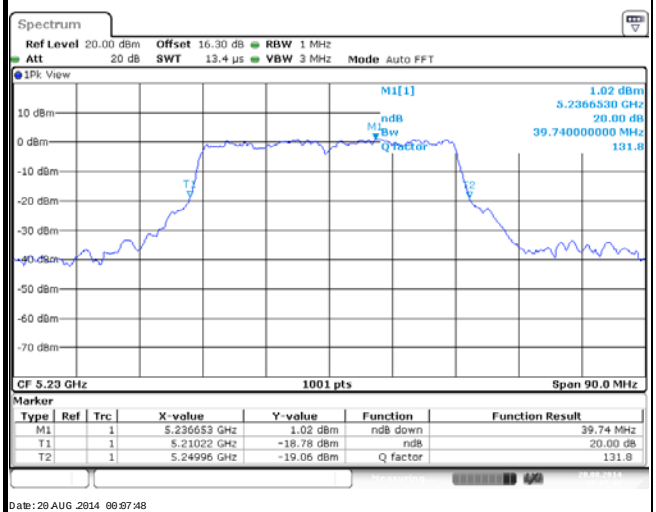
Maximum 99% Occupied Bandwidth



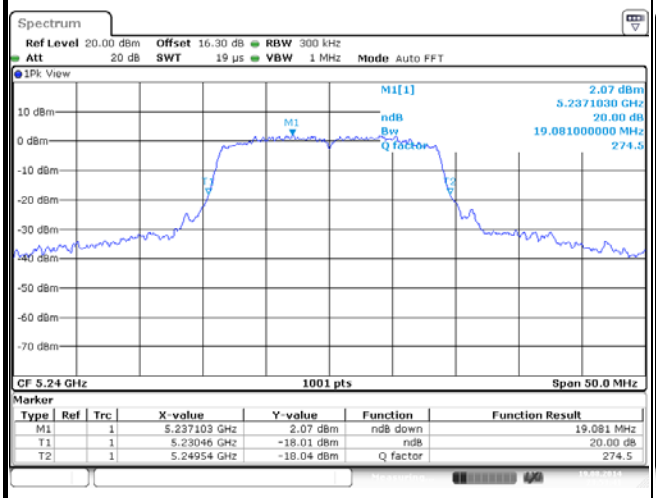
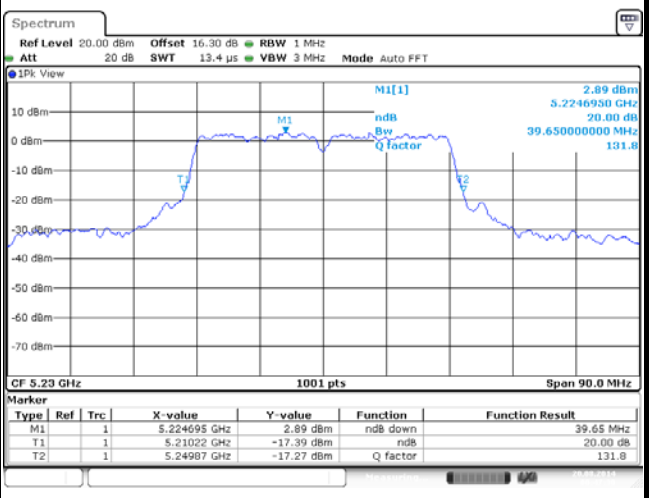
3.1.6 Test Result of 20dB Occupied Bandwidth

Mod.	Data Rate	NTX	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		
11a	6Mbps	1	48	5240	-	18.13	-	5248.94	5250	Pass
HT20	MCS0	1	48	5240	-	18.88	-	5249.44		Pass
HT40	MCS0	1	46	5230	-	39.74	-	5249.96		Pass
HT20	MCS8	2	48	5240	19.08	-	5249.54	-		Pass
HT40	MCS8	2	46	5230	39.65		5249.87			Pass

Number of TX = 1 (Chain Port 1)

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

Number of TX = 2 (Chain Port 0+1 (0))

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

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.

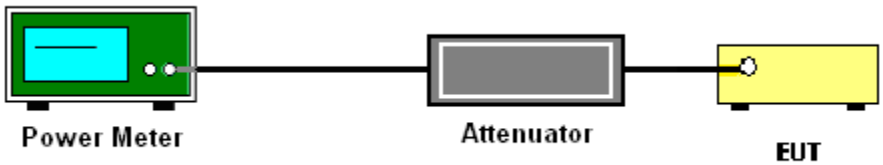
3.2.3 Test Procedures

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

Test Band :	5GHz band 1	Temperature :	23~24℃
Test Engineer :	Adoms Li	Relative Humidity :	47~18%

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	
11a	6Mbps	1	36	5180	0.21	0.22	10.48	10.69	-	24.00	24.00	2.00	2.00	Pass
11a	6Mbps	1	44	5220	0.21	0.22	10.49	10.27		24.00	24.00	2.00	2.00	Pass
11a	6Mbps	1	48	5240	0.21	0.22	10.53	10.01		24.00	24.00	2.00	2.00	Pass
HT20	MCS0	1	36	5180	0.22	0.23	10.40	10.69		24.00	24.00	2.00	2.00	Pass
HT20	MCS0	1	44	5220	0.22	0.23	10.26	10.32		24.00	24.00	2.00	2.00	Pass
HT20	MCS0	1	48	5240	0.22	0.23	10.34	10.21		24.00	24.00	2.00	2.00	Pass
HT40	MCS0	1	38	5190	0.43	0.44	10.18	10.64		24.00	24.00	2.00	2.00	Pass
HT40	MCS0	1	46	5230	0.43	0.44	9.85	10.44		24.00	24.00	2.00	2.00	Pass
HT20	MCS8	2	36	5180	0.43	0.42	10.82	10.92	13.88	24.00		2.00		Pass
HT20	MCS8	2	44	5220	0.43	0.42	10.77	10.24	13.52	24.00		2.00		Pass
HT20	MCS8	2	48	5240	0.43	0.42	10.58	10.17	13.39	24.00		2.00		Pass
HT40	MCS8	2	38	5190	0.78	0.79	10.87	11.20	14.05	24.00		2.00		Pass
HT40	MCS8	2	46	5230	0.78	0.79	11.10	11.28	14.20	24.00		2.00		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 and Chain Port 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 #

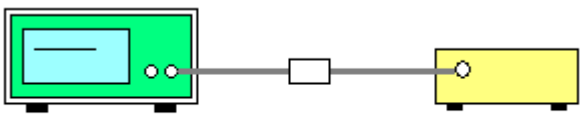
(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules 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.
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



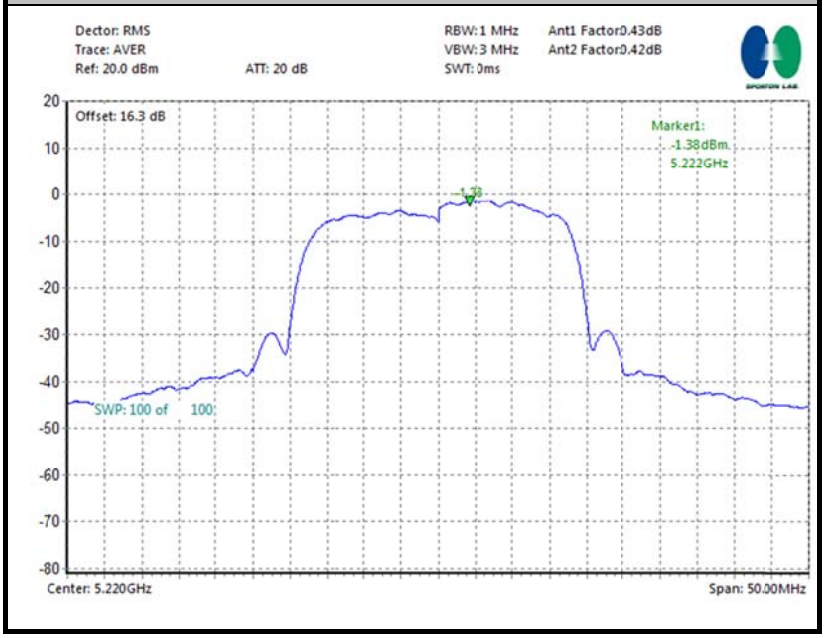
3.3.5 Test Result of Power Spectral Density

Test Band :	5GHz band 1	Temperature :	23~24℃
Test Engineer :	Adoms Li	Relative Humidity :	47~18%

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	
11a	6Mbps	1	36	5180	0.21	0.22	-	-5.13	-	11.00	11.00	2.00	2.00	Pass
11a	6Mbps	1	44	5220	0.21	0.22	-	-3.92		11.00	11.00	2.00	2.00	Pass
11a	6Mbps	1	48	5240	0.21	0.22	-	-4.05		11.00	11.00	2.00	2.00	Pass
HT20	MCS0	1	36	5180	0.22	0.23	-	-4.75		11.00	11.00	2.00	2.00	Pass
HT20	MCS0	1	44	5220	0.22	0.23	-	-6.26		11.00	11.00	2.00	2.00	Pass
HT20	MCS0	1	48	5240	0.22	0.23	-	-6.42		11.00	11.00	2.00	2.00	Pass
HT40	MCS0	1	38	5190	0.43	0.44	-	-9.59		11.00	11.00	2.00	2.00	Pass
HT40	MCS0	1	46	5230	0.43	0.44	-	-10.57		11.00	11.00	2.00	2.00	Pass
HT20	MCS8	2	36	5180	0.43	0.42	-		-3.71	11.00		5.01		Pass
HT20	MCS8	2	44	5220	0.43	0.42			-1.38	11.00		5.01		Pass
HT20	MCS8	2	48	5240	0.43	0.42			-3.08	11.00		5.01		Pass
HT40	MCS8	2	38	5190	0.78	0.79			-10.63	11.00		5.01		Pass
HT40	MCS8	2	46	5230	0.78	0.79			-10.32	11.00		5.01		Pass

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

Chain Port	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
0	802.11a	95.32	2.07	0.48	1KHz
1	802.11a	95.12	2.06	0.49	1KHz
0+1	802.11n HT20	90.75	0.98	1.02	3KHz
0+1	802.11n HT40	83.50	0.50	2.01	3KHz

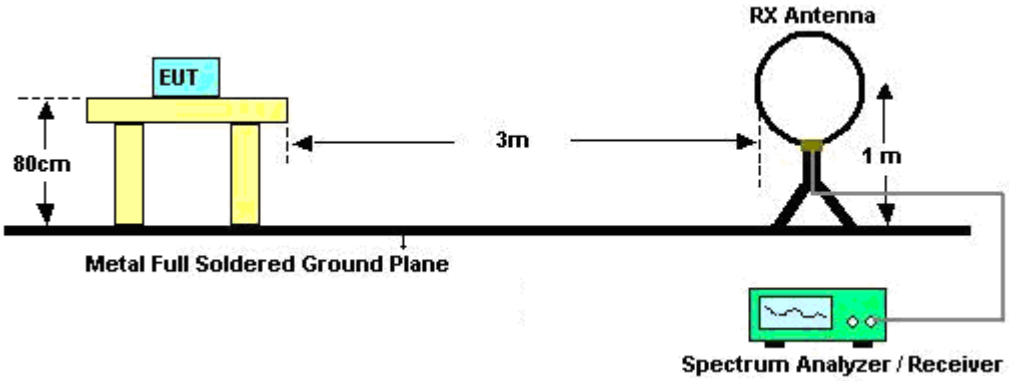
2. The EUT was placed on a rotatable table top 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters 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.

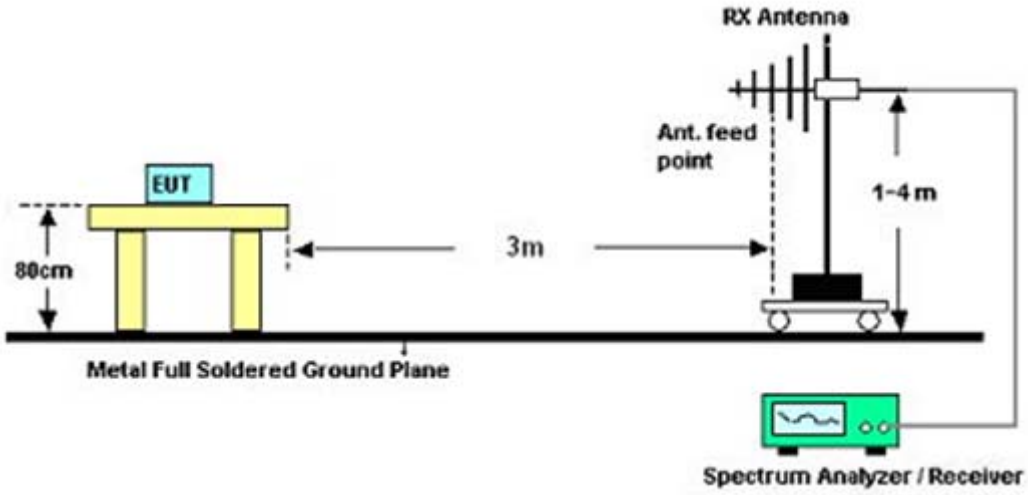
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again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

3.4.4 Test Setup

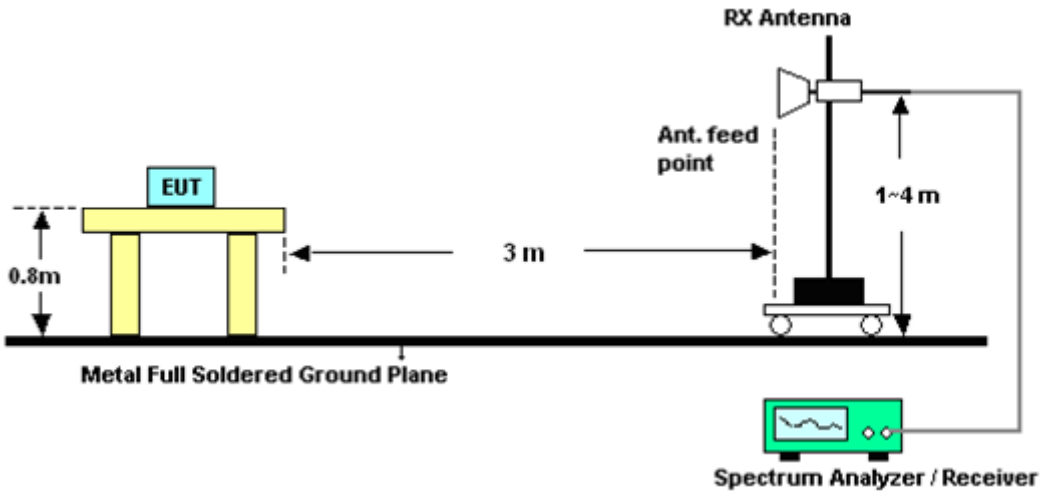
For radiated emissions below 30MHz



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

Chain Port 0

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu		

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
5147.2	66.13	-7.87	74	65.98	34.11	3.9	37.86	101	356	Peak
5150	46.87	-7.13	54	46.72	34.11	3.9	37.86	101	356	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
5150	57.71	-16.29	74	57.56	34.11	3.9	37.86	190	343	Peak
5149.65	38.68	-15.32	54	38.53	34.11	3.9	37.86	190	343	Average

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	48	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu		

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
5393.05	53.97	-20.03	74	54.82	34.44	4.02	39.31	123	0	Peak
5386.8	40.12	-13.88	54	40.97	34.44	4.02	39.31	123	0	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
5391.4	50.69	-23.31	74	51.54	34.44	4.02	39.31	161	109	Peak
5384.75	36.5	-17.5	54	37.35	34.44	4.02	39.31	161	189	Average

Chain Port 1

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu		

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
5148.7	70.07	-3.93	74	69.92	34.11	3.9	37.86	100	86	Peak
5150	50.98	-3.02	54	50.83	34.11	3.9	37.86	100	86	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
5149.2	68.9	-5.10	74	68.75	34.11	3.9	37.86	176	76	Peak
5150	49.97	-4.03	54	49.82	34.11	3.9	37.86	100	76	Average

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	48	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu		

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
5384.75	53.8	-20.20	74	54.65	34.44	4.02	39.31	155	331	Peak
5386.55	39.66	-14.34	54	40.51	34.44	4.02	39.31	155	331	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
5385.05	54.28	-19.72	74	55.13	34.44	4.02	39.31	200	70	Peak
5386.9	40.47	-13.53	54	41.32	34.44	4.02	39.31	200	70	Average

Chain Port 0+1

Test Mode :	802.11n HT20	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu		

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
5148.7	66.25	-7.75	74	66.1	34.11	3.9	37.86	100	180	Peak
5149.9	47.86	-6.14	54	47.71	34.11	3.9	37.86	100	180	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
5149.1	61.72	-12.28	74	61.57	34.11	3.9	37.86	100	158	Peak
5149.75	42.87	-11.13	54	42.72	34.11	3.9	37.86	100	158	Average

Test Mode :	802.11n HT20	**Temperature :**	22~23°C
Test Channel :	48	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu		

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
5386	53.41	-20.59	74	54.26	34.44	4.02	39.31	100	180	Peak
5393.8	40.58	-13.42	54	41.43	34.44	4.02	39.31	100	180	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
5392.6	52.66	-21.34	74	53.51	34.44	4.02	39.31	154	165	Peak
5383.35	39.38	-14.62	54	40.23	34.44	4.02	39.31	154	165	Average

Test Mode :	802.11n HT40	Temperature :	22~23°C
Test Channel :	38	Relative Humidity :	42~43%
Test Engineer :	Simon Lu		

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
5149.9	71.97	-2.03	74	71.82	34.11	3.9	37.86	101	171	Peak
5150	52.04	-1.96	54	51.89	34.11	3.9	37.86	101	171	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
5149.45	62.95	-11.05	74	62.8	34.11	3.9	37.86	186	318	Peak
5148.75	43.92	-10.08	54	43.77	34.11	3.9	37.86	186	318	Average

Test Mode :	802.11n HT40	Temperature :	22~23°C
Test Channel :	46	Relative Humidity :	42~43%
Test Engineer :	Simon Lu		

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
5374	53.98	-20.02	74	54.76	34.41	4.01	39.2	100	177	Peak
5373.95	40.93	-13.07	54	41.71	34.41	4.01	39.2	100	177	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
5393.1	53.15	-20.85	74	54	34.44	4.02	39.31	102	270	Peak
5386.9	39.43	-14.57	54	40.28	34.44	4.02	39.31	102	270	Average

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

Chain Port 0

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu	**Polarization :**	Horizontal
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10359 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	108.66	-	-	108.58	34.16	3.92	38	101	356	Peak
5180	96.62	-	-	96.54	34.16	3.92	38	101	356	Average
10359	32.62	-41.38	74	62.08	1.46	5.85	36.77	141	25	Peak

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu	**Polarization :**	Vertical
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10359 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	98.17	-	-	98.09	34.16	3.92	38	190	343	Peak
5180	86.7	-	-	86.62	34.16	3.92	38	190	343	Average
10359	30.41	-43.59	74	59.87	1.46	5.85	36.77	100	32	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	44	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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
3622	61.37	-12.63	74	58.95	32.57	3.17	33.32	100	0	Peak
3622	35.01	-18.99	54	32.59	32.57	3.17	33.32	100	0	Average
5220	107.92	-	-	107.95	34.2	3.95	38.18	100	0	Peak
5220	96.22	-	-	96.25	34.2	3.95	38.18	100	0	Average
10440	30.43	-43.57	74	59.83	1.53	5.89	36.82	122	34	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	44	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	98.71	-	-	98.74	34.2	3.95	38.18	191	145	Peak
5220	86.87	-	-	86.9	34.2	3.95	38.18	191	145	Average
10440	29.86	-44.14	74	59.26	1.53	5.89	36.82	100	7	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	48	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Horizontal
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10479 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
3652	57.58	-16.42	74	55	32.62	3.21	33.25	100	358	Peak
3652	36.09	-17.91	54	33.51	32.62	3.21	33.25	100	358	Average
5240	104.09	-	-	104.2	34.23	3.95	38.29	123	0	Peak
5240	92.04	-	-	92.15	34.23	3.95	38.29	123	0	Average
10479	29.99	-44.01	74	59.43	1.56	5.91	36.91	114	85	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	48	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Vertical
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10479 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	100.94	-	-	101.05	34.23	3.95	38.29	200	344	Peak
5240	88.4	-	-	88.51	34.23	3.95	38.29	200	344	Average
10479	29.49	-44.51	74	58.93	1.56	5.91	36.91	124	52	Peak

Chain Port 1

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu	**Polarization :**	Horizontal
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10359 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	109	-	-	108.92	34.16	3.92	38	100	298	Peak
5180	97.22	-	-	97.14	34.16	3.92	38	100	298	Average
10359	29.93	-44.07	74	59.39	1.46	5.85	36.77	100	211	Peak

Test Mode :	802.11a	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu	**Polarization :**	Vertical
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10359 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	105.01	-	-	104.93	34.16	3.92	38	192	67	Peak
5180	93.27	-	-	93.19	34.16	3.92	38	192	67	Average
10359	28.45	-45.55	74	57.91	1.46	5.85	36.77	100	345	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	44	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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
3622	58.7	-15.30	74	56.28	32.57	3.17	33.32	100	256	Peak
3622	37.66	-16.34	54	35.24	32.57	3.17	33.32	100	256	Average
5220	109.14	-	-	109.17	34.2	3.95	38.18	101	253	Peak
5220	98.27	-	-	98.3	34.2	3.95	38.18	101	253	Average
10440	28.22	-45.78	74	57.62	1.53	5.89	36.82	110	5	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	44	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	105.08	-	-	105.11	34.2	3.95	38.18	154	66	Peak
5220	93.89	-	-	93.92	34.2	3.95	38.18	154	66	Average
10440	29.32	-44.68	74	58.72	1.53	5.89	36.82	120	25	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	48	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Horizontal
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10479 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
3660	56.89	-17.11	74	54.31	32.62	3.21	33.25	100	251	Peak
3660	36.16	-17.84	54	33.58	32.62	3.21	33.25	100	251	Average
5240	109.06	-	-	109.17	34.23	3.95	38.29	101	253	Peak
5240	97.65	-	-	97.76	34.23	3.95	38.29	101	253	Average
10479	27.86	-46.14	74	57.3	1.56	5.91	36.91	100	86	Peak

Test Mode :	802.11a	Temperature :	22~23°C
Test Channel :	48	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Vertical
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10479 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	104.8	-	-	104.91	34.23	3.95	38.29	200	70	Peak
5240	93.64	-	-	93.75	34.23	3.95	38.29	200	70	Average
10479	28.52	-45.48	74	57.96	1.56	5.91	36.91	100	58	Peak

Chain Port 0+1

Test Mode :	802.11n HT20	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu	**Polarization :**	Horizontal
Remark :	1. 5180 MHz is fundamental signal which can be ignored. 2. 10359 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	106.21	-	-	106.13	34.16	3.92	38	100	180	Peak
5180	96.26	-	-	96.18	34.16	3.92	38	100	180	Average
10359	29.15	-44.85	74	58.61	1.46	5.85	36.77	100	348	Peak

Test Mode :	802.11n HT20	**Temperature :**	22~23°C
Test Channel :	36	**Relative Humidity :**	42~43%
Test Engineer :	Simon Lu	**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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	101.33	-	-	101.25	34.16	3.92	38	100	158	Peak
5180	89.32	-	-	89.24	34.16	3.92	38	100	158	Average
10360	29.32	-44.68	74	58.78	1.46	5.85	36.77	100	345	Peak

Test Mode :	802.11n HT20	Temperature :	22~23°C
Test Channel :	44	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	106.67	-	-	106.7	34.2	3.95	38.18	100	180	Peak
5220	95.41	-	-	95.44	34.2	3.95	38.18	100	180	Average
10440	27.57	-46.43	74	56.97	1.53	5.89	36.82	110	14	Peak

Test Mode :	802.11n HT20	Temperature :	22~23°C
Test Channel :	44	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	100.39	-	-	100.42	34.2	3.95	38.18	109	161	Peak
5220	88.75	-	-	88.78	34.2	3.95	38.18	109	161	Average
10440	29.6	-44.4	74	59	1.53	5.89	36.82	123	10	Peak

Test Mode :	802.11n HT20	Temperature :	22~23°C
Test Channel :	48	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Horizontal
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10479 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	103.99	-	-	104.1	34.23	3.95	38.29	100	180	Peak
5240	93.85	-	-	93.96	34.23	3.95	38.29	100	180	Average
10479	27.66	-46.34	74	57.1	1.56	5.91	36.91	102	54	Peak

Test Mode :	802.11n HT20	Temperature :	22~23°C
Test Channel :	48	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Vertical
Remark :	1. 5240 MHz is fundamental signal which can be ignored. 2. 10479 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	100	-	-	100.11	34.23	3.95	38.29	154	165	Peak
5240	89.17	-	-	89.28	34.23	3.95	38.29	154	165	Average
10479	28.3	-45.7	74	57.74	1.56	5.91	36.91	115	65	Peak

Test Mode :	802.11n HT40	Temperature :	22~23°C
Test Channel :	38	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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
98.87	32.48	-11.02	43.5	54.23	10.45	0.43	32.63	200	0	Peak
113.42	30.11	-13.39	43.5	50.35	11.82	0.58	32.64	-	-	Peak
239.52	32.22	-13.78	46	53.01	10.85	0.84	32.48	-	-	Peak
480.08	27.4	-18.60	46	41.05	17.3	1.22	32.17	-	-	Peak
721.61	27.5	-18.50	46	38.57	19.58	1.35	32	-	-	Peak
960.23	38.5	-15.50	54	47.73	20.76	1.72	31.71	-	-	Peak
5190	102.65	-	-	102.57	34.16	3.92	38	101	171	Peak
5190	91.34	-	-	91.26	34.16	3.92	38	101	171	Average
10380	29.33	-44.67	74	58.76	1.48	5.86	36.77	114	0	Peak

Test Mode :	802.11n HT40	Temperature :	22~23°C
Test Channel :	38	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

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
32.91	30.36	-9.64	40	46.54	16.27	0.19	32.64	-	-	Peak
47.46	32.32	-7.68	40	55.92	8.73	0.31	32.64	100	0	Peak
59.1	28.61	-11.39	40	55.21	5.53	0.47	32.6	-	-	Peak
95.96	27.02	-16.48	43.5	49.24	9.95	0.43	32.6	-	-	Peak
896.21	30.3	-15.70	46	39.83	20.39	1.8	31.72	-	-	Peak
960.23	31.97	-22.03	54	41.2	20.76	1.72	31.71	-	-	Peak
5190	93.73	-	-	93.65	34.16	3.92	38	186	318	Peak
5190	82.66	-	-	82.58	34.16	3.92	38	186	318	Average
10380	28.86	-45.14	74	58.29	1.48	5.86	36.77	100	27	Peak

Test Mode :	802.11n HT40	Temperature :	22~23°C
Test Channel :	46	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Horizontal
Remark :	1. 5230 MHz is fundamental signal which can be ignored. 2. 10461 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	101.85	-	-	101.96	34.23	3.95	38.29	100	177	Peak
5230	90.42	-	-	90.53	34.23	3.95	38.29	100	177	Average
10461	28.51	-45.49	74	57.94	1.55	5.9	36.88	140	134	Peak

Test Mode :	802.11n HT40	Temperature :	22~23°C
Test Channel :	46	Relative Humidity :	42~43%
Test Engineer :	Simon Lu	Polarization :	Vertical
Remark :	1. 5230 MHz is fundamental signal which can be ignored. 2. 10461 MHz is not within a restricted band, and satisfies both the average and peak limits of 15.209. 3. Average measurement was not performed if peak level went lower than the average limit.		

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	94.13	-	-	94.24	34.23	3.95	38.29	102	270	Peak
5230	82.47	-	-	82.58	34.23	3.95	38.29	102	270	Average
10461	27.26	-46.74	74	56.69	1.55	5.9	36.88	108	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.

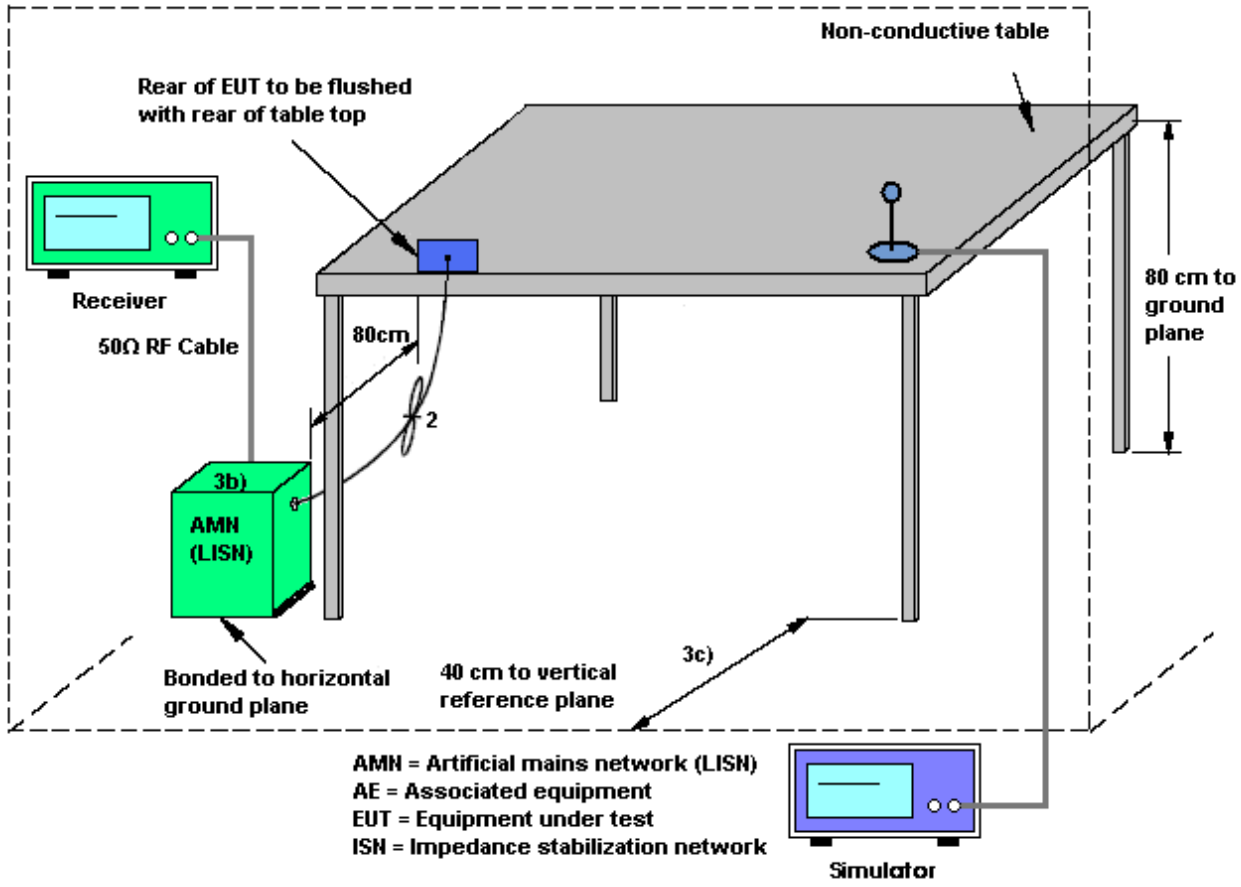
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

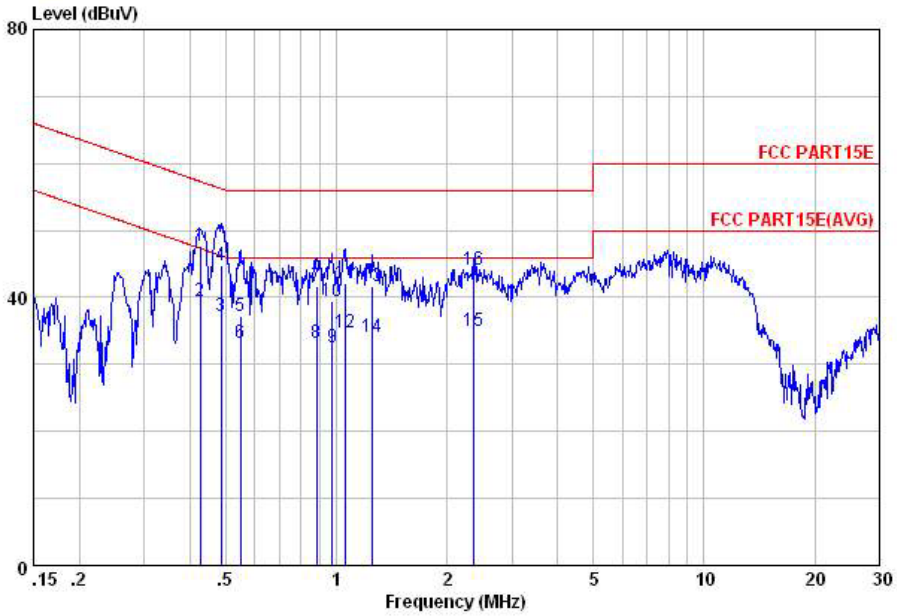
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.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

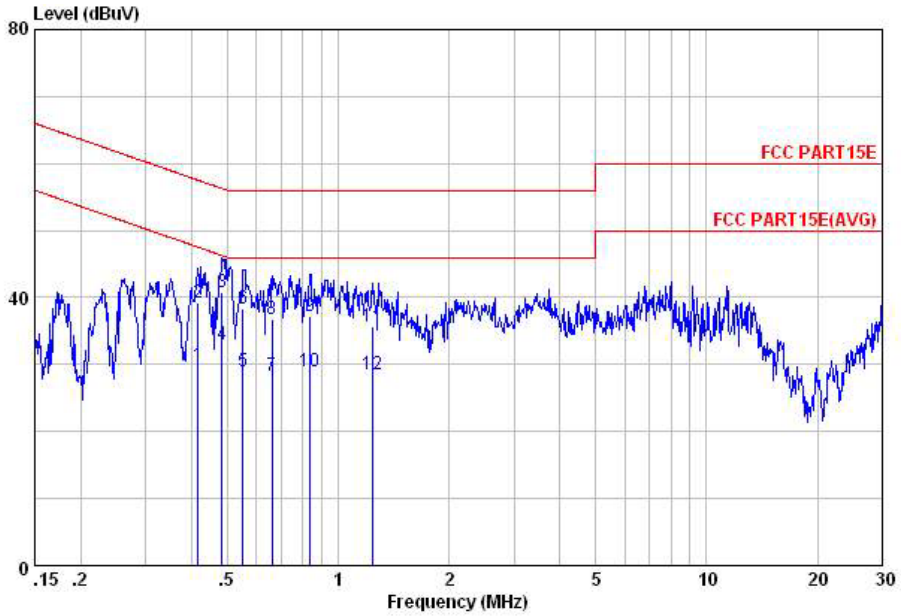
Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Eligah Wang	Relative Humidity :	37~39%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band V Idle + WLAN(5G) Link + USB Cable (Charging from Adapter)		



Site : CO01-KS
Condition: FCC PART15E LISN-L20130306 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.43	47.75	-9.58	57.33	37.19	0.28	10.28	QP
2	0.43	39.45	-7.88	47.33	28.89	0.28	10.28	Average
3	0.49	37.28	-8.95	46.23	26.80	0.21	10.27	Average
4	0.49	44.88	-11.35	56.23	34.40	0.21	10.27	QP
5	0.55	37.25	-18.75	56.00	26.80	0.20	10.25	QP
6	0.55	33.25	-12.75	46.00	22.80	0.20	10.25	Average
7	0.88	41.72	-14.28	56.00	31.40	0.13	10.19	QP
8	0.88	33.12	-12.88	46.00	22.80	0.13	10.19	Average
9	0.97	32.59	-13.41	46.00	22.31	0.10	10.18	Average
10	0.97	39.49	-16.51	56.00	29.21	0.10	10.18	QP
11	1.05	42.18	-13.82	56.00	31.90	0.10	10.18	QP
12	1.05	34.78	-11.22	46.00	24.50	0.10	10.18	Average
13	1.26	41.68	-14.32	56.00	31.40	0.10	10.18	QP
14	1.26	34.08	-11.92	46.00	23.80	0.10	10.18	Average
15	2.37	35.01	-10.99	46.00	24.70	0.11	10.20	Average
16	2.37	44.11	-11.89	56.00	33.80	0.11	10.20	QP

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Eligah Wang	Relative Humidity :	37~39%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band V Idle + WLAN(5G) Link + USB Cable (Charging from Adapter)		



Site : CO01-KS
Condition: FCC PART15E LISN-N20130306 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.42	29.86	-17.65	47.51	19.20	0.38	10.28	Average
2	0.42	39.26	-18.25	57.51	28.60	0.38	10.28	QP
3	0.48	40.78	-15.49	56.27	30.20	0.31	10.27	QP
4	0.48	32.98	-13.29	46.27	22.40	0.31	10.27	Average
5	0.55	29.03	-16.97	46.00	18.50	0.28	10.25	Average
6	0.55	38.33	-17.67	56.00	27.80	0.28	10.25	QP
7	0.66	28.33	-17.67	46.00	17.90	0.21	10.22	Average
8	0.66	36.83	-19.17	56.00	26.40	0.21	10.22	QP
9	0.84	37.14	-18.86	56.00	26.80	0.15	10.19	QP
10	0.84	28.94	-17.06	46.00	18.60	0.15	10.19	Average
11	1.24	35.68	-20.32	56.00	25.40	0.10	10.18	QP
12	1.24	28.48	-17.52	46.00	18.20	0.10	10.18	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.

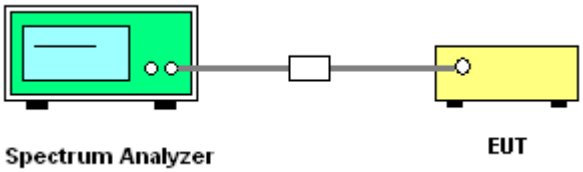
3.6.2 Measuring Instruments

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 :	Adoms Li

Mod.	Data Rate	NTX	Channel	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stability (ppm)	Temperature (°C)	Voltage (V)
11a	6Mbps	1	36	5180	5179.975	-0.025	-4.83	20	3.7
11a	6Mbps	1	36	5180	5179.975	-0.025	-4.83	-10	3.5
11a	6Mbps	1	36	5180	5179.975	-0.025	-4.83	-10	4.2
11a	6Mbps	1	36	5180	5179.975	-0.025	-4.83	55	3.5
11a	6Mbps	1	36	5180	5179.975	-0.025	-4.83	55	4.2

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

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For CDD transmissions, directional gain is calculated as

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

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

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

For power measurements on IEEE 802.11 devices,

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

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.

			DG	DG	Power	PSD
			for	for	Limit	Limit
	Ant 1	Ant 2	Power	PSD	Reduction	Reduction
	(dBi)	(dBi)	(dBi)	(dBi)	(dB)	(dB)
Band I	2.00	2.00	2.00	5.01	0.00	0.00

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

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	9kHz~30GHz	May 04, 2014	Aug. 19, 2014~ Aug. 20, 2014	May 03, 2015	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	30MHz~40GHz	Feb. 27, 2014	Aug. 19, 2014~ Aug. 20, 2014	Feb. 26, 2015	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Feb. 27, 2014	Aug. 19, 2014~ Aug. 20, 2014	Feb. 26, 2015	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Dec. 10, 2013	Aug. 19, 2014~ Aug. 20, 2014	Dec. 09, 2014	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Nov. 05, 2013	Aug. 06, 2014	Nov. 04, 2014	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Dec. 28, 2013	Aug. 06, 2014	Dec. 27, 2014	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 09, 2013	Aug. 06, 2014	Oct. 08, 2014	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Jan. 08, 2014	Aug. 06, 2014	Jan. 07, 2015	Radiation (03CH01-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 08, 2014	Aug. 06, 2014	Jan. 07, 2015	Radiation (03CH01-KS)
Active Horn Antenna	com-power	AHA-118	701030	1GHz~18GHz	Nov. 18, 2013	Aug. 06, 2014	Nov. 17, 2014	Radiation (03CH01-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Mar. 10, 2014	Aug. 06, 2014	Mar. 09, 2015	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161073	1MHz~1GHz	May 04, 2014	Aug. 06, 2014	May 03, 2015	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02371	1GHz~26.5GHz	Dec. 10, 2013	Aug. 06, 2014	Dec. 09, 2014	Radiation (03CH01-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 06, 2014	NCR	Radiation (03CH01-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Aug. 06, 2014	NCR	Radiation (03CH01-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Aug. 06, 2014	NCR	Radiation (03CH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 04, 2014	Jul. 30, 2014	May 03, 2015	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Dec. 10, 2013	Jul. 30, 2014	Dec. 09, 2014	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Dec. 10, 2013	Jul. 30, 2014	Dec. 09, 2014	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Nov. 12, 2013	Jul. 30, 2014	Nov. 11, 2014	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**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.5**