



FCC Test Report

APPLICANT : Ubiquiti Network, Inc
EQUIPMENT : Access Point
BRAND NAME : UBIQUITI
MODEL NAME : NBE-M2-13
FCC ID : SWX-NBE2M13
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

The product was received on Apr. 29, 2015 and testing was completed on Jun. 18, 2015. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2009 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 INC., the test report shall not be reproduced except in full.

Louis Wu

Reviewed by: Louis Wu / Manager

Jones Tsai

Approved by: Jones Tsai / Manager



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FCC ID : SWX-NBE2M13

Page Number : 1 of 20

Report Issued Date : Jul. 22, 2015

Report Version : Rev. 01

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TABLE OF CONTENTS

REVISION HISTORY	3
SUMMARY OF TEST RESULT	4
1. GENERAL DESCRIPTION	5
1.1. Applicant.....	5
1.2. Manufacturer	5
1.3. Product Feature of Equipment Under Test	5
1.4. Product Specification subjective to this standard.....	5
1.5. Modification of EUT	5
1.6. Test Location.....	6
1.7. Applicable Standards	6
2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST	7
2.1. Test Mode	7
2.2. Connection Diagram of Test System	8
2.3. Support Unit used in test configuration and system.....	9
2.4. EUT Operation Test Setup	9
3. TEST RESULT	10
3.1. Test of AC Conducted Emission Measurement	10
3.2. Test of Radiated Emission Measurement	14
4. LIST OF MEASURING EQUIPMENT	19
5. UNCERTAINTY OF EVALUATION	20
APPENDIX A. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC542937-01	Rev. 01	Initial issue of report	Jul. 22, 2015



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	ICES003 Section 6.1	AC Conducted Emission	< 15.107 limits < ICES003 6.1 limits	PASS	Under limit 5.60 dB at 0.430 MHz
3.2	15.109	ICES003 Section 6.2	Radiated Emission	< 15.109 limits < ICES003 6.2 limits	PASS	Under limit 13.02 dB at 43.770 MHz for peak

1. General Description

1.1. Applicant

Ubiquiti Network, Inc
12F, No.105, Song Ren Rd.,SinYi District, Taipei 110,Taiwan

1.2. Manufacturer

Ubiquiti Network, Inc
12F, No.105, Song Ren Rd.,SinYi District, Taipei 110,Taiwan

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Access Point
Brand Name	UBIQUITI
Model Name	NBE-M2-13
FCC ID	SWX-NBE2M13
EUT supports Radios application	802.11g (5MHz/8MHz/10MHz/20MHz/30MHz) 802 11n HT20 (5MHz/8MHz/10MHz/20MHz/30MHz) 802 11n HT40
EUT Stage	Production Unit

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

1.4. Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	802.11g/n: 2412 MHz ~ 2462 MHz
Rx Frequency	802.11g/n: 2412 MHz ~ 2462 MHz
Antenna Type	Disc Antenna
Type of Modulation	802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5. Modification of EUT

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

1.6. Test Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	CO05-HY	03CH06-HY

1.7. Applicable Standards

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

- ♦ FCC 47 CFR FCC Part 15 Subpart B
- ♦ ANSI C63.4-2009

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2. Test Configuration of Equipment Under Test

2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2009 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following tables are showing the test modes as the worst cases and recorded in this report.

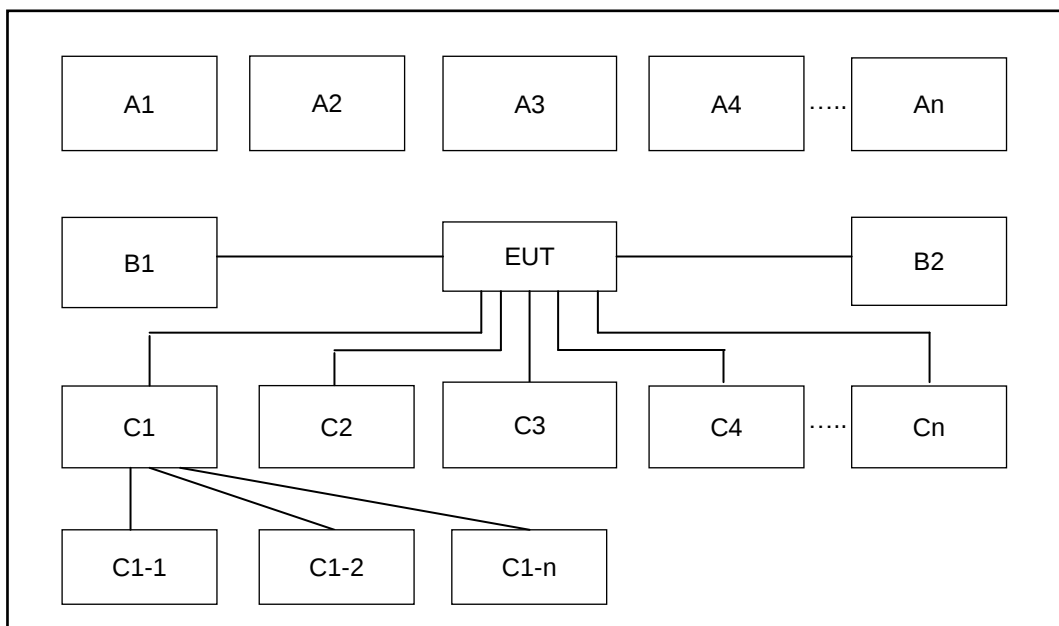
Item	EUT Configuration	Test Condition	
		EMI AC	EMI RE
1.	Charging Mode (EUT with POE)	☒	☒

Abbreviations:

- EMI AC: AC conducted emissions
- EMI RE: EUT radiated emissions

Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1	Mode 1: WLAN Idle + POE + RJ45 Link with Notebook
Radiated Emissions	1	Mode 1: WLAN Idle + POE + RJ45 Link with Notebook

2.2. Connection Diagram of Test System



Conduction and Radiation Test Setup									
No.	Wireless Station	Connection Type	Test Mode						
			1	-	-	-	-	-	-
A1	Outdoor AP router (Notebook)	WiFi	X						
No.	Power Source	Connection Type	1	-	-	-	-	-	-
B1	AC : 120V/60Hz	AC Power Cable	X						
No.	Setup Peripherals	Connection Type	1	-	-	-	-	-	-
C1	EUT(POE Port)	RJ-45 Cable	X						
C2	Notebook(POE Port)	RJ-45 Cable	X						

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Outdoor AP	Ubiquiti	NBE-M2-13	N/A	N/A	Unshielded, 0.3 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Notebook	DELL	P20G	FCC DoC/ Contains FCC ID:QDS-BRCM1051	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.4. EUT Operation Test Setup

The EUT was synchronized to the BCCH, and is in continuous receiving mode by setting system simulator's paging reorganization.

At the same time, the EUT was attached to the WLAN AP, and the following programs installed in the EUT were programmed during the test.

Execute "Ping" and link with Notebook via RJ-45 Cable.

3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1 Limits 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 (dBuV)	
	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.

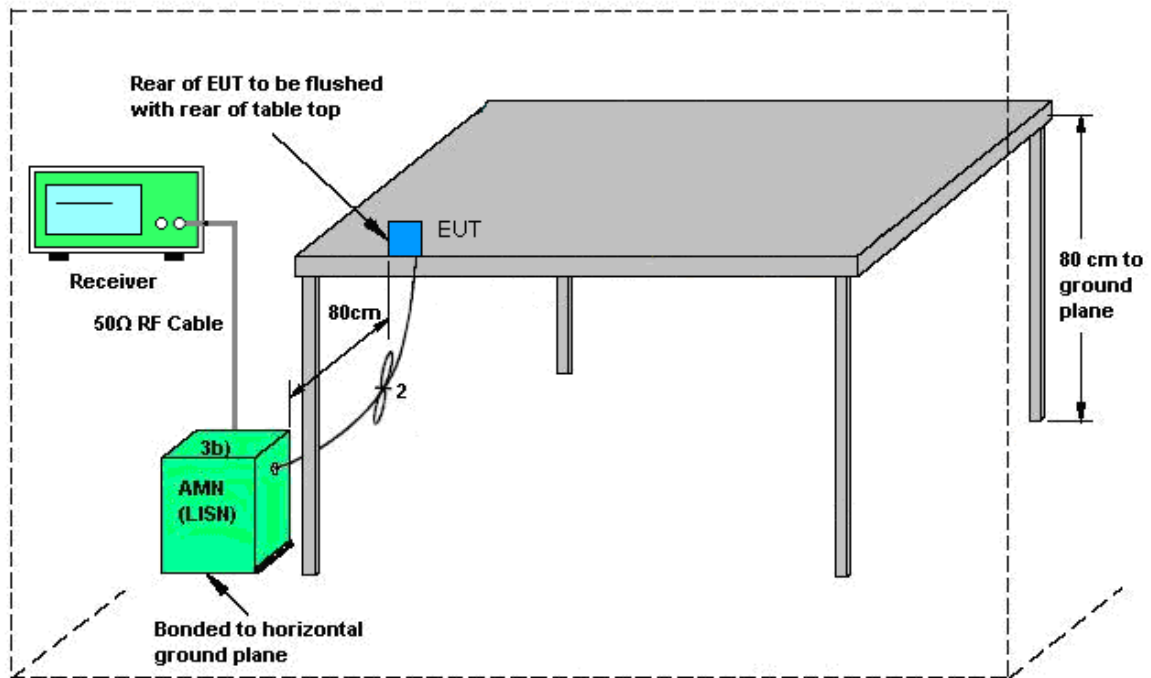
3.1.2 Measuring Instruments

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

3.1.3 Test Procedure

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 (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

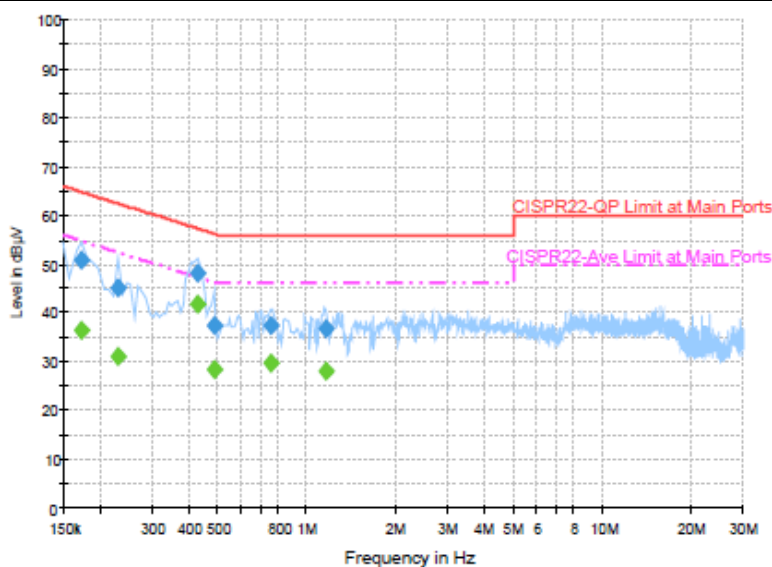
3.1.4 Test Setup



AMN = Artificial mains network (LISN)
 AE = Associated equipment
 EUT = Equipment under test
 ISN = Impedance stabilization network

3.1.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Eric Jeng	Relative Humidity :	65~68%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN Idle + POE + RJ45 Link with Notebook		



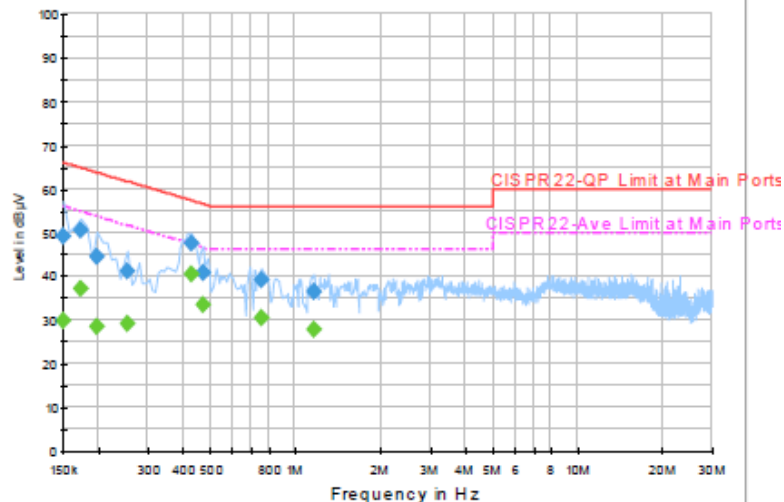
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	51.0	Off	L1	19.5	13.8	64.8
0.230000	45.0	Off	L1	19.6	17.4	62.4
0.430000	48.3	Off	L1	19.5	9.0	57.3
0.486000	37.4	Off	L1	19.5	18.8	56.2
0.758000	37.6	Off	L1	19.5	18.4	56.0
1.166000	36.8	Off	L1	19.6	19.2	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	36.6	Off	L1	19.5	18.2	54.8
0.230000	31.1	Off	L1	19.6	21.3	52.4
0.430000	41.7	Off	L1	19.5	5.6	47.3
0.486000	28.6	Off	L1	19.5	17.6	46.2
0.758000	29.7	Off	L1	19.5	16.3	46.0
1.166000	28.2	Off	L1	19.6	17.8	46.0

Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Eric Jeng	Relative Humidity :	65~68%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Idle + POE + RJ45 Link with Notebook		


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	49.0	Off	N	19.5	17.0	66.0
0.174000	50.6	Off	N	19.5	14.2	64.8
0.198000	44.6	Off	N	19.4	19.1	63.7
0.254000	41.3	Off	N	19.4	20.3	61.6
0.430000	47.5	Off	N	19.5	9.8	57.3
0.470000	40.7	Off	N	19.5	15.8	56.5
0.758000	39.1	Off	N	19.5	16.9	56.0
1.166000	36.4	Off	N	19.6	19.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	29.8	Off	N	19.5	26.2	56.0
0.174000	37.0	Off	N	19.5	17.8	54.8
0.198000	28.4	Off	N	19.4	25.3	53.7
0.254000	29.2	Off	N	19.4	22.4	51.6
0.430000	40.5	Off	N	19.5	6.8	47.3
0.470000	33.5	Off	N	19.5	13.0	46.5
0.758000	30.6	Off	N	19.5	15.4	46.0
1.166000	27.9	Off	N	19.6	18.1	46.0



3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

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

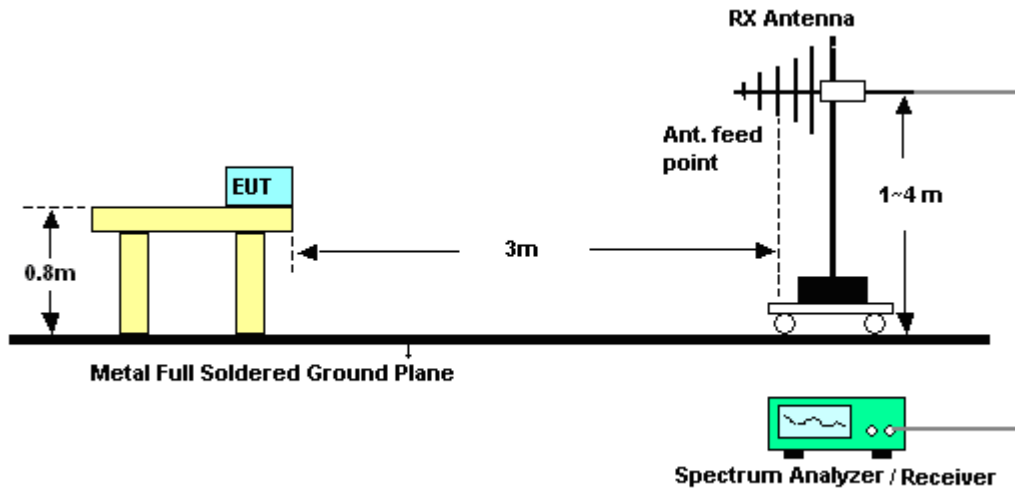


3.2.3. Test Procedures

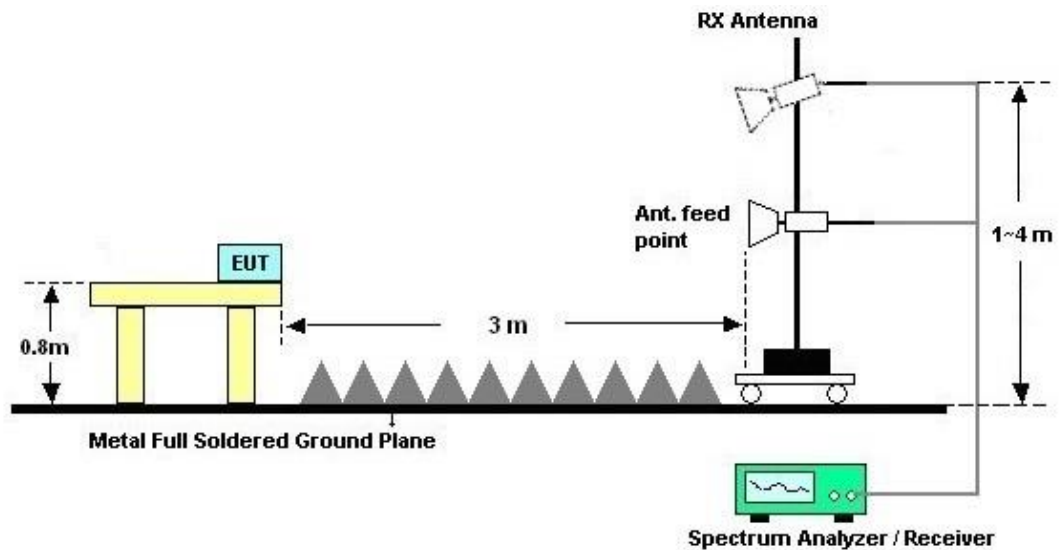
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to 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 tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dB μ V/m) = 20 log Emission level (μ V/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

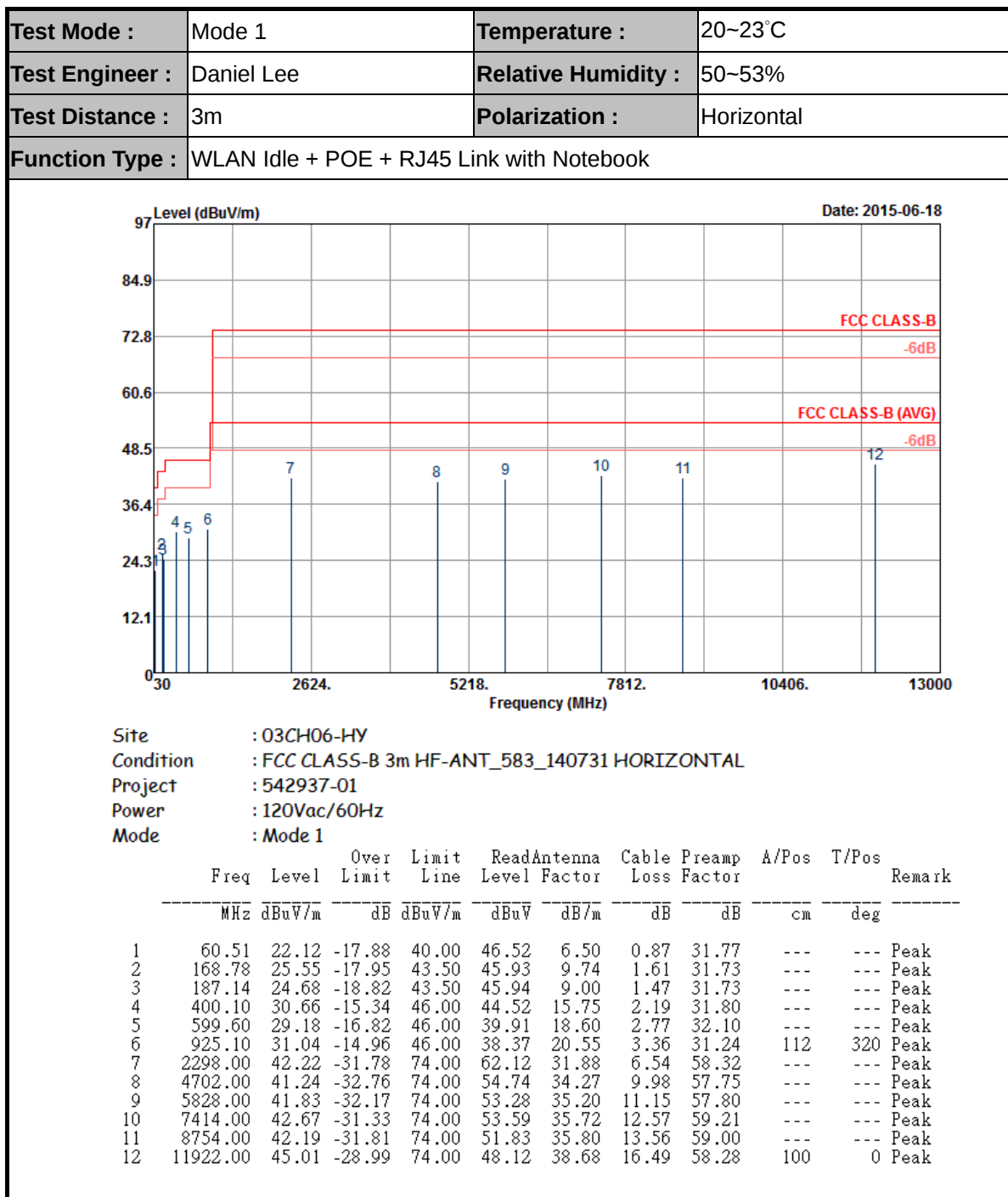


For radiated emissions above 1GHz



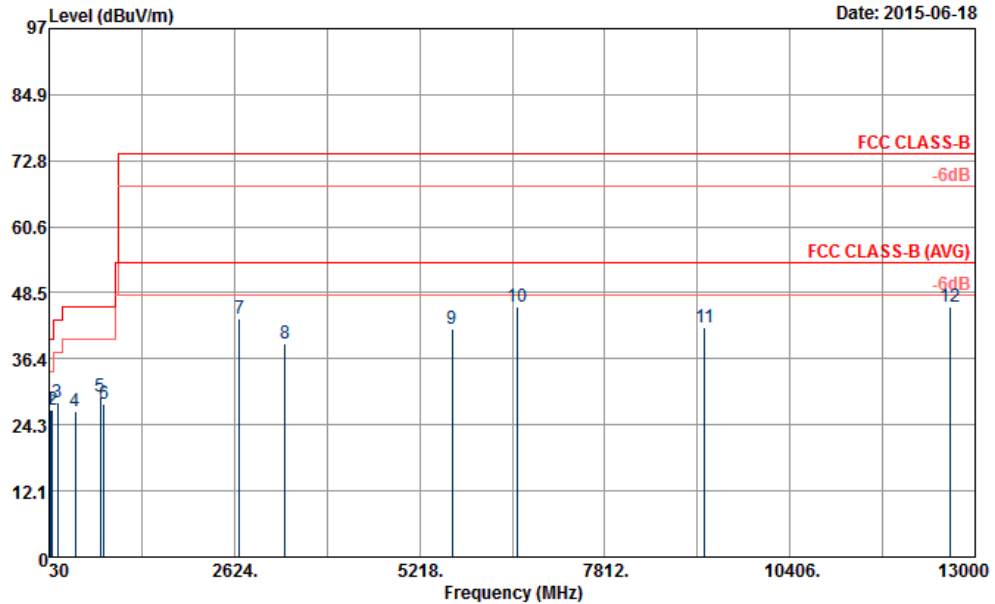


3.2.5. Test Result of Radiated Emission





Test Mode :	Mode 1	Temperature :	20~23°C
Test Engineer :	Daniel Lee	Relative Humidity :	50~53%
Test Distance :	3m	Polarization :	Vertical
Function Type :	WLAN Idle + POE + RJ45 Link with Notebook		



Site : 03CH06-HY
Condition : FCC CLASS-B 3m HF-ANT_583_140731 VERTICAL
Project : 542937-01
Power : 120Vac/60Hz
Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	43.77	26.98	-13.02	40.00	47.30	10.70	0.76	31.78	100	125	Peak
2	75.09	26.90	-13.10	40.00	51.30	6.40	0.96	31.76	---	---	Peak
3	149.88	28.30	-15.20	43.50	47.79	10.90	1.34	31.73	---	---	Peak
4	400.10	26.79	-19.21	46.00	40.65	15.75	2.19	31.80	---	---	Peak
5	746.60	29.51	-16.49	46.00	38.79	19.71	3.04	32.03	---	---	Peak
6	799.80	27.99	-18.01	46.00	36.99	19.90	3.06	31.96	---	---	Peak
7	2700.00	43.84	-30.16	74.00	62.53	32.32	7.19	58.20	---	---	Peak
8	3336.00	39.12	-34.88	74.00	56.88	32.67	8.03	58.46	---	---	Peak
9	5672.00	42.01	-31.99	74.00	53.78	35.10	11.03	57.90	---	---	Peak
10	6580.00	45.83	-28.17	74.00	56.74	35.80	11.75	58.46	---	---	Peak
11	9208.00	42.25	-31.75	74.00	51.17	36.21	13.95	59.08	---	---	Peak
12	12658.00	46.04	-27.96	74.00	48.55	39.37	16.59	58.47	100	0	Peak



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz – 2.75GHz	Dec. 01, 2014	Jun. 03, 2015	Nov. 30, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 02, 2014	Jun. 03, 2015	Dec. 01, 2015	Conduction (CO05-HY)
AC Power Source()	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 03, 2015	N/A	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 08, 2014	Jun. 03, 2015	Dec. 07, 2015	Conduction (CO05-HY)
Bilog Antenna	Teseq GmbH	CBL6112D	35379	30MHz~2GHz	Sep. 27, 2014	Jun. 18, 2015	Sep. 26, 2015	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Jul. 24, 2014	Jun. 18, 2015	Jul. 23, 2015	Radiation (03CH06-HY)
Preamplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 20, 2015	Jun. 18, 2015	Apr. 19, 2016	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Jun. 18, 2015	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0 ~ 360 degree	N/A	Jun. 18, 2015	N/A	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1815698	1GHz~18GHz	Dec. 12, 2014	Jun. 18, 2015	Dec. 11, 2015	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 19, 2015	Jun. 18, 2015	Jan. 18, 2016	Radiation (03CH06-HY)



5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.50
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