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Revision History

Report No.	Version	Description	Issue Date
1401RSU01502	Rev. 01	Initial report	02-26-2014

§2.1033 General Information

Applicant:	Compex Systems Pte Ltd.
Applicant Address:	No 135 Joo Seng Road, #08-01 PM Industrial Building Singapore 368363
Manufacturer:	Compex Systems Pte Ltd.
Manufacturer Address:	No 135 Joo Seng Road, #08-01 PM Industrial Building Singapore 368363
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT IC Registration No.:	11384A
IC SPECIFICATION(S):	ICES-003 Issue 5
IC:	7849A-WLE200N2
Model Name:	WLE200N2
Test Device Serial No.:	N/A <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
FCC Classification:	FCC Class B Digital Device (JBP)
Date(s) of Test:	February 16 ~ 17, 2014
Test Report S/N:	1401RSU01502

1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
Model No.	WLE200N2
Frequency Range	802.11b/g/n: 2412 ~ 2462 MHz
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM

2.2. Description of Available Antennas

Frequency Band (GHz)	Type	Model No.	Antenna Gain (dBi)
2.4 ~ 2.5	Dual Band Omni Directional Antenna	SAA04-22008A	4.5
2.4 ~ 2.5	Omni Directional Antenna	WD12020124G	2.0

Note: The antenna (yellow marker) was used in this test report.

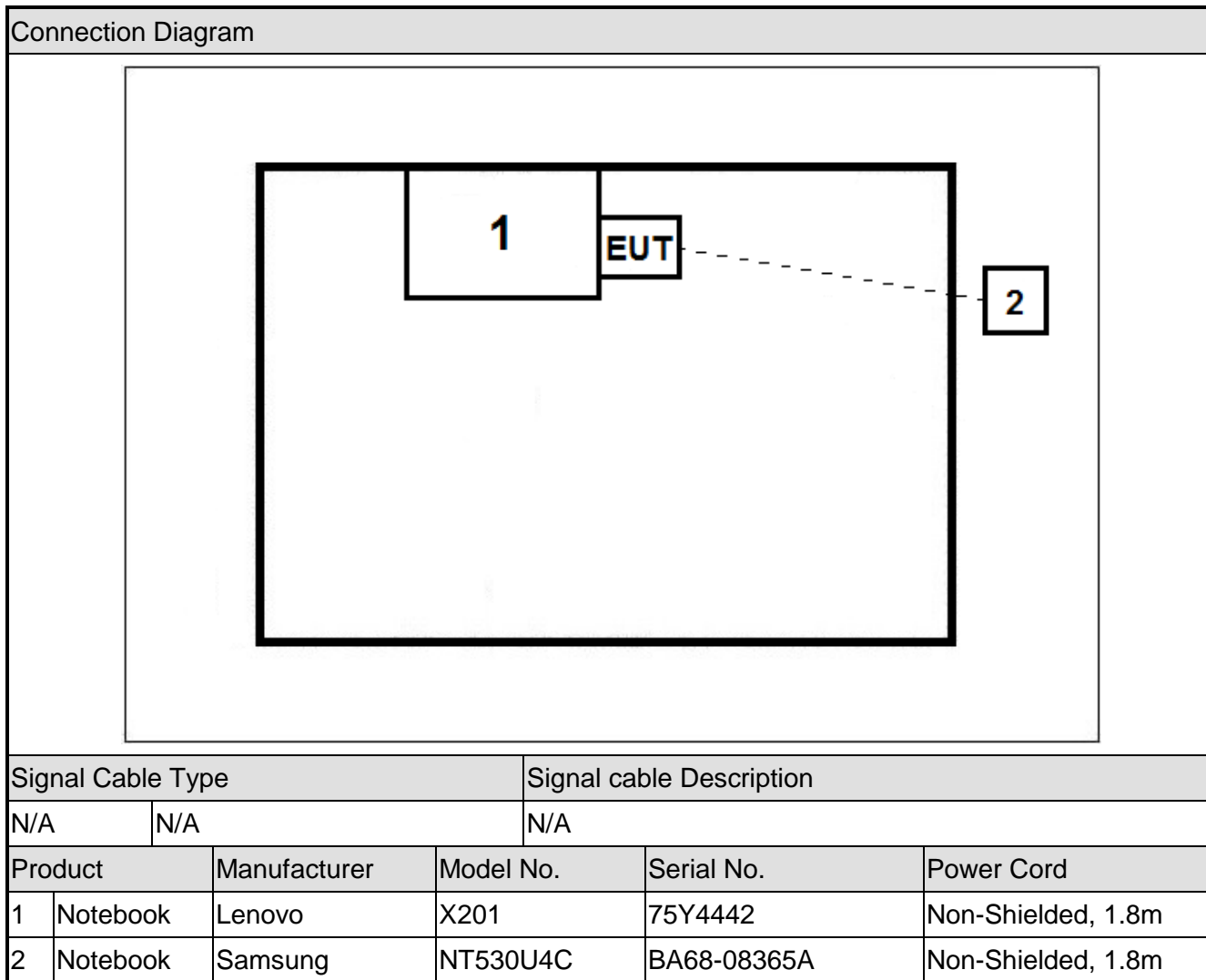
2.3. Device Capabilities

This device contains the following capabilities:

802.11b/g/n WLAN (DTS)

2.4. Test Configuration

The WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER IC: 7849A-WLE200N2 was tested per the guidance FCC Part 15 Subpart B: 2013 and ANSI C63.4: 2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.



2.5. Test Software

Not applicable.

2.6. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.7. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase.

However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5).

Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2009) was used in the measurement of the **WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER IC: 7849A-WLE200N2**.

Deviation from measurement procedure.....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. Line conducted emissions test results are shown in Section 6.2.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beamwidth of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. TEST EQUIPMENT CALIBRATION DATA

Conducted Emissions

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
EMI Test Receiver	R&S	ESR7	101209	2014/07/16
Two-Line V-Network	R&S	ENV216	101683	2014/07/21
Two-Line V-Network	R&S	ENV216	101683	2014/07/21
Temperature/Humidity Meter	Anymetre	TH101B	SR2-01	2014/08/15

Radiated Emissions

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	2014/08/15
EMI Test Receiver	R&S	ESR7	101209	2014/07/16
Preamplifier	MRT	AP01G18	1310002	2014/10/08
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	2014/09/12
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	2014/09/12
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	2014/08/15

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Conducted Emissions Measurement
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 150kHz~30MHz: $\pm 3.5\text{dB}$
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz ~ 1GHz: $\pm 4.2\text{dB}$ 1GHz ~ 40GHz: $\pm 4.7\text{dB}$

6. TEST RESULT

6.1. Summary

Company Name: Compex Systems Pte Ltd.
IC: 7849A-WLE200N2
FCC Classification: FCC Class B Digital Device (JBP)
Test Mode: Normal Operation

FCC Part Section(s)	IC Section(s)	Test Description	Test Result
15.107	ICES-003 Issue5 – 6.1	Conducted Emissions	Pass
15.109	ICES-003 Issue5 – 6.2	Radiated Emissions	Pass

6.2. Conducted Emission Measurement

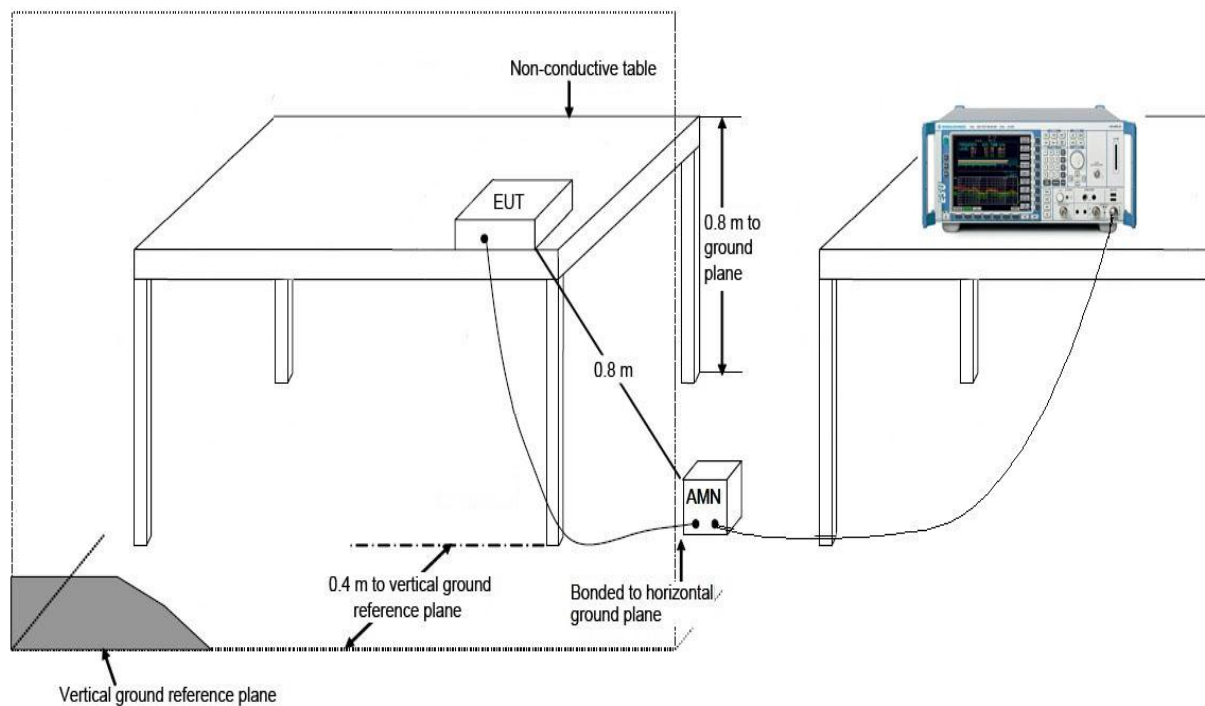
6.2.1. Test Limit

FCC Part 15.107 / ICES-003 Limits		
Frequency (MHz)	QP (dB μ V)	AV (dB μ V)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

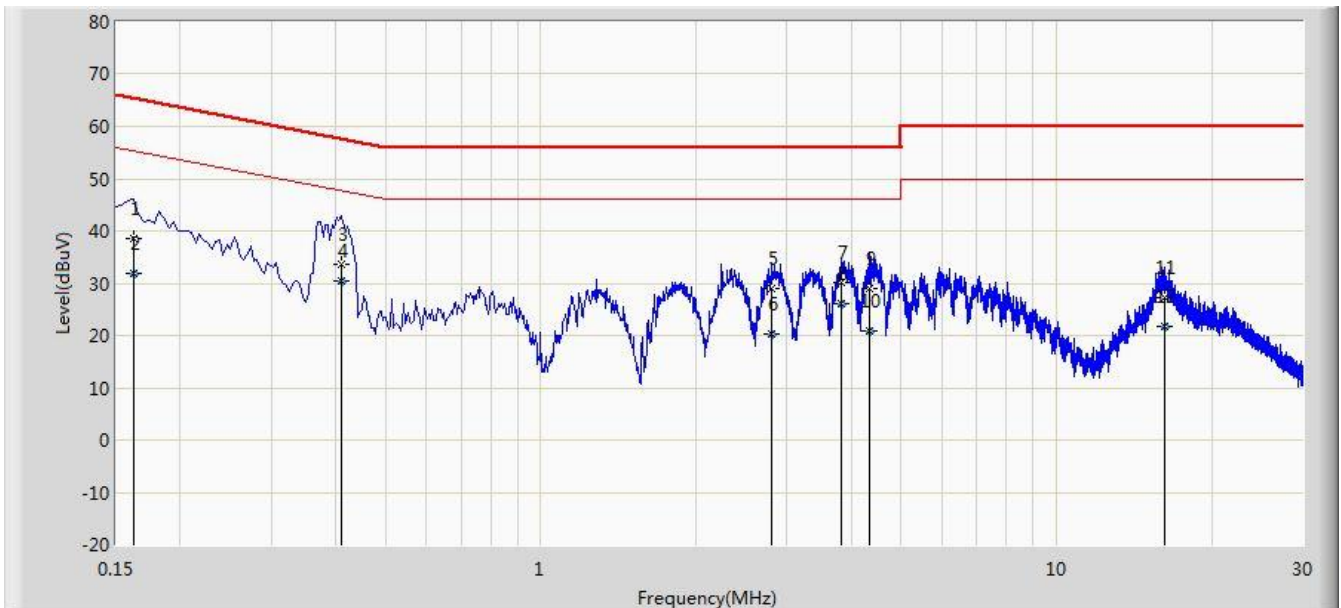
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.2.2. Test Setup



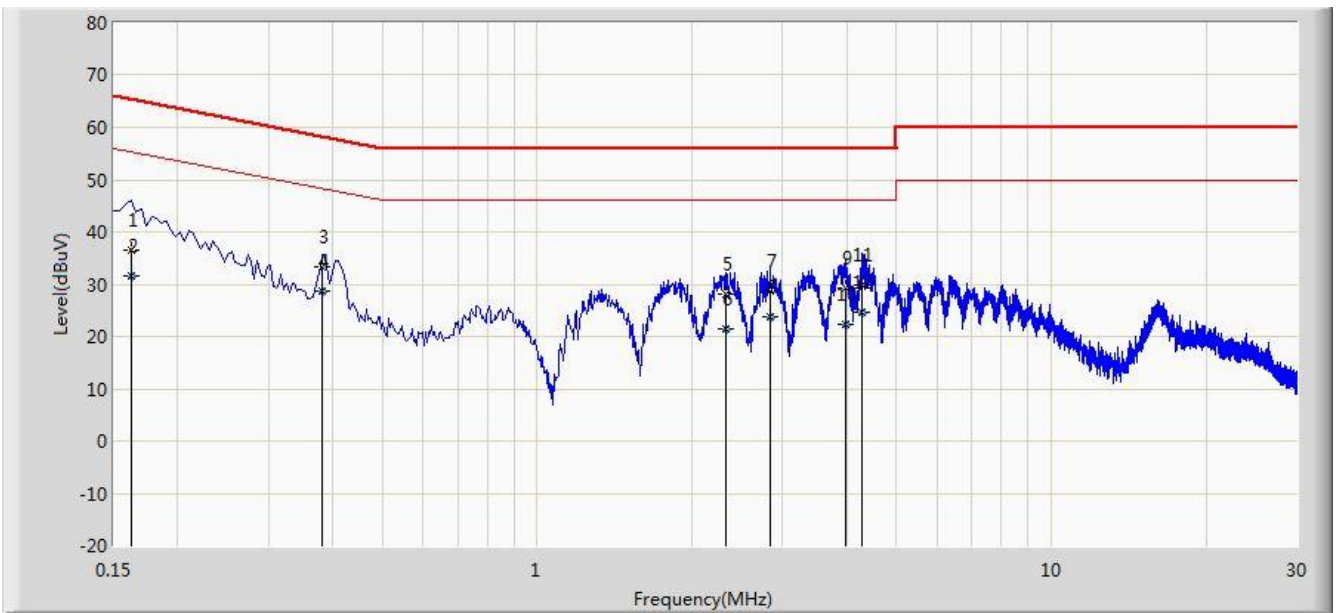
6.2.3. Test Result of Conducted Emissions

Engineer: Roy Cheng	
Site: SR2	Time: 2014/02/17 - 09:24
Limit: FCC_Part15.107	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER	Power: AC 120V/60Hz
Note: Normal Operation	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor	Type
1			0.162	38.524	28.427	-26.837	65.361	10.097	QP
2			0.162	31.963	21.866	-23.398	55.361	10.097	AV
3			0.410	33.689	23.596	-23.959	57.648	10.093	QP
4		*	0.410	30.330	20.237	-17.318	47.648	10.093	AV
5			2.806	28.934	19.086	-27.066	56.000	9.848	QP
6			2.806	20.290	10.442	-25.710	46.000	9.848	AV
7			3.822	30.149	20.191	-25.851	56.000	9.958	QP
8			3.822	26.118	16.160	-19.882	46.000	9.958	AV
9			4.334	28.853	18.873	-27.147	56.000	9.980	QP
10			4.334	20.909	10.929	-25.091	46.000	9.980	AV
11			16.170	27.296	17.221	-32.704	60.000	10.075	QP
12			16.170	21.689	11.614	-28.311	50.000	10.075	AV

Engineer: Roy Cheng	
Site: SR2	Time: 2014/02/17 - 09:29
Limit: FCC_Part15.107	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER	Power: AC 120V/60Hz
Note: Normal Operation	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor	Type
1			0.162	36.580	26.502	-28.781	65.361	10.078	QP
2			0.162	31.562	21.484	-23.798	55.361	10.078	AV
3			0.382	33.380	23.281	-24.856	58.236	10.099	QP
4		*	0.382	28.808	18.709	-19.428	48.236	10.099	AV
5			2.334	28.048	18.183	-27.952	56.000	9.866	QP
6			2.334	21.329	11.463	-24.671	46.000	9.866	AV
7			2.838	28.551	18.700	-27.449	56.000	9.851	QP
8			2.838	23.702	13.851	-22.298	46.000	9.851	AV
9			3.986	29.250	19.279	-26.750	56.000	9.970	QP
10			3.986	22.416	12.445	-23.584	46.000	9.970	AV
11			4.290	29.786	19.799	-26.214	56.000	9.986	QP
12			4.290	24.603	14.616	-21.397	46.000	9.986	AV

6.3. Radiated Emission Measurement

6.3.1. Test Limit

FCC Part 15.109 / ICES-003 Limits		
Frequency (MHz)	Distance (m)	Level (dB μ V/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

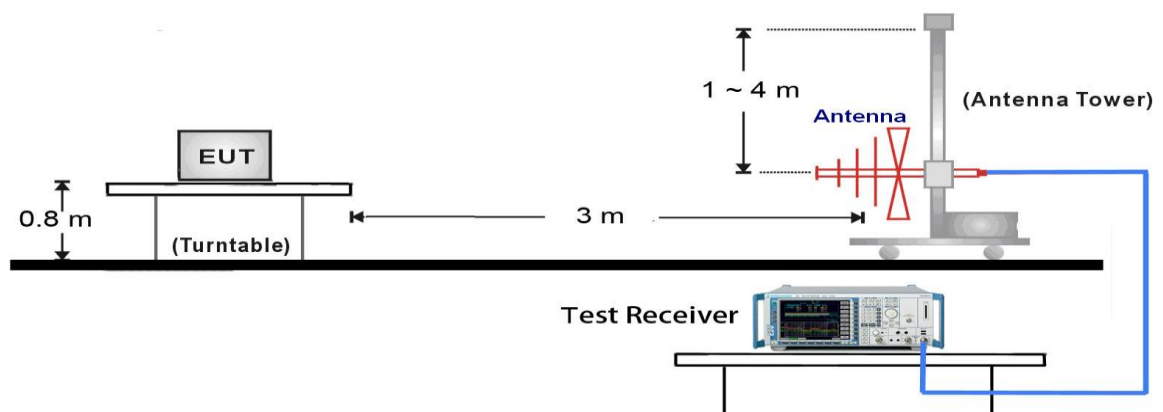
Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

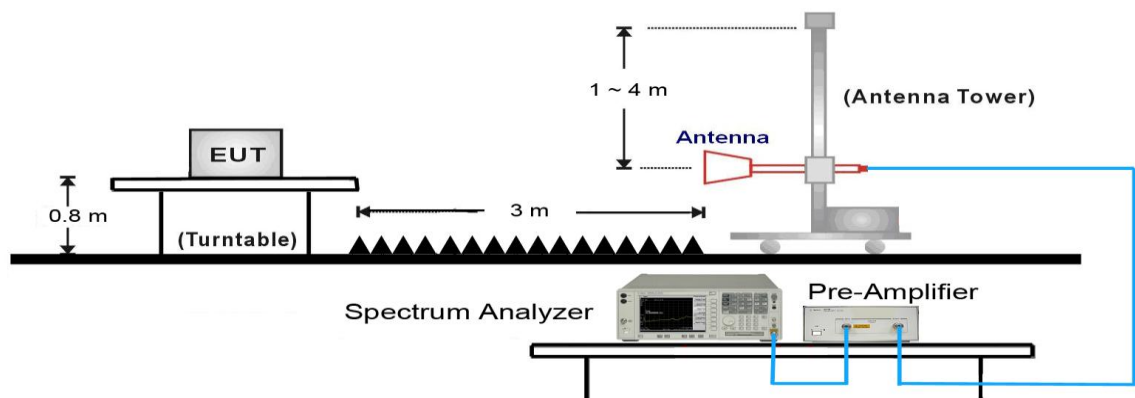
Note 3: E field strength (dB μ V/m) = 20 log E field strength (uV/m)

6.3.2. Test Setup

30MHz ~ 1GHz Test Setup:

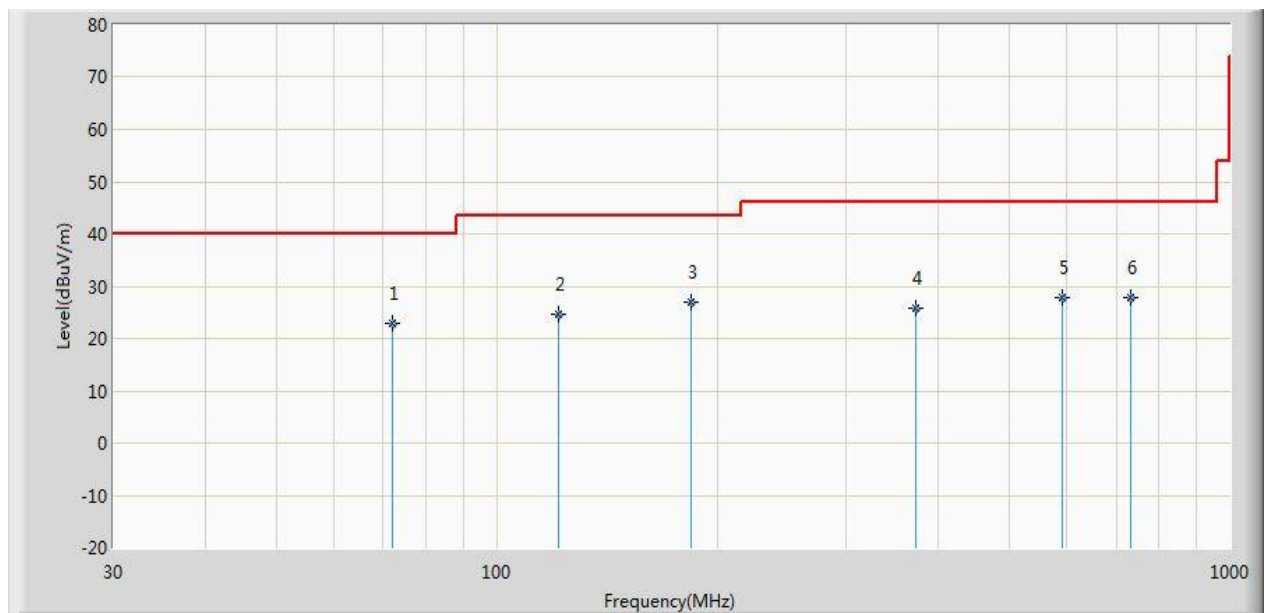


1GHz ~18GHz Test Setup:



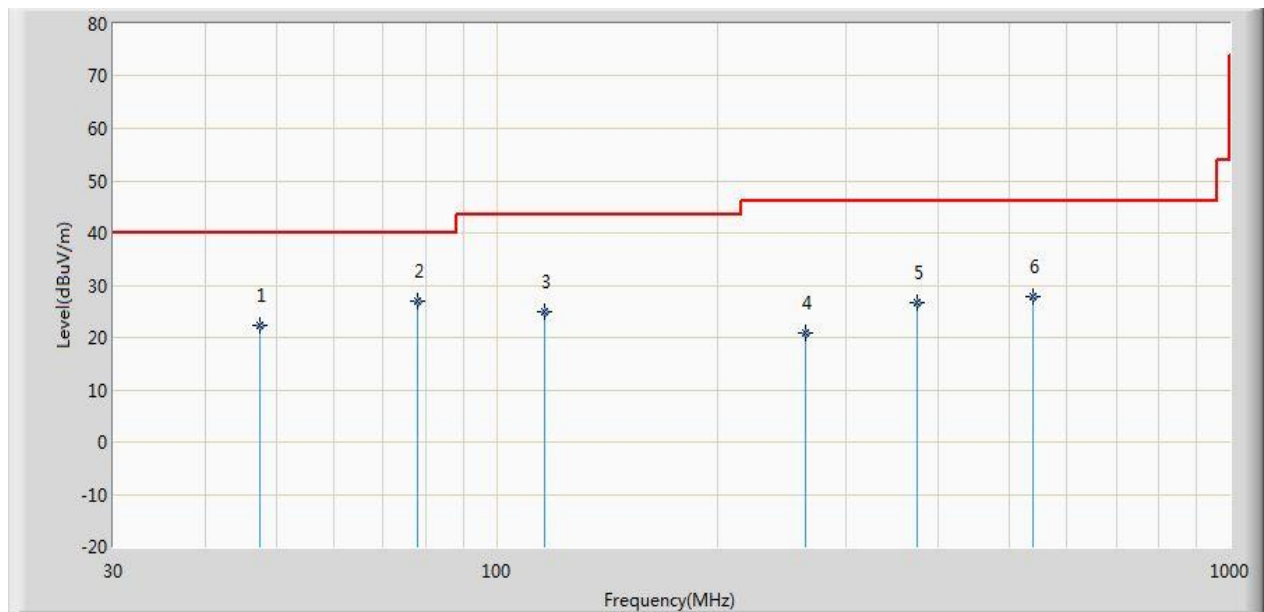
6.3.3. Test Result of Radiated Emissions

Test Engineer:	Roy Cheng	Test Data:	2014-02-16- 16:33:51
Test Site:	AC1	Power:	AC 120V/60Hz
Limit:	FCC_Part15.109	Polarity:	Horizontal
Antenna:	VULB_9162	EUT Model:	WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
Test Mode:	Normal Operation		



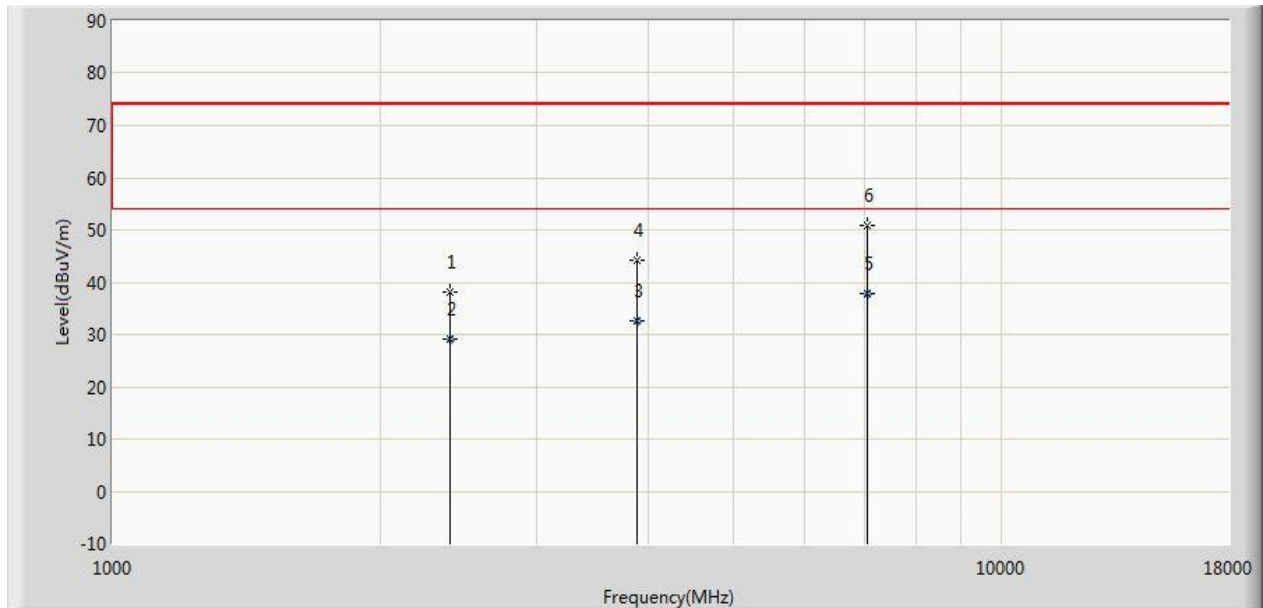
Freq (MHz)	Level (dBμV/m)	Reading (dBμV)	Detector	Factor (dB)	Limit (dBμV/m)	Margin (dB)
72.195	22.839	45.925	QP	-23.086	40.000	-17.161
121.665	24.579	47.204	QP	-22.624	43.500	-18.921
184.230	26.839	49.520	QP	-22.681	43.500	-16.661
373.380	25.738	44.047	QP	-18.309	46.000	-20.262
591.630	27.877	43.258	QP	-15.381	46.000	-18.123
731.795	27.789	40.949	QP	-13.161	46.000	-18.211

Test Engineer:	Roy Cheng	Test Data:	2014-02-16- 16:33:44
Test Site:	AC1	Power:	AC 120V/60Hz
Limit:	FCC_Part15.109	Polarity:	Vertical
Antenna:	VULB_9162	EUT Model:	WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
Test Mode:	Normal Operation		



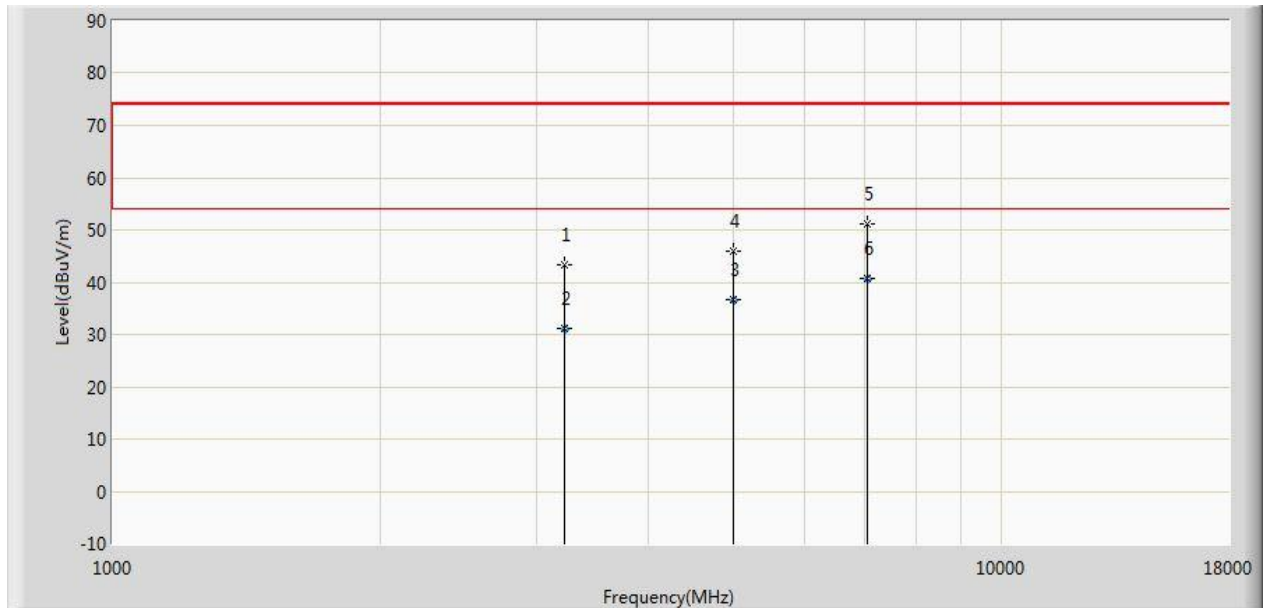
Freq (MHz)	Level (dBuV/m)	Reading (dBuV)	Detector	Factor (dB)	Limit (dBuV/m)	Margin (dB)
47.460	22.220	40.521	QP	-18.301	40.000	-17.780
78.015	26.915	51.375	QP	-24.460	40.000	-13.085
116.330	24.910	46.702	QP	-21.792	43.500	-18.590
263.770	20.823	40.868	QP	-20.045	46.000	-25.177
373.865	26.618	44.925	QP	-18.307	46.000	-19.382
539.735	27.790	44.209	QP	-16.420	46.000	-18.210

Test Engineer:	Roy Cheng	Test Data:	2014-02-17- 18:18:51
Test Site:	AC1	Power:	AC 120V/60Hz
Limit:	FCC_Part15.109	Polarity:	Horizontal
Antenna:	BBHA9120D_1-18GHz	EUT Model:	WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
Test Mode:	Normal Operation		



Freq (MHz)	Level (dBuV/m)	Reading (dBuV)	Detector	Factor (dB)	Limit (dBuV/m)	Margin (dB)
2394.000	38.005	35.292	PK	2.713	74.000	-35.995
2394.240	29.062	26.350	AV	2.712	54.000	-24.938
3889.635	32.505	28.204	AV	4.301	54.000	-21.495
3890.000	44.059	39.758	PK	4.301	74.000	-29.941
7068.655	37.832	24.655	AV	13.178	54.000	-16.168
7069.000	50.991	37.812	PK	13.179	74.000	-23.009

Test Engineer:	Roy Cheng	Test Data:	2014-02-17- 18:26:44
Test Site:	AC1	Power:	AC 120V/60Hz
Limit:	FCC_Part15.109	Polarity:	Vertical
Antenna:	BBHA9120D_1-18GHz	EUT Model:	WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER
Test Mode:	Normal Operation		



Freq (MHz)	Level (dBμV/m)	Reading (dBμV)	Detector	Factor (dB)	Limit (dBμV/m)	Margin (dB)
3218.500	43.280	39.797	PK	3.483	74.000	-30.720
3218.652	31.132	27.650	AV	3.483	54.000	-22.868
4985.650	36.795	29.960	AV	6.834	54.000	-17.205
4986.500	46.032	39.196	PK	6.836	74.000	-27.968
7069.000	51.216	38.037	AV	13.179	74.000	-22.784
7069.365	40.836	27.655	PK	13.181	54.000	-13.164

7. CONCLUSION

The data collected relate only the item(s) tested and show that the **WIRELESS-BGN 2X2 NETWORK MINI PCIE ADAPTER IC: 7849A-WLE200N2** has been tested to comply with the requirements specified in ICES-003 of the IC Rules.