

FCC PART 15B, CLASS B
MEASUREMENT AND TEST REPORT

For

Billion Electric Co., Ltd.

8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City, Taiwan

FCC ID: QI3BIL-8920NE

Report Type: Original Report	Product Type: The Ultimate Residential Gateway
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Report Number: RSZ130423003-00A	
Report Date: 2013-05-29	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Billion Electric Co., Ltd.*'s product, model number: *BEC 8920NE (FCC ID: QI3BIL-8920NE)* or the "EUT" in this report was a *The Ultimate Residential Gateway*, which was measured approximately: 18.3 cm (L) x 12.7 cm (W) x 3.6 cm (H), rated input voltage: DC 12.0V from adapter. The highest operating frequency is 400 MHz.

Adapter 1 Information:

Model: SFF1200150A1BA

Input: 100-240 V~50/60Hz, 0.4A

Output: DC 12.0V, 1.5A

Adapter 2 Information:

Model: ADS18B-W 120150

Input: 100-240 V~50/60Hz, 0.5A

Output: DC 12.0V, 1.5A

Note: The serial product, models BEC 8920NE, BEC 8921NE, BiPAC 8920NE, BiPAC 8921NE, BEC 6920N, BEC 6921N, BiPAC 6920N and BiPAC 6921N are electrically identical, they have the same PCB Layout and schematic, the only difference is the ports and trade name, the model BEC 8920NE was selected to test which was explained in the attached product similarity declaration letter that was provided and guaranteed by applicant.

** All measurement and test data in this report was gathered from production sample serial number: 1304119 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-04-23.*

Objective

This report is prepared on behalf of *Billion Electric Co., Ltd.* in accordance with Part 2-Subpart J, Part 15- Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15B, Class B.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submission with FCC ID: QI3BIL-8920NE.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical mode which is provided by manufacture.

EUT Exercise Software

N/A

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

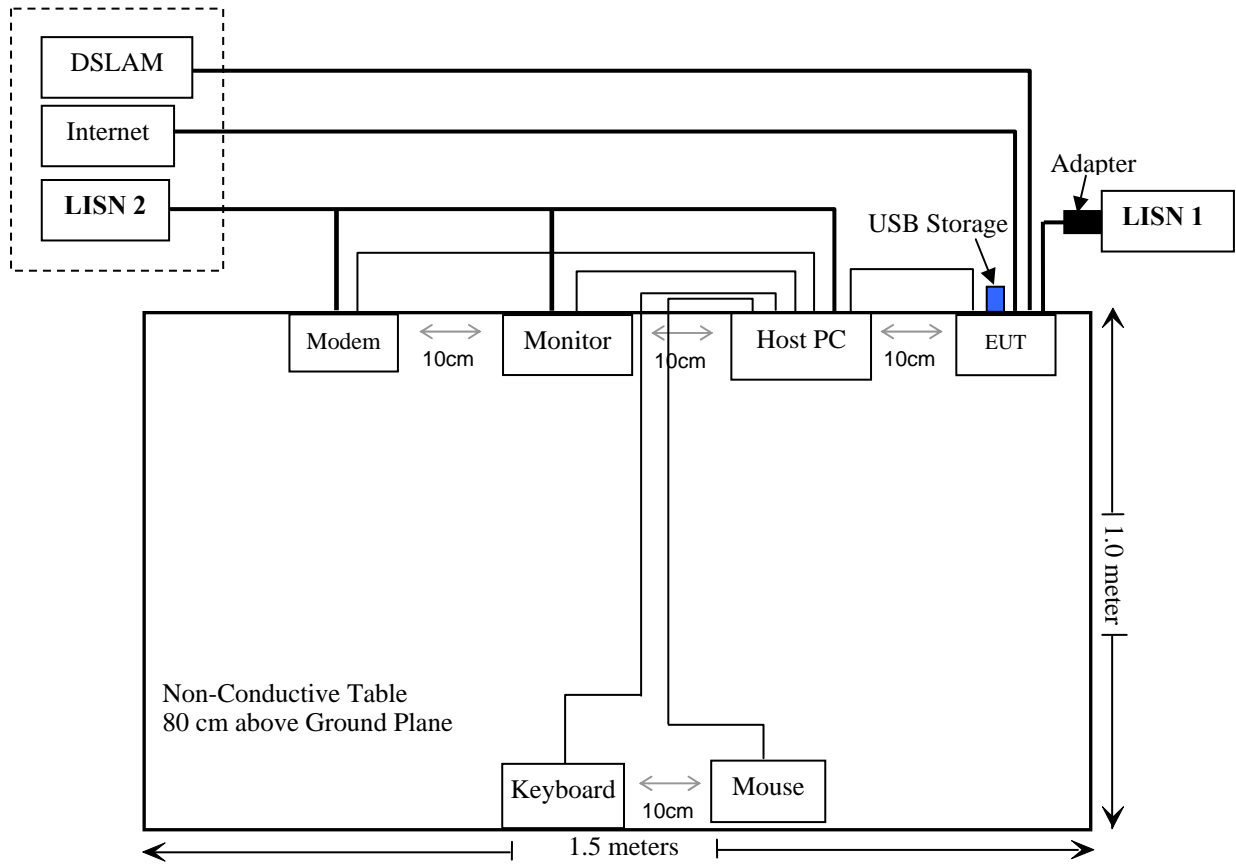
Manufacturer	Description	Model	Serial Number
DELL	PC	VOSTRO 220S	127BP2X
DELL	Keyboard	L100	CNORH656658907BL05DC
DELL	Mouse	MOC5UO	G1900NKD
DELL	LCD Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
SAST	Modem	AEM-2100	0293
Huawei	DSLAM	MA5105	N/A
Kingston	USB Storage	U204G-STJAMMDBG	972325

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielded Detachable Mouse Cable	1.5	Host PC	Mouse
Shielded Detachable Serial Cable	1.2	Host PC	Modem
Shielded Detachable K/B Cable	1.5	Host PC	Keyboard
Shielded Detachable VGA Cable	1.5	Host PC	Monitor
Shielded Detachable RJ45 Cable	1.5	EUT	Host PC
Shielded Detachable RJ11 Cable	1.5	EUT	DSLAM
Unshielded Detachable DC Power Cable	1.5	Adapter	EUT

Block Diagram of Test Setup

For AC line conducted emissions



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

FCC §15.107 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

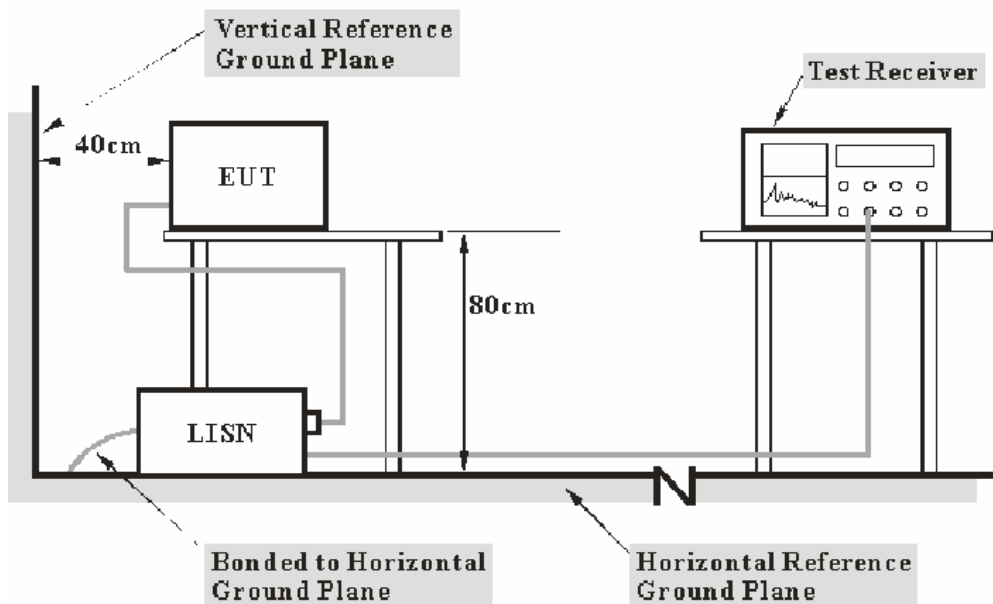
According to FCC §15.107

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 2.4 dB.(k=2, 95% level of confidence), and the uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.4-2009. The related limit was specified in FCC Part 15.107 Class B.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC 120V/60 Hz power source

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emissions, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-08
Rohde & Schwarz	1st LISN	ESH2-Z5	892107/021	2012-08-22	2013-08-22
COM-POWER	2nd LISN	LI-200	12208	NCR	NCR
BACL	CE Test software	BACL-CE	V1.0	-	-

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.107, with the worst margin reading of:

4.2 dB at **19.977599 MHz** in the **Line** conducted mode for downloading mode

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

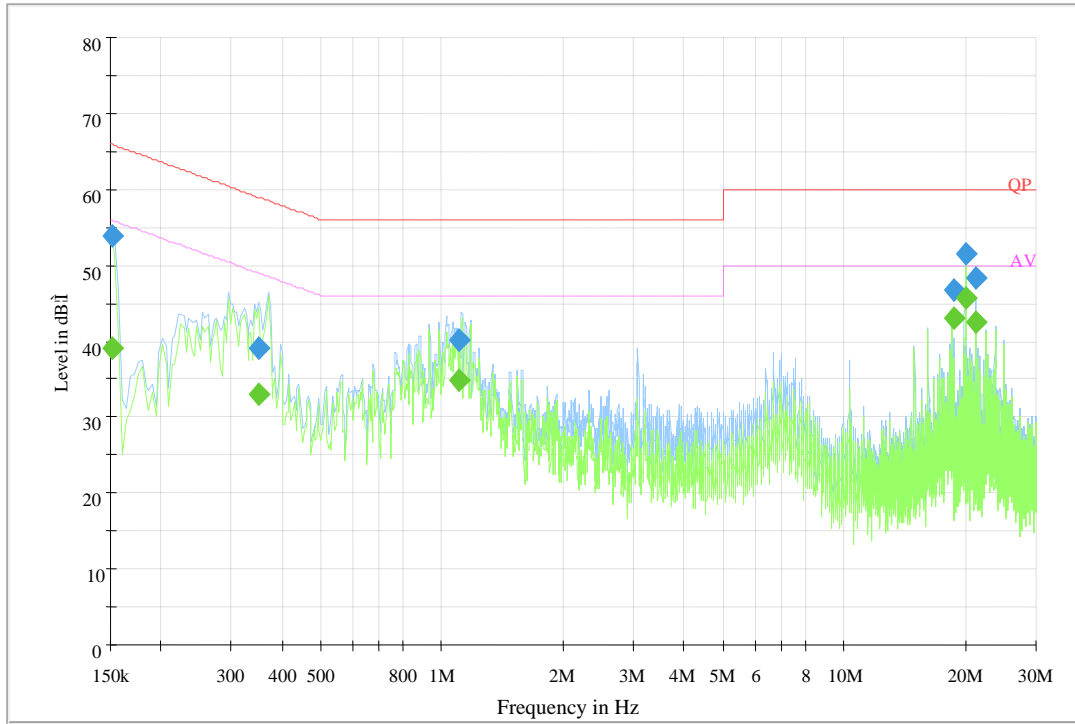
The testing was performed by Gardon Zhang on 2013-05-17.

EUT operation mode: Operating

Scan with two adapter, and worst case is adapter 1, the test data as below:

AC 120V/60 Hz, Line

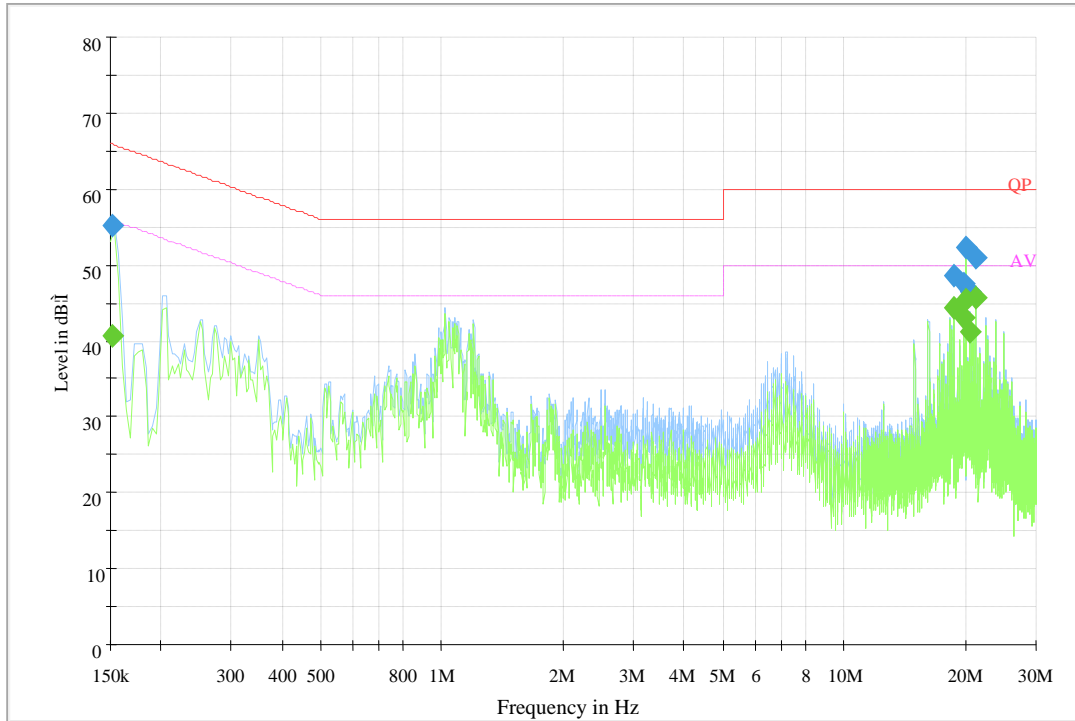
EMI Auto Test L



Frequency (MHz)	Corrected Amplitude (dBμV)	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Remark (PK/ QP/Ave)
19.977599	45.8	0.8	50.0	4.2	Ave.
18.730522	43.0	0.8	50.0	7.0	Ave.
21.216202	42.4	0.8	50.0	7.6	Ave.
19.977599	51.7	0.8	60.0	8.3	QP
1.098401	34.9	0.4	46.0	11.1	Ave.
21.216202	48.2	0.8	60.0	11.8	QP
0.151004	53.9	0.3	65.9	12.0	QP
18.730522	46.7	0.8	60.0	13.3	QP
1.098401	40.2	0.4	56.0	15.8	QP
0.348949	33.0	0.4	49.0	16.0	Ave.
0.151004	39.0	0.3	55.9	16.9	Ave.
0.348949	39.0	0.4	59.0	20.0	QP

AC 120V/60 Hz, Neutral

EMI Auto Test N



Frequency (MHz)	Corrected Amplitude (dBμV)	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Remark (PK/ QP/Ave)
19.985467	45.7	0.7	50.0	4.3	Ave.
21.231624	45.0	0.7	50.0	5.0	Ave.
18.736834	44.4	0.7	50.0	5.6	Ave.
19.847642	43.1	0.7	50.0	6.9	Ave.
20.437553	41.1	0.7	50.0	8.9	Ave.
19.985467	51.0	0.7	60.0	9.0	QP
21.231624	50.9	0.7	60.0	9.1	QP
0.152125	55.1	0.3	65.9	10.8	QP
18.736834	48.6	0.7	60.0	11.4	QP
19.847642	47.5	0.7	60.0	12.5	QP
20.437553	46.5	0.7	60.0	13.5	QP
0.152125	40.6	0.3	55.9	15.3	Ave.

Note:

- 1) Correction Factor = LISN/ISN VDF (Voltage Division Factor) + Cable Loss
The corrected factor has been input into the transducer of the test software.
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit - Corrected Amplitude

FCC §15.109 - RADIATED EMISSIONS

Applicable Standard

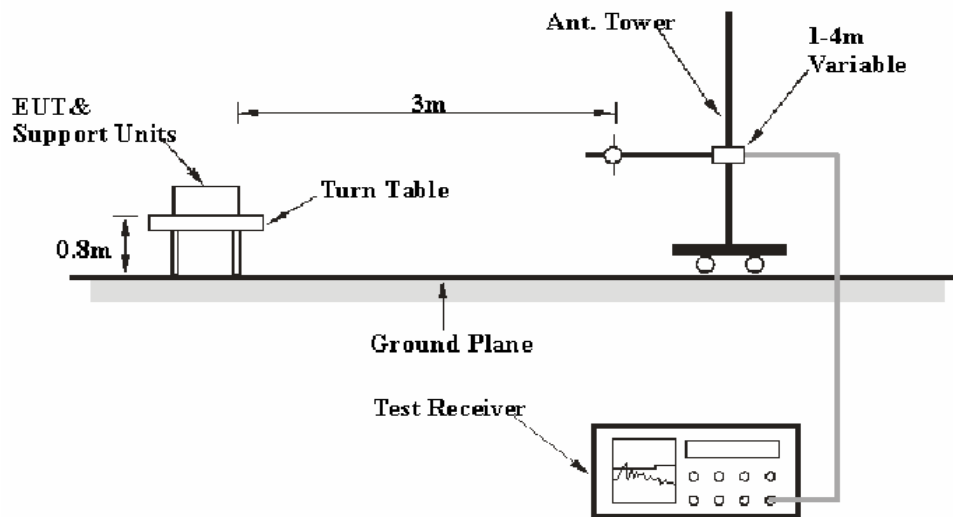
According to FCC §15.109

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB. ($k=2$, 95% level of confidence), and the uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC Part 15.109 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC 120V/60 Hz power source

EMI Test Receiver Setup

The system was investigated from 30 MHz to 2000 MHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

During the radiated emissions, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2012-11-24	2013-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2012-11-24	2013-11-24
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Super Ultra	Amplifier	ZVA-213+	N/A	2012-11-24	2013-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
R&S	Auto test Software	EMC32	V6.30	-	-

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Correction Factor} = \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.109, with the worst margin reading of:

2.4 dB at 249.94 MHz in the Vertical polarization

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Gardon Zhang on 2013-05-17.

EUT operation mode: Operating

Scan with two adapter, and worst case is adapter 2, the test data as below:

30MHz-2 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB μ V/m)	FCC Part 15.109	
	Reading (dB μ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
249.94	59.4	QP	0	1.2	V	-15.8	43.6	46	2.4
800.05	47.0	QP	278	1.7	H	-5.2	41.8	46	4.2
500.08	51.7	QP	148	1.4	V	-10.1	41.6	46	4.4
400.05	53.3	QP	152	1.0	H	-11.8	41.5	46	4.5
565.52	48.6	QP	227	1.6	H	-9.1	39.5	46	6.5
47.73	52.7	QP	136	1.7	V	-19.1	33.6	40	6.4
1991.9	38.29	Ave.	158	1.1	H	3.23	41.52	54	12.48
1991.9	33.47	Ave.	169	1.3	V	3.23	36.70	54	17.30
1991.9	50.84	PK	158	1.1	H	3.23	54.07	74	19.93
1991.9	46.81	PK	169	1.3	V	3.23	50.04	74	23.96

Note:

- 1) Corrected Amplitude = Corrected Factor + Reading
- 2) Corrected Factor=Antenna factor (RX) + Cable loss – Amplifier factor
- 3) Margin = Limit - Corrected Amplitude

PRODUCT SIMILARITY DECLARATION LETTER



Billion Electric Co., Ltd.

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2013-5-20

Product Similarity Declaration Letter

To Whom It May Concern,

We, Billion Electric Co., Ltd., hereby declare that our product The Ultimate Residential Gateway, the models list as below are electrically identical, they have the same PCB layout and schematic, the only difference are the ports and trade name. Model BEC 8920NE was tested by BACL. The detailed differences as the form below:

Model	GbE WAN	GbE LAN Port #4	10/100 LAN Port #1~#3	WIFI Antenna 11n (2Tx2R)	USB	VDSL / Bonded VDSL	Trade name
BEC 8920NE	YES	YES	YES	YES	YES	YES	BEC
BEC 8921NE	YES	YES	YES	YES	NO	YES	
BiPAC 8920NE	YES	YES	YES	YES	YES	YES	Billion
BiPAC 8921NE	YES	YES	YES	YES	NO	YES	
BEC 6920N	YES	YES	YES	YES	YES	NO	BEC
BEC6921N	YES	YES	YES	YES	NO	NO	
BiPAC 6920N	YES	YES	YES	YES	YES	NO	Billion
BiPAC 6921N	YES	YES	YES	YES	NO	NO	

Please contact me if you have any question.

Signature:
 Ted Ho
 CTO

*******END OF REPORT*******