

# RF Exposure Evaluation declaration

Product Name : 4G/LTE Broadband Router with PoE

Model No. : MX-210NP, MX-210

FCC ID : QI3BIL-MX210NP

Applicant : Billion Electric Co., Ltd.

Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,  
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Date of Receipt : Feb. 13, 2018

Date of Declaration : May 16, 2018

Report No. : 1820150R-SAUSP03V00

Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	4G/LTE Broadband Router with PoE
Model No.	MX-210NP, MX-210
Trade Name	BEC, Billion
IMEI No.	86110703
FCC ID	QI3BIL-MX210NP
TX Frequency	LTE Band 12: 699MHz~716MHz
Rx Frequency	LTE Band 12: 729~746MHz
Frequency Range (WLAN)	2412-2462MHz for 802.11b/g/n-20BW, 2422-2452MHz for 802.11n-40BW
HW Version	1.010
SW Version	1.04.1.249
Antenna Type	Dipole

Note: The different description of Model

Model	MX-210NP	MX-210
Product Name	4G/LTE Broadband Router with PoE	
Trade Name	BEC, Billion	
LTE antennas(SMA)	Detachable LTE Antenna *2pcs	
SIM slot (2FF)	1	
Ethernet Giga port	2	
802.11b/g/n	Yes	No
Power input from PoE PoE injector	802.3af/at type I (12.95W)	
Power Input: Power adapter	12VDC 1.2A	
External color	Casing: ABS / Dark blue	
Software	without VPN	

### 1.2. Antenna List :

No	Manufacturer	Part No	Antenna Type	Peak Gain
1	Cortec	AN0727-64DP5BSM	Dipole Antenna	0.28 dBi for LTE Band12
2	Grand-Tek Technology	N/A	PCB Antenna	2.5 dBi for 2.4GHz

## 2. RF Exposure Evaluation

### 2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (Minutes)
<b>(A) Limits for Occupational/ Control Exposures</b>				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
<b>(B) Limits for General Population/ Uncontrolled Exposures</b>				
300-1500	--	--	F/1500	30
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

$\pi$  = 3.1416

R = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

### 2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 22°C and 50% RH.

### 2.3. Test Result of RF Exposure Evaluation

Product : 4G/LTE Broadband Router with PoE  
 Test Item : RF Exposure Evaluation  
 Test Site : N/A

#### LTE Band 12 -Peak Gain: 0.28dBi

Frequency	Conducted Peak Power (dBm)	Maximum ERP/EIRP (W)	Maximum ERP/EIRP Limit (W)	Duty Cycle (%)	Conducted Average Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Pass/Fail
700.5	23.24	0.137	3	100	23.24	210.86	0.0447	0.467	Pass
707.5	23.40	0.142	3	100	23.4	218.78	0.0464	0.472	Pass
713.5	23.38	0.142	3	100	23.38	217.77	0.0462	0.476	Pass

Note: The conducted output power is refer to report No.: 1820150R-HPUSP40V00 from the DEKRA.

#### WLAN

##### Peak Gain for 2.4G: 2.5dBi

Band	Frequency	Conducted maximum Peak Power (dBm)	Duty Cycle (%)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Pass/Fail
2.4	2437	24.44	98.64	274.2	0.097	5.404	Pass

Note: The conducted output power is refer to report No.: 1820150R-RFUSP26V00 from the DEKRA.

### 2.4. calculations for Multi-Transmitter

Mode	Exposure Calculations	result	Limit	Pass/Fail
WLAN	0.0180	0.1164	1	Pass
WWAN	0.0984			