

# RF Exposure Evaluation Declaration

Product Name : 4G/LTE Industrial M2M Router  
Trade Name : BEC, Billion  
Model No. : MX-230 M1  
FCC ID. : QI3BIL-MX230M1

Applicant : Billion Electric Co., Ltd.  
Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,  
New Taipei City 231, Taiwan (R.O.C.)

Date of Receipt : Jul. 03, 2018  
Date of Declaration : Jul. 27, 2018  
Report No. : 1870018R-SAUSP03V00  
Report Version : V1.0



The declaration results relate only to the samples calculated.

The declaration shall not be reproduced except in full without the written approval of DEKRA Testing and Certification Co., Ltd..

## 1. RF Exposure Evaluation

### 1.1. 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)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

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

Where

$P_d$  = power density in  $\text{mW/cm}^2$

$P_{out}$  = 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,  $1 \text{ mW/cm}^2$ . 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.

### 1.2. 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:  $18^\circ\text{C}$  and 78% RH.

### 1.3. Test Result of RF Exposure Evaluation

Product	4G/LTE Industrial M2M Router
Test Mode	Mode 1: LTE_CAT-M1_Band 13_QPSK_Link Mode 2: LTE_CAT-M1_Band 13_16-QAM_Link
Test Condition	RF Exposure Evaluation

#### Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 0.28 dBi or 1.07 in linear scale.

#### Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> .)
	(dBm)	(mW)	(dBm)	(mW)		
779.5	25	316.23	23.91	246.04	0.052	0.520
782.0	25	316.23	24.08	255.86	0.054	0.521
784.5	25	316.23	23.72	235.50	0.050	0.523