IEEE C95.1

KDB 447498 D01 v06

47 C.F.R. Part 1, Subpart I, Section 1.1310
47 C.F.R. Part 2, Subpart J, Section 2.1091

RF EXPOSURE REPORT
For

3G/4G LTE Embedded with Dual-SIM Slots ADSL2+ Wireless-N VPN Firewall Router

Model: BiPAC 7820NZ

Data Applies To : BiPAC 7820NZL ; BiPAC 6820NZ ; BiPAC 6820NZL ; BEC 7820NZ ; BEC 7820NZL ; BEC 6820NZ ; BEC 6820NZL ; BiPAC 7800NZ ; BiPAC 7800NZL ; BiPAC 6800NZ ; BiPAC 6800NZL ; BEC 7800NZ ; BEC 7800NZL ; BEC 6800NZ ; BEC 6800NZL

Trade Name: Billion ; BEC

Issued for

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Issued by

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TAF
Testing Laboratory
0240

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	03/24/2017	Initial Issue	All Page	Gloria Chang

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1. TEST REPORT CERTIFICATION

We hereby certify that:

The equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirement of the applicable standards. The test record, data evaluation and Equipment under Test (EUT) configurations represented herein are true and accurate accounts of the measurement of the sample's RF characteristics under the conditions specified in this report.
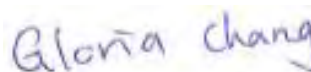
APPLICABLE STANDARD	
Standard	**Test Result**
IEEE C95.1 KDB 447498 D01 v06 47 C.F.R. Part 1, Subpart I, Section 1.1310 47 C.F.R. Part 2, Subpart J, Section 2.1091	No non-compliance noted

Approved by: *Prepared by:*

Sb. Lu   Gloria Chang
Sr. Engineer   Report coordinator

2. Limit

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

3. EUT Specification

Product Name	3G/4G LTE Embedded with Dual-SIM Slots ADSL2+ Wireless-N VPN Firewall Router
Model Number	BiPAC 7820NZ
Data Applies To	BiPAC 7820NZL ; BiPAC 6820NZ ; BiPAC 6820NZL ; BEC 7820NZ ; BEC 7820NZL ; BEC 6820NZ ; BEC 6820NZL ; BiPAC 7800NZ ; BiPAC 7800NZL ; BiPAC 6800NZ ; BiPAC 6800NZL ; BEC 7800NZ ; BEC 7800NZL ; BEC 6800NZ ; BEC 6800NZL
Identify Number	T161219S07
Received Date	May 26, 2014
Frequency band (Operating)	IEEE 802.11b/g/gn HT20 Mode: 2412MHz ~ 2462MHz IEEE 802.11gn HT40 Mode: 2422MHz ~ 2452MHz LTE Band 4: 1710.7MHz ~ 1754.2MHz
Device category	Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna Specification	Embedded Dipole Antenna × 2: Ant. 0 (Chain 0), Antenna Gain: 2.4 dBi Ant. 1 (Chain 1), Antenna Gain: 2.8 dBi LTE Antenna, Gain: 2.26dBi
Maximum average output power	IEEE 802.11b Mode: 19.27 dBm IEEE 802.11g Mode: 20.71 dBm IEEE 802.11gn HT20 MCS0 Mode: 21.31 dBm IEEE 802.11gn HT40 MCS0 Mode: 16.16 dBm LTE Mode: 22.8 dBm
Evaluation applied	MPE Evaluation*

Remark:
1. *For more details, please refer to the User's manual of the EUT.*
2. *This submittal(s) (test report) is intended for FCC ID: QI3BIL-7820NZ-4G filing.*
3. *The model BiPAC 7820NZ was considered the main model for testing.*

4. Test Results

No non-compliance noted.

<u>**Calculation**</u>

Given $E = \dfrac{\sqrt{30 \times P \times G}}{d}$ & $S = \dfrac{E^2}{3770}$

Where   E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \textbf{\textit{Equation 1}}$$

Where   d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

5. Maximum Permissible Exposure

Substituting the MPE safe distance using d = **20** cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm^2

Mode	Frequency (MHz)	Power (dBm)	Ant. Gain (dBi)	Distance (cm)	Power density (mW/cm^2)	Limit (mW/cm^2)
IEEE 802.11b	2412	19.27	2.4	20	0.0292	1
IEEE 802.11g	2437	20.71	2.4	20	0.0407	1
IEEE 802.11gn HT20 MCS0	2437	21.31	2.8	20	0.0513	1
IEEE 802.11gn HT40 MCS0	2422	16.16	2.8	20	0.0157	1
LTE Band 4	1745.0	22.8	2.26	20	0.0638	1.1633

Simultaneously MPE

Simultaneously MPE = MPE 1 / Limit 1 + MPE 2 / Limit 2 + ……..

WiFi 2.4GHz + LTE Band 4 Mode

Simultaneously MPE = (0.0513 / 1) + (0.0638 / 1.1633) = **0.1061 W/m^2**

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