APPENDIX I
RADIO FREQUENCY EXPOSURE

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.

EUT Specification

EUT	4G/LTE VoIP Wireless-N VPN Broadband Router
Model	BiPAC 6300VNOZ (Other series models, Please see the page 4.)
Trade Name	Billion
Frequency band (Operating)	☒ GPRS / EDGE 850MHz: 824.2MHz ~ 848.8MHz ☒ GPRS / EDGE 1900MHz: 1850.2MHz ~ 1909.8MHz ☒ WCDMA Band II: 1852.4MHz ~ 1907.6MHz ☒ WCDMA Band V: 826.4MHz ~ 846.6MHz ☒ LTE Band IV: 1710.0MHz ~ 1755.0MHz ☒ LTE Band XIII: 704.0MHz ~ 716.0MHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)

Antenna Specification

GPRS / EDGE 850MHz:
(1) AN0727-13B03SM 1.70 dBi (Numeric gain: 1.48)
(2) AN8921F-9219SM 2.50 dBi (Numeric gain: 1.78)
Type: Dipole Antenna

GPRS / EDGE 1900MHz:
(1) AN0727-13B03SM 1.70 dBi (Numeric gain: 1.48)
(2) AN8921F-9219SM 1.50 dBi (Numeric gain: 1.41)
Type: Dipole Antenna

WCDMA / HSDPA / HSUPA Band II:
(1) AN0727-13B03SM 1.70 dBi (Numeric gain: 1.48)
(2) AN8921F-9219SM 1.50 dBi (Numeric gain: 1.41)
Type: Dipole Antenna

WCDMA / HSDPA / HSUPA Band V:
(1) AN0727-13B03SM 1.70 dBi (Numeric gain: 1.48)
(2) AN8921F-9219SM 2.50 dBi (Numeric gain: 1.78)
Type: Dipole Antenna

LTE Band IV:
(1) AN0727-13B03SM 1.70 dBi (Numeric gain: 1.48)
(2) AN8921F-9219SM 1.50 dBi (Numeric gain: 1.41)
Type: Dipole Antenna

LTE Band XIII:
(1) AN0727-13B03SM 1.70 dBi (Numeric gain: 1.48)
(2) AN8921F-9219SM 2.50 dBi (Numeric gain: 1.78)
Type: Dipole Antenna

Measurement Average output power

System	Power	
GPRS850	32.90 dBm	(1949.84 mW)
EDGE850	26.10 dBm	(407.38 mW)
GPRS1900	28.90 dBm	(776.25 mW)
EDGE1900	24.70 dBm	(295.12 mW)
WCDMA Band II	22.48 dBm	(177.01 mW)
WCDMA Band V	22.54 dBm	(179.47 mW)
LTE Band IV	23.54 dBm	(225.94 mW)
LTE Band XIII	23.53 dBm	(225.42 mW)

Power Target / Tolerance

System	Target Power	Tolerance
GPRS850	32.0 dBm	± 1 dB
EGPRS850	27.0 dBm	± 1 dB
GPRS1900	29.0 dBm	± 1 dB
EGPRS1900	25.0 dBm	± 1 dB
WCDMA Band II	23.0 dBm	± 1 dB
WCDMA Band V	23.0 dBm	± 1 dB
LTE Band IV	23.0 dBm	± 1 dB
LTE Band XIII	23.0 dBm	± 1 dB

Max tune up Power / Max time Average Power

System	Max Tune up Power	Time Average Power
GPRS850	33.0dBm (1995.262mW)	24.0dBm (251.189mW)
EGPRS850	28.0dBm (630.957mW)	19.0dBm (79.433mW)
GPRS1900	30.0dBm (1000.000mW)	21.0dBm (125.893mW)
EGPRS1900	26.0dBm (398.107mW)	17.0dBm (50.119mW)
WCDMA Band II	24.0dBm (251.189mW)	24.0dBm (251.189mW)
WCDMA Band V	24.0dBm (251.189mW)	24.0dBm (251.189mW)
LTE Band IV	24.0dBm (251.189mW)	24.0dBm (251.189mW)
LTE Band XIII	24.0dBm (251.189mW)	24.0dBm (251.189mW)

Evaluation applied

☒ MPE Evaluation*
☐ SAR Evaluation
☐ N/A

Model Discrepancy

Product: 4G/LTE VoIP Wireless-N VPN Broadband Router

Model: BiPAC 6300VNOZ

Data Applies To : BiPAC 4500VNOZ,
BiPAC 6300VNPZ, BiPAC 4500VNPZ, BEC 6300VNL, RidgeWave 6300VNL
BiPAC 6300NZ, BiPAC 4500NZ,
BiPAC 6300NZL, BiPAC 4500NZL, BEC 6300NEL, RidgeWave 6300NEL

For FCC (BiPAC 6300VNOZ)

The difference of the model :												
Model /Difference Item	BiPAC 6300VNOZ	BiPAC 4500VNOZ	BiPAC 6300VNPZ	BiPAC 4500VNPZ	BEC 6300VNL	RidgeWave 6300VNL	BiPAC 6300NZ	BiPAC 4500NZ	BiPAC 6300NZL	BiPAC 4500NZL	BEC 6300NEL	RidgeWave 6300NEL
LAN	3	3	3	3	3	3	4	4	4	4	4	4
EWAN	1	1	1	1	1	1	1	1	1	1	1	1
UPS	1	1	1	1	1	1	0	0	0	0	0	0
USB	1	1	1	1	1	1	1	1	1	1	1	1
FXS	2	2	2	2	2	2	0	0	0	0	0	0
SIM	1	1	1	1	1	1	1	1	1	1	1	1
Note	For the marketing purpose											
Power Adapter	15V / 1.6A					15V / 1.6A						

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	April 13, 2015	Initial Issue	ALL	Doris Chu

TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

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:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

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

d (cm) = d(m) / 100

Yields

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

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

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 / cm²

GPRS850 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
190	836.6	251.189	1.78	20	0.0890	0.558

EGPRS850 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
190	836.6	79.433	1.78	20	0.0281	0.558

GPRS1900 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
661	1880	125.893	1.48	20	0.0371	1.000

EGPRS1900 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
512	1850.2	50.119	1.48	20	0.0148	1.000

WCDMA Band II mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
9538	1907.6	251.189	1.48	20	0.0740	1.000

WCDMA Band V mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
4128	836.4	251.189	1.78	20	0.0890	0.558

LTE Band IV mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
20350	1750	251.189	1.48	20	0.0740	1.000

LTE Band XIII mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
23255	784.5	251.189	1.78	20	0.0890	0.523