



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
Data Applies To	BiPAC 6300VNPZ ; BEC 6300VNL ; BiPAC 6300NZ ; BiPAC 6300NZL ; BEC 6300NL
Frequency band (Operating)	☒ LTE Band 12: 701.5MHz ~ 713.5MHz (Channel Bandwidth 5MHz) ☒ LTE Band 12: 704.0MHz ~ 711.0MHz (Channel Bandwidth 10MHz) ☒ WLAN: 2412MHz ~ 2462MHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure ($S = 5\text{mW/cm}^2$) ☒ General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$)
Average output power	LTE Band 12 : Channel Bandwidth 5MHz : QPSK : 24.26 dBm(266.686mW) 16QAM : 23.86 dBm(243.220mW) Channel Bandwidth 10MHz : QPSK : 23.10 dBm(204.174mW) 16QAM : 24.18 dBm(261.818mW) WLAN : IEEE 802.11b : 20.45dBm (110.9mW) IEEE 802.11g : 25.61dBm (363.9mW) IEEE 802.11n HT20 : 23.76dBm (237.4mW) IEEE 802.11n HT40 : 25.46dBm (351.6mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark : 1. For more details, please refer to the User's manual of the EUT.

2. The models BiPAC 6300VNOZ was considered the main model for testing.



Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2014/07/04	Initial Issue	ALL	Gloria Chang
01	2014/07/14	Revised	ALL	Gloria Chang

**Table 1: LTE Band 12 Channel Bandwidth 5MHz QPSK**

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW/cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
23155	713.5	286.418	371.535	1.48	20	0.0844	0.1094	0.5

Table 2: LTE Band 12 Channel Bandwidth 5MHz 16QAM

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW/cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
23155	713.5	243.220	371.535	1.48	20	0.0716	0.1094	0.5

Table 3: LTE Band 12 Channel Bandwidth 10MHz QPSK

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW/cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
23130	711.0	204.174	371.535	1.48	20	0.0601	0.1094	0.5

Table 4: LTE Band 12 Channel Bandwidth 10MHz QPSK

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW/cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
23155	711.0	261.818	371.535	1.48	20	0.0771	0.1094	0.5

Table 5: WLAN

Frequency (MHz)	Maximum Conducted Power		Gain (num.)	D (cm)	Power density in mW/cm ²	Limit (mW/cm ²)
	dBm	mW				
2437	25.61	363.9	1.72	20	0.124663	1



TEST RESULTS

No non-compliance noted.

Calculation

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

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:

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

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P / 1000) \times G}{3770 \times (d / 100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \textbf{Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

**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

Test Result**Table 1 : LTE Band 12 (701.5MHz ~ 713.5MHz) + WLAN**

Frequency (MHz)	WLAN (mW/cm ²)	FCC MPE Limit (mW/cm ²)	WLAN / MPE Limit	LTE Band 12 (mW/cm ²)	FCC MPE Limit (mW/cm ²)	LTE Band 12 / MPE Limit	(LTE + WLAN fraction)	Limit
713.5	0.0124663	1.000	0.0124663	0.0844	0.5	0.1688	0.1813	1.000
2437								

Table 2 : LTE Band 12 (704.0MHz ~ 711.0MHz) + WLAN

Frequency (MHz)	WLAN (mW/cm ²)	FCC MPE Limit (mW/cm ²)	WLAN / MPE Limit	LTE Band 12 (mW/cm ²)	FCC MPE Limit (mW/cm ²)	LTE Band 12 / MPE Limit	(LTE + WLAN fraction)	Limit
711.0	0.0124663	1.000	0.0124663	0.0771	0.5	0.1542	0.1667	1.000
2437								